Pneumatic rotating turret
RVK 100-P

Assembly and Operating Manual

Imprint

Technical changes:
We reserve the right to make alterations for the purpose of technical improvement.

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Dear customer,

congratulations on choosing a SCHUNK product. By choosing SCHUNK, you have opted for the highest precision, top quality and best service.

You are going to increase the process reliability of your production and achieve best machining results – to the customer's complete satisfaction.

SCHUNK products are inspiring.

Our detailed assembly and operation manual will support you.

Do you have further questions? You may contact us at any time – even after purchase.

Kindest Regards

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Reg. No. 003496 QM08

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Table of contents

1 General

1.1 About this manual

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

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

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

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

In addition to these instructions, the documents listed under Link Mitgeltende Unterlagen are applicable.

1.1.1 Presentation of Warning Labels

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

	**⚠ DANGER** **Danger for persons!** Non-observance will inevitably cause irreversible injury or death.

	**⚠ WARNING** **Dangers for persons!** Non-observance can lead to irreversible injury and even death.

	**⚠ CAUTION** **Dangers for persons!** Non-observance can cause minor injuries.

	***NOTICE*** **Material damage!** Information about avoiding material damage.

1.1.2 Applicable documents

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

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

1.1.3 Sizes

This operating manual applies to the following sizes:

- RVK 100-4-P-87
- RVK 100-6-P-87

1.2 Warranty

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

- Observe the ambient conditions and operating conditions (☞ 2.5, Page 8)
- Observe the specified maintenance intervals, (☞ 8, Page 49)

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

1.3 Scope of delivery

The scope of delivery includes

- Pneumatic rotating turret RVK in the version ordered
- Accessory pack

1.4 Accessories

The following accessories, which must be ordered separately, are required for the product:

- Adapter plates
- Grippers
- Sensors

A wide range of accessories are available for this product

For information about which accessories can be used with the appropriate product version see catalog.

2 Basic safety notes

2.1 Intended use

The product was designed for reliable gripping, turning (with predefined cycle types) and collection of workpieces or objects in combination with suitable grippers and turning devices.

The product is intended for installation in a machine/system. The requirements of the applicable guidelines must be observed and complied with.

The product may be used only in the context of its defined application parameters (☞ 3, Page 15).

The product is designed for industrial use.

To use this unit as intended, it is also essential to observe the technical data and installation and operation notes in this manual and to comply with the maintenance intervals.

2.2 Not intended use

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

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

2.3 Constructional changes

Making constructional changes

Modifications, constructional changes and subsequent work, e.g. additional threads, drill holes and safety devices may impair the operation and safety or damage the product.

- Constructional changes may only be done with SCHUNK's permission.

2.4 Spare parts

Use of unauthorised spare parts

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

- Use only original spare parts or spares authorised by Schunk.

2.5 Environmental and operating conditions

Required ambient conditions and operating conditions

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

- Make sure that the product is used only in the context of its defined application parameters, (☞ 3, Page 15).
- Observe maintenance and lubrication intervals, (☞ 8.2, Page 49).
- Make sure that the environment is free from splash water and vapors as well as from abrasion or processing dust. Exceptions are products that are designed especially for contaminated environments.
- Make sure that the product is not exposed to excessive vibrations and/or strokes.
- Ensure that no strong magnetic fields impair the function of the product.
  Contact your SCHUNK partner if the product is to be used in strong magnetic fields.

2.6 Personnel qualification

Inadequate qualifications of the personnel

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

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

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

Trained electrician	Due to their technical training, knowledge and experience, trained electricians are able to work on electrical systems, recognize and avoid possible dangers and know the relevant standards and regulations.
Pneumatics specialist	Pneumatics specialists have been trained for this particular area of responsibility and know the relevant standards and regulations.
Hydraulic specialist	Hydraulic specialists have been trained for this particular area of responsibility and knows the relevant standards and regulations.
Qualified personnel	Due to its technical training, knowledge and experience, qualified personnel is able to perform the delegated tasks, recognize and avoid possible dangers and knows the relevant standards and regulations.
Instructed person	Instructed persons were instructed by the operator about the delegated tasks and possible dangers due to improper behaviour.
Service personnel of the manufacturer	Due to its technical training, knowledge and experience, service personnel of the manufacturer is able to perform the delegated tasks and to recognize and avoid possible dangers.

2.7 Personal protective equipment

Using personal protective equipment

Not wearing personal protective equipment while working with the product, may result in dangers that impact the personnel's safety and health.

- While working with the product, observe the health and safety regulations and wear the required personal safety equipment.
- Observe the valid safety and accident prevention regulations.
- In case of sharp edges and corners and rough surfaces, wear protection gloves.
- In case of hot surfaces, wear heat-resistant protection gloves.
- When dealing with hazardous substances, wear protection gloves and goggles.
- In case of moving parts, wear tight protection clothes.

2.8 Notes on safe operation

Incorrect handling of the personnel

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

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

2.9 Transport

Handling during transport

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

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

2.10 Malfunctions

Behavior in case of malfunctions

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

2.11 Disposal

Handling of disposal

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

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

2.12 Fundamental dangers

General

- Observe safety distances.
- Never deactivate safety installations.
- Install the provided protective product in the danger zone before switching on the product.
- Remove energy supplies before the installation, modification, maintenance or adjustment work. Make sure that no residual energy is remaining in the system.
- Do not move parts by hand while the energy supply is connected.
- Do not reach into the open mechanism or movement area of the product during operation.

2.12.1 Protection during handling and assembly

Incorrect handling and assembly

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

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

Incorrect lifting of loads

Falling loads may cause serious injuries and even death.

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

2.12.2 Protection during commissioning and operation

Falling or violently ejected components

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

- The danger zone must be cordoned off by a protective barrier.
- Never step into the danger zone during operation.

2.12.3 Protection against dangerous movements

Unexpected movements

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

- Switch off the energy supply and ensure that no residual energy remains.
- Never rely solely on the response of the monitoring function to avert danger. Until the installed monitors become effective, it must be assumed that the drive movement is faulty, with its action being dependent on the control unit and the current operating condition of the drive. Perform maintenance work, modifications, and attachments outside the danger zone defined by the movement range.
- To avoid accidents and/or material damage, human access to the movement range of the machine must be restricted. Restrict unintentional access by persons to this range e.g. via a protective cover, protective fence or photoelectric barrier. The protective cover and protective fence must be rigid enough to withstand the maximum possible movement energy. EMERGENCY STOP switches must be easily and quickly accessible. Check the function of the EMREGENCY STOP before starting up the machine or system. If this protective equipment is not working properly, prevent the operation of the machine.

2.13 Notes on particular risks

⚠ DANGER

Risk of fatal injury from suspended loads!
Falling loads can cause serious injuries and even death.

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

⚠ WARNING

Risk of injury from objects falling and being ejected!
Falling and ejected objects during operation can lead to serious injury or death.

- The danger zone must be cordoned off by a protective barrier.

⚠ WARNING

Risk of injury from uncontrolled movements!
If the energy supply is switched on or residual energy remains in the system, parts may move unexpectedly and cause serious injuries.

- Switch off energy supply.
- Make sure there is no residual energy in the system

⚠ WARNING

Risk of injury from sharp edges and corners!
Sharp edges and corners can cause cuts.

- Use suitable protective equipment.

⚠ WARNING

Risk of injury due to rotating components!!
With rotary actuators or rotary indexing tables with rotary actuator serious injuries can be caused by rotating components

- The danger zone must be surrounded by a safety fence during operation.

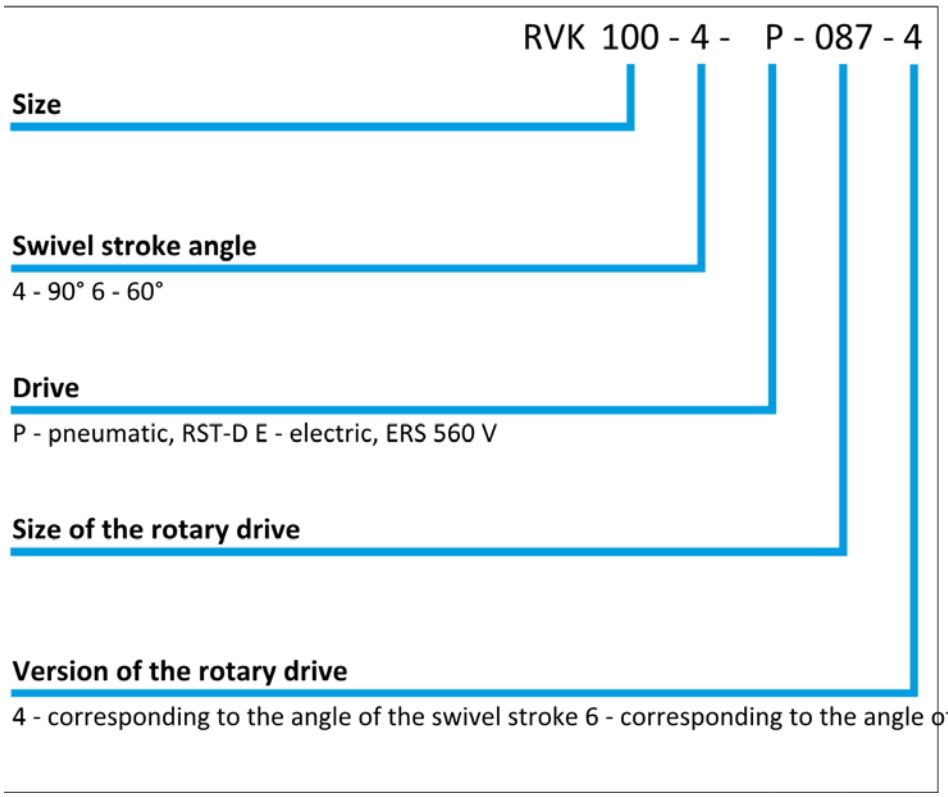
NOTICE

Material damage caused by switching from oiled to oil-free compressed air!
If the product is operated with oiled compressed air, switching to oil-free compressed air may cause the lubrication ex-works to be washed out and the product may be damaged.

- Do not operate the product with oil-free compressed air if the product was previously operated with oiled compressed air.

