Power Chuck
ROTA NCR
Assembly and operating manual
Dear customer,

congratulations on choosing a SCHUNK product. By choosing SCHUNK, you have opted for the highest precision, top quality and best service.

You are going to increase the process reliability of your production and achieve best machining results – to the customer's complete satisfaction.

SCHUNK products are inspiring.

Our detailed assembly and operation manual will support you.

Do you have further questions? You may contact us at any time – even after purchase.

Kindest Regards

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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, Page 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.

<table>
<thead>
<tr>
<th><strong>DANGER</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Danger for persons!</td>
</tr>
<tr>
<td>Non-observance will inevitably cause irreversible injury or death.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>WARNING</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dangers for persons!</td>
</tr>
<tr>
<td>Non-observance can lead to irreversible injury and even death.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>CAUTION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dangers for persons!</td>
</tr>
<tr>
<td>Non-observance can cause minor injuries.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>NOTICE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Material damage!</td>
</tr>
<tr>
<td>Information about avoiding material damage.</td>
</tr>
</tbody>
</table>
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 www.schunk.com.

1.1.3 Sizes

This operating manual applies to the following sizes:

- ROTA NCR
  165; 200; 250; 315; 400; 500; 630; 800; 1000; 1250; 1600
- ROTA NCR with centrifugal force compensation
  200; 250; 315; 400; 500; 630

1.2 Warranty

The warranty period is 24 months after delivery date from factory or 500 000 cycles*, if it is used as intended, under the following conditions:

- Observe the applicable documents (1.1.2, Page 6)
- Observe the ambient conditions and operating conditions (2.6, Page 9)
- Observe the specified maintenance and lubrication intervals (7, Page 36)

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 Chuck
3 Fastening screws (up to size 400)
6 Fastening screws (from size 500 on)
12 T-nuts for fine serration
12 Screws for tongue and groove
1 Eye bolt from size 250 and up
1 Operating manual
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, Page 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, Page 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, Page 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 unauthorised spare parts**

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

- Use only original spare parts or spares authorised 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 replace chuck jaws if no residual energy can be released.
- Do not use welded jaws.
- The jaws should be designed 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.
- Screw the jaw mounting screws into the bore holes furthest apart.
- The jaw fastening screws must be replaced if they show any signs of wear or damage. Only use screws with a quality of 12.9.
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, Page 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, Page 36). 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, Page 36).

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

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

Using personal protective equipment

Not wearing personal protective equipment while working with the product, may result in dangers that impact the personnel's safety and health.

- While working with the product, observe the health and safety regulations and wear the required personal safety equipment.
- Observe the valid safety and accident prevention regulations.
- In case of sharp edges and corners and rough surfaces, wear protection gloves.
- In case of hot surfaces, wear heat-resistant protection gloves.
- When dealing with hazardous substances, wear protection gloves and goggles.
- In case of moving parts, wear tight protection clothes.

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. Restrict unintentional access by persons to this range e.g. via a protective cover, protective fence or photoelectric barrier. 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. Check the function of the EMERGENCY STOP before starting up the machine or system. If this protective equipment is not working properly, prevent the operation of the machine.

### 2.13.4 Notes on particular risks

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
</table>

**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 chuck jaws.
- Automatic loading is preferred.
- If manual loading is used, adjust the jaw position so that the opening gap between the jaw and the workpiece is less than 4 mm.
- Wear protective gloves.
- Observe the safety and accident prevention regulations during operation of the chuck, especially in connection with machining centers and other technical equipment.
### Basic safety notes

<table>
<thead>
<tr>
<th><strong>CAUTION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk of burns due to workpieces with high temperatures.</strong></td>
</tr>
</tbody>
</table>
| - Wear protective gloves when removing the workpieces.  
- Automatic loading is preferred. |

<table>
<thead>
<tr>
<th><strong>CAUTION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk of damage due to incorrect choice of clamping position for chuck jaws on workpiece.</strong></td>
</tr>
</tbody>
</table>
| 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. |

<table>
<thead>
<tr>
<th><strong>CAUTION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hazard from vibration due to imbalanced rotating parts and noise generation.</strong></td>
</tr>
</tbody>
</table>
| 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

