Pneumatic power chuck
ROTA TB
Assembly and Operating Manual

Translation of Original Operating Manual

Hand in hand for tomorrow

Imprint

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

Document number: 0889073

Version: 04.00 | 18/06/2024 | en

Dear Customer,

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

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

Best regards,

Your SCHUNK team

Customer Management

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

Table of Contents

1 General

1.1 About this manual

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

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

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

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

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

1.1.1 Illustration of warnings

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

CAUTION

Information about avoiding material damage.

1.1.2 Applicable documents

- General Terms and Conditions *
- Calculation of the jaw centrifugal forces and jaw guidance load, in the "Technology" chapter of the lathe chuck catalog * and the "Calculating the clamping force and RPM" chapter
- Brief operating instructions if available
- Approval drawings

The documents labeled with an asterisk (*) can be downloaded from **schunk.com**.

1.2 Warranty

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

- Observe the applicable documents, ▸ 1.1.2 [🗋 6]
- Observance of the ambient conditions and operating conditions, ▸ 2.5 [🗋 8]
- Observance of the specified maintenance and lubrication intervals ▸ 6.3 [🗋 49]

Parts touching the workpiece and wearing parts are not part of the warranty.

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

1.3 Scope of delivery

1	**ROTA TB chuck**
6	**T-Nuts**
2	**Elbow connectors**
2	**Straight connectors**
1	**Eye bolt**
	Mounting screws
1	**Assembly and Operating Manual**

2 Basic safety notes

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

2.1 Appropriate use

- The product is used for clamping metal and plastic workpieces on machine tools.
- The product may only be used within the scope of its technical data.
- The product is intended for industrial and commercial use.
- Appropriate use of the product includes compliance with all instructions in this manual.
- The maximum speed and the necessary clamping force must be determined by the operator for each clamping task in accordance with the valid standards or technical specifications of the manufacturer.
  (See also "Calculation for clamping force and speed of rotation" in the chapter "Technical data").
- Use suitable top jaws with a suitable interface.
- The interference circuit diameter of the workpiece must be smaller or at most equal to the outer diameter of the clamping device.
- The workpiece must not experience plastic deformation under clamping force (clamping pressures are permissible).

2.2 Inappropriate use

The product is not being used appropriately if:

- the product is used as a press, a punch, a toolholder, a load-handling device or as lifting equipment.
- the specified technical data for use of the product are exceeded.
- workpieces are not properly clamped, paying particular attention to the specified clamping forces.
- the top jaws are not mounted properly.
- the product is not being operated properly.
- the product is operated in the stroke end positions.
- the guideways are overloaded due to the chuck jaws being too high or the clamping point being selected too high.
- the product has been insufficiently maintained.
- the product is brought into contact with aggressive media, especially acids.
- the product is used in abrasive blasting processes, especially sandblasting.

2.3 Structural changes

Implementation of structural changes

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

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

2.4 Spare parts

Use of unauthorized spare parts

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

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

2.5 Ambient conditions and operating conditions

Required ambient conditions and operating conditions

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

- Make sure that the product is only used within its defined application parameters.
- Ensure that the product is of a sufficient size for the application.
- Ensure that maintenance and lubricating intervals are observed.
- Only use cooling emulsions with anti-corrosive additives when machining.

Depending on the operating conditions, the function and clamping force must be checked after a certain period of operation.

With the smallest possible actuation pressure on the clamping cylinder, the base jaws should move evenly. This method is not a substitute for measuring the clamping force.

If the clamping force has dropped too much or if the base jaws and/or the release mechanism no longer move properly, the clamping device must be disassembled, cleaned, and relubricated.

2.6 Material limitations

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

2.7 Chuck Jaws

Requirements of the chuck jaws

Rotational or if applicable, accumulated energy, can make the product unsafe and risk the danger of serious injuries and considerable material damage.

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

2.8 Personnel qualifications

Inadequate qualification of personnel

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

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

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

Qualified electrician Qualified electricians have the professional training, knowledge, and experience to work on electrical systems, to recognize and avoid potential dangers, and know the relevant standards and regulations.

Specialist personnel Specialist personnel have the specialized training, knowledge, and experience to perform the tasks entrusted to them, to recognize and avoid potential dangers, and know the relevant standards and regulations.

Instructed person Instructed persons have been instructed by the operator regarding the tasks entrusted to them and the potential dangers of inappropriate behavior.

Manufacturer's service personnel The manufacturer's service personnel have the specialized training, knowledge, and experience to perform the work entrusted to them and to recognize and avoid potential dangers.

2.9 Personal protective equipment

Use of personal protective equipment

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

2.10 Transport

Handling during transport

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

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

2.11 Protection during handling and assembly

Incorrect handling and assembly

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

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

2.12 Protection during commissioning and operation

Falling or violently ejected components

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

- Take suitable protective measures to secure the danger zone.

2.13 Notes on safe operation

Incorrect manner of working by personnel

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

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

Functionality check

After installation of the clamping device, its function must be checked prior to commissioning.

Two important points are:

- **Clamping force:** At max. actuation force/pressure/torque, the clamping force specified for the clamping device must be reached.
- **Stroke control:** The stroke of the clamping piston must have a margin of safety at the front and back end positions. The machine spindle must not start up until the clamping piston has passed through this safety margin.

With manual clamping devices, stroke control is carried out via the indicator pin. Clamping is only correct if the indicator pin is countersunk and clamping force is applied to the workpiece.

When determining the clamping force required to machine a workpiece, the centrifugal force acting on the chuck jaws must be taken into account (according to VDI 3106).

Maintenance instructions

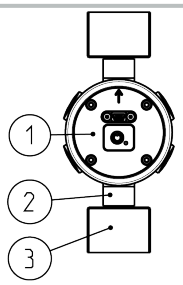
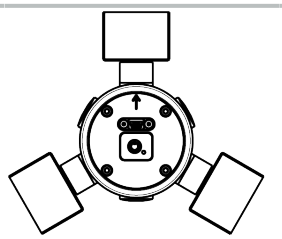
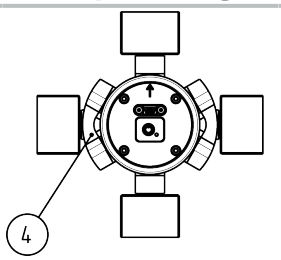
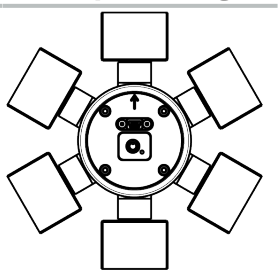
The clamping device's reliability and safety can only be guaranteed if the operator complies with the manufacturer's maintenance instructions.

- For lubrication, we recommend our tried and tested special grease, LINOMAX plus. Unsuitable lubricants can have a negative impact on the functioning of the clamping device (clamping force, coefficient of friction, wear behavior). (For product information about LINOMAX plus, see the "Accessories" chapter of the SCHUNK lathe chuck catalog or contact SCHUNK.)
- Use a suitable high-pressure grease gun to ensure that you reach all the greasing areas.

- To ensure correct distribution of the grease, move the clamping device to its end positions several times, lubricate again, and then check the clamping force.
- Move the clamping device through to its end position several times after 500 clamping strokes, at the latest. This moves the lubricant back to the surfaces of the force transmission.
- Check the clamping device regularly for clamping force and jaw stroke.

Clamping force measurement

- Depending on the operating conditions, the function and clamping force must be checked after a certain period of operation . For this purpose, a calibrated clamping force meter (e.g. SCHUNK IFT) must be used. The loading conditions are shown below for the different chuck variants.

	2-jaw	3-jaw	4-jaw (compensating)	6-jaw (compensating)
				
Measuring device	SCHUNK IFT clamping force tester	SCHUNK IFT clamping force tester	SCHUNK IFT clamping force tester	SCHUNK IFT clamping force tester
Accessories	–	–	IFT MA4	–
Measuring points	0°/180°	0°/120°/240°	0° / 180° / 90° / 270° (IFT MA4)	0°/60°/120°/180°/ 240°/300°
Please note	Operating manual SCHUNK IFT Clamping force tester	Operating manual SCHUNK IFT Clamping force tester	Operating manual SCHUNK IFT Clamping force tester **Attention** Compensation must be activated, otherwise it may lead to inconsistent results.	Operating manual SCHUNK IFT Clamping force tester **Attention** Compensation must be activated, otherwise it may lead to inconsistent results.

① Measuring head
② Clamping insert
③ Chuck jaw
④ Bridge element (IFT MA4)

- If the clamping force has dropped too much or if the base jaws and piston no longer move properly, the chuck will have to be disassembled, cleaned and relubricated.
- The clamping force should always be measured with the clamping device in the same condition as it is used in for the current clamping application. If top jaws with clamping steps

are used, measuring must be performed in the same step as for the respective clamping task. In the event of high operating speeds, clamping force losses must be accounted for due to the centrifugal force acting on the chuck jaws. In this case the value of the operating clamping force should be measured dynamically.

- We recommend checking the clamping force using a clamping force tester before starting a new production run and between maintenance intervals. "Optimum safety can only be guaranteed through regular checks".

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.

Use of special chuck jaws

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

- The chuck jaws should be designed to be as light and as low as possible. The clamping point must be as close as possible to the chuck face (clamping points at a greater distance lead to greater surface pressure in the jaw guidance and can significantly reduce the clamping force).
- Do not use welded jaws.
- If for constructional reasons the chuck jaws in special design are heavier than the top jaws assigned to the clamping device, greater centrifugal forces must be accounted for when defining the required clamping force and the recommended speed.
- Screw the jaw mounting screws into the bore holes furthest apart.
- The maximum recommended speed may only be operated in conjunction with maximum actuating force and only with the chuck in optimal, fully functioning condition.
- If the chuck is involved in a collision, it must be subjected to a crack test before using it again. Replace damaged parts with original SCHUNK spare parts.
- Replace the chuck jaw mounting screws if there are signs of wear or damage. Only use screws with a quality of 12.9.

2.14 Disposal

Handling of disposal

Incorrect handling of disposal can make the product unsafe and lead to risks of environmental harm.

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

2.15 Fundamental dangers

General

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

2.16 Protection against dangerous movements

Unexpected movements

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

- Switch off the energy supply, ensure that no residual energy remains and secure against inadvertent reactivation.
- Never rely merely on the response of the monitoring function to avert danger. Assume that the drive movement is faulty as long is the installed monitors are not effective, since the effect depends on the control and the current operating state of the drive.
- To avoid accidents and/or material damage, human access to the movement range of the machine must be restricted.

2.17 Notes on particular risks

⚠ DANGER

Risk of fatal injury to operating personnel due to the workpiece falling down or being flung out in the event of a power failure

This poses a risk of death or injury to the operating personnel and can result in serious damage to the machine.

⚠ DANGER

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

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

- Re-clamping of the workpiece with manual or pneumatic clamping devices after 4 hours.
- The energy supply must be constantly applied to power-operated clamping devices during operation.
- Use clamping cylinders with energy conservation.

⚠ DANGER

Possible risk of death for operating personnel if the clamping device's top speed of rotation is exceeded and a workpiece is released or parts fly off.

If the machine tool or the technical equipment can reach a higher speed than the maximum speed of the clamping device, the speed must be limited for safety purposes!

⚠ DANGER

Possible risk of death for operating personnel if a jaw breaks or if the clamping device fails because the technical data has been exceeded and a workpiece is released or parts fly off!

- Never exceed the technical data specified by the manufacturer for using the clamping device.

⚠ DANGER

Possible risk of death for operating personnel from clothing or hair getting caught on the clamping device and being dragged into the machine!

Loose clothing or long hair may become caught on projecting parts of the clamping device and be drawn into the machine.

- Always wear tight-fitting clothing and a hairnet when working on the machine and the lathe chuck.

⚠ WARNING

Possible risk of death for the operating personnel due to impact of the rotating clamping device!

- Keep a safe distance to the rotating clamping device!
- Do not reach into the rotating clamping device!

⚠ CAUTION

Risk of limbs being crushed when opening and closing the chuck jaws during manual loading or unloading or when exchanging moving parts.

- Do not reach between the chuck jaws.

⚠ CAUTION

Hazard from vibration due to imbalanced rotating parts and noise generation.

Physical and mental strains due to imbalanced workpieces and noise during the machining process on the clamped and rotating workpiece.

- Ensure the clamping device's axial and concentric runout.
- Check options for remedying imbalances on special top jaws and workpieces.
- Reduce the speed.
- Wear hearing protection.

⚠ CAUTION

There is a risk of limbs being crushed by moving parts during manual loading and unloading and the clamping procedure.

- Do not reach between the chuck jaws.
- Use loading devices.

⚠ CAUTION

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

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

CAUTION

Risk of damage due to incorrect choice of clamping position for chuck jaws on workpiece.

If an incorrect clamping position is chosen for the chuck jaws on the workpiece, the base and top jaws may become damaged.

- Observe maximum positions of base and top jaws.
- The diameter of the workpiece must not be greater than the clamping device diameter.
- For clamping devices with fine serration, do not allow the T-nuts for connecting the top jaws to protrude beyond the base jaws in radial direction.
- The outer diameter of the screwed-on top jaws must not exceed the outer diameter of the clamping device by more than 10%.

3 Technical data

3.1 Chuck data

ROTA TB

Max. Operating pressure [bar]	8
Min. Operating pressure [bar]	2
Serration of the jaws	3/32" x 90°

Size	400	400	470	500	500	500	600	630
Chuck Ø	400	422	470	500	540	570	610	630
Chuck through bore [mm]	115	140	185	160	205	230	260	265
Max. clamping force [kN] at 6 bar	200	180	115	300	240	230	190	330
Max. Speed of rotation [RPM]	1700	1700	1700	1300	1300	1300	1300	1000
Stroke per jaw [mm]	7	7	7	8.5	8.5	8.5	12	10
Distributor ring Ø [mm]	467	467	470	570	570	570	570	685
Centrifugal torque of base jaw [kgm] M_{cGB}	0.497	0.535	0.626	0.749	0.847	0.891	1.300	1.624
Max. jaw eccentricity of center of gravity in axial direction [mm] a_{max}	36	36	36	36	36	36	36	36

Size	630	630	800	800	1000	400-LH	470-LH	500-LH
Chuck Ø	662	685	800	800	1000	467	470	570
Chuck through bore [mm]	310	330	365	410	534	140	185	205
Max. clamping force [kN] at 6 bar	280	280	420	400	280	180	115	240
Max. Speed of rotation [RPM]	1000	700	750	750	450	1300	1300	1100
Stroke per jaw [mm]	10	10	12	12	12	19	20	25.4
Distributor ring Ø [mm]	685	685	850	850	850	467	470	570
Centrifugal torque of base jaw [kgm] M_{cGB}	1.745	1.815	3.031	3.172	4.292	0.866	0.823	1.399
Max. jaw eccentricity of center of gravity in axial direction [mm] a_{max}	36	36	42	42	42	36	36	36

Size	500-LH	600-LH	630-LH	630-LH	850-LH	1000-LH	1200-LH
Chuck Ø	570	610	685	720	850	1000	1200
Chuck through bore [mm]	230	275	265	325	375	560	640
Max. clamping force [kN] at 6 bar	220	180	330	280	330	170	170
Max. Speed of rotation [RPM]	1100	1100	900	900	750	450	180
Stroke per jaw [mm]	25.4	25.4	38	25.4	25.4	25.4	38
Distributor ring Ø [mm]	570	570	685	685	850	850	925
Centrifugal torque of base jaw [kgm] M_{cGB}	1.312	1.349	2.251	2.641	4.806	5.189	9.062
Max. jaw eccentricity of center of gravity in axial direction [mm] a_{max}	36	36	36	36	42	42	42

ROTA EP

Max. Operating pressure [bar]	8
Min. Operating pressure [bar]	2
Serration of the jaws (Sizes 380, 460, 460-LH)	3/32" x 90°
Serration of the jaws (Size 500)	1/16" x 90°

Size	380	460	460	500	460-LH	460-LH
Chuck Ø	380	460	460	500	460	460
Chuck through bore [mm]	127	165	185	26	165	185
Max. clamping force [kN] at 6 bar	160	230	230	80	230	220
Max. Speed of rotation [RPM]	2300	1600	1600	1000	1600	1600
Stroke per jaw [mm]	7	7	7	15	19	19
Distributor ring Ø [mm]	380	460	460	467	460	460
Centrifugal torque of base jaw [kgm] M_{cGB}	0.432	0.622	0.640	0.343	0.787	0.816
Max. jaw eccentricity of center of gravity in axial direction [mm] a_{max}	36	36	36	32	36	40

The specified maximum speed of rotation stated only applies when using the maximum clamping force and the SHB-type, hard, standard stepped jaws that go with the chuck.

If unhardened top jaws or chuck jaws in a special design are used, ensure that the jaws weigh as little as possible. For soft top jaws or chuck jaws in special design, the permissible speed of rotation according to VDI 3106 must be calculated for the machining job in question. The recommended maximum speed must not be exceeded. The calculations must be checked using dynamic measurement. Function monitoring (piston movement and actuating pressure) must be performed in accordance with the guidelines of the Berufsgenossenschaft (employers' mutual insurance association).

3.2 Clamping force / speed diagrams

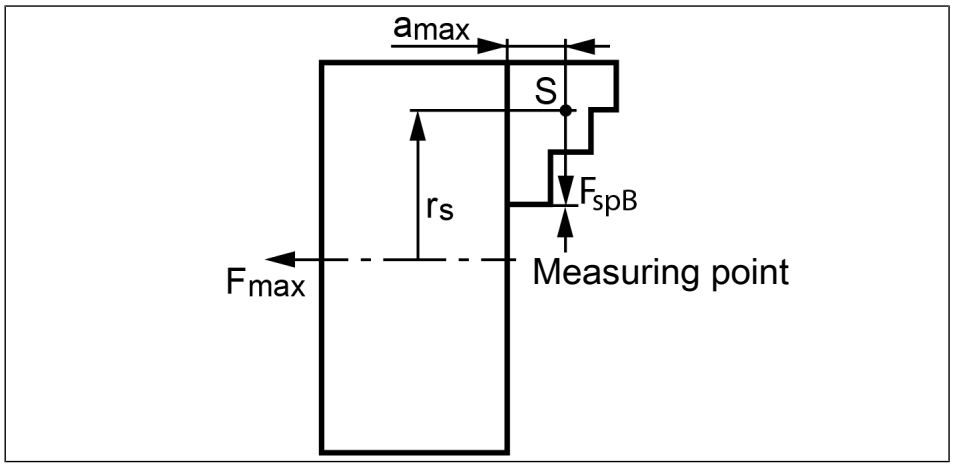
The diagrams refer to 3-jaw-chuck.

Clamping force/RPM curves have been calculated using standard hard stepped jaws SHB, SWB and SWB-AL. In doing this, the maximum actuating force was applied and the jaws were set flush with the outer diameter of the chuck.

The chuck is in perfect condition and lubricated with SCHUNK LINOMAX plus special grease.

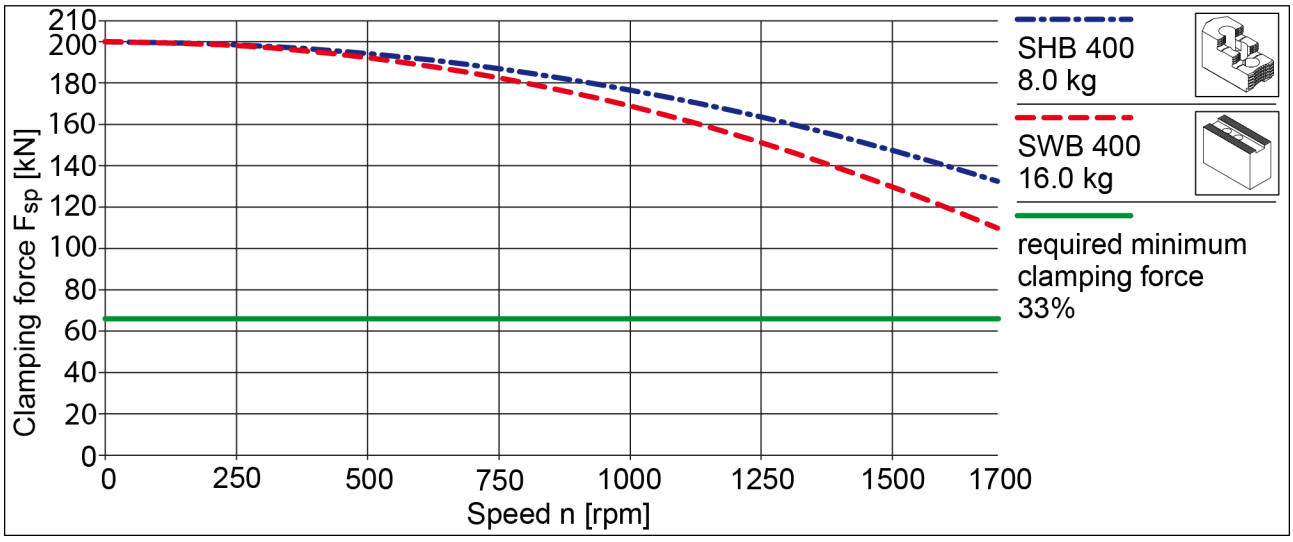
If one or more of these prerequisites is altered, the diagrams will no longer be valid.