3 Technical data

3.1 Type designation



Type designation

3.2 Basic data

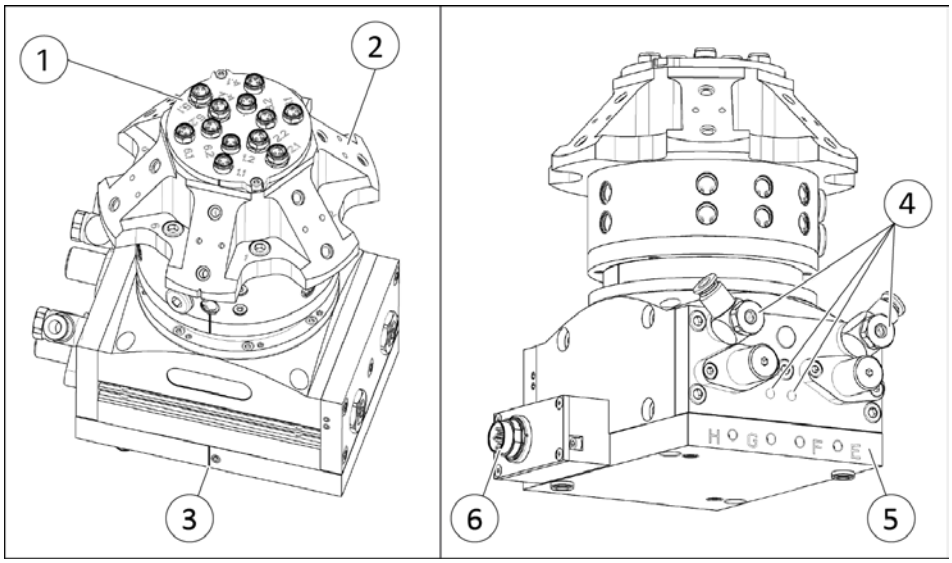
Designation	RVK
Ambient temperature [°C] * min. max.	 + 5 + 60
IP protection class *	40
Pressure medium	Compressed air, compressed air quality according to ISO 8573-1:7 4 4
Nominal working pressure [bar]	6
Minimum pressure [bar]	4
Maximum pressure [bar]	8
Voltage electrical feed through [VDC]	24
* Pay attention to the data of the attached gripper	

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

The catalog data sheet includes permissible cycle and swiveling times, for precise calculations please contact SCHUNK.

4 Design and description

4.1 Design



Design

1	Sensor connections	4	Rotary movement actuation
2	Gripper spaces with air bores for direct connection	5	Actuating grippers
3	Marking groove of the switching position for single grippers	6	Main connection of sensors

4.2 Description

With the turret, 4 or 6 grippers can be swiveled at the same time using a pneumatic rotary drive.

The grippers can be actuated as follows:

- All grippers at the same time in any position.
- One gripper individually in a specific position (switching position), without the state of the other grippers changing. This works using a central valve mechanism, which reaches into the rotating outer part from the fixed central section.

The state of all grippers can be continuously recorded and centrally queried.

For instance, the turret can be used as a collect and place application on a room gantry or robot.

5 Assembly

5.1 Installing and connecting

⚠ WARNING

Risk of injury from uncontrolled movements!
If the energy supply is switched on or residual energy remains in the system, parts may move unexpectedly and cause serious injuries.

- Switch off energy supply.
- Make sure there is no residual energy in the system

NOTICE

Risk of damage to the product!
If the end position is approached too hard, the product may be damaged.

- As a rule, a rotary movement must take place without impact and bouncing.
- To do this, carry out sufficient throttle and dampening.
- Observe specifications in the catalog data sheet.

NOTE
When mounting loads, do not allow impermissible forces and moments to be exerted, see catalog data sheet.
When assembling, select a suitable tightening torque for screws in accordance with generally accepted guidelines for screw connections.
Secure all screws using a suitable chemical screw lock.

1 Check the flatness of the mounting surface, (☞ 5.2.1, Page 19).
2 Screw the product to the machine/system, (☞ 5.2.1, Page 19).
   ⇨ Use suitable connecting elements (adapter plates) if necessary.
   ⇨ Observe the permissible depth of engagement as well as strength class, if required.
3 Mount gripper and adapter plates,(☞ 5.3, Page 21).
4 Pneumatically connect product, (☞ 5.2.2, Page 20).
5 Set rotary indexing table, (☞ 5.6, Page 28).
   ⇨ Adjust swivelling time using the swiveling speed.
   ⇨ Set end position damper using the shock absorber stroke.

6 Connect air purge connection if necessary.

7 Mount and connect the sensor, (☞ 5.5, Page 24) and Sensor Assembly and Operating Manual.

5.2 Connections

5.2.1 Mechanical connection

Levelness of the mounting surface

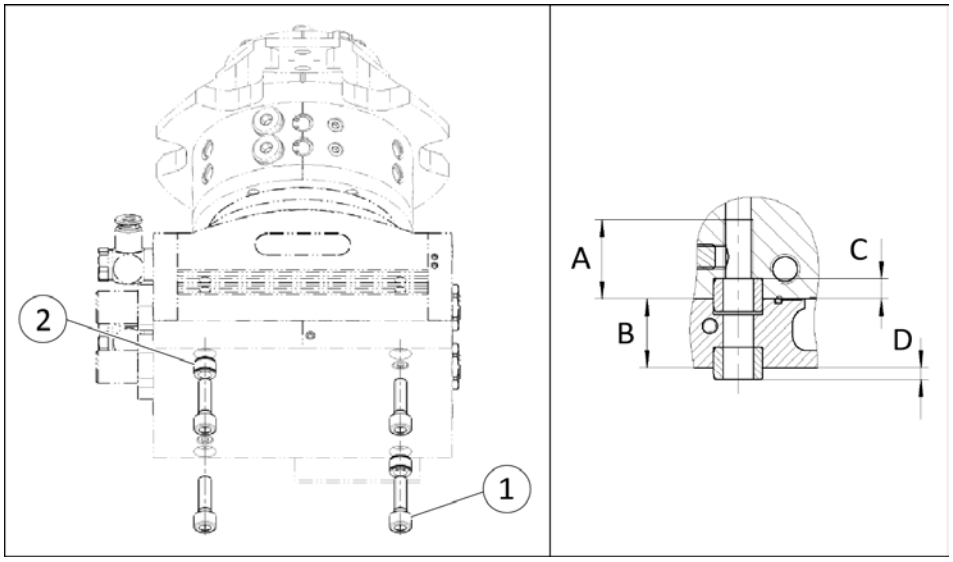
The values apply to the whole mounting surface to which the product is mounted .

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

Diameter	Permissible unevenness
< 100	< 0.02
> 100	< 0.05

Turret connection

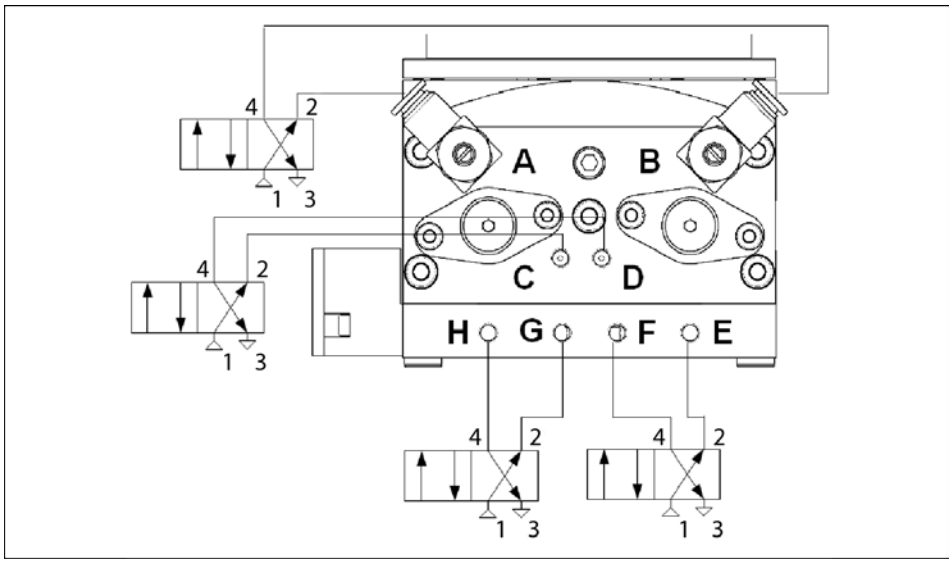
The turret is mounted on the base side. It can be installed at any position.



Mechanical connection

Item	Mounting	RVK
1	Mounting screw *	M6
2	centering sleeves **	Ø 10
A	Length of thread [mm]	16
B	Base plate [mm]	14
C	Sleeve projection [mm]	4
D	Sleeve projection [mm]	2.7
* customer side ** Included in accessory pack		

5.2.2 Pneumatic connection



Pneumatic connection

Channel	Designation	Connection
A	• Actuating rotary indexing table drive piston, exhaust throttle valve is mounted – Turn clockwise (CW)	Ø 6
B	• Actuating rotary indexing table drive piston, exhaust throttle valve is mounted – Turn anti-clockwise (ACW)	Ø 6
C	• Actuating rotary indexing table lock – Unlock position	M5
D	• Actuating rotary indexing table lock – Lock position	
E	• Compressed air supply/air bleed screw gripper	
F	• Air bleed/compressed air supply gripper	
G	• Switching position – Gripper inactive	
H	• Switching position – Gripper active	

Place the connections A/B, C/D, E/F and G/H on one valve each.
Do not use a valve with ventilated center position.