<table>
<thead>
<tr>
<th>ROTA NCR</th>
<th>165</th>
<th>200</th>
<th>250</th>
<th>315</th>
<th>400</th>
<th>500</th>
<th>630</th>
<th>800</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. actuating force [kN]</td>
<td>20</td>
<td>25</td>
<td>38</td>
<td>40</td>
<td>54</td>
<td>65</td>
<td>80</td>
<td>80</td>
<td>150</td>
</tr>
<tr>
<td>Max. clamping force [kN]</td>
<td>36</td>
<td>50</td>
<td>64</td>
<td>80</td>
<td>100</td>
<td>125</td>
<td>160</td>
<td>160</td>
<td>300</td>
</tr>
<tr>
<td>Max. speed [rpm]</td>
<td>4000</td>
<td>3500</td>
<td>3000</td>
<td>2500</td>
<td>1400</td>
<td>1200</td>
<td>1000</td>
<td>700</td>
<td>600</td>
</tr>
<tr>
<td>Stroke per jaw [mm]</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>12</td>
<td>12</td>
<td>16</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>Piston stroke [mm]</td>
<td>13.5</td>
<td>15.0</td>
<td>18.5</td>
<td>20.0</td>
<td>30.0</td>
<td>30.0</td>
<td>40.0</td>
<td>40.0</td>
<td>60.0</td>
</tr>
<tr>
<td>Pendular compensation</td>
<td>1+1</td>
<td>1+1</td>
<td>2+2</td>
<td>2+2</td>
<td>2.5+2.5</td>
<td>2.5+2.5</td>
<td>3.5+3.5</td>
<td>3.5+3.5</td>
<td>6+6</td>
</tr>
<tr>
<td>Moment of inertia [kg m²]</td>
<td>0.04</td>
<td>0.09</td>
<td>0.31</td>
<td>0.71</td>
<td>2.4</td>
<td>5.6</td>
<td>19.1</td>
<td>31.7</td>
<td>143</td>
</tr>
<tr>
<td>Weight [kg]</td>
<td>11.5</td>
<td>17.5</td>
<td>35</td>
<td>54</td>
<td>118</td>
<td>175</td>
<td>375</td>
<td>480</td>
<td>1250</td>
</tr>
<tr>
<td>Centrifugal force of the base jaw $M_{cGB}$ [kgm]</td>
<td>0.009</td>
<td>0.015</td>
<td>0.041</td>
<td>0.063</td>
<td>0.216</td>
<td>0.338</td>
<td>0.935</td>
<td>1.491</td>
<td>3.360</td>
</tr>
<tr>
<td>Max. jaw eccentricity of center of gravity in axial direction $a_{max}$ [mm]</td>
<td>12</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>40</td>
</tr>
</tbody>
</table>

**Sizes 1200 to 2500 upon request**

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.

If unhardened 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 permissible speed of rotation according to VDI 3106 must be calculated for the machining job in question. The recommended maximum speed must not be exceeded. The calculations must be checked using dynamic measurement. Function monitoring (piston movement and actuating pressure) must be performed in accordance with the guidelines of the Berufsgenossenschaft (employers' mutual insurance association).
3.2 Clamping force / speed diagrams

Clamping force/RPM curves have been calculated using hard jaws. The chucks were operated with the max. permissable force and the jaws were located exactly on line with the chuck O.D.

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

Should one or several of the above mentioned parameters be changed the diagrams are no longer valid.

Chuck set-up for clamping force / speed diagram

<table>
<thead>
<tr>
<th>F/3</th>
<th>Clamping force per jaw</th>
<th>S</th>
<th>Center of gravity</th>
</tr>
</thead>
<tbody>
<tr>
<td>r_s</td>
<td>Center of gravity radius</td>
<td>a_max</td>
<td>Max. jaw eccentricity of center of gravity in axial direction</td>
</tr>
<tr>
<td>F_max</td>
<td>Max. actuating force</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Clamping force/RPM graph for ROTA NCR 165
### Clamping force/RPM graph for ROTA NCR 200

- **SHF 160**
  - 1.2 kg
- **SFA 160**
  - 2.4 kg
- **SHF 160**
  - 1.2 kg
- **SFA 160**
  - 2.4 kg

