



Clamping force block TANDEM KSP3-IM

Assembly and Operating Manual

Imprint

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Dear Customer,

Thank you for trusting our products and our family-owned company, the leading technology supplier of robots and production machines.

Our team is always available to answer any questions on this product and other solutions. Ask us questions and challenge us. We will find a solution!

Best regards,

Your SCHUNK team

Customer Management

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Please read the operating manual in full and keep it close to the product.

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1 General

1.1 About this manual

This manual contains important information for the safe, correct use of the product.

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

Personnel must have read and understood this manual before beginning any work. The observance of all safety notes in this manual is a prerequisite to ensure safe work processes.

The illustrations are intended to provide a basic understanding and may deviate from the actual version.

Besides this manual, other documents which apply are those listed under ► 1.1.2 [6]

1.1.1 Illustration of warning notices

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



⚠ DANGER

Denotes a hazard with a high degree of risk that, if not avoided, will result in death or serious injury.



⚠ WARNING

Denotes a hazard with a medium degree of risk that, if not avoided, could result in death or serious injury.



⚠ CAUTION

Denotes a hazard with a low degree of risk that, if not avoided, could result in a minor or moderate injury.

NOTICE

Information about avoiding material damage.

1.1.2 Applicable documents

- General Terms and Conditions *
- Catalog data sheet for the attached product *
- Technical data sheet for optional attachments *
- Approval drawings

Documents marked with a star (*) can be downloaded at **schunk.com**.

1.1.3 Sizes

This operating manual applies to the following sizes:

- KSP3 IM 100, 140, 160, 200, 250, 315
- KSP3-LH IM 100, 140, 160, 200, 250, 315

1.1.4 Variants

This manual applies to the following variants:

- Clamping force amplification for O.D. clamping (AS)
- Jig-machined positioning bores (Z)

1.2 Warranty

The warranty for standard products is 24 months from the date of delivery from the factory, or 50,000 cycles* for manually operated clamping devices and 500,000 cycles* for power operated clamping devices. For special clamping devices, it is 12 months from the date of delivery from the factory, assuming appropriate use in accordance with the following conditions:

- Observe the applicable documents, ▶ 1.1.2 [6]
- Observance of the ambient conditions and operating conditions, ▶ 2.5 [8]
- Observance of maintenance and lubrication intervals, ▶ 6.2 [29]

Parts touching the workpiece and wearing parts are not covered by the warranty.

* One cycle comprises one complete clamping procedure ("opening" and "closing").

1.3 Scope of Delivery

Clamping force block

KSP3 IM, KSP3-LH IM

including inductive proximity switch
(without top jaws)

ACCESSORY KIT:

(for contents, see sealing kit list and parts list) ▶ 9.1 [40]

1.4 Accessories

(see catalog or data sheets when ordering separately)

Top jaw blanks, type: STR, KTR

Supporting jaws, type: TBA-G

TANDEM Base plates

Valves, pneumatic screws

Extension cable for INW inductive proximity switch

2 Basic safety notes

Improper handling, assembly and maintenance of this product may result in risk to persons and equipment if this operating manual is not observed.

2.1 Appropriate use

- The product is used for clamping metal and plastic workpieces on machine tools.
- The product may only be used within the scope of its technical data.
- The product is designed to be set up on a machine table or machine pallets.
- The product is intended for industrial and commercial use.
- Appropriate use of the product includes compliance with all instructions in this manual.
- Use suitable top jaws with a suitable interface.
- Clamping workpieces with temperatures between 0°C and 100°C.
- The outer dimensions of the workpiece must be smaller than or at most equal to the outer diameter of the clamping device.
- The workpiece must not undergo plastic deformation while under clamping force (clamping indentations are permissible).

2.2 Inappropriate use

The product is not being used appropriately if:

- the product is used as a press or a punch, as a toolholder, as a lathe chuck, as a drill or as a cutting tool.
- the technical data specified are exceeded during usage.
- workpieces are not properly clamped, paying particular attention to the specified clamping forces.
- the top jaws are not mounted properly.
- the product is not being operated properly.
- the product is operated in the stroke end positions.
- the guideways are overloaded due to the chuck jaws being too high or the selected clamping point being too high.
- the product has been insufficiently maintained.
- the product is used for turning applications over 100 RPM without consulting SCHUNK.
- the product is brought into contact with aggressive media, especially acids.
- the product is used in abrasive blasting processes, especially sandblasting.

2.3 Structural changes

Implementation of structural changes

Modifications, changes or reworking, e.g. additional threads, holes, or safety devices, can damage the product or impair its functionality or safety.

- Structural changes should only be made with the written approval of SCHUNK.

2.4 Spare parts

Use of unauthorized spare parts

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

- Only use original spare parts and spares authorized by SCHUNK.

2.5 Ambient conditions 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 in the service life of the product

- Make sure that the product is only used within its defined application parameters.
- Ensure that the product is of a sufficient size for the application.
- Ensure that maintenance and lubricating intervals are observed.
- When machining, use only coolant emulsions with anti-rust properties.
- Depending on the operating conditions, the function must be checked after a certain period of operation.

2.6 Material limitations

The product is made of steel alloys, elastomers, aluminum alloys and brass. In addition, Microgleit LP 410 grease, Branotect anti-rust oil and Renolit HLT2 are incorporated into the product as auxiliary and operating materials. The safety data sheet for Microgleit LP 410 can be found at www.schunk.com.

2.7 Chuck Jaws

Requirements of the chuck jaws

When using chuck jaws, please observe the following rules:

- Change chuck jaws at a standstill and without a clamped workpiece.
- Do not use welded jaws.
- Design the chuck jaws to be as low as possible. The clamping point must be as close as possible to the housing. (clamping points at a greater distance cause higher surface pressures in the jaw guides and can significantly reduce the clamping force.)
- If the clamping point is at a greater distance from the housing, the operating pressure must be reduced.
- After a collision, the clamping device and the chuck jaws must be subjected to a crack detection test before being used again. Replace damaged parts with original SCHUNK spare parts.
- The chuck jaw mounting screws and if present, the T-nuts, must be replaced if there are signs of wear or damage. Only use screws of quality grade 12.9 in compliance with the specified tightening torques. For clamping devices with fine serration, the jaw mounting screws must be screwed into the holes closest to the clamping point.

2.8 Personnel qualifications

Inadequate qualification of personnel

Any work on the product by inadequately qualified personnel can lead to serious injuries and considerable material damage.

- All work must be performed by appropriately qualified personnel.
- Personnel must have read and understood the complete manual before beginning any work on the product.
- Observe country-specific accident prevention regulations and the general safety notes.

The following personnel qualifications are required for the various activities on the product:

Qualified electrician	Qualified electricians have the professional training, knowledge, and experience to work on electrical systems, to recognize and avoid potential dangers, and know the relevant standards and regulations.
Specialist personnel	Specialist personnel have the specialized training, knowledge, and experience to perform the tasks entrusted to them, to recognize and avoid potential dangers, and know the relevant standards and regulations.

Instructed person	Instructed persons have been instructed by the operator regarding the tasks entrusted to them and the potential dangers of inappropriate behavior.
Manufacturer's service personnel	The manufacturer's service personnel have the specialized training, knowledge, and experience to perform the work entrusted to them and to recognize and avoid potential dangers.

2.9 Personal protective equipment

Use of personal protective equipment

Personal protective equipment serves to protect staff in the event of a danger that may interfere with their health or safety at work.

2.10 Transport

Handling during transport

Incorrect handling during transport can make the product unsafe and risks the danger of serious injuries and considerable material damage.

- During transport and handling, secure the product to prevent it from falling.
- Use the transport thread on the clamping device.

2.11 Protection during handling and assembly

Incorrect handling and assembly

Incorrect handling and assembly can make the product unsafe and can risk the danger of serious injuries and considerable material damage.

- All work must only be performed by appropriately qualified personnel.
- Secure the system against accidental operation during all work.
- Use suitable assembly and transport equipment and take precautions to prevent jamming and crushing.

2.12 Protection during commissioning and operation

Falling or violently ejected components

Falling and ejected components can lead to serious injury or death.

- Take suitable protective measures to secure the danger zone.

2.13 Notes on safe operation

Incorrect manner of working by personnel

An incorrect manner of working can make the product unsafe and risks serious injuries and considerable material damage.

- Observe the safety notes and assembly instructions.
- Do not expose the product to any corrosive media.
Products for special ambient conditions are excluded.
- Rectify malfunctions as soon as they occur.
- Observe the care and maintenance instructions.
- Observe the current safety, accident prevention, and environmental protection regulations for the application field of the product.
- Do not start the machine spindle until the force has built up in the chuck jaw and clamping is complete in the permissible operating range.
- Unclamping may only occur once the machine spindle has come to a standstill.

IMPORTANT!

Following a longer shutdown period (more than 8 hours), always re-tension the clamping device in order to compensate for the setting properties of the clamping situation or possible pressure losses and the resulting loss of clamping force.

2.14 Disposal

Handling of disposal

Incorrect handling during disposal can make the product unsafe and risks serious injuries and considerable material and environmental harm.

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

2.15 Fundamental dangers

General

- Disconnect power sources before installation, modification, maintenance, or calibration. Ensure that no residual energy remains in the system.
- Do not reach into the open mechanism or movement area of the product during operation.

2.16 Protection against dangerous movements

Safe condition

1. Clamping force block with workpiece:
Workpiece clamped outside the end positions of the clamping force block with clamping pressure applied.
2. Clamping force block without workpiece, without clamping or release pressure applied.
3. Clamping force block with spring force:
Clamped without energy without workpiece.
Special feature: Due to the built-in spring, an opened clamping force block clamps without release pressure.
Unexpected clamping movements could result if the release pressure fails. Take suitable measures, e.g. a pilot-controlled check valve with manual venting.

Unexpected movements

If the system still retains residual energy, serious injuries can be caused while working on the product.

- Establish a safe state, switch off the energy supply, ensure that no residual energy remains and secure against inadvertent reactivation.

2.17 Notes on particular risks



⚠ WARNING

Risk of injury in the event of workpiece loss due to component failure on the product as a result of exceeding the technical data.

- The product is only allowed to be used within the scope of its technical data.



⚠ WARNING

Risk of injury due to immediate closing of the product with high spring force in the event of pneumatic pressure failure (AS variant).

- Wait for the system to come to a complete standstill in the safe state.
- Do not reach into the clamping force block.



⚠ WARNING

Danger of crushing due to the chuck jaws moving to the workpiece during the clamping procedure when loading and unloading manually.

- Do not reach between the workpiece and the chuck jaw during the clamping procedure.
- Implement the safety functions according to the integrator's risk assessment.



⚠ WARNING

Risk of injury in the event of workpiece loss due to failure or pressure reduction.

- Implementing safety functions according to the integrator's risk assessment.
- Ensure stable pressure supply.
- Use pressure maintenance valves.



⚠ WARNING

Risk of injury from falling parts during transport, assembly and disassembly of the product and its accessories.

- Use suitable load handling equipment for transport.
- Do not linger in the danger zone.
- Wear protective equipment (protective shoes).



⚠ CAUTION

Ergonomic risk to the musculoskeletal system when lifting and transporting the product using manual force.

- Use load handling equipment for lifting and transporting.



⚠ CAUTION

Allergic reactions or irritation due to skin or eye contact with lubricants on the product.

- In case of foreseeable contact with lubricants on the product (e.g. when lubricating or cleaning),
- wear protective equipment (protective gloves, protective goggles).



⚠ CAUTION

Danger for the operating personnel in case of insufficient clamping force due to ejection or falling of the workpiece!

Due to settling behavior, the clamping force may decrease over time.

- Ensure that the clamping pressure is applied to the clamping force block while the workpiece is being machined.
- Re-clamping of the workpiece with manual or pneumatic clamping force blocks.

