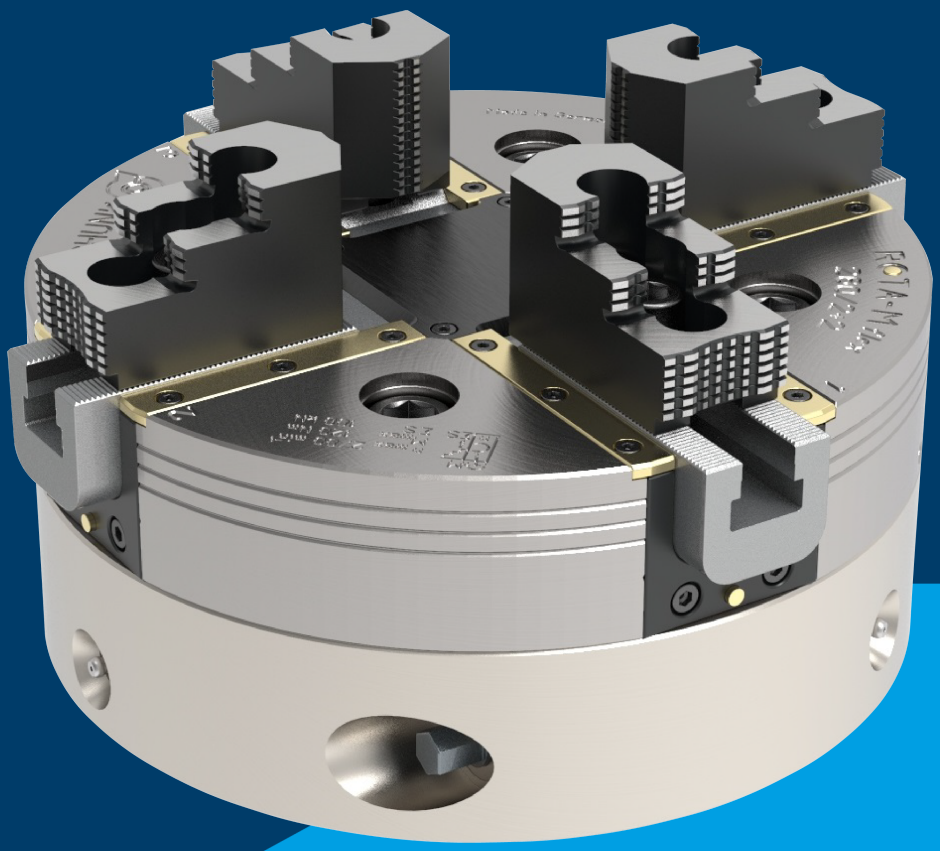
SCHUNK



Manual Lathe Chuck
ROTA-M flex 2+2
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

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

Table of Contents

1 General

1.1 About this manual

This manual contains important information for 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*
- VDI guideline 3106

1.1.3 Sizes

This operating manual applies to the following sizes:

- ROTA-M flex 2+2 260
- ROTA-M flex 2+2 315
- ROTA-M flex 2+2 400
- ROTA-M flex 2+2 500
- ROTA-M flex 2+2 630
- ROTA-ML flex 2+2 630
- ROTA-ML flex 2+2 800
- ROTA-ML flex 2+2 1000
- ROTA-ML flex 2+2 1200

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 [🗋 10]
- Observance of the specified care and maintenance instructions ▸ 7 [🗋 44]

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

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

1.3 Scope of delivery

1 Manual lathe chuck in the ordered variant

4 Mounting screws (up to size 630)

8 T-nuts with screws or 4 combi T-nuts (for variants with 60° fine serration)

1 Assembly key

1 Actuating key or ratchet with adapter (ML lathe chuck only)

1 (2) Eye bolt (ML lathe chuck only)

1 Assembly and Operating Manual

ML lathe chuck only:

12 (16) T-nuts with screw for table assembly (size 1200)

1 Centering pin

12 (16) Covers for mounting screws (size 1200)

2 Basic safety notes

2.1 Intended use

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

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

Any other use is not as intended.

2.2 Reasonably foreseeable misuse

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

Examples of foreseeable misuse:

- Operation by unauthorized personnel:
  - incorrect mounting of the top jaws.
  - incorrect actuation of the lathe chuck.
  - incorrect feeding of the workpiece.
- Clamping in stroke end position of the lathe chuck:
  - The clamping point is too close or directly on the stroke end position of the lathe chuck, which means that the desired clamping force will not act on the workpiece.
- Use of jaws that are too high or a clamping area that is too high.
- Due to the clamping force and height of the clamping area, a moment load acts on the guideways of the lathe chuck. This must not exceed the maximum value.

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

2.3 Constructional changes

Implementation of structural changes

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.

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

2.5 Chuck jaws

Requirements of the chuck jaws

Accumulated energy can make the product unsafe and risk the danger of serious injuries and considerable material damage.

- Only change chuck jaws if no residual energy can be released.
- Do not use welded jaws.
- The chuck jaws must be designed to be as light and as low as possible. The clamping point must be as close as possible to the lathe chuck face (clamping points at a greater distance lead to greater surface pressure in the jaw guidance and can significantly reduce the clamping force).
- If, for constructional reasons, the special chuck jaws are heavier than the top jaws assigned to the lathe chuck, greater centrifugal forces must be taken into account when defining the required clamping force and the recommended speed of rotation.
- The maximum recommended speed of rotation may only be operated in conjunction with maximum actuating force and only with the lathe chuck in optimum, fully functioning condition.
- After a collision, the lathe chuck and the chuck jaws must be subjected to a crack test before being used again. Replace damaged parts with original SCHUNK spare parts.
- Renew the chuck jaw mounting bolts if there are signs of wear or damage. Only use bolts with a quality of 12.9.

2.6 Environmental and operating conditions

Spatial limitations	The lathe chuck is operated in the machining area of a machine tool or an assembly device.
Interfaces	• Lathe chuck–machine/device: mounting surface • Lathe chuck–workpiece: chuck jaws • Lathe chuck–human: actuation key, lubrication nipple
Field of application	Industry
Environmental limitations	• Temperature range: 15 °C to 60 °C • Media: coolant
Material limitations	• Auxiliary and operating materials: grease LINOMAX plus, anti-rust oil Branotect, Renolit HLT2 • Materials used: steel alloys, elastomers, aluminum alloys, brass

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

Required ambient conditions and operating conditions

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

- Make sure that the product is used only in the context of its defined application parameters, ▸ 3 [🗋 18].
- Make sure that the product is a sufficient size for the application.
- Only use high-quality cooling emulsions with anti-corrosive additives during processing.

Clamping force measurement

Depending on the operating conditions, the function and clamping force must be checked after a certain period of operation ▸ 7.2 [🗋 45]. Only perform the clamping force test with a calibrated clamping force tester.

If the clamping force has dropped too much or if the base jaws no longer move properly, the lathe chuck must be disassembled, cleaned, and relubricated ▸ 7 [🗋 44].

2.7 Personnel qualification

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

Qualified personnel

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

User

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

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

Inadequate qualification of personnel

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

2.8 Personal protective equipment

Use of personal protective equipment

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

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

2.9 Notes on safe operation

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

- Avoid any manner of working that may interfere with the function and operational safety of the product.
- Use the product as intended.
- Observe the safety notes and assembly instructions.
- Do not expose the product to any corrosive media.
- Rectify malfunctions as soon as they occur.
- Observe the care and maintenance instructions.
- Observe the current safety, accident prevention, and environmental protection regulations for the application field of the product.

2.10 Transport

Handling during transport

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

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

2.11 Malfunctions

Behavior in case of malfunctions

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

2.12 Disposal

Handling of disposal

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

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

2.13 Fundamental dangers

General

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

2.13.1 Protection during handling and assembly

Incorrect handling and assembly

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

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

Incorrect lifting of loads

Falling loads may cause serious injuries and even death.

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

2.13.2 Protection during commissioning and operation

Falling or violently ejected components

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

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

2.13.3 Protection against dangerous movements

Unexpected movements

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

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

2.13.4 Notes on particular risks

⚠ DANGER

Risk of fatal injury from suspended loads!

Falling loads can cause serious injuries and even death.

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

⚠ 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.

⚠ DANGER

Possible risk of fatal injury to operating personnel from workpiece loss or parts flying off due to incorrectly selected clamping position of the chuck jaws in relation to the workpiece.

- The chuck jaws must not touch in the clamping position → no collision as otherwise no clamping force is transmitted to the workpiece.
- When fastening the chuck jaws, ensure sufficient clamping reserves (lathe chuck residual jaw stroke) as otherwise no clamping force is transmitted to the workpiece.

⚠ DANGER

Possible risk of fatal injury to operating personnel due to loss of clamping force as a result of temperature changes between the clamping procedure and machining due to loss of workpiece!

- If the chuck jaws are expected to penetrate the workpiece during the clamping procedure and if a temperature change occurs between the clamping procedure and machining, it is imperative that the lathe chuck is re-tensioned before machining.
- The larger the clamping diameter, the difference in the linear expansion coefficient of the workpiece compared to steel and the temperature range, the greater the loss of clamping force.

⚠ DANGER

Possible risk of fatal injury to operating personnel due to loss of clamping force as a result of the time period between the clamping procedure and machining due to loss of workpiece!

- If the time between the clamping procedure and machining is longer than 8 hours, it is imperative to re-tension before machining.

⚠ CAUTION

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

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

⚠ CAUTION

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

If an incorrect clamping position is chosen for the chuck jaws on the 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 must not be bigger than the lathe chuck diameter.

