

Tolerance Compensation Unit TCU-P

Assembly and Operating Manual



Imprint

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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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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 [\(☞ 1.1.2, Page 6\)](#) are applicable.

1.1.1 Presentation of Warning Labels

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

	<p>⚠ DANGER</p> <p>Danger for persons! Non-observance will inevitably cause irreversible injury or death.</p>
	<p>⚠ WARNING</p> <p>Dangers for persons! Non-observance can lead to irreversible injury and even death.</p>
	<p>⚠ CAUTION</p> <p>Dangers for persons! Non-observance can cause minor injuries.</p>
	<p>NOTICE</p> <p>Material damage! Information about avoiding material damage.</p>

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:

- TCU-P 050
- TCU-P 064
- TCU-P 080
- TCU-P 100
- TCU-P 125
- TCU-P 160
- TCU-P 200
- TCU-P 240

1.1.4 Variants

This operating manual applies to the following variations:

- TCU-P Without "locking"
- TCU-P With "locking"

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:

- Intended use in 1-shift operation
- Observe the mandatory maintenance and lubrication intervals
- Observe the environmental and operating conditions

Parts touching the work piece and wear parts are not part of the warranty.

1.3 Scope of delivery

The scope of delivery includes

- Tolerance Compensation Unit TCU-P in the version ordered
- Accessory pack

1.4 Accessories

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

- Sensors, plus extension cables as an option

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.

1.4.1 Sealing kit

ID.-No. of the seal kit

Seal kit for	ID number
TCU-P 64-MV	0324870
TCU-P 80-MV	0324872
TCU-P 100-MV	0324874
TCU-P 125-MV	0324876
TCU-P 160-MV	0324878
TCU-P 200-MV	0324880
TCU-P 240-MV	0324882

Contents of the sealing kit, ([👉 7, Page 26](#)).

2 Basic safety notes

2.1 Intended use

This product is designed for compensating tolerances and positioning inaccuracies in handling workpieces.

- The product may only be used within the scope of its technical data, ([👉 3, Page 15](#)).
- The product is intended for installation in a machine/system. The applicable guidelines must be observed and complied with.
- The product is intended for industrial use.
- Appropriate use of the product includes compliance with all instructions in this manual.

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

Requirements for the ambient and operating conditions

Due to incorrect ambient and operating conditions, dangers may arise from the product, which can cause serious injuries and substantial property damage.

- Make sure that the product is used only in the context of its defined application parameters, ([☞ 3, Page 15](#)).
- Make sure that the product has a sufficient size for the application.
- Observe maintenance and lubrication intervals, ([☞ 6.2, Page 23](#)).
- 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.

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 manner of working by personnel

Working in an incorrect manner 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.
- Rectify malfunctions as soon as they occur.
- 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 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.

2.11 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.

2.11.1 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.

2.11.2 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.

2.11.3 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 EMERGENCY STOP before starting up the machine or system. If this protective equipment is not working properly, prevent the operation of the machine.



2.11.4 Protection against electric shock

Possible electrostatic energy

Components or assembly groups may become electrostatically charged. When the electrostatic charge is touched, the discharge may trigger a shock reaction leading to injuries.

- The operator must ensure that all components and assembly groups are included in the local equipotential bonding in accordance with the applicable regulations.
- While paying particular attention to the actual conditions of the working environment, the equipotential bonding must be implemented by a specialist electrician according to the applicable regulations.
- The effectiveness of the equipotential bonding must be verified by executing regular safety measurements.

2.12 Notes on particular risks

	 WARNING
	<p>Danger of injury due to spring forces! Parts are under spring tension on modules which clamp using spring force or which have a gripping force maintenance.</p> <ul style="list-style-type: none">• Only specially trained staff should disassemble the module.

