SCHUNK

Manual Power Chuck
ROTA-G
Assembly and operating manual

Translation of the original manual

Hand in hand for tomorrow

Imprint

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

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Dear Customer,

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

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

Best regards,

Your SCHUNK team

Customer Management

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

Table of Contents

1 General

1.1 About this manual

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

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

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

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

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

1.1.1 Illustration of warnings

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

CAUTION

Information about avoiding material damage.

1.1.2 Applicable documents

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

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

1.2 Warranty

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

- Observe the applicable documents, ▸ 1.1.2 [🗋 6]
- Observance of the ambient conditions and operating conditions, ▸ 2.5 [🗋 8]
- Observance of the specified maintenance and lubrication intervals ▸ 6.5 [🗋 33]

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

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

1.3 Scope of delivery

1 **Manual Chuck (completely)**
either with straight recess and fixation screws
or with corresponding flanges and accessories as per
– DIN 55026 Short taper A 1 or A 2 with fastening screws
– DIN 55027 Bajonett mount C (J) with stud bolt and collar nut
– DIN 55029 Camlock mount S (D) with Camlock bolt and Camlock screws

1 **Set of base jaws (GBK) or**

1 **Set of stepped block jaws (GST)**

1 **Clamping key**

1 **Assembly and operating manual**

2 Basic safety notes

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

2.1 Appropriate use

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

2.2 Inappropriate use

The product is not being used appropriately if:

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

2.3 Structural changes

Implementation of structural changes

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

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

2.4 Spare parts

Use of unauthorized spare parts

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

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

2.5 Ambient conditions and operating conditions

Required ambient conditions and operating conditions

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

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

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

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

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

2.6 Material limitations

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

2.7 Chuck Jaws

Requirements of the chuck jaws

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

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

2.8 Personnel qualifications

Inadequate qualification of personnel

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

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

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

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

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

Instructed person Instructed persons have been instructed by the operator regarding the tasks entrusted to them and the potential dangers of inappropriate behavior.

Manufacturer's service personnel The manufacturer's service personnel have the specialized training, knowledge, and experience to perform the work entrusted to them and to recognize and avoid potential dangers.

2.9 Personal protective equipment

Use of personal protective equipment

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

2.10 Transport

Handling during transport

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

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

2.11 Protection during handling and assembly

Incorrect handling and assembly

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

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

2.12 Protection during commissioning and operation

Falling or violently ejected components

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

- Take suitable protective measures to secure the danger zone.

2.13 Notes on safe operation

Incorrect manner of working by personnel

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

- Observe the safety notes and assembly instructions.
- Do not expose the product to any corrosive media. Products for special ambient conditions are excluded.
- Rectify malfunctions as soon as they occur.
- Observe the care and maintenance instructions.
- Observe the current safety, accident prevention, and environmental protection regulations for the application field of the product.
- The chuck may only be accelerated to speed or otherwise when a workpiece is correctly clamped. This means that the clamping force has been applied to the workpiece and the clamping has taken place within the permissible operating range.
- Unclamping may only occur once the machine spindle has come to a standstill.

Functionality check

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

Two important points are:

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

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

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

Maintenance instructions

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

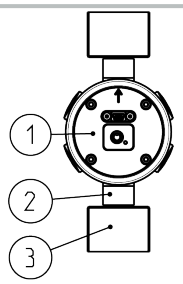
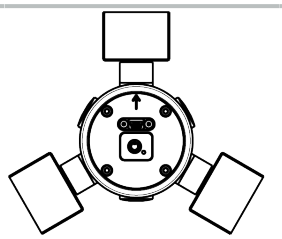
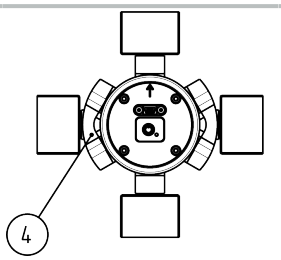
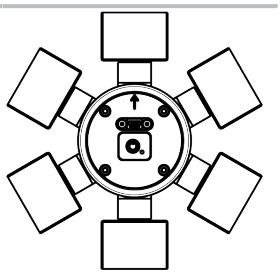
- For lubrication, we recommend our tried and tested special grease, LINOMAX plus. Unsuitable lubricants can have a negative impact on the functioning of the clamping device (clamping force, coefficient of friction, wear behavior). (For

product information about LINOMAX plus, see the "Accessories" chapter of the SCHUNK lathe chuck catalog or contact SCHUNK.)

- Use a suitable high-pressure grease gun to ensure that you reach all the greasing areas.
- To ensure correct distribution of the grease, move the clamping device to its end positions several times, lubricate again, and then check the clamping force.
- Move the clamping device through to its end position several times after 500 clamping strokes, at the latest. This moves the lubricant back to the surfaces of the force transmission.
- Check the clamping device regularly for clamping force and jaw stroke.

Clamping force measurement

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

	2-jaw	**3-jaw**	**4-jaw (compensating)**	**6-jaw (compensating)**
				
Measuring device	SCHUNK IFT clamping force tester	SCHUNK IFT clamping force tester	SCHUNK IFT clamping force tester	SCHUNK IFT clamping force tester
Accessories	–	–	IFT MA4	–
Measuring points	0°/180°	0°/120°/240°	0° / 180° / 90° / 270° (IFT MA4)	0°/60°/120°/180°/ 240°/300°
Please note	Operating manual SCHUNK IFT Clamping force tester	Operating manual SCHUNK IFT Clamping force tester	Operating manual SCHUNK IFT Clamping force tester **Attention** Compensation must be activated, otherwise it may lead to inconsistent results.	Operating manual SCHUNK IFT Clamping force tester **Attention** Compensation must be activated, otherwise it may lead to inconsistent results.

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

- If the clamping force has dropped too much or if the base jaws and piston no longer move properly, the chuck will have to be disassembled, cleaned and relubricated.
- The clamping force should always be measured with the clamping device in the same condition as it is used in for the current clamping application. If top jaws with clamping steps are used, measuring must be performed in the same step as for the respective clamping task. In the event of high operating speeds, clamping force losses must be accounted for due to the centrifugal force acting on the chuck jaws. In this case the value of the operating clamping force should be measured dynamically.
- We recommend checking the clamping force using a clamping force tester before starting a new production run and between maintenance intervals. "Optimum safety can only be guaranteed through regular checks".

