TANDEM Clamping Block
KSF plus, KSF-LH plus, KSF-F plus

Assembly and Operating Manual

Imprint

Technical changes:

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

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Dear Customer,

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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Table of contents

1 About this manual

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

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

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

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

In addition to these instructions, the documents listed under (☞ 1.2, Page 4) are applicable.

1.1 Presentation of Warning Labels

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

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

1.2 Applicable documents

- General terms of business *
- Catalog data sheet of the purchased product *

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

2 Basic safety instructions

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

Report any failures and damage immediately and repair without delay to keep the extent of the damage to a minimum and prevent compromising the safety of the product.
Only original SCHUNK spare parts may be used.

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, (☞ 5, Page 12).
- 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 Notes on particular risks

The TANDEM clamping block can cause injury for persons and material damage, for example:

- it is used other than as intended;
- it is not installed or maintained properly;
- the safety and installation instructions, the safety and accident prevention regulations valid at the usage site or the EC Machinery Directive are not observed.

⚠ WARNING

Risk of injury to operating personnel if the clamping block fails because the technical data have been exceeded and a workpiece is released or parts fly off!

- The technical data specified by the manufacturer for using the clamping block must never be exceeded.
- The clamping block may only be used on machines and facilities that fulfill the minimum requirements of the EC Machinery Directive 2006/42/EC; specifically, they must have effective technical measures to protect against possible mechanical hazards.

⚠ WARNING

Risk of injury due to immediate closing of the clamping block with a high spring pressure in case of failure of the pneumatic pressure.

- Do not reach between the chuck jaws when manually loading and unloading.
- Remove the power supplies of the clamping block for maintenance work.

⚠ WARNING

Risk of injury from clamping block or chuck jaws falling during transport, installation or removal!

- Make sure the clamping block and chuck jaws do not fall during transport, installation or removal.
- Use a crane and/or a transport truck for transport.
- Only install the clamping block on machines with the appropriate connection dimensions.

⚠ CAUTION

Risk of crushing from chuck jaws opening and closing when manually loading and unloading!

- Do not reach between the chuck jaws.
- Wear personal protective equipment.
- Prevent the clamping block from being actuated unintentionally.
- Use automated loading.

⚠ CAUTION

Risk of slipping or falling if the clamping block's operational environment is not clean (e.g. contaminated with cooling lubricants or oil).

- Ensure that the working environment is clean before starting assembly and installation work.
- Wear suitable safety boots.
- Follow the safety and accident-prevention regulations when operating the clamping block, especially when working with machine tools and other technical equipment.

⚠ CAUTION

Risk of burns due to workpieces with high temperatures.

- Wear protective gloves when removing the workpieces.
- Automatic loading is preferred.

2.4 Notes on safe operation

Follow the care and maintenance instructions.

Assembling the TANDEM clamping block

During assembly and connection, the power supply for the clamping block must be switched off. During connection, adjustment, commissioning and testing, make sure that no accidental operation of the TANDEM clamping block by the fitter or other persons is possible.

Remove the power supplies for installation, modification, maintenance, or adjustment work. Do maintenance work, modifications, and add attachments outside of the danger zone.

Functional testing

- After installing the TANDEM clamping block, its proper function must be checked before putting it into operation. There must be no leaks in the piping system here.
- If the clamping block is involved in a collision, it must be tested to see if it is still functioning properly before using it again. Only use original SCHUNK spare parts when replacing damaged items.
- Check the clamping block at least once per shift for externally visible damage and malfunctions.
- If there are signs of wear or damage, the fixing screws for the chuck jaws must be replaced. Only use screws with a quality of 12.9.

Maintenance instructions

The reliability of the clamping block can be guaranteed only if the maintenance instructions are followed exactly.

Use of special 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 near 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.)
- For higher clamping points, the operating pressure must be reduced.
- Do not use welded jaws.

2.4.1 Constructional changes, attachments or modifications

Modifications and rework (additional threads or bore holes) or attaching fittings that are not offered as accessories by SCHUNK may be performed only with permission of SCHUNK. This also applies to the installation of safety devices.

2.5 Personnel qualification

The clamping block must only be installed, removed, started up, operated and serviced by qualified specialist personnel with the relevant safety training.

All persons charged with operating, maintaining and servicing the clamping block must have access to the operating manual, especially the chapter "Basic safety notes". We recommend that the operator draw up in-house safety operating instructions.

Trainees may not work on machines and technical equipment in which a clamping block is installed unless they are supervised at all times by qualified specialist personnel.

2.6 Organizational measures

Obeying the rules
Via suitable organizational measures and instructions, the operator must ensure that the relevant safety rules are obeyed by the persons asked to operate, maintain and repair the clamping block.

Checking the behavior of personnel
The operator must at least occasionally check that the personnel are behaving in a safety conscious manner and are aware of the potential hazards.

Danger signs
The operator must ensure that the signs concerning safety and hazards mounted on the machine where the clamping block is mounted are clearly legible and are observed.

Faults
If a fault occurs on the clamping block which endangers safety or if a problem is suspected due to production characteristics, the machine where the clamping block is mounted must be immediately stopped and remain shut down until the fault has been located and remedied. Only allow specialists to remedy faults.

Spare parts

Only use original SCHUNK spare parts.

Environmental regulations

The applicable environmental regulations must be observed for all maintenance and repair work.

The use of petroleum ether is prohibited. It is extremely flammable, can build up an electrostatic charge and can form an explosive gas air mixture. When selecting greases and lubricating oils, pay attention to environmental compatibility, health risks, disposal regulations and to local options for disposal according to regulations.

2.7 Personal protective equipment

Using personal protective equipment

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

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

3 Warranty

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

- Observe the applicable documents, (☞ 1.2, Page 4)
- Observe the ambient conditions and operating conditions
- Observe the maximum number of clamping cycles (☞ 5, Page 12)
- Observance of the specified care and maintenance instructions (☞ 9, Page 23)

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

4 Scope of delivery

Clamping block
KSF plus or KSF-F plus or KSF-LH plus (without top jaws)

Operating manual

ACCESSORY PACK:
(for contents, see sealing kit and parts list) (☞ 10.2, Page 29)

5 Technical data

Pressure medium	Compressed air, compressed air quality according to ISO 8573-1:7 4 4
Operating pressure	max. 6 bar
Operating temperature	5 °C to 60 °C
Installation position	Any
Noise emission [dB(A)]	≤ 70

