



TANDEM Clamping Block

KSH3 IM, KSH3-LH IM

Assembly and Operating Manual

Translation of Original Operating
Manual

Imprint

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Technical changes:

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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

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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 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.

NOTE: The illustrations in this manual are intended to provide a basic understanding and may deviate from the actual version.

In addition to these instructions, the documents listed under ▶ 1.1.2 [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.



⚠ DANGER

Dangers 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 *

The documents labeled with an asterisk (*) can be downloaded from [schunk.com](https://www.schunk.com).

1.1.3 Sizes

This operating manual applies to the following sizes:

- KSH3 IM 100, 140, 160, 200
- KSH3-LH IM 100, 140, 160, 200, 250, 315

1.1.4 Variants

This manual applies to the following variants:

- Jig-machined positioning bores (Z)

1.2 Warranty

If the product is used as intended, the warranty is valid for 24 months from the date of delivery from the production facility or 500 000 cycles* under the following conditions:

- Observe the applicable documents, ▶ [1.1.2 \[6 \]](#)
- Observe the ambient conditions and operating conditions, ▶ [2.6 \[8 \]](#)
- Observance of the specified care and maintenance instructions ▶ [7 \[33 \]](#)

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

* A cycle consists of a complete clamping process ("Open" and "Close").

1.3 Scope of delivery

Power clamping block

KSH3 IM, KSH3-LH IM

including inductive proximity switch
(without top jaws)

ACCESSORY KIT:

(for contents, see sealing kit list and parts list) ▶ [8.1 \[41 \]](#)

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

2.1 Intended use

- This product is intended for clamping and holding workpieces on machine tools and other suitable technical devices.
- It is designed to be set up on a machine table or machine pallets.
- The product may only be used within the scope of its technical data, ▶ 3 [14].
- The product is intended for industrial and industry-oriented use.
- Appropriate use of the product includes compliance with all instructions in this manual.

2.2 Not intended use

- The product is not being used as intended if, for example:
- It is used as lifting equipment, as a press, as a punching tool, as a lathe chuck, as a drill or as a cutting tool.
- It is used in working environments that are not permissible.
- Workpieces are not properly clamped.
- Safety regulations are disregarded and persons are working at this product (for example, to machine clamped workpieces) without additional protective equipment.
- The technical data specified by the manufacturer are exceeded during usage.
- It is used with machines/systems or workpieces that are not designed to be used with it.

2.3 Constructional changes

Implementation of structural changes

By conversions, changes, and reworking, e.g. additional threads, holes, or safety devices can impair the functioning or safety of the product or damage it.

- 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.

- Use only original spare parts or spares authorized by SCHUNK.

2.5 Use of special chuck jaws

Requirements of the chuck jaws

When using special chuck jaws, please observe the following rules:

- The chuck jaws should be designed 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 guidance and can significantly reduce the clamping force.)
- Do not use welded jaws.
- Reduce operating pressure for higher clamping points.

2.6 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 [14].
- Make sure that the product is a sufficient size for the application.
- Ensure that maintenance and lubrication intervals are observed, ▶ 7 [33].
- Ensure that the environment is free from ferromagnetic particles or chips.

2.7 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.
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.

2.8 Personal protective equipment

Use of personal protective equipment

Personal protective equipment serves to protect staff against danger which may interfere with their health or safety at work.

- When working on and with the product, observe the occupational health and safety regulations and wear the required personal protective equipment.
- Observe the valid safety and accident prevention regulations.
- Wear protective gloves to guard against sharp edges and corners or rough surfaces.
- Wear heat-resistant protective gloves when handling hot surfaces.
- Wear protective gloves and safety goggles when handling hazardous substances.
- Wear close-fitting protective clothing and also wear long hair in a hairnet when dealing with moving components.

2.9 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.

IMPORTANT!

Following a longer shutdown period (more than approx. 6 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.

2.10 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.

2.11 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.

2.12 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.

2.13 Fundamental dangers

General

- Observe safety distances.
- Never deactivate safety installations.
- Before commissioning the product, take suitable protective measures to secure the danger zone.
- 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.

2.13.1 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.

2.13.2 Protection during commissioning and operation

Falling or violently ejected components

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

- Take appropriate protective measures to secure the danger zone.
- Never step into the danger zone during operation.

2.13.3 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, ensure that no residual energy remains and secure against inadvertent reactivation.
- 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. Limit/prevent accidental access for people in this area due through technical safety measures. 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. Before starting up the machine or automated system, check that the EMERGENCY STOP system is working. Prevent operation of the machine if this protective equipment does not function correctly.

2.13.4 Notes on particular risks



⚠ WARNING

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

- Provide system pressure monitoring in the hydraulic system
- Ensure stable hydraulic pressure



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

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



⚠ WARNING

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

- Prioritize automated loading
- Do not reach between the workpiece and the chuck jaw during the clamping procedure



⚠ WARNING

Risk of injury due to accidental actuation when working on the product

- Disconnect the power supply when working on the product



⚠ 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.

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



⚠ CAUTION

Risk of injury due to damaged connection cable on live parts

- Check the connection cables of the inductive proximity switches for damage before starting work.

3 Technical data

Installation position	any
Operating temperature	+5 °C to +60 °C
Noise emission [dB(A)]	≤ 70
Pressure medium	Hydraulic oil
Requirement for the pressure medium	filtered (10 µm), viscosity 46 mm/s at 40 °C in line with ISO VG
Volumetric flow	max. 2 l/min
Oil loss by adhering oil removal	max. 0.5 mg/cycle
Max. speed of rotation	100 RPM

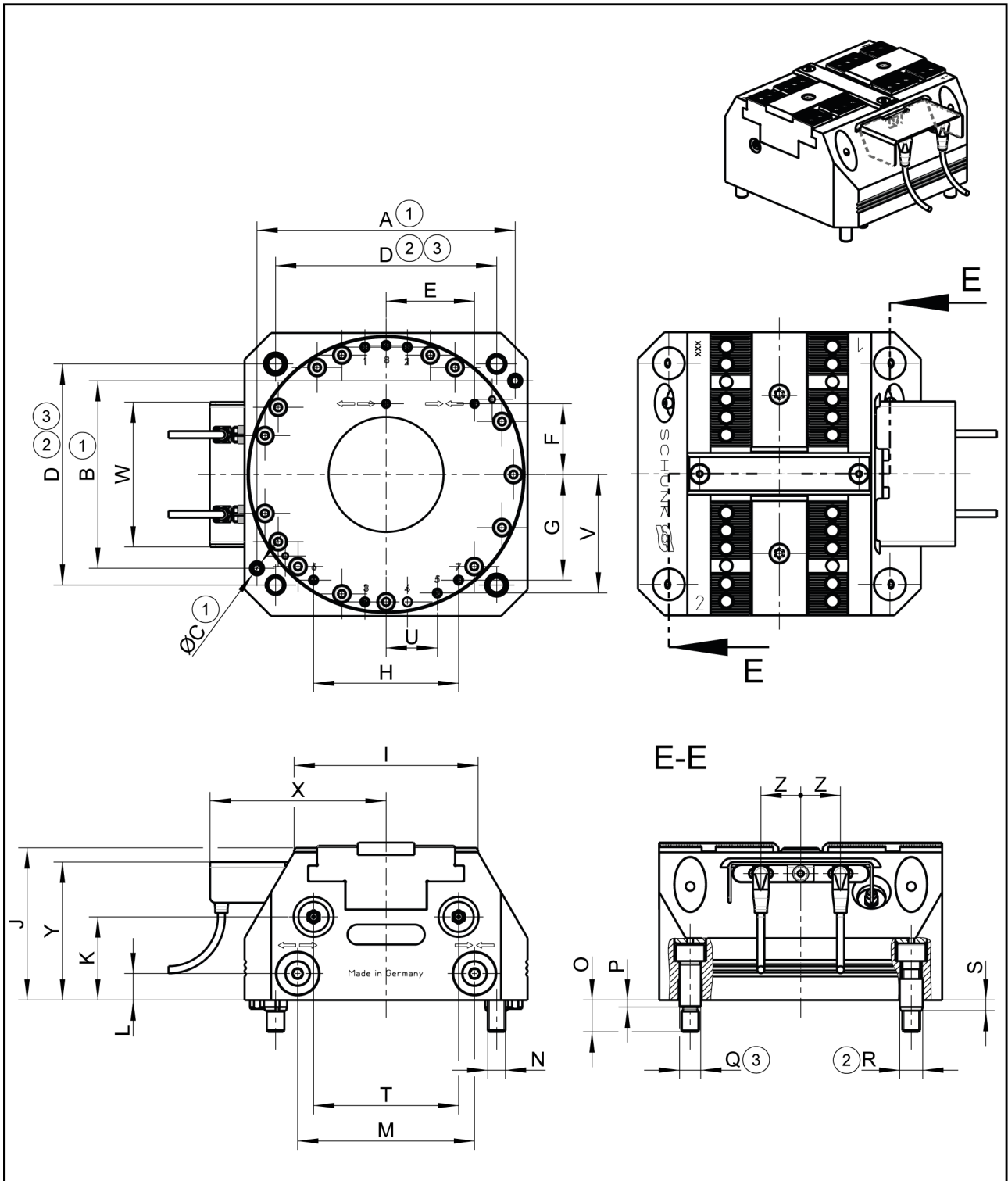
Designation	KSH3			
	100	140	160	200
Stroke/jaw [mm]	2	3	3	4
Clamping force at max. pressure* [kN]	18	30	45	60
Max. pressure [bar]	60	60	60	60
Repeat accuracy ** [mm]	0.01	0.01	0.01	0.02
max. jaw height [mm]	60	60	60	100
Weight [kg]	5	9.5	14	24

Designation	KSH3-LH					
	100	140	160	200	250	315
Stroke/jaw [mm]	6	7	8	10	15	18
Clamping force at max. pressure* [kN]	16	30	40	53	50	95
Max. pressure [bar]	120	120	120	120	60	120
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]	5	9.5	14	24	36.5	83

* 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]).