Minimum required clamping force 33%

### Clamping force/RPM graph for ROTA NCR 250

- **SHB 165**
  - 2.6 kg
- **SWB 165**
  - 5.0 kg
- **SHB 165**
  - 2.6 kg
- **SWB 165**
  - 5.0 kg

Minimum required clamping force 33%

### Clamping force/RPM graph for ROTA NCR 315

- **SHB 165**
  - 2.6 kg
- **SWB 165**
  - 5.0 kg
- **SHB 165**
  - 2.6 kg
- **SWB 165**
  - 5.0 kg

Minimum required clamping force 33%
Clamping force/RPM graph for ROTA NCR 800

Clamping force/RPM graph for ROTA NCR 1000

* without centrifugal force compensation  ** with centrifugal force compensation

3.3 Calculations for clamping force and speed
Missing information or specifications can be requested from the manufacturer.

**Legend**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fc</td>
<td>Total centrifugal force [N]</td>
<td></td>
</tr>
<tr>
<td>Fsp</td>
<td>Effective clamping force [N]</td>
<td></td>
</tr>
<tr>
<td>Fspmin</td>
<td>Minimum required clamping force [N]</td>
<td></td>
</tr>
<tr>
<td>Fsp0</td>
<td>Initial clamping force [N]</td>
<td></td>
</tr>
<tr>
<td>Fsp2</td>
<td>Cutting force [N]</td>
<td></td>
</tr>
<tr>
<td>mAB</td>
<td>Mass of one top jaw [kg]</td>
<td></td>
</tr>
<tr>
<td>mB</td>
<td>Mass of chuck jaw set [kg]</td>
<td></td>
</tr>
<tr>
<td>Mc</td>
<td>Centrifugal force torque [Nm]</td>
<td></td>
</tr>
<tr>
<td>Mcab</td>
<td>Centrifugal torque of top jaws [Nm]</td>
<td></td>
</tr>
<tr>
<td>Mcgb</td>
<td>Centrifugal torque of base jaws [Nm]</td>
<td></td>
</tr>
<tr>
<td>r</td>
<td>Center of gravity radius [mm]</td>
<td></td>
</tr>
<tr>
<td>rs</td>
<td>Center of gravity radius of top jaw [mm]</td>
<td></td>
</tr>
<tr>
<td>ssp</td>
<td>Safety factor for clamping force</td>
<td></td>
</tr>
<tr>
<td>s2</td>
<td>Safety factor for machining</td>
<td></td>
</tr>
<tr>
<td>Σs</td>
<td>Max. clamping force of chuck [N]</td>
<td></td>
</tr>
</tbody>
</table>

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 $F_{sp\text{min}}$. 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: $S_z \geq 1.5$.

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

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

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

(+) for gripping from the outside inwards

(–) for gripping from the inside outwards

**NOTICE**

This calculated force must not be larger than the maximum clamping force $\Sigma S$ engraved on the chuck. See also "Chuck data" table (☞ 3.1, Page 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.

**NOTICE**

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

The formula for the calculation of the total centrifugal force $F_{c}$ is:

$$F_{c} = \sum (m_{B} \cdot r_{s}) \cdot \left(\frac{\pi \cdot n}{30}\right)^2 = \sum M_{c} \cdot \left(\frac{\pi \cdot n}{30}\right)^2 \ [N]$$

For this, $n$ is the **given speed of rotation** in RPM. The product $m_{B} \cdot r_{s}$ is referred to as the centrifugal force 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 "Chuck data" (Page 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 $F_{sp0}$ 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. speed of rotation $n_{\text{max}} = 3200 \, \text{rpm}$ ("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:

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

Initial clamping force during shutdown:

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

Calculation of total centrifugal force:

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

For two-part chuck jaws, the following applies:

$$M_c = M_{CGB} + M_{CAB}$$

Centrifugal torque of base jaw and top jaw specified in "Chuck data" table:

$$M_{CGB} = 0.319 \, \text{kgm}$$

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

$$M_{CAB} = m_{AB} \cdot r_{SAB} = 5.33 \cdot 0.107 \Rightarrow M_{CAB} = 0.57 \, \text{kgm}$$

