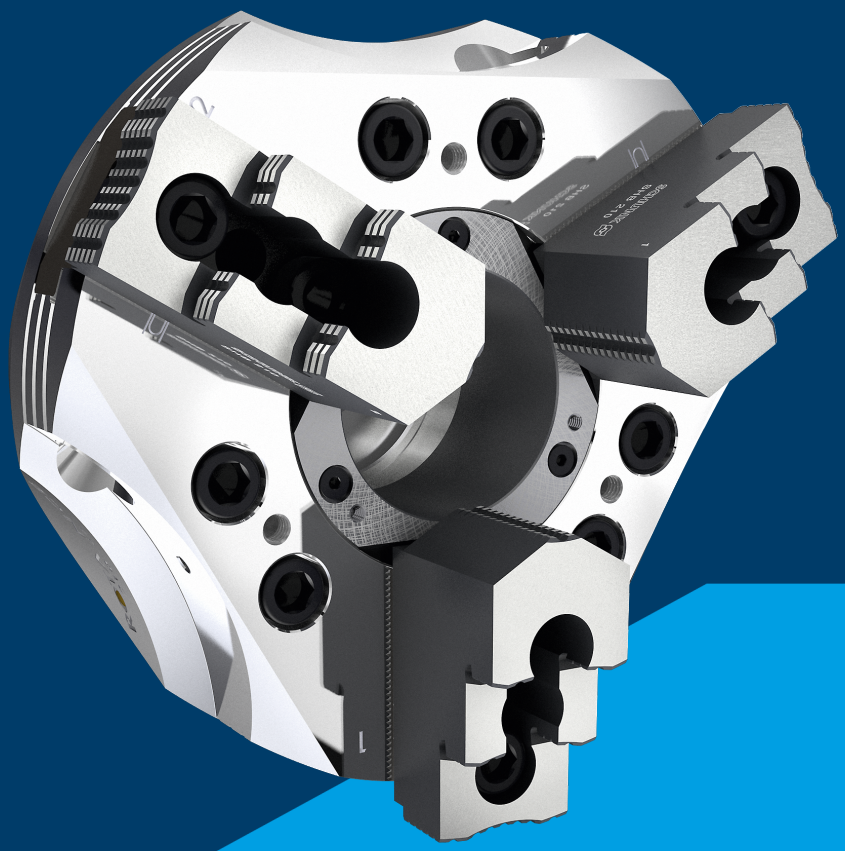

# Power Lathe Chuck
# ROTA NCE
## Assembly and Operating Manual

Translation of Original Operating Manual

Hand in hand for tomorrow

# Imprint



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

**Document number:** 1150766

**Version:** 05.00 | 25/07/2023 | en

Dear Customer,

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

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

Best regards,

Your SCHUNK team

Customer Management
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cmm@de.schunk.com

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

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# 1 General

## 1.1 About this manual

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

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

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

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

In addition to these instructions, the documents listed under ▸ 1.1.2 [🗋 6] are applicable.

### 1.1.1 Presentation of Warning Labels

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

**⚠ DANGER**

**Danger for persons!**

Non-observance will inevitably cause irreversible injury or death.

**⚠ WARNING**

**Dangers for persons!**

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

**⚠ CAUTION**

**Dangers for persons!**

Non-observance can cause minor injuries.

***CAUTION***

**Material damage!**

Information about avoiding material damage.

### 1.1.2 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**

### 1.1.3 Sizes

This operating manual applies to the following sizes:

- ROTA NCE 130-38
- ROTA NCE 165-53
- ROTA NCE 210-66
- ROTA NCE 260-81
- ROTA NCE 315-106

## 1.2 Warranty

If the product is used as intended, the warranty is valid for 24 months from the date of delivery from the production facility or 500 000 cycles* under the following conditions:

- Observe the applicable documents, ▸ 1.1.2 [🗋 6]
- Observe the ambient conditions and operating conditions, ▸ 2.6 [🗋 9]
- Observe the specified maintenance and lubrication intervals, ▸ 7 [🗋 34]

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

* A cycle consists of a complete clamping process ("Open" and "Close").

## 1.3 Scope of delivery

| | |
|---|---|
| 1 | **Power lathe chuck** in ordered version |
| 6 | **Mounting screws (NCE 130-38 3 pieces)** |
| 6 | **T-nuts with screws or 3 combination T-nuts for base jaws with fine serration or 6 screws for base jaws with tongue and groove** |
| 1 | **Assembly key, starting from size 165** |
| 1 | **Eye bolt, starting from size 210** |

# 2 Basic safety notes

## 2.1 Intended use

This product is intended for clamping workpieces on machine tools and other suitable technical devices.

- The product may only be used within the scope of its technical data, ▸ 3 [🗋 17].
- The product is intended for industrial and industry-oriented use.
- Appropriate use of the product includes compliance with all instructions in this manual.
- 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"). ▸ 3 [🗋 17]

## 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. ▸ 3 [🗋 17]
- 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 Constructional changes

**Implementation of structural changes**

By conversions, changes, and reworking, e.g. additional threads, holes, or safety devices can impair the functioning or safety of the product or damage it.

- 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.

- Use only original spare parts or spares authorized by SCHUNK.

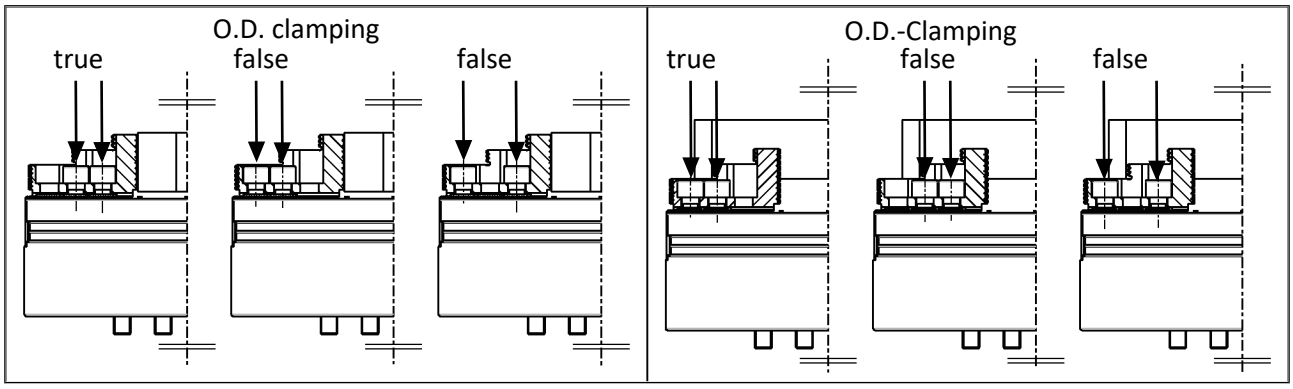
## 2.5 Chuck jaws

### Requirements of the chuck jaws

Stored energy can make the product unsafe and risk the danger of serious injuries and considerable material damage.

- Only change chuck jaws if no residual energy can be released.
- Do not use welded jaws.
- 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).
- If for constructional reasons the special chuck jaws are heavier than the top jaws assigned to the lathe chuck, greater centrifugal forces must be accounted for when defining the required clamping force and the recommended speed.
- The maximum recommended speed may only be operated in conjunction with maximum actuating force and only with the lathe chuck in optimal, fully functioning condition.
- After a collision, the lathe chuck and the chuck jaws must be subjected to a crack test before being used again. Damaged parts must be replaced with original SCHUNK spare parts.
- Renew the chuck jaw mounting bolts if there are signs of wear or damage. Only use bolts with a quality of 12.9.
- The jaw mounting screws must be installed so that they counteract the tilting moments caused by the clamping force on the largest possible lever arm.