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

Dimension	KSH3 IM / KSH3-LH IM			KSH3-LH IM		
	100	140	160	200	250	315
A	90	126	146	184	180	290
B	64	92	106	146	160	230
∅ C	6H7 x 12	8H7 x 14	8H7 x 14	8H7 x 14	10H7 x 20	10H7 x 20
D	80	110	125	160	200 x 180	250
E	29.5	25 (2x)	50	64.5	45 (off-center)	100
F	32	40.0	40	64.5	80	108
G	34.5	51.8	59.7	72	50	112
H	55	74	82	116	140	192
I	64	91	104	138	170	220
J	74.2	77.7	87.2	95.2	103.2	141
K	41	43	47	53	57	78
L	15	13.5	15	17.5	20	25
M	57	88	100	129	45 (off-center)	200
N	M8	M8	M10	M12	M12	M16
O	15	15.5	18	21	20	26
P	4	3.5	4	6	5	5
∅ Q	10f7	10f7	12f7	14f7	14f7	18f7
∅ R	11	11	13	16	16	21
S	4.5	5.5	6	6	6	6
T	54	74	82	116	140	192
U	18.7	26	29	41	54	65
V	40	58.5	67	83	104	132
W	65.8	81.8	81.8	95	134.8	142
X	82.1	93	99.5	113.5	124.5	169.5
Y	68.5	70	78	87	92.2	123
Z	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 Clamping sleeve 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)

Description	Screw size	M5	M8	M10	M12	M20
KSH3	Tightening torque M_A (Nm)	9	32	62	108	510
KSH3-LH	Tightening torque M_A (Nm)	9	32	75	140	510

5 Assembly and connection

The numbers shown for individual components refer to the illustrations for assembly or connections of the clamping force block and to the "Drawings" chapter. ▶ 9 [45]



⚠ 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

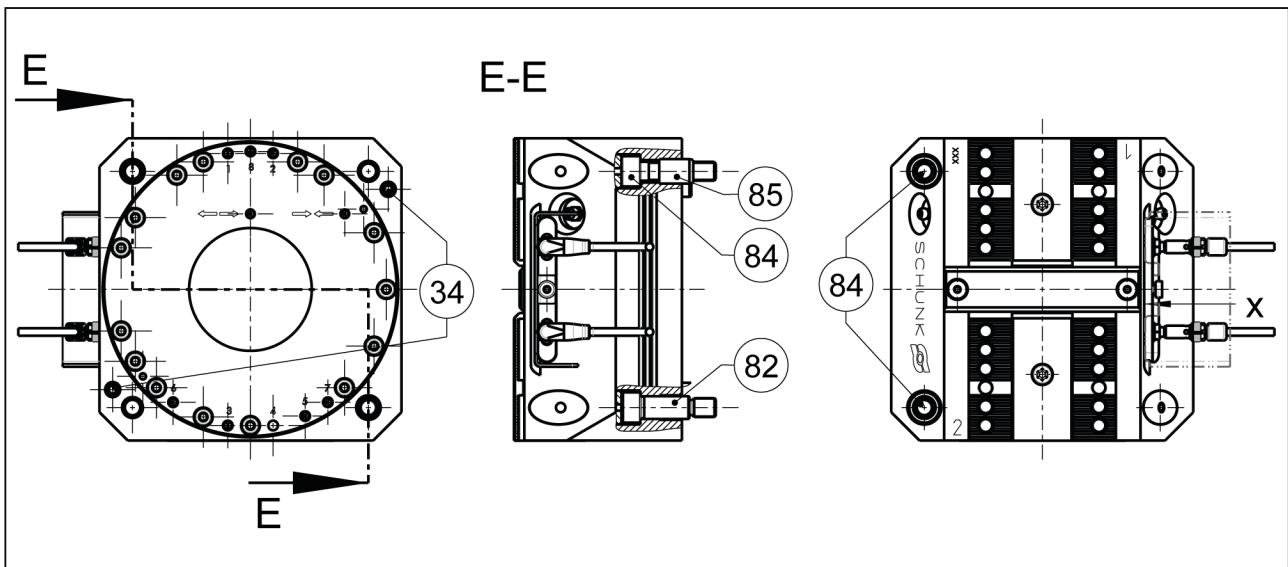


⚠ CAUTION

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



34 Cylindrical pins \varnothing M6 ▶ 8.3 [44]

82 Fitting screw \varnothing f7 ▶ 8.3 [44]

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.
-

Assembly with clamping sleeves:

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

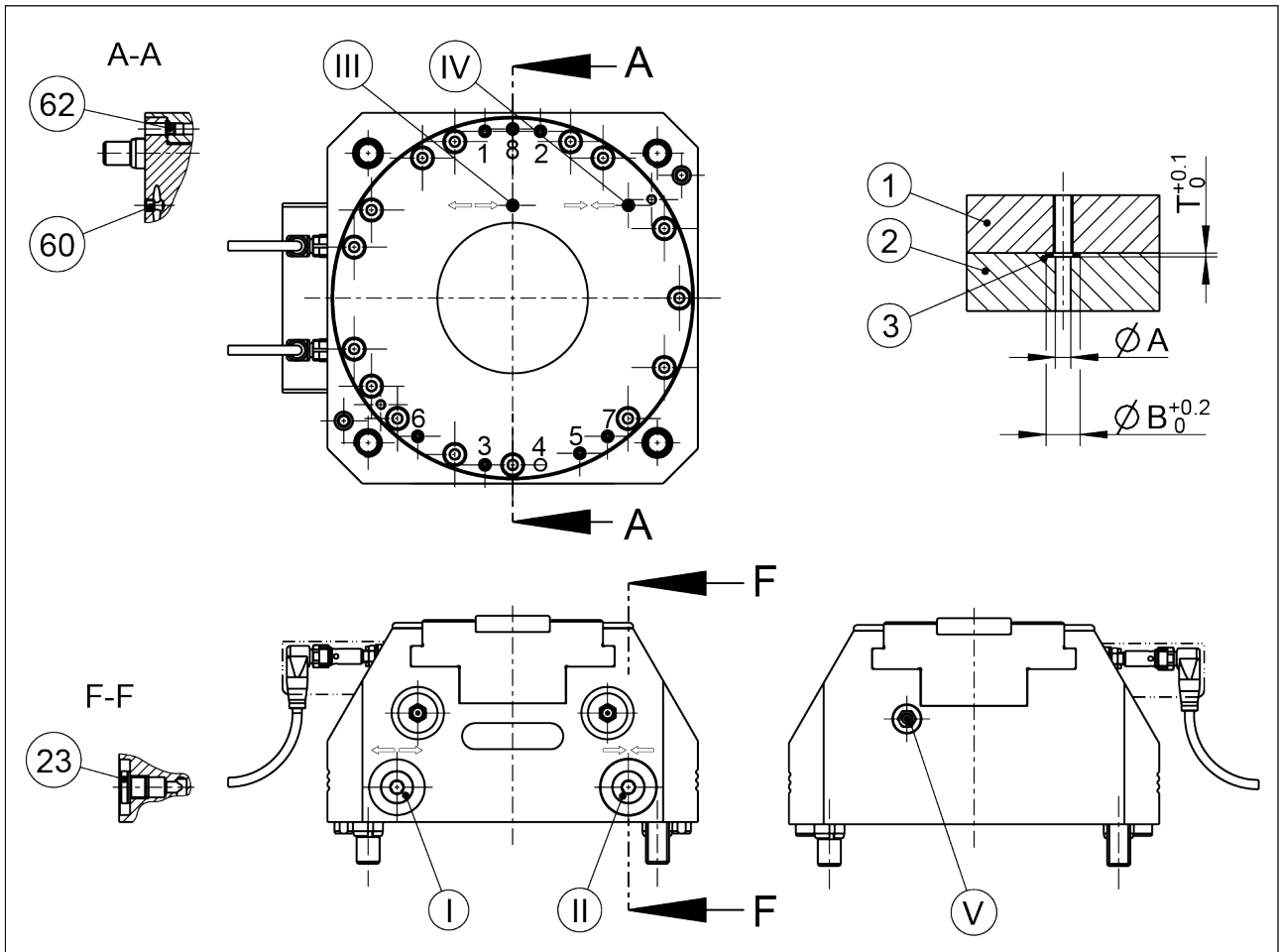
Assembly with fitting screws:

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 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 |

5.2.1 Supply lines

The clamping force block has four hydraulic connections: **I, II, III, IV**.

