OPTIMUM®
MASCHINEN - GERMANY

Operating manual

Version 1.0.6

Lathe

OPTI turn® TM 3310

Part no. 3403020
3403025

EN

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Preface

Dear customer,

Thank you very much for purchasing a product made by OPTIMUM.

OPTIMUM metal working machines offer a maximum of quality, technically optimum solutions and convince by an outstanding price performance ratio. Continuous enhancements and product innovations guarantee state-of-the-art products and safety at any time.

Before commissioning the machine please thoroughly read these operating instructions and get familiar with the machine. Please also make sure that all persons operating the machine have read and understood the operating instructions beforehand.
Keep these operating instructions in a safe place nearby the machine.

Information

The operating instructions include indications for safety-relevant and proper installation, operation and maintenance of the machine. The continuous observance of all notes included in this manual guarantee the safety of persons and of the machine.

The manual determines the intended use of the machine and includes all necessary information for its economic operation as well as its long service life.

In the paragraph "Maintenance" all maintenance works and functional tests are described which the operator must perform in regular intervals.

The illustration and information included in the present manual can possibly deviate from the current state of construction of your machine. Being the manufacturer we are continuously seeking for improvements and renewal of the products. Therefore, changes might be performed without prior notice. The illustrations of the machine may be different from the illustrations in these instructions with regard to a few details. However, this does not have any influence on the operability of the machine.
Therefore, no claims may be derived from the indications and descriptions. Changes and errors are reserved!

Your suggestion with regard to these operating instructions are an important contribution to optimising our work which we offer to our customers. For any questions or suggestions for improvement, please do not hesitate to contact our service department.

If you have any further questions after reading these operating instructions and you are not able to solve your problem with a help of these operating instructions, please contact your specialised dealer or directly the company OPTIMUM.

Optimum Maschinen Germany GmbH
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1 Safety

Glossary of symbols

►	provides further instructions
→	calls on you to act
O	listings

This part of the operating instructions

- O explains the meaning and use of the warning notes included in these operating instructions,
- O defines the intended use of the lathe,
- O defines the target group of the lathe,
- O points out the dangers that might arise for you or others if these instructions are not observed,
- O informs you about how to avoid dangers.

In addition to these operating instructions, please observe

- O the applicable laws and regulations,
- O the statutory provisions for accident prevention,
- O the prohibition, warning and mandatory signs as well as the warning notes on the lathe.

European standards must be observed during the installation, operation, maintenance and repair of the lathe.

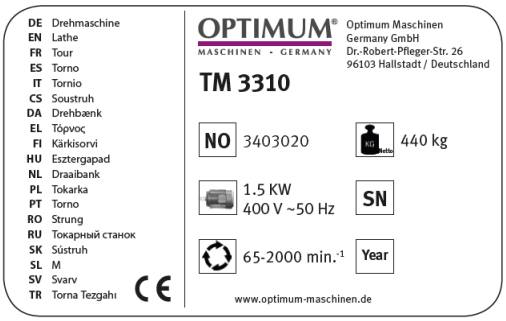
If European standards have not yet been incorporated in the national legislation of the country of destination, the specific applicable regulations of each country must be observed.

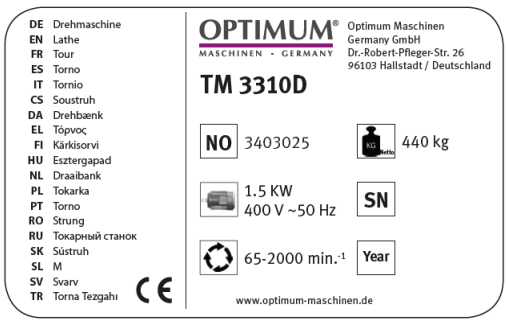
If applicable, necessary measures must be taken to comply with the country-specific regulations before commissioning the lathe.

Always keep this documentation close to the lathe.

If you would like to order another operating manual for your machine, please indicate the serial number of your machine. The serial number is located on the type plate.

1.1 Rating plate





1.1.1 Machine variants

- O TM3310 - manual lathe without digital readout.
- O TM3310D - manual lathe with digital readout.

INFORMATION

If you are unable to rectify an issue using these operating instructions, please contact us for advice:

Optimum Maschinen Germany GmbH
Dr.-Robert-Pfleger-Str. 26
D- 96103 Hallstadt, Germany
Email: info@optimum-maschinen.de

1.2 Safety instructions (warning notes)

1.2.1 Classification of risks

We classify the safety warnings into different categories. The table below gives an overview of the classification of symbols (ideogram) and the warning signs for each specific danger and its (possible) consequences.

Symbol	Alarm expression	Definition / consequence
	**DANGER!**	Impending danger that will cause serious injury or death to people.
	WARNING!	A danger that can cause serious injury or death.
	CAUTION!	A danger or unsafe procedure that can cause personal injury or damage to property.
	**ATTENTION!**	Situation that could cause damage to the lathe and the product and other types of damage. No risk of injury to persons.
	**INFORMATION**	Practical tips and other important or useful information and notes. No dangerous or harmful consequences for people or objects.

In case of specific dangers, we replace the pictogram with

general danger

with a warning of

injury to hands,

hazardous electrical voltage,

or

rotating parts.

1.2.2 Pictograms

Warning: danger of slipping!

Warning: risk of stumbling!

Warning: hot surface!

Warning: biological hazard!


Warning: automatic start-up!


Warning: tilting danger!


Warning: suspended loads!


Caution, danger of explosive substances!


Switching on forbidden!


Do not clean with compressed air!


Read the operating instructions before commissioning!


Wear protective glasses!


Wear protective gloves!


Wear safety shoes!


Wear a protective suit!


Use ear protection!


Pull out the mains plug!


Protect the environment!


Contact address

1.3 Intended use

WARNING!

Improper use of the lathe will result in

- **will endanger personnel,**
- **will endanger the lathe and other material property of the operator,**
- **the correct function of the lathe may be affected.**

The lathe is designed and manufactured to be used in environments where there is no potential danger of explosion.

The lathe is designed and manufactured for longitudinal and straight turning of round and regular formed
three-, six- or twelve-square workpieces in cold metal. The lathe must only be installed and operated in a dry and ventilated place.

If the lathe is used in any way other than described above, or modified without the approval of Maschinen Germany GmbH, then the lathe is being used improperly.

We will not be held liable for any damages resulting from any operation which is not in accordance with the intended use.

We expressly point out that the guarantee will expire, if any constructive, technical or procedural changes are not performed by the company Optimum Maschinen Germany GmbH.

It is also part of the intended use that you

- observe the limits of the lathe,
- observe the operating instructions,
- and comply with the inspection and maintenance instructions.

► Technical specification on page 16

In order to achieve optimum cutting performance, it is essential to choose the right turning tool, feed, tool pressure, cutting speed and coolant.

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WARNING!

Severe injuries due to non-intended use.

It is forbidden to make any modifications or alternations to the operation values of the lathe. They could endanger the personnel and cause damage to the lathe.

1.4 Reasonably foreseeable misuses

Any other use other than that specified under "Intended use" or any use beyond the described use shall be deemed as non-intended use and is not permissible.

Any other use has to be discussed with the manufacturer.

The lathe must not be used to process metal, cold and non-inflammable materials.

In order to avoid misuse, it is necessary to read and understand the operating instructions before the first commissioning.

The lathe operator must be qualified. ► Obligations of the operating company on page 10

1.4.1 Avoiding misuse

→ Use of suitable cutting tools.

→ Adapting the speed adjustment and feed to the material and workpiece.

→ Insert the workpiece tightly, without vibration and without one-sided imbalances.

→ The machine is not designed for the use of hand tools (e.g. emery cloth or files). It is forbidden to use any hand tools on this machine.

→ The machine is not designed to allow long parts to protrude beyond the spindle hole. If longer parts have to protrude beyond the spindle hole, an additional operator-side, permanent device must be mounted, which completely covers the protruding part and provides complete protection against spinning parts.

→ Long workpieces must be propped up. Use the steady rest or follow rest in conjunction with the tailstock spindle to support longer parts and prevent the workpiece from flapping around and flying away.

→ Risk of fire and explosion due to the use of flammable materials or cooling lubricants. Before processing inflammable materials (e.g. aluminium, magnesium) or using inflammable auxiliary materials (e.g. spirit), it is necessary to take additional preventive measures in order to avoid health risks.

→ When processing carbons, graphite and carbon-fibre-reinforced carbons, the machine is no longer being used as intended. When processing carbons, graphite and carbon-fibre-reinforced carbons and similar materials, the machine can be damaged quickly, even if the dusts generated are completely sucked out during the work process.

→ The processing of plastics with the lathe leads to static charge. The static charge of machine parts from processing plastics cannot be safely conducted away from the lathe.

→ When using lathe dogs as carriers for rotating workpieces between the lathe centres, the standard lathe chuck shield must be replaced with a circular lathe chuck shield.

1.5 Potential dangers that can be caused by the lathe

The lathe has been tested for operational safety. The construction and type are state of the art.

Nevertheless, there is a residual risk as the lathe operates with

- high revolutions,
- with rotating parts,
- electrical voltage and currents,

We have used design and safety engineering to minimize the health risk to personnel resulting from these hazards.

If the lathe is used and maintained by personnel who are not duly qualified, there may be a risk resulting from incorrect or unsuitable maintenance of the lathe. ► Obligations of the operating company on page 10

INFORMATION

Everyone involved in the assembly, commissioning, operation and maintenance must

- be duly qualified,
- and strictly follow these operating instructions.

In the event of improper use

- there may be a risk to the persons,
- there is a risk of damage to the lathe and other property,
- the correct function of the lathe may be affected.

Always disconnect the lathe, when cleaning or maintenance work is being carried out.

WARNING!

The lathe may only be used with the safety devices activated. Disconnect the lathe immediately whenever you detect a failure in the safety devices or when they are not mounted!

1.6 Qualification

1.6.1 Obligations of the operating company

The operator must instruct the personnel at least once a year regarding

- all safety standards that apply to the lathe.
- the operation,
- generally accepted engineering standards.

The operator must also

- check the personnel‘s knowledge level,
- document the training/instruction,
- have attendance at the training/instruction confirmed by signature and
- check whether personnel is working in a manner that shows awareness of safety and risks.
- Define and document the machine inspection deadlines in accordance with section 3 of the Factory Safety Order and perform an operational risk analysis in accordance with section 6 of the Safety at Work Act.

1.6.2 User's obligations

The operator must

- have read and understood the operating manual,
- be familiar with all safety devices and regulations,
- be able to operate the lathe.

1.6.3 Additional requirements regarding the qualification

Additional requirements apply for work on electrical components or equipment:

- They must only be performed by a qualified electrician or person working under the instructions and supervision of a qualified electrician.

Before starting work on electrical parts or operating agents, the following actions must be taken in the order given:

→ disconnect all poles,
→ secure against restarting,
→ check that there is no voltage.

1.7 Operator positions

The operator position is in front of the lathe.

1.8 Safety measures during operation

CAUTION!

Danger due to inhaling dust and mist that are hazardous to health.

Dependent on the material which need to be processed and the used auxiliaries dusts and mist may be caused which might impair you health.

Make sure that the generated health hazardous dusts and mist are safely sucked off at the point of origin and is dissipated or filtered from the working area. To do so, use a suitable extraction unit.

CAUTION!

Risk of fire and explosion by using flammable materials or cooling lubricants.

Extra precautionary measures must be taken before machining flammable materials (e.g. aluminium, magnesium) or using combustible agents (e.g. spirit) to avert a health hazard.

CAUTION!

Risk of becoming entangled or lacerations when using hand tools.

The machine is not designed for the use of hand tools (e.g. emery cloth or files). It is forbidden to use any hand tools on this machine.

Extra precautionary measures must be taken before machining flammable materials (e.g. aluminium, magnesium) or using combustible agents (e.g. spirit) to avert a health hazard.

1.9 Safety devices

Use the lathe only with properly functioning safety devices.

Stop the lathe immediately if there is a failure on the safety device or if it is not functioning for any reason.

It is your responsibility!

If a safety device has been deactivated or is defective, the lathe can only be used again if you

- the cause of the fault has been eliminated,
- you have verified that there is no danger to personnel or objects.

WARNING!

If you bypass, remove or override a safety device in any other way, you are endangering yourself and other persons working on the lathe. The possible consequences are:

- **injuries due to components or workpieces flying off at high speed,**
- **contact with rotating parts and**
- **fatal electrocution,**
- **pulling-in of clothes.**

The lathe includes the following safety devices:

- an emergency-stop switch,
- a lathe chuck protection with position switch,
- a protective cover on the headstock with switch,
- a safety screw at the tailstock,
- a mechanical spindle brake,
- an protective cover on lead screw.
- an overload clutch on the feed rod,
- a chips shield.

WARNING!

Although the isolating safety devices provided and delivered with the machine are designed to reduce the risks of workpieces being ejected or parts of tools or workpieces breaking off, they cannot eliminate these risks completely.

1.9.1 Emergency-stop button

CAUTION!

The drive or the lathe chuck will continue to run for a while, depending on the mass moment of inertia of the lathe chuck and the workpiece.

The emergency stop button brings the machine to a standstill.

Turn the knob to the right to unlock and release the emergency stop button.

CAUTION!

Only press the emergency-stop button in a genuine emergency. Do not use the emergency stop button to stop the machine during normal operation.

1.9.2 Protective cover of the headstock

The headstock of the lathe is equipped with a separating protective cover. The protective cover is equipped with a switch.

1.9.3 Lathe chuck protection with position switch

The lathe is equipped with a lathe chuck protection. The spindle of the lathe can only be switched on if the lathe chuck protection is closed.

1.9.4 Protective cover of lead screw

The lead screw of the lathe is equipped with a protective cover.

1.10 Safety check

Check all safety devices

- O when starting any work,
- O once a week,
- O after all maintenance and repair work.

INFORMATION

Use the following summary to perform the checks.

General check		
Equipment	**Check**	**OK**
Guards	Mounted, firmly bolted and not damaged	
Signs, Markers	Installed and legible	

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Functional check		
Equipment	**Check**	**OK**
Emergency-stop button	After activating the emergency stop button, the control voltage on the lathe will shut off. The spindle continues to rotate for a while, depending on the mass moment of inertia of the spindle and workpiece.	
Positions switch Lathe chuck protection	The spindle drive of the lathe must only be switch on if the lathe chuck protection is closed.	
Switch on protective cover on the headstock	The spindle drive of the lathe must only be switch on if the protective cover of the headstock is closed.	

