

Power Chuck

ROTA NC02, ROTA NC02-JA

Assembly and Operating Manual

Translation of Original Operating
Manual

Imprint

Copyright:

This manual is protected by copyright. The author is SCHUNK SE & Co. KG.
All rights reserved.

Technical changes:

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

Document number: 1506425

Version: 02.00 | 14/01/2025 | en

Dear Customer,

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

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

Best regards,

Your SCHUNK team

Customer Management

Tel. +49-7572-7614-1300

Fax +49-7572-7614-1039

cmm@de.schunk.com



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

Table of Contents

1 General	5
1.1 About this manual.....	5
1.1.1 Illustration of warnings	5
1.1.2 Applicable documents	6
1.2 Warranty	6
1.3 Sizes.....	6
1.4 Scope of delivery.....	6
2 Basic safety notes	7
2.1 Appropriate use	7
2.2 Inappropriate use	7
2.3 Structural changes.....	8
2.4 Spare parts	8
2.5 Ambient conditions and operating conditions	8
2.6 Material limitations	8
2.7 Chuck Jaws	9
2.8 Personnel qualifications	9
2.9 Personal protective equipment	10
2.10 Transport.....	10
2.11 Protection during handling and assembly	10
2.12 Protection during commissioning and operation	10
2.13 Notes on safe operation.....	10
2.14 Disposal	13
2.15 Fundamental dangers	13
2.16 Protection against dangerous movements	13
2.17 Notes on particular risks	14
3 Technical data	17
3.1 Chuck data	17
3.2 Clamping force / speed diagrams	17
3.3 Calculations for clamping force and speed	21
3.3.1 Calculation of the required clamping force in case of a given rpm.....	21
3.3.2 Calculation example: required initial clamping force for a given speed ..	23
3.3.3 Calculation of the permissible speed in case of a given initial clamping force	24
3.4 Grades of Accuracy	25
3.5 Permissible imbalance	25
4 Mounting	26
4.1 Torques per screw	26

4.2	Mounting in general	26
4.2.1	Pre-assembly measures	26
4.2.2	Chuck assembly options	27
4.3	Mounting of the Power Chuck	28
4.3.1	Horizontal attachment	28
4.3.2	Vertical attachment	29
5	Function	30
5.1	Function and handling	30
5.2	Change or supplement of jaws	30
5.3	Disassembly of chucks for complete cleaning or in case of damage	30
5.4	Individual jaw adjustment function	32
6	Maintenance	33
6.1	Lubrication	33
6.2	Maintenance and lubrication plan	34
6.3	Changing the top jaws	34
7	Storage	35
8	Disposal	36
9	Parts list	37
10	Assembly drawings	40
11	Manufacturer certificate	42

1 General

1.1 About this manual

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

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

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

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

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

1.1.1 Illustration of warnings

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



⚠ DANGER

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



⚠ WARNING

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



⚠ CAUTION

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

CAUTION

Information about avoiding material damage.

1.1.2 Applicable documents

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

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

1.2 Warranty

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

- Observe the applicable documents, ▶ 1.1.2 [6]
- Observance of the ambient conditions and operating conditions, ▶ 2.5 [8]
- Observance of the specified maintenance and lubrication intervals ▶ 6.2 [34]

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

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

1.3 Sizes

This operating manual applies to the following sizes:

- ROTA NC02 / NC02-JA 800
- ROTA NC02 / NC02-JA 1000
- ROTA NC02 / NC02-JA 1200
- ROTA NC02 / NC02-JA 1400

1.4 Scope of delivery

- 1 **Power lathe chuck incl. mounting screws**
- 1 **Set of base jaws with module serration (NC02)**
- 1 **Set of split base jaws with individual adjustment and module serration (NC02-JA)**
- 3 **Eye bolt M24 (DIN 580)**
- 1 **Assembly and Operating Manual**

2 Basic safety notes

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

2.1 Appropriate use

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

2.2 Inappropriate use

The product is not being used appropriately if:

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

2.3 Structural changes

Implementation of structural changes

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

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

2.4 Spare parts

Use of unauthorized spare parts

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

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

2.5 Ambient conditions and operating conditions

Required ambient conditions and operating conditions

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

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

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

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

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

2.6 Material limitations

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

2.7 Chuck Jaws

Requirements of the chuck jaws

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

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

2.8 Personnel qualifications

Inadequate qualification of personnel

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

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

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

Qualified electrician

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

Specialist personnel

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

- Instructed person** Instructed persons have been instructed by the operator regarding the tasks entrusted to them and the potential dangers of inappropriate behavior.
- Manufacturer's service personnel** The manufacturer's service personnel have the specialized training, knowledge, and experience to perform the work entrusted to them and to recognize and avoid potential dangers.

2.9 Personal protective equipment

Use of personal protective equipment

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

2.10 Transport

Handling during transport

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

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

2.11 Protection during handling and assembly

Incorrect handling and assembly

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

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

2.12 Protection during commissioning and operation

Falling or violently ejected components

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

- Take suitable protective measures to secure the danger zone.

2.13 Notes on safe operation

Incorrect manner of working by personnel

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

- Observe the safety notes and assembly instructions.
- Do not expose the product to any corrosive media. Products for special ambient conditions are excluded.

- Rectify malfunctions as soon as they occur.
- Observe the care and maintenance instructions.
- Observe the current safety, accident prevention, and environmental protection regulations for the application field of the product.
- The chuck may only be accelerated to speed or otherwise when a workpiece is correctly clamped. This means that the clamping force has been applied to the workpiece and the clamping has taken place within the permissible operating range.
- Unclamping may only occur once the machine spindle has come to a standstill.

Functionality check

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

Two important points are:

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

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

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

Maintenance instructions

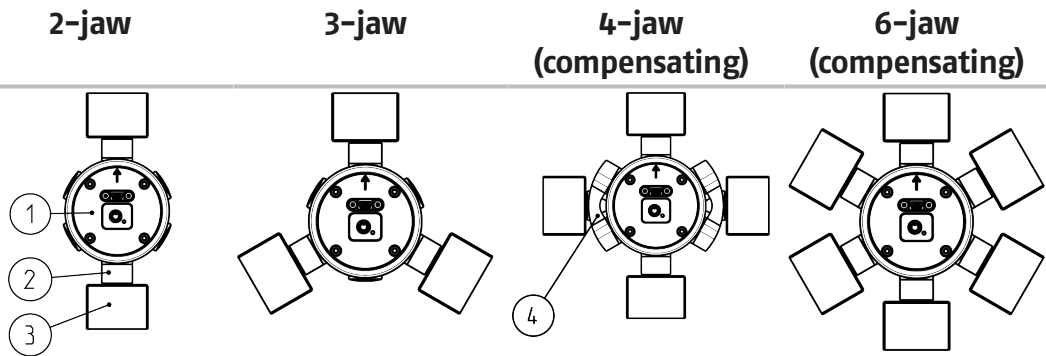
The clamping device's reliability and safety can only be guaranteed if the operator complies with the manufacturer's maintenance instructions.