Two connections for OPEN (**I** and **III**) and two connections for CLOSE (**II** and **IV**).

Which of the two hydraulic connections has to be opened for actuation depends on the specific application:

- Connection **I** and **II** for operation with external hydraulic pipes or hose lines.
- The threads for the hydraulic screw fitting – on the front of the housing (item 1) – are G $\frac{1}{8}$ " for all clamping force blocks.
- Connection **III** and **IV** in the base for hose-free direct connection in the machine table.

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

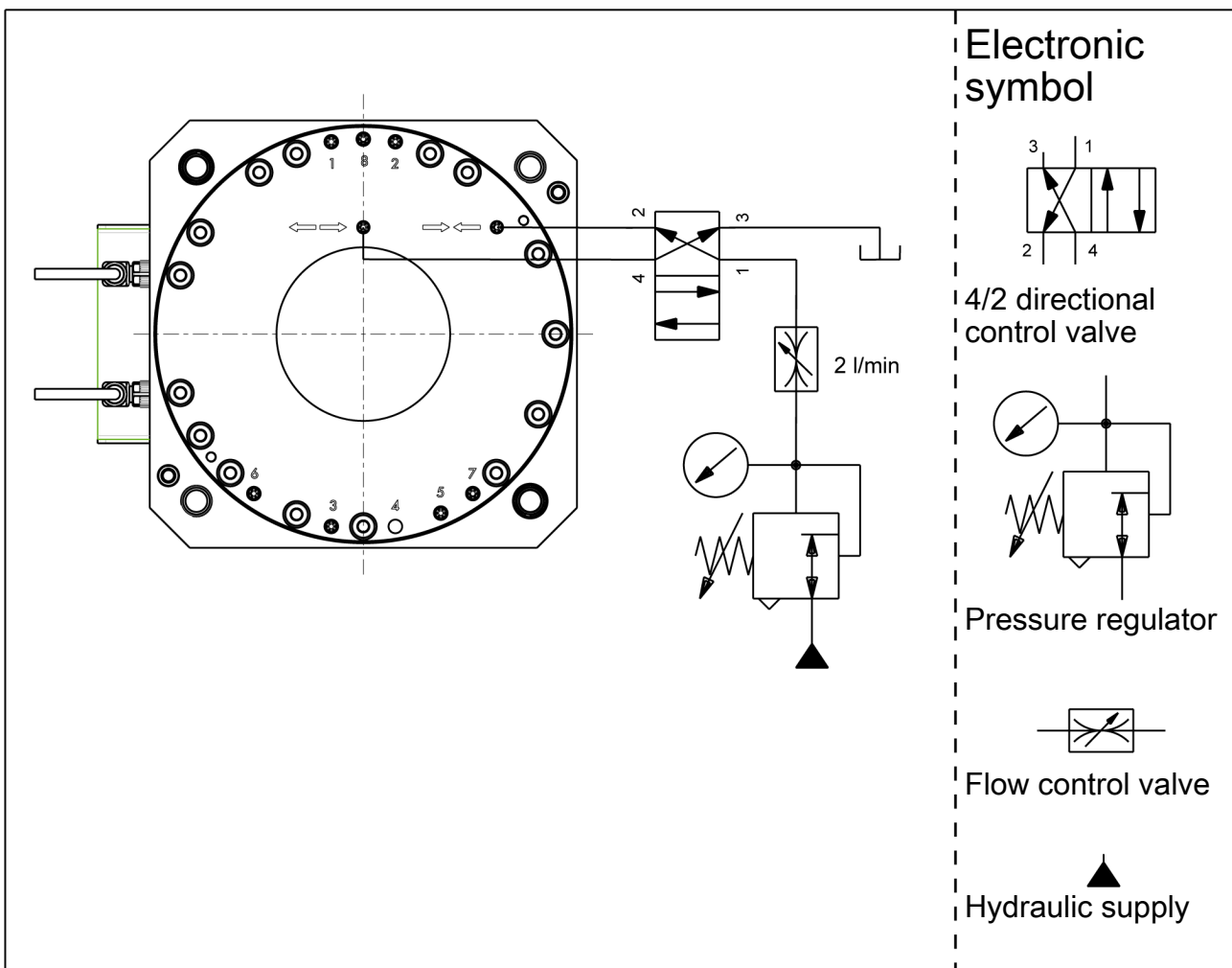
Hose-free direct connection		64	100	140	160	200	250	315
Connection III – IV	Ø A [mm]	4						7
	Ø B [mm]	8.8						12.8
	T [mm]	1.0						1.4
	O-ring* [mm]	Ø 5.28 x 1.78						Ø 9 x 2
Connection 1–8	Ø A [mm]	3	4				7	
	Ø B [mm]	5.3	8.8				12	
	T [mm]	0.6	1.0				1.4	
	O-ring* [mm]	Ø 3.5 x 1	Ø 5.28 x 1.78				Ø 9 x 2	

*Included in accessory kit and sealing kit

NOTE

- On delivery of the clamping force block, all four hydraulic connections are 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 sound absorber (**V**) must be removed and replaced by a set-screw (item 93). ▶ 8.2 [41]
- 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).

5.2.2 Hydraulic circuit diagram



5.3 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 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 schunk.com).

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

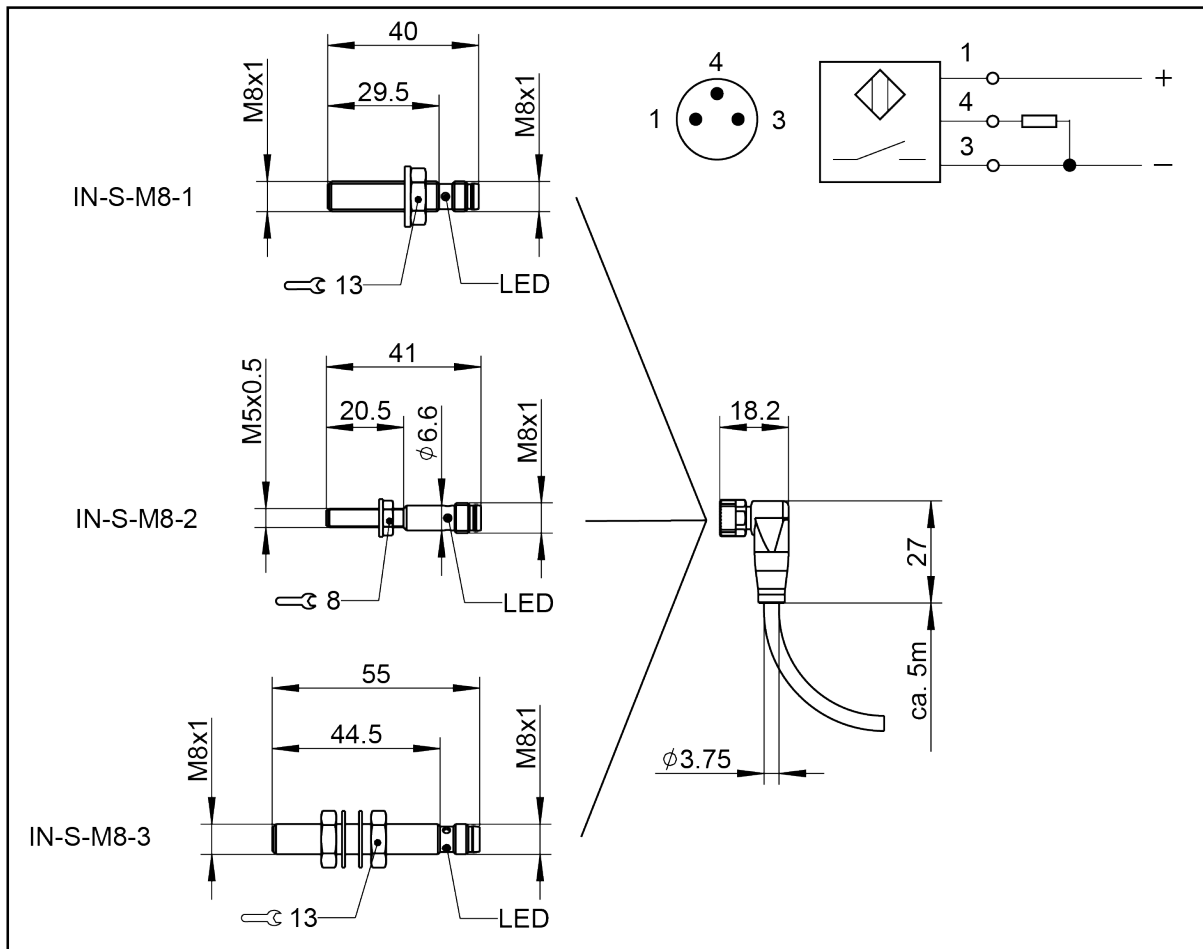
For the proper use of the proximity switches, observe the following:

- 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).