2.14 Disposal

Handling of disposal

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

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

2.15 Fundamental dangers

General

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

2.16 Protection against dangerous movements

Unexpected movements

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

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

2.17 Notes on particular risks

⚠ DANGER

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

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

⚠ DANGER

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

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

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

⚠ DANGER

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

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

⚠ DANGER

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

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

⚠ DANGER

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

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

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

⚠ WARNING

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

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

⚠ CAUTION

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

- Do not reach between the chuck jaws.

⚠ CAUTION

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

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

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

⚠ CAUTION

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

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

⚠ CAUTION

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

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

CAUTION

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

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

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

3 Technical data

3.1 Chuck data

Size	200-62	250-82	315-102	400 - 630
Max. torque [Nm]	90	200	210	On request
Max. clamping force [kN]	95	160	200	
Max. rotation speed [rpm]	4600	4000	3200	
Stroke per jaw [mm]	6.8	7.1	8.5	
Chuck through hole [mm]	62	82	102	
Weight [kg]	16.3	26.6	52	
Centrifugal torque of the base jaw M_{cGB} [kgm]	For the ROTA-G lathe chucks it is necessary to determin these data. For calculation examples see chapter „Customised jaws/ Technology“ in our current chuck jaw catalog.			
Max. jaw eccentricity of center of gravity in axial direction a_{max} [mm]				

The recommended max. r.p.m. is only valid for max. operating force and the use of the suitable stepped block jaws, hard, Type GST.

The recommended r.p.m. is valid for ROTA-G with stepped block jaws, hard, Type GST.

The base jaws have to be aligned with the outside diameter of the chuck.

Jaw type	GST 160	GST 200	GST 250	GST 315	GST 400	GST 500 - 600
Weight [kg]	0.6	1.2	3.0	3.4	4.4	11.7

For jaws with higher wight must the circle number be reduced!

Max. oscillating diameter – with base jaws type GBK

ROTA-G	160-46	200-62	250-82	315-102	400-122	500-162	630-252
Oscillating diameter Ø [mm]	221	270	326	403	511	594	820

The chuck is balanced at Q 6.3 at rated speed.

⚠ WARNING

Danger of personal injury and property damage caused by flying parts in case of spiral fracture of soft top jaws!

Soft top jaws must be hardened in the area of the screw's counterbore.

Just deep hardened no surface hardening.

When using unhardened top jaws or jaws in special design, make sure that their weight is as low as possible. For soft top jaws or special design jaws the speed permitted for the cutting task must be calculated in accordance with VDI 3106 whereby the max.

recommended speed may not be exceeded. The calculated values must be checked by dynamic measurement. Monitor of function must be carried out in accordance with the guidelines of the trade associtation.

More technical data is included in the catalog data sheet. Whichever is the latest version.

3.2 Clamping force-RPM-diagrams

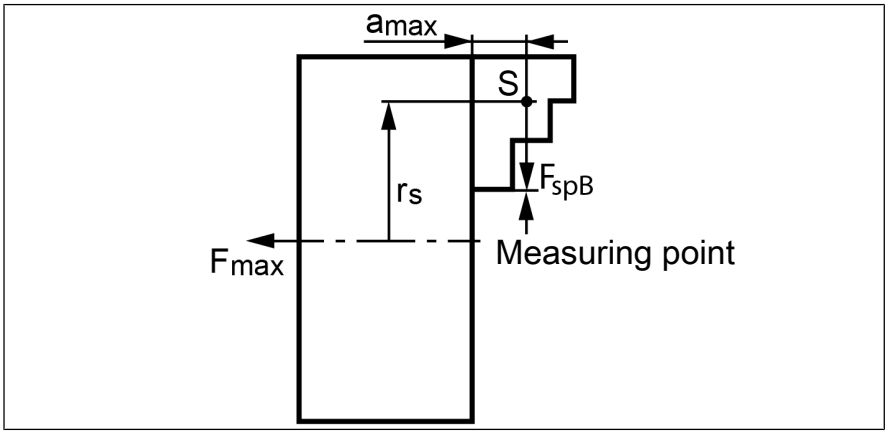
The clamping force diagrams refer to 3-jaw-chuck.

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

It is also assumed the chuck is in perfect condition and lubricated with SCHUNK LINOMAX plus special grease .

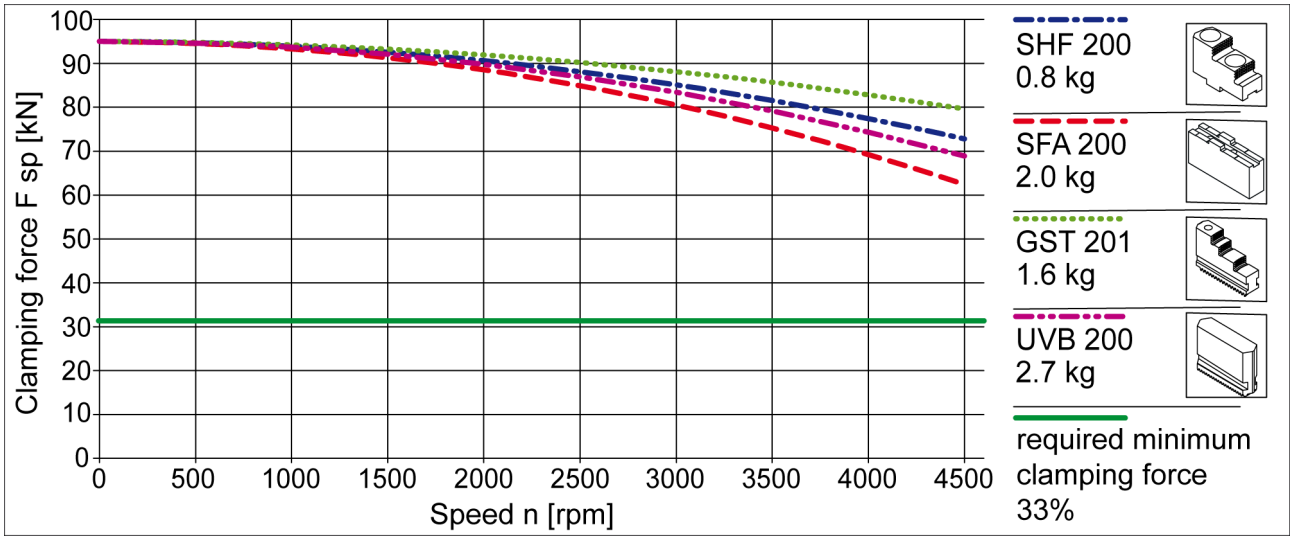
If one or more of these prerequisites is altered, the diagrams will no longer be valid.

