Manual Lathe Chucks
ROTA-M flex 2+2
Assembly and Operating Manual
Imprint

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

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Dear Customer,

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

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

Best regards,
Your SCHUNK team

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

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

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

<table>
<thead>
<tr>
<th>CAUTION</th>
<th>Material damage!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information about avoiding material damage.</td>
<td></td>
</tr>
</tbody>
</table>
1.1.2 Applicable documents

- General terms of business*
- VDI guideline 3106

1.1.3 Sizes

This operating manual applies to the following sizes:

- ROTA-M flex 2+2 260
- ROTA-M flex 2+2 315
- ROTA-M flex 2+2 400
- ROTA-M flex 2+2 500
- ROTA-M flex 2+2 630

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 10)
- Observance of the specified care and maintenance instructions (☞ 7, Page 38)

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 Manual lathe chuck in the ordered variant
4 Mounting screws
8 T-nuts with screws or 4 combi T-nuts (for variant with 60° fine serration)
1 Assembly key
1 Actuation keys
1 Eye bolt
1 Assembly and Operating Manual
2 Basic safety notes

2.1 Intended use

The product is used to clamp workpieces in machine tools or assembly devices during machining.

- Rotation of the lathe chuck can be initiated by the machine during machining or the lathe chuck can be at rest. The use of coolants during machining is permitted.
- Use top jaws with a suitable interface and associated T-nuts.
- Workpiece specifications:
  - Workpiece temperature between 0°C and 100°C.
  - Interference circuit diameter of the workpiece must be smaller or at most equal to the outer diameter of the lathe chuck.
  - Sufficient rigidity in the elastic range to absorb the clamping force.
- The necessary speed of rotation and the clamping force of the lathe chuck must be determined by the operator for the respective clamping task, however the technical data engraved on the lathe chuck should never be exceeded!

Any other use is not as intended.

2.2 Reasonably foreseeable misuse

Any use other than that defined under "Appropriate Use" or any use that goes beyond that definition is considered improper use and is prohibited.

Examples of foreseeable misuse:

- Operation by unauthorized personnel:
  - incorrect mounting of the top jaws.
  - incorrect actuation of the lathe chuck.
  - incorrect feeding of the workpiece.

- Clamping in stroke end position of the lathe chuck:
  - The clamping point is too close or directly on the stroke end position of the lathe chuck, which means that the desired clamping force will not act on the workpiece.

- Use of jaws that are too high or a clamping area that is too high.
- Due to the clamping force and height of the clamping area, a moment load acts on the guideways of the lathe chuck. This must not exceed the maximum value.
- Incorrect application parameters for the machining situation. No determination of the clamping force or maximum speed of rotation required for the clamping situation. These parameters can be calculated from the desired machining situation.
- Exceeding the technical data of the lathe chuck. Actuation with an actuation moment that is too high, rotation above the maximum speed of rotation.
- Use on machines other than machine tools or assembly devices.
- Use as a safety component.
- Carelessness, lack of concentration.
- Clamping of insufficiently rigid workpieces, clamping of workpieces that do not meet the specifications:
  - The rigidity of the workpiece is not sufficient to provide the lathe chuck with the necessary resistance that will allow the clamping force to build up.
- Use for stationary or rotating processes where there is no workpiece or the workpiece is not clamped.
- Use of chuck jaws that have not been approved by SCHUNK (self-built, third-party products).
- Removing the release mechanism from the actuation key.
- By removing the release mechanism, the actuation key can remain on the lathe chuck.

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

Accumulated 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 must be designed to be as light and as low as possible. The clamping point must be as close as possible to the lathe 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 taken into account when defining the required clamping force and the recommended speed of rotation.
• The maximum recommended speed of rotation may only be operated in conjunction with maximum actuating force and only with the lathe chuck in optimum, fully functioning condition.
• After a collision, the lathe chuck and the chuck jaws must be subjected to a crack test before being used again. Replace damaged parts 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.
### 2.6 Environmental and operating conditions

<table>
<thead>
<tr>
<th>Spatial limitations</th>
<th>The lathe chuck is operated in the machining area of a machine tool or an assembly device.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interfaces</td>
<td>• Lathe chuck-machine/device: mounting surface,</td>
</tr>
<tr>
<td></td>
<td>• Lathe chuck-workpiece: chuck jaws.</td>
</tr>
<tr>
<td></td>
<td>• Lathe chuck-human: actuation key, lubrication nipple.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field of application</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental limitations</td>
<td>• Temperature range: 15°C to 60°C.</td>
</tr>
<tr>
<td></td>
<td>• Media: coolant.</td>
</tr>
</tbody>
</table>

| Material limitations | • Auxiliary and operating materials: grease LINOMAX plus, anti-rust oil Branotect, Renolit HLT2.  |
|                     | • Materials used: steel alloys, elastomers, aluminum alloys, brass.  |

Safety data sheet for LINOMAX plus available at www.schunk.com

**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, ([ Page 18]).
- 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 measurement**

Depending on the operating conditions, the function and clamping force must be checked after a certain period of operation ([ Page 38]). Only perform the clamping force test with a calibrated clamping force tester.
If the clamping force has dropped too much or if the base jaws and piston no longer move properly, the chuck must be disassembled, cleaned, and relubricated (page 7, Page 38).

2.7 Personnel qualification

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

**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.

**User**
The user has been instructed by the operator regarding the tasks entrusted to them and the potential dangers of inappropriate behavior. The user may only carry out tasks that go beyond the use in normal operation if this is indicated in this manual and the operator has expressly instructed them to do so.

- Order all work to be performed only by appropriately qualified personnel.
- Personnel must have read and understood the complete manual before beginning any work on the product.
- Observe national accident prevention regulations and the general safety notes.