NOTICE

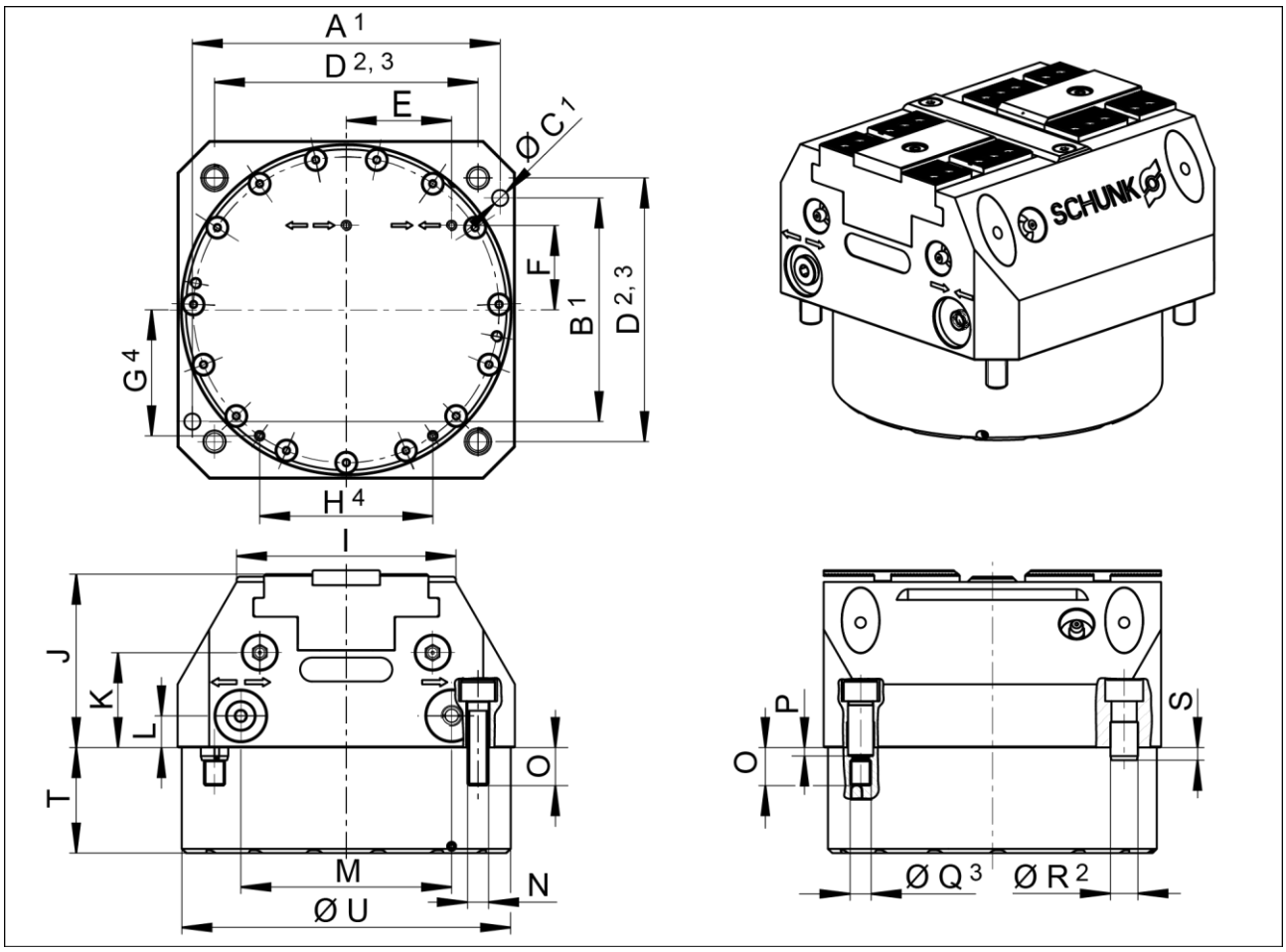
The TANDEM clamping blocks **KSF plus** and **KSF-F plus** may **not** be operated with the turbo function. Additional pressure support can damage the clamping blocks.

Designation	KSF plus, KSF-LH plus, KSF-F plus											
	100	**140**	**160**	**250**	**LH 100**	**LH 140**	**LH 160**	**LH 250**	**F 100**	**F 140**	**F 160**	**F250**
Stroke per jaw [mm]	2	3	3	5	6	7	8	15	4	6	6	10
Clamping force* at max. pressure [kN]	10	16	25	40	4.5 10 with turbo	7.5 17.5 with turbo	10 25 with turbo	20 40 with turbo	10	16	25	40
max. pressure **	6	6	6	6	6	6	6	6	6	6	6	6
Repeat accuracy [mm]***	0.01	0.015	0.02	0.03	0.01	0.015	0.02	0.03	0.01	0.015	0.02	0.03
max. jaw height [mm]	60	60	60	150	150***	120***	200***	500***	60	60	60	150
Weight [kg]	5	10	16	42	5	10	16	42	5	10	16	42

*	Clamping force is the arithmetic sum of the individual forces occurring at the chuck jaws at a distance of "H" (see catalog data sheet (☞ 1.2, Page 4)).
**	End positions spread after 100 consecutive strokes.
***	for applications without turbo function

Warranty and maximum clamping cycles

Length of warranty	24 Months
Maximum clamping cycle number	500 000 Cycles



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	Bottom lubrication connection

	KSF plus, KSF-LH plus, KSF-F plus			
Dimension	**100**	**140**	**160**	**250**
A	90	126	146	230
B	64	92	106	154
Ø C	6H7 x 12	8H7 x 14	8H7 x 14	10H7 x 20
D	80	110	125	200
E	29.5	44 (2x)	50	75
F	32	45.5	40	64
G	34.5	51.8	59.7	92.6
H	55	74	82	139.6
I	64	91	104	170
J	69.2	72.7	82.2	98.2
K	42	41	45	52

	KSF plus, KSF-LH plus, KSF-F plus			
Dimension	**100**	**140**	**160**	**250**
L	10	13.5	15	20
M	59	88	100	150
N	M8	M8	M10	M12
O	15	15.5	18	20
P	4	3.5	4	5
Ø Q	10f7	10f7	12f7	14f7
Ø R	11	11	13	16
S	4.5	5.5	6	6
D	37.3	44.2	50	58
Ø U	97.5	136.5	156	246

6 Tightening torques for screws

Tightening torques to mount 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
Admissible torque M_A (Nm)	4.2	7.5	13	28	50	88	120	160	200	290	400	500

Tightening torques to mount top jaws on the TANDEM clamping block (screw quality 12.9)

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

Tightening torques to mount the chuck piston onto the cylinder piston (screw quality 12.9)

Screw size	M5	M8	M10	M12
Tightening torques M_A (Nm)	9	32	62	108

7 Assembly

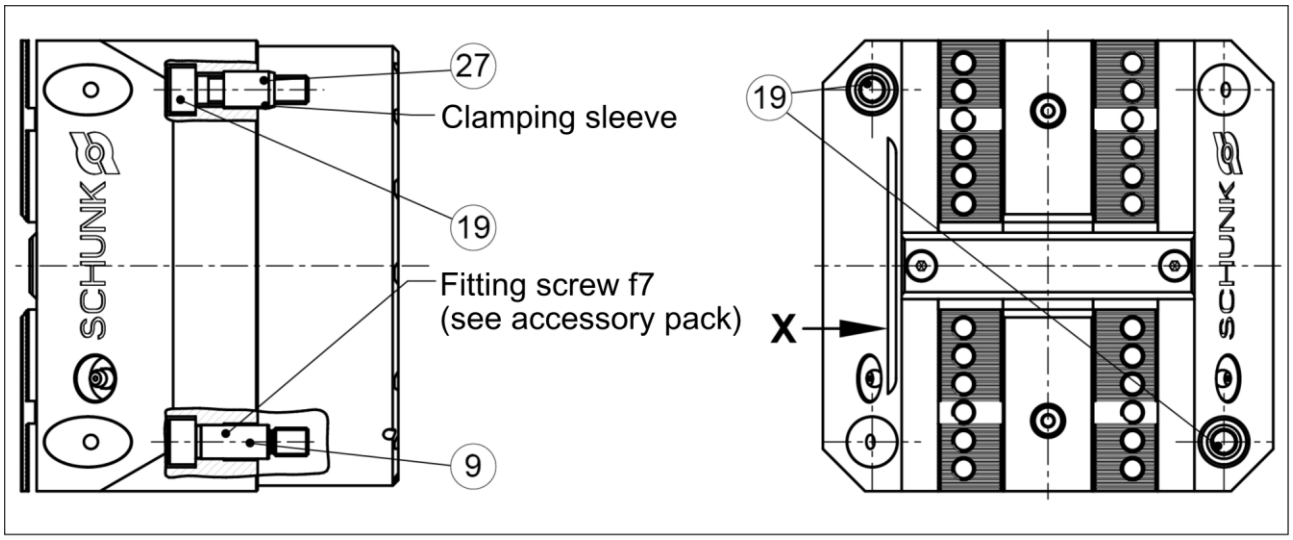
The numbers shown for individual components refer to the assembly illustrations or clamping block connections and to the "Drawings" chapter. (☞ 11, Page 43)

Make sure the power supply for the clamping block is off during assembly and connection. See chapter "Basic Safety Notes". (☞ 2, Page 5)

7.1 Assembly of the clamping block on the machine table

- The clamping block must be partly built into the table top. The cover (item 5) is built into the table top via a mounting- or through-hole. To mount the clamping block with the flat bottom surface of the housing (item 1) to the machine table, the cover must be built into a cylindrical mounting- or through-hole in the table top. The cylindrical mounting hole should be drilled + 0.2 to + 0.4 mm wider than the Ø U of the clamping block (see "Technical Data" (☞ 5, Page 12) and fig. "Connections of the clamping block" (☞ 7.2, Page 17)). The clamping block is not positioned over the cover.
- If installed vertically, the opening of the coolant drain (item 13) must always face downwards

- Surface **"X"** is parallel to the guideway of the base jaws (item 2) so that the clamping block can be aligned on the machine table.