1.11 Personal protective equipment

For certain work personal protective equipment is required.

Protect your face and your eyes: Wear a safety helmet with facial protection when performing work where your face and eyes are exposed to hazards.

Wear protective gloves when handling pieces with sharp edges.

Wear safety shoes when you assemble, disassemble or transport heavy components.

Use ear protection if the noise level (emission) in the workplace exceeds 80 dB (A).

Before starting work make sure that the required personnel protective equipment is available at the work place.

CAUTION!

Dirty or contaminated personnel protective equipment can cause illness. It must be cleaned after each use and at least once a week.

1.12 Safety during operation

We provide information about the specific dangers when working with and on the lathe in the descriptions for these types of work.

WARNING!

Before activating the lathe ensure that this will neither endanger other persons nor cause damage to equipment.

Avoid any unsafe work methods:

- Make sure that your work does not endanger anyone.
- Clamp the workpiece tightly before activating the lathe.
- Observe the maximum lathe chuck opening.
- Wear safety goggles.
- Do not remove the turning chips by hand. Use a chip hook and / or a hand brush to remove turning chips.
- Clamp the turning tool at the correct height and with the least possible overhang.
- Turn off the lathe before measuring the workpiece.
- The instructions described in these operating instructions must be strictly observed during assembly, operation, maintenance and repair.
- Do not work on the lathe if your concentration is reduced, for example, because you are taking medication.

- Stay at the lathe until all movements have come to a complete standstill.
- Use the prescribed personnel protective equipment. Make sure to wear a well-fitting work suit and, if necessary, a hairnet.

1.12.1 Disconnecting and securing the lathe

Turn off the main switch of the lathe before starting any maintenance or repair work.

Use a padlock to prevent the switch from being turned on without authorization and keep the key in a safe place.

All machine parts as well as all dangerous voltages are switched off.

Excepted are only the positions which are marked with the adjoining pictogram. These positions may be live, even if the main switch is switched off.

Attach a warning sign to the lathe.

WARNING!

Live parts and moves of machine parts can injure you or others dangerously!

Take extreme care if you do not switch off
the lathe by turning off the main switch due to required works (e.g. functional control).

1.12.2 Using lifting equipment

WARNING!

The use of unstable lifting and load suspension equipment that might break under load can cause severe injuries or even death.

Check to ensure that the lifting and load-suspension equipment are of sufficient load-bearing capability and are in perfect condition. Fasten the loads carefully. Never walk under suspended loads!

1.12.3 Mechanical maintenance work

Remove or install protection safety devices before starting or after completing any maintenance work; this include:

- covers,
- safety instructions and warning signs,
- grounding cables.

If you remove protection or safety devices, refit them immediately after completing the work. Check that they are working properly!

1.13 Electronics

Have the machine and/or the electric equipment checked regularly. Immediately eliminate all defects such as loose connections, defective wires, etc.

A second person must be present during work on live components to disconnect the power in the event of an emergency. If there is a fault in the power supply, switch off the lathe immediately!

Comply with the required inspection intervals in accordance with the factory safety directive, operating equipment inspection.

The operator of the machine must ensure that the electrical systems and operating equipment are inspected with regards to their proper condition, namely,

- by a qualified electrician or under the supervision and direction of a qualified electrician, prior to initial commissioning and after modifications or repairs, prior to recommissioning
- and at certain intervals.

The intervals must be set so that foreseeable defects can be detected in a timely manner, when they occur.

The relevant electro-technical rules must be followed during the inspection.

The inspection prior to initial commissioning is not required if the operator receives confirmation from the manufacturer or installer that the electrical systems and operating equipment comply with the accident prevention regulations, see conformity declaration.

Permanently installed electrical systems and operating equipment are considered constantly monitored if they are continually serviced by qualified electricians and inspected by means of measurements in the scope of operation (e.g. monitoring the insulation resistance).

1.14 Inspection deadlines

Define and document the inspection deadlines for the machine in accordance with § 3 of the Factory Safety Act and perform an operational risk analysis in accordance with § 6 of the Work Safety Act. Also use the inspection intervals in the maintenance section as reference values.

2 Technical specification

The following information represents the dimensions and indications of weight and the manufacturer‘s approved machine data.

2.1 Electrical connection	
	3 x 400V ~ 50 Hz (~60Hz)
2.2 Power	
Spindle drive	1.5 kW
2.3 Work areas	
Centres height [mm]	165
Distance between centres [mm]	1000
Travel of bed slide [mm]	850
Swing diameter over machine bed [mm]	330
Main spindle bore [mm]	38
2.4 Work area	Keep a work area of at least one metre around the machine free for operation and maintenance.
2.5 Headstock	
Main spindle nose	DIN ISO 702-2 No. 4 (Camlock)
Spindle taper	MT5
Spindle speeds [rpm]	65 - 2000 (~50Hz) 78 - 2400 (~60Hz)
Gear stages	9
2.6 Slides	
Travel cross slide [mm]	168
Travel top slide [mm]	90
2.7 Feeds and pitches	
Longitudinal feed [mm/rev]	0.02 - 0.4
Cross feed [mm/rev]	0.01 - 0.2
Metric thread [mm/rev]	0.4 - 10
2.8 Tailstock	
Quill diameter [mm]	38
Quill travel [mm]	100
Taper in the quill	MT3
2.9 Dimensions	
Weight of machine [kg]	440
2.10 Environmental conditions	

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Temperature	5 - 35 °C
Relative humidity	25...80% no condensation
2.11 Operating material	
Headstock	3.1 litres - ISO VG 68
Apron gearbox	0.35 litres - ISO VG 68
Feed gear	0.5 litres - ISO VG 68
Bare steel parts and lubricating nipple,	bare steel parts, lubricating nipple, slideways (ISO VG 68, Mobilgear 626 or a comparable oil)

2.12 Emissions

The airborne noise of the lathe is 75 to 80 dB (A) at the operator position and operating conditions in accordance with DIN ISO 8525 If the machine is installed in an area where various machines are in operation, the noise exposure (immission) on the operator of the drilling machine at the working place may exceed 85 dB(A).

INFORMATION

This numerical value was measured on a new machine under the operating conditions specified by the manufacturer. The noise behaviour of the machine might change depending on the age and wear of the machine. Furthermore, the noise emission also depends on production engineering factors, e.g. speed, material and clamping conditions.

INFORMATION

The specified numerical value represents the emission level and does not necessarily a safe working level. Though there is a dependency between the degree of the noise emission and the degree of the noise disturbance it is not possible to use it reliably to determine if further precaution measures are required or not.

The following factors influence the actual degree of the noise exposure of the operator:

- Characteristics of the working area, e.g. size of damping behaviour,
- other noise sources, e.g. the number of machines,
- other processes taking place in proximity and the period of time, during which the operator is exposed to the noise.

Furthermore, it is possible that the admissible exposure level might be different from country to country due to national regulations. This information about the noise emission should, however, allow the operator of the machine to more easily evaluate the hazards and risks.

CAUTION!

Depending on the overall noise exposure and the basic threshold values, machine operators must wear appropriate hearing protectors.

We generally recommend the use of noise and ear protectors.

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3 Delivery, interdepartmental transport, assembly and commissioning

3.1 Notes on transport, installation, commissioning

Improper transport, installation and commissioning is liable to accidents and can cause damage or malfunctions to the machine for which we do not assume any liability or guarantee.

Transport the scope of delivery secured against shifting or tilting with a sufficiently dimensioned industrial truck or a crane to the installation site.

WARNING!

Severe or fatal injuries may occur if parts of the machine tumble or fall down from the forklift truck or from the transport vehicle. Follow the instructions and information on the transport box.

Note the total weight of the machine. The weight of the machine is indicated in the "Technical data" of the machine. When the machine is unpacked, the weight of the machine can also be read on the rating plate.

Only use transport devices and load suspension gear that can hold the total weight of the machine.

WARNING!

The use of unstable lifting and load suspension equipment that might break under load can cause severe injuries or even death. Check that the lifting and load suspension gear has sufficient load-bearing capacity and that it is in perfect condition.

Observe the accident prevention regulations issued by your Employers Liability Insurance Association or other competent supervisory authority, responsible for your company. Fasten the loads properly.

3.1.1 General risks during internal transport

WARNING: TILTING DANGER!

The machine may be lifted unsecured by a maximum of 2 cm.

Employees must be outside the danger zone, i.e. the reach of the load.

Warn employees and advise them of the hazard.

Machines may only be transported by authorized and qualified persons. Act responsibly during transport and always consider the consequences. Refrain from daring and risky actions.

Gradients and descents (e.g. driveways, ramps and the like) are particularly dangerous. If such passages are unavoidable, special caution is required.

Before starting the transport check the transport route for possible danger points, unevenness and faults.

Danger points, unevenness and disturbance points must be inspected before transport. The removal of danger spots, disturbances and unevenness at the time of transport by other employees leads to considerable dangers.

Careful planning of interdepartmental transport is therefore essential.

3.2 Delivery

INFORMATION

The machine is pre assembled. It is delivered in a transport box. After the unpacking and the transportation to the installation site it is necessary to mount and assemble the individual components of the machine.s

Check the status of the machine immediately upon receipt and claim possible damages at the last carrier also if the packing is not being damaged. In order to ensure claims towards the freight carrier we recommend you to leave the machines, devices and packing material for the time being in the status at which you have determined the damage or to take photos of this status. Please inform us about any other claims within six days after receipt of delivery.

Check if all parts are firmly seated.

3.3 Unpacking

Install the machine close to its final position before unpacking. If the packaging shows signs of having possibly been damaged during transport, take the appropriate precautions to prevent the machine being damaged when unpacking. If damage is discovered, the carrier and/or shipper must be notified immediately so the necessary steps can be taken to register a complaint.

Inspect the machine completely and carefully, making sure that all materials, such as shipping documents, manuals and accessories supplied with the machine have been received.

→ Dismantle the cover and side parts of the box.

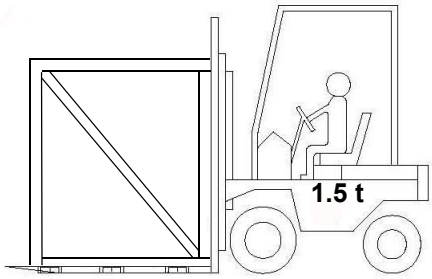
→ Disassemble the clamping bolts which are used to fix the machine on the pallet.

3.4 Transport

m Weights

► Installation plan on page 22

Weight of the lathe ► „ Weight of machine [kg]“ on page 16

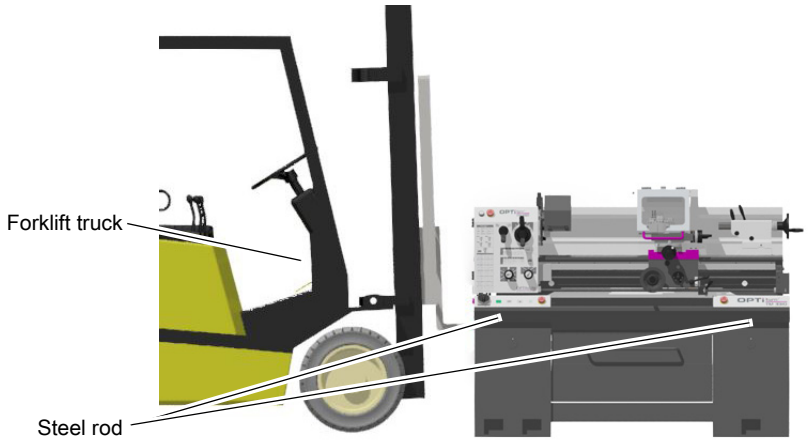


3.4.1 Load suspension point

3.4.2 Gravity of the machine

► Installation plan on page 22

3.4.3 Lifting with a forklift

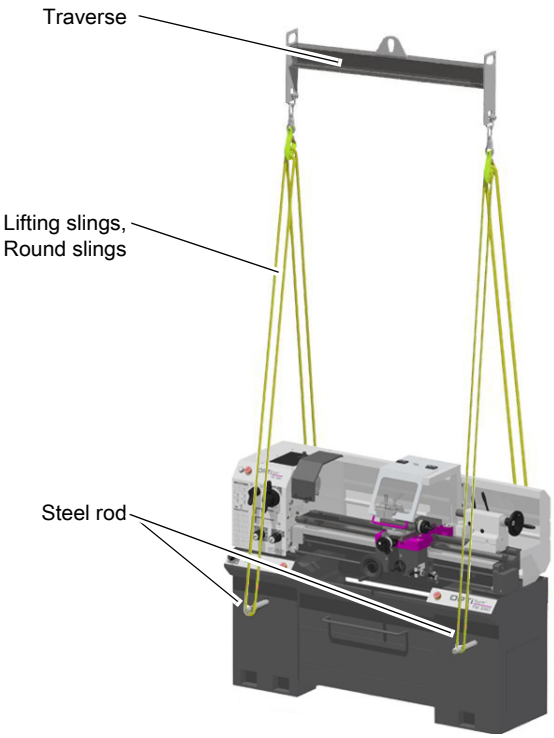


→ Put two steel rods with a diameter of 30 to 34mm (round steel C45, thick - walled tube) and a length of one meter through the holes of the machine substructure.

→ Firmly clamp the tailstock.

→ Slowly raise the machine on the steel rods with a forklift. Use long forks.

3.4.4 Lifting by crane



→ Disassemble the splash board on the lathe.

→ Put an adequately thick piece of steel with a diameter of 30 to 34mm (round steel C45, thick - walled tube) and a length of one meter through the hole of the machine substructure.

→ Suspend a lifting sling to each of the two sides of the machine bed and to the ends of the piece of steel. Secure the lifting slings on the steel rods with clamping rings to prevent slipping.

→ Firmly clamp the tailstock.

→ Slowly raise the machine using the crane.

3.5 Installation conditions

In order to achieve sufficient safety against falls by slipping, the accessible area in the mechanical machining zone of the machine must be equipped with a slip resistance. The slip-resistant mat and/or slip-resistant flooring must be at least R11 in accordance with BGR 181.

The used shoes must be suitable for being used in those machining areas. The accessible surfaces must be cleaned.

Organize the working area around the machine according to the local safety regulations. The work area for operation, maintenance and repair must not be restricted.