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



Pin 1: Brown

Pin 2: Blue

Pin 3: 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	1.5 mm	1.5 mm	1.5 mm
Voltage	10 – 30 V DC	10 – 30 V DC	10 – 30 V DC
Ripple	≤ 15%	≤ 15%	≤ 15%
Switched current max.	200 mA	100 mA	100 mA
Switching hysteresis in % from switching distance	≤ 15	≤ 15	≤ 15
Temperature range	-25 °C – +70 °C	-25 °C – +70 °C	-40 °C – +85 °C
Switching frequency approx.	1000 Hz	5000 Hz	3000 Hz
Voltage drop (max. load)	2.5 V	2 V	2.5 V
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 67

5.3.2 Assembly and adjustment of the proximity switches

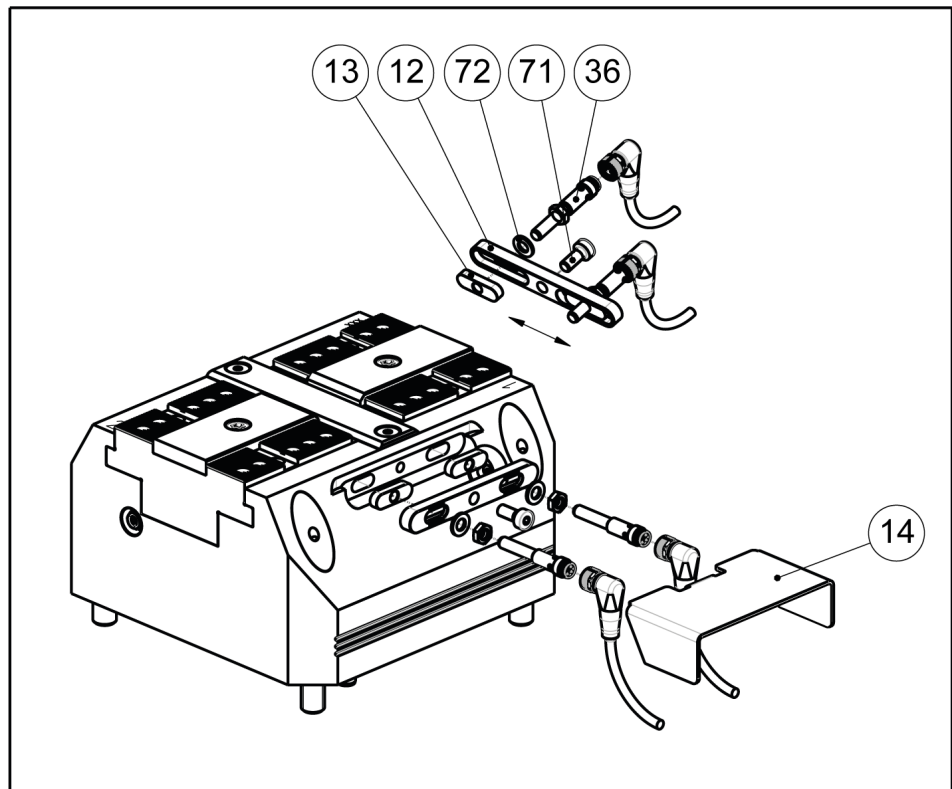
For TANDEM KSP3-IM/KSP3-LH-IM, two inductive proximity switches have been fitted. The proximity switches can be moved on the retaining plate (item 12) so that the switching point can be individually adjusted. The proximity switches are used for monitoring the jaw stroke end position for O.D. and I.D.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

5.3.3 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 Clamping force block closed	0	0

Fig. 95 Circuit diagram for external workpiece clamping

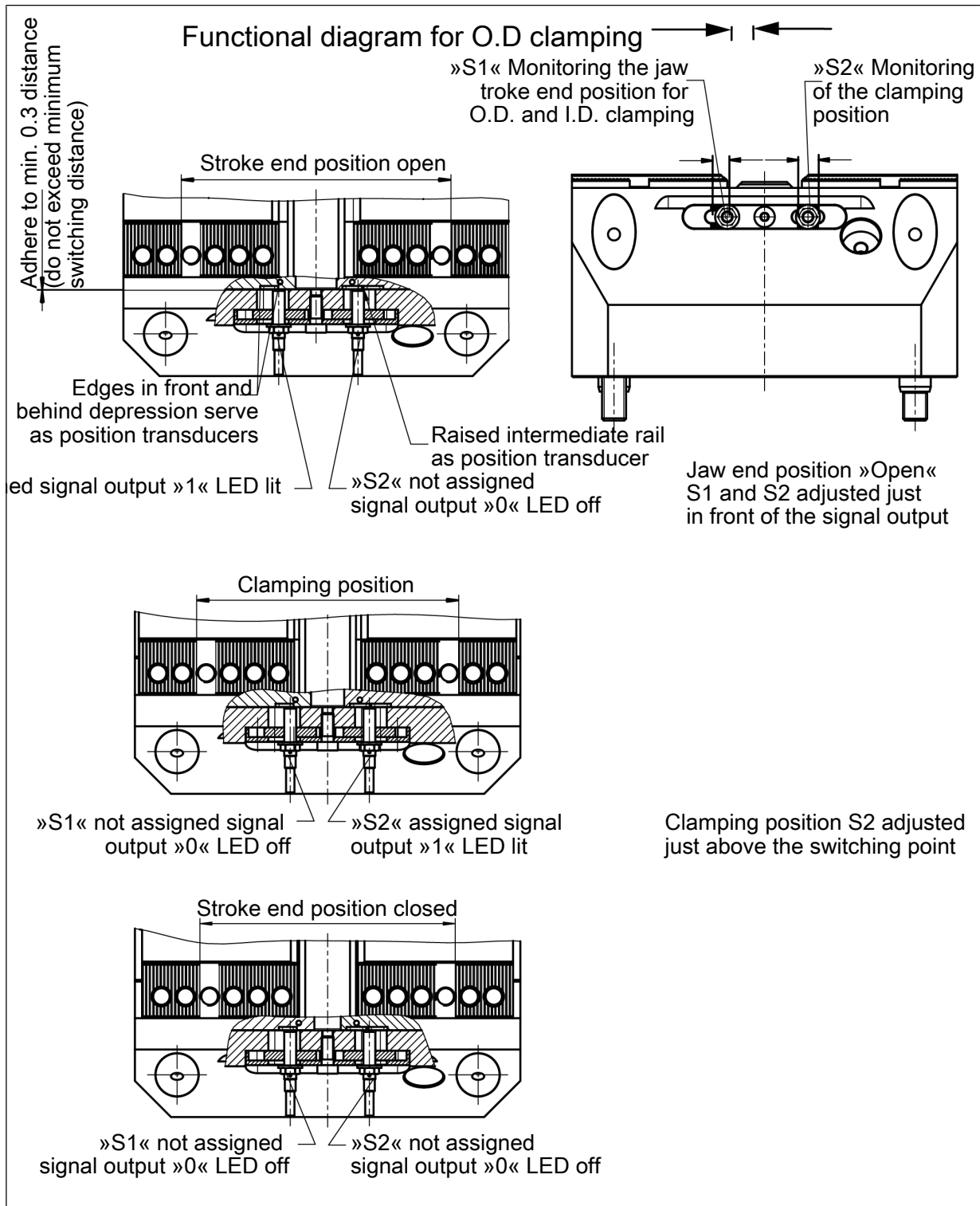


Fig.°6 Functional diagram for external workpiece clamping

5.3.4 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 Clamping force block closed	0	0

