FLOWSERVE

USER INSTRUCTIONS

ROTADISK Pneumatic Actuator

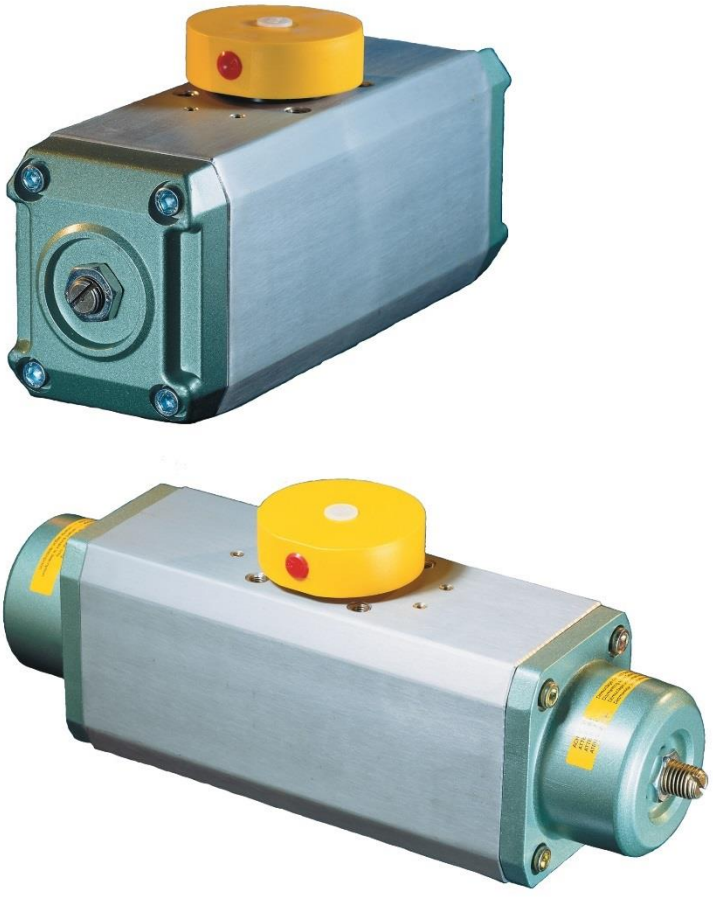
Type RD & RDF 2,5 – 160

BA3002 EN

Translation of Original Operating Manual

Installation
Operation
Maintenance

⚠	***Read and follow this operating manual before using a ROTADISK Pneumatic Actuator.***



Experience in Motion

Document version

Rev.: -, 30. Jul. 2021

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Overview of ROTADISK Pneumatic Actuator versions

Make		**ROTADISK**						
								
Series/type		RD						
Functional principle/ control type		double-action/pneumatic						
Version		2.5	5	10	20	40	80	160
Weight in kg		0.85	1.4	3.46	5.78	13.2	25.6	46.9
Dimensions in mm	L W H*	134 65 82	180 78 91	260 90 117	310 108 133	394 138 177	495 168 213	608 204 278
Stroke in mm		25	32	42	53	66	84	104
Piston-Ø in mm		40	50	65	80	102	130	165
Filling volume per stroke in l		0.07	0.14	0.28	0.56	1.12	2.2	4.5

*Height without position indicator

Make		ROTADISK						
								
Series/type		RDF						
Functional principle/control type		single-action (spring-loaded return)/pneumatic with failsafe function						
Version		2.5	5	10	20	40	80	160
Available spring package		–1 –1.5 –2 –2.5 –3				–1 –1.3 –1.5 –1.8 –2 –2.5 –3		
Weight in kg		1,15	1,48	4,43	7,93	15,5	31,1	64,2
Dimensions in mm	L W H*	187 65 82	260 78 91	340 90 117	440 108 133	485 138 177	630 168 213	835 204 278
Stroke in mm		25	32	42	53	66	84	104
Piston-Ø in mm		40	50	65	80	102	130	165
Filling volume per stroke in l		0.07	0.14	0.28	0.56	1.12	2.2	4.5

*Height without position indicator

Make		**ROTADISK Type RD & RDF**	
Materials	Body	aluminium alloy (anodised)	
	Lid	aluminium alloy (PU multilayer paint)	
	Piston	aluminium alloy	
	Transmission shaft	stainless steel	
Control media/ operating media		compressed air (dry, filtered according to PNEUROP/ISO class 4 [50 µ]) neutral gases such as N2, und CO2 hydraulic oil (water on request)	
Control pressure		3 to 8 bar (max. 8 bar)	
Operating temperature		standard: –20 °C to +80 °C temporary: –30 °C to +100 °C special version low temperature: –40 °C to +60 °C special version high temperature: –20 °C to +180 °C	
Direction of rotation		clockwise rotation anti-clockwise rotation (optional)	
Lubrication		permanent lubrication SAPPHIRE Lo-Temp 2 made by ROCOL	
Angle of rotation		90° ± 3° OPEN position, (not in RD 2.5) slewing actuator with stroke limitation (optional)	90° ± 3° OPEN position, (not in RDF 2,5) slewing actuator with stroke limitation (optional)
Spring load cycles		—	10^7 ≙ 10 000 000
Corrosion protection		anodised actuator body PU-painted lid	
Standardised interfaces for add-ons		fittings	DIN/ISO 5211 and DIN 3337
		signal devices	VDI/VDE 3845
		positioners	
		solenoid valves	– Namur 1/4"

Available spring packages with number of springs for ROTADISK Type RDF single-action (spring-loaded return)

Spring package	Number of large springs	Number of small springs	Number of special springs ("medium")
-1	0	2	0
-1.5	1	1	0
-2	2	0	0
-2.5	2	1	0
-3	2	2	0
-1.3	0	1	1
-1.8	0	0	2

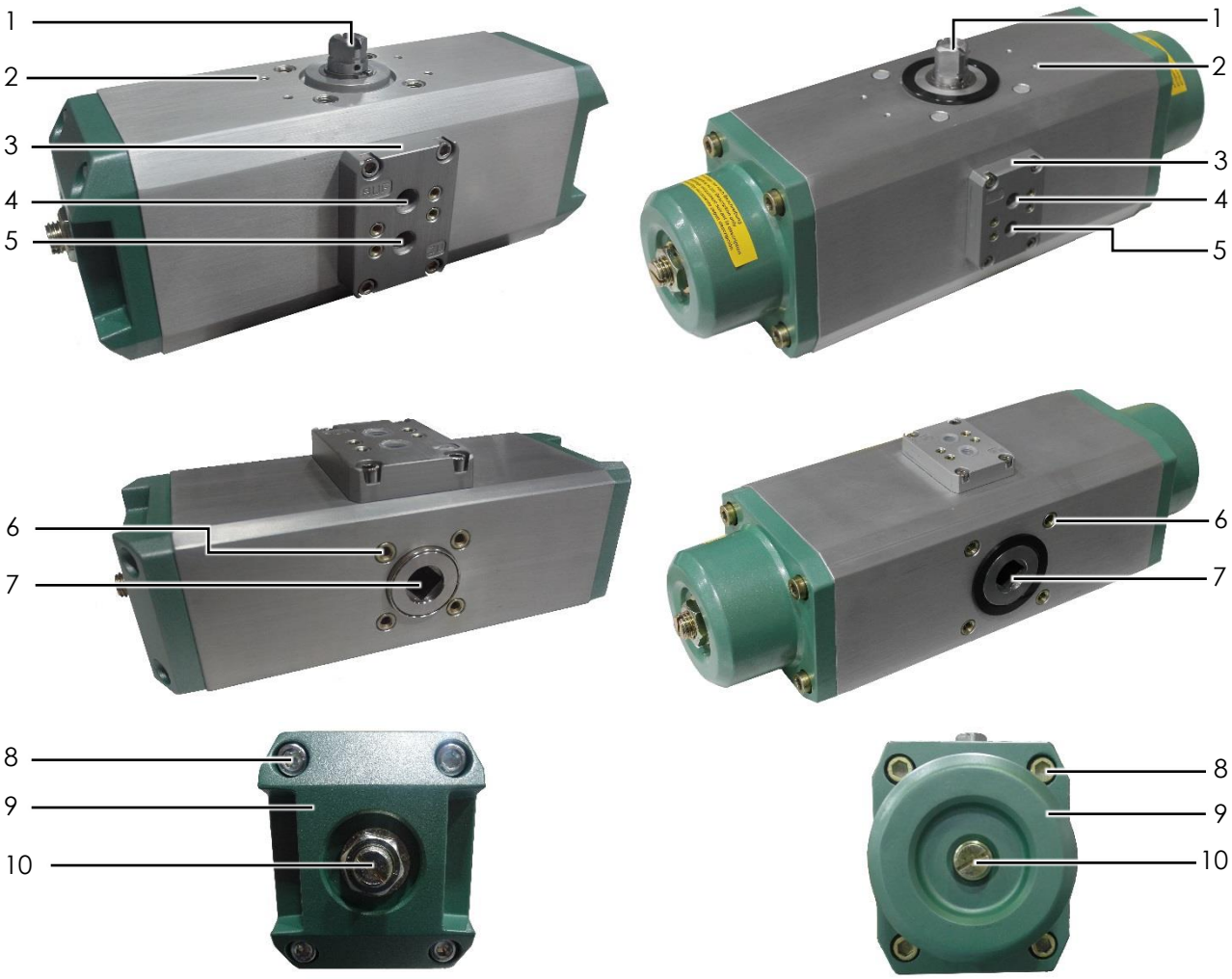


Figure 1: Components of the ROTADISK Pneumatic Actuators RD & RDF

Item	Component
1	transmission shaft (signal device side)
2	threaded fastening holes for signal devices (M5 x 7)
3	solenoid valve panel
4	control air connection OPEN
5	control air connection CLOSED
6	connection to fittings according to DIN ISO 5211
7	transmission shaft (fittings side)
8	hexagon socket head screws for fastening the lid
9	lid
10	threaded pin/end stop for end position setting (only in OPEN position is standard design, not in RD/F 2.5)

1 General Information

1.1 Aim of This Operating Manual

This operating manual is intended to familiarise the reader with the ROTADISK Pneumatic Actuator and its proper use. Use of the ROTADISK Pneumatic Actuator in compliance with this operating manual is important to ensure its functionality and to avoid hazards.

This operating manual contains information for qualified personnel for using the ROTADISK Pneumatic Actuator for its intended purpose.

Read this operating manual before using the ROTADISK Pneumatic Actuator in any region world-wide and pay particular attention to the safety-relevant warnings, information and notes.

Do not put the ROTADISK Pneumatic Actuator into operation until all the safe conditions referred to in this operating manual are satisfied.
Failure to observe the information contained in this operating manual will be considered as misuse of the product. Personal injury, product damages, holdups in operation or product failure due to misuse of the product are not covered by the Flowserve guarantee.

Observe all the relevant local health and work safety regulations at the place of work – even when these are not explicitly referred to in this operating manual.

Coordinate all repair work with the operating personnel and observe all safety regulations of the industrial plant and applicable health and safety laws.

Inform Flowserve Flow Control GmbH if documents are missing or incomplete. You will then receive replacements in electronic form.

Provide this operating manual at all workplaces near the production site.

1.2 Exclusion of Liability

The information in this operating manual can be considered as complete and reliable. Despite all efforts of Flowserve Flow Control GmbH to supply comprehensible information and instructions, good engineering and safety practice must be applied at all times. Please consult a qualified engineer if in doubt.

Flowserve Flow Control GmbH manufacturers products according to applicable international quality management standards which are audited by external quality assurance organisations. Original spare parts and original accessories have been designed, tested and incorporated into Flowserve products to ensure continuous product quality and product performance in use. Since Flowserve Flow Control GmbH cannot test the spare parts and accessories of other manufacturers, (incorrect) installation of these parts can have a detrimental effect on the performance and safety properties of the product. The wrong choice or incorrect installation or failure to use approved Flowserve spare parts and accessories will be considered as misuse of the product. Damage or failure due to product misuse is not covered by the Flowserve guarantee. Moreover, any modifications to

Flowserve products or the removal of original components can impair the safety of the products in use.

1.3 Safety Information

This safety section contains detailed explanations of the different types of safety messages that are used in this operating manual.

In accordance with ANSI standard Z535.6, safety information is classified in:

- *Supplemental Directives*
- *Grouped Safety Messages*
- *Section Safety Messages*
- *Embedded Safety Messages*

Supplemental Directives are complementary safety messages containing one or more safety-relevant actions to ensure safe use of the ROTADISK Pneumatic Actuator. *Supplemental Directives* are usually found at the beginning of a chapter in this operating manual.

Grouped Safety Messages contain grouped general safety information to ensure safe use of the ROTADISK Pneumatic Actuator. *Grouped Safety Messages* can be found in section 2.1 Grouped Safety Messages and in several safety sections of a chapter.

Section and Embedded Safety Messages warn against residual hazards which might possibly occur during proper use and improper use (reasonably foreseeable misuse) of the ROTADISK Pneumatic Actuator.
In addition, *Section and Embedded Safety Messages* offer safety information for avoiding hazards resulting from various work situations and danger areas within the scope of the product life cycle.

Section Safety Messages can be found in the safety section of a chapter.

Embedded Safety Messages can be found in front of a potentially very dangerous action.

1.3.1 Safety Symbols and Description

This operating manual contains specific safety messages with signal word fields which, if unheeded, could constitute a hazard. The specific signal word fields are:

Table 1: Explanation of the signal word fields

Signal word field	Description
DANGER	**DANGER** This signal word field indicates an immediate dangerous activity which can result in death or severe injury. Observe all safety messages with this signal word field to avoid the danger.
WARNING	**WARNING** This signal word field indicates a potentially dangerous activity which can result in death or severe injury. Observe all safety messages with this signal word field to avoid the danger.
CAUTION	**CAUTION** This signal word field indicates a potentially dangerous activity which can result in slight or minor injury. Observe all safety messages with this signal word field to avoid the danger.
NOTICE	**NOTICE** This signal word field indicates an activity which can lead to material damage. Observe all safety messages with this signal word field to avoid the danger.

