

Manual Lathe Chuck

ROTA-M flex 2+2 500 & ROTA-ML flex 2+2

Assembly and Operating Manual

Translation of Original Operating
Manual

Hand in hand for tomorrow

Imprint

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Technical changes:

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

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Dear Customer,

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

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

Best regards,

Your SCHUNK team

Customer Management

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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 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 [5]

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, assuming appropriate use in accordance with the following conditions:

- Observe the applicable documents, ▶ 1.1.2 [5]
- Observance of the ambient conditions and operating conditions, ▶ 2.5 [8]
- Observance of the specified maintenance and lubrication intervals ▶ 6.2 [40]

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 Sizes

This operating manual applies to the following sizes:

- ROTA-M flex 2+2 500 (ID number 1573344)
- ROTA-ML flex 2+2 500 (ID number 1583348)
- ROTA-ML flex 2+2 630 (ID number 1570299)
- ROTA-ML flex 2+2 800 (ID number 1573345)
- ROTA-ML flex 2+2 1000 (ID number 1573346)
- ROTA-ML flex 2+2 1200 (ID number 1573347)

1.4 Scope of delivery

- 1 Manual lathe chuck** in the ordered variant
- 4 Mounting screws**
- 8 T-nuts with screws**
- 1 Ratchet with adapter**
- 2 Eye bolts**
- 1 Assembly and Operating Manual**

ML lathe chuck only:

- 4 (2) Eye bolts (size 630)**
- 12 T-nuts with screw for table assembly**
- 1 Centering pin**
- 20 Covers for mounting screws**

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.
- Removing the release mechanism from the actuation key.
 - By removing the release mechanism, the actuation key can remain on the lathe chuck.

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 chuck face, 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.
- Do not start the machine spindle until the clamping force has built up on the chuck jaws and clamping has taken place in 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

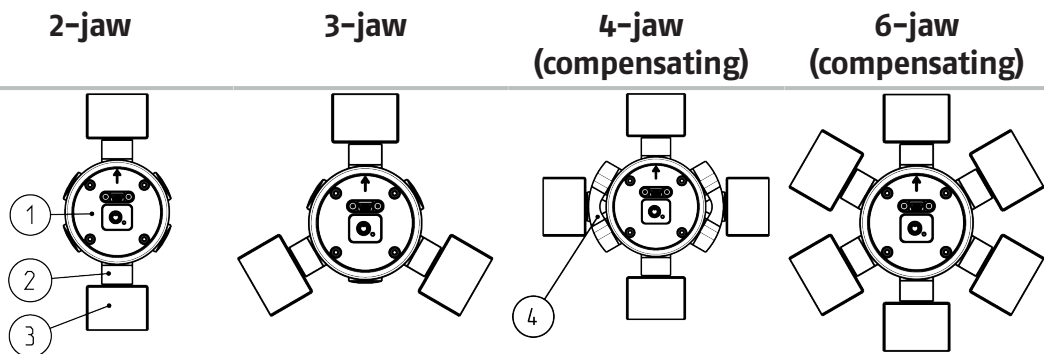
The clamping device's reliability and safety can only be guaranteed if the operator complies with the manufacturer's maintenance instructions.

- 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.



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)

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

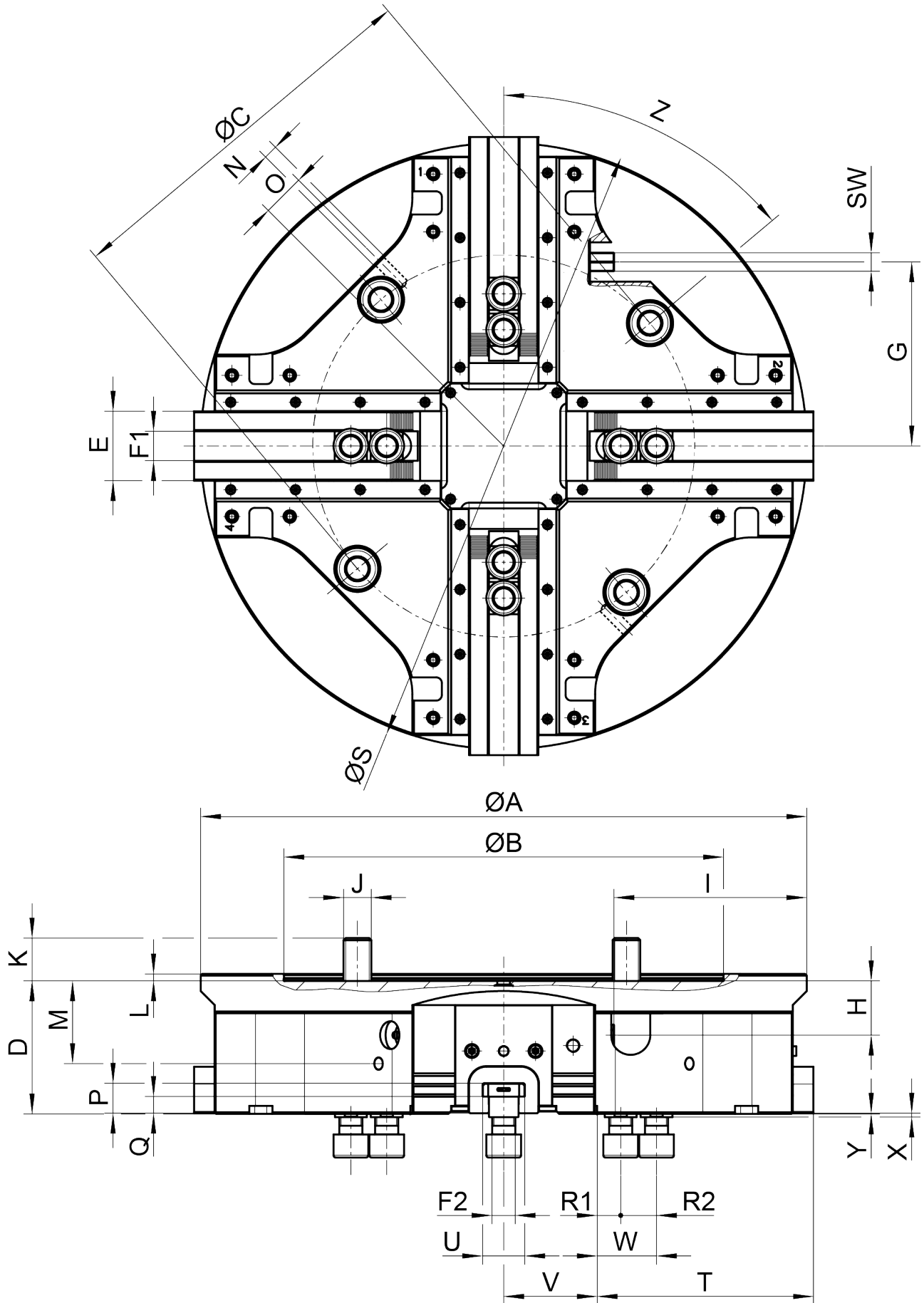
3.1 Lathe chuck data

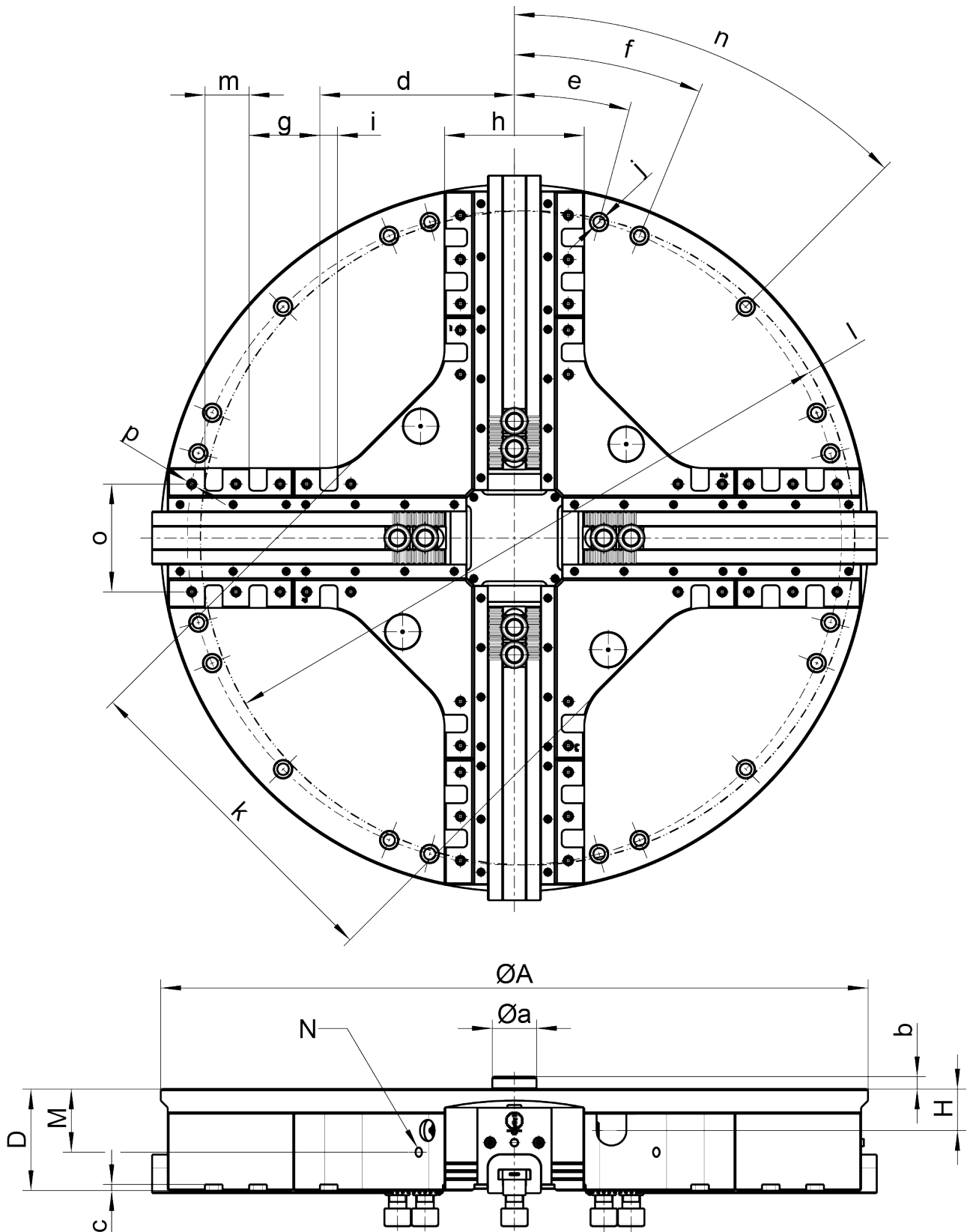
Max. actuation torque [Nm]	210
Max. clamping force [kN]	180
Overall stroke per jaw [mm]	17.3
Compensation per jaw [mm]	12
Spindle holder	ISO 702-4 (ROTA-M flex) Base plate (ROTA-ML flex)
Operating temperature [°C]	+15 to +60

ROTA-M flex 2+2	500	ML 500	ML 630	ML 800	ML 1000	ML 1200
Max. speed of rotation [RPM]	1500	1500	1300	1100	850	750
Weight with base jaws [kg]	135.6	129.5	167	243	397	530
Weight of base jaws [kg]	3.16	3.16	4.01	5.912	7.543	9.26
Mass moment of inertia [kgm ²]	4.09	4.09	6.92	16.37	43.07	84.1
Centrifugal torque of base jaw M _{cGB} [kgm]	0.489	0.489	0.731	1.364	2.103	3.05
Serration [inch]	3/32x90°	3/32x90°	3/32x90°	Modul 2	Modul 2	Modul 2

Ensure minimal weight for all jaws. For the respective machining task, the permissible speed of rotation for a given initial clamping force or the required clamping force for a given speed of rotation must be calculated according to VDI 3106, whereby the maximum speed of rotation or the maximum clamping force of the lathe chuck must not be exceeded. The calculated values must be verified by means of a dynamic measurement. Functional monitoring must be performed according to the guidelines of the insurance association.

