

- 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).

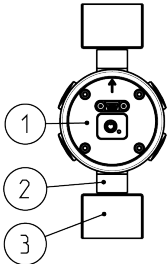
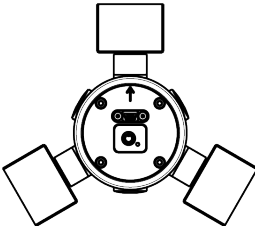
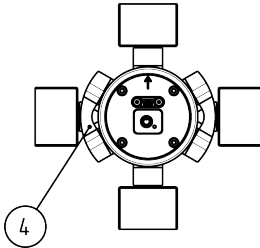
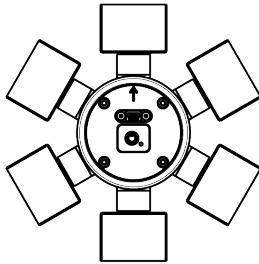
Maintenance instructions

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	Operating manual SCHUNK IFT Clamping force tester
			Attention Compensation must be activated, otherwise it may lead to inconsistent results.	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 as 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)

NOTICE

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

ROTA-S flex (with long base jaws)	550	700	1000	1200	1400
Chuck bore [mm]	52	92	102	162	252
Max. torque [Nm]	120	220	280	320	350
Max. clamping force [kN]	100	180	230	270	270
Max. speed of rotation [rpm]	1000	800	500	500	400
Stroke per jaw [mm]	7	9.7	12	12	15
Mass moment of inertia [kgm ²]	1.6	7.078	25.03	57.89	125.28
Weight with jaws	65	150	360	490	830
Centrifugal force of the long base jaws M_{cGB} [kgm]	0.153	0.5448	1.8	2.66	5.59
Max. jaw eccentricity of center of gravity in axial direction a_{max} [mm]	For the ROTA-S plus chuck, it is necessary to specifically determine this data. Examples of calculation can be found in the "Chuck jaws in special design/ technology" chapter in our current chuck jaw catalog.				

The recommended max. speed is only valid for max. operating force and the use of the suitable hard standard stepped jaws.

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 jaws in special design the permissible speed of the respective cutting task has to be calculated in accordance to VDI 3106, whereby the maximum standard value may not be exceeded. The calculated values have to be examined with a dynamic measurement. Control of function (piston movement and actuation pressure) has to be accomplished in accordance with the guidelines of the professional association.

The recommended speed is valid for ROTA-S flex with long base jaws and SCHUNK stepped block jaws, hard, type STF.

In this the base jaws are inserted flush with outer diameter of the chuck.

Jaw type	SFA 200	SFA 315	SFA 400	SFA 500	SFA 630
Weight / Set [kg]	2.0	5.6	13.5	13.5	40.0

The speed of rotation must be reduced for jaws with a higher weight!

Max. oscillating diameter – with base jaws type SFG

ROTA-S flex	550	700	1000	1200	1400
Oscillating diameter $\emptyset$ [mm]	570	755	1000	1265	1400

The chuck is balanced at Q 6.3 at rated speed.

3.2 Clamping force / speed diagrams

The diagrams relate to a 3-jaw chuck.

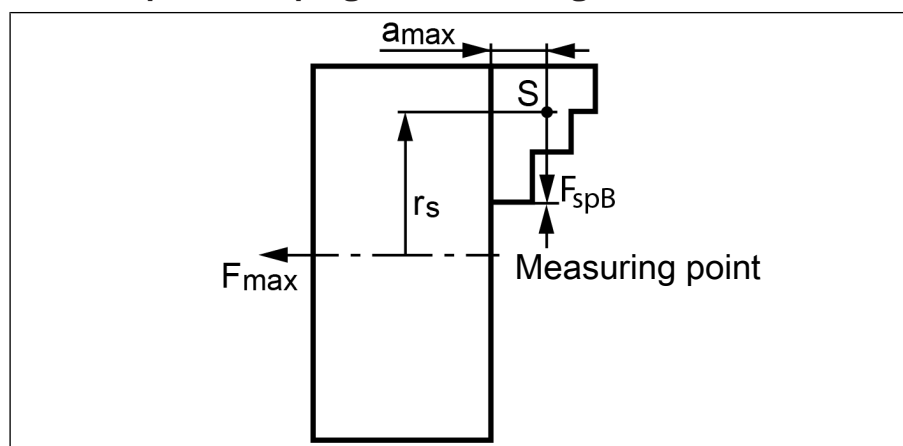
Clamping force/RPM curves have been calculated using long, hard base jaws and hard SHF and SFA standard jaws. During this the maximum actuating force was applied.

The diagrams showing short, hard base jaws and hard SHF and SFA standard jaws can be found in the ROTA-S plus or ROTA-S plus 2.0 operating manuals contained in the scope of delivery.

