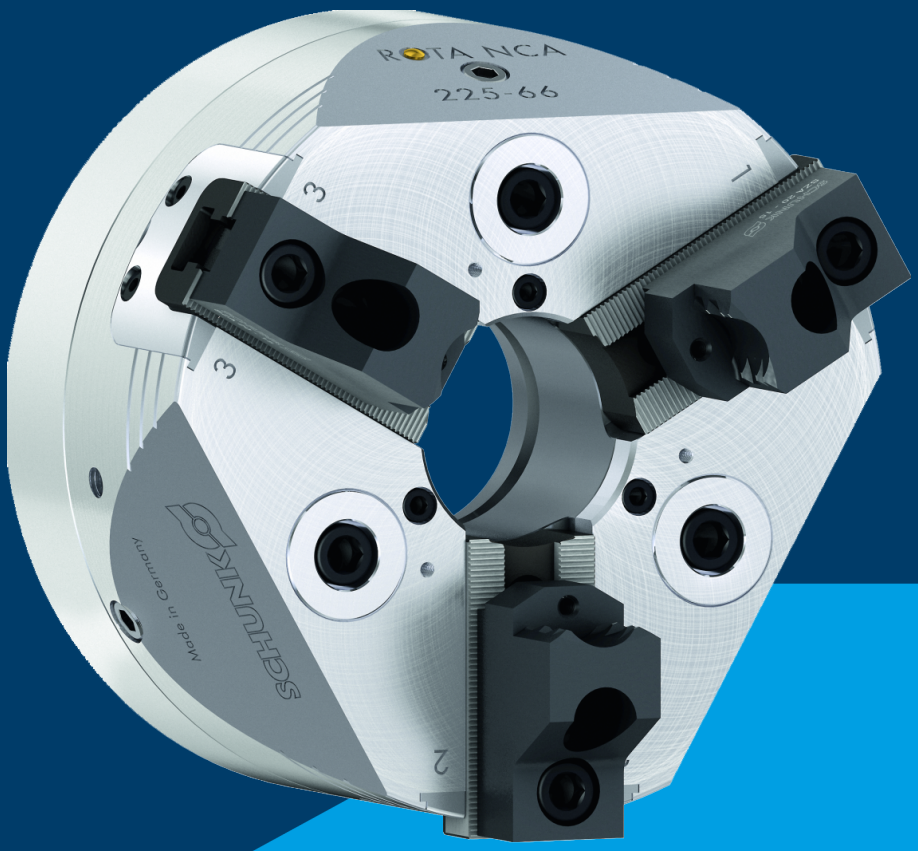

Power Lathe Chuck
ROTA NCA
Assembly and Operating Manual

Translation of Original Operating Manual

Hand in hand for tomorrow

Imprint

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

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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
Tel. +49-7572-7614-1300
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cmm@de.schunk.com

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

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1 General

1.1 About this manual

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

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

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

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

NOTE: The illustrations in this manual are intended to provide a basic understanding and may deviate from the actual version.

1.1.1 Presentation of Warning Labels

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

⚠ DANGER

Dangers for persons!

Non-observance will inevitably cause irreversible injury or death.

⚠ WARNING

Dangers for persons!

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

⚠ CAUTION

Dangers for persons!

Non-observance can cause minor injuries.

CAUTION

Material damage!

Information about avoiding material damage.

1.1.2 Applicable documents

- General terms of business *
- Catalog data sheet of the purchased product *
- Calculation of the jaw centrifugal forces, "Technology" chapter in the lathe chuck catalog *

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

1.1.3 Sizes

This operating manual applies to the following sizes:

- ROTA NCA 160-32
- ROTA NCA 200-52
- ROTA NCA 225-66
- ROTA NCA 280-86
- ROTA NCA 330-104

1.2 Warranty

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

- Observe the applicable documents, ▸ 1.1.2 [🗋 6]
- Observe the ambient conditions and operating conditions, ▸ 2.6 [🗋 9]
- Observe the specified maintenance and lubrication intervals, ▸ 7 [🗋 36]

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

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

1.3 Scope of Delivery

1	Power lathe chuck in the version ordered
3	Mounting screws
6	T-nuts with screws or 3 combination T-nuts
1	Assembly key from size 280
1	Eye bolt

2 Basic safety notes

2.1 Intended use

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

- The product may only be used within the scope of its technical data, ▸ 3 [🗋 17].
- The product is intended for industrial and industry-oriented use.
- Appropriate use of the product includes compliance with all instructions in this manual.
- The maximum RPM of the chuck and the required clamping force must be determined by the user for the respective clamping task based on the applicable standards and technical specifications of the manufacturer.
  (See also "Calculations for clamping force and RPM" in the chapter "Technical data"). ▸ 3 [🗋 17]

2.2 Not intended use

A not intended use of the product is for example:

- It is used as a press, a punch, a toolholder, a load-handling device or as lifting equipment.
- the product is used for unintended machines or workpieces.
- the technical data is exceeded when using the product. ▸ 3 [🗋 17]
- if workpieces are not clamped properly, paying particular attention to the clamping forces specified by the manufacturer.
- if it is used in working environments that are not permissible.
- if the product is operated without a protective cover.

2.3 Constructional changes

Implementation of structural changes

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

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

2.4 Spare parts

Use of unauthorized spare parts

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

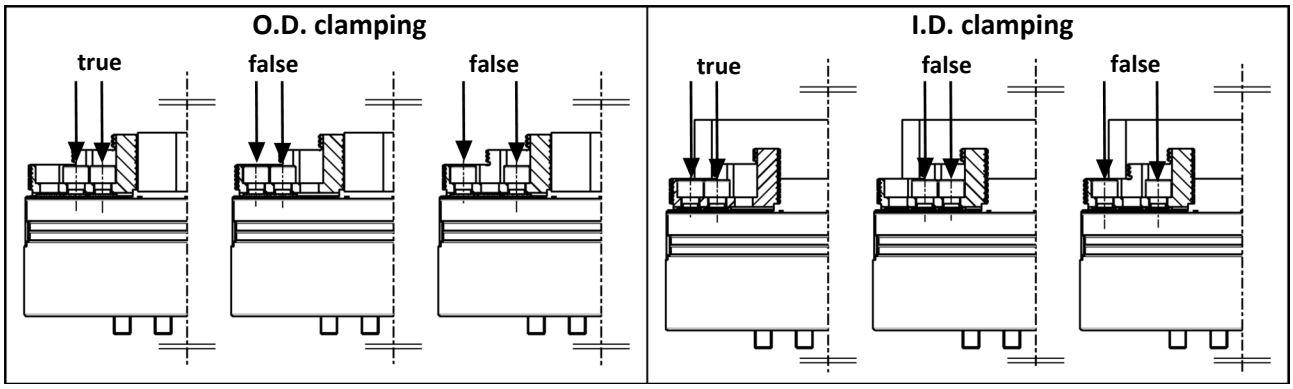
- Use only original spare parts or spares authorized by SCHUNK.