3 Technical data

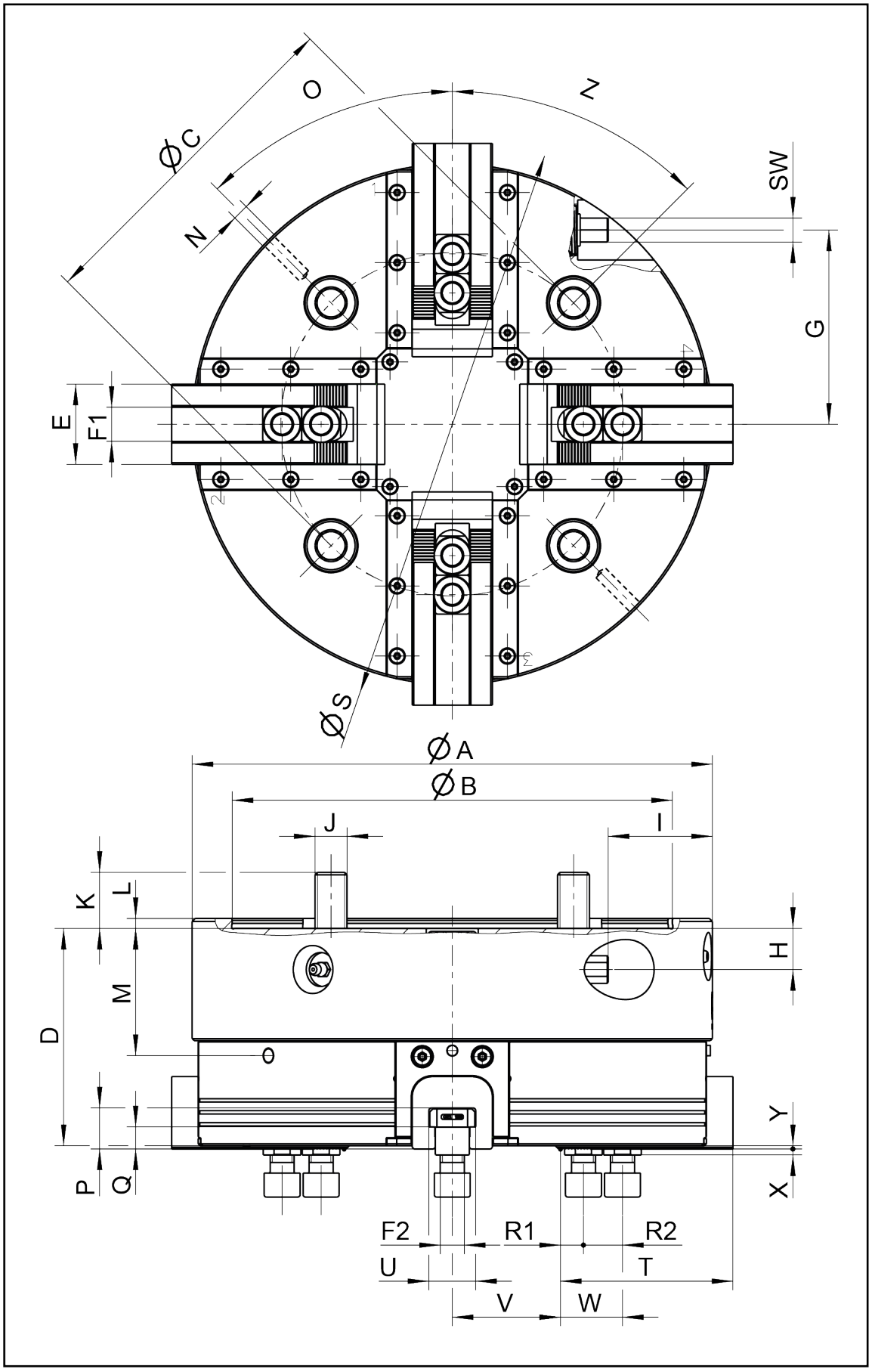
3.1 Lathe chuck data

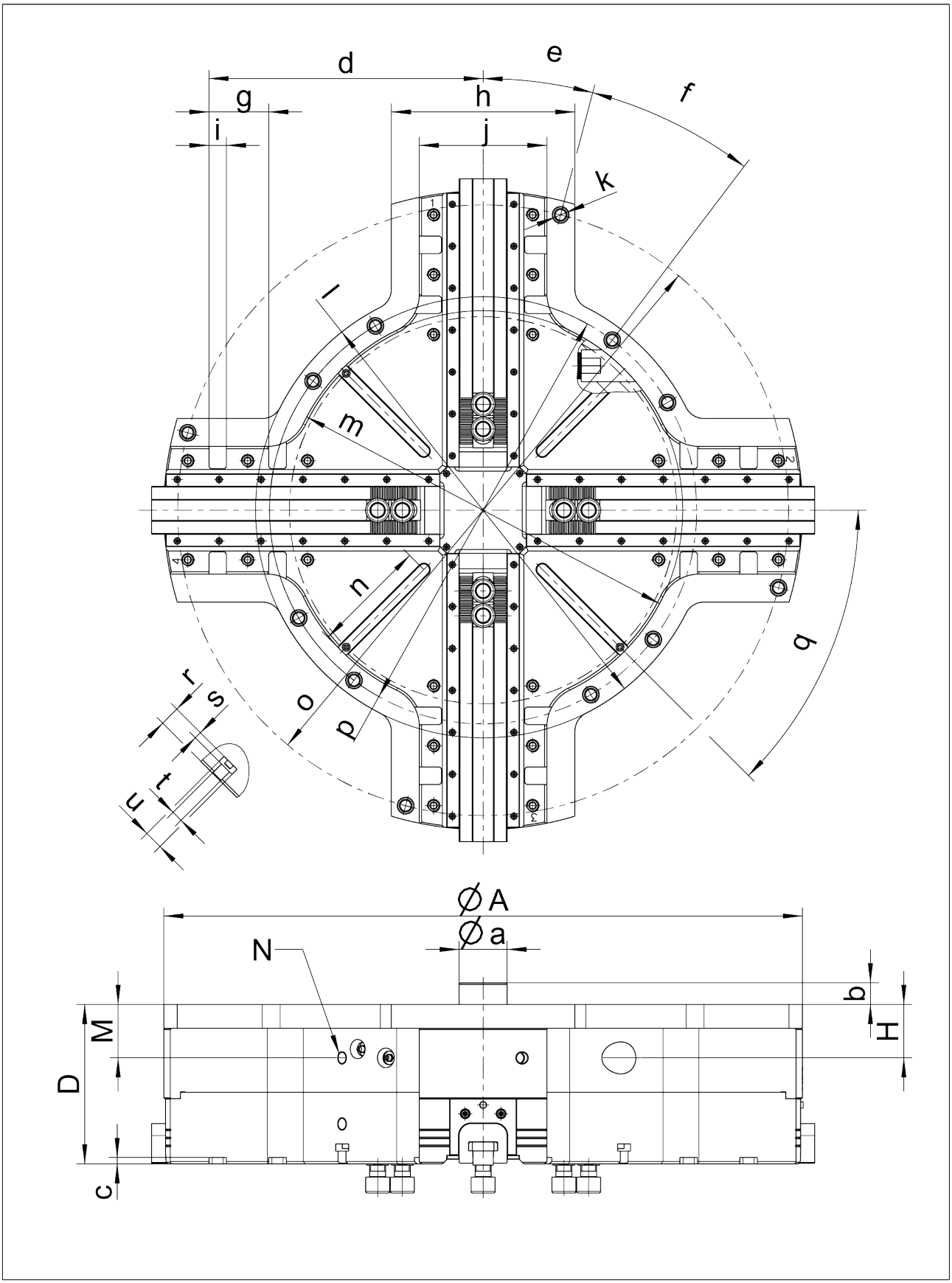
ROTA-M flex 2+2	260	315	400	500	630
Max. actuation torque [Nm]	120	120	200	250	250
Max. clamping force [kN]	100	100	150	180	180
Max. speed [rpm]	2700	2200	1500	1100	950
Overall stroke per jaw [mm]	9.5	9.5	14.5	17.8	17.8
Compensation per jaw [mm]	5.1	5.1	7.9	10	10
Weight with base jaws [kg]	41.7	62.9	127.8	227.2	307.4
Weight of base jaws [kg]	0.93	1.2	2.07	3.664	4.91
Mass moment of inertia [kgm²]	0.36	0.81	2.54	7.27	14.14
Centrifugal torque of base jaw [kgm] M_{cGB}	0.08	0.11	0.262	0.577	0.925
Spindle holder ISO 702-4	Nr. 8 (220 H6)	Nr. 11 (300 H6)	Nr. 15 (380 H6)	Nr. 15 (380 H6)	Nr. 15 (380 H6)
Operating temperature	+15 °C bis +60 °C				

ROTA-M flex 2+2	ML 630	ML 800	ML 1000	ML 1200
Max. actuation torque [Nm]	200	250	250	250
Max. clamping force [kN]	150	180	180	180
Max. speed [rpm]	900	800	700	600
Overall stroke per jaw [mm]	14.5	17.8	17.8	17.8
Compensation per jaw [mm]	7.9	10	10	10
Weight with base jaws [kg]	217	395	520	620
Weight of base jaws [kg]	4.92	6.688	8.603	10.518
Mass moment of inertia [kgm²]	8.29	23.06	45.34	75.08
Centrifugal torque of base jaw [kgm] M_{cGB}	0.909	1.538	1.979	2.419
Spindle holder ISO 702-4	Base plate			
Operating temperature	+15 °C bis +60 °C			

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

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Index	260 SV90° (60°)	315 SV90° (60°)	400 SV90° (60°)	500 SV90°	630 SV90°	ML 630 SV90°	ML 800 modul e 2	ML 1000 modul e 2	ML 1200 modul e 2
A [mm]	260	315	400	500	630	630	800	1000	1200
W [mm]	220	220	380	380	380	–	–	–	–
C [mm]	171.4	171.4	330.2	330.2	330.2	–	–	–	–
D [mm]	108.5	108.5	138	160	160	172.2	189.8	199.8	199.8
E [mm]	40	40	50	60	60	60	60	60	60
F1 H7 [mm]	17 (14)	17 (14)	21 (21)	25.5	25.5	25.5	25.5	25.5	25.5
F2 [mm]	M12	M12	M16	M20	M20	M20	M20	M20	M20
G [mm]	97	97	145	181	181	145	181	181	181
H [mm]	20.5	20.5	28	31	31	54	57	67	67
I [mm]	52.1	79.6	88.1	102.7	167.7	203.5	252.7	352.7	452.7
J [mm]	M16	M16	M24	M24	M24	–	–	–	–
K [mm]	28	28	31	31	31	–	–	–	–
L [mm]	5	5	6	6	6	–	–	–	–
M [mm]	63.5	63.5	83	94	94	54	57	67	67
N [mm] (trans- port)	M8	M8	M12	M16	M16	M12	M16	M16	M16
O [°]	45	45	45	45	45	–	–	–	–
P [mm]	20.5 (19.5)	20.5 (19.5)	25 (26)	26	26	26	27	27	27
Q [mm]	11 (10)	11 (10)	13.5 (13.5)	14.5	14.5	14.5	15.5	15.5	15.5
R1 min. [mm]	11.5 (13.1)	11.5 (13.1)	16.7 (14)	18.8	18.8	18.8	13.6	13.6	13.6
R2 min. [mm]	19.5 (25)	19.5 (25)	25 (30)	31	31	31	31	31	31
S max. [mm]	283.4	335.9	432.4	534.1	663.1	656.4	832.6	1032.1	1232.2
A/F [mm]	12	12	16	19	19	16	19	19	19
T [mm]	86.2	112.9	145.1	183	248	247.6	327	427	527
U [mm]	23.5 (21.5)	23.5 (21.5)	30.5	36.5	36.5	36.5	36.5	36.5	36.5
V min. [mm]	44.6	44.6	55.2	64.6	64.6	64.6	70.6	70.6	70.6

Index	260 SV90° (60°)	315 SV90° (60°)	400 SV90° (60°)	500 SV90°	630 SV90°	ML 630 SV90°	ML 800 module 2	ML 1000 module 2	ML 1200 module 2
V max . [mm]	54.1	54.1	69.7	82.4	82.4	82.4	88.4	88.4	88.4
W max. [mm]	77 (75.5)	95 (96.2)	133.2 (131.9)	169.2	234.2	233.7	313.1	413.1	513.1
X [mm]	3 (1.8)	3 (1.8)	2.5 (2.8)	3.3	3.3	2.5	2.3	2.3	2.3
Y [mm]	1.6	1.6	1.6	2	2	-0.8	-0.75	-0.75	-0.75
Z [°]	45	45	50	45	45	-	-	-	-

Index	ML 630 SV90°	ML 800 module 2	ML 1000 module 2	ML 1200 module 2
a	50 g6	60 g6	60 g6	60 g6
b	14	27	17	17
c	7	8	8	8
d	270	343.5	443.5	543.5
e	17.8	14.7	13	11.25
f	22.5	22.5	22.5	22.5
g	50	75	75	75
h	220	160	160	160
i	20 G7	22 G7	22 G7	22 G7
j	150	230	250	250
k	13	13.5	17.5	22
l	460	570	590	590
m	385	500	500	500
n	90	145	145	145
o	590	765	930	1050
p	430	535	550	550
q	45	45	45	45
r	25	25	25	25
s	9	9	9	9
t	14	14	14	14
u	23	23	23	23

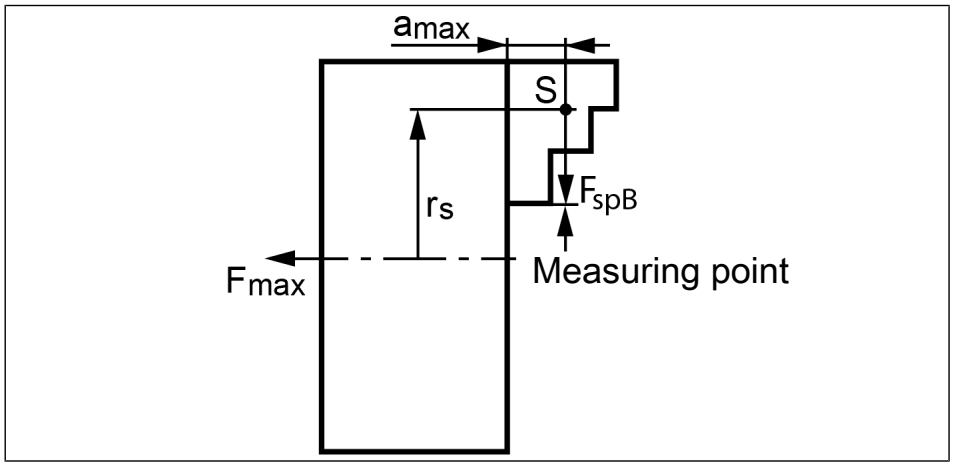
3.3 Clamping force / speed diagrams

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.