Table 2: Additional symbols

Symbol/Warning Sign	Description
	**GENERAL DANGER** Indicates a danger which can lead to danger for the safety of persons and/or material damage if not heeded.
	**DANGER FROM HEAVY OBJECTS** Indicates danger from a heavy object which can lead to danger for the safety of persons and/or material damage if not heeded.
	**DANGER FROM EXPLOSIVE MATERIAL** Indicates danger from explosive material which can lead to danger for the safety of persons and/or material damage if not heeded.

Symbol/Warning Sign	Description
	**DANGER FROM MOVING PARTS** Indicates danger from moving parts which can lead to danger for the safety of persons and/or material damage if not heeded.
	**DANGER FROM SUSPENDED LOADS** Indicates danger from a suspended load which can lead to danger for the safety of persons and/or material damage if not heeded.
	**DANGER FROM TOXIC SUBSTANCES** Indicates danger from toxic substances which can lead to danger for the safety of persons and/or material damage if not heeded.
	**DANGER FROM HOT SURFACES** Indicates danger from a hot surface which can lead to danger for the safety of persons and/or material damage if not heeded.
	**DANGER FROM INFLAMMABLE MATERIALS** Indicates danger from inflammable materials which can lead to danger for the safety of persons and/or material damage if not heeded.
	**DANGER FROM MEDIA UNDER PRESSURE** Indicates danger from media under pressure which can lead to danger for the safety of persons and/or material damage if not heeded.
	**DANGER HIGH VOLTAGE** Indicates danger from high voltage which can lead to danger for the safety of persons and/or material damage if not heeded.
	**DANGER FROM AN EXPLOSIVE ATMOSPHERE** Indicates danger from an explosive atmosphere in accordance with ATEX which can lead to danger for the safety of persons and/or material damage if not heeded.
	**ENVIRONMENT HAZARD** Indicates an environment hazard from environmentally harmful hazardous materials.

Symbol/Warning Sign	Description
	**HEALTH HAZARD** Indicates a health hazard from irritant hazardous substances.
	**HEALTH HAZARD** Indicates a health hazard from inflammable hazardous materials.
	**HEALTH HAZARD** Indicates a health hazard from explosive hazardous materials.
	Indicates a potential danger of personal injury and/or material damage. Please observe all the supplemental directives with this warning sign.
	Indicates particularly important information. Observe all general information with this symbol.
1. **2.** **3.**	Introduces an action.
☝	Indicates a prerequisite for an action referring to a subsequent action.
▶	Indicates a secondary action or an action within a safety directive.
✓	Indicates the result of previous actions.
■	Indicates a list entry.

1.3.2 Graphic Convention and Content Structure of the General Information

The following graphic conventions and content structure apply for general information:

 General information

Example:

This operating manual contains further information about the use of the ROTADISK Pneumatic Actuator.

1.3.3 Graphic Convention and Content Structure of Safety Directives

Supplemental Directives

The following graphic convention and content structure apply for Supplemental Directives:

	***Action***

Example:

	***Provide this operating manual at all workplaces near the production site.***

Grouped Safety Messages

The following graphic convention and content structure apply for *Grouped Safety Messages*:

Signal word field

Type and source of danger!

Consequences of failure to heed.

- ▶ Action for avoiding the hazard.

Example:

NOTICE

Danger of material damage due to inadequately qualified personnel!

Inadequate qualification of the personnel can lead to material damage on the ROTADISK Pneumatic Actuator.

- ▶ Make sure that only qualified personnel with suitable personal protective equipment (PPE) and suitable tools are deployed.
  ↳ See chapter 2 Safety Information.
- ▶ Make sure that no unauthorised persons have access to the ROTADISK Pneumatic Actuator.

Section Safety Messages

The following graphic convention and content structure apply for *Section Safety Messages*:

Warning sign	Signal word field **Type and source of danger!** Consequences of failure to heed. ▶ Action for avoiding the hazard.

Signal word field

Type and source of danger!

Consequences of failure to heed.

- ▶ Action for avoiding the hazard.

Example:

⚠WARNING

Danger of injury due to inadequately secured loads during transport!

Inadequate securing of transported loads can lead to severe injuries.

▶ Secure the ROTADISK Pneumatic Actuator against turning and tipping.

NOTICE

Danger of material damage due to inadequately secured loads during transport!

Inadequate securing of transported loads can lead to material damage.

▶ Secure the ROTADISK Pneumatic Actuator against turning and tipping.

Embedded Safety Messages

The following graphic convention and content structure apply for *Embedded Safety Messages*:

Signal word field

Type and source of danger!

Consequences of failure to heed.

▶ Action for avoiding the hazard.

Example:

⚠DANGER

Danger of injury from falling loads!

Falling of suspended loads can lead to severe injury or death.

▶ Never stand beneath suspended loads.

1.4 Units

The metric unit system (SI) is used in this operating manual.

1.5 Graphic Conventions for Special Designations

The following graphic conventions apply for special designations:

- For better legibility, some special English designations consisting of two or more parts are written in *italics*.
- For better legibility, object designations (for example, buttons, text fields, switches, levers, knobs) of a product (machine or software) are written in CAPITALS.

1.6 ROTADISK Pneumatic Actuator as a "Partially Completed Machine"

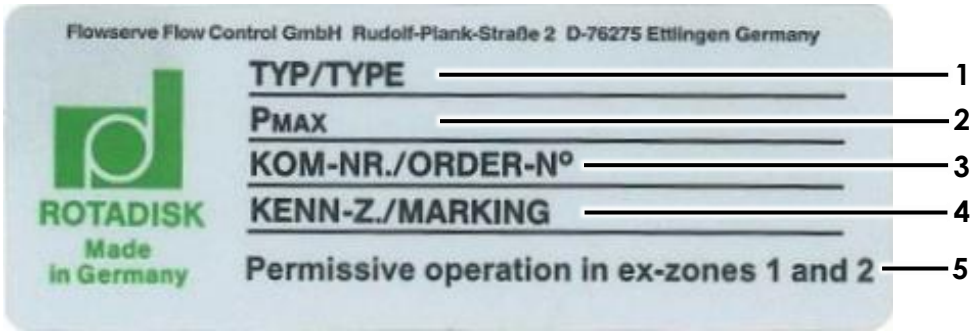
The automatic ARGUS Ball Valve, i.e. an assembly comprising an ARGUS Ball Valve and permanently fixed ROTADISK Pneumatic Actuator with the appropriate control components for automatic switching can be considered as a "machine" in the sense of the European Machinery Directive 2006/46/EC. The ROTADISK Pneumatic Actuator prepared for assembly with the ARGUS Ball Valve is a "partially completed machine" in the sense of the Machinery Directive.

This operating manual for the ROTADISK Pneumatic Actuators is part of the overall documentation of the assembly (ARGUS Ball Valve and ROTADISK Pneumatic Actuator).

1.7 Nameplate: Identification of the ROTADISK Pneumatic Actuator

The nameplate that is affixed permanently to the ROTADISK Pneumatic Actuator contains the most important information regarding the design and application of the ROTADISK Pneumatic Actuators.

If the nameplate is missing or illegible, do not put the ROTADISK Pneumatic Actuator into operation and contact the *Quick Response Center (QRC)* of Flowserve Flow Control GmbH for support.



1 Type designation
(e.g. RDF 10-3 | RDF = version | 10 = size [from 2.5 to 160] | -3 = spring package [only for RDF actuators])

2 Maximum control pressure in bar

3 Commissioning number/order number

4 Identification number/serial number

5 Identification in which explosive areas (ex-zones) its use is permitted

2 Safety Information

2.1 Grouped Safety Messages

The following sections contain *Grouped Safety Messages* for the qualification of personnel and for the important life cycle phases of the ROTADISK Pneumatic Actuator.

2.1.1 Qualification of Personnel

⚠WARNING

Danger of injury due to inadequately qualified personnel!

Inadequate qualification of the personnel can lead to severe injury.

- Make sure that only qualified personnel with suitable personal protective equipment (PPE) and suitable tools are deployed.
  ↳ See chapter 2 Safety Information.
- Make sure that no unauthorised persons have access to the ROTADISK Pneumatic Actuator.

NOTICE

Danger of material damage due to inadequately qualified personnel!

Inadequate qualification of the personnel can lead to material damage on the ROTADISK Pneumatic Actuator.

- Make sure that only qualified personnel with suitable personal protective equipment (PPE) and suitable tools are deployed.
  ↳ See chapter 2 Safety Information.
- Make sure that no unauthorised persons have access to the ROTADISK Pneumatic Actuator.

2.1.2 Life Cycle Phases of the ROTADISK Pneumatic Actuator

Installation

⚠WARNING **NOTICE**

Danger of injury and material damage due to improper installation work!

Improper installation work can lead to severe injury and material damage.

- Make sure that only qualified personnel with suitable personal protective equipment (PPE) and suitable tools are deployed.
  ↳ See chapter 2 Safety Information.
- Make sure that no unauthorised persons have access to the ROTADISK Pneumatic Actuator.
- Make sure that the ROTADISK Pneumatic Actuator is designed for the special operating conditions.
- Make sure that falling of parts is ruled out by taking appropriate safety precautions at the work places.

Commissioning/Shutting Down and Dismantling

⚠WARNING **NOTICE**

Danger of injury and material damage due to improper commissioning/shutdown!

Improper commissioning/shutdown can lead to severe injury and material damage.

- Make sure that only qualified personnel with suitable personal protective equipment (PPE) and suitable tools are deployed.
  ↳ See chapter 2 Safety Information.
- Make sure that no unauthorised persons have access to the ROTADISK Pneumatic Actuator.
- Make sure that the ROTADISK Pneumatic Actuator is designed for the special operating conditions.
- Make sure that falling of parts is ruled out by taking appropriate safety precautions at the work places.

Maintenance/Repair

⚠WARNING **NOTICE**

Danger of injury and material damage due to improper maintenance/repair work!

Improper maintenance/repair work can lead to severe injuries and material damage.

- Make sure that only qualified personnel with suitable personal protective equipment (PPE) and suitable tools are deployed.
  ↳ See sections 2.2 to 2.4.
- Make sure that no unauthorised persons have access to the ROTADISK Pneumatic Actuator.
- Make sure that the ROTADISK Pneumatic Actuator is designed for the special operating conditions.
- Use only original spare parts from Flowserve Flow Control GmbH.
- Make sure that falling of parts is ruled out by taking appropriate safety precautions at the work places.
- Do not carry out repair work on the ROTADISK Pneumatic Actuator during operation or when it is under pressure.
- If repair work must be carried out, contact Flowserve Flow Control GmbH Service Teams or the *Flowserve Quick Response Centers* for support.

Storage

⚠WARNING **NOTICE**

Danger of injury and material damage due to improper storage work!

Improper storage work can lead to severe injuries and material damage.

- Make sure that only qualified personnel with suitable personal protective equipment (PPE) and suitable tools are deployed.
  ↳ See sections 2.2 to 2.4.
- Make sure that no unauthorised persons have access to the ROTADISK Pneumatic Actuator.

Packing

⚠WARNING **NOTICE**

Danger of injury and material damage due to improper packing work!

Improper packing work can lead to severe injuries and material damage.

- Make sure that only qualified personnel with suitable personal protective equipment (PPE) and suitable tools are deployed.
  ↳ See sections 2.2 to 2.4.
- Make sure that no unauthorised persons have access to the ROTADISK Pneumatic Actuator.

Transport

⚠WARNING **NOTICE**

Danger of injury and material damage due to improper transport work!

Improper transport work can lead to severe injuries and material damage.

- Make sure that only qualified personnel with suitable personal protective equipment (PPE) and suitable tools are deployed.
  ↳ See sections 2.2 to 2.4.
- Make sure that no unauthorised persons have access to the ROTADISK Pneumatic Actuator.
- Secure the ROTADISK Pneumatic Actuator against turning and tipping.
- Properly attach slings to the ROTADISK Pneumatic Actuator.
- If the lifting gear is only attached to the ROTADISK Pneumatic Actuator, never lift the entire unit of ball valve and pneumatic actuator.
- Protect the ROTADISK Pneumatic Actuator against damage with a suitable transport protection (e.g. a packing blanket).
- Observe all transport securing regulations.

2.2 Responsibility of the Owner Company

ROTADISK Pneumatic Actuators are frequently used as safety-relevant components in industrial plants and pipeline systems. The owner company is responsible for the intended use or intended operation of the ROTADISK Pneumatic Actuator and all the necessary work during the Pneumatic Actuator's life cycle. They will take all the necessary preventive safety measures to protect the personnel and the environment.

The owner company is responsible for taking the following preventive safety measures:

- All applicable laws, technical safety regulations and standards, rules for avoiding accidents and protecting the environment as well as company regulations shall be observed and enforced.
- Correct use of the ROTADISK Pneumatic Actuator shall be ensured.

- The operating conditions and limits of the ROTADISK Pneumatic Actuator shall be continuously monitored and all risks ensuing from operation of the ROTADISK Pneumatic Actuator shall be eliminated.
- Only personnel qualified for the necessary work in the life cycle of the ROTADISK Pneumatic Actuator shall be deployed.
- The personnel shall be provided with extensive personal protective equipment (PPE) and suitable tools.
- A risk assessment of the company premises on which the ROTADISK Pneumatic Actuators are operated shall be carried out.
- Company-specific work instructions shall be compiled for operation of the ROTADISK Pneumatic Actuator.
- It shall be continuously monitored that the personnel have read and understood all the pertinent instructions and this operating manual.
- The personnel shall be kept up to date with the latest knowledge by regular training courses.

2.3 Qualified Personnel

Qualified personnel are authorised by an individual who is responsible for the operational safety of the industrial plant or the pipeline system. He/she is empowered to perform all the necessary activities within the scope of his/her experience, knowledge of all applicable laws, technical safety regulations and standards, rules for avoiding accidents and protecting the environment as well as company regulations and operating conditions. Qualified personnel are capable of recognising and avoiding dangers.
The owner company shall ensure that only qualified personnel are deployed for the necessary work within the ROTADISK Pneumatic Actuator life cycle.