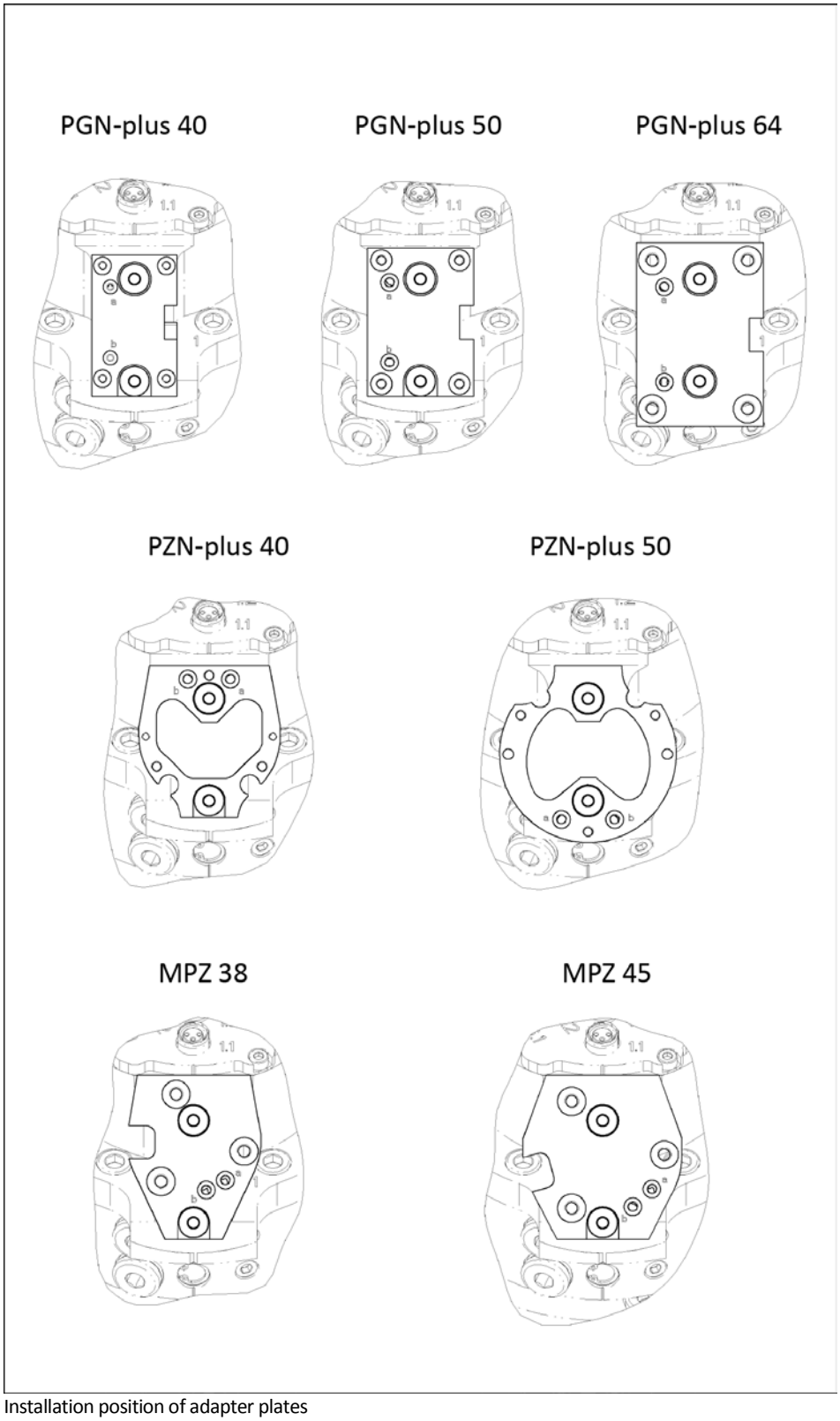
For more information, see the catalog data sheet.

NOTE

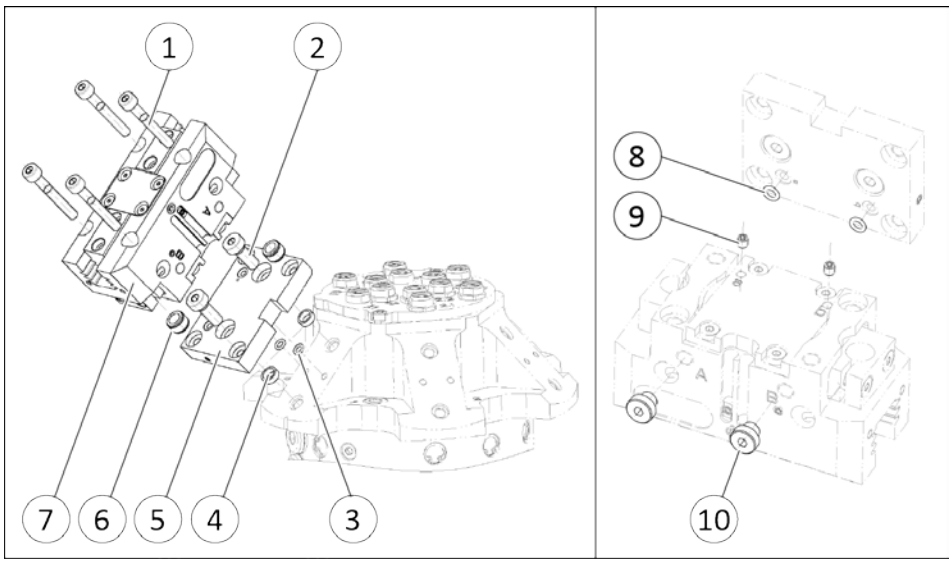
Observe the requirements for the air supply, (☞ 3, Page 15).

5.3 Mount gripper and adapter plates

The following graphic shows the alignment of the adapter plates during assembly.



Installation position of adapter plates



Gripper attachment

1	Gripper mounting screw *	6	Centering sleeve **
2	Adapter plate mounting screw ***	7	Gripper *
3	O-ring	8	O-ring ***
4	Centering sleeve ***	9	Gripper set-screw
5	Adapter plate ***	10	Gripper locking screw
* customer-side ** included in the gripper accessory pack *** included in the scope of delivery of the adapter plate			

1 Insert O-rings (3) and centering sleeves (4), align adapter plate (5) on the turret and tighten, adapter plates see catalog data sheet.

   ⇨ For the installation position of the adapter plate, see graphic "Adapter plates installation position".

2 When attaching the gripper, use the bottom direct connections.

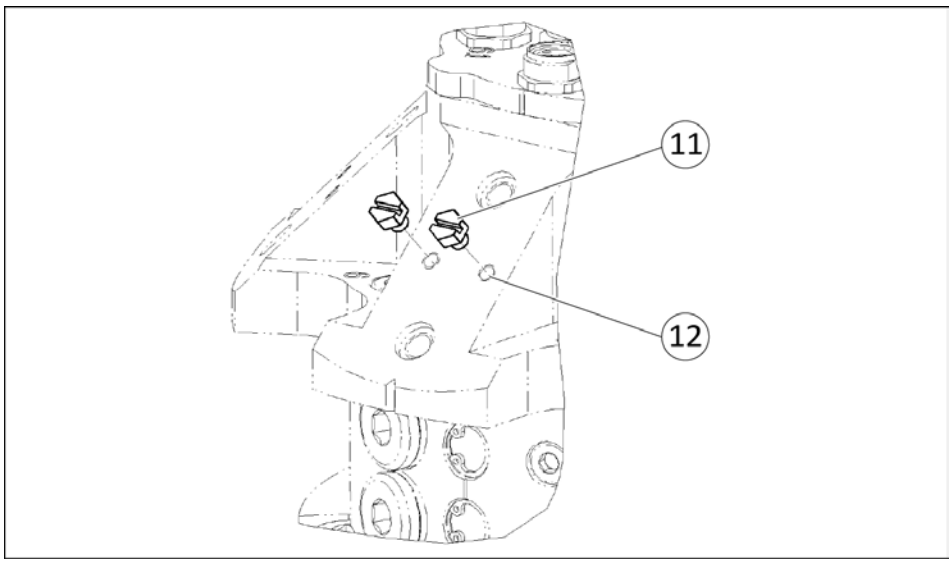
3 If available, screw set-screws out of the bottom direct connections.

4 Insert O-rings (8) and centering sleeves (6), align gripper on the adapter plate (5) and tighten.

5 Secure all screws using a suitable screw lock.

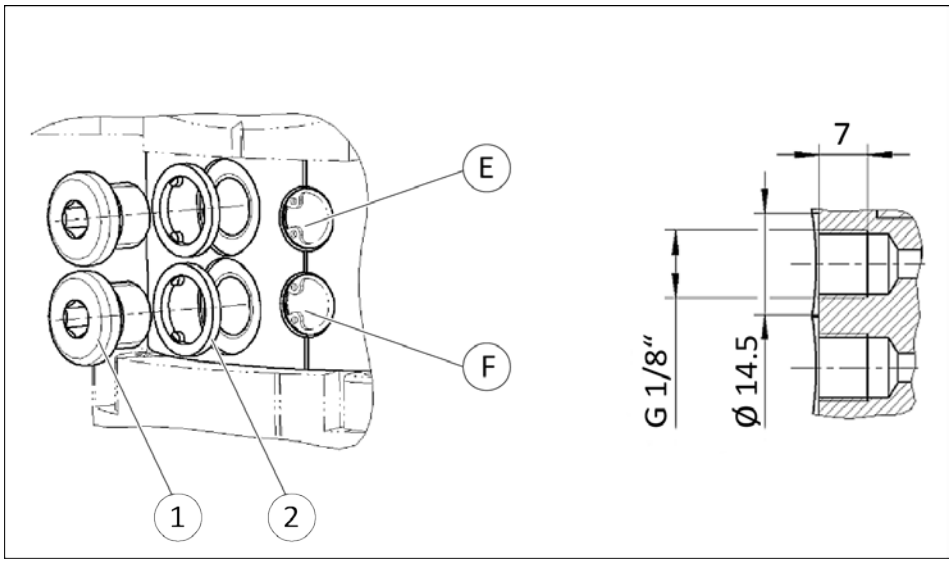
6 If necessary, screw locking screws (10) into the main air connections of the gripper.

7 If necessary, screw set-screws into the lateral direct connections.



8 **NOTICE! Only assigned gripper spaces are sealed.**
Seal air connections (12) from non-assigned gripper spaces with the locking screws (11) from the accessory pack.

5.4 Air purge connection for external products



Air purge connection

1	Locking screw
2	Sealing disk G1/8“

There are two connections on the turret that can be used as air purge connections for external products.

The two connections are directly connected to the pressure ranges/connections E and F and are not throttled.

If the connections are used as air purge connections, suitable pressure regulators or throttle valves must be used.

5.5 Mounting the sensor

The product is prepared for using sensors

- Exact type designation of the compatible sensors, see catalog.
- Technical data of the matching sensors, see assembly and operating manual and data sheet.
  - The assembly and operating manual and the catalogue data sheet are included in the scope of delivery and can be downloaded from www.schunk.com.
- If you require further information on sensor operation, contact your SCHUNK contact person or download information from our homepage.