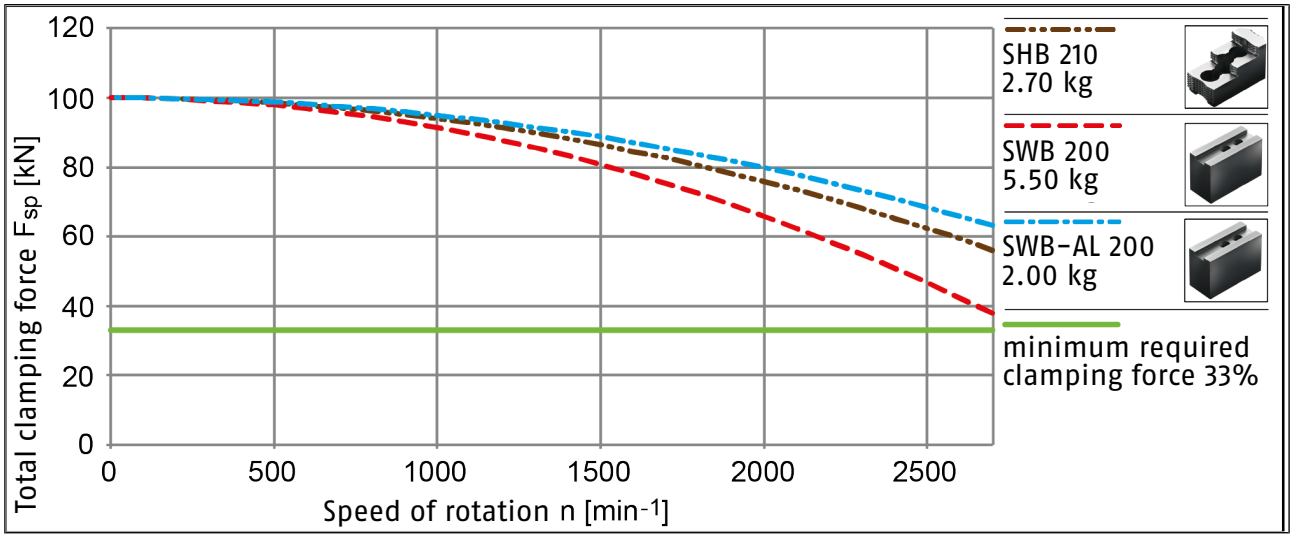
If one or more of these prerequisites is modified, the diagrams will no longer be valid.

Lathe chuck setup for clamping force/RPM graph

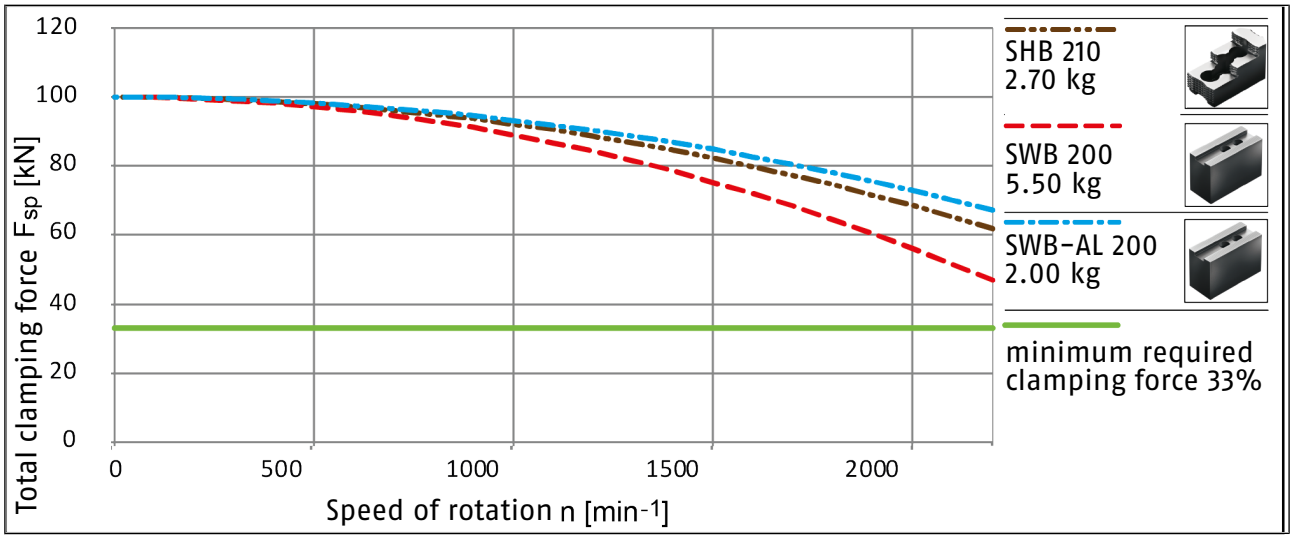


F_{spB}	Jaw clamping force	S	Center of gravity
r_s	Center of gravity radius	a_{max}	Max. jaw eccentricity of center of gravity in axial direction
F_{max}	Max. actuating force		

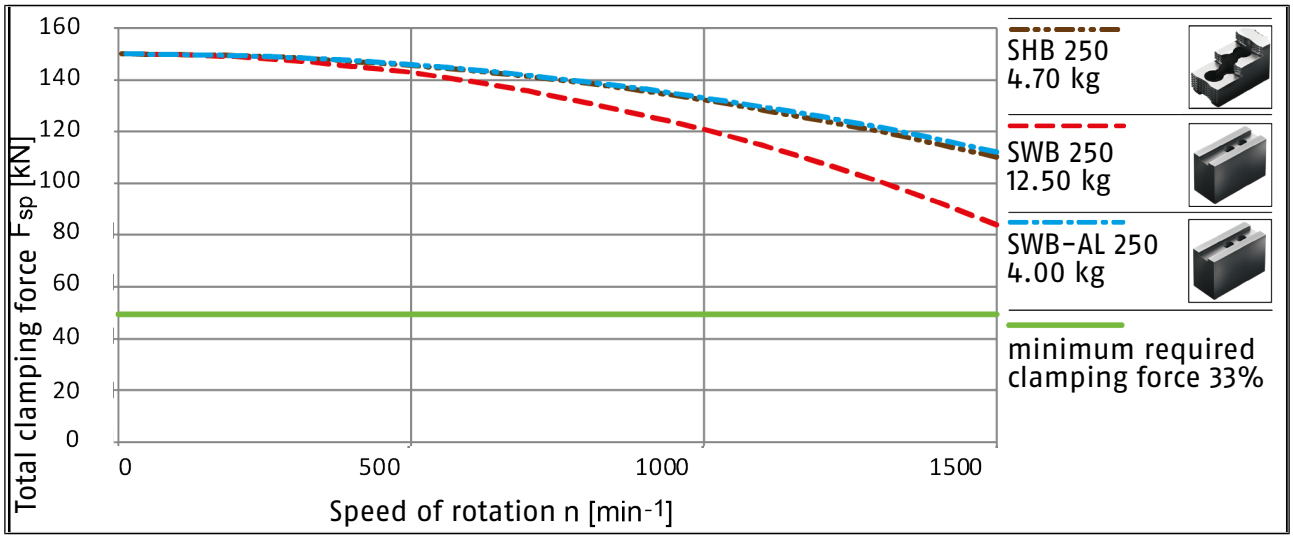
Clamping force/RPM graph for ROTA-M flex 2+2 260



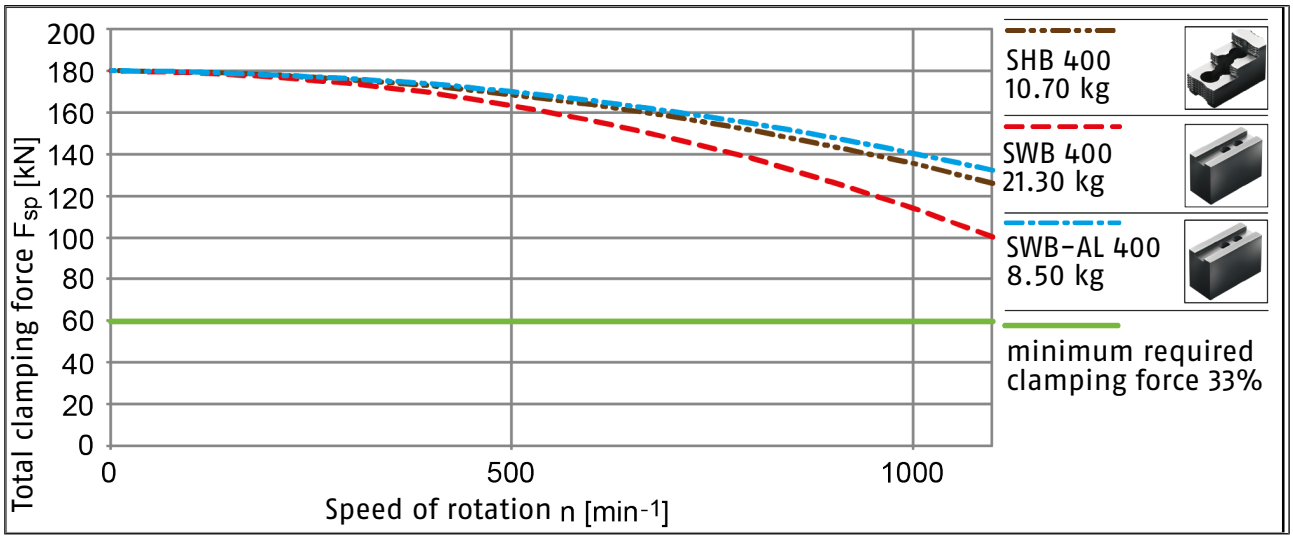
Clamping force/RPM graph for ROTA-M flex 2+2 315