For correct mounting of jaws, the fixing screws must be set accordingly




*Proper mounting of jaws*

## 2.6 Environmental 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 to the product's life span.

- Make sure that the product is used only in the context of its defined application parameters, ▸ 3 [🗋 17].
- Make sure that the product is a sufficient size for the application.
- Only use high-quality cooling emulsions with anti-corrosive additives during processing.

### Clamping force tester

Depending on the operating conditions, the function and clamping force must be checked after a certain period of operation ▸ 7.2 [🗋 34]. Only use a calibrated clamping force tester for measuring during the clamping force test.

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

If the clamping force has dropped too much or if the base jaws and pistons no longer move properly, the chuck must be disassembled, cleaned, and relubricated ▸ 7 [🗋 34].

## 2.7 Personnel qualification

### Inadequate qualifications of the personnel

If the personnel working with the product is not sufficiently qualified, the result may be serious injuries and significant property damage.

- All work may only be performed by qualified personnel.
- Before working with the product, the personnel must have read and understood the complete assembly and operating manual.
- Observe the national safety regulations and rules and general safety instructions.

The following personal qualifications are necessary for the various activities related to the product:

**Trained electrician** Due to their technical training, knowledge and experience, trained electricians are able to work on electrical systems, recognize and avoid possible dangers and know the relevant standards and regulations.

**Qualified personnel** Due to its technical training, knowledge and experience, qualified personnel is able to perform the delegated tasks, recognize and avoid possible dangers and knows the relevant standards and regulations.

**Instructed person** Instructed persons were instructed by the operator about the delegated tasks and possible dangers due to improper behaviour.

**Service personnel of the manufacturer** Due to its technical training, knowledge and experience, service personnel of the manufacturer is able to perform the delegated tasks and to recognize and avoid possible dangers.

## 2.8 Personal protective equipment

### Use of personal protective equipment

Personal protective equipment serves to protect staff against danger which may interfere with their health or safety at work.

- When working on and with the product, observe the occupational health and safety regulations and wear the required personal protective equipment.
- Observe the valid safety and accident prevention regulations.
- Wear protective gloves to guard against sharp edges and corners or rough surfaces.
- Wear heat-resistant protective gloves when handling hot surfaces.
- Wear protective gloves and safety goggles when handling hazardous substances.
- Wear close-fitting protective clothing and also wear long hair in a hairnet when dealing with moving components.

## 2.9 Notes on safe operation

**Incorrect handling of the personnel**

Incorrect handling and assembly may impair the product's safety and cause serious injuries and considerable material damage.

- Avoid any manner of working that may interfere with the function and operational safety of the product.
- Use the product as intended.
- Observe the safety notes and assembly instructions.
- Do not expose the product to any corrosive media. This does not apply to products that are designed for special environments.
- Eliminate any malfunction immediately.
- Observe the care and maintenance instructions.
- Observe the current safety, accident prevention and environmental protection regulations regarding the product's application field.

## 2.10 Transport

**Handling during transport**

Incorrect handling during transport may impair the product's safety and cause serious injuries and considerable material damage.

- When handling heavy weights, use lifting equipment to lift the product and transport it by appropriate means.
- Secure the product against falling during transportation and handling.
- Stand clear of suspended loads.

## 2.11 Malfunctions

**Behavior in case of malfunctions**

- Immediately remove the product from operation and report the malfunction to the responsible departments/persons.
- Order appropriately trained personnel to rectify the malfunction.
- Do not recommission the product until the malfunction has been rectified.
- Test the product after a malfunction to establish whether it still functions properly and no increased risks have arisen.

## 2.12 Disposal

**Handling of disposal**

The incorrect handling of disposal may impair the product's safety and cause serious injuries as well as considerable material and environmental harm.

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

## 2.13 Fundamental dangers

**General**

- Observe safety distances.
- Never deactivate safety devices.
- Before commissioning the product, take appropriate protective measures to secure the danger zone.
- Disconnect power sources before installation, modification, maintenance, or calibration. Ensure that no residual energy remains in the system.
- If the energy supply is connected, do not move any parts by hand.
- Do not reach into the open mechanism or movement area of the product during operation.

### 2.13.1 Protection during handling and assembly

**Incorrect handling and assembly**

Incorrect handling and assembly may impair the product's safety and cause serious injuries and considerable material damage.

- Have all work carried out by appropriately qualified personnel.
- For all work, secure the product against accidental operation.
- Observe the relevant accident prevention rules.
- Use suitable assembly and transport equipment and take precautions to prevent jamming and crushing.

**Incorrect lifting of loads**

Falling loads may cause serious injuries and even death.

- Stand clear of suspended loads and do not step into their swiveling range.
- Never move loads without supervision.
- Do not leave suspended loads unattended.

### 2.13.2 Protection during commissioning and operation

**Falling or violently ejected components**

Falling and violently ejected components can cause serious injuries and even death.

- Take appropriate protective measures to secure the danger zone.
- Never step into the danger zone during operation.

### 2.13.3 Protection against dangerous movements

**Unexpected movements**

Residual energy in the system may cause serious injuries while working with the product.

- Switch off the energy supply, ensure that no residual energy remains and secure against inadvertent reactivation.
- Never rely solely on the response of the monitoring function to avert danger. Until the installed monitors become effective, it must be assumed that the drive movement is faulty, with its action being dependent on the control unit and the current operating condition of the drive. Perform maintenance work, modifications, and attachments outside the danger zone defined by the movement range.
- To avoid accidents and/or material damage, human access to the movement range of the machine must be restricted. Limit/prevent accidental access for people in this area due through technical safety measures. The protective cover and protective fence must be rigid enough to withstand the maximum possible movement energy. EMERGENCY STOP switches must be easily and quickly accessible. Before starting up the machine or automated system, check that the EMERGENCY STOP system is working. Prevent operation of the machine if this protective equipment does not function correctly.

### 2.13.4 Notes on particular risks

**⚠ DANGER**

**Risk of fatal injury from suspended loads!**

Falling loads can cause serious injuries and even death.

- Stand clear of suspended loads and do not step within their swiveling range.
- Never move loads without supervision.
- Do not leave suspended loads unattended.
- Wear suitable protective equipment.

**⚠ 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.

**⚠ 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 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 workpiece, the base and top jaws may become damaged.

- The T-nuts for connecting the top jaws to the base jaws must not protrude beyond the base jaws in the radial direction.
- The diameter of the workpiece may not be bigger than the chuck diameter.

**⚠ 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.

# 3 Technical data

## 3.1 Chuck data

| ROTA NCE | 130-38 | 165-53 | 210-66 | 260-81 | 315-106 |
|---|---|---|---|---|---|
| Max. actuating force [kN] * | 19 | 26.5 | 38 | 45 | 58 |
| Max. clamping force [kN] | 45 | 65 | 100 | 130 | 155 |
| Max. speed [RPM] | 7500 | 6000 | 5000 | 4500 | 3500 |
| Stroke per jaw [mm] | 3.2 | 3.3 | 4.2 | 4.9 | 5.8 |
| Piston stroke [mm] | 14 | 14 | 18 | 21 | 25 |
| Chuck through-bore [mm] | 38 | 53 | 66 | 81 | 106 |
| Centrifugal torque of base jaw [kgm] $M_{cGB}$ | 0.013 | 0.024 | 0.048 | 0.083 | 0.144 |
| Operating temperature [°C] | +15 to +60 | | | | |

* For I.D. clamping, the maximum actuating force must be reduced by 30%.

| Weight with base jaw in kg | 130-38 | 165-53 | 210-66 | 260-81 | 315-106 |
|---|---|---|---|---|---|
| Z 100 | 4.1 | | | | |
| ISO 702-4-Nr. 5 | | 8.6 | | | |
| ISO 702-1-A5 | | 9.7 | | | |
| ISO 702-4-Nr. 6 | | | 15.0 | | |
| ISO 702-1-A6 | | | 16.7 | | |
| ISO 702-4-Nr. 8 | | | | 24.0 | |
| ISO 702-1-A6 | | | | 28.9 | |
| ISO 702-1-A8 a | | | | 26.5 | |
| ISO 702-4-Nr. 8 | | | | | 37.7 |
| ISO 702-1-A6 | | | | | 43.0 |
| ISO 702-1-A8 | | | | | 40.3 |
| ISO 702-1-A11 | | | | | 49.8 |

The maximum RPM stated is only valid with the maximum clamping force and when using the hard standard chuck jaws that go with the chuck.