3 Technical data

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

3.1 With "Locking" (MV)

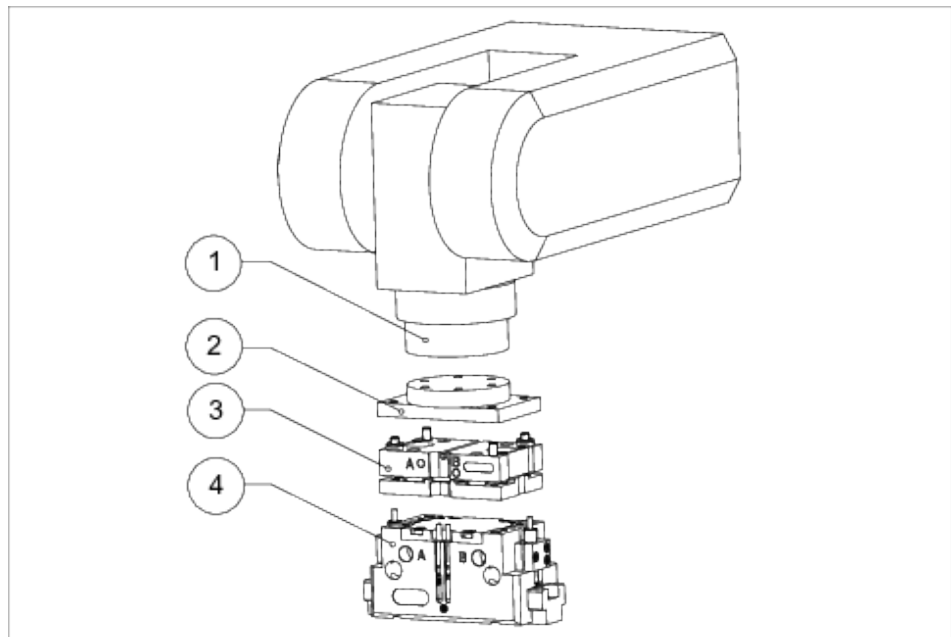
Size	64	80	100	125	160	200	240
Weight [kg]	0.1	0.15	0.27	0.4	0.7	1.3	2.1
permissible operating temperature	-10 to +90 °C / 14 to 194 °F						
Pressure medium	Druckluft, Druckluftqualität nach ISO 8573-1: 7:4:4						
Min. pressure [bar]	4						
Max. pressure [bar]	8						
Noise emission [dB(A)]	≤ 70						

3.2 Without "Locking" (OV)

Size	50	64	80	100	125	160	200	240
Weight [kg]	0.1	0.08	0.1	0.22	0.3	0.55	1.0	1.8
Permissible operating temperature	-10 to +90 °C / 14 to 194 °F							
Noise emission [dB(A)]	≤ 10							

4 Assembly

4.1 Assembly example



Assembly example

Item	Description
1	robot or gantry axis
2	adapter plate (optional from SCHUNK or provided by customer)
3	tolerance compensation unit
4	handling device e.g. Gripper

Optional, SCHUNK can provide an adapter plate with hole pattern for mounting holes.

The adapter plate (2) is mounted to the robot (1) and to the TCU-P (3) (see our catalog for mounting data).

SCHUNK gripper types PGN-plus, DPG, PGB and JPG are attached directly to the TCU-P.

For all other handling devices (4) is an adapter plate required.

Air connection and electrical cables must be fixed and bundled with cable clamp, in order that during use the greatest possible freedom of movement is possible.