Chuck setup for clamping force/RPM diagram

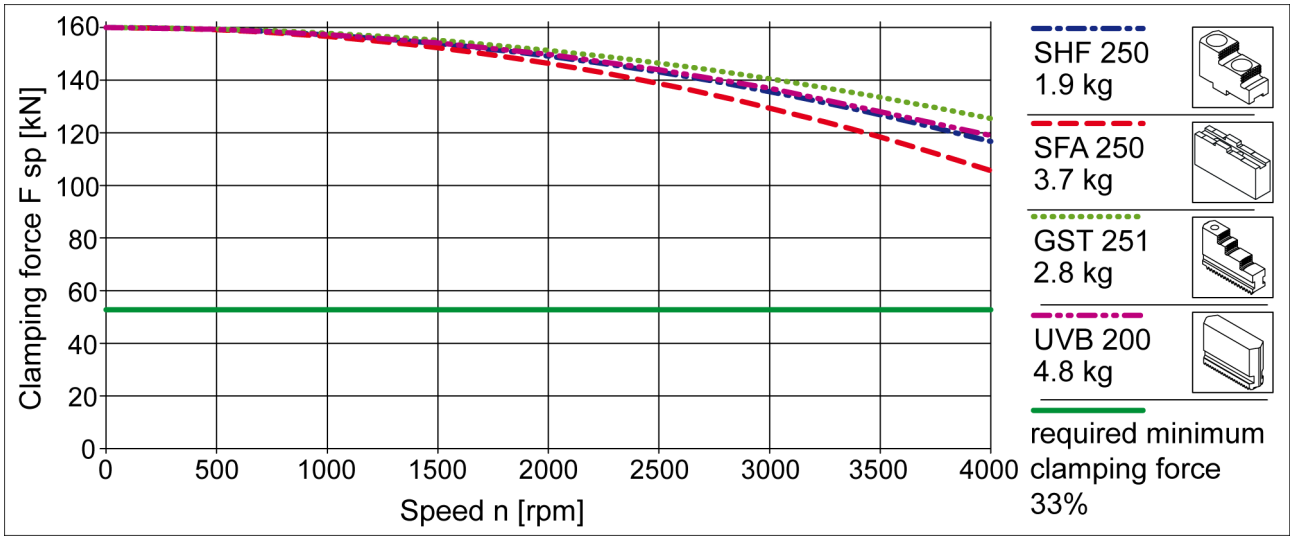


F_{spB}	Clamping force per jaw	S	Center of gravity
r_s	Center of gravity radius	a_{max}	Max. jaw center of gravity eccentricity in axial direction
F_{max}	Max. actuating force		

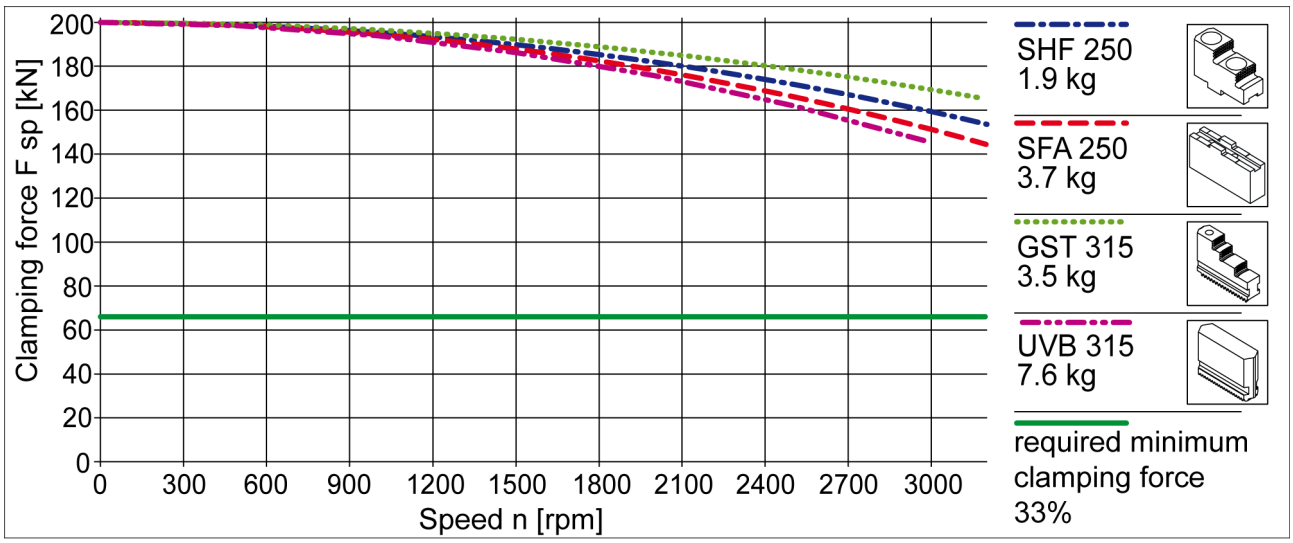
Clamping force-RPM-diagram ROTA-G 200-62



Clamping force-RPM-diagram ROTA-G 250-82



Clamping force-RPM-diagram ROTA-G 315-102



3.3 Calculations for clamping force and speed

Missing information or specifications can be requested from the manufacturer.