**Inadequate qualification of personnel**
Work on the product by inadequately qualified personnel can lead to serious injuries and considerable material damage.
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

An incorrect manner of working can make the product unsafe and risk the danger of 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.
- Rectify malfunctions as soon as they occur.
- Observe the care and maintenance instructions.
- Observe the current safety, accident prevention, and environmental protection regulations for the application field of the product.
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 installations.
- 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.
- 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.
Basic safety notes

⚠️ 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 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 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.
3  Technical data

3.1  Lathe chuck data

<table>
<thead>
<tr>
<th>ROTA-M flex 2+2</th>
<th>260</th>
<th>315</th>
<th>400</th>
<th>500</th>
<th>630</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. actuation moment [Nm]</td>
<td>120</td>
<td>120</td>
<td>200</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>Max. clamping force [kN]</td>
<td>100</td>
<td>100</td>
<td>150</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td>Max. speed [rpm]</td>
<td>2700</td>
<td>2200</td>
<td>1500</td>
<td>1100</td>
<td>950</td>
</tr>
<tr>
<td>Overall stroke per jaw [mm]</td>
<td>9.5</td>
<td>9.5</td>
<td>14.5</td>
<td>17.8</td>
<td>17.8</td>
</tr>
<tr>
<td>Compensation per jaw [mm]</td>
<td>5.1</td>
<td>5.1</td>
<td>7.9</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Weight mit base jaws [kg]</td>
<td>41.7</td>
<td>62.9</td>
<td>124.8</td>
<td>227.2</td>
<td>307.4</td>
</tr>
<tr>
<td>Weight of base jaws [kg]</td>
<td>0.93</td>
<td>1.2</td>
<td>2.07</td>
<td>0.577</td>
<td>4.91</td>
</tr>
<tr>
<td>Mass moment of inertia [kgm²]</td>
<td>0.36</td>
<td>0.81</td>
<td>2.54</td>
<td>7.27</td>
<td>14.14</td>
</tr>
<tr>
<td>Centrifugal torque of base jaw [kgm] $M_{CGB}$</td>
<td>0.08</td>
<td>0.11</td>
<td>0.262</td>
<td>0.577</td>
<td>0.925</td>
</tr>
<tr>
<td>Spindle holder ISO 702-4</td>
<td>No. 8 (220 H6)</td>
<td>No. 11 (300 H6)</td>
<td>No. 15 (380 H6)</td>
<td>No. 15 (380 H6)</td>
<td>No. 15 (380 H6)</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>+ 15°C to + 60°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ensure minimal weight for all jaws.

For the respective machining task, the permissible speed of rotation for a given initial clamping force or the required clamping force for a given speed of rotation must be calculated according to VDI 3106, whereby the maximum speed of rotation or the maximum clamping force of the lathe chuck must not be exceeded. The calculated values must be checked by dynamic measurement. Functional monitoring must be performed according to the guidelines of the insurance association.
3.2 Dimensions
<table>
<thead>
<tr>
<th>Index</th>
<th>260 SV90° (60°)</th>
<th>315 SV90° (60°)</th>
<th>400 90SV° (60°)</th>
<th>500 SV90°</th>
<th>630 SV90°</th>
</tr>
</thead>
<tbody>
<tr>
<td>A [mm]</td>
<td>260</td>
<td>315</td>
<td>400</td>
<td>500</td>
<td>630</td>
</tr>
<tr>
<td>W [mm]</td>
<td>220</td>
<td>220</td>
<td>380</td>
<td>380</td>
<td>380</td>
</tr>
<tr>
<td>C [mm]</td>
<td>171,4</td>
<td>171,4</td>
<td>330,2</td>
<td>330,2</td>
<td>330,2</td>
</tr>
<tr>
<td>D [mm]</td>
<td>108,5</td>
<td>108,5</td>
<td>138</td>
<td>160</td>
<td>160</td>
</tr>
<tr>
<td>E [mm]</td>
<td>40</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>F1 H7 [mm]</td>
<td>17 (14)</td>
<td>17 (14)</td>
<td>21 (21)</td>
<td>25,5</td>
<td>25,5</td>
</tr>
<tr>
<td>F2 [mm]</td>
<td>M12</td>
<td>M12</td>
<td>M16</td>
<td>M20</td>
<td>M20</td>
</tr>
<tr>
<td>G [mm]</td>
<td>97</td>
<td>97</td>
<td>145</td>
<td>181</td>
<td>181</td>
</tr>
<tr>
<td>H [mm]</td>
<td>20,5</td>
<td>20,5</td>
<td>28</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>I [mm]</td>
<td>52,1</td>
<td>79,6</td>
<td>88,1</td>
<td>102,7</td>
<td>167,7</td>
</tr>
<tr>
<td>J [mm]</td>
<td>M16</td>
<td>M16</td>
<td>M24</td>
<td>M24</td>
<td>M24</td>
</tr>
<tr>
<td>K [mm]</td>
<td>28</td>
<td>28</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>L [mm]</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>M [mm]</td>
<td>63,5</td>
<td>63,5</td>
<td>83</td>
<td>94</td>
<td>94</td>
</tr>
<tr>
<td>N [mm] (transport)</td>
<td>M8</td>
<td>M8</td>
<td>M12</td>
<td>M16</td>
<td>M16</td>
</tr>
<tr>
<td>O [°]</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>P [mm]</td>
<td>20,5 (19,5)</td>
<td>20,5 (19,5)</td>
<td>25 (26)</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>Q [mm]</td>
<td>11 (10)</td>
<td>11 (10)</td>
<td>13,5 (13,5)</td>
<td>14,5</td>
<td>14,5</td>
</tr>
<tr>
<td>R1 min [mm]</td>
<td>11,5 (13,1)</td>
<td>11,5 (13,1)</td>
<td>16,7 (14)</td>
<td>18,8</td>
<td>18,8</td>
</tr>
<tr>
<td>R2 min [mm]</td>
<td>19,5 (25)</td>
<td>19,5 (25)</td>
<td>25 (30)</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>S max [mm]</td>
<td>283,4</td>
<td>335,9</td>
<td>432,4</td>
<td>534,1</td>
<td>663,1</td>
</tr>
<tr>
<td>SW [mm]</td>
<td>12</td>
<td>12</td>
<td>16</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>T [mm]</td>
<td>86,2</td>
<td>112,9</td>
<td>145,1</td>
<td>183</td>
<td>248</td>
</tr>
<tr>
<td>U [mm]</td>
<td>23,5 (21,5)</td>
<td>23,5 (21,5)</td>
<td>30,5</td>
<td>36,5</td>
<td>36,5</td>
</tr>
<tr>
<td>V min [mm]</td>
<td>44,6</td>
<td>44,6</td>
<td>55,1</td>
<td>64,6</td>
<td>64,4</td>
</tr>
<tr>
<td>V max [mm]</td>
<td>54,1</td>
<td>54,1</td>
<td>69,6</td>
<td>82,4</td>
<td>82,2</td>
</tr>
<tr>
<td>W max [mm]</td>
<td>77 (75,5)</td>
<td>95 (96,2)</td>
<td>133,2 (131,9)</td>
<td>169,2</td>
<td>234,2</td>
</tr>
<tr>
<td>X [mm]</td>
<td>3 (1,8)</td>
<td>3 (1,8)</td>
<td>2,5 (2,8)</td>
<td>3,3</td>
<td>3,3</td>
</tr>
<tr>
<td>Y [mm]</td>
<td>1,6</td>
<td>1,6</td>
<td>1,6</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Z [°]</td>
<td>45</td>
<td>45</td>
<td>50</td>
<td>45</td>
<td>45</td>
</tr>
</tbody>
</table>
3.3 Clamping force / speed diagrams