4.2 Mechanical connection



NOTICE

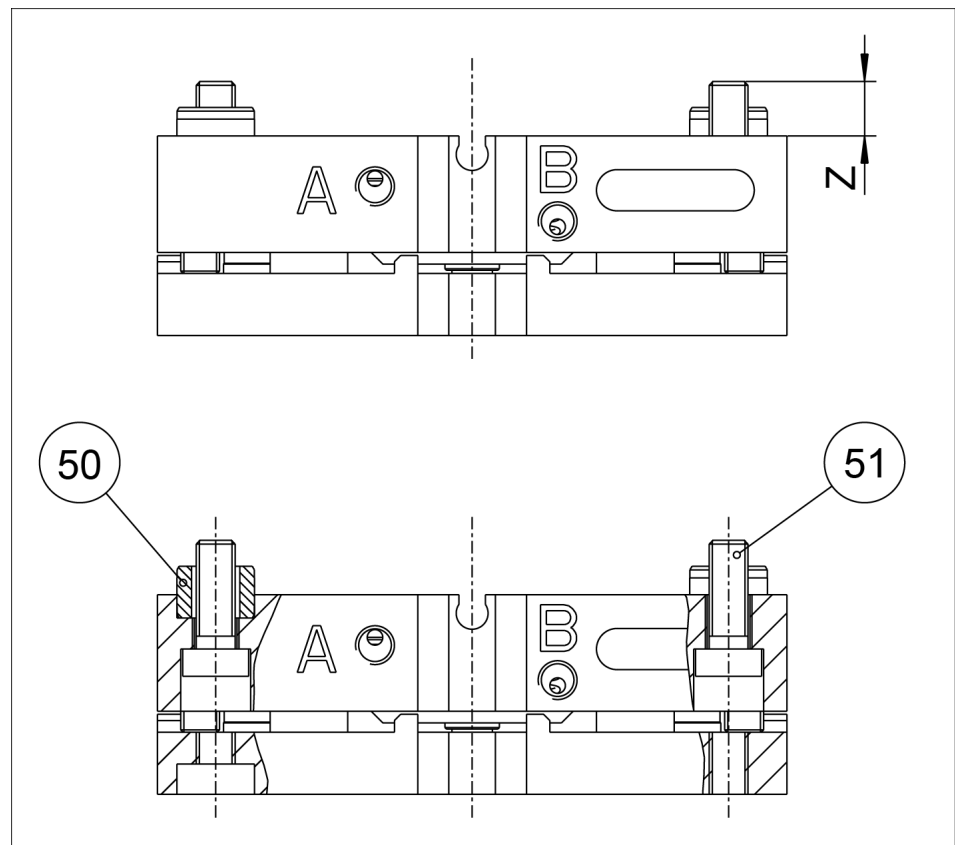
Break of the module because of faulty installation is possible!
Observe maximum depth of engagement at robot side and handling device.

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

4.2.1 Assembly at the robot



Possibilities of assembly

The centering sleeves (50) are included in the enclosed pack. The mounting screws (51) are pre-assembled in the module.

- 1 Fix the module on the fixing bore, using the cylindrical pin (50)

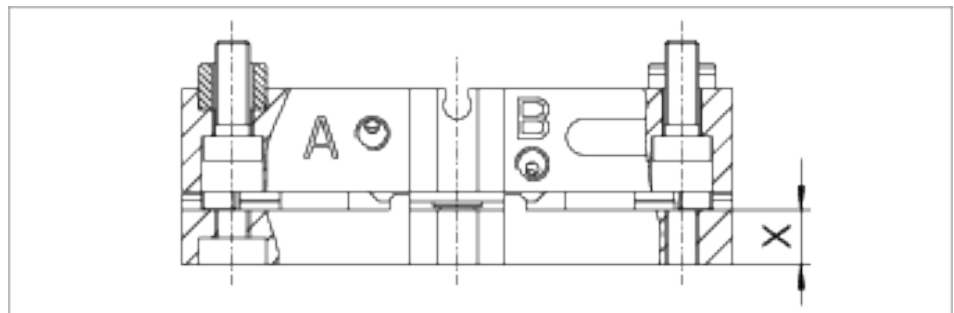
NOTE

Observe tightening torque.

- 2 Tighten mounting screws (51) with a hexagon screwdriver.

I-tem	Mounting	50	64	80	100	125	160	200	240
50	Dimensions	Ø6 / 5.35	Ø8 / 5.35		Ø10 / 6.65	Ø12 / 6.65		Ø14 / 8.6	Ø16 / 8.6
51	Thread diameter	M3	M4		M5	M6		M8	M10
	Tightening torque [Nm]	1.27	3.0		5.9	10.0	10.1	24.6	49
Z	maximum depth [mm]		6		7	8	9	10	14