Centrifugal torque for one jaw:

$$M_c = 0.319 + 0.571 \Rightarrow M_c = 0.89 \, \text{kgm}$$
The chuck has 3 jaws, the total centrifugal torque is:
\[ \sum M_c = 3 \cdot M_c = 3 \cdot 0.889 \Rightarrow \sum M_c = 2.667 \text{ kgm} \]

The total centrifugal force can now be calculated:
\[ F_c = \sum M_c \cdot \left( \frac{\pi \cdot n}{30} \right)^2 = 2.668 \cdot \left( \frac{\pi \cdot 1200}{30} \right)^2 \Rightarrow F_c = 42131 \text{ N} \]

Initial clamping force during shutdown that was sought:
\[ F_{sp0} = S_{sp} \cdot (F_{sp} + F_c) = 1.5 \cdot (4500 + 42131) \Rightarrow F_{sp0} = 69947 \text{ N} \]

### 3.3.3 Calculation of the permissible rpm \( n_{zul} \) 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:
\[
 n_{zul} = \frac{30}{\pi} \cdot \sqrt{\frac{F_{sp0} - (F_{spz} \cdot S_z)}{\sum M_c}} \text{ [min}^{-1}] \]

**NOTICE**

The calculated permissible RPM may not exceed the maximum RPM inscribed on the chuck for safety reasons!

#### 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:
\[
 n_{zul} = \frac{30}{\pi} \cdot \sqrt{\frac{F_{sp0} - (F_{spz} \cdot S_z)}{\sum M_c}} = \frac{30}{\pi} \cdot \sqrt{\frac{69947 - (3000 \cdot 1.5)}{2668}} \Rightarrow n_{zul} = 1495 \text{ min}^{-1} \]

The calculated RPM \( n_{zul} = 1495 \text{ rpm} \) is smaller than the maximum permissible RPM of the chuck \( n_{max} = 3200 \text{ rpm} \) (see "Chuck data" table ([§ 3.1, Page 17])).

This calculated RPM may be used.
3.4 Grades of Accuracy

Tolerances for run-out accuracy and axial run-out accuracy correspond to the Technical Supply Terms for lathe chucks as per DIN ISO 3089.

3.5 Permissible imbalance

The permissible imbalance for lathe chucks is quality class G 6.3 as per 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)

<table>
<thead>
<tr>
<th>Screw size</th>
<th>M6</th>
<th>M8</th>
<th>M10</th>
<th>M12</th>
<th>M14</th>
<th>M16</th>
<th>M18</th>
<th>M20</th>
<th>M22</th>
<th>M24</th>
<th>M27</th>
<th>M30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admissible torque ( M_A ) (Nm)</td>
<td>13</td>
<td>28</td>
<td>50</td>
<td>88</td>
<td>120</td>
<td>160</td>
<td>200</td>
<td>290</td>
<td>400</td>
<td>500</td>
<td>1050</td>
<td>1500</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Screw size</th>
<th>M6</th>
<th>M8</th>
<th>M10</th>
<th>M12</th>
<th>M14</th>
<th>M16</th>
<th>M20</th>
<th>M24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. admissible torque ( M_A ) (Nm)</td>
<td>16</td>
<td>30</td>
<td>50</td>
<td>70</td>
<td>130</td>
<td>150</td>
<td>220</td>
<td>450</td>
</tr>
</tbody>
</table>
5 Mounting

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.
- Ensure 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 chuck mount (☞ 5.2, Page 27)
2 Mounting of the chuck (☞ 5.3, Page 28)
3 Check the function(☞ 6.2, Page 34)

5.2 Checking the chuck mounting

Checking the spindle nose for mounting the chuck flange

The machine side has to be aligned prior to the flange being installed in order to achieve high true running accuracy for the chuck. To do this, check the contact surfaces on the spindle for axial and concentric run-out using a dial indicator (see Fig. "Chuck assembly" - A).

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 straight edge.

Make sure that the surface area of the flat surface is deburred at the bore holes and is clean.
5.3 Assembly of the chuck on the machine

The item numbers specified for the corresponding individual components relate to chapter drawings. (☞9, Page 41)

Chucks in sizes 165 and 200

The screws (item 10) cannot be inserted into the piston (item 3) and rotated.