2.4 Personal Protective Equipment

It is the owner company's responsibility to provide the operating personnel with high-quality personal protective equipment (PPE). This personal protective equipment must also be suitable for work on the ROTADISK Pneumatic Actuator within the scope of the life cycle. The following personal protective equipment must be provided by the owner company:

Table 3: Personal protective equipment

Personal protective equipment	
	Protective helmet
	Protective glasses
	Protective gloves
	Safety shoes

2.5 Qualification of the Personnel

The personnel of the owner company who are entrusted to work on the ROTADISK Pneumatic Actuator must have suitable knowledge and skills as well as satisfying the following prerequisites:

- Adequate qualification and personal aptitude for the respective activity.
- Successfully completed user training for supervised or unsupervised work with the ROTADISK Pneumatic Actuator.
- Knowledge of the personal protective equipment (PPE) and its correct use.
- Knowledge of this operating manual and especially knowledge of the safety messages and the chapters relevant to the activities to be performed.
- Knowledge of the basic directives/regulations regarding health and safety and prevention of accidents.

2.6 Target Groups

This operating manual is intended for the following target groups:

2.6.1 Owner Company Management

The management of the owner company makes compliance and management decisions and can be held responsible for their decisions.

2.6.2 Specialists

Specialists have completed special technical training and have knowledge and experience of the relevant work requirements and suitable work equipment. Specialists are able to carry out the tasks assigned to them independently and to recognise and avoid possible work-related hazards.

2.6.3 Instructed Workers

Instructed workers have received instruction from the owner company in all the work to be performed and the work-related hazards.

2.6.4 Work Activities of the Target Groups

The table below lists the work activities assigned to the target groups.

In order to avoid personal injury and/or material damage, make sure that only target groups with suitable qualifications are allowed to perform the work listed in Table 4: Target groups with assigned work activities.

Table 4: Target groups with assigned work activities

Target groups	Work activities
Management and executives of the owner company	■ Compliance and organisation management (this includes initial reading and observance of this operating manual ■ Compilation of training documents and conducting of training courses
Specialists	■ Installation ■ Commissioning/shutdown ■ Maintenance (service) ■ Repair (fault rectification/troubleshooting) ■ Returns management and disposal ■ Other related work
Instructed workers	■ Unpacking ■ Packing ■ Transport ■ Storage ■ Other related work

2.7 Product Warranty Information

All improper uses of the ROTADISK Pneumatic Actuator can impair its function. This will lead to the voiding of all product warranty rights!

Please note that the owner company is liable in the following cases:

- The ROTADISK Pneumatic Actuator is operated in a way that is not compliant with this operating manual, especially with regard to the safety messages, handling instructions and section 2.8 Intended Use.
- The ROTADISK Pneumatic Actuator is put into operation by personnel who are not qualified for work on the ROTADISK Pneumatic Actuator.
- The ROTADISK Pneumatic Actuator is used with spare parts and/or accessories from third suppliers which do not originate from Flowserve Flow Control GmbH.
- The ROTADISK Pneumatic Actuator is operated with unauthorised modifications.

2.8 Intended Use

The ROTADISK Pneumatic Actuator is intended to be used within the operating parameters/operating limits for switching valves.

⚠	***In order to avoid personal injury and/or material damage, make sure that the operating parameters on the nameplate and the structural design of the ROTADISK Pneumatic Actuator are suitable for the specific application.*** ***See section 1.7 Nameplate: Identification of the ROTADISK Pneumatic Actuator.*** ***Observe all labels on the ROTADISK Pneumatic Actuator and keep in a legible condition.*** ***Replace damaged and/or illegible labels immediately if necessary.***

ROTADISK Pneumatic Actuators are basically suitable for use in explosive areas (ex-zones 1 and 2). ROTADISK Pneumatic Actuators have no own potential ignition sources when used as intended and are therefore not “devices” in the sense of article 1 of the directive 2014/34/EU (“ATEX Directive”).

2.9 Misuse

Misuse (only reasonably foreseeable misuse) is identified in the following cases:

- The ROTADISK Pneumatic Actuator is not used for switching valves (e.g. ball valves)
- The ROTADISK Pneumatic Actuator is not operated within the operating parameters/limits specified on the nameplate.
- Installation, commissioning, maintenance, repair and other work on the ROTADISK Pneumatic Actuator are not carried out according to this operating manual.
- The ROTADISK Pneumatic Actuator is out into operation without observing the instructions on the product.
- The ROTADISK Pneumatic Actuator is modified or used with spare parts that are not provided by Flowserve Flow Control GmbH.
- The ROTADISK Pneumatic Actuator is out into operation without all acceptance test criteria being successfully fulfilled.
- The ROTADISK Pneumatic Actuator is operated in a partially installed state.

If there are any doubts regarding the suitability of the ROTADISK Pneumatic Actuator for the respective intended use, contact the *Quick Response Center (QRC)* of Flowserve Flow Control GmbH and state the serial number or article number of the ROTADISK Pneumatic Actuator that is specified on the nameplate.

If the application conditions change (for example, fluids, temperature or pressures), contact the *Quick Response Center (QRC)* of Flowserve Flow Control GmbH for support before putting the ROTADISK Pneumatic Actuator into operation.

2.10 General Sources of Hazard/Residual Hazards

This section describes general sources of hazard/residual hazards that exist during intended and improper use (reasonably foreseeable misuse).

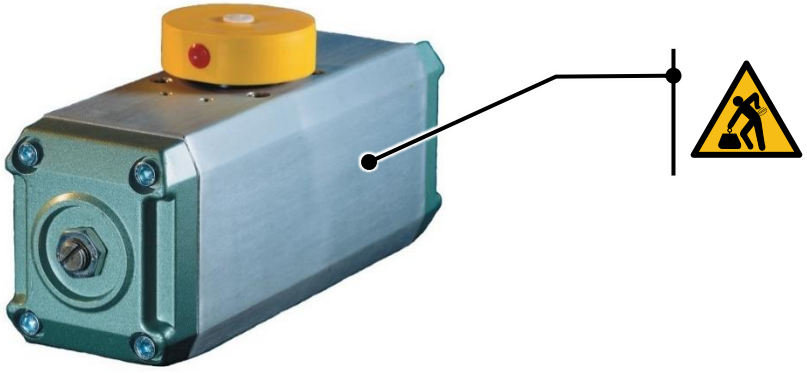


Figure 2: General sources of hazard/residual hazards of the ROTADISK Pneumatic Actuator

⚠WARNING

Danger of injury from a heavy ROTADISK Pneumatic Actuator!

A heavy ROTADISK Pneumatic Actuator (≥ 15 kg) can lead to back injuries when lifted without aids (e.g. lifting gear).

- ▶ Only lift the ROTADISK Pneumatic Actuator in accordance with the owner's safety protocol, the local regulations and industrial standards.
- ▶ Examine the approximate weight and stability of the ROTADISK Pneumatic Actuator before lifting the ROTADISK Pneumatic Actuator.
- ▶ Only lift the ROTADISK Pneumatic Actuator (≥ 15 kg) with suitable mechanical aids in accordance with current laws.
- ▶ Always wear personal protective equipment (PPE).

In addition, the following can occur in case of misuse (reasonably foreseeable misuse):

- Failure of basic pneumatic actuator functions
- Material damage to the industrial plant and pipeline system
- Failure of necessary maintenance and repair work
- General risks of injury for the operating personnel

3 Product Description

3.1 General Product Description

The ROTADISK Pneumatic Actuators serve for valve automation. They are available in two types:

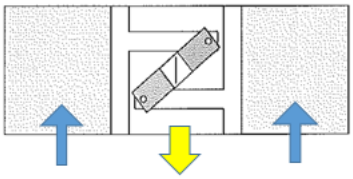
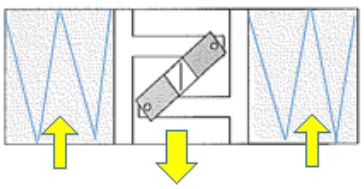
- RD (double-action)
- RDF (single-action or spring-loaded return)

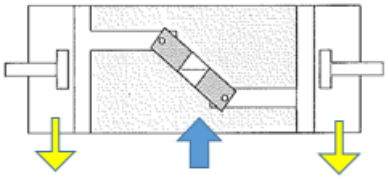
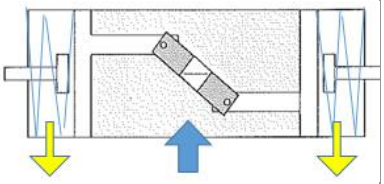
ROTADISK Pneumatic Actuators are based on a pneumatic twin piston drive according to the Scotch-Yoke principle which are designed primarily for switching check valves and ball valves. The twin piston drive is available in double-action and single-action versions.
With the smallest possible outer dimensions, the Scotch-Yoke principle enables a high torque in the end positions.

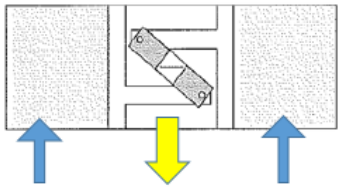
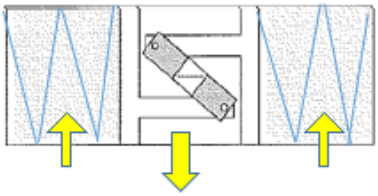
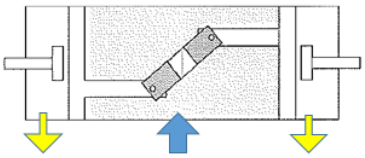
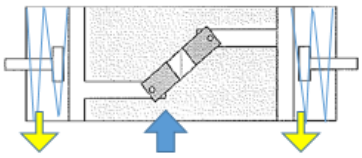
The basic position in the standard design is CLOSED (*NC: normally closed* for single-action or spring-loaded return RDF pneumatic actuators) and the standard direction of rotation, looking onto the ROTADISK Pneumatic Actuator from above is clockwise (right-hand rotation) for closing and anti-clockwise (left-hand rotation) for opening.

There is also an optional alternative design with standard OPEN position (*NO: normally open* for single-action or spring-loaded return RDF pneumatic actuators). In this case, the direction of rotation is anti-clockwise (left-hand rotation) for closing and clockwise (right-hand rotation) for opening.

The tables below show the relation between design, type and piston position/transmission shaft position:

Design	standard right-hand rotation (CW) or spring closing, *Normally Closed* (NC) or *Fail Close* (FC)	
Basic position	CLOSED	
Type	RD double-action	RDF single-action (spring closing)
Piston position/transmission shaft position after applied pressure/ venting	transmission shaft position: CLOSED  interior vented exterior pressurised	transmission shaft position: CLOSED  interior vented

	transmission shaft position: OPEN  interior pressurised exterior vented	transmission shaft position: OPEN  interior pressurised

Design	alternative left-hand rotation (CCW) or spring opening, *Normally Open* (NO) or *Fail Open* (FO)	
Basic position	OPEN	
Type	RD double-action	RDF single-action (spring opening)
Piston position/transmission shaft position after pressure applied/ venting	transmission shaft position: OPEN  interior vented exterior pressurised	transmission shaft position: OPEN  interior vented exterior vented
	transmission shaft position: CLOSED  interior pressurised exterior vented	transmission shaft position: CLOSED  interior pressurised exterior vented

ROTADISK Pneumatic Actuators have a fail-safe function. This function ensures that the position is LOAD in the event of a compressed air drop in double-action ROTADISK Pneumatic Actuators of the RD type. This means that the ROTADISK Pneumatic Actuator stays in its last position in the event of a compressed air drop.

In single-action ROTADISK Pneumatic Actuators of the RDF type, the fail-safe function causes the ROTADISK Pneumatic Actuator to move into the CLOSED position by means of the springs (spring closing or *Fail Close*) in the event of a compressed air drop. Alternatively, it is

also possible that the ROTADISK Pneumatic Actuator moves into the OPEN position by means of the springs (spring opening or *Fail Open*) in the event of a compressed air drop.

The slewing angle of the ROTADISK Pneumatic Actuators can be adjusted by ±3° with the standard end position setting[1].
The ROTADISK Pneumatic Actuators of the RD & RDF types have standardised interfaces for adding signal devices, positioners, solenoid valves and valves.

3.2 Variants

The ROTADISK Pneumatic Actuators of the RD & RDF types are available in different variants which differ with regard to the size, spring package and sealing material.

3.3 Functional Description

The ROTADISK Pneumatic Actuators of the RD & RDF types operate according to the double wing functional principle. The generated force is converted by two pistons (twin piston principle) and a lever, the double swing arm, into useful torque at the drive shaft. The design principle of the double swing arm achieves optimum transformation of the energy of the compressed air into the useful torque. The user therefore benefits from a low air consumption.

A high start and end torque results from the characteristic kinematic. The drive torque characteristic therefore corresponds almost ideally with the torque behaviour of a ball valve or a check valve. The compact design also allows later automation in confined spaces. The anodised drive body and the PU-painted li das well as the rust and acid-resistant drive shaft ensure reliable functioning even under the harsh conditions of the chemical industry.

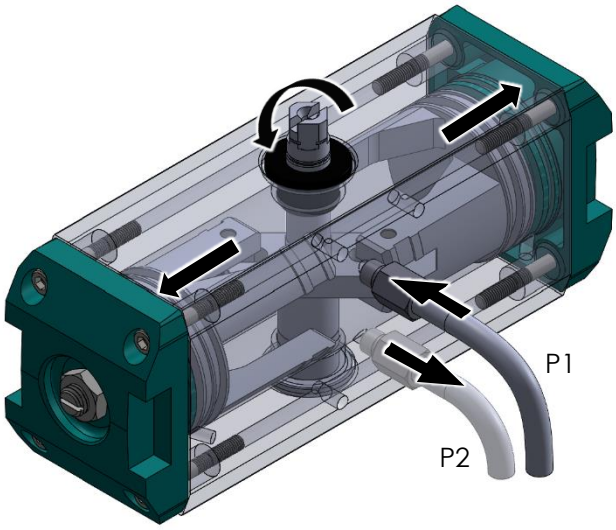
The springs of the single-action pneumatic actuators are designed for more than 10^7 load cycles and have optimal corrosion protection.