4.2.2 Mounting at the handling device



Data for mounting at the adapter plate / handling device

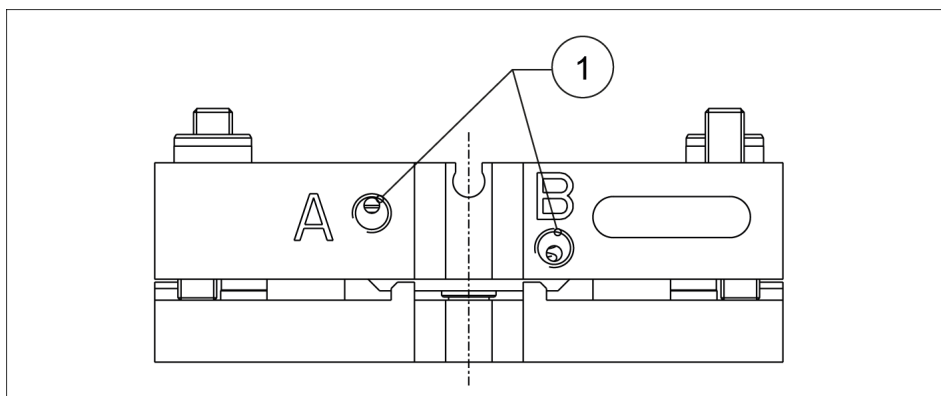
Item	Mounting	50	64	80	100	125	160	200	240
x	thread diameter	M3	M4		M5	M6		M8	M10
	Max. screw-in depth [mm]	7	8			9	10	11	15

4.3 Air connection



NOTICE

Observe the requirements for the air supply
[\(→ 3, Page 15\).](#)



Air connection

Item	64	80	100	125	160	200	240
Pressure medium	Compressed air						
Standard for quality of the compressed air	According to DIN ISO 8573: 6 4 4						
Hose connection	Connect pressure line to the air connection.						
Thread diameter hose connection (A= unlocked, B= locked)	M3	M5	G1/8				

- Open only the air connections that are needed.
- Close unused main air connections using the screw plugs from the enclosed pack.
- For a hose-free direction connection, use the O-rings from the enclosed pack.

4.4 Mounting the sensor

NOTE

Observe the assembly and operating manual of the sensor for mounting and connecting.


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.

4.4.1 Overview of sensors

Designation	TCU-P
	050 - 240
Programmable Magnetic Switch MMS-P 22	x

4.4.2 Mounting the programmable magnetic switch MMS-P 22

	NOTICE
	<p>Risk of damage to the sensor during assembly!</p> <ul style="list-style-type: none"> • Observe the maximal tightening torque.

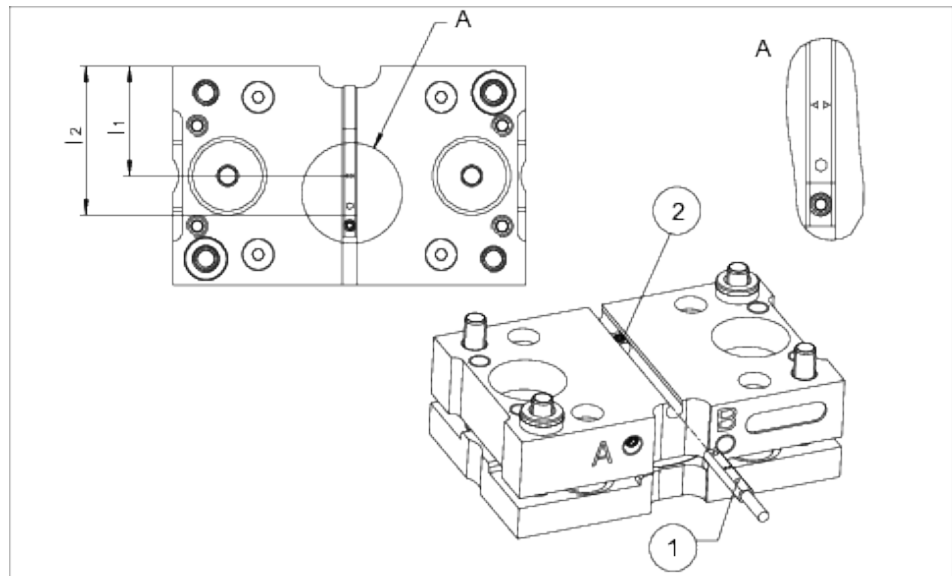
NOTE

Ferromagnetic materials changes the switching positions of the sensor. For example adapter plate made ordinary steel.

In case of ferromagnetic adapter plate:

- First TCU-P mounted on adapter plate
- Then, set the positions of the magnetic switch.