• Fully screw the chuck into the drawbar.
• Fasten the chuck with the mounting screws supplied (item 60) to the spindle nose. Tighten the chuck mounting screws (item 60) alternately.
• Check radial and axial run-out at the checking edge.
• Check the jaw stroke of the base jaws and that these can move easily.
• Attach top jaws according to the marking to the base jaws.

Chuck from size 250

• Remove screws (item 39) and take off cover (item 34).
• Disassemble the three stop pins (item 40). (The pins can be unscrewed on the 2-edge).
Mounting

- Completely unscrew screw (item 33) from the piston. **Caution:** Secure loose pins (item 31) separately.
- The rotatable screw (item 10) can only be actuated directly using an Allen key.
- Lift the chuck using lifting equipment on the eye bolt so that it is flush with the center of the spindle.
- Screw the rotatable screw (item 10) onto the draw tube using the assembly key as far as this will go.
- Tighten the chuck mounting screws (item 60) alternately.
- Check radial and axial run-out at the checking edge.
- Check the jaw stroke of the base jaws and that these can move easily.
- Screw screws (item 33) together with pins (item 31) into the piston (item 3) as far as it will go (pendulum locking is active).
- Assemble the three stop pins (item 40).
- Place cover on (item 34) and tighten with screws (item 39).
- Attach top jaws according to the marking to the base jaws.

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

**The following must be taken into account during chuck assembly:**

The attachment of the chuck to the machine spindle must be designed in such a way so that when the chuck is open, a safety distance between the piston (item 3) and cover (item 34) or from size 400 between the piston (item 3) and the chuck body (item 1) of 0.5 + 0.5 mm is adhered to.

**The stop when opening the chuck must take place via the activation cylinder and may not take place in the chuck!**

<table>
<thead>
<tr>
<th>S</th>
<th>Spindle nose</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>Chuck</td>
</tr>
</tbody>
</table>

![Diagram of chuck assembly](image)
Cylinder piston in foremost position
R1 = Push the chuck piston to its foremost position and measure with a depth gauge.
R2 = Draw bar in foremost position. Measure with a depth gauge.

5.3.1 Mounting the chuck with a reduction or extension flange

If the chuck is screwed on with an intermediate flange, the following points must be observed:

- For mounting the chuck on the machine spindle with a short taper by means of a reduction or extension flange, a corresponding chuck flange is attached on the spindle nose.
- Before installing the chuck flange, remove any dirt or swarf from the machine spindle and from the centring mount and the contact surface of the flange.
- A chuck flange made by the user himself must be finished machining on the machine spindle and must be balanced before the chuck is mounted.
- After mounting, it must be ensured that the flange is fitted tightly on the entire surface.
- Then check the run-out accuracy and true running as described in "Measures before starting assembly" (see Fig. "Assembly of the chuck" – B)

The chuck is mounted after the flange has been aligned. During this, it must be ensured that any contaminations on the flange and on the chuck contact surfaces are removed.

⚠️ WARNING

Risk of injury from falling of the unit during transport and assembly!
The use of a crane is necessary for assembling the lathe chuck. This can be fastened on the eye bolt provided (see Fig. "Assembly of the chuck" - C). The eye bolt is in all deliveries from chuck size 250 and up included.

Before commissioning the lathe chuck, the eye-bolt has to be removed.
- Push the chuck onto the intermediate flange. During this, it must be ensured that the through-holes for attaching the chuck coincide with the threaded holes of the flange (see Fig. "Assembly of the chuck" - D).
• Next, turn in the fastening screws and tighten them slightly. Check the chuck for radial and axial run-out (see figure "Assembly of the chuck" - E) and align with slight blows with a hammer on the outer diameter if necessary. Next, screw the chuck tightly onto the chuck flange by means of the fastening screws using a torque wrench. During this, pay attention to the specified maximum tightening torques \( \varphi \), Page 26. Next, check the radial and axial run-out again as described in figure (see figure "Assembly of the chuck" - E).

5.3.2 Mounting the chuck by means of a direct mount

When mounting the chuck by means of a direct mount with a through screw connection, the flange is first attached to the chuck and subsequently mounted on the spindle.

• Before mounting the chuck flange on the cylindrical recess of the chuck, dirt and swarf must be removed from the centring mount and contact surface of the flange.