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

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

Clamping force measurement

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



Measuring device	SCHUNK IFT clamping force tester	SCHUNK IFT clamping force tester	SCHUNK IFT clamping force tester	SCHUNK IFT clamping force tester
Accessories	-	-	IFT MA4	-
Measuring points	0°/180°	0°/120°/240°	0° / 180° / 90° / 270° (IFT MA4)	0°/60°/120°/180°/ 240°/300°
Please note	Operating manual SCHUNK IFT Clamping force tester	Operating manual SCHUNK IFT Clamping force tester	Operating manual SCHUNK IFT Clamping force tester	Operating manual SCHUNK IFT Clamping force tester

Attention
 Compensation must be activated, otherwise it may lead to inconsistent results.

Attention
 Compensation must be activated, otherwise it may lead to inconsistent results.

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

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

- The clamping force should always be measured with the clamping device in the same condition as it is used in for the current clamping application. If top jaws with clamping steps are used, measuring must be performed in the same step as for the respective clamping task. In the event of high operating speeds, clamping force losses must be accounted for due to the centrifugal force acting on the chuck jaws. In this case the value of the operating clamping force should be measured dynamically.
- We recommend checking the clamping force using a clamping force tester before starting a new production run and between maintenance intervals. "Optimum safety can only be guaranteed through regular checks".

2.14 Disposal

Handling of disposal

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

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

2.15 Fundamental dangers

General

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

2.16 Protection against dangerous movements

Unexpected movements

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

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

2.17 Notes on particular risks



⚠ DANGER

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

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



⚠ DANGER

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

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

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



⚠ DANGER

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

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



⚠ DANGER

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

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



⚠ DANGER

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

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

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



⚠ WARNING

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

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



⚠ CAUTION

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

- Do not reach between the chuck jaws.



⚠ CAUTION

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

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

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



⚠ CAUTION

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

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



⚠ CAUTION

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

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

CAUTION

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

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

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

3 Technical data

3.1 Chuck data

ROTA NC02 / ROTA NC02-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 M_{cGB} [kgm]				
ROTA NC02	4.1	6.0	8.8	11.4
ROTA NC02-JA	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 NC02-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).

3.2 Clamping force / speed diagrams

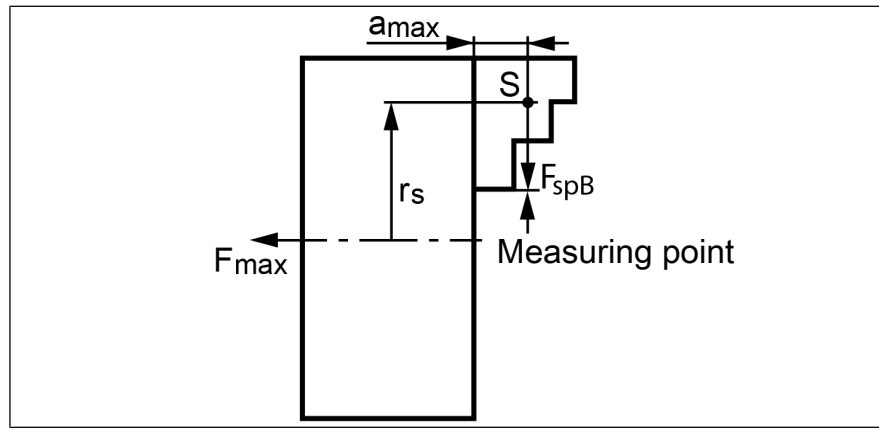
The diagrams relate to a 3-jaw chuck.

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 .

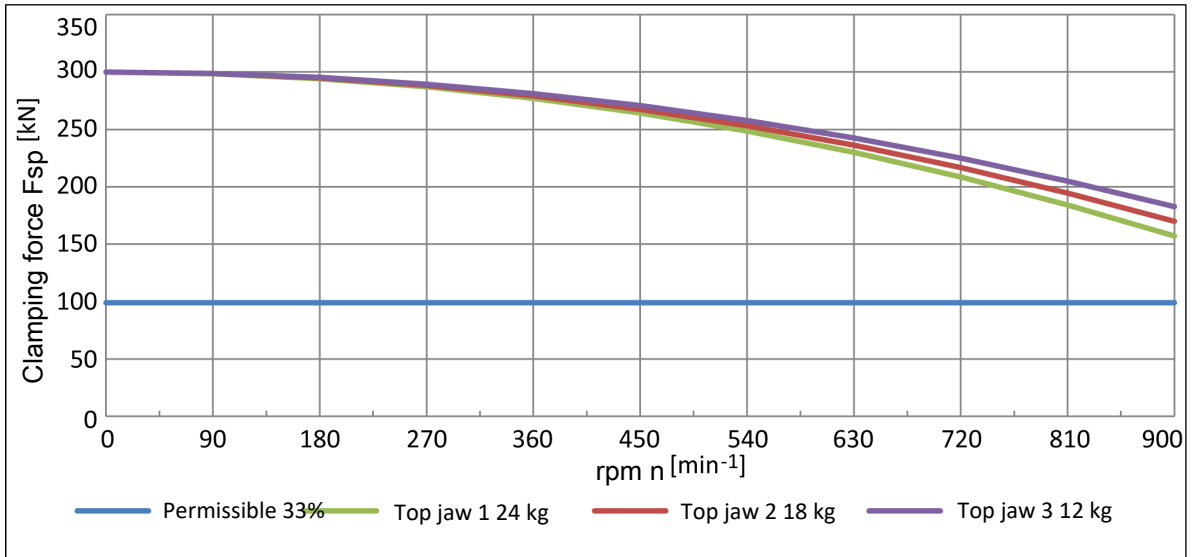
If one or more of these prerequisites is altered, the diagrams will no longer be valid.

