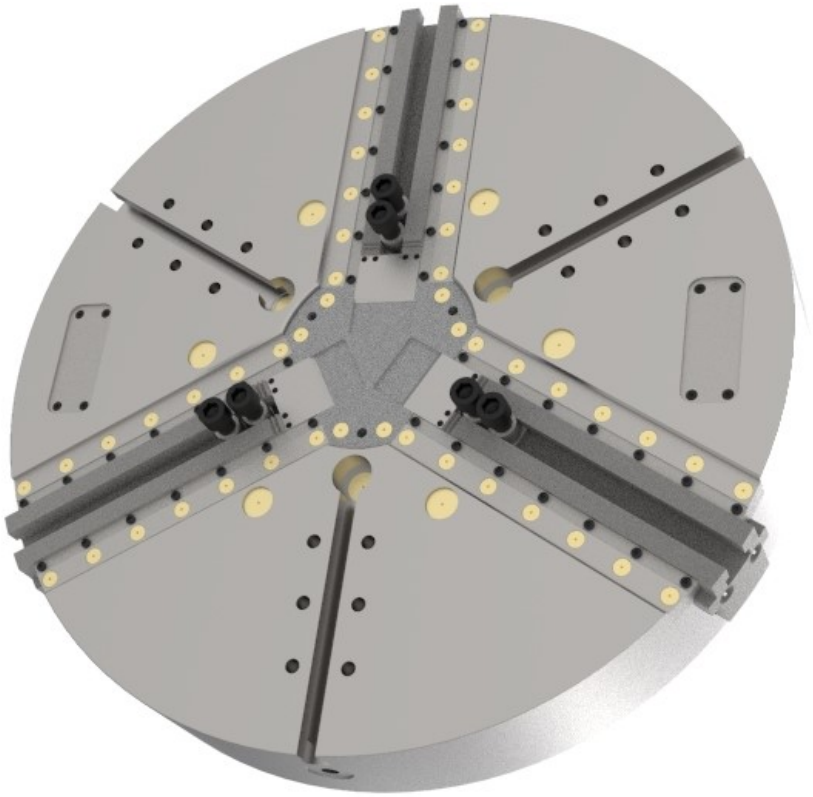
Power Chuck
ROTA NCO2,
ROTA NCO2-JA
Assembly and Operating Manual



Superior Clamping and Gripping

SCHUNK®

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

Danger for persons!

Non-observance will inevitably cause irreversible injury or death.

⚠ WARNING

Dangers for persons!

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

⚠ CAUTION

Dangers for persons!

Non-observance can cause minor injuries.

CAUTION

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 marked with an asterisk (*) can be downloaded on our homepage **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.

2.1 Intended use

The chuck is used to clamp workpieces on machine tools and other suitable technical facilities, paying particular attention to the technical data specified by the manufacturer. The technical data specified by the manufacturer must never be exceeded.

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 automated 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.

⚠ 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

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

Checking the behavior of personnel

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

Danger signs

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

Faults

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

Spare parts

Only 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 [🗋 37]

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

4 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

Tightening torques for the protection sleeve mounting screws (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 lathe chuck incl. mounting screws

1 Set of base jaws with module serration (NCO2)

1 Set of split base jaws with individual adjustment and module serration (NCO2-JA)

3 Eye bolt M24 (DIN 580)

6 Technical data

6.1 Chuck data

ROTA NCO2 / ROTA NCO2-JA	800	1000	1200	1400
Max. actuating force [kN]	170	170	170	170
Max. clamping force [kN]	300	300	300	300
Max. rotation speed [min-1]	900	700	600	500
Individual stroke adjustment per jaw [mm]*	30 (±15)	30 (±15)	30 (±15)	30 (±15)
Stroke per jaw [mm]	23	23	23	23
Piston stroke [mm]	57	57	57	57
Centrifugal torque of the base jaw ROTA NCO2 $\mathbf{M}_{cGB}$ [kgm]	4.1	6.0	8.8	11.4
Centrifugal torque of the base jaw ROTA NCO2-JA $\mathbf{M}_{cGB}$ [kgm]	4.8	7.5	11.0	14.9
Max. jaw eccentricity of center of gravity in axial direction a_{max} [mm]	20	20	20	20

*only with ROTA NCO2-JA

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 untempered top jaws or special chuck jaws are used, ensure that the jaws weigh as little as possible.
For soft top jaws or special chuck jaws, the speed of rotation permitted for the cutting task must be calculated in accordance with VDI 3106 but in doing so the maximum recommended speed may not be exceeded. The calculated values must be verified by means of a dynamic measurement. Monitoring of functions (piston movement and actuating pressure) must be performed in accordance with the guidelines of the Berufsgenossenschaft (employers' mutual insurance association).

6.2 Clamping force / speed diagrams

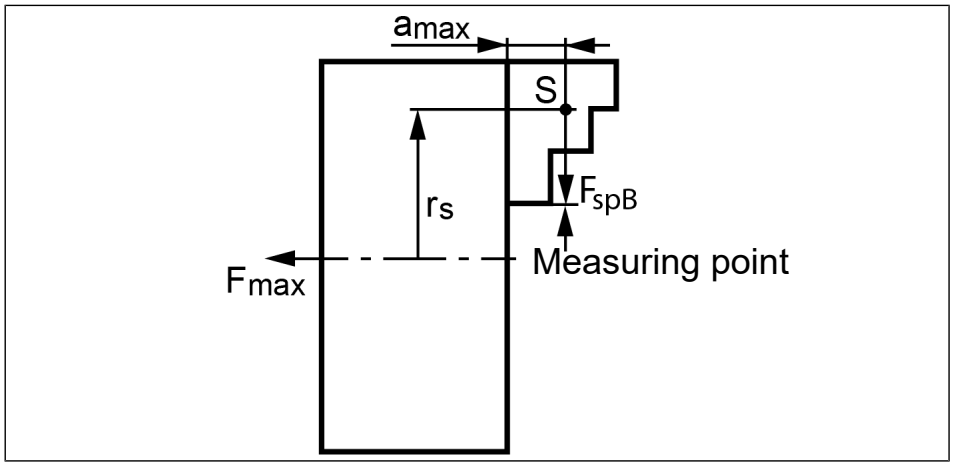
The diagrams relate to a 3-jaw chuck.

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 .

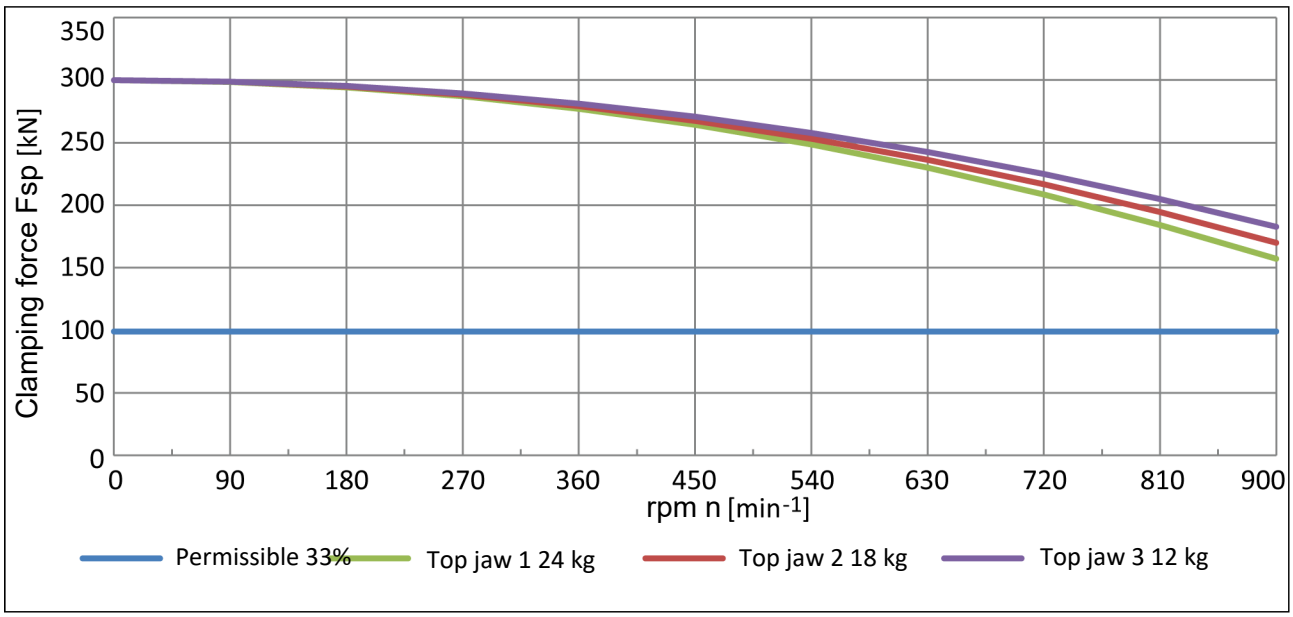
If one or more of these prerequisites is altered, the diagrams will no longer be valid.