2.5 Chuck jaws

Requirements of the chuck jaws

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

- Only change chuck jaws if no residual energy can be released.
- Do not use welded jaws.
- The chuck jaws should be designed to be as light and as low as possible. The clamping point must be as close as possible to the chuck face (clamping points at a greater distance lead to greater surface pressure in the jaw guidance and can significantly reduce the clamping force).
- If for constructional reasons the special chuck jaws are heavier than the top jaws assigned to the lathe chuck, greater centrifugal forces must be accounted for when defining the required clamping force and the recommended speed.
- The maximum recommended speed may only be operated in conjunction with maximum actuating force and only with the lathe chuck in 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. Damaged parts must be replaced with original SCHUNK spare parts.
- Renew the chuck jaw mounting screws if there are signs of wear or damage. Only use screws with a quality of 12.9.
- Screw the jaw mounting screws into the bore holes furthest apart.



2.6 Environmental and operating conditions

Required ambient conditions and operating conditions

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

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

Clamping force measurement

Depending on the operating conditions, the function and clamping force must be checked after a certain period of operation ▸ 7.2 [🗋 37].

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

If the clamping force has dropped too much or if the base jaws and piston no longer move properly, the chuck must be disassembled, cleaned, and relubricated ▸ 7 [🗋 36].

2.7 Personnel qualification

Inadequate qualifications of the personnel

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

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

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

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

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

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

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

2.8 Personal protective equipment

Use of personal protective equipment

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

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

2.9 Notes on safe operation

Incorrect handling of the personnel

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

- Avoid any manner of working that may interfere with the function and operational safety of the product.
- Use the product as intended.
- Observe the safety notes and assembly instructions.

- Do not expose the product to any corrosive media. This does not apply to products that are designed for special environments.
- Eliminate any malfunction immediately.
- Observe the care and maintenance instructions.
- Observe the current safety, accident prevention and environmental protection regulations regarding the product's application field.

2.10 Transport

Handling during transport

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

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

2.11 Malfunctions

Behavior in case of malfunctions

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

2.12 Disposal

Handling of disposal

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

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

2.13 Fundamental dangers

General

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

2.13.1 Protection during handling and assembly

Incorrect handling and assembly

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

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

Incorrect lifting of loads

Falling loads may cause serious injuries and even death.

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

2.13.2 Protection during commissioning and operation

Falling or violently ejected components

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

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

2.13.3 Protection against dangerous movements

Unexpected movements

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

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

2.13.4 Notes on particular risks

⚠ DANGER

Risk of fatal injury from suspended loads!

Falling loads can cause serious injuries and even death.

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

⚠ DANGER

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

In the event of a power failure, the lathe chuck's clamping force may fail immediately and the workpiece may be released in an uncontrolled manner. This poses a risk of death or injury to the operating personnel and can result in serious damage to the automated system.

- The machine manufacturer and the operator of the machine must carry out and document a hazard assessment and risk analysis to ensure that suitable measures are taken to maintain the lathe chuck's clamping force until the machine comes to a standstill and the workpiece can be secured (e.g. using a crane or suitable lifting equipment).
- The machines and equipment must fulfill the minimum requirements of the EC Machinery Directive; specifically, they must have effective technical measures to protect against potential mechanical hazards.

⚠ DANGER

Possible risk of fatal injury to operating personnel if a jaw breaks or if the lathe chuck fails because the technical data have been exceeded and a workpiece is released or parts fly off

- The technical data specified by the manufacturer for using the lathe chuck must never be exceeded.
- The lathe chuck may only be used on machines and facilities that fulfill the minimum requirements of the EC Machinery Directive; specifically, they must have effective technical measures to protect against possible mechanical hazards.

⚠ DANGER

Possible risk of fatal injury to operating personnel from clothing or hair being caught on the lathe chuck and being dragged into the machine

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

- The machines and equipment must fulfill the minimum requirements of the EC Machinery Directive; specifically, they must have effective technical measures to protect against potential mechanical hazards.
- Always wear tight-fitting clothing and a hairnet when working on the machine and the lathe chuck.

⚠ CAUTION

Danger of slipping and falling in case of dirty environment where the chuck is used (e.g. by cooling lubricants or oil).

- Ensure that the working environment is clean before starting assembly and installation work.
- Wear suitable safety shoes.
- Follow the safety and accident-prevention regulations when operating the chuck, especially when working with machine tools and other technical equipment.

⚠ CAUTION

Danger of limbs being crushed by opening and closing of the chuck jaws during manual loading and unloading or when replacing moving parts.

- Do not reach between the jaws.
- Wear safety gloves.
- Observe the safety and accident prevention regulations during operation of the chuck, especially in connection with machining centers and other technical equipment.

⚠ CAUTION

Risk of burns due to workpieces with high temperatures.

- Wear protective gloves when removing the workpieces.
- Automatic loading is preferred.

⚠ CAUTION

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

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

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

⚠ CAUTION

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

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

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

3 Technical data

3.1 Chuck data

ROTA NCA	160	200	225	280	330
Max. actuating force [kN] *	20	32	45	63	72
Max. clamping force [kN]	45	72	100	140	160
Max. speed [rpm]	5500	5000	5000	4000	3500
Stroke per jaw [mm]	4	5.3	5.3	5.3	5.3
Piston stroke [mm]	15	20	20	20	20
Chuck through bore [mm]	32	52	66	86	104
Weight [kg]	11.5	19.6	29	42	62.8
Centrifugal torque of base jaw [kgm] M_{cGB}	0.039	0.089	0.153	0.348	0.478
Operating temperature	+ 15°C to + 60°C				

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

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

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

Ensure minimal weight for all jaws.
For unhardened top jaws or chuck jaws in special design, the permissible RPM according to VDI 3106 must be determined by means of calculation for the respective machining job. In this, however, the recommended maximum speed must not be exceeded. The calculated values must be checked by dynamic measurement. Function monitoring (piston movement and actuating pressure) must be performed in accordance with the guidelines of the Berufsgenossenschaft (employers' mutual insurance association).