Chuck setup for clamping force/RPM diagram

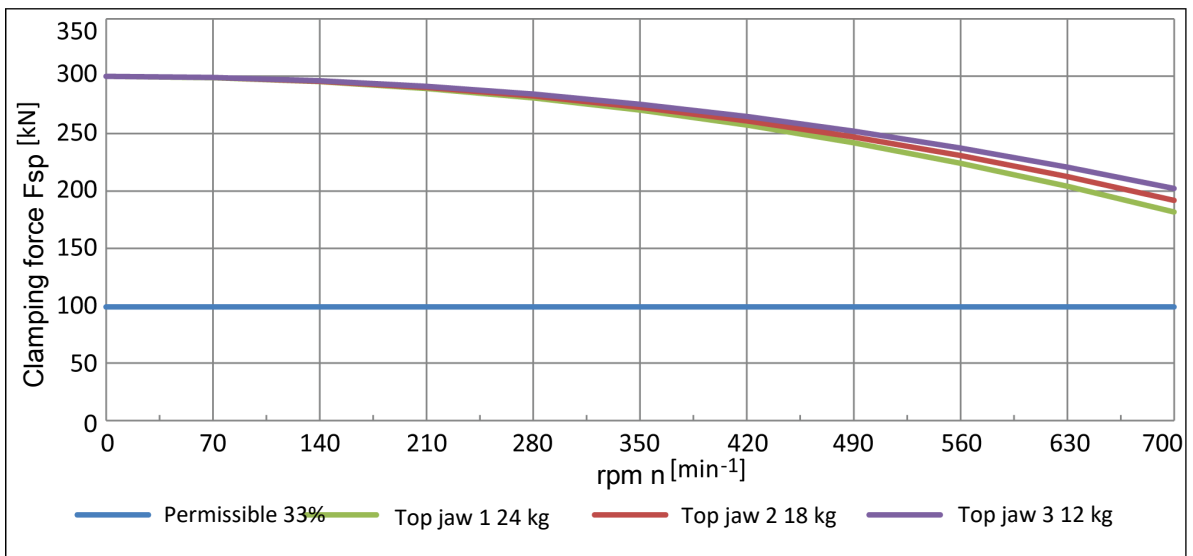


F_{spB}	Clamping force per jaw	S	Center of gravity
r_s	Center of gravity radius	a_{max}	Max. jaw center of gravity eccentricity in axial direction
F_{max}	Max. actuating force		

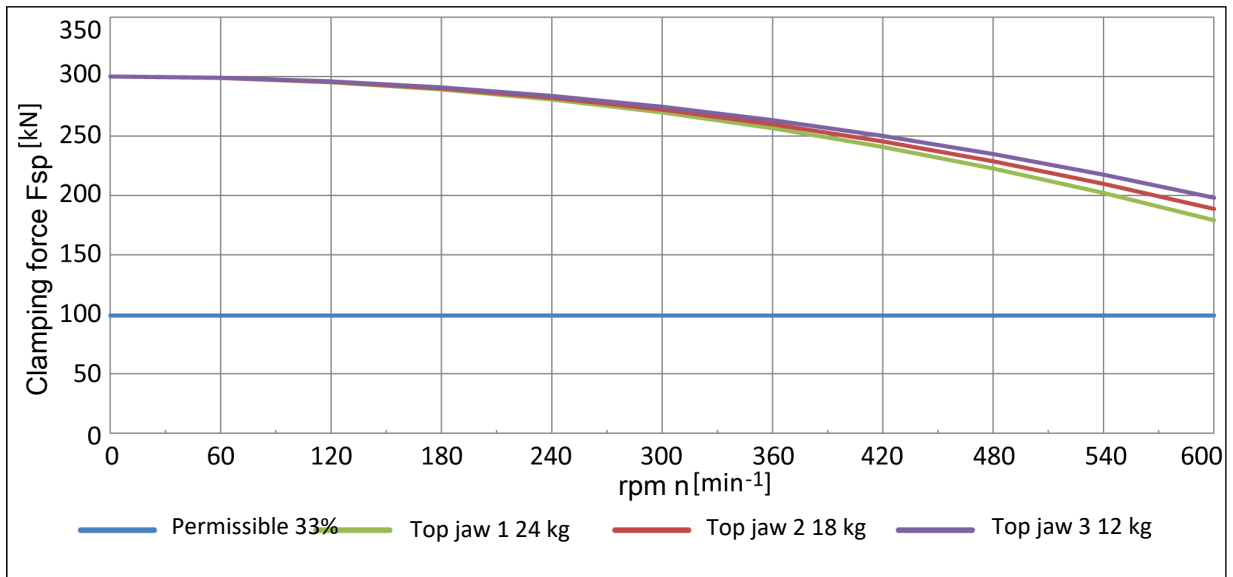
Clamping force/RPM diagram for ROTA NC02 800



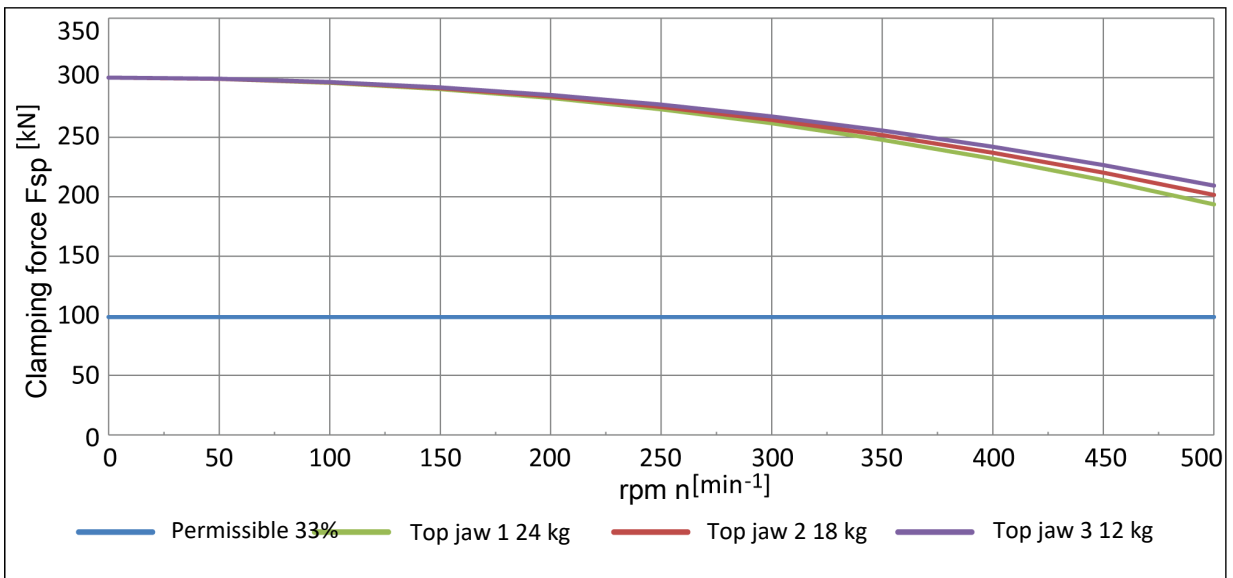
Clamping force/RPM diagram for ROTA NC02 1000