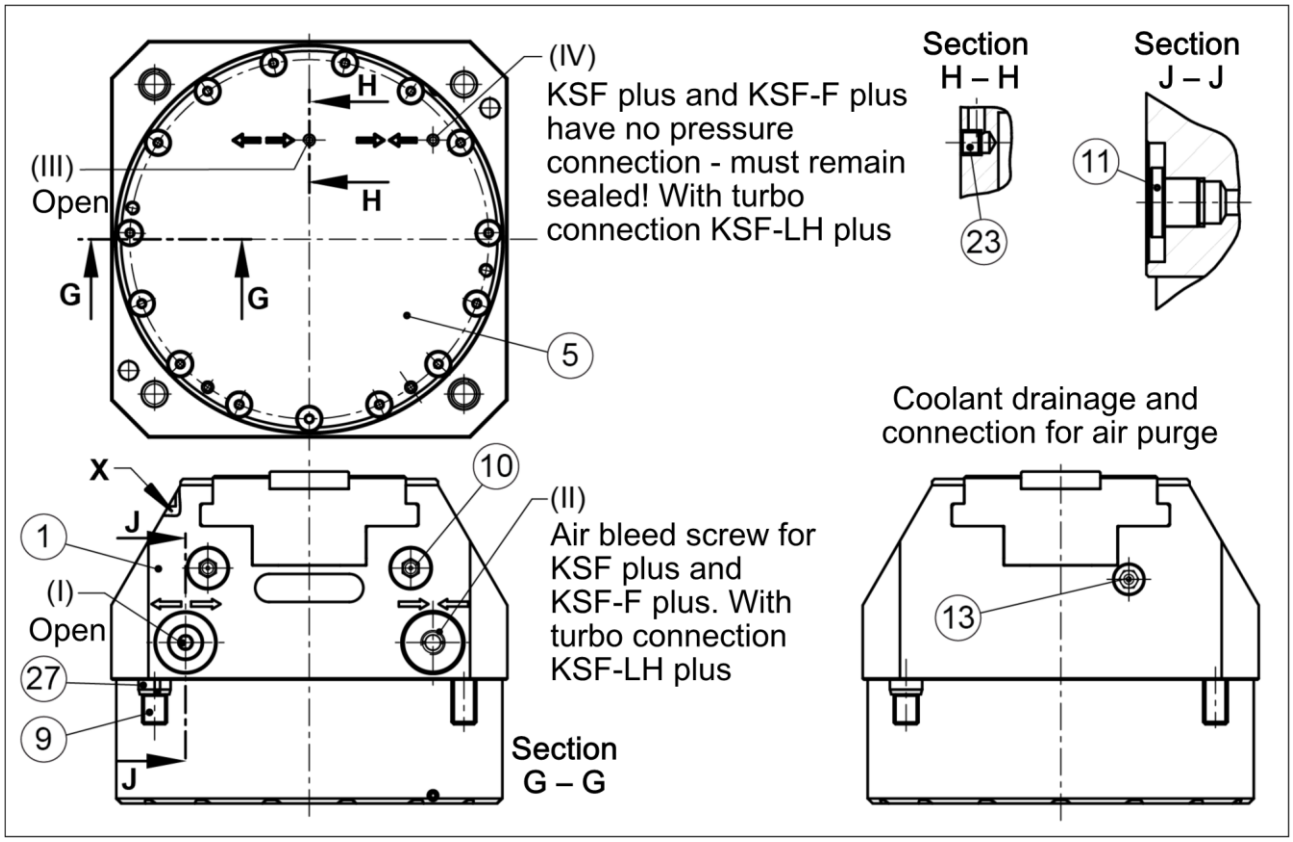


Assembling the clamping block

Assembly with clamping sleeves:
the clamping block is mounted on the machine table together with clamping sleeves (item 27) and screws (item 19).

Assembly with fitting screws:
There are two fittings in the housing (item 1) that, along with the optional fitting screws (item 9), are used to center the clamping block on the machine table with repeat accuracy. Do not realign the clamping block after removing it from the machine table (e.g., after replacing the seals). When using fitting screws (item 9), use them instead of the clamping sleeves (item 27) and the two corresponding screws (item 19).

7.2 Connections of the clamping block



Connections of the clamping block

KSF plus and KSF-F plus:

The clamping block has two air connections: »**I**« and »**III**«

- Open against spring assembly, no turbo function.

The clamping block is closed mechanically via the integrated spring assembly. A sound absorber for ventilation is built into the front instead of connection "II". **Connection "IV" has no function and must remain closed.**

KSF-LH:

The clamping force can be raised by the additional turbo function at connections "**II**" and "**IV**".
The clamping block has four air connections: "**I, II, III, IV**".

- Open against spring assembly, optionally at connection "**I**" or "**III**". Ventilation is performed via the return flow of the air supply, optionally at connection "**II**" or "**IV**".

The clamping block is closed mechanically via the integrated spring assembly and additional pressure support from the turbo connection.

Connection of the KSF plus and KSF-F plus versions:

The clamping block has two air connections for OPEN: "**I**" and "**III**" (opening against spring assembly, no turbo function) and an air bleed screw (sound absorber). The application determines which of the two air connections (at the front or at the base) must be opened for actuation:

- Connection "**I**" for operations with external hose line.
- Connection "**III**" for air supply to the base side in the machine table.

Connection of the KSF-LH version:

The clamping block has four air connections: "**I, II, III, IV**". Which of the two air connections (at the front or at the base) must be opened for actuation depends on the application:

- Connections "**I**" and "**II**" for operations with external hose line.
- Connections "**III**" and "**IV**" for air supply to the base side in the machine table.

NOTE:
A pneumatic plug-in connection with an M5 connecting thread for actuating the clamping block can be built in at the thread of the base side OPEN air supply in the cover (item 5). The hose line must have a nominal width of min. 6 mm. In KSF-LH, both connections can be fitted with a pneumatic plug-in connection.

Thread for pneumatic fitting (at the front on housing item 1):

- KSF plus, KSF-F plus, KSF-LH plus 100: M5
- KSF plus, KSF-F plus, KSF-LH plus 140, 160, 250: G1/8"

Thread for pneumatic fitting (at the base in cover item 5):

- All sizes of KSF plus, KSF-F plus and KSF-LH plus: M5

The clamping block is delivered with all four air connections sealed. On base side with set-screws (item 23) and on front with locking screws (item 11).

The compressed air used to operate the clamping block must be dry, filtered and oiled.

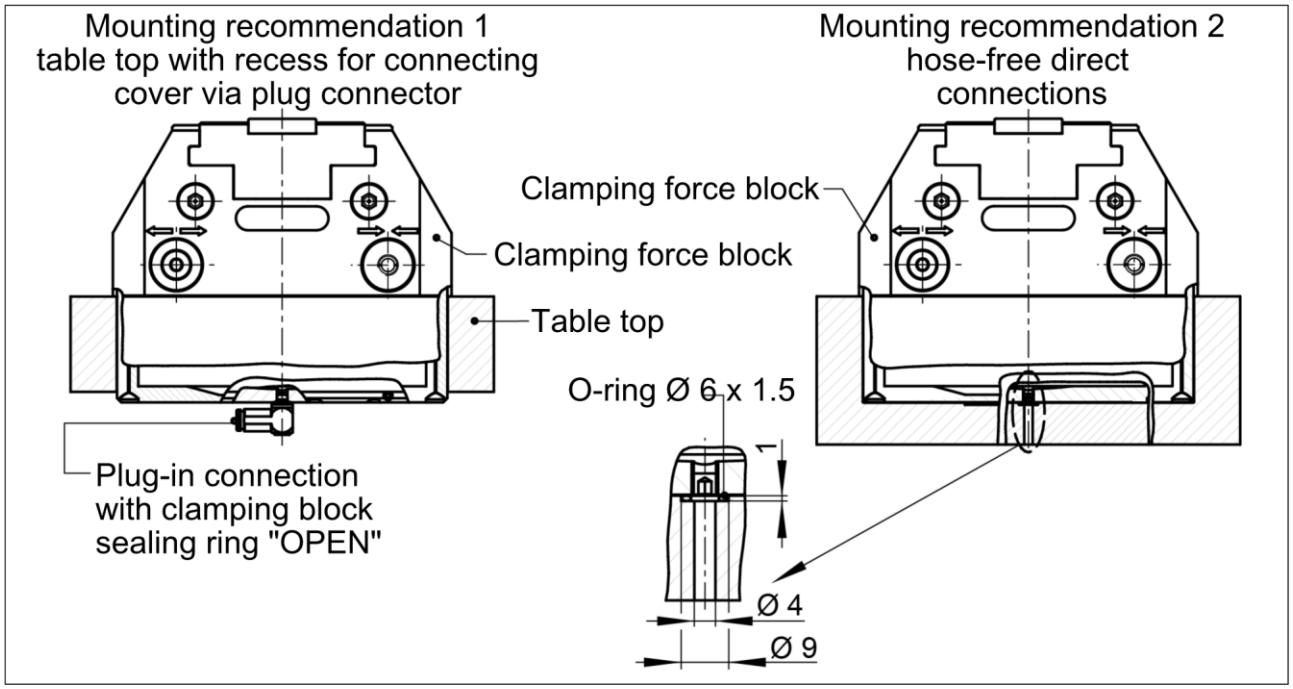
Unconditioned compressed air contains dust and oil particles and moisture, all of which can lead to malfunctions or premature wear in the clamping block. The oiler should be no more than 2 meters from the coupling point.