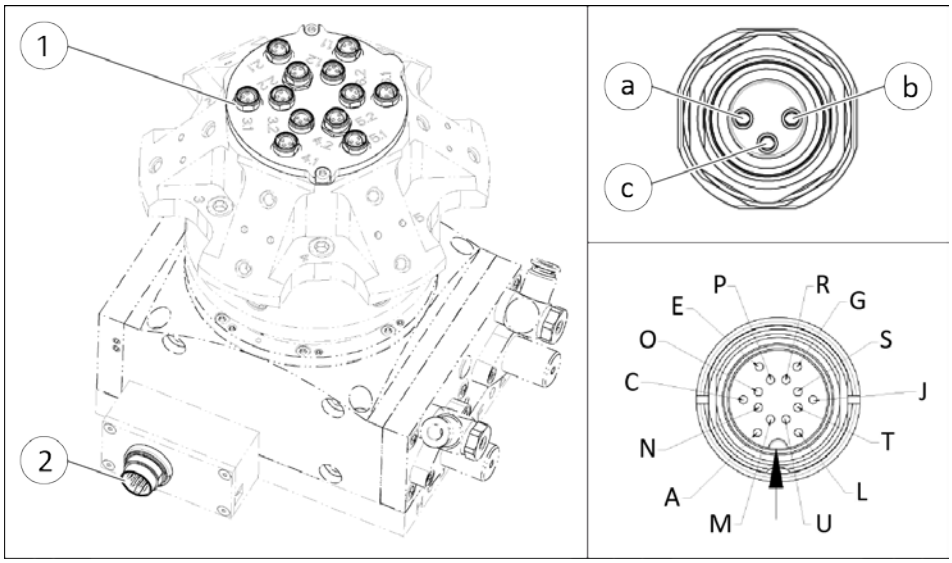
When assembling and connecting sensors, observe the Sensor Assembly and Operating Manual.

When assembling and connecting sensors to the grippers, observe the Gripper Assembly and Operating Manual.

5.5.1 Overview of sensors

Designation	Attachment	
Inductive Proximity Switch IN	Zero point monitoring rotary module	External connection
Magnetic Switch MMS 22	Rotary module piston monitoring	External connection
Magnetic Switch MMS 22	Gripper monitoring	Internal connection

5.5.2 Electrical connection gripper monitoring



Sensor electrical connections

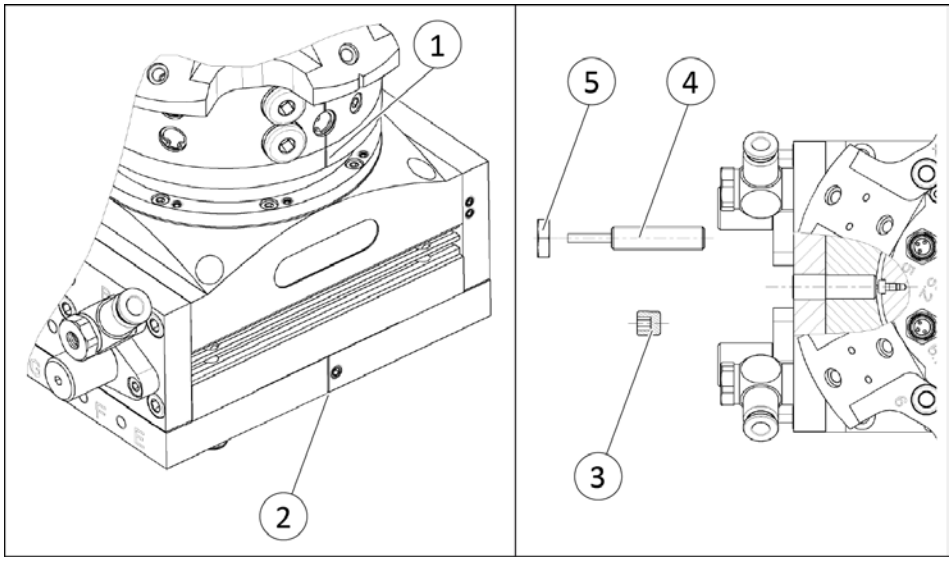
1	3-pin connections, M8 connector						
	a	24V	**b**	GND	**c**	Signal	
2	16-pin main connection; M16 connector						
PIN	**A**	**C**	**E**	**G**	**J**	**L**	**M**
	+24V	S1.1	S1.2	S2.1	S2.2	S3.1	S3.2
PIN	**N**	**O**	**P**	**R**	**S**	**D**	**U**
	S4.1	S4.2	S5.1	S5.2	S6.1	S6.2	GND

To monitor the status of each gripper, two connections each are available for M8 sensors.

The system picks up signals from the sensors and supplies power to them via the main connection on the baseplate.

5.5.3 Mount sensor for zero point monitoring rotary module

	***NOTICE*** **Property damage due to incorrect assembly!** If the sensor is screwed into the thread too far, the sensor may become damaged. • Only screw in the sensor until the signal is present at the output.



1 Set cycle ring to zero point position.

⇨ The marking groove on the gripper ring (1) matches the marking groove in the base plate (2).

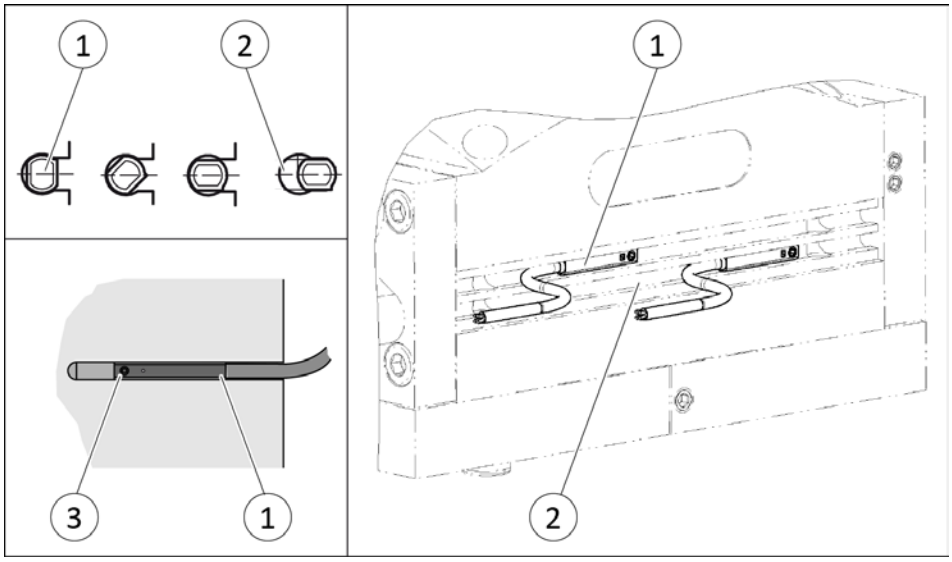
2 Turn locking screw (3) out of the housing.

3 Only screw the sensor (4) into the thread until the signal is present at the output.

4 Lock sensor into place with a counter nut (5).

5.5.4 Mount sensor for piston monitoring rotary module

	NOTICE
	Risk of damage to the sensor during assembly! • Observe a maximum tightening torque of 10 Ncm for the set-screws.



1 Turn the sensor 1 (1) into the groove (2).

2 Pressurize the drive pistons using air connections A or B until they are in the end position.

3 Adjust sensor 1 (1) to the end position, see Sensor Assembly and Operating Manual.

4 Secure the sensor 1 (1) using the set-screw (4).
Tightening torque: 10 Ncm

5 Repeat steps for sensor 2 with opposing end position.

5.6 Settings

	NOTICE
	Risk of damage to the product! If the end position is approached too hard, the product may be damaged. • Adjust exhaust throttle valve and shock absorber so that the movement is braked smoothly.

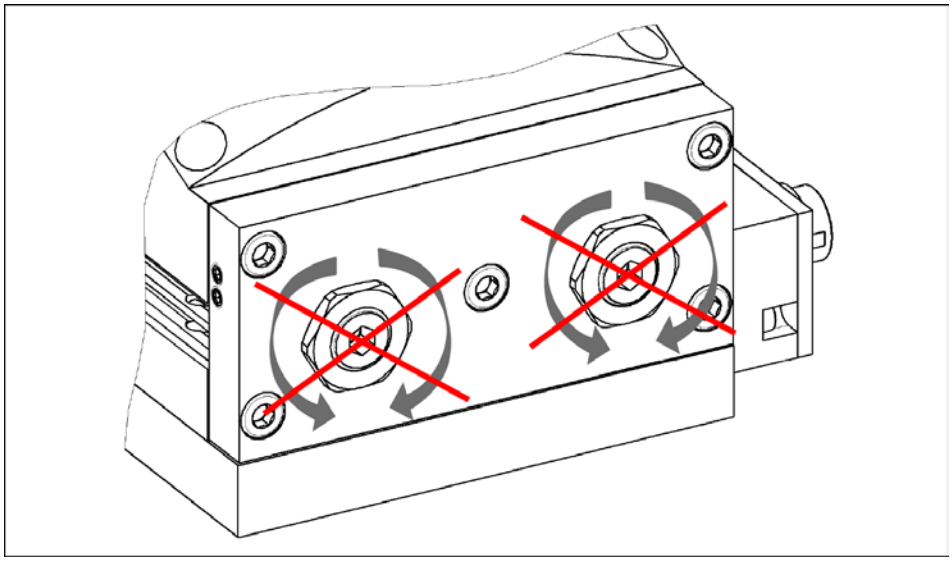
The swiveling speed and absorber stroke must be set for operation.

The settings must always be configured under subsequent operational conditions. If the operating conditions change, e.g. weight of the workpiece, check that the movement decelerates smoothly. If necessary, readjust swiveling speed and absorber stroke.

Angle of rotation end positions

The positions for the angle of rotation end positions are preset by SCHUNK and must not be changed.

	NOTICE
	Material damage due to erroneous settings! If the setscrews for the angle of rotation end positions are changed, the product will not pulse at the right angle and will jolt upon reaching the end position. This will cause the lock to become stiff or no longer work. • Do not change the setting of the angle of rotation end positions.