The maximum permissible RPM for the specific machining has to be defined by the user on the basis of the required clamping forces. This speed must not exceed the maximum speed of the lathe chuck.

Ensure minimal weight for all jaws. For unhardened top jaws or special chuck jaws, the permissible RPM according to VDI 3106 must be calculated for the respective machining job, whereby the maximum recommended speed must not be exceeded. The calculations must be checked using dynamic measurement.

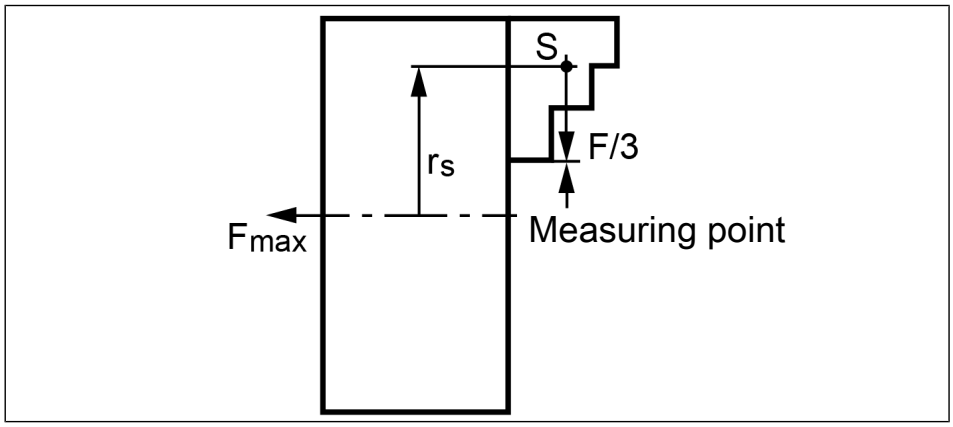
## 3.2 Clamping force / speed diagrams

Clamping force/RPM curves have been calculated using the corresponding standard top jaws (stepped jaws and monoblock jaws). For this, the maximum actuating force was applied and the jaws were set flush with the outer diameter of the chuck.

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

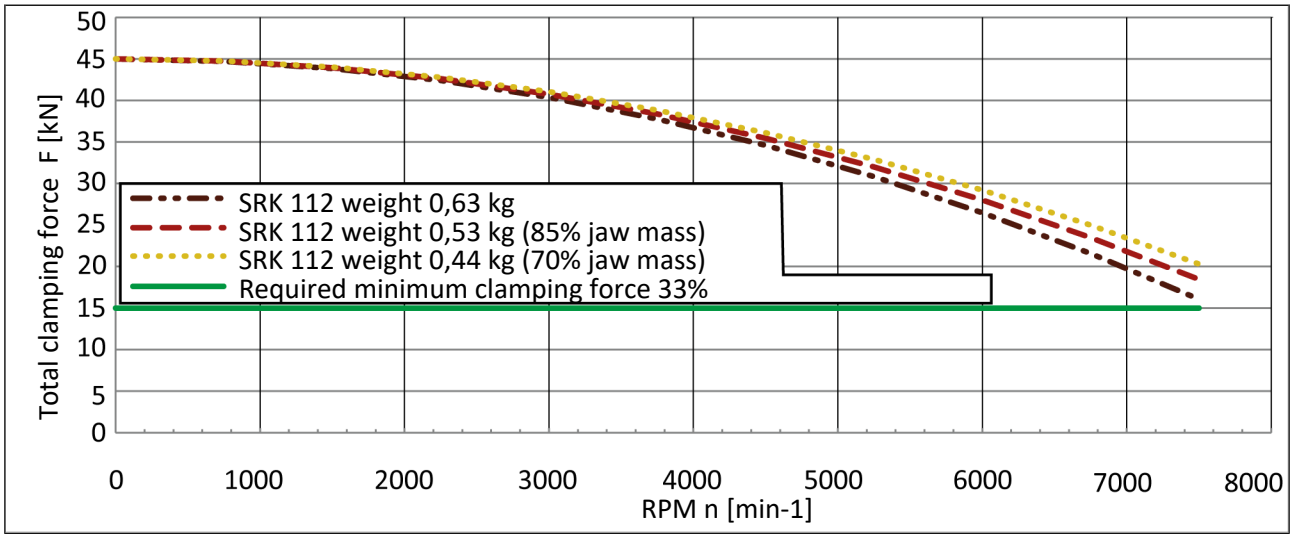
If one or more of these prerequisites is modified, the graphs will no longer be valid.

**Chuck setup for clamping force/RPM diagram**

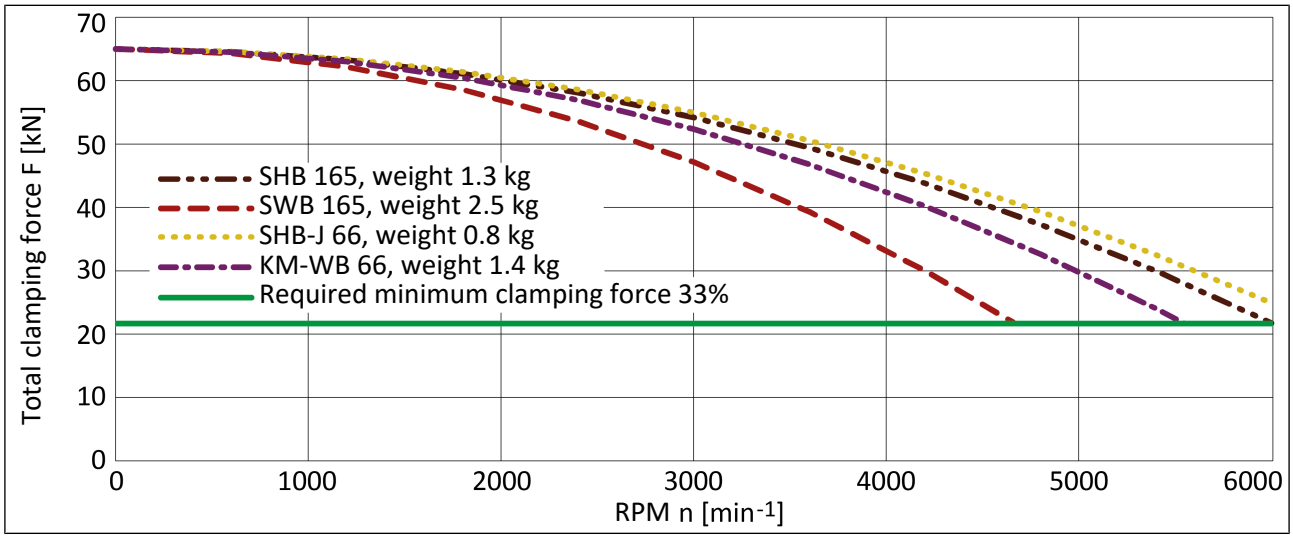



| | | | |
|---|---|---|---|
| F/3 | Clamping force per jaw | $F_{max}$ | Max. actuating force |
| $r_s$ | Center of gravity radius | S | Center of gravity |