3 Technical data

Installation position	any
Operating temperature [°C]	+5 to +60
Noise emission [dB(A)]	≤ 70
Pressure medium	Compressed air, compressed air quality according to ISO 8573-1:2010 [7:4:4]
Max. speed of rotation [rpm]	100

Designation	KSP3-IM					
	100	140	160	200	250	315
Standard operating pressure / AS operating pressure [bar]	2 – 9 / 3 – 9	2 – 9 / 3 – 9	2 – 9 / 3 – 9	2 – 9 / 3 – 9	2 – 6 / 3 – 6	2 – 6 / 3 – 6
Stroke/jaw [mm]	2	3	3	4	5	6.5
Clamping force at max. pressure* [kN]	18	30	45	55	55	100
Additional clamping force from spring assembly**(AS) [kN]	2.5 – 6.5	4.5 – 9	5.5 – 11	8.5 – 16	10.5 – 20	16 – 32.5
Repeat accuracy ** [mm]	0.01	0.01	0.01	0.02	0.02	0.02
max. jaw height [mm]	60	60	60	100	150	200
Weight [kg]	4	7.5	11	19	32	70

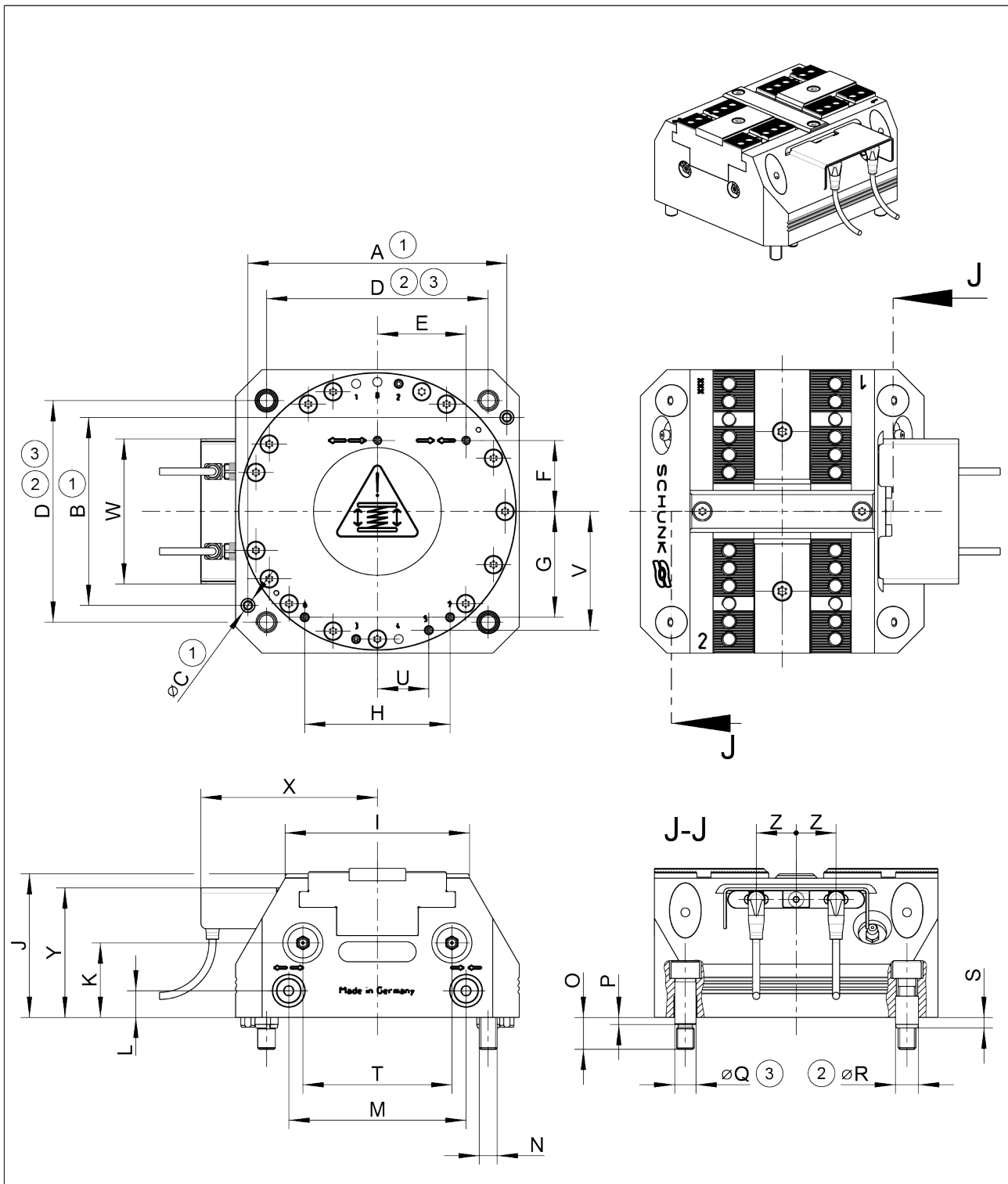
Designation	KSP3-LH-IM					
	100	140	160	200	250	315
Standard operating pressure / AS operating pressure [bar]	2 – 9 / 3 – 9	2 – 9 / 3 – 9	2 – 9 / 3 – 9	2 – 9 / 3 – 9	2 – 6 / 3 – 6	2 – 6 / 3 – 6
Stroke/jaw [mm]	6	7	8	10	15	18
Clamping force at max. pressure* [kN]	8	15	20	25	20	40
Additional clamping force from spring assembly**(AS) [kN]	1 – 2.5	2 – 4	2 – 4.5	3.5 – 7	3.5 – 7	6.5 – 12.5
Repeat accuracy *** [mm]	0.01	0.01	0.01	0.02	0.02	0.02
max. jaw height [mm]	150	120	200	200	500	500
Weight [kg]	4	7.5	11	19	32	70

* Clamping force is the arithmetic sum of the individual forces occurring at the chuck jaws at a distance of "H" (see catalog ► 1.1.2 [6]).

** The clamping force increase caused by the spring assembly depends on the stroke because of the spring tension. The maximum spring force is reached in the "open" state, the minimum spring force in the "closed" state.

*** Distribution of the clamping position with 100 consecutive clamping operations.

Dimension	KSP3 IM/KSP3-LH IM					
	100	140	160	200	250	315
A [mm]	90	126	146	184	230	290
B [mm]	64	92	106	146	154	230
Ø C [mm]	6 H7 x 12	8 H7 x 14	8 H7 x 14	8 H7 x 14	10 H7 x 20	10 H7 x 20
D [mm]	80	110	125	160	200	250
E [mm]	29.5	44	50	64.5	75	100
F [mm]	32	45.5	40	64.5	64	108
G [mm]	34.5	51.8	59.7	72	92.6	112
H [mm]	55	74	82	116	139.6	192
I [mm]	64	91	104	138	170	220
J [mm]	69.2	72.7	82.2	90.2	98.2	136
K [mm]	36	38	42	48	82	73
L [mm]	10	13.5	15	17.5	20	20
M [mm]	59	88	100	129	150	200
N [mm]	M8	M8	M10	M12	M12	M16
O [mm]	15	15.5	18	21	20	26
P [mm]	4	3.5	4	6	5	5
Ø Q [mm]	10 f7	10 f7	12 f7	14 f7	14 f7	18 f7
Ø R [mm]	11	11	13	16	16	21
S [mm]	4.5	5.5	6	6	6	6
T [mm]	54	76	84	110	140	180
U [mm]	18.7	26	29	41	54	65
V [mm]	40	58.5	67	83	104	132
W [mm]	65.8	81.8	81.8	95	134.8	142
X [mm]	82.1	93	99.5	113.5	124.5	164.5
Y [mm]	63.5	65	73	82	87.2	123
Z [mm]	14...20	18.5...26.5	18.5...26.5	22.5...32.5	27.5...42.5	28.5...51.5



- | | |
|---|---|
| 1 | Optional Z variant ± 0.01 mm to clamping center |
| 2 | Clamping sleeve ± 0.04 mm to clamping center |
| 3 | Fitting screw ± 0.02 mm to clamping center |

4 Tightening torques for screws

Tightening torques for mounting the clamping system on the machine table (screw quality 10.9)

Screw size	M4	M5	M6	M8	M10	M12	M14	M16	M18	M20	M22	M24
Tightening torque M_A (Nm)	4.2	7.5	13	28	50	88	120	160	200	290	400	500

Tightening torques for mounting top jaws on the TANDEM clamping force block (screw quality 12.9)

Screw size	M4	M5	M6	M8	M10	M12	M14	M16	M20	M24
Tightening torque M_A (Nm)	5	9	15	32	62	108	170	262	510	880

Tightening torques for mounting the chuck piston onto the cylinder piston (screw quality 12.9)

Screw size	M5	M8	M10	M12	M20
Tightening torque M_A (Nm)	9	32	62	108	510

Tightening torques for mounting the cover on the body (screw quality A2-70)

Size	100	140	160	200	250	315
Screw size	M5	M5	M5	M6	M6	M8
Tightening torque M_A (Nm)	4.5	4.5	4.5	7	7	16

5 Assembly

The numbers shown for individual components refer to the illustrations for assembly or connections of the clamping force block and to the "Drawings" chapter, ► 10 [44].



⚠ WARNING

Danger of crushing due to the product approaching the machine table during assembly.

- Do not reach between the product and machine table during assembly



⚠ CAUTION

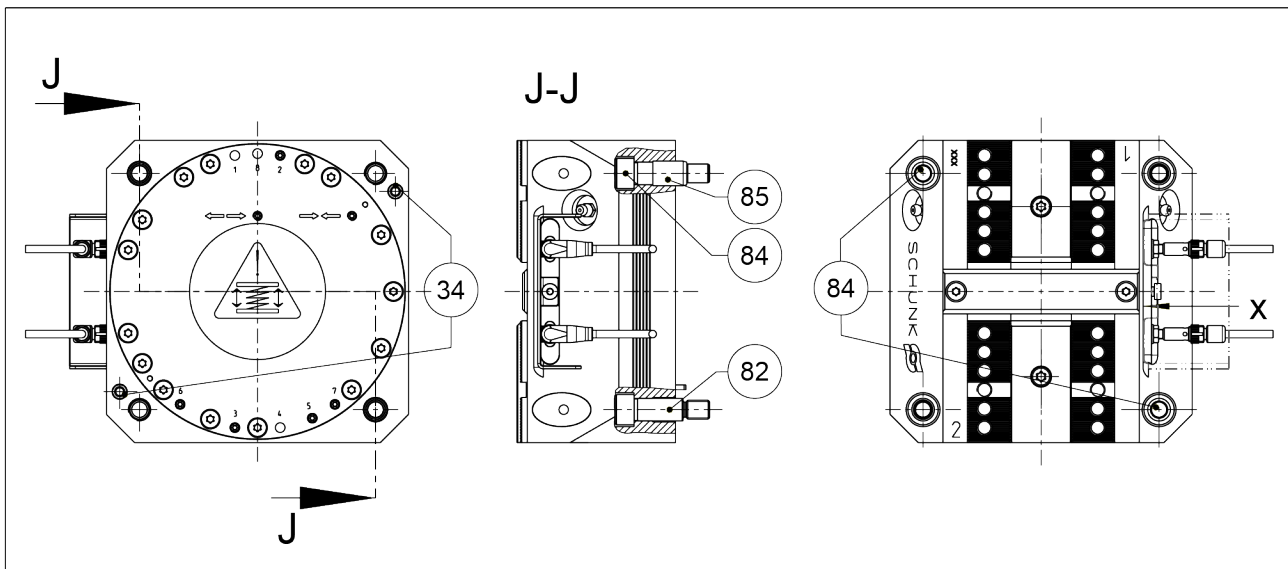
Danger of abrasions due to rough components of the product and its accessories, which may slip out of your hands during assembly.

- Wear protective equipment (protective gloves) when working on the product and when handling its accessories

5.1 Assembly of the Clamping Block on the machine table

Assembly with clamping sleeves:

Mount the clamping force block on the machine table together with clamping sleeves (item 27) and screws (item 19).