	***NOTICE*** **Always make sure that the connections are tight and use a suitable metal hose to protect the pneumatic hoses against hot chips, falling parts or other damage.**

	**⚠ WARNING** **Risk of injury due to immediate closing of the clamping block with a high spring pressure in case of failure of the pneumatic pressure.** • Do not reach between the chuck jaws when manually loading and unloading. • Remove the power supplies of the clamping block for maintenance work.

7.3 Mounting recommendations

The clamping block must be partly (1) or completely (2) built into the table top.



Mounting recommendations

7.3.1 Installation recommendation for partial integration:

- The cover (part 5) is built into the table top via a mounting- or through-hole.
- Compressed air is supplied to the base-side air connection »**III**« on the clamping block by a hose line with a pneumatic plug-in connection that is built into the opening in the cover (item 5) below the table top.
- Do not open the frontal connection »**I**« of the clamping block, or seal it airtight with a suitable dummy plug (M5 or G1/8").
- Before mounting the clamping block on the table top, unscrew the Torx setscrew (item 23) at the base-side air connection »**III**« in the cover (item 5) and replace it with the screw-in union with the M5 connection thread.

NOTE:

- Screw the clamping block onto the machine table or the device. Observe the screw tightening torques in doing so (☞ 6, Page 15).
- For the different ways to mount the clamping block, see the chapter on "Mounting the clamping block on the machine table" (☞ 7.1, Page 15).
- Before commissioning the clamping block, ensure that the frontal pneumatic connection »**I**« is properly sealed.
- The assembly parts (screws, clamping sleeves) are included in the accessory pack. The recommended plug-in connections are not delivered with the clamping block.

7.3.2 Installation recommendation for complete installation:

- The cover (item 5) is built into the table top via a mounting hole.
- Compressed air is supplied to the air connection »**III**« at the base of the clamping block by a hose-free direct connection in the machine table. The base-side opening is sealed with an O-ring for this purpose.
- The cylindrical mounting hole should be drilled + 0.1 to + 0.4 mm wider than the Ø »U« of the clamping block.
- Exact compliance with the specified mounting depth of the cover (item 5) is essential. The mounting depth is determined by the dimension »T« and must be finished to a tolerance of + 0.1 to + 0.3 mm (see "Technical data" (☞ 5, Page 12)).

- Do not open the frontal connection »**I**« of the clamping block or seal it airtight with a locking screw (M5 or G1/8").
- The pneumatic pressure supply to connection »**III**« is sealed by an O-ring, which is laid into the O-ring seat in the flat surface of the mounting hole. The mounting dimensions for the axially sealing O-ring seat must be machined to appropriate specifications for mounting recommendation 2, namely Ø $9^{+0.1}$ x $1.1^{+0.05}$.
- Before mounting the clamping block on the table top, the Torx set-screw (item 23) must be removed from the base-side air connection »**III**« in the cover (item 5) of the clamping block.

NOTE:

- When joining the clamping block and the table top, ensure that the feed-through of the compressed air supply line for the clamping block and the table top is precisely aligned and the O-ring for sealing has been inserted.
- Screw the clamping block to the machine table in compliance with the screw tightening torques (☞ 6, Page 15).
- The assembly parts (screws, clamping sleeves, O-rings) are included in the accessory pack.
- For the different mounting variations of the clamping block, see the chapter on "Mounting the clamping block on the machine table" (☞ 7.1, Page 15).
- Before commissioning the clamping block, make sure that the frontal hydraulic connections are properly sealed.

8 Trouble shooting

The chuck jaws of the clamping block do not move

Possible cause	Remedial measures
Air supply is interrupted or pressure is insufficient.	Check air supply
Connections unintentionally interchanged	Check the connections. (☞ 7.2, Page 17)
Air connections that are not required are not sealed	Check connections and close
Active air connections sealed	Check and open connections
Screw breakage on the chuck piston or piston rod breakage (e.g. due to overload)	Disassemble clamping block and replace damaged parts (☞ 9.1, Page 23) or send to Schunk for repair

Clamping block does not complete stroke

Possible cause	Remedial measures
Chips or dirt between covering strip and base jaws	Unscrew the covering strip (item 7) and remove chips and dirt

Clamping force weakens

Possible cause	Remedial measures
Clamping block not sealed tightly	Check connection or sealing screws; reseal or replace
Seals damaged	Disassemble clamping block (☞ 9.1, Page 23) and replace all the seals (see sealing kit lists (☞ 10.1, Page 28))
Inadequate lubrication	Grease the lubrication nipples with LINOMAX 200 (see chapter "Maintenance and Care" (☞ 9, Page 23))

Clamping block moves jerkily

Possible cause	Remedial measures
Steel guide rollers on sliding surfaces not greased	See chapter "Maintenance and Care" (☞ 9, Page 23)

9 Maintenance and care

To ensure fault-free operation of the clamping block, the following instructions must be observed:

- Make sure the bore hole for coolant drainage remains unblocked!
- Depending on the load, but at least once a month or after every 10,000 clampings, grease the guides on the two frontal or the two lateral lubricatiion nipples with LINOMAX 200 or an equivalent lubricant. The chuck jaws must be in the open position during lubrication.
- Disassemble the base jaw and chuck piston at least once every three months (or more often, if necessary). Clean the housing, base jaw and chuck piston and lubricate all the guides (housing, base jaw, chuck piston) with LINOMAX 200 or an equivalent lubricant. Reassemble everything and relubricate the two frontal or the two lateral lubricating nipples with LINOMAX 200 or an equivalent lubricant.

(Product information about LINOMAX can be requested from SCHUNK).

⚠ CAUTION

Skin contact with lubricating grease can cause allergic reactions!
Wear protective gloves.

9.1 Disassembly and assembly of the clamping block

The item numbers specified for the corresponding individual components relate to chapter drawings.(☞ 11, Page 43)

⚠ WARNING

Danger of injury during disassembly of clamping block because of the high spring pressure in the cover.

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

NOTE:
The base jaws (items 2, 31), the chuck piston (item 3) and the housing (item 1) are specially attuned to each other. To replace these parts, ship the entire clamping block to SCHUNK along with a repair order.

When replacing wearing parts (e.g. seals), adhere to the following order:

1 Pressurize the clamping block at 6 bar until the jaws are in the OPEN position.

2 Remove the covering strip (item 7) and the guide strips (item 6).

3 Remove the cylindrical screw (item 14) from the chuck piston.

4 Close the clamping block so that the jaws are in the CLOSED position.

5 **Remove the pressure line. There must be no more residual energy in the clamping block.**

6 Pull the plugs (item 8) out of the housing (item 1).

7 Loosen the screws (items 9, 19) and remove the clamping block from the machine table. Residual air may escape at this point.

8 To remove the chuck piston (item 3) of KSF plus 100, screw an M10 x > 25 screw into the center bore and, in the case of KSF plus 160 and 250, screw in a M12 x > 25 screw.
Additionally in the KSF-F plus version
   – Remove the screw (item 32) between base jaw (item 31) and housing (item 1).
   – Remove the positioning bolt (item 29) between base jaw (item 31) and housing (item 1). To do this, screw an M5 screw into the thread of the positioning bolt (item 29).
   – Pull the base jaw (item 31) out of the housing (item 1).

9 Pull the base jaws (item 2) out of the housing (item 1).

10 **Carefully clamp the clamping block into a suitable disassembly device between the housing (item 1) and the cover (item 5). The cover is under high spring tension!**
Loosen the screws (item 21) evenly and remove them. Slowly lift the cover and unclamp the spring assembly.