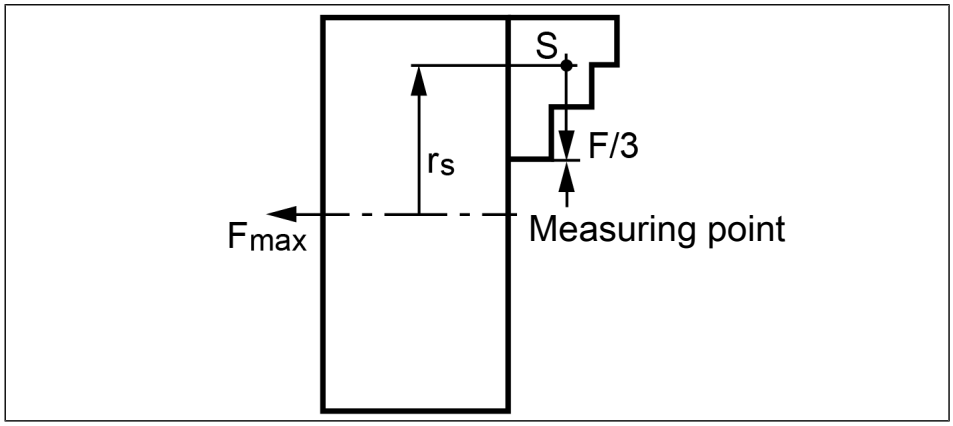
3.2 Clamping force-RPM diagrams

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

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

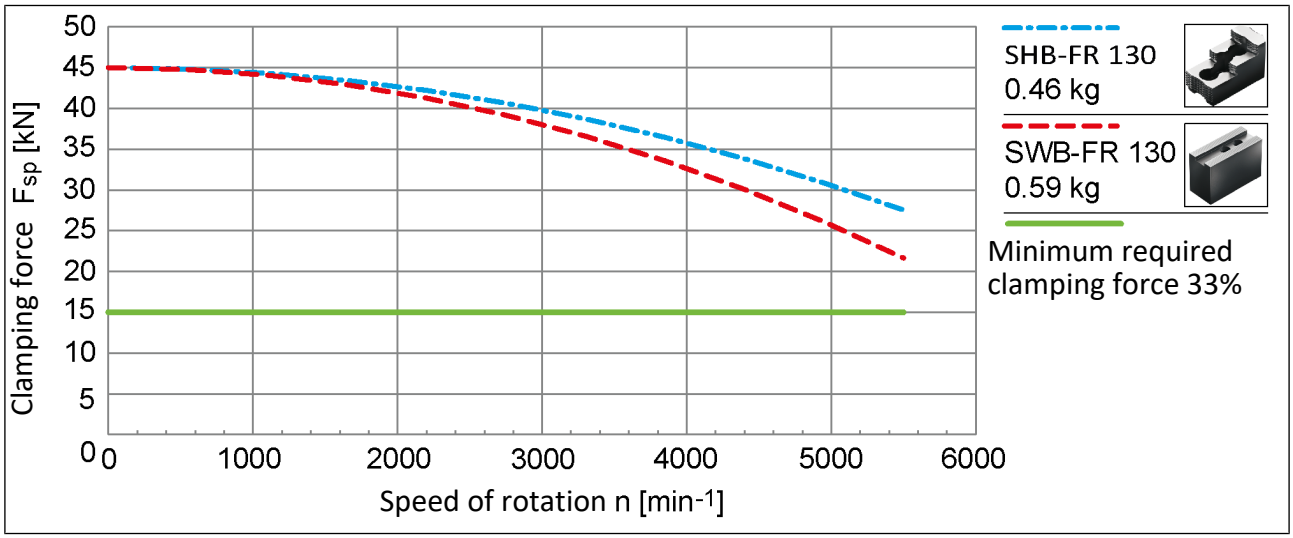
If one or more of these prerequisites is modified, the graphs will no longer be valid.

Chuck setup for clamping force/RPM graph

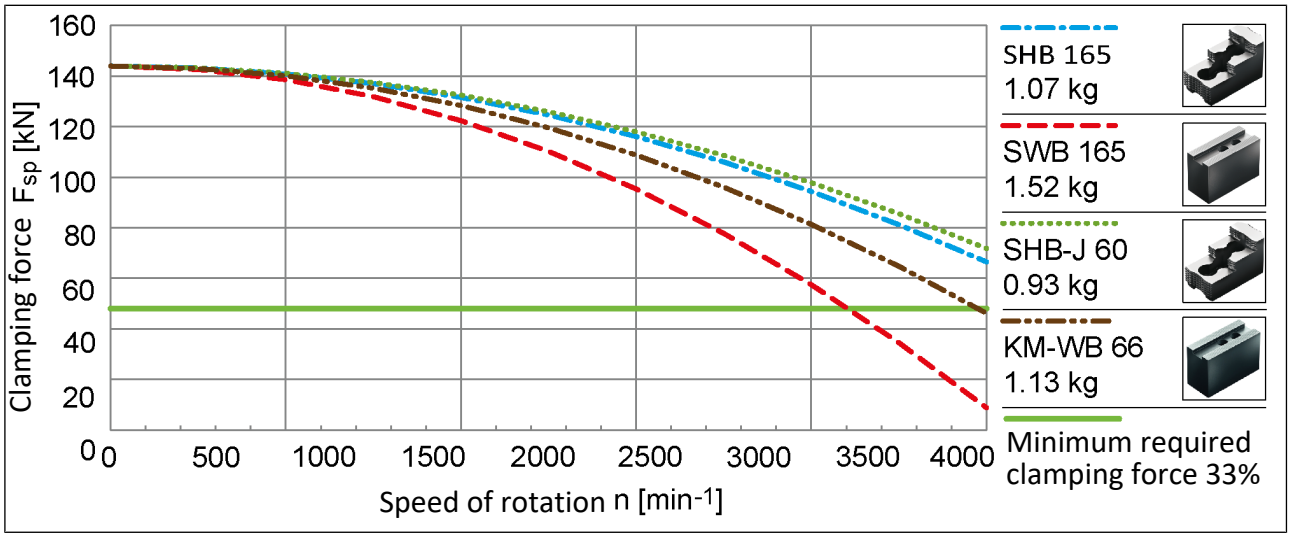


F/3	Clamping force per jaw	F_{max}	Max. actuating force
r_s	Radius of centre	S	center of gravity