- 1 Move the sensor (1) into the bracket up to the stop (2).
OR: If there is no stop, adjust the L1 or L2 protrusion of the sensor (see table "adjustment dimensions").
- 2 Fasten the sensor using a threaded pin.
Tightening torque: 10 Ncm
- 3 Adjust the sensor, see assembly and operating manual of the sensor.



Assembling the sensor, .

1	sensor
2	stop
l1	lower edge TCU-Pup to the double arrow on the sensor
l2	bottom edge of TCU-Pup to front side of sensor

Adjustment dimensions

Size	50	64	80	100	125	160	200	240
dimension l1 [mm]	-	18	21	25	30	36	50	57.5
dimension l2 [mm]	-	26.9	29.9	33.9	38.9	44.9	58.9	66.4

5 Troubleshooting

5.1 Compensation unit does not move

Possible cause	Corrective action
Incorrect air supply.	Check air supply.

5.2 Compensation unit does not lock itself

Possible cause	Corrective action
Proximity switch defective or set incorrect.	Disassemble and clean the product.
Pressure drops below minimum.	Readjust or change sensor.

5.3 Compensation unit does not execute the full stroke for the locking

Possible cause	Corrective action
Dirt between cylinder and cylinder cover.	Disassemble and clean the product.
Pressure drops below minimum.	Check air supply., (↩ 4.3)

5.4 Locking force decreases during locking

Possible cause	Corrective action
Compressed air can escape.	Check seals, if necessary, disassemble the product and replace seals.
To much grease in the mechanical movement space.	Clean and lubricate product.
Pressure drops below minimum.	Check air supply.

6 Maintenance

6.1 Notes

Original spare parts

When replacing damaged parts (wearing parts/spare parts) only use SCHUNK original spares.

6.2 Maintenance intervalls



NOTICE

Damage caused by insufficient lubricant!

Lubricants harden more quickly at temperatures above 60°C, leading to possible product damage.

- Reduce the lubricant intervals accordingly.

Interval [Mio. cycles] at TCU-P			Maintenance work
100 - 50	125 - 150	200 - 240	
4	3	2	Treat all grease areas with lubricant, (↗ 6.3, Page 24)
4	3	2	Clean all parts thoroughly, check for damage and wear, if necessary replace seals and wearing parts, (↗ 7, Page 26)
4	3	2	Replace shear pads, (↗ 6.4, Page 24)

6.3 Lubricants/Lubrication points (basic lubrication)

SCHUNK recommends the lubricants listed.


During maintenance, treat all greased areas with lubricant. Thinly apply lubricant with a lint-free cloth.

Lubricant point	Lubricant
Metallic sliding surfaces	microGLEIT GP 360
All seals	Renolit HLT 2
Bores on the piston	Renolit HLT 2

6.4 Disassembly and assembly

6.4.1 Variant with locking (MV)

Position of the position numbers ([👉 7, Page 26](#))

	<p>! WARNING</p>
	<p>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.</p> <ul style="list-style-type: none"> • Switch off energy supply. • Make sure there is no residual energy in the system

- 1 Detach cable connections.
- 2 Remove the compressed air line.
- 3 Remove product from handling device.

NOTE

Housing-top (22) and adapter plate are aligned to each other, using centering sleeves (50).

- 4 Remove screws (51) and separate product from the adapter plate.
- 5 Remove screws (52) from the housing-top (02).


! WARNING
Risk of injury due to spring forces!

The cylinder piston is under spring tension.
Carefully disassemble the product.

- 6 Remove screws (53) and remove bolt (09).
- 7 Separate housing top (22) from flange bottom (01).
- 8 Unscrew screws (49) and remove cylinder cover (04).
- 9 Remove cylinder piston (03) from the housing-top (02)
- 10 Remove screws (52) from the flange-bottom (01) and replace shear pads (15).

6.4.2 Variant without locking (OV)

Position of the position numbers ([↩ 7, Page 26](#))


! 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

- 1 Detach cable connections.
- 2 Remove compressed air lines.
- 3 Remove product from handling device.