34 Cylindrical pins $\varnothing$ m6 ► 9.3 [43]

82 Fitting screw $\varnothing$ f7 ► 9.3 [43]

84 Screw DIN EN ISO 4762

85 Clamping sleeve DIN EN ISO 13337

NOTE

- For vertical installation, the openings of the coolant drain (V) must always face downwards
 - Surface >>X<< is parallel to the guideway of the base jaws (item 2) in order to be able to align the clamping force block on the machine table or check the positioning.
 - Installation drawings can be requested from SCHUNK.
-

Assembly with clamping sleeves:

Mount the clamping force block on the machine table together with clamping sleeves (item 85) and screws (item 84).

Assembly with fitting screws:

There are two fittings in the housing (item 1) that, along with fitting screws (item 82), are used to center the clamping force block on the machine table with repeat accuracy. Do not realign the clamping force block after removing it from the machine table (e.g. after replacing the seals). When using fitting screws (item 82), these are used instead of the clamping sleeves (item 85) and two of the four screws (item 84).

Mounting with cylindrical pins (Z variant):

The clamping force block is fastened to the machine table with 4 screws (item 84). The two cylindrical pins (item 34) are used for alignment with repeat accuracy. Do not realign the clamping force block after removing it from the machine table (e.g. after replacing the seals).

5.2 Mounting the clamping force block on the base plate (if the two parts are delivered separately)

When mounting TANDEM clamping force blocks on TANDEM base plates **ABP-h plus** use the shorter mounting screws included in the base plate accessory kit instead of the standard mounting screws (item 19) that come with the clamping force block.

For KSP3 100-IM, KSP3-LH 100-IM:

Use the **M8 x 30** screws from the base plate accessory kit instead of the M8 x 35 screws (item 84).

For KSP3 160-IM, KSP3-LH 160-IM:

Use the **M10 x 35** screws from the base plate accessory kit instead of the M10 x 40 screws (item 84).

For KSP3 250-IM, KSP3-LH 250-IM:

Use the **M12 x 40** screws from the base plate accessory kit instead of the M12 x 45 screws (item 84).

NOTE

If the clamping force block and base plate are ordered separately, the screws, O-rings and clamping sleeves for assembling the parts are included in the accessory kit that comes with the clamping force block.

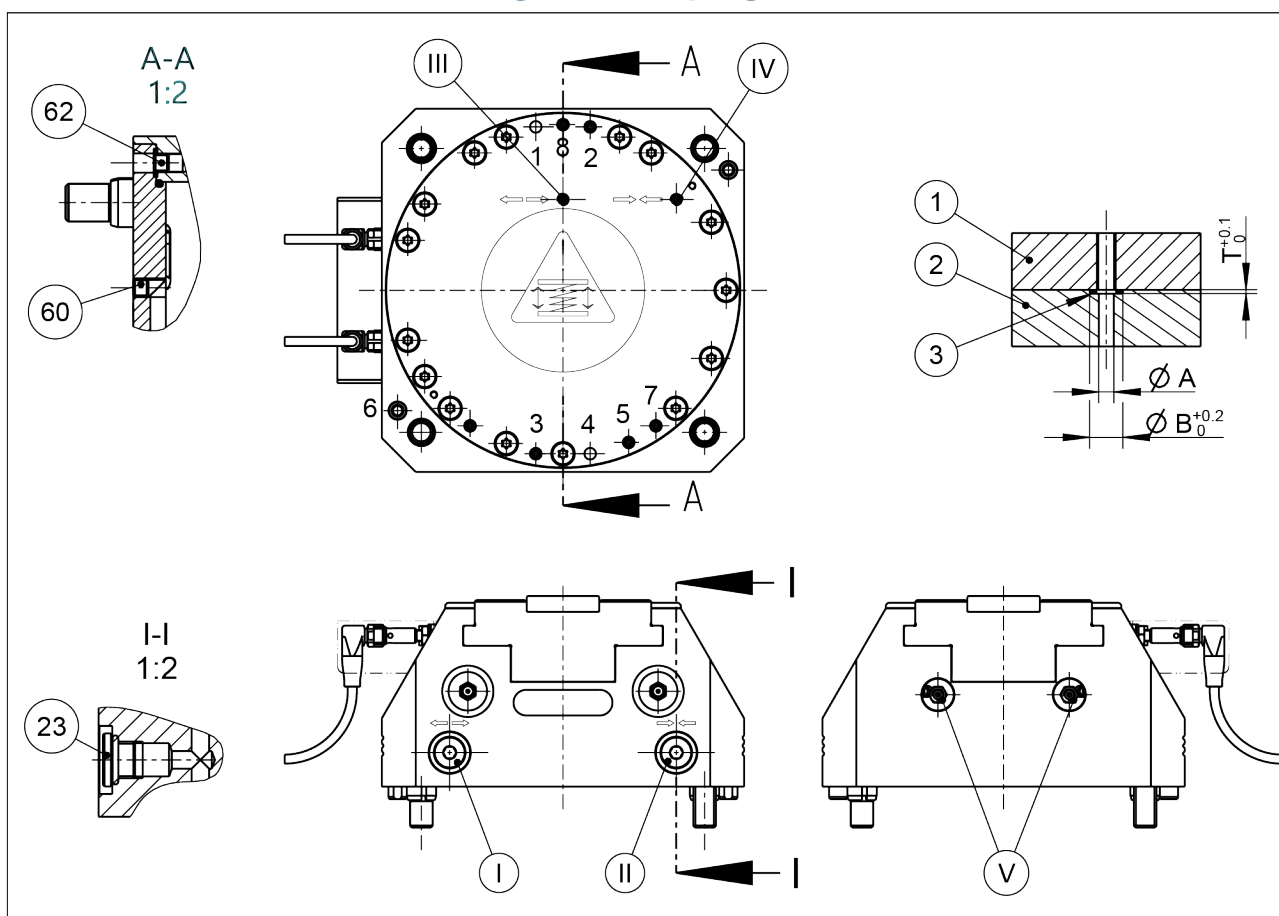
- Do not open the connections on the front of the clamping force block (I, II), or seal them with suitable dummy plugs (M5 or G1/8").
 - Insert the clamping sleeves from the accessory kit into the centering holes on the base plate.
 - Remove the center plugs from the base plate (internal air feed-through III, IV) and insert the O-rings from the accessory kit into the recesses for the air feed-throughs.
 - Mount the clamping force block onto the base plate.
-

NOTE

The TANDEM base plates do not have a connection possibility for the inductive proximity switches on the TANDEM clamping blocks. The function for monitoring the jaw position can only be connected externally. When joining, make sure the air feed-throughs for the clamping system and the base plate are precisely aligned.

- Screw the two parts together using the four screws (item 84) from the accessory kit. In doing so, observe tightening torques, ► 4 [17].
 - Remove the locking screws from the pneumatic connections on the base plate.
 - Connect the diaphragm pressure switch and set the switch to the required minimum pressure.
-

5.3 Connecting the clamping block



I	OPEN (front)
II	CLOSED (front)
III	OPEN (bottom)
IV	CLOSED (bottom)
V	Coolant drainage/connection for air purge (front)
1	No use
2	No use
3	No use
4	No use
5	Bottom connection for coolant drain or use for air purge
6	Bottom connection for lubrication (one-sided supply, left)
7	Bottom connection for lubrication (one-sided supply, right)
8	No use

Tab.: Hose-free direct connection

①	Clamping system
②	Adapter
③	Sealing element

5.3.1 Supply lines

The clamping force block has four air connections: **I, II, III, IV**. Two connections for OPEN (**I** and **III**) and two connections for CLOSE (**II** and **IV**).

The application determines which of the two air connections must be opened for actuation:

- Connections **I** and **II** for operation without a base plate
- Connections **III** and **IV** in the base for hose-free, direct connection to the machine table or on the base plate.

The threads for hose-free, direct connection are not designed for pneumatic fittings.

Thread for pneumatic fitting (front):

KSP3 and KSP3-LH 100	M5
KSP3 and KSP3-LH 140, 160, 200 and 250	G1/8"
KSP3 and KSP-LH 315	G1/4"

Hose-free direct connection		100	140	160	200	250	315
Connection III – IV	Ø A [mm]			4			7
	Ø B [mm]			8.8			12.8
	T [mm]			1.0			1.4
	O-ring* [mm]			Ø 6x1.5			Ø 9x2
Connection 1–8	Ø A [mm]			4			7
	Ø B [mm]			8.8			12.8
	T [mm]			1.0			1.4
	O-ring* [mm]			Ø 6x1.5			Ø 9x2

*Included in accessory kit and sealing kit

NOTE

- The clamping force block is delivered with all four air connections sealed. On the base side with set-screws (item 60) and on the front with locking screws (item 23).
- When using the air purge via connection 5, the two sound absorbers (**V**) must be removed and replaced by set-screws (item 93), ► 9.2 [40].
- Requirements for compressed air supply: Compressed air, compressed air quality according to ISO 8573-1:2010 [7:4:4]. Unconditioned compressed air contains moisture as well as dust and oil particles, all of which can lead to malfunctions or premature wear in the clamping force block. The oiler should be no more than 2 meters from the coupling point.
- The clamping force block has two more base connections (**6/7**) for direct lubrication through the machine table. These connections come sealed on delivery with set-screws (item 62).

5.4 Monitoring of the jaw position via inductive proximity switches

The TANDEM KSP3-IM/KSP3-LH-IM clamping system is designed for use with IN S-M8-1/IN S-M8-2 inductive proximity switches for monitoring jaw positions.

The jaw stroke end positions for O.D. and I.D. clamping as well as the exact clamping position can be monitored through recesses in the base jaws of the clamping force block. The signals can be directly processed by the machine control system.

The monitoring result is: The clamping force block is open or closed (for I.D. or O.D. clamping depending on the application).

- Information on handling sensors is available at www.schunk.com or from SCHUNK contact persons.
- Technical data for the sensors can be found in the data sheets (included in the scope of delivery or at www.schunk.com).

The proximity switch used has reverse polarity protection and is short-circuit-proof.

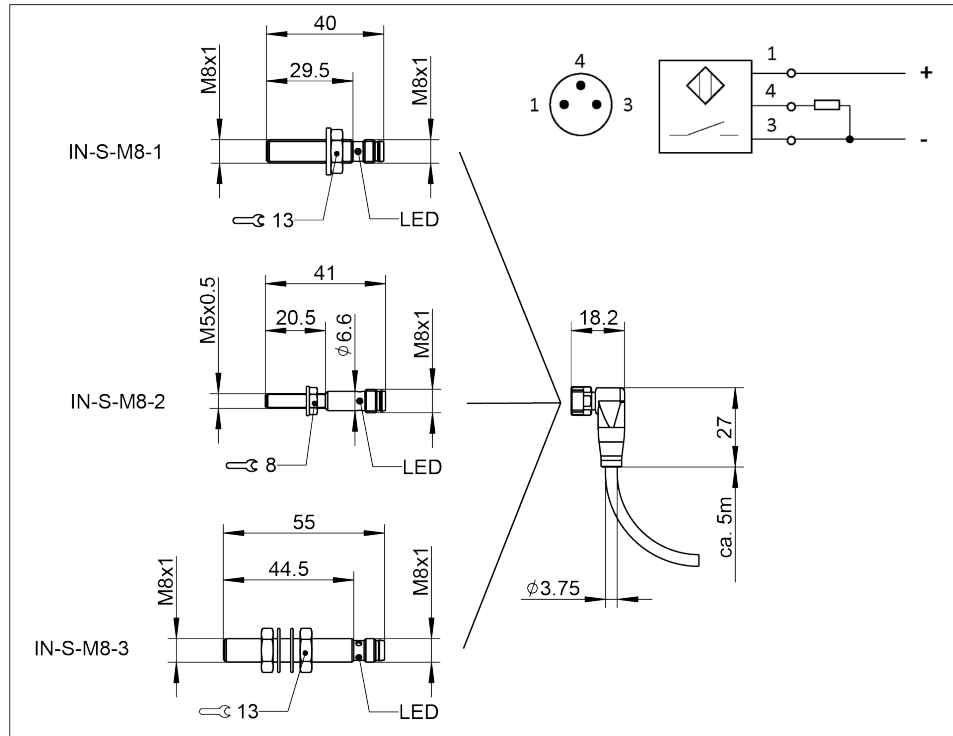
For the proper use of the proximity switches, observe the following:

- Do not pull forcefully on the sensor cable.
- Do not subject the sensor cable to tensile strain.
- Install the sensor connection cable straight and do not twist it.
- Tighten the counter nut for clamping the sensor using a suitable tool and moderate manual force.
- Do not exceed the permissible bending radius of the cable (→ catalog specifications)
- Position the sensor so that the signal LED on the sensor head is clearly visible (with cover, LED is not visible).
- Prevent the proximity switch from coming into contact with hard objects or with chemicals; in particular, nitric, chromic or sulfuric acid.