Chuck setup for clamping force/RPM diagram

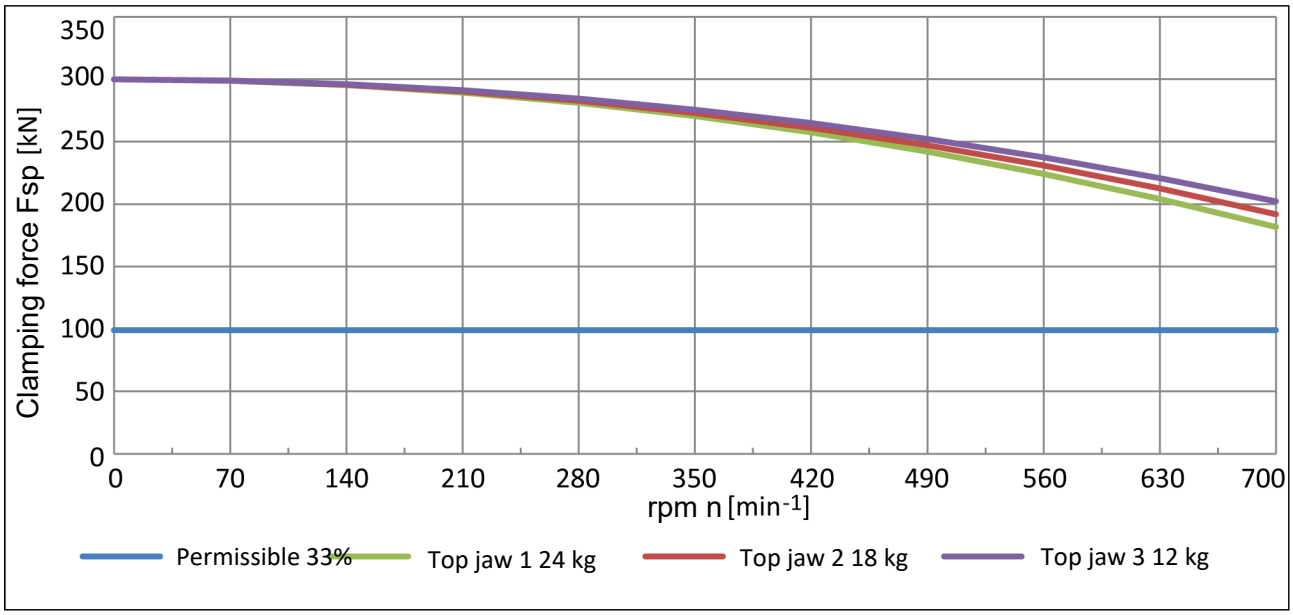


F_{spB}	Clamping force per jaw	S	Center of gravity
r_s	Center of gravity radius	a_{max}	Max. jaw center of gravity eccentricity in axial direction
F_{max}	Max. actuating force		

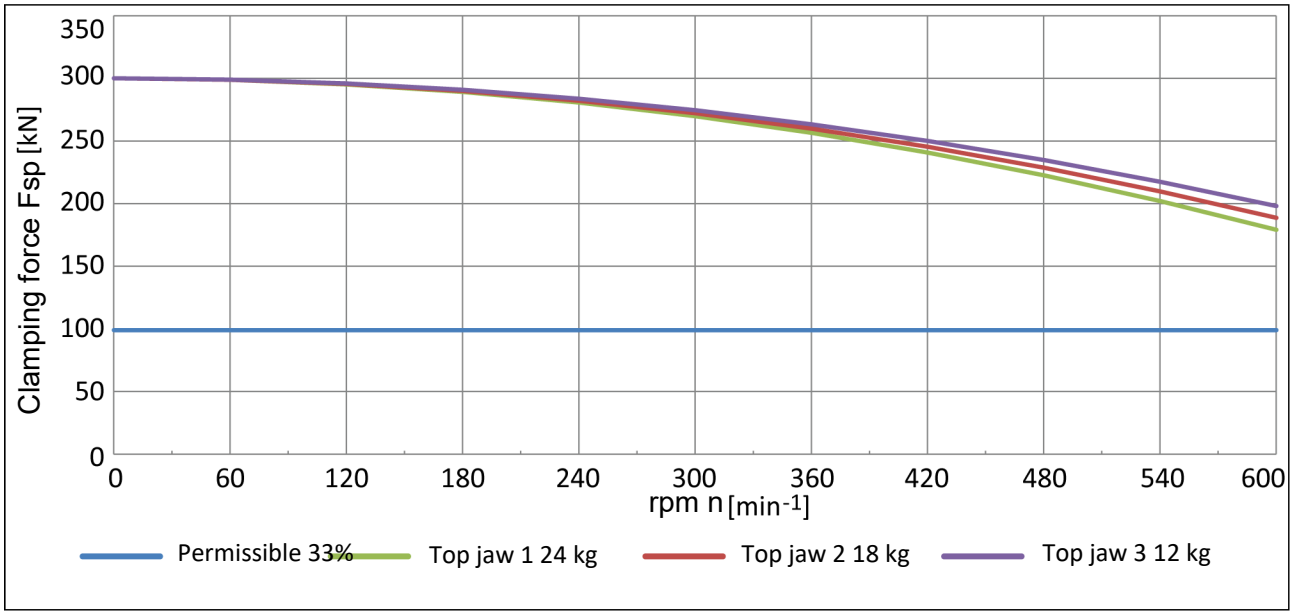
Clamping force/RPM diagram for ROTA NCO2 800



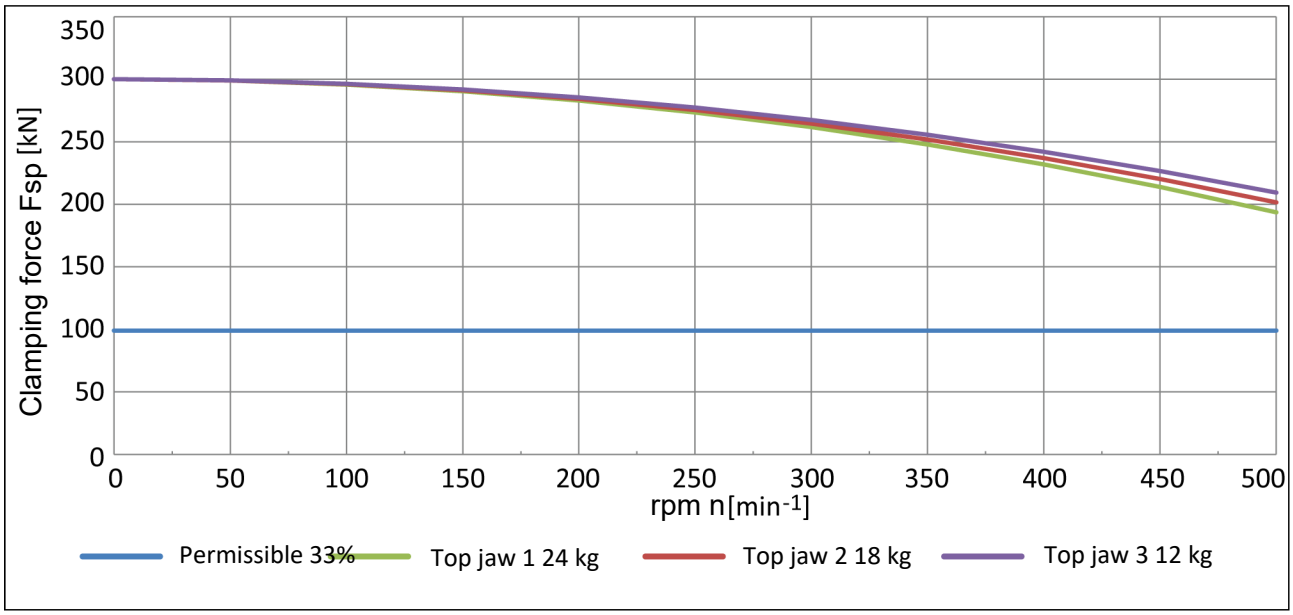
Clamping force/RPM diagram for ROTA NCO2 1000