3.2 Dimensions





Index	500	ML 500	ML 630	ML 800	ML 1000	ML 1200
A [mm]	524	524	630	800	1000	1200
W [mm]	380	-	-	-	-	-
C [mm]	330.2	-	-	-	-	-
D [mm]	115	115	115	117.9	127.9	127.9
E [mm]	60	60	60	60	60	60
F1 H7 [mm]	25.5	25.5	25.5	25.5	25.5	25.5
F2	M20	M20	M20	M20	M20	M20
G [mm]	159	159	159	159	159	159
H [mm]	46.9	46.9	46.9	46.9	56.9	56.9
I [mm]	166.6	166.6	219.6	304.6	404.6	504.6
J	M24	-	-	-	-	-
K [mm]	37	-	-	-	-	-
L [mm]	6	-	-	-	-	-
M [mm]	71.5	71.5	56	71.5	81.5	81.5
N	M12	M12	M12	M12	M12	M12
O [°]	37	37	-	37	37	37
P [mm]	26	26	26	27	27	27
Q [mm]	14.5	14.5	14.5	15.5	15.5	15.5
R1 min. [mm]	18.8	18.8	18.8	14.3	14.3	14.3
R2 min. [mm]	31	31	31	31	31	31
S max. [mm]	538.8	538.8	646.9	821.9	1024.4	1226.1
SW [mm]	16	16	16	16	16	16
T [mm]	186.9	186.9	241.6	324.5	426	527
U [mm]	36.5	36.5	36.5	37.5	38.5	39.5
V min. [mm]	63.5	63.5	63.5	68	68	68
V max. [mm]	80.2	80.2	80.2	85.3	85.3	85.3
W max. [mm]	173	173	227.1	310.6	412.1	513.1
X [mm]	3.3	3.3	3.3	2.3	2.3	2.3
Y [mm]	0.6	0.6	0.6	2.9	2.9	2.9
Z [°]	45	-	-	-	-	-

Index	500	ML 500	ML 630	ML 800	ML 1000	ML 1200
a [mm]	-	50 g6	50 g6	50 g6	50 g6	50 g6
b [mm]	-	14	14	14	14	14
c [mm]	7	7	7	7	7	7
d [mm]	220	220	220	220	220	220
e [°]	-	22.5	22.5	15	15	15
f [°]	-	30	30	22.5	22.5	22.5
g [mm]	-	-	50	80	80	80
h [mm]	158	158	158	158	158	158
i [mm]	20	20	20	20	20	20
j [mm]	-	13	13	13	17	21
k [mm]	380	380	380	380	380	380
l [mm]	-	490	570	740	900	1100
m [mm]	-	-	50	50	50	50
n [°]	-	-	45	45	45	45
o [mm]	122	122	122	122	122	122
p	M12	M12	M12	M12	M12	M12

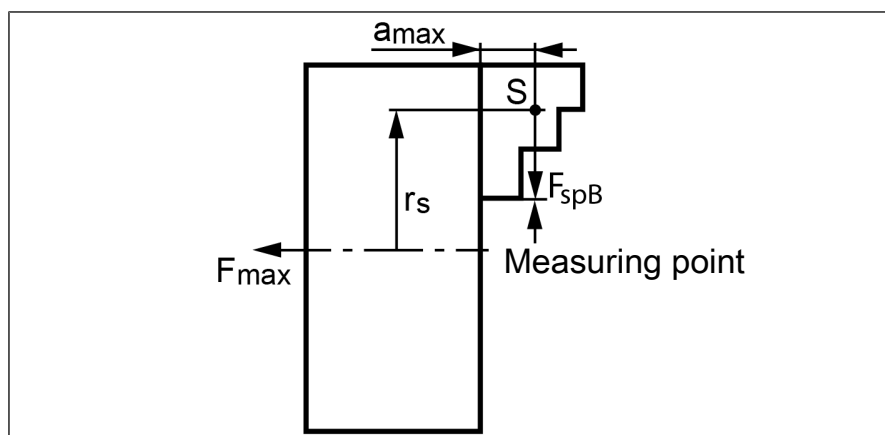
3.3 Clamping force / speed diagrams

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

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

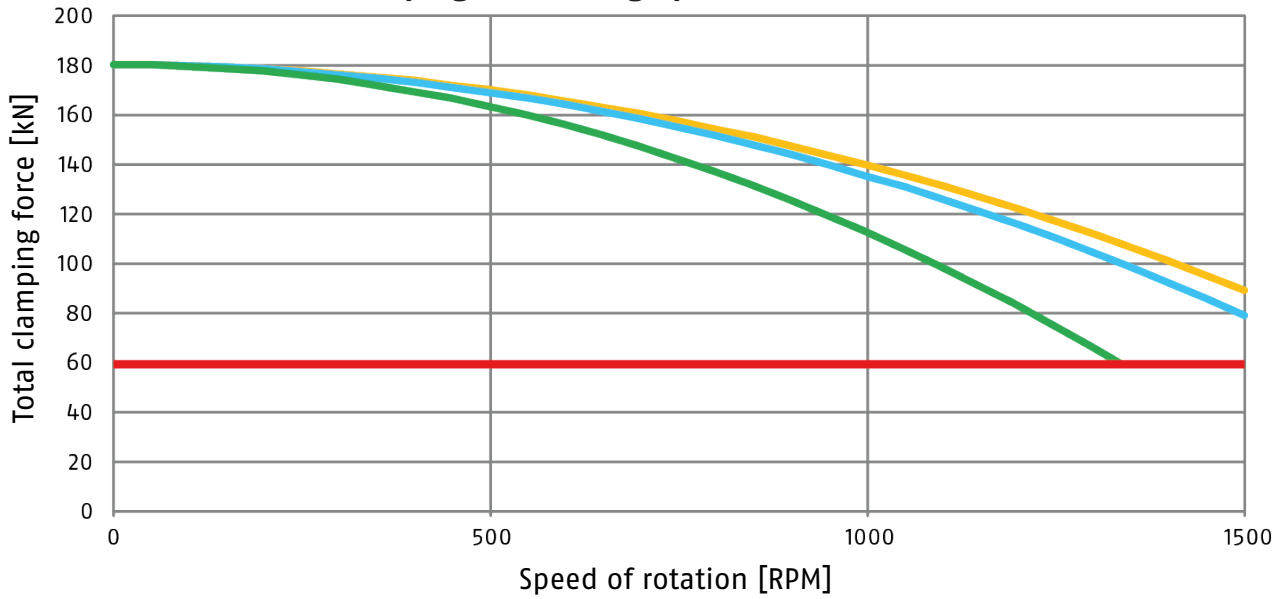
If one or more of these prerequisites is modified, the diagrams will no longer be valid.








Lathe chuck setup for clamping force/RPM graph



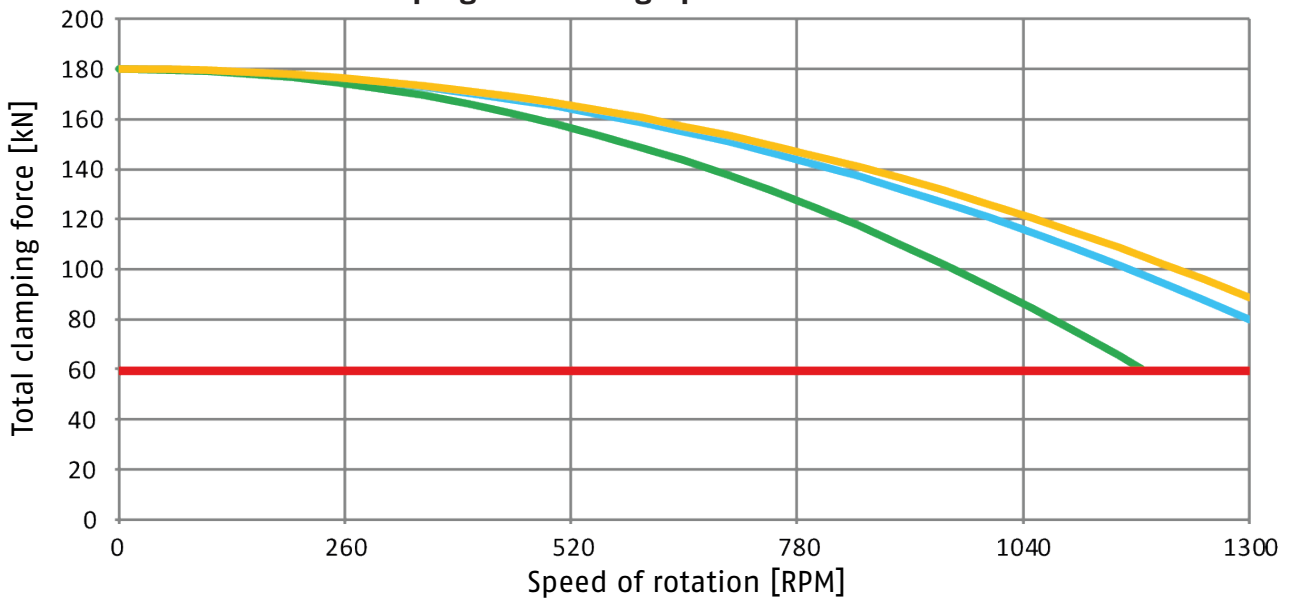
F_{spB}	Jaw clamping force	S	Center of gravity
r_s	Center of gravity radius		Max. jaw eccentricity of center of gravity in axial direction
F_{max}	Max. actuating force	a_{max}	