Proximity switches are electronic components which can react sensitively to high-frequency interference or electromagnetic fields.

- Check that the cable is correctly connected and installed. There must be sufficient distance between the switches and sources of interference and their supply cables.
- Parallel switching of multiple sensor outputs of the same design (npn, pnp) is permissible, though this does not increase the permissible load current.
- Please note that the leakage current of the individual sensors is accumulative (by about 2 mA).

5.4.1 Construction concept and dimensions of inductive proximity switches with screw-on connection cable



Pin 1: Brown

Pin 3: Blue

Pin 4: Black

	IN-S-M8-1	IN-S-M8-2	IN-S-M8-3
Size	M8 x 1 x 40 mm	M5 x 0.5 x 41 mm	M8 x 1 x 55 mm
Switching function	Closer	Closer	Closer
Switching distance [mm]	1.5	1.5	1.5
Voltage [V DC]	10 – 30	10 – 30	10 – 30
Ripple [%]	≤ 15	≤ 10	≤ 10
Switched current max. [mA]	200	100	100
Switching hysteresis in % from switching distance	≤ 15	≤ 15	≤ 15
Temperature range [°C]	– 25 to +70	– 25 to +70	– 40 to +85
Switching frequency approx. [Hz]	1000	5000	3000
Voltage drop (max. load) [V]	2.5	2	2.5
Connecting plug thread	M8 x 1	M8 x 1	M8 x 1
Protection class in accordance with DIN EN 60529*	IP 67	IP 67	IP 68

* for the pin terminal only when screwed on

5.4.2 Assembly and adjustment of the proximity switches

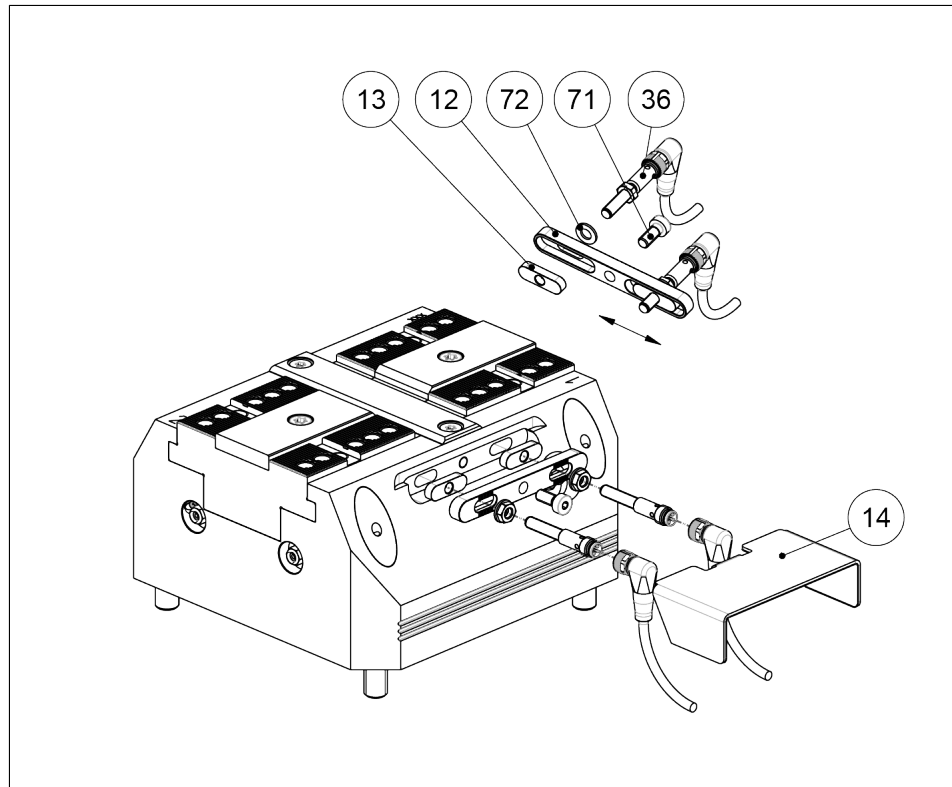
For TANDEM KSP3-IM/KSP3-LH-IM, two inductive proximity switches have been fitted. The proximity switches can be moved on the retaining plate (item 12) so that the switching point can be individually adjusted. The proximity switches are used for monitoring the jaw stroke end position for O.D. and I.D. clamping as well as for monitoring the clamping position.

Adjust the switching point of proximity switch "S1" (installed on the left) so that the required switching signal is present when the stroke end position is "open" or "closed."

Proximity switch "S2" is used for monitoring the clamping position between the two jaw end positions. Adjust the switching point so that a switching signal is present in the area of the clamping position. Exceeded workpiece tolerances can be monitored via the signal output of switch "S2".

The function and circuit diagram for adjusting the proximity switches is shown in illustrations 6, 7 and 8. The proximity switches are equipped with an LED signal display on the sensor head.

Insert the counter-supports (item 13) into the retaining plate (item 12). Screw both proximity switches (item 36) together with hexagon nuts and washers (item 72) through the retaining plate into the counter-support with the sensor head facing forward so that the switches are flush or project slightly. Tighten the retaining plate (item 12) together with the cover (item 14) using the screw (item 71) in the recess of the clamping force block. To fine-tune the switching distance, manually screw in each proximity switch until it stops at the base jaw and then unscrew it by approximately 1.5 turns. The connection cable must not be excessively twisted nor damaged in any way. When making the adjustment, make sure that the signal LED on the sensor is easily visible. Then fasten the proximity switch to the retaining plate (item 12) using the counter nut.



Test the function by clamping and opening the clamping system. If necessary, adjust the switching position. Then link the plug connection between the proximity switch and connection cable.

NOTE

The sensor head of the proximity switches may not touch the base jaws under any circumstances during operation. Both proximity switches must be installed in the operating condition to prevent chips from entering the clamping system through the open clamp.

5.4.3 Circuit and functional diagram for external workpiece clamping

Circuit diagram and monitoring/control functions for external workpiece clamping

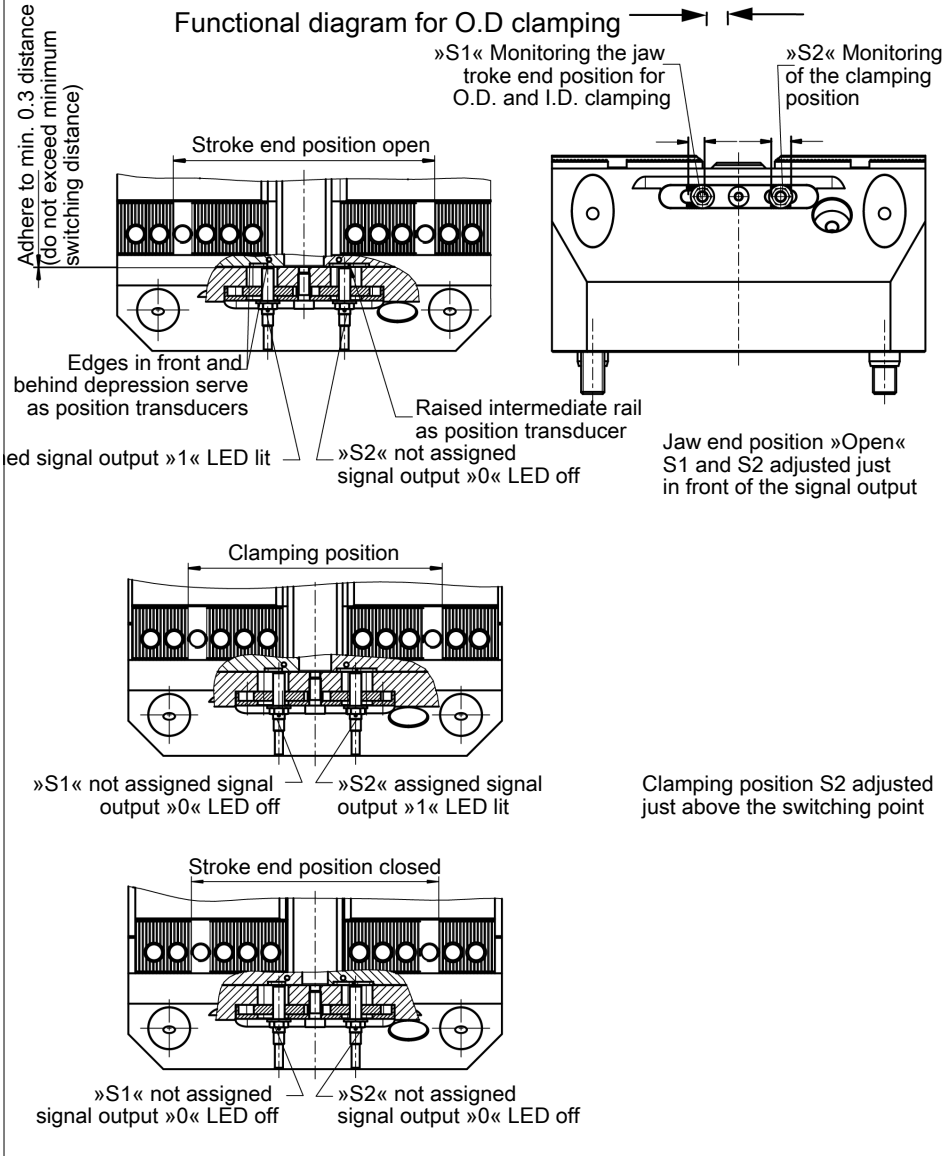
The circuit diagram and the functional diagram show the recommended settings of the proximity switches for monitoring "End position open" and "Clamping position reached."

The circuit diagram can also be adjusted for monitoring "Stroke end position closed" and "Missed clamping position." The proximity switches can also be individually adjusted on the retaining plate.

Circuit diagram and monitoring/control functions for external workpiece clamping

	Circuit diagram proximity switch			
proximity switch	S1		S2	
Signal output	0	1	0	1
Jaw end position open				
Clamping position				
Jaw end position closed				

	S1	S2
Jaw end position on clamping force block open	1	0
Clamping position	0	1
Jaw end position closed	0	0
Clamping force block closed	0	0



5.4.4 Circuit and functional diagram for internal workpiece clamping

Circuit diagram and monitoring/control functions for internal workpiece clamping

The circuit diagram and the functional diagram show the recommended settings of the proximity switches for monitoring "End position closed" and "Clamping position reached."