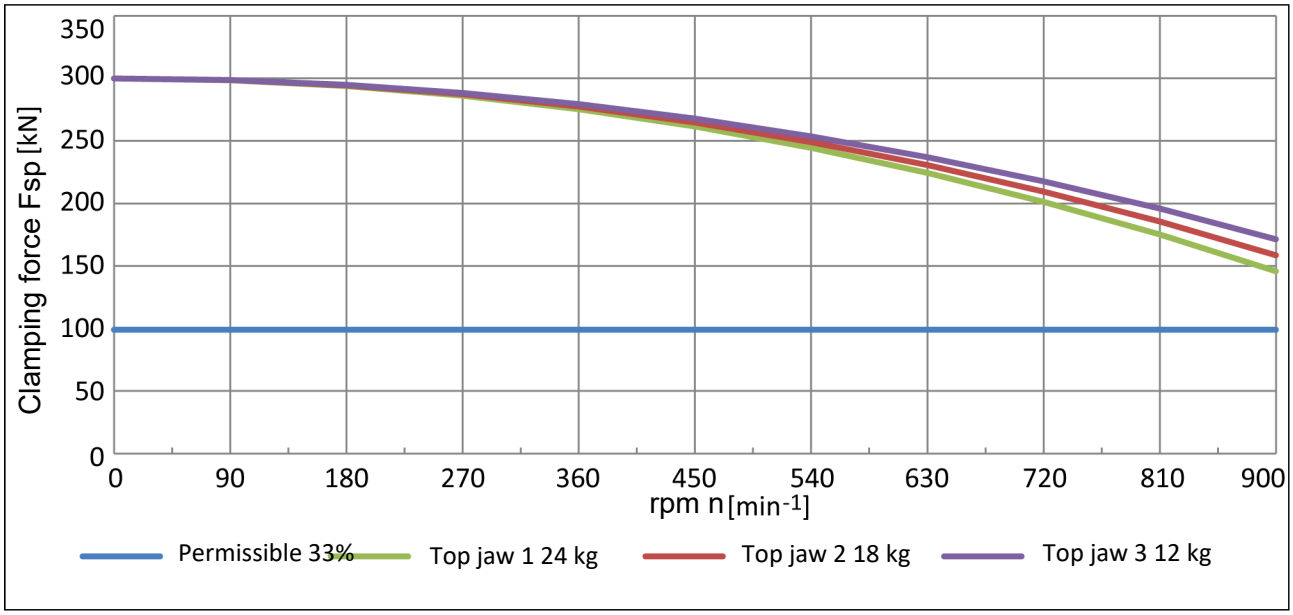
Clamping force/RPM diagram for ROTA NCO2 1200



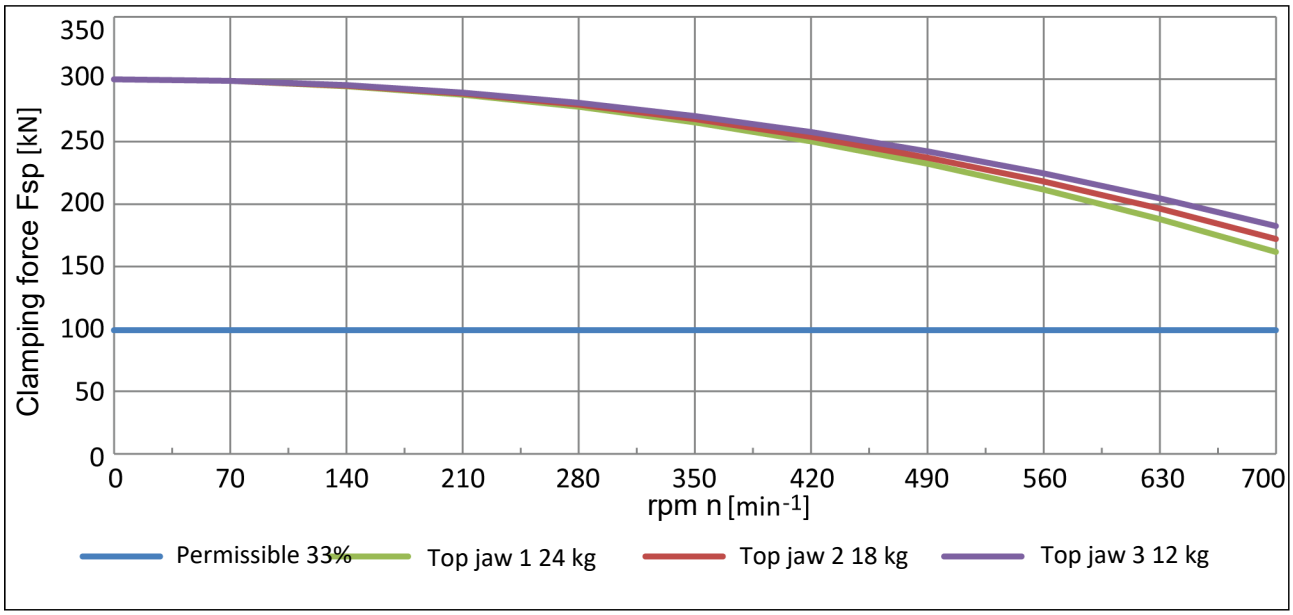
Clamping force/RPM diagram for ROTA NCO2 1400



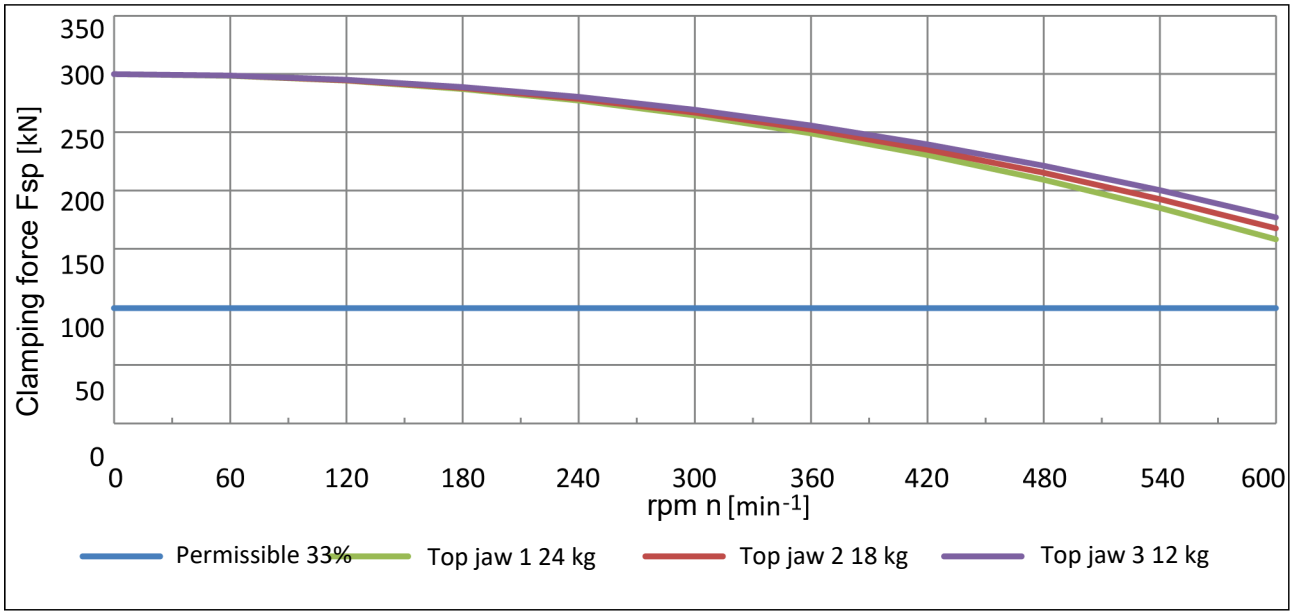
Clamping force/RPM diagram for ROTA NCO2-JA 800