• The flange must be slightly tightened on the chuck by means of the supplied screws and aligned towards the chuck body. The radial and axial run-out must be checked.

• Next, the screws must be tightened with the specified torque \( \varphi \), Page 26.

• After mounting, it must be ensured that the flange is fitted tightly on the entire surface. Check radial and axial run-out.

**After mounting the flange on the chuck, the chuck must be mounted on the machine spindle.**

• Push the chuck onto the intermediate flange. During this, it must be ensured that the through-holes for attaching the chuck coincide with the threaded holes of the flange (see Fig. "Assembly of the chuck" - D).

• Then screw in the mounting screws and tighten slightly. Then check the chuck for radial and axial runout (see Fig. "Assembly of the chuck" - E). Tighten the mounting screws on the chuck flange with a torque wrench. During this, pay attention to the specified maximum tightening torques \( \varphi \), Page 26. Then check again for radial and axial runout (see Fig. "Assembly of the chuck" - E).

The target radial and axial run-out accuracies depend on the outer diameter of the chuck.
The following table shows the maximum attainable radial and axial run-out tolerances:

<table>
<thead>
<tr>
<th>Chuck size</th>
<th>165</th>
<th>200</th>
<th>250</th>
<th>315</th>
<th>400</th>
<th>500</th>
<th>630</th>
<th>800</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>max. radial run-out error [mm]</td>
<td>0.02</td>
<td>0.02</td>
<td>0.03</td>
<td>0.03</td>
<td>0.04</td>
<td>0.05</td>
<td>0.06</td>
<td>0.08</td>
<td>0.10</td>
</tr>
<tr>
<td>max. axial run-out error [mm]</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
<td>0.03</td>
<td>0.04</td>
<td>0.04</td>
<td>0.05</td>
<td>0.06</td>
<td></td>
</tr>
</tbody>
</table>

5.4 Replacing or adding to jaws

When changing the top jaws, the serration must be cleaned.

Chuck jaws for maximum clamping repeat accuracy must be turned or ground in the lathe 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.

Tighten jaw mounting screws (screw quality 12.9) to specified torque (see "Screw torques" chapter (☞ 4, Page 26)).

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.

WARNING

If the workpiece is clamped at the end of the base jaw stroke, this poses the risk that the entire clamping force is not transferred onto the workpiece.
Risk of injury due to loss of workpiece.
• Always clamp the workpiece at the middle of the base jaw stroke.

5.5 Switching the compensating clamping on and off

The item numbers specified for the corresponding individual components relate to chapter drawings. (☞ 9, Page 41)

With the bolts (item 31), the oscillating clamp blocks the oscillation of the compensation pieces (item 5) installed in the piston. The bolts (item 31) are moved by screwing in or unscrewing the screw (item 33).

Switching on the oscillating clamp:

Piston position or jaw position freely selectable.
• Remove the screw (item 35).
• Fully screw in the screw (item 33) as far as it will go into the piston (item 3).
• Screw in the screw (item 35).

Switching off the oscillating clamp:
The chuck needs to be moved into the open position for shaft clamping. This could otherwise lead to malfunctions and damage in the chuck.
• Remove the screw (item 35).
• Fully unscrew the screws (item 33) until the stop on the stop pins (item 40). Observe the maximum permissible torque. The stop pin (item 40) may be damaged.
• Screw in the screw (item 35).

5.6 Option with bearing plate

Using the conversion kit, a workpiece rest can be produced on the chuck face. In addition, an air control can be created.

The bearing plate (Item 44) has not been pre-drilled for the workpiece bolts (Item 45). Instead, the radial position of the workpiece bolts (Item 45) must be produced by the customer in accordance with the specific workpieces to be machined.

Furthermore, the chuck mounting must be prepared for the air control.
6 Function

6.1 Function and handling

The lever chuck is actuated using a rotating solid or through-hole cylinder. The axial tension and pressure forces are diverted into the radial clamping force via lever action.

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

The 6-jaw compensation chuck has paired pendulum chuck jaws that clamp concentrically. Two base jaws are always connected with a compensation piece. The result is workpiece centering between six points of contact, which are averaged in pairs. Even raw parts can be centered without distortion of the workpiece.