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



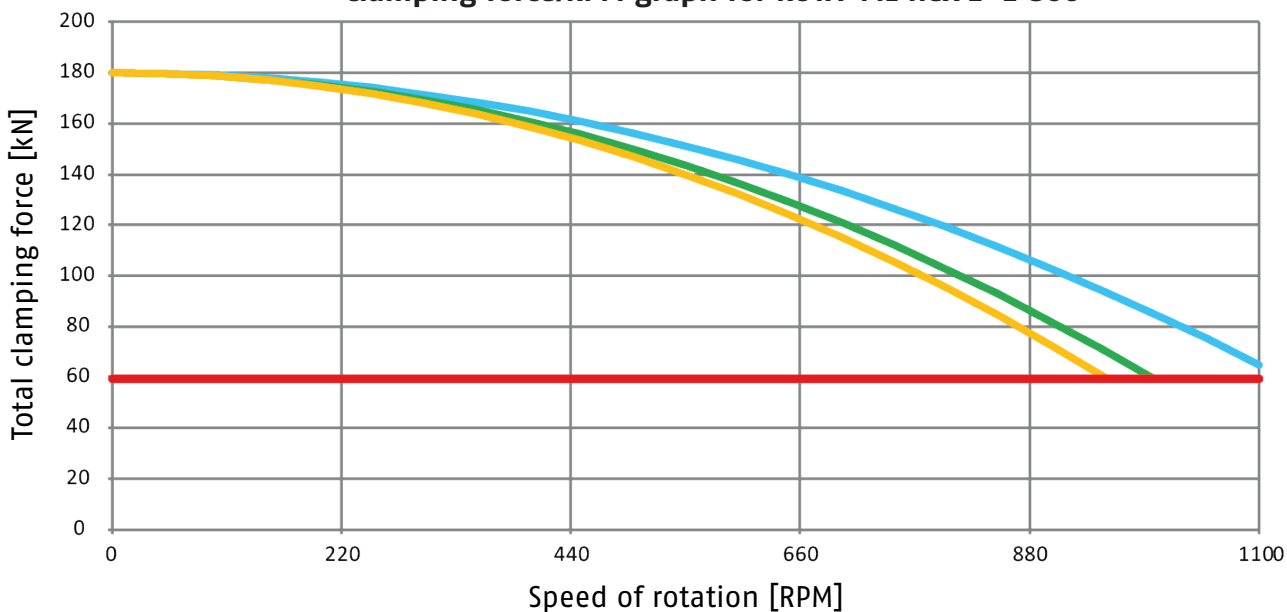
Colour	Jaw ID	Weight [kg]	Center of gravity radius [mm]
	 SWB-AL 400	10.9	241
	 SHB 400	12.7	245
	 SWB 400	23.9	237
	minimum required clamping force 33%		

Clamping force/RPM graph for ROTA-ML flex 2+2 630



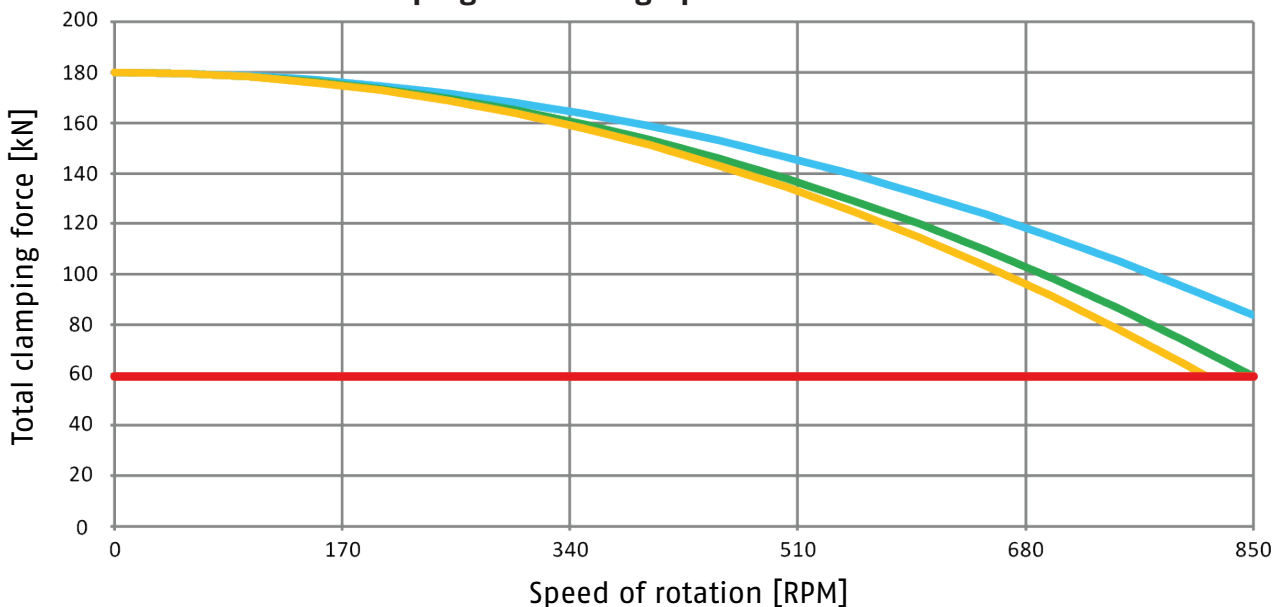
Colour	Jaw ID	Weight [kg]	Center of gravity radius [mm]
	 SWB-AL 400	10.9	295
	 SHB 400	12.7	300
	 SWB 400	23.9	291
	minimum required clamping force 33%		

Clamping force/RPM graph for ROTA-ML flex 2+2 800



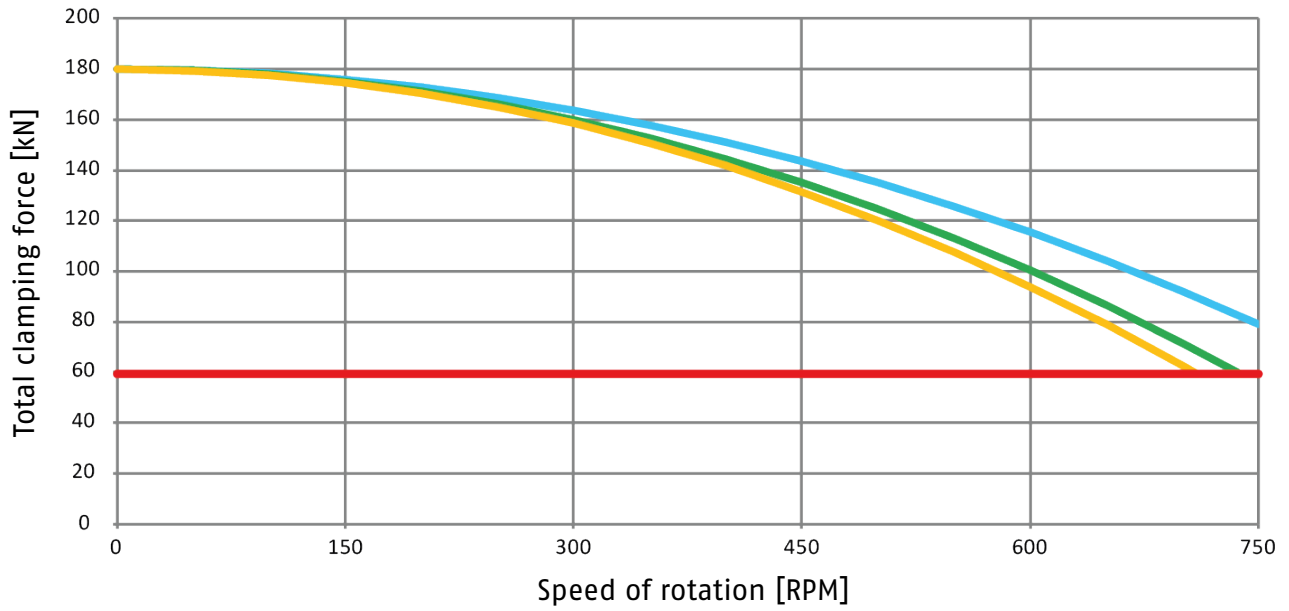
Colour	Jaw ID	Weight [kg]	Center of gravity radius [mm]
	SWBL 400	27.6	241
	SHB-M 400	14.6	245
	SWB-M 400	23.9	237
	minimum required clamping force 33%		

Clamping force/RPM graph for ROTA-ML flex 2+2 1000



Colour	Jaw ID	Weight [kg]	Center of gravity radius [mm]
	SWBL 400	27.6	446
	SHB-M 400	14.6	466
	SWB-M 400	23.9	444
	minimum required clamping force 33%		

Clamping force/RPM graph for ROTA-ML flex 2+2 1200



Colour	Jaw ID	Weight [kg]	Center of gravity radius [mm]
	SWBL 400	27.6	547
	SHB-M 400	14.6	567
	SWB-M 400	23.9	545
	minimum required clamping force 33%		

3.4 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]
$kgm \times 9.81 = Nm$			

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

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

The sum of the initial clamping force F_{sp0} and the **total centrifugal force** F_c is the **effective clamping force** F_{sp} .

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

(-) for gripping from the outside inwards

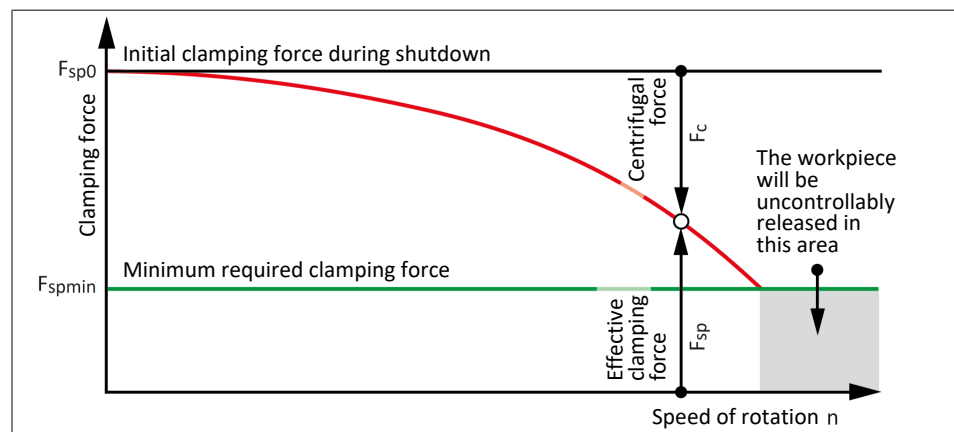
(+) for gripping from the inside outwards



⚠ 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:

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

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

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

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

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

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

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

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

Required initial clamping force F_{sp0} for a given speed of rotation 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 $n = 1200$ min^{-1} (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:

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

Initial clamping force during shutdown:

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

Calculation of total centrifugal force:

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

For two-part chuck jaws, the following applies:

$$M_c = M_{cGB} + M_{cAB}$$

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

$$\mathbf{M_{cGB} = 0.319 \text{ kgm}}$$

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

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

Centrifugal torque for one jaw:

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

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

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

The total centrifugal force can now be calculated:

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

Initial clamping force during shutdown that was sought:

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

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

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

NOTE:

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

Identifying the permissible RPM:

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

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

This calculated RPM may be used.

3.5 Grades of Accuracy

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

3.6 Permissible imbalance DIN ISO 21940-11

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

4 Assembly

4.1 Torques per screw

Tightening torques for mounting screws used to set up the lathe chuck on lathes or other suitable technical equipment and screws of the lathe chuck itself. (Screw quality 10.9)

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 Mounting in general

4.2.1 Pre-assembly measures

Carefully lift the product (e.g. using suitable lifting gear) from the packaging.



⚠ 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.

Check the delivery for completeness and for transport damage.