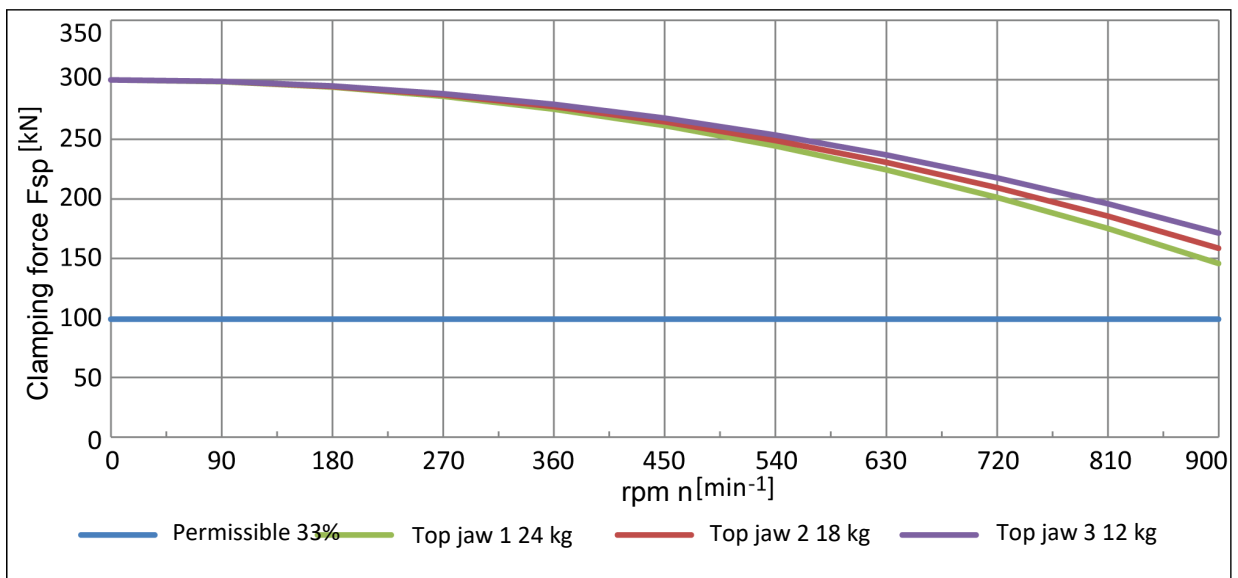
Clamping force/RPM diagram for ROTA NC02 1200



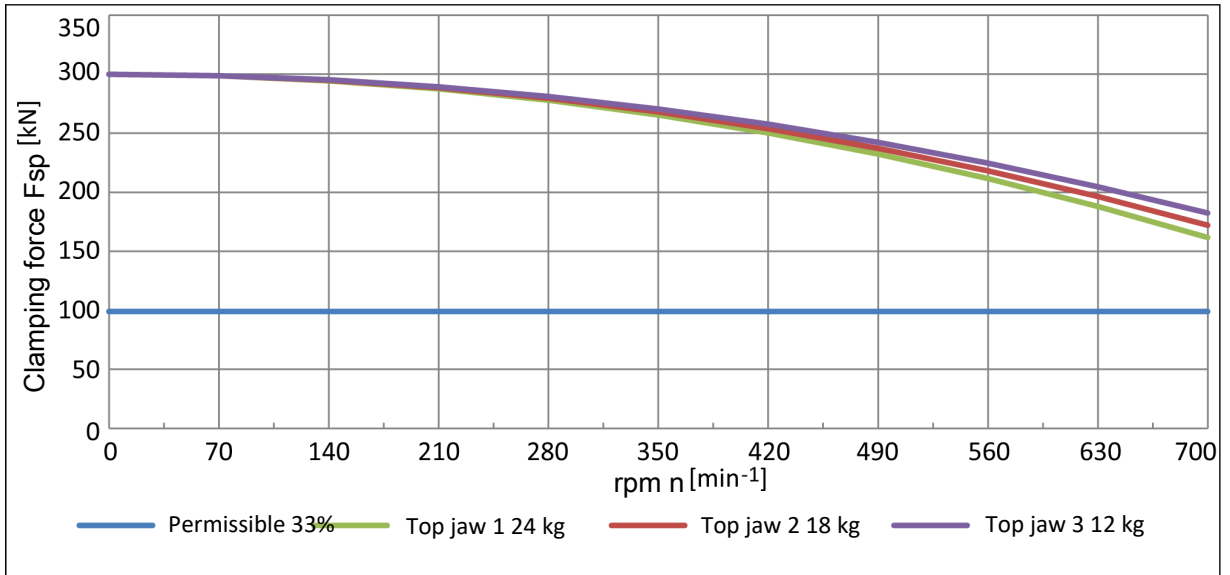
Clamping force/RPM diagram for ROTA NC02 1400



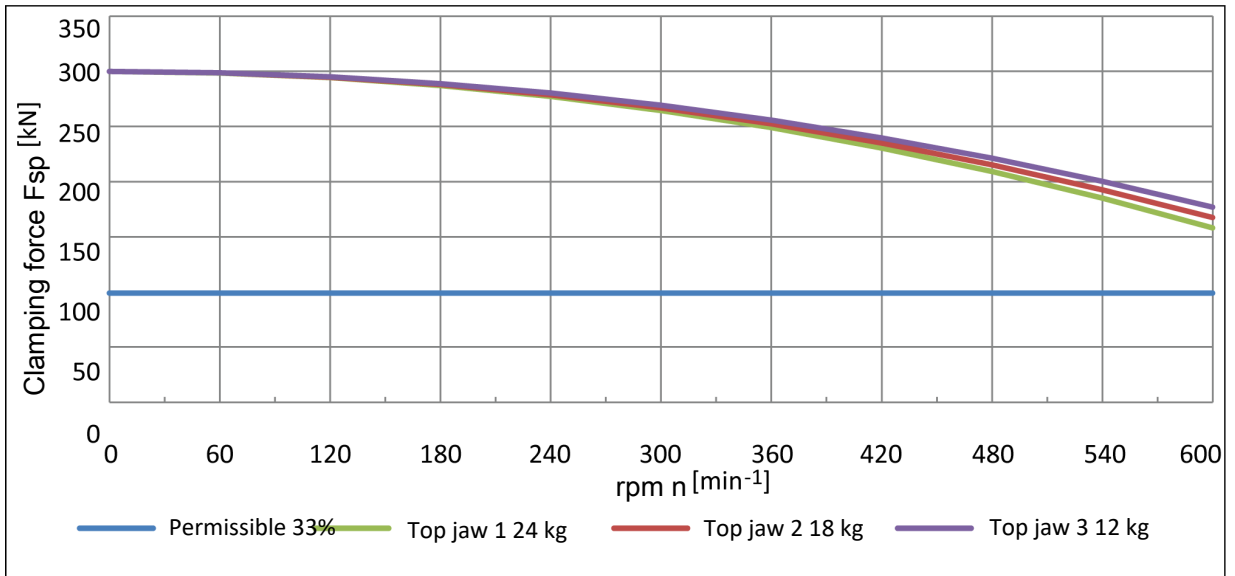
Clamping force/RPM diagram for ROTA NC02-JA 800