11 Pull the cylinder piston (item 4) out of the housing (item 1).

12 Remove the entire spring assembly (item 50) as well as the sleeve (item 42) from the housing (item 1). In model sizes 160 and 250, the sleeve (item 42) is glued in and can only be

removed after being heated by a hot-air blower. The sleeve should therefore remain built into the base body.

13 Remove the seals (items 20, 22).

14 Remove the seals (items 12, 15, 17).

15 Clean all the parts thoroughly and check for damage and wear. Damaged and worn parts must be replaced.

16 Lubricate the new seals (items 12, 15, 17, 20, 22) with Renolit HLT 2 or equivalent grease.

17 Mount the new seals carefully. The seals must not be damaged in the process.

18 Place the O-Rings (items 20 and 22) in the housing (item 1) and lay the O-ring (item 17) around the cover (item 5).

19 Grease the sliding surfaces of the cylinder and piston with Renolit HLT 2 or equivalent grease.

20 **For model size 100**: insert the sleeve (item 42) with the collar in front into the housing.
For model sizes 140, 160 and 250: place the sleeve (item 42) with the conical taper facing forward into the housing and screw it to the body (item 1) by fastening the screws (item 43).

21 Grease the springs of the disassembled spring assembly with Renolit HLT 2 or an equivalent grease. Assemble the spring assembly; the spring coils have an alternating clockwise and counter-clockwise thread.

22 Loosely insert the cylinder piston (item 4) into the cylinder, ensuring that the spring assembly is positioned centrally and not displaced. Lay the end coils of the innermost springs into the recess in the cylinder piston.

23 Gently press the quad ring (item 12) inwards from all sides so that it slides more easily over the edge of the cover (item 5).

24 Carefully push the cover (item 5) over the cylinder piston (item 4) as well as the sleeve, making sure that the openings of the air feed-throughs lie vertically opposite each other.

25 Carefully clamp the clamping block into a suitable assembly device between the housing (item 1) and the cover (item 5). Work carefully while assembling the parts and make sure that the cover is not twisted in the housing.

26 Insert the screws (item 21) and screw the cover (item 21) onto the housing (item 1). Observe the screw-tightening torques (☞ 6, Page 15).
Alternatively, the cover can also be assembled with mounting screws in graduated lengths by tightening them in cross-wise

diagonal sequence. It is absolutely necessary to install the original fastening screws (item 21) afterwards.

27 If using clamping sleeves (item 27) for centering, insert these into the housing (item 1) now.

28 Grease the sliding surfaces of the housing (item 1), base jaws (item 2) and chuck piston (item 3) with LINOMAX 200 or an equivalent lubricant.

29 Assemble the base jaws (item 2) and the chuck piston (item 3). Be sure to observe the installation position for the base jaws and the chuck piston.
Additionally for the KSP-F plus variant:
- Mount the base jaw (item 31) into the housing (item 1).
- Mount the positioning bolt (item 29) between base jaw (item 31) and housing (item 1).
- Screw in the screw (item 32) between the base jaw (item 31) and the housing (item 1).

30 Connect the clamping block to the air supply and set the jaws in the OPEN position.

31 Screw down the chuck piston (item 3) and cylinder piston (item 4). Tighten the screw (item 14) with a torque wrench (☞ 6, Page 15).

32 Fasten the guide strips (item 6) and the covering strip (item 7).

33 Check for leaks.

9.2 Control of thightness

- The following components are required to check for leaks: pressure gauge, pneumatic fitting, supply line and quick coupler.
- Check for leaks with the clamping block in the CLOSED position.

Proceed as follows:

1 Connect the following sequence of parts to the connection in the OPEN (I) position: pressure gauge, pneumatic fitting, supply line with fast coupler.

2 Apply compressed air to the clamping block.

3 Close the shut-off valve and remove the supply line.

If the clamping system is leaking, check the screws first (e.g. with Metaflux leak detection spray). Seal any leaking screws.
If the screw fastenings are tight, check the seals and replace if necessary. (☞ 9.1, Page 23).

10 Sealing kits, accessory packs and parts lists

When ordering spare parts, the type
, size and, if possible, the serial number of the
clamping block must always be stated to avoid delivery mistakes.
Seals, sealing elements, screw connections, springs, bearings, screws, wiper bars and parts that come into contact with the workpiece are not covered by the warranty.

10.1 Seal kit lists

KSF plus 100, KSF-LH plus 100, KSF-F plus 100 (ID: 9985763)

Item	Designation	Quantity
12	Quad ring	1
15	Combined sealing element	1
17	O-ring	1
20	O-ring	13
22	O-ring	2
54	O-ring	4

KSF plus 140, KSF-LH plus 140, KSF-F plus 140 (ID: 1352795)

Item	Designation	Quantity
12	Quad ring	1
15	Combined sealing element	1
17	O-ring	1
20	O-ring	19
54	O-ring	4

KSFplus 160, KSF-LH plus 160, KSF-F plus 160 (ID: 9985764)

Item	Designation	Quantity
12	Quad ring	1
15	Combined sealing element	1
17	O-ring	1
20	O-ring	15
22	O-ring	2
45	O-ring	2
54	O-ring	4

KSFplus 250, KSF-LH plus 250, KSF-F plus 250 (ID: 1370978)

Item	Designation	Quantity
12	Quad ring	1
15	Combined sealing element	1
17	O-ring	1
20	O-ring	19
22	O-ring	2
45	O-ring	2
54	O-ring	4

Wear parts - replacement recommended during maintenance

The sealing kit can only be ordered as a compete kit.

10.2 Accessory packs

KSF plus 100, KSF-LH plus 100, KSF-F plus 100 (ID: 8508184)

Item	Designation	Quantity
8	Plug	4
9	Fitting screw	2
18	O-ring	4
19	Screw	4
27	Clamping sleeve	2
51	Screw	8
54	O-ring	4

KSF plus 140, KSF-LH plus 140, KSF-F plus 140(ID: 1344305)

Item	Designation	Quantity
8	Plug	4
9	Fitting screw	2
18	O-ring	4
19	Screw	4
27	Clamping sleeve	2
51	Screw	8
54	O-ring	4

KSF plus 160, KSF-LH plus 160, KSF-F plus 160 (ID: 8508185)

Item	Designation	Quantity
8	Plug	4
9	Fitting screw	2
18	O-ring	4
19	Screw	4
27	Clamping sleeve	2
51	Screw	8
54	O-ring	4

KSF plus 250, KSF-LH plus 250, KSF-F plus 250 (ID: 8508534)

Item	Designation	Quantity
8	Plug	4
9	Fitting screw	2
18	O-ring	4
19	Screw	4
27	Clamping sleeve	2
51	Screw	8
52	T-handle	2
53	Set-screw	2
54	O-ring	4

10.3 Lists of spare parts

KSF plus 100 (ID: 0405260)

Item	Designation	Quantity
1*	Body	1
2*	Base jaws	2
3*	Chuck piston	1
4	Cylinder piston	1
5	Cover	1
6	Guide strip	2
7	Covering strip	1
8***	Plug	4
9***	Fitting screw	2
10	Funnel lubrication nipple	4

11	Locking screw	1
12**	Quad ring	1
13	Sound absorber	1
14	Screw	1
15**	Combined sealing ring	1
16	Screw	2
17**	O-ring	1
18***	O-ring	4
19***	Screw	4
20**	O-ring	13
21	Countersunk screw	11
22**	O-ring	2
23	Set-screw	2
24	Set-screw	2
25	Countersunk screw	2
27***	Clamping sleeve	2
33	Sound absorber	1
42	Sleeve	1
50	Compression spring	1
51***	Screw	8
54***	O-ring	4

KSF-LH plus 100 (ID: 0405280)

Item	Designation	Quantity
1*	Body	1
2*	Base jaws	2
3*	Chuck piston	1
4	Cylinder piston	1
5	Cover	1
6	Guide strip	2
7	Covering strip	1
8***	Plug	4
9***	Fitting screw	2
10	Funnel lubrication nipple	4
11	Locking screw	2
12**	Quad ring	1