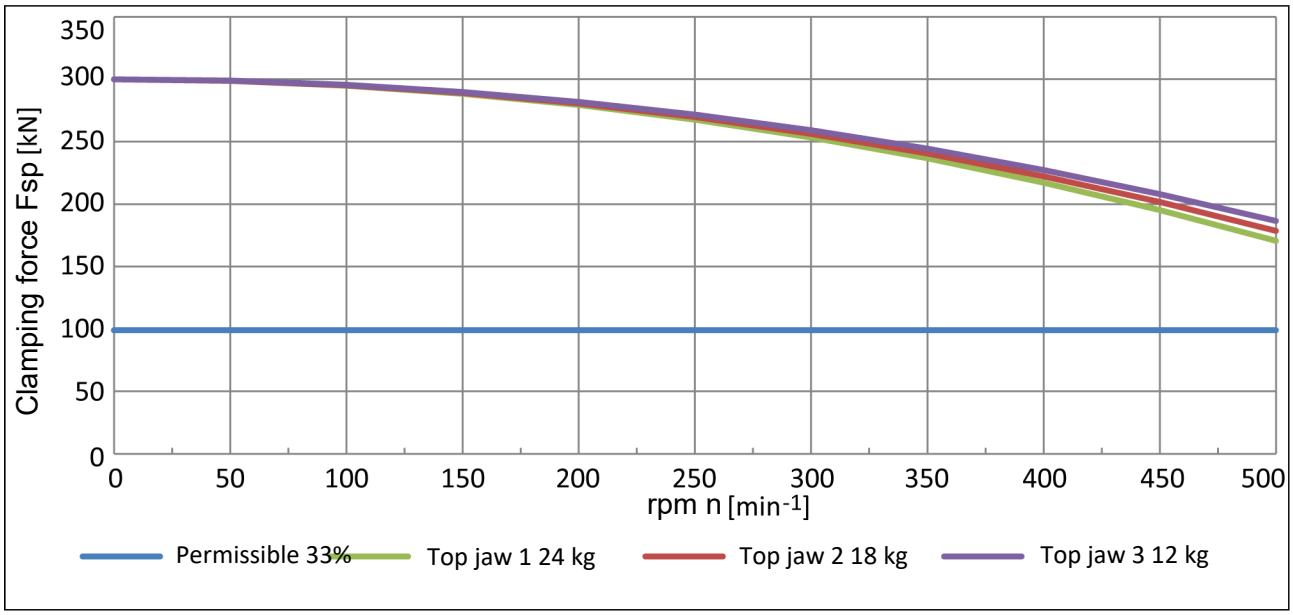
Clamping force/RPM diagram for ROTA NCO2-JA 1000



Clamping force/RPM diagram for ROTA NCO2-JA 1200



Clamping force/RPM diagram for ROTA NCO2-JA 1400



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}**.

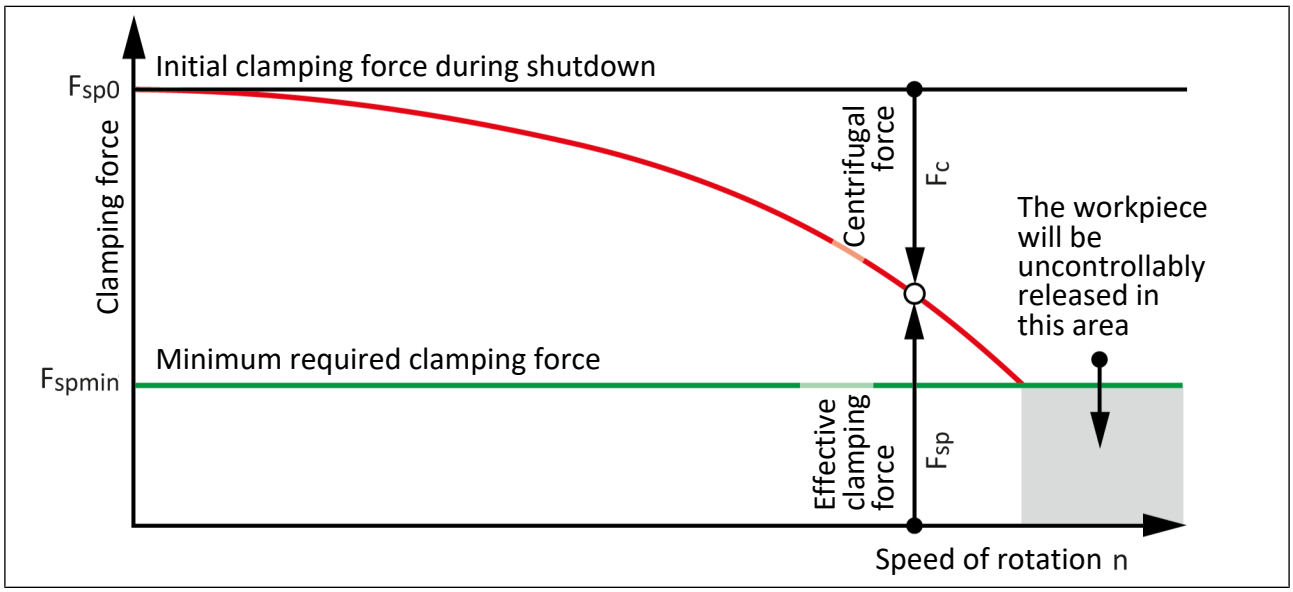
$$F_{sp} = F_{sp0} \mp F_c \text{ [N]}$$

(–) 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

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 ▶ 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 speed of rotation.

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:

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

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.**

$$M_C = m_B \cdot r_S [kgm]$$

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:

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

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:

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

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:

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

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:

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

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:

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

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 $\sum M_c$ = 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 ROTA NCO2 in an ungreased condition without T-nuts and top jaws corresponds to the balancing quality class 6.3 (according to DIN ISO 21940-1).
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 of rotation, asymmetrical workpieces or the use of different 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 21940-1.