Legend			
F_c	Total centrifugal force [N]	M_{cAB}	Centrifugal torque of top jaws [Kgm]
F_{sp}	Effective clamping force [N]	M_{cGB}	Centrifugal torque of base jaws [Kgm]
F_{spmin}	Minimum required clamping force [N]	n	Speed [rpm]
F_{sp0}	Initial clamping force [N]	r_s	Center of gravity radius [m]
F_{spz}	Cutting force [N]	r_{sAB}	Center of gravity radius of top jaw [m]
m_{AB}	Mass of one top jaw [kg]	s_{sp}	Safety factor for clamping force
m_B	Mass of chuck jaw set [kg]	s_z	Safety factor for machining
M_c	Centrifugal force torque [Kgm]	Σ_s	Max. clamping force of chuck [N]

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

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

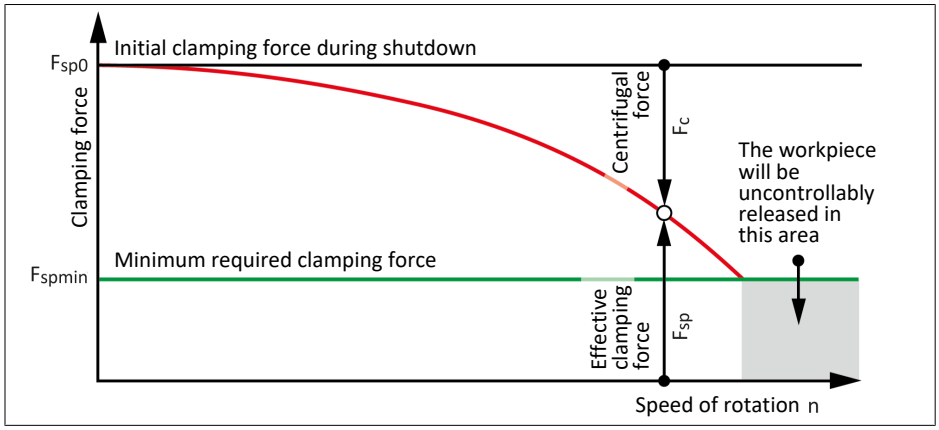
$$F_{sp} = F_{sp0} \mp F_c \text{ [N]}$$

(–) for gripping from the outside inwards
(+) for gripping from the inside outwards

⚠ DANGER

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

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



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

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

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

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

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

(+) for gripping from the outside inwards
(–) for gripping from the inside outwards

CAUTION

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

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

From the above formula it is evident that the sum of the effective clamping force F_{sp} and the total centrifugal force F_c is multiplied by the **safety factor for the clamping force S_{sp}**. According to VDI 3106, the following also applies here: **$S_{sp} \geq 1.5$.**
The **total centrifugal force F_c** is dependent on both the sum of the masses of all jaws and on the center of gravity radius and the rpm.

CAUTION

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

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

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

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

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

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

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

The centrifugal torque of the base jaws M_{cGB} can be found in the table "Lathe chuck data"▶ 3.1 [🗋 17]. The centrifugal torque of the top jaws M_{cAB} is calculated as per:

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

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

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

The following data is known for the machining job:

- Gripping from the outside in (application-specific)
- Machining force F_{spz} = 3000 N (application-specific)
- max. RPM n_{max} = 3200 RPM ("Lathe chuck data" table)
- RPM n = 1200 RPM (application-specific)
- Mass of one (!) top jaw m_{AB} = 5.33 kg (application-specific)

- Center of gravity radius of top jaw r_{sAB} = 0.107 m (application-specific)
- Safety factor S_z = 1.5 (according to VDI 3106)
- Safety factor S_{sp} = 1.5 (according to VDI 3106)

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

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

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

Initial clamping force during shutdown:

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

Calculation of total centrifugal force:

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

For two-part chuck jaws, the following applies:
$M_c = M_{cGB} + M_{cAB}$

Take the centrifugal torque of the base jaw and top jaw specified from the "Lathe chuck data" table:
$\mathbf{M_{cGB} = 0.319\ kgm}$

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

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

Centrifugal torque for one jaw:

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

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

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

The total centrifugal force can now be calculated:

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

Initial clamping force during shutdown that was sought:

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

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

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

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

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

CAUTION

For safety reasons, the calculated permissible RPM may not exceed the maximum RPM inscribed on the lathe chuck!

Example of calculation: Permissible RPM for a given effective clamping force

The following data is known from previous calculations:

- Initial clamping force during shutdown F_{sp0} = 17723 N
- Machining force for machining job F_{spz} 3000 N (application-specific)
- Total centrifugal torque of all jaws ΣM_c = 2,668 kgm
- Safety factor S_z = 1.5 (according to VDI 3106)
- Safety factor S_{sp} = 1.5 (according to VDI 3106)

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

Identifying the permissible RPM:

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

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

This calculated RPM may be used.

3.4 Grades of Accuracy

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

3.5 Permissible imbalance DIN ISO 21940-11

The ROTA-G in ungreased state without chuck 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 chuck 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 Assembly

4.1 Torques per screw

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

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

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

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

4.2 Pre-assembly measures

4.2.1 Handling before mounting

1. Actuate the chuck before assembly on the lathe.
2. Turn the spindle (Item 10) to the left by means of the clamping key (Item 16) until it stops.
3. Push the cartridge (Item 14) under the first jaw (Item 4). Now the base jaw is moveable.
4. After tearing out the jaw, push it into the chuck again until the lock bolt (plunger pin, Item 15) snaps in.
5. Proceed the same way with all 3 base jaws.

NOTE

The numbered jaws have to be pushed into the correspondingly numbered guidance (jaw 1 into guidance 1 etc.).

6. Finally turn the spindel several times to the right and to the left until it bottoms out.

4.2.2 Preparing the chuck attachment

1. First check the spindle head of the lathe on T.I.R. and face stop as well as on "pushing".
2. Alternately use the dial indicator at the front side and the rear side.
3. Remove possible damages on the mounting face of the spindle head. In case of a flange spindle, please check the locating face with a straight edge.
4. Check the machined flange on T.I.R. and face play. Alternately use the dial indicator at the front side and the rear side. Do not mount the chuck before!

NOTE

For fastening with an intermediate flange please note that the flange needs full contact with the chuck body. The flange must be supported by the whole face.