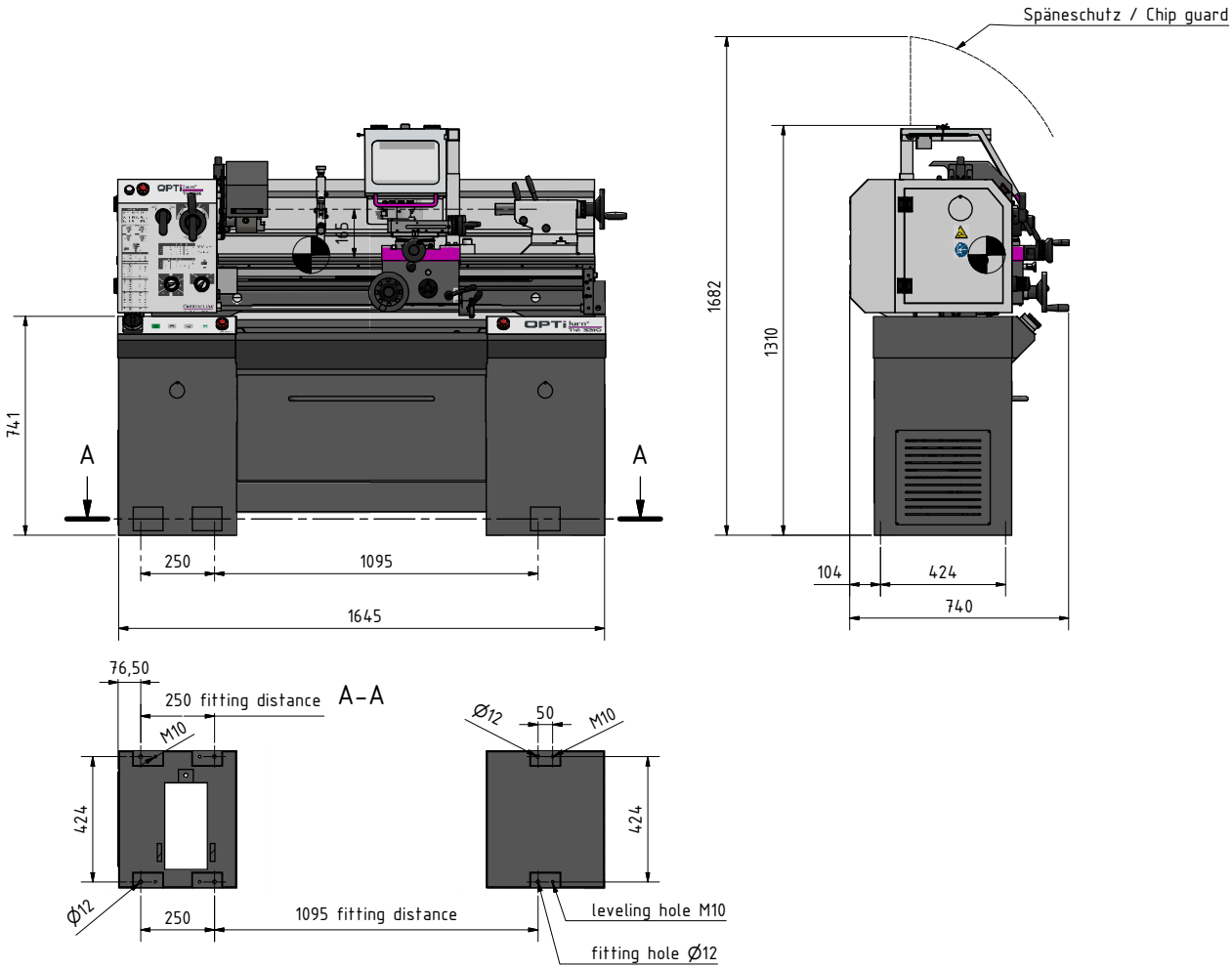
- Follow the prescribed safety areas and escape routes according to VDE 0100 part 729 as well as the environmental conditions for the operation of the machine.
- The main switch of the machine must be freely accessible.
- The machine must only be installed and operated in a dry and well-ventilated place.
- Avoid places near machines generating chips or dust.
- The installation site must be free from vibrations also at a distance of presses, planing machines, etc.
- Provide sufficient space for the personnel preparing and operating the machine and transporting the material.
- Also make sure the machine is accessible for setting and maintenance works.

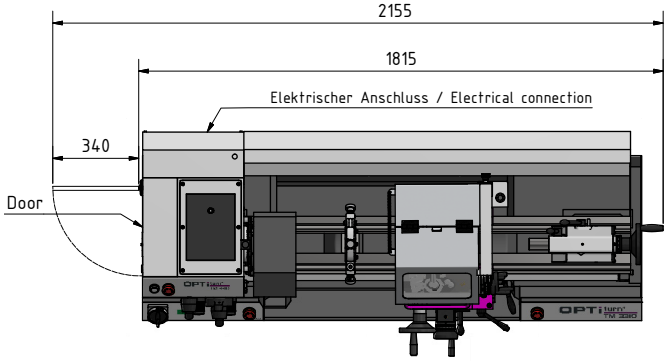
3.5.1 Foundation and floor

→ The substructure must be prepared in such a way as to ensure that, if any lubricant is used, it cannot penetrate the floor.

3.5.2 Installation plan

Make sure that the change gears can be accessed as easily as possible via the door on the headstock.





Schwerpunkt / Centre of gravity

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3.5.3 Assembly and installation, initial operation

WARNING!

The machine may only be commissioned after proper installation.

There is a danger to persons and equipment, if the first commissioning carried out by inexperienced personnel. We do not assume any liability for damages caused by incorrectly performed commissioning.

The machine can be placed in three different ways.

- O Anchor-free assembly,
- O with vibration dampers,
- O anchored assembly.

ATTENTION!

Insufficient rigidity of the ground leads to superposition of vibrations between the lathe and the ground (natural frequency of the components). Critical speeds with unpleasant vibrations are rapidly achieved if the rigidity of the whole system is insufficient; this will lead to bad turning results.

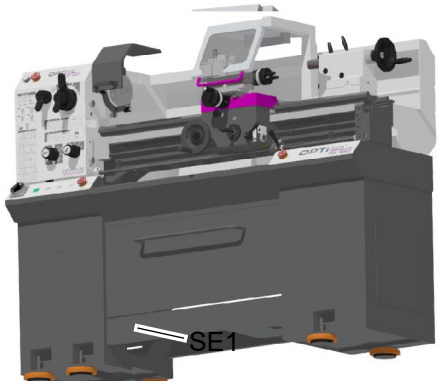
3.5.4 Anchor-free assembly

This must be done by laying down a strong base on each support of the levelling points, between the foundation and the machine foot.

3.5.5 Installation with levelling discs

Optional levelling discs

Attaching of 8 pieces SE1 levelling discs on levelling points between the foundation and machine stand.



3.5.6 Installation with vibration dampers

Optional vibration dampers

Attaching of 8 pieces SE55 vibration dampers on levelling points between the foundation and machine stand.

In order to obtain optimum anti-slip protection, the subfloor must be free of oil and grease before the machine or system is installed.

CAUTION!

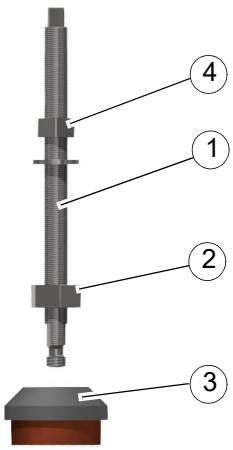
The max. load per element refers to the sum of static plus dynamic forces. The machine must not be moved after the machine has been lowered!

For machines with transverse forces greater than max. 0.5 kN, machine shoes e.g. SEU1 must be used. Therefore, place the machine as far down as possible on the levelling nuts.

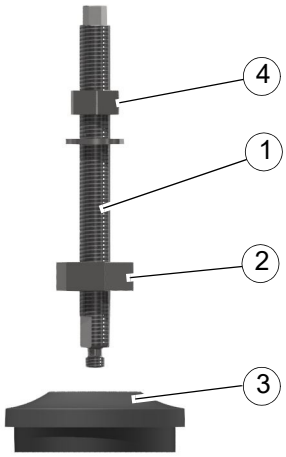
Lift the machine with suitable lifting gear so that the SE55 or SE85 elements can be pushed underneath. Insert the levelling screw (1) without the lower large levelling nut (2) from above into the through hole of the machine foot. Then screw the levelling nut (2) onto the levelling screw from below. Adjust the levelling screw with the levelling nut until it stands up in the spherical holder of the vibration damper (3). The screw must be vertical in the through hole. Carry out these preparations at all support points, and now carefully lower the machine further and level it via the levelling nut by holding it against the upper hexagon or lower two-edge of the levelling screw. After levelling, screw the upper lock nut (4) with washer onto the levelling screw and tighten. The lock nut can also be fitted underneath the levelling nut if height is not a decisive factor. A levelling screw (threaded rod) M16 in 300mm length incl. nut M16 with the article no. 3352988 is optionally available. The levelling screw M16 is suitable for both elements SE55 and SE85.

	SE55	**SE85**
maximum load per element	600 kg	1500 kg
Levelling screw (threaded rod)	M12x1 x 150mm	M16x2 x 150mm
Vibration damper	Ø 47mm	Ø 83 mm

Note: The machine base stands on the levelling nut (2) and not on the levelling disc with vibration damper (3).



SE55



SE85

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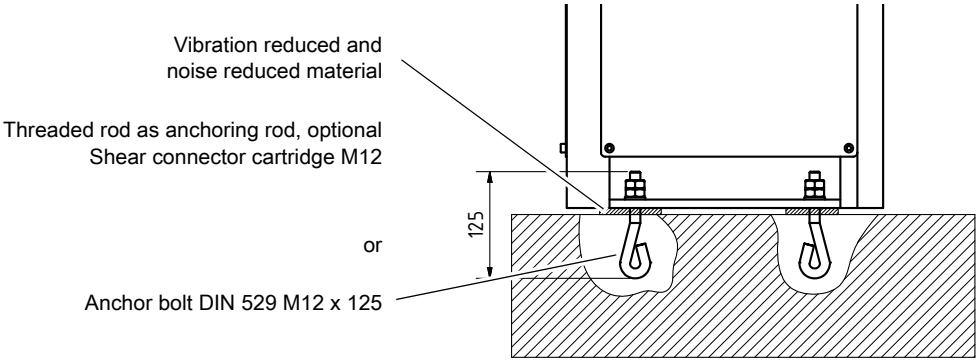
3.5.7 Anchored assembly

Use the anchored assembly in order to attain a firm connection to the ground. An anchored assembly is always reasonable if parts are manufactured to the maximum capacity of the lathe.



Img.3-1: Drawing of the anchoring

INFORMATION

The components required for the anchored assembly are not included in the scope of delivery.

3.5.8 Aligning the machine

Once the bases are in place proceed to level according to the following description:

→ Fit precision spirit levels on the cross slide.

→ Position the carriage on the centre of the bed and, using the four end adjusting screws, adjust until the machine spirit level displays an approximate value.

→ Move the carriage to the headstock and then to the tailstock and align the machine simultaneously with the adjusting screws until the machine spirit level shows a value of 0.05mm/m.

→ Adjust the adjusting screws until they place pressure but do not vary the levelling.

→ Lock with nuts and check the levelling again.

3.6 Cleaning the machine

ATTENTION!

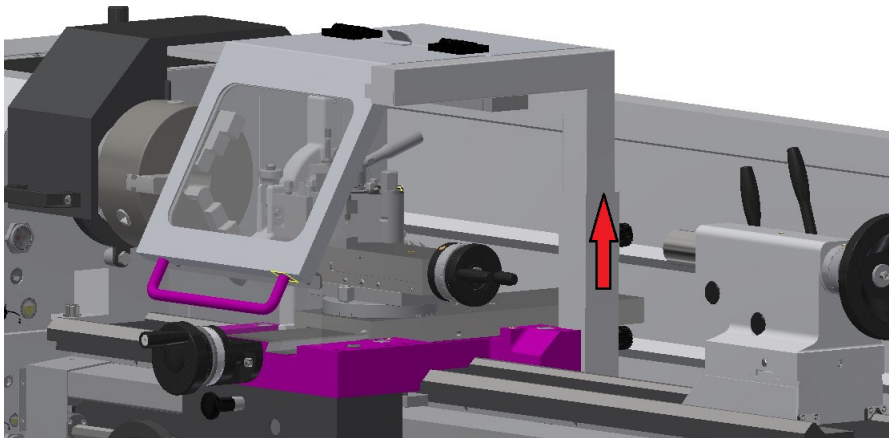
Do not use compressed air to clean the machine.

Your new lathe must be completely cleaned after being unpacked to make sure that all the moving parts and sliding surfaces are not damaged when the machine is operated. Each unit leaves the factory with all its polished parts and sliding surfaces suitably greased to avoid oxidation in the period of time that elapses, until it is started up. Remove all the wrapping and clean all the surfaces with a degreaser to soften and remove the protecting greases and coatings.

Clean all the surfaces with a clean cotton cloth and lubricate the lathe as explained in the following section, before connecting the power and beginning to operate the machine.

3.7 Chip protection Transport position

During transport, the chip guard is fixed in the transport position. Before Initial start-up, the chip guard must be mounted in the operating position. To do this, please do not use the handle screws that can be loosened by hand, but loosen the hexagon socket screws of the lower bracket and reattach them at the upper position.



3.7.1 Lubrication

The lubrication and initial greasing of your new lathe consists of checking the oil levels through the headstock, apron and feed box oil sight glasses. The oil tanks must be filled to half way up the sight glass. Only afterwards can the machine be placed into operation.

→ The headstock and feed box oil must be changed 50 hours after being filled for the first time, then after every 2000 hours of operation.

→ Use the oil types recommended in the reference table . The table shows a list of well-known companies and brands for oils that meet our specifications. This table can be used to compare the characteristics of each different type of oil of your choice.
► Lubricant on page 105

→ The lubrication nipples must be lubricated every 8 hours using an oiler. Furthermore, it is also recommended to lubricate the slide tracks of the machine bed once a day.

3.8 One-component paint

The machine is lacquered with a one-component paint. Take this criterion into account when selecting your cooling lubricant and cleaning the machine.

A one-component lacquer with solvent part hardens when the solvent evaporates.

As soon as the lacquer is applied the solvent evaporates into the air. The binder becomes felted and a dry film is formed. This process is reversible, i.e. the binder can be etched again and again.