[1] The end position setting is only possible in the open position of right-hand rotating pneumatic actuators or the closed position of left-hand rotating pneumatic actuators. The end position setting is not possible in the RD/RDF 2.5 models.

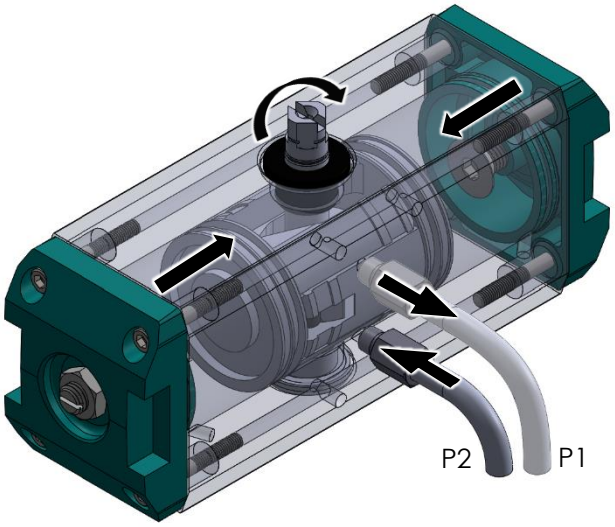
3.3.1 Double-action Function (ROTADISK Pneumatic Actuator Type RD)

The following functional description refers to a ROTADISK Pneumatic Actuator in standard design (see section 3.1).

The interior of the ROTADISK Pneumatic Actuators is pressurised through connection “P1” between the two pistons. The pistons move apart. The force of both pistons is transmitted to by the double swing arm to the drive shaft which rotates anti-clockwise by 90°. This moves the pneumatic actuator into the “OPEN” position.



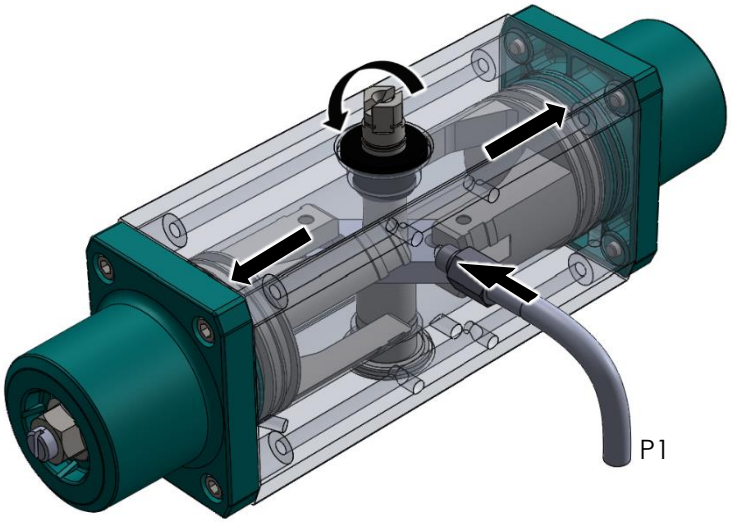
If connection “P2” is pressurised and “P1” vented, the two outer chambers are pressurised and the pistons move together. The drive shaft then rotates clockwise by 90° and the pneumatic actuator moves into the “CLOSED” position.



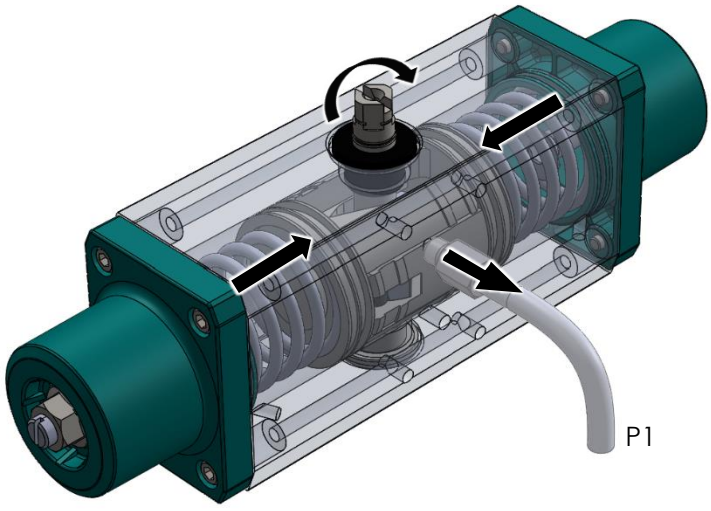
3.3.2 Single-action Function (ROTADISK Pneumatic Actuator Type RDF)

The following functional description refers to a ROTADISK Pneumatic Actuator in standard design (see section 3.1).

The interior is pressurised through connection “P1” between the two pistons. The pistons move apart and press the springs together. The force of both pistons is transmitted to by the double swing arm to the drive shaft which rotates anti-clockwise by 90°. This moves the pneumatic actuator into the “OPEN” position.



On venting the connection “P1“, the spring force resets the pistons to the basic position whereby the drive shaft rotates clockwise by 90° and the pneumatic actuator moves into the “CLOSED” position.



3.4 Scope of Delivery

The scope of delivery usually includes the following components:

- ROTADISK Pneumatic Actuator (usually switch to closed position)
- Operating manual (digital) including the EU declaration of conformity and declaration of incorporation
- Documents demanded by law or by the customer

Check whether the delivery complies with the specifications on the delivery note upon receipt of the goods.
Report any deviations immediately to the carrier and Flowserve Flow Control GmbH.

4 Receipt of Goods

4.1 Safety Information

⚠	***To avoid personal injury and/or material damage, make sure that the goods are examined and unpacked only by qualified personnel with suitable personal protective equipment (PPE) and suitable tools.*** ***See chapter 2 Safety Information.***

4.2 Examining Received Goods

1. Check the ROTADISK Pneumatic Actuator against the delivery note for completeness immediately upon receiving the goods.

ⓘ A delivery note is enclosed with every delivery.
The information on the nameplate of the ROTADISK Pneumatic Actuator serves for clear identification and must match the information on the delivery note.

2. Check the ROTADISK Pneumatic Actuator for transport damage.
3. Report any defects and/or material damages immediately to the carrier and Flowserve Flow Control GmbH.

ⓘ Flowserve Flow Control GmbH must receive all claims in writing within one month of receipt of the ROTADISK Pneumatic Actuator.
Please note that Flowserve Flow Control GmbH will be unable to accept later claims.

✓ Examination of the received goods is completed.

4.3 Unpacking the ROTADISK Pneumatic Actuator

1. Open the box or wooden crate.
2. Loosen and remove the entire packing and load securing material (for example, wedges).
3. Lift the ROTADISK Pneumatic Actuator out of the box and/or wooden crate (↳ see chapter 12 Transport).

ⓘ In case of a heavy ROTADISK Pneumatic Actuator (≥ 15 kg), the ROTADISK Pneumatic Actuator must be lifted out of the box or wooden crate with lifting gear and straps (↳ see chapter 12 Transport).

4. Break up the box and/or wooden crate.
5. Dispose of boxes and/or wooden crates, pallets, support frames, skeleton boxes and all packing and load securing materials that are no longer needed (see also section 13.2 for disposal).
6. Transport the ROTADISK Pneumatic Actuator carefully to the application site (↳ see the chapter 12 Transport).

✓ Unpacking of the ROTADISK Pneumatic Actuators is completed.

5 Installation

5.1 Safety Information

To avoid personal injury and/or material damage, make sure that installation work is performed only by qualified personnel with suitable personal protective equipment (PPE) and suitable tools.
See chapter 2 Safety Information.

DANGER

Danger of injury due to incorrect installation of the ROTADISK Pneumatic Actuator on the valve!

Incorrect installation can lead to the valve not switching correctly. This can cause severe injuries or even death.

- ▶ Make sure, on installation, that the valve and the pneumatic actuator have identical basic settings.

NOTICE

Danger of material damage due to incorrect installation of the ROTADISK Pneumatic Actuator on the valve!

Incorrect installation can lead to the valve not switching correctly. This can cause material damage.

- ▶ Make sure, on installation, that the valve and the pneumatic actuator have identical basic settings.

5.2 Preparations for ROTADISK Pneumatic Actuator Installation

Make the following preparations before installing the ROTADISK Pneumatic Actuator on the valve or pipeline:

- Make sure that the load capacity of the pipeline is sufficient to support the ROTADISK Pneumatic Actuator with valve and add-on components.
- Make sure that there is enough free space around the ROTADISK Pneumatic Actuator with valve and add-on components to allow installation work without risks.
- Provide suitable installation equipment (e. g. lifting gear, installation device, torque wrench, open-ended wrench, valve wrench, assembly grease).
- Determine suitable installation alternatives (direct installation or installation by means of console).

Direct installation is possible when the dimensions of the drive shaft and the ISO flange of the ROTADISK Pneumatic Actuator match those of the valve (e. g. ball valve) and the ISO flange of the valve has a through-hole. Differences in dimensions to transmission shaft of the valve could be compensated by optionally available reducers.

Installation by means of a console is necessary when the differences in dimensions between the drive shaft of the ROTADISK Pneumatic Actuator and the transmission shaft of the actuator cannot be compensated by reducers or the ISO flanges do not match. This installation alternative can also be used for high/low medium temperatures or thick pipe insulations.

5.3 Installing ROTADISK Pneumatic Actuator on the Valve

The ROTADISK Pneumatic Actuator has a standardised DIN/ISO 5211 valve interface on which valves can be mounted with the aid of installation kits in accordance with EN 15081.
For valve installation, see also the enclosed valve product information (e. g. operating manual).

Important for the correct switching of the valve by the ROTADISK Pneumatic Actuator is that the valve and the pneumatic actors have an identical basic setting. Contact the *Quick Response Center (QRC)* of Flowserve Flow Control GmbH for installation support.

Figure 3: ARGUS Ball Valve with installed ROTADISK Pneumatic Actuator RDF (closed ball position)

6 Commissioning

6.1 Safety Information

To avoid personal injury and/or material damage, make sure that commissioning, flushing and pressure testing work is performed only by qualified personnel with suitable personal protective equipment (PPE) and suitable tools.
See chapter 2 Safety Information.

DANGER

Danger of injury due to failure to observe plant-specific regulations!

Failure to observe plant-specific regulations can cause severe injuries or even death.

- Observe plant-specific regulations.
- Observe safety information in section 2.1.

NOTICE

Danger of material damage due to control medium!

A wrong control medium or too high control pressure (> 8 bar) can cause material damage to the ROTADISK Pneumatic Actuator.

- Use only a gaseous control medium (usually compressed air or neutral gases such as N_2, CO_2.
- Pressurise the ROTADISK Pneumatic Actuator with maximum 8 bar control pressure.

6.2 Commissioning the ROTADISK Pneumatic Actuator

Observe the specifications in the manufacturer documentation (e.g. ball valve operating manual) of the automatic valve components for commissioning work.

1. Check the pipework and all control lines for leakages.
2. Connect the power supply to the pneumatic actuator control components.
3. Connect the compressed air supply.
4. Check the function of optionally mounted auxiliary devices.
5. Switch the valve (e.g. ball valve) with the ROTADISK Pneumatic Actuator and check whether
   - the valve opens and closes correctly.
   - the red dot on the yellow position indicator of the ROTADISK Pneumatic Actuator points in longitudinal or flow direction when the valve is open (opening of the ball parallel to flow direction).
   - the red dot on the yellow position indicator of the ROTADISK Pneumatic Actuator points transversely to the flow direction when the valve is closed (opening of the ball is turned 90° to the flow direction) (see Figure 3, page 38.

✓ Commissioning is completed.

7 Maintenance

7.1 Safety Information

To avoid personal injury and/or material damage, make sure that maintenance work is performed only by qualified personnel with suitable personal protective equipment (PPE) and suitable tools.
See chapter 2 Safety Information.

7.2 Required Spare Parts for Maintenance

Under particularly harsh operating conditions, the sealing elements of the ROTADISK Pneumatic Actuator can begin to show signs of wear after a certain time. Moreover, very critical or extreme operating conditions may necessitate periodic replacement of the ROTADISK Pneumatic Actuator components.

Suitable spare parts are required for maintenance work. Flowserve Flow Control GmbH offers repair sets or spare parts kits for every ROTADISK Pneumatic Actuator. In order for Flowserve Flow Control GmbH to be able to offer suitable repair sets and spare parts kits for the ROTADISK Pneumatic Actuator, the ROTADISK Pneumatic Actuator must be clearly identified.
This technical identification is provided either by a reference to the customer order documents (e.g. delivery note or invoice) or by the data on the nameplate.

7.3 Maintenance Plan

The recommended inspections/maintenance work can be carried out in the installed state. As a rule, it applies that the normal industrial plant operation must not be interrupted.
In case of a leakage, damage and/or faulty operating state: ↳ See chapter 8 Repair.

Table 5: Recommended maintenance work for the pipeline section

No.	Inspections/maintenance work	Interval
1	Check pneumatic actuator body and body lid for cracks.	every 3 months
2	Checked screwed hose unions for leaks (pressure loss) using a leak spray.	
3	Check seals of the threaded pins/end stops for leaks with a leak spray.	
4	Check whether a lock nut on the stop screws has come loose.	

8 Repair

8.1 Safety Information

	***To avoid personal injury and/or material damage, make sure that repair work is performed only by qualified personnel with suitable personal protective equipment (PPE) and suitable tools.*** ***See chapter 2 Safety Information.***

	**DANGER** **Danger of injury due to improper repair work on the ROTADISK Pneumatic Actuator!** Improper repair work on the ROTADISK Pneumatic Actuator can lead to severe injury or even death. ▶ Do not carry out repair work on a ROTADISK Pneumatic Actuator when it is in operation and/or under pressure. ▶ Do not carry out repair work on ROTADISK Pneumatic Actuators without consultation and support by Flowserve Flow Control GmbH. ▶ Do not unscrew the lid of the ROTADISK Pneumatic Actuator RDF without the disassembly device (the lids are under high spring tension!). ▶ Contact service teams of Flowserve Flow Control GmbH or the *Flowserve Quick Response Centers* if repair work needs to be carried out.