The chucks were in perfect condition and lubricated with SCHUNK LINOMAX plus special grease.

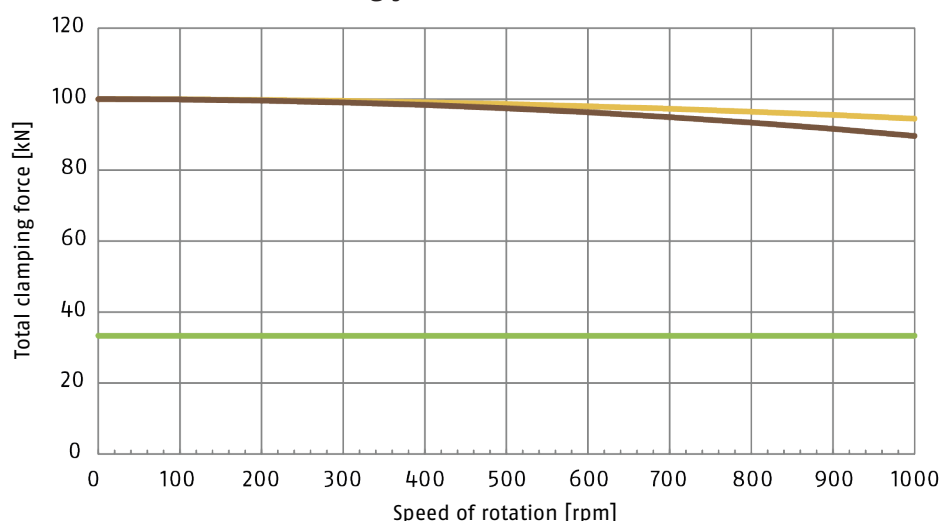
After modification of one or several of these prerequisites the diagram will no longer be valid.

Chuck setup for clamping force/RPM diagram



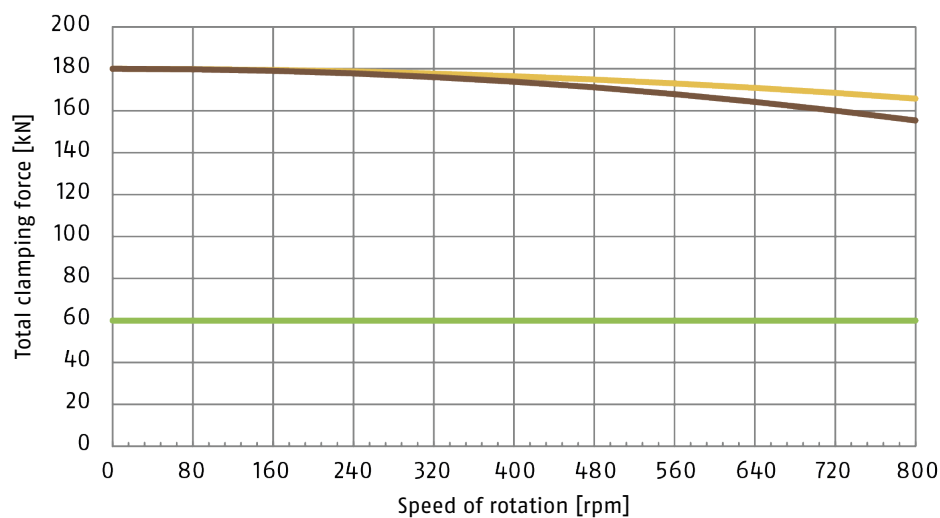
F_{spB}	Jaw clamping force	S	Center of gravity
r_s	Center of gravity radius	a_{max}	Max. jaw center of gravity eccentricity in axial direction
F_{max}	Max. actuating force		

ROTA-S flex 550 (with long jaws)



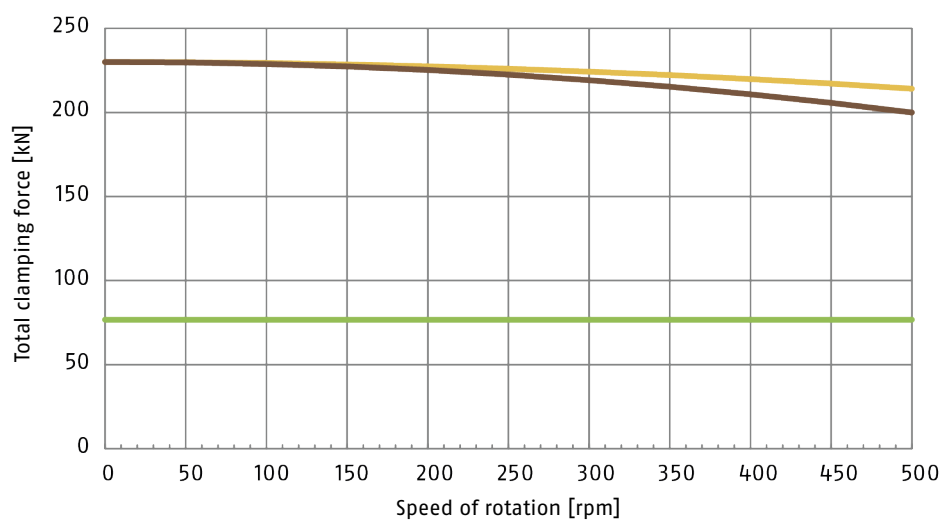
Colour	Jaw ID	Weight [kg]
	SHF 200	2.8
	SFA 200	4.1
	minimum required clamping force 33%	