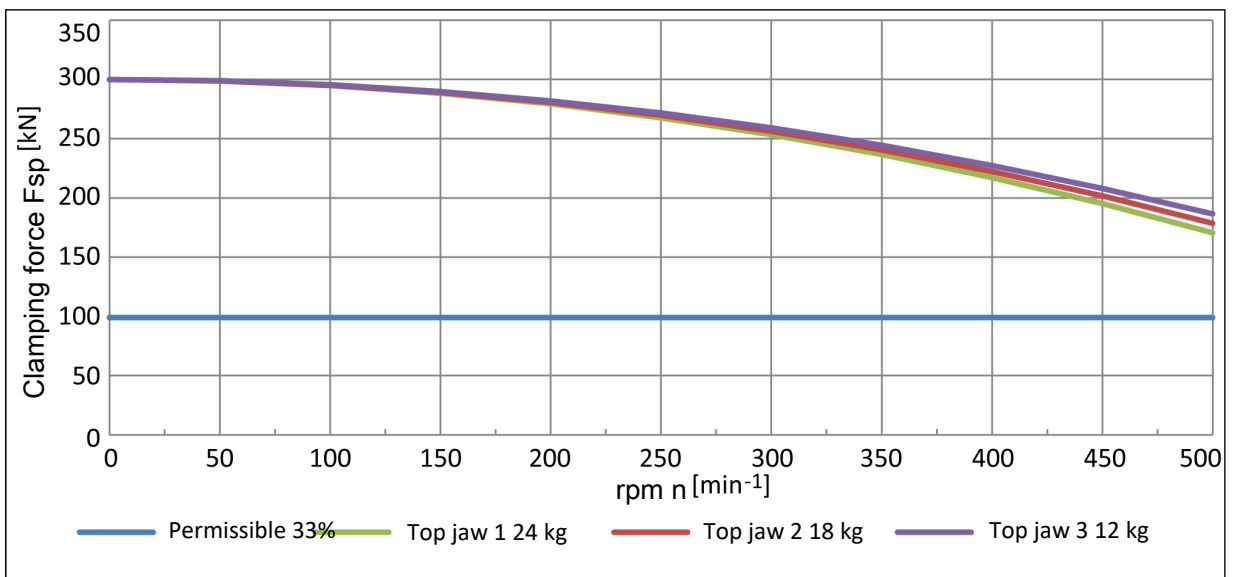
Clamping force/RPM diagram for ROTA NC02-JA 1000



Clamping force/RPM diagram for ROTA NC02-JA 1200



Clamping force/RPM diagram for ROTA NC02-JA 1400



3.3 Calculations for clamping force and speed

Missing information or specifications can be requested from the manufacturer.

Legend			
F_c	Total centrifugal force [N]	M_{cAB}	Centrifugal torque of top jaws [Kgm]
F_{sp}	Effective clamping force [N]	M_{cGB}	Centrifugal torque of base jaws [Kgm]
F_{spmin}	Minimum required clamping force [N]	n	Speed [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]

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

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

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

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

(-) for gripping from the outside inwards

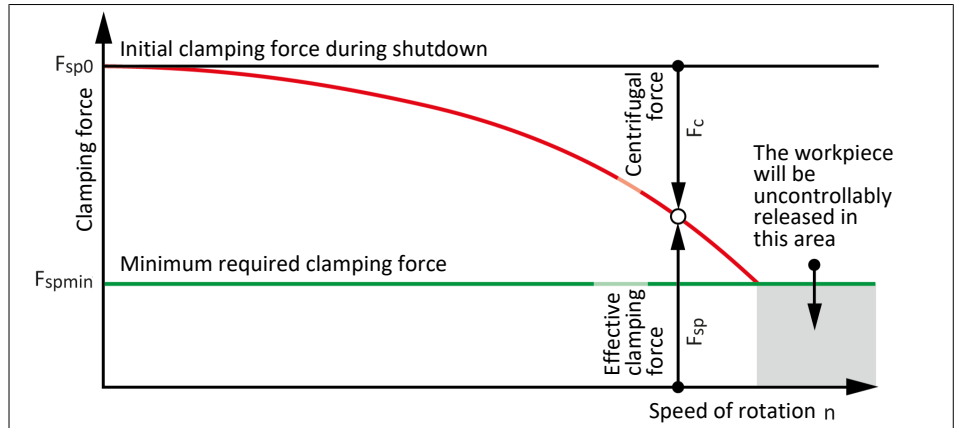
(+) for gripping from the inside outwards



⚠ DANGER

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

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



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

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

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

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

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

(+) for gripping from the outside inwards

(-) for gripping from the inside outwards

CAUTION

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

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

From the above formula it is evident that the sum of the effective clamping force F_{sp} and the total centrifugal force F_c is multiplied by the **safety factor for the clamping force** S_{sp} . According to VDI 3106, the following also applies here: $S_{sp} \geq 1.5$.

The **total centrifugal force** F_c is dependent on both the sum of the masses of all jaws and on the center of gravity radius and the rpm.