Set screw for the end position of the angle of rotation

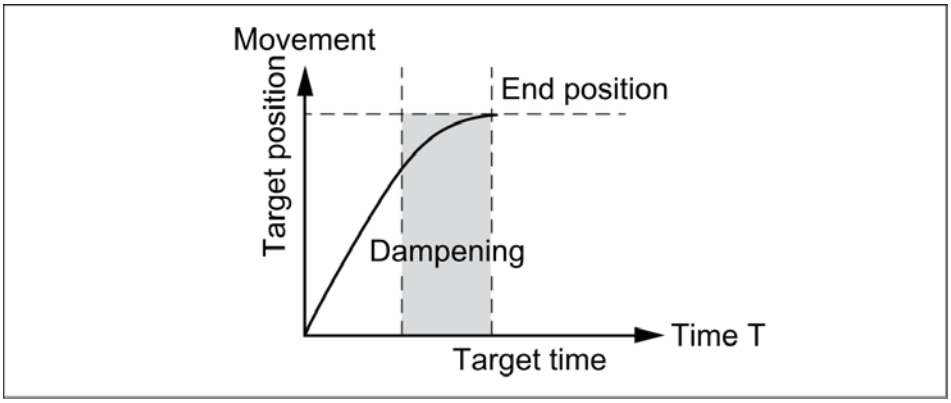
Swiveling speed and absorber stroke

Swiveling speed and absorber stroke are set in order to ensure a smooth operating cycle for the operating conditions, as both settings are dependent on each other.

Each end position is set separately. The position of the exhaust throttle valve and shock absorber may deviate from one another.

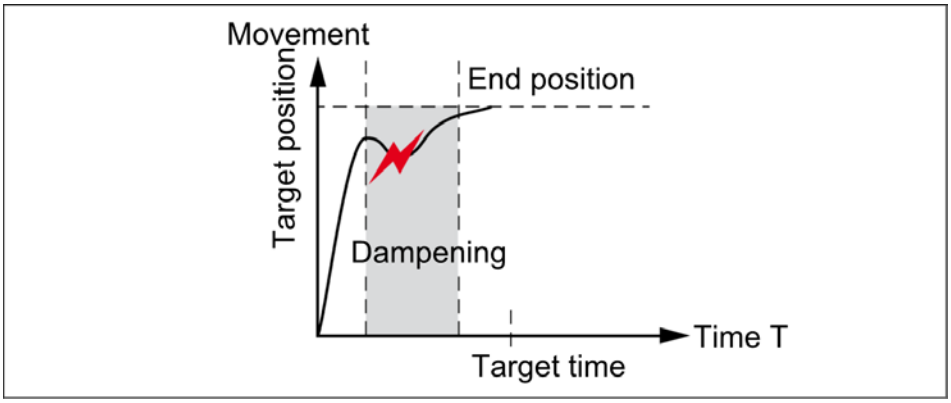
Set the swiveling speed so that the permissible swiveling times are not exceeded. The catalog data sheet contains data for the swiveling time.

Optimal setting

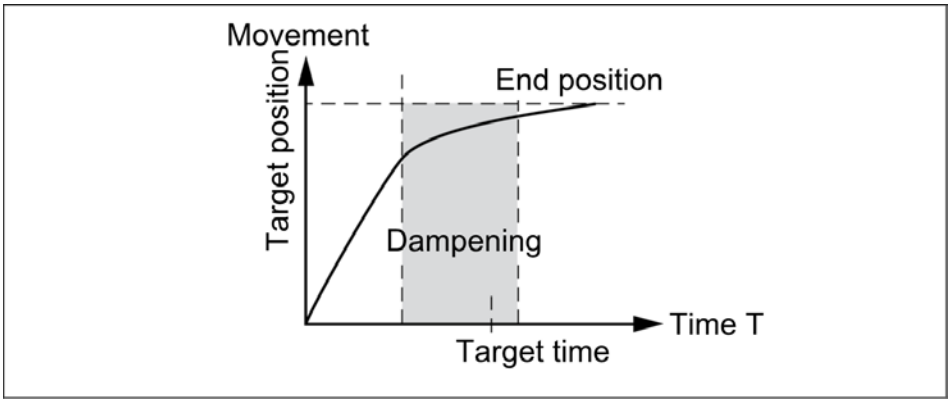


Swiveling speed and absorber stroke are optimal.

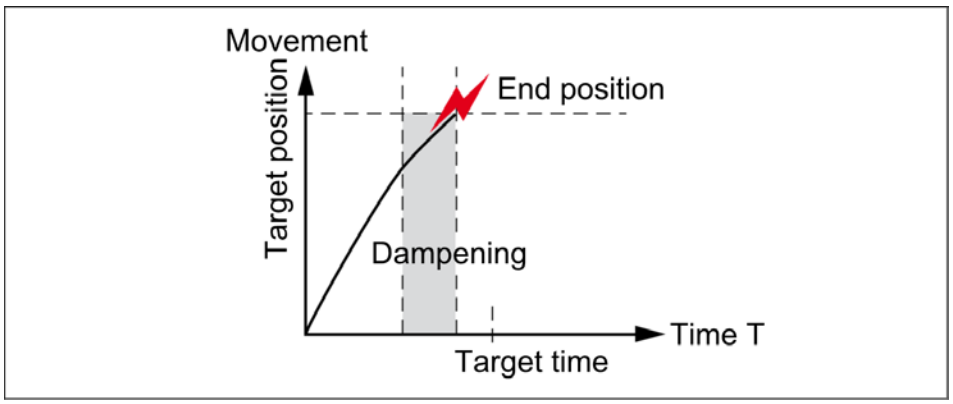
Erroneous setting



Swiveling speed too high. Assembly oscillates back.



Absorber stroke is too long. End position is reached too slowly.



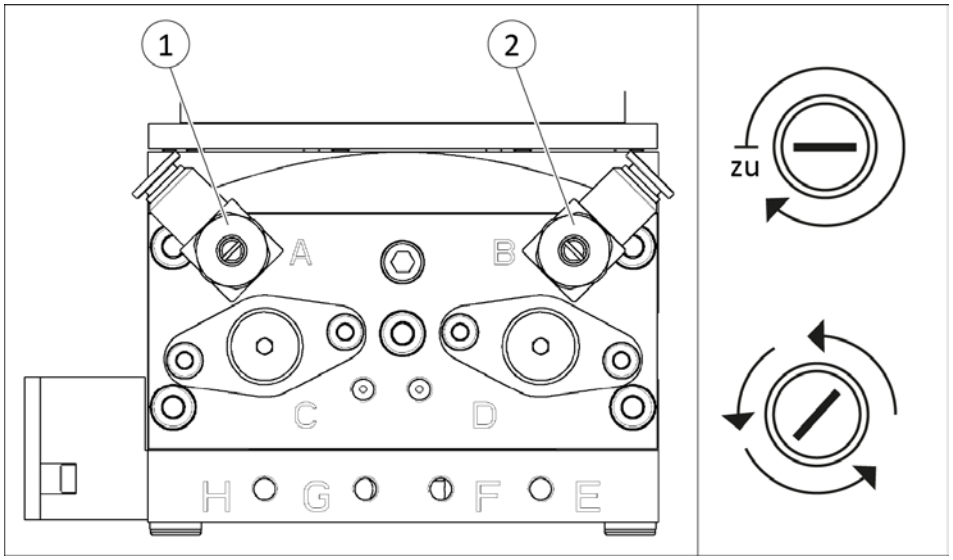
Absorber stroke is too short. Assembly hits the end position.

5.6.1 Adjusting swiveling speed

	***NOTICE*** **Damage due to too high swiveling speed!** If the swiveling speed is too high, the assembly will be decelerated abruptly by the shock absorber and will continue to oscillate until reaching the end position. This will overload the shock absorber and may cause damage to it. • Do not set the swiveling speed too high; the movement must decelerate smoothly.

NOTE

In order to achieve the swiveling times, always set swiveling speed and absorber stroke, (☞ 5.6.2, Page 31) and (☞ 5.6, Page 28).



NOTE

Before swiveling, always first pressurize the air connection "G" (unlocking valve mechanism).

1 Close both exhaust throttle valves completely.

2 **On air connection "A" (1):**

3 Pressurize air connection "A" (1).

4 Open exhaust throttle valve until the pinion starts to move.

⇨ Pinion swivels towards the end position.

5 Continue to open the exhaust throttle valve incrementally until the movement decelerates smoothly.

6 If the swivel speed is too high, the exhaust throttle valve must be closed again incrementally, until the optimal swivel time is reached.

7 Swivel repeatedly to test the setting, readjust if necessary.

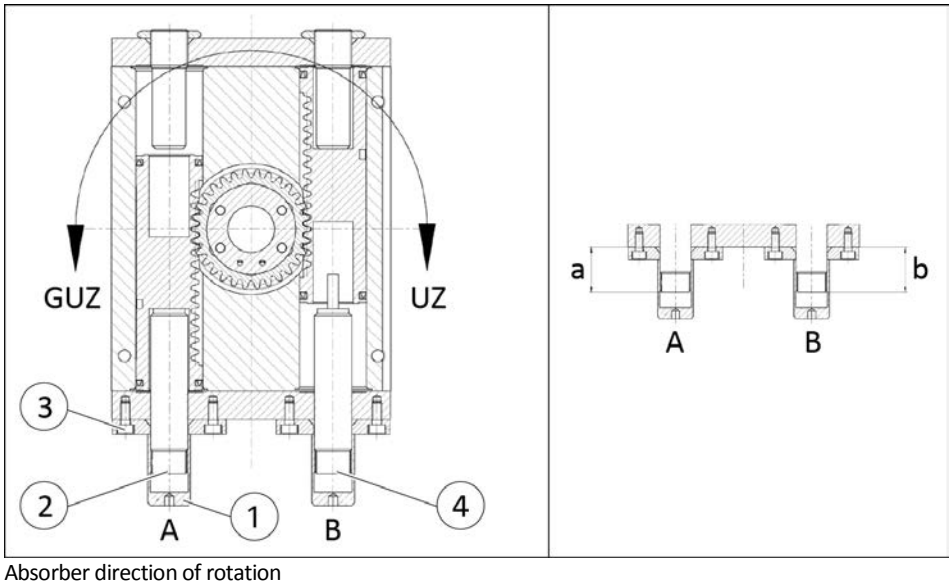
8 **On the air connection "B" (2):**
Repeat the steps for the other air connection.