Chuck setup for clamping force/RPM diagram

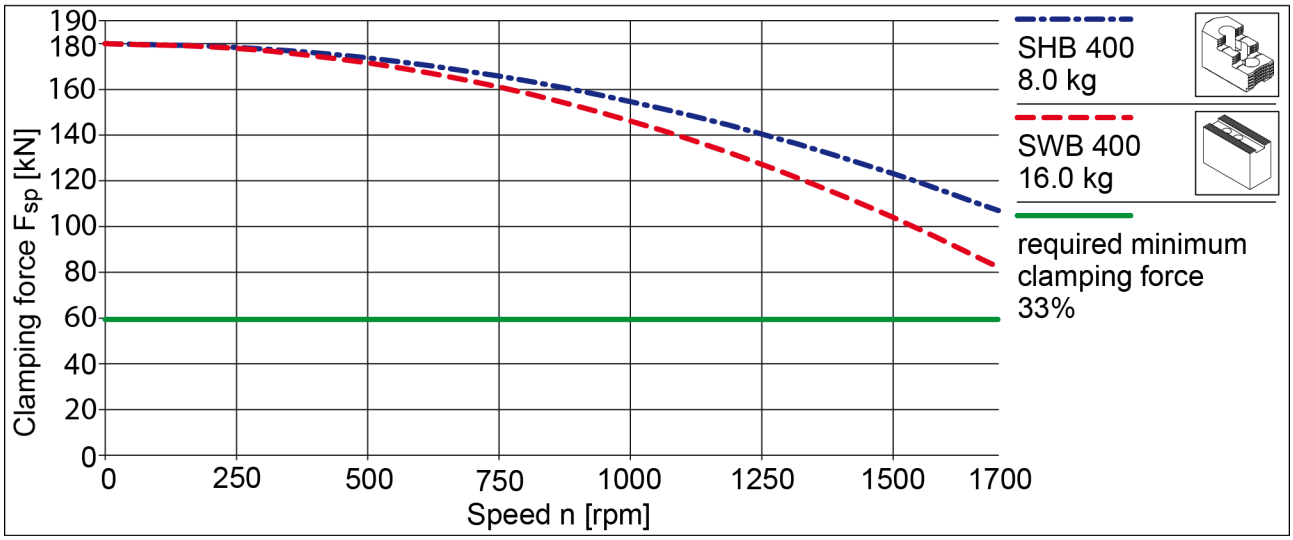


F_{spB}	Clamping force per jaw	S	Center of gravity
r_s	Center of gravity radius	a_{max}	Max. jaw center of gravity eccentricity in axial direction
F_{max}	Max. actuating force		

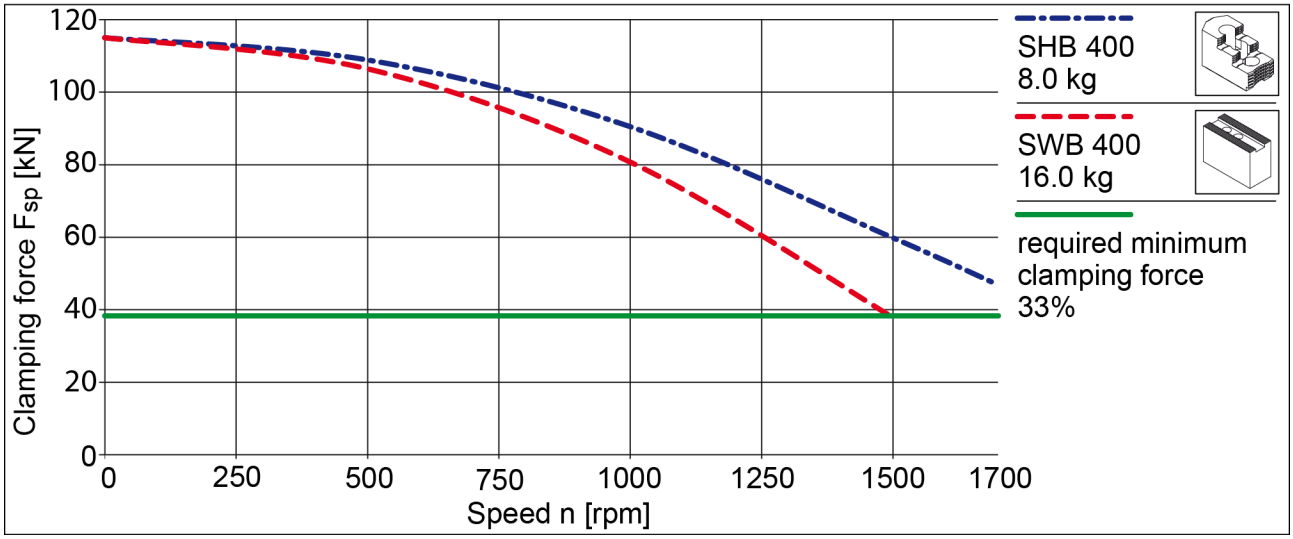
Clamping force-RPM-diagram ROTA TB 400-115



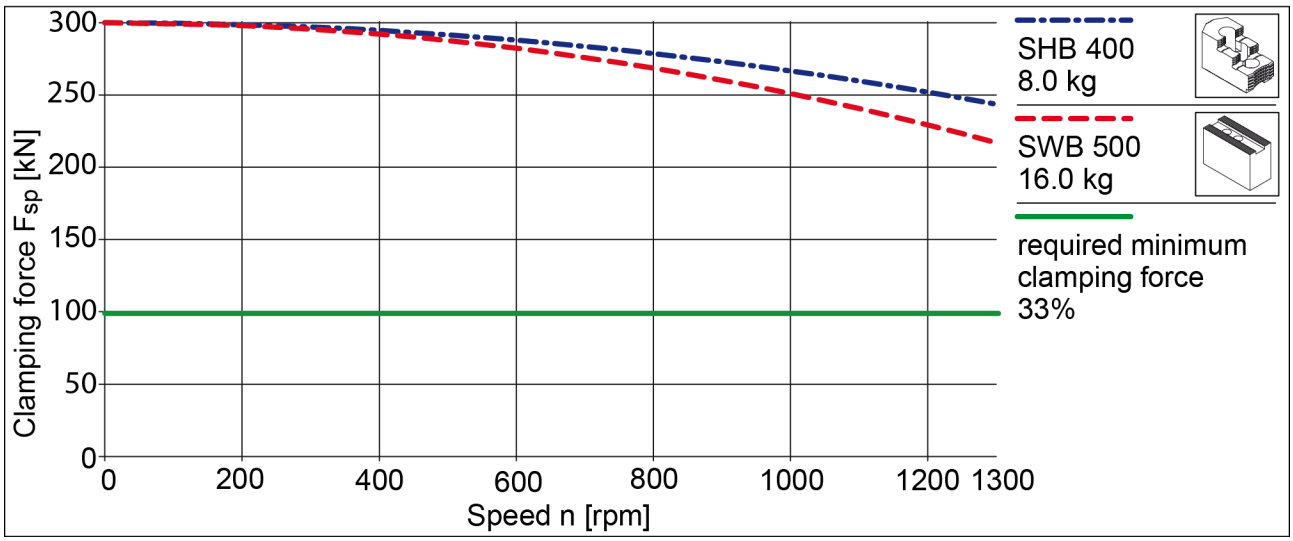
Clamping force-RPM-diagram ROTA TB 400-140



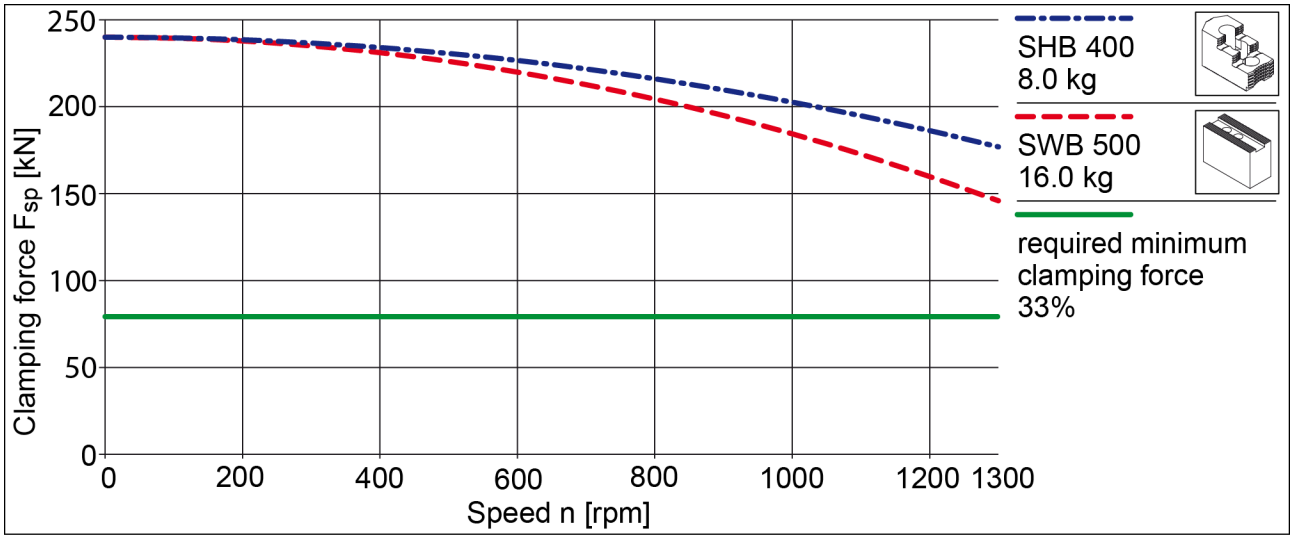
Clamping force-RPM-diagram ROTA TB 470-185



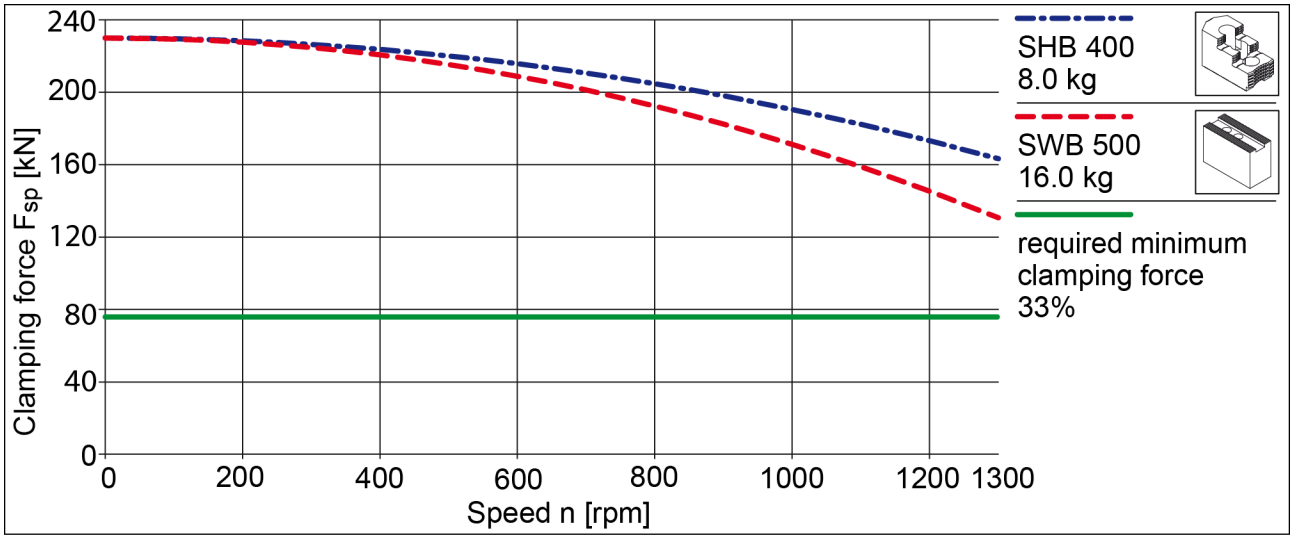
Clamping force-RPM-diagram ROTA TB 500-160



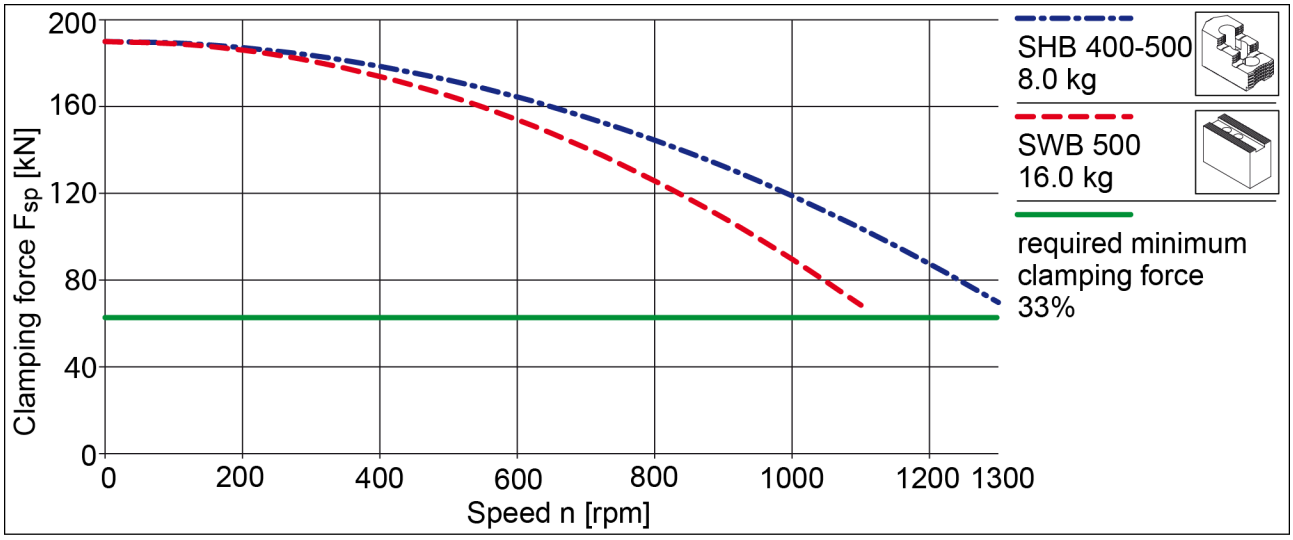
Clamping force-RPM-diagram ROTA TB 500-205



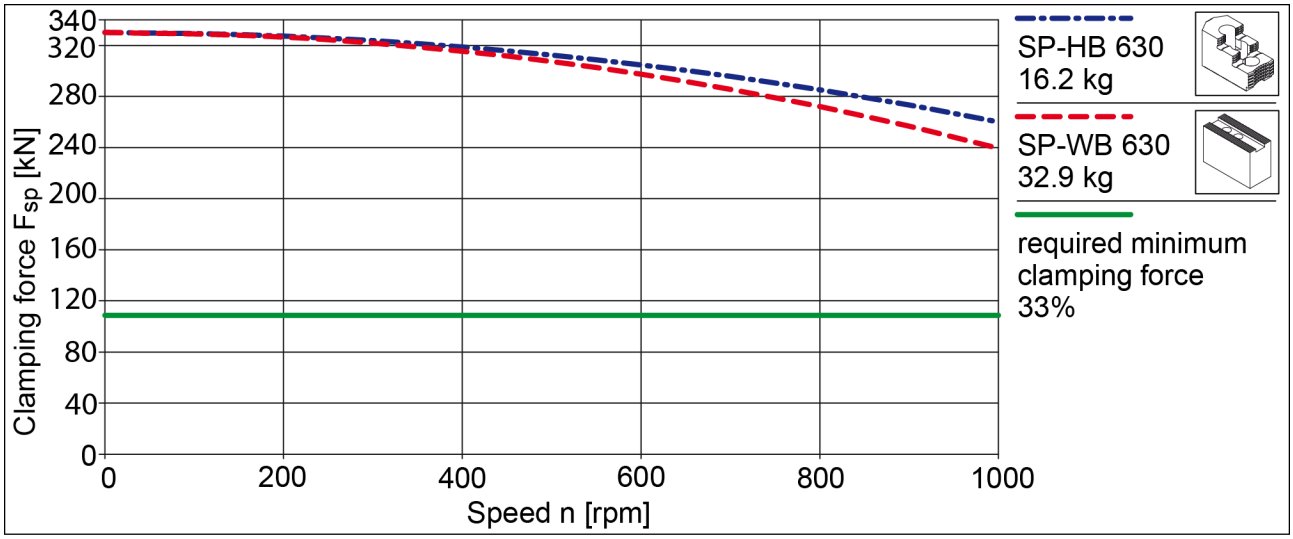
Clamping force-RPM-diagram ROTA TB 500-230



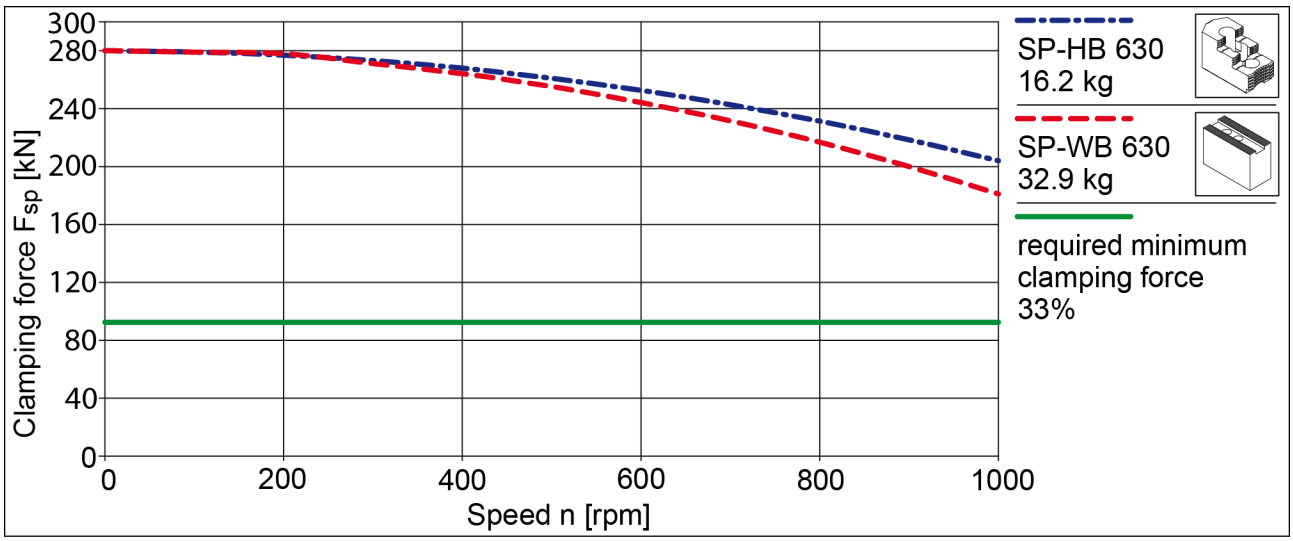
Clamping force-RPM-diagram ROTA TB 600-275



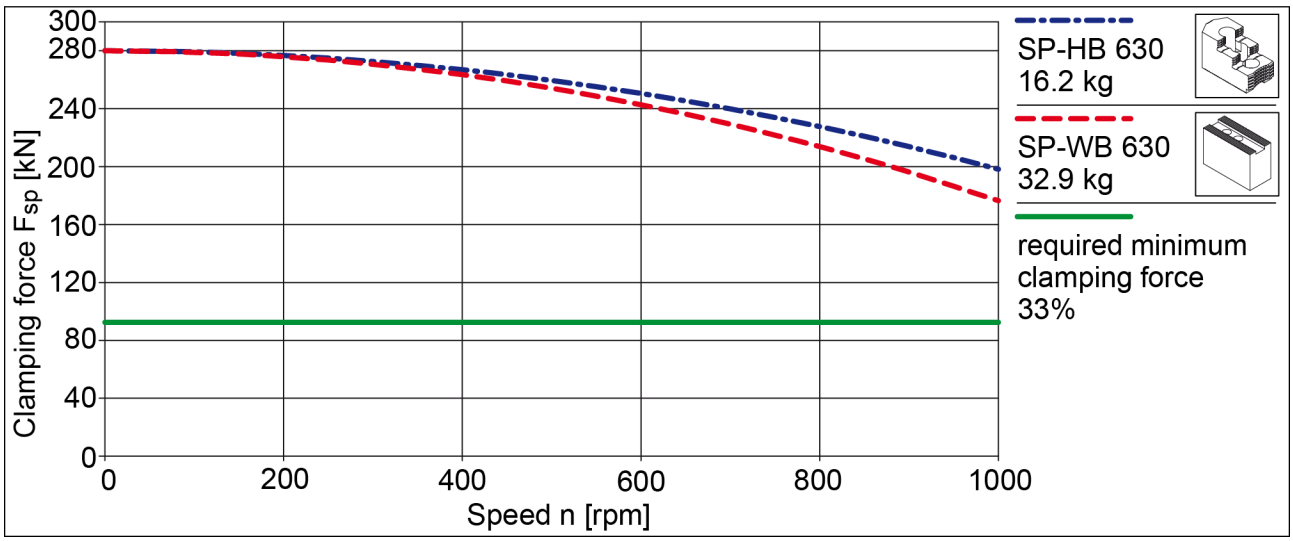
Clamping force-RPM-diagram ROTA TB 630-265



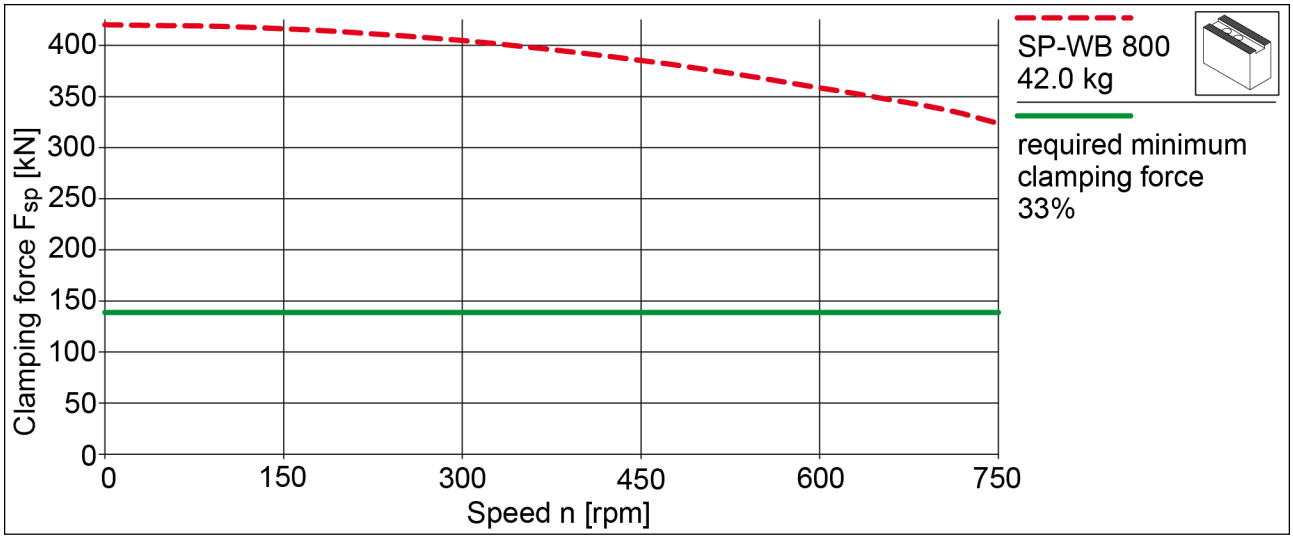
Clamping force-RPM-diagram ROTA TB 630-310



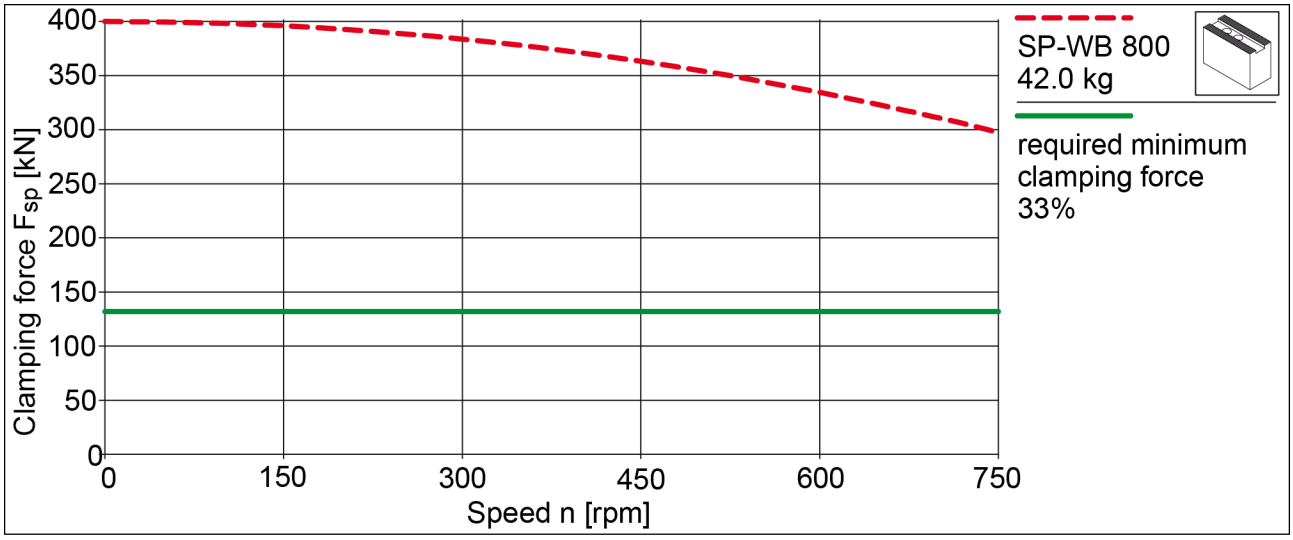
Clamping force-RPM-diagram ROTA TB 630-330



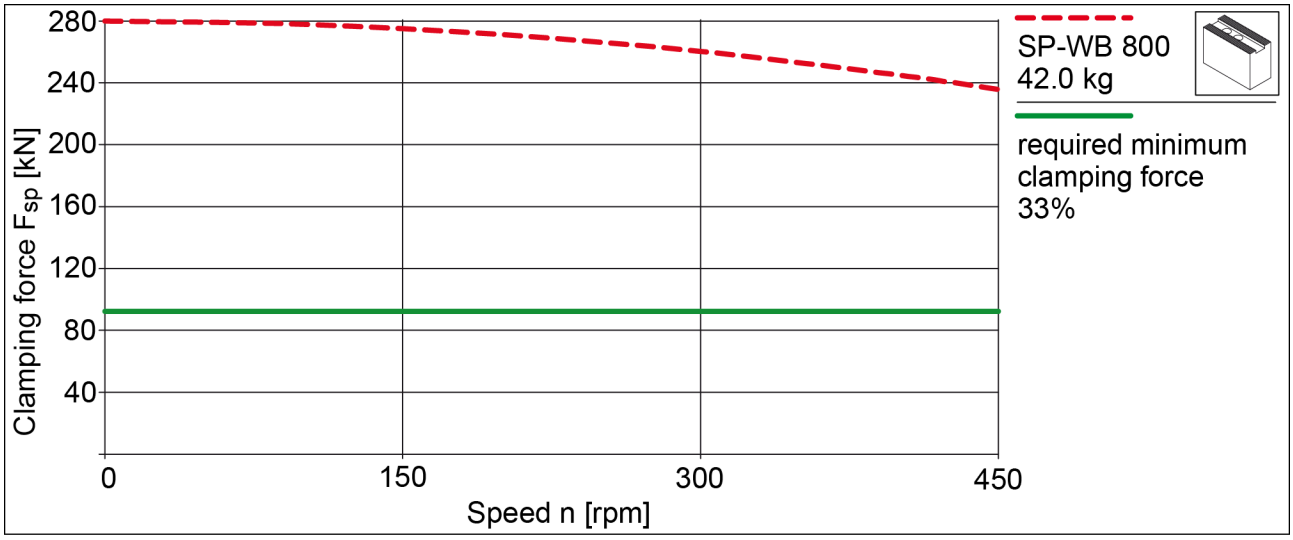
Clamping force-RPM-diagram ROTA TB 800-365