For special applications, the pendulum compensation can be disabled and all jaws simultaneously clamp concentrically. (☞ 5.5, Page 32)

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

**DANGER**

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

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

7.1 Lubrication

To maintain the safe function and high quality of the power chuck it is important to lubricate it regularly at the greese nipples (item 90).

Lubricate the chuck without a workpiece, with the base jaws in the fully closed position.

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

<table>
<thead>
<tr>
<th>Chuck size</th>
<th>165</th>
<th>200</th>
<th>250</th>
<th>315</th>
<th>400</th>
<th>500</th>
<th>630</th>
<th>800</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of grease-gun strokes</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>16</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

Operating Conditions

Depending on operating conditions, check the function and the clamping force after a certain time of operation (see chapter "Maintenance intervals" (see 7.2, Page 36)). Measure the clamping force only by using a calibrated Grip Force Tester (SCHUNK SGT 270).

Technical Condition

The base jaws must move evenly at the smallest possible operating pressure (cylinder). This method is only to some extend expressive and cannot replace clamping force measurement.

If clamping force has dropped too low, or if base jaws and piston cannot be moved perfectly, it is necessary to disassemble the chuck to clean it and to relubricate it.

Use original SCHUNK spare parts only when exchanging damaged parts.

7.2 Maintenance intervals

Lubrication of the grease areas:

<table>
<thead>
<tr>
<th>Lubrication interval</th>
<th>Strain</th>
</tr>
</thead>
<tbody>
<tr>
<td>every 25 hours</td>
<td>normal / coolant utilization</td>
</tr>
<tr>
<td>every 8 hours</td>
<td>high / coolant utilization</td>
</tr>
<tr>
<td>after 1200 hours or as needed</td>
<td>Total cleaning with disassembly of the chuck, depending on type and degree of contamination</td>
</tr>
</tbody>
</table>
7.3 Disassembly and assembly of the Chuck

The item numbers specified for the corresponding individual components relate to chapter drawings. (☞ 9, Page 41)

The lathe chuck must only be disassembled once it has been uninstalled (see chapter "Mounting the chuck to the machine" (☞ 5.3, Page 28)).

- Remove the screws (item 63) and take off the cover (item 34).
- Remove the screws (item 61) and take off the mount (item 7). The mount (item 7) can be pushed off the chuck body (item 1) from the rear with the suitable screws (screws not included in the scope of delivery).
- Remove the six levers (item 6) together with the bearing seat (item 8) from the chuck body. To do this, there is a bore hole on the side of the bearing seat in which a removal tool can be inserted.

At chuck size 165 / 200 / 250:

- Push the six base jaws (item 2) radially outwards to the stop and push the piston (item 3) out of the chuck body (item 1).
- Slide the base jaws (item 2) radially inwards until they can be removed from the chuck body (item 1).

From chuck size 315:

- Unscrew and remove the screws (item 29) from the chuck body (item 1).
- Push the six base jaws (item 2) radially outwards and push the piston (item 3) out of the chuck body (item 1).
Degrease and clean all parts and check them for damage or wear. **Only use genuine SCHUNK spare parts when replacing damaged parts.**

Before assembly, grease well with LINOMAX special grease paste. **The lathe chuck is assembled in the same way but in the reverse order.**

During assembly, the following must be observed in particular:

- The piston has a point marking on the front side. This is assigned to base jaw guide 1 during assembly.
- The bore hole on the side of the bearing seat (item 8) must point in the direction of the mount.

### 7.4 Disassembling and assembling the piston

The item numbers specified for the corresponding individual components relate to chapter drawings. *(☞ 9, Page 41)*

- **For chuck sizes 165 and 200** the screw (item 10) is screwed in directly to the piston (item 3) and secured using the pin (item 67). Items 9, 70 and 80 are no longer required.
- Unscrew the stop pin (item 40) from the piston.
- Unscrew and remove the screw (item 33) and take off the safety ring (item 38), then remove the thrust washer (item 32).
- Remove the screws (item 64), take off the plate (item 12), and pull the compensation piece (item 5) out of the piston (item 3).
- The screw (item 66) is glued into the compensation piece (item 5) such that the connecting member (item 11) is pivot-mounted with 0.2 mm axial play. Only remove the connecting member (item 11) if disassembly is required.
- Undo the securing screws (item 67) such that the flange (item 9) or the screw (item 10) can be removed from the piston (item 3).