Two-component lacquer also consists of binder and solvent. However, the paint only dries when a setting agent is added. This process is not reversible, i.e. the binder cannot be etched again and again.

The company Optimum Maschinen Germany GmbH does not assume any guarantee for subsequent damages due to unsuitable cooling lubricants.

3.9 Electric three-phase connection

WARNING!

The three-phase electrical connection may only be performed by an electrician or under the guidance and supervision of an electrician.

CAUTION!

Arrange the machine's connection cable in such a way that it will not cause a tripping hazard.

→ Connect the electrical supply cable. The connection points are at the terminal block for the main switch and are marked with L1, L2, L3.

→ Check the fusing (fuse) of your electrical supply according to the technical instructions regarding the total connected power of the Drehmaschine.

→ Mains fuse 16A.

ATTENTION!

Ensure that all 3 phases (L1, L2, L3) and the ground wire are connected correctly.

The neutral conductor (N) of its power supply is not connected.

ATTENTION!

Make sure that the direction of rotation of the drive motor is correct. If the rotational direction switch is switched to the down position, the lathe spindle must rotate anticlockwise. If necessary, exchange two phase connections. The guarantee will become null and void if the machine is connected incorrectly.

3.10 Warming up the machine

ATTENTION!

If the machine and in particular the lathe spindle are immediately operated at maximum load when cold, this may result in damages.

If the machine is cold, e.g. directly after having transported the machine, it should be warmed up at a spindle speed of only 500 1/min for the first 30 minutes.

4 Operation

4.1 Control and indicating elements

Pos.	Designation	Pos.	Designation
1	Speed selector switch	2	Change wheel and feed table
3	Lathe chuck protection	4	Selector switch feed gear mechanism
5	Quadruple toolholder	6	Chip protection shield with LED lighting
7	Spindle rotation lever	8	Main switch
9	Emergency stop button	10	Tailstock
11	Control panel on lathe saddle Engaging lever cross feed | longitudinal feed | thread cutting | handwheel lathe saddle | handwheel cross slide	12	Chip drawer
13	Digital position indicator (TM3310D only)	14	Control panel
15	Control ON	16	Spindle direct run

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4.2 Safety

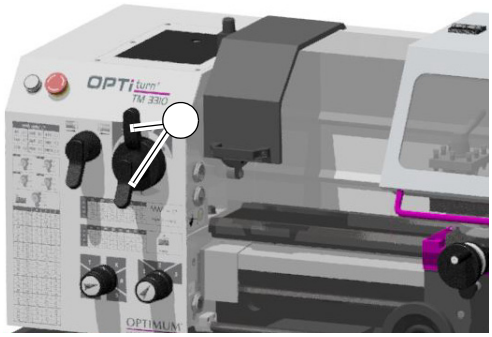
Commission the lathe only under the following conditions:

- O The lathe is in proper working order.
- O The lathe is used as prescribed.
- O Follow the operating instructions.
- O All safety devices are installed and activated.

Eliminate or have all malfunctions rectified promptly. Stop the lathe immediately in the event of any abnormality in operation and make sure it cannot be started-up accidentally or without authorisation. Notify the person responsible immediately of any modification.

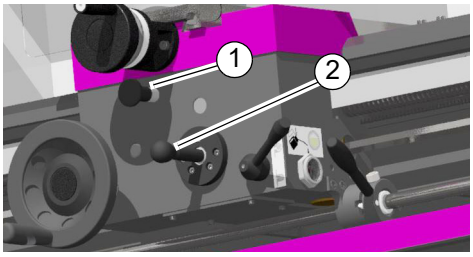
► Safety during operation on page 13

4.2.1 Overview of the control elements

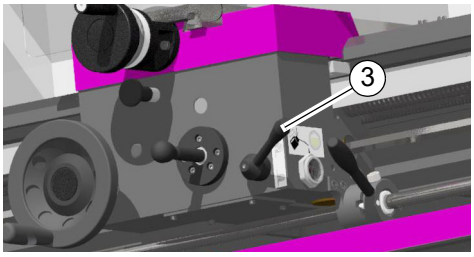


Speed setting

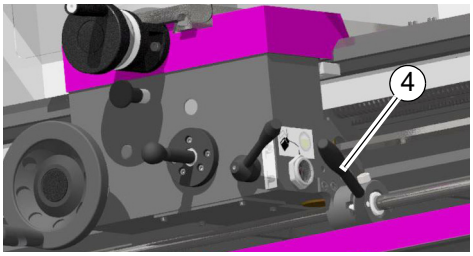
Feed direction (1)
Infeed speed (2)



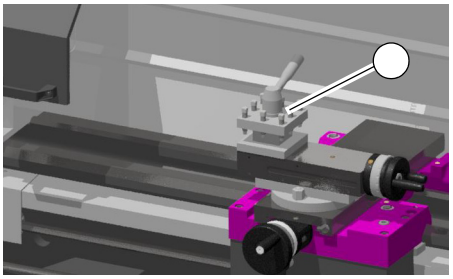
Engaging rod longitudinal feed / cross feed (1)
Feed rod engagement lever (2)



Engaging lever thread cutting (3)



Spindle rotation lever (4)



Tool holder

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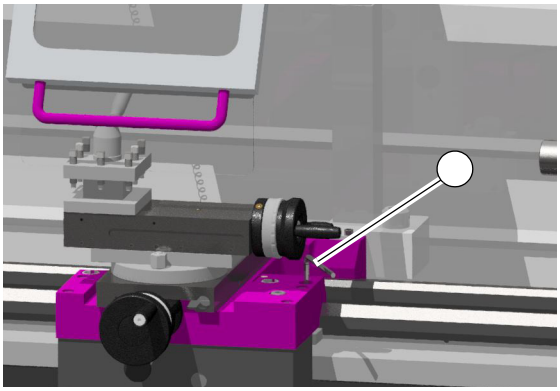
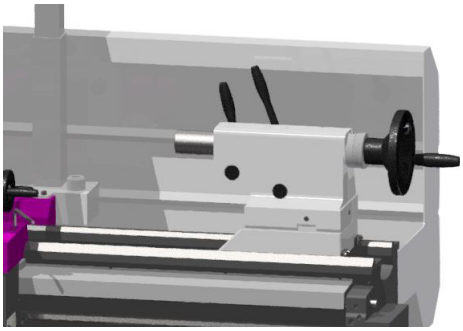
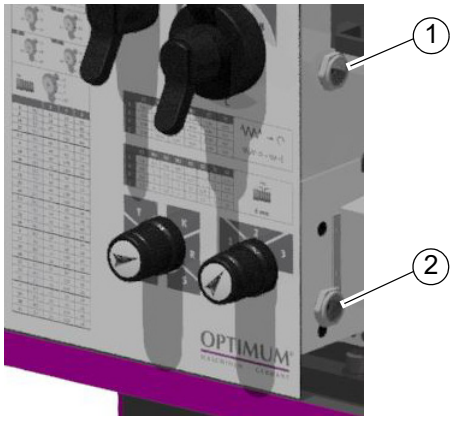


Attachment screw lathe saddle

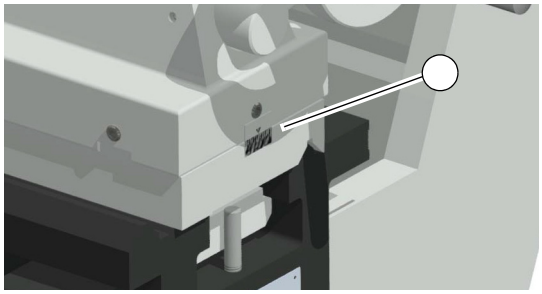


Tailstock

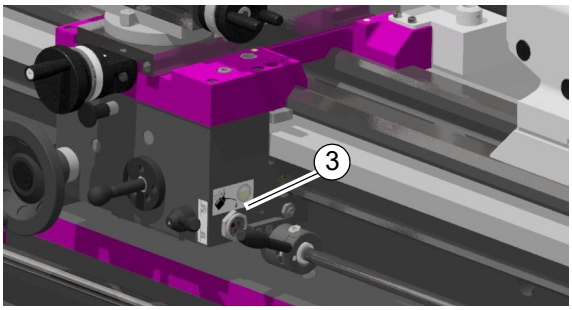
4.2.2 Overview of indicator elements



(1) Oil sight glass speed gear unit
(2) Oil sight glass feed gear



Scale cross offset tailstock



(3) Oil sight glass apron

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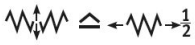
4.2.3 Control elements



Cross feed / Longitudinal feed 1/2

Inch thread [threads / inch]

Metric thread [mm / spindle revolution]

mm per spindle revolution

Feed direction

Oil fill, oiling

Position clamp bolt on the lathe spindle holding fixture

4.3 Switching on the machine

4.3.1 Switching on

→ Check that the emergency-stop button is not pressed or is unlocked. Turn the emergency-stop button to the right in order to release the push button.

→ Close the lathe chuck protection.

→ Actuate the rotation direction lever.

4.4 Switching the machine off

→ Set the rotation direction lever to the neutral middle position.

→ If the lathe has been shut off for a longer period of time, switch it off using the main switch and secure it against being unintentionally switched on again or pull the power plug.

CAUTION!

Only press the emergency-stop button in a genuine emergency. You may not use the emergency stop button to stop the machine during normal operation.

4.5 Resetting an emergency stop condition

→ Unlock the emergency stop button again.

→ Set the rotation direction lever to the neutral middle position.

→ Switch the control on.

4.6 Power failure, Restoring readiness for operation

→ Set the rotation direction lever to the neutral middle position.

→ Switch the control on.

4.7 Speed setting

ATTENTION!

Only change gear positions when the lathe is being completely stopped.

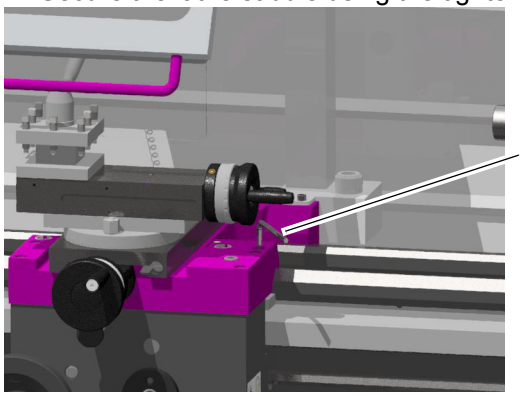
A speed change is done by setting the shift lever at the speed gear unit.

4.8 Fixing the lathe saddle

ATTENTION!

The cutting force produced during facing, recessing or slicing process may displace the lathe saddle.

→ Secure the lathe saddle using the tightening screw.



Img.4-1: Lathe saddle

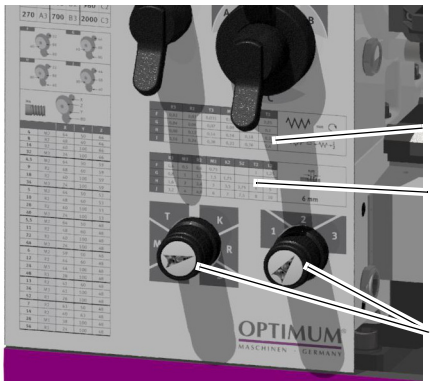
4.9 Changing the feed rate

4.9.1 Selector switch

Use the selector rotary switches to select the feed direction and feed speed.

ATTENTION!

Wait until the machine has come to a complete stop before making any change to the selector levers.



Img.4-2: Changing the feed rate

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INFORMATION

Use the table on the lathe for selecting the feed speed or the thread pitch. Replace the change gears if the required thread pitch or feed cannot be obtained with the installed gear set.

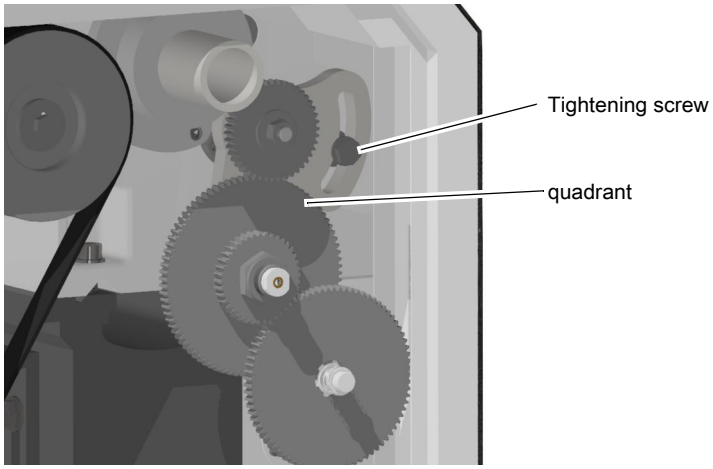
4.9.2 Changing the change gears

The change gears for the feed are mounted on a quadrant.

PREVENTIVE MEASURES!

Switch off the master switch.

→ Replace the change gears as shown in the table to obtain the desired pitch.



Img. 4-3: Locking screw quadrant

→ Install the gear couples using the feed or change gear table and screw the gearwheels onto the quadrant again.

→ Re-adjust gear flank clearance by inserting a normal sheet of paper as an adjusting or distance aid between the gearwheels.

→ Immobilise the quadrant with the locking screw.

→ Close the protective cover of the headstock and switch on the main switch again.

4.10 Crossfeed, Longitudinal feed

CAUTION!

Danger of cutting. Avoid obtaining long flow chips with the longitudinal feed. Change the feed rate to achieve chip breaking. The chip guard on the top slide is not designed to hold back flow chips.

ATTENTION!

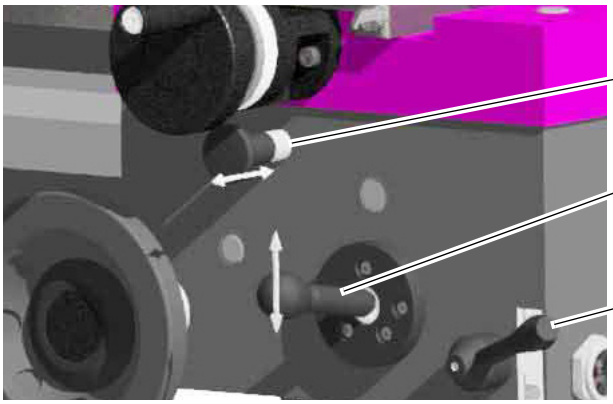
Damage to mechanical parts. The automatic feed is not designed to move onto mechanical stops or the mechanical end of the headstock.

The automatic feed for turning is performed with the feed rod.