13	Sound absorber	1
14	Screw	1
15**	Combined sealing ring	1
16	Screw	2
17**	O-ring	1
18***	O-ring	4
19***	Screw	4
20**	O-ring	13
21	Countersunk screw	11
22**	O-ring	2
23	Set-screw	2
24	Set-screw	2
25	Countersunk screw	2
27***	Clamping sleeve	2
42	Sleeve	1
50	Compression spring	1
51***	Screw	8
54***	O-ring	4

KSF-F plus 100 (ID: 0405270)

Item	Designation	Quantity
1*	Body	1
2*	Base jaw	2
3*	Chuck piston	1
4	Cylinder piston	1
5	Cover	1
6	Guide strip	2
7	Covering strip	1
8***	Plug	4
9***	Fitting screw	2
10	Funnel lubrication nipple	4
11	Locking screw	1
12**	Quad ring	1
13	Sound absorber	1
14	Screw	1
15**	Combined sealing ring	1

16	Screw	1
17**	O-ring	1
18***	O-ring	4
19***	Screw	4
20**	O-ring	13
21	Countersunk screw	11
22**	O-ring	2
23	Set-screw	2
24	Set-screw	2
25	Countersunk screw	2
27***	Clamping sleeve	2
28	Spherical washer	1
29	Socket pin	1
30	Screw	1
31*	Base jaw	1
32	Screw	1
33	Sound absorber	1
42	Sleeve	1
50	Compression spring	1
51***	Screw	8
54***	O-ring	4

KSF plus 140 (ID: 1330220)

Item	Designation	Quantity
1*	Body	1
2*	Base jaw	2
3*	Chuck piston	1
4	Cylinder piston	1
5	Cover	1
6	Guide strip	2
7	Covering strip	1
8***	Plug	4
9***	Fitting screw	2
10	Funnel lubrication nipple	4
11	Locking screw	1
12**	Quad ring	1

13	Sound absorber	1
14	Screw	1
15**	Combined sealing ring	1
16	Screw	2
17**	O-ring	1
18***	O-ring	4
19***	Screw	4
20**	O-ring	4
21	Countersunk screw	15
23	Set-screw	4
25	Countersunk screw	2
27***	Clamping sleeve	2
33	Sound absorber	1
42	Sleeve	1
50	Compression spring	1
51***	Screw	8
54***	O-ring	4

KSF-LH plus 140 (ID: 1330222)

Item	Designation	Quantity
1*	Body	1
2*	Base jaws	2
3*	Chuck piston	1
4	Cylinder piston	1
5	Cover	1
6	Guide strip	2
7	Covering strip	1
8***	Plug	4
9***	Fitting screw	2
10	Funnel lubrication nipple	4
11	Locking screw	2
12**	Quad ring	1
13	Sound absorber	1
14	Screw	1
15**	Combined sealing ring	1
16	Screw	2

17**	O-ring	1
18***	O-ring	4
19***	Screw	4
20**	O-ring	19
21	Countersunk screw	15
23	Set-screw	2
25	Countersunk screw	2
27***	Clamping sleeve	2
42	Sleeve	1
50	Compression spring	1
51***	Screw	8
54***	O-ring	4

KSF-F plus 140 (ID: 1330224)

Item	Designation	Quantity
1*	Body	1
2*	Base jaws	2
3*	Chuck piston	1
4	Cylinder piston	1
5	Cover	1
6	Guide strip	1
7	Covering strip	1
8***	Plug	4
9***	Fitting screw	2
10	Funnel lubrication nipple	4
11	Locking screw	1
12**	Quad ring	1
13	Sound absorber	1
14	Screw	1
15**	Combined sealing ring	1
16	Screw	1
17**	O-ring	1
18***	O-ring	4
19***	Screw	4
20**	O-ring	4
21	Countersunk screw	15

23	Set-screw	2
25	Countersunk screw	2
27***	Clamping sleeve	2
28	Spherical washer	1
29	Socket pin	1
30	Screw	1
31*	Base jaws	1
32	Screw	1
33	Sound absorber	1
42	Sleeve	1
50	Compression spring	1
51***	Screw	8
54***	O-ring	4
55	Guide strip	1

KSF plus 160 (ID: 0405360)

Item	Designation	Quantity
1*	Body	1
2*	Base jaws	2
3*	Chuck piston	1
4	Cylinder piston	1
5	Cover	1
6	Guide strip	2
7	Covering strip	1
8***	Plug	4
9***	Fitting screw	2
10	Funnel lubrication nipple	4
11	Locking screw	1
12**	Quad ring	1
13	Sound absorber	1
14	Screw	1
15**	Combined sealing ring	1
16	Screw	2
17**	O-ring	1
18***	O-ring	4
19***	Screw	4

20**	O-ring	15
21	Countersunk screw	15
22**	O-ring	2
23	Set-screw	4
25	Countersunk screw	2
26	Set-screw	1
27***	Clamping sleeve	2
33	Sound absorber	1
42	Sleeve	1
43	Screw	3
45	O-ring	2
50	Compression spring	1
51***	Screw	8
54***	O-ring	4

KSF-LH plus 160 (ID: 0405380)

Item	Designation	Quantity
1*	Body	1
2*	Base jaws	2
3*	Chuck piston	1
4	Cylinder piston	1
5	Cover	1
6	Guide strip	2
7	Covering strip	1
8***	Plug	4
9***	Fitting screw	2
10	Funnel lubrication nipple	4
11	Locking screw, G1/8	2
12**	Quad ring	1
13	Sound absorber	1
14	Screw	1
15**	Combined sealing ring	1
16	Screw	2
17**	O-ring	1
18***	O-ring	4
19***	Screw	4

20**	O-ring	15
21	Countersunk screw	15
22**	O-ring	2
23	Set-screw	4
25	Countersunk screw	2
26	Set-screw	1
27***	Clamping sleeve	2
42	Sleeve	1
43	Screw	3
45	O-ring	2
50	Compression spring	1
51***	Screw	8
54***	O-ring	4

KSF-F plus 160 (ID: 0405370)

Item	Designation	Quantity
1*	Body	1
2*	Base jaws	2
3*	Chuck piston	1
4	Cylinder piston	1
5	Cover	1
6	Guide strip	2
7	Covering strip	1
8***	Plug	4
9***	Fitting screw	2
10	Funnel lubrication nipple	4
11	Locking screw	1
12**	Quad ring	1
13	Sound absorber	1
14	Screw	1
15**	Combined sealing ring	1
16	Screw	1
17**	O-ring	1
18***	O-ring	4
19***	Screw	4
20**	O-ring	17

21	Countersunk screw	15
22**	O-ring	2
23	Set-screw	4
25	Countersunk screw	2
26	Set-screw	1
27***	Clamping sleeve	2
28	Spherical washer	1
29	Socket pin	1
30	Screw	1
31*	Base jaws	1
32	Screw	1
33	Sound absorber	1
42	Sleeve	1
43	Screw	3
45	O-ring	2
50	Compression spring	1
51***	Screw	8
54***	O-ring	4

KSF plus 250 (ID: 0405560)

Item	Designation	Quantity
1*	Body	1
2*	Base jaws	2
3*	Chuck piston	1
4	Cylinder piston	1
5	Cover	1
6	Guide strip	2
7	Covering strip	1
8***	Plug	4
9***	Fitting screw	2
10	Conical lubrication nipple	4
11	Locking screw	1
12**	Quad ring	1
13	Sound absorber	1
14	Screw	1
15**	Combined sealing ring	1

16	Screw	2
17**	O-ring	1
18***	O-ring	4
19***	Screw	4
20**	O-ring	19
21	Countersunk screw	19
22**	O-ring	2
23	Set-screw	2
24	Set-screw	2
25	Countersunk screw	2
26	Set-screw	1
27***	Clamping sleeve	2
33	Sound absorber	1
42	Sleeve	1
43	Screw	3
45**	O-ring	2
50	Compression spring	1
51***	Screw	8
52***	T-handle	2
53***	Set-screw	2
54***	O-ring	4

KSF-LH plus 250 (ID: 0405580)

Item	Designation	Quantity
1*	Body	1
2*	Base jaws	2
3*	Chuck piston	1
4	Cylinder piston	1
5	Cover	1
6	Guide strip	2
7	Covering strip	1
8***	Plug	4
9***	Fitting screw	2
10	Conical lubrication nipple	4
11	Locking screw	1
12**	Quad ring	1