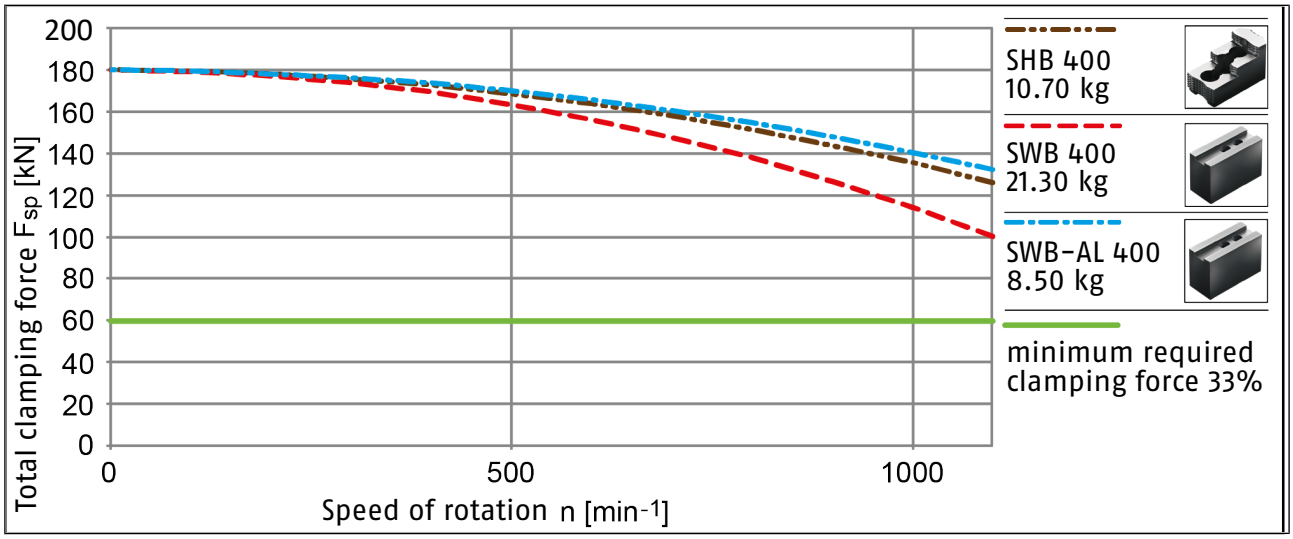
Clamping force/RPM graph for ROTA-M flex 2+2 400



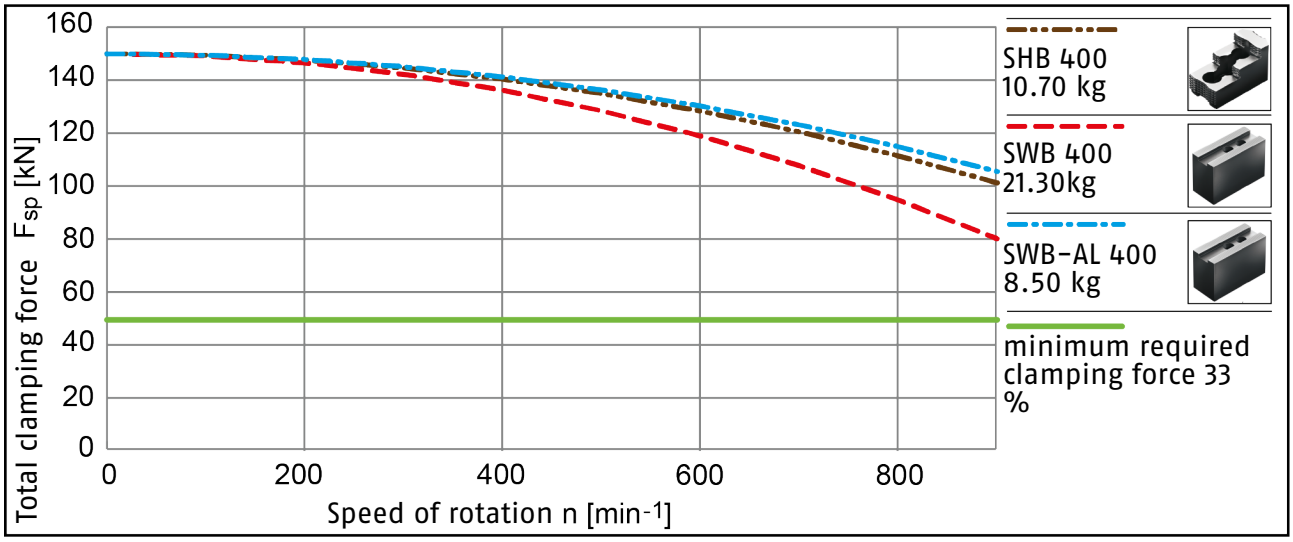
Clamping force/RPM graph for ROTA-M flex 2+2 500



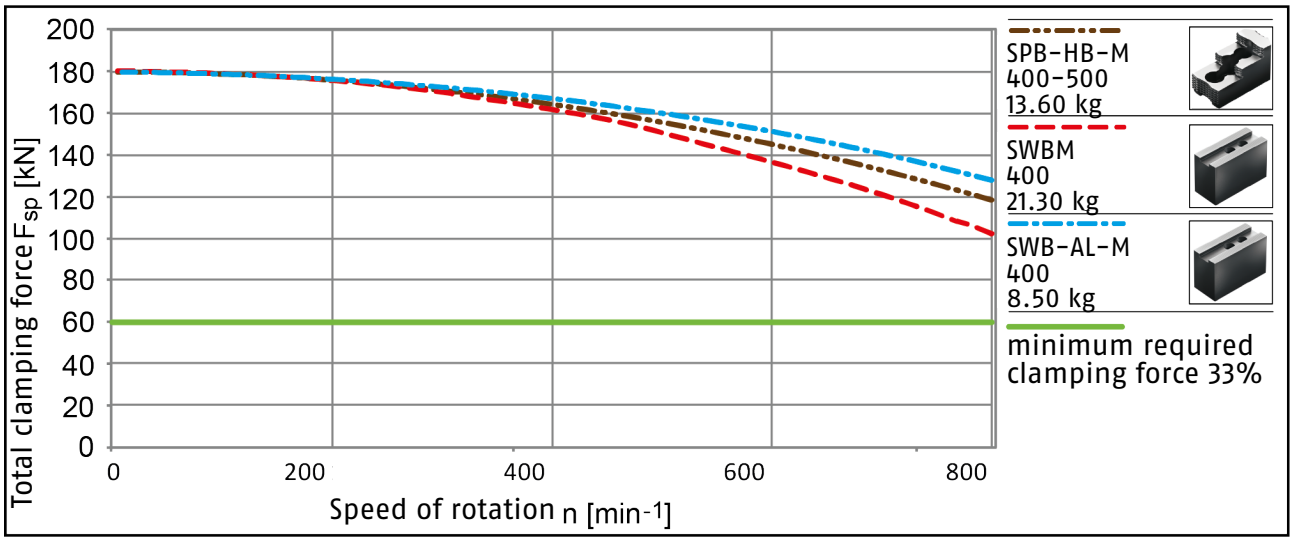
Clamping force/RPM graph for ROTA-M flex 2+2 630



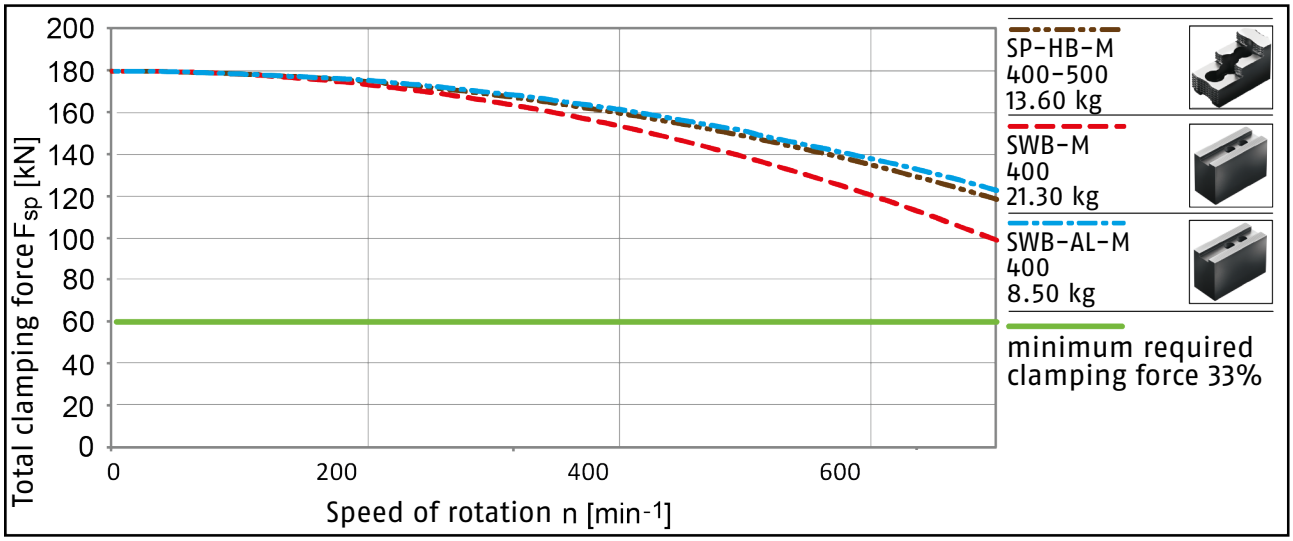
Clamping force/RPM graph for ROTA-ML flex 2+2 630



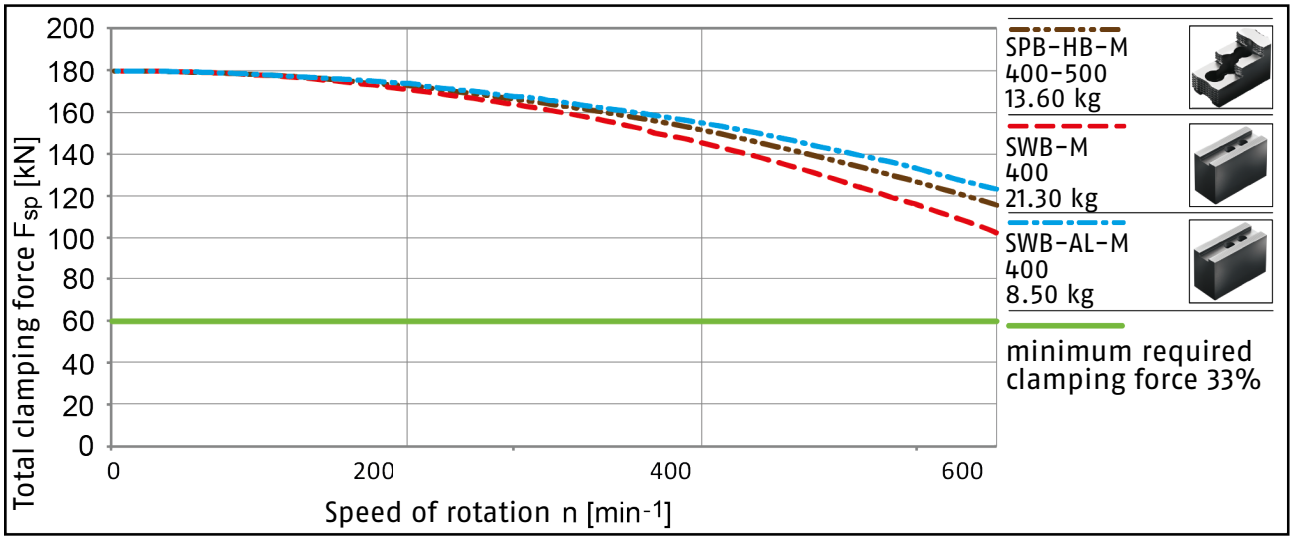
Clamping force/RPM graph for ROTA-ML flex 2+2 800



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



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



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 × 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}**.