In order to achieve high run-out accuracy of the chuck, the machine side must be aligned before mounting the chuck and, if present, the flange. To do this, check the mounting surfaces for radial and axial run-out using a dial indicator.

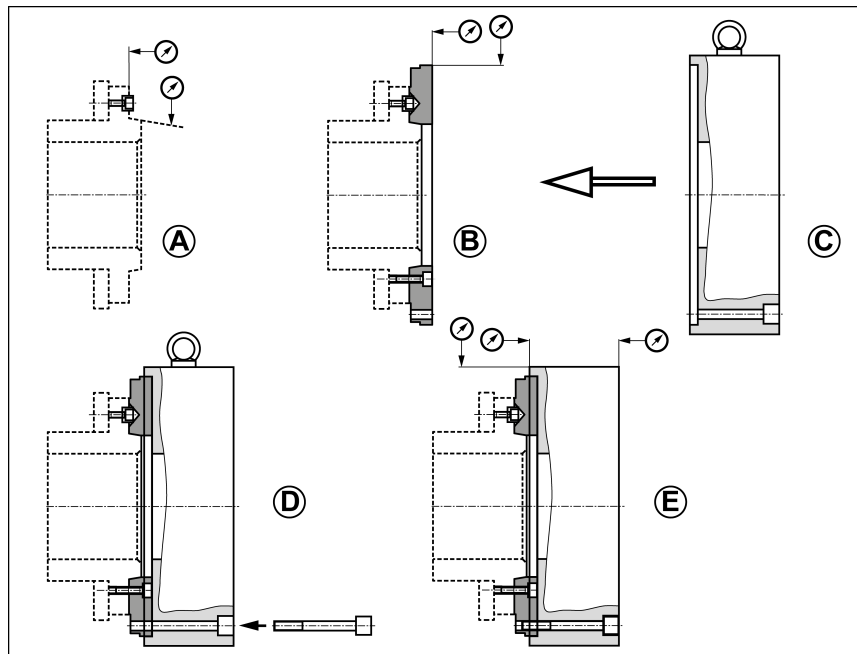
A maximum concentricity error of 0.01 mm should be ensured for the centring of the mount and a maximum axial run-out error of 0.01 mm for the contact surfaces. In addition, the flat surface must be checked for evenness using a straight edge (flat surface deburred and clean at the bore holes).

Maximum achievable radial and axial run-out tolerances of the chuck:

Chuck size [mm]	Max. Radial run-out tolerance [mm]	Max. Axial run-out tolerance [mm]
≤ 315	0.02	0.02
≤ 400	0.03	0.03
≤ 800	0.04	0.04
≤ 1200	0.05	0.05
≤ 1600	0.06	0.06

4.2.2 Chuck assembly options

If the interface of the machine spindle and chuck is identical, assembly is carried out without assembly preparation. If the interface of the machine spindle deviates from the interface of the chuck, a connecting flange must be installed before assembly.



Chuck assembly

- Direct assembly of the chuck to the machine spindle
- Assembly of the chuck with connecting flange
 - Direkt flange (insert ring)
 - Reduction flange
 - Expansion flange

CAUTION

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

CAUTION

Use a crane to install the chuck. Fasten the chuck to the eye bolt provided for this purpose (see Fig. "Chuck assembly" – C) The eye bolt must be removed prior to commissioning.

4.3 Installing and connecting

1. Checking the spindle nose and/or machine table
2. Lathe chuck assembly
 - ⇒ Assembly of the lathe chuck (with cylindrical recess) ▶ 4.3.1 [31]
if required:
 - ⇒ Assembly preparation for lathe chuck with reduction or expansion adapter plate ▶ 4.3.2 [32] or
 - ⇒ Assembly preparation for the lathe chuck with direct mounting ▶ 4.3.3 [32]
 - ⇒ Assembly preparation for lathe chuck with base plate on machine table (only ROTA-ML flex 2+2) ▶ 4.3.4 [32]
3. Performing a functional check
▶ 5.2 [33]

4.3.1 Assembly of the lathe chuck (with cylindrical recess)

See ▶ 4.3.2 [32] or ▶ 4.3.3 [32].

1. Remove the cylindrical screws for the top jaws together with the T-nuts (item 41).
2. Screw the eye bolt into the lathe chuck.
3. Lift the lathe chuck with suitable lifting equipment in alignment with the spindle center.
4. Insert and slightly tighten the mounting screws.
5. Check the lathe chuck for radial and axial run-out accuracy (see Fig. "Chuck assembly" – E ▶ 4 [29]) and, if necessary, align at the outer diameter with light taps using a hammer.
6. Tighten the mounting screws with a torque wrench. Observe the maximum admissible torques ▶ 4.1 [29].
7. Remove the eye bolt from the lathe chuck.
8. Check the lathe chuck again for radial and axial run-out accuracy (see Fig. "Chuck assembly" – E ▶ 4 [29]).
9. Check the jaw stroke of the base jaws and that these can move easily.
10. Fasten the top jaws marked 1, 2, 3 and 4 to the base jaws using T-nuts (item 41) and screws.

4.3.2 Assembly preparation for lathe chuck with reduction or expansion adapter plate

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

1. Before assembly of the flange, remove any dirt or chips from the machine spindle and from the centering mount and contact surface of the flange.
2. A flange produced by the user must be finished on the machine spindle and balanced before the lathe chuck is mounted.
3. After assembly, ensure that the flange is in contact with the entire surface.
4. Check the concentricity and axial run-out accuracy of the flange (see Fig. "Lathe chuck assembly" – B).
5. The lathe chuck assembly follows ▶ 4.3.1 [31].

4.3.3 Assembly preparation for lathe chuck with direct mounting

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

1. Before mounting the direct mount on the cylindrical recess of the lathe chuck, remove dirt or chips from the centering mount and the contact surface of the direct mount.
2. Tighten the direct mount slightly on the lathe chuck with the supplied fixing screws.
3. The lathe chuck assembly follows ▶ 4.3.1 [31].

4.3.4 Assembly preparation for lathe chuck with base plate on machine table (ML lathe chuck only)

Insert the T-slot nuts (item 87) into the grooves provided in the machine table. Then lift the toolholder and supplied eye bolts onto the machine table. Position via the centering disk (item 64). Align the chuck and then fasten using the screws (item 88) and the T-slot nuts. To protect the counterbore holes against contamination, fit the locking covers (item 89).



⚠ WARNING

Risk of injury due to the mounting screw locking covers (item 89) being thrown out during turning applications on the chuck.

The mounting screw locking covers (item 89) are only allowed to be used for stationary operation of the chuck.

5 Function

5.1 Function and handling

The ROTA-M flex 2+2 & ROTA-ML flex 2+2 has a centrally balanced clamping function which enables the clamping of round, cubic and geometrically bulky workpieces.

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

The fine serration of the base jaws can be used to mount standard jaws as well as special jaws for complicated workpiece shapes. The top jaws are moved or changed in the open clamping position.



⚠ WARNING

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

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

- Refer to the "Technical data" chapter!

5.2 Function test before use

Functional test

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

Two important points are:

- **Clamping force!** At max. actuation moment, the clamping force specified for the lathe chuck must be reached. If this is not the case, the lathe chuck needs to be lubricated, ▶ 6 [□ 39].

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).

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!

5.3 Replacement or renewal of jaws

Changing the top jaws

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

Tighten the jaw mounting screws (screw quality 12.9) to the specified torque, ▶ 4.1 [□ 29].

CAUTION

Tighten the mounting screws of the top jaws with a torque wrench. Never tighten the screws with hammer strikes on the Allen key or extend the Allen key with a pipe.

Turning chuck jaws

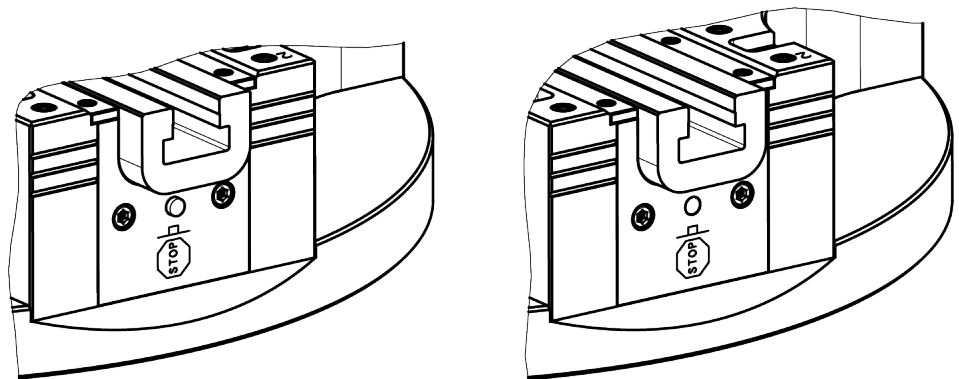
For maximum clamping repeat accuracy, the chuck jaws must be turned or ground in the lathe chuck under clamping pressure.

CAUTION

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

5.4 Clamping the workpiece

1. Determination of the required actuation moment is based on the clamping force calculation, ▶ 3.4 [□ 24].
2. Clamp the workpiece by twisting the spindle (item 8) using the actuation key or a torque wrench.
3. Check both stroke controls, which are located below guideways 1 and 2. Both of the indicator pins (item 19) must be completely recessed, only then is permissible clamping achieved.



⚠ WARNING

When a workpiece is clamped, the indicator pins must be completely recessed. If the indicator pins are not completely recessed, there is a risk that the lathe chuck gear will move!



stay against the stop. Risk of injury due to the workpiece being ejected from the machine. If the indicator pin protrudes, do not clamp the lathe chuck and do not start up.

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

- If the indicator pin protrudes, do not clamp the lathe chuck and do not start up.