	**DANGER** **Danger of injury due to high spring tension!** A lid under spring tension can cause severe injury or even death if you remove it without an assembly device with press. ▶ Do not loosen/unscrew lid screws without an assembly device with press. ▶ Contact Flowserve Flow Control GmbH if no assembly device with press is available.

8.2 Required Spare Parts

Under particularly harsh operating conditions, the sealing elements of the ROTADISK Pneumatic Actuator can begin to show signs of wear after a certain time. Moreover, very critical or extreme operating conditions with approx. 500,000 to 1,000,000 cycles may necessitate periodic replacement of the ROTADISK Pneumatic Actuator components.
Suitable spare parts are required for this repair work. Flowserve Flow Control GmbH offers spare parts kits for every ROTADISK Pneumatic Actuator.
In order for Flowserve Flow Control GmbH to be able to offer suitable spare parts kits for the ROTADISK Pneumatic Actuator, the ROTADISK Pneumatic Actuator must be clearly identified.
This technical identification can be provided by the data on the nameplate.

8.3 Repairing the ROTADISK Pneumatic Actuator

Do not carry out your own repair work on ROTADISK Pneumatic Actuators without consultation and support by Flowserve Flow Control GmbH because the very size of the pneumatic actuator also presents a considerable danger.

The following repair instructions (installation and disassembly instructions) describe the replacement of (worn) seals which are usually the reason for leakages.
Please note that these repair instructions describe the principal procedure for replacing the seals of ROTADISK Pneumatic Actuators (RD/RDF 2,5–160) and that this repair work entails considerable risks.
Do not carry out your own repair work on the ROTADISK Pneumatic Actuator without suitable tools (e.g. an assembly device with press), original spare parts and prior consultation with Flowserve Flow Control GmbH.
In case of damage, contact the *Quick Response Center (QRC)* of Flowserve Flow Control GmbH.

8.3.1 Replacing Seals on the ROTADISK Pneumatic Actuator (RDF 2,5–160)

The ROTADISK Pneumatic Actuator is

- taken out of operation (no compressed air supply is connected).
- Disconnected from the valve and all other sub-assemblies (e.g. solenoid valve, limit switch, position indicator or position controller).

DANGER

Danger of injury due to high spring tension!

A lid under spring tension can cause severe injury or even death if you remove it without an assembly device with press.

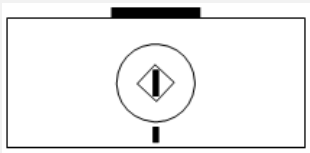
- ▶ Do not loosen/unscrew lid screws without an assembly device with press.
- ▶ Contact Flowserve Flow Control GmbH if no assembly device with press is available.

1. Make different marks on the edges of both lids [2] on the top of the body.

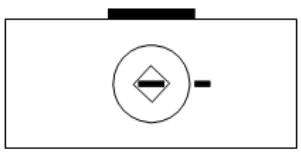
The marks simplify correct installation of the ROTADISK Pneumatic Actuator after disassembly.
Make sure that you do not adjust the nuts of the threaded pins/end stops so that the pre-set end position setting and thus the angle of rotation of 90° ± 3° is retained.

2. Mark the position of the drive shaft groove on the body [10].

Standard design
Fail Close (FC)



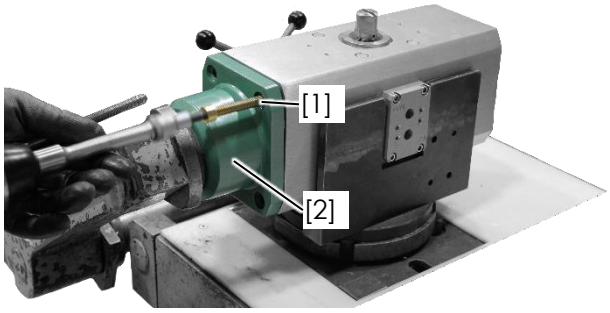
Alternative design (inverse direction of rotation)
Fail Open (FO)



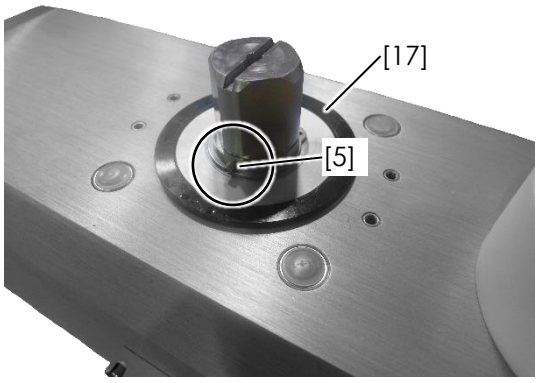
3. Clamp the ROTADISK Pneumatic Actuator in an assembly device with press.

The assembly device with press prevents the lid [2] from being flung off by spring tension when the lid screws [1] are unscrewed.

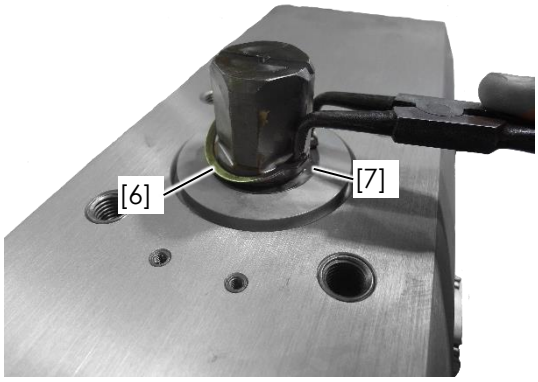
4. Loosen the lid screws [1] diagonally opposed on the lid [2].



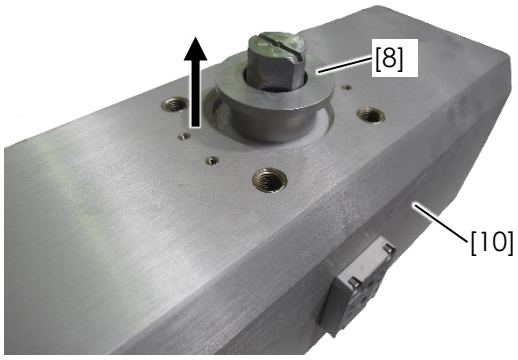
5. Take the spring package out of the side of the body.
6. Repeat the previous steps for the other side of the body.
7. Unscrew the locking pin (threaded pin) [5] from the drive shaft.
8. Remove the black support ring [17].



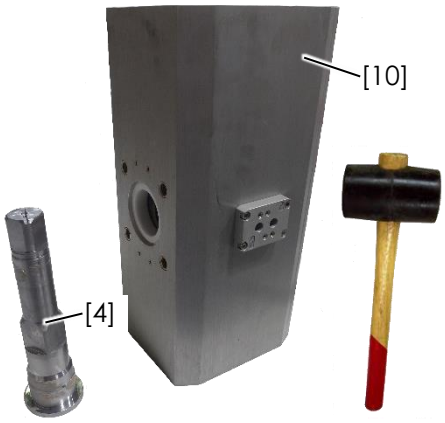
9. Remove the shaft locking ring [6] and the washer [7].



10. Pull the shim bushing [8] out of the body [10].



11. Knock the drive shaft [4] out of the body [10] with a rubber hammer.

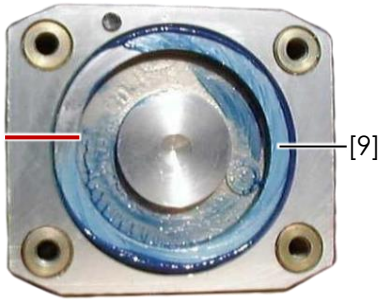


12. Remove the bearing bushes [15] and the Q/O-rings [12][14] from the body [10].

13. Press out the piston pair [9] with a soft tool until it is flush with the body [10].

14. Mark the piston [9] and the body end wall.

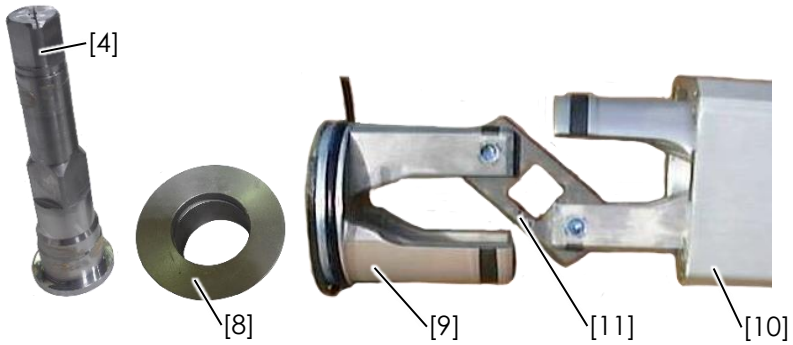
Ideally, a felt-tipped pen or scriber is used for marking.



15. Then push the piston pair [9] completely out of the body [10].

16. Clean the drive shaft [4], shim bushing [8], double swing arm [11], body [10] and piston pair [9].

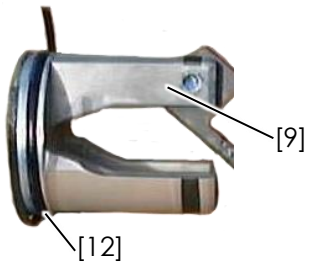
Do not use a solvent to clean the piston pair [10].



17. Grease the cleaned parts with low-temperature grease.

Flowserve Flow Control GmbH recommends the low-temperature grease SAPPHIRE Lo-Temp 2 made by ROCOL.

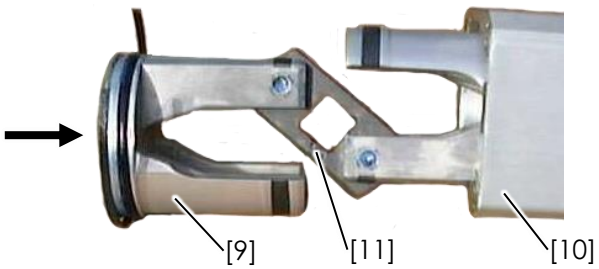
18. Pull the new O-rings [12] onto both pistons [9].



19. Assemble the two pistons [9] with the double swing arm [11] in a piston pair [9].

20. Hold the guide bands tight and push the piston pair [9] back into the body [10].

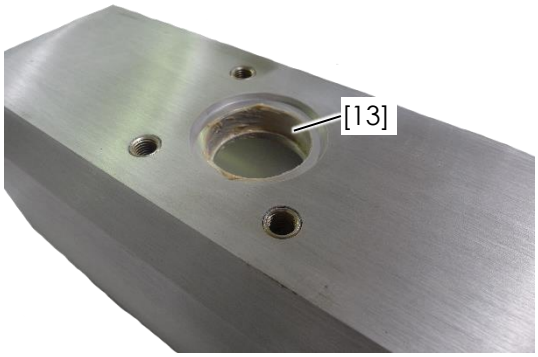
Make sure that the marks on the piston [9] and body wall are in line.



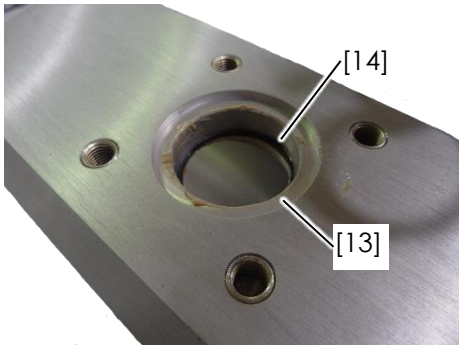
21. Centre the piston [9] or double swing arm [11] in the middle below the shaft bearing.

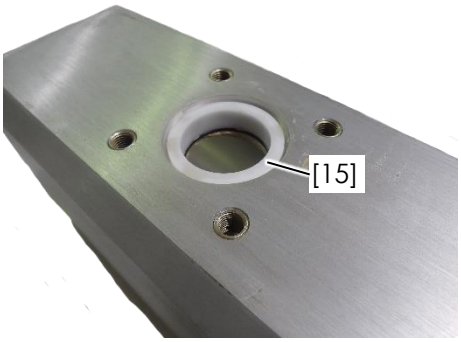
22. Grease the bearing opening [13] on the bottom side of the body flange.

Flowserve Flow Control GmbH recommends the low-temperature grease SAPPHIRE Lo-Temp 2 made by ROCOL.



23. Fit a new Q-ring [14] to the bottom side of the body flange and a new bearing bush [15] into the bearing opening [13].

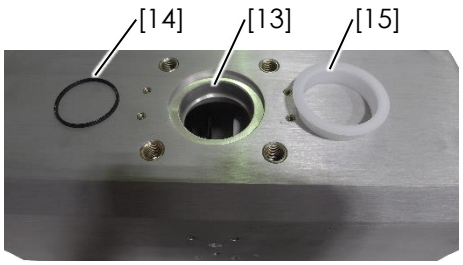




24. Grease the bearing opening [13] on the top body flange side.

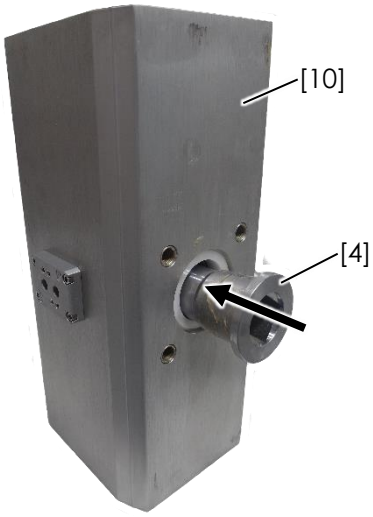
Flowserve Flow Control GmbH recommends the low-temperature grease SAPPHIRE Lo-Temp 2 made by ROCOL.