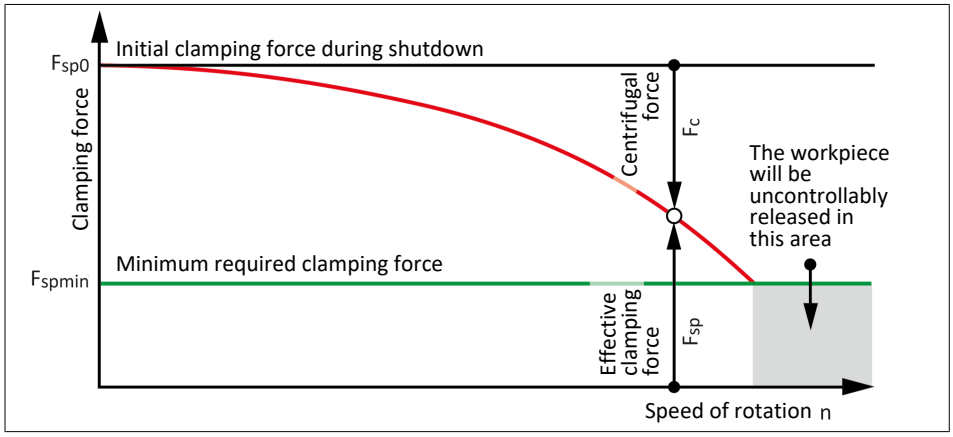
$$F_{sp} = F_{sp0} \mp F_c \text{ [N]}$$

(–) 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: **$S_z \geq 1.5$.**

$F_{sp} = F_{spz} \cdot S_z$ [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 [🗋 18]

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

$M_C = m_B \cdot r_S$ [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 [🗋 18]. The centrifugal torque of the top jaws M_{cAB} is calculated as per:

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

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

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

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

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:

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

3.4.3 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:

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

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 [🗋 18]).

This calculated RPM may be used.

3.5 Grades of Accuracy

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

3.6 Permissible imbalance DIN ISO 21940-11

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

4 Torques per screw

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

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

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 and/or machine table ▸ 5.2 [🗋 33]
2. Lathe chuck assembly
   - ⇨ Assembly of the lathe chuck (with cylindrical recess) ▸ 5.3.1 [🗋 35]
     if required:
   - ⇨ Assembly preparation for lathe chuck with reduction or expansion adapter plate ▸ 5.3.2 [🗋 36] or
   - ⇨ Assembly preparation for the lathe chuck with direct mounting ▸ 5.3.3 [🗋 36]
   - ⇨ Assembly preparation for lathe chuck with base plate on machine table (from size 800) ▸ 5.3.4 [🗋 36]
3. Performing a functional check ▸ 6.2 [🗋 37]

5.2 Testing the spindle nose and/or machine table

Spindle nose

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

The concentricity error in the centering of the mount must not exceed 0.005 mm and the maximum axial run-out error in the contact surfaces must not exceed 0.005 mm. The flat surface of the spindle must also be checked for flatness using a straight edge.

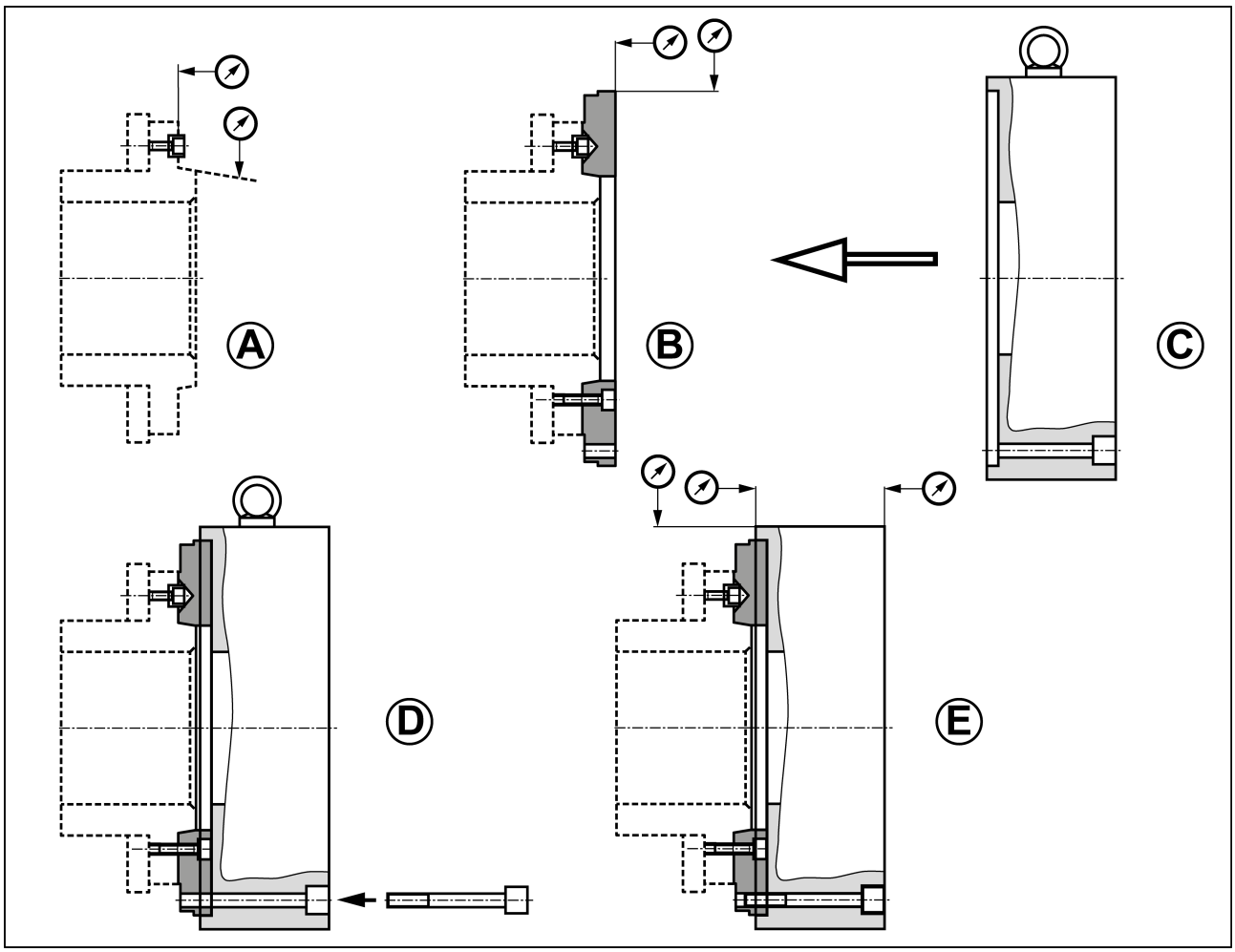
Make sure that the surface area of the flat surface is deburred at the bore holes and is clean.

Machine table

Check the machine table and ready-machined intermediate flange for radial and axial runout. The permissible limit is 0.005 mm as per DIN 6386-1 and ISO 3089.

The contact surface must be chamfered and clean. Rectify any damage of the machine table contact surfaces.

5.3 Assembly



Lathe chuck assembly

5.3.1 Assembly of the lathe chuck (with cylindrical recess)

NOTE

If the interface of the machine spindle and lathe chuck is identical, assembly is carried out without assembly preparation.

If the interface of the machine spindle deviates from the interface of the lathe chuck, a connecting flange must be installed before assembly. See ▸ 5.3.2 [🗋 36] or ▸ 5.3.3 [🗋 36].

CAUTION

Use a crane to install the chuck. Fasten the lathe chuck to the eye bolt provided for this purpose (see Fig. "Lathe chuck assembly" – C ▸ 5.3 [🗋 34]).

The eye bolt must be removed prior to commissioning.

The eye bolt is included in the scope of delivery.

CAUTION

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

Lathe chuck assembly

1. Remove the cylindrical screws for the top jaws together with the T-nuts (item 41).
2. Screw the eye bolt into the lathe chuck.
3. Lift the lathe chuck with suitable lifting equipment in alignment with the spindle center.
4. Insert and slightly tighten the mounting screws.
5. Check the lathe chuck for radial and axial run-out accuracy (see Fig. "Lathe chuck assembly" – E ▸ 5.3 [🗋 34]) and, if necessary, align at the outer diameter with light taps using a hammer.
6. Tighten the mounting screws (item 30) with a torque wrench. Observe the maximum admissible torques ▸ 4 [🗋 32].
7. Remove the eye bolt from the lathe chuck.
8. Check the lathe chuck again for radial and axial run-out accuracy (see Fig. "Lathe chuck assembly" – E ▸ 5.3 [🗋 34]).
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.

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

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

1. Before assembly of the flange, remove any dirt or chips from the machine spindle and from the centering mount and contact surface of the flange.
2. A flange produced by the user must be finished on the machine spindle and balanced before the lathe chuck is mounted.
3. After assembly, ensure that the flange is in contact with the entire surface.
4. Check the concentricity and axial run-out accuracy of the flange (see Fig. "Lathe chuck assembly" – B ▸ Link Assembly [🗋 34]).
5. The lathe chuck assembly follows ▸ 5.3.1 [🗋 35].

5.3.3 Assembly preparation for lathe chuck with direct mounting

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

1. Before mounting the direct mount on the cylindrical recess of the lathe chuck, remove dirt or chips from the centering mount and the contact surface of the direct mount.
2. Tighten the direct mount slightly on the lathe chuck with the supplied fixing screws.
3. The lathe chuck assembly follows ▸ 5.3.1 [🗋 35].

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

Insert the T-nuts (item 76) into the grooves provided in the machine table. Then lift the toolholder and supplied eye bolts onto the machine table. Position via the centering pins (item 64). Align the chuck and then fasten using the screws (item 77) and the T-nuts. To protect the counterbore holes against contamination, fit the caps (item 78).

⚠ WARNING

Risk of injury due to the mounting screw brass cover caps (item 78) being thrown out during turning applications on the chuck.

The mounting screw brass cover caps (item 78) are only allowed to be used for stationary operation of the chuck.

6 Function

6.1 Function and handling

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

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

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

⚠ WARNING

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

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

- Refer to the "Technical data" chapter!

6.2 Function test before use

Functional test

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

Two important points are:

- **Clamping force!** At max. actuation moment, the clamping force specified for the lathe chuck must be reached. If this is not the case, the lathe chuck needs to be lubricated. ▸ 7 [🗋 44]

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

Speed of rotation

⚠ DANGER

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

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

6.3 Replacement or renewal of jaws

Changing the top jaws

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

Tighten the jaw mounting screws (screw quality 12.9) to the specified torque. ▸ 4 [🗋 32]

CAUTION

Tighten the mounting screws of the top jaws with a torque wrench.
Never tighten the Allen key with an extension pipe or by hitting it with a hammer!