5.5 Compensation / workpiece dimensions

ROTA-M flex 2+2 500 / ROTA-ML flex 2+2

Overall stroke per jaw [mm]	17.3
Compensation per jaw [mm]	12

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

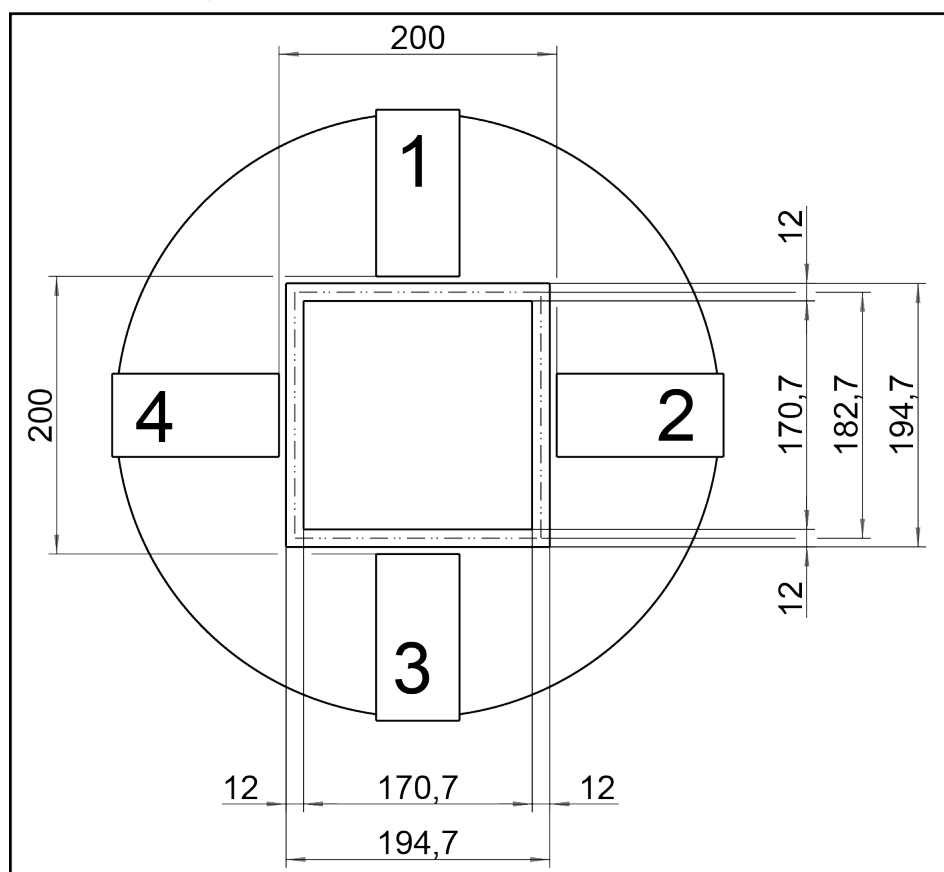
Using the compensation function, the lathe chuck can accommodate workpieces that have the dimension $X \pm$ **compensation per jaw** when their side lengths are placed vertically next to each other

Example:

Distance between chuck jaws when the lathe chuck is open: 200 mm

Center of overall jaw stroke: 200 mm – 17.3 mm = 182.7 mm.

Possible workpiece dimension: 182.7 mm \pm 12 mm



Compensation

5.6 Fixed workpiece stops and stop jaws

With the ML design from size 630, the ROTA-M flex 2+2 makes it possible to realize clamping structures with one or two fixed workpiece stops through the use of fixed workpiece stops and the related stop jaws. Fixed workpiece stops and stop jaws are available as accessories.



⚠ DANGER

Possible risk of fatal injury to operating personnel due to workpiece loss when using the fixed workpiece stops during turning operations!

Fixed workpiece stops are not intended for use under rotation.



⚠ WARNING

If fixed workpiece stops are used for clamping on the lathe chuck, observe the maximum actuation moment permitted depending on the clamping structure. If it is exceeded, there is a danger of damaging the lathe chuck and a risk of injury from the workpiece being ejected.

Observe the specified maximum actuation torque for the clamping structure used.

5.6.1 Assembly of the fixed workpiece stop

1. Remove the set-screws (item 70) from the bore holes where you want to install the fixed workpiece stop.
2. Clean the mounting surfaces of the mounting grooves at the fixed workpiece stop and lathe chuck.
3. Place the fixed workpiece stop in the mounting grooves on the lathe chuck and tighten the mounting screws with torque, ▶ 4.1 [29].

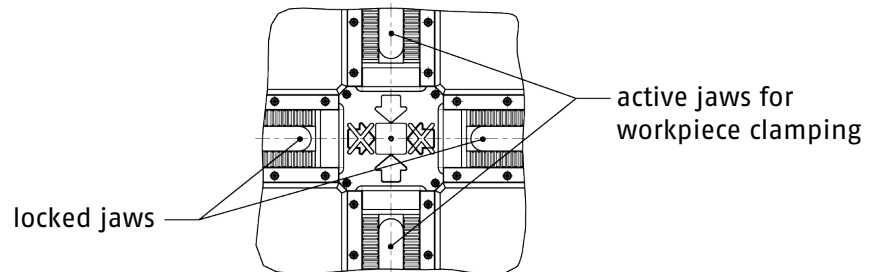
5.7 Locking cover

If a clamping structure is to be realized that only contains one active level of jaws (centric clamping vise and vise), it is necessary to use the locking cover. Locking covers are available as accessories.

Size	ID number
500 – 1200	1471989

5.7.1 Assembly of the locking cover

1. Loosen the screws (item 33) and remove the cover (item 3) with the O-ring (item 37).
2. Install the pre-assembled locking cover so that the arrows are in line with the jaws with which the workpiece is to be clamped.



⚠ WARNING

The locking cover must be used when using the centric clamping vise and vise clamping structure. This prevents the lathe chuck gear from moving/staying against the stop. If this is not observed, there is a danger of damaging the lathe chuck and a risk of injury from the workpiece being thrown out.

Use of the locking cover in the corresponding direction.

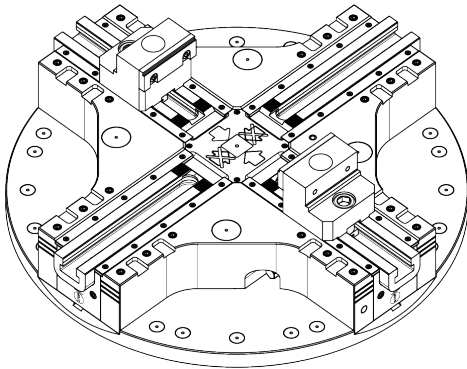


⚠ WARNING

Only O.D. clamping is permissible when using a locking cover. If this is not observed, there is a danger of damaging the lathe chuck and a risk of injury from the workpiece being thrown out.

Use of the locking cover only for O.D. clamping.

5.8 Possibilities for clamping structure (only ROTA-ML flex 2+2)

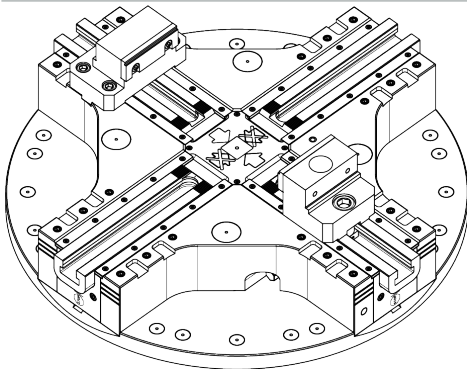


Centric clamping vises (2 stop jaws or jaws):

Each (stop) jaw presses on the workpiece with 25% of the clamping force generated by the actuation moment.

- max. actuation moment: max. lathe chuck value
- max. clamping force on the workpiece: 0.5 x max. clamping force specifications of lathe chuck

**USE LOCKING COVER!
FOR O.D. CLAMPING ONLY!**

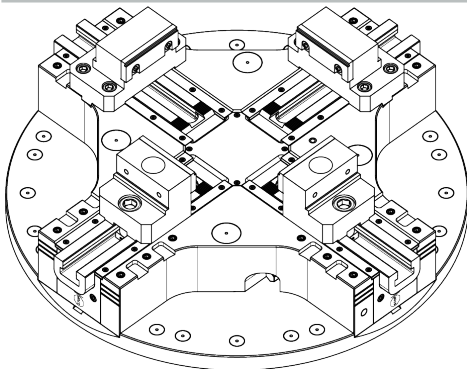


Vise (1 stop jaws / 1 fixed workpiece stop):

The stop jaws press the workpiece against the fixed workpiece stop with 50% of the clamping force generated by the actuation moment.

- max. actuation moment: 0.5 x max. lathe chuck value
- max. clamping force on the workpiece: 0.5 x max. clamping force specifications of lathe chuck

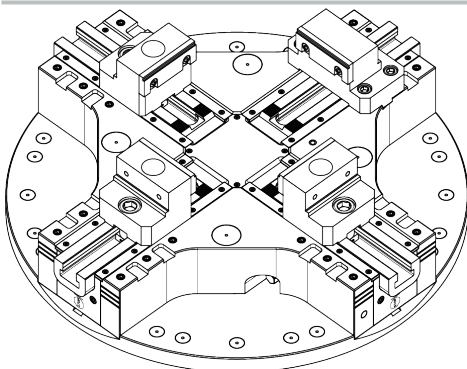
**USE LOCKING COVER!
FOR O.D. CLAMPING ONLY!**



2 stop jaws / 2 fixed workpiece stops:

The individual stop jaws each press the workpiece against the fixed workpiece stops with 50% of the clamping force generated by the actuation moment.

- max. actuation moment: 0.5 x max. lathe chuck value
- max. clamping force on the workpiece: max. clamping force specifications of lathe chuck



3 stop jaws / 1 fixed workpiece stop:

The opposite stop jaws each press against the workpiece with 12.5% of the clamping force generated by the actuation moment.

The individual stop jaw presses the workpiece against the fixed workpiece stop with 25% of the clamping force generated by the actuation moment.

- max. actuation moment: 0.5 x max. lathe chuck value
- max. clamping force on the workpiece: 0.75 x max. clamping force specifications of lathe chuck

6 Maintenance

6.1 Lubrication

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

The lathe chuck must be lubricated in the open position.

For optimum grease distribution, the chuck must be moved through to its end position several times after lubrication.

Move the lathe chuck 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. In this way, the clamping force is retained for longer).



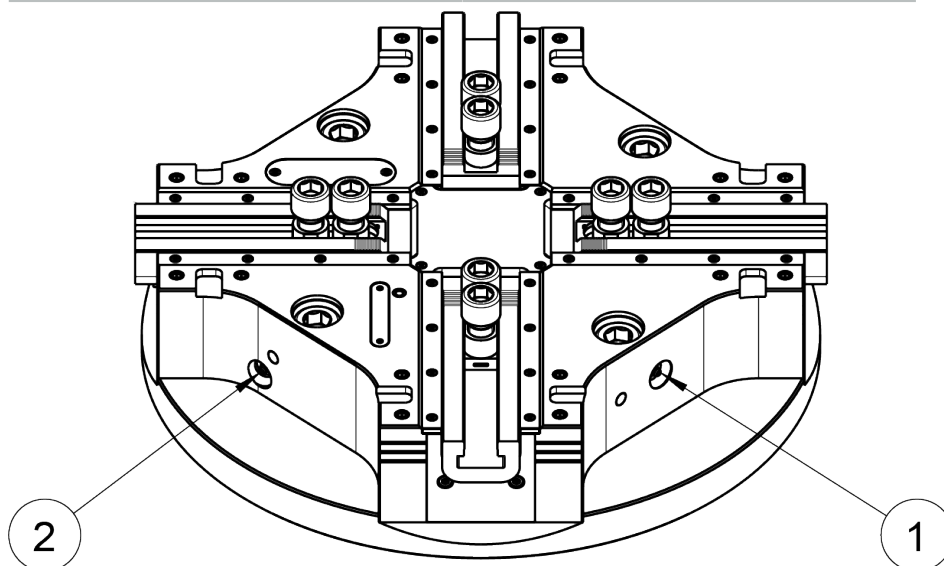
⚠ CAUTION

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

- Wear protective gloves.

Number of grease press strokes

Chuck size / greasing area	500 / (ML) 630 - 1200
Jaws (1)	15
Spindle (2)	8



6.2 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	Weekly / every 120 hours*
	high / coolant utilization	Daily / every 24 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.

6.3 Disassembling and assembling the chuck

The lathe chuck can only be disassembled once it has been removed.