The feed for thread cutting is performed with the lead screw.

The shift rod is used to switch on the cross feed and longitudinal feed. The engagement lever activates the feed with the feed rod.

Due to a safety mechanism it is not possible to use the engagement lever feed rod and the engagement lever lead screw for thread cutting at the same time.



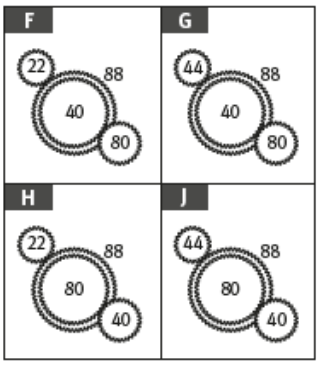
Img.4-4: Apron

INFORMATION

Move the hand wheel of the lathe saddle a little in order to facilitate the locking of the engaging lever.

4.10.1 Thread cutting table

Inch threads



		X	Y	Z
4	M2	64	50	66
8	R2	48	60	66
16	R2	40	100	66
32	M3	24	100	66
4.5	M2	64	50	59
9	R2	48	60	59
18	R2	40	100	59
36	M3	24	100	59
5	M2	64	50	53
10	R2	48	60	53
20	R2	40	100	53
40	M3	24	100	53
5.5	M2	64	50	48
11	R2	48	60	48
22	R2	40	100	48
44	M3	24	100	48
6	M2	59	50	48
12	R2	44	60	48
24	M3	44	100	48
48	R3	28	100	48
13	R2	41	60	48
26	M3	41	100	48
52	R3	26	100	48
7	R2	63	50	48
14	R2	40	63	48
28	M3	38	100	48
56	R3	24	100	48

Metric threads

	R3	R2	T3	M2	K2	T2
F	0,02	0,03	0,035	0,04	0,045	0,05
G	0,04	0,06	0,07	0,08	0,09	0,1
H	0,08	0,12	0,14	0,16	0,18	0,2
J	0,16	0,24	0,28	0,32	0,36	0,4

Longitudinal and transversal feeds

	R3	M3	R2	M2	K2	S2	T2	L2
F	0,4	0,5	0,6	0,75			1	1,25
G	0,8	1	1,2	1,5	1,75		2	2,5
H	1,6	2	2,4	3	3,5	3,75	4	5
J	3,2	4	4,8	6	7	7,5	8	10

6 mm

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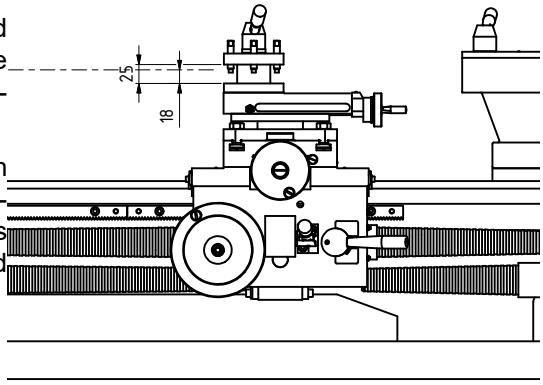
4.11 Tool holder

Clamp the lathe tool into the tool holder.

The lathe tool needs to be clamped as short and tight as possible when turning in order to be able to absorb the cutting force during the chip formation well and reliably.

Adjust the height of the tool. Use the tailstock with the centering point in order to determine the required height. If necessary, put the steel washers beneath the lathe tool to achieve the required height.



Img.4-5: Height up to the turning centre 18mm

4.12 Lathe spindle fixture

WARNING!

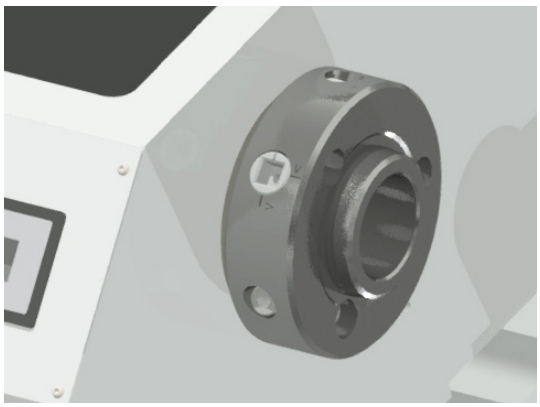
Do not clamp any workpieces that exceed the permitted chucking capacity of the lathe chuck. The clamping force of the chuck is too low if its capacity is being exceeded. The clamping jaws may loosen.

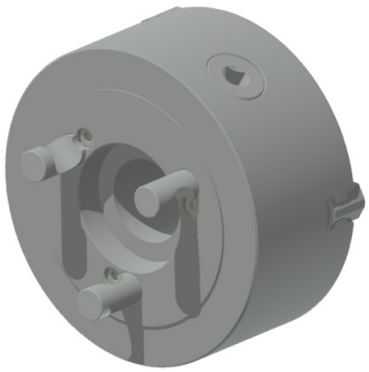
Only use lathe chucks designed for the speed of the machine.

Do not use lathe chucks with an external diameter that is too large.

Please ensure that lathe chucks are manufactured to EN 1550 standards.

The spindle is designed as Camlock DIN ISO 702-2 no.4 holding fixture.





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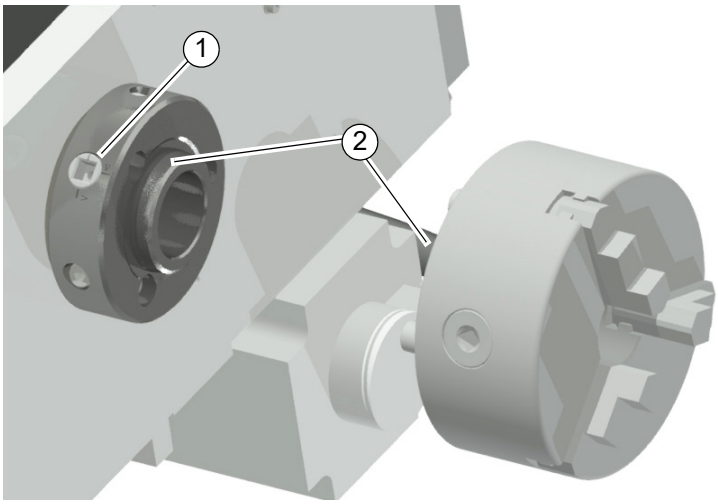
4.12.1 Fasten workpiece holder



Img. 4-6: Fasten workpiece holder

→ Turn clamp bolts (1) into the open position.

→ Clean the taper attachment on the lathe chuck and the spindle fixture.

→ Fit lathe chuck.

→ Turn the clamp bolts (1) to the closed position.

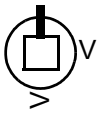
CAUTION!

If the reference mark on the clamp bolt is not between the two V markings, the chuck must be removed and this bolt (D) must be re-adjusted.

→ Fasten the workpiece holder by turning the clamping bolts clockwise.

The right clamp position is reached when the reference marker at the clamp holder are between the two marks at the lead spindle seat.

The tightening torque must be approximately 80 Nm, otherwise the rotational accuracy of the lathe chuck is not present. 100 Nm is about the torque used for aluminium rims on cars.



Marking clamp bolt
"Open position"

Marking clamp bolt
"Closed position"

Img. 4-7: Camlock clamp bolt markings

4.12.2 Adjusting the Camlock bolts to the workpiece holder

Insert all of the bolts in the screwed flange of the chuck, until the reference mark, the circular reference line (F) is in line with the wall of the chuck flange surface and the semicircular grooves are in line with the holes of the safety screw (E).

→ Fit the safety screw (E) into each bolt and tighten.

→ Make sure that the two contact sides (plate and shaft) are free from impurities.

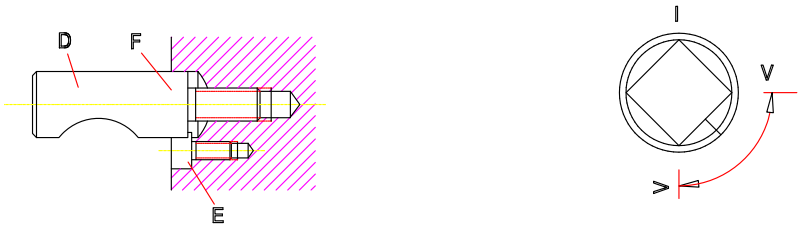
Now the chuck can be mounted.

Before coupling the chuck to the shaft nose, check that the clamp bolts are in an unlocked position.

→ Fasten the workpiece holder by turning the clamping bolts clockwise.

INFORMATION

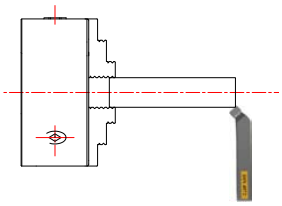
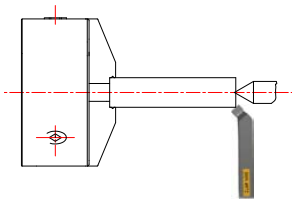
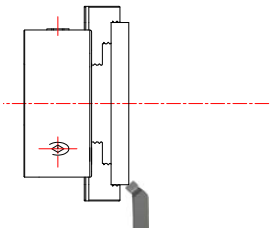
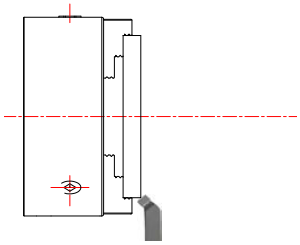
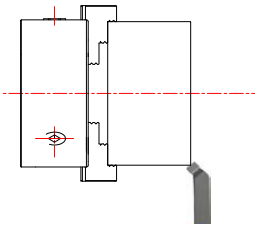
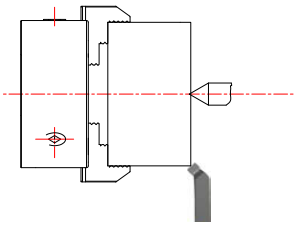
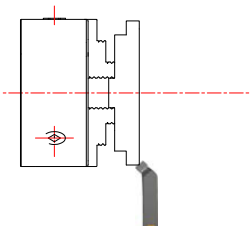
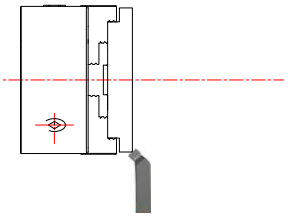
The reference mark (F) on each Cam-lock bolt serves as an orientation for the correct adjustment.



Img.4-8: Camlock fixture

4.12.3 Clamping a workpiece into the three jaw chuck

When the workpiece is being clamped unprofessionally, there is a risk of injury as the workpiece may fly off or the jaws may break. The following examples do not show all possible situations of danger.

Incorrect		Correct	
	Clamping length too short, overhang too long.		Additional support over center or rest.
	Clamping diameter too large.		Larger lathe necessary.
	Workpiece is too heavy and clamping jaw is too short.		Support over center, enlarged jaw. Enlarged jaws are not available for this three-jaw chuck. Possibly use larger lathe.
	Clamping diameter too small.		Clamping on the largest possible diameter.

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4.13 Turning tapers

4.13.1 Taper turning with the top slide

With the top slide short cone can be rotated. The scaling is performed up to 60° degree of angle. It is also possible to adjust the top slide over the 60°- angular mark.

→ Loosen the two clamping screw at the top slide.

→ Swivel the top slide.

→ Clamp the top slide again.

4.13.2 Taper turning with the tailstock

The cross-adjustment of the tailstock is used for turning long, thin bodies.

→ Loosen the locking nut of the tailstock.

→ Unscrew the locking screw approximately half a turn.

By alternately loosening and tightening the two (front and rear) adjusting screws, the tailstock is moved out of the central position. The desired cross-adjustment can be read off the scale.

→ First retighten the locking screw and then the two (front and rear) adjusting screws. Retighten the adjusting screws of the tailstock.

CAUTION!

Check clamping of the tailstock and the sleeve, respectively for the turning jobs between the centres!

Tighten the securing screw at the end of the lathe bed in order to prevent the tailstock from unintentional drawing-out of the lathe bed.

4.13.3 Turning of cones with high precision

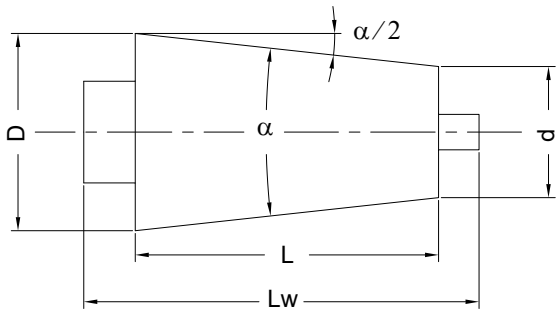


Abb.4-9: Designation on the cone

D = large diameter [mm]
d = small diameter [mm]
L = cone length [mm]
Lw = workpiece length [mm]
α = cone angle
α/2 = setting angle
Kv = cone proportion
Vr = tailstock offset
Vd = measure change [mm]
Vo = twist measure of top slide [mm]

There are different possibilities to machine a cone on a common small lathe:

1. By twisting the top slide by setting the setting-angle with the angular scale. But there the graduation of the scale is too inaccurate. For chamfers and conic passings the graduation of the angular scale is sufficient.
2. By a simple calculation, a stop measure of 100mm length (of your own production) and a gauge with stand.

Calculation

of the offset of the top slide relating to the stop measure with a length of 100 mm.