7 Mounting

7.1 Pre-assembly measures

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

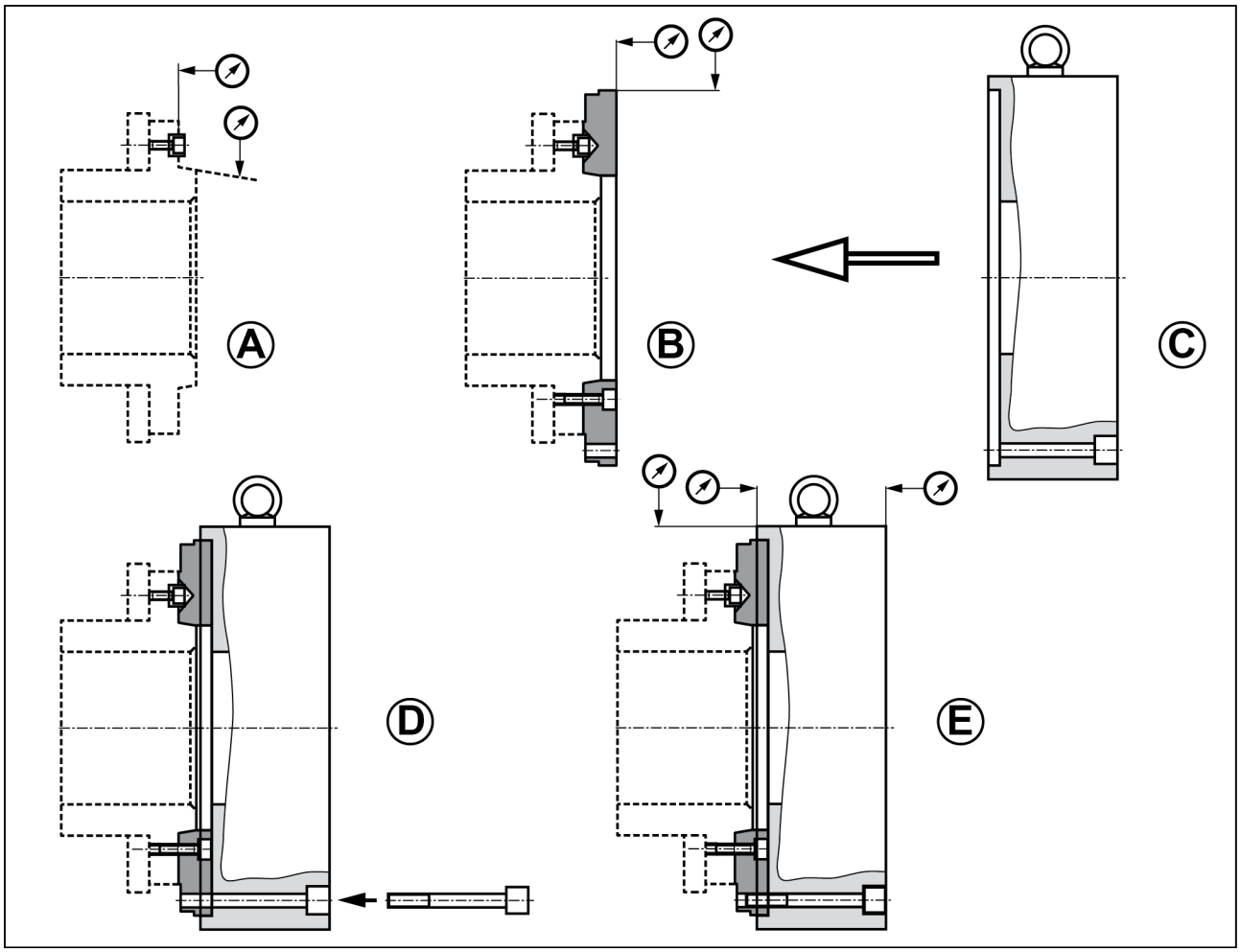
⚠ CAUTION

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



Chuck assembly

Maximum attainable radial and axial run-out tolerances related to the chuck

Chuck size [mm]	Max. radial run-out tolerance [mm]	Max. axial run-out tolerance [mm]
800	0.06	0.05
1000	0.06	0.05
1200	0.08	0.06
1400	0.08	0.06

- Remove the top jaws with mounting screws and any T-nuts from the base jaws.
- Move the draw bar to its foremost position by actuating the clamping cylinder.
- Disassemble the cover.
- Push the chuck piston into the foremost position.
- In principle, it is possible to mount the chuck in two installation positions (horizontal/vertical), depending on the position of the machine spindle.

Horizontal mounting of the lathe chuck. ▶ 7.3 [🗋 31]

Vertical mounting of the lathe chuck.▶ 7.4 [🗋 31]

7.3 Horizontal attachment

Lift the chuck to the front of the spindle lug using eye bolts flush to the center of the spindle.

- **ROTA NCO2 800 – 1400 & ROTA NCO2-JA 800 – 1400:**
  Turn the chuck on the spindle or machine table until the mounting holes and spindle flange threads are aligned. Screw the central mounting screw into the drawbar or the draw tube adapter with a hexagon socket wrench until the stop.

7.4 Vertical attachment

- **ROTA NCO2 800 – 1400 & ROTA NCO2-JA 800 – 1400:**
  Turn the chuck on the spindle or machine table until the mounting holes and spindle flange threads are aligned.
  Screw the central mounting screw into the drawbar or the draw tube adapter with a hexagon socket wrench until the stop.
- Mount the cover.
- Insert and **slightly tighten** the mounting screws.
- Check the chuck for radial and axial run-out and, if necessary, align it at the outer diameter with gentle taps using a plastic hammer. (See "Chuck assembly" Fig. - E and the table of the attainable maximum radial and axial run-out tolerances in the Assembly chapter)

- Then tighten the fastening screws alternately with a torque wrench. Observe the specified maximum admissible torques. ▶ 4 [🗋 17]
- Check radial and axial run-out again.
- Check the actuating force is functioning and is sufficiently large.
- Check the jaw stroke of the base jaws and that these can move easily.
- Fasten the top jaws marked 1, 2 and 3 to the base jaws using T-nuts and screws.

The spindle is disassembled in the same way but in the reverse order.

8 Function

The item numbers specified for the corresponding individual components relate to chapter drawings.▶ 12 [🗋 42]

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

Chuck jaws for maximum clamping repeat accuracy must be turned or ground in the chuck under clamping pressure.

- When turning or grinding, ensure that the turning ring or turning pin is clamped **by the top jaws** and not by the base jaws.
- Keep the base jaws and top jaws screwed in place for recurring work. Tighten the jaw mounting screws to the specified torque. ▶ 4 [🗋 17]

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 [🗋 42]

The tightening torques for all screws must be observed during every assembly and disassembly! ▶ 4 [🗋 17]

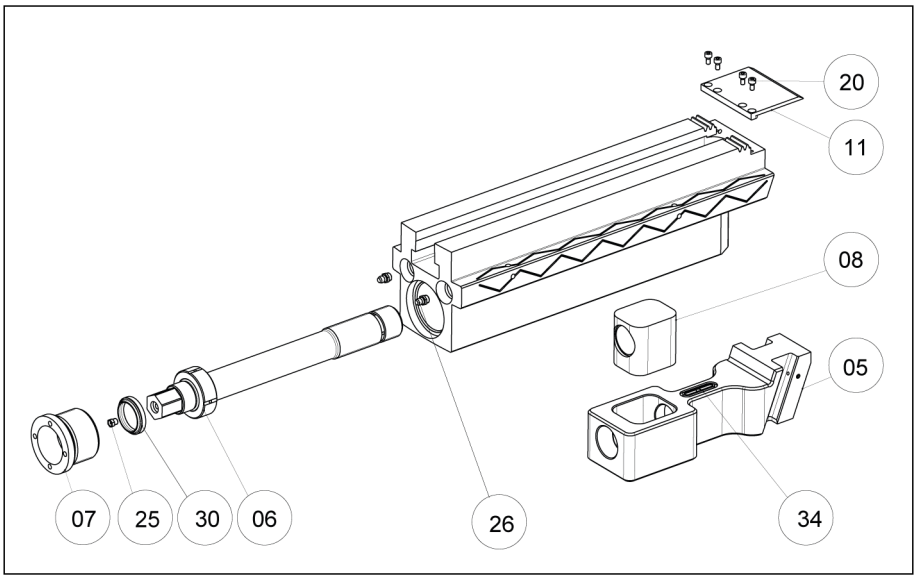
The chuck can only be disassembled once it has been removed.