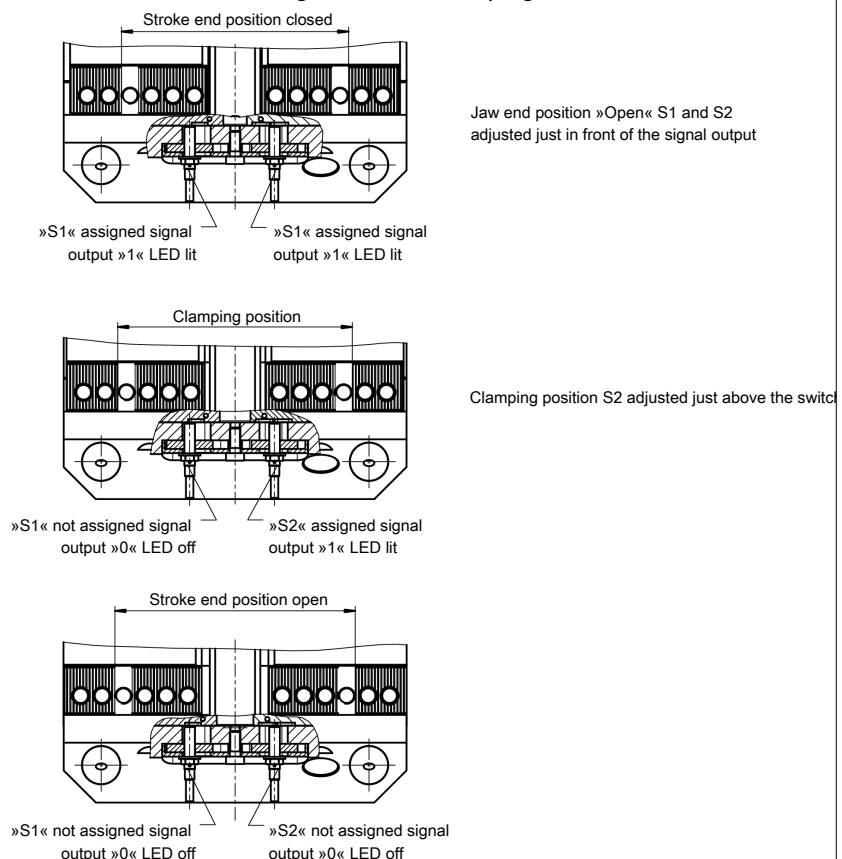
The circuit diagram can also be adjusted for monitoring "Stroke end position open" and "Missed clamping position." The proximity switches can also be individually adjusted on the retaining plate.

Circuit diagram and monitoring/control functions for internal workpiece clamping

	Circuit diagram proximity switch			
proximity switch	S1		S2	
Signal output	0	1	0	1
Jaw end position open				
Clamping position				
Jaw end position closed				

	S1	S2
Jaw end position on clamping force block open	1	0
Clamping position	0	1
Jaw end position closed	0	0
Clamping force block closed	0	0

Functional diagram for I.D clamping



6 Maintenance and care

6.1 Notes

Original spare parts

Only use original SCHUNK spare parts when replacing wearing parts/spare parts.

Replacement of the housing and base jaws

The base jaws and the guides in the housing are matched to each other. To replace these parts, send the entire product to SCHUNK with a repair order.

Maintenance variant with clamping force maintenance (AS)

The cylinder piston must be disassembled or assembled using a disassembly and assembly device. We therefore recommend you have maintenance work and change of seals performed at SCHUNK.

6.2 Maintenance and lubrication intervals

The following maintenance work should be carried out after the specified cycle numbers or, at the latest, according to the monthly data.

Maintenance work	Interval [cycles / months]
Lubrication	10000 / 1
Basic cleaning	– / 6
Leak test	5000 / 1

Regularly check inductive proximity switches for proper functioning. Check for damage to connection cables, connection plugs and the sensor head.

6.3 Greasing areas/lubricants

Greasing areas	Lubricant
Sliding surfaces body – base jaw	microGLEIT LP 410
Sliding surfaces base jaws – chuck piston	microGLEIT LP 410
Lubrication nipple	microGLEIT LP 410
Central lubrication	microGLEIT LP 410
All seals	RENOLIT HLT 2
Sliding surfaces cylinder piston – housing	RENOLIT HLT 2

(Product information about microGLEIT LP 410 & RENOLIT HLT 2 can be requested from SCHUNK).

Alternative lubricant

As an alternative to microGleit LP 410, LINOMAX plus can also be used. However, the specified clamping forces exclusively refer to the microGleit LP 410 used by SCHUNK.

For LINOMAX plus, the clamping forces can be lower.

6.4 Maintenance work

6.4.1 Lubrication



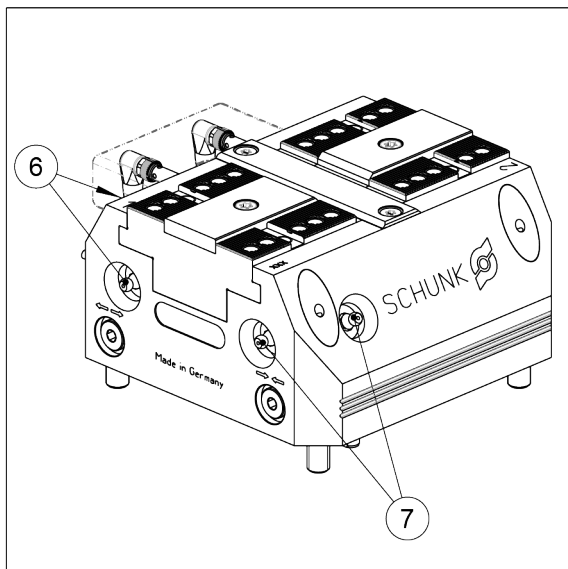
⚠ CAUTION

Allergic reactions or irritation due to skin or eye contact with lubricants on the product.

- Wear protective equipment (protective gloves, protective goggles) in case of foreseeable contact with lubricants on the product (e.g. when lubricating or cleaning)

To maintain reliable function and high quality of the product, it has to be regularly lubricated. This can be done with a hand lever press for greases or by means of central lubrication.

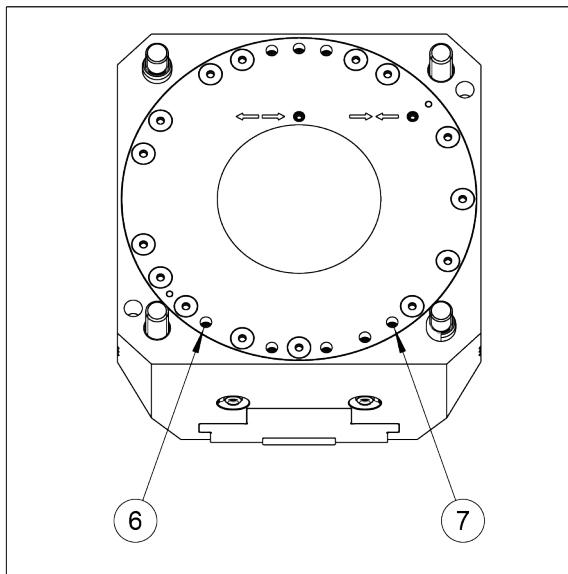
Manual lubrication



- Press grease either into the grease nipples at the side or front of the respective supply line (6/7).
- Only lubricate in the open position.
- After greasing, run through the complete stroke several times.
- grease to be used and lubrication intervals, ► 6.3 [29].

Size	Grease quantity (strokes per grease nipple)
100	2
140	2
160	2
200	2
250	3
315	4

Central lubrication



- To use central lubrication, the set-screws of the factory sealed connections (6, 7) must be removed.
- For proper lubrication, both supply lines must be connected.
- The central lubrication system must be suitable for greases of NLGI 2 classification.
- Only lubricate in the open position.
- After greasing, run through the complete stroke several times.
- Grease to be used and lubrication intervals, ► 6.3 [29].

Size	Grease quantity (per connection) [cm ³]
100	4
140	4
160	4
200	4
250	4
315	6

Basic cleaning



⚠ WARNING

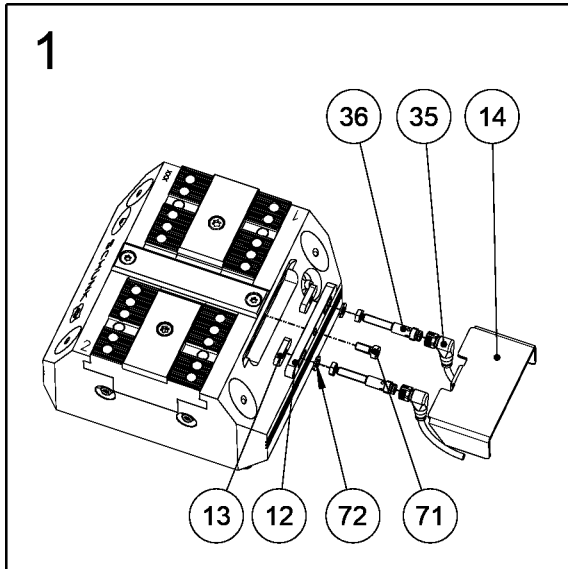
Risk of injury during disassembly of the product because of the high spring pressure in the cover and the cylinder pistons (AS variant)

- Only trained specialist personnel may disassemble the clamping force block!
- The cover may only be removed with the aid of a suitable disassembly device!

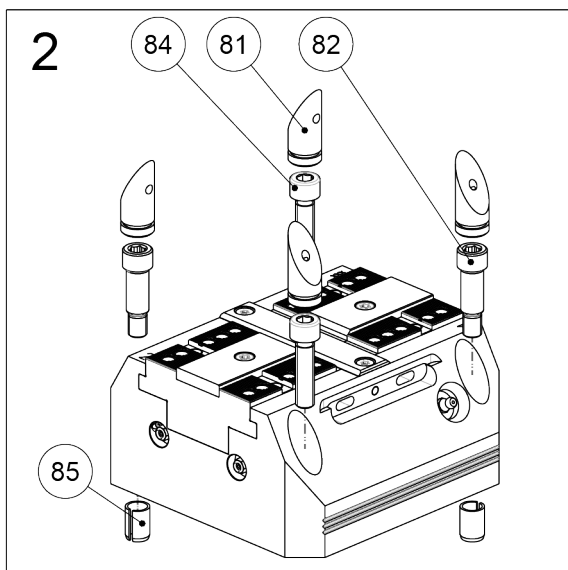
For basic cleaning, the product must be disassembled, cleaned and reassembled.

Disassembly

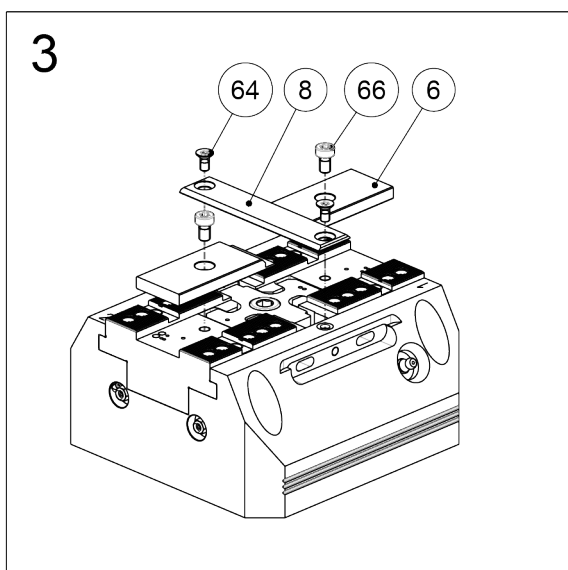
Before disassembling the product, switch off the machine and secure it against being switched on again. Then remove all compressed air lines. No residual energy may be left in the product.