CAUTION

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

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

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

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" ▶ 3.1 [17]. The centrifugal torque of the top jaws M_{cAB} is calculated as per:

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

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

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

The following data is known for the machining job:

- Gripping from the outside in (application-specific)
- Machining force $F_{spz} = 3000 \text{ N}$ (application-specific)
- max. RPM $n_{max} = 3200 \text{ RPM}$ ("Lathe chuck data" table)
- RPM $n = 1200 \text{ RPM}$ (application-specific)
- Mass of one (!) top jaw $m_{AB} = 5.33 \text{ kg}$ (application-specific)
- Center of gravity radius of top jaw $r_{sAB} = 0.107 \text{ m}$ (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:

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

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:

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

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

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

Centrifugal torque for one jaw:

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

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

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

The total centrifugal force can now be calculated:

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

Initial clamping force during shutdown that was sought:

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

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

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

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

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

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 $F_{sp0} = 17723 \text{ N}$
- Machining force for machining job $F_{spz} 3000 \text{ N}$ (application-specific)
- Total centrifugal torque of all jaws $\sum M_c = 2,668 \text{ kgm}$
- 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:

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

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

This calculated RPM may be used.

3.4 Grades of Accuracy

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

3.5 Permissible imbalance

The ROTA NC02 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.

4 Mounting

4.1 Torques per screw

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

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

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

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

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

4.2 Mounting in general

4.2.1 Pre-assembly measures

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



⚠ WARNING

Risk of injury due to unexpected movements!

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

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



⚠ CAUTION

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

- Wear personal protective equipment, particularly protective gloves.

Check the delivery for completeness and for transport damage.

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

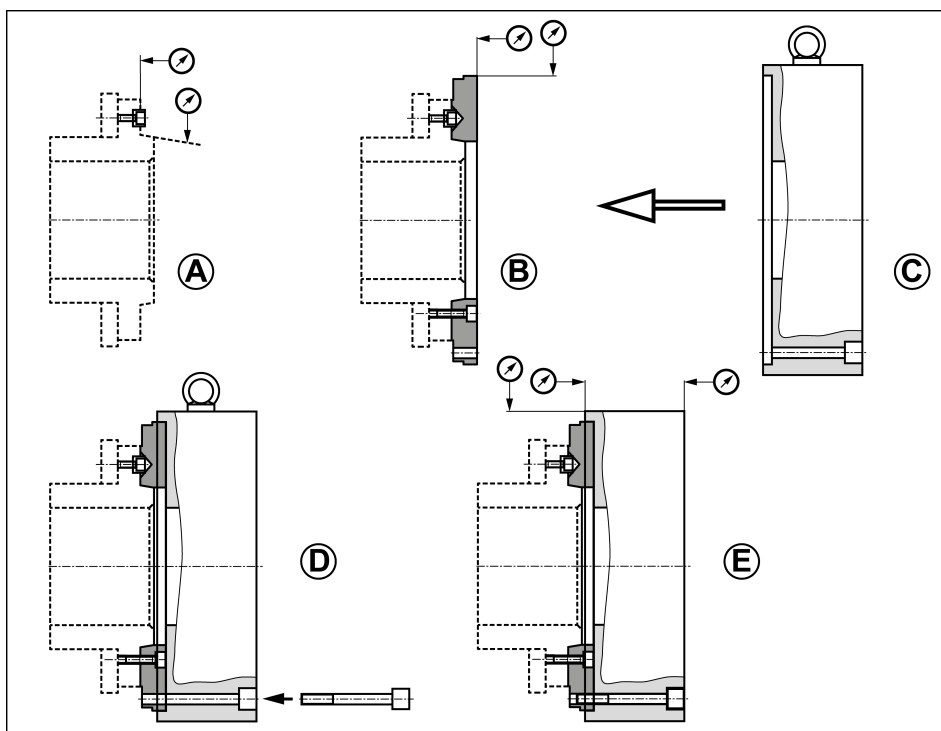
A maximum concentricity error of 0.01 mm should be ensured for the centring of the mount and a maximum axial run-out error of 0.01 mm for the contact surfaces. In addition, the flat surface must be checked for evenness using a straight edge (flat surface deburred and clean at the bore holes).

Radial and axial run-out tolerances of the chuck:

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

4.2.2 Chuck assembly options

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



Chuck assembly

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

CAUTION

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

CAUTION

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

4.3 Mounting of the Power Chuck

- 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 (▶ 4.3.1 [📄 28]) / vertical (▶ 4.3.2 [📄 29])), depending on the position of the machine spindle.

4.3.1 Horizontal attachment

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

- **ROTA NC02 800 – 1400 & ROTA NC02-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.

4.3.2 Vertical attachment

- **ROTA NC02 800 – 1400 & ROTA NC02-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, ▶ 4.1 [26].
- 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.

5 Function

The item numbers specified for the corresponding individual components relate to the chapter Drawings, ▶ 10 [□ 41].

5.1 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. Base jaws as well as special jaws for difficult workpiece shapes can be accommodated via the pointed toothing of the base jaws. Moving or changing the base jaws with top jaws bolted to them must be carried out in unclamped position.

5.2 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, ▶ 4.1 [□ 26].

Tighten the jaw mounting screws with a torque wrench.

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

The item numbers specified for the corresponding individual components relate to the chapter Drawings, ▶ 10 [□ 41].

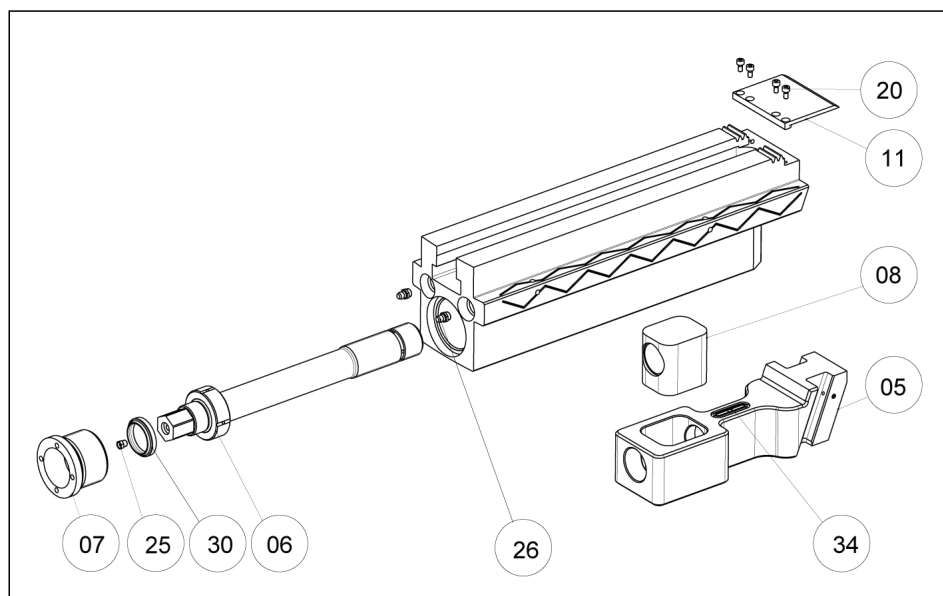
The tightening torques for all screws must be observed during every assembly and disassembly! ▶ 4.1 [□ 26]

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.