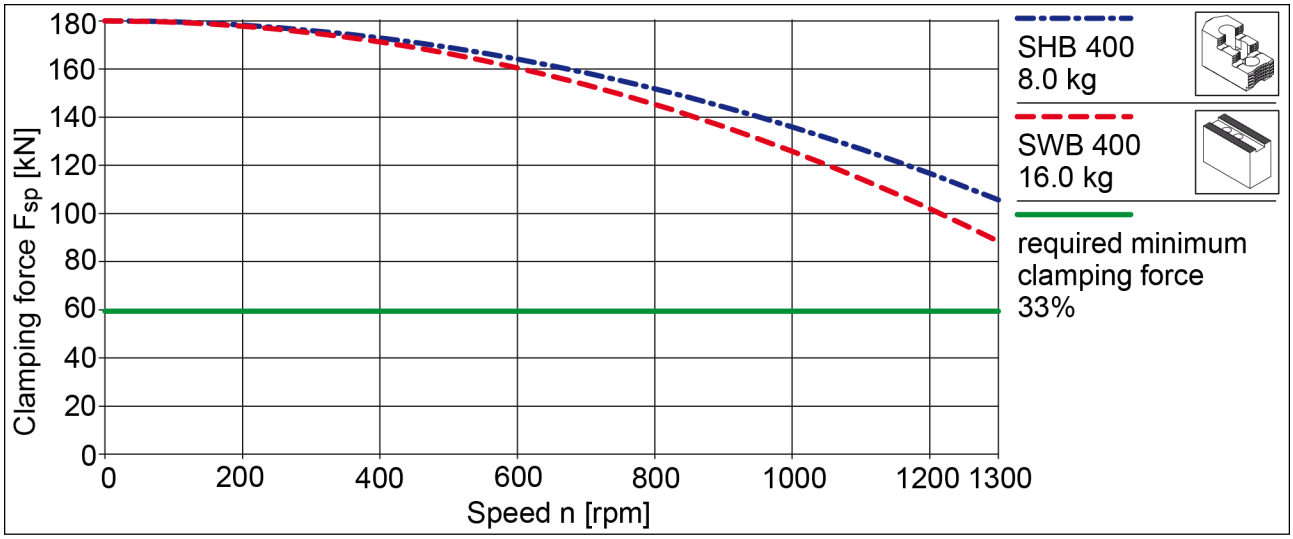
Clamping force-RPM-diagram ROTA TB 800-410



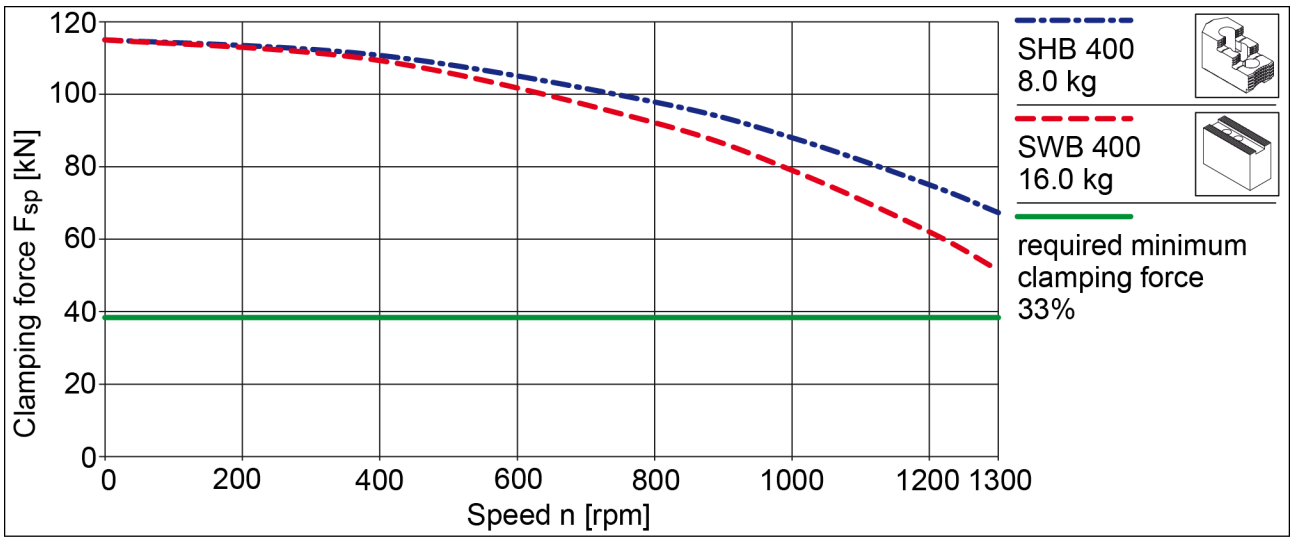
Clamping force-RPM-diagram ROTA TB 1000-534



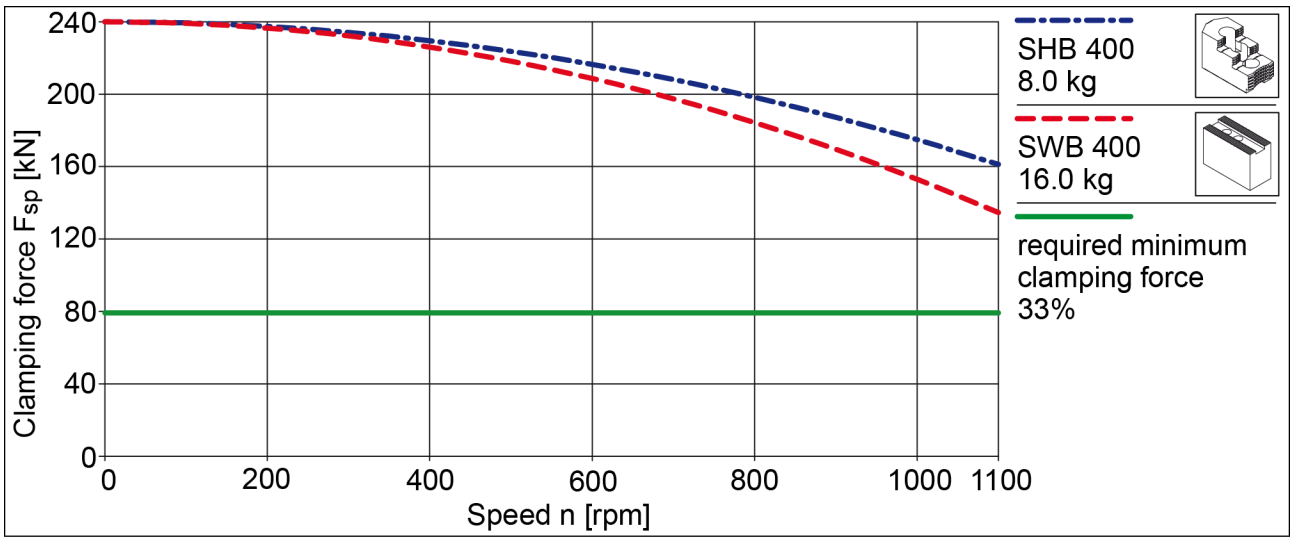
Clamping force-RPM-diagram ROTA TB-LH 400-140



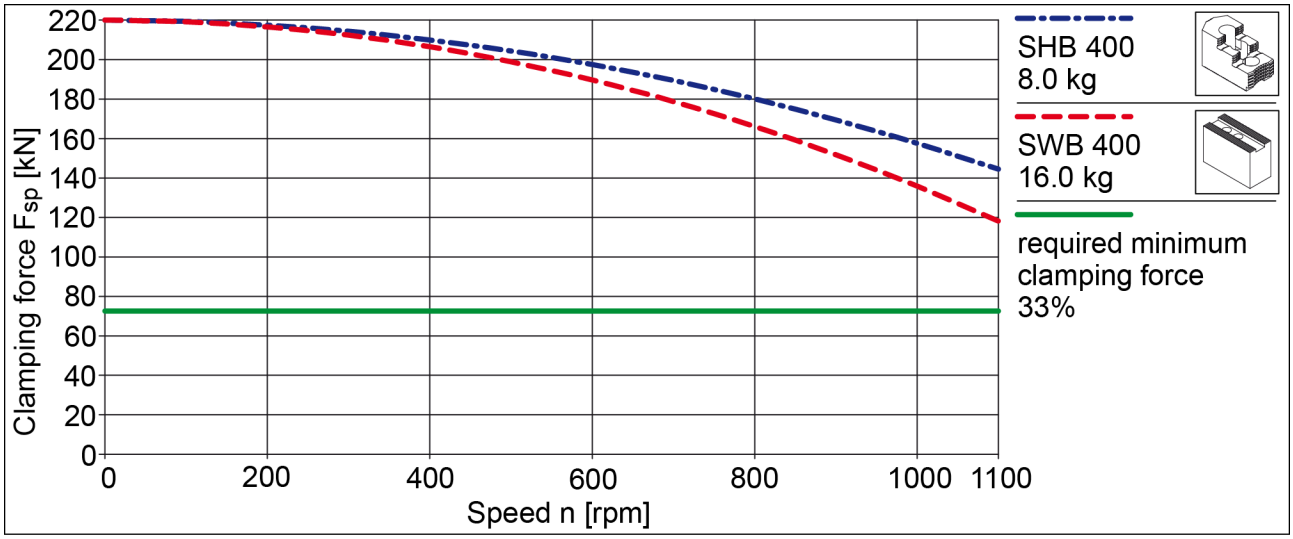
Clamping force-RPM-diagram ROTA TB-LH 470-185



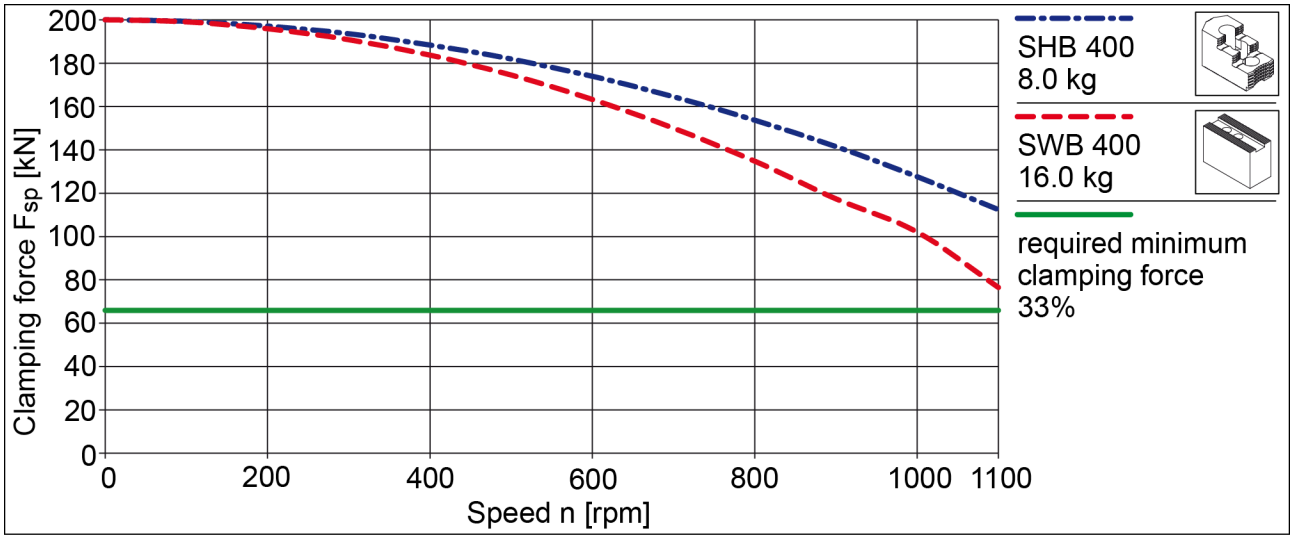
Clamping force-RPM-diagram ROTA TB-LH 500-205



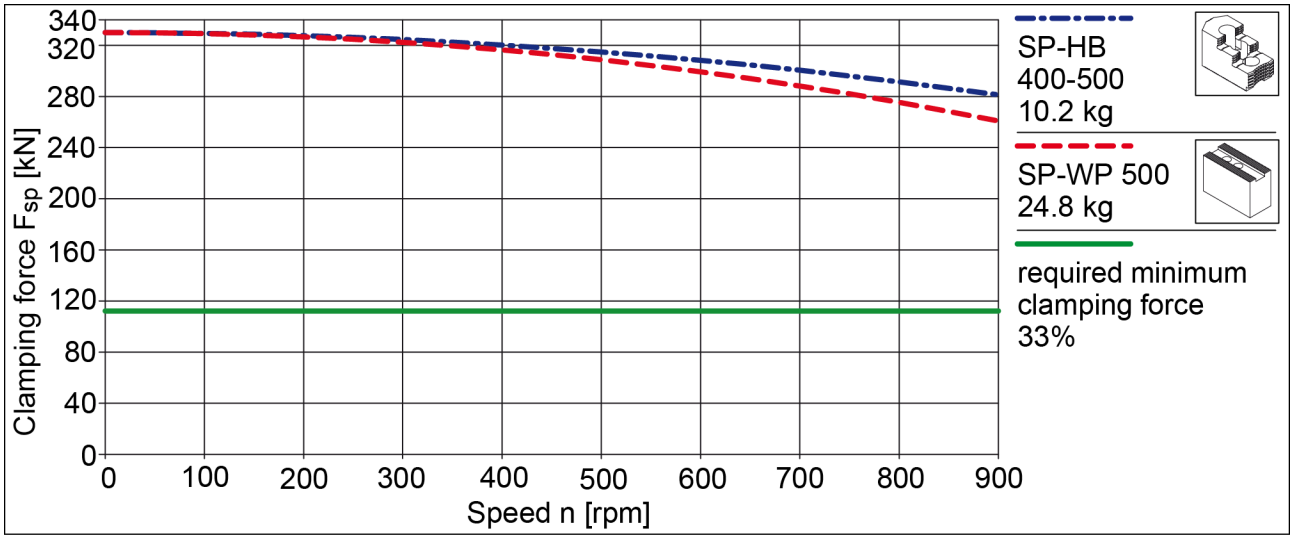
Clamping force-RPM-diagram ROTA TB-LH 500-230



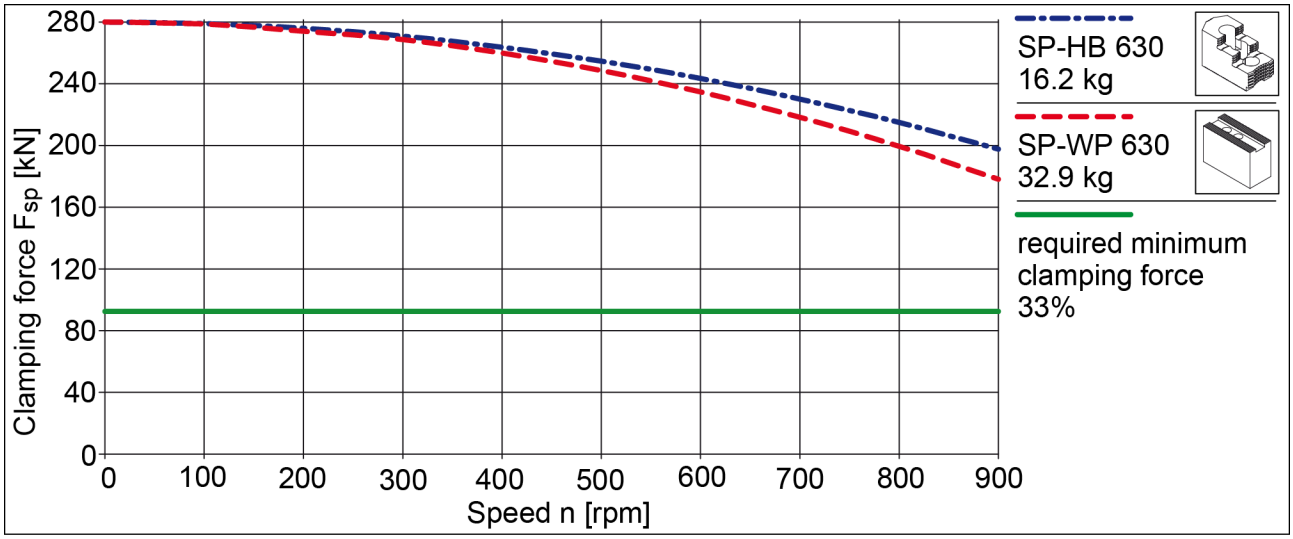
Clamping force-RPM-diagram ROTA TB-LH 600-275



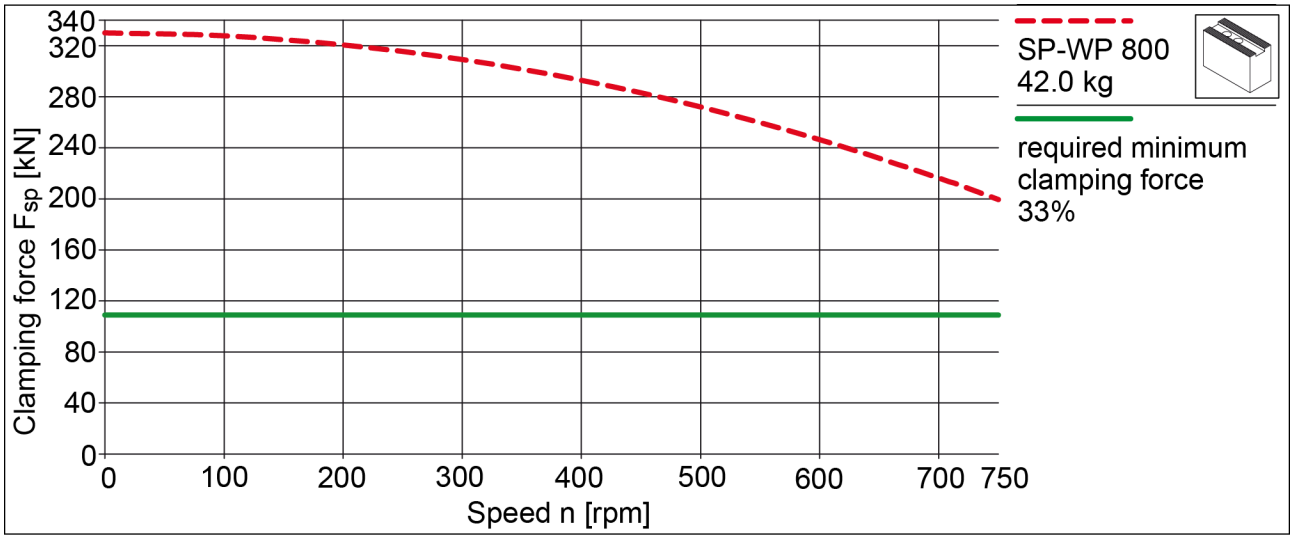
Clamping force-RPM-diagram ROTA TB-LH 630-265



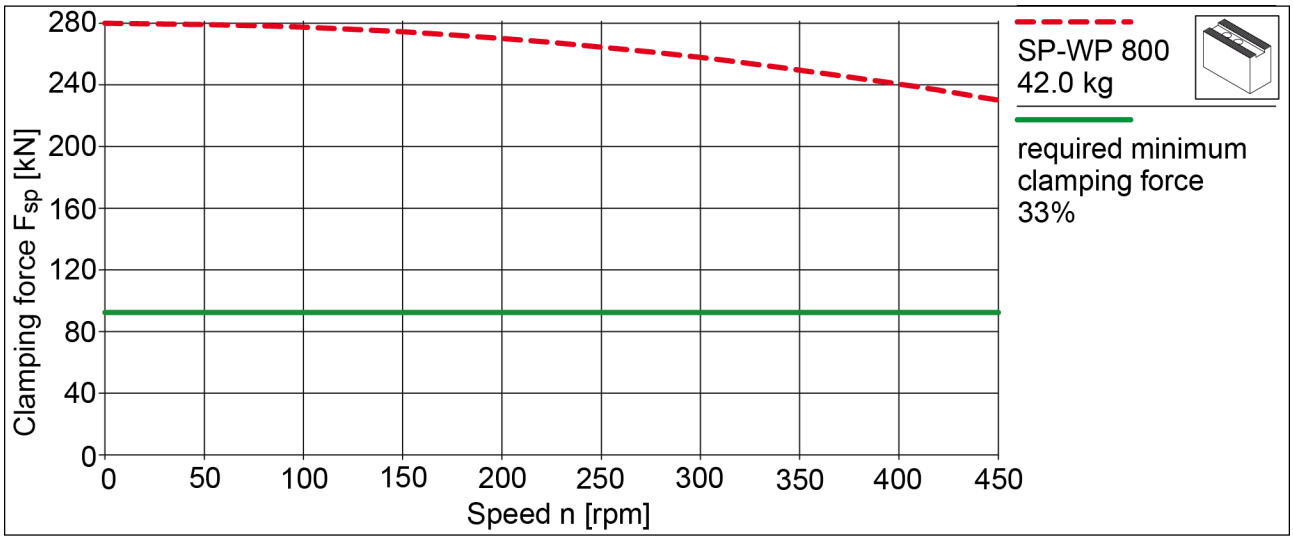
Clamping force-RPM-diagram ROTA TB-LH 630-325



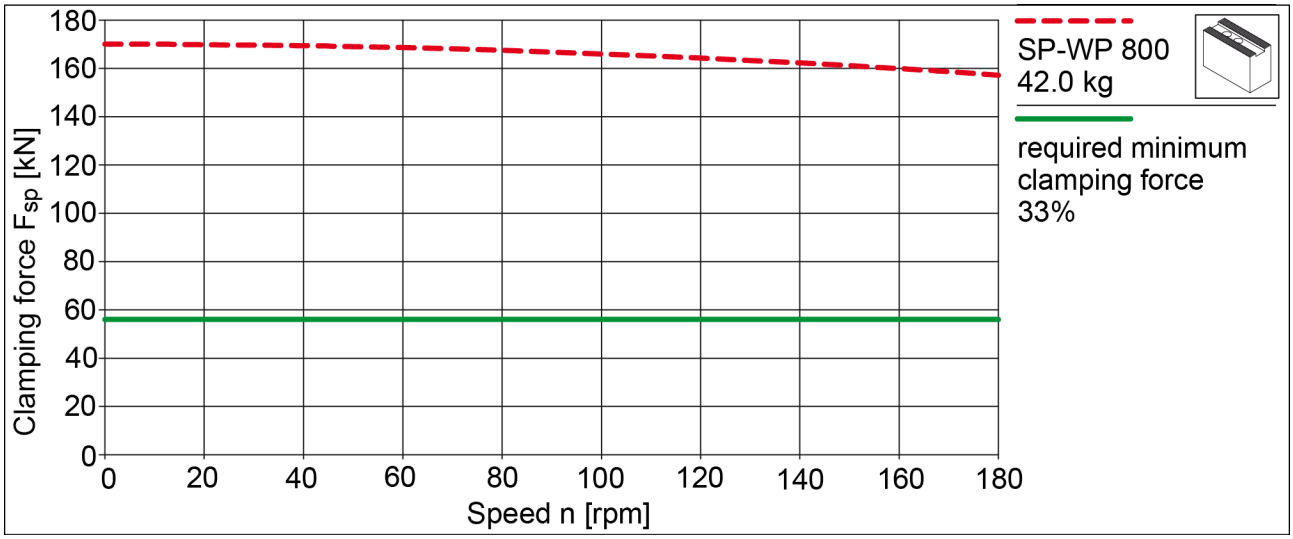
Clamping force-RPM-diagram ROTA TB-LH 850-375