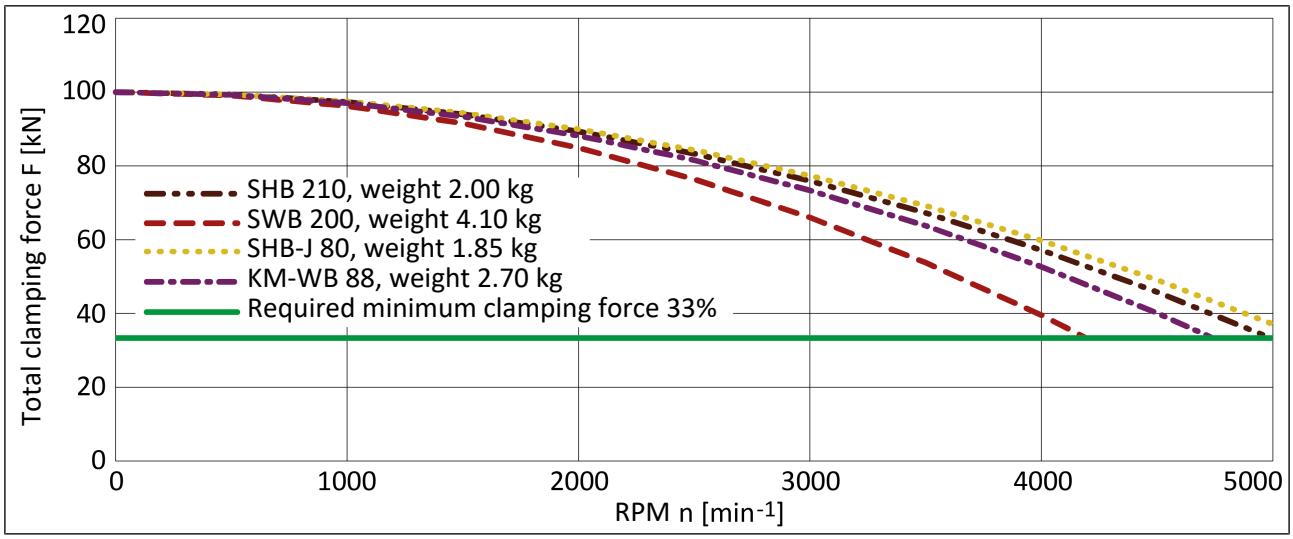
**ROTA NCE 130-38 clamping force-RPM diagram**



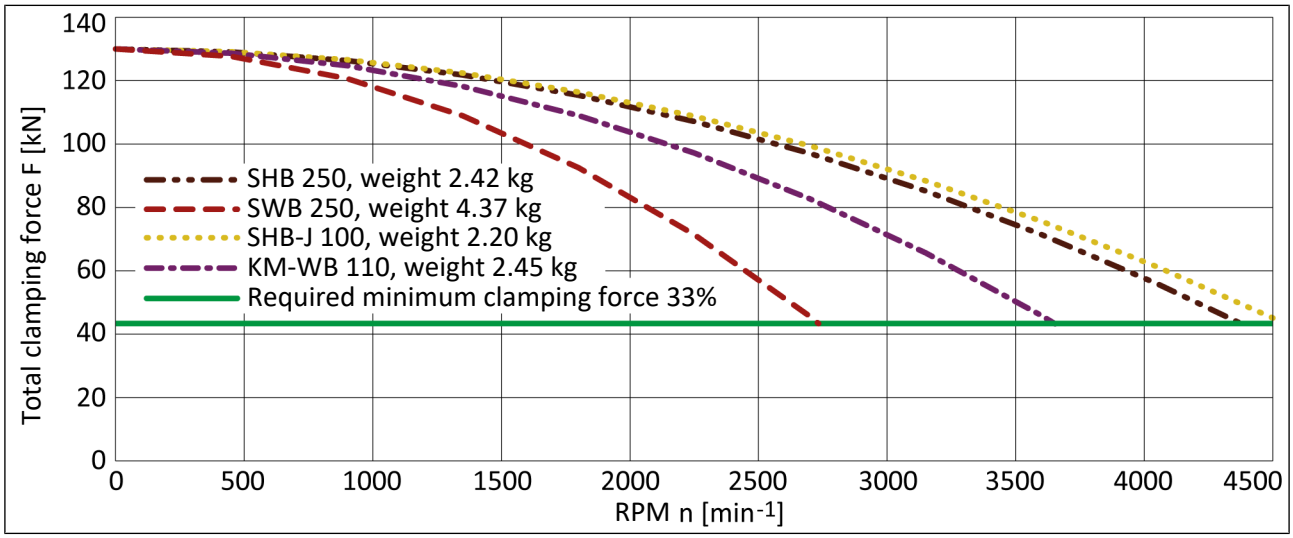
## ROTA NCE 165-53 clamping force-RPM diagram



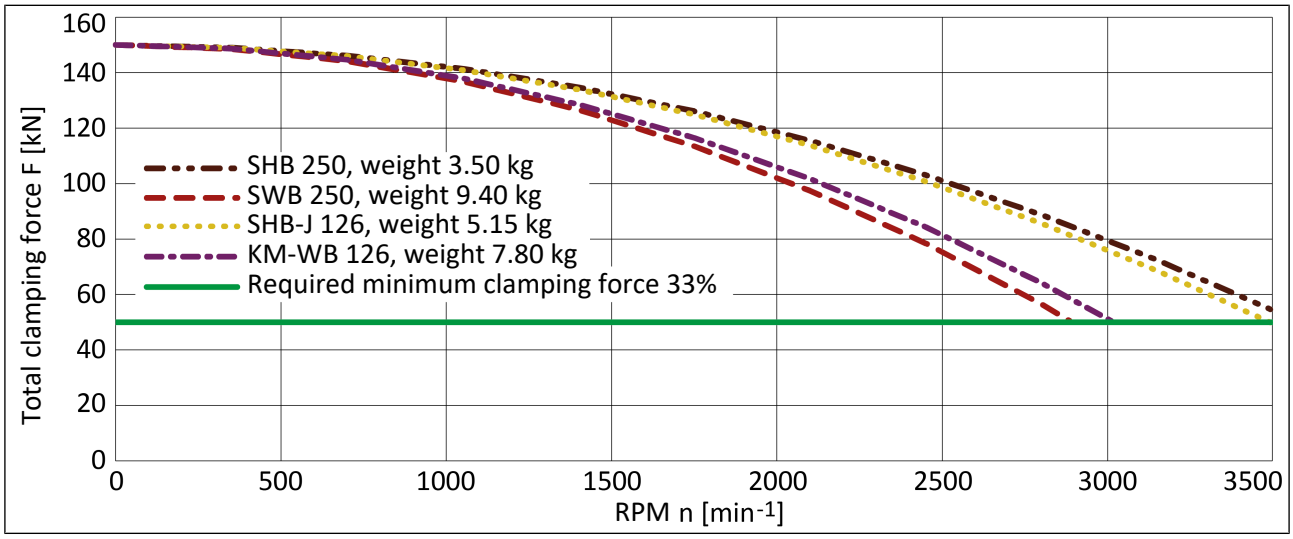

## ROTA NCE 210-66 clamping force-RPM diagram




## ROTA NCE 260-81 clamping force-RPM diagram



**ROTA NCE 315-106 clamping force-RPM diagram**




## 3.3 Calculations for clamping force and speed

**Missing information or specifications can be requested from the manufacturer.**

| Legend | | | |
|---|---|---|---|
| $F_c$ | Total centrifugal force [N] | $M_{cAB}$ | Centrifugal torque of top jaws [Kgm] |
| $F_{sp}$ | Effective clamping force [N] | $M_{cGB}$ | Centrifugal torque of base jaws [Kgm] |
| $F_{spmin}$ | minimum required clamping force [N] | n | Speed of rotation [RPM] |
| $F_{sp0}$ | Initial clamping force [N] | $r_s$ | Center of gravity radius [mm] |
| $F_{spz}$ | Cutting force [N] | $r_{sAB}$ | Center of gravity radius of top jaw [mm] |
| $m_{AB}$ | Mass of one top jaw [kg] | $s_{sp}$ | Safety factor for clamping force |
| $m_B$ | Mass of chuck jaw set [kg] | $s_z$ | Safety factor for machining |
| $M_c$ | Centrifugal torque [kgm] | $\Sigma_s$ | Max. clamping force of lathe chuck [N] |
| kgm × 9.81 = Nm | | | |