25. Fit a new greased Q-ring [14] on the top body flange side and a new bearing bush [15] into the bearing opening [13].



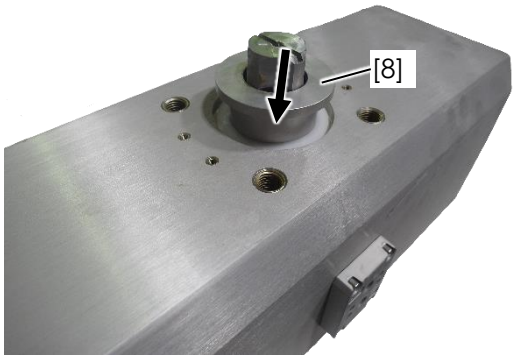
26. Press the greased drive shaft [4] carefully into the body [10] from the bottom.

Make sure that the groove in the drive shaft [4] has the original position (transverse or parallel to the longitudinal axis).

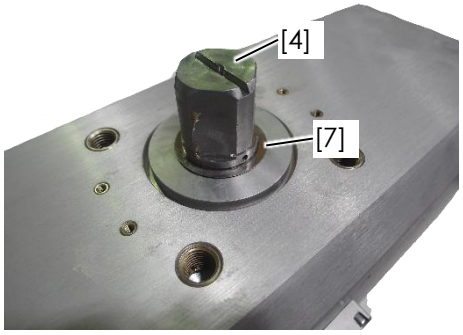


27. Place a new O-ring [12] in the shim bushing [8].

28. Insert the shim bushing [8] into the bearing opening.

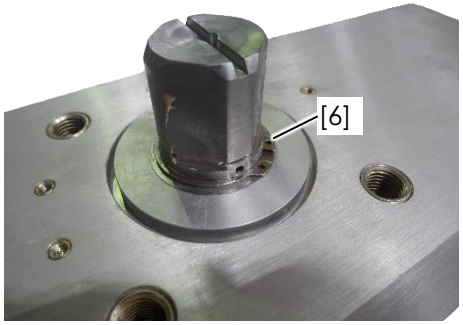


29. Place the washer [7] over the drive shaft [4].



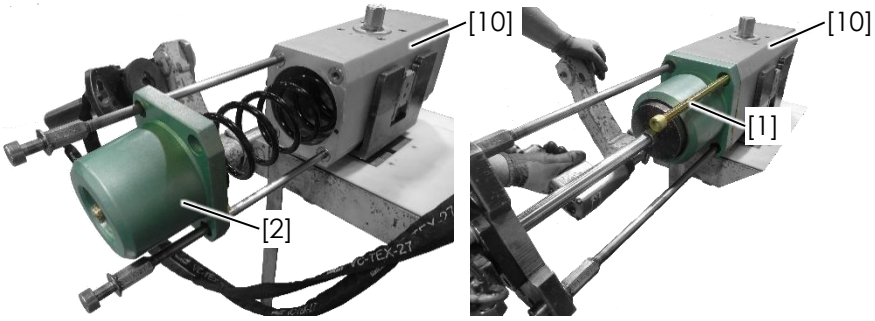
30. Fit the shaft locking ring [6].

Make sure that the sharp side is facing upwards.

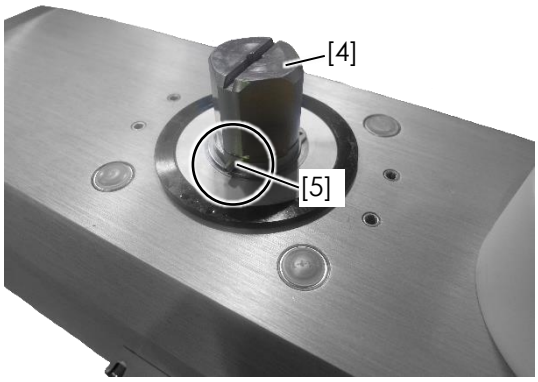


31. Mount both lids [2] with spring package on the body [10].

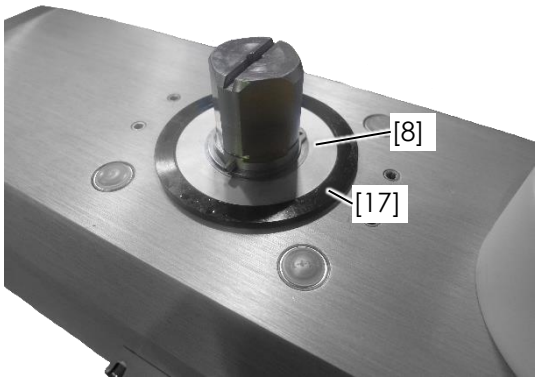
Use an assembly device with press and the lid screws [1] for mounting.
Also check whether the marks (↳ see step 1) on the lid [2] and body [10] match.



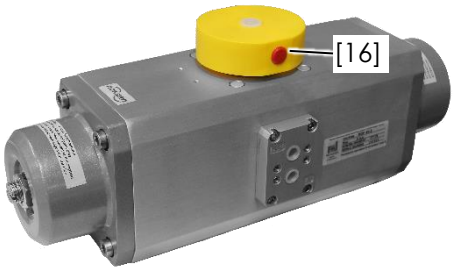
32. Screw the locking pin (threaded pin) [5] into the drive shaft [4].



33. Place the black support ring [17] onto the shim bushing [8].



34. Fit the position indicator [16].



35. Check the ROTADISK Pneumatic Actuator for correct direction of rotation and leaks.

✓ Replacement of the seals is completed.

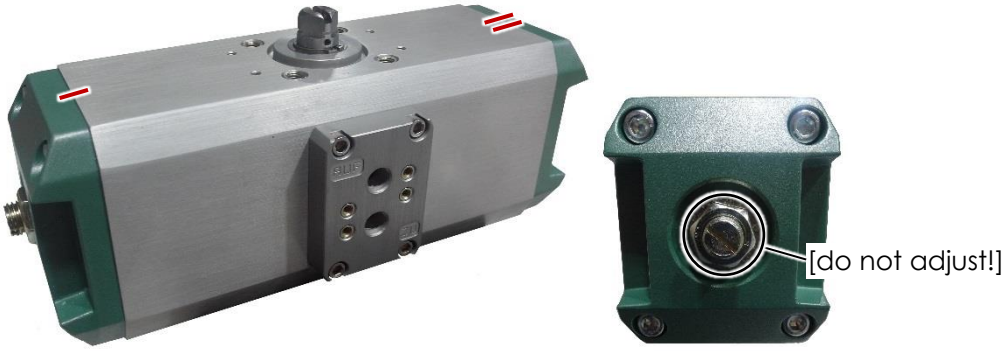
8.3.2 Replacing Seals on the ROTADISK Pneumatic Actuator (RD 2,5–160)

The ROTADISK Pneumatic Actuator is

- taken out of operation (no compressed air supply is connected).
- Disconnected from the valve and all other sub-assemblies (e.g. solenoid valve, limit switch, position indicator or position controller.

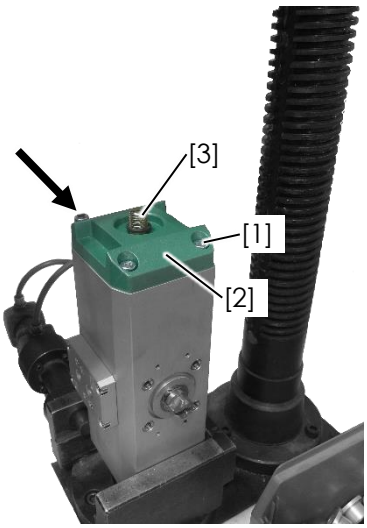
1. Make different marks on the edges of both lids [2] on the top of the body.

The marks simplify correct installation of the ROTADISK Pneumatic Actuator after disassembly.
Make sure that you do not adjust the nuts of the threaded pins/end stops so that the pre-set end position setting and thus the angle of rotation of 90° ± 3° is retained.

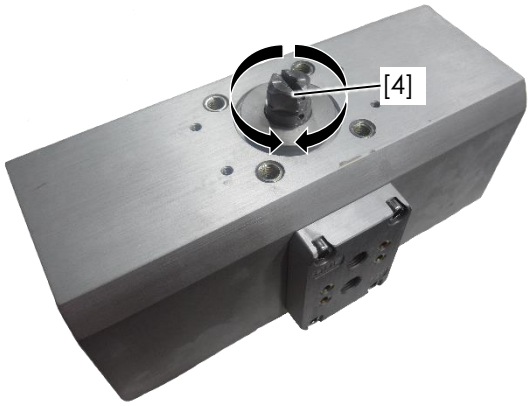


2. Remove the lids [2] from the ROTADISK Pneumatic Actuator by loosening the lid screws [1] on both sides of the body.

Use a suitable assembly device for this.

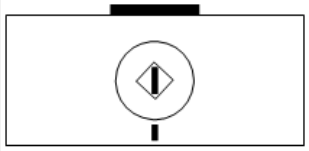


3. Move the pistons up to the inside stop by turning the drive shaft [4] on the outer square bar.

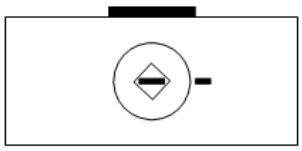


4. Mark the position of the drive shaft groove on the body [10].

Standard design

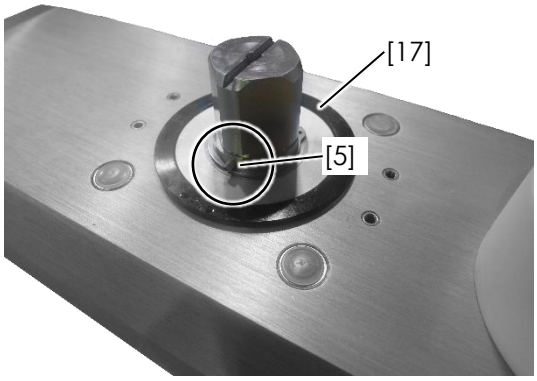


Alternative design (inverse direction of rotation)

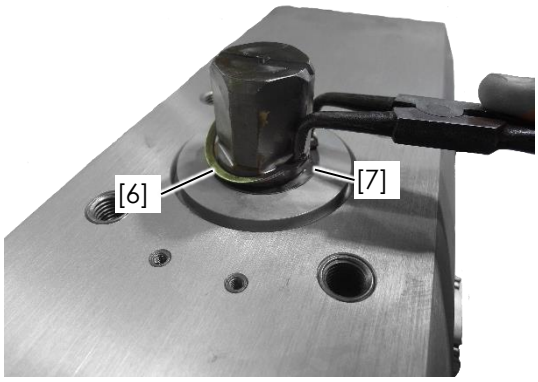


5. Unscrew the locking pin (threaded pin) [5] from the drive shaft.

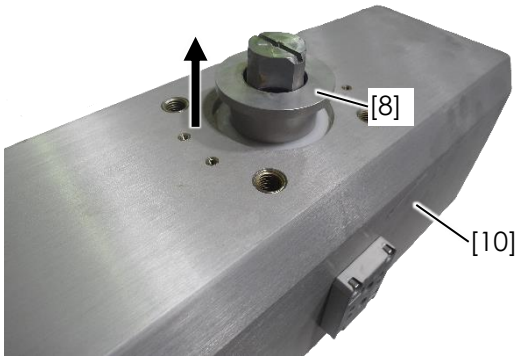
6. Remove the black support ring [17].



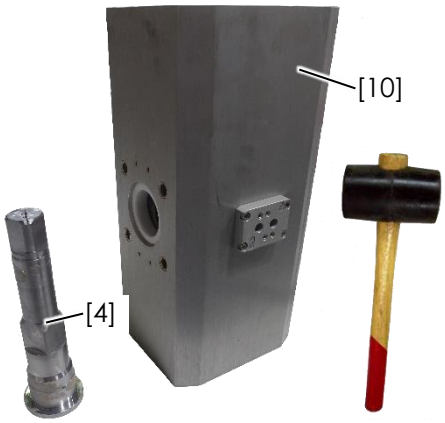
7. Remove the shaft locking ring [6] and the washer [7].



8. Pull the shim bushing [8] out of the body [10].



9. Knock the drive shaft [4] out of the body [10] with a rubber hammer.

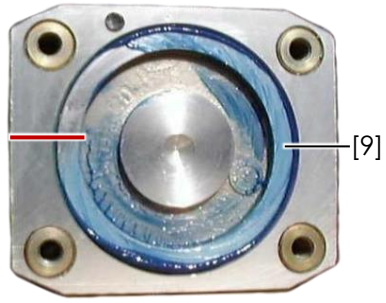


10. Remove the bearing bushes [15] and the Q/O-rings [12][14] from the body [10].

11. Push out the piston pair [9] with a soft tool until it is flush with the body [10].

12. Mark the piston [9] and the body end wall.

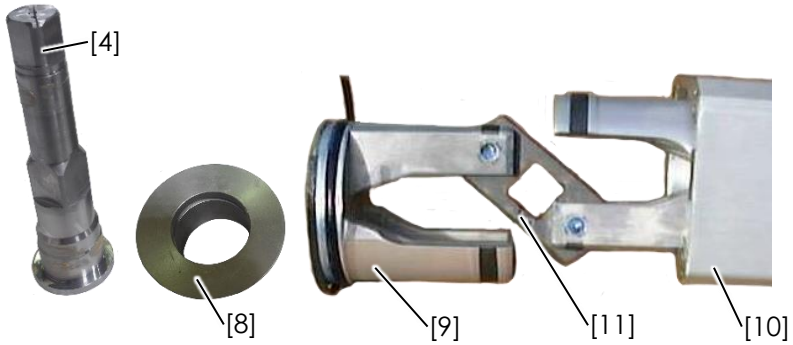
Ideally use a felt-tipped pen or scriber for marking.



13. Then push the piston pair [9] completely out of the body [10].

14. Clean the drive shaft [4], shim bushing [8], double swing arm [11], body [10] and piston pair [9].

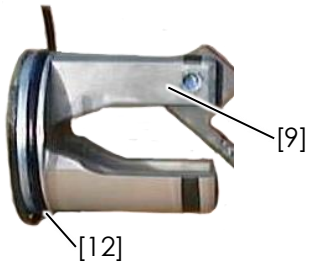
Do not use a solvent to clean the piston pair [10].