- Remove the top jaws (if present), T-nuts, and mounting screws from the base jaws.
- Remove screws (item 20) and covers (item 11) from the base jaws.
- Unscrew the cover plate (item 28) screws on the cover (item 22) from the chuck and remove the cover (item 3).
- Remove the central mounting screw M36x90.
- Remove all cover plates (item 28) in the chuck and unscrew the screws (item 22).

- Remove the guide strips (items 9 and 10). Remove screws (item 21), scraper strips (item 13) and wiper plates (item 14).
- Remove the base jaws (item 4) from the rest of the chuck individually or as an assembly group (individual jaw adjustment version). Remove the piston (item 2) from the chuck.

WARNING! If the base jaws should break, then the screws (item 1) also have to be changed.

The jaw guidances on the chuck body are numbered consecutively from 1 to 3. When assembling the base jaws, make sure that the number of notches on the base jaws matches the numbering on the jaw guidances and that the base jaws are reinstalled in the same position as they were prior to disassembly. When installing the piston, make sure that wedge hook 1 is assigned to jaw guidance 1.



- **NCO2-JA 800 – 1400 – Disassembly of base jaw (item 4):** Remove the nut (item 7), unscrew the spindle (item 6) and remove the wiper (item 30). Remove the seat of bearing (item 8) and slide (item 5) including the O-ring (item 34).

Degrease and clean all parts and check them for damage. Prior to assembly, lubricate parts well with Linomax plus special grease paste.

Only use original SCHUNK spare parts when replacing damaged parts.

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

⚠ DANGER

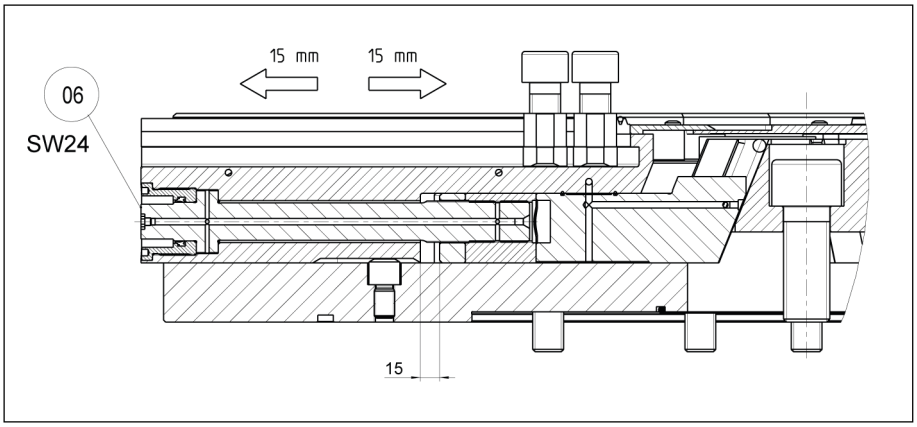
Risk to life and limb of operating personnel due to the chuck being torn off the spindle when using chuck mounting screws of quality class 8.8

If chuck mounting screws of quality class 8.8 are used, this can result in a risk to life and limb of operating personnel and to substantial damage in the automated system.

- **Only use screws of property class 10.9, even if these are panhead screws.**

Chuck mounting screws of property class 10.9 can be ordered as spare parts at SCHUNK.

8.4 Individual jaw adjustment function



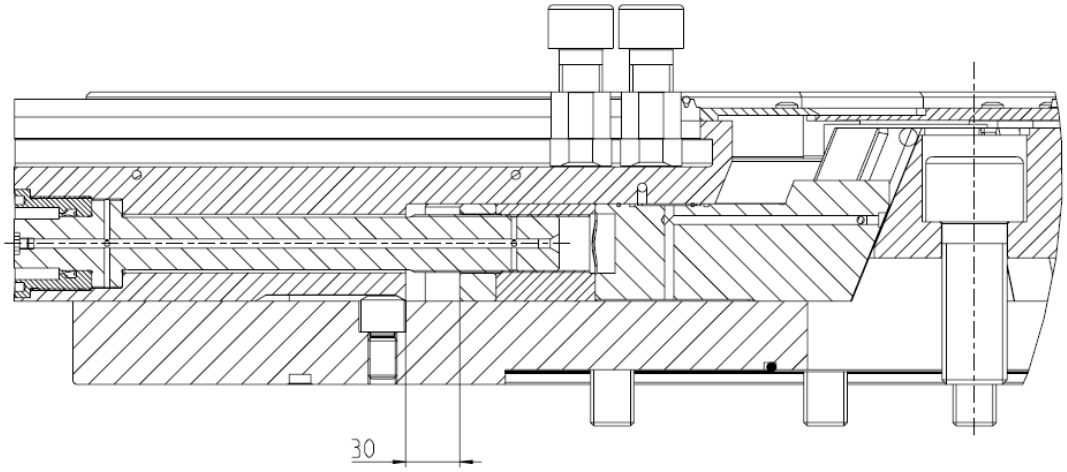
By turning the spindle (item 06), the base jaw is shifted radially to the chuck center. This displacement is used so that the jaws can be separately and individually adapted to workpieces.

Spindle rotation to the right – jaw moves radially inwards.

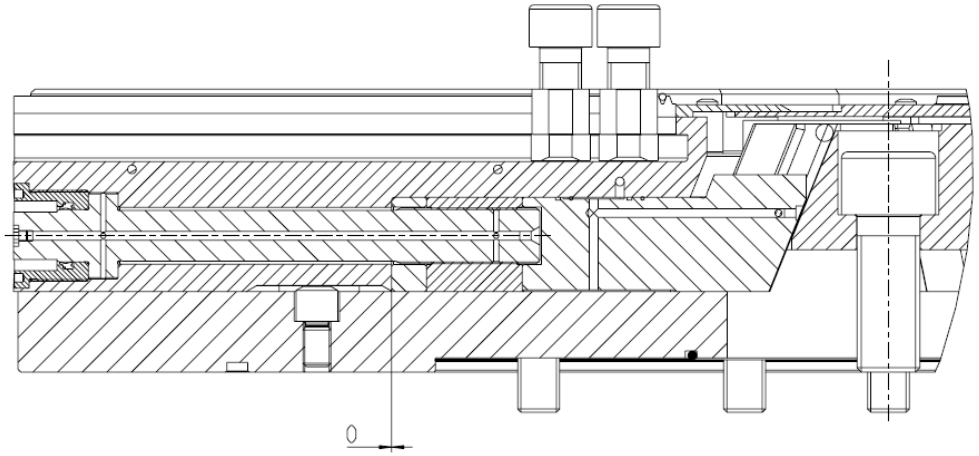
Spindle rotation to the left – jaw moves radially outwards.

The jaws are adjustable by 30 mm: 15 mm inwards and outwards.

offen
open



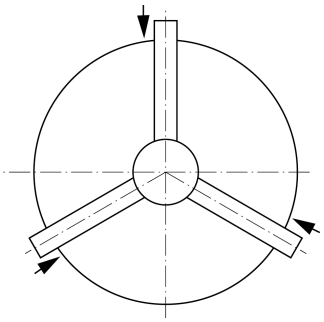
geschlossen
closed



9 Maintenance

9.1 Lubrication

To maintain the reliable function and high quality of the lathe chuck, it has to be regularly lubricated at the lubrication nipples (items 25 and 26).



In order to achieve optimum 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 [🗋 37]). Only use a calibrated gripping force gauge for measuring during the clamping force test (SCHUNK IFT).

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

Technical condition

With the smallest possible actuating pressure (hydraulic cylinder), the base jaws should move evenly. This method only provides a limited indication and is no 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 will have to be disassembled, cleaned and relubricated.

Only use original 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 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 serial no. of the chuck.