13	Sound absorber	1
14	Screw	1
15**	Combined sealing ring	1
16	Screw	2
17**	O-ring	1
18***	O-ring	4
19***	Screw	4
20**	O-ring	19
21	Countersunk screw	19
22**	O-ring	2
23	Set-screw	2
24	Set-screw	2
25	Countersunk screw	2
26	Set-screw	1
27***	Clamping sleeve	2
42	Sleeve	1
43	Screw	3
45**	O-ring	2
50	Compression spring	1
51***	Screw	8
52***	T-handle	2
53***	Set-screw	2
54***	O-ring	4

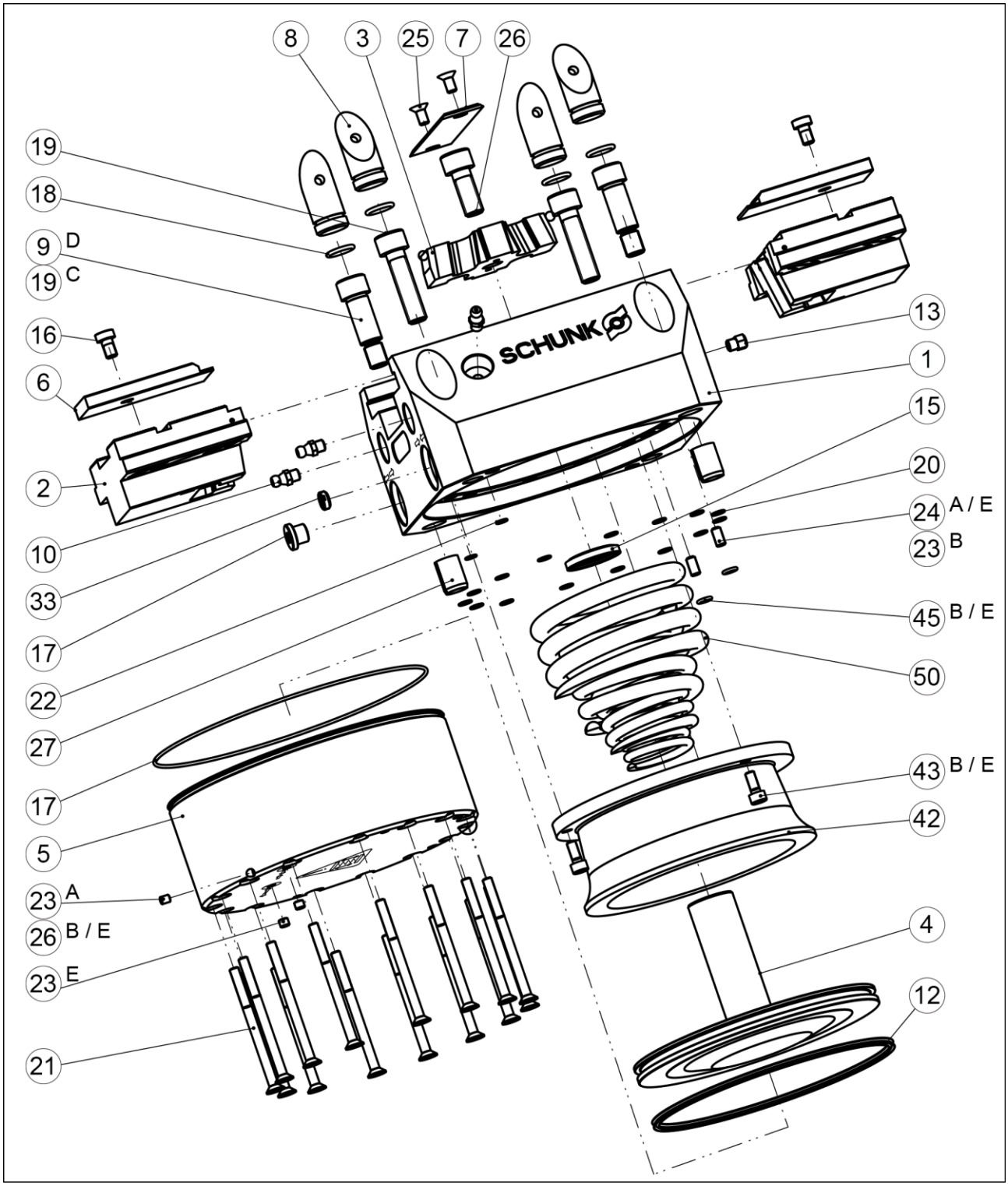
KSF-F plus 250 (ID: 0405570)

Item	Designation	Quantity
1*	Body	1
2*	Base jaws	2
3*	Chuck piston	1
4	Cylinder piston	1
5	Cover	1
6	Guide strip	2
7	Covering strip	1
8***	Plug	4
9***	Fitting screw	2
10	Conical lubrication nipple	4

11	Locking screw	1
12**	Quad ring	1
13	Sound absorber	1
14	Screw	1
15**	Combined sealing ring	1
16	Screw	1
17**	O-ring	1
18***	O-ring	4
19***	Screw	4
20**	O-ring	19
21	Countersunk screw	19
22**	O-ring	2
23	Set-screw	2
24	Set-screw	2
25	Countersunk screw	2
26	Set-screw	1
27***	Clamping sleeve	2
28	Spherical washer	1
29	Socket pin	1
30	Screw	1
31*	Base jaw	1
32	Screw	1
33	Sound absorber	1
42	Sleeve	1
43	Screw	3
45**	O-ring	2
50	Compression spring	1
51***	Screw	8
52***	T-handle	2
53***	Set-screw	2
54***	O-ring	4

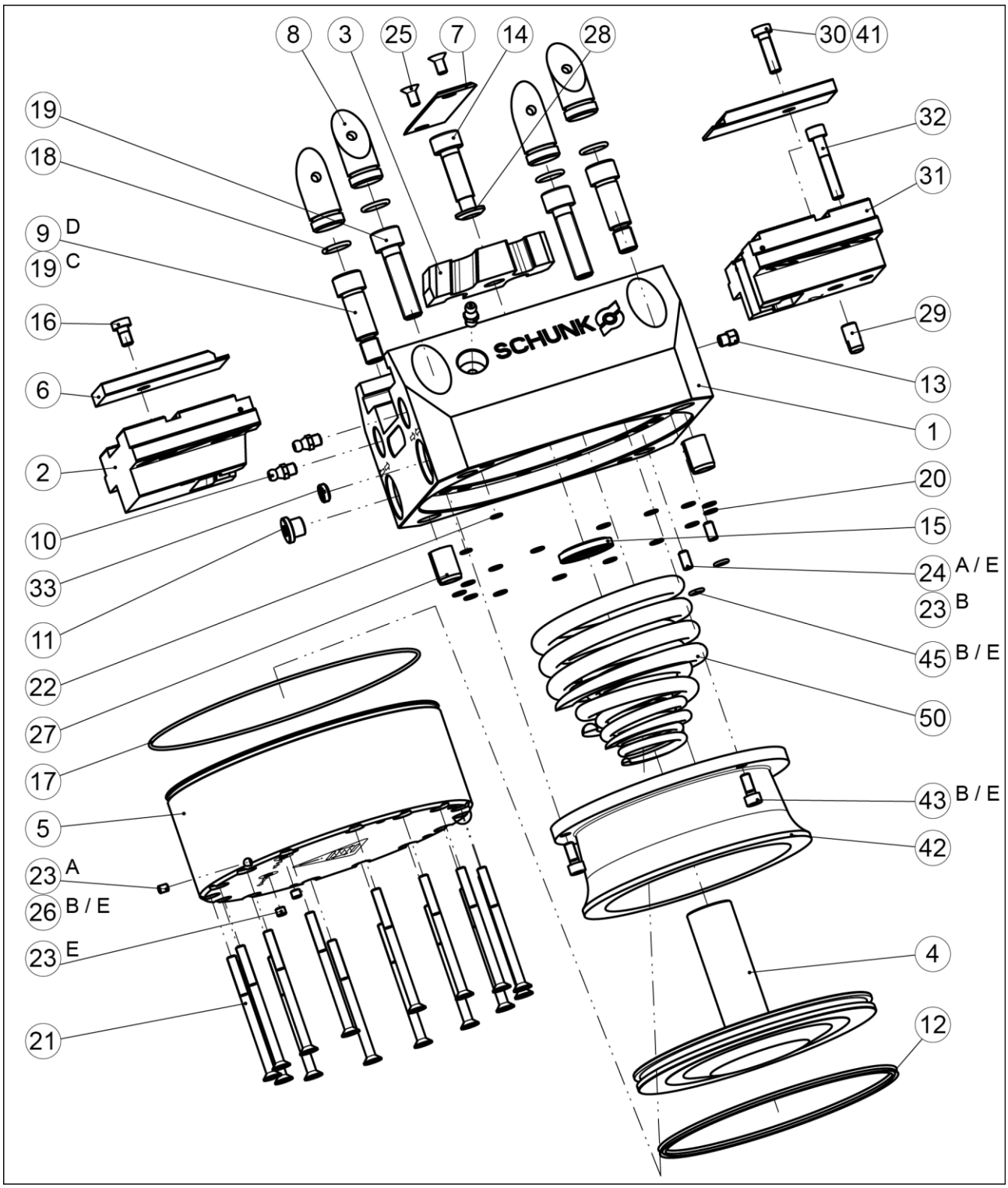
* Individual components are matched to each other and cannot be exchanged by the customer.
** See sealing kit list - parts cannot be ordered individually
*** Wearing parts included in accessory pack,
part exchange recommended during maintenance