15. Grease the cleaned parts with low-temperature grease.

Flowserve Flow Control GmbH recommends the low-temperature grease SAPPHIRE Lo-Temp 2 made by ROCOL.

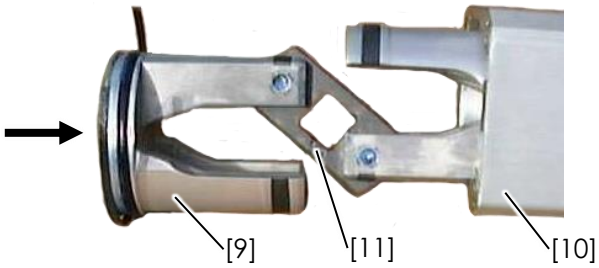
16. Pull new O-rings [12] onto the two pistons [9].



17. Assemble the two pistons [9] with the double swing arm [11] in a piston pair [9].

18. Hold the guide bands tight and feed the piston pair [9] back into the body [10].

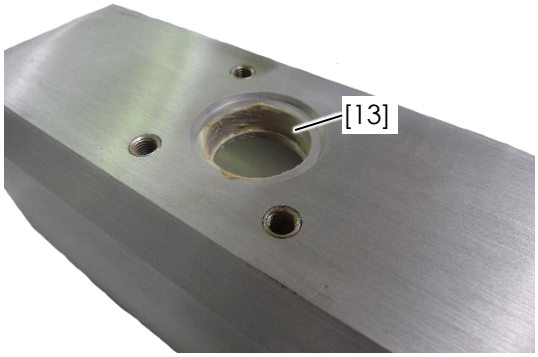
Make sure that the marks on the piston [9] and the body wall are in line.



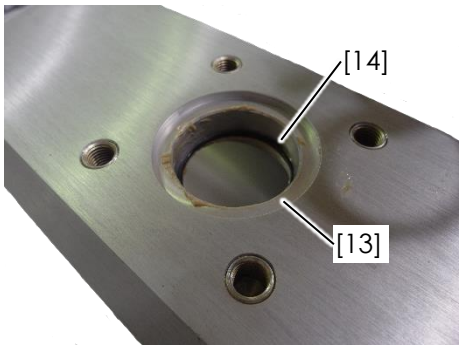
19. Centre the pistons [9] or double swing arm [11] in the middle under the shaft bearing.

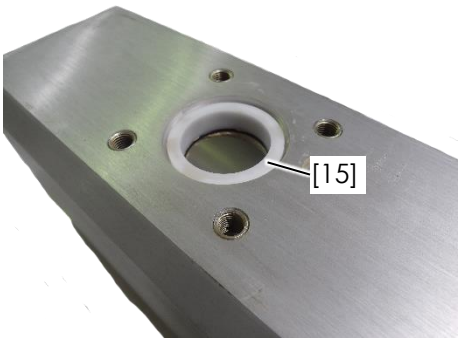
20. Grease the bearing opening on the bottom body flange side [13].

Flowserve Flow Control GmbH recommends the low-temperature grease SAPPHIRE Lo-Temp 2 made by ROCOL.

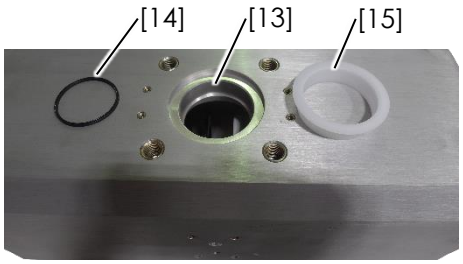


21. Fit a new Q-ring [14] on the bottom body flange side and a new bearing bush [15] into the bearing opening [13].



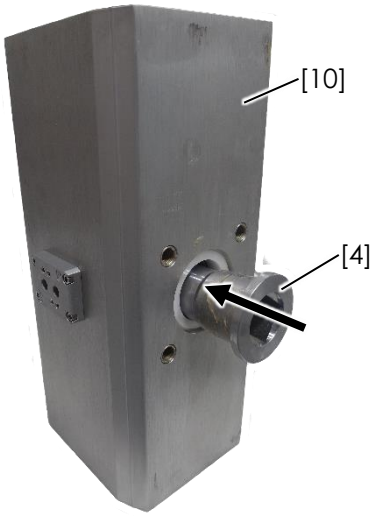


22. Fit a new greased Q-ring [14] on the top body flange side and a new bearing bush [15] into the bearing opening [13].



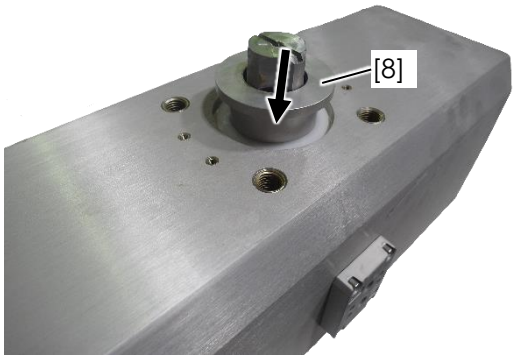
23. Press the greased drive shaft [4] carefully into the body [10] from the bottom.

Make sure that the groove in the drive shaft [4] has the original position (transverse or parallel to the longitudinal axis).

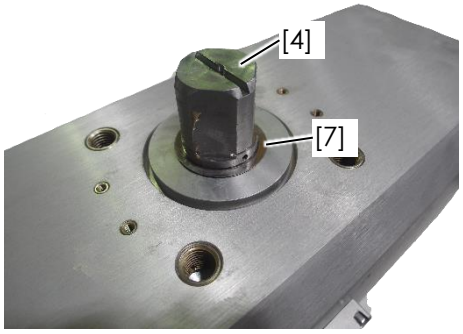


24. Place a new O-ring [12] in the shim bushing [8].

25. Insert the shim bushing [8] into the bearing opening.

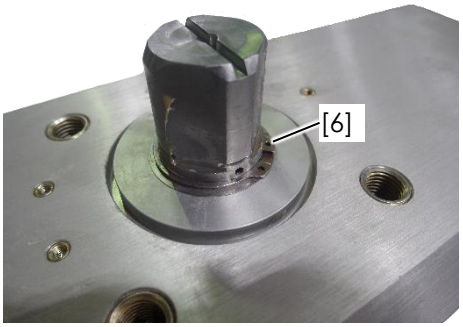


26. Place the washer [7] over the drive shaft [4].



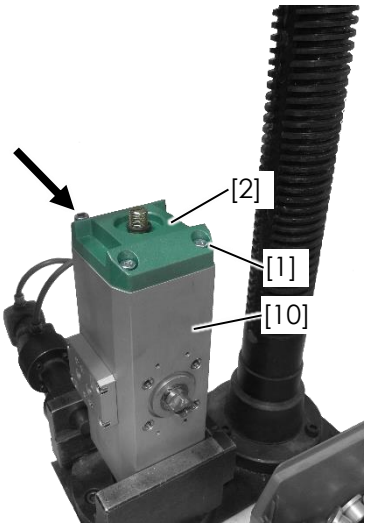
27. Fit the shaft locking ring [6].

Make sure that the sharp side is facing upwards.

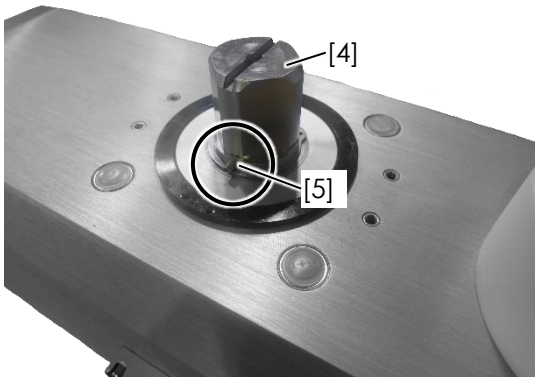


28. Mount both lids [2] on the body [10].

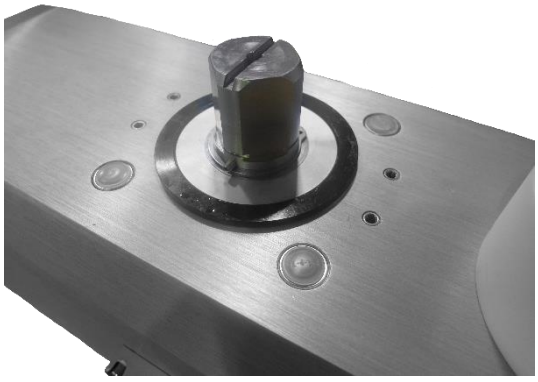
Use an assembly device with press and the lid screws [1] for mounting.
Also check whether the marks (↳ see step 1) on the lid [2] and body [10] match.



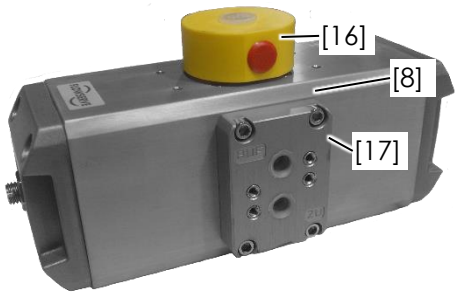
29. Screw the locking pin (threaded pin) [5] into the drive shaft [4].



30. Place the black support ring [17] on the shim bushing [8].



31. Fit the position indicator [16].



32. Check the ROTADISK Pneumatic Actuator for correct direction of rotation and leaks.

✓ Replacement of the seals is completed.

8.4 Troubleshooting Table

Because of the large number of ROTADISK Pneumatic Actuator versions and applications, it is not possible to describe all kinds of problems, causes and remedies in the troubleshooting table below.
It is generally an advantage to contact the service teams of Flowserve Flow Control GmbH or the *Flowserve Quick Response Centers* to get specific support.

Table 6: Troubleshooting table

No.	Problem description	Possible cause	Remedies/ Recommended actions
1	Fault on the ROTADISK Pneumatic Actuator	The control unit has no power supply.	Connect power supply.
		There is no compressed air supply.	Connect compressed air supply. Make sure that no vent is blocked (e.g. by a completely closed throttle valve).
		The control air lines to the drive are defective, leaking, blocked or connections have been switched.	Check control air lines for leaks, unhindered flow, correct laying.
		Control components are not connected correctly.	Check control components (e.g. solenoid valves, position controllers) for correct connection. Check whether the control components switch with a control signal.

No.	Problem description	Possible cause	Remedies/ Recommended actions
2	Fault on the valve	Add-on between pneumatic actuator and valve is defective or installed incorrectly.	Repair or correctly install the add-on.
		The pneumatic actuator is too “weak”.	Design control pressure or sparing package correctly.
		Transmission shaft/ball connection defective.	Repair valve.

8.5 Sending In the ROTADISK Pneumatic Actuator for Repair

If you are unable to repair the ROTADISK Pneumatic Actuator with the help of this chapter, send the ROTADISK Pneumatic Actuator to Flowserve Flow Control GmbH for repair.

Please make sure that the ROTADISK Pneumatic Actuator is free from hazardous fluid residues and other substances as well as cleaned and preserved before it is sent in to Flowserve Flow Control GmbH. Flowserve Flow Control GmbH will only open and repair the ROTADISK Pneumatic Actuator if a decontamination certificate and the safety data sheet of the ROTADISK Pneumatic Actuator are enclosed. Flowserve Flow Control GmbH provides you with a form for the decontamination certificate and the safety data sheet prior to dispatch.

The ROTADISK Pneumatic Actuator to be sent in is

- free from fluid residues and other substances.
- cleaned.
- preserved.

1. Pack the ROTADISK Pneumatic Actuator properly for dispatch. (↳ See chapter 11 Packing).
2. Fill in and sign the decontamination certificate and safety data sheet to Flowserve Flow Control GmbH in advance or attach the documents well visibly to the outside of the shipped goods.

The decontamination certificate and the safety data sheet certify that the ROTADISK Pneumatic Actuator presents no risk for persons and the environment.
Flowserve Flow Control GmbH will only accept the returned goods if a completely filled in and signed decontamination certificate and safety data sheet are enclosed with them.

3. Send the goods to Flowserve Flow Control GmbH.

✓ Dispatch of the ROTADISK Pneumatic Actuator is completed.

9 Shutdown

9.1 Safety Information

To avoid personal injury and/or material damage, make sure that shutdown work is performed only by qualified personnel with suitable personal protective equipment (PPE) and suitable tools.
See chapter 2 Safety Information.

9.2 Shutting Down the ROTADISK Pneumatic Actuator

9.2.1 Prerequisites for Shutdown

Make sure that the following prerequisites are fulfilled before shutting down and disassembling:

- The owner's specifications for shutdown and disassembly are observed.
- The pipework and the ROTADISK Pneumatic Actuator are depressurised and free from fluid residues and cooled down so that there is no danger of injury.

9.2.2 Shutting Down the ROTADISK Pneumatic Actuator

For shutting down, observe the information in the manufacturer's documentation (e.g. Ball Valve operating manual) of the automatic valve components.

1. Take the pipework out of operation.
2. Switch the valve (e.g. ball valve) several times so that fluid residues and entrapped pressure can escape.
3. Make sure that there are no fluid residues or other substances in the pipework.
4. Disconnect the power and air supply from the ROTADISK Pneumatic Actuator and its control components.
5. Dismantle the ROTADISK Pneumatic Actuator from the valve.

✓ Shutdown is completed.

10 Storage

10.1 Safety Information

To avoid personal injury and/or material damage, make sure that storage work is performed only by qualified personnel with suitable personal protective equipment (PPE) and suitable tools.
See chapter 2 Safety Information.

DANGER

Danger of injury due to falling loads!

Falling of suspended loads can lead to severe injury or death.

- Never stand beneath suspended loads.

NOTICE

Danger of material damage due to unsuitable storage!

Unsuitable storage of the ROTADISK Pneumatic Actuator can lead to material damage.

- Observe the measures in the following sections.

10.2 Storing the ROTADISK Pneumatic Actuator

The following prerequisites are satisfied:
The ROTADISK Pneumatic Actuator

- is not connected to and has been dismantled from the valve (e.g. ball valve).
- is free from dirt.
- is dry.