Turning chuck jaws

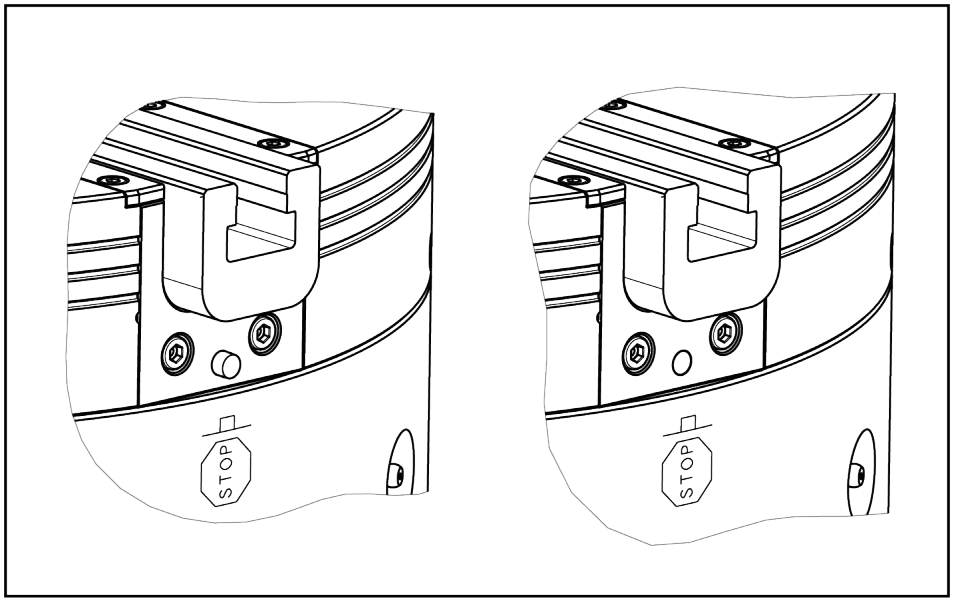
For maximum clamping repeat accuracy, the chuck jaws must be turned or ground in the lathe chuck under clamping pressure.

CAUTION

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

6.4 Clamping the workpiece

1. Determination of the required actuation moment is based on the clamping force calculation. ▸ 3.4 [🗋 26]
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.

6.5 Compensation / workpiece dimensions

ROTA-M flex 2+2	260	315	400	500	ML 630	ML 800-1200
Overall stroke per jaw [mm]	9.5	9.5	14.5	17.8	14.5	17.8
Compensation per jaw [mm]	5.1	5.1	7.9	10	7.9	10

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.

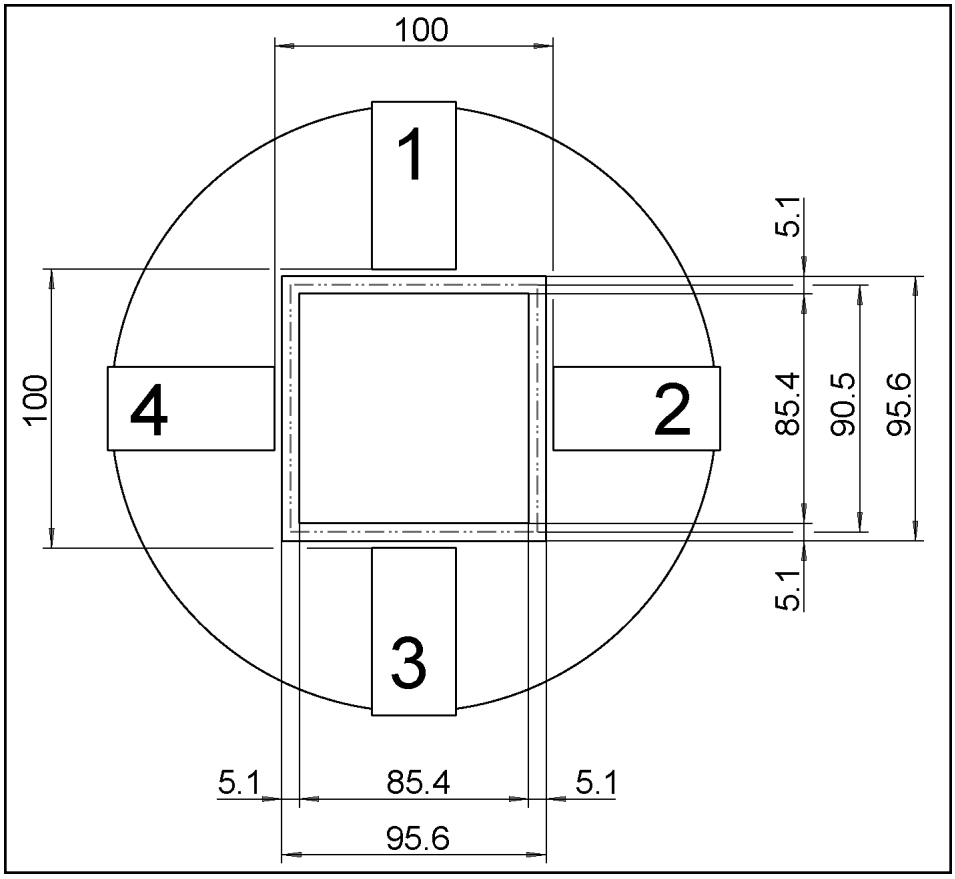
Using the compensation function, the lathe chuck can accommodate workpieces that have the dimension **X +/- compensation per jaw** when their side lengths are placed vertically next to each other

Example: ROTA-M flex 2+2 315

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

Center of overall jaw stroke: 100 mm – 9.5 mm = 90.5 mm.

Possible workpiece dimension: 90.5 mm +/- 5.1 mm



Compensation

6.6 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.

6.6.1 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 [🗋 32]

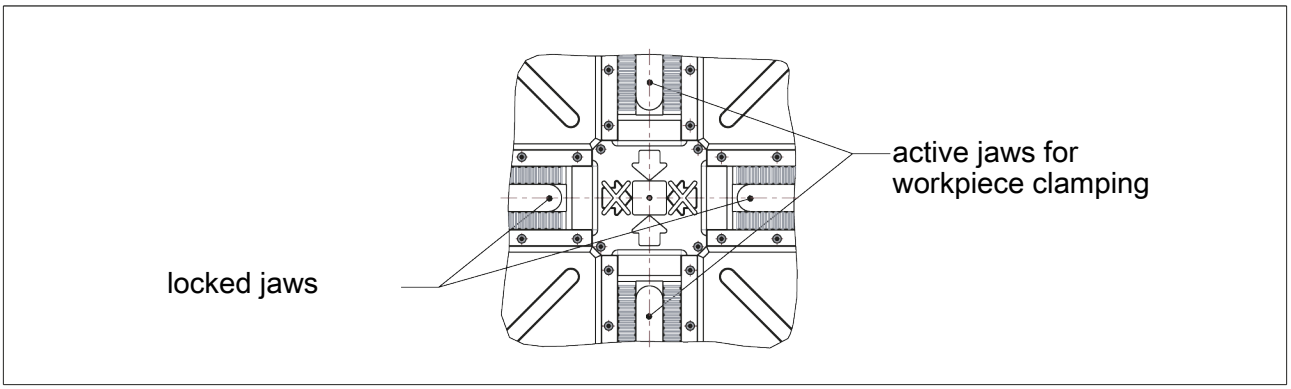
6.7 Locking cover

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
260 + 315	1471984
400	1471897
500 – 1200	1471989

6.7.1 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 (consisting of items 61, 62, 72, 73) 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.

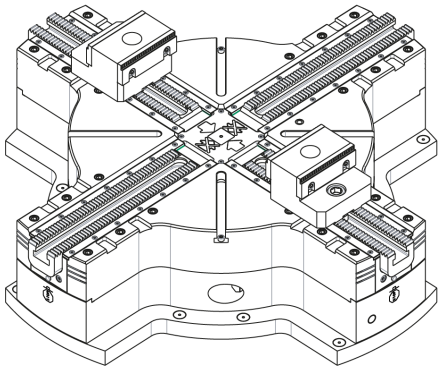
⚠ WARNING

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.

6.8 Possibilities for clamping structure

6.8.1 Size 260 – 1200

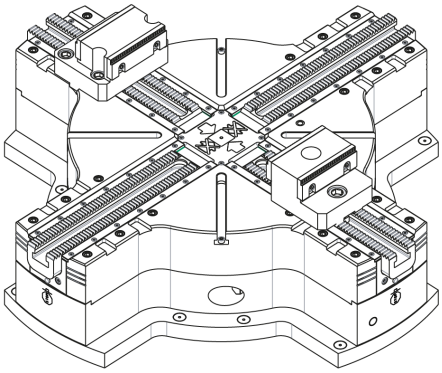


Centric clamping vises (2 stop jaws or jaws):
Each (stop) jaw presses on the workpiece with 25% of the clamping force generated by the actuation moment.

- 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!

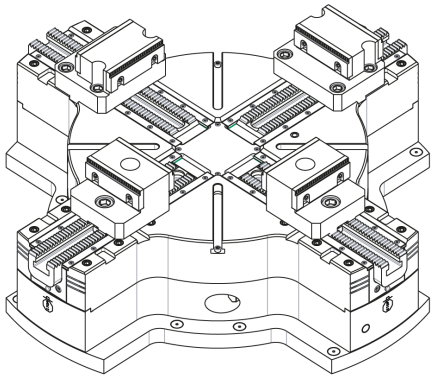
6.8.2 Possibilities for clamping structure size ML 630 – ML 1200



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.

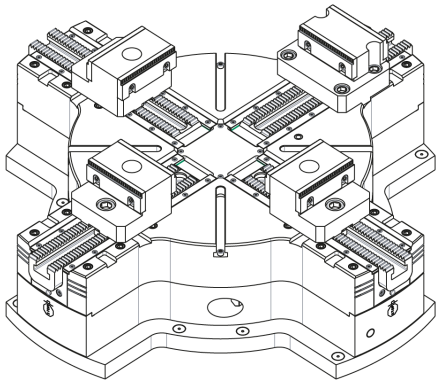
- max. actuation moment: 0.5 x max. lathe chuck value
- max. clamping force on the workpiece: 0.5 x max. clamping force specifications of lathe chuck

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

7 Maintenance

7.1 Lubrication

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

The lathe chuck must be lubricated in the open position.

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

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).

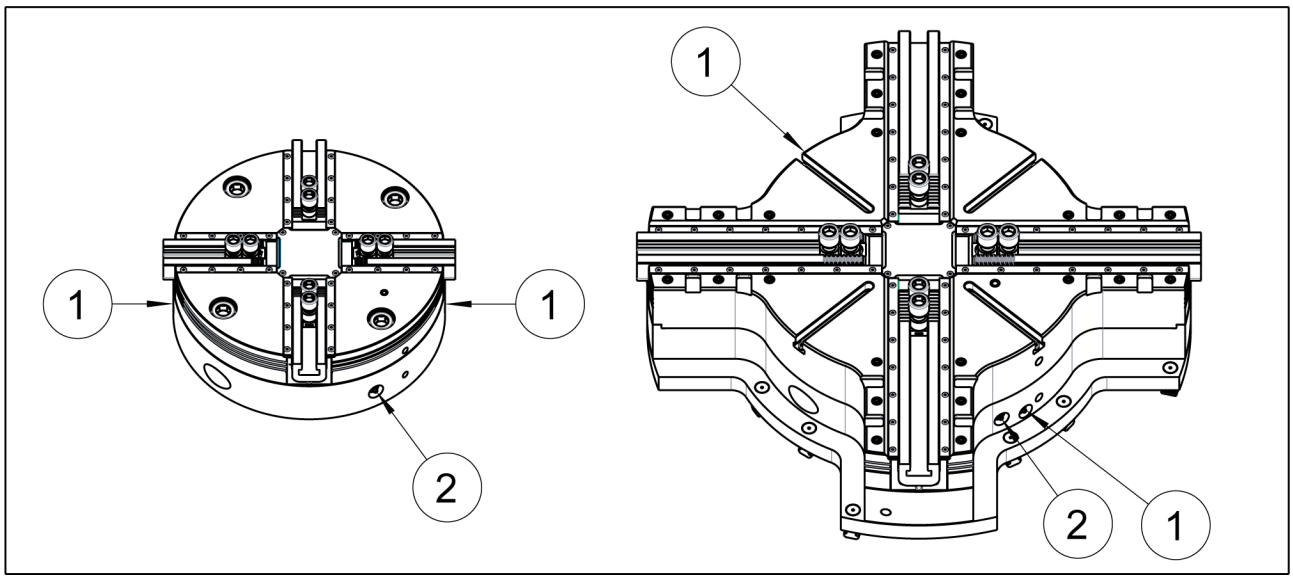
⚠ CAUTION

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

- Wear protective gloves.