### 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 $F_{sp}$**.

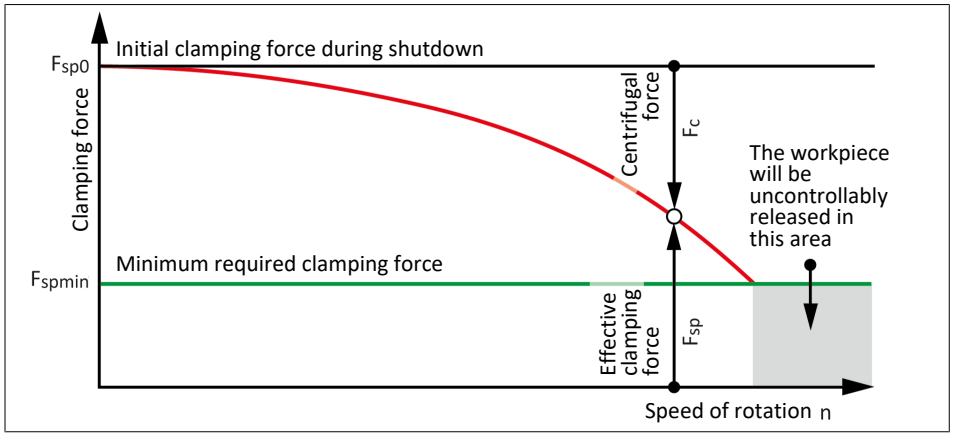
$$F_{sp} = F_{sp0} \mp F_c \text{ [N]}$$

**(–)** 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:

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

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

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

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

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

The following data is known for the machining job:

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

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

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

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

Initial clamping force during shutdown:

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

Calculation of total centrifugal force:

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

For two-part chuck jaws, the following applies:

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

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

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

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

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

Centrifugal torque for one jaw:

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

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

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

The total centrifugal force can now be calculated:

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

Initial clamping force during shutdown that was sought:

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

### 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:

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

**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 N
- Machining force for machining job $F_{spz}$ 3000 N (application-specific)
- Total centrifugal torque of all jaws $\Sigma M_c$ = 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 ▸ 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 NCE in ungreased state without T-nuts and top jaws corresponds to the balancing quality class 6.3 (according to DIN ISO 1940-1). Residual imbalance risks may arise due to insufficient rotation compensation being achieved (see DIN EN 1550 6.2 e). This applies particularly to high RPM, asymmetrical workpieces or the use of various top jaws, as well as uneven lubrication. In order to prevent damage resulting from these residual risks, the entire rotor must be dynamically balanced in accordance with DIN ISO 1940-1.

# 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 Assembly

## 5.1 Installing and connecting

**⚠ 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.

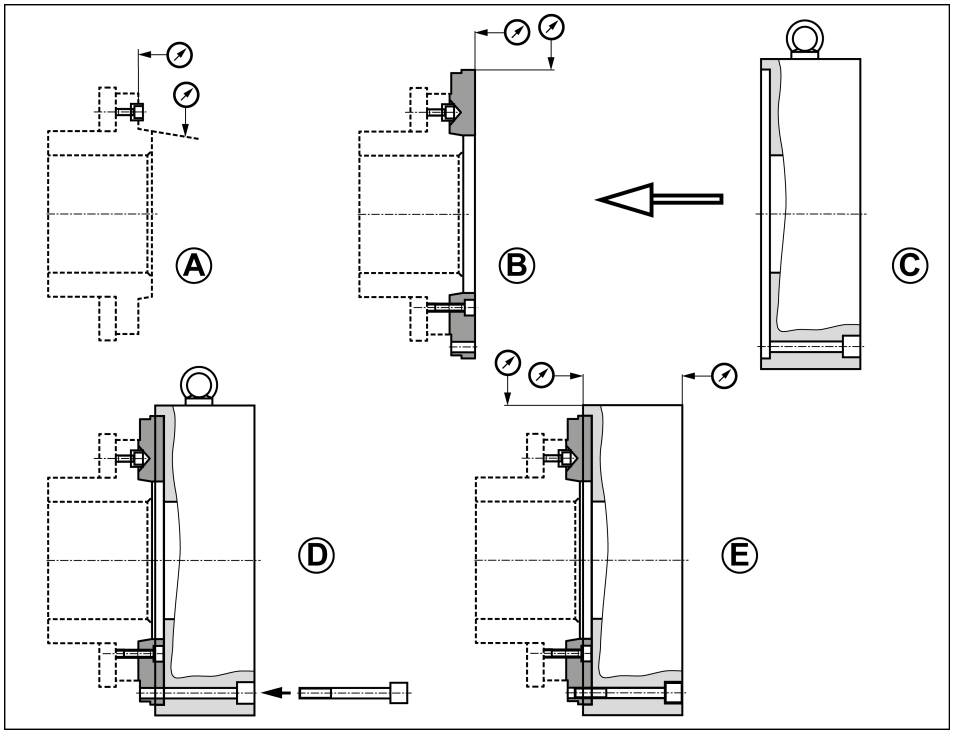
- Before starting any work on the product: Switch off the power supply and secure against restarting.
- Make sure, that no residual energy remains in the system.

**⚠ CAUTION**

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

- Wear personal protective equipment, particularly protective gloves.

1. Checking the spindle nose for mounting the chuck flange ▸ 5.2 [🗋 27]
2. Chuck assembly
   - ⇨ Chuck assembly (with cylindrical recess) ▸ 5.3 [🗋 28]
     If required:
   - ⇨ Assembly preparation for chuck with reduction or extension flange ▸ 5.4 [🗋 31] or
   - ⇨ Assembly preparation for chuck with direct mount ▸ 5.5 [🗋 31]
3. Performing a functional check ▸ 6.2 [🗋 32]