Fig. 97 Circuit diagram for internal workpiece clamping

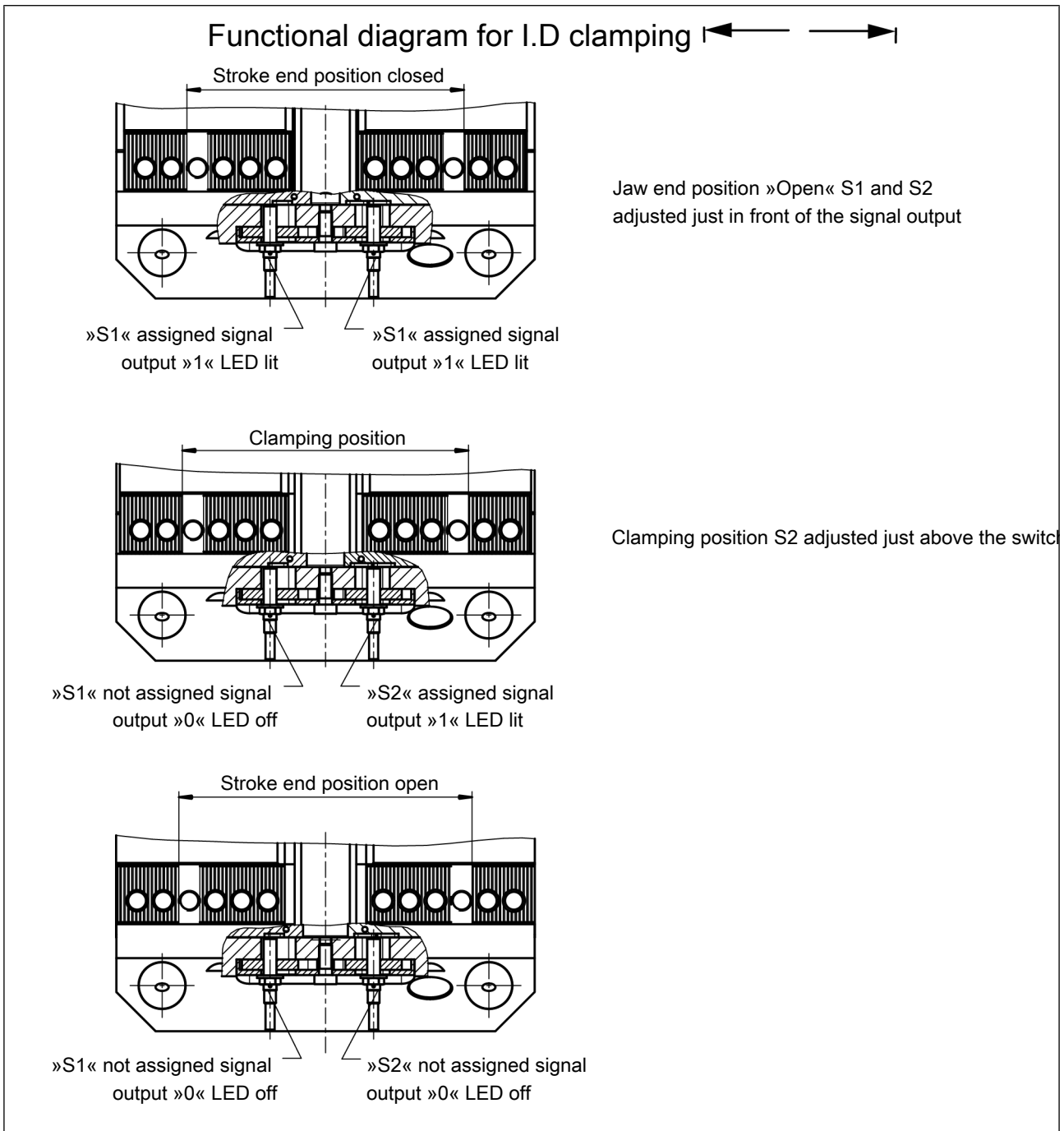


Fig.° 8 Functional diagram for internal workpiece clamping

6 Troubleshooting

Clamping force block chuck jaws will not move

Possible cause	Solution(s)
Oil supply interrupted	Check the hydraulic supply
System pressure too low	Increase system pressure according to clamping system technical specifications
Connections mixed up	Check connections and functions and connect properly
Hydraulic connections that are in use are closed	Check connections and open

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
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 and replace all the seals (see sealing kit lists ▶ 8.1 [41])
Inadequate lubrication	Lubricate the lubrication nipples with microGleit LP 410 ▶ 7 [33]

Clamping force block movement jerky

Possible cause	Solution(s)
Steel guide rollers on sliding surfaces not greased	See chapter "Maintenance and Care" ▶ 7 [33]

7 Maintenance and care

7.1 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.

7.2 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.

7.3 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 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.

7.4 Maintenance work

7.4.1 Lubrication



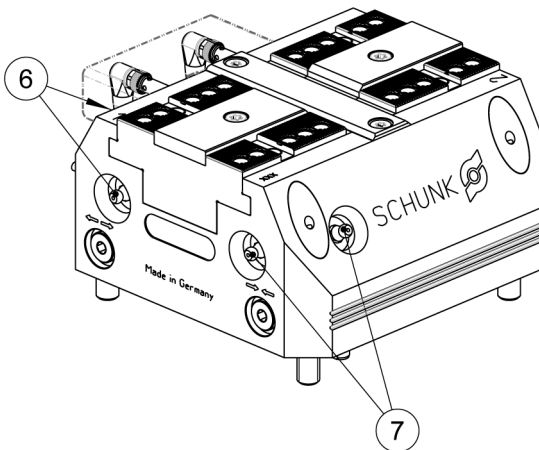
⚠ CAUTION

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.

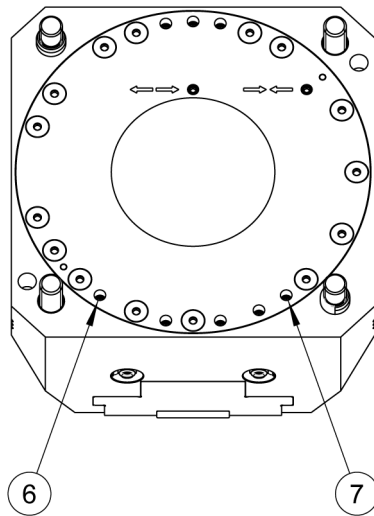
Manual lubrication



- 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. ▶ 7.3 [33]

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. ▶ 7.3 [33]

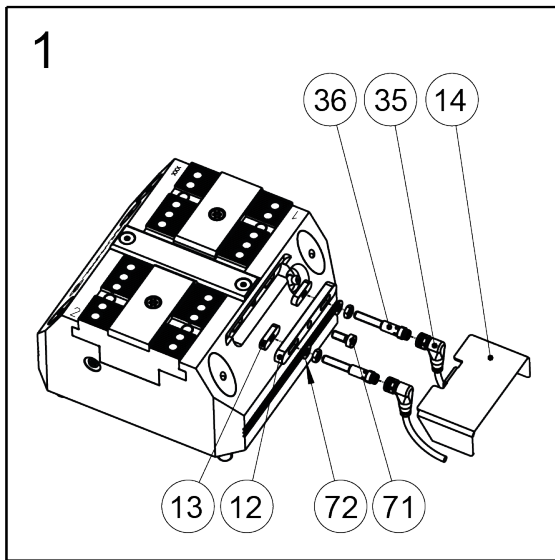
Size	Grease quantity (per connection) [cm ³]
64	2
100	4
140	4
160	4
200	4
250	4
315	5

7.4.2 Basic cleaning

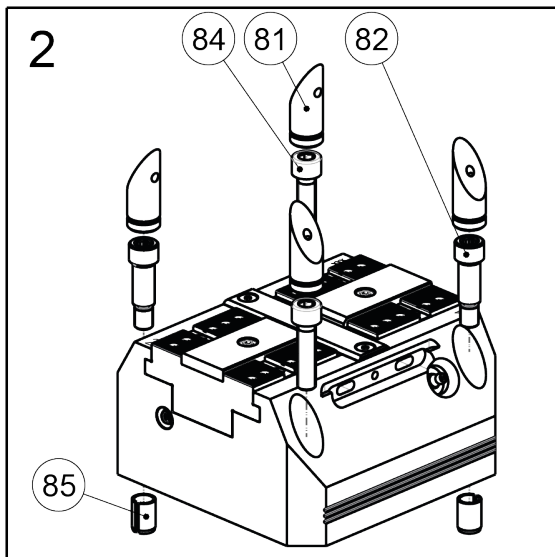
For basic cleaning, the product must be disassembled, cleaned and reassembled.