Step by step		

$Kv = \frac{L}{D - d}$	$Vd = \frac{100\ mm}{Kv}$	$Vo = \frac{Vd}{2}$

by one calculation step (summary)

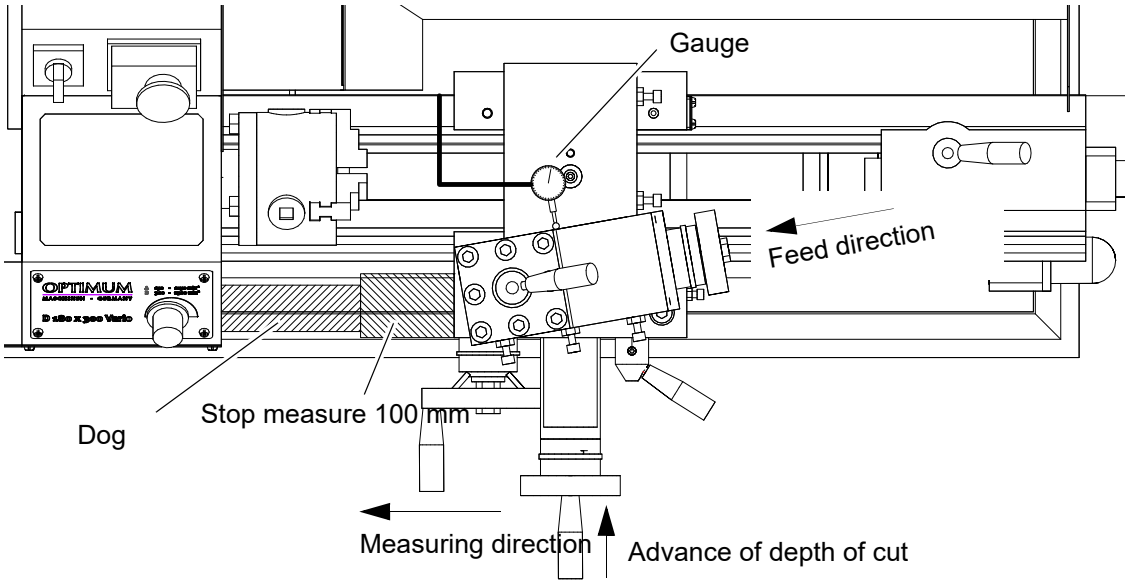
$$Vo = \frac{100\ mm \times (D - d)}{2 \times L}$$

Example:

D = 30.0 mm ; d = 24.0 mm ; L = 22.0 mm

$$Vo = \frac{100\ mm \times (30\ mm - 24\ mm)}{2 \times 22\ mm} = \frac{100\ mm \times 6\ mm}{44\ mm} \quad 13.63\ mm$$

The stop measure (100mm) is to be put between a fixed unit stop and the bedslide. Put the gauge with stand on the lathe bed and horizontally align the test prod with the test prod with thetop slide (90° to the top slide). The twisting measure is calculated with the above mentioned formula.
The top slide is twisted by this value (then set the gauge to zero). After removing the stop measure, the bedslide will be aligned to the limit stop. The gauge must indicate the calculated value "Vo" Then the workpiece and the tool are clamped and positioned (the bedslide is fixed). The infeed is performed with the handwheel of the top slide. The depth of cut is advanced with the handwheel of the cross slide.

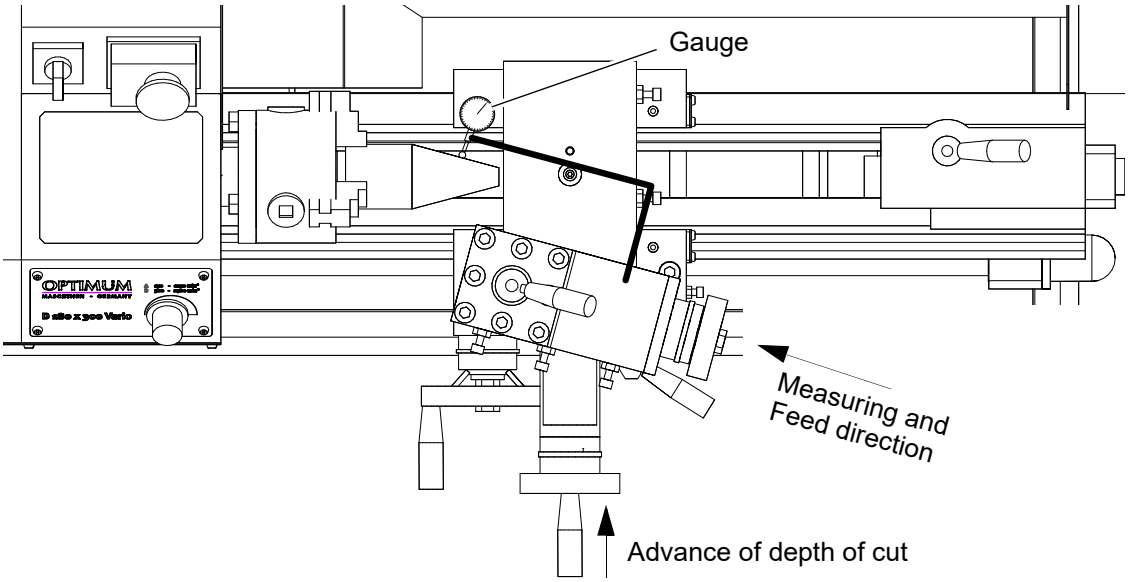


Img.4-10: Cone setting with stop measure

3. By measuring an existing cone with gauge and stand.

The stand is put on the top slide. The gauge is aligned horizontally and 90° to the top slide. The top slide is approximately adjusted to the cone angle and the test prod brought in contact with the cone surface (fix the bedslide). Now the top slide is twisted in a way that the gauge does not indicate any travel of the pointer over the whole length of the cone (offset over the handwheel of the top slide).

Then you may start reaming the lathe as described under point 2. The workpiece might be a flange for lathe chucks or a face plate.



Img.4-11: Cone setting with stop measure

4. By offsetting the tailstock as the cone length is larger than the adjustable stroke of the top slide.

The workpiece is clamped between two points, therefore center holes are required on the face. They are to be drilled before removing the lathe chuck. The slaving of the workpiece is performed by a pulling pin and a lathe carrier.

The calculated value "Vr" is the offset measure of the tailstock. The offset is monitored with the gauge (also the return travel).

For this type of cone machining the lowest speed is used !

Annotation:

In order to check the position of the tailstock axis to the rotation axis, a shaft with two centeringsis clamped between the points. The stand with the gauge is put on the bedslide. The gauge is aligned 90° to the rotation axis and horizontally brought into contact with the shaft. The gauge will pass along the shaft with the bedslide. There must not be any travel of the pointer along the whole length of the shaft. If a deviation is being shown, the tailstock is to be corrected.

Calculation:

$$Vr = \frac{Lw}{2 \times Kv} \quad \text{or} \quad Vr = \frac{D - d}{2 \times L} \times Lw$$

$$Vr_{max} = \frac{Lw}{50}$$

The tailstock offset must not exceed the value *"Vrmax"* as the workpiece tumbles!

Example:

Kv = 1 : 40 ; Lw = 150 mm ; L = 100 mm

$$Vr = \frac{150}{2 \times 40} \; 1.875 \text{ mm} \qquad Vr_{max} = \frac{150}{50} \; 3 \text{ mm}$$

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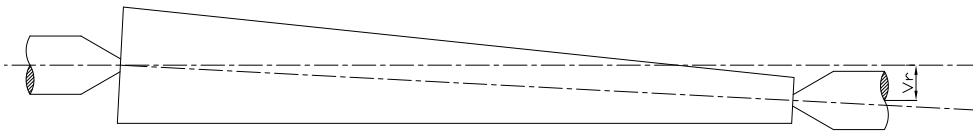


Img.4-12: Workpiece between centres: Tailstock offset Vr

4.14 Standard values for cutting data when turning

The better the cutting data are selected, the better the turning result. Some standard values for cutting speeds of different materials are listed on the following pages.

► Cutting speed table on page 43

Criteria of the cutting conditions:

Cutting speed: Vc (m/min)

Depth of cut: ap (mm)

Infeed: f (mm/rev)

Cutting speed:

In order to get the speed for the machine settings of the selected cutting speeds the following formula is to be applied:

$$n = \frac{Vc \times 1000}{d \times 3.14}$$

Speed: n (rpm)

Workpiece diameter: d (mm)

For lathes without continuously adjustable drive (flat belt drive, speed gear) the nearest speed is being selected.

Cutting depth:

In order to achieve a good chipping, the results of the depth of cut divided by the feed shall result in a figure between 4 and 10.

Example: ap = 1.0 mm; f = 0.14 mm/rev ; and this equals to in a value of 7.1 !

Feed:

The feed for rough turning is to be selected in a way that it does not exceed half the value of the corner radius.

Example: r = 0.4 mm ; equals to fmax. = 0.2 mm/rev !

For planing/turning the infeed should be maximum 1/3 of the corner radius.

Example: r = 0.4 mm ; equals to fmax. = 0.12 mm/rev !

4.15 Cutting speed table

	Turning								Drilling
Materials	Cutting materials								
	HSS	P10	P20	P40	K10	HC P40	HC K15	HC M15/ K10	HSS
non-alloyed steel; steel casting; C45; St37	35 - - 50	100 - - 150	80 - - 120	50 - - 100	- -	70 - - 180	150 - - 300	90 - - 180	30 - - 40
low-alloy steel, steel casting; 42Cr-Mo4; 100Cr6	20 - - 35	80 - - 120	60 - - 100	40 - - 80	- -	70 - - 160	120 - - 250	80 - - 160	20 - - 30
high-alloyed steel; steel casting; X38CrMoV51; S10-4-3-10	10 - - 20	70 - - 110	50 - - 90	- -	- -	60 - - 130	80 - - 220	70 - - 140	8 - - 15
rust-resistant steel X5CrNi1810; X10CrNiMoTi12	- -	- -	- -	- -	30 - - 80	- -	- -	50 - - 140	10 - - 15
Grey cast iron GG10 ; GG40	15 - - 40	- -	- -	- -	40 - - 190	- -	90 - - 200	70 - - 150	20 - - 30
Cast iron with nodular graphite GGG35 ; GGG70	10 - - 25	- -	- -	- -	25 - - 120	- -	80 - - 180	60 - - 130	15 - - 25
Copper; Brass	40 - - 90	- -	- -	- -	60 - - 180	- -	90 - - 300	60 - - 150	30 - - 80
Aluminium alloys	40 - - 100	- -	- -	- -	80 - - 200	- -	100 - - 400	80 - - 200	40 - - 80

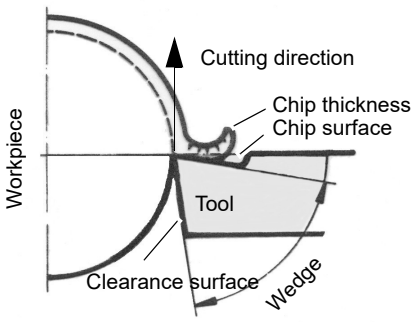
Description of the coated hard metals:

HC P40 = a PVD - coating TiAlN

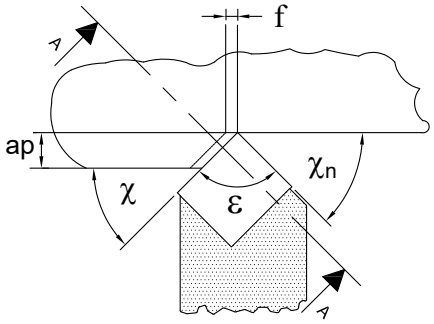
HC K15 = a CVD - coating TiN-Al_2O_3 - TiCN - TiN

HC M15/K10 = CVD - coating TiAiN

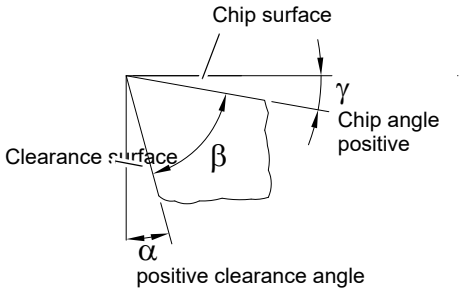
4.16 Terms for the rotating tool



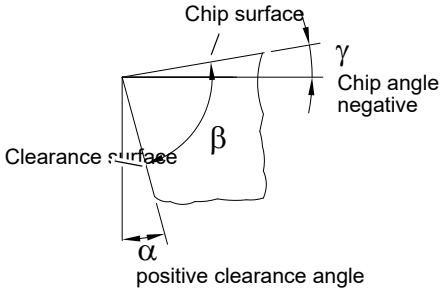
Img.4-13: Geometrically determined cutter for the separation process



Img.4-14: Cut and chip size



Img.4-15: Cut A - A, positive cutter



Img.4-16: Cut A - A, negative cutter

Wedge angle	β	The following factors influence the chip break when turning	
Chip angle	γ	Setting angle	χ
Clearance angle	α	Corner radius	r
Clearance angle minor cutting edge	α_n	Cutting edge geometry	
Setting angle	χ	Cutting speed	Vc
Setting angle minor cutting edge	χ_n	Depth of cut	ap
Point angle	ε	Feed	f
Depth of cut	ap (mm)		
Feed	f (mm/ rev)		

In most cases the setting angle is depending on the work piece. A setting angle of 45° to 75° is suitable for roughing. Setting angle of 90° to 95° (no tendency to chattering) is suitable for planing.

The corner angle serves as passing from the major cutting edge to the minor cutting edge. Together with the infeed it determines the surface quality. The corner radius must not be selected too large as this might result in vibrations.

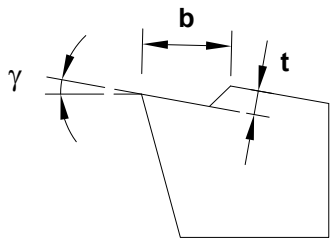
4.16.1 Cutting edge geometry for turning tools

	High-speed steel		Hard metal	
	Clearance angle	Chip angle	Clearance angle	Chip angle
Steel	+5° to +7°	+5° to +6°	+5° to +11°	+5° to +7°
Cast iron	+5° to +7°	+5° to +6°	+5° to +11°	+5° to +7°
Non-ferrous metal	+5° to +7°	+6° to +12°	+5° to +11°	+5° to +12°
Aluminium alloys	+5° to +7°	+6° to +24°	+5° to +11°	+5° to +24°

4.16.2 Types of cutting form levels

They are needed to influence the chip drain and the chip shape in order to achieve optimum chipping conditions.

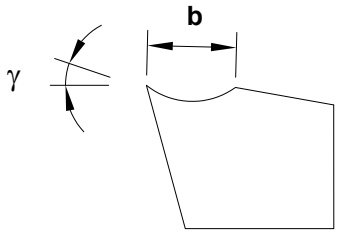
Examples of types of cutting form levels



Img. 4-17: Cutting form level

b = 1.0 mm to 2.2 mm

t = 0.4 mm to 0.5 mm

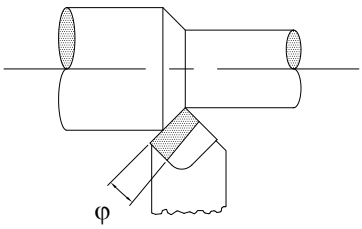


Img. 4-18: Cutting form level with fillet

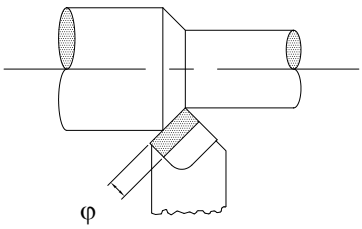
b = 2.2 mm with fillet

For infeeds of 0.05 to 0.5 mm per revolution and depths of cut of 0.2 mm to 3.0 mm.