Chuck size			Task
500	630	800-1200	Description
1	1	1	Remove the top jaws and mounting screws.
	2	2	Remove the locking cover (item 48) and loosen the screws (item 77).
2			Loosen screws (item 42) and lift the lathe chuck from the machine spindle with lifting equipment.
	3	3	Lift the lathe chuck from the machine table with lifting equipment.
3	4	4	Loosen screws (item 33) and remove cover (item 3) with O-ring (item 37) and wiper (item 21).
4	5	5	Remove locking screw (item 30).
	6	6	Loosen screws (item 42).
5	7	7	Place the lathe chuck on the flat surface of the chuck body (item 1).
	8	8	Loosen screws (item 31) and remove the centering disk (item 64).
6			Loosen screws (item 31) and remove the base plate (item 60).
	9	9	Loosen screws (item 36 & 83) and remove the base plate (item 60).
7	10	10	Remove cylindrical pin (item 47).
8	11	11	Loosen screw (item 44).

Chuck size			Task
500	630	800-1200	Description
9	12	12	Remove the slide without thread (item 17). Lift the drive package, consisting of spindle (item 8), plate (item 9), upper drive ring (item 11), center drive ring (item 12), bottom drive ring (item 13), sleeve (item 14), toggle (item 15), threaded slide (item 16), bushing (item 28) and bearing seat (item 29) from the chuck body (item 1). Possibly the wedge bar (item 5) and sliding block (item 20) may also come loose.
10	13	13	The following items are not permanently attached to the drive unit and can be removed: Spindle (item 8), plate (item 9), slide with thread (item 16), bearing seat (item 29), sleeve (item 14), toggle (item 15), possibly wedge bar (item 5) and sliding block (item 20).
11	14	14	Unscrew the spindle (item 8) from the slide with thread (item 16).
12	15	15	Remove screw (item 43) from the drive ring assembly.
13	16	16	Loosen the drive rings (items 11; 12 and 13) from each other.
14	17	17	If any wedge bar (item 5) and sliding block (item 20) remain in the chuck body (item 1), remove them.
15	18	18	Loosen screw (item 35).
16	19	19	Push the indicator pin (item 19) to the center of the chuck in the bore.
17	20	20	Remove screws (item 34) and pull off the cover plates (items 23 and 24).
18	21	21	Place the chuck with lifting equipment on the back.
19	22	22	Remove the O-ring sections (item 26) and sealing elements (item 25).
20	23	23	Remove the base jaws (item 2)
21	24	24	Remove the bar (item 18) and steel ball (item 45).
22	25	25	Remove the cylindrical pin (item 46) with a slide hammer.
23	26	26	Remove the indicator pin (item 19) and pressure spring (item 38).
		27	Loosen the screw (item 84) and remove the guideway extension.
		28	Remove shim plate (item 85), sealing plate (item 82) and indicator bar (item 81).

Degrease and clean all parts and check them for damage.
Before assembly, grease well with LINOMAX plus.

Only use original SCHUNK spare parts when replacing damaged parts.

6.4 Assembling the lathe chuck

CAUTION

When assembling the base jaws and wedge bars, make sure that the numbers on the base jaws and wedge bars match the numbers on the jaw guidances.

Chuck size			Task
500	600	800-1200	Description
1	1	1	Place the chuck body (item 1) with the guideways facing upwards.
2	2		Insert the indicator pin (item 19) into the hole under guideway 1 and 4 in the chuck body (item 1) and drive the cylindrical pin (item 46) through the slotted hole in the guideway into the indicator pin (item 19).
		2	Screw the screw (item 84) with shim plate (item 85) into the chuck body (item 1) on the front of the guideway.
3	3		Slide the spring (item 38) onto the indicator pin (item 19). Countersink both parts into the chuck body (item 1).
		3	Slide the sealing plate (item 82) into the groove on the chuck body (item 1) at the end of the guideway.
		4	Place the guideway extension (item 80) on the screws (item 84). Shim plates (item 85) must be placed between the guideway extension (item 80) and the chuck body (item 1).
		5	As an alignment aid, slide the base jaw (item 2) into the guideway of the chuck body (item 1) and extension (item 80). Tighten the screws (item 84).
		6	Remove the base jaw (item 2) from the guideway; it must be possible to remove the base jaw (item 2) easily.
		7	Insert the indicator bar (item 81) into the hole under guideway 1 and 4 in the guideway extension (item 80) or chuck body (item 1) and drive the cylindrical pin (item 46) through the slotted hole in the guideway into the indicator bar (item 81).
		8	Insert the indicator pin (item 19) and spring (item 38) into the hole under guideway 1 and 4 in the guideway extension (item 80). Fully countersink the components.
4	4	9	Glue the steel ball (item 45) with a little grease into the bore of the bar (item 18) and place it in the groove in guideway 1 and 4 in the chuck body (item 1). The steel ball points towards the center of the chuck.
5	5		Slide the base jaws (item 2) into the guideways in the chuck body (item 1). ATTENTION: Base jaws are numbered, install according to the numbering on the chuck body!

Chuck size			Task
500	600	800-1200	Description
		10	Slide the base jaws (item 2) into the guideways in the guideway extension (item 80) or chuck body (item 1). ATTENTION: Base jaws are numbered, install according to the numbering on the chuck body!
6	6		Fit the sealing elements (item 25) around the protruding base jaws (item 2) and place them in the gap between the chuck body (item 1) and base jaw (item 2).
		11	Place the sealing elements (item 25) around the protruding base jaws (item 2) and place them in the gap between the guideway extension (item 80) or chuck body (item 1) and base jaw (item 2).
7	7		Position the O-ring sections (item 26) in the center of the groove in the cover plates (item 23 and 24) and push them into the chuck body (item 1) from below. Ensure that the sealing element (item 25) is also accommodated by the groove in the cover plate (items 23 and 24). ATTENTION: Use the cover plates (item 23) on guideways 1 and 4.
		12	Position the O-ring sections (item 26) in the center of the groove in the cover plates (item 23 and 24) and push them into the guideway extensions (item 80) from below. Ensure that the sealing element (item 25) is also accommodated by the groove in the cover plate (items 23 and 24). ATTENTION: Use the cover plates (item 23) on guideways 1 and 4.
8	8	13	Fix the cover plates (items 23 and 24) in place with screws (item 34).
9	9	14	Press the protruding O-ring sections (item 26) into the gap between the guideway extension (item 80) or chuck body (item 1) and the sealing element (item 25).
10	10	15	Fasten the wipers (item 21) with screws (item 33) next to the guideways.
11	11	16	Screw the locking screw (item 30) into the chuck body (item 1).
12	12	17	Press the O-ring (item 37) into the groove in the cover (item 3) and fasten with screws (item 33) in the center of the chuck body (item 1).
13	13	18	Slide the base jaws (item 2) to the outer position, turn the chuck body (item 1).
14	14	19	Screw the screw (item 35) into the chuck body (item 1).
15	15	20	Insert the wedge bars (item 5) into the chuck body in the right end position as seen from the chuck center. The marking must point outwards. Ensure that the toothing meshes ATTENTION: Wedge bars are numbered, install according to the numbering on the chuck body!
16	16	21	Place the sliding blocks (item 20) on the pins of the wedge bars (item 5) and align them with the chuck center.
17	17	22	Place the upper drive ring (item 11) on the shaft in the chuck center, the marking must be visible and point in the direction of guideway 1. Thread the sliding blocks (item 20) into the grooves.

Chuck size			Task
500	600	800-1200	Description
18	18	23	Screw the spindle (pos. 8) into the slide with thread (pos. 16). Place the plate (item 9) on the spindle (item 8), the marking must point inwards. Place the bearing seat (item 29) on the spindle (item 8) and align with the threaded slide (item 16).
19	19	24	After the parts have been lowered approx. halfway into the chuck body (item 1) in the pocket under the guideway 1, insert the marked pin of the middle drive ring (item 12) into the pocket of the threaded slide (item 16) and thread the middle drive ring (item 12) onto the shaft in the chuck center in the chuck body (item 1) while lowering the components.
20	20	25	Insert the slide without thread (item 17) in the pocket under guideway 3 in the chuck body over the pin of the middle drive ring (item 12).
21	21	26	Place the lower drive ring (item 13) on the middle drive ring (item 12) and thread the sliding blocks (item 20) into the grooves. Marking must be visible and point in the direction of guideway 1.
22	22	27	Insert the sleeves (item 14) into the lower drive ring (item 13), the chamfers must point downwards.
23	23	28	Insert the toggle (item 15) into the drive ring holes.
24	24	29	Screw in screw (item 44) (in direction of jaw no. 4) through the drive ring assembly in the chuck body (item 1).
25	25	30	Screw in screw (item 43) (in direction of jaw no. 2) into upper drive ring (item 11).
26	26	31	Drive the cylindrical pin (item 47) into the center of the chuck body (item 1).
27	27	32	Align the base plate (item 60) with the recess on the chuck body (item 1) and insert it onto the cylindrical pin (item 47).
28	28		Fasten the base plate (item 60) to the chuck body (item 1) using screws (items 36).
		33	Fasten the base plate (item 60) to the chuck body (item 1) using screws (items 36 and 83).
	29	34	Screw on the centering disk (item 64) in the center of the base plate (item 60) using screws (item 31).
	30	35	Turn chuck with lifting equipment.
	31	36	Fasten the base plate (item 60) to the chuck body (item 1) using screws (item 42). Attention: Tighten screws (item 42) to 300 Nm only!
	32	37	Press the locking covers (item 48) into the countersunk holes (item 42).

7 Remedies for faults

Fault	Cause	Remedy
Actuation stiffness	Tightening torque of top jaws too high	Use correct tightening torque
	Damage to the guideways	Disassemble and check the lathe chuck. Replace worn or damaged parts with SCHUNK spare parts
	Drive spindle damaged (due to overload)	Disassemble and check the lathe chuck. Replace worn or damaged parts with SCHUNK spare parts
Concentricity error	Top jaws on incorrect base jaw	Mount top jaws in correct allocation
	Allocation of the components switched during assembly	Disassemble the lathe chuck and assemble it using correct component allocation
	Top jaws not correctly turned/ground	Repeat turning/grinding
	Dirty clamping faces	Clean the clamping faces
	Dirty jaw interface	Clean the jaw interface
	Compensation stroke depleted in clamping situation	Adjust position of top jaws to workpiece geometry
Drop in clamping force	Lathe chuck lubrication insufficient, maintenance interval exceeded	Lubricate the lathe chuck, and if necessary, disassemble, clean and relubricate
	Small stroke movement with large repetition	Open and close the lathe chuck several times without workpiece
	Components worn in the force flow	Disassemble and check the lathe chuck. Replace worn or damaged parts with original SCHUNK spare parts
Vibrations on machine spindle	Compensation stroke depleted in clamping situation	Adjust position of top jaws to workpiece geometry
	Imbalance due to workpiece	Compensate for imbalance by adding weight to the chuck body
	Imbalance due to top jaw	Correct the top jaw position
	Imbalance due to machine spindle or flange/direct mounting	Check components for concentricity, align, balance or replace if necessary

8 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.