Disassembly

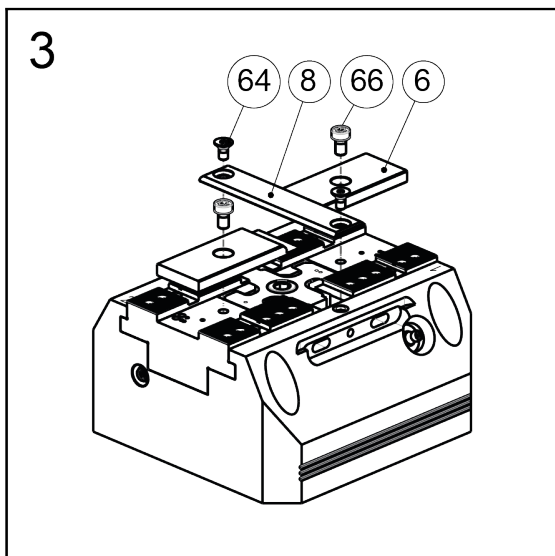
Before disassembling the product, switch off the machine and secure it against being switched on again. Then remove all compressed air lines. No residual energy may be left in the product.



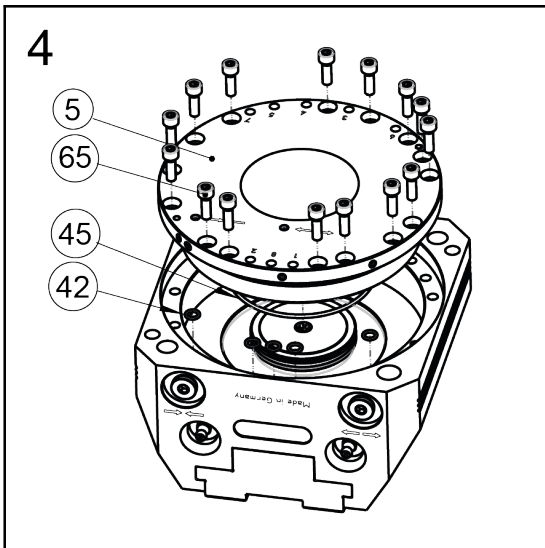
- Disassemble the supply cable to the pin terminal of the inductive proximity switches on the separable elbow fitting
- Remove the screw (item 71) and take the retaining plate (item 12) together with the cover (item 14) and the proximity switches (item 36) out of the body
- Each proximity switch is fastened 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

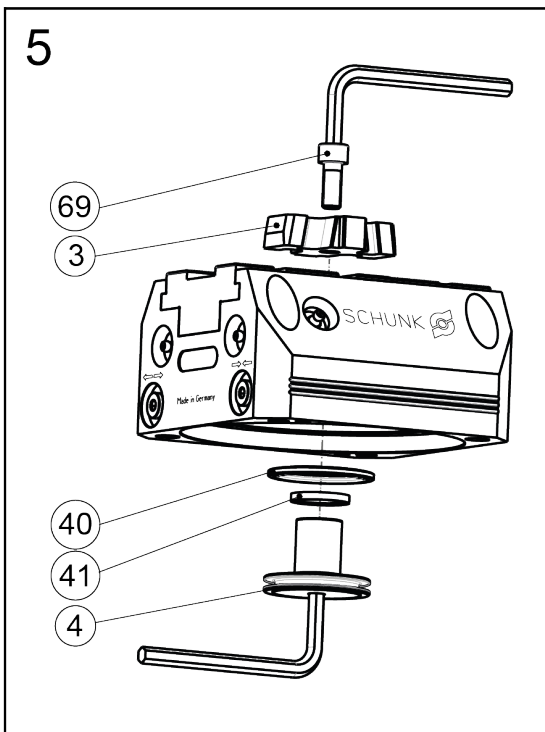


- Remove screws (item 64) and take off the cover strip (item 8)
- Remove screws (item 66) and take off the guide strip (item 6)

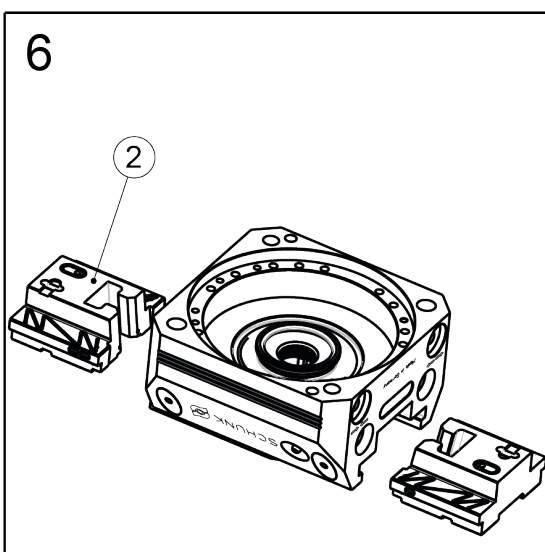


Remove screws (item 65) and pull out cover (item 5) together with O-ring (item 45) and flat gaskets (item 48) out of the housing. To do this, screw two screws into the threaded holes as an extraction tool

- 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: M8 x L > 25



- 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 seal (41) 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 ▶ 7.3 [33]
- Replace all wearing parts and seals if necessary ▶ 8.1 [41]

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 ▶ 7.4.3 [38].

7.4.3 Testing the leakage and tightness of the hydraulic system

The following is needed to check for leaks:

hydraulic unit or manually actuated hydraulic pump, pressure gauge, shut-off valve and quick couplers.

- Check for tightness in the clamping system in the OPEN and CLOSED positions

Connect the components for the leakage and tightness test on the clamping system in the following order:

1. Adjust the hydraulic unit with pressure gauge and shut-off valve to minimum pressure.
2. Connect the hydraulic screw fittings to the frontal OPEN and CLOSED connections.
3. Link the supply line and hydraulic coupling to the hydraulic screw fittings.

The leakage and tightness test is to be performed in the following order:

1. Actuate the clamping force block with reduced hydraulic pressure. Check the clamping force block for free movement by opening and closing the jaws several times.
2. Check the clamping force block with the maximum permissible hydraulic pressure.
3. Inspect the outside of the TANDEM clamping force block for visible signs of damage and oil leakage.

Measures in the event of a leaking hydraulic system

If the clamping system is leaking, check the fittings first.

Seal any leaking fittings. Once the fittings are sealed, check for leaks in the clamping force block and replace if necessary (see the chapter "Disassembling and assembling the clamping system" ▶ 7.4.2 [38])

7.4.4 Assembly devices piston seals

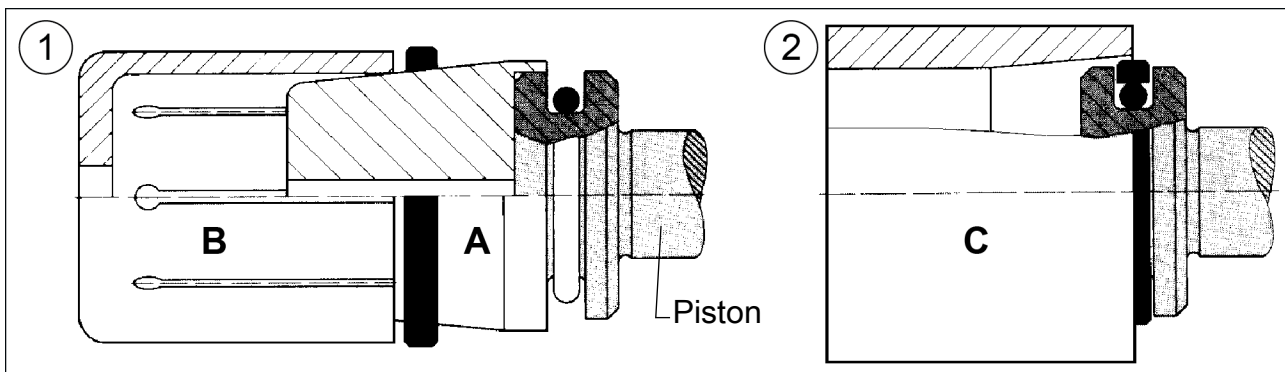
To assemble the seal (item 40), a multi-part assembly tool is required. If no assembly tool is available, repair work on the TANDEM clamping force block should be carried out by SCHUNK.