ROTA-G chucks are supplied with various short taper mountings. For bajonett mounting Type C (J), for Camlock fastening Type S (D) and with intermediate flanges for short taper shape A1 and A2 (☞ ROTA-G catalogue).

4.3 Mounting of the Manual Chuck

Thoroughly clean the centering and the bearing surfaces of both parts and lubrify them with oil before placing the chuck onto the spindle head. When the chuck is slightly pressed, there should be a noticeable play and between the faces there should be a gap of max. 0.02 mm (feeler gauge).

⚠ WARNING

Never set down the chuck on the cartridge (Item 14), e.g. when cleaning or during maintenance! The cartridge could otherwise be damaged!

⚠ WARNING

Chucks with straight recess, where the cover (item 2) is used: When the cover (item 2) is mounted, carefully tighten the screws (item 27) of the smaller bolt circle (bolt circle acc. to DIN). The tightening torque should not exceed 50 Nm▸ 4.1 [🗋 24].

5 Function

The item numbers specified for the corresponding individual components relate to the chapter Drawings, ▸ 10 [🗋 37].

5.1 Handling and change of jaws

1. Turn the spindle (Item 10) to the left by means of the Allan key (Item 16) and bottom it out. Stop. appr. 4 – 5 turns before the safety indicating pin (item 12) contacts the stop, it comes out of the chuck body (gold-coloured pin).

NOTE

If the safety indicating pin is visible, less than 75 % of the wedge bar serration (Item 5 and 6) engage the base jaws. In this position do not clamp the chuck nor start it. The base jaws do not engage the wedge bar deep enough.

2. After the spindle (Item 10) has contacted the stop, press the cartridge (Item 14) below the base jaw. The corresponding jaw (Item 4) moves and can be now adjusted or exchanged.

NOTE

If the cartridge is jammed or stiff (Item 14), it must be removed and cleaned ▸ 6.1 [🗋 30]. Lubricate the cleaned cartridge, do not grease with chuck grease! Never loosen the cartridge by using force (e.g. hammer blows etc.), as this may damage the plunger pin (Item 15) which could, in turn, impair the safety mechanism.
CAUTION: Do not dismantle the cartridge!

3. **The numbered jaws have to be inserted into the numbered guidances of the chuck body (Jaw No. 1 into guidance 1 etc.).**
4. Adjust the exchanged jaws until the required clamping diameter is achieved. The jaw securing device (Pos 15) has to snap in.

NOTE

In order to assure that all the teeth of the wedge bar are engaged (Item 5 and 6): Move the base jaws into the guidances until they reach the marked line on the chuck body (compare illustration 2). An additional jaw locking device avoids that the spindle can be turned to the right if the base jaws are not mounted! Never turn the spindle with force to the right! First move the jaws into the guidance – now it is unlocked. Then the wedge bar may be moved into its operating position. (Turn the spindle to the right!)

The jaws hardly move

If jaws move hardly and are not correctly snaped on, slightly off-set one jaw (possibly by slightly knocking) and carefully turn the Allan key at the same time to the right until it contacts the serration. Turn the spindle back again and if necessary, off-set the other hardly moveable jaws as well.

NOTE

If there is a noticeable resistance (the jaws are not correctly engaged) do not turn with force! Off-set the base jaw slightly until it grips.

Basically, the base jaws suit for both directions in the chuck. Therefore, they can be reversed.

When the spindle is turned to the right, shortly before it contacts the stop, the safety indicating pin will go out of the chuck (gold-coloured pin).

NOTE

If the safety indicating pin hangs over, the serration of the wedge bar (Item 5 and 6) grips less than 75% of the base jaws. In this case do not clamp the chuck and do not start it. The base jaw serration does not have enough overlap over the wedge bar serration.

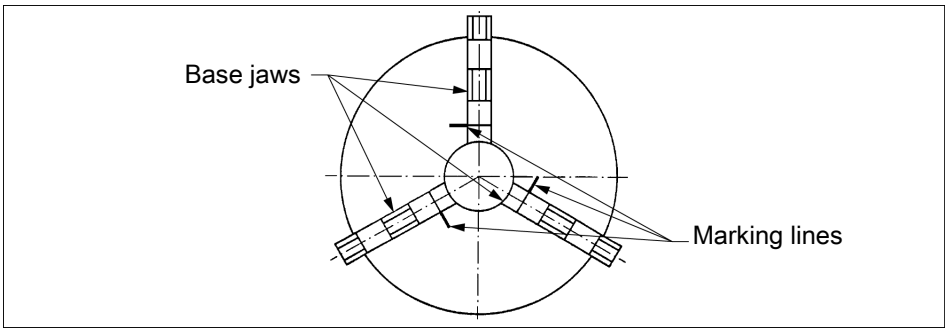
5.2 Important Notes

If it is worked with very short opening stroke or major series, grease can be pressed out between the loaded surfaces of the chuck gear.In this case, the efficiency drops!

After a number of clamping cycles, actuate the chuck several times without a workpiece gripped at full stroke, so that the grease will distribute evenly on the sliding faces inside the chuck. The chuck will achieve its full clamping force again.

- Never remove the base jaws without actuating the cartridge (Item 14).
- Always retighten the clamped chuck after a longer stop (of more than appr. 8 hours) in order to compensate the loosening of the spindle and the therefrom resulting loss of clamping force.
- When clamping the chuck with an Allen key, never use an extension rod or a hammer! Always clamp with a flange-mounted chuck!
- Never mount the chuck at the edge of the chuck body!

- Never clamp the base jaws outside the marked lines▸ 6.1 [🗋 30]!
- Never move hardly moving jaws with force (e.g. with a hammer)! Clean the guidances and the jaws.
- In order to achieve a good true-running, hard top jaws (Type SHF) or one-pieced hard jaws (Type GST) which were not supplied together with the chuck, have to be ground on the chuck.
- In order to achieve best clamping results, never separate the top jaws from the base jaws! Loss of accuracy! Use another set of jaws!
- When changing from a cylindrical mounting to a short taper flange, the cover (Item 2) of the centering cover has to be removed.



5.3 Control of the chuck

The Manual Chuck ROTA-G can be only inspected in flanged position. The round and planar surfaces in the rear area of the chuck body area must run true. The jaws must be as easy-to-move after mounting as they were before mounting, ▸ 6.1 [🗋 30].