5.6.2 Adjusting absorber stroke

NOTE

In order to achieve optimal swiveling times, always set absorber stroke and swiveling speed, (☞ 5.6.1, Page 30) and (☞ 5.6, Page 28).

The minimum absorber stroke is only designed for dampening the return stroke of the pistons. If loads are moved, the absorber has to be reset, if necessary.



Absorber direction of rotation

Direction of rotation	Absorber
Anti-clockwise (ACW)	A
Clockwise (CW)	B

Setting dimensions absorber stroke	RVK
Dimension a min. or b min. [mm] (maximum absorber stroke)	17
Dimension a max. or b max. [mm] (minimum absorber stroke)	21.5
Dimension a or b [mm] factory settings	17.5

NOTE

The absorber dampens the movement in the end position. Absorbers do not serve as an end stop for the drive.
Always set the absorbers back so that the product performs and locks the full angle stroke and allows pulsing to continue. Observe the setting dimensions of the absorber stroke.

1 Check deceleration of the movement in the end positions.

   ⇨ If the absorber stroke is too long, the end position is reached too slowly.

   ⇨ If the absorber stroke is too short, the assembly impacts in the end position.

2 **On the first absorber (2):**
   Unscrew counter sleeve (1).

3 **NOTICE! If the screws are loosened (3), compressed air may be blown off to a lesser extent.**
   Loosen the screws (3) until the absorber (2) can be turned.

4 Set absorbers (2) by turning the range "a min." to "a max.".

5 Tighten screws (3).

NOTE

If the absorber stroke is changed, the swivel speed might also need to be changed as well, so that the movement remains smooth, (☞ 5.6.1, Page 30).

6 Swivel repeatedly to test the setting, readjust if necessary.

   ⇨ The end positions must be approached gently.

NOTE

The counter sleeves lock the absorbers into position and must be tightened before operating the turret.

7 Tighten counter sleeve (1).

⇨ The absorber (2) is locked in position

8 Check operating cycle and the mechanical locking and unlocking.

9 **On the second absorber (4)**
, repeat the steps for the other end position.

Setting return stroke

When the load is only ever swiveled in one direction, the second absorber must be reset to dimension "a max." or "b max." to achieve fast cycle times.

1 Unscrew counter sleeve (1).

2 **NOTICE! If the screws are loosened (3), compressed air may be blown off to a lesser extent.**
Undo the screws (3), until the absorber (2/4) can be turned.

3 Turn back absorber (2/4) to dimension "a max." or "b max.".

4 Tighten screws (3).

5 Tighten counter sleeve (1) as far as it will go.

6 Completely open throttle valve on the absorber side.

6 Start-up

6.1 Bringing turret into operation

NOTICE

Material damage caused by mechanical blows!
Mechanical blows that are transferred to the turret, e. g. due to incorrectly set and functioning absorbers of the rotary indexing table, may cause the turret to become damaged.

- Check that the grippers work correctly and the rotary movement is set correctly. No mechanical blows may be transferred to the turret.

✓ Turret is mounted and connected

✓ All grippers are mounted and connected

✓ The air bores on unused mounting surfaces are sealed off

✓ All energy lines (compressed air) are connected

✓ Sensors are mounted and connected

1 Check that the technical data is adhered to, (☞ 3, Page 15).

2 Deactivate the switching position of the turret.

⇨ Pressurize channel **G**, ventilate channel **H**

3 Set rotary movement and dampening, (☞ 5.6, Page 28).

4 Check gripper for correct operation. In doing so, take into consideration all permissible operating parameters, see Gripper Assembly and Operating Manual.

⇨ All grippers work properly.

⇨ The turret can be operated, (☞ 6.3, Page 36).

1 Check gripper for correct operation. In doing so, take into consideration all permissible operating parameters, see Gripper Assembly and Operating Manual.

⇨ All grippers work properly.

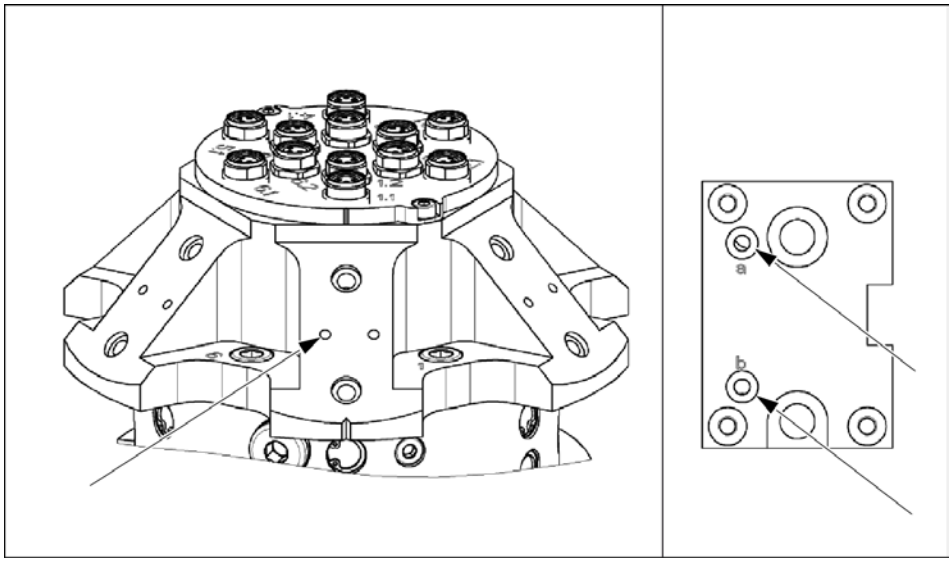
NOTE

Only switch channels G and H when channel D is pressurized and the rotary index table is locked.
Only switch channels A and B when channel G is pressurized, otherwise uncontrolled movements may occur.
Only switch channels E and F at the beginning once, except when all workpieces are to be cast at the same time.

6.2 Function of the air connections

Valve	Channel	Function
1	• **A** pressurize – **B** ventilate – **C** and **G** are pressurized	Turn clockwise
	• **B** pressurize – **A** ventilate – **C** and **G** are pressurized	Turn anti-clockwise
2	• **C** pressurize and wait 0.1 s – **D** ventilate	Unlock rotary module
	• **D** pressurize and wait 0.1 s – **C** ventilate	Lock rotary module
3	• **E** pressurize – **F** ventilate – **G** is pressurized	Close all grippers (for O.D. gripping) • Set once at the beginning. • Only use during the process if all work-pieces can be gripped together at the same time.
	• **F** pressurize – **E** ventilate – **G** is pressurized	Close all grippers (for I.D. gripping) • Set once at the beginning. • Only use during the process if all work-pieces may be cast together at the same time.
4	• **G** pressurize – **H** ventilate – **D** and **E** are pressurized	1 gripper (with marking) close
	• **H** pressurize – **G** ventilate – **D** and **E** are pressurized	1 gripper (with marking) open
	• **G** pressurize – **H** ventilate – **D** and **F** are pressurized	1 gripper (with marking) open
	• **H** pressurize – **G** ventilate – **D** and **F** are pressurized	1 gripper (with marking) close

6.3 Pneumatic actuation



Air bores adapter plate and gripper head

The air connections on the mounting surfaces of the gripper are supplied by two pressure areas, which make a ring around the fixed inner ring.

All grippers are connected to the pressure areas. Switching the pressure effects a switching of all grippers.

Channels **E** and **F** pressurize or ventilate the pressure areas. Channel **E** controls the "O.D. gripping" function and channel **F** controls the "I.D. gripping" function.

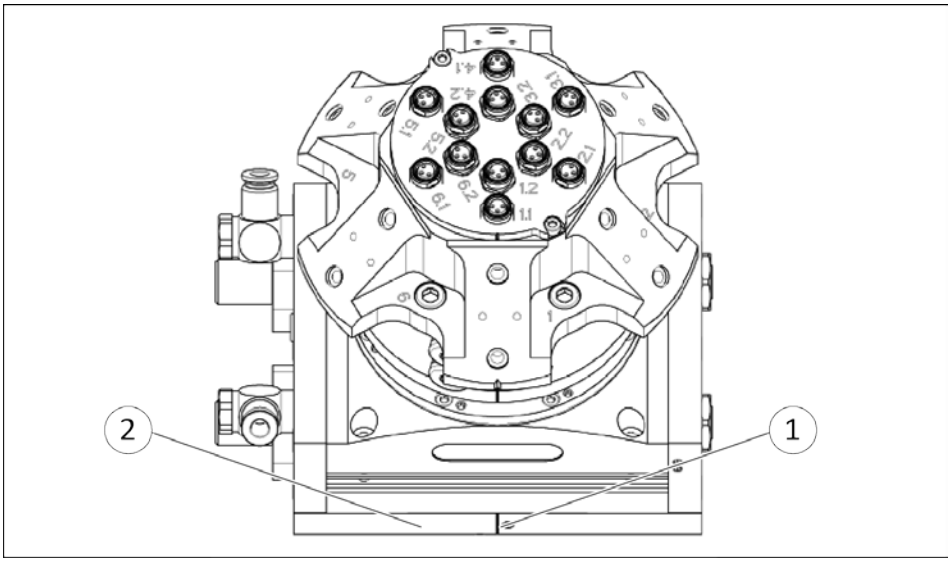
In the switching position, only the gripper is switched, which is located on the switching position. In doing so, the internal valve mechanism is switched from inactive to active.

- **Inactive:** Connection G aerated, connection H ventilated
- **Active:** Connection H aerated, connection G ventilated

NOTE

When grippers are controlled individually, only turn the rotary indexing table further with the valve switching inactive.

6.4 Switching position



Switching position

1	Switching position	2	Base plate

On the turret, the system only individually controls the gripper that is located at the switching position. The switching position is marked on the baseplate.

6.5 Sequence for customer-side programming

Information on the functions of the individual air connections, (☞ 6.2, Page 35).

If the product is already in the correct position, the points "Prepare piston position of the rotary index table" and "Bring RVK in starting position" may not be necessary.