The different apex angles (φ) of the cutting form level need to conduct the chip.



Img. 4-19: Positive apex angle for planing



Img. 4-20: Neutral apex angle for planing and roughing

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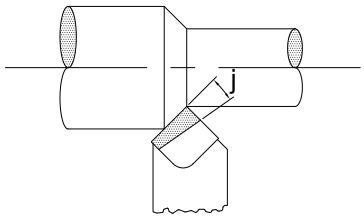
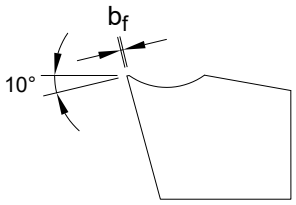


Img.4-21: Negative apex angle for roughing

The ready-ground major cutting edge must be slightly ground with a grindstone for the planing.

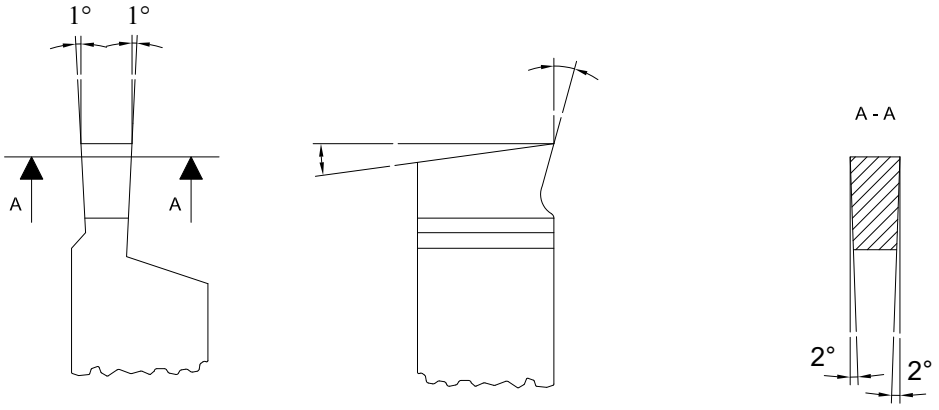
For the roughing, a small chamfer must be produced with the grindstone in order to stabilize the cutting edge against striking chips (b_f = f x 0.8).



Img.4-22: Stabilize cutting edge

Polished section for recessing and cutting off

(for chip angle refer to table)



Img.4-23: Polished section recessing and cutting off

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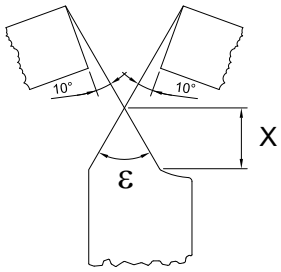
Polished section for threading

The point angle or the shape for chasing tools is depending on the type of thread.

See also:

O ► Thread types on page 48

The measure X must be larger than the depth of thread. Make save that no chip angle is being ground as in this case there would be a strain of the profile.



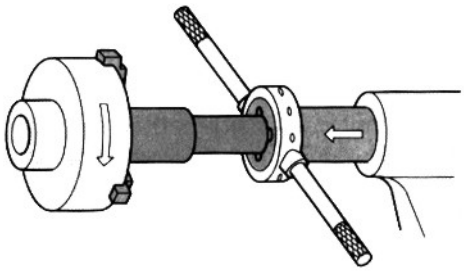
Img.4-24: Polished section for threading

4.17 Tapping of external and internal threads

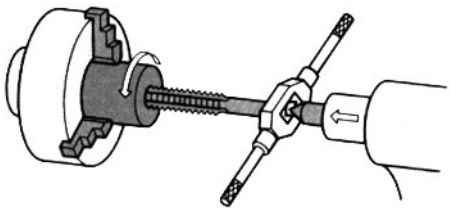
Threads with smaller diameters and standard thread pitches should be tapped manually on the lathe with screw-taps or dies by turning the clamping chuck as this is more simple to produce.

CAUTION!

Pull off the mains plug of the lathe if you want to tap a thread as described above.

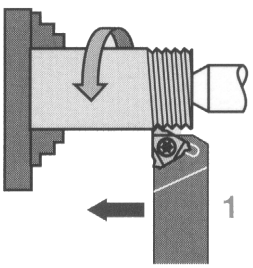


Img.4-25: die

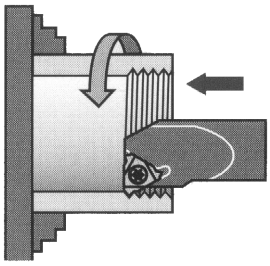


Img.4-26: screw tap

Bolts and nuts with large thread diameters, deviating thread pitches or special types of thread, right-handed and left-handed threads may be produced by threading. For this manufacturing there are as well tool holders and drill rods with exchangeable indexable inserts (one-edged or multiple-edged).

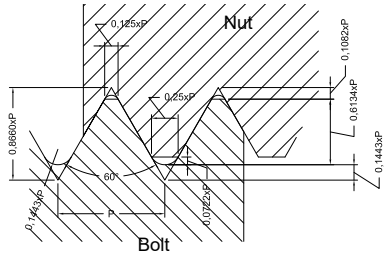
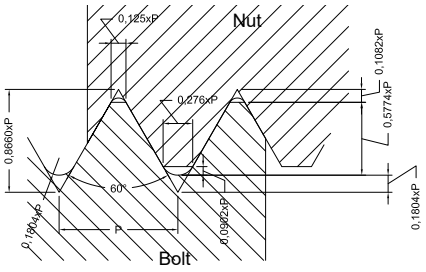
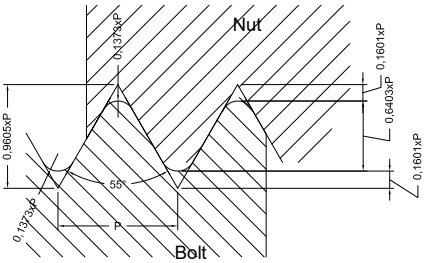
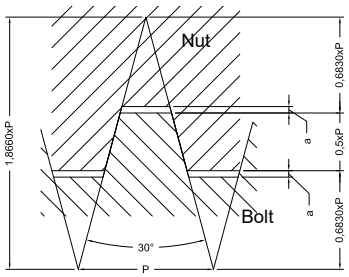
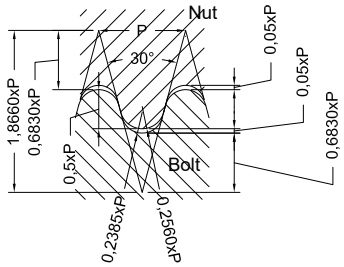


Img.4-27: Tap external thread



Img.4-28: Tap internal thread

4.18 Thread types

Designation	Profile	Code letter	Short term (e. g.)	Application
ISO-threads		M UN UNC UNF UNEF UNS	M4x12 1/4" - 20UNC - 2A 0.250 - UNC - 2A	Machine tools and general mechanical engineering
UNJ		UNJ	1/4" - 20UNJ	Aircraft industry and aerospace industry
Whitworth		B.S.W. W	1/4" in. -20 B.S.W.	Cylindrical threads, Pipe threads, or conical pipe threads for thread connections which seal
ISO trapezoidal thread (one- and multiple-threaded)		TR	Tr 40 x 7 Tr 40 x 14 P7	Motion thread, Leading spindle and transport spindle
Round thread		RD	RD DIN 405	Fittings and for purposes of the fire brigade

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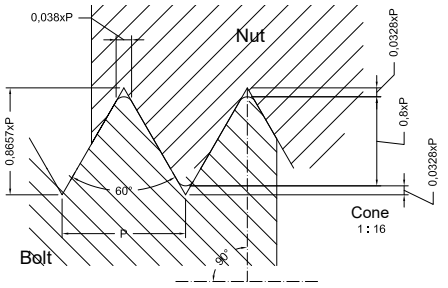
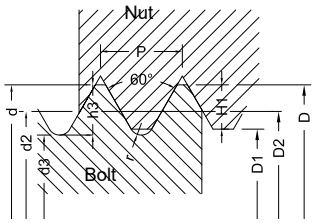
NPT		NPT	1“ – 11 ½“ NPT	Fittings and tube joints

4.18.1 Metric threads (60° flank angle)



pitch P

depth of thread of the bolt h2=0.6134 x P

depth of thread of the nut H1 = 0.5413 x P

rounding r = 0.1443 x P

flank diameter d2 = D2 =d - 0.6493

core removing hole drill = d - P

flank angle = 60°

Metric coarse-pitch thread

Sizes in mm: preferably use the threads in column 1

Denomination of thread d = D		pitch P	Flank diameter d2 = D2	Core diameter		Depth of thread		Rounding r	Core removing hole drill
Column 1	Column 2			Bolt d3	Nut D1	Bolt h3	Nut H1		
M 1		0.25	0.838	0.693	0.729	0.153	0.135	0.036	0.75
	M 1.1	0.25	0.938	0.793	0.829	0.153	0.135	0.036	0.85
M 1.2		0.25	1.038	0.893	0.929	0.153	0.135	0.036	0.95
	M 1.4	0.3	1.205	1.032	1.075	0.184	0.162	0.043	1.1
M 1.6		0.35	1.373	1.171	1.221	0.215	0.189	0.051	1.3
	M 1.8	0.35	1.573	1.371	1.421	0.215	0.189	0.051	1.5
M 2		0.4	1.740	1.509	1.567	0.245	0.217	0.058	1.6
	M 2.2	0.45	1.908	1.648	1.713	0.276	0.244	0.065	1.8
M 2.5		0.45	2.208	1.948	2.013	0.276	0.244	0.065	2.1
M 3		0.5	2.675	2.387	2.459	0.307	0.271	0.072	2.5
	M 3.5	0.6	3.110	2.764	2.850	0.368	0.325	0.087	2.9
M 4		0.7	3.545	3.141	3.242	0.429	0.379	0.101	3.3
M 5		0.8	4.480	4.019	4.134	0.491	0.433	0.115	4.2
M 6		1	5.350	4.773	4.917	0.613	0.541	0.144	5.0
M 8		1.25	7.188	6.466	6.647	0.767	0.677	0.180	6.8
M 10		1.5	9.026	8.160	8.376	0.920	0.812	0.217	8.5
M 12		1.75	10.863	9.853	10.106	1.074	0.947	0.253	10.2
	M14	2	12.701	11.546	11.835	1.227	1.083	0.289	12
M 16		2	14.701	13.546	13.835	1.227	1.083	0.289	14
	M18	2.5	16.376	14.933	15.294	1.534	1.353	0.361	15.5
M 20		2.5	18.376	16.933	17.294	1.534	1.353	0.361	17.5
	M 22	2.5	20.376	18.933	19.294	1.534	1.353	0.361	19.5
M 24		3	22.051	20.319	20.752	1.840	1.624	0.433	21
	M 27	3	25.051	23.319	23.752	1.840	1.624	0.433	24

M 30		3.5	27.727	25.706	26.211	2.147	1.894	0.505	26.5
M 36		4	33.402	31.093	31.670	2.454	2.165	0.577	32
M 42		4.5	39.077	36.479	37.129	2.760	2.436	0.650	37.5
M 48		5.5	44.752	41.866	41.866	3.067	2.706	0.722	43
M 56		5.5	52.428	49.252	49.252	3.374	2.977	0.794	50.5
M 64		6	60.103	56.639	56.639	3.681	3.248	0.866	58

Metric fine-pitch thread

Denomination of thread d x P	Flank diameter d2 = D2	Core diameter Bolt	Core diameter Nut	Denomination of thread d x P	Flank diameter d2 = D2	Core diameter Bolt	Core diameter Nut
M2 x 0.2	1.870	1.755	1.783	M16 x 1.5	15.026	14.160	14.376
M2.5 x 0.25	2.338	2.193	2.229	M20 x 1	19.350	18.773	18.917
M3 x 0.35	2.773	2.571	2.621	M20 x 1.5	19.026	18.160	18.376
M4 x 0.5	3.675	3.387	3.459	M24 x 1.5	23.026	22.160	22.376
M5 x 0.5	4.675	4.387	4.459	M24 x 2	22.701	21.546	21.835
M6 x 0.75	5.513	5.080	5.188	M30 x 1.5	29.026	28.160	28.376
M8 x 0.75	7.513	7.080	7.188	M30 x 2	28.701	27.546	27.835
M8 x 1	7.350	6.773	6.917	M36 x 1.5	35.026	34.160	34.376
M10 x 0.75	9.513	9.080	9.188	M36 x 2	34.701	33.546	33.835
M10 x 1	9.350	8.773	8.917	M42 x 1.5	41.026	40.160	40.376
M12 x 1	11.350	10.773	10.917	M42 x 2	40.701	39.546	39.835
M12 x 1.25	11.188	10.466	10.647	M46 x 1.5	47.026	46.160	46.376
M16 x 1	15.350	14.773	14.917	M48 x 2	46.701	45.546	45.835

4.18.2 British thread (55° flank angle)

BSW (Ww.): British Standard Whitworth Coarse Thread Series is the most common coarse thread in Great Britain and corresponds in its usage category to the metric coarse-pitch thread. The designation of a hexagon head screw 1/4" - 20 BSW x 3/4" , is here: . 1/4" is the nominal diameter of the screw and 20 is the number of threads in 1" of length

BSF: British Standard Fine Thread Series. British Standard Fine Thread Series. BSW- and BSF are the thread selection for the common screws. This fine thread is very common in the British machine tool industry, but it is replaced by the American UNF thread.

BSP (R): British Standard Pipe Thread. Cylindric pipe thread; designation in Germany: R 1/4" (nominal width of the tube in inch). Tube threads are larger in their diameter as "BSW". Designation 1/8" - 28 BSP

BSPT: BSPT: British Standard Pipe - Taper Thread. Conic tube thread, cone 1:16; designation: 1/4" - 19 BSPT

BA: BA: British Association Standard Thread (47 1/2° flank angle). Common with instruments and watches, is being replaced by the metric ISO thread and by the ISO miniature thread. It consists of numeric designations from 25 to 0=6.0 mm max diameter.