If the jaws are more difficult to move than before attachment, the chuck body has been incorrectly attached. The chuck may have become twisted.

5.4 Control of true-running

(For delivery of a ROTA-G with hard jaws GST/SHF grounded on the chuck)

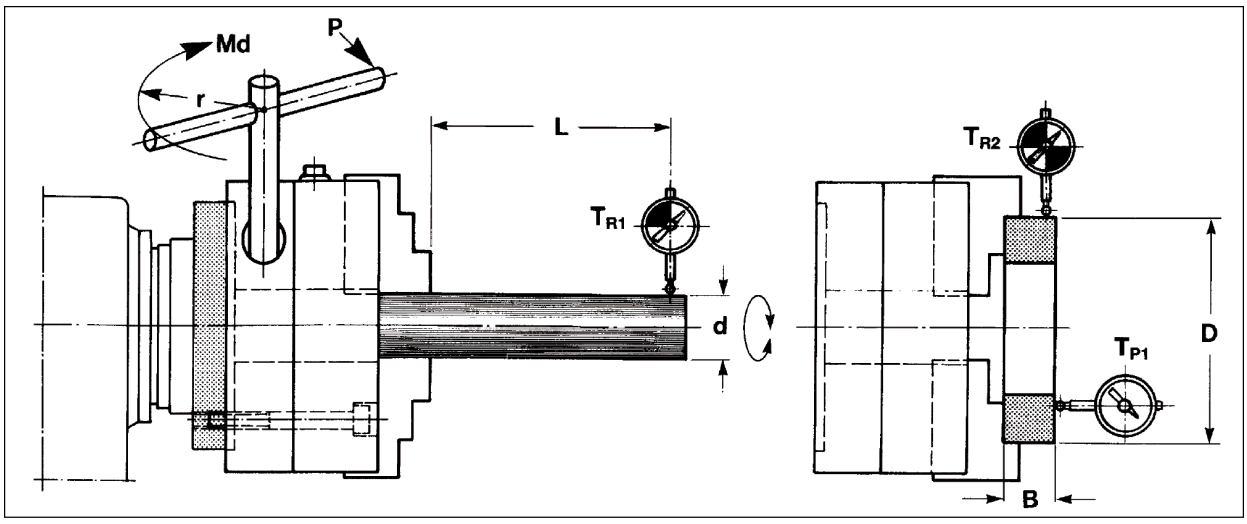
For control of true-running and face play hardened and ground inspection arbors or inspection disks are clamped (see illustration "Control of true-running"). The torque (Md) at the key during tensioning of the inspection arbors and inspection disks corresponds to ca. 67% to the max. chuck operating torque. You can read off the values, diameters of the inspection arbors as well as the positon of the measuring table according to the jaws, on the below chart.

If the admissible T.I.R or face play error (compare chart below) are exceeded, check the following points:

- the tightening torque of the key (Md)
- the correct mounting of the chuck
- does the inspection arbor- and inspection disk diameter deviate from the factory settings.

Chart of the max. admiss. T.I.R.and face play error at the ROTA-G Chuck with GST- or SHF-jaws

Chuck size	160-46	200-62	250-82	315-102	400-122	500-162	630-252
Jaw type	GST-140/160	GST-200	GST-250	GST-315	GST-400	GST-500	-
	SHF-160	SHF-200	SHF-250	SHF-250	SHF-315	SHF-400	SHF-630
Md [Nm]	40	70	80	90	100	100	100
L [mm]	60	80	80	120	120	160	160
d (STF) [mm]	Ø 34	Ø 41	Ø 50	Ø 89	Ø 100	Ø 134	Ø 134
d (SHF) [mm]	Ø 34	Ø 41	Ø 41	Ø 41	Ø 55	Ø 119	Ø 120
T_{R1} max [mm]	0.03	0.03	0.03	0.04	0.04	0.05	0.05
D (STF) [mm]	Ø 129	Ø 160	Ø 212	Ø 278	Ø 250	Ø 440	--
D (SHF) [mm]	Ø 140	Ø 140	Ø 210	Ø 210	Ø 243	Ø 243	Ø 243
B [mm]	20	25	25	25	35	35	50
T_{P1} max [mm]	0.02	0.02	0.03	0.03	0.03	0.03	0.03



Control of true-running

6 Maintenance

The high load capacity with secure workpiece clamping can only be guaranteed with regular lubrication with a high-performance lubricant.

It is therefore recommended that the chuck is cleaned regularly and greased with SCHUNK LINOMAX plus special grease.

⚠ CAUTION

Allergic reactions if lubricating grease comes into contact with the skin.

- Wear protective gloves.

Depending on the application, the chuck must be dismounted and cleaned at regular intervals.

6.1 Disassembly and assembly of the Chuck

Disassembly

In order to exchange components or for cleaning, the chuck has to be disassembled.

- First step will be to disassemble the manual chuck from the lathe.

Therefore consider the following:

- For Camlock mounting (DIN 55029) and bajonett mounting (DIN 55027):
  loosen all screws (Item 21 and 27) and remove the chuck.
- For direct mounting as per DIN 55026:
  loosen the screws of the bolt circle (Item 27) and remove them.(ROTA-G: 160-A5, 200-A6, 250-A8, 315-A11, 400-A11, 500-A11, 630-A15).
- With intermediate flange as per DIN 55026:
  Loosen the screws of the first bolt circle (Item 21) and remove the chuck (ROTA-G: 160-A4, 200-A4, 200-A5, 250-A5, 250-A6, 315-A6, 316-A8, 400-A8, 500-A8, 500A15, 630-A11).

⚠ WARNING

Risk of injury from the Power Chuck falling during transport, attaching and removing.

When transporting and assembly and disassembly the Power Chuck, take appropriate safety precautions to avoid dropping it.