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

The lathe 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.

Lathe chuck setup for clamping force/RPM graph

<table>
<thead>
<tr>
<th>Fsb</th>
<th>Jaw clamping force</th>
</tr>
</thead>
<tbody>
<tr>
<td>rs</td>
<td>Center of gravity radius</td>
</tr>
<tr>
<td>Fmax</td>
<td>Max. actuating force</td>
</tr>
</tbody>
</table>

S | Center of gravity
a_max | Max. jaw eccentricity of center of gravity in axial direction

Clamping force/RPM graph for ROTA-M flex 2+2 260
Torques per screw

Clamping force/RPM graph for ROTA-M flex 2+2 315

Clamping force/RPM graph for ROTA-M flex 2+2 400

Clamping force/RPM graph for ROTA-M flex 2+2 500

minimum required clamping force 33%
3.4 Calculations for clamping force and speed

Missing information or specifications can be requested from the manufacturer.

<table>
<thead>
<tr>
<th>Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td>$F_c$</td>
</tr>
<tr>
<td>$F_{sp}$</td>
</tr>
<tr>
<td>$F_{sp\min}$</td>
</tr>
<tr>
<td>$F_{sp0}$</td>
</tr>
<tr>
<td>$F_{spz}$</td>
</tr>
<tr>
<td>$m_{AB}$</td>
</tr>
<tr>
<td>$m_B$</td>
</tr>
<tr>
<td>$M_c$</td>
</tr>
<tr>
<td>$r_s$</td>
</tr>
<tr>
<td>$r_{sAB}$</td>
</tr>
<tr>
<td>$s_{sp}$</td>
</tr>
<tr>
<td>$s_z$</td>
</tr>
<tr>
<td>$\Sigma_s$</td>
</tr>
</tbody>
</table>

3.4.1 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* $F_{sp}$.
Torques per screw

\[ F_{SP} = F_{SP0} \pm F_c \ [N] \]

(−) 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
**CAUTION**

This calculated force must not be larger than the maximum clamping force $\Sigma S$ engraved on the lathe chuck. See also "Lathe chuck data" table (☞ 3.1, Page 18)

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

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

**CAUTION**

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

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

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

For this, $n$ is the given speed of rotation in RPM. The product $m_B \cdot r_s$ is referred to as the centrifugal torque $M_c$.

$M_c = m_B \cdot r_s \text{ [kgm]}$

In case of toolholders with split chuck jaws, i.e., with base jaws and top jaws, for which the base jaws change their radial position only by the stroke amount, the centrifugal torque of the base jaws $M_{cGB}$ and the centrifugal torque of the top jaws $M_{cAB}$ need to be added:

$M_c = M_{cGB} + M_{cAB} \text{ [kgm]}$

The centrifugal torque of the base jaws $M_{cGB}$ can be found in the table "Lathe chuck data" (☞ 3.1, Page 18). The centrifugal torque of the top jaws $M_{cAB}$ is calculated as per:

$M_{cAB} = m_{AB} \cdot r_{SAB} \text{ [kgm]}$
3.4.2 Calculation example: required initial clamping force for a given speed

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

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

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

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

\[ F_{sp} = F_{spz} \cdot S_z = 3000 \cdot 1.5 \Rightarrow F_{sp} = 4500 \text{ N} \]

Initial clamping force during shutdown:

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

Calculation of total centrifugal force:

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

For two-part chuck jaws, the following applies:

\[ M_c = M_{CGB} + M_{CAB} \]

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

\[ M_{CGB} = 0.319 \text{ kgm} \]

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:
Torques per screw

\[ \sum M_c = 3 \cdot M_c = 3 \cdot 0.889 \Rightarrow \sum M_c = 2.667 \text{ kgm} \]

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:

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

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

Calculation of the permissible RPM \( n_{\text{perm}} \) 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 \( F_{sp0} = 17723 \text{ N} \)
- Machining force for machining job \( F_{spz} 3000 \text{ N} \) (application-specific)
- Total centrifugal torque of all jaws \( \sum M_c = 2,668 \text{ kgm} \)
- Safety factor \( S_z = 1.5 \) (according to VDI 3106)
- Safety factor \( S_{sp} = 1.5 \) (according to VDI 3106)

**NOTE:**

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

Identifying the permissible RPM:

\[
 n_{zul} = \frac{30}{\pi} \cdot \sqrt{\frac{F_{sp0} - (F_{spz} \cdot S_z)}{\sum M_c}} = \frac{30}{\pi} \cdot \sqrt{\frac{69947 - (3000 \cdot 1.5)}{2.668}} \Rightarrow n_{zul} = 1495 \text{ min}^{-1}
\]
The calculated RPM \( n_{\text{perm}} = 1495 \) RPM is smaller than the maximum permissible RPM of the lathe chuck \( n_{\text{max}} = 3200 \) RPM (see "Lathe chuck data" table (\( \text{cf. 3.1, Page 18} \)).

**This calculated RPM may be used.**

### 3.5 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.

### 3.6 Permissible imbalance DIN ISO 21940-11

The ROTA-M flex 2+2 in ungreased state without T-nuts and top jaws corresponds to the balancing quality class 6.3 (according to DIN ISO 21940-11). Residual imbalance risks may arise due to insufficient rotation compensation being achieved (see DIN EN 1550 6.2 e). This applies particularly to high speeds, asymmetrical workpieces or the use of various top jaws, as well as uneven application of lubricants. In order to prevent damage resulting from these residual risks, the entire rotor is to be dynamically balanced in accordance with DIN ISO 21940-11.

### 4 Torques per screw

**Tightening torques for mounting screws used to set up the lathe chuck on lathes or other suitable technical equipment and screws of the lathe chuck itself. (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 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 (☞ 5.2, Page 30)
2. Lathe chuck assembly
   - Assembly of the lathe chuck (with cylindrical recess) (☞ 5.3.1, Page 31)
   - if required:
     - Assembly preparation for lathe chuck with reduction or expansion adapter plate (☞ 5.3.2, Page 32) or
     - Assembly preparation for lathe chuck with direct mounting (☞ 5.3.3, Page 33)
3. Performing a functional check (☞ 6.2, Page 34)
5.2 Testing the spindle nose

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

The concentricity error of the locating centering of the mount must not exceed 0.005 mm and the maximum axial run-out error of the contact surfaces must not exceed 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
5.3.1 Assembly of the lathe chuck (with cylindrical recess)

NOTE
If the interface of the machine spindle and lathe chuck is identical, the assembly is carried out 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 (5.3.2, Page 32) or (5.3.3, Page 33).

CAUTION
Use a crane to install the chuck. Fasten the lathe chuck to the eye bolt provided for this purpose (see Fig. "Mounting the lathe chuck" - C (5.3, Page 30)).
The eye bolt must be removed prior to starting up.
The eye bolt is included in the scope of delivery.

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

Lathe chuck assembly
1 Remove the cylindrical screws for the top jaws together with the T-nuts (item 41).
2 Screw the eye bolt into the lathe chuck.
3 Lift the lathe chuck with suitable lifting equipment in alignment with the spindle center.
4 Insert and slightly tighten the mounting screws.
5 Check the lathe chuck for concentricity and axial run-out accuracy (see Fig. "Lathe chuck assembly" - E (5.3, Page 30)) and, if necessary, align at the outer diameter with light taps using a hammer.
6 Tighten the fastening screws (item 30) with a torque wrench. Observe the tightening torques (4, Page 28).
7 Remove the eye bolt from the lathe chuck.
8 Check the lathe chuck again for concentricity and axial run-out accuracy (see Fig. "Lathe chuck assembly" - E (☞ 5.3, Page 30)). The "Concentricity and axial run-out tolerances" table shows the concentricities and axial run-out accuracies to be achieved.

9 Check the jaw stroke of the base jaws and that these can move easily.

10 Fasten the top jaws marked 1, 2, 3 and 4 to the base jaws using T-nuts (item 41) and screws.

### Concentricity and axial run-out tolerances

<table>
<thead>
<tr>
<th>Lathe chuck size [mm]</th>
<th>Max. concentricity error [mm]</th>
<th>Max. axial run-out error [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>260</td>
<td>0.03</td>
<td>0.02</td>
</tr>
<tr>
<td>315</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>630</td>
<td>0.06</td>
<td>0.03</td>
</tr>
</tbody>
</table>

### 5.3.2 Assembly preparation for lathe chuck with reduction or expansion adapter plate

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. Fasten this flange to the spindle nose prior to lathe chuck assembly.

1 Before assembly of the flange, remove any dirt or chips from the machine spindle and from the centering mount and contact surface of the flange.

2 A flange produced by the user must be finished on the machine spindle and balanced before the lathe chuck is mounted.

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 (☞ 5.3, Page 30)).

5 The lathe chuck assembly follows (☞ 5.3.1, Page 31).
5.3.3 Assembly preparation for lathe chuck with direct mounting

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. Fasten the direct mount to the lathe chuck prior to lathe chuck assembly.

1 Before mounting the direct mount on the cylindrical recess of the lathe chuck, remove dirt or chips from the centering mount and the contact surface of the direct mount.
2 Tighten the direct mount slightly on the lathe chuck with the supplied fixing screws.
3 The lathe chuck assembly follows [5.3.1, Page 31].
6 Function

6.1 Function and handling

The manual lathe chuck ROTA-M flex 2+2 has a centrically balanced clamping function which enables the clamping of round, cubic and geometrically bulky workpieces.