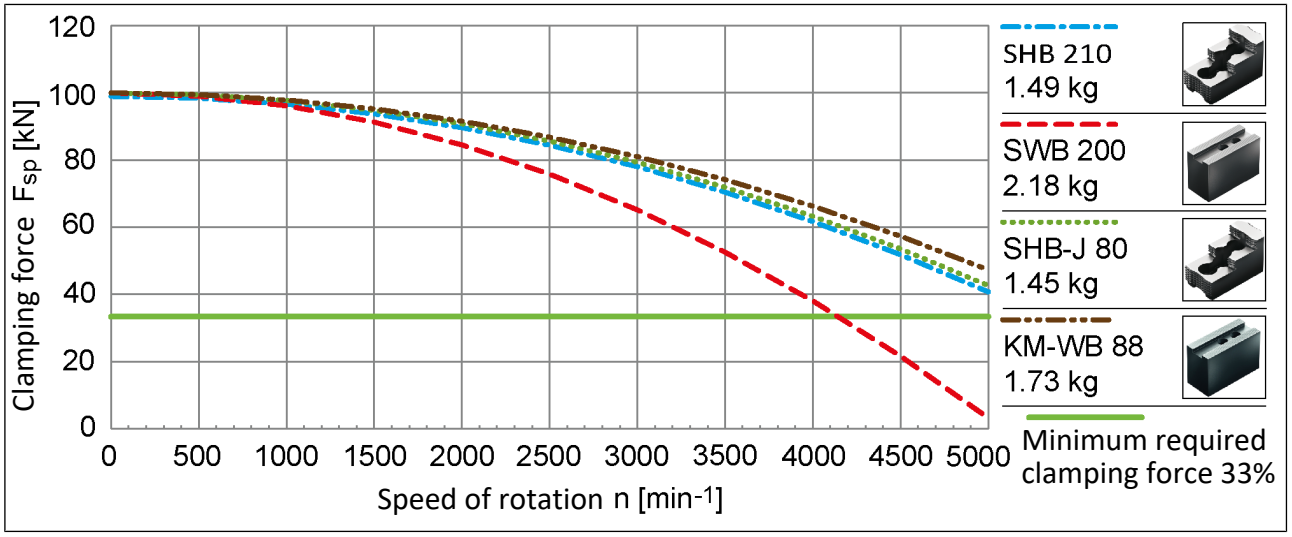
Clamping force/RPM graph for ROTA NCA 160-32



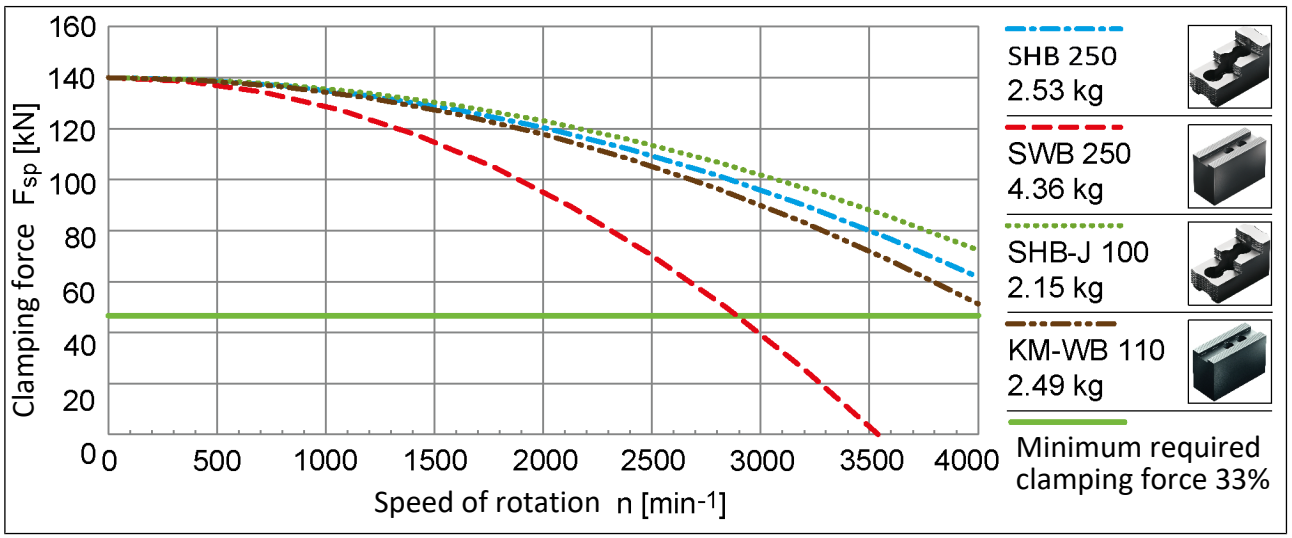
Clamping force/RPM graph for ROTA NCA 200-52



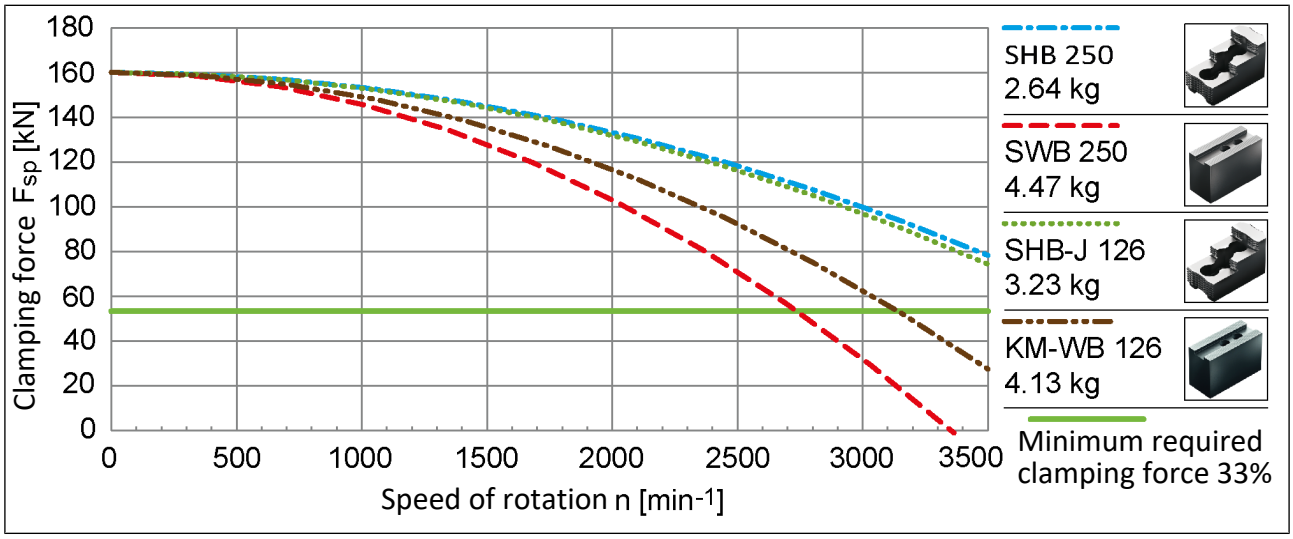
Clamping force/RPM graph for ROTA NCA 225-66



Clamping force/RPM graph for ROTA NCA 280-89



Clamping force/RPM graph for ROTA NCA 330-104



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}**.