1. Remove the clamping jaws (Item 4) from the manual power chuck▸ 4.2 [🗋 24].

2. In case of intermediate flange mounting (DIN 55026) loosen the screws (Item 27) and remove the cover (Item 2).
   For ROTA-G 500 and 630 additionally disassemble the screws (Item 22).
3. In case of bajonett- (DIN 55027) or Camlock-mounting (DIN 55029) loosen the screws (Item 21 and 27) and disassemble the flange.
4. Put the chuck onto the face. Take the thrust ring (item 3), the sliding stone (item 7) and the wedge bar without thread (Item 6) out of the chuck.
5. Then remove the safety indicating pin with pressure spring (Item 12) and the springs from the bore of the plunger pin.Additional for ROTA-G 315 to 630:
   unscrew the set screw (item 41) and remove the spring (Item 42) and 2nd plunger pin (Item 43).
6. Turn the spindle (Item 10) to the right with the key (Item 16) until the wedge bar with the thread (Item 5) has reached the stop of the chuck body (for chuck sizes 160 to 315) or the stop of the pressure ring (Item 13, for chuck sizes 400 to 630).
7. Screw in a cylinder screw M 3 (length appr.20 mm) into the cyl. pin for removing the cylinder pin as per DIN 7979 (Item 19) of ROTA-G 160.
   From size ROTA-G 200 on, a cyl. screw M 4 (Length appr.20 mm) has to be screwed into the cyl. pin.
8. Tear out the cyl. pin (Item 19) by means of flat pliers.
9. Then loosen the adjustment screw with bearing shell (Item 11) with a suitable key and remove it from the chuck.
10. Move the spindle (Item 10) and the srewed in wedge bar (Item 5) in direction of the adjustment screw bore of the chuck body (Item 1) and take out the chuck body.
11. Screw the wedge bar (Item 5) out of the spindle (Item 10) and take out the pressure ring (Item 13).
12. Remove the outside safety rings of the plunger pins (Item 15) with pliers for retaining rings (do not expand the safety rings too far).
13. Then turn the chuck body (Item 1) onto its rear side and tear out the plunger pins. Remove the cartridges (Item 14) from the chuck body.

NOTE

The cartridge (Item 14) is a safety unit and never should be disassembled!

Never loosen jammed or stiff cartridges (Item 14) by using force! Remove cartridges as described, then lubricate the cleaned cartridges (do not grease with chuck grease!) and reinstall afterwards.

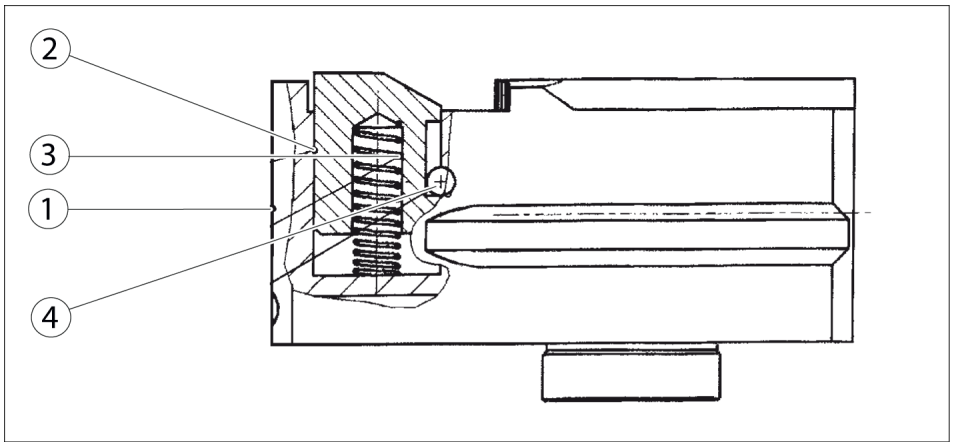
Disassembly of wedge bar without thread (Item 6):

1. Remove cyl. pin (④).
2. The pressure spring (③) as well as the pins (②) may be removed from the wedge bar (①).

Thoroughly clean the components with degreasing agent and check all components on wear and damage.

Damaged components have to be replaced by original SCHUNK spare parts!

Before mounting, grease well with lubricant LINOMAX plus.



Wedge bar with jaw locking device

Assembly

The assembly of the chuck is done in the reverse order. Please consider the following points:

NOTE

If you want to use the adjustment screw with the bearing shell again, please consider that the adjustment screw must be turned in until the taper pin hole of the chuck body and the adjustment screw are aligned.

f the adjustment screw with the bearing shell are not used, please return the chuck for repair to SCHUNK.

- Carefully assemble the cylinder pin (Item 19).

⚠ WARNING

Do not forget to assemble any components! Even small components assure safe turning!

When mounting the spindle (item 8) care that the spindle nut (item 9) must not be tightened!

1. Assemble all cartridges.
2. Assemble the plunger pin together with the safety rings again and insert the springs of the plunger pin.
3. Before inserting the thrust ring (Item 3), assemble the safety indicating pin (Item 12) with pressure spring in the chuck body (Item 1).

6.2 Jaw change

Clean and lubricate jaws if there is no film of grease.

6.3 At least once a month

1. Grease the spindle (Item 10) with a grease gun via the lubrication nipples in the adjustment screw (Item 11), or via the spindle at the square side (for size ROTA-G 200).
2. Lubrify the force transmission at the wedge bar (Item 5 and 6), the thrust ring (Item 3), the pressing ring (Item 13) and the thread of the spindle (Item 10) with grease (LINOMAX plus).

6.4 In the case of decreasing clamping force or after approx. 200 operating hours

If the clamping force decreases, the inside of the chuck is contaminated or the coolant has washed out or decomposed the grease.

In this case disassemble the chuck, carefully clean all parts with degreasing agent and check for wear and damage.

Replace damaged parts with original SCHUNK spare parts only!

Before installation, lubricate all individual components with SCHUNK LINOMAX plus special grease.

This cleaning procedure should be performed about every 200 operating hours, depending on the extent of stress on the chuck.

6.5 Maintenance and lubrication plan

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

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

* Depending on which event occurs earlier.