Degrease and clean all parts and check them for damage or wear. **Only use genuine SCHUNK spare parts when replacing damaged parts.**

Before assembly, grease well with LINOMAX special grease paste. **The piston is assembled in the same way but in the reverse order.**
8 Spare parts

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

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Designation</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chuck body</td>
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</tr>
<tr>
<td>2</td>
<td>Base jaws</td>
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</tr>
<tr>
<td>3</td>
<td>Piston</td>
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<tr>
<td>5</td>
<td>Compensation piece</td>
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<td>Lever</td>
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<td>Mount</td>
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</tr>
<tr>
<td>8</td>
<td>Seat of bearing</td>
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<tr>
<td>9</td>
<td>Nut</td>
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<tr>
<td>10</td>
<td>Screw</td>
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<tr>
<td>11</td>
<td>Connecting member</td>
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</tr>
<tr>
<td>12</td>
<td>Plate</td>
<td>3</td>
</tr>
<tr>
<td>15*</td>
<td>Scraper strips (630/800/1000)</td>
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<tr>
<td>29</td>
<td>Jaw safety lock screw</td>
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<tr>
<td>31</td>
<td>Bolt</td>
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<td>32</td>
<td>Thrust washer</td>
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<td>33</td>
<td>Screw</td>
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<td>34</td>
<td>Cover</td>
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<td>35</td>
<td>Locking screw</td>
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<td>Safety ring</td>
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<td>39</td>
<td>Pan-head screw</td>
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<td>Stop pin</td>
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<td>42</td>
<td>Pipe (workshop star option)</td>
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<td>Cover (workshop star option)</td>
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<td>Workpiece bolt (workshop star option)</td>
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<td>56*</td>
<td>Mounting position orientation</td>
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<td>Piston torque pin (400/500/630/800/1000)</td>
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<td>Fastening screw scraper strips (630/800/1000)</td>
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<td>Fastening screws from front (800/1000)</td>
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<tr>
<td>Item</td>
<td>Designation</td>
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<td>Mounting screw (machine from behind) - DIN EN ISO 4762-10.9</td>
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<td>Pan-head screw</td>
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<td>Countersunk screw connecting member</td>
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<td>67</td>
<td>Set-screw piston</td>
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<td>The plunger pin</td>
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<td>72*</td>
<td>Torque pin seat of bearing (165/200/250)</td>
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<td>Eye bolt</td>
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<td>83</td>
<td>Mounting seal</td>
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<td>Chuck body seal</td>
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<td>85</td>
<td>Pipe seal</td>
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<td>86</td>
<td>Locking screw seal</td>
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<tr>
<td>87</td>
<td>Workpiece bolt seal (workshop star option)</td>
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<td>88</td>
<td>Screw seal</td>
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<td>Conical lubrication nipple</td>
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<td>Set-screw piston</td>
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<td>92</td>
<td>Set-screw lever</td>
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</tr>
<tr>
<td>93</td>
<td>Set-screw lever</td>
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</tbody>
</table>
9 Assembly drawings
Translation of the original declaration of incorporation


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

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

Product designation:  ROTA NCR Power lathe chuck without through-hole
ROTA NCR 165; 200; 250; 315; 400; 500; 630; 800; 1000; 1250; 1600
ROTA NCR with centrifugal force compensation 200; 250; 315; 400; 500; 630

ID number  0860010; 0860020; 0860025; 0860031; 0860036; 0860041; 0860046;
0860051; 0860056; 0860061; 0860066; 0860071; 0860076; 0860081;
0860091; 0860095; 0860096; 0860030; 0860035; 0860040; 0860045;
0860050; 0860055; 0860060; 0860065; 0860080

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

Applied harmonized standards, especially:
DIN EN ISO 12100:2011-03  Safety of machinery - General principles for design -
Risk assessment and risk reduction

Other related technical standards and specifications:
VDI 3106:2004-04  Determination of permissible speed (rpm) of lathe chucks (jaw chucks)

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

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

Person authorized to compile the technical documentation:
Philipp Schräder, Address: see manufacturer’s address

Signature: see original declaration

Quantities, November 2016  p.p. Philipp Schräder; Head of Engineering Design