NOTE

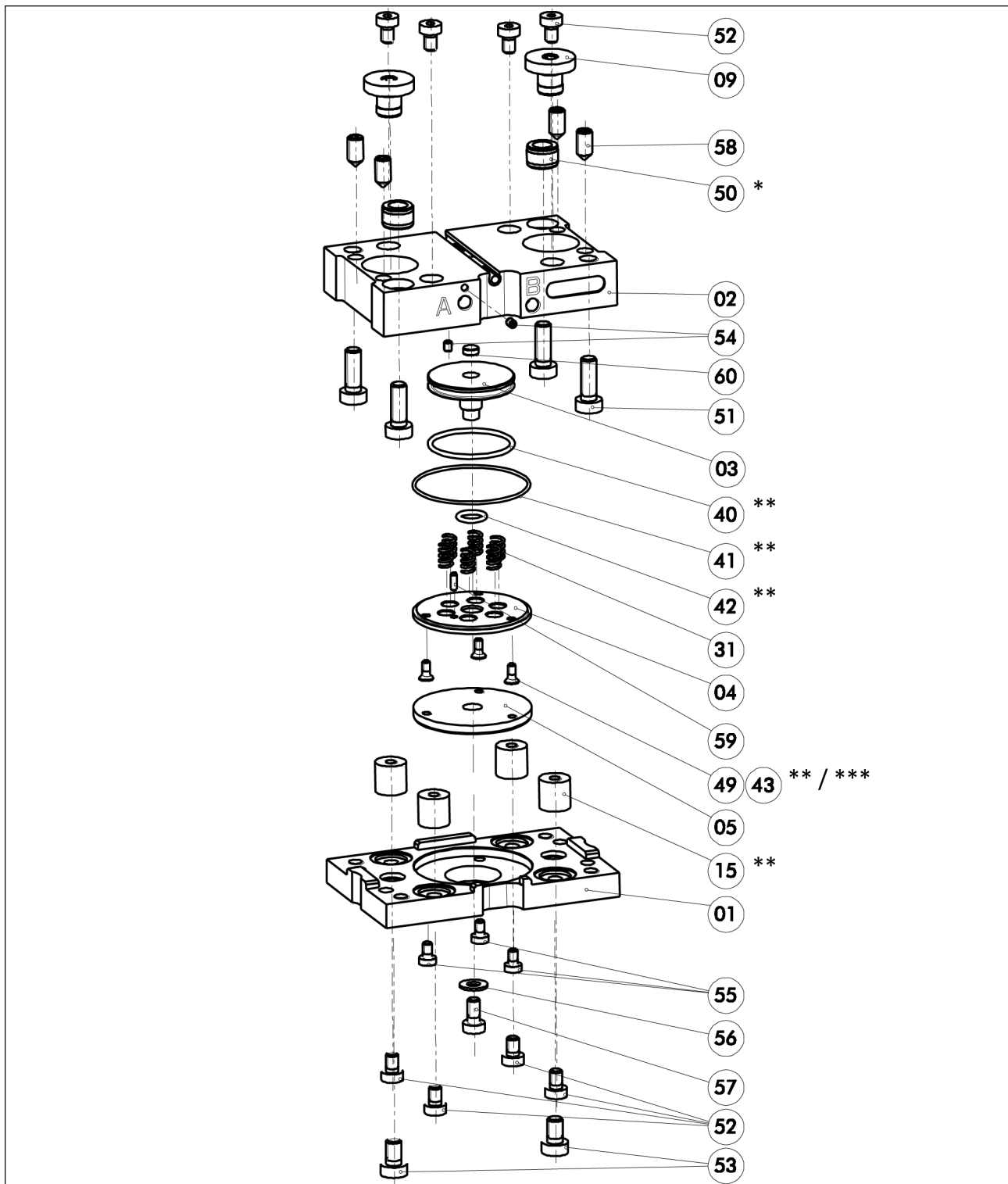
Housing-top (22) and adapter plate are aligned to each other, using centering sleeves (50).

- 4 Remove screws (51) and separate product from the adapter plate.
- 5 Remove screws (52) from the housing-top (02).
- 6 Remove screws (53) and remove bolt (09).
- 7 Separate housing top (22) from flange bottom (01).
- 8 Remove screws (52) from the flange-bottom (01) and replace elastomer (15/16).

7 Assembly drawings

The following figures are example images.
They serve for illustration and assignment of the spare parts.
Variations are possible depending on size and variant.