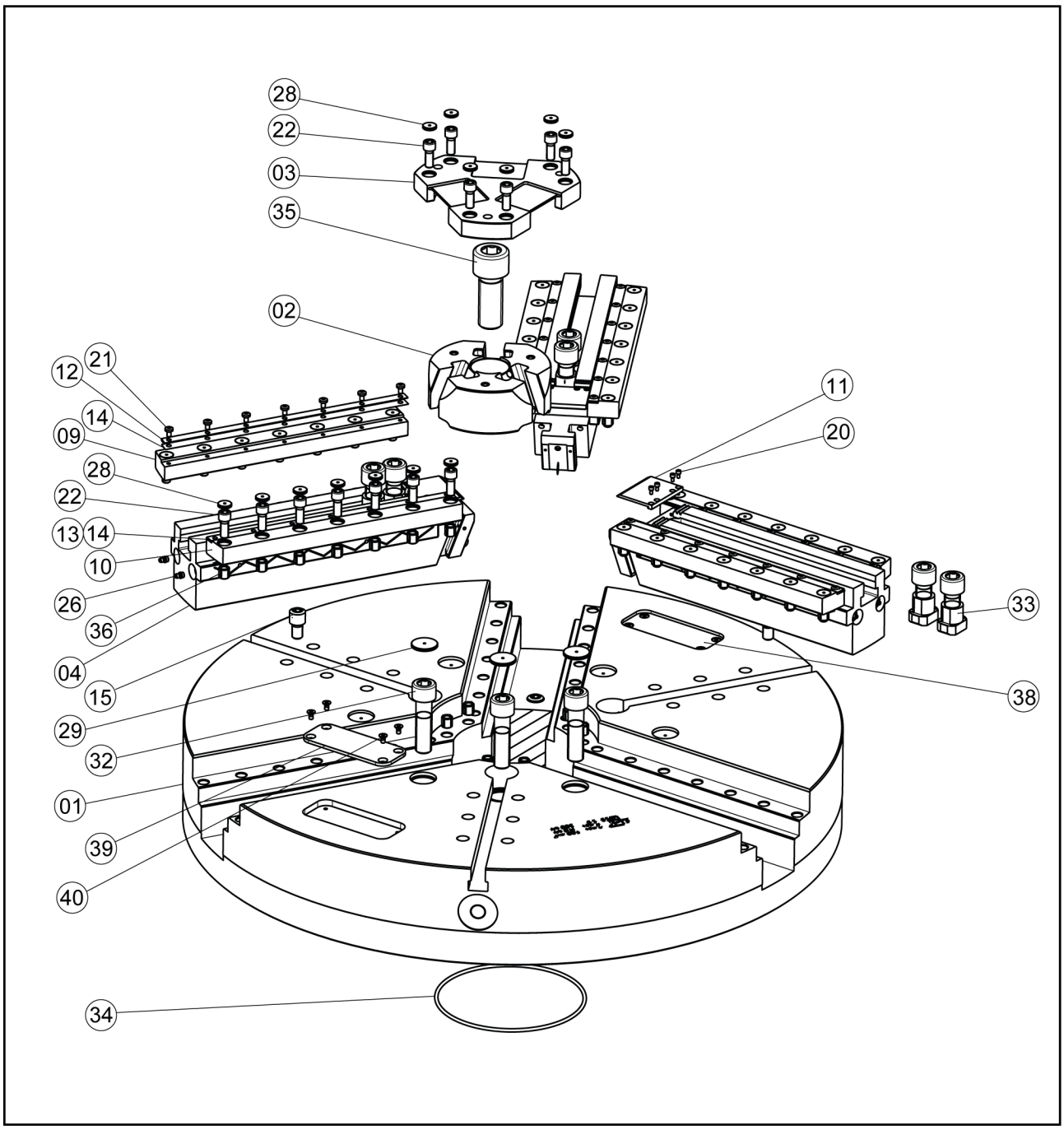
Seals, sealing elements, screw connections, springs, bearings, screws and wiper bars plus parts coming into contact with the workpiece are not covered by the warranty.

Item	ROTA NCO2 800 – 1400
1	Chuck body
2	Piston
3	Cover
4	Base jaw
9	Left bar
10	Right bar
11	Cover
12	Sealing strip, left
13	Sealing strip, right
14	Wiper plate
15	Screw ROTA NCO2
20	Cylindrical screw DIN EN ISO 4762 M4x8 – 10.9
21	Pan-head screw ISO 14583 M6x10 – 12.9
22	Cylindrical screw DIN EN ISO 4762 M12x30 – 10.9
26	Conical lubrication nipple M6x1
27	Expander SK550-050
28	Cover M12
29	Cover M24
31	Set-screw DIN 34827 M5x4 – 45H
32	Cylindrical screw DIN EN ISO 4762 M24x90 – 12.9
33	T-nut NS240
34	O-Ring DIN 3771 220 x 5 – NBR
35	Cylindrical screw DIN EN ISO 4762 M36x90 – 12.9
36	Thread insert M12 Norelem 17660-12
37	DIN 580 M24 eye bolt
38	Sign 160 x 65 x 6 SCHUNK
39	Sign 160 x 65 x 6 "Chuck designation + size".
40	Countersunk screw DIN EN ISO 10642 M6x12 – 10.9
46	Expander MB700-080

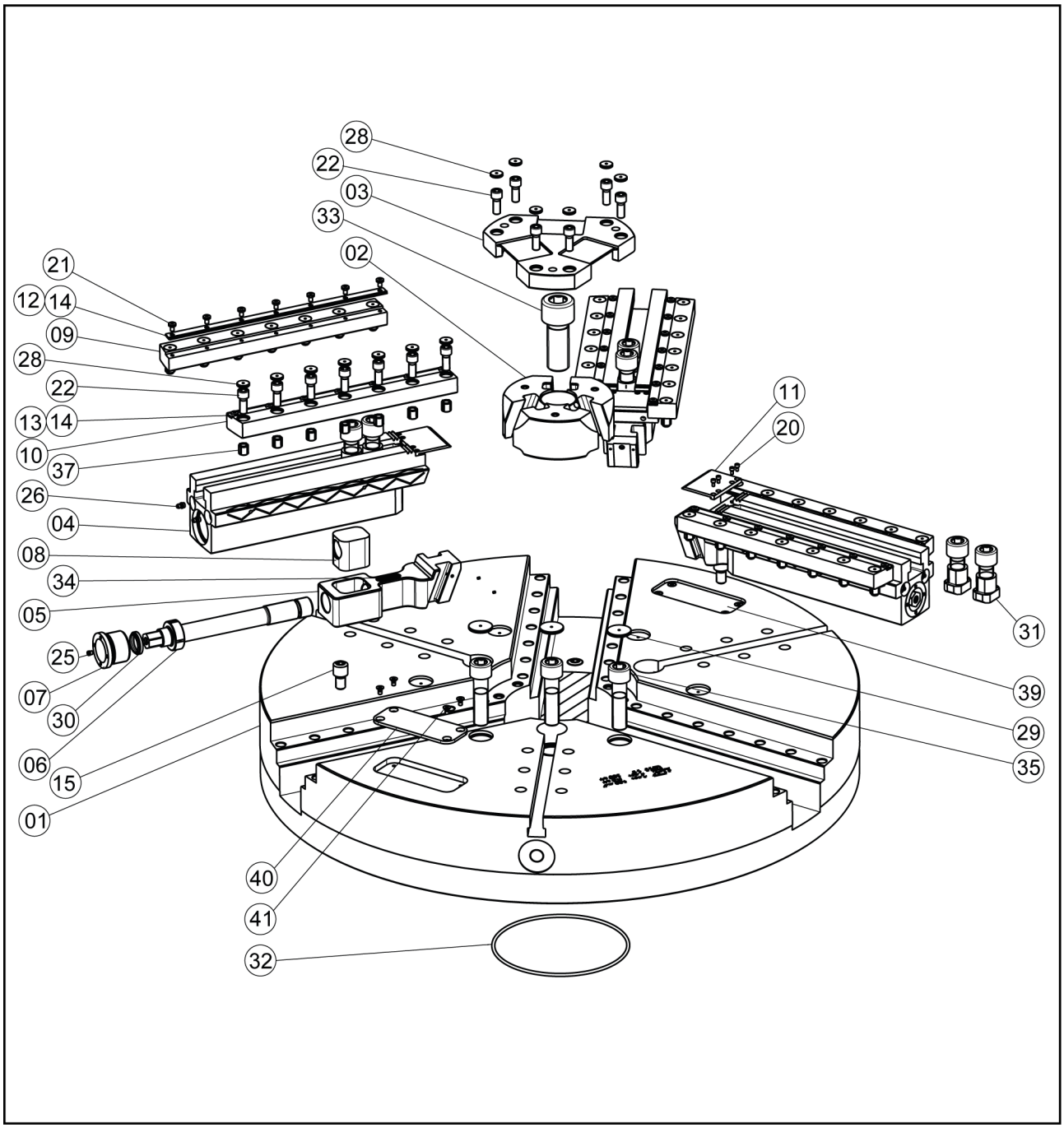
Item	ROTA NCO2-JA 800 – 1400
1	Chuck body
2	Piston
3	Cover
4	Base jaw individual adjustment
5	Slide individual adjustment
6	Spindle
7	Nut
8	Seat of bearing
9	Left bar
10	Right bar
11	Cover
12	Sealing strip, left
13	Sealing strip, right
14	Wiper plate
15	Screw ROTA NCO2
20	Cylindrical screw DIN EN ISO 4762 M4x8 – 10.9
21	Pan-head screw ISO 14592 M6x30 – 12.9
22	Cylindrical screw DIN EN ISO 4762 M12x30 – 10.9
25	Lubrication nipple M6x1
26	Conical lubrication nipple M6x1
27	Expander SK550-050
28	Cover M12
29	Cover M24
30	Wiper DA17 BUSAK WD1700300-N90
31	T-nut NS240
32	O-Ring DIN 3771 220 x 5 – NBR
33	Cylindrical screw DIN EN ISO 4762 M36x90 – 12.9
34	O-Ring DIN 3771 28 x 2 – NBR
35	Cylindrical screw DIN EN ISO 4762 M24x90 – 12.9
36	Set-screw DIN 34827 M5x4 – 45H
37	Thread insert M12 Norelem 17660-12
38	Eye bolt DIN580 M24
39	Sign 160 x 65 x 6 SCHUNK
40	Sign 160 x 65 x 6 "Chuck designation + size".
41	Countersunk screw DIN EN ISO 10642 M6x12 – 10.9
46	Expander MB700-080