6.5.1 O.D. gripping - rotating clockwise

Loading turret

Sequence for customer-side programming			Waiting time after actuation
	Channel **E** is permanently pressurized		
1	If necessary, prepare piston position of the rotary index table		
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
2	If necessary, bring RVK into the start position		
		• **C** pressurize, **D** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
3	Move gripper to the "open" position		
		• **H** pressurize, **G** will be ventilated	
4	Z axis method		
5	Bring gripper into "closed" position		
		• **G** pressurize, **H** will be ventilated	
6	Z axis method		
7	Turn RVK into the next position		
		• **C** pressurize, **D** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
8	Repeat points 3 - 7 for all connected grippers.		

Unloading turret

Sequence for customer-side programming			Waiting time after actuation
	Channel **E** is permanently pressurized		
1	If necessary, prepare piston position of the rotary index table		
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
2	If necessary, bring RVK into the start position		
		• **C** pressurize, **D** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
3	Z axis method		
4	Move gripper to the "open" position		
		• **H** pressurize, **G** will be ventilated	
5	Z axis method		
6	Bring gripper into "closed" position		
		• **G** pressurize, **H** will be ventilated	
7	Turn RVK into the next position		
		• **C** pressurize, **D** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
8	Repeat points 3 - 7 for all connected grippers.		

6.5.2 O.D. gripping - rotating anti-clockwise

Loading turret

Sequence for customer-side programming			Waiting time after actuation
	Channel **E** is permanently pressurized		
1	If necessary, prepare piston position of the rotary index table		
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
2	If necessary, bring RVK into the start position		
		• **C** pressurize, **D** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
3	Move gripper to the "open" position		
		• **H** pressurize, **G** will be ventilated	
4	Z axis method		
5	Bring gripper into "closed" position		
		• **G** pressurize, **H** will be ventilated	
6	Z axis method		
7	Turn RVK into the next position		
		• **C** pressurize, **D** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
8	Repeat points 3 - 7 for all connected grippers.		

Unloading turret

Sequence for customer-side programming			Waiting time after actuation
	Channel **E** is permanently pressurized		
1	If necessary, prepare piston position of the rotary index table		
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
2	If necessary, bring RVK into the start position		
		• **C** pressurize, **D** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
3	Z axis method		
4	Move gripper to the "open" position		
		• **H** pressurize, **G** will be ventilated	
5	Z axis method		
6	Bring gripper into "closed" position		
		• **G** pressurize, **H** will be ventilated	
7	Turn RVK into the next position		
		• **C** pressurize, **D** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
8	Repeat points 3 - 7 for all connected grippers.		

6.5.3 I.D. gripping - rotating clockwise

Loading turret

Sequence for customer-side programming			Waiting time after actuation
	Channel **F** is permanently pressurized		
1	If necessary, prepare piston position of the rotary index table		
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
2	If necessary, bring RVK into the start position		
		• **C** pressurize, **D** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
3	Bring gripper into "closed" position		
		• **H** pressurize, **G** will be ventilated	
4	Z axis method		
5	Move gripper to the "open" position		
		• **G** pressurize, **H** will be ventilated	
6	Z axis method		
7	Turn RVK into the next position		
		• **C** pressurize, **D** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
8	Repeat points 3 - 7 for all connected grippers.		

Unloading turret

Sequence for customer-side programming			Waiting time after actuation
	Channel **F** is permanently pressurized		
1	If necessary, prepare piston position of the rotary index table		
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
2	If necessary, bring RVK into the start position		
		• **C** pressurize, **D** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
3	Z axis method		
4	Bring gripper into "closed" position		
		• **H** pressurize, **G** will be ventilated	
5	Z axis method		
6	Move gripper to the "open" position		
		• **G** pressurize, **H** will be ventilated	
7	Turn RVK into the next position		
		• **C** pressurize, **D** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
8	Repeat points 3 - 7 for all connected grippers.		

6.5.4 I.D. gripping - rotating anti-clockwise

Loading turret

Sequence for customer-side programming			Waiting time after actuation
	Channel **F** is permanently pressurized		
1	If necessary, prepare piston position of the rotary index table		
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
2	If necessary, bring RVK into the start position		
		• **C** pressurize, **D** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
3	Bring gripper into "closed" position		
		• **H** pressurize, **G** will be ventilated	
4	Z axis method		
5	Move gripper to the "open" position		
		• **G** pressurize, **H** will be ventilated	
6	Z axis method		
7	Turn RVK into the next position		
		• **C** pressurize, **D** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
8	Repeat points 3 - 7 for all connected grippers.		

Unloading turret

Sequence for customer-side programming			Waiting time after actuation
	Channel **F** is permanently pressurized		
1	If necessary, prepare piston position of the rotary index table		
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
2	If necessary, bring RVK into the start position		
		• **C** pressurize, **D** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
3	Z axis method		
4	Bring gripper into "closed" position		
		• **H** pressurize, **G** will be ventilated	
5	Z axis method		
6	Move gripper to the "open" position		
		• **G** pressurize, **H** will be ventilated	
7	Turn RVK into the next position		
		• **C** pressurize, **D** will be ventilated	0.1 s
		• **B** pressurize, **A** will be ventilated	
		• **D**pressurize, **C** will be ventilated	0.1 s
		• **A** pressurize, **B** will be ventilated	
8	Repeat points 3 - 7 for all connected grippers.		

7 Troubleshooting

7.1 Product does not pulse

Possible cause	Corrective action
Pressure drops below minimum.	Check air supply. (☞ 5.2.2, Page 20)
Pressure lines connected incorrectly.	Check compressed air lines. (☞ 5.2.2, Page 20)
Compressed air lines switched.	
Component part defective.	Replace component or send it to SCHUNK for repair.
Product does not lock correctly	See product does not lock correctly.
Valve switching active	Before introducing the rotary movement, valve switching must always first be switched to inactive. To do this, aerate connection G and ventilate connection H. (☞ 5.2.2, Page 20).

7.2 Product does not lock correctly

Possible cause	Corrective action
Damper turned in too far (piston does not reach end position).	Readjust absorber. (☞ 5.6.2, Page 31)
Pressure drops below minimum.	Check air supply. (☞ 5.2.2, Page 20)

7.3 Signal for piston position or zero point monitoring missing

Possible cause	Corrective action
Zero point monitoring sensor set incorrectly.	Reset the sensor. (☞ 5.5, Page 24)
Piston position monitoring sensor set incorrectly.	Reset the sensor. (☞ 5.5, Page 24)
Sensor defective.	Change sensor. (☞ 5.5, Page 24)
Cable breakage.	Replace connection cable for sensor.

7.4 Rotary movement impacts in the end positions

Possible cause	Corrective action
Dampening not ideally set	Readjust absorber. (☞ 5.6.2, Page 31)
Shock absorber defective	Replace shock absorber.
The exhaust air throttle valve is defective	Replace the exhaust air throttle valve.
Swiveling speed too high.	Check swiveling time and adjust with exhaust air throttle valves as necessary. (☞ 5.2.2, Page 20)

7.5 Cycle times are not reached

Possible cause	Corrective action
ACTUAL operating pressure does not equal the TARGET rated operating pressure	Check operating pressure. (☞ 3, Page 15)
Compressed air lines are not installed optimally.	Check compressed air lines.
	Use exhaust air throttle valves from the accessory pack.
	Inner diameters of compressed air lines are of sufficient size in relation to compressed air consumption.
	Keep compressed air lines between the product and directional control valve as short as possible.
	Flow rate of valve is sufficiently large relative to the compressed air consumption.
Dampening and return stroke not completely reset (not for swiveling load in both directions).	Readjust absorber. (☞ 5.6.2, Page 31)
Dampening not ideally set	Readjust absorber. (☞ 5.6.2, Page 31)
Swiveling speed not ideally set	Readjust swiveling speed. (☞ 5.6.1, Page 30)
	Caution: Observe setpoint times.

7.6 Gripper cannot be switched over in switching position

Possible cause	Corrective action
Pressure drops below minimum.	Check air supply. (☞ 3, Page 15)
Pressure lines connected incorrectly.	Check compressed air lines. (☞ 5.2.2, Page 20)
Position of the switching position was not approached exactly	Check whether the rotary drive is in fully locked position. (☞ 5.6, Page 28).
Other.	For more troubleshooting, see Grippers.

7.7 Gripper state in inactive position not as desired

Possible cause	Corrective action
Compressed air lines E and F incorrectly connected or incorrectly actuated	Check compressed air lines. (☞ 5.2.2, Page 20)

7.8 Signal for monitoring gripper state is not present

Possible cause	Corrective action
Sensor inaccurately adjusted or defective.	Adjust sensor or if necessary change sensor. (☞ 5.5, Page 24)
Cable breakage.	Replace connection cable for sensor.
Internal signal feedthrough defective	Send the product to SCHUNK with a repair order.

8 Maintenance

8.1 Notes

original spare parts

Use only original spare parts of SCHUNK when replacing spare and wear parts.

8.2 Maintenance intervals

Interval [Mio. cycles] for RVK	Maintenance work
Daily	Visually check the function of the shock absorbers. (☞ 8.5, Page 51)
2	Replace shock absorber. (☞ 8.6, Page 51)

8.3 Grease/greasing areas

The product has life-time lubrication and must not be greased during operation.

8.4 Wear parts

The expected lifespan depends on the respective application. Therefore, the information concerning the life span is a guide value.