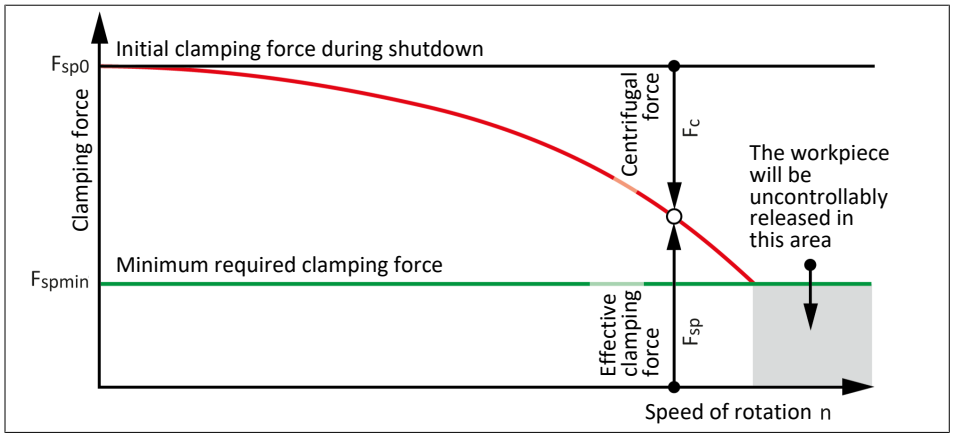
$$F_{sp} = F_{sp0} \mp F_c \text{ [N]}$$

(–) 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: **$S_z \geq 1.5$.**

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

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 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:

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

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

The ROTA NCA in ungreased state without T-nuts and top jaws corresponds to the balancing quality class 6.3 (according to DIN ISO 1940-1). Residual imbalance risks may arise due to insufficient rotation compensation being achieved (see DIN EN 1550 6.2 e). This applies particularly to high RPM, asymmetrical workpieces or the use of various top jaws, as well as uneven lubrication. In order to prevent damage resulting from these residual risks, the entire rotor must be dynamically balanced in accordance with DIN ISO 21940-11.

4 Torques per screw

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

Screw size	M6	M8	M10	M12	M14	M16	M18	M20	M22	M24	M27	M30
			7/16"	1/2"		5/8"		3/4"	7/8"	1"		
Tightening torques M_A (Nm)	13	28	50	88	120	160	200	290	400	500	1050	1500

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

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

Tightening torques for the protection sleeve mounting screws (screw quality 8.8)

Screw size	M4	M5	M6	M8
Tightening torques M_A (Nm)	3.2	7.5	13	28

5 Assembly

5.1 Installing and connecting

⚠ WARNING

Risk of injury due to unexpected movements!

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

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

⚠ CAUTION

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

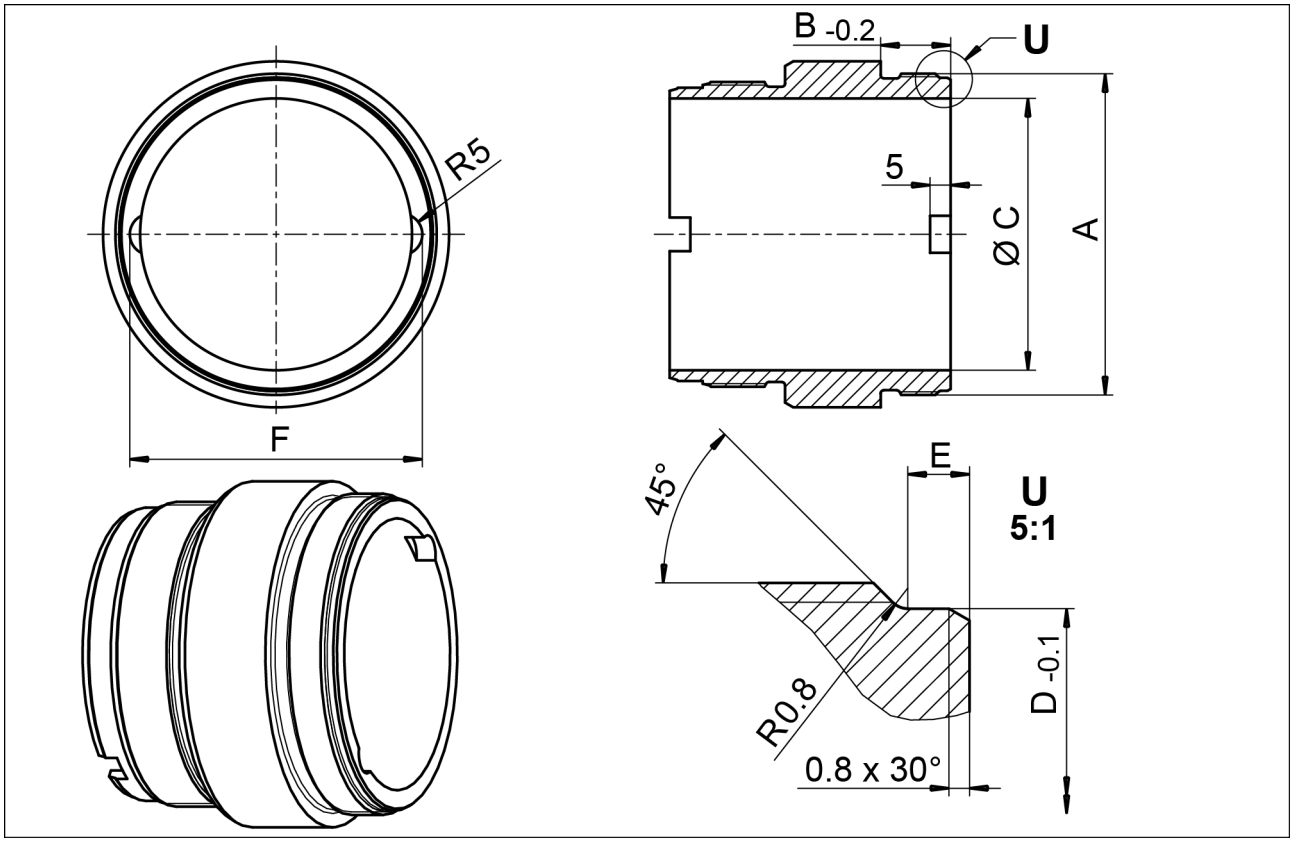
- Wear personal protective equipment, particularly protective gloves.

1. Checking the spindle nose for mounting the chuck flange ▸ 5.3 [🗋 29]
2. Chuck assembly
   - ⇨ Chuck assembly (with cylindrical recess) ▸ 5.4.1 [🗋 30]
     If required:
   - ⇨ Assembly preparation for chuck with reduction or extension flange ▸ 5.4.2 [🗋 32] or
   - ⇨ Assembly preparation for chuck with direct mount ▸ 5.4.3 [🗋 32]
3. Performing a functional check ▸ 6.2 [🗋 33]

5.2 Connection thread draw tube

The chuck and draw tube are connected via a thread. The following requirements must be met on the draw tube side. If they cannot be attached directly to the draw tube, an adapter must be used.