7 Storage

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

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

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

8 Disposal

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

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

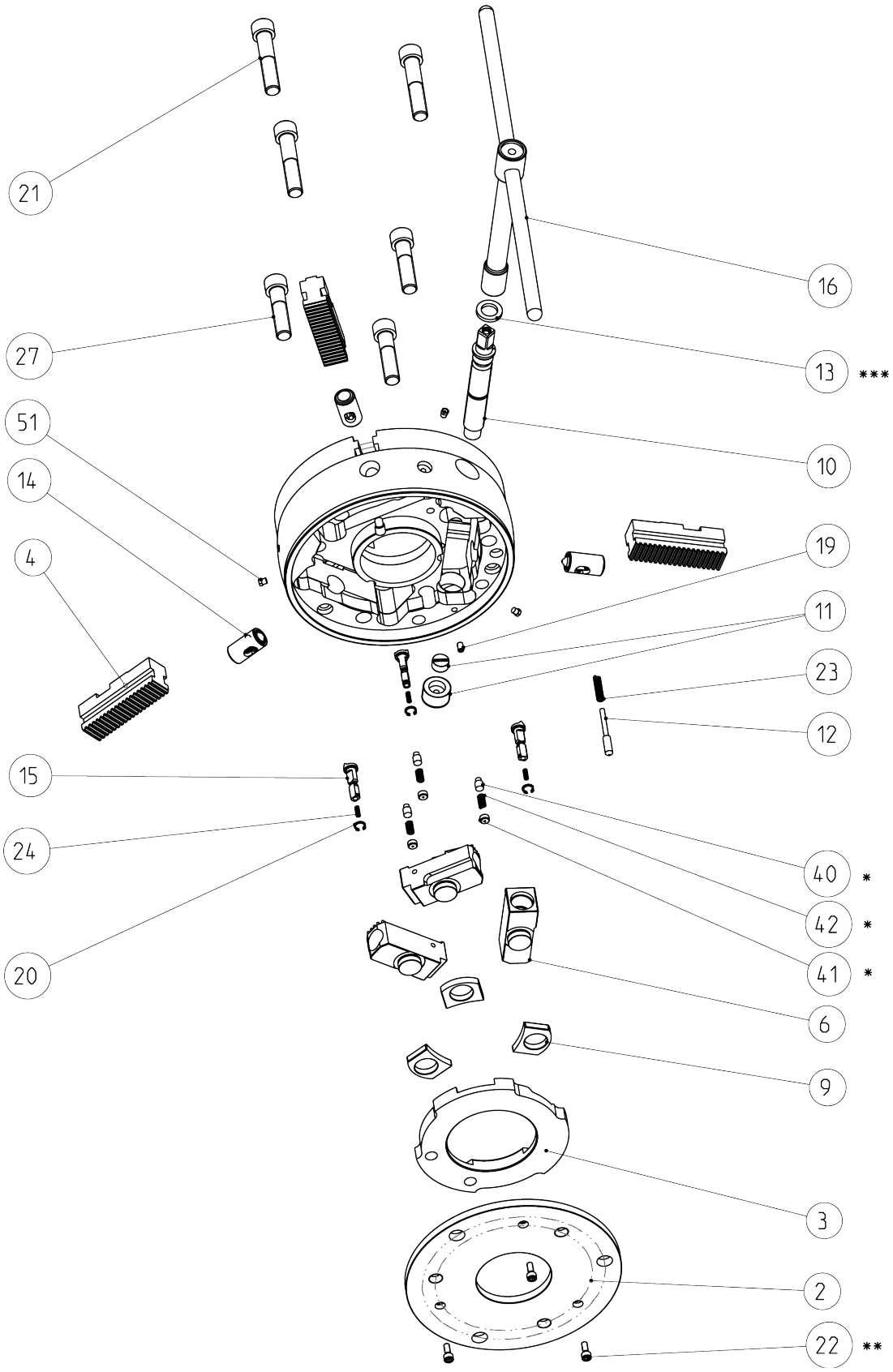
Alternatively, you can return the chuck to SCHUNK for proper disposal.

9 Spare parts

In case of an order for spare parts, please indicate the Type, size and the most important, the manufacturing number of the chuck to avoid failed deliveries. Basically all seals, sealing elements, screw connections, springs, bearings, screws and wipers as well as workpiece touching parts are not part of the warranty.

Item	Designation	Quantity	Note
1	Chuck body	1	
2	Cover	1	
3	Thrust ring	1	
4	Base jaw with screws or GST	3	
5	Wedge bar with thread	1	
6	Wedge bar without thread	2	
9	Sliding block	3	
10	Spindle	1	
11	Adjusting screw with bearing bracket	1	
12	Indicating pin	1	
13	Pressure ring	1	500 – 630
14	Cartridge	3	
15	Plunger pin	3	
16	Clamping key	1	
19	Cylindrical pin	1	
20	Circlip	3	
21	Screw	3	
22	Screw	3	400 – 630
23	Pressure spring	1	
24	Pressure spring	3	
27	Screw	3	
40	Plunger pin 2	3	315 – 630
41	Set-screw	3	315 – 630
42	Pressure spring	3	315 – 630
51	Lubricating nipple	3	

10 Assembly drawing



* ROTA-G 315 – 630

** ROTA-G 400 – 630

*** ROTA-G 500 – 630

11 Manufacturer certificate

Manufacturer / Distributor:	H.-D. SCHUNK GmbH & Co. Spanntechnik KG Lothringer Str. 23 D-88512 Mengen
Product:	Lathe chuck
Designation:	ROTA
Type designation:	M-flex 2+2, S-flex, SPK, ROTA-G, ROTA-S, Vario-M

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

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

Harmonized Standards applied:

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

Other related technical Standards and specifications:

- **ISO 702-1:2010-04** Machine tools – Connecting dimensions of spindle noses and lathe chucks – Part 1: front short-taper mount with screws
- **ISO 702-2:2010-04** Machine tools – Connecting dimensions of spindle noses and lathe chucks – Part 2: front short-taper mount with camlock mounting
- **ISO 702-3:2010-04** Machine tools – Connecting dimensions of spindle noses and lathe chucks – Part 3: front short-taper mount with bayonet mounting
- **ISO 702-4:2010-04** Machine tools – Connecting dimensions of spindle noses and lathe chucks – Part 4: cylindrical mount
- **VDI 3106:2004-04** Determination of permissible RPM of lathe chucks (jaw chucks)

Mengen, 25th of April 2023

Signature: see original declaration

p.p. Philipp Schräder
Head of Development standard products

Signature: see original declaration

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

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