Table of the British threads

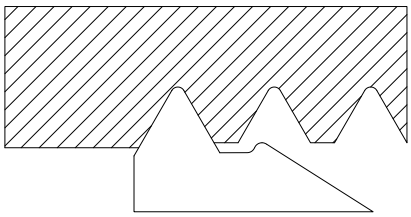
Nominal diameter of the thread		Threads in 1"				Threads in 1"		
		BSW	BSF:	BSP/BSPT		BA-threads		
Inch	mm			(R)	D. [mm]	No.		D. [mm]
		55° Flank angle				47 1/2° Flank angle		
1/16	1.588	60	-	-		16	134	0.79
3/32	2.382	48	-	-		15	121	0.9
1/8	3.175	40	-	28	9.73	14	110	1.0
5/32	3.970	32	-	-	-	13	102	1.2
3/16	4.763	24	32	-	-	12	90.9	1.3
7/32	5.556	24	28	-	-	11	87.9	1.5
1/4	6.350	20	26	19	13.16	10	72.6	1.7
9/32	7.142	20	26	-	-	9	65.1	1.9
5/16	7.938	18	22	-	-	8	59.1	2.2
3/8	9.525	16	20	19	16.66	7	52.9	2.5
7/16	11.113	14	18	-	-	6	47.9	2.8
1/2	12.700	12	16	14	20.96	5	43.0	3.2
9/16	14.288	12	16	-	-	4	38.5	3.6
5/8	15.875	11	14	14	22.91	3	34.8	4.1
11/16	17.463	11	14	-	-	2	31.4	4.7
3/4	19.051	10	12	14	26.44	1	28.2	5.3
13/16	20.638	10	12	-	-	0	25.3	6.0

7/8	22.226	9	11	14	30.20
15/16	23.813	9	11	-	-
1"	25.401	8	10	11	33.25
1 1/8	28.576	7	9	-	-
1 1/4	31.751	7	9	11	41.91
1 3/8	34.926	6	8	-	-
1 1/2	38.101	6	8	11	47.80
1 5/8	41.277	5	8	-	-
1 3/4	44.452	5	7	11	53.75
1 7/8	47.627	4 1/2	7	-	-
2"	50.802	4 1/2	7	11	59.62

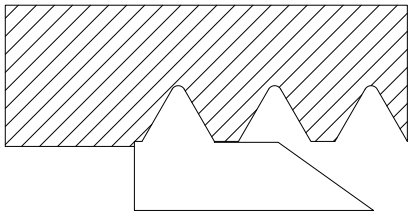
4.18.3 Indexable inserts

For indexable inserts there are partial profile and full profile indexable inserts. The partial profile indexable inserts are designed for a certain pitch range (e.g. 0.5 - 3 mm).

- The partial profile indexable insert is optimally appropriate for the single-piece production.
- The full profile indexable insert is only designed for a certain pitch.



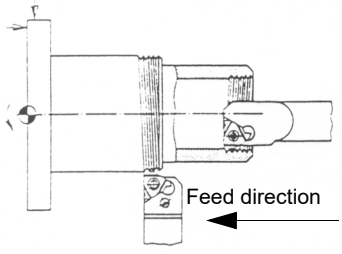
Img. 4-29: partial profile indexable insert



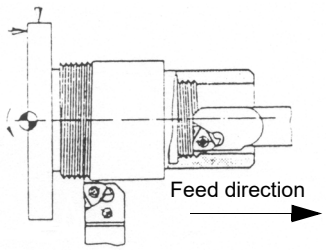
Img. 4-30: full profile indexable insert

Determining the machining method of right-handed and left-handed threads:

Right-handed tool holders or drill rods are used. In order to top right-handed threads the feed direction towards the clamping chuck is selected and the machine spindle turns to the right (the turning direction of the machine spindle is determined when you look into the spindle from the rear side). If a left-handed thread is to be tapped, the feed direction is selected away from the clamping chuck in direction to the tailstock and the machine spindle turns to the right.

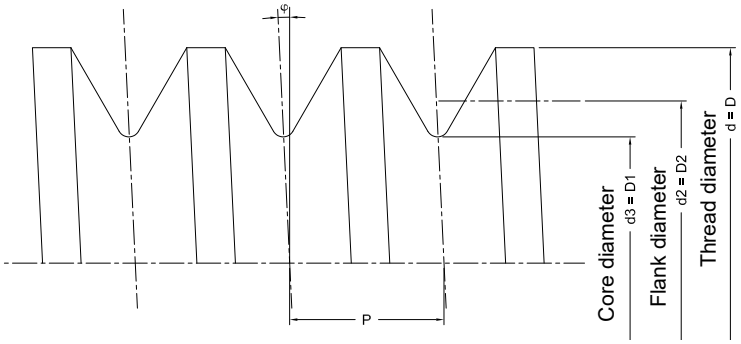


Img. 4-31: right-handed thread with the machine spindle turning to the right



Img. 4-32: left-handed thread with the machine spindle turning to the right

As for thread cutting there are other conditions as for longitudinal turning, the forward cutter must show a larger clearance as the pitch angle of the thread.



Pitch angle φ

Pitch P

$$\tan\varphi = \frac{P}{D_2 \times \pi}$$

Img.4-33: Pitch angle

4.18.4 Examples for thread cutting

As an example, a metric external thread M30 x 1.0 mm made of brass is being machined.

→ Steel sheets are to be laid under the complete tool holder or turning tool to achieve exactly the turning center.

→ The lowest spindle speed is set so that the lathe will not coast too long !

→ Mount gear pairing for pitch 1.0 mm in the change gear !

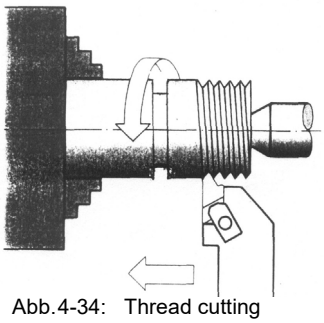


Abb.4-34: Thread cutting

The outer diameter had been turned to 30.0 mm and the tool holder is clamped in the quadruple holder for threading aligned angular to the rotation axis. The height of centres is checked (as described).

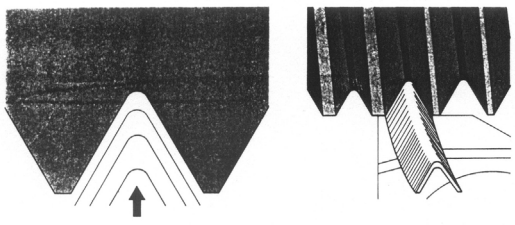


Abb.4-35: radial infeed

The depth of thread is manufactured in various passes. The infeed is to be reduced after each pass.

The first pass takes place with a infeed of 0.1 to 0.15 mm.

For the last pass the infeed shall not be below 0.04 mm.

For pitches up to 1.5 mm the infeed may be radial.

For our example 5 to 7 passes are being determined.

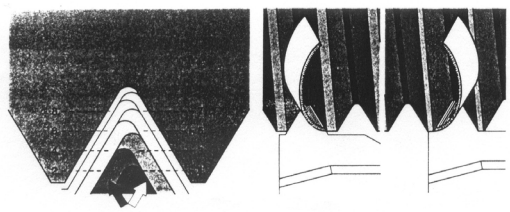


Abb. 4-36: Alternately infeed

For larger pitches the alternately flank infeed is selected. The top slide is from the 2nd passage in each case 0.05 - 0.10 mm adjusted alternately to the left and right. The last two passes are performed without lateral offset. When the depth of thread is achieved, two passes are performed without infeed.

To machine internal threads, about 2 passes shall be selected additionally for the infeed (drill rods are more instable).

The cutting point is slit slightly by turning the handwheel of the cross slide the scale is turned to zero. This is the point of departure for the infeed of the depth of thread.

The scale of the top slide is also set to zero (this is important for the lateral offset when turning threads with larger pitches).

The cutting point is set just in front of the starting point of the start of the thread by actuating the handwheel of the lathe saddle.

In standstill of the lathe a connection to the lead-screw is made by shifting the operating lever of the lead-screw nut. With this connection, the adjusted thread pitch is transferred to the lathe saddle and to the tool holder.

ATTENTION!

This connection must not be disconnected until the thread is finished !

Starting the threading:

- Radial infeed over the handwheel of the cross slide.
- Switch the direction of rotation to counter clockwise rotation.
- Start the machine and have the first cutting process run.

ATTENTION!

Always have the thumb ready on the OFF-switch in order to prevent a collision with the workpiece or with the lathe chuck !

- Immediately switch off the machine at the run out of the thread and cam the cutter out by turning the handwheel of the cross slide.
- Switch the direction of rotation to clockwise rotation.
- Switch the machine on; move the lathe saddle to the starting point; switch the machine off.
- Radial infeed over the handwheel of the cross slide.
- Switch the direction of rotation to counter clockwise rotation.
- Switch the machine on and have the second cutting process run.
- Repeat this procedure as often as necessary until the depth of thread is achieved.
- To check the thread you may use a thread gauge or a workpiece with an internal thread M30 x 1.0
- If the thread is having the exact size, the thread cutting process may be terminated. Now you may again shift the operating lever of the lead-screw nut in standstill. In this way, the connection between the lead-screw and the lathe saddle is interrupted.
- Now the gearwheels for the longitudinal feed are to be mounted again!

4.19 General operating instructions

4.19.1 Clamping long workpieces

o through the hollow shaft of the spindle

CAUTION!

Long rotating parts that protrude from the hollow shaft of the spindle must be secured by the operator using suitable covers. A cover can be a sleeve that is mounted on the headstock that, as a permanent safety device, completely covers the protruding workpiece.

o between the tips

CAUTION!

Long workpieces must be additionally supported. They are supported by the tailstock sleeve and, if necessary, a rest.

o with a lathe dog

CAUTION!

When clamping workpieces between the tips of the lathe while using a lathe dog, the existing lathe chuck protection must be replaced with a circular lathe chuck protection.

4.20 Mounting of rests

Use steady rest or follow rest to support longer parts and prevent the workpiece from flapping around and flying away.

CAUTION!

When mounting a rest, the rest is due his function near the top slide, which results in additional crushing and shearing points between the guide of rest and the workpiece.

Increased attention is therefore absolutely necessary when working with an rest.

4.21 Tailstock

The tailstock quill is used to hold the tools (bits, centres, etc.)

→ Clamp the required tool into the quill of the tailstock.

O Use the scale on the sleeve to re-adjust and / or adjust the tool.

→ Clamp the quill with the clamping lever.

❍ Use the hand wheel to move the sleeve back and forth.

The quill of the tailstock is useable with a drill chuck with countersinking tools.

INFORMATION

Use the longer fixed centring point from the delivery, so that the centring point can be pressed out again from the tailstock sleeve.

INFORMATION

When using different tools, it can happen that you cannot start with the quill marking with scale value 0, because the tool is already ejected in this position by the expulsion flap. In such cases we recommend to start at a value of 10mm and to convert from here on.

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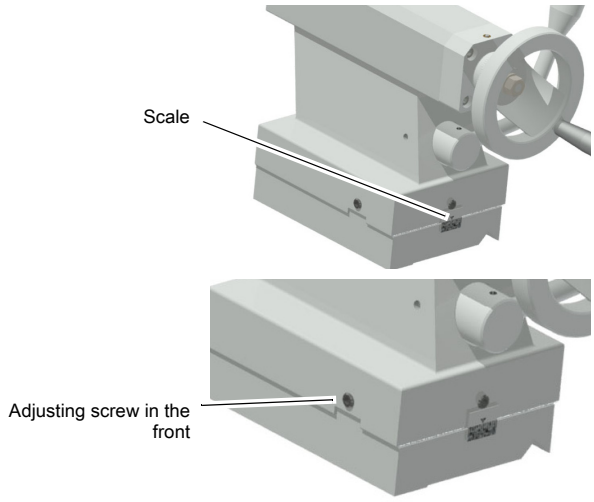
4.21.1 Cross-adjustment of the tailstock

The cross-adjustment of the tailstock is used for turning long, thin bodies.

→ Loosen the adjusting screws in the front and in the rear of the tailstock.

❍ By alternately loosening and tightening the two (front and rear) adjusting screws, the tailstock is moved out of the central position. The desired cross-adjustment can be read off the scale.

→ Re-tighten the adjusting screws of the tailstock.



Img. 4-37: Cross-adjustment of the tailstock

INFORMATION

The tailstock may be cross-adjusted to each direction by approximately + - 10mm.
Example:
A 300mm long shaft is to be taper-turned between the centres with an angle of 1°.
Cross-adjustment of the tailstock = 300mm x Tan 1°. The tailstock must be cross-adjusted by approximately 5.236mm.

CAUTION!

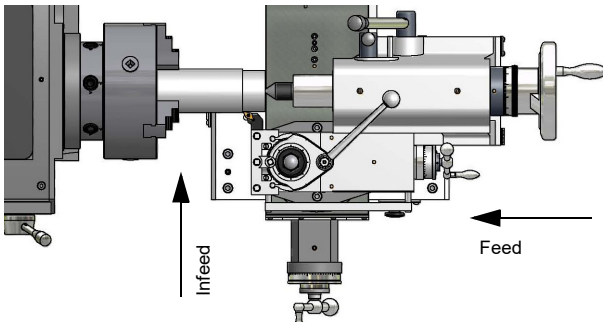
Check clamping of the tailstock and the sleeve, respectively for the turning jobs between the centres!

Tighten the securing screw at the end of the lathe bed in order to prevent the tailstock from unintentional drawing-out of the lathe bed.

4.22 General operating instructions

4.22.1 Longitudinal turning

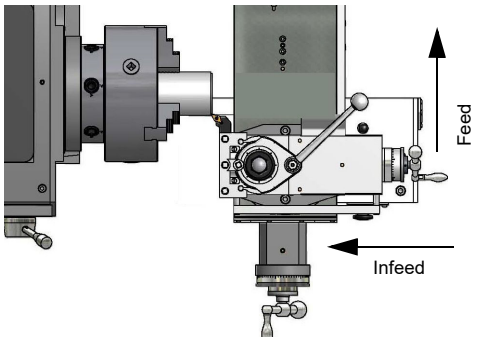
In the straight turning operation, the tool feeds parallel to the axis of rotation of the workpiece. The feed can be either manual - by turning the handwheel on the lathe saddle or the top slide - or by activating the automatic feed. The cross feed for the depth of cut is achieved using the cross slide.



Img. 4-38: Graphic: Longitudinal turning

4.22.2 Face turning and recessing