## 5.2 Checking the chuck mount

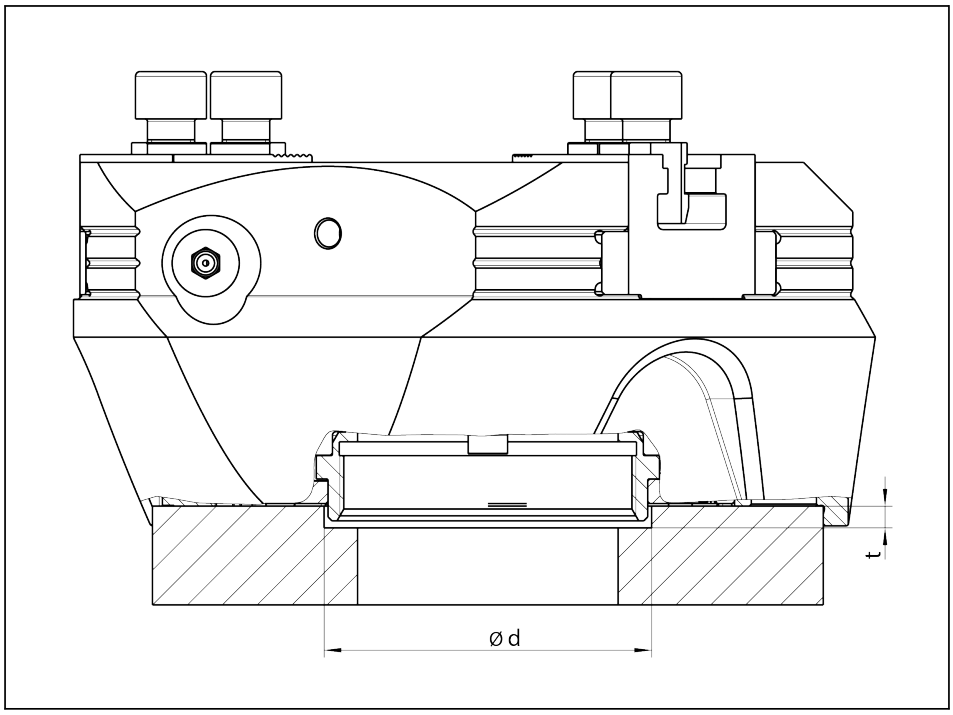
The machine side must be aligned prior to the flange being installed in order to achieve high concentricity of the chuck. To do this, check the contact surfaces on the spindle for concentricity and axial run-out accuracy using a dial indicator.

There should be a maximum concentricity error in the centering of the mount of 0.005 mm and a maximum axial run-out error in the contact surfaces of 0.005 mm. The flat surface of the spindle must also be checked for flatness using a straightedge.

Make sure that the surface area of the flat surface is deburred at the bore holes and is clean.

Make sure that the surface area of the flat surface is deburred at the bore holes and is clean.

Here, it must be ensured that the center sleeve protrudes from the rear of the chuck in line with its size. There must be sufficient free space for the full piston stroke.




| Chuck size | Ø d | | t |
|---|---|---|---|
| | min. | max. | min. |
| NCE 130 | - | 60 | 0 |
| NCE 165 | 68 | 93 | 5 |
| NCE 210 | 83 | 115 | 5.5 |
| NCE 260 | 99 | 139 | 14.5 |
| NCE 315 | 126 | 161 | 19 |

## 5.3 Chuck assembly (with cylindrical recess)

**NOTE**

**If the mount of the machine spindle and the lathe chuck are identical, chuck assembly takes place without assembly preparation.**

**If the mount of the machine spindle deviates from the mount of the lathe chuck, a connecting flange must be affixed before the chuck is assembled.** (See ▸ 5.4 [🗋 31]or ▸ 5.5 [🗋 31]

**CAUTION**

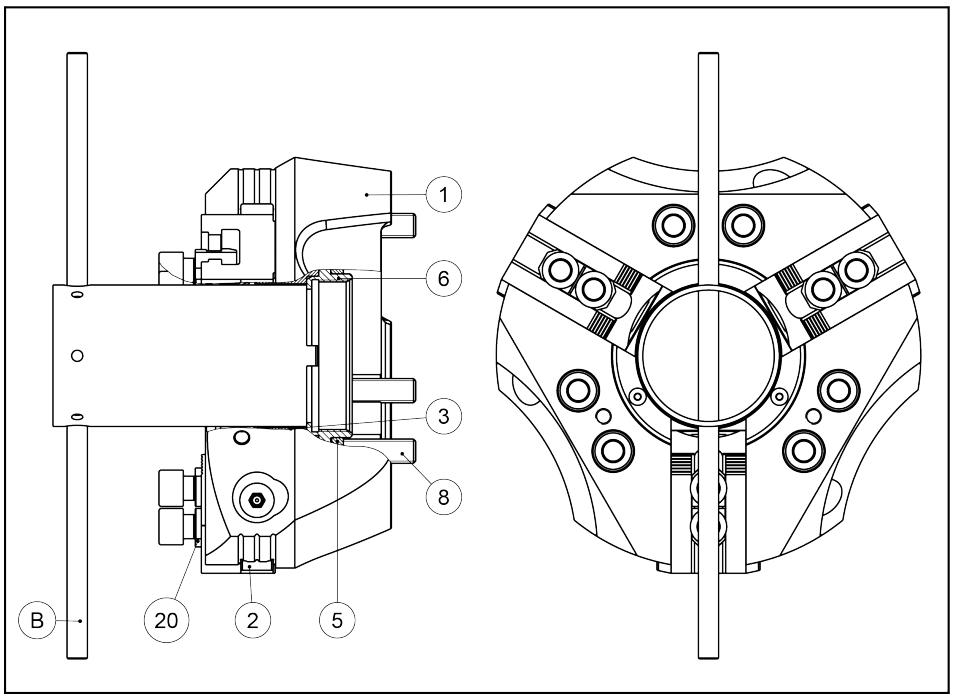
**Use a crane to install the lathe chuck. The chuck can be fastened to the eye bolt provided (see Fig. "Lathe chuck assembly" ▸ 5 [🗋 26]).**

**The eye bolt must be removed prior to starting up.**

**The eye bolt is included in the scope of delivery from size 210.**

**CAUTION**

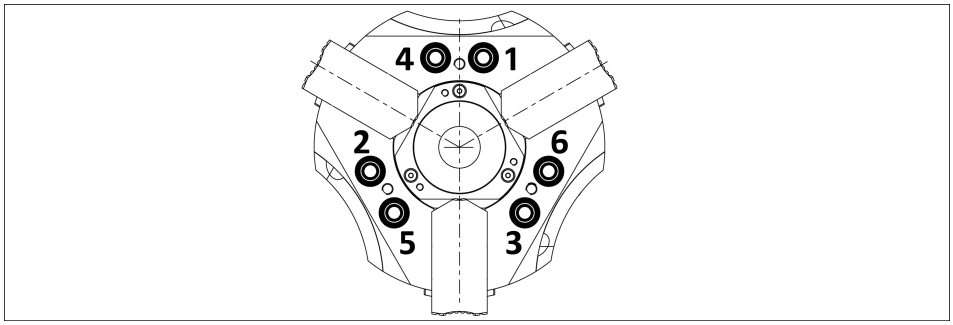
**When mounting on machines with a vertically suspended spindle, the screws (item 12) serve as a back stop for the chuck piston. Before beginning assembly, it must be ensured that the screws (item 12) are tight and not damaged.**




| | | | |
|---|---|---|---|
| 1 | Chuck body | 6 | Center sleeve |
| 2 | Base jaw | 8 | Screw |
| 3 | Chuck piston | 20 | T-nut |
| 5 | Retainer ring | B | Assembly key |

### Chuck assembly

1. Remove the cylindrical screws for the top jaws together with the T-nuts (item 20).
2. Unscrew the cylindrical screws (item 9) and remove the protection sleeve (item 4). In order to press the protection sleeve off the chuck body, screw the cylindrical screws (item 9) into the additional threads of the protection sleeve.
3. Move the draw tube to the frontmost position.
4. Push the chuck piston (item 3) to the frontmost position (chuck open).
5. Lift the lathe chuck flush to the center of the spindle.
6. 
   - ⇨ Screw the retainer ring (item 5) in the chuck onto the draw tube as far as this will go.
   - ⇨ Screw the rotating center sleeve (item 6) in the chuck onto the draw tube using the enclosed assembly key as far as this will go.
7. Insert and slightly tighten the mounting screws.
8. Check the chuck for concentricity and axial run-out accuracy (see Fig. "Lathe chuck assembly" - E ▸ 5 [🗋 26]) and, if necessary, align at the outer diameter with gentle taps using a hammer.