9 Disposal

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

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

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

10 Part list

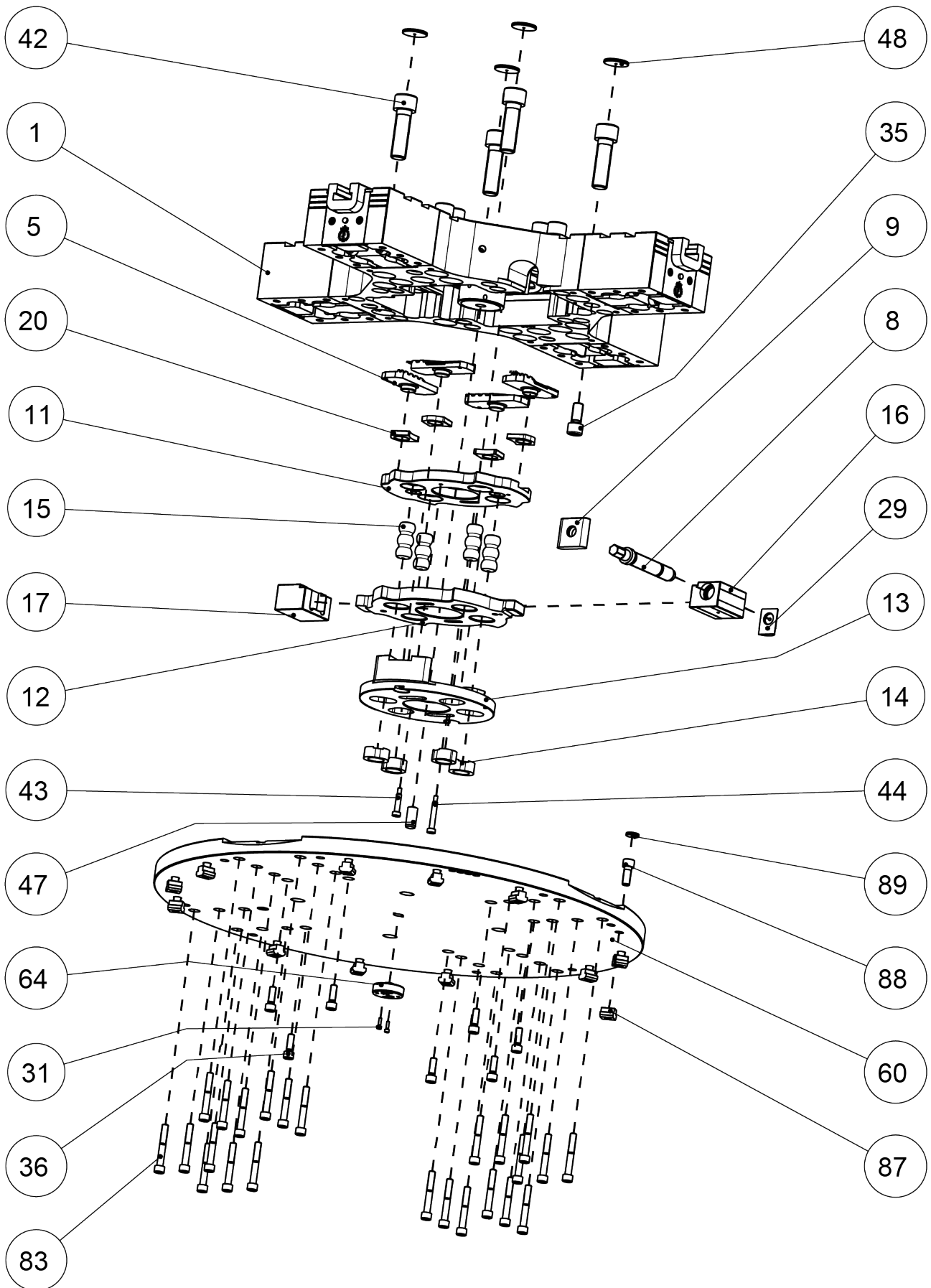
When ordering spare parts, the type, size and, if possible, the serial number of the chuck must always be stated to avoid delivery mistakes.

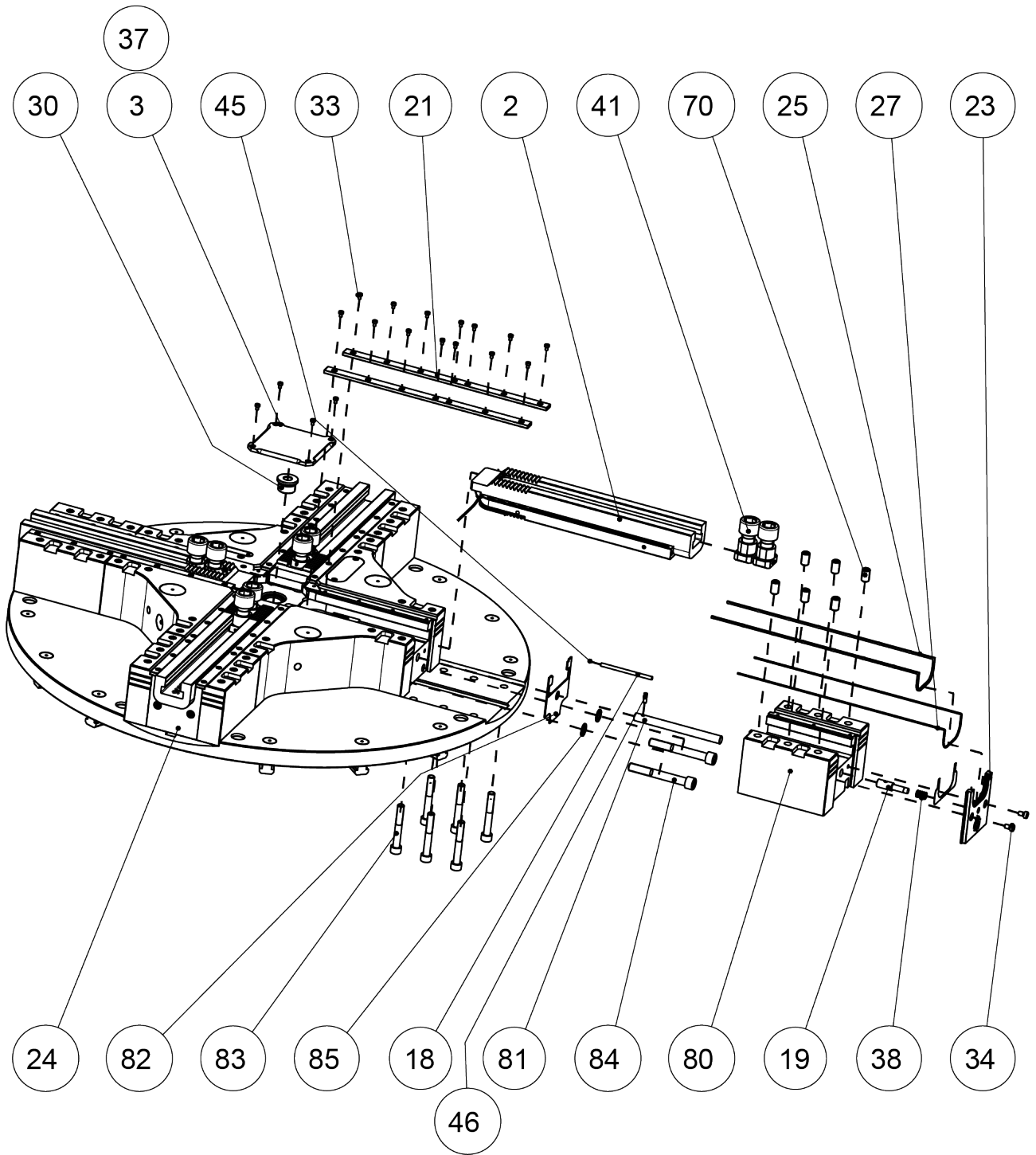
Seals, sealing elements, fittings, springs, bearings, screws, wiper bars and parts that come into contact with the workpiece are not covered by the warranty.

Item	Designation	Quantity	Note
1	Chuck body	1	
2	Base jaw	4	
3	Cover	1	
5	Wedge bar	4	
8	Spindle	1	
9	Plate	1	
11	Upper drive ring	1	
12	Middle drive ring	1	
13	Lower drive ring	1	
14	Sleeve	4	
15	Toggle	4	
16	Slide with thread	1	
17	Slide without thread	1	
18	Bar	2	
19	Indicator pin	2	
20	Sliding block	4	
21	Wiper	8	
23	Cover plate with hole	2	
24	Cover plate without hole	2	
25	Sealing element	4	
26	O-ring	4	
27	Sealing insert	4	
28	Bushing	8	
29	Seat of bearing	1	
30	Locking screw	1	
31	Screw	2	ML
33	Screw	36	500
	Screw	44	630
	Screw	60	800
	Screw	76	1000
	Screw	84	1200
34	Screw	8	
35	Screw	4	
36	Screw	8	500 / 800 / 1000 / 1200
	Screw	12	630

Item	Designation	Quantity	Note
37	O-ring	1	
38	Pressure spring	2	
39	Lubrication nipple	2	
41	Sliding block	8	
42	Screw	4	
43	Screw	1	
44	Screw	1	
45	Steel ball	2	
46	Cylindrical pin	2	
47	Cylindrical pin	1	
48	Locking cover	4	ML
50	Eye bolt	2	500 / 630
	Eye bolt	4	800 / 1000 / 1200
51	Tensioning wrench	1	
52	Switching ratchet	1	ML
60	Base plate	1	
64	Centering disk	1	ML
70	Set-screw	16	500
	Set-screw	24	630
	Set-screw	40	800
	Set-screw	56	1000
	Set-screw	72	1200
77	Screw	4	500 / ML 800 / ML 1000 / ML 1200
80	Guideway extension	4	ML 800 / ML 1000 / ML 1200
81	Indicator bar	2	ML 800 / ML 1000 / ML 1200
82	Sealing plate	4	ML 800 / ML 1000 / ML 1200
83	Screw	24	ML 800 / ML 1000 / ML 1200
84	Screw	8	ML 800 / ML 1000 / ML 1200
85	Shim plate	8	ML 800 / ML 1000 / ML 1200
87	T-slot nut	8	ML 500
	T-slot nut	12	ML 630
	T-slot nut	16	ML 800 / ML 1000 / ML 1200
88	Screw	8	ML 500
	Screw	12	ML 630
	Screw	16	ML 800 / ML 1000 / ML 1200
89	Locking cover	16	ML 500
	Locking cover	20	ML 630
	Locking cover	24	ML 800 / ML 1000 / ML 1200

11 Drawing





12 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)