12 Assembly drawings

ROTA NCO2 800 – 1400



ROTA NCO2-JA 800 – 1400



13 Translation of the original declaration of incorporation

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

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

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

Product designation:	Power lathe chucks without through-hole
Typenbezeichnung:	ROTA NCO2 in sizes 800, 100, 1200, 1400 ROTA NCO2-JA in sizes 800, 100, 1200, 1400
ID number	1481247,1481305,01481309,1481323, 1481248,1481306,1481310,1481324

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

Applied harmonized standards, especially:

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

DIN ISO 702-1:2010-04	Machine tools - Connecting dimensions of spindle noses and work holding chucks - Part 1: Conical connection
DIN ISO 702-4:2010-04	Machine tools - Connecting dimensions of spindle noses and work holding chucks - Part 4: cylindrical assembly
VDI 3106:2004-04	Determination of permissible speed (rpm) of lathe chucks (jaw chucks)

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

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

Person authorized to compile the technical documentation:
Alexander Koch, Address: see manufacturer's address

Signature: see original declaration

Mengen, November 2021 p.p. Alexander Koch; Head of Engineering Design

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

1. Description of the basic safety and health protection requirements, as per 2006/42/EC, annex I, that apply to and are fulfilled for the scope of the incomplete machine:

Product designation	Power lathe chucks without through-hole
Type designation	ROTA NCO2 in sizes 800, 100, 1200, 1400 ROTA NCO2-JA in sizes 800, 100, 1200, 1400
ID number	1481247,1481305,01481309,1481323, 1481248,1481306,1481310,1481324

To be provided by the System Integrator for the overall machine	☐
Fulfilled for the scope of the partly completed machine	☐
Not relevant	☐

1.1	**Essential Requirements**			
1.1.1	Definitions		X	
1.1.2	Principles of safety integration		X	
1.1.3	Materials and products		X	
1.1.4	Lighting			X
1.1.5	Design of machinery to facilitate its handling		X	
1.1.6	Ergonomics			X
1.1.7	Operating positions			X
1.1.8	Seating			X

1.2	**Control Systems**			
1.2.1	Safety and reliability of control systems			X
1.2.2	Control devices			X
1.2.3	Starting			X
1.2.4	Stopping			X
1.2.4.1	Normal stop			X
1.2.4.2	Operational stop			X
1.2.4.3	Emergency stop			X
1.2.4.4	Assembly of machinery			X
1.2.5	Selection of control or operating modes			X
1.2.6	Failure of the power supply			X

1.3	**Protection against mechanical hazards**			
1.3.1	Risk of loss of stability		X	
1.3.2	Risk of break-up during operation		X	
1.3.3	Risks due to falling or ejected objects			X
1.3.4	Risks due to surfaces, edges or angles		X	

1.3	Protection against mechanical hazards			
1.3.5	Risks related to combined machinery			X
1.3.6	Risks related to variations in operating conditions		X	
1.3.7	Risks related to moving parts		X	
1.3.8	Choice of protection against risks arising from moving parts			X
1.3.8.1	Moving transmission parts			X
1.3.8.2	Moving parts involved in the process			X
1.3.9	Risks of uncontrolled movements			X

1.4	Required characteristics of guards and protective devices			
1.4.1	General requirements			X
1.4.2	Special requirements for guards			X
1.4.2.1	Fixed guards			X
1.4.2.2	Interlocking movable guards			X
1.4.2.3	Adjustable guards restricting access			X
1.4.3	Special requirements for protective devices			X

1.5	Risks due to other hazards			
1.5.1	Electricity supply			X
1.5.2	Static electricity			X
1.5.3	Energy supply other than electricity			X
1.5.4	Errors of fitting		X	
1.5.5	Extreme temperatures		X	
1.45.6	Fire			X
1.5.7	Explosion			X
1.5.8	Noise		X	
1.5.9	Vibrations		X	
1.5.10	Radiation	X		
1.5.11	External radiation	X		
1.5.12	Laser radiation	X		
1.5.13	Emissions of hazardous materials and substances			X
1.5.14	Risk of being trapped in a machine			X
1.5.15	Risk of slipping, tripping or falling			X
1.5.16	Lightning			X

1.6	Maintenance			
1.6.1	Machinery maintenance		X	
1.6.2	Access to operating positions and servicing points		X	
1.6.3	Isolation of energy sources			X
1.6.4	Operator intervention			X
1.6.5	Cleaning of internal parts			X

1.7	**Information**			
1.7.1	Information and warnings on the machinery		X	
1.7.1.1	Information and information devices		X	
1.7.1.2	Warning devices			X
1.7.2	Warning of residual risks		X	
1.7.3	Marking of machinery	X		
1.7.4	Instructions	X		
1.7.4.1	General principles for the drafting of instructions		X	
1.7.4.2	Contents of the instructions	X		
1.7.4.3	Sales literature		X	

	The classification from Annex 1 is to be supplemented from here forward.			
2	Supplementary essential health and safety requirements for certain categories of machinery			X
2.1	Foodstuffs machinery and machinery for cosmetics or pharmaceutical products			X
2.2	Portable hand-held and/or guided machinery			X
2.2.1	Portable fixing and other impact machinery			X
2.3	Machinery for working wood and material with similar physical characteristics			X
3	Supplementary essential health and safety requirements to offset hazards due to the mobility of machinery			X
4	Supplementary essential health and safety requirements to offset hazards due to lifting operations			X
5	Supplementary essential health and safety requirements for machinery intended for underground work			X
6	Supplementary essential health and safety requirements for machinery presenting particular hazards due to the lifting of persons			X

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