	A	B	C	D	E	F	O-ring
ROTA NCA 160-32	M38 x 1.5	15	32	36	2.4	28	38 x 1.5
ROTA NCA 200-53	M67 x 1.5	15	52	65	2.4	58	66 x 2
ROTA NCA 225-66	M74 x 1.5	14.5	66	72	2.4	70	72 x 2
ROTA NCA 280-86	M94 x 1.5	20	86	91	2.4	89	93 x 2
ROTA NCA 330-104	M115 x 2	22.5	104	110	3.2	107	110 x 3



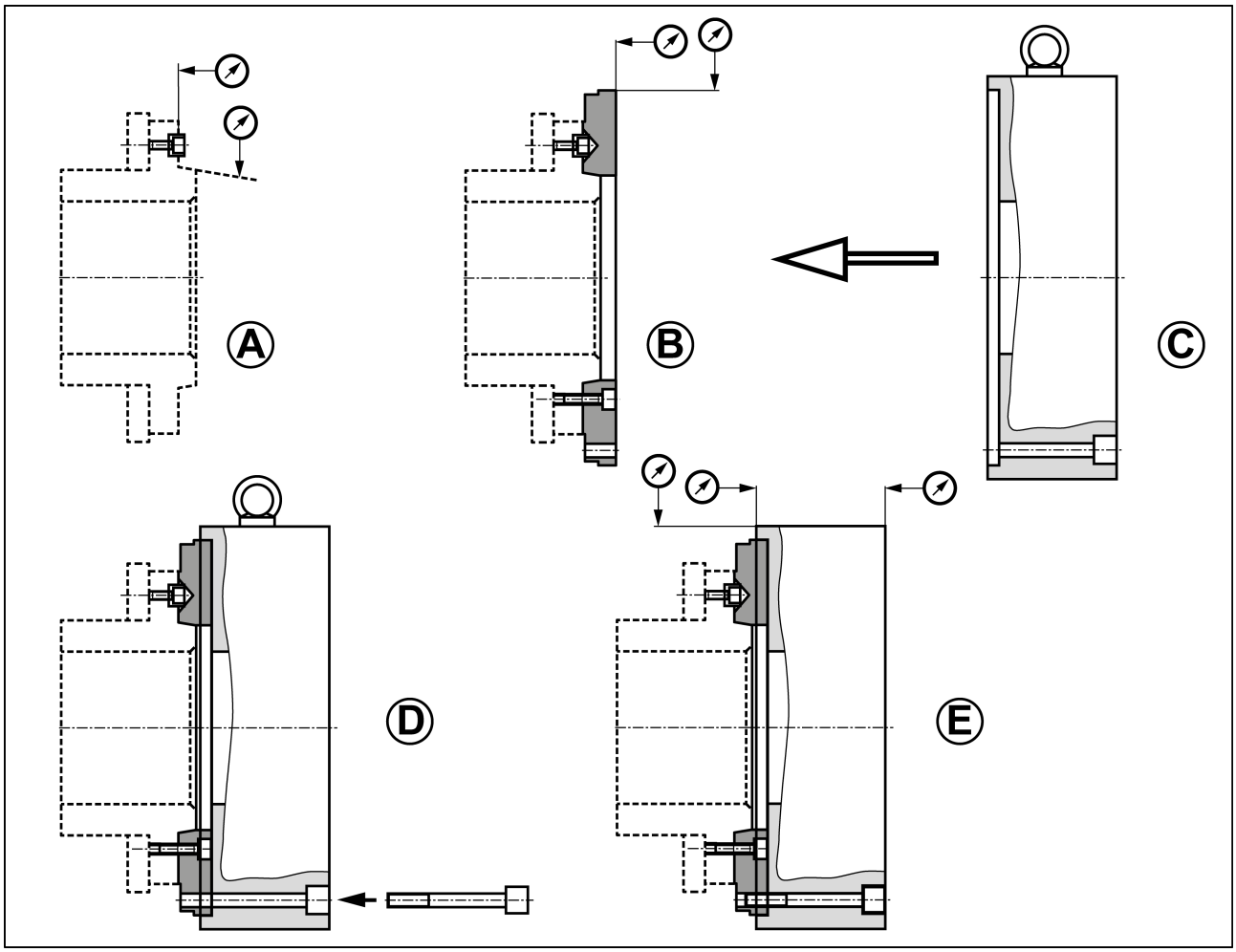
5.3 Checking the chuck mount

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

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

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

5.4 Assembly



Lathe chuck assembly

- Chuck assembly (with cylindrical recess) ▸ 5.4.1 [🗋 30]
  - ⇨ Assembly preparation for chuck with reduction or extension flange ▸ 5.4.2 [🗋 32]
  - ⇨ Assembly preparation for chuck with direct mount ▸ 5.4.3 [🗋 32]

5.4.1 Chuck assembly (with cylindrical recess)

NOTE

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

If the mount of the machine spindle deviates from the mount of the lathe chuck, a connecting flange must be affixed before the chuck is assembled. (See ▸ 5.4.2 [🗋 32] or ▸ 5.4.3 [🗋 32].)

CAUTION

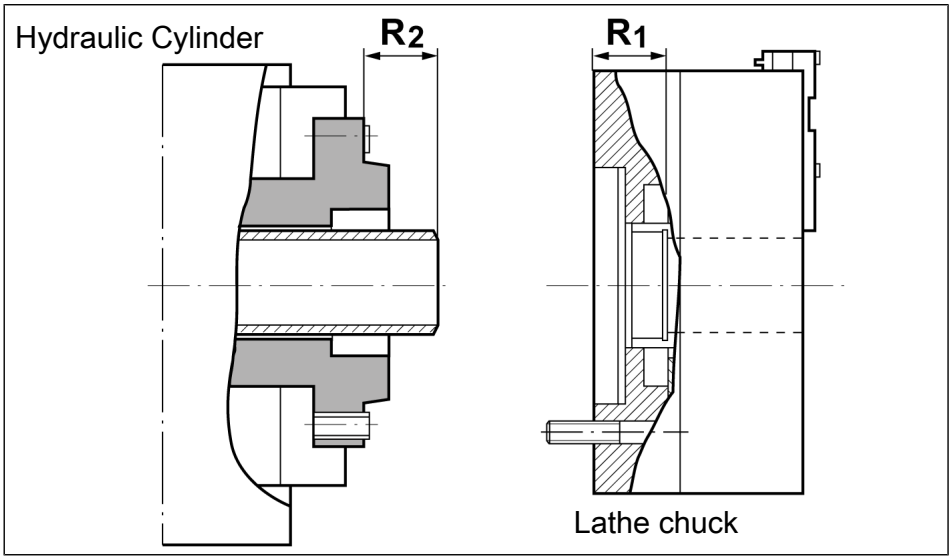
Use a crane to install the chuck. The chuck can be fastened to the eye bolt provided (see Fig. "Lathe chuck assembly" – C ▸ 5.4 [🗋 29]).

The eye bolt must be removed prior to starting up.

The eye bolt is included in the scope of delivery.

Chuck assembly

1. Remove the cylindrical screws (item 27) for the top jaws together with the T-nuts (item 26).
2. Move the draw tube to the frontmost position.
   Piston in foremost position R1 = press chuck piston in foremost position
   and measure with depth gauge R2 = R1 – 0.1 mm (max. – 0.3 mm)
   It must be ensured that the piston can be brought into the foremost (jaw change) position. To do this, ensure that the dimensions for the attachment are complied with.