- Disassemble the supply cable to the pin terminal of the inductive proximity switches on the separable elbow fitting
- Remove the screw (item 71) and take the retaining plate (item 12) together with the cover (item 14) and the proximity switches (item 36) out of the body
- Each proximity switch is fastened with a hexagon nut and washer (item 72)
- The counter-supports (item 13) can be disassembled simultaneously

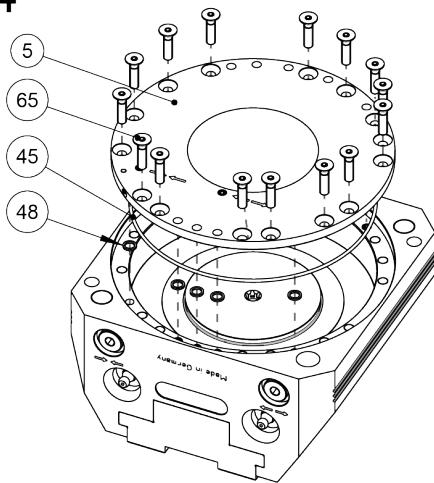


- Pull out the plug (item 81)
- Unscrew the screws (item 84) and the fitting screws (item 82) and disassemble the clamping system from the machine table
- If using clamping sleeves (item 85), remove them from the housing



- Remove screws (item 64) and take off the cover strip (item 8)
- Remove screws (item 66) and take off the guide strip (item 6)

4



Remove screws (item 65) and pull out cover (item 5) together with O-ring (item 45) and flat gaskets (item 48) out of the housing. To do this, screw two screws into the threaded holes as an extraction tool

for size 100: M3 x L > 25

for size 140: M4 x L > 25

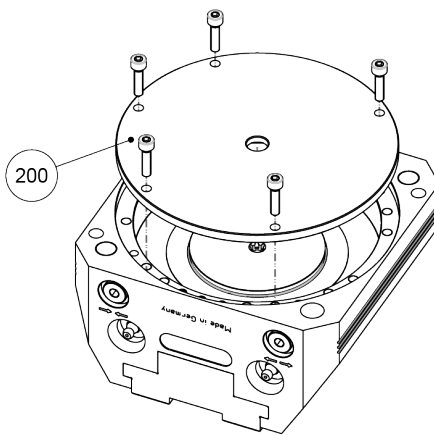
for size 160: M3 x L > 25

for size 200: M5 x L > 25

for size 250: M5 x L > 25

for size 315: M6 x L > 25

5 AS



Variant with clamping force maintenance (AS)

Fasten mounting cover (200) with cheese-head screws DIN EN ISO 4762. Mounting cover ► 6.4.3 [36]

for size 100: M5 x 8 – 14

for size 140: M5 x 12 – 16

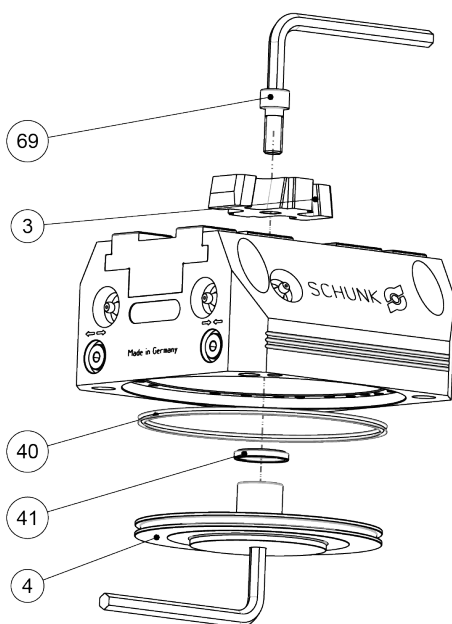
for size 160: M5 x 16 – 20

for size 200: M6 x 16 – 20

for size 250: M6 x 20 – 25

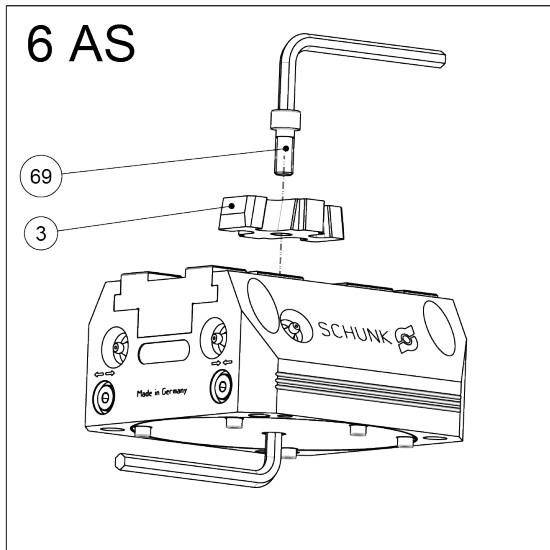
for size 315: M8 x 25

6



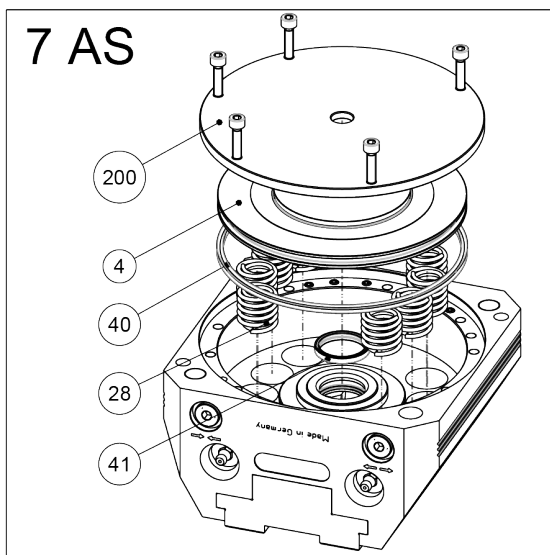
Variant without clamping force maintenance

- Unscrew the screw (item 69) by holding it against the cylinder piston (item 4)
- Pull the chuck piston (item 3) out of the housing via its extraction thread
- Push the cylinder piston together with the quad ring (item 40) out of the housing. Remove the combination sealing ring (item 41) from the housing



Variant with clamping force maintenance (AS)

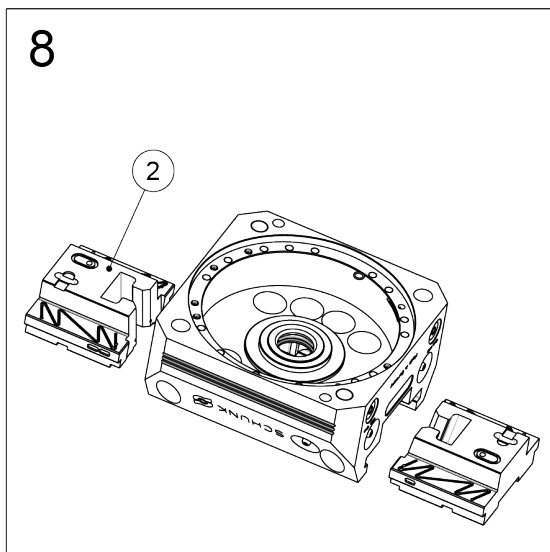
- Unscrew the screw (item 69) by holding it against the cylinder piston (item 4)
- Pull the chuck piston (item 3) out of the housing via its extraction thread



Variant with clamping force maintenance (AS)
Warning! Risk of injury due to spring forces!
The cylinder piston and cover are under spring tension!

- Clamp the product between the base jaws (item 2) and the mounting cover (item 200) using a suitable device (e.g. press, vise) so that the screws in the cover can still be removed
- Remove screws (item 65) and slowly open device until compression springs are released
- Remove the mounting cover (item 200), compression springs (item 28), combination sealing ring (item 41) and cylinder piston (item 4) together with the quad ring (item 40) from the housing

Pull the base jaws (item 2) out of the housing



Maintenance

- Clean all parts thoroughly and check for damage and wear
- Treat all greasing areas with lubricant ► 6.3 [29]
- Replace all wearing parts and seals if necessary ► 9.1 [40]

Assembly

Assembly is done in the reverse order of disassembly. In doing so, observe the following:

- Pay attention to the mounting position of the base jaws (item 2) and the chuck piston (item 3)
- Observe the tightening torques for the screws ▶ 4 [17]
- After completion of the assembly, carry out a leak test and a function test ▶ 6.4.2 [35].
- For variants with clamping force maintenance (AS), mount the cylinder piston using an assembly device ▶ 6.4.3 [36].

6.4.2 Leak test

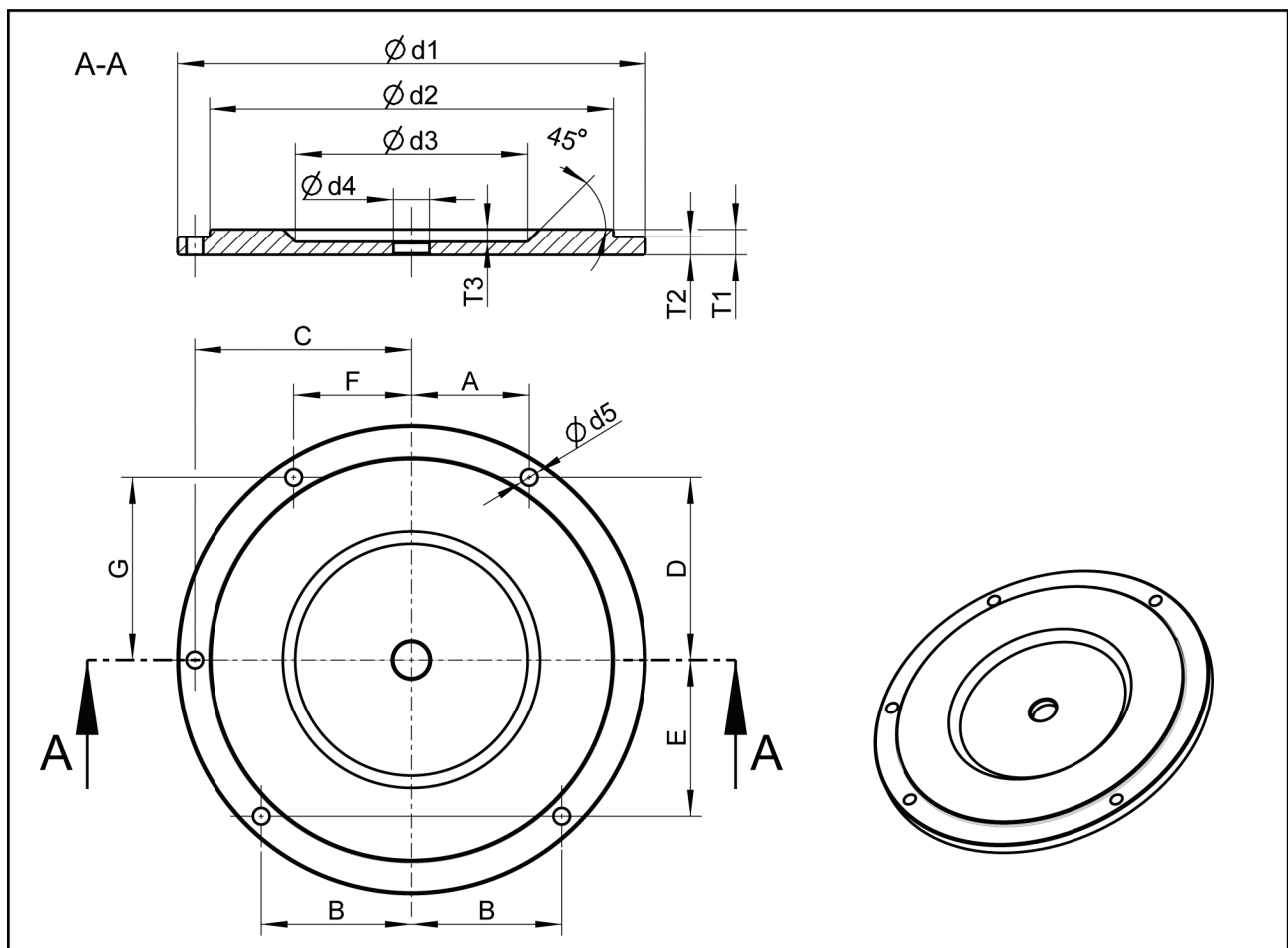
The following components are required to check for leaks: Pressure gauge, shut-off valve, supply line and quick coupling.

- Check for tightness in the clamping system in the OPEN and CLOSED positions
1. Connect the components to the open CLOSED connection in the following order:
Pressure gauge – shut-off valve – quick coupling – supply line
 2. Pressurize the clamping force block
 3. Close the shut-off valve and remove the supply line
 4. Let the clamping force block sit clamped for 24 hours
 5. After 24 hours, the clamping force block is
 - sealed, if the pressure gauge indicates a drop in pressure of less than 0.5 bar
 - leaking if the pressure gauge indicates a drop in pressure of more than 0.5 bar

If the clamping system is leaking, check the fittings first (e.g. with Metaflux leak detection spray). Seal any leaking fittings.