The opposite jaws move centrically towards each other. The workpiece is centered in two compensating planes that are perpendicular to each other. Only once centering has been carried out by both pairs of jaws is the clamping force is applied evenly over all four jaws. Compensation is performed by several drive rings, which are flexibly connected by ball pins. The rotary movement of the drive rings is converted into a linear movement of the jaws by means of a wedge bar gear.

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 lathe chuck surface results in a 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 Function test before use

**Functional test**

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

Two important points are:

- **Clamping force!** At max. actuation moment, the clamping force specified for the lathe chuck must be reached. If this is not the case, the lathe chuck needs to be lubricated. ([7, Page 38](#))

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

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

**Changing the top jaws**

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

Tighten the jaw mounting screws (screw grade 12.9) to the specified torque. (*☞ 4, Page 28*)

**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!

**Turning chuck 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 jaw turning ring or turning pin is clamped by the top jaws and not by the base jaws!
6.4 Clamping the workpiece

1. Determination of the required actuation moment is based on the clamping force calculation. (see 3.4, Page 23)

2. The workpiece is clamped by twisting the spindle (item 8) using the actuation key or a torque wrench.

3. Check both stroke controls, which are located below the guideways 1 and 4. Both of the indicator pins (item 19) must be completely recessed, only then is permissible clamping achieved.

**WARNING**

When a workpiece is clamped, the indicator pins must be completely recessed. If the indicator pins are not completely recessed, there is a risk that the lathe chuck gear will move/stay against the stop. Risk of injury due to the workpiece being ejected from the machine. If the indicator pin protrudes, do not clamp the lathe chuck and do not start up.

Risk of injury due to the workpiece being ejected from the machine.

- If the indicator pin protrudes, do not clamp the lathe chuck and do not start up.
6.5 Compensation / workpiece dimensions

<table>
<thead>
<tr>
<th>ROTA-M flex 2+2</th>
<th>260</th>
<th>315</th>
<th>400</th>
<th>500</th>
<th>630</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall stroke per jaw [mm]</td>
<td>9.5</td>
<td>11.4</td>
<td>14.5</td>
<td>17.8</td>
<td>17.8</td>
</tr>
<tr>
<td>Compensation per jaw [mm]</td>
<td>5.1</td>
<td>6.3</td>
<td>7.9</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

The compensation area of the lathe chuck is located in the center of the total jaw stroke and is also the area within which the indicator pins are completely recessed.

Using the compensation function, the lathe chuck can accommodate workpieces, that have the dimension \( X \pm \text{compensation per jaw} \) when their side lengths are placed perpendicular to each other.

**Example: ROTA-M flex 2+2 315**

Distance between chuck jaws when the lathe chuck is open: 100 mm.

Middle of total jaw stroke: 100 mm - 9.5 mm = 90.5 mm. Possible workpiece dimension: 90.5 mm +/− 5.1 mm.

Possible workpiece dimension: 90.5 mm +/− 5.1 mm.
7 Maintenance

7.1 Lubrication

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 lathe chuck must be lubricated in the open position.

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

<p>|</p>
<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Allergic reactions due to grease in contact with skin!</strong></td>
</tr>
<tr>
<td>Wear gloves.</td>
</tr>
</tbody>
</table>

7.2 Maintenance intervals

**Lubricating the greasing areas:**

<table>
<thead>
<tr>
<th>Lubrication interval</th>
<th>Demands</th>
<th>To be carried out</th>
</tr>
</thead>
<tbody>
<tr>
<td>every 25 hours</td>
<td>normal / use of coolant</td>
<td>User</td>
</tr>
<tr>
<td>every 8 hours</td>
<td>high / use of coolant</td>
<td>User</td>
</tr>
<tr>
<td>after 1200 hours or when needed</td>
<td>Full cleaning with disassembly of lathe chuck depending on type of contamination and quantity</td>
<td>Specialist personnel</td>
</tr>
</tbody>
</table>

7.3 Disassembling and assembling the chuck

The item numbers specified for the corresponding individual components relate to chapter drawings. (☞ 12, Page 48)

**The stationary chuck can only be disassembled once it has been removed.** (☞ 5, Page 29)

1. Loosen the screws of the T-nuts and remove T-nuts with top jaws.
2. Loosen screws (item 30) and lift the lathe chuck from the machine spindle with lifting equipment.
3 Place the lathe chuck on the flat surface of the chuck body (item 1).
4 Remove the screws (items 31 and 32).
5 Remove the mount (item 7) from the lathe chuck.
6 Drive cylindrical pin (item 38) out of the mount (item 7) using a punch, remove O-ring (item 36).
7 Remove the spindle nut (item 9) using the assembly tool (item 49).
8 Turn the spindle (item 8) from the slide (item 16) and remove it from the mount (item 7), also remove the seat of bearing (item 10).
9 Remove the slide (item 17) and both sliding blocks (item 20) from the middle drive ring (item 12).
10 Pull off lower drive ring (item 13), remove sleeves (item 14) and two connecting members (item 7) from lower drive ring (item 13).
11 Pull off four locking bolts (item 15).
12 Remove the middle drive ring (item 12).
13 Pull off upper drive ring (item 11), remove two connecting members (item 7) from upper drive ring (item 12).
14 Remove wedge bars (item 5) from chuck body (item 1).
15 Push the indicator pin (item 19) inwards until it reaches the stop.
16 Remove screws (item 34) and pull off cover plates (items 23 and 24).
17 Remove indicator pins (item 19) and springs (item 38) from chuck body (pos. 1).
18 Turn the chuck body (item 1).
19 Remove screws (item 33) and then remove cover (item 3) with O-ring (item 37) and wiper (items 21 and 22).
20 Remove O-ring sections (item 26) and sealing elements (item 25).
21 Remove base jaws (item 2).
22 Remove bolts (item 18).