ROTA-S flex 700 (with long jaws)



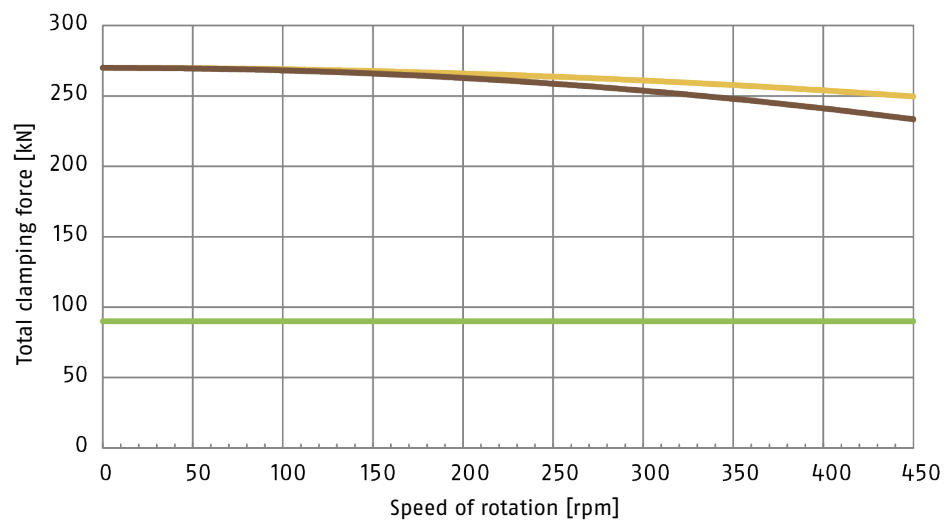
Colour	Jaw ID	Weight [kg]
	 SHF 315	11.9
	 SFA 315	18.5
	minimum required clamping force 33%	

ROTA-S flex 1000 (with long jaws)



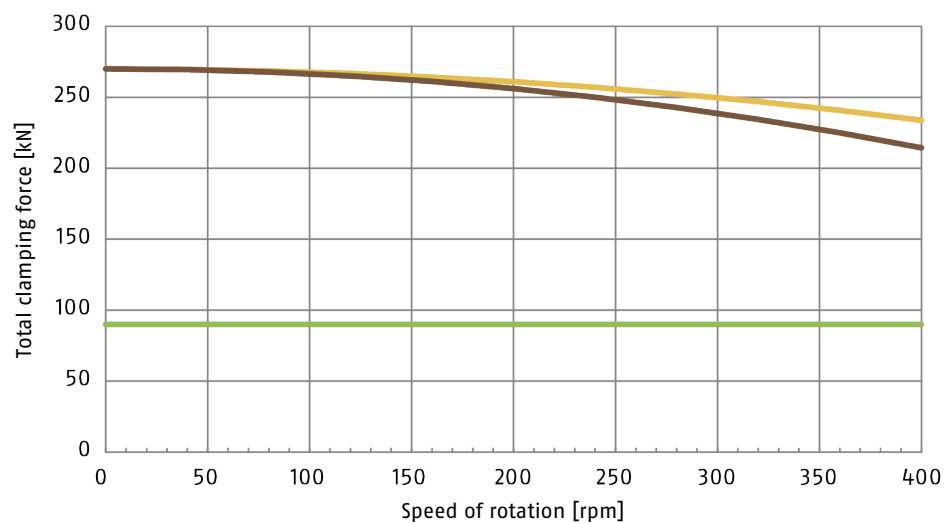
Colour	Jaw ID	Weight [kg]
	 SHF 400	11.0
	 SFA 400	20.0
	minimum required clamping force 33%	

ROTA-S flex 1200 (with long jaws)



Colour	Jaw ID	Weight [kg]
	 SHF 400	11.0
	 SFA 400	20.0
	minimum required clamping force 33%	

ROTA-S flex 1400 (with long jaws)



Colour	Jaw ID	Weight [kg]
	 SHF 630	18.0
	 SFA 630	40.0
	minimum required clamping force 33%	

3.3 Calculations for clamping force and speed

Missing information or specifications can be requested from the manufacturer.

Legend

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