1. Assembly

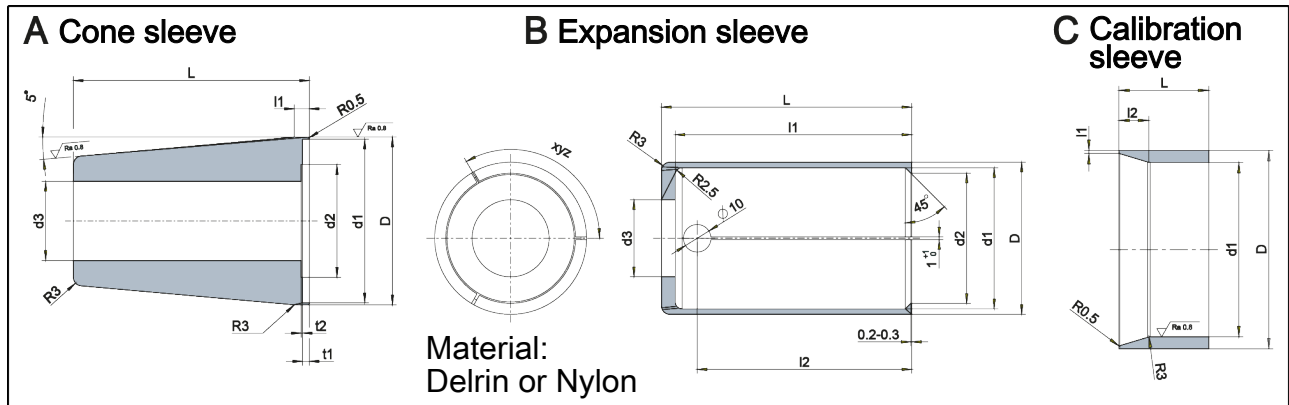
- Disassemble the two-part seal (item 40) and grease with Renolit HLT 2 or an equivalent grease.
- Pull the O-ring of the seal (item 40) over the cylinder piston (item 4) and into the groove. (Do not stretch or tear the O-ring.)
- Stretch the sealing ring with an expansion sleeve over the cone sleeve and slide over the cylinder piston and the O-ring that was previously inserted into the groove.

2. Calibration

After sliding it over, the Turcon-ring snaps into the groove. However, assembly is still not complete. The stretched ring needs to be returned to its original shape with a calibration sleeve.



Assembly tools for the piston seal



Assembling the piston seal

A cone sleeve			Material: steel						
KSH3	Piston Ø	D	$d_1^{+0.15}$	d_2	d_3	L	l_1	$t_1^{+0.3}$	t_2
100	35	36.5	35	22	17	75	5.7	2.7	0.5
140	50	51.5	50	37	25	80	5	2	0.5
160	58	59.5	58	40	28	85	5.4	2.4	0.5
200	75	76.5	75	55	43	85	6	3.5	0.5
250/315	105	106.5	105	80	58	100	6	3	0.5

B expansion sleeve			Material: POM, Nylon® or similar						
KSH3	Piston Ø	D	d_1	d_2	d_3	L	l_1	l_2	xyz
100	35	34.64	30.64	26.64	17	81	76	68	3 x 120°
140	50	48.94	44.94	40.94	25	86	81	73	4 x 90°
160	58	55.22	51.22	47.22	28	91	86	78	4 x 90°
250	120	115.54	111.54	107.54	58	106	101	93	6 x 60°

C calibration sleeve		Material: steel				
KSH3	Piston Ø	D	$d_1^{+0.1}$	L	l_1	$l_2^{\pm 1}$
100	35	43.05	35.05	30	1	10
140	50	58.05	50.05	30	1	10
160	58	66.05	58.05	30	1	10
200	75	85.5	75.05	30	1	10
250/315	105	120.5	105.05	30	1	10

8 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.

8.1 Sealing kit lists

Sealing kit *	ID
Size 100	1477671
Size 140	1477673
Size 160	1477675
Size 200	1516776
Size 250	1477677
Size 315	1516778

* 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.

8.2 Accessory packs

Accessory kit *	ID
Size 100	1446556
Size 140	1446557
Size 160	1446558
Size 200	1486400
Size 250	1446559
Size 315	1487988

* For included items, see Note **Z** in the Parts List chapter below.

8.3 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	1	
23	Locking screw	2	
34	Cylindrical pin	2	
35	Angular plug	2	
36	Proximity switch	2	
37	Supply cable	2	
40	Turcon Glyd Ring	1	Y
41	Turcon Glyd Ring	1	Y
45	O-ring	1	Y
47	Sealing ring	1	Y
48	Flat gasket	10	Y
60	Set-screw	2	100 / 140 / 160 / 200 / 315
	Set-screw	4	250
62	Set-screw	6	100 / 140 / 160 / 200 / 315
	Set-screw	4	250
64	Countersunk screw	2	100 / 140 / 160 / 200 / 250
	Countersunk screw	4	315
65	Countersunk screw	9	100
	Cylindrical screw	15	140 / 160 / 315
	Cylindrical screw	13	200
66	Cylindrical screw	2	
69	Screw	1	

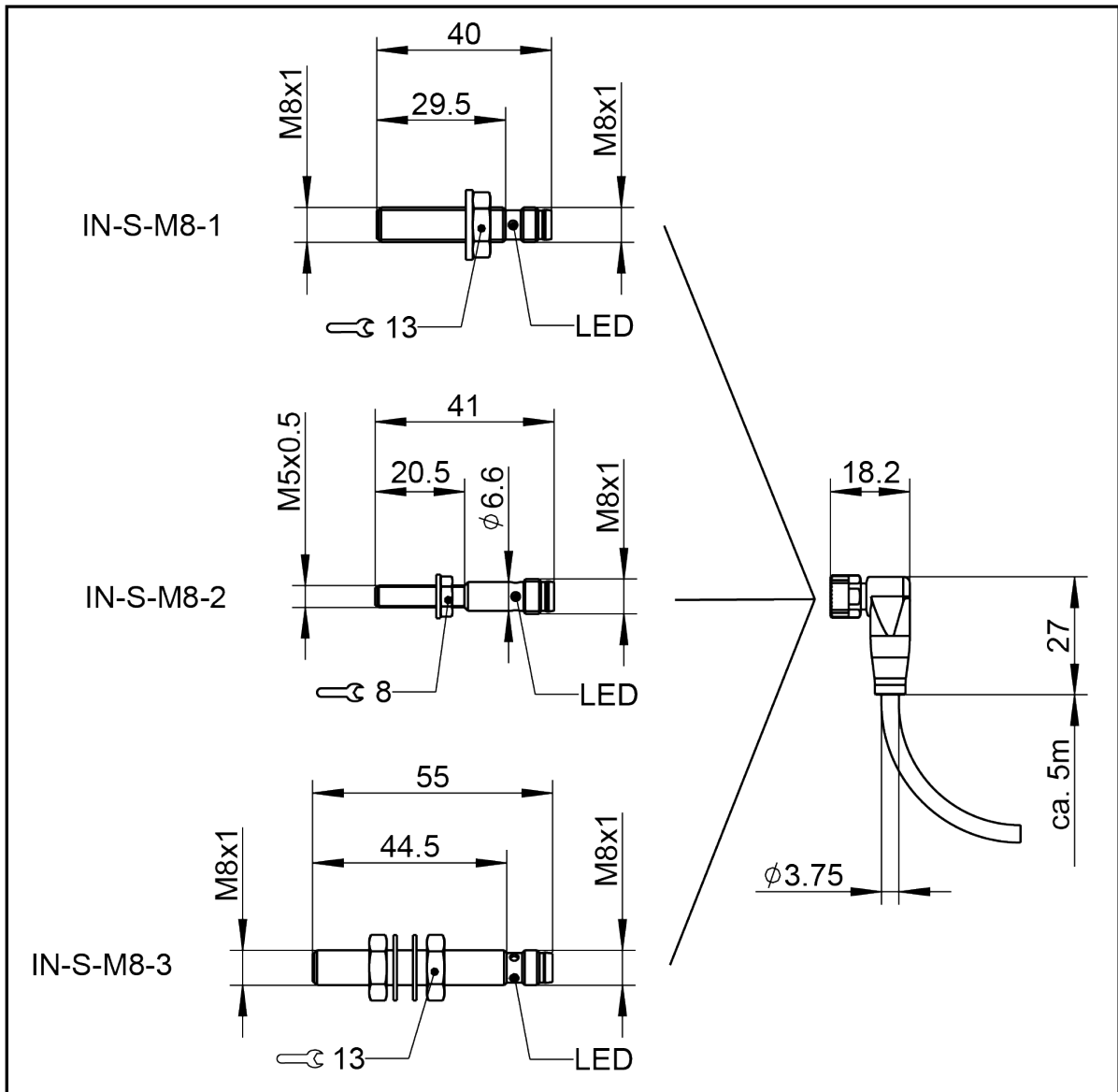
Item	Designation	Quantity	Note
70	Sealing plug	3	100
	Sealing plug	4	140 / 160
71	Cylindrical screw	1	
72	Washer	2	
74	Cylindrical screw	2	200 / 315
81	Plug	4	Z
82	Fitting screw	2	Z
83	O-ring	4	Y / Z
84	Screw	4	Z
85	Clamping sleeve	2	Z
86	Screw	8	Z
87	O-ring	10	Y
93	Set-screw	2	Z
100	Eye bolt	2	200 / 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.