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.**
7.4 Assembling the lathe chuck

1. Place the chuck body (item 1) with the guideways facing upwards.
2. Slide base jaws (item 2) into guideways in the chuck body (item 1).
   CAUTION: The base jaws are numbered; install according to the numbering on the chuck body!
3. Fold sealing element (item 25) around projecting base jaws (item 2) and place in gap between chuck body and base jaw.
4. Insert each two indicator pins (item 19) and springs (item 38) into the holes below the guideway in the chuck body (item 1).
5. Position O-ring sections (pos. 26) centrally in the groove of the cover plates (items 23 and 24) and slide them into the chuck body (item 1) from below. Make sure that the sealing element (item 25) is also incorporated into the groove in the cover plate (item 23 and 24).
   CAUTION: Use the cover plates (item 23) on guideways 1 and 4.
6. Fix the cover plates (items 23 and 24) with screws (item 34).
7. Press projecting O-ring sections (item 26) into the gap between the chuck body (item 1) and the sealing element (item 25).
8. Secure the wipers (item 21 and 22) with screws (item 33) flat on the guideways.
9. Press O-ring (item 37) into groove in cover (item 3) and fasten with screws (item 33) in the middle of the chuck body (item 1).
10. Slide base jaws (item 2) into the outer position in the chuck body (item 1).
11. Insert bolts (item 18) in holes in chuck body (item 1).
12. Press indicator pins (item 19) outwards and secure position with cylindrical pins (item 51).
13. From the view of the chuck center, insert the wedge bars (item 5) into the chuck body in the right end position. Make sure that the serration interlaces.
   CAUTION: The wedge bars are numbered; install according to the numbering on the chuck body!
14. Place the connecting member (item 6) on the bar of the wedge bars (item 5).
15 Place the upper drive ring (item 11) on the shaft in the center of the lathe chuck, thread the connecting members (item 6) into the holes. The marking must be visible and point in the direction of guideway 1.

16 Remove the cylindrical pins (item 51) on guideway 1.

17 Accurately place the middle drive ring (item 12) on the upper drive ring (item 11); the marking must be visible and point in the direction of guideway 1.

18 Place sliding blocks (item 20) in grooves in the middle drive ring (item 12); the marking must be visible and point outwards.

19 Place the lower drive ring (item 13) on the middle drive ring (item 12) and thread the connecting members (item 6) into the holes. The marking must be visible and point in the direction of guideway 1.

20 Remove the cylindrical pins (item 51) on guideway 1.

21 Insert sleeves (item 14) into the lower drive ring (item 13), chamfers must point downwards.

22 Insert the locking bolts (item 15) into the bores of the drive rings.

23 Insert the slide (item 17) in the sliding block (item 20) at guideway 3 and align it parallel to the plane of guideways 2 and 4.

24 Place the seat of bearing (item 10) in the mount (item 7).

25 Place slide (item 16) in the pocket; the pin must face the middle axis.

26 Screw spindle (item 8) from the outside through the hole in the mount (item 7) into the slide (item 16) until it is braced in the end position.

27 Turn the spindle nut (item 9) with the assembly tool (item 49) up to the block in the mount (item 7).

28 Turn back the spindle nut (item 9) using the assembly tool (item 49) until the cylindrical pin (item 38) can be inserted into the hole of the mount (item 7).

29 Place the mounting assembly on the chuck body assembly. Observe the following points:

30 thread the shaft of the mount into the drive rings.

31 thread the pin of the slide in the assembly mount into the sliding block of the chuck body assembly.
32 thread the slide of the chuck body assembly into the groove of the assembly mount.
33 Fasten the mount (item 7) to the chuck body with screws (items 31 and 32).
34 Turn the lathe chuck.
35 Loosen screws (item 34) and fix cover plate (items 23 and 24) against the mount (item 7); tighten the screws (item 34).

**CAUTION**

When assembling the base jaws and wedge bars, make sure that the numbers on the base jaws and wedge bars match the numbers on the jaw guidance.
## 8 Remedies for faults

<table>
<thead>
<tr>
<th>Malfunction</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuation stiffness</td>
<td>Tightening torque of top jaws too high</td>
<td>Use correct tightening torque</td>
</tr>
<tr>
<td></td>
<td>Damage to the guideways</td>
<td>Disassemble and check the lathe chuck. Replace worn or damaged parts with SCHUNK spare parts</td>
</tr>
<tr>
<td></td>
<td>Drive spindle damaged (due to overload)</td>
<td>Disassemble and check the lathe chuck. Replace worn or damaged parts with SCHUNK spare parts</td>
</tr>
<tr>
<td>Concentricity errors</td>
<td>Top jaws on incorrect base jaw</td>
<td>Mount top jaws in correct allocation</td>
</tr>
<tr>
<td></td>
<td>Allocation of the components switched during assembly</td>
<td>Disassemble lathe chuck and assemble using correct component allocation</td>
</tr>
<tr>
<td></td>
<td>Top jaws not correctly turned/ground</td>
<td>Repeat turning/grinding</td>
</tr>
<tr>
<td></td>
<td>Dirty clamping faces</td>
<td>Cleaning the clamping faces</td>
</tr>
<tr>
<td></td>
<td>Dirty jaw interface</td>
<td>Clean the jaw interface</td>
</tr>
<tr>
<td></td>
<td>Compensation stroke worn in clamping situation</td>
<td>Adjust position of top jaws to workpiece geometry</td>
</tr>
<tr>
<td>Drop in clamping force</td>
<td>Stationary chuck lubrication insufficient, maintenance interval exceeded</td>
<td>Lubricate lathe chuck, if necessary, disassemble, clean and re-lubricate</td>
</tr>
<tr>
<td></td>
<td>No stroke movement with large repetition</td>
<td>Open and close the lathe chuck several times without workpiece</td>
</tr>
<tr>
<td></td>
<td>Components worn in the force flow</td>
<td>Disassemble and check the lathe chuck. Replace worn or damaged parts with SCHUNK spare parts</td>
</tr>
<tr>
<td>Vibrations on machine spindle</td>
<td>Compensation stroke worn in clamping situation</td>
<td>Adjust position of top jaws to workpiece geometry</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Imbalance due to workpiece</td>
<td>Compensate for imbalance by adding weight to the chuck body</td>
<td></td>
</tr>
<tr>
<td>Imbalance due to top jaw</td>
<td>Correct the top jaw position</td>
<td></td>
</tr>
<tr>
<td>Imbalance due to machine spindle or flange/direct mounting</td>
<td>Check components for concentricity, align, balance or replace if necessary</td>
<td></td>
</tr>
</tbody>
</table>
9 Storage
If the chuck is not used for a longer period of time, this must be stored in a dry and protected place, taking into account the ambient conditions (☞ 2.6, Page 10). If possible, it should be stored in the original packaging.