Once the fittings are sealed, check the seals for leaks and replace if necessary ▶ 6.4.1 [32]

6.4.3 Assembly device



Dimension	Sizes				
	100	140	160	200	250
$\varnothing d1$ [mm]	97.5	137.5	155.5	195.5	245
$\varnothing d2$ [mm]	79	118	135	171	219
$\varnothing d3$ [mm]	40	57	77	90	123
$\varnothing d4$ [mm]	10	12	12	12	12
$\varnothing d5$ [mm]	5.5	5.5	5.5	6.6	6.6
T1 [mm]	5	6.5	8.5	10	10.5
T2 [mm]	3	3.5	6	6.5	7.5
T3 [mm]	1.8	3	4.1	3.5	5
A [mm]	38.9	45.5	39	50	93.8
B [mm]	38.9	36	49.8	50	93.8
C [mm]	43.5	63.5	72	91.5	116
D [mm]	19.4	44	60.5	76.5	68.3
E [mm]	19.4	52	52	76.5	68.3
F [mm]	34.3	45.5	39	55	93.8
G [mm]	26.8	44	60.5	73	68.3

7 Troubleshooting

Clamping force block chuck jaws will not move

Possible cause	Solution(s)
Air supply interrupted	Check air supply
System pressure too low	Increase system pressure according to clamping system technical specifications
Connections mixed up	Check connections and functions and connect properly
Unused air connections not sealed	Seal front or base connections using accessories (included in scope of delivery)
Active air connections sealed	Remove set-screws from sealed air connections

Piston will not move

Possible cause	Solution(s)
Air is not oiled	Check maintenance unit, perform maintenance Place oiler closer to clamping system Set required oil level
Chuck piston screw broken (overload)	Send clamping system to SCHUNK for repairs or disassemble clamping system and repair using original SCHUNK spare parts
Piston rod or piston rod screw connection broken (overload)	Send clamping system to SCHUNK for repairs or disassemble clamping system and repair using original SCHUNK spare parts
Active air connections sealed	Remove set-screws from sealed air connections

No control of switching valves due to missing signal output

Possible cause	Solution(s)
Proximity switch not switching	Adjust the switching distance to the recess in the base jaw and clamp it in place Adjust position slightly forward or backward
Proximity switch not switching	Completely disassemble the proximity switch along with the retaining plate and check the switching functions on the sensor head (replace proximity switch if necessary)
Proximity switch switching sporadically	Readjust the position Adjust position to workpiece tolerances
Proximity switch cable damaged	Replace proximity switch Replace supply cable
Cable plug-in connection to the supply cable	Check the plug-in connections, tighten if necessary Replace IN proximity switch or separately available supply cable
Proximity switch moves independently	Tighten the hexagonal nut for clamping Replace IN proximity switch

Possible cause	Solution(s)
Both proximity switches reporting the same switching signal simultaneously	Readjust the proximity switch switching position
Clamping force block does not complete stroke	
Possible cause	Solution(s)
Chips or dirt between covering strip and base jaws	Unscrew the covering strip (item 8) and remove chips and dirt
Clamping force getting weaker	
Possible cause	Solution(s)
Clamping force block not sealed tightly	Check connection and seal screws; reseal or replace
Seals damaged	Disassemble clamping force block Link Modul zerlegen and replace all the seals (see sealing kit lists ▶ 9.1 [40])
Inadequate lubrication	Lubricate the lubrication nipples with microGLEIT LP 410 ▶ 6 [29]
Clamping force block movement jerky	
Possible cause	Solution(s)
Steel guide rollers on sliding surfaces not greased	See chapter "Maintenance and Care" ▶ 6 [29]

8 Storage

When storing the product for a longer period of time, observe the following points:

- Clean the product and lubricate it lightly.
- Store the product in a suitable transport container.
- Only store the product in dry rooms.
- Protect the product from major temperature fluctuations.

NOTE: Before recommissioning, clean the product and all attachments, check for damage, functionality and leaks.

9 Sealing kits, accessory packs and parts lists

When ordering spare parts, the type, size and, if possible, the serial number of the clamping force block must always be stated to avoid delivery mistakes.

Seals, sealing elements, fittings, springs, bearings, screws, wiper bars and parts that come into contact with the workpiece are not covered by the warranty.

9.1 Sealing kit lists

Sealing kit *	ID number
Size 100	1470645
Size 140	1470642
Size 160	1470647
Size 200	1508677
Size 250	1470648
Size 315	1508678

* For included items, see note **X** in the Parts List chapter below. Seals are wearing parts and are recommended to be replaced during maintenance. The sealing kit can only be ordered as a complete kit.

9.2 Accessory packs

Accessory kit *	ID number
Size 100	1428583
Size 140	1428599
Size 160	1428591
Size 200	1428597
Size 250	1428597
Size 315	1496737

9.3 Parts lists

Item	Designation	Quantity	Note
1	Body >Housing<	1	*
2	Base jaw	2	*
3	Chuck piston	1	
4	Cylinder piston	1	
5	Cover	1	
6	Guide strip	2	
8	Covering strip	1	
12	Retaining plate	1	
13	Counter-support	2	
14	Cover	1	
21	Cupped-type lubrication nipple	4	100
	Conical lubrication nipple	4	140 / 160 / 200 / 250 / 315
22	Sound absorber	2	
23	Locking screw	2	
28	Compression spring kit	6	315
	Compression spring kit	8	100 / 140 / 160 / 200 / 250
34	Cylindrical pin	2	Z
35	Angular plug	2	
36	Proximity switch	2	
37	Supply cable	2	
40	Turcon Glyd Ring	1	Y
41	Combi-sealing ring	1	100 / 140 / 160 / 200 / 250 / Y
	Rod gasket	1	315 / Y
45	O-ring	1	Y
48	Flat gasket	10	Y
56	Screw	8	140 / Z
60	Set-screw	2	
62	Set-screw	8	
64	Countersunk screw	2	100 / 140 / 160 / 200 / 250
	Countersunk screw	4	315
65	Countersunk screw	9	100
	Countersunk screw	13	140
	Countersunk screw	15	160
	Countersunk screw	16	200
	Countersunk screw	17	315
	Countersunk screw	18	250

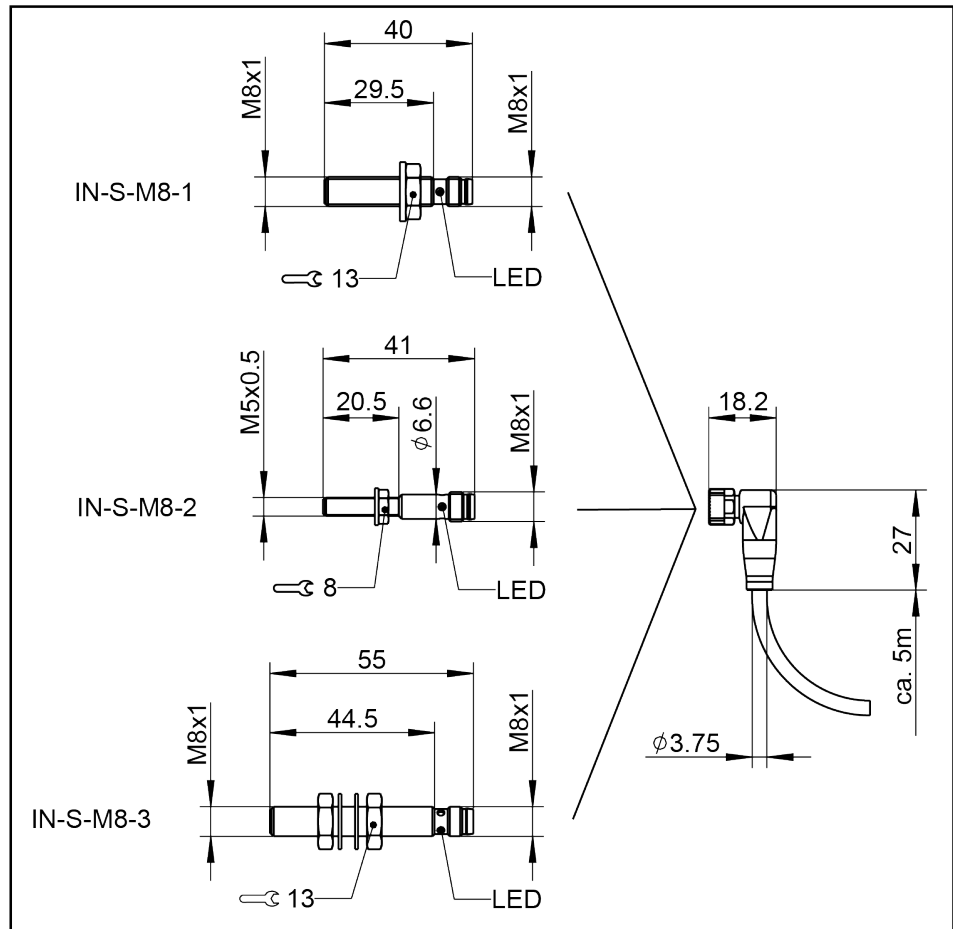
Item	Designation	Quantity	Note
66	Cylindrical screw	2	
69	Screw	1	
70	Set-screw	1	160 / 250
71	Cylindrical screw	1	
72	Washer	2	
74	Cylindrical screw	2	200 / 315
81	Plug	4	Z
82	Fitting screw	2	Z
83	O-ring	4	Y / Z
84	Screw	4	Z
85	Clamping sleeve	2	Z
86	Screw	8	100 / 160 / 200 / 250 / 315 / Z
87	O-ring	10	Y / Z
93	Set-screw	2	Z
100	Eye bolt	2	200 / 250 / 315 / Z

Parts list key

100	for size 100	250	for size 250
140	for size 140	315	for size 315
160	for size 160	Y	included in the sealing kit
200	for size 200	Z	included in accessory kit

* Individual components are specially tuned to one another and cannot be replaced by the customer.

9.4 Proximity switches and supply cables for single or replacement orders



The IN inductive proximity switch consists of an angular supply cable type KA-M12 and self-customizable plug connector.