3. Push the chuck piston (item 3) to the frontmost position (chuck open).
4. Lift the lathe chuck flush to the center of the spindle.

5. Screw the rotating center sleeve (item 6) in the chuck onto the draw tube using the enclosed assembly key as far as this will go. Chuck without rotatable center sleeve must be bolted onto the draw tube/pull rod.
6. Insert and slightly tighten the mounting screws (item 10).
7. Check the chuck for concentricity and axial run-out accuracy *(see Fig. "Lathe chuck assembly" - E* ▶ 5.4 [🗋 29]) and, if necessary, align at the outer diameter with gentle taps using a hammer.
8. Tighten the fastening screws (item 10) with a torque wrench. The breakaway torques▶ 4 [🗋 26]
9. Check the chuck again for concentricity and axial run-out accuracy (see Fig. "Lathe chuck assembly" - E ▶ 5.4 [🗋 29]). The "Concentricity and axial run-out tolerances" table shows the concentricities and axial run-out accuracies to be achieved.
10. Check the actuating force is functioning and is sufficient.
11. Check the jaw stroke of the base jaws. (Item 2) Fasten the top jaws marked 1, 2 and 3 to the base jaws using T-nuts (item 27) and screws (item 26).

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

Concentricity and axial run-out tolerances

Chuck size [mm]	Max. concentricity error [mm]	Max. axial run-out error [mm]
160	0.01	0.01
200	0.02	
225		
280	0.03	0.02
330		

5.4.2 Assembly preparation for chuck with reduction or extension flange

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

1. Before assembly of the chuck flange, remove any dirt or chips from the machine spindle and from the centering mount and contact surface of the flange.
2. A chuck flange produced by the user must be fully machined on the machine spindle and balanced before assembly of the chuck.
3. After assembly, ensure that the flange is in contact with the entire surface.
4. Check the concentricity and axial run-out accuracy of the flange (see Fig. "Lathe chuck assembly" – B ▸ Link Assembly [🗋 29]).
5. Then the chuck is assembled ▸ 5.4.1 [🗋 30].

5.4.3 Assembly preparation for chuck with direct mount

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

1. Before mounting the chuck flange on the cylindrical recess of the chuck, remove any dirt or chips from the centering mount and contact surface of the flange.
2. Slightly tighten the flange onto the chuck with the supplied mounting screws.
3. Then the chuck is assembled ▸ 5.4.1 [🗋 30].

6 Function

6.1 Function and handling

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

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

⚠ WARNING

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

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

- Refer to the "Technical data" chapter!

6.2 Functional testing

Functional test

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

Two important points are:

- **Clamping Force!** The clamping force of the chuck must be achieved at max. operating force/pressure.
- **Stroke control!** The stroke of the clamping piston must allow a safety zone at the front and rear end position. The machine spindle may only be started when the clamping piston has passed through the safety zone. Only limit switches that meet the requirements for safety limit switches specified in DIN EN 60204-1 may be used.

When determining the necessary clamping force to machine a workpiece, take the centrifugal force acting on the chuck jaws into account (according to VDI 3106).
If the chuck jaws are changed, adjust the stroke control to the new situation.

Speed of rotation

⚠ DANGER

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

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

6.3 Replacement or renewal of jaws

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

CAUTION

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

Tighten the jaw mounting screws (screw grade 12.9) to the specified torque ▸ 4 [🗋 26].

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!

CAUTION

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

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

⚠ WARNING

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

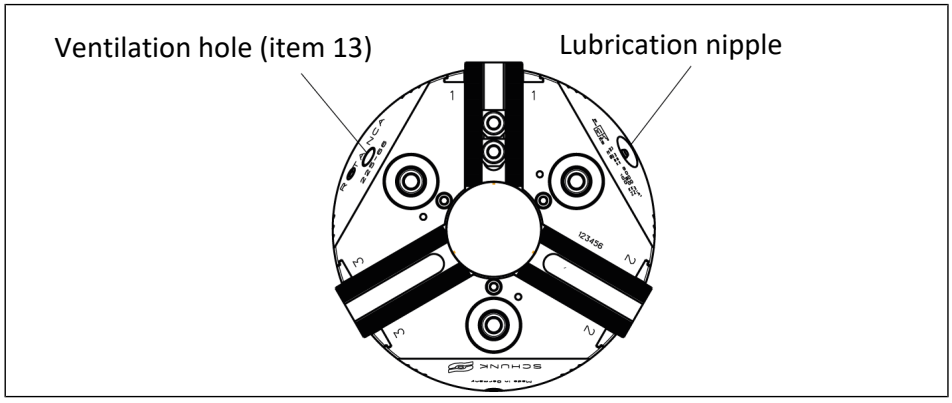
Soft standard top jaws must be hardened in the countersink region.
They should only be depth-hardened, not surface-hardened.

Changing the top jaws

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

7 Maintenance

7.1 Lubrication



Greasing areas

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

The chuck must be lubricated in the open position.

Select the position with the chuck set up horizontally when lubricating so that the lubricating nipple and the ventilation hole are at 60° to the horizontal.

When lubricating a vertical or hanging chuck, the upper ventilation hole must be opened.

When lubricating, press the grease gun until grease is pushed out on the 120° offset upper ventilation hole.

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

⚠ CAUTION

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

- Wear protective gloves.

Operating conditions

Depending on the operating conditions, the function and clamping force must be checked after a specific period of operation (see "Maintenance intervals" ▸ 7.2 [🗋 37]). Only use a calibrated clamping force tester for measuring in the clamping force test (SCHUNK GFT-X).

Technical condition

With the smallest possible actuating pressure (clamping cylinder), the base jaws should move evenly. This method only provides a limited indication and is not a substitute for measuring the clamping force. If the clamping force has dropped too much or if the base jaws and piston no longer move properly, the chuck has to be disassembled, cleaned, and relubricated.

Only use genuine SCHUNK spare parts when replacing damaged parts.

7.2 Maintenance intervals

Lubricating the greasing areas:

Lubrication interval	Demands
every 30 days or after 50,000 clamping cycles	normal / use of coolant
every 10 days or after 15,000 clamping cycles	high / use of coolant
after one year or after 250,000 clamping cycles	Full cleaning with disassembly of chuck depending on type of contamination and quantity

7.3 Disassembling and assembling the chuck

The item numbers specified for the corresponding individual components relate to the chapter Drawings, ▶ 9 [🗋 000].