- **NC02-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

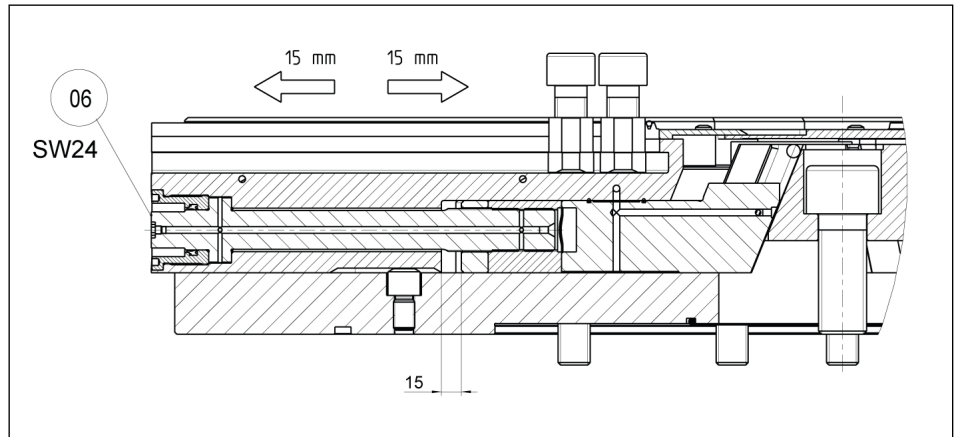
Risk to life and limb of operating personnel due to the chuck being torn off the spindle when using chuck mounting screws of quality class 8.8

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.

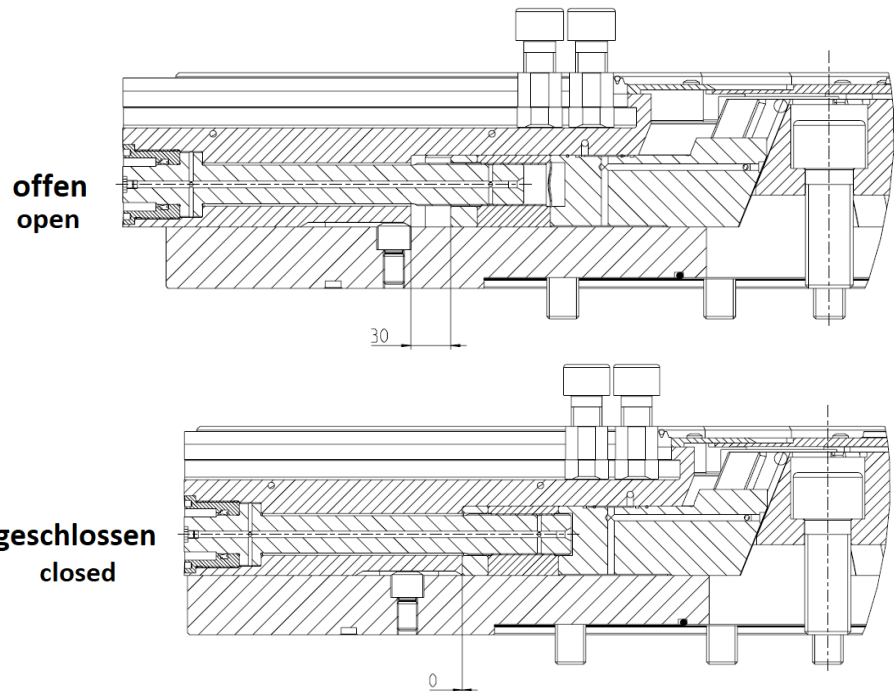
- **Only use screws of property class 10.9, even if these are panhead screws.**

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

5.4 Individual jaw adjustment function



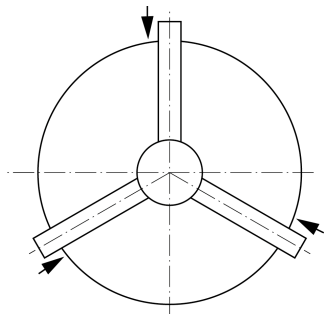
By turning the spindle (item 06), the base jaw is shifted radially to the chuck center. This displacement is used so that the jaws can be separately and individually adapted to workpieces. Spindle rotation to the right – jaw moves radially inwards. Spindle rotation to the left – jaw moves radially outwards. The jaws are adjustable by 30 mm: 15 mm inwards and outwards.



6 Maintenance

6.1 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 ▶ 6.2 [34]). 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.

6.2 Maintenance and lubrication plan

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

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

* Depending on which event occurs earlier.

6.3 Changing the top jaws

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

7 Storage

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

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

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

8 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.

9 Parts list

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

ROTA NC02

Item	Designation	Quantity	Note
1	Chuck body	1	
2	Piston	1	
3	Cover	1	
4	Base jaw	3	
9	Guide bar, left	3	
10	Guide bar, right	3	
11	Cover	3	
12	Scraper strip, left	3	
13	Scraper strip, right	3	
14	Wiper plate	6	
15	Screw ROTA NC02	3	
20	Screw	12	
21	Pan head screw	30	800
	Pan head screw	42	1000
	Pan head screw	48	1200
	Pan head screw	60	1400
22	Screw	36	800
	Screw	48	1000
	Screw	54	1200
	Screw	60	1400
26	Lubrication nipple	6	
28	Cover M12	36	800
	Cover M12	48	1000
	Cover M12	54	1200
	Cover M12	60	1400
29	Cover M24	9	
31	Set-screw	3	
32	Screw	9	
33	Slot nut	6	
34	O-Ring	1	