8.4 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

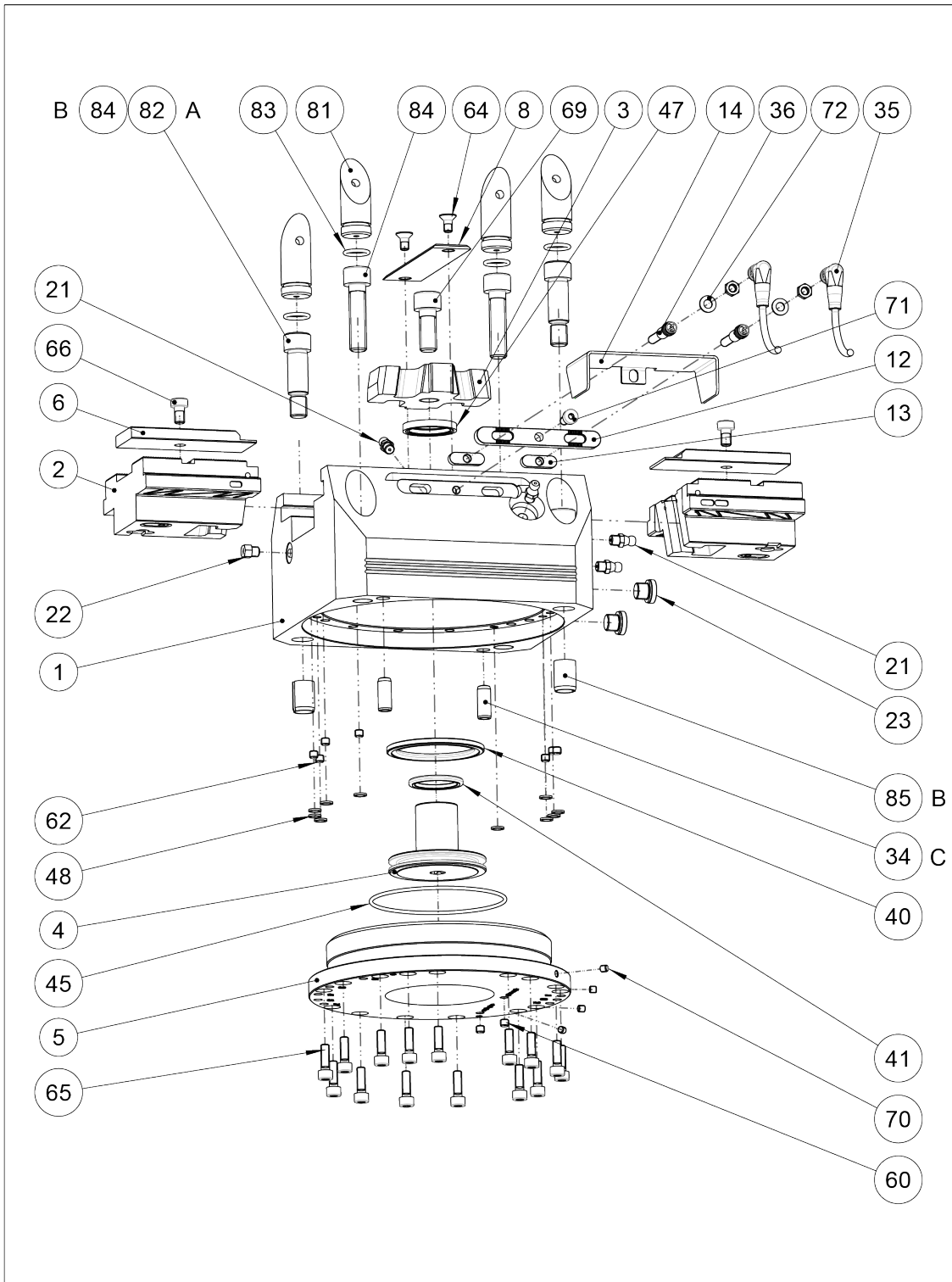
Supply cable KA – M12 plug connection

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

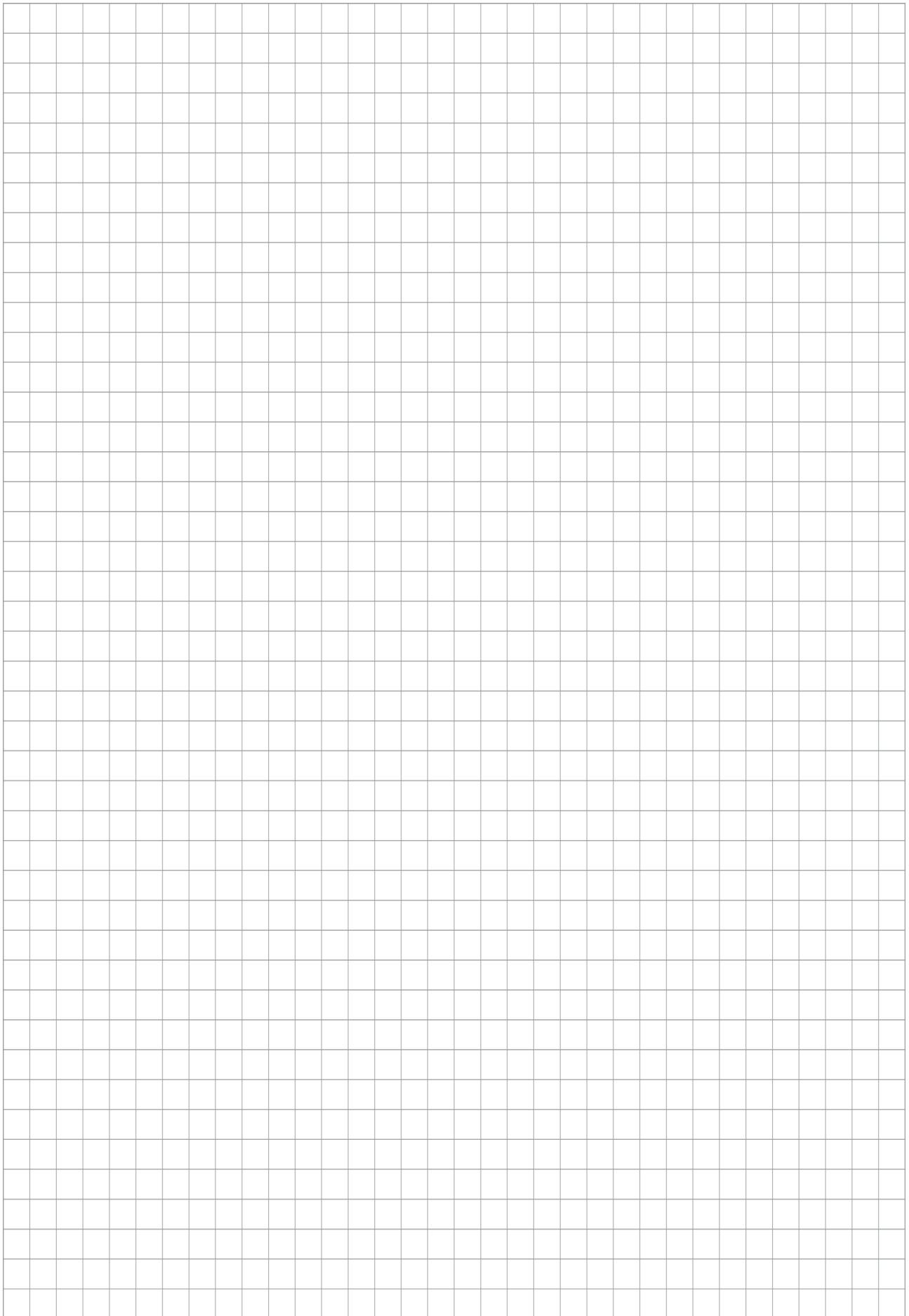
9 Assembly drawing



A Centering with fitting screw

B Centering with clamping sleeves

C Centering with cylindrical pins
(Z variant)





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Manufacturer certificate

Manufacturer / Heinz-Dieter SCHUNK GmbH & Co. Spanntechnik KG.
Distributor: Lothringer Str. 23
D-88512 Mengen

Product: Clamping force block
Description: TANDEM
Type designation: KSH, KRH, HZS

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.
- the **fault exclusion** against the fault "Unexpected release without applied pending 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.

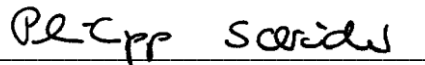
Harmonized standards applied:

- **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, 25. Aug. 2022



p.p. Philipp Schröder / Head of Development

Reviewed and approved / Date: A. Koch /07/07/2022

Modified/date: P. Schröder/07/07/2022;

FB No. 822M, Ver. 02

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