*Tightening sequence for the mounting screws*

9. Tighten the mounting screws (item 9) in the prescribed order with a torque wrench. Observe the tightening torques▸ 4 [🗋 25].
10. Check the chuck again for concentricity and axial run-out accuracy (see Fig. "Lathe chuck assembly" - E ▸ 5 [🗋 26]). The "Concentricity and axial run-out tolerances" table shows the concentricities and axial run-out accuracies to be achieved.
11. Slide in the protection sleeve (item 4) and secure it using the cylindrical screws (item 9).
12. Check that the actuating force is functioning and is sufficient.
13. Check the jaw stroke of the base jaws and that these can move easily.
14. Fasten the top jaws marked 1, 2 and 3 to the base jaws using T-nuts (item 20) and screws.

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

### Concentricity and axial run-out tolerances

| Chuck size [mm] | Max. concentricity error [mm] | Max. axial run-out error [mm] |
|---|---|---|
| 130 | 0.01 | 0.01 |
| 165 | | |
| 210 | 0.02 | |
| 260 | | |
| 315 | 0.03 | 0.02 |

**CAUTION**

**Tighten the screws of the protection sleeve to the specified torque ▶ 4 [🗋 25]. If the specified torque is not reached or is exceeded, the screws might break.**

Only use the screws provided.

**CAUTION**

**Tighten the screws of the protection sleeve to the specified torque. If the specified torque is not reached or is exceeded, the screws might break. Only use the screws provided.**

**⚠ CAUTION**

**Danger of crushing of limbs when the mechanical system of the chuck is open.**

The mechanical system of the chuck is opened when the protection sleeve is changed.

- Do not reach into the open mechanical system of the chuck.
- The lathe chuck must not be actuated and the chuck piston must not be moved.

## 5.4 Assembly preparation for chuck with reduction or extension flange

If the bolt pitch circle of the machine spindle does not correspond to the bolt pitch circle of the lathe chuck, a reduction or extension flange must be used. Affix this flange to the spindle nose prior to chuck assembly.

1. Before assembly of the chuck flange, remove any dirt or chips from the machine spindle and from the centering mount and contact surface of the flange.
2. A chuck flange produced by the user must be fully machined on the machine spindle and balanced before assembly of the chuck.
3. After assembly, ensure that the flange is in contact with the entire surface.
4. Check the concentricity and axial run-out accuracy of the flange (see Fig. "Lathe chuck assembly" – B ▸ 5 [🗋 26]).
5. Then the chuck is assembled ▸ 5.3 [🗋 28].

## 5.5 Assembly preparation for chuck with direct mount

If the bolt pitch circle of the short taper machine spindle is identical to that of the lathe chuck, a direct mount must be used. Affix the direct mount to the lathe chuck prior to chuck assembly.

1. Before mounting the chuck flange on the cylindrical recess of the chuck, remove any dirt or chips from the centering mount and contact surface of the flange.
2. Slightly tighten the flange onto the chuck with the supplied mounting screws.
3. Then the chuck is assembled ▸ 5.3 [🗋 28].

# 6 Function

## 6.1 Function and handling

Wedge-hook chucks are actuated using rotating closed-center or open-center hydraulic cylinders or via a static hydraulic cylinder. The axial tensile and pressure forces are converted to the radial jaw clamping force by the wedge hook angle in the piston and base jaws.

The clamping and opening path of the chuck jaws is determined by the hydraulic cylinder. The fine serration of the base jaws can be used to mount standard jaws as well as special jaws for complicated workpiece shapes. The top jaws are moved or changed in the open clamping position.

**⚠ WARNING**

**Clamping further above the chuck surface results in lower clamping force.**

If the workpiece is released in an uncontrolled manner, there is a risk of personal injury and damage to the system.

- Refer to the "Technical data" chapter!

## 6.2 Functional testing

**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**

**Risk of fatal injury to operating personnel if the top speed is exceeded, resulting in workpiece loss and parts flying off!**

- A reliable speed limiter must be installed in the machine tool or technical equipment and proof must be provided that the speed limiter is effective!

## 6.3 Replacement or renewal of jaws

For maximum clamping repeat accuracy, the chuck jaws must be turned or ground in the lathe chuck under clamping pressure.

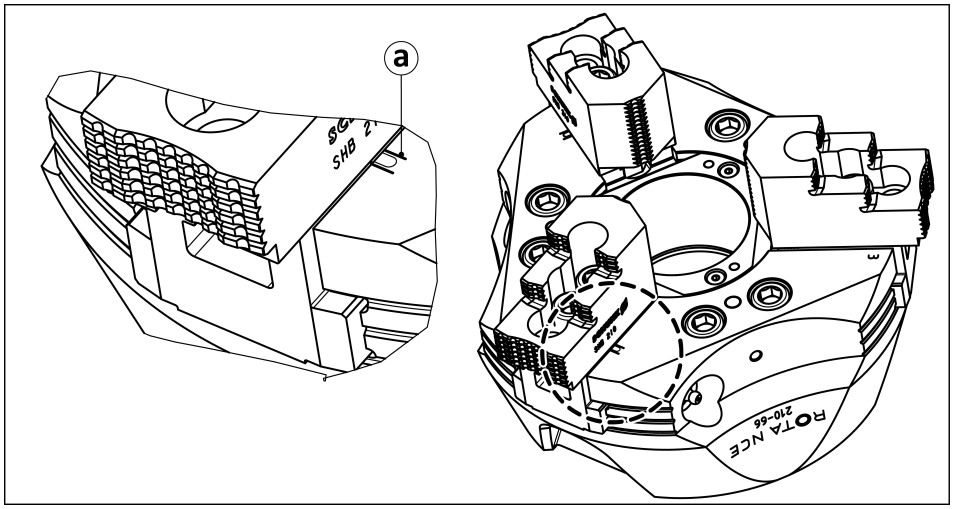
**CAUTION**

**When turning or grinding, ensure that the turning ring or turning pin is clamped by the top jaws and not by the base jaws.**

Tighten the jaw mounting screws (screw grade 12.9) to the specified torque ▸ 4 [🗋 25].

**CAUTION**

**Tighten the mounting screws of the top jaws with a torque wrench.**
**Never tighten the Allen key with an extension pipe or by hitting it with a hammer!**




*Jaw stroke display*

**CAUTION**

**Make sure that the workpiece is clamped halfway up the base jaw stroke.**

**The workpiece must not be clamped at the end of the base jaw stroke. This can lead to the workpiece becoming loose.**

**⚠ WARNING**

**Risk of personal injury and property damage due to parts flying off in the event of a screw breakage on unhardened top jaws!**

Soft standard top jaws must be hardened in the countersink region. **They should only be depth-hardened, not surface-hardened.**

### Changing the top jaws

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

# 7 Maintenance

## 7.1 Lubrication

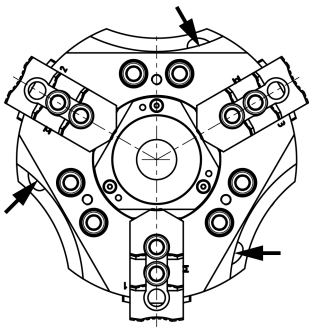


*Fig. 1: Lubrication positions*

To maintain the safe function and high quality of the lathe chuck, it has to be regularly lubricated at the lubrication nipples in the chuck body.

The chuck must be lubricated in the open position.

For optimum grease distribution, the chuck piston must travel the entire clamping stroke several times after lubrication.

**⚠ CAUTION**

**Allergic reactions due to grease in contact with skin!**

Wear gloves.

## 7.2 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 |

## 7.3 Disassembling and assembling the chuck

The item numbers specified for the corresponding individual components relate to chapter drawings.▸ 9 [🗋 36]

**The lathe chuck can only be disassembled once it has been removed.** ▸ 5 [🗋 26]

1. Unscrew the screws (item 9) and remove the protection sleeve (item 4).
2. Pull the chuck piston (item 3) out of the chuck body (item 1).
3. Push the base jaws (item 2) inwards out of the base jaw guide.