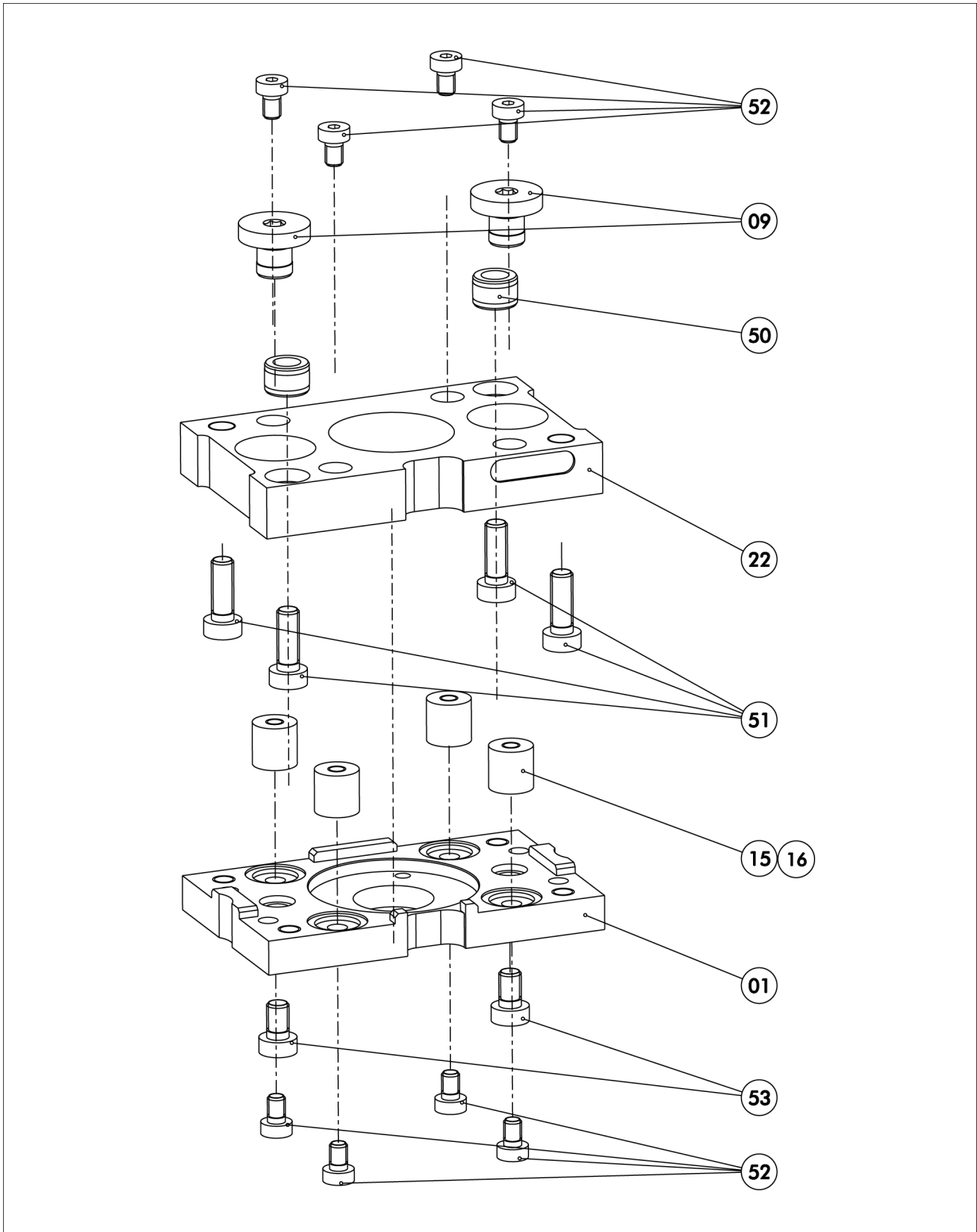
7.1 Assembling of the variant with locking (MV)



Assembling of variants with locking (MV)

- * Contained in accessory pack.
- ** Wearing part, replace during maintenance.
Included in the seal kit. Seal kit can only be ordered completely.
- *** only for TCU-P 64, TCU-P 100, TCU-P 160

7.2 Assembling of the variant without locking (OV)



Assembling of the variant without locking (OV)