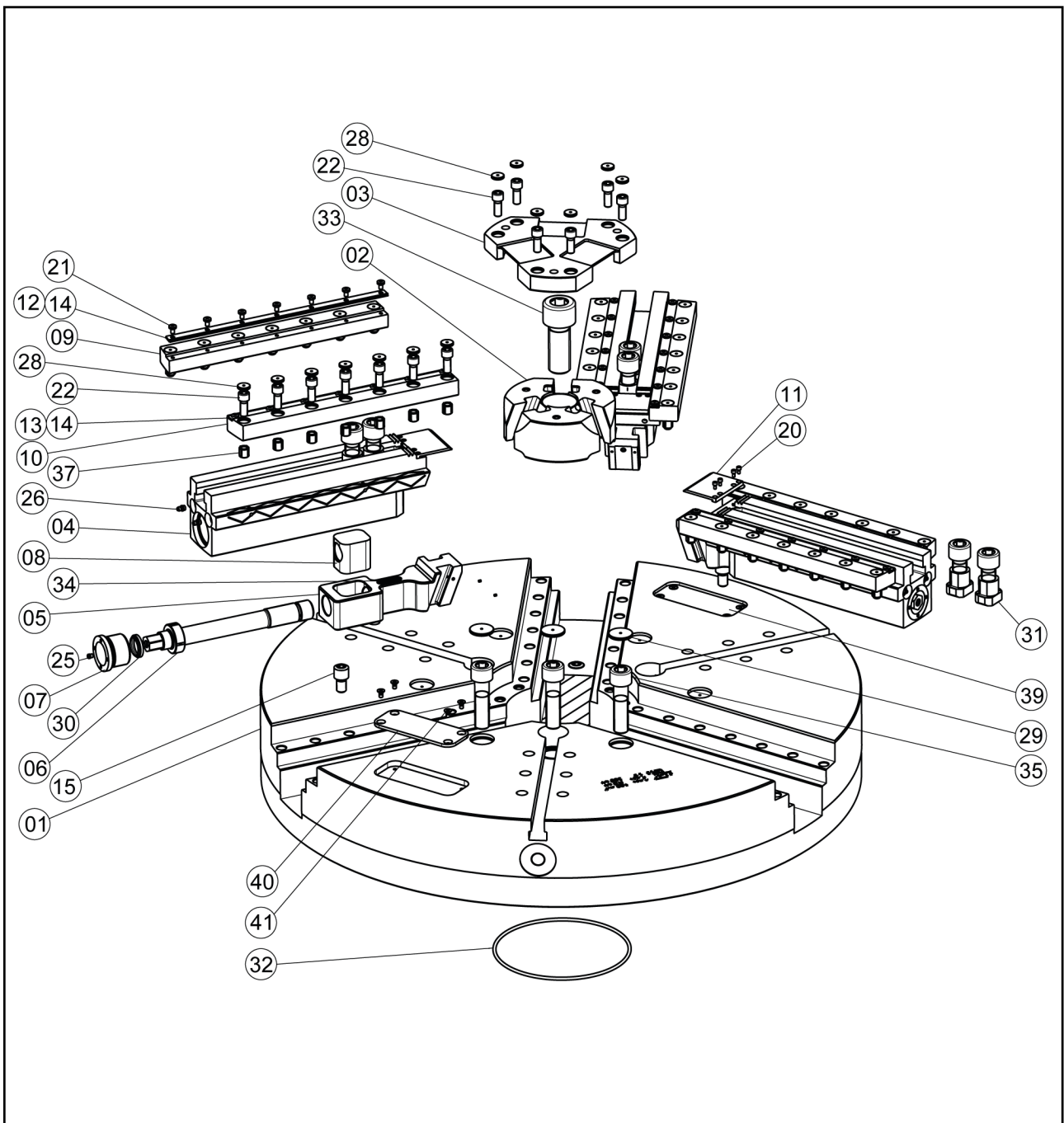
Item	Designation	Quantity	Note
35	Screw	1	
36	Thread insert	36	800
	Thread insert	48	1000
	Thread insert	54	1200
	Thread insert	60	1400
37	Eye bolt	3	
40	Countersunk screw	12	
43	Screw	6	1200, 1400
44	Cover	6	1200, 1400

ROTA NCO2-JA

Item	Designation	Quantity	Note
1	Chuck body	1	
2	Piston	1	
3	Cover	1	
4	Base jaw	3	
5	Slide	3	
6	Spindle	3	
7	Nut	3	
8	Seat of bearing	3	
9	Guide bar, left	3	
10	Guide bar, right	3	
11	Cover	3	
12	Scraper strip, left	3	
13	Scraper strip, right	3	
14	Wiper plate	6	
15	Screw ROTA NCO2	3	
20	Screw	12	
21	Pan head screw	30	800
	Pan head screw	42	1000
	Pan head screw	48	1200
	Pan head screw	60	1400
22	Screw	36	800
	Screw	48	1000
	Screw	54	1200
	Screw	60	1400

Item	Designation	Quantity	Note
25	Lubrication nipple	3	
26	Lubrication nipple	6	
28	Cover M12	36	800
	Cover M12	48	1000
	Cover M12	54	1200
	Cover M12	60	1400
29	Cover M24	9	
30	Wiper	3	
31	Slot nut	6	
32	O-Ring	1	
33	Screw	1	
34	O-Ring	3	
35	Screw	9	
37	Thread insert	36	800
	Thread insert	48	1000
	Thread insert	54	1200
	Thread insert	60	1400
38	Eye bolt	3	
41	Countersunk screw	12	
43	Screw	6	1200, 1400
44	Cover	6	1200, 1400

ROTA NC02-JA 800 – 1400



11 Manufacturer certificate

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

Heinz-Dieter SCHUNK GmbH & Co. Spanntechnik KG certifies that the above-mentioned products, when used as intended and in compliance with the operating manual and the warnings on the product, are safe according to the national regulations and:

- a **risk assessment** has been carried out in accordance with ISO 12100:2010.
- an **operating manual** for the assembly instructions has been created in accordance with the contents of the Machinery Directive 2006/42/EC Annex I No. 1.7.4.2. and the contents of the provisions of Annex VI of the Machinery Directive 2006/42/EC.
- the relevant basic and proven safety principles of the Annexes of **ISO 13849-2:2012**, taking into account the requirements of the documentation have been observed for the component. The parameters, limitations, ambient conditions, characteristic values, etc. for proper operation are defined in the operating manual.
- an $MTTF_D$ value of 150 years can be estimated for mechanical components using the informative procedure in Table C.1 of ISO 13849-1:2015.
- **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, 02nd of August 2023

Signature: see original declaration

Signature: see original declaration

p.p. Philipp Schröder
Head of Development standard products

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





H.-D. SCHUNK GmbH & Co.
Spanntechnik KG

Lothringer Str. 23
D-88512 Mengen
Tel. +49-7572-7614-0
info@de.schunk.com
schunk.com

Folgen Sie uns | *Follow us*



Wir drucken nachhaltig | *We print sustainable*