If the lathe chuck is reused after storage, the clamping force must be checked. If this does not correspond to the nominal clamping force, the lathe chuck must be dismantled, cleaned and relubricated.

10 Disposal
After decommissioning, place the chuck in a position that enables any liquids in the lathe chuck to drain out.

- Collect the escaping liquids and dispose of them properly in line with the statutory provisions.
- Remove any identifiable plastic or aluminum parts installed in or on the chuck and dispose of them properly in line with the statutory provisions.
- Dispose of the chuck's metal parts as scrap metal.

Alternatively, you can return the chuck to SCHUNK for proper disposal.
11 Spare parts

When ordering spare parts, it is crucial to state the type, size, and most importantly the serial number of the lathe chuck.

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

<table>
<thead>
<tr>
<th>No.</th>
<th>Characterization</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chuck body</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Base jaws</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Cover</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Wedge bar</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Connecting member</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Mount</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Spindle</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Spindle nut</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Seat of bearing</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Drive ring top</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Drive ring middle</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Drive ring bottom</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Sleeve</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>Locking bolt</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>Slide with thread</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>Slide without thread</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>Bolts</td>
<td>4</td>
</tr>
<tr>
<td>19</td>
<td>Indicator pin</td>
<td>2</td>
</tr>
<tr>
<td>20</td>
<td>Sliding block</td>
<td>2</td>
</tr>
<tr>
<td>21</td>
<td>Right wiper</td>
<td>4</td>
</tr>
<tr>
<td>22</td>
<td>Left wiper</td>
<td>4</td>
</tr>
<tr>
<td>23</td>
<td>Wiper plate with hole</td>
<td>2</td>
</tr>
<tr>
<td>24</td>
<td>Wiper plate without hole</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td>Sealing element</td>
<td>4</td>
</tr>
<tr>
<td>26</td>
<td>O-ring section</td>
<td>4</td>
</tr>
<tr>
<td>27</td>
<td>Sealing insert</td>
<td>4</td>
</tr>
<tr>
<td>30</td>
<td>Screw</td>
<td>4</td>
</tr>
<tr>
<td>31</td>
<td>Screw</td>
<td>1</td>
</tr>
<tr>
<td>32</td>
<td>Screw</td>
<td>6</td>
</tr>
<tr>
<td>No.</td>
<td>Description</td>
<td>Quantity</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>33</td>
<td>Screw (260+315/400+500/630)</td>
<td>28/36/44</td>
</tr>
<tr>
<td>34</td>
<td>Screw</td>
<td>8</td>
</tr>
<tr>
<td>35</td>
<td>Cylindrical pin</td>
<td>1</td>
</tr>
<tr>
<td>36</td>
<td>O-ring</td>
<td>1</td>
</tr>
<tr>
<td>37</td>
<td>O-ring</td>
<td>1</td>
</tr>
<tr>
<td>38</td>
<td>Compression spring</td>
<td>2</td>
</tr>
<tr>
<td>41</td>
<td>T-nut (SV90°/SV60°)</td>
<td>8/4</td>
</tr>
<tr>
<td>47</td>
<td>Actuation keys</td>
<td>1</td>
</tr>
<tr>
<td>48</td>
<td>Cylindrical pin</td>
<td>2</td>
</tr>
<tr>
<td>49</td>
<td>Assembly key</td>
<td>1</td>
</tr>
<tr>
<td>50</td>
<td>Eye bolt</td>
<td>1</td>
</tr>
</tbody>
</table>

Accessories and replacement orders at:

H.-D. SCHUNK GmbH & Co.
Spanntechnik KG
Lothringer Str. 23
D-88512 Mengen
Tel. +49–7572-7614-0
Fax +49-7572-7614-1099
info@de.schunk.com
schunk.com

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

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

Product designation: Manually operated, centrically balanced 4-jaw lathe chuck

ID number: ROTA-M flex 2+2

ID numbers: 1410479, 1410477, 1407685, 1407684, 1400911, 1400910, 1389671, 1389670

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

Applied harmonized standards, especially:
DIN EN ISO 12100:2011-03 Safety of machinery - General principles for design - Risk assessment and risk reduction
DIN EN 1550:2008-11 Machine-tools safety - Safety requirements for the design and construction of work holding chucks

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

Mengen, November 2019

Signature: see original declaration

p.p. Philipp Schräder; Head of Engineering Design
14 Appendix on Declaration of Incorporation, as per 2006/42/EC, Annex II, No. 1 B