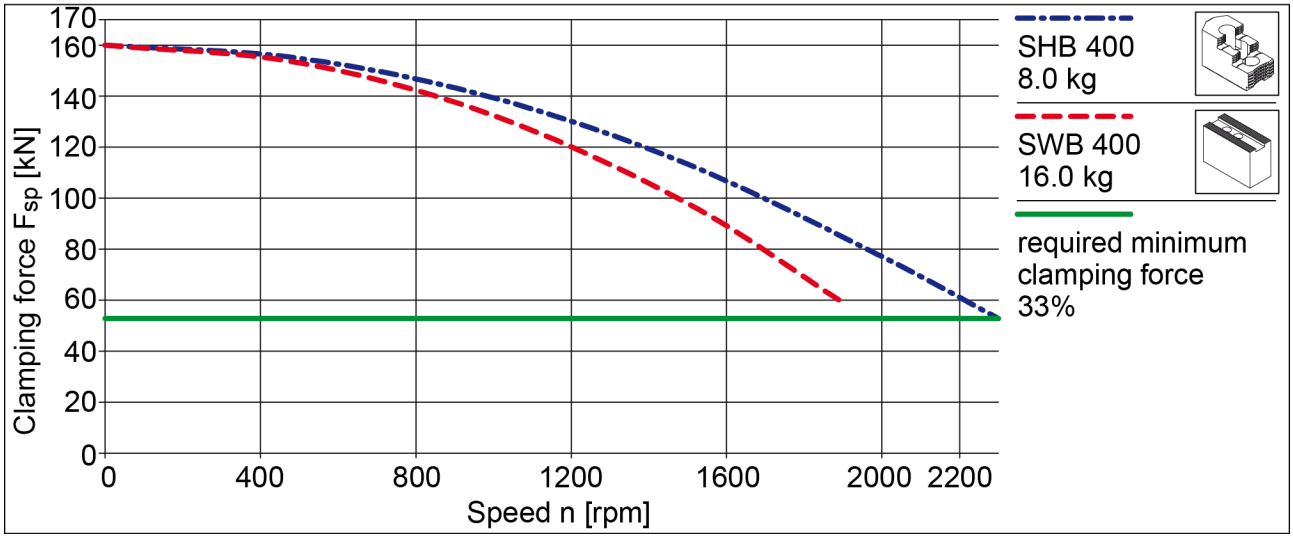
Clamping force-RPM-diagram ROTA TB-LH 1000-560



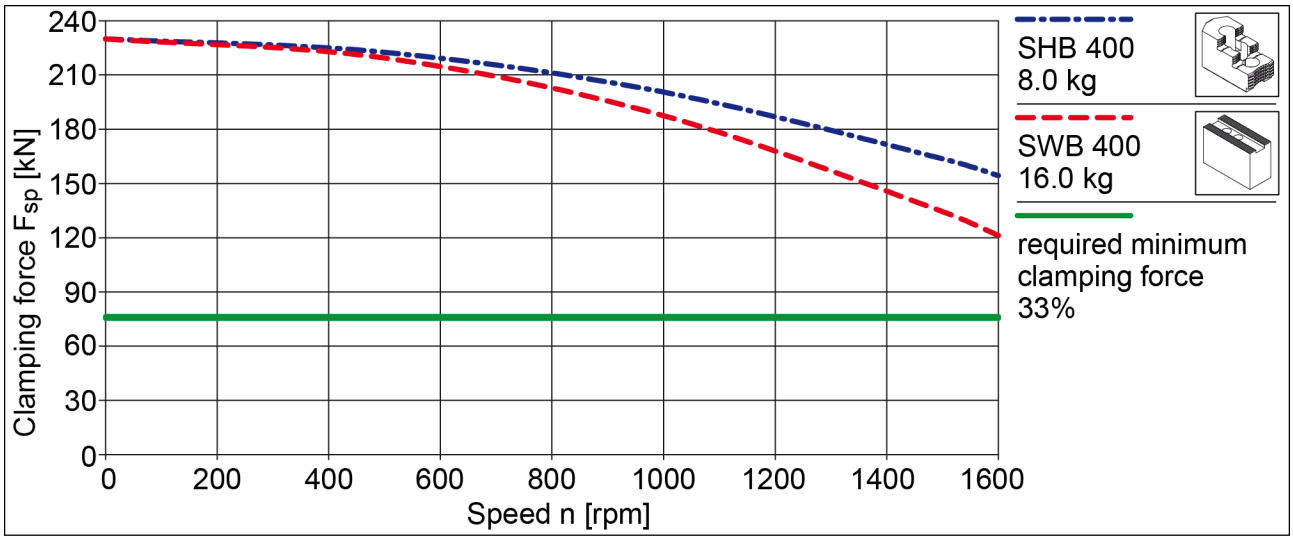
Clamping force-RPM-diagram ROTA TB-LH 1200-640



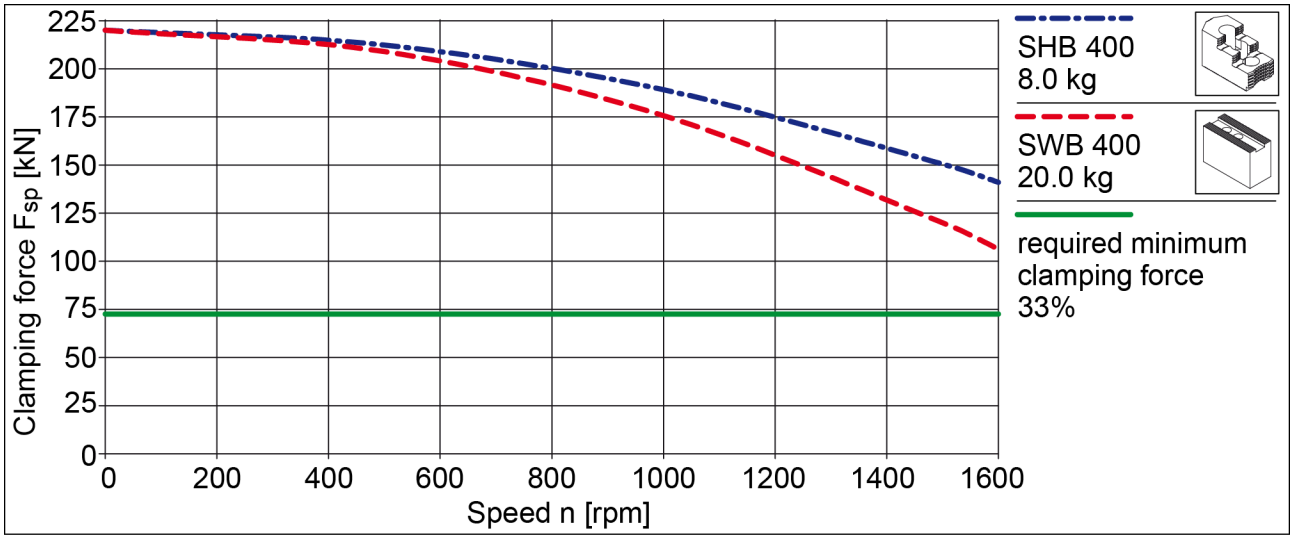
Clamping force-RPM-diagram ROTA EP 380-127



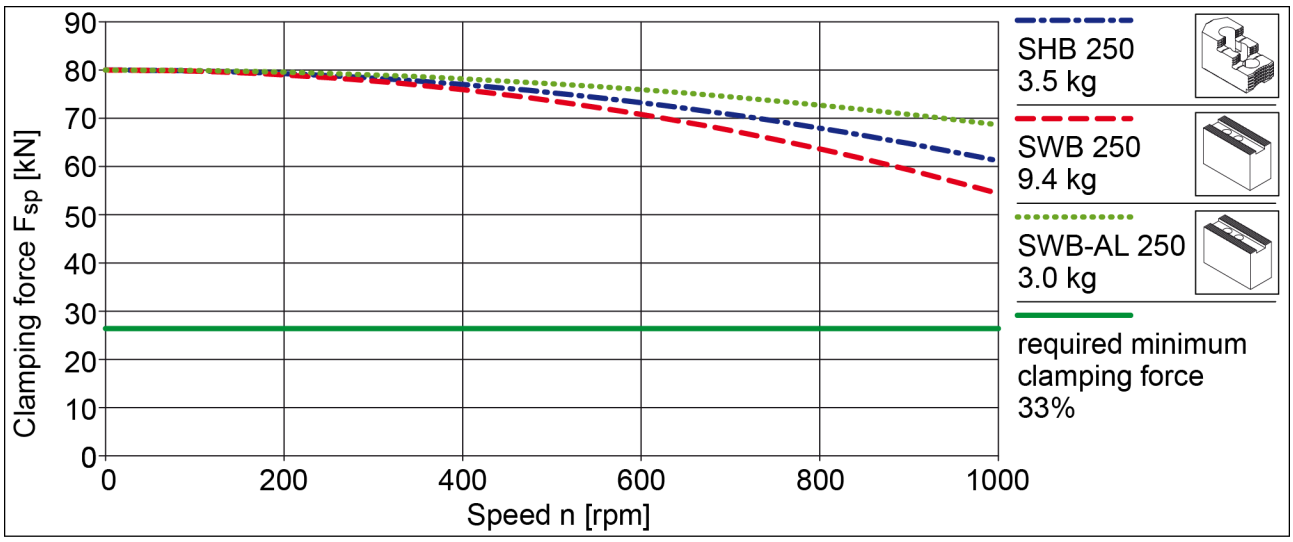
Clamping force-RPM-diagram ROTA EP 460-165



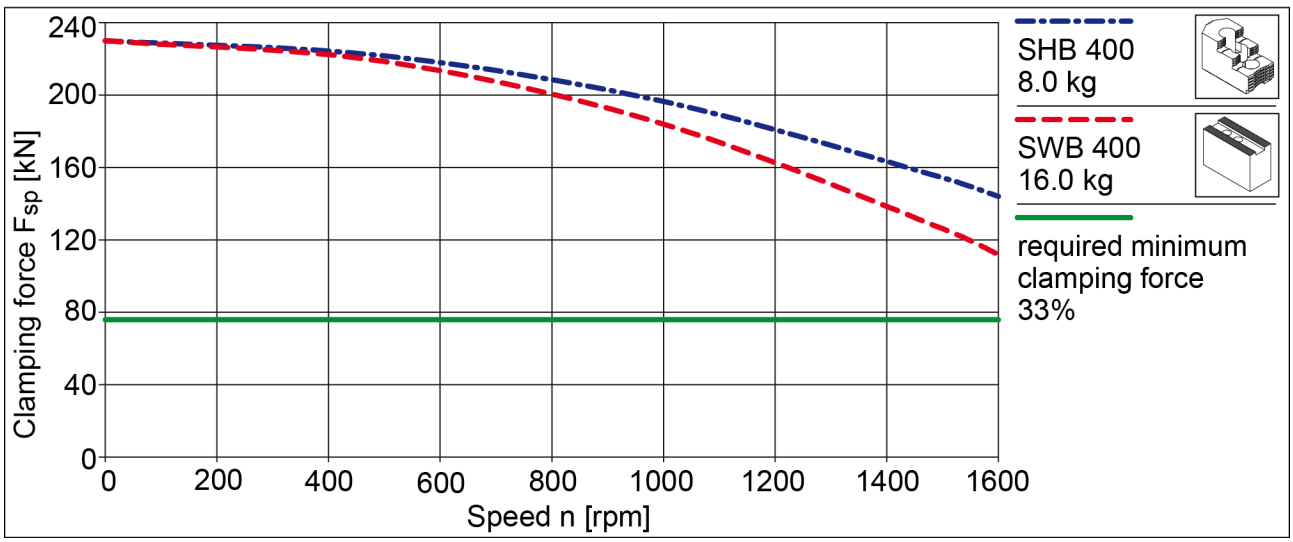
Clamping force-RPM-diagram ROTA EP 460-185



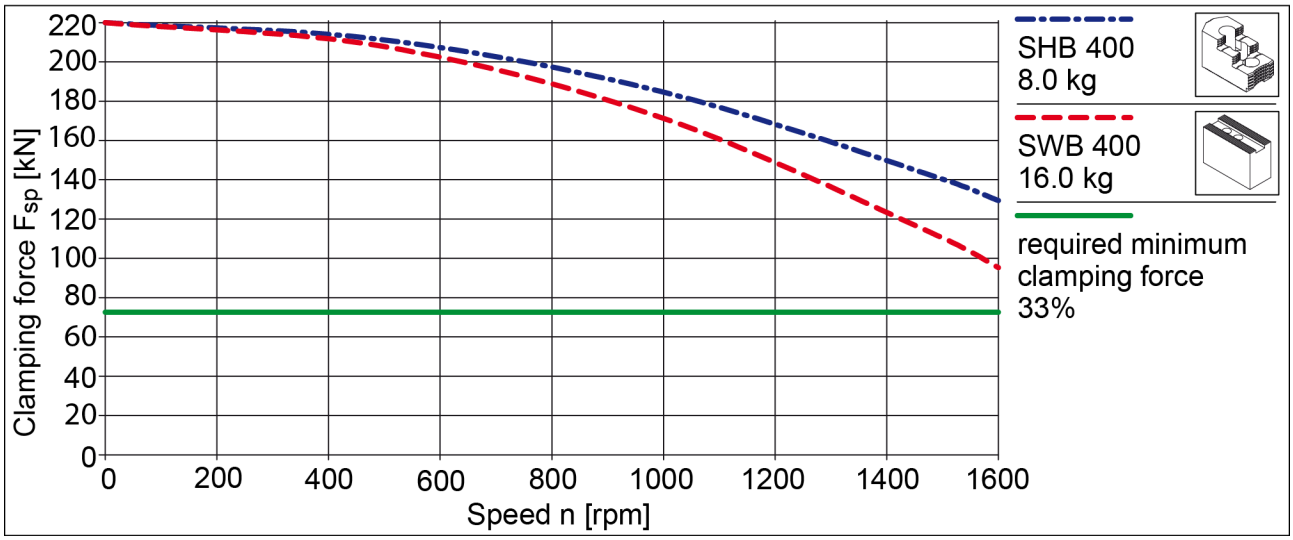
Clamping force-RPM-diagram ROTA EP 500-260



Clamping force-RPM-diagram ROTA EP-LH 460-165



Clamping force-RPM-diagram ROTA EP-LH 460-185



3.3 Calculations for clamping force and speed

Missing information or specifications can be requested from the manufacturer.

Legend			
F_c	Total centrifugal force [N]	M_{cAB}	Centrifugal torque of top jaws [Kgm]
F_{sp}	Effective clamping force [N]	M_{cGB}	Centrifugal torque of base jaws [Kgm]
F_{spmin}	minimum required clamping force [N]	n	Speed of rotation [RPM]
F_{sp0}	Initial clamping force [N]	r_s	Center of gravity radius [mm]
F_{spz}	Cutting force [N]	r_{sAB}	Center of gravity radius of top jaw [mm]
m_{AB}	Mass of one top jaw [kg]	s_{sp}	Safety factor for clamping force
m_B	Mass of chuck jaw set [kg]	s_z	Safety factor for machining
M_c	Centrifugal torque [kgm]	Σ_s	Max. clamping force of lathe chuck [N]

3.3.1 Calculation of the required clamping force in case of a given rpm

The initial clamping force F_{sp0} is the total force impacting radially on the workpiece via the jaws due to actuation of the lathe chuck during shutdown. Under the influence of rotation, the jaw mass generates an additional centrifugal force. The centrifugal force reduces or increases the initial clamping force depending on whether gripping is from the outside inwards or from the inside outwards.

The sum of the initial clamping force F_{sp0} and the **total centrifugal force F_c** is **the effective clamping force F_{sp}**.

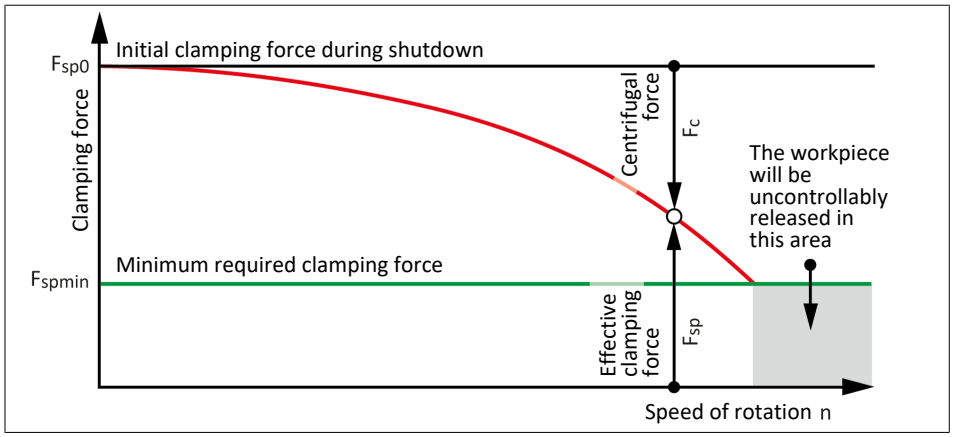
$$F_{sp} = F_{sp0} \mp F_c \text{ [N]}$$

(–) for gripping from the outside inwards
(+) for gripping from the inside outwards

⚠ DANGER

Risk to life and limb of the operating personnel and significant property damage when the RPM limit is exceeded! With gripping from the outside inwards, and with increasing RPM, the effective clamping force is reduced by the magnitude of the increasing centrifugal force (the forces are opposed). When the RPM limit is exceeded, the clamping force drops below the required minimum clamping force F_{spmin}. Consequently, the workpiece is released spontaneously.

- Do not exceed the calculated RPM.
- Do not fall below the necessary minimum clamping force.



Reduction in effective clamping force by the magnitude of the total centrifugal force, for gripping from the outside inwards.

The required effective clamping force for machining F_{sp} is calculated from the product of the **machining force F_{spZ}** and the **safety factor S_z**. This factor takes into account uncertainties in the calculation of the machining force. According to VDI 3106: **$S_z \geq 1.5$.**

$$F_{sp} = F_{spz} \cdot S_z \text{ [N]}$$

From this we can derive the calculation of the initial clamping force during shutdown:

$$F_{sp0} = S_{sp} \cdot (F_{sp} \pm F_C) \text{ [N]}$$

(+) for gripping from the outside inwards
(–) for gripping from the inside outwards

CAUTION

This calculated force must not be larger than the maximum clamping force ΣS engraved on the lathe chuck.

See also "Lathe chuck data" table ▶ 3.1 [🗋 17]

From the above formula it is evident that the sum of the effective clamping force F_{sp} and the total centrifugal force F_c is multiplied by the **safety factor for the clamping force S_{sp}**. According to VDI 3106, the following also applies here: **$S_{sp} \geq 1.5$.**
The **total centrifugal force F_c** is dependent on both the sum of the masses of all jaws and on the center of gravity radius and the rpm.

CAUTION

For safety reasons, in accordance with DIN EN 1550, the centrifugal force may be a maximum of 67% of the initial clamping force.

The formula for the calculation of the total centrifugal force F_c is:

$$F_C = \sum(m_B \cdot r_s) \cdot (\frac{\pi \cdot n}{30})^2 = \sum M_C \cdot (\frac{\pi \cdot n}{30})^2 \text{ [N]}$$

For this, **n is the given speed of rotation** in RPM. The product $\mathbf{m_B \cdot r_s}$ **is referred to as the centrifugal torque $\mathbf{M_c}$.**

$$M_C = m_B \cdot r_S \text{ [kgm]}$$

In case of toolholders with split chuck jaws, i.e., with base jaws and top jaws, for which the base jaws change their radial position only by the stroke amount, the **centrifugal torque of the base jaws $\mathbf{M_{cGB}}$** and the **centrifugal torque of the top jaws $\mathbf{M_{cAB}}$** need to be added:

$$M_C = M_{cGB} + M_{cAB} \text{ [kgm]}$$

The centrifugal torque of the base jaws M_{cGB} can be found in the table "Lathe chuck data"▸ 3.1 [🗋 17]. The centrifugal torque of the top jaws M_{cAB} is calculated as per:

$$M_{cAB} = m_{AB} \cdot r_{sAB} \text{ [kgm]}$$

3.3.2 Calculation example: required initial clamping force for a given speed

Required initial clamping force F_{sp0} for a given RPM n

The following data is known for the machining job:

- Gripping from the outside in (application-specific)
- Machining force F_{spz} = 3000 N (application-specific)
- max. RPM n_{max} = 3200 RPM ("Lathe chuck data" table)
- RPM n = 1200 RPM (application-specific)
- Mass of one (!) top jaw m_{AB} = 5.33 kg (application-specific)
- Center of gravity radius of top jaw r_{sAB} = 0.107 m (application-specific)
- Safety factor S_z = 1.5 (according to VDI 3106)
- Safety factor S_{sp} = 1.5 (according to VDI 3106)

Note: Masses of the jaw mounting screws and T-nuts are not taken into account.

First the required effective clamping force F_{sp} is calculated using the machining force stated:

$$F_{sp} = F_{spz} \cdot S_z = 3000 \cdot 1.5 \Rightarrow \mathbf{F_{sp} = 4500\ N}$$

Initial clamping force during shutdown:

$$F_{sp0} = S_{sp} \cdot (F_{sp} + F_C)$$

Calculation of total centrifugal force:

$$F_c = \sum M_c \cdot (\frac{\pi \cdot n}{30})^2$$

For two-part chuck jaws, the following applies:

$M_c = M_{cGB} + M_{cAB}$

Take the centrifugal torque of the base jaw and top jaw specified from the "Lathe chuck data" table:

M_{cGB} = 0.319 kgm

For the centrifugal torque of the top jaw, the following applies:

$M_{cAB} = m_{AB} \cdot r_{sAB} = 5.33 \cdot 0.107 \Rightarrow$ **M_{cAB} = 0.57 kgm**

Centrifugal torque for one jaw:

$M_c = 0.319 + 0.571 \Rightarrow$ **M_c = 0.89 kgm**

The chuck has 3 jaws, the total centrifugal torque is:

$\sum M_c = 3 \cdot M_c = 3 \cdot 0.889 \Rightarrow$ **$\sum M_c$ = 2.667 kgm**

The total centrifugal force can now be calculated:

$$F_c = \sum M_c \cdot (\frac{\pi \cdot n}{30})^2 = 2.668 \cdot (\frac{\pi \cdot 1200}{30})^2 \Rightarrow \mathbf{F_c = 42131\ N}$$

Initial clamping force during shutdown that was sought:

$F_{sp0} = S_{sp} \cdot (F_{sp} + F_c) = 1.5 \cdot (4500 + 42131) \Rightarrow$ **F_{sp0} = 69947 N**

3.3.3 Calculation of the permissible speed in case of a given initial clamping force

Calculation of the permissible RPM n_{perm} in case of a given initial clamping force F_{sp0}

The following formula can be used to calculate the permissible RPM for a given initial clamping force during shutdown:

$$n_{zul} = \frac{30}{\pi} \cdot \sqrt{\frac{F_{sp0} - (F_{spz} \cdot S_z)}{\sum M_c}}\ [min^{-1}]$$

CAUTION

For safety reasons, the calculated permissible RPM may not exceed the maximum RPM inscribed on the lathe chuck!

Example of calculation: Permissible RPM for a given effective clamping force

The following data is known from previous calculations:

- Initial clamping force during shutdown F_{sp0} = 17723 N
- Machining force for machining job F_{spz} 3000 N (application-specific)
- Total centrifugal torque of all jaws ΣM_c = 2,668 kgm
- Safety factor S_z = 1.5 (according to VDI 3106)
- Safety factor S_{sp} = 1.5 (according to VDI 3106)

NOTE:

Masses of the jaw mounting screws and T-nuts are not taken into account.

Identifying the permissible RPM:

$$n_{zul} = \frac{30}{\pi} \cdot \sqrt{\frac{F_{sp0} - (F_{spz} \cdot S_z)}{\sum M_c}} = \frac{30}{\pi} \cdot \sqrt{\frac{69947 - (3000 \cdot 1.5)}{2.668}} \Rightarrow \mathbf{n_{zul} = 1495\ min^{-1}}$$

The calculated RPM n_{perm} = 1495 RPM is smaller than the maximum permissible RPM of the lathe chuck n_{max} = 3200 RPM (see "Lathe chuck data" table ▶ 3.1 [🗋 17]).

This calculated RPM may be used.

3.4 Grades of Accuracy

Tolerances for radial and axial run-out accuracy correspond to the Technical Supply Terms for lathe chucks as per DIN ISO 3442-3.

3.5 Permissible imbalance DIN ISO 21940-11

The ROTA TB in ungreased state without T-nuts and top jaws corresponds to the balancing quality class 6.3 (according to DIN ISO 21940-11). Residual imbalance risks may arise due to insufficient rotation compensation being achieved (see DIN EN 1550 6.2 e). This applies particularly to high speeds, asymmetrical workpieces or the use of various top jaws, as well as uneven application of lubricants. In order to prevent damage resulting from these residual risks, the entire rotor is to be dynamically balanced in accordance with DIN ISO 21940-11.

4 Mounting

4.1 Torques per screw

Tightening torques for mounting screws used to clamp the chuck on lathes or other suitable technical equipment (screw quality 10.9)

Screw size	M6	M8	M10	M12	M14	M16	M18	M20	M22	M24	M27	M30
Admissible torque M_A (Nm)	13	28	50	88	120	160	200	290	400	500	1050	1500

Tightening torques for mounting screws used to attach top jaws onto the chuck (screw quality 12.9)

Screw size	M6	M8	M10	M12	M14	M16	M20	M24
Max. admissible torque M_A (Nm)	16	30	50	70	130	150	220	450

4.2 Mounting in general

4.2.1 Pre-assembly measures

Carefully lift the product (e.g. using suitable lifting gear) from the packaging.

⚠ WARNING

Risk of injury due to unexpected movements!

If the power supply is switched on or residual energy remains in the system, components can move unexpectedly and cause serious injuries.

- Before starting any work on the product: Switch off the power supply and secure against restarting.
- Make sure, that no residual energy remains in the system.

⚠ CAUTION

Danger of injury due to sharp edges and rough or slippery surfaces

- Wear personal protective equipment, particularly protective gloves.

Check the delivery for completeness and for transport damage.

In order to achieve high run-out accuracy of the chuck, the machine side must be aligned before mounting the chuck. To do this, check the mounting surfaces for radial and axial run-out using a dial indicator.

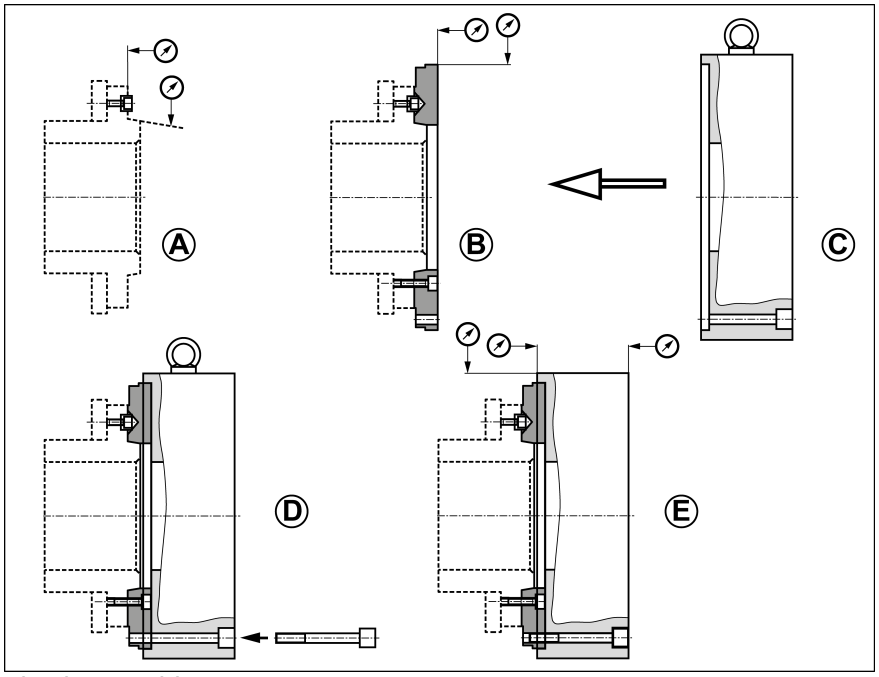
A maximum concentricity error of 0.01 mm should be ensured for the centring of the mount and a maximum axial run-out error of 0.01 mm for the contact surfaces. In addition, the flat surface must be checked for evenness using a straight edge (flat surface deburred and clean at the bore holes).

Radial and axial run-out tolerances of the chuck:

Chuck size [mm]	Max. Radial run-out tolerance [mm]	Max. Axial run-out tolerance [mm]
≤ 315	0.02	0.02
≤ 400	0.03	0.03
≤ 800	0.04	0.04
≤ 1200	0.05	0.05
≤ 1600	0.06	0.06

4.2.2 Chuck assembly options

If the interface of the machine spindle and chuck is identical, assembly is carried out without assembly preparation. If the interface of the machine spindle deviates from the interface of the chuck, a connecting flange must be installed before assembly.



Chuck assembly

- Direct assembly of the chuck to the machine spindle
- Assembly of the chuck with connecting flange
  - Direkt flange (insert ring)
  - Reduction flange
  - Expansion flange

CAUTION

When mounting with the connecting flange, never allow the outer rim of the chuck body to make contact. The flange must support on the entire surface.

CAUTION

Use a crane to install the chuck. Fasten the chuck to the eye bolt provided for this purpose (see Fig. "Chuck assembly" – C) The eye bolt must be removed prior to commissioning.

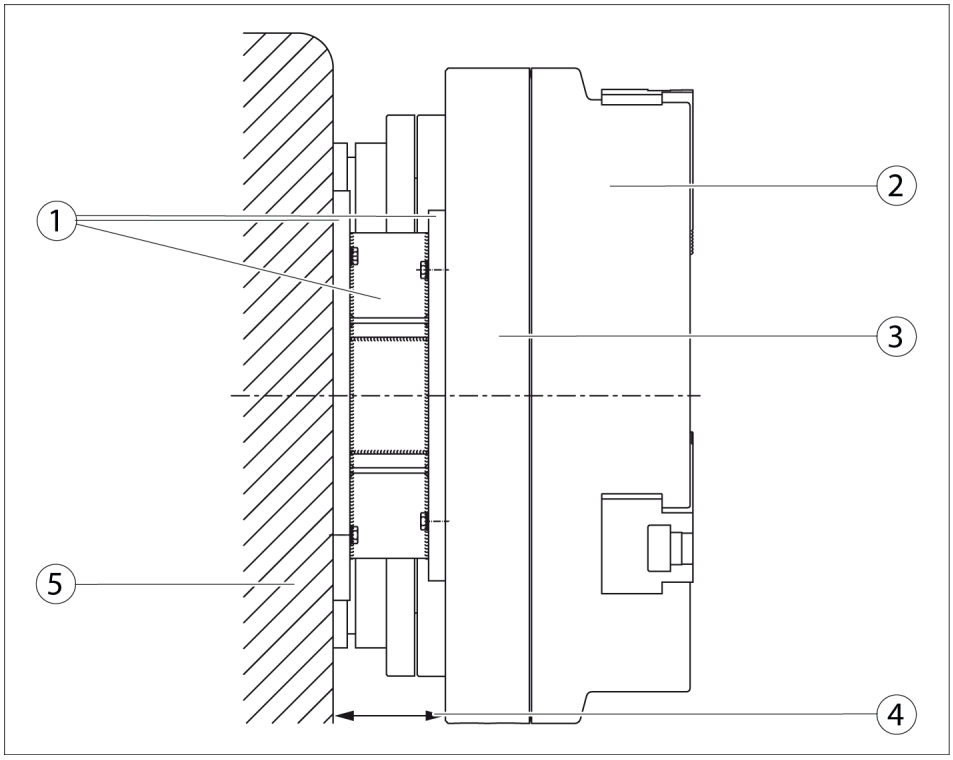
4.3 Distributor ring

The distributor ring is a component that is completely separate from the chuck and is centered and retained on the headstock of the lathe axially and radially by means a spacing console.

Once the chuck has been mounted on the lath spindle nose for the first time, the height dimension of the spacing console is determined. When determining which version of the console to use, it is important to consider whether the front mounting surface on the lathe headstock is machined or unmachined.

CAUTION

The axial labyrinth gap between the chuck body and the distributor ring must be 1.5 mm on all TB chucks. This is the only way to ensure that the air is transmitted properly from the distributor ring to the chuck body.



1	Spacing console	4	Height dimension
2	Chuck	5	Headstock
3	Distributor ring		

4.3.1 Mounting with bracket

The console height dimension is calculated by adding together the distances between the face side of the headstock and that of the distributor ring. If the headstock face surface is machined, the calculated dimension can be taken as the height dimension for the spacing console. If the end face of the headstock is unmachined, the height dimension should be calculated by adding together the individual distances then subtracting 4 – 5 mm. In accordance with the sketch overleaf, the spacing console comprises two shells and is made of suitable steel plate. The main dimensions match the individual chuck sizes, and can be taken from the sketch overleaf.

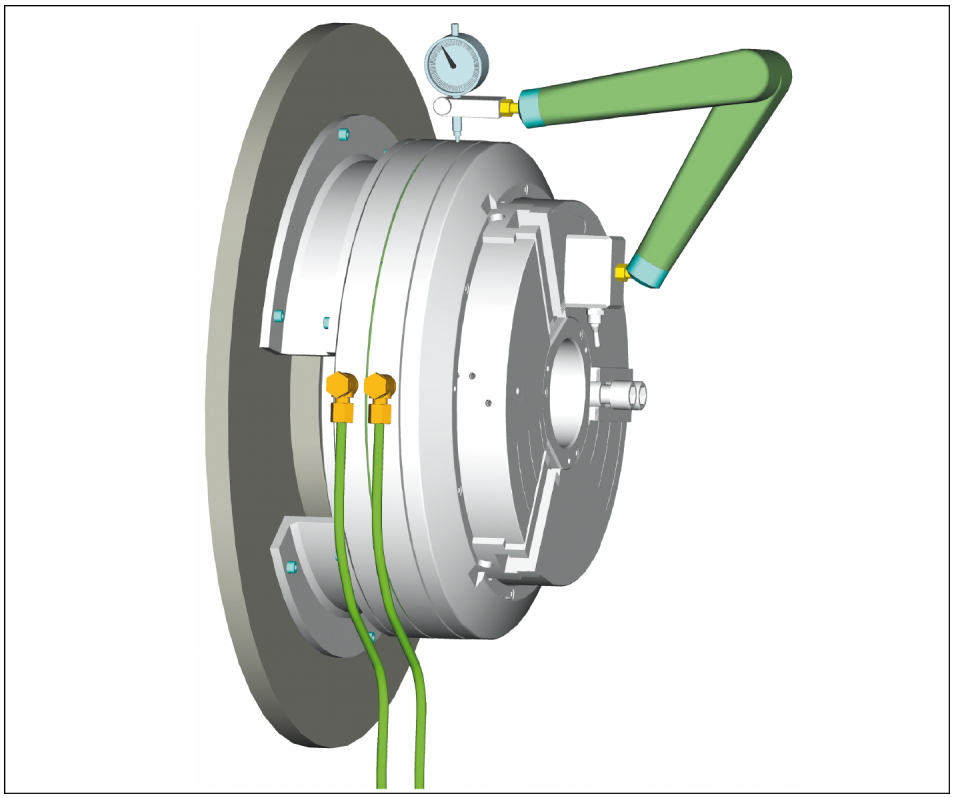
Incidentally, the spacing console can be customized, but it should achieve the stability of the design shown. The spacing console is mounted using 6 M8 threaded holes in the chuck distributor ring, which have been drilled in at a 60° angle. When the threaded mounting holes in the headstock and the holes in the spacing console have been drilled, the spacing console is screwed onto the distributor ring.

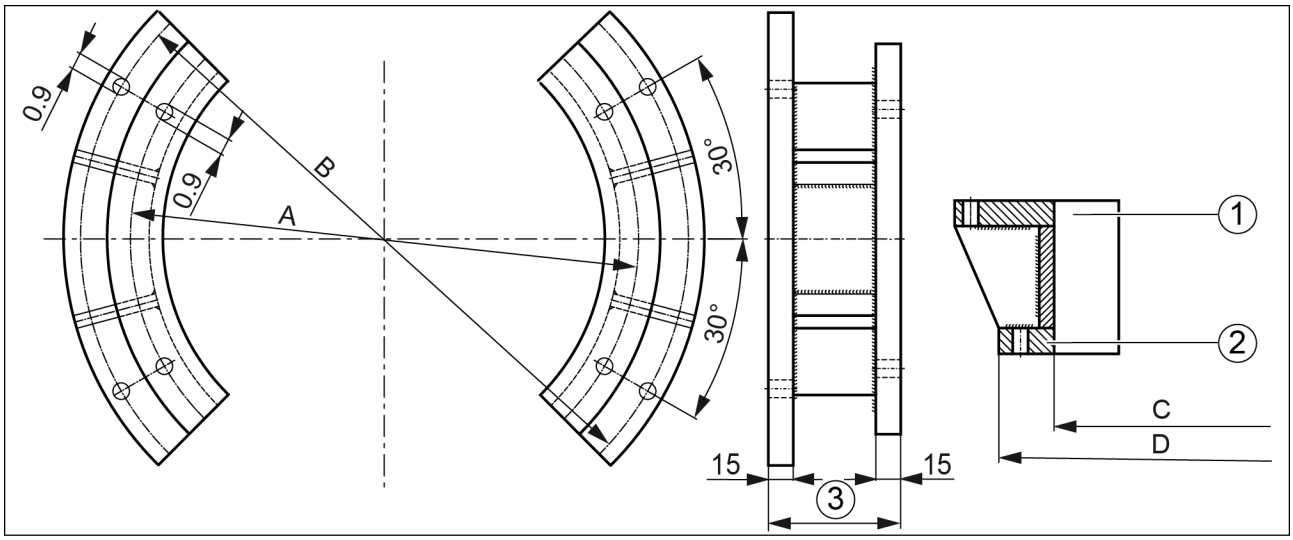
The chuck with the distributor ring and the bolted-on spacing console are now finally mounted on the spindle nose. The outer diameter of the distributor ring matches the max. outer diameter of the chuck. As such, the distributor ring can be centrally aligned with the chuck using a ruler for complete accuracy, then screwed onto it.

CAUTION

The distributor ring must be aligned with the outer chuck diameter in such a way that a radial and axial run-out tolerance of at least 0.1 mm is achieved.

When detaching the chuck from the spindle nose, the spacing console remains attached to the distributor ring, and is only detached from the headstock. No more adjustments must be made to the positioning sleeves. When detaching the chuck from the spindle nose, the spacing console remains attached to the distributor ring, and is only detached from the headstock. No more adjustments must be made to the positioning sleeves.





1	Headstock mounting surface	3	Height dimension
2	Distributor ring mounting surface		

Type	TB-400	TB-500	TB-630	TB-800/850
ØA	448	550	665	830
ØB*	497	600	715	880
ØC	410	510	620	785
ØD	467	570	685	850

* Example only (deviations possible)

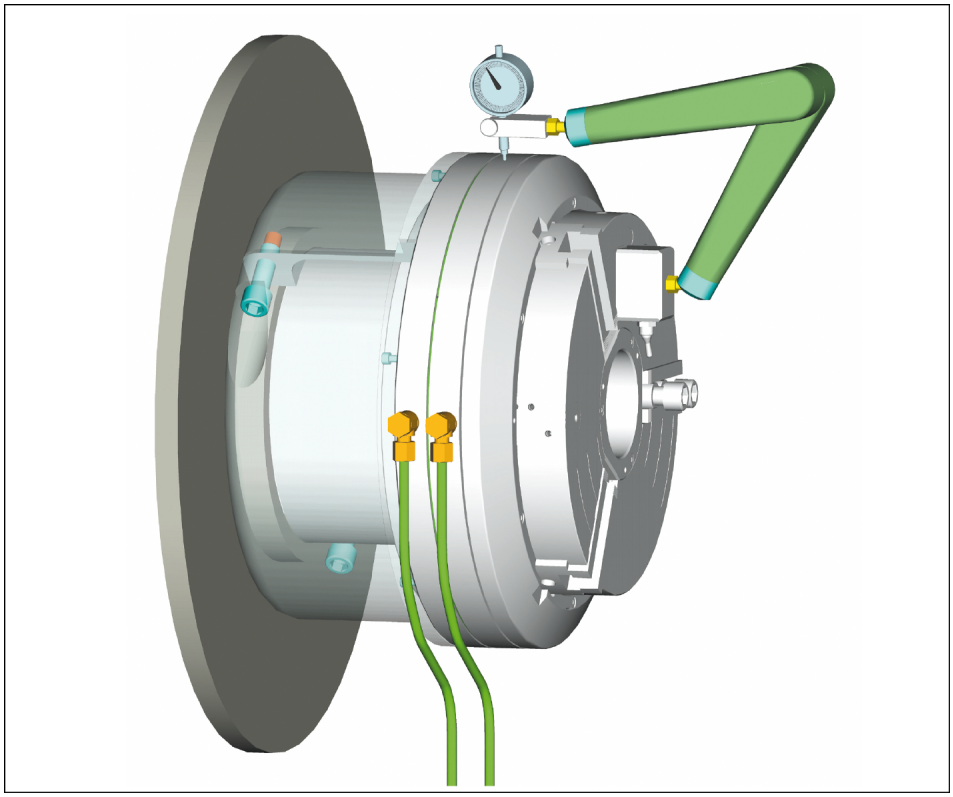
4.3.2 Mounting with 2-part clamping ring (D.R.M.B.)

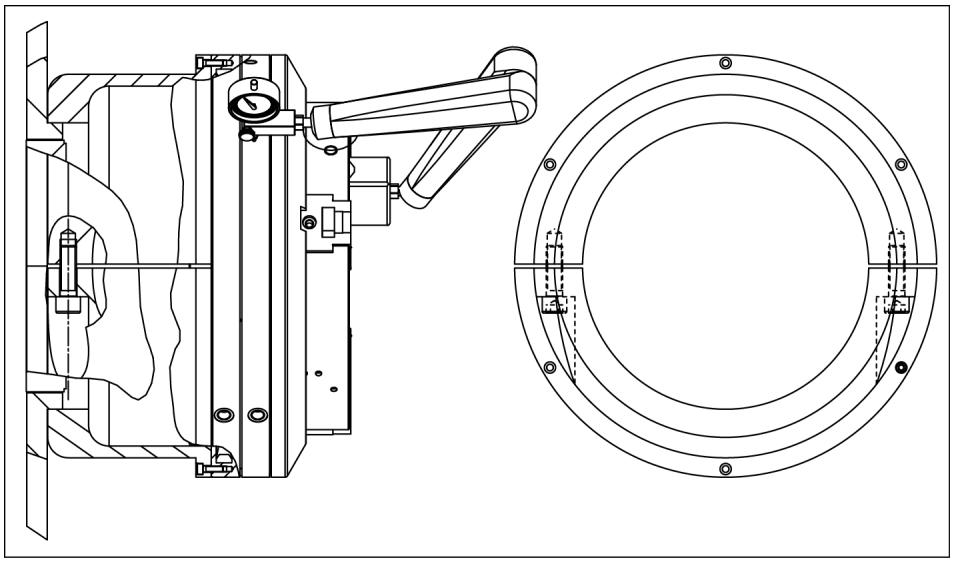
The distributor ring can be clamped onto a rigid collar on the machine (at least 8 mm wide) using a two-piece clamping ring. The distributor ring is clamped onto this collar using two screws. The height of the clamping ring is configured as described in the previous chapter ▸ 4.3.1 [🗋 37].

During assembly, this two-piece clamping ring is first screwed to the threads of the distributor ring. Once this is done, the entire assembly group is clamped onto the rigid collar of the machine. When mounting the chuck with a bayonet or Camlock, the clamping ring should have a cut-out to allow access to the collar nuts or clamping cams using the corresponding wrench.

CAUTION

The distributor ring must be aligned with the outer chuck diameter in such a way that a radial and axial run-out tolerance of at least 0.1 mm is achieved.



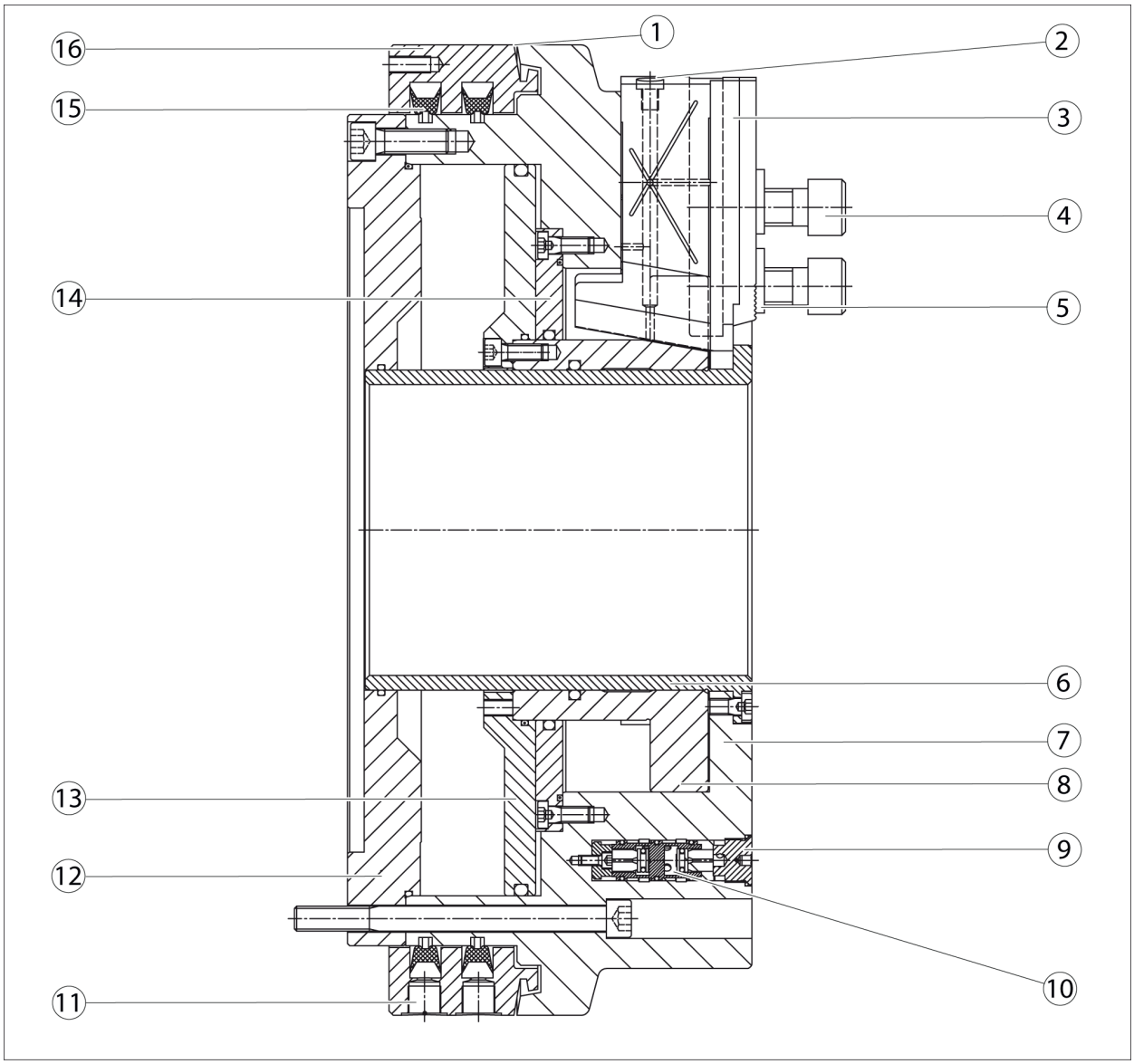


4.4 Attachment

4.4.1 All TB 400 – 850, TB-LH 400 – 850, TB/TB-LH 1000 (2010 or later*)

* TB/TB-LH 1000 for year of construction 2010 or later

For power chuck types TB and TB-LH in size 400 – 850, a chuck flange is mounted on the spindle nose. 12 M12, M16 or M24 hexagon socket screws (for TB-400 9 x 40°) are used to screw the chuck onto the chuck flange by the front face side. The cylindrical recess on the flange must protrude 1 mm from the floor of the cylindrical recess on the mount (depth 8 mm) - i.e. only screwed in only 7 mm deep - to ensure that it touches the outer edge of the chuck. SCHUNK provides standard flanges that can be used to mount the pneumatic chuck on spindles in accordance with DIN 55026, DIN 55027 and DIN 55029.



TB and TB-LH 400 – 850

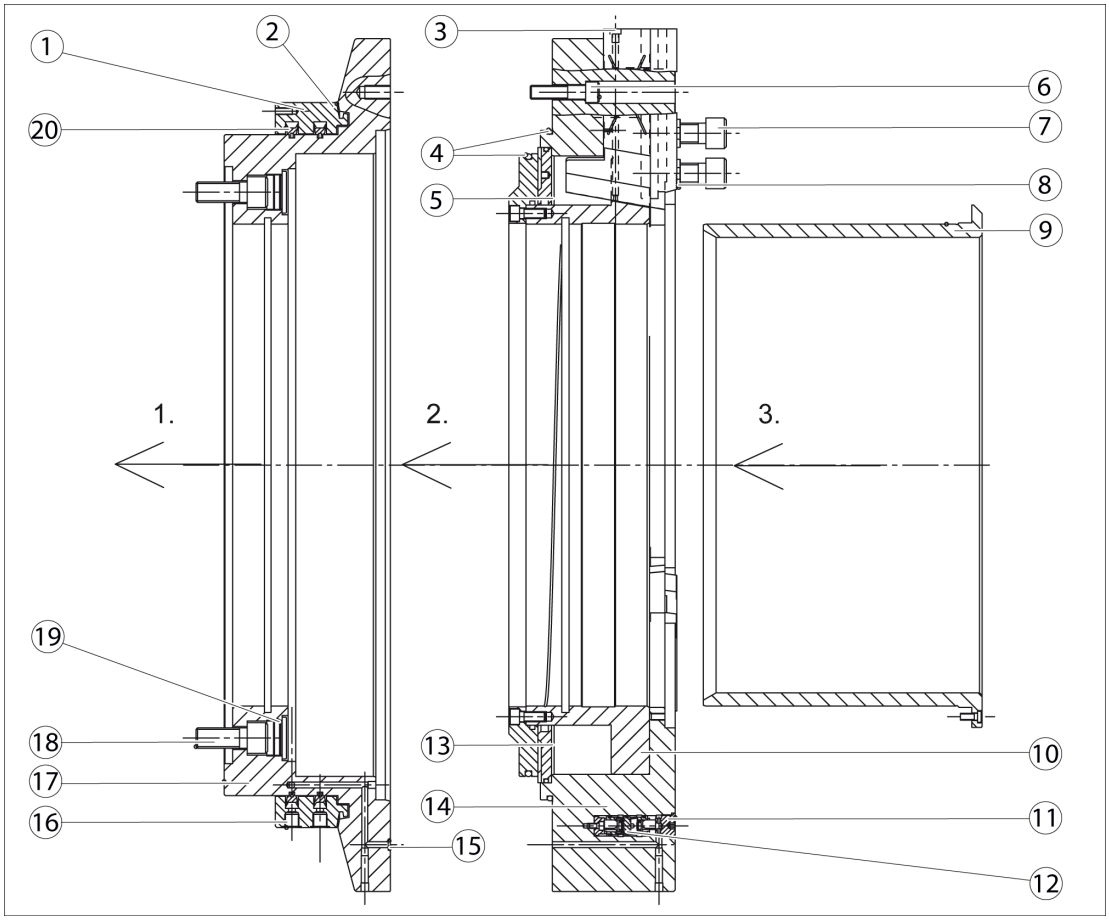
1	Labyrinth gap 1.5 mm	9	Locking screw
2	Lubricating nipple	10	Pilot-controlled check valve
3	Base jaw	11	Pneumatic connection
4	Hexagon socket screw	12	Chuck mount
5	T-nut	13	Piston cover
6	Guide bushing	14	Sealing disk
7	Chuck body	15	Profile seal
8	Piston	16	Distributor ring

4.4.2 All TB/TB-LH 1000 (up to 2009*) and EP/EP-LH

* TB/TB-LH 1000 for year of construction up to 2009

For power chuck types EP, EP-LH, TB and TB-LH in sizes of 1000 and larger, mounting is a several-step process. First, the chuck body is unscrewed and separated from the cylinder. The cylinder is then screwed onto the spindle nose/chuck flange, and the bore holes are sealed using DIN 908 locking screws and copper sealing rings. In order to simplify the mounting procedure, the bushing is removed

from the chuck body. The chuck body cannot be screwed onto the cylinder until this is done. When doing this, pay attention to the three O-rings used to seal the channel bore holes, taking care to ensure that they are mounted properly and not damaged.



TB and TB-LH for size 1000 and larger - all EP and EP-LH

1	Distributor ring	11	Locking screw
2	Profile gap 1.5 mm	12	Pilot-controlled check valve
3	Lubricating nipple	13	Piston cover
4	O-rings	14	Chuck body
5	Sealing disk	15	O-rings
6	Screw (for mounting chuck body on cylinder)	16	Pneumatic connection
7	Cylindrical screw with hexagon socket	17	Cylinder
8	T-nut	18	Screw for mounting cylinder on flange or spindle
9	Guide bushing	19	DIN 908 locking screw and copper seal
10	Piston	20	Profile seal

In order to prevent the chuck from being subjected to greater loads, the centering mount can be replaced with one that has a short taper and is suitable for direct mounting on the spindle nose using a bayonet (DIN 55027) or Camlock (DIN 55029). The inner and outer O-rings that are used for static sealing must be taken into account if doing this. The guide bushing can only be mounted with screws once this is done.

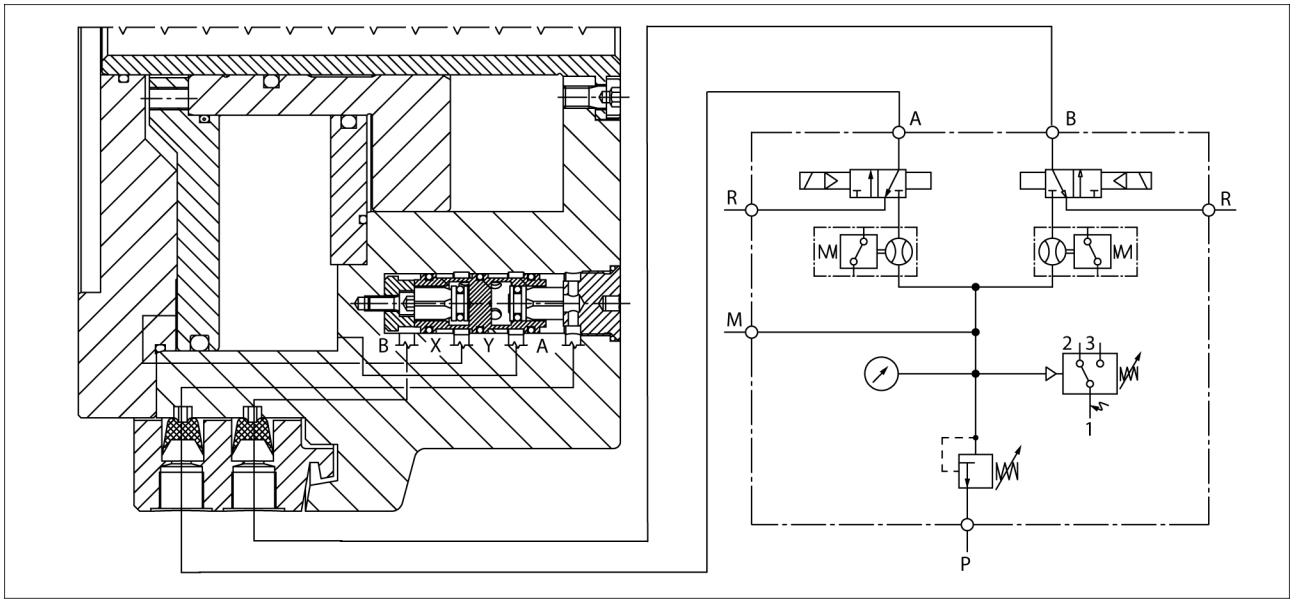
5 Function

The item numbers specified for the corresponding individual components relate to the chapter Drawings, ▶ 14 [🗋 63].

5.1 Principle of Operation

The problem of air supply was solved by a stationary distributor ring with profile ring seals arranged therein. Openings in the two elastic radially deformable profile seals allow the compressed air to flow through a non-return valve to one of the two pressure chambers. The pilot controlled non-return valve controls the feeding to one pressure chamber and the simultaneous forced ventilation of the second pressure chamber. This triggers the piston stroke and the base jaws are moved by the wedge hook. The valve system blocks and stores the pressure in the chuck body while the profile seals, due to their elasticity, are raised from the chuck body by the ventilation of the supply lines and therefore are not subject to wear from the rotating chuck.

5.2 Air transmission system



Air transfer takes place only when the headstock spindle is at a standstill, via profile seals provided radially in the distributor ring. The profile seal is designed so that the outer upper section of the surface is larger than the surface of the openings. Upon pressurization the difference in surface area exerts a radial force on the profile seal in the ring-shaped chamber of the distributor ring, resulting in optimal static sealing of the profile seal at the air transfer point. This allows low-loss flow of the air through the openings in the profile seal into the cylinder chamber of the chuck.

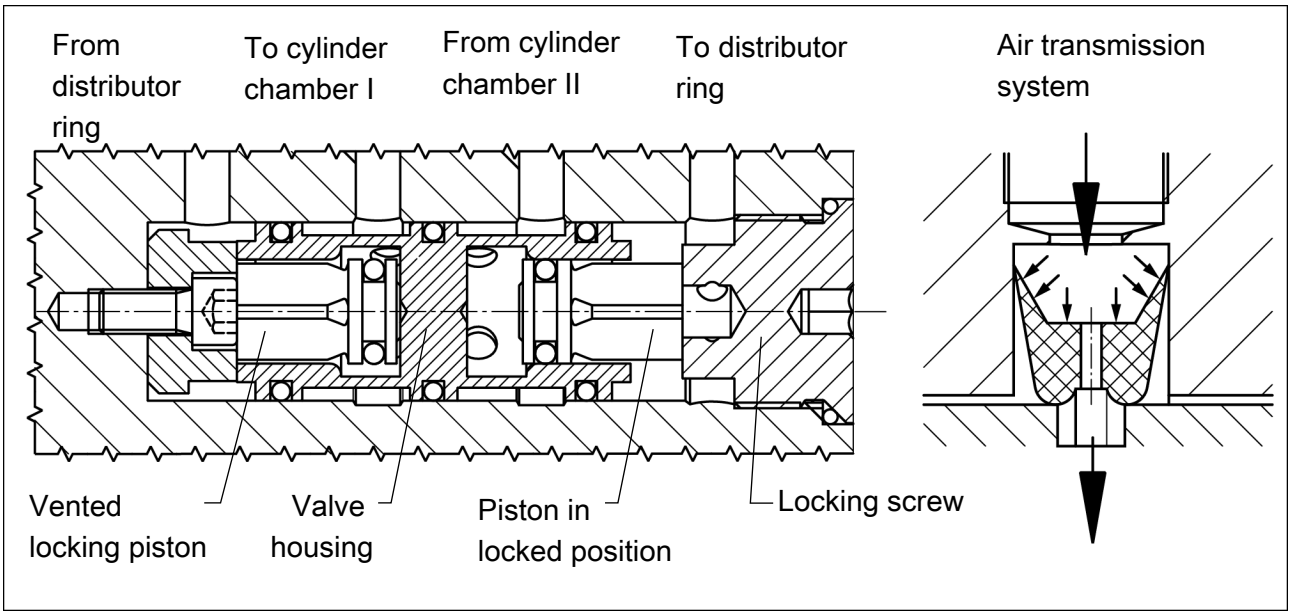
If the supply of compressed air is stopped, the double check valve closes and the pre-tensioned profile seal raises from the chuck body due to its elasticity and is not subjected to wear during rotation of the chuck. The off- and return air out of the opposit cylinder chamber leaves for the most part directly below the associated profile sealing.

CAUTION

During actuation of the clamping device (clamping or releasing) it must be ensured that a short ventilation time is maintained between the switching processes. This ventilation time must last at least 0.5 seconds, depending on the hose length. For this purpose we recommend the use of a 4/3- or 5/3- way valve (central position depressurized).

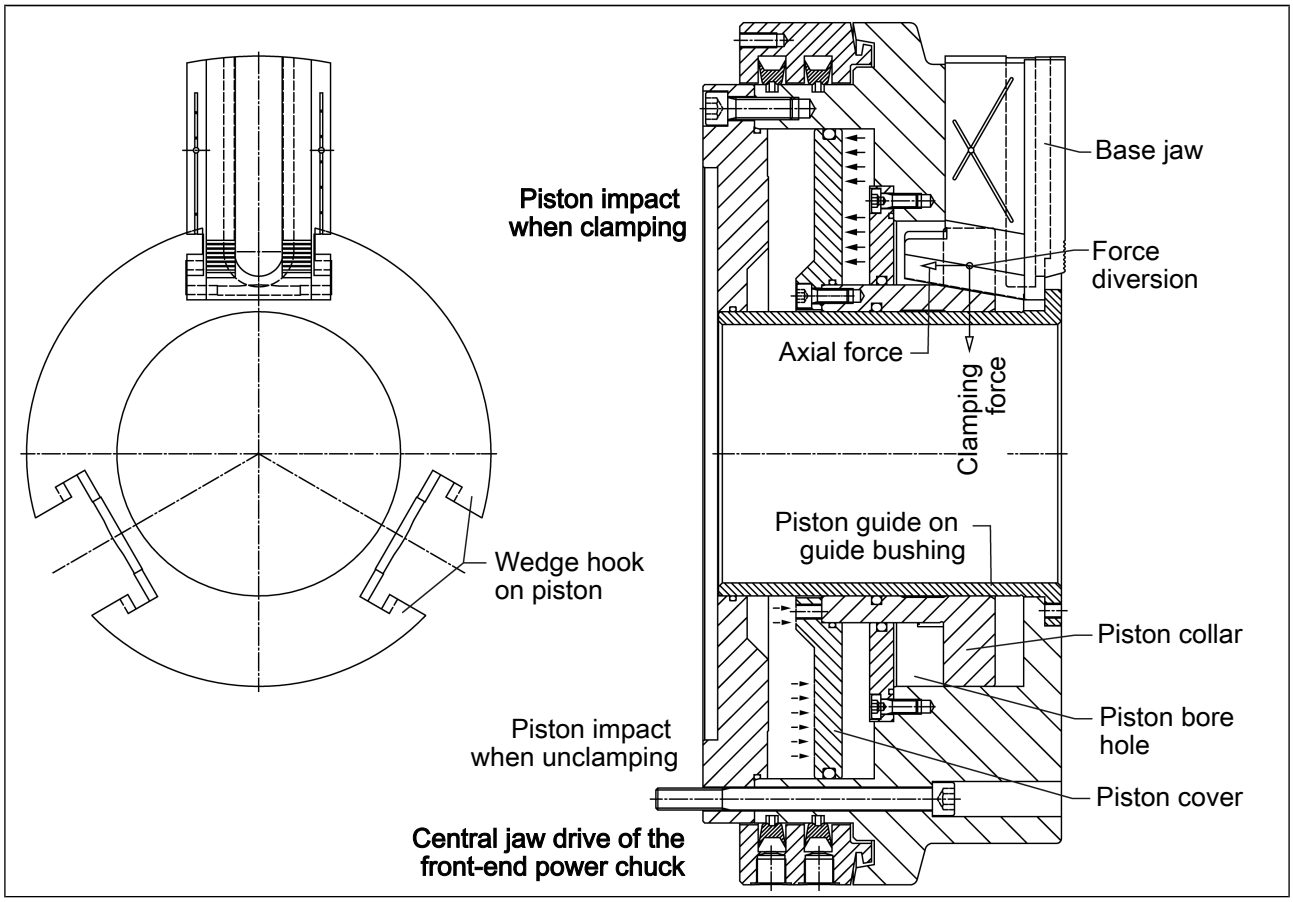
5.3 Pilot controlled check valve

The pilot controlled check valve is a self-contained structural unit consisting of a valve body and two blocking pistons. It can easily be serviced from the face side of the chuck by means of a locking screw. The valve unit controls the flow of two air channels from and to the profile seals through the two blocking pistons. The change of the air flow at the profile seals causes the air channel to one cylinder chamber (release chamber) to be ventilated. The reversal of compressed air from one cylinder chamber to another is caused by the axial movement of the valve body, while the two single blocking or non-return pistons execute only one stroke during blocking of their corresponding cylinder chambers. Both O.D. and I.D. clamping are therefore possible through the entire valve system.



Pilot-controlled check valve

5.4 Clamping or jaw actuation



All three base jaws are centrically driven by a piston with a collar. The force is transmitted on the two-sided, extended and self-locking (10° wedge slant standard) wedge hook or base jaw. The clamping forces are absorbed by the diameter of the piston collar and braced against by the chuck body. Both sides of a piston cover screwed onto the piston neck for clamping and unclamping are pressurized, thus causing the piston cover to trigger the axial motion of the piston.

6 Commissioning and maintenance

6.1 Commissioning

Check that the jaw guides and the piston of the ROTA B-type power chuck are sufficiently lubricated at the lubrication nipples set into the base jaws; if not, relubricate LINOMAX acid-free grease with the base jaws in the retracted position. When the chuck is dried out, the clamping force is significantly reduced.

A locking screw with a hexagon socket is located on the front face side of the chuck. Behind the locking screw, the pilot-controlled non-return valve controls the pressurization and venting of the two pressure chambers and blocks the pressure from the outside. It is very important that the bore hole of the valve system be lightly lubricated with oil so that the valve system can move easily. Too much grease lubrication and dirt in the valve bore hole will significantly impair the function of the chuck, and should be avoided.

CAUTION

When actuating the clamping device (clamping or releasing), allow a short pause for ventilation between each shifting operation. This ventilation pause must be at least 0.5 seconds, depending on the length of the hose. We recommend using a 4/3 or 5/3 directional control valve for this (center position depressurized).

CAUTION

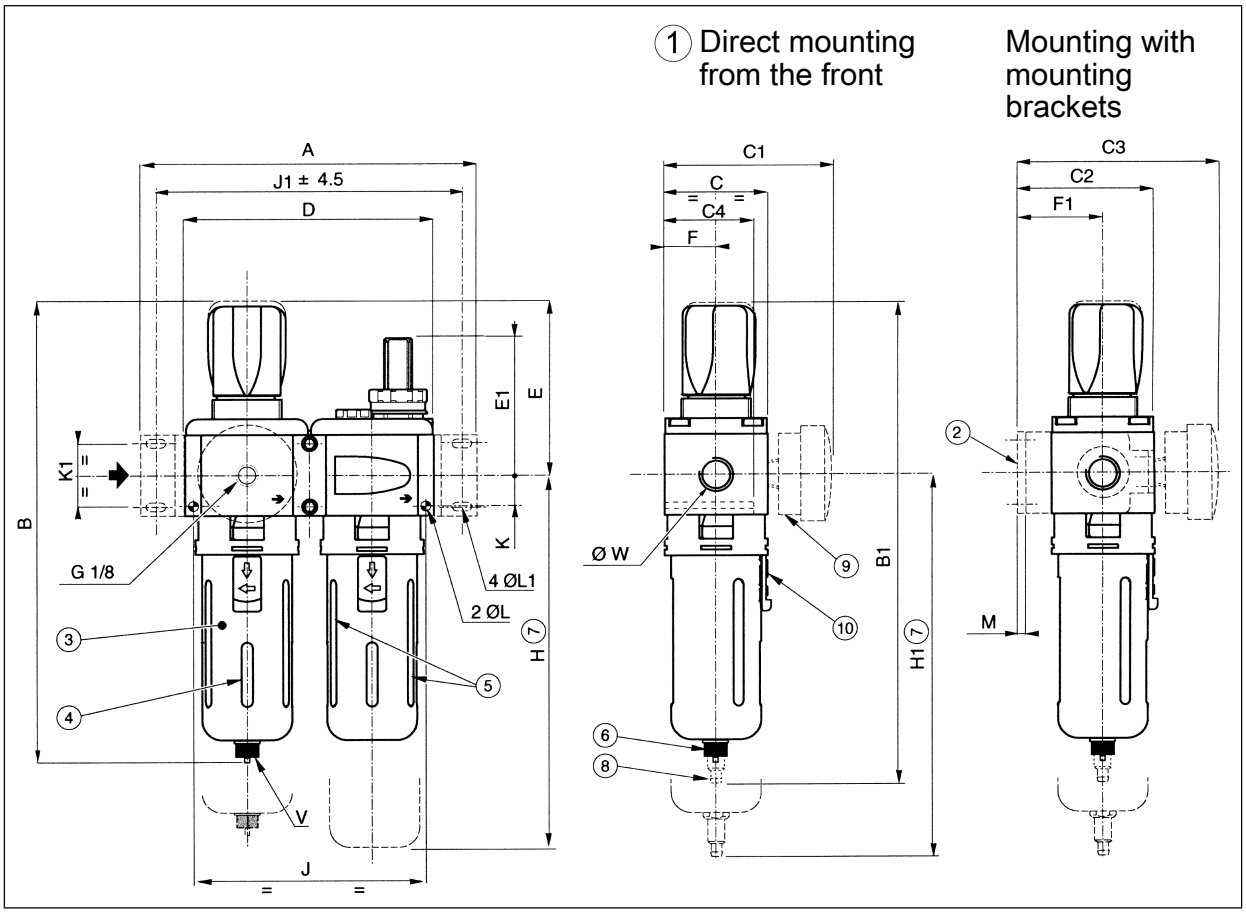
Facing or skimming of the pneumatic power chuck is not permitted. Drilling of the chuck on the front face side may be performed only in accordance with the drilling patterns on the SCHUNK dimension sheets.

6.2 Maintenance

A type WEH maintenance unit, consisting of filter, water separator, and oiler, must be connected upstream of the power chuck. The air enriched with oil supplies all sliding parts of the cylinder chamber with an oil film. The oil level of the oil tank must be checked daily, and oil must be added if necessary. If the oil consumption is too low, i.e. if the oil level does not visibly drop over a period of 2–3 days, the oil adjustment screw must be opened slightly. Depending on the accumulation of condensation, the condensation drain screw must be opened occasionally.

2-part maintenance unit, type WEH with filter, oiler, and pressure control valve

Type	WEH-1
ID number	0890021
Technical Data	
Oil type	Shell Tellus S2 MA 32 Esso Febis
Connection	G 1/4"
Nominal pressure	10 bar



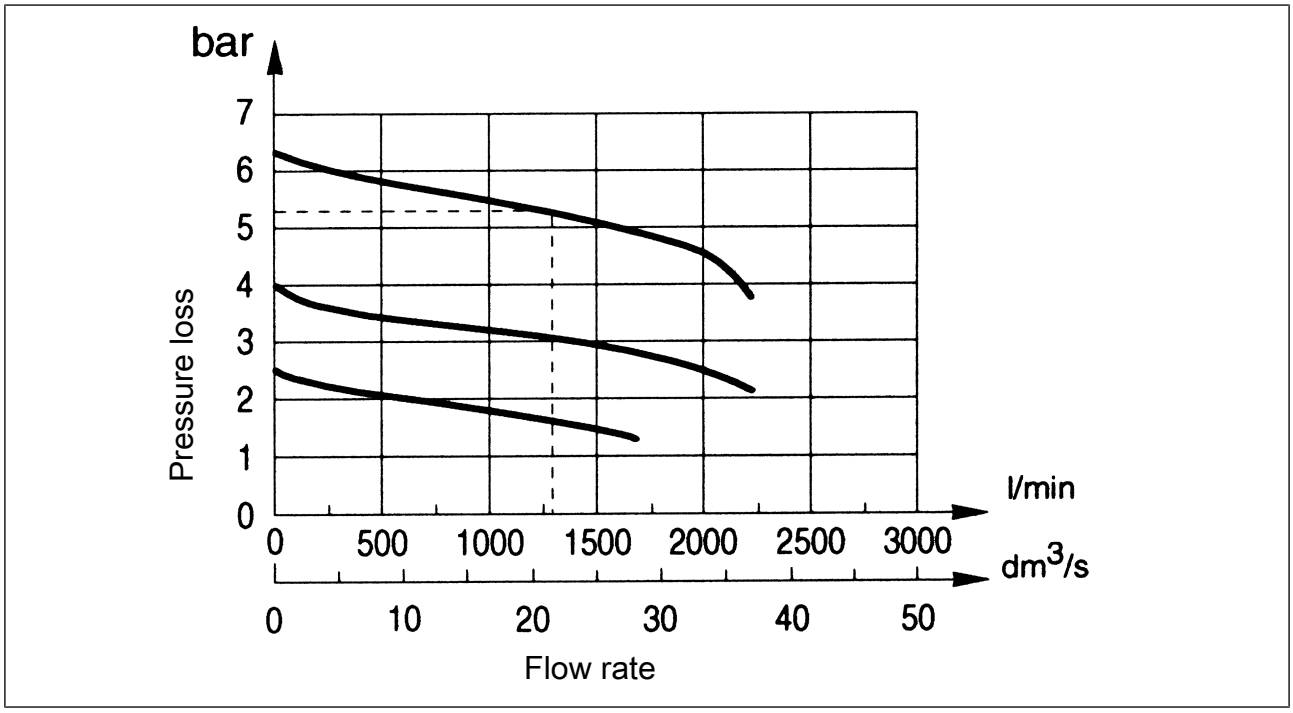
1	Mounted directly from front: 2 bore holes Ø L, depth C4	7	Required distance for removing the container
2	Lateral mounting with two retaining brackets (accessories)	8	Automatic condensate drain can be connected by means of a hose with inner Ø 6
3	Protective metal cage with container made of transparent polycarbonate	9	Pressure gauge, Ø 40
4	Fill level indication for condensate (small inspection port)	10	Protective cage lock
5	Fill level indication for oil – min./max. (large inspection port)	11	Distributor module as accessory: with two connections (Ø T) at front and rear and one already mounted center plug
6	Semi-automatic condensate drain, G 1/8 connection		

Ø W	G 1/4"	D	84	K	10
Container	7 cl	D1	42	K1	28
A	125	E	89	Ø L	4.1
B	213	E1	65	Ø L1	4.5
B1	–	F	21	M	3
C	42	F1	40	Ø T	G 1/8"
C1	76	H	215	V	G 1/8"
C2	61	H1	–	Weight [kg]	0.760 (weight without pressure gauge)
C3	95	J	74		
C4	38	J1	110.5		

Basic setting for oiler

Chuck type	Air consumption/jaw stroke at 6 bar	Clamping strokes	Number of oil drops	Oil amount
ROTA TB 400 to ROTA TB 1200	5–11 liters	1000	approx. 1000	approx. 50000 mm^3 = 0.05 liter

Flow rate characteristic curves and pressure drops



Cleaning and lubrication of the lathe chuck

The even clamping force, accuracy, and life span of the chuck depend greatly on regular cleaning and sufficient lubrication. Rust, scale, casting dust, and chips produce friction and reduce motion.

Therefore, the lathe chuck must be lubricated with LINOMAX special grease paste at the 3 base jaw lubrication nipples by means of a grease gun after every 20–30 operating hours. The lathe chuck must be actuated two to three times without a workpiece to achieve grease distribution by means of the completely extended jaw stroke.

The valve system of the chuck must be occasionally lightly lubricated with oil after the locking screw has been removed on the face side of the chuck. The non-return valve is removed from the bore hole, and the bore hole and the valve are cleaned to remove dirt and any foreign bodies.

The fine serration of the base jaws and top jaws must be cleaned when the hardened reversible jaws or soft top jaws are adjusted, because otherwise the run-out accuracy will be reduced.

Foreign matter, such as rust, scale, casting dust, and fine chips, penetrates into almost every chuck, even though there is optimum sealing provided by the hardened guide bushing in the through-hole and by the closed base jaws. Coolant washes away lubricant. Therefore, every lathe chuck occasionally must be completely disassembled, cleaned, and lubricated, and the sealing rings replaced. The time for which the chuck can be used before full maintenance is required depends on the level of dirt it accumulates and the clamping frequency. As such, it is not possible to specify a generally applicable rule for this.

Please regularly check the lathe chuck for tightness by applying a clamping force tester over a longer period of time (> 10 min.). The clamping force should not drop during this period. Please adjust the inspection interval to the operating conditions of the clamping device. We recommend conducting a check every 5,000 clamping cycles at the latest however.

6.3 Maintenance and lubrication plan

The specified intervals are guide values and must be adjusted by the operator depending on the ambient and operating conditions and the frequency of use of the clamping device used. In order to determine a suitable lubrication interval for the respective application, it is recommended to carry out a regular clamping force test. If only 80% of the maximum clamping force is reached, the clamping device must be lubricated. In accordance with VDI 3106, it must be ensured that sufficient clamping force is available for the application.

Maintenance task	Strain	Interval
Lubricate	normal / coolant utilization	Daily / every 16 hours*
	high / coolant utilization	1x per shift / every 8 hours*
Check clamping force		To be determined by the operator
Complete cleaning / disassembly	depending on soiling	as required / after 1200 hours

* Depending on which event occurs earlier.

6.4 Hardened Reversible Jaws and Soft Top Jaws

The fine serration of the base and top jaws for sizes 400 – 1200 is 3/32" x 90°, so the adjusting stroke from tooth to tooth is 2.4 mm.

Care must be taken to ensure that the top jaws are set on the fine serration in such a way that a maximum of 2/3 of the jaw stroke is extended for clamping (clamping reserve).

Hardened reversible jaws should only be used in sets in accordance with the packaging, as they are ground on the chuck in sets. 1 set of hardened reversible jaws is normally ordered for a chuck. When installing and removing the reversible jaws numbered 1 to 3, make sure that the individual jaws are installed/removed on/from the base jaws with the same designation in order to ensure a high level run-out accuracy.

The soft top jaws are turned on the chuck in the same clamping position and under the same operating pressure as are used for machining the workpiece. When doing this, it is important to ensure that all the mounting screws are screwed in tightly and evenly.

The fine serration of the base jaws and top jaws should always be cleaned, especially when the top jaws are adjusted, otherwise the run-out accuracy will be impaired. Hardened reversible jaws and soft top jaws must be tightened to the same torque. Insufficient tightening of the top jaws will cause significant run-out inaccuracies!

7 Disassembly and assembly

The item numbers specified for the corresponding individual components relate to the chapter Drawings, ▶ 14 [🗋 63].

7.1 TB 400 – 850, TB-LH 400 – 850, TB/TB-LH 1000 (year of construction 2010 or later)

7.1.1 Disassembly

1. Unscrew both the pneumatic quick coupling pieces from the distributor ring (8), then detach the distributor ring (8) from the spindle nose together with the mount. Screw in the eye bolt (thread on circumference of chuck body) and mount using a cargo crane. Undo the chuck mounting screws (24) and lift the chuck off the spindle nose.
2. Remove both profile ring seals (47) from the distributor ring (8) and check for wear.
3. Carefully unscrew the locking screw (15) and remove the pilot-controlled non-return valve system and O-ring (37).

CAUTION

Pressure in the chuck!

The valve system (13) must be removed before proceeding with disassembly.

4. Check all the O-rings in the valve system for wear and replace them if necessary.
5. Unscrew the hexagon socket screws (23) from the chuck mount (7), then screw 3 of them into the threaded extraction holes provided and use them to extract the mount. Remove the mount and O-rings (39,44).
6. Undo the hexagon sockets screws (25) that connect the piston cover (6) to the piston (3).
7. Screw three hexagon socket screws into the threaded holes on the piston cover (6) and extract the piston cover (6) from the piston (3).
8. On the front side of the chuck, undo the hexagon socket screws (20) on the bushing (4) and pull out the bushing (4) from the front, tapping it lightly from the back of the chuck to move it forward.
9. Remove the sealing disk (5) that is held in place by hexagon socket screws (21) and take out the O-ring (43).
10. The piston (3) can be pulled out of the chuck body (1) and the base jaws (2) can be pulled out of the base jaw guides from the inside, through the piston bore hole in the chuck body.
11. Clean and blow out all parts of the chuck. Check all O-rings for possible damage and wear, and replace them if necessary. Lubricate the cylinder chamber of the chuck with oil. The jaw guides in the chuck body, the base jaws and the piston on the wedge hooks are greased with LINOMAX special grease paste.

SCHUNK offers complete sealing kits for the O-rings.

7.1.2 Assembly

The chuck is assembled in the same way, but in reverse order. Observe the following points when doing this:

1. The base jaws (2), the base jaw guides in the chuck body (1) and the hardened reversible jaws are all numbered 1, 2, and 3. Insert the base jaws (2) in the corresponding guides to achieve the same run-out accuracy.
   NOTE
   The piston wedge hook with the dot marking on the inside is aligned using jaw guide 1.
2. Allow the piston with the O-rings (40) to snap into the base jaw wedge hooks (2) and push it in up to the end of the stroke.
3. Insert the O-ring (43) and sealing disk (5) with O-ring (42) and screw them into the chuck body securely and air-tight using the hexagon socket screws (21).
4. Push the piston cover (6) with O-ring (41) into the piston (3) and tighten the hexagon socket screws (25).
5. Place the chuck on the chuck mount with O-rings (39, 44) and fasten it with hexagon socket screws (23).
6. Lubricate the valve system (13) and valve bore hole with oil, install the valve system, and seal it with the locking screw (15) and O-ring (37).
7. Insert the guide bushing (4) from the front side of the chuck and fasten it tightly using the hexagon socket screws (20).
8. Before inserting the profile ring seals (47) in the slots in the distributor ring, rub them with grease by hand so that they remain elastic. There must be no visible grease residue.
   When re-inserting the profile ring seals (47), ensure the that air passage openings do not overlap with the pneumatic connections on the distributor ring.
9. Mounting the distributor ring (see chapter " Mounting with a 2-piece clamping ring" ▶ 4.3 [🗋 36]).

CAUTION

All parts of the SCHUNK power chuck move easily. As such, hard hammer blows should never be used during assembly.

7.2 All TB/ TB-LH up to size 1000 (until year of construction 2009) and all EP/EP-LH

7.2.1 Disassembly

1. The chuck is still entirely on the machine spindle.
2. Remove the T-nuts (9) from the base jaw.
3. Carefully unscrew the locking screw (15) and remove the pilot-controlled non-return valve system and O-ring (37).

CAUTION

Pressure in the chuck!

The valve system (13) must be removed before proceeding with disassembly.

4. Check all the O-rings in the valve system for wear and replace them if necessary.
5. Unscrew the screws (24) in the chuck and extract the bushing (4) from the chuck body using the extraction threads. Disassemble the bushing completely.
6. Use the supplied eye bolt (thread on circumference) to secure the chuck body (part 1) to a cargo crane.
7. First, undo the screws (21). Remove the locking screws (31) (TB sizes 1000 and larger only). The chuck bodies can now be extracted from the chuck through the cylinder through-hole using three screws. Place the detached part (chuck body with accessories) on the crane with the front face pointing down.
8. Unscrew both the pneumatic quick coupling pieces from the distributor ring, then detach the distributor ring (8) from the spindle nose together with the bracket.
9. Use the eye bolt (thread on circumference) to secure the cylinder body (10) to a cargo crane.
10. Unscrew the locking screw from the cylinder together with the copper sealing rings (18 and 46). Remove the cylindrical screws (27) and set down the cylinder with the spindle side facing down. Remove the O-ring (41) and small O-rings (42) from the cylinder.
11. Remove both profile ring seals (49) from the distributor ring. Check the profile rings for damage.
12. Undo the hexagon socket screws (22) and extract and remove the piston cover (6). Remove the O-rings (36 and 40) check for wear and renew if necessary.

13. On TB sizes 1000 and larger, the sealing disk (5) can now be removed from the chuck. On all EP chucks, the cylindrical screws with copper sealing rings (23 and 48) must first be unscrewed. Remove the O-rings (38 and 39), check for wear and renew if necessary.
14. Pull the piston (3) out of the chuck body using the screws. Remove the O-ring (37), check for wear and renew if necessary.
15. Secure the whole chuck body to a cargo crane with the eye bolt on the circumference, then turn it 180° with the front facing upward.
16. All the base jaws can now be removed from the jaw guide from the inside. The lubricating nipples (28) can be unscrewed from the base jaws.
17. Clean and blow out all parts of the chuck. Check all O-rings for possible damage and wear, and replace them if necessary. The jaw guides in the chuck body, the base jaws and the piston on the wedge hooks are greased with LINOMAX special grease paste.

SCHUNK offers complete sealing kits for the O-rings.

7.2.2 Assembly

The chuck is assembled in the same way, but in reverse order. Observe the following points when doing this:

1. Both the base jaws (2) and the base jaw guides in the chuck body (1) are numbered 1, 2, and 3. Insert the base jaws (2) from the chuck bore hole back into the corresponding jaw guide in the chuck body (1) in order to achieve the same run-out accuracy.
2. Allow the piston with the O-rings (36 and 37) to snap into the base jaw wedge hooks and push them in up to the end of the stroke.

   NOTE

   The piston wedge hook with the dot marking on the inside is aligned using jaw guide 1.
3. Insert the sealing disk (5) with the O-rings (38 and 39) into the chuck body and, if you are working on an EP chuck, evenly tighten the screw with the copper sealing rings (23 and 48) beneath it.
4. Push the piston cover (6) with the O-rings (36 and 40) into the piston (3) and tighten the cylindrical screws (22) evenly.
5. Insert the O-ring (35).

6. Before inserting the profile ring seals (47) in the slots in the distributor ring, rub them with grease by hand so that they remain elastic. There must be no visible grease residue. **When re-inserting the profile ring seals (47), ensure the that air passage openings do not overlap with the pneumatic connections on the distributor ring.**
7. Mounting the distributor ring (see chapter " Mounting with a 2-piece clamping ring" ▶ 4.3 [🗋 36]).
8. Using the supplied eye bolt, hold the cylinder (10) in front of the spindle on the cargo crane, together with the O-ring (41). Screw the cylinder onto the spindle or intermediate flange using the matching cylindrical screws. Install the locking screws with the copper sealing rings beneath them into the cylinder. Insert the three small O-rings (42) into the cylinder.
9. Using the cargo crane, hold the chuck body in front of the spindle nose together with the other accessories, and screw it onto the cylinder using the cylindrical screws (21).
10. Slide the bushing (4) into the chuck and secure it using cylindrical screws (24).
11. Install the double check valve. Fix the sealing cover (16) in place using the screw (19). Carefully insert the valve (13) into the fitting bore up to the stop. Screw the locking screw (15) with the O-ring (45) into the chuck body.

CAUTION

All parts of the SCHUNK power chuck move easily. As such, hard hammer blows should never be used during assembly.

8 Control of types TB / TB-LH / EP / EP-LH

For actuation of the front-end power chuck, a 24V electropneumatic safety control block is available, consisting of a pressure control valve, a pressure switch, 2 magnetic valves with automatic clamping time monitoring including 2 sensors and 2 analysis units.

A maintenance unit consisting of a filter, water separator and oiler must be installed upstream of this control block.

9 TBS, TBS-LH stationary power chucks

CAUTION

No distributor ring,
no check valve,
always continuous pressure

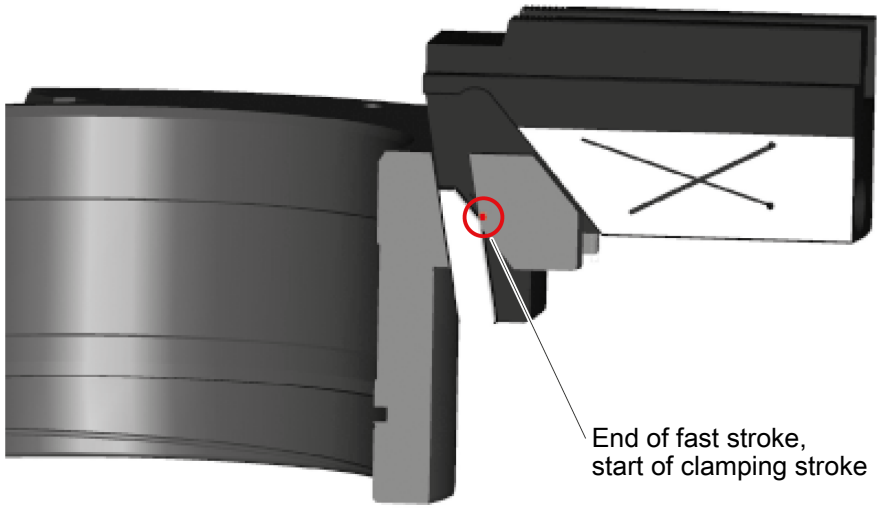
The operating manual for the types TB / TB-LH also applies analogously for the types TBS / TBS-LH. Due to the horizontal chuck utilization, extra care should be taken with respect to lubrication of the base jaws and cleaning of the fine serration.

Instead of the control unit described above, normal 5/2-way valves are used for actuation.

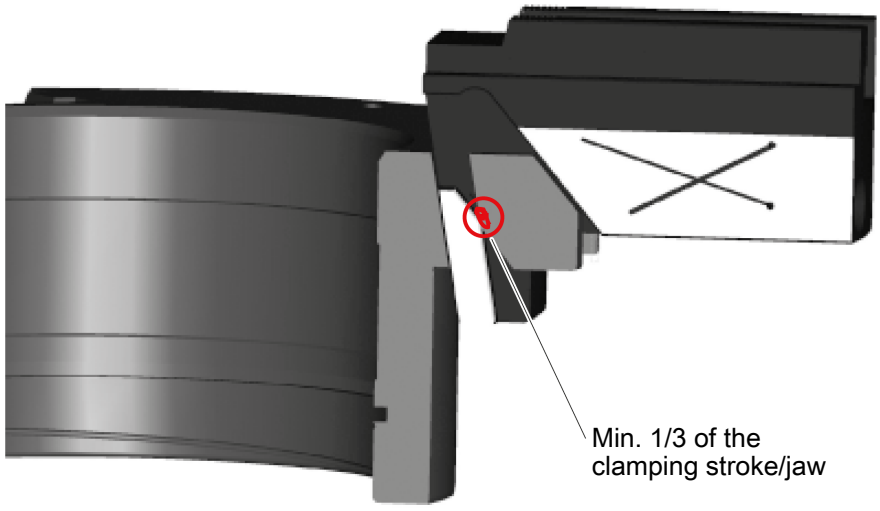
10 Power Chuck with extended and standard jaw stroke (LH)

Lathe chucks with dual stroke system (LH-serie) are not allowed to be used for I.D. clamping. Moreover, no workpieces are allowed to be clamped on the fast jaw stroke, since due to the long jaw strokes the resulting clamping forces are lower (1). Please make sure that the entire fast stroke plus at least 1/3 of the clamping stroke (corresponding to the basic covering) of the TB-LH lathe chuck is executed during workpiece clamping (2).

1



2



11 Storage

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

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

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

12 Disposal

After decommissioning, place the chuck in a position that enables any liquids in the chuck to drain out.

- Collect the escaping liquids and dispose of them properly in line with the statutory provisions.
- Remove any identifiable plastic or aluminum parts installed in or on the chuck and dispose of them properly in line with the statutory provisions.
- Dispose of the chuck's metal parts as scrap metal.

Alternatively, you can return the chuck to SCHUNK for proper disposal.

13 Spare parts

When ordering spare parts, it is essential to specify the type, size and, above all, the serial number of the chuck. **Seals, sealing elements, screw connections, springs, bearings, screws and wiper strips as well as parts that come into contact with the workpiece are not covered by the warranty.**

Spare parts list for all TB 400 – 850 and TB-LH 400 – 850

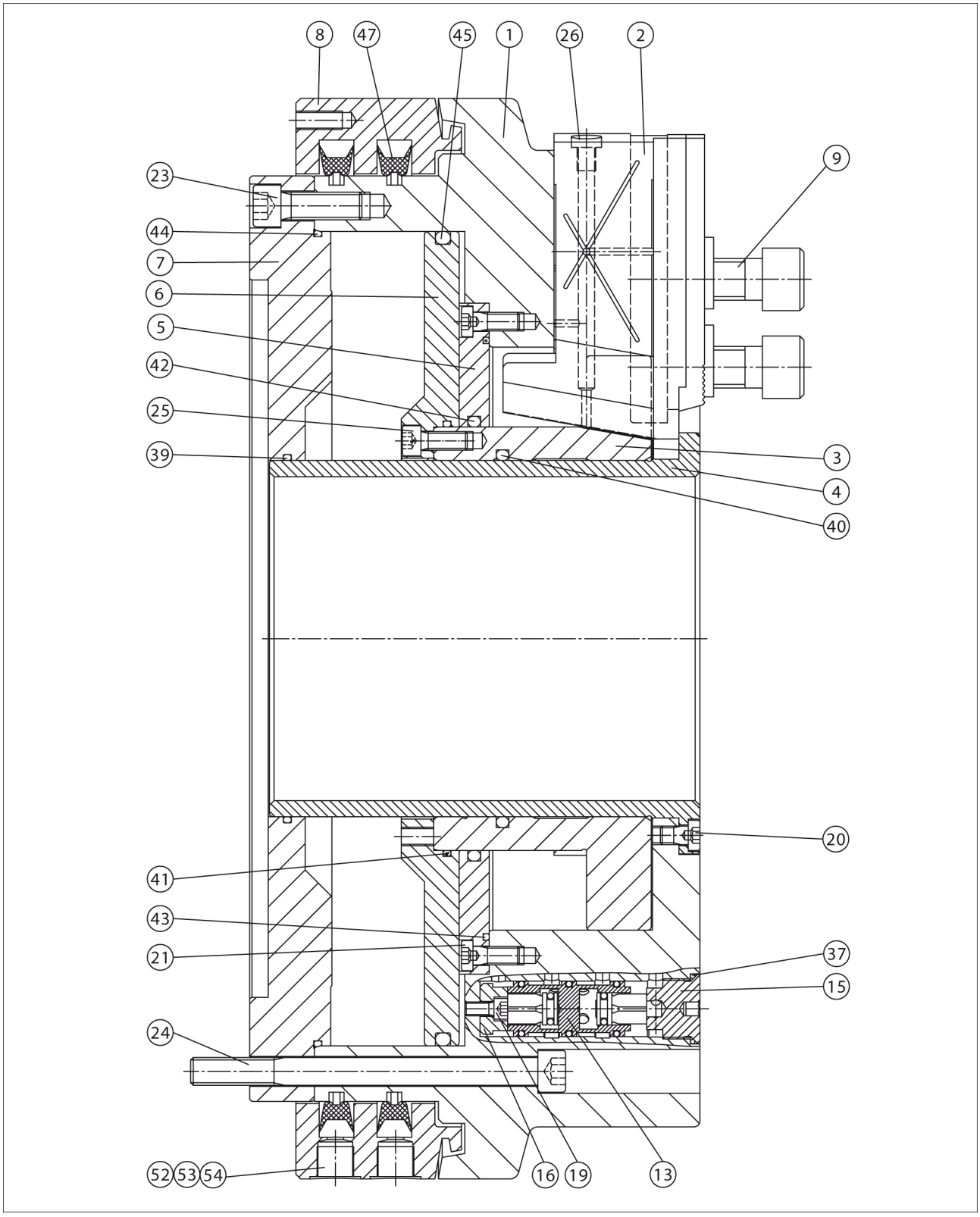
Item	Designation
1	Chuck body
2	base jaw
3	Piston
4	Sleeve
5	Sealing disk
6	Piston cover
7	Cylinder mount
8	Distributor ring
9	T-nuts
13	double check valve
15	Locking screw
16	Filler plug
19	Screw DIN EN ISO 4762/10.9
20	Screw DIN 7984 / 10.9
21	Screw DIN 7984 / 10.9
23	Screw DIN EN ISO 4762 / 10.9
24	Screw DIN EN ISO 4762 / 10.9
25	Screw DIN EN ISO 4762/10.9
26	funnel lubrication nipple
37	O-ring DIN 3771
39	O-ring DIN 3771
40	O-ring DIN 3771
41	O-ring DIN 3771
42	O-ring DIN 3771
43	O-ring DIN 3771
44	O-ring DIN 3771
45	O-ring DIN 3771
47	Profile seal
52	Straight screw connection
53	Swivel fitting
54	Fiber sealing

Spare parts list for all TB / TB-LH from size 1000 and EP / EP-LH

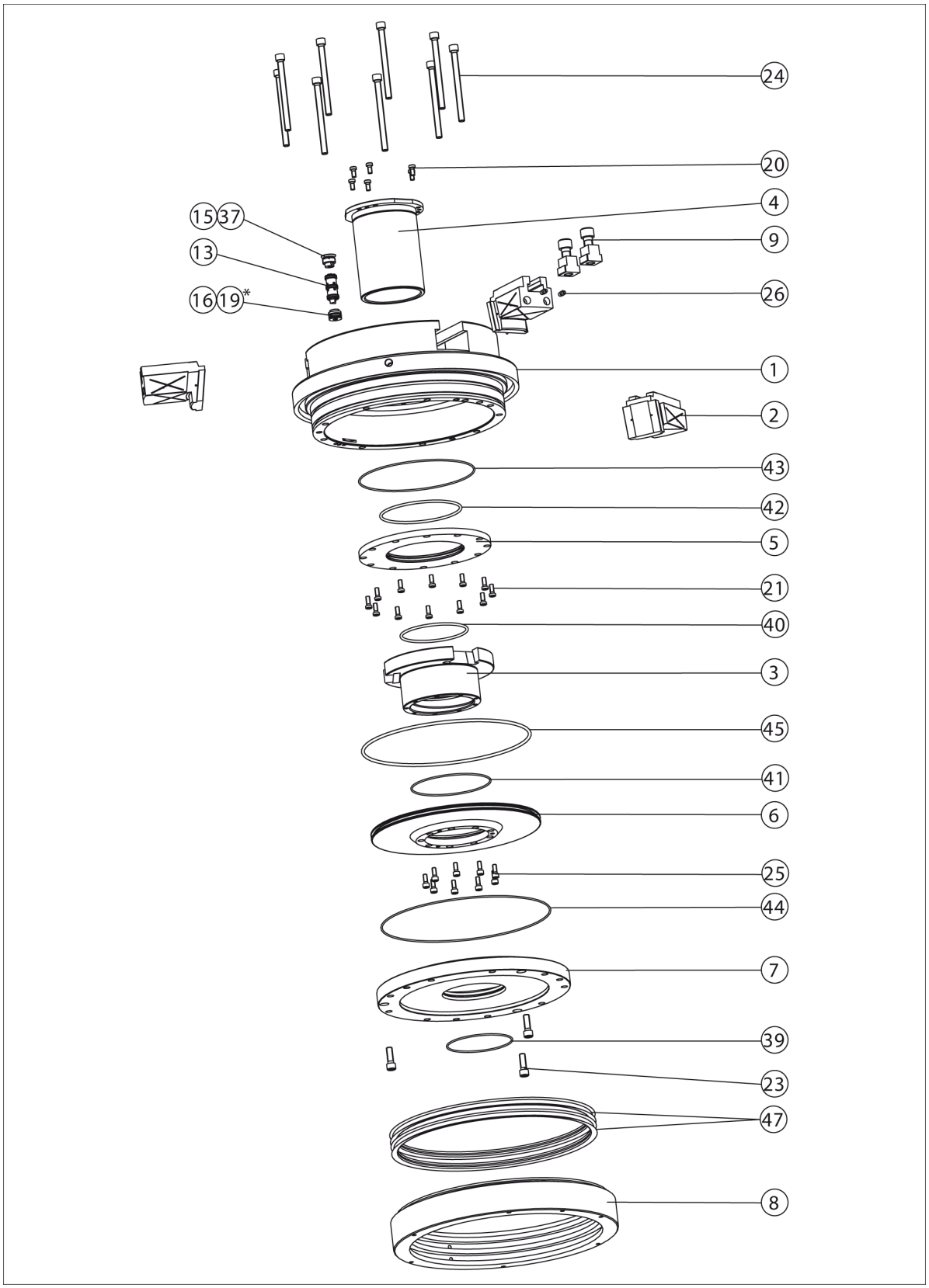
Item	Designation
1	Chuck body
2	base jaw
3	Piston
4	Sleeve
5	Sealing disk
6	Piston cover
7	Cylinder mount
8	Distributor ring
9	T-nuts
10	Cylinder
13	Double check valve
15	Locking screw
16	Filler plug
19	Screw DIN EN ISO 4762 / 10.9
22	Screw DIN EN ISO 4762 / 10.9
23	Screw DIN EN ISO 4762/10.9
24	Screw DIN EN ISO 4762/10.9
25	Screw DIN EN ISO 4762/10.9
28	Funnel- or Hydraulic-type lubrication nipple
35	O-ring
36	O-ring
37	O-ring
38	O-ring
39	O-ring
40	O-ring
41	O-ring
42	O-ring
45	O-ring
46	Copper sealing ring DIN 7603
48	Copper sealing ring DIN 7603
49	Profile ring seal
52	Straight screw connection
53	Swivel fitting
54	Fiber sealing

14 Assembly drawings

TB 400 – 850

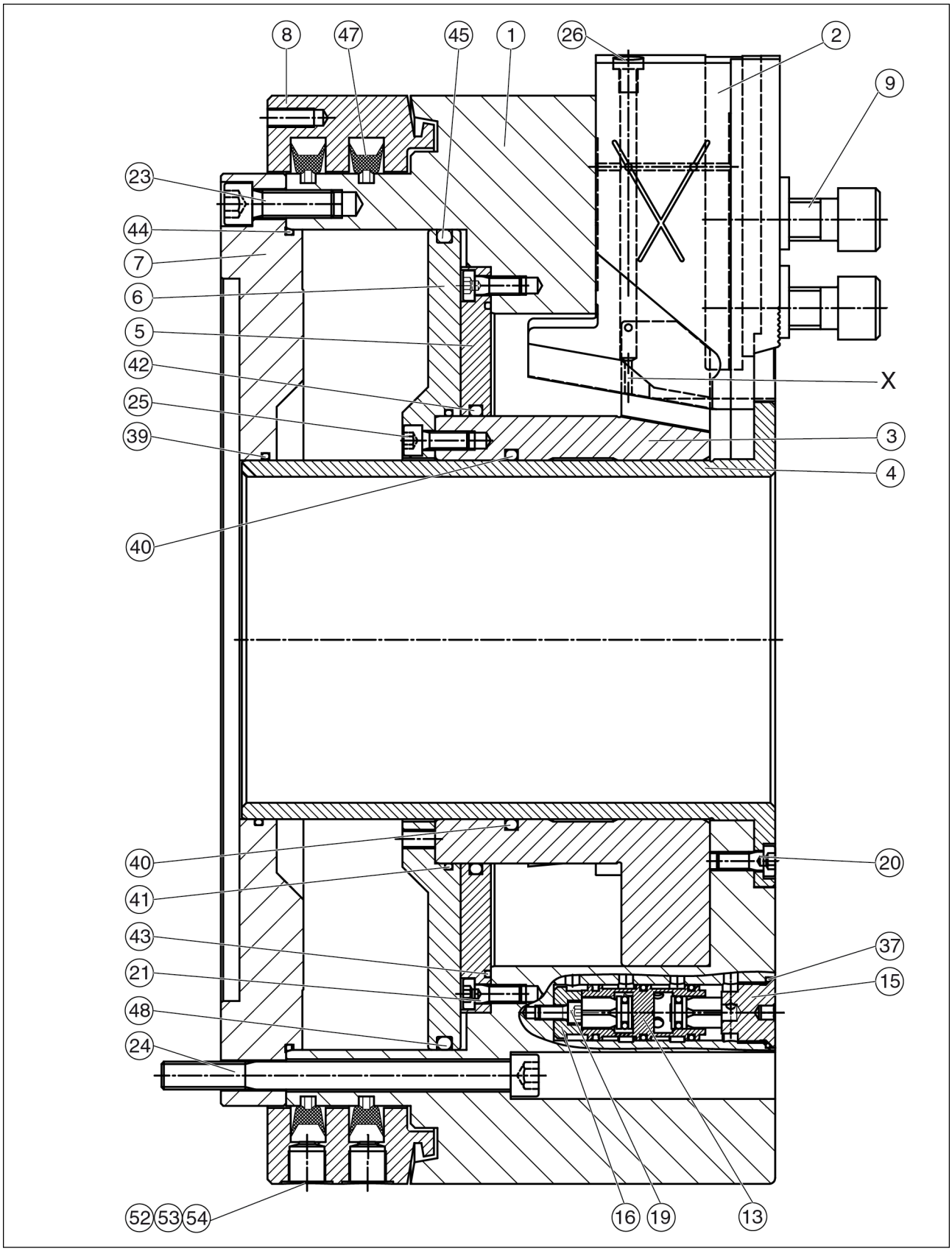


TB 400 – 850 (LH)



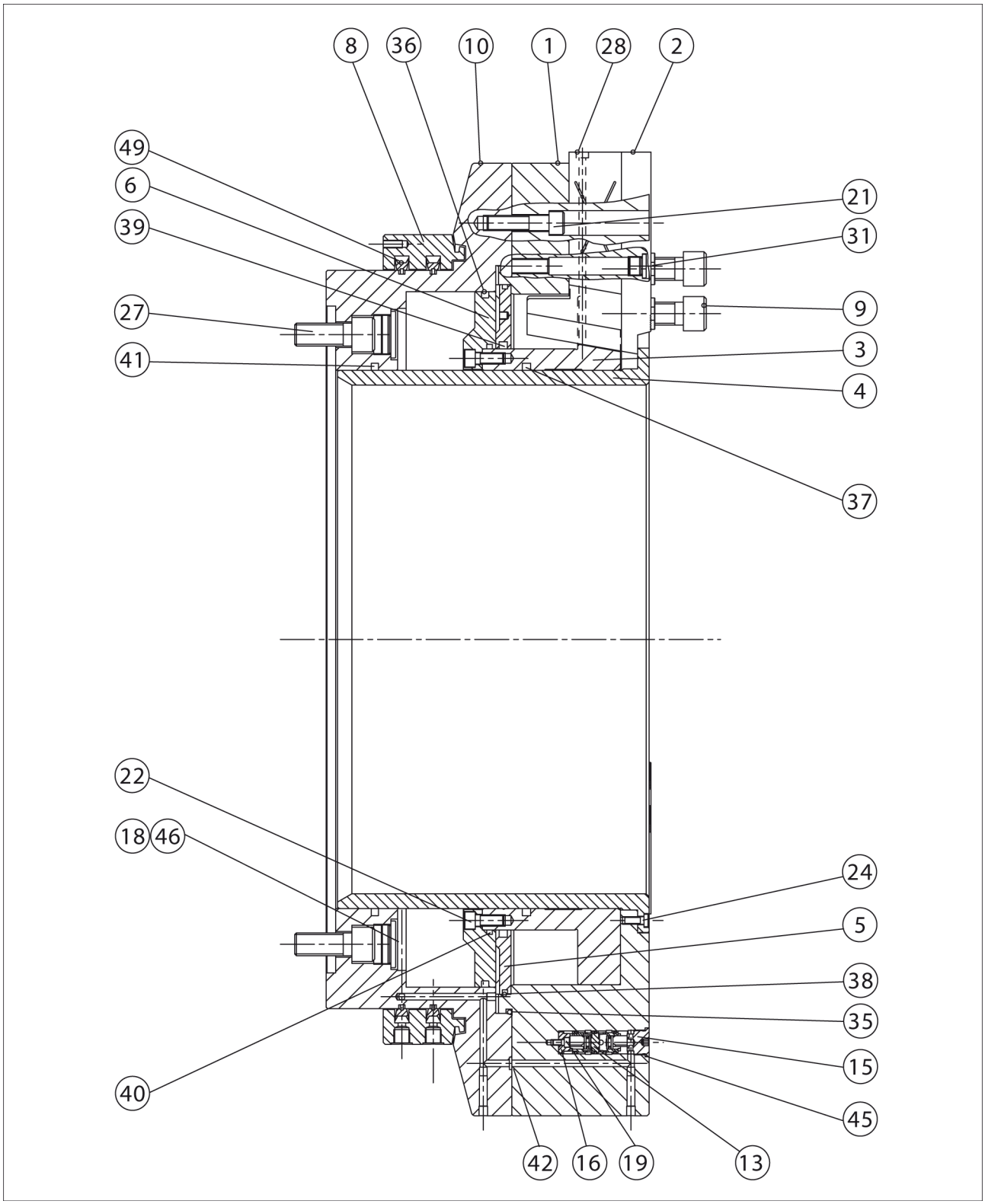
* Item 19 for TB 400-115 and TB 400-140

TB 400 – 850 LH



X Clamping stroke

TB 1000 (LH)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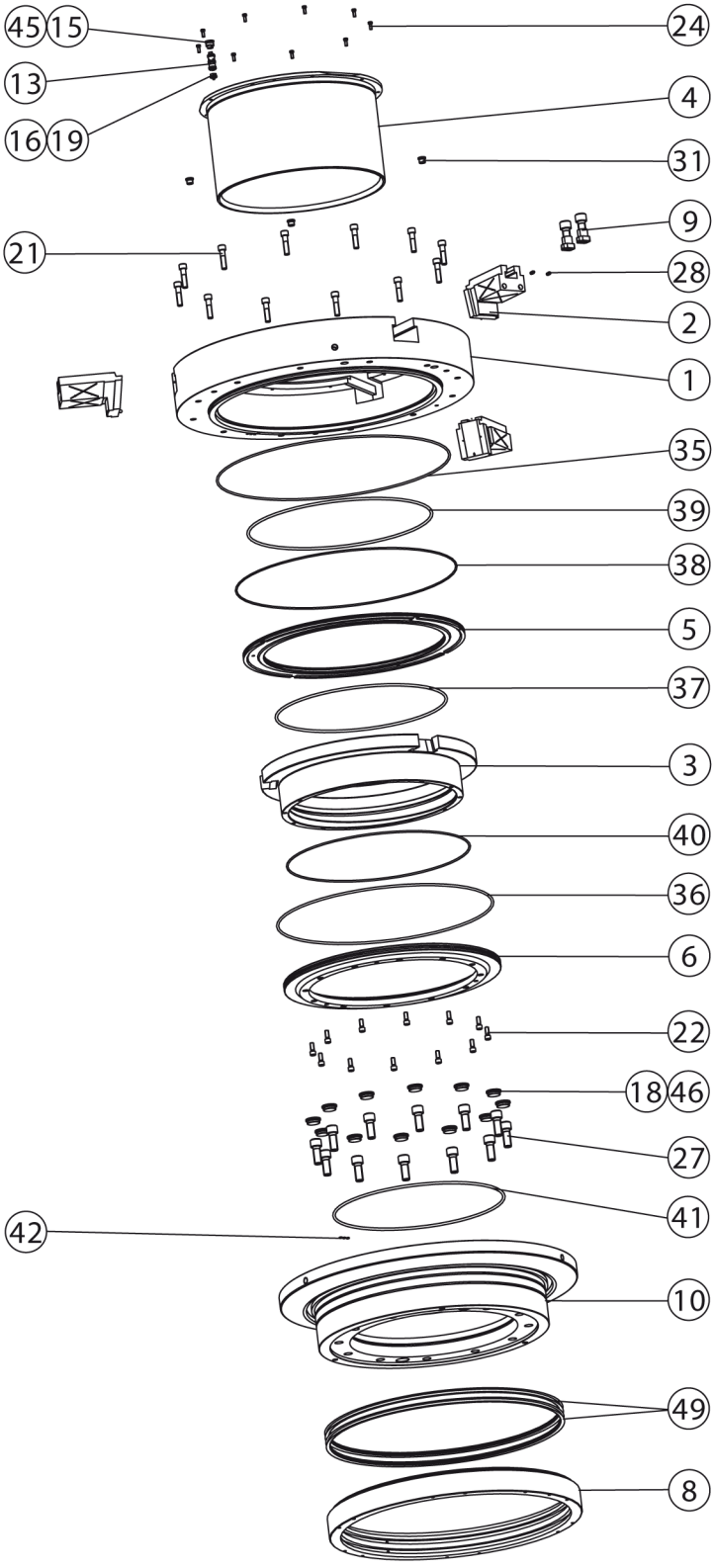
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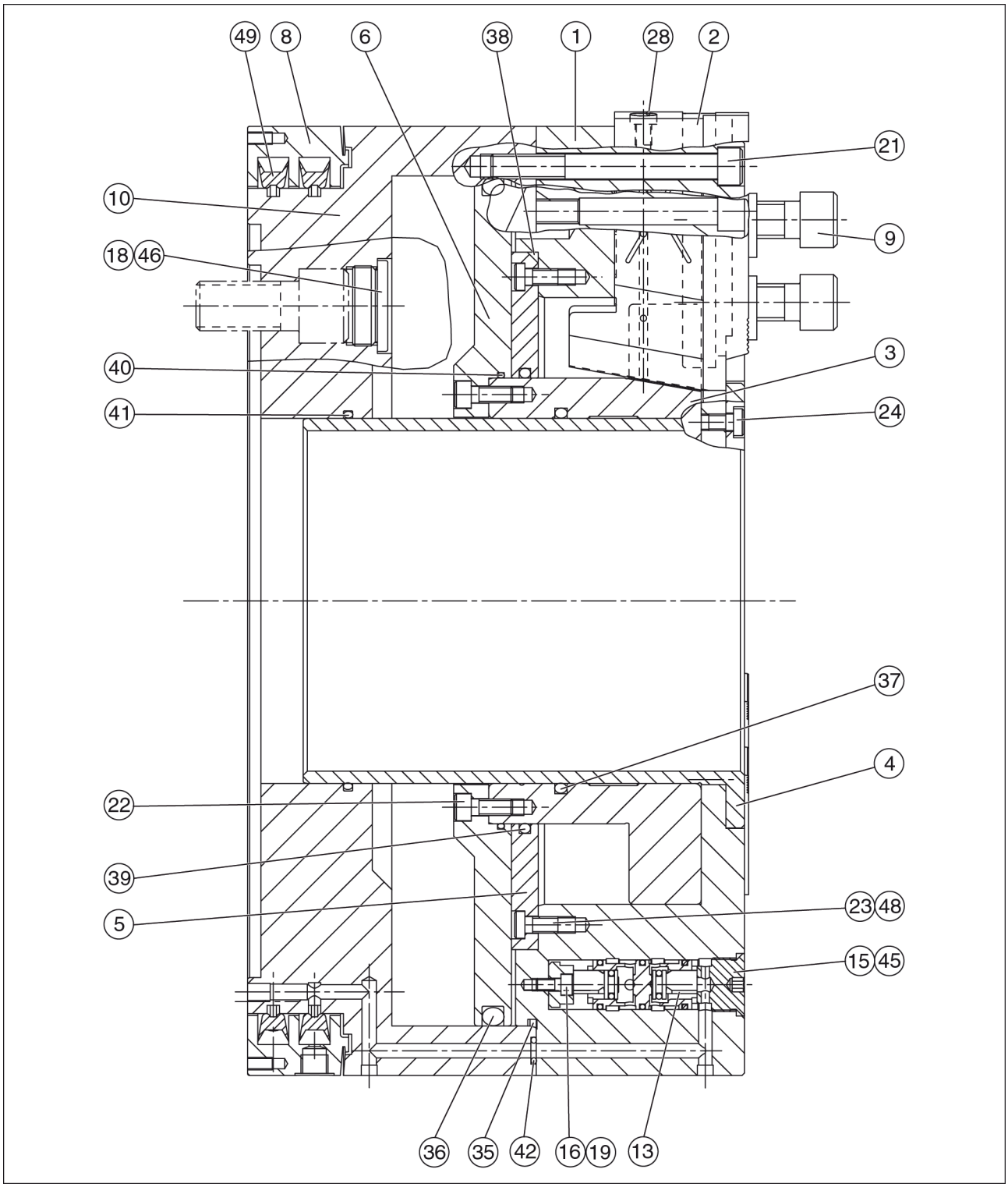
EP (LH)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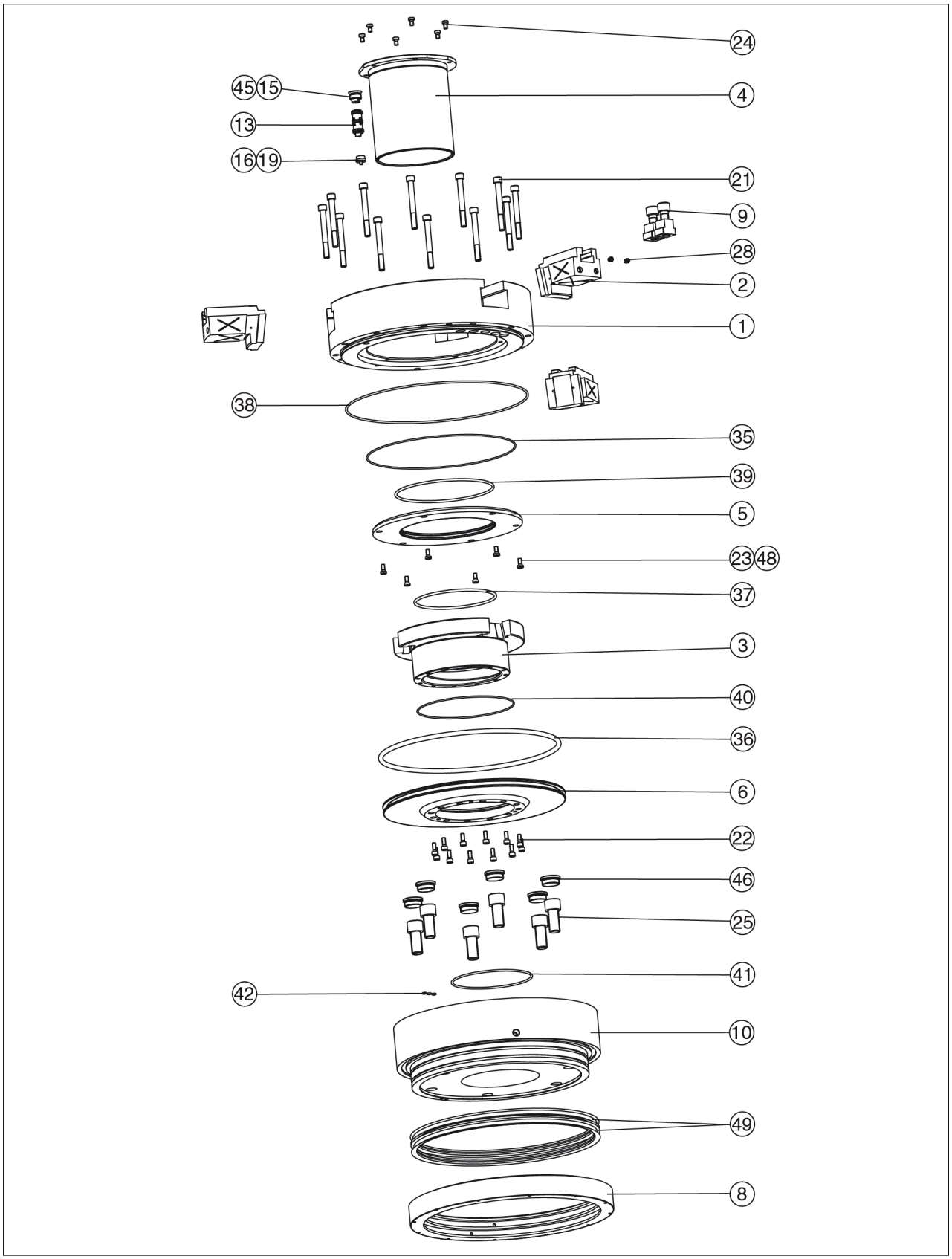
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15 Manufacturer certificate

Manufacturer / Distributor:	H.-D. SCHUNK GmbH & Co. Spanntechnik KG Lothringer Str. 23 D-88512 Mengen
Product:	Lathe chuck
Designation:	ROTA
Type designation:	TB, EP, TP, ROTA-P

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.
- 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 "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
- **EN 1550:1997+A1:2008** Machine-tools safety – Safety requirements for the design and construction of lathe chucks for the workpiece mount

Other related technical Standards and specifications:

- **ISO 702-1:2010-04** Machine tools – Connecting dimensions of spindle noses and lathe chucks – Part 1: front short-taper mount with screws
- **ISO 702-4:2010-04** Machine tools – Connecting dimensions of spindle noses and lathe chucks – Part 4: cylindrical mount
- **VDI 3106:2004-04** Determination of permissible RPM of lathe chucks (jaw chucks)

Mengen, 25th of April 2023

Signature: see original declaration

p.p. Philipp Schräder
Head of Development standard products

Signature: see original declaration

p.p. Alexander Koch
Head of Engineering Design special products

H.-D. SCHUNK GmbH & Co.
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