Number of grease press strokes

Chuck size / greasing area	260 / 315	400	500 / (ML) 630	ML 800 / ML 1000 / ML 1200
Jaws (1)	6	10	15	20
Spindle (2)	4	6	8	8



7.2 Maintenance intervals

Lubricating the greasing areas:

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

7.3 Disassembling and assembling the chuck

The item numbers specified for the corresponding individual components relate to the chapter Drawings, ▸ 12 [🗋 56].

The lathe chuck can only be disassembled once it has been removed. ▸ 5 [🗋 33]

1. Loosen screws of the T-nuts and lift the lathe chuck from the machine spindle with lifting equipment.
2. **up to size 630:**
   a. Loosen screws (item 30) and lift the lathe chuck from the machine spindle with lifting equipment
   b. Place the lathe chuck on the flat surface of the chuck body (item 1)
   from size ML 630:
   a. Remove the cover (item 78) and loosen the screws (item 77)
   b. Lift the lathe chuck from the machine table with lifting equipment
   c. Place the lathe chuck on the flat surface of the chuck body (item 1)
   d. Loosen screws (item 81) and remove centering pin (item 64)
   e. Loosen screws (item 73 and item 74) and lift the base plate (item 60) with the lifting equipment
   f. Loosen screws (item 75) and remove the centering disk (item 63) from the base plate (item 60)
   g. Loosen screw (item 79) and remove the T-nut (item 80)
   h. Loosen screw (item 30)
3. Remove screws (items 31, 32). Then first remove the screws (item 42)

4. Remove the mount (item 7) from the lathe chuck
5. Drive cylindrical pin (item 35) out of the mount (item 7) using a punch, remove O-ring (item 36)
6. Remove the spindle nut (item 9) using the assembly tool (item 49)
7. Turn the spindle (item 8) out of slide (item 16) and remove it from the mount (item 7), also remove the seat of bearing (item 29)
8. Remove screws (item 45) and washer (item 46)
9. Remove the slide (item 17) from the mount (item 7)
10. Remove screw (item 44) (in direction of jaw no. 4) from the chuck body
11. The drive ring assembly, consisting of items 11, 12 and 13, can now be lifted out of the chuck body (item 1)
12. Remove screw (item 43) from the drive ring assembly
13. Remove sliding block (item 20) from the middle drive ring (item 12)
14. Pull off the lower drive ring (item 13), remove the sleeves (item 14) and two connecting members (item 6) from the lower drive ring (item 13)
15. Pull off the four locking bolts (item 15)
16. Remove the middle drive ring (item 12)
17. Remove the two connecting members (item 6) from the upper drive ring (item 12)
18. Remove the wedge bars (item 5) from the chuck body (item 1)
19. Remove the indicator pin (item 19) and springs (item 38) from the chuck body (item 1)
20. Remove screws (item 34) and pull off the cover plates (items 23 and 24)
21. Turn over the chuck body (item 1)
22. Remove screws (item 33) and then remove the cover (item 3) with the O-ring (item 37) and wipers (items 21 and 22)
23. Remove the O-ring sections (item 26) and sealing elements (item 25)
24. Remove the base jaws (item 2)
25. Remove the bolts (item 18)

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.

7.4 Assembling the lathe chuck

1. Place the chuck body (item 1) with the guideways facing upwards
2. Slide the base jaws (item 2) into the guideways in the chuck body (item 1)
   CAUTION: The base jaws are numbered; install according to the numbering on the chuck body!
3. Wrap the sealing element (item 25) snugly around the projecting base jaws (item 2) and place in the gap between the chuck body and base jaw.
4. Position the O-ring sections (item 26) centrally in the groove of the cover plates (items 23 and 24) and slide them into the chuck body (item 1) from below. Make sure that the sealing element (item 25) is also incorporated into the groove in the cover plate (items 23 and 24).
   CAUTION: Use the cover plates (item 23) on guideways 1 and 4.
5. Fix the cover plates (items 23 and 24) in place with screws (item 34)
6. Press the projecting O-ring sections (item 26) into the gap between the chuck body (item 1) and the sealing element (item 25)
7. Secure the wipers (items 21 and 22) with screws (item 33) beside the guideways.
8. Press the O-ring (item 37) into the groove in the cover (item 3) and fasten with screws (item 33) in the middle of the chuck body (item 1).
9. Slide the base jaws (item 2) into the outer position, turn over the chuck body (item 1).
10. Insert two indicator pins (item 19) and springs (item 38) respectively into the holes below the guideway in the chuck body (item 1)
11. Insert the bolts (item 18) into the holes in the chuck body (item 1)
12. Press the indicator pins (item 19) outwards and secure the position with cylindrical pins (item 48)
13. From the view of the lathe chuck center, insert the wedge bars (item 5) into the chuck body in the right end position. The marking must face outwards. Make sure that the serration interlaces
    CAUTION: The wedge bars are numbered; install according to the numbering on the chuck body!

14. Place connecting member (item 6) on the bar of the wedge bars (item 5)
15. Place the upper drive ring (item 11) on the shaft in the lathe chuck center, thread the connecting members (item 6) into the holes. The marking must be visible and point in the direction of guideway 1
16. Remove the cylindrical pins (item 48) on guideway 1
17. Accurately place the middle drive ring (item 12) on the upper drive ring (item 11); the marking must be visible and point in the direction of guideway 1
18. Place the sliding block (item 20) in the groove of the middle drive ring (item 12); the marking must be visible and point outwards
19. Place the lower drive ring (item 13) on the middle drive ring (item 12) and thread the connecting members (item 6) into the holes. The marking must be visible and point in the direction of guideway 1
20. Remove the cylindrical pins (item 48) on guideway 2
21. Insert the sleeves (item 14) into the lower drive ring (item 13), the chamfers must point downwards
22. Insert the locking bolts (item 15) into the holes of the drive rings
23. Screw in screw (item 44) (in direction of jaw no. 4) through the drive ring assembly in the chuck body
24. Screw in screw (item 43) (in direction of jaw no. 2) into upper drive ring (item 11)
25. Place the seat of bearing (item 29) in the mount (item 7).
26. Place the slide (item 16) in the pocket, the pin must face the middle axis
27. Screw the spindle (item 8) from the outside through the hole in the mount (item 7) into the slide (item 16) until the end face of the spindle is at least in contact with the base of the circular pocket of the seat of bearing
28. Turn the spindle nut (item 9) up to the stop in the mount (item 7) using the assembly tool (item 49).
29. Turn back the spindle nut (item 9) using the assembly tool (item 49) until the cylindrical pin (item 35) can be inserted into the hole of the mount (item 7)
30. Place the slide (item 17) in the pocket, the pin must face the middle axis

31. Secure with screws (item 45) and washers (item 46) in mount (item 7). Secure screws and slide (item 17) in the pocket
32. Place the mounting assembly on the chuck body assembly. Observe the following points:
    a. Thread the shaft of the mount (item 7) into the drive rings
    b. Thread the pin of the slider (item 16) into the groove of the center drive ring (item 12)
    c. Thread the pin of the slider (item 17) into the bore of the sliding block (item 20)
33. Fasten the mount (item 7) to the chuck body with screws (item 42). Grease the fitting diameter. First insert all screws (item 42) without torque, then tighten them with torque.
34. Fasten the mount (item 7) to the chuck body with screws (items 31 and 32)
35. Turn over the lathe chuck
36. Loosen the screws (item 34) so that the cover plate (items 23 and 24) comes in contact with the mount (item 7), tighten screws (item 34)

37. **from size ML 630:**
38. Fasten the mount (item 7) to the chuck body (item 1) with screws (item 30)
39. Fasten centering disk (item 63) with screw (item 75) to the base plate (item 60)
40. Screw T-nut (item 80) into the base plate with screw (item 79)
41. Place the assembled base plate (item 60) on the mount (item 7). Carry out centering via the centering disk (item 63) and alignment via the T-nut (item 80)
42. Screw in screw (item 73) and (item 74) into the base plate (item 60)
43. Place the centering pin (item 64) in the center hole of the base plate (item 60) and fasten with screws (item 81)

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.

8 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

9 Storage

If the chuck is not used for a longer period of time, this must be stored in a dry and protected place, taking into account the ambient conditions ▸ 2.6 [🗋 10]. If possible, it should be stored in the original packaging.

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

10 Disposal

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

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

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

11 Spare parts

When ordering spare parts, it is imperative to state the type, size, and above all the serial number of the lathe chuck.

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
1	Chuck body	1
2	Base jaws	4
3	Cover	1
5	Wedge bar	4
6	Connecting member	4
7	Mount	1
8	Spindle	1
9	Spindle nut	1
11	Upper drive ring	1
12	Middle drive ring	1
13	Lower drive ring	1
14	Sleeve	4
15	Locking bolt	4
16	Slide with thread	1
17	Slide without thread	1
18	Bolt	4
19	Indicator pin	2
20	Sliding block	1
21	Right wiper	4
22	Left wiper	4
23	Wiper plate with hole	2
24	Wiper plate without hole	2
25	Sealing element	4
26	O-ring section	4
27	Sealing insert	4
29	Seat of bearing	1
30	Screw	4
31	Screw	1
32	Screw	3

Item	Designation	Quantity
33	Screw (260 + 315 / 400 + 500 / 630 / ML 630 / ML 800 / ML 1000 / ML 1200)	28 / 36 / 44 / 52 / 60 / 68 / 76
34	Screw	8
35	Cylindrical pin	1
36	O-ring	1
37	O-ring	2
38	Compression spring	2
41	T-nut (SV90° / SV60°)	8 / 4
42	Screw	1
43	Screw	1
44	Screw	1
45	Screw	2
46	Washer	2
47	Actuation key / from ML 630: Wrench	1
48	Cylindrical pin	2
49	Assembly key	1
50	Eye bolt	1
61	Plate	1
62	Locking cover	1
72	Screw	1