Inductive proximity switch IN – M8 plug connection

Designation	ID number
IN S-M8-1	1349984
IN S-M8-2	1349990
IN S-M8-3	1496579

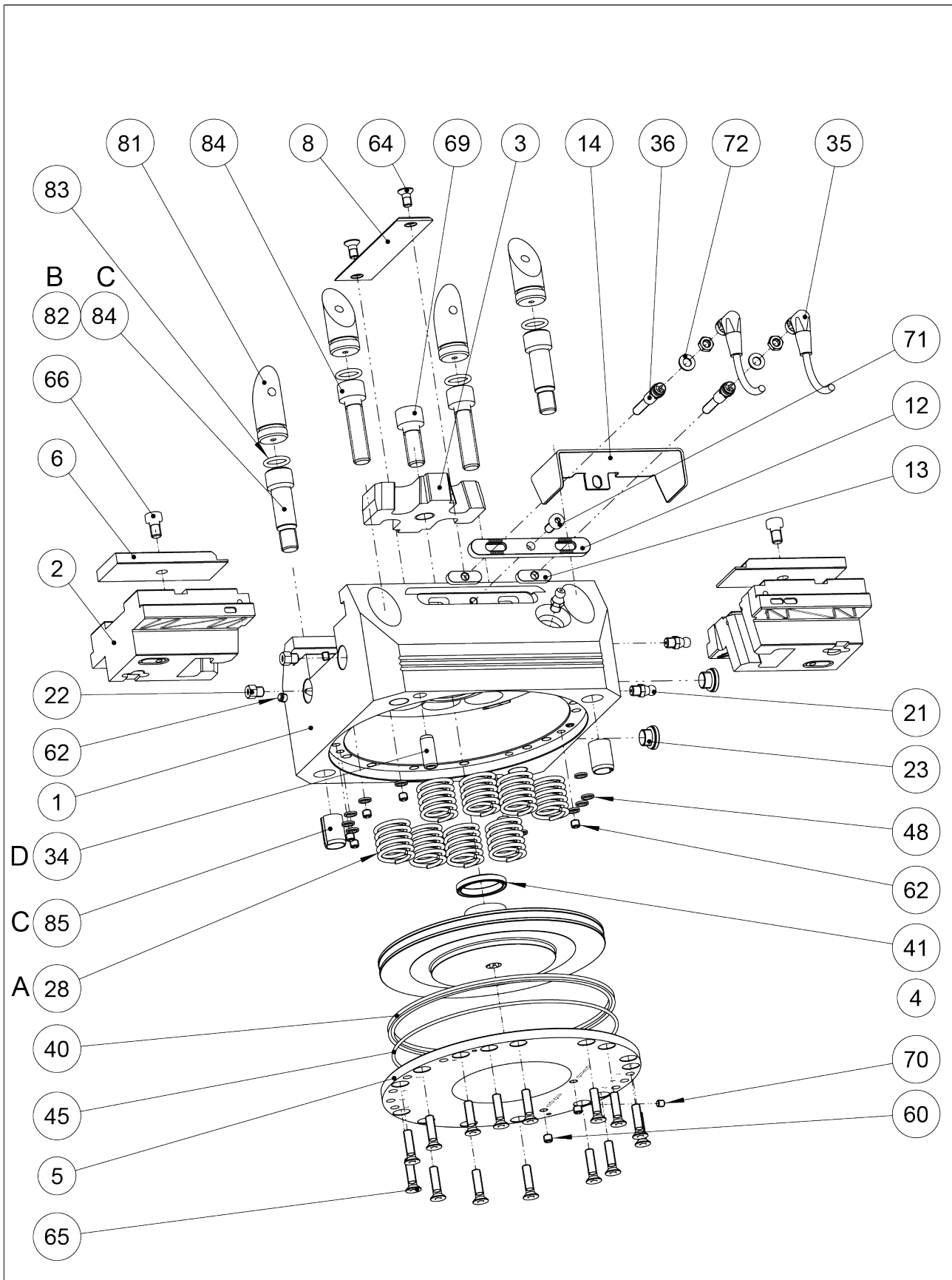
Supply cable KA – M12 plug connection

Designation	ID number
KA BW8-L 3P-0500 (cable length 5 m)	1350000

Self-assembly plug connector M12

Designation	ID number
Connector M12 BCC02H9	1154135

10 Assembly drawing



A Only for variant "AS"

B Centering with fitting screw

C Centering with clamping sleeves

D Centering with cylindrical pins (Z variant)

11 Manufacturer certificate

Manufacturer / Distributor:	H.-D. SCHUNK GmbH & Co. Spanntechnik KG Lothringer Str. 23 D-88512 Mengen
Product:	Clamping force block
Designation:	TANDEM
Type designation:	KSP, KRP, PZS, PZS-D, PGS

Heinz-Dieter SCHUNK GmbH & Co. Spanntechnik KG certifies that the above-mentioned products, when used as intended and in compliance with the operating manual and the warnings on the product, are safe according to the national regulations and:

- a **risk assessment** has been carried out in accordance with ISO 12100:2010.
- an **operating manual** for the assembly instructions has been created in accordance with the contents of the Machinery Directive 2006/42/EC Annex I No. 1.7.4.2. and the contents of the provisions of Annex VI of the Machinery Directive 2006/42/EC.
- **Markings** have been made in accordance with EN 1550:1997+A1:2008 Section 6.3.1, VDMA 34192:2019 Section 6.3 or ISO 16156:2004 Section 6.3. The requirements of Annex I No. 1.7.3. of the Machinery Directive 2006/42/EC have been complied with.
- the relevant basic and proven safety principles of the Annexes of **ISO 13849-2:2012**, taking into account the requirements of the documentation have been observed for the component. The parameters, limitations, ambient conditions, characteristic values, etc. for proper operation are defined in the operating manual.
- an $MTTF_D$ value of 150 years can be estimated for mechanical components using the informative procedure in Table C.1 of ISO 13849-1:2015.
- **fault exclusion** against the fault "Unexpected release without pending release signal".
- the **fault exclusion** against the fault "Breakage during operation" in compliance with the parameters, limitations, ambient conditions, characteristic values and maintenance intervals, etc., specified in the operating manual.
- that internal bore diameters in the **pipe or control lines** are at least 2 mm for pneumatic clamping systems and at least 3 mm for hydraulic clamping systems

Harmonized Standards applied:

- **ISO 12100:2010** Safety of machinery – General principles for design – Risk assessment and risk reduction

Other related technical Standards and specifications:

- **VDMA 34192:2019** Safety requirements for clamping devices for use on machines

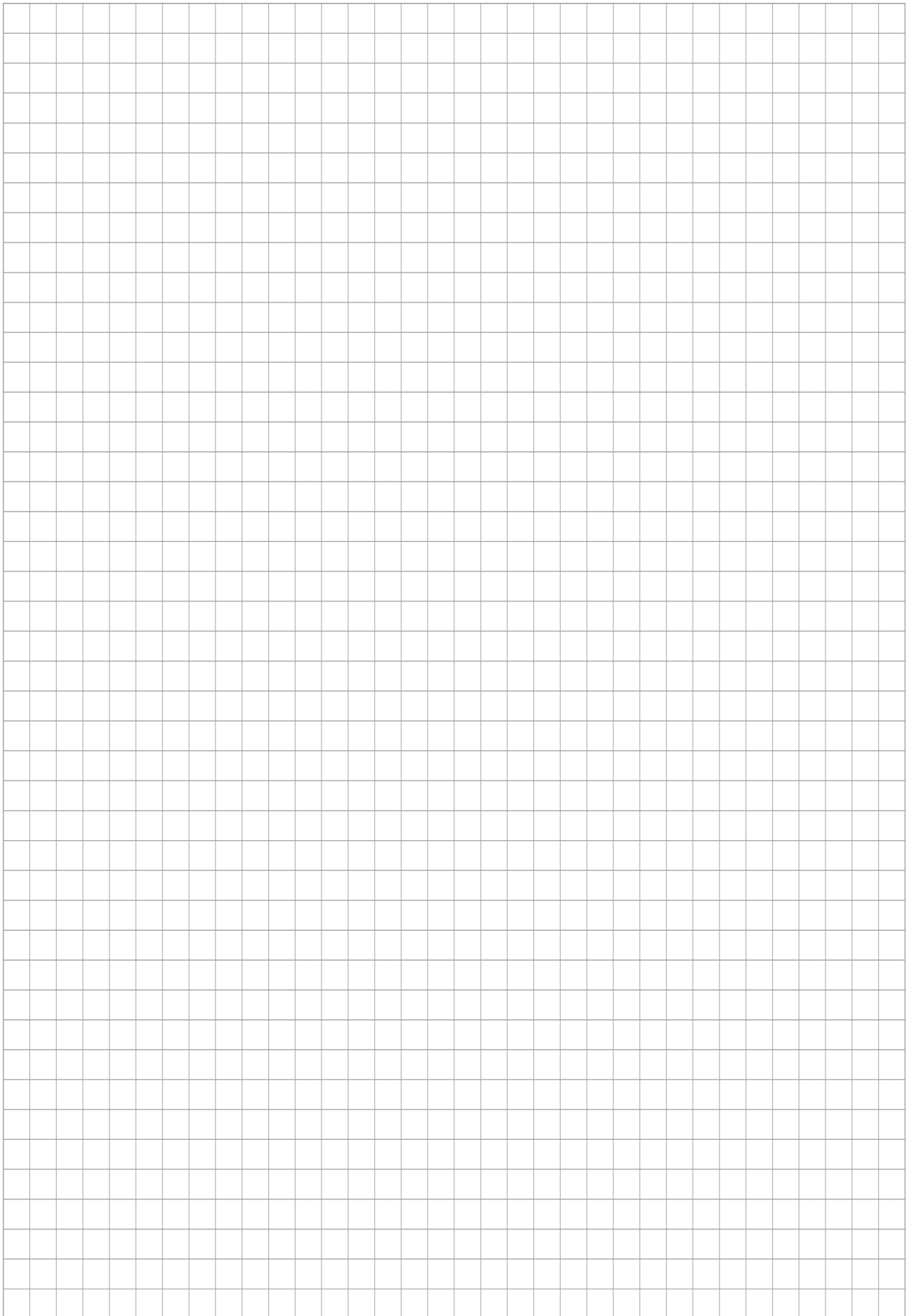
Mengen, 25th of April 2023

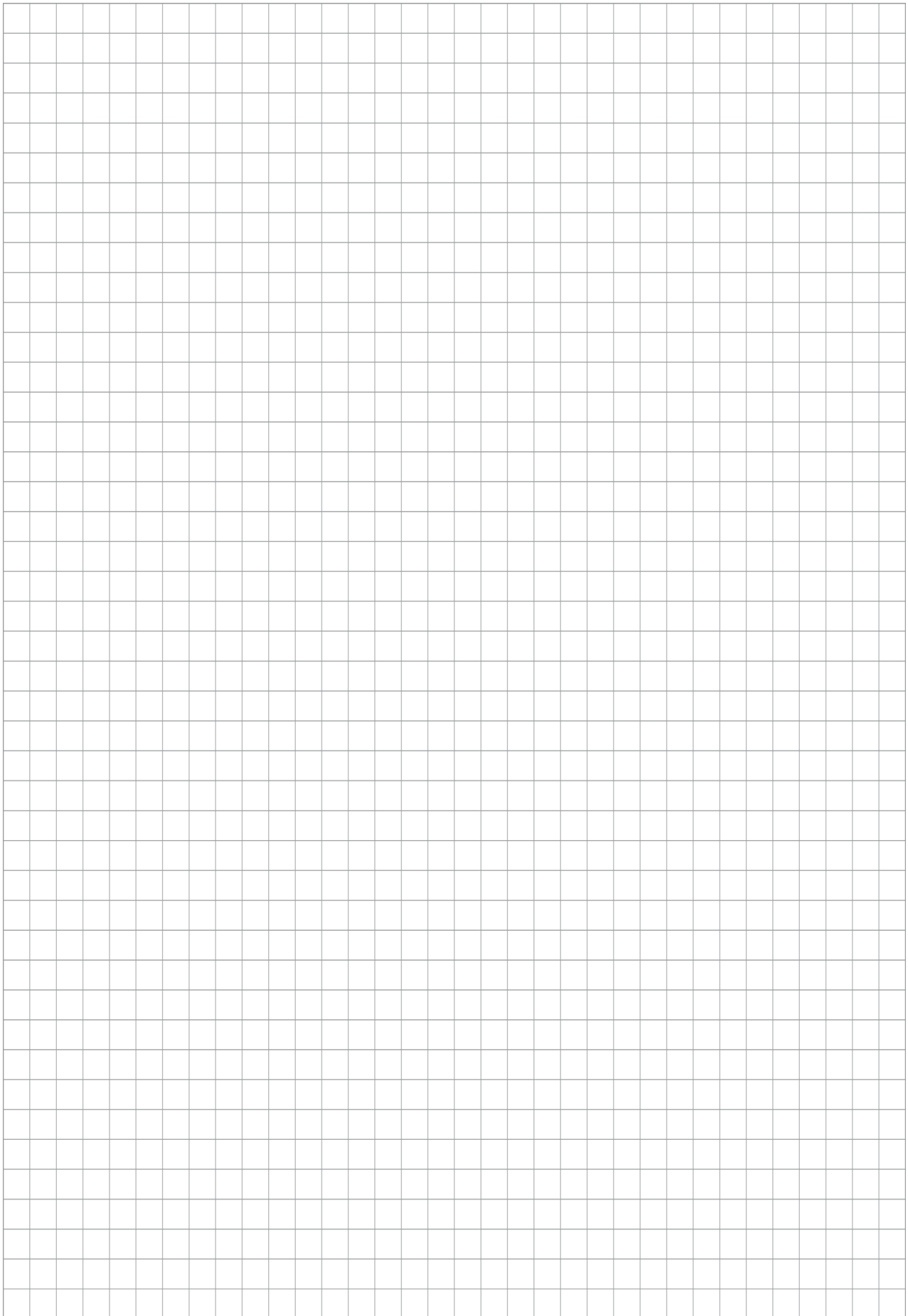
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