Wearing part	Life span [Mil.]	Note
O-ring	-	Fig. item 44
Shock absorber	2 Mil. cycles	Fig. item 57 Id. 9953563
Exhaust air throttle valve	-	Fig. item 90 Id. 9936159
Slip ring (signal feedthrough)	3 Mil. revolutions	Change only at SCHUNK
Radial seals	8 Mil. revolutions	
Valve mechanism with seals	10 Mil. valve switching cycles (actuation G/H)	

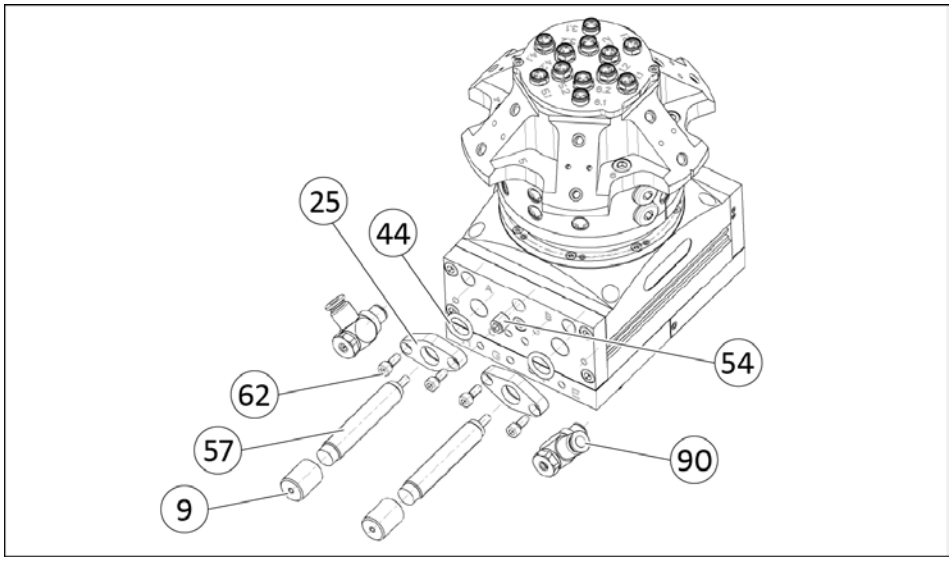
Further wearing parts that cannot be exchanged by the customer:

- All other sealing elements
- All rolling-contact bearings in the product
- Drive components and components in the locking mechanism
- Back stops

In the case of defects in the drive and/or the locking, contact SCHUNK.

Dismantling and assembling

	***NOTICE***
	Material damage due to erroneous dismantling!
	Faulty disassembly of the product can cause damage to the mechanics and internal electronics
	• Only allow SCHUNK to repair the product.
	• The following components may be dismantled by the customer
	  • Grippers and adapter plates mounted by the customer
	  • Components for air supply and end position dampers



Dismantling and assembling

9	Counter sleeve	57	Absorber
25	Counter plate	62	Counter plate screw
44	O-ring for counter plate seal	90	Throttle valve
54	Locking screw for zero point monitoring sensor		

8.5 Inspect shock absorbers

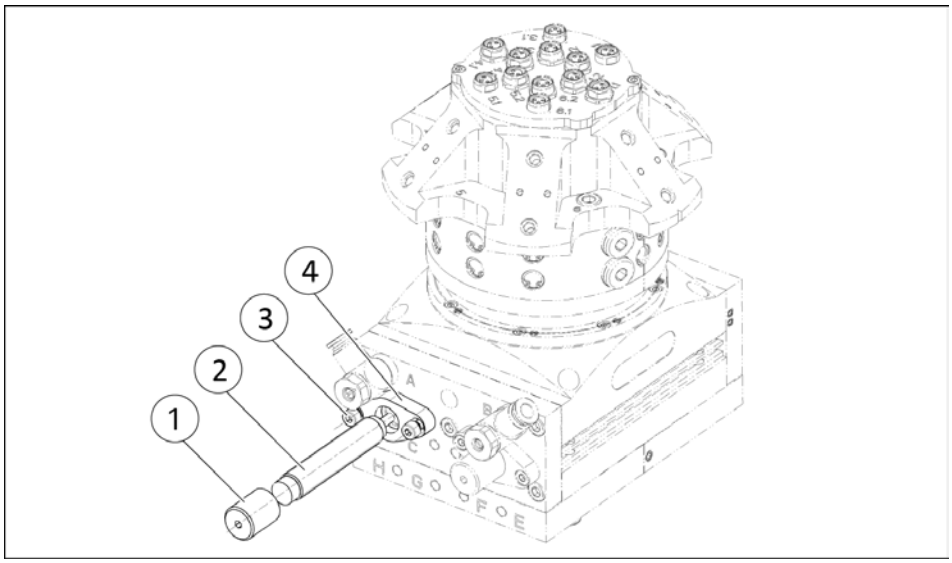
	***NOTICE*** **Material damage caused by absorber failure!** Shock absorbers have a limited life span. But overloading the product or exceeding the permissible swiveling speed can lead to a shortened life-span. If the absorber fails, this may result in severe mechanical damage. • Regularly check that the shock absorbers are working. • Observe the catalog data sheet and technical data.

1 Regularly check that the shock absorbers are working.

⇨ The shock absorber is working correctly if the product moves quickly and without mechanical impacts into the end positions when set correctly and the prescribed swiveling time is reached.

8.6 Replace shock absorber

	**⚠ WARNING** **Risk of injury from uncontrolled movements!** If the energy supply is switched on or residual energy remains in the system, parts may move unexpectedly and cause serious injuries. • Switch off energy supply. • Make sure there is no residual energy in the system



Replace shock absorber

1 Switch off the energy supply.

2 Unscrew counter sleeve (1).

3 **NOTICE! The new absorber must be set to the same dimensions.**
Measure up absorber screwing in length (2).

4 Loosen screws (3) of the counter plate (4) until the absorber (2) can be turned.

5 Unscrew absorber (2) from the counter plate (4).

6 Screw new absorber (2) with the dimensions of the old absorber into the counter plate (4).

7 Tighten counter plate (4).

8 **NOTICE! The counter sleeves lock the absorbers into position and must be tightened before operating the turret.**
Tighten counter sleeve (1).

9 Switch on energy supply.

10 Check absorber stroke and swiveling speed by swiveling several times, if necessary readjust, (☞ 5.6.1, Page 30) and (☞ 5.6.2, Page 31).

9 Translation of original declaration of incorporation

in terms of the Directive 2006/42/EG, Annex II, Part 1.B of the European Parliament and of the Council on machinery.

Manufacturer/ Distributor	SCHUNK GmbH & Co. KG Spann- und Greiftechnik Bahnhofstr. 106 – 134 D-74348 Lauffen/Neckar

We hereby declare that on the date of the declaration the following incomplete machine complied with all basic safety and health regulations found in the directive 2006/42/EC of the European Parliament and of the Council on machinery. The declaration is rendered invalid if modifications are made to the product.

Product designation:	Pneumatic rotating turret / RVK / electro-pneumatic
ID number	0315640, 0315650

The incomplete machine may not be put into operation until conformity of the machine into which the incomplete machine is to be installed with the provisions of the Machinery Directive (2006/42/EC) is confirmed.

Applied harmonized standards, especially:

DIN EN ISO 12100:2011-03	Safety of machinery - General principles for design - Risk assessment and risk reduction

The manufacturer agrees to forward on demand the relevant technical documentation for the partly completed machinery in electronic form to national authorities.

The relevant technical documentation according to Annex VII, Part B, belonging to the partly completed machinery, has been created.

Person authorized to compile the technical documentation:
Robert Leuthner, Address: see manufacturer's address

Signature: see original declaration

Lauffen/Neckar, September 2016

p.p. Ralf Winkler,
Head of Gripping Systems Development

10 Annex to Declaration of Incorporation

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

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

Product designation	Pneumatic rotating turret
Type designation	RVK
ID number	0315640, 0315650

To be provided by the System Integrator for the overall machine	⇓
Fulfilled for the scope of the incomplete machine	⇓
Not relevant	⇓

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

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

1.3	**Protection against mechanical hazards**			
1.3.1	Risk of loss of stability			X
1.3.2	Risk of break-up during operation			X

1.3	Protection against mechanical hazards			
1.3.3	Risks due to falling or ejected objects			X
1.3.4	Risks due to surfaces, edges or angles		X	
1.3.5	Risks related to combined machinery			X
1.3.6	Risks related to variations in operating conditions			X
1.3.7	Risks related to moving parts		X	
1.3.8	Choice of protection against risks arising from moving parts			X
1.3.8.1	Moving transmission parts		X	
1.3.8.2	Moving parts involved in the process			X
1.3.9	Risks of uncontrolled movements			X

1.4	Required characteristics of guards and protective devices			
1.4.1	General requirements			X
1.4.2	Special requirements for guards			X
1.4.2.1	Fixed guards			X
1.4.2.2	Interlocking movable guards			X
1.4.2.3	Adjustable guards restricting access			X
1.4.3	Special requirements for protective devices			X

1.5	Risks due to other hazards			
1.5.1	Electricity supply		X	
1.5.2	Static electricity		X	
1.5.3	Energy supply other than electricity		X	
1.5.4	Errors of fitting		X	
1.5.5	Extreme temperatures			X
1.45.6	Fire			X
1.5.7	Explosion			X
1.5.8	Noise			X
1.5.9	Vibrations			X
1.5.10	Radiation	X		
1.5.11	External radiation	X		
1.5.12	Laser radiation	X		
1.5.13	Emissions of hazardous materials and substances			X
1.5.14	Risk of being trapped in a machine	X		
1.5.15	Risk of slipping, tripping or falling	X		
1.5.16	Lightning			X

1.6	Maintenance			
1.6.1	Machinery maintenance		X	
1.6.2	Access to operating positions and servicing points		X	
1.6.3	Isolation of energy sources		X	
1.6.4	Operator intervention		X	
1.6.5	Cleaning of internal parts		X	

1.7	Information			
1.7.1	Information and warnings on the machinery	X	X	
1.7.1.1	Information and information devices		X	
1.7.1.2	Warning devices		X	
1.7.2	Warning of residual risks	X	X	
1.7.3	Marking of machinery	X		
1.7.4	Instructions	X		
1.7.4.1	General principles for the drafting of instructions	X		
1.7.4.2	Contents of the instructions	X		
1.7.4.3	Sales literature	X		

	The classification from Annex 1 is to be supplemented from here forward.			
2	Supplementary essential health and safety requirements for certain categories of machinery			X
2.1	Foodstuffs machinery and machinery for cosmetics or pharmaceutical products			X
2.2	Portable hand-held and/or guided machinery			X
2.2.1	Portable fixing and other impact machinery			X
2.3	Machinery for working wood and material with similar physical characteristics			X
3	Supplementary essential health and safety requirements to offset hazards due to the mobility of machinery		X	
4	Supplementary essential health and safety requirements to offset hazards due to lifting operations		X	
5	Supplementary essential health and safety requirements for machinery intended for underground work			X
6	Supplementary essential health and safety requirements for machinery presenting particular hazards due to the lifting of persons		X	