11 Drawings



KSF plus, KSF-LH plus

A	For size 100	B	For sizes 140/160
C	Centering with clamping sleeves	D	Centering with fitting screws
E	For size 250		



KSF-F plus

A	For size 100	B	For sizes 140/160
C	Centering with clamping sleeves	D	Centering with fitting screws
E	For size 250		

12 Translation of original declaration of incorporation

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

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

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

Product designation:	TANDEM clamping block, spring-tensioned
Type designation	KSF plus 100; KSF-Z plus 100; KSF plus 140; KSF-Z plus 140; KSF plus 160; KSF-Z plus 160; KSF plus 250; KSF-Z plus 250; KSF-LH plus 100; KSF-LH-Z plus 100; KSF-LH plus 140; KSF-LH-Z plus 140; KSF-LH plus 160; KSF-LH-Z plus 160; KSF-LH plus 250; KSF-LH-Z plus 250; KSF-F plus 100; KSF-F-Z plus 100; KSF-F plus 140; KSF-F-Z plus 140; KSF-F plus 160; KSF-F-Z plus 160; KSFP-F plus 250; KSF-F-Z plus 250
ID number	0405260; 0405262; 1330220; 1330221; 0405360; 0405362; 0405560; 0405562; 0405280; 0405282; 1330222; 1330223; 0405380; 0405382; 0405580; 0405582; 0405270; 0405272; 1330224; 1330225; 0405370; 0405372; 0405570; 0405572

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

Applied harmonized standards, especially:

EN ISO 12100:2011-03	Safety of machinery - General principles for design - Risk assessment and risk reduction
DIN EN ISO 4414:2010	Pneumatic fluid power - General rules and safety requirements for systems and their components

Other related technical standards and specifications:

VDI 3035:2008-05	Design of machine tools, production lines and peripheral equipment for the use of metalworking fluids

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

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

Person authorized to compile the technical documentation:
Philipp Schräder, Address: see manufacturer's address

Signature: see original declaration

Mengen, January 2016 p.p. Philipp Schräder; Head of Engineering Design

13 Appendix on Declaration of Incorporation, as per 2006/42/EC, annex II, No. 1 B

1. Description of the basic safety and health protection requirements, as per 2006/42/EC, Annex I, that apply to and are fulfilled for the scope of the partly completed machinery:

Product designation	$Company name$
Type designation	KSF plus 100; KSF-Z plus 100; KSF plus 140; KSF-Z plus 140; KSF plus 160; KSF-Z plus 160; KSF plus 250; KSF-Z plus 250; KSF-LH plus 100; KSF-LH-Z plus 100; KSF-LH plus 140; KSF-LH-Z plus 140; KSF-LH plus 160; KSF-LH-Z plus 160; KSF-LH plus 250; KSF-LH-Z plus 250; KSF-F plus 100; KSF-F-Z plus 100; KSF-F plus 140; KSF-F-Z plus 140; KSF-F plus 160; KSF-F-Z plus 160; KSFP-F plus 250; KSF-F-Z plus 250
ID number	0405260; 0505262; 1330220; 1330221; 0405360; 0405362; 0405560;0405562; 0405280; 0405282; 1330222; 1330223; 0405380;0405382; 0405580; 0405582; 0405270; 0405272; 1330224; 1330225; 0405370; 0405372; 0405570; 0405572

		To be provided by the System Integrator for the overall machine ⇓	Fulfilled for the scope of the partly completed machine ⇓	Not relevant ⇓
1.1	**Essential Requirements**			
1.1.1	Definitions		X	
1.1.2	Principles of safety integration		X	
1.1.3	Materials and products		X	
1.1.4	Lighting			X
1.1.5	Design of machinery to facilitate its handling		X	
1.1.6	Ergonomics			X
1.1.7	Operating positions			X
1.1.8	Seating			X
1.2	**Control Systems**			
1.2.1	Safety and reliability of control systems			X
1.2.2	Control devices			X
1.2.3	Starting			X
1.2.4	Stopping			X
1.2.4.1	Normal stop			X
1.2.4.2	Operational stop			X
1.2.4.3	Emergency stop			X
1.2.4.4	Assembly of machinery			X
1.2.5	Selection of control or operating modes			X
1.2.6	Failure of the power supply			X
1.3	**Protection against mechanical hazards**			
1.3.1	Risk of loss of stability		X	
1.3.2	Risk of break-up during operation		X	
1.3.3	Risks due to falling or ejected objects		X	

1.3.4	Risks due to surfaces, edges or angles		X	
1.3.5	Risks related to combined machinery			X
1.3.6	Risks related to variations in operating conditions		X	
1.3.7	Risks related to moving parts		X	
1.3.8	Choice of protection against risks arising from moving parts			X
1.3.8.1	Moving transmission parts		X	
1.3.8.2	Moving parts involved in the process			X
1.3.9	Risks of uncontrolled movements		X	
1.4	**Required characteristics of guards and protective devices**			
1.4.1	General requirements			X
1.4.2	Special requirements for guards			X
1.4.2.1	Fixed guards			X
1.4.2.2	Interlocking movable guards			X
1.4.2.3	Adjustable guards restricting access			X
1.4.3	Special requirements for protective devices			X
1.5	**Risks due to other hazards**			
1.5.1	Electricity supply			X
1.5.2	Static electricity			X
1.5.3	Energy supply other than electricity			X
1.5.4	Errors of fitting		X	
1.5.5	Extreme temperatures		X	
1.45.6	Fire			X
1.5.7	Explosion			X
1.5.8	Noise		X	
1.5.9	Vibrations		X	
1.5.10	Radiation	X		
1.5.11	External radiation	X		
1.5.12	Laser radiation	X		
1.5.13	Emissions of hazardous materials and substances			X
1.5.14	Risk of being trapped in a machine			X
1.5.15	Risk of slipping, tripping or falling			X
1.5.16	Lightning			X
1.6	**Maintenance**			
1.6.1	Machinery maintenance		X	
1.6.2	Access to operating positions and servicing points		X	
1.6.3	Isolation of energy sources			X
1.6.4	Operator intervention			X
1.6.5	Cleaning of internal parts	X		
1.7	**Information**			
1.7.1	Information and warnings on the machinery		X	
1.7.1.1	Information and information devices			X
1.7.1.2	Warning devices			X

1.7.2	Warning of residual risks		X	
1.7.3	Marking of machinery			X
1.7.4	Instructions			X
1.7.4.1	General principles for the drafting of instructions		X	
1.7.4.2	Contents of the instructions			X
1.7.4.3	Sales literature		X	
	The classification from Annex 1 is to be supplemented from here forward.			
2	Supplementary essential health and safety requirements for certain categories of machinery			X
2.1	Foodstuffs machinery and machinery for cosmetics or pharmaceutical products			X
2.2	Portable hand-held and/or guided machinery			X
2.2.1	Portable fixing and other impact machinery			X
2.3	Machinery for working wood and material with similar physical characteristics			X
3	Supplementary essential health and safety requirements to offset hazards due to the mobility of machinery			X
4	Supplementary essential health and safety requirements to offset hazards due to lifting operations			X
5	Supplementary essential health and safety requirements for machinery intended for underground work			X
6	Supplementary essential health and safety requirements for machinery presenting particular hazards due to the lifting of persons			X