Degrease and clean all parts and check them for damage. Before assembly, grease well with LINOMAX.

**Only use genuine SCHUNK spare parts when replacing damaged parts.**

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

***CAUTION***

**When assembling the base jaws, make sure that the numbers on the base jaws match the numbers on the jaw guides.**

# 8 Part list

**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.**

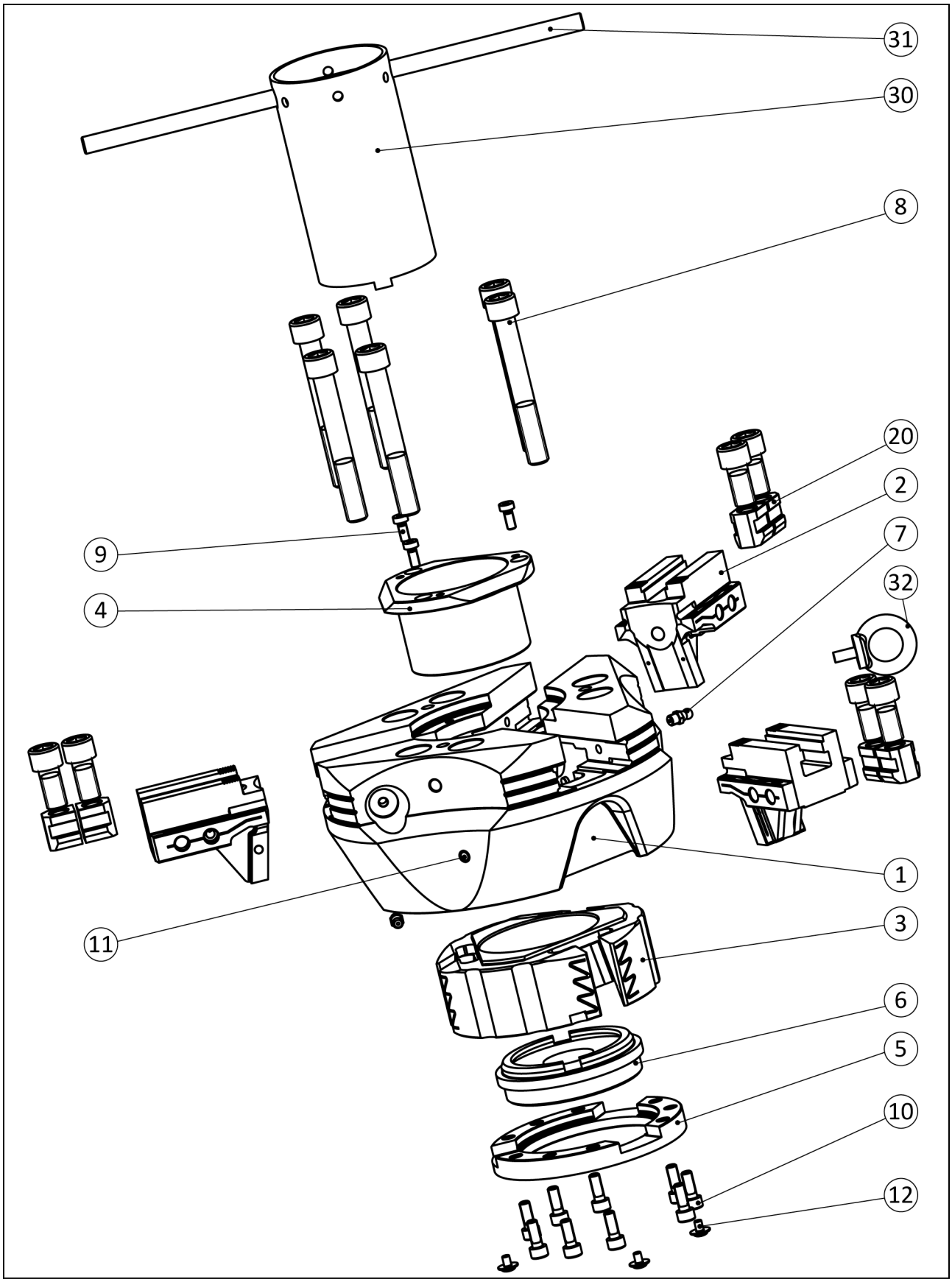
| Item | Designation | Quantity | Note |
|---|---|---|---|
| 1 | Chuck body | 1 | |
| 2 | Base jaws | 3 | |
| 3 | Chuck piston | 1 | |
| 4 | Protection sleeve | 1 | |
| 5 | Retainer ring | 1 | |
| 6 | Center sleeve | 1 | 165 / 210 / 260 / 315 |
| 7 | Lubrication nipple | 3 | |
| 8 | Screws | 3 | 130 |
| | Screws | 6 | 165 / 210 / 260 / 315 |
| 9 | Screws | 3 | |
| 10 | Screws | 9 | |
| 11 | Emblem | 1 | |
| 12 | Screws | 3 | 165 / 210 / 260 / 315 |
| 20 | Screws | 6 | KV |
| | T-nuts | 6 | SV 90 |
| | Combination T-nuts | 3 | SV 60 |
| 30 | Assembly key | 1 | 165 / 210 / 260 / 315 |
| 31 | Locking bolt | 1 | 165 / 210 / 260 / 315 |
| 32 | Eye bolt | 1 | 210 / 260 / 315 |

| Parts list key | | | |
|---|---|---|---|
| 130 | for size 130 | 315 | for size 315 |
| 165 | for size 165 | KV | for base jaws with tongue and groove |
| 210 | for size 210 | SV 60 | for base jaws with fine serration 60° |
| 260 | for size 260 | SV 90 | for base jaws with fine serration 90° |

**Center sleeves and retainer rings for the mounting on the draw tube**

| Size | ID number retainer ring | ID number center sleeve | thread chuck mount |
|---|---|---|---|
| ROTA NCE 130 | 1387812 | - | M38 x 1.5 |
| ROTA NCE 165 | - | 1150393 | M60 x 2 |
| ROTA NCE 210 | - | 88042509 | M75 x 2 |
| ROTA NCE 260 | - | 1560645 | M90 x 2 |
| ROTA NCE 315 | - | 1150399 | M115 x 2 |

# 9 Drawing



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# Manufacturer certificate

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

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

- a **risk assessment** has been carried out in accordance with ISO 12100:2010.
- an **operating manual** for the assembly instructions has been created in accordance with the contents of the Machinery Directive 2006/42/EC Annex I No. 1.7.4.2. and the contents of the provisions of Annex VI of the Machinery Directive 2006/42/EC.
- the relevant basic and proven safety principles of the Annexes of **ISO 13849-2:2012**, taking into account the requirements of the documentation have been observed for the component. The parameters, limitations, ambient conditions, characteristic values, etc. for correct operation are defined in the operating manual.
- an $MTTF_D$ value of 150 years can be estimated for mechanical components using the informative procedure in Table C.1 of ISO 13849-1:2015.
- the **fault exclusion** against the fault "Unexpected release without pending release signal".
- the **fault exclusion** against the fault "Breakage during operation" in compliance with the parameters, limitations, ambient conditions, characteristic values and maintenance intervals, etc., specified in the operating manual.
- that internal bore diameters in the **pipe or control lines** are at least 2 mm for pneumatic clamping systems and at least 3 mm for hydraulic clamping systems

**Harmonized standards applied**:

- **ISO 12100:2010** Safety of machinery - General principles for design - Risk assessment and risk reduction
- **EN 1550:1997+A1:2008** Machine-tools safety – Safety requirements for the design and construction of lathe chucks for the workpiece mount

**Other related technical standards and specifications:**

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

Mengen, 25. Apr. 2023

i. V. Philipp Schräder

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