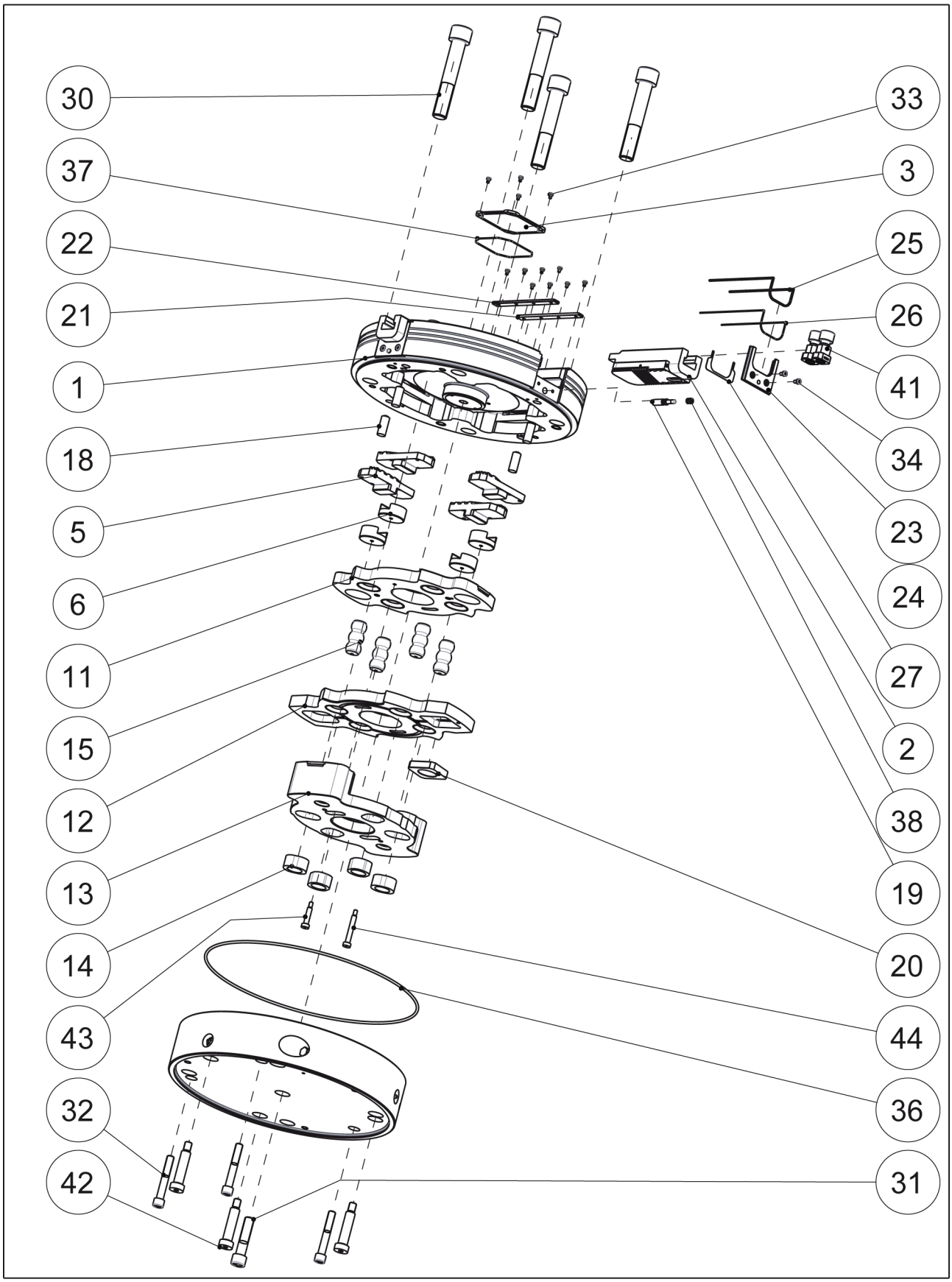
Extended parts list ML lathe chuck

Item	Designation	Quantity
60	Base plate	1
63	Centering disk	1
64	Centering pin	1
65	Insert	4
70	Set-screw (630 / 800 / 1000 / 1200)	24 / 24 / 32 / 40
71	Screw	4
73	Screw	16
74	Screw	6
75	Screw	4
76	T-slot nut (630 / 800 / 1000 / 1200)	12 / 12 / 12 / 16
77	Screw (630 / 800 / 1000 / 1200	12 / 12 / 12 / 16
78	Cover (630 / 800 / 1000 / 1200)	12 / 12 / 12 / 16
79	Screw	1
80	T-nut	1
81	Screw	2
82	Adapter	1

Accessories and replacement orders at:

H.-D. SCHUNK GmbH & Co.
Spanntechnik KG
Lothringer Str. 23
D-88512 Mengen, Germany
Tel. +49-7572-7614-1300
Fax +49-7572-7614-1039
cmm@de.schunk.com
schunk.com

12 Drawing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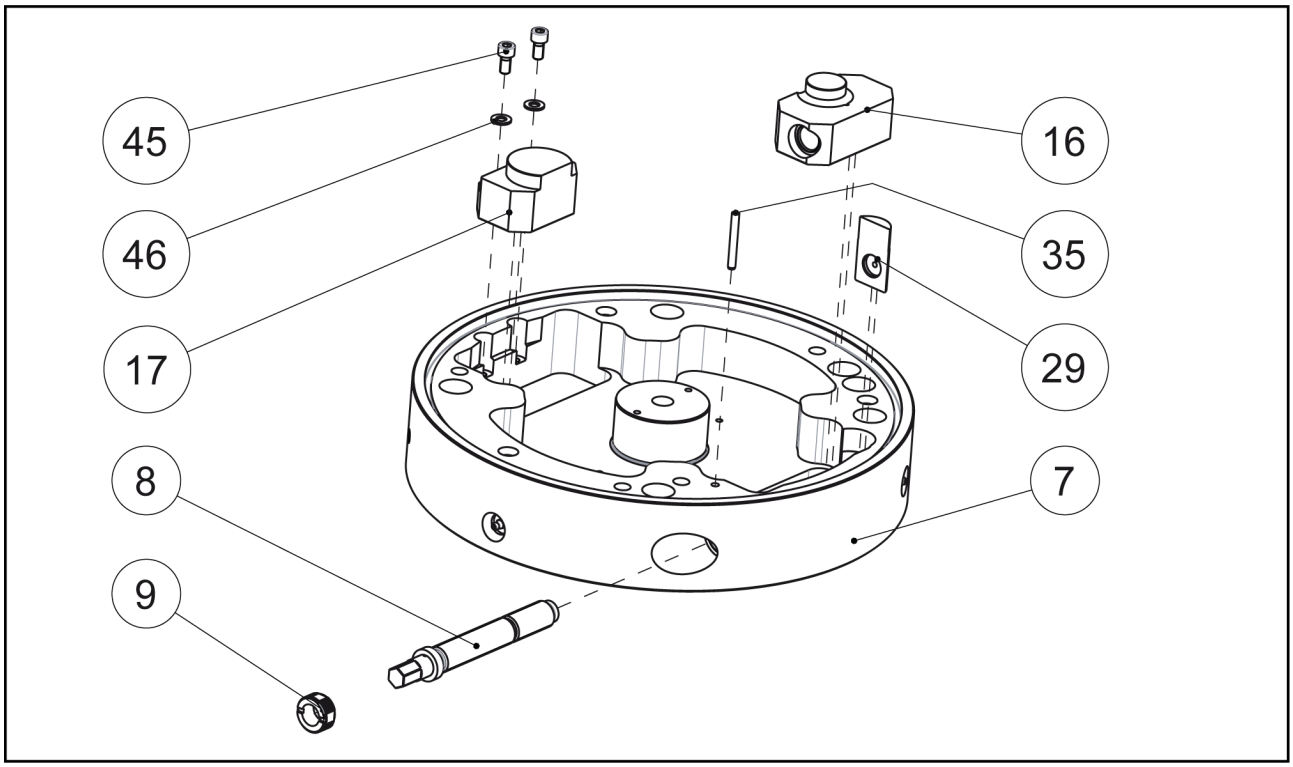
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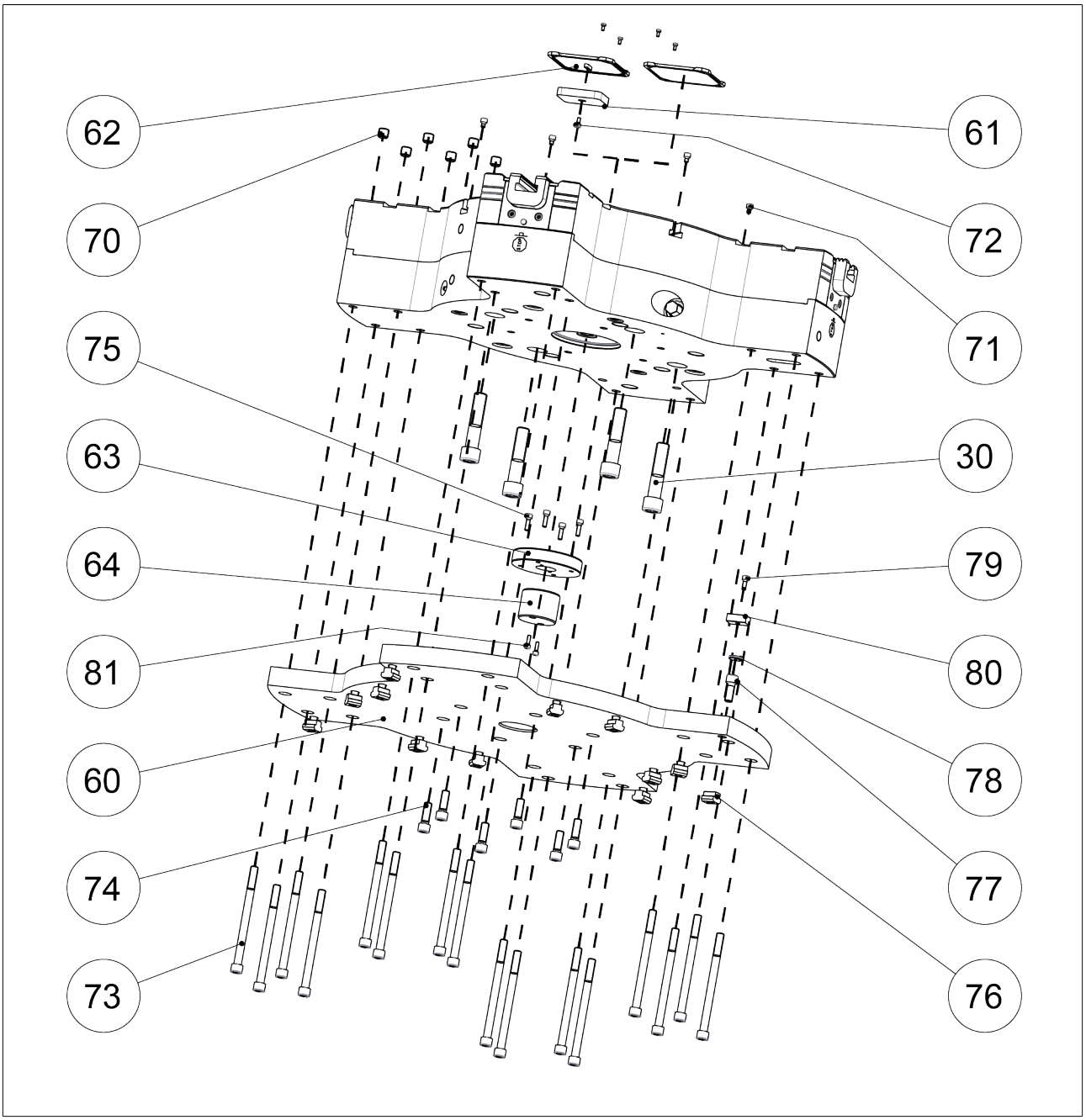
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Manufacturer certificate

Manufacturer / Distributor:	Heinz-Dieter SCHUNK GmbH & Co. Spanntechnik KG. Lothringer Str. 23 D-88512 Mengen
Product:	**Lathe chucks**
Description:	**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, 25. Apr. 2023

i. V. Philipp Schräder

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