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

<table>
<thead>
<tr>
<th>Product designation</th>
<th>Manually operated, centrically balanced 4-jaw lathe chuck</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type designation</td>
<td>ROTA-M flex 2+2</td>
</tr>
<tr>
<td>ID number</td>
<td>1410479, 1410477, 1407685, 1407684, 1400911, 1400910, 1389671, 1389670</td>
</tr>
</tbody>
</table>

To be provided by the System Integrator for the overall machine

Fulfilled for the scope of the partly completed machine

Not relevant

1.1 Essential Requirements

1.1.1 Definitions

1.1.2 Principles of safety integration

1.1.3 Materials and products

1.1.4 Lighting

1.1.5 Design of machinery to facilitate its handling

1.1.6 Ergonomics

1.1.7 Operating positions

1.1.8 Seating

1.2 Control Systems

1.2.1 Safety and reliability of control systems

1.2.2 Control devices

1.2.3 Starting

1.2.4 Stopping

1.2.4.1 Normal stop

1.2.4.2 Operational stop

1.2.4.3 Emergency stop

1.2.4.4 Assembly of machinery

1.2.5 Selection of control or operating modes

1.2.6 Failure of the power supply

1.3 Protection against mechanical hazards

1.3.1 Risk of loss of stability

1.3.2 Risk of break-up during operation

1.3.3 Risks due to falling or ejected objects

1.3.4 Risks due to surfaces, edges or angles

1.3.5 Risks related to combined machinery

1.3.6 Risks related to variations in operating conditions

1.3.7 Risks related to moving parts

1.3.8 Choice of protection against risks arising from moving parts

1.3.8.1 Moving transmission parts

1.3.8.2 Moving parts involved in the process

1.3.9 Risks of uncontrolled movements

1.4 Required characteristics of guards and protective devices

1.4.1 General requirements

1.4.2 Special requirements for guards

1.4.2.1 Fixed guards

1.4.2.2 Interlocking movable guards

1.4.2.3 Adjustable guards restricting access

1.4.3 Special requirements for protective devices
### 1.5 Risks due to other hazards

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<thead>
<tr>
<th>1.5.1</th>
<th>Electricity supply</th>
<th>X</th>
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</thead>
<tbody>
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<td>1.5.2</td>
<td>Static electricity</td>
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<tr>
<td>1.5.3</td>
<td>Energy supply other than electricity</td>
<td>X</td>
</tr>
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<td>1.5.4</td>
<td>Errors of fitting</td>
<td>X</td>
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<tr>
<td>1.5.5</td>
<td>Extreme temperatures</td>
<td>X</td>
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<tr>
<td>1.5.6</td>
<td>Fire</td>
<td>X</td>
</tr>
<tr>
<td>1.5.7</td>
<td>Explosion</td>
<td>X</td>
</tr>
<tr>
<td>1.5.8</td>
<td>Noise</td>
<td>X</td>
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<tr>
<td>1.5.9</td>
<td>Vibrations</td>
<td>X</td>
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<td>1.5.10</td>
<td>Radiation</td>
<td>X</td>
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<tr>
<td>1.5.11</td>
<td>External radiation</td>
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<tr>
<td>1.5.12</td>
<td>Laser radiation</td>
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</tr>
<tr>
<td>1.5.13</td>
<td>Emissions of hazardous materials and substances</td>
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</tr>
<tr>
<td>1.5.14</td>
<td>Risk of being trapped in a machine</td>
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</tr>
<tr>
<td>1.5.15</td>
<td>Risk of slipping, tripping or falling</td>
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</tr>
<tr>
<td>1.5.16</td>
<td>Lightning</td>
<td>X</td>
</tr>
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### 1.6 Maintenance

<table>
<thead>
<tr>
<th>1.6.1</th>
<th>Machinery maintenance</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1.6.2</td>
<td>Access to operating positions and servicing points</td>
<td>X</td>
</tr>
<tr>
<td>1.6.3</td>
<td>Isolation of energy sources</td>
<td>X</td>
</tr>
<tr>
<td>1.6.4</td>
<td>Operator intervention</td>
<td>X</td>
</tr>
<tr>
<td>1.6.5</td>
<td>Cleaning of internal parts</td>
<td>X</td>
</tr>
</tbody>
</table>

### 1.7 Information

<table>
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<tr>
<th>1.7.1</th>
<th>Information and warnings on the machinery</th>
<th>X</th>
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</thead>
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<td>1.7.1.1</td>
<td>Information and information devices</td>
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<tr>
<td>1.7.1.2</td>
<td>Warning devices</td>
<td>X</td>
</tr>
<tr>
<td>1.7.2</td>
<td>Warning of residual risks</td>
<td>X</td>
</tr>
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<td>1.7.3</td>
<td>Marking of machinery</td>
<td>X</td>
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<td>1.7.4</td>
<td>Instructions</td>
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<td>1.7.4.1</td>
<td>General principles for the drafting of instructions</td>
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<tr>
<td>1.7.4.2</td>
<td>Contents of the instructions</td>
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<tr>
<td>1.7.4.3</td>
<td>Sales literature</td>
<td>X</td>
</tr>
</tbody>
</table>

The classification from Annex 1 is to be supplemented from here forward.

### 2 Supplementary essential health and safety requirements for certain categories of machinery

| 2.1 | Foodstuffs machinery and machinery for cosmetics or pharmaceutical products | X |
| 2.2 | Portable hand-held and/or guided machinery                                   | X |
| 2.2.1| Portable fixing and other impact machinery                                   | X |

### 3 Supplementary essential health and safety requirements to offset hazards due to the mobility of machinery

### 4 Supplementary essential health and safety requirements to offset hazards due to lifting operations

### 5 Supplementary essential health and safety requirements for machinery intended for underground work

### 6 Supplementary essential health and safety requirements for machinery presenting particular hazards due to the lifting of persons