The chuck can only be disassembled once it has been removed. ▶ 5 [🗋 27]

1. Remove the screws (item 10).
2. Remove screws (item 27), T-nuts (item 26) and top jaws.
3. Unscrew screws (item 11).
4. Mark the position of the mount (item 7) in relation to the chuck body (item 1).
5. Undo the screws (item 14) several thread turns and hammer gently on the screw heads using a rubber mallet. In so doing, the chuck must be in a horizontal position. This allows the mount (item 7) to be released from the centering for the chuck body (item 1). Remove screws (item 14), the pin (item 29) and sealing rings (item 15, 16, 18 and 23).
6. Pull piston (item 3) out of the chuck body (item 1) or lever out with an aluminum arbor using light knocks on the surface of the chuck. Remove sealing ring (item 17).

7. Remove bolts (item 12) and remove center sleeve (item 4) to the rear from the chuck body (item 1). Remove sealing ring (item 19 and 21).
8. Remove the screws (item 28).
9. Slide the base jaws (item 2) over the cover (item 5) to the chuck center. Lift the seal (item 20) out of the groove above the base jaw (item 2) and remove the axial cover (item 5) upwards out of the chuck body (item 1). Remove seal (item 22).
10. Lift seal (item 20) as before over the base jaw (item 2) and remove the base jaw (item 2) outwards out of the chuck body.
11. The sleeves (items 6 and 8) may not be removed.
12. Remove the screws (item 13).

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.

1. When inserting the base jaw (item 2), make sure that the base jaw is not pushed too far inwards. In doing so, the seal (item 20) may become damaged.
2. When introducing the cover (item 5), make sure that the seal (item 22) is not damaged.

The chuck is assembled in the same way, but in reverse order. The following must be considered here!

CAUTION

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

8 Spare parts

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

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

Seal kits

Seal kit	Ident number
ROTA NCA 160	1352529
ROTA NCA 220	1352530
ROTA NCA 225	1352531
ROTA NCA 280	1352532
ROTA NCA 330	1352533

Spare parts

Item	Designation	Quantity	a	b	c	d	e
1	Chuck body	1					
2	Base jaw	3					
3	Piston	1					
4	Protection sleeve	1					
5	Cover	3					
6	Sleeve	3				x	
7	Mount	1					
8	Sleeve	6	x			x	
9	Center sleeve	1		x			
10	Screw	3					
11	Screw	6					
12	Screw	3					
13	Screw	2					x
14	Screw	6					
15	Seal	1					x
16	Seal	1					x
17	Seal	3					x
18	Seal	6					x
19	Seal	1					x
20	Seal	3					x
21	Seal	3					x
22	Seal	3					x

Item	Designation	Quantity	a	b	c	d	e
23	Seal	6	x				x
24	Eye bolt	1					
25	Seal	3			x	x	
26	T-nut	36					
27	Screw	6					
28	Screw	6					
29	Pin	1					
30	Emblem	1					
35	Lubrication nipple	1					

a = not in size 160

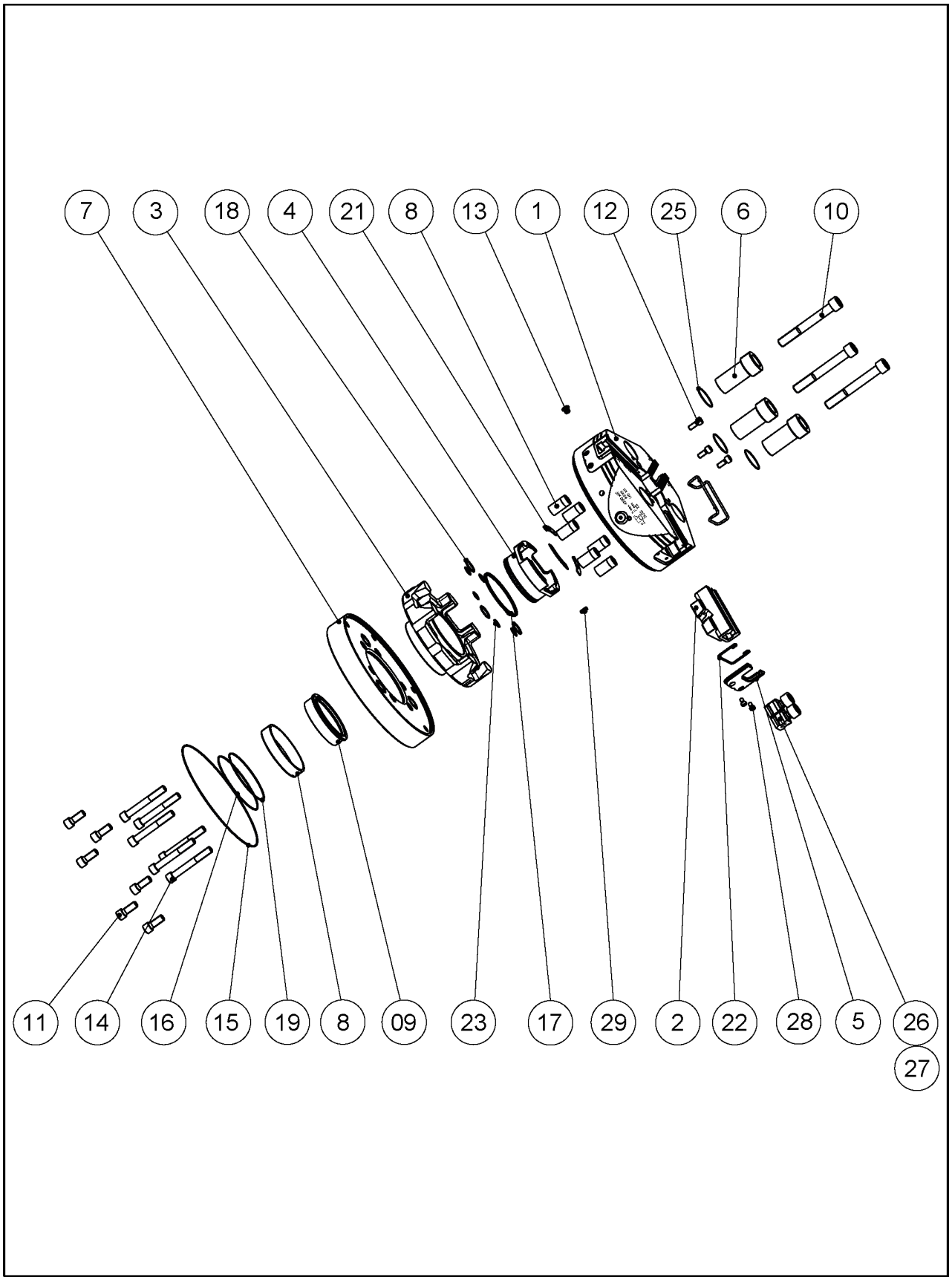
b =only size 280 and 330

c =not in size 33

d= the positions are fixed and cannot be removed

e =included in the sealing kit

9 Drawing



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Manufacturer certificate

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

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

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

Harmonized standards applied:

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

Other related technical standards and specifications:

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

Mengen, 25. Apr. 2023

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