1. In the case of a heavy ROTADISK Pneumatic Actuator (≥ 15 kg), strap the sling loops of a suitable lifting gear around the body of the ROTADISK Pneumatic Actuator or fasten the slings to the lifting eyes (if available).
2. Transport the ROTADISK Pneumatic Actuator to its storage location (see chapter 12 Transport).
3. Place the ROTADISK Pneumatic Actuator carefully into a pallet box.
4. Ensure the following storage conditions to prolong the service life of the ROTADISK Pneumatic Actuator:

Storage conditions for the ROTADISK Pneumatic Actuator:

Indoor areas/rooms (long-term storage):
– dry, free from dust and adequately aired
– storage temperature between +1 °C and +50 °C
– relative humidity of < 50 %

Outdoors/construction sites (short-term storage; ≤ 14 days):
– storage temperature between −10 °C and +50 °C

✓ The preparations for storing the ROTADISK Pneumatic Actuator are completed.

11 Packing

11.1 Safety Information

To avoid personal injury and/or material damage, make sure that packing work is performed only by qualified personnel with suitable personal protective equipment (PPE) and suitable tools.
See chapter 2 Safety Information.

NOTICE

Danger of material damage due to unsuitable packing!

Unsuitable packing of the ROTADISK Pneumatic Actuator can lead to material damage during transport.

- ▶ Observe the measures in the following sections.

11.2 Packing the ROTADISK Pneumatic Actuator

The following prerequisites are satisfied:
The ROTADISK Pneumatic Actuator

- is not connected to and has been dismantled from the valve (e.g. ball valve).
- is free from dirt.
- is dry.

1. Select suitable packing to ensure that the ROTADISK Pneumatic Actuator reaches its destination without damage.

Select suitable packing and observe intended destination, customer specifications, applicable laws, load securing regulations, the properties of the transport goods (size, weight, dimensions), protection requirements and means of transport (road, rail, air and sea freight).

2. Protect the ROTADISK Pneumatic Actuator against tipping and slipping if necessary.
3. Attach suitable and clearly legible transport symbols to the packing – especially for sea freight – in accordance with ISO 780 and DIN 55402 if necessary.

Transport markings on the wooden crates are either stuck on or sprayed on with weather-proof paint.
Possible transport symbols are:


This way up


Delicate packed goods


Protect from wet


Protect from heat (direct sunlight)


Centre of gravity


Do not use hooks


Attach here

✓ Packing of the ROTADISK Pneumatic Actuator is completed.

12 Transport

12.1 Safety Information

To avoid personal injury and/or material damage, make sure that transport work is performed only by qualified personnel with suitable personal protective equipment (PPE) and suitable tools.
↳ See chapter 2 Safety Information.

DANGER

Danger of injury due to falling loads!

Falling of suspended loads can lead to severe injury or death.

- ▶ Never stand beneath suspended loads.

WARNING

Danger of injury due to improper transport!

Improper transport can lead to severe injuries.

- ▶ Secure the ROTADISK Pneumatic Actuator against turning and tipping.
- ▶ Attach slings to the ROTADISK Pneumatic Actuator correctly.
  ↳ See the following section 12.2.

  Never lift the whole unit (ball valve and actuator) with one lifting gear with the slings attached only to the pneumatic actuator!
- ▶ Observe all load securing regulations.

NOTICE

Danger of material damage due to improper transport!

Improper transport of the ROTADISK Pneumatic Actuators can cause damage.

- ▶ Observe the measures in the following sections.

12.2 Transporting the ROTADISK Pneumatic Actuator

The following prerequisites are satisfied:
The ROTADISK Pneumatic Actuator

- is not connected to and has been dismantled from the valve (e.g. ball valve).
- is free from dirt.
- is dry.

1. Protect the ROTADISK Pneumatic Actuator against damage with suitable transport protection (e.g. packing blanket).
2. In the case of a heavy ROTADISK Pneumatic Actuator (≥ 15 kg), strap the sling loops of a suitable lifting gear around the body of the ROTADISK Pneumatic Actuator or fasten the slings to the lifting eyes (if available).
3. Make sure that the ROTADISK Pneumatic Actuator cannot turn when lifted.
4. Hang the sling loops in the load hook of a suitable lifting gear.
5. Transport the ROTADISK Pneumatic Actuator to the desired location and set it down carefully.
6. Remove the slings from the ROTADISK Pneumatic Actuator.

✓ Transport of the ROTADISK Pneumatic Actuator is completed.

13 Disposal and Recycling

13.1 Safety Information

⚠	***To avoid personal injury and/or material damage, make sure that disposal and recycling work is performed only by qualified personnel with suitable personal protective equipment (PPE) and suitable tools.*** ***↳ See chapter 2 Safety Information.***

13.2 Disposing of and Recycling the ROTADISK Pneumatic Actuator

At the end of the service life of the ROTADISK Pneumatic Actuator, all relevant materials and parts must be recycled or disposed of in compliance with local environment laws and regulations. If the ROTADISK Pneumatic Actuator contains hazardous substances or toxic fluid residues which are harmful to health and the environment, the ROTADISK Pneumatic Actuators must be disassembled and disposed of in accordance with local/regional disposal regulations and laws.

ⓘ The safety data sheet of hazardous substances or toxic fluid residues contains important information on disposal and recycling.

☝ The ROTADISK Pneumatic Actuator

- is shut down.
- is disconnected/dismantled from the valve (e.g. ball valve).
- is not under pressure.
- Is decontaminated (free from hazardous substances or toxic fluid residues).

☝ The two lids of the ROTADISK Pneumatic Actuator RDF are removed (↳ see section 8.3.1).

1. Hand over the ROTADISK Pneumatic Actuator to an authorised disposal or recycling company.

ⓘ An authorised disposal or recycling company will process the disposal or recycling of the ROTADISK Pneumatic Actuator.

✓ Disposal or recycling is completed.

Appendix A: Manufacturer's Declaration

MANUFACTURER'S DECLARATION ACC. DIRECTIVE 2014/34/EU

TRANSLATION OF ORIGINAL AZ1799_DE

Product

ROTADISK Pneumatic Actuator Types:
RD 2.5, RD 5, RD 10, RD 20, RD 40, RD 80, RD 160
and RDF 2.5, RDF 5, RDF 10, RDF 20, RDF 40, RDF 80, RDF 160

Manufacturer

Flowserve Flow Control GmbH
Rudolf-Plank-Str. 2
76275 Ettlingen
Deutschland / Germany

Directive

Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 ... "relating to equipment and protective systems ... for use in potentially explosive atmosphere" – "ATEX Directive"

Flowserve Flow Control GmbH, the manufacturer, hereby declares that the mentioned products were subjected to a risk assessment procedure considering the valid harmonized standards and good engineering practice.
The pneumatic actuators do not have their own potential source of ignition and are thus not considered "equipment" as defined by article 2, paragraph 1 of Directive 2014/34/EU.
The Directive does not apply to the mentioned actuators.

The user instructions must be followed.

Applied Standards:

- EN 15198:2007
- EN 1127-1:2019
- EN ISO 80079-36:2016
- EN ISO 80079-37:2016

Peter Benien
Managing Director

Dirk Malischewsky
Head of Research & Development

Ettlingen, 02.10.2020

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Experience In Motion

AZ1799 EN S.1/1
Rev.: F

Appendix B: Declaration of Incorporation

DECLARATION OF INCORPORATION ACCORDING TO DIRECTIVE 2006/42/EC

TRANSLATION OF ORIGINAL AZ2287_DE

Product

ROTADISK brand pneumatic actuator, types:
RD 2.5, RD 5, RD 10, RD 20, RD 40, RD 80, RD 160 and
RDF 2.5, RDF 5, RDF 10, RDF 20, RDF 40, RDF 80, RDF 160

Manufacturer

Flowserve Flow Control GmbH
Rudolf-Plank-Str. 2
76275 Ettlingen
Deutschland / Germany

Directive

Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006, „European Machinery Directive"

Person Authorised to Compile the Relevant Technical Documentation

Flowserve Flow Control GmbH
Rudolf-Plank-Str. 2
76275 Ettlingen
Deutschland / Germany

Flowserve Flow Control GmbH as manufacturer hereby declares that the products listed meet the basic requirements of directive 2006/42/EC as "partly completed machinery":
Annex I, sections 1.1.2, 1.1.3, 1.1.5, 1.2.1, 1.2.6, 1.3.1, 1.3.2, 1.3.4, 1.3.7, 1.3.8, 1.5.2, 1.5.4, 1.5.7, 1.6.1,1.7.1 and 1.7.4.

Commissioning is prohibited until it has been ensured that the complete machine or system in which the ROTADISK actuators are installed complies with the provisions of directive 2006/42/EC.

The relevant technical documentation for the partly completed machinery according to Annex VII Part B of the directive has been prepared and the manufacturer is obliged to transmit this documentation electronically to national authorities upon justified request.

The instructions must be observed.

Considered standard:

- EN ISO 12100:2010

Peter Benien
Managing Director

Dirk Malischewsky
Head of Design Engineering and R&D

Ettlingen, den 16.12.2020

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Rev.: -

Appendix C: Torques of the ROTADISK Pneumatic Actuators

Series/Type RD	Control pressure (bar)								
	2	3	3.5	4	4.5	5	6	7	8
2.5	10	15	17,5	20	22,5	25	30	35	40
5	20	30	35	40	45	50	60	70	80
10	40	60	70	80	90	100	120	140	160
20	80	120	140	160	180	200	240	280	320
40	160	240	280	320	360	400	480	560	640
80	320	480	560	640	720	800	960	1120	1280
160	640	960	1120	1280	1440	1600	1920	2240	2560

Series/ Type RDF		Control pressure (bar)								Spring
		3	3,5	4	4,5	5	6	7	8	
2.5-1	at 0° at 90°	10.5 9	14 11.5	16.5 14	– –	– –	– –	– –	– –	3.5 6
2.5-2	at 0° at 90°	8 4	10.5 7.2	13 10.5	16 12.5	18.5 15	23.5 20	– –	– –	6.5 10
2.5-3	at 0° at 90°	– –	– –	8 3	10.5 5.5	13 8.5	18 14	24 17.5	29 22.5	11 17.5
5-1	at 0° at 90°	23 17	28 22	33 27	38 32	– –	– –	– –	– –	7 13
5-1.5	at 0° at 90°	20 15	25 20	30 25	35 30	40 35	– –	– –	– –	10 15
5-2	at 0° at 90°	17 13	22 18	27 23	32 28	37 33	47 43	– –	– –	13 17
5-2.5	at 0° at 90°	– –	18 11	23 16	28 21	33 26	43 36	53 46	– –	16 23
5-3	at 0° at 90°	– –	15 5	20 10	25 15	30 20	40 30	50 40	– –	20 30

Series/ Type RDF		Control pressure (bar)								Spring
		3	3,5	4	4,5	5	6	7	8	
10-1	at 0° at 90°	50 40	60 50	70 60	80 70	– –	– –	– –	– –	10 20
10-1.5	at 0° at 90°	43 30	53 40	63 50	73 60	83 70	– –	– –	– –	17 30
10-2	at 0° at 90°	35 20	45 30	55 40	65 50	75 60	95 80	– –	– –	25 40
10-2.5	at 0° at 90°	– –	40 20	50 30	60 40	70 50	90 70	110 90	– –	30 50
10-3	at 0° at 90°	– –	35 10	45 20	55 30	65 40	85 60	105 80	125 100	35 60
20-1	at 0° at 90°	95 80	115 100	135 120	15 140	– –	– –	– –	– –	25 40
20-1.5	at 0° at 90°	85 60	105 80	125 100	145 100	165 140	– –	– –	– –	35 60
20-2	at 0° at 90°	70 40	90 60	110 80	130 100	150 120	190 160	– –	– –	50 80
20-2.5	at 0° at 90°	– –	80 40	100 60	120 80	140 100	180 140	– –	– –	60 100
20-3	at 0° at 90°	– –	65 20	85 40	105 60	125 80	165 120	205 160	245 200	75 120
40-1	at 0° at 90°	180 145	220 185	260 225	300 265	– –	– –	– –	– –	60 95
40-1.5	at 0° at 90°	140 90	180 130	220 170	260 210	300 250	– –	– –	– –	100 150
40-2	at 0° at 90°	100 35	140 75	180 115	220 155	260 195	340 275	– –	– –	140 205
40-2.5	at 0° at 90°	– –	– –	150 65	190 105	230 145	310 225	– –	– –	170 255
40-3	at 0° at 90°	– –	– –	120 20	160 60	200 100	280 180	360 260	440 340	200 300
80-1	at 0° at 90°	360 290	440 370	520 450	600 530	– –	– –	– –	– –	120 190

Series/ Type RDF		Control pressure (bar)								Spring
		3	3,5	4	4,5	5	6	7	8	
80-1.5	at 0° at 90°	280 185	360 265	440 345	520 425	– –	– –	– –	– –	200 295
80-2	at 0° at 90°	200 85	280 165	360 245	440 325	520 405	– –	– –	– –	280 395
80-2.5	at 0° at 90°	– –	– –	300 150	380 230	460 310	620 470	– –	– –	340 490
80-3	at 0° at 90°	– –	– –	240 55	320 135	400 215	560 375	720 535	880 695	400 585
160-1	at 0° at 90°	720 595	880 755	1040 915	1200 1075	– –	– –	– –	– –	240 365
160-1.5	at 0° at 90°	560 390	720 550	880 710	1040 870	– –	– –	– –	– –	400 570
160-2	at 0° at 90°	400 185	560 345	720 505	880 665	1040 825	1360 1145	– –	– –	560 775
160-2.5	at 0° at 90°	– –	– –	600 321	760 481	920 641	1240 961	– –	– –	680 959
160-3	at 0° at 90°	– –	– –	480 140	640 300	800 460	1120 780	1440 1100	1760 1420	800 1140

*Torques specified in Newton meter [Nm]

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Operating manuals for download:

www.flowserve.com/en/argus-iom-english

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To find your local Flowserve representative use the Sales Support Locator System found at www.flowserve.com.

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