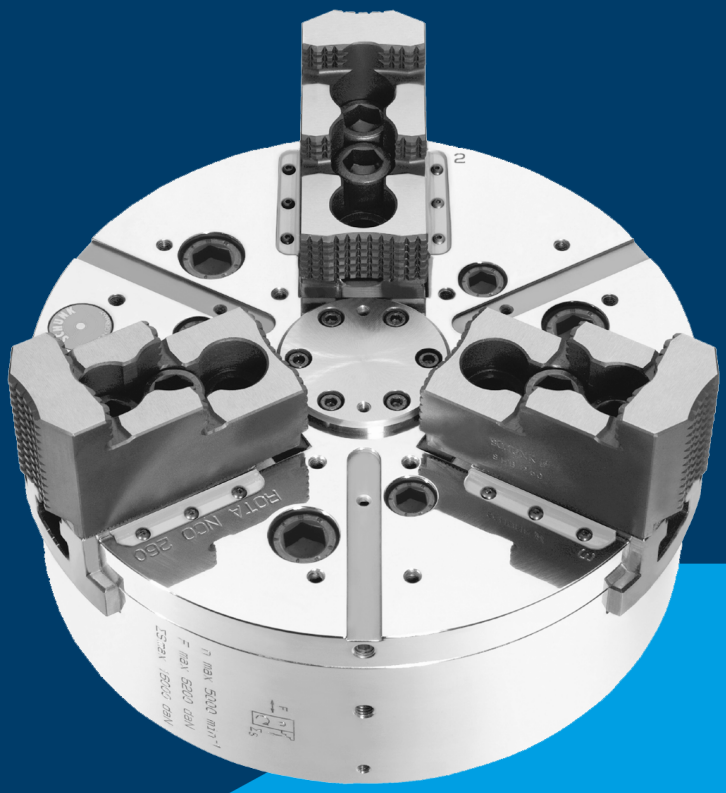
SCHUNK



Power Chuck
ROTA NCO
Assembly and operating manual

Translation of the original manual

Hand in hand for tomorrow

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

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

This operating manual is an integral component of the product and contains important information on safe and proper assembly, commissioning, operation, care, maintenance and disposal. This manual must be stored in the immediate vicinity of the product where it is accessible to all users at all times.

Before using the product, read and comply with this manual, especially the chapter “Basic safety notes”.▸ 2 [🗋 7]

If the product is passed on to a third party, these instructions must also be passed on.

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

We accept no liability for damage resulting from the failure to observe and comply with this operating manual.

1.1 Warnings

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

⚠ DANGER

Dangers for persons!

Non-observance will inevitably cause irreversible injury or death.

⚠ WARNING

Dangers for persons!

Non-observance can lead to irreversible injury and even death.

⚠ CAUTION

Dangers for persons!

Non-observance can cause minor injuries.

NOTICE

Material damage!

Information about avoiding material damage.

⚠ WARNING

Warning about hand injuries

⚠ WARNING

Warning about hot surfaces

1.2 Applicable documents

- General terms of business *
- Catalog data sheet of the purchased product *
- Calculation of the jaw centrifugal forces, "Technology" chapter in the lathe chuck catalog *

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

2 Basic safety instructions

Improper handling, assembly and maintenance of this product may result in risks 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.

NOTE
We hereby confirm that the components comply with the relevant basic and proven safety principles of Annex A and C of ISO 13849-2, taking into account the requirements of the documentation. The parameters, limitations, ambient conditions, characteristic values, etc. for proper operation are defined in the operating manual.

2.1 Intended use

The product is suitable for clamping workpieces on milling or lathe machines and other suitable tooling machines.

The product is intended for industrial use.

Intended use also means that the user has read and understood this operating manual in its entirety, especially the chapter "Basic safety notes".

- The maximum RPM of the chuck and the required clamping force must be determined by the user for the respective clamping task based on the applicable standards and technical specifications of the manufacturer.
  (See also "Calculations for clamping force and RPM" in the chapter "Technical data"). ▸ 6 [🗋 19]

2.2 Not intended use

A not intended use of the product is for example:

- It is used as a press, a punch, a toolholder, a load-handling device or as lifting equipment.
- the product is used for unintended machines or workpieces.
- the technical data is exceeded when using the product. ▸ 6 [🗋 19]
- if workpieces are not clamped properly, paying particular attention to the clamping forces specified by the manufacturer.
- if it is used in working environments that are not permissible.
- if the product is operated without a protective cover.

2.3 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.

In the event of a power failure, the lathe chuck's clamping force may fail immediately and the workpiece may be released in an uncontrolled manner. This poses a risk of death or injury to the operating personnel and can result in serious damage to the system.

- The machine manufacturer and the operator of the machine must carry out and document a hazard assessment and risk analysis to ensure that suitable measures are taken to maintain the lathe chuck's clamping force until the machine comes to a standstill and the workpiece can be secured (e.g. using a crane or suitable lifting equipment).
- The machines and equipment must fulfill the minimum requirements of the EC Machinery Directive; specifically, they must have effective technical measures to protect against potential mechanical hazards.
- Perform regular maintenance.

⚠ DANGER

Possible risk of fatal injury to operating personnel if a jaw breaks or if the lathe chuck 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 lathe chuck must never be exceeded.
- The lathe chuck may only be used on machines and facilities that fulfill the minimum requirements of the EC Machinery Directive; specifically, they must have effective technical measures to protect against possible mechanical hazards.

⚠ DANGER

Possible risk of fatal injury to operating personnel from clothing or hair being caught on the lathe chuck and being dragged into the machine

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

- The machines and equipment must fulfill the minimum requirements of the EC Machinery Directive; specifically, they must have effective technical measures to protect against potential mechanical hazards.
- Always wear tight-fitting clothing and a hairnet when working on the machine and the lathe chuck.

⚠ WARNING

Risk of injury due to dropping the chuck during transport, installation or removal.

- Take special care in the danger zone when transporting, installing or removing the chuck.
- Note the relevant load securing regulations for working safely with cranes, ground conveyors, lifting gear and load-handling equipment.

⚠ CAUTION

Danger of slipping and falling in case of dirty environment where the chuck is used (e.g. by cooling lubricants or oil).

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

⚠ CAUTION

Danger of limbs being crushed by opening and closing of the chuck jaws during manual loading and unloading or when replacing moving parts.

- Do not reach between the jaws.
- Wear safety gloves.
- Observe the safety and accident prevention regulations during operation of the chuck, especially in connection with machining centers 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.

⚠ CAUTION

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

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

- The T-nuts combine the top jaws with the base jaws and they should never protude over the base jaws in radial direction.
- The outer diameter of the screwed top jaws must not exceed the outer diameter of the chuck by more than 10%.

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

2.4 Notes on safe operation

- The machine spindle may only be started up when clamping pressure has built up in the cylinder and clamping has followed in the permitted work area.
- Unclamping may only be possible when the machine spindle has come to a standstill.
- If the clamping energy fails, the workpiece must remain firmly clamped until the spindle is shut down and the workpiece is secured.
- The technical safety requirements in the respective operating instructions must be observed exactly.

Functional test

After installation of the chuck, its function must be checked prior to start-up.

Two important points are:

- **Clamping Force!** The clamping force of the chuck must be achieved at max. operating force/pressure.
- **Stroke control!** The stroke of the clamping piston must allow a safety zone at the front and rear end position. The machine spindle may only be started when the clamping piston has passed through the safety zone. Only limit switches that meet the requirements for safety limit switches specified in DIN EN 60204-1 may be used.

When determining the necessary clamping force to machine a workpiece, take the centrifugal force acting on the chuck jaws into account (according to VDI 3106).
If the chuck jaws are changed, adjust the stroke control to the new situation.

Speed of rotation

⚠ DANGER

Possible risk of fatal injury to operating personnel if the chuck's top speed is exceeded and a workpiece is released or parts fly off.

If the machine tool or technical equipment can reach a higher speed than the chuck's top speed, a reliable speed limiter must be installed and proof must be provided that the speed limiter is effective.

Maintenance instructions

The chuck'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 chuck (clamping force, coefficient of friction, wear characteristics).
  (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 piston to its end positions several times, lubricate again, and then check the clamping force.
- 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*.
- The clamping force should always be measured in the state of the lathe chuck as used for the current clamping situation. 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.
- Move the clamping piston 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, so that the clamping force is retained for longer).

Safety notes for servicing

Follow all the applicable legal standards for health and safety during servicing. Use suitable personal protective equipment, especially protective gloves, goggles, and safety boots – paying particular attention to the operating system and hazard assessment.