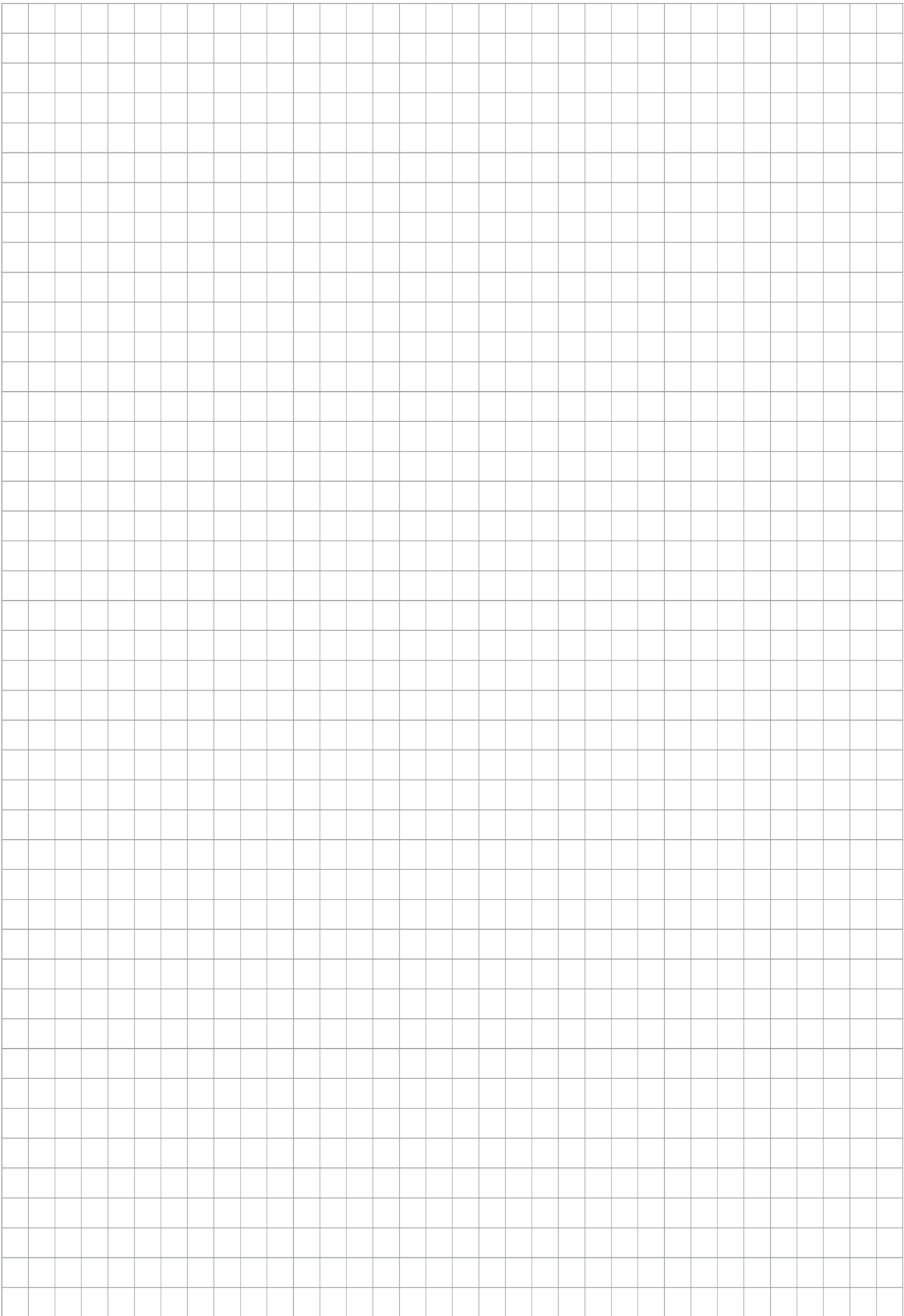
Mengen, 25th of April 2023

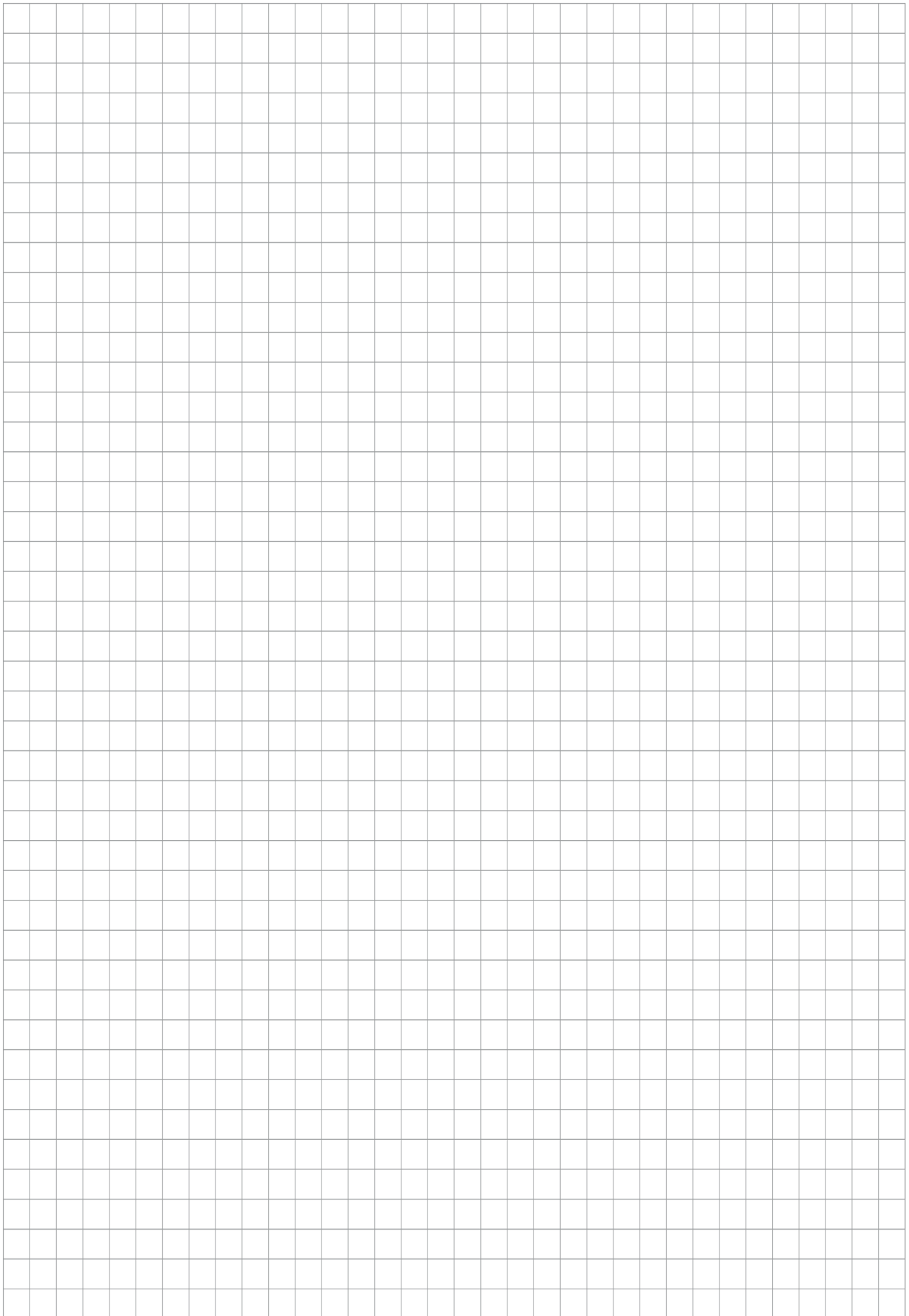
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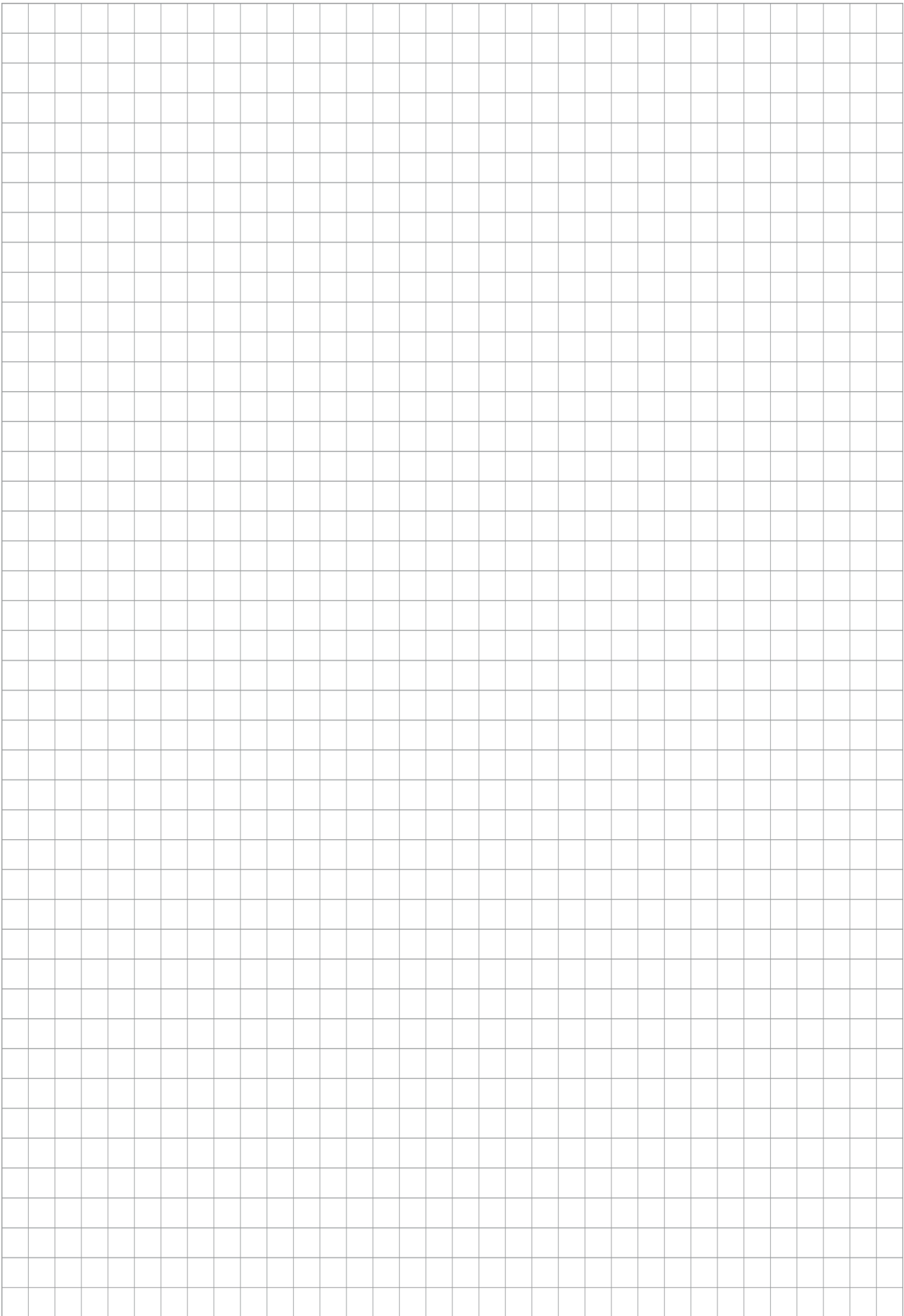
Signature: see original declaration

p.p. Philipp Schröder
Head of Development standard products

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









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