⚠ DANGER

Possible risk of fatal injury to operating personnel due to toolholder failure if the maintenance and servicing instructions for the toolholder are disregarded.

The servicing instructions specified by the manufacturer must be complied with to ensure safe operation of the chuck.
Work must be carried out by qualified specialist personnel with the relevant safety training.
Observe the maintenance instructions in this manual.

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.

2.4.1 Substantial modifications

No substantial modifications may be made to the chuck.

If the operator carries out a substantial modification to the chuck, the product shall no longer conform to the EC Machinery Directive 2006/42/EC.

2.5 Personnel qualification

Assembly and disassembly, commissioning, operation and repair of the chuck may be performed only by qualified specialists who have been instructed with respect to safety.

All persons who are assigned to operate, maintain and repair our chuck must have access to the operating manual, especially the chapter "Fundamental safety instructions". We recommend that the operator create in-house safety operating instructions.

Persons in training may be assigned to machines and technical equipment in which a chuck is mounted only if they are under the constant guidance and supervision of qualified specialists.

2.6 Organizational measures

Obeying the rules

By means of suitable organizational measures and instructions, the operator must ensure that the relevant safety rules are obeyed by any persons asked to operate, maintain and repair the lathe chuck.

Monitoring the behavior of personnel

The operator must check that the personnel are behaving in a safety-conscious manner and are aware of the potential hazards at least from time to time.

Danger signs

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

Faults

If a fault occurs on the lathe chuck and this fault endangers safety or if a problem is suspected due to production characteristics, the machine tool where the lathe chuck is mounted must be immediately stopped and remain shut down until the fault has been located and remedied. Only allow specialists to remedy malfunctions.

Spare parts

Only ever use original SCHUNK spare parts.

Environmental regulations

Comply with the applicable legal norms when disposing of waste.

2.7 Using personal protective equipment

When using this product, you must comply with the relevant health and safety at work rules and you must use the required personal safety equipment (minimum: category 2).

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 [🗋 6]
- Observe the ambient conditions and operating conditions
- Observe the maximum number of clamping cycles ▸ 6 [🗋 19]
- Observe the specified maintenance and lubrication intervals, ▸ 9 [🗋 35]

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

4 Torque per screw

Tightening torques for mounting screws for clamping the chuck (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 to mount 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

Tightening torques to mount the protection sleeve (screw quality 8.8)

Screw size	M3	M4	M5	M6
Tightening torques M_A (Nm)	1.3	3.0	5.5	9.0

5 Scope of delivery

1 **Power Chuck incl. fastening screws**
base jaws with fine serration incl. T-nuts with screws
base jaws with tenon and slot incl. jaw fixing screws

1 **Eye bolt** (DIN 580) from size 260 and up

6 Technical data

6.1 Chuck data

ROTA NCR	165	200	250	315	400	500	630
Max. actuating force [kN]	30	42	62	90	120	140	140
Max. clamping force [kN]	72	95	150	190	270	330	330
Max. rotation speed [min-1]	6000	5000	4500	3600	2500	2000	1600
Stroke per jaw [mm]	6.4	9.0	10.0	13.0	15.0	15.0	15.0
Piston stroke [mm]	24	27	30	40	45	45	45
Centrifugal torque of base jaw fine serration $\mathbf{M}_{cGB}$ [kgm]	0.025	0.043	0.099	0.161	0.431	0.674	1.085
Centrifugal torque of base jaw Tongue and groove $\mathbf{M}_{cGB}$ [kgm]	0.030	0.056	0.137	0.241	0.571	–	–
Max. jaw eccentricity of center of gravity in axial direction a_{max} [mm]	30	30	40	32	40	40	40

The recommended max. r.p.m. is only valid for max. operating force and the use of the suitable hard standard stepped jaws Type SHB.

When using unhardened top jaws or jaws in special design, make sure that their weight is as low as possible.
For soft top jaws or jaws in special design the permissible speed of the respective cutting task has to be calculated in accordance to VDI 3106, whereby the maximum standard value may not be exceeded. The calculated values have to be examined with a dynamic measurement. Control of function (piston movement and actuation pressure) has to be accomplished in accordance with the guidelines of the professional association.

6.2 Clamping force / speed diagrams

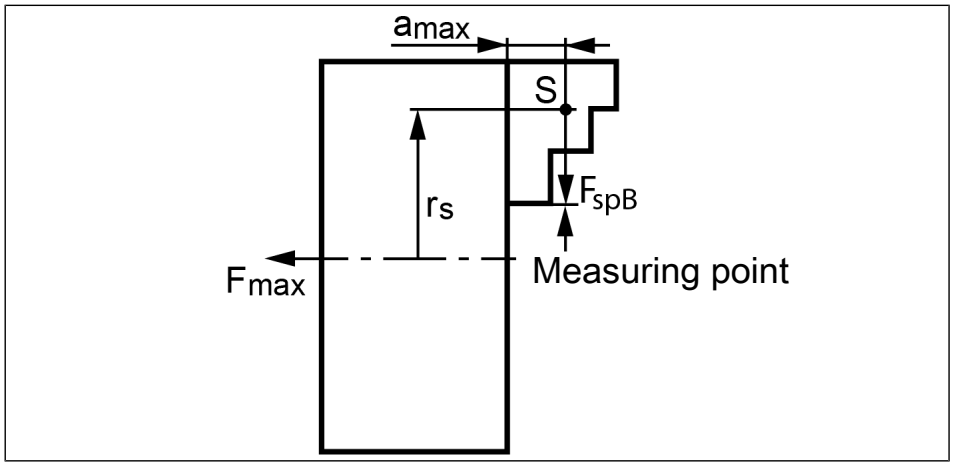
The diagrams refer to 3-jaw-chuck.

Clamping force/RPM curves have been determined by using hard jaws. In the determination process, the maximum actuating force was applied and the jaws were set flush with the outer diameter of the chuck.

It is also assumed the chuck is in perfect condition and lubricated with SCHUNK LINOMAX plus special grease .

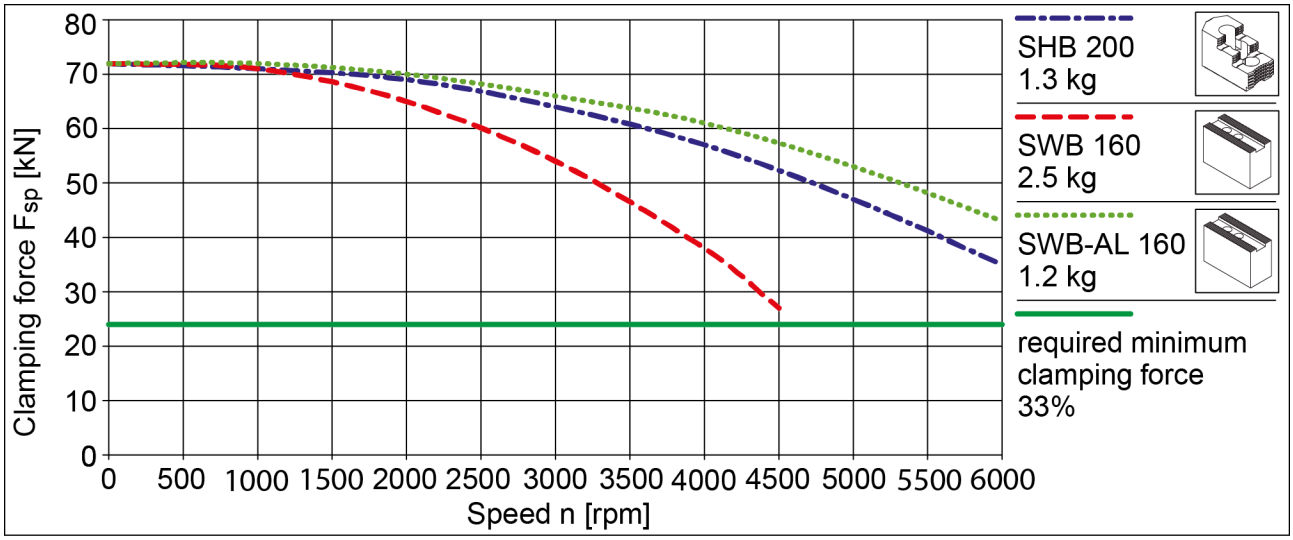
If one or more of these prerequisites is altered, the diagrams will no longer be valid.

Chuck setup for clamping force/RPM diagram

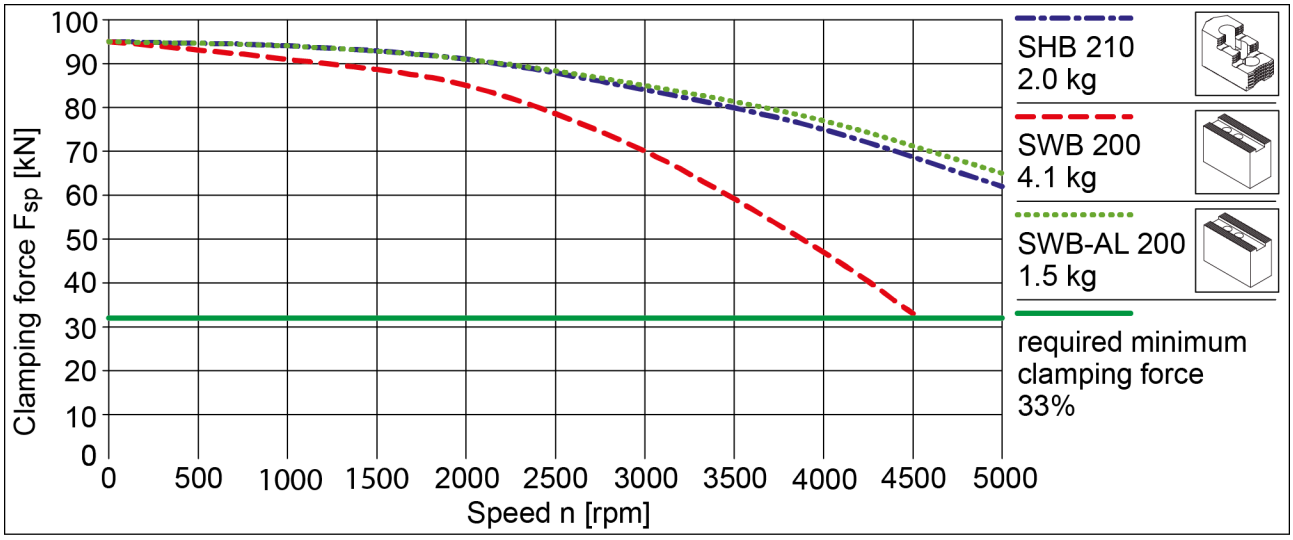


F_{spB}	Clamping force per jaw	S	Center of gravity
r_s	Center of gravity radius	a_{max}	Max. jaw center of gravity eccentricity in axial direction
F_{max}	Max. actuating force		

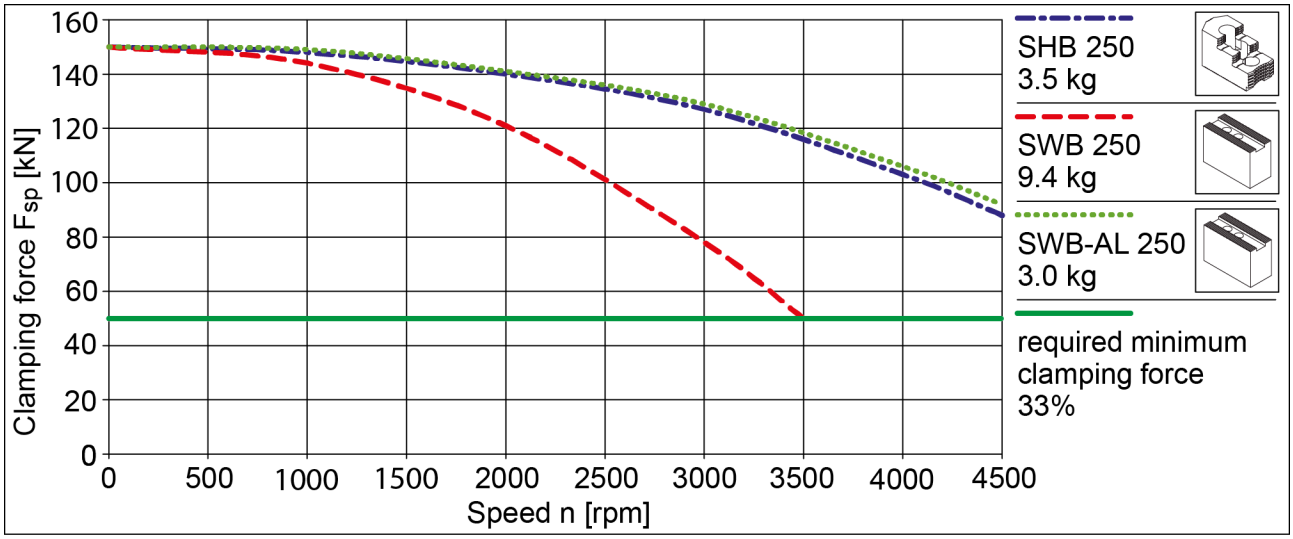
Clamping force / speed diagram ROTA NCO 165



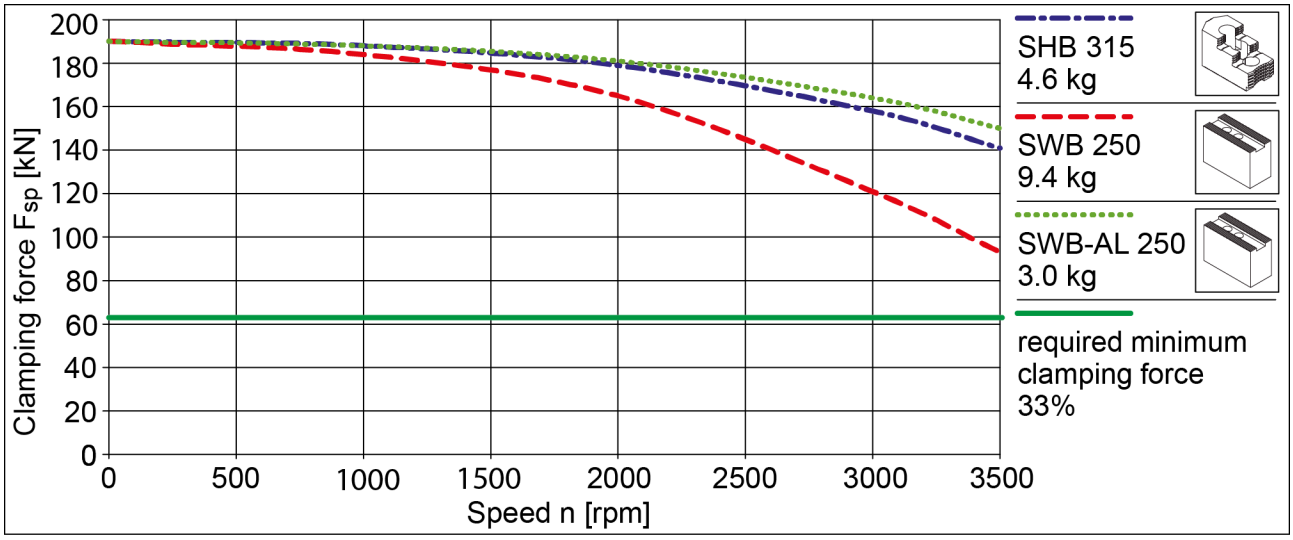
Clamping force / speed diagram ROTA NCO 210



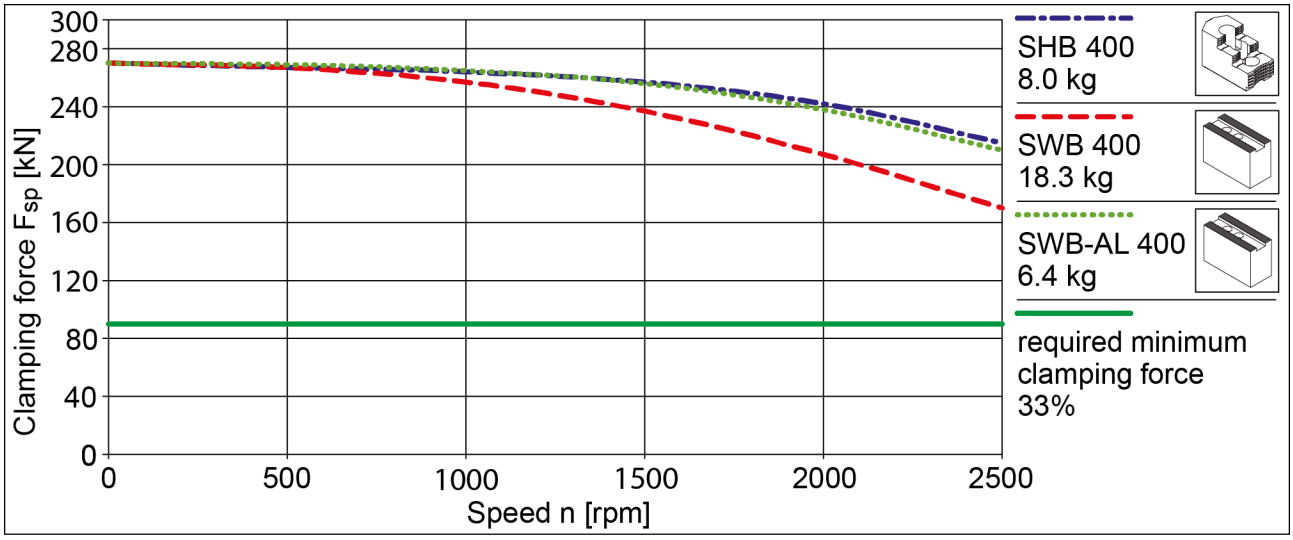
Clamping force / speed diagram ROTA NCO 260



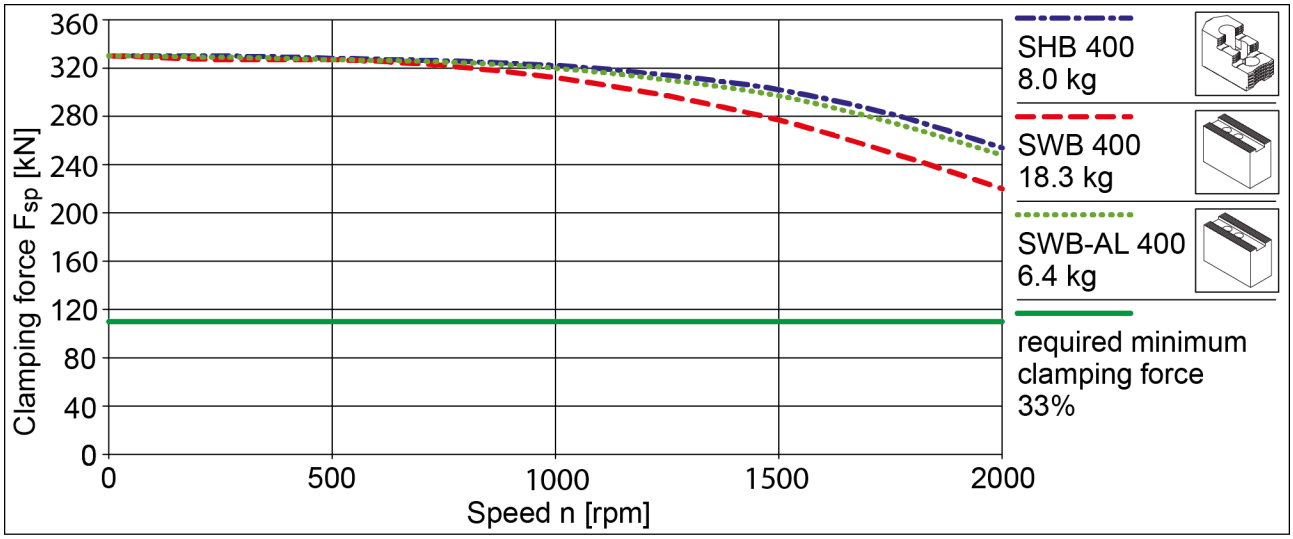
Clamping force / speed diagram ROTA NCO 315



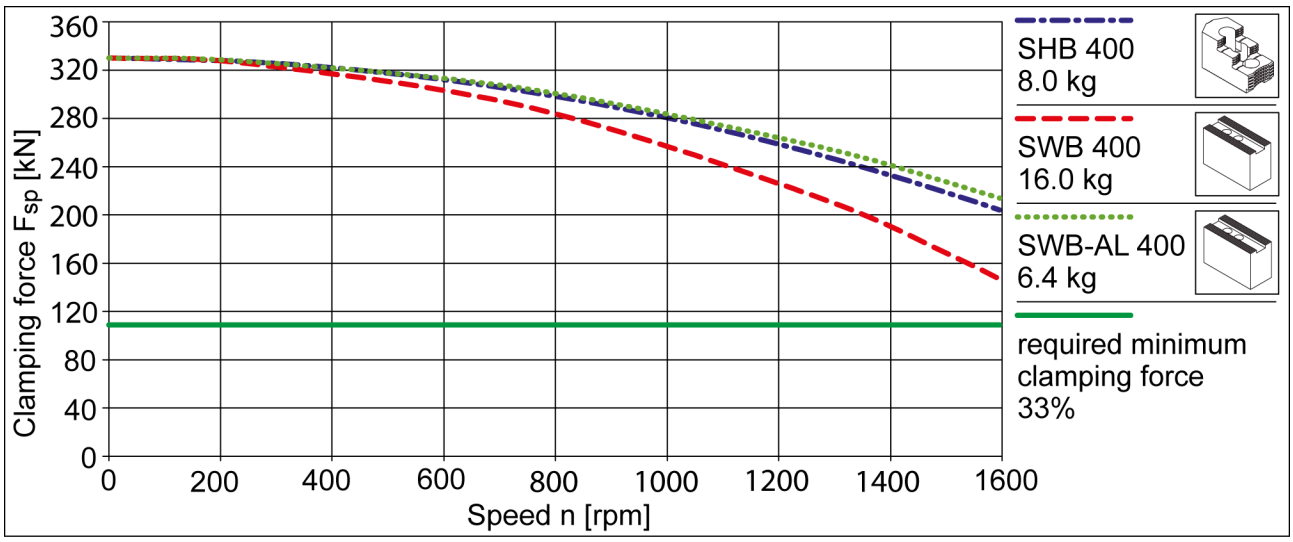
Clamping force / speed diagram ROTA NCO 400



Clamping force / speed diagram ROTA NCO 500



Clamping force / speed diagrams ROTA NCO 630



6.3 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 [rpm]
F_{sp0}	Initial clamping force [N]	r_s	Center of gravity radius [m]
F_{spz}	Cutting force [N]	r_{sAB}	Center of gravity radius of top jaw [m]
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 force torque [Kgm]	Σ_s	Max. clamping force of chuck [N]

6.3.1 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}**.

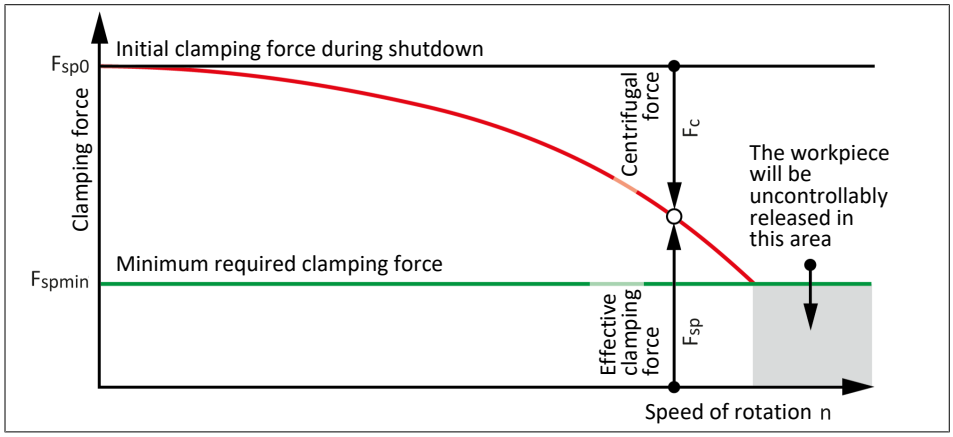
$$F_{sp} = F_{sp0} \mp F_c \text{ [N]}$$

(–) 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

NOTICE

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

See also "Lathe chuck data" table ▸ 6.1 [🗋 19]

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.

NOTICE

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:

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

For this, **n is the given speed of rotation** in RPM. The product **$m_B \cdot r_s$ is referred to as the centrifugal torque 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 M_{cGB}** and the **centrifugal torque of the top jaws 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"▸ 6.1 [🗋 19]. The centrifugal torque of the top jaws M_{cAB} is calculated as per:

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

6.3.2 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:

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

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:

$$\mathbf{M_{cGB} = 0.319\ kgm}$$

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

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

Centrifugal torque for one jaw:

$M_C = 0.319 + 0.571 \Rightarrow \mathbf{M_c = 0.89\ kgm}$

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

$\sum M_C = 3 \cdot M_C = 3 \cdot 0.889 \Rightarrow \mathbf{\sum M_c = 2.667\ kgm}$

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:

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

6.3.3 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:

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

NOTICE

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 ▶ 6.1 [🗋 19]).

This calculated RPM may be used.

6.4 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.

6.5 Permissible imbalance

The permissible imbalance for lathe chucks is quality class G 6.3 as per DIN ISO 1940-1.

7 Mounting

7.1 Pre-assembly measures

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

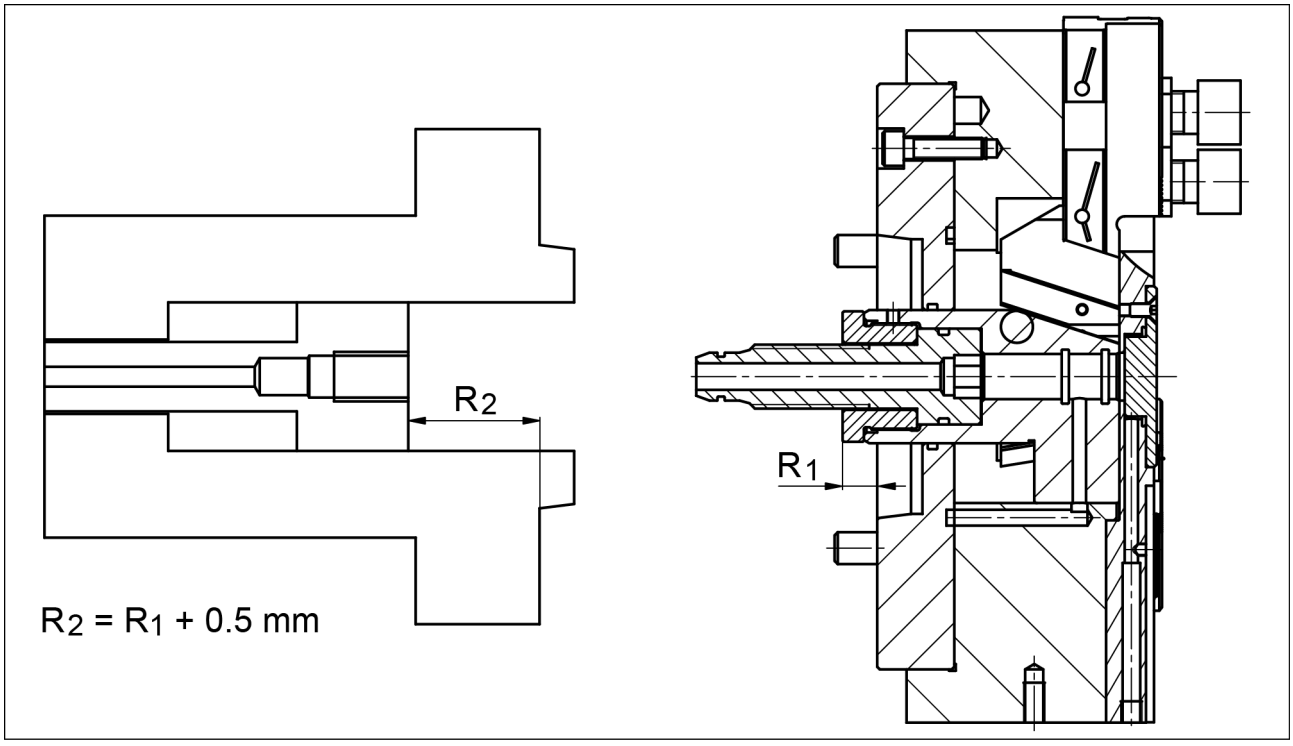
⚠ CAUTION

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

Use personal protective gear, especially safety gloves.

Check the delivery for completeness and for transport damage.

7.2 Mounting of the Power Chuck



- Remove top jaws with fasten screws as well as T-nuts (if available).
- For actuation of the clamping cylinder, please remove the drawbar to its front position.
- Disassemble the central feeding insert.
- Move the chuck piston into the front position.
- Basically the chuck can be attached in two positions (horizontally or vertically), depending on the position of the machine spindle.

7.3 Horizontal attachment

Lift the chuck by means of an assembly belt or with a ring bolt aligned to the spindle centre in front of the spindle nose.

- **ROTA NCO 165:**
  Screw the chuck on to the spindle by turning it on its axis until it stops. Turn the chuck back towards the left until the through bolts are in alignment with the threads or the driving hole is in alignment with the driving keys in the spindle for the first time.
- **ROTA NCO 210 – 630:**
  Screw the central fastening screw with a hexagon wrench into the draw bar or into the drawing tube adapter, until it contacts the stop.

7.4 Vertical attachment

- **ROTA NCO 165:**
  Screw the chuck on to the spindle by turning it on its axis until it stops. Turn the chuck back towards the left until the through bolts are in alignment with the threads or the driving hole is in alignment with the driving keys in the spindle for the first time.
- **ROTA NCO 210 – 630:**
  Put the chuck upside-down onto the assembly device.
  Turn the spindel with the assembly device onto the spindle.
  Afterwards turn the chuck back until the fastening bores and the threads of the spindle flang are aligned.
  Screw in the central fastening screw with a hexagon wrench into the draw bar or into the drawing tube adapter.
- Assemble the central feeding insert.
- Secure the chuck fixing screws crosswise.
- Check the concentricity and face runout at the control rim.
- Check the function and the size of the operating force.
- Check that the base jaws run smoothly and that the jaw stroke is correct.
- Mount the top jaws firmly on the base jaws with the T-nuts and screws according to the markings 1, 2 and 3.

Dismounting of the spindle is carried out in reverse order.

8 Function

The item numbers specified for the corresponding individual components relate to chapter drawings.▸ 12 [🗋 40]

8.1 Function and handling

Wedge hook chuck are actuated by rotating cylinders with or without through holes. The axial draw- or pressure forces are deviated into a radial jaw clamping force via the helical angle of traction between the piston and the base jaws.

The clamp and unclamping stroke of the jaws is determined by the cylinder. Moving or changing the base jaws with top jaws bolted to them must be carried out in unclamped position. For safety reasons the base jaws are still interlocked when the chuck piston is in this position. The base jaws are unlocked mechanically.

8.2 Change or supplement of jaws

Jaws for highest repeatability must be bored and ground in the chuck under clamping pressure.

- When boring and grinding it is important that the boring ring or the boring bolts are clamped **by the top jaws** – and not by the base jaws. Keep base and top jaws screwed together for later tasks.
- Keep the base jaws and top jaws screwed in place for recurring work. Tighten the jaw mounting screws to the specified torque Link Anzugsmoment für Schrauben.

Tighten the jaw mounting screws with a torque wrench. On no account tighten the screws with an extension pipe or with hammer blows.

8.3 Disassembly of chucks for complete cleaning or in case of damage

The item numbers specified for the corresponding individual components relate to chapter drawings.▸ 12 [🗋 40]

Please cinsider the tightening torques of all screws at every assembly and disassembly work! (see chapter 4)!

For disassembly, please remove the chuck from the machine and then disassemble it. Otherwise it can't be disassembled.

- Remove the top jaws (if existing), T-nuts and fastening screws from the base jaws.

- Screw screws (item 73) out of the chuck and take out media insert (item 24). Set screw (item 28) can be taken out (insert without media lead-through only). 0-rings (items 86 and 88) can be removed from the insert.
- Turn chuck on its back. Remove screws (item 78) and take out mounting (item 7). 0-ring (item 68) can be taken out.
- For chucks with central oil lubrication, remove gauge cartridges from the chuck.
- Loosen and remove all screws item 75 in the chuck. Carefully turn chuck on its face side.
- **NCO 165 – 400:**
  The lid (item 2) can now be taken out of the chuck. The wiper ledges and the flange head screws (items 66 and 67) can be removed from the chuck lid.
- **NCO 500 – 630:**
  The ledges of the jaw guiding (items 69 and 70) can be taken out of the chuck. The wiper ledges and the flange head screws (items 66 and 67) can be removed from the ledges.
- Individually remove base jaws (item 3) from the remaining chucks. Remove piston (item 4) from the chuck. Loosen set screw (item 89) and remove nut (item 9). Remove screw (item 8) and pressure pieces (item 56) from the remaining pistons. The 0-rings (items 87 and 72) can be removed from the components.

WARNING! In case of base jaw breakage, the bolts and set screws (item 19) must be exchanged.

The jaw guidings on the chuck body are numbered from 1 – 3. When mounting the base jaws, it must be ensured that the number of groovings on the base jaws is identical with the numbering of the jaw guidings and that the base jaws are remounted in the same position they were in before their removal. When mounting the piston, it must be ensured that wedge hook 1 is assigned to jaw guiding 1.

- Remove set screws (items 47, 48 and 59) and lubricating nipples (item 55) from the chuck body (item 1) and remove lid (item 2).
- **NCO 210 – 400:**
  Remove cylindrical pins (item 19) from the chuck body.
- **NCO 500 – 630:**
  Remove set screws (item 19) from the base jaw (item 3).

Degrease and clean all parts and check them for damage or wear. Before installation, lubricate parts well with LINO MAX special grease.

Only use original SCHUNK spare parts when exchanging damaged parts.

The chuck is assembled in the same way but in the reverse order.

⚠ DANGER

Danger to life and limb of the user by tearing of the chuck of the spindle when using chuck mounting screws quality 8.8.

If chuck mounting screws of the quality 8.8 get used it can lead to danger for life and limb of the user and to vastly damage of the unit.

- **Only use screws of the quality 10.9 even if they are flat headed screws.**

Chuck mounting screws of the quality 10.9 can be ordered as spare parts from SCHUNK.

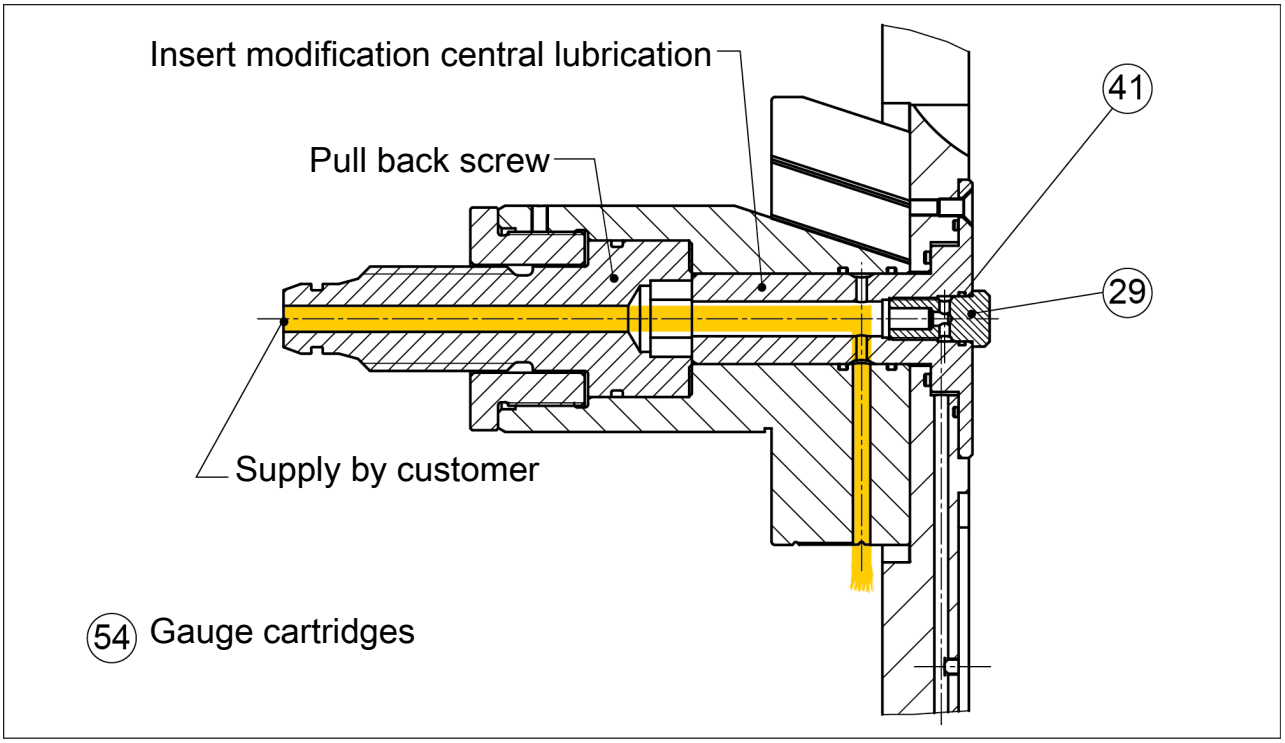
8.4 Assembly of various energy inserts

(Accessories – have to be ordered separately)

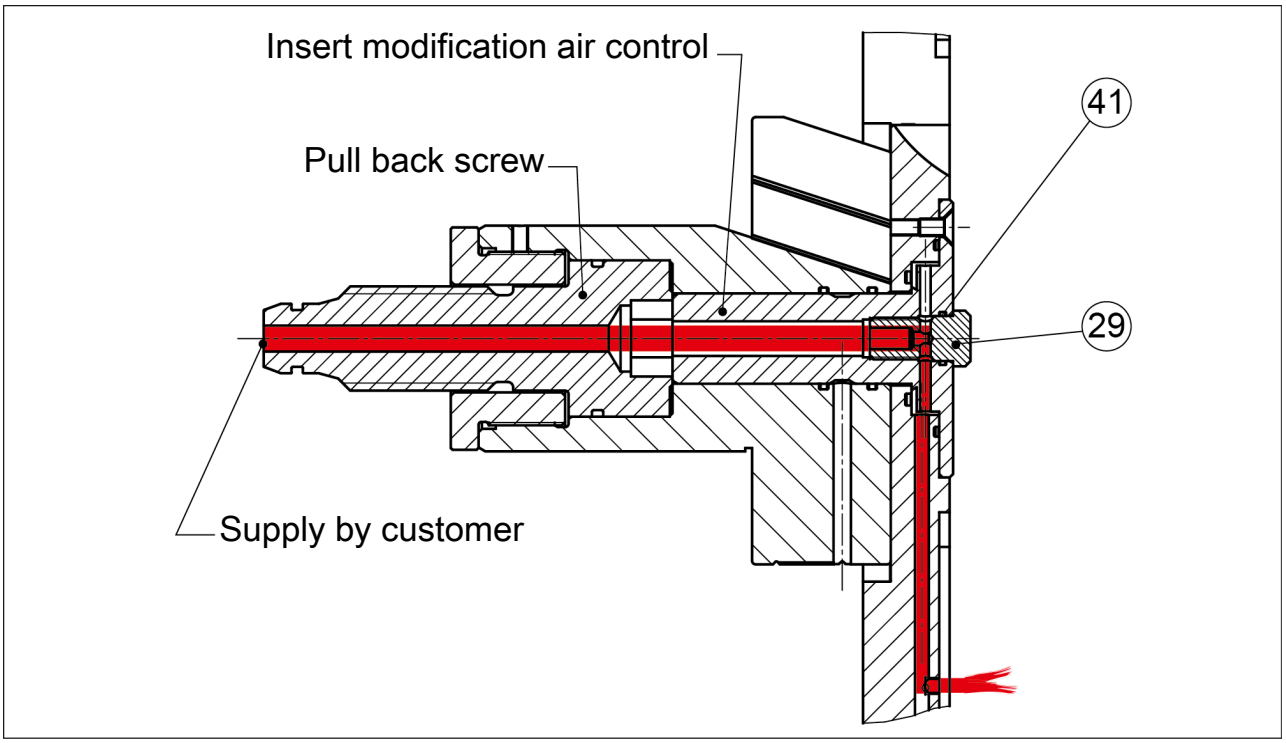
Our standard chucks are equipped with a central energy insert (no energy feed through!).
The chuck can be modified with various energy feed throughsat a later date.

Please consider the detailed list of necessary components.(see spare parts list in chapter 10).

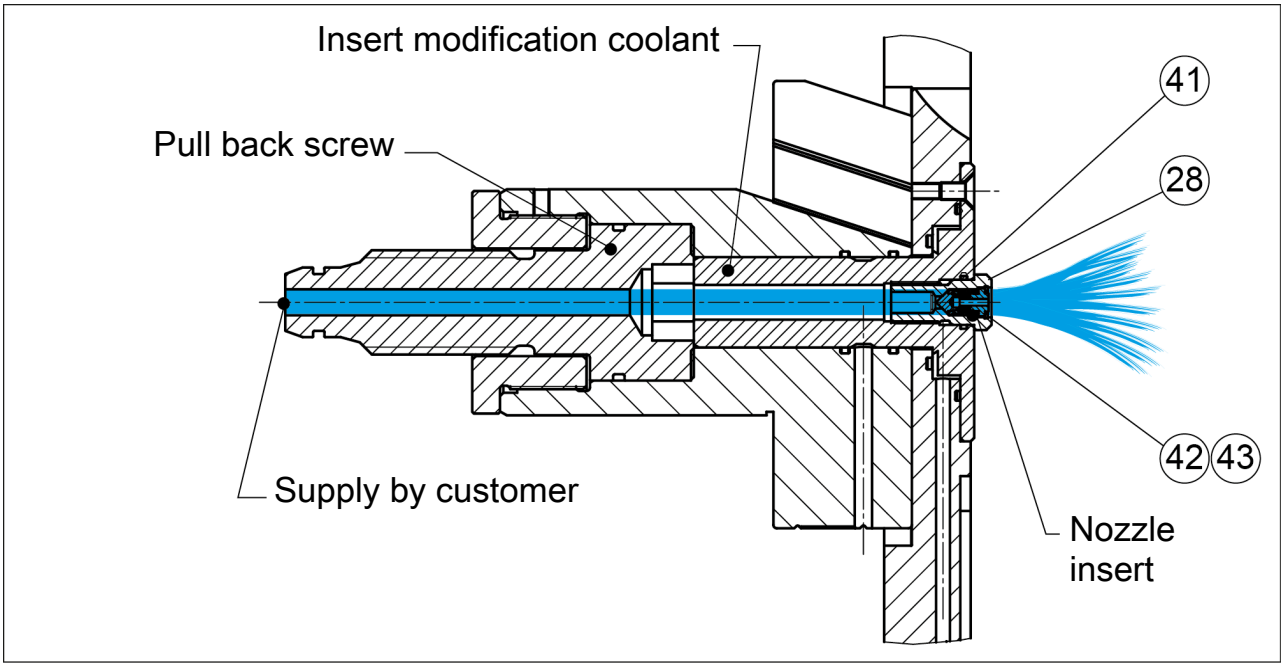
Modification – Central lubrication



Modification – Air control

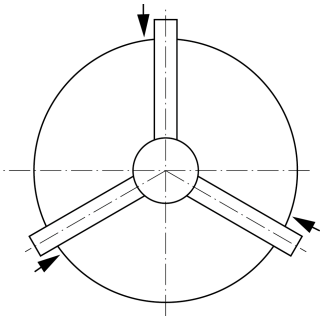


Modification – Coolant



9 Maintenance

9.1 Lubrication



To maintain the safe function and high quality of the chuck, it has to be regularly lubricated at the lubrication nipples (item 55).

In order to achieve optimal grease distribution, the base jaws need to be moved into the open position for O.D. clamping, the power chuck lubricated, and the base jaws then closed again. Repeat this procedure one more time.
Then the piston has to be moved several times up to its end positions.

Operating conditions
Depending on the operating conditions, the function and clamping force need to be checked after a specific period of operation (see chapter "Maintenance intervals" ▶ 9.2 [🗋 35]).
Only use a calibrated clamping force tester for measuring in the clamping force test (SCHUNK SGT 270).

Lubricate all three segments evenly in order to avoid large imbalances.

Technical condition When the smallest possible actuating pressure is applied (clamping cylinder), the base jaws must move evenly. This method only provides a limited indication and is not a substitute for measuring the clamping force.

If the clamping force has dropped too much or if the base jaws and piston no longer move properly, the chuck has to be disassembled, cleaned, and relubricated.

Only use genuine SCHUNK spare parts when replacing damaged parts.

9.2 Maintenance intervals

Lubrication of the grease areas:

Lubrication interval	Strain
every 25 hours	normal / coolant utilization
every 8 hours	high / coolant utilization
after 1200 hours or as needed	Total cleaning with disassembly of the chuck, depending on type and degree of contamination

9.3 Central oil lubrication

Applies to the ROTA NCO lathe chuck with modification central oil lubrication.

ATTENTION:
only lubricate in the open position for O.D. clampings (compare with image "Modification central lubrication").

The chuck must be lubricated at regular intervals, which are dependent on the operating conditions. The lubrication oil VG 220 DIN 51519 is fed into a bore hole in the center of the chuck (see chapter "Maintenance intervals" ▸ 9.2 [🗋 35]). As a rule, an impulse (3 sec.) should be given to the chuck 3 to 6 times an hour at 10 to 30 bar. Three gauge cartridges in the chuck ensure the oil is evenly distributed in the chuck.

Fill quantity of the gauge cartridges:

ROTA NCO 165	ROTA NCO 210	ROTA NCO 260	ROTA NCO 315	ROTA NCO 400	ROTA NCO 500	ROTA NCO 630
0.3 ccm	0.3 ccm	0.3 ccm	0.6 ccm	0.6 ccm	0.6 ccm	0.6 ccm

9.4 Changing the top jaws

When changing the top jaws, the serration has to be cleaned and greased with SCHUNK LINOMAX plus special grease.

10 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.

11 Spare parts

When ordering spare parts, it is imperative to specify the type, size and above all the manufacturing no of the chuck.

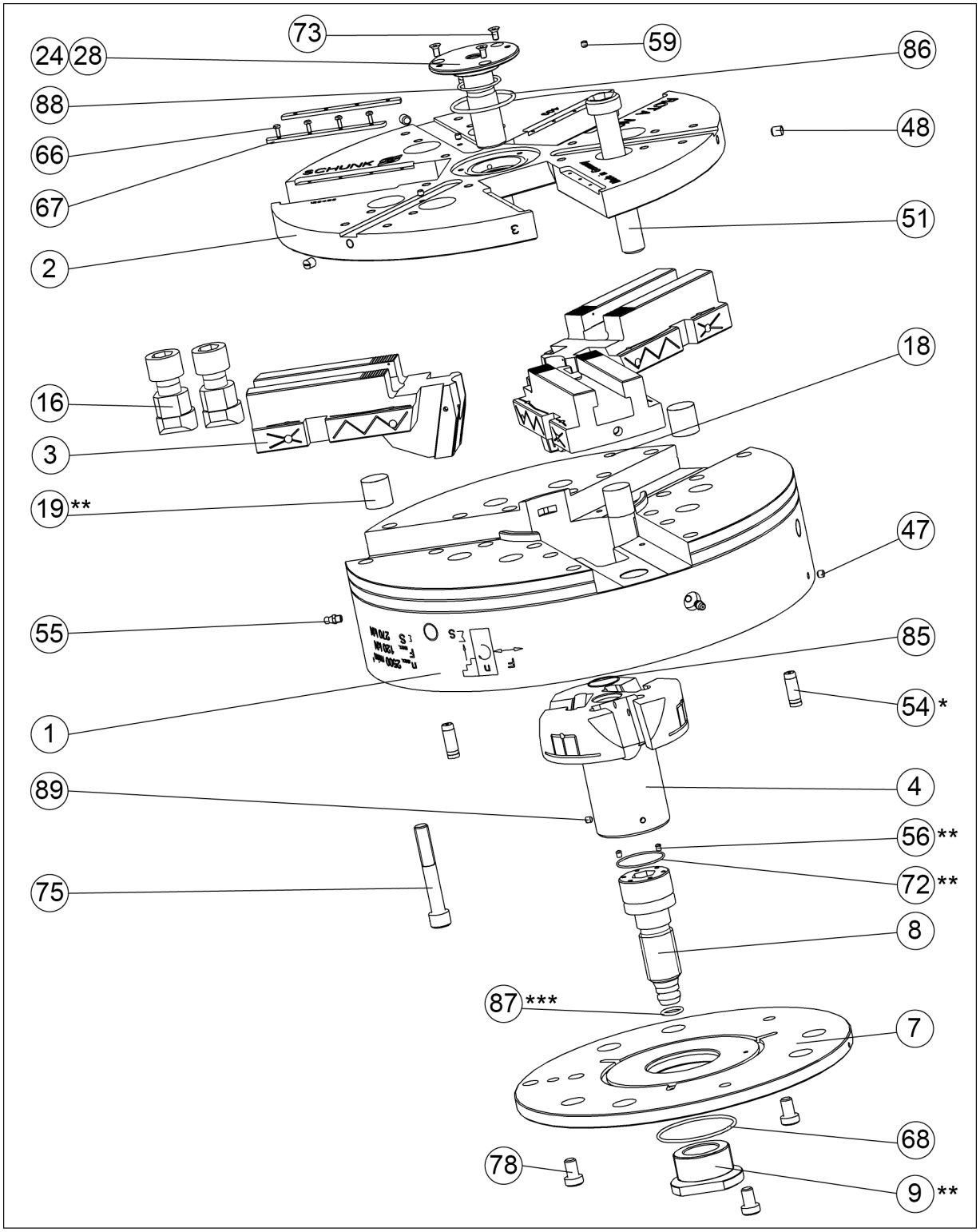
Seals, sealing elements, screw connections, springs, bearings, screws and wiper bars plus parts coming into contact with the workpiece are not covered by the warranty.

Item	NCO 165 – 400	Item	NCO 500 – 630
1	Chuck body	1	Chuck body
2	Cover	2	Cover
3	Base jaws	3	Base jaws
4	Piston	4	Piston
7	Mount	7	Mount
8	Screw	8	Screw
9*	Nut	9	Nut
16	T-nut	16	T-nut
18	Pin	18	Pin
19*	Set screw/Bolt	19	Set screw/Bolt
24	Insert 01	37	Insert 01
28	Set screw DIN EN ISO 4026	47	set screw DIN EN ISO 4026 (Polyamide coated)
47	Set screw DIN EN ISO 4026 (Polyamide coated)	48	O-ring
48	Set screw DIN EN ISO 4026 (Polyamide coated)	51	Screw DIN 7984 – 10.9 (pitch circle)
51	screw DIN 7984 – 10.9 (pitch circle)	55	Tapered lubricating nipple
52	Screw DIN 7984 – 10.9 (pitch circle)	57	Expander
55	Tapered lubricating nipple	58	Expander
56*	Pressure piece	60	Pressure spring
59	Set screw DIN EN ISO 4026 (Polyamide coated)	61	Ball
66	Oval-head screw	66	Oval-head screw
67	Wiper	67	Wiper
68	O-ring DIN 3771	68	O-ring / O-ring DIN 3771
69	Gasket, right side (NCO 500)	69	Gasket, right side (NCO 500)
70	Gasket, left side (NCO 500)	70	Gasket, left side (NCO 500)
72*	O-ring DIN 3771	72	O-ring DIN 3771
73	Countersunk screw DIN 7991 – 10.9	74	Screw
75	Screw DIN EN ISO 4762 – 10.9	75	Screw DIN EN ISO 4762 – 10.9

Item	NCO 165 – 400	Item	NCO 500 – 630
78	Screw	78	Screw
85	O-ring DIN 3771	85	O-ring DIN 3771
86	O-ring DIN 3771	86	O-ring DIN 3771
87	O-ring DIN 3771	87	O-ring DIN 3771
88	O-ring DIN 3771	88	O-ring DIN 3771
89	Set screw DIN EN ISO 4027	89	Set screw DIN EN ISO 4027
Modifications(chapter 8.4)		** Not use for ROTA NCO 165	
29	Plug		
41	O-ring DIN 3771		
42	Internal valve components		
43	Scuring ring DIN 472		
54	Gauge cartridge		

12 Assembly drawings

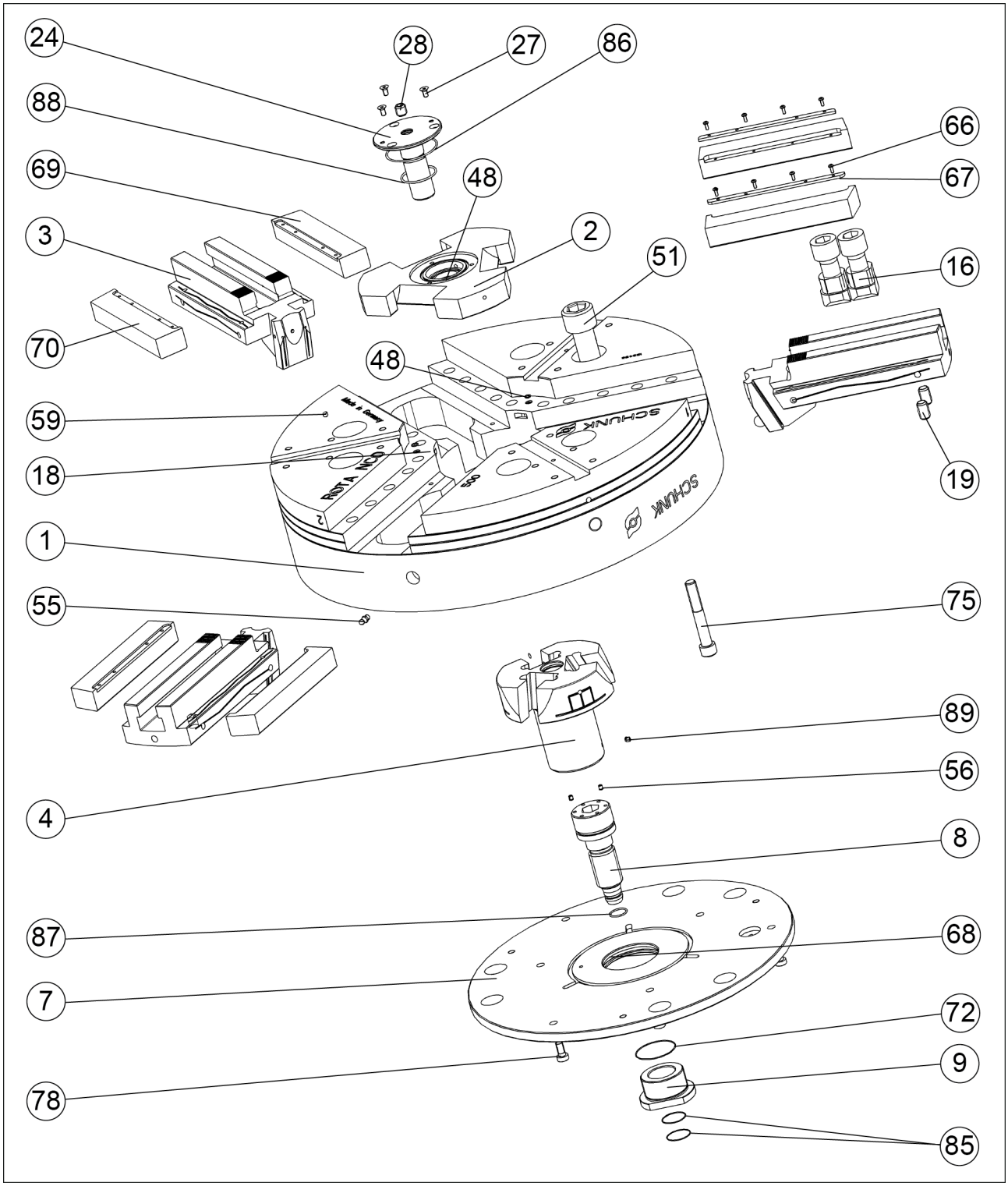
ROTA NCO 165 – 400



Tab.:

*	At modification oil central lubrication
**	Not use for NCO 165, Item 8 is screwed with Item 4
***	2 x for NCO 165

ROTA NCO 500 – 630



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Manufacturer certificate

Manufacturer / Distributor:	Heinz-Dieter SCHUNK GmbH & Co. Spanntechnik KG. Lothringer Str. 23 D-88512 Mengen
Product:	**Lathe chuck**
Description:	**ROTA**
Type designation:	2B, NCA, NCD, NCE, NC, NCF, NCK, NCO, NCR, NCS, NCX, TH, THW

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 correct operation are defined in the operating manual.
- an $MTTF_D$ value of 150 years can be estimated for mechanical components using the informative procedure in Table C.1 of ISO 13849-1:2015.
- the **fault exclusion** against the fault "Unexpected release without pending release signal".
- the **fault exclusion** against the fault "Breakage during operation" in compliance with the parameters, limitations, ambient conditions, characteristic values and maintenance intervals, etc., specified in the operating manual.
- that internal bore diameters in the **pipe or control lines** are at least 2 mm for pneumatic clamping systems and at least 3 mm for hydraulic clamping systems

Harmonized standards applied:

- **ISO 12100:2010** Safety of machinery - General principles for design - Risk assessment and risk reduction
- **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, 25. Apr. 2023

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p.p. Philipp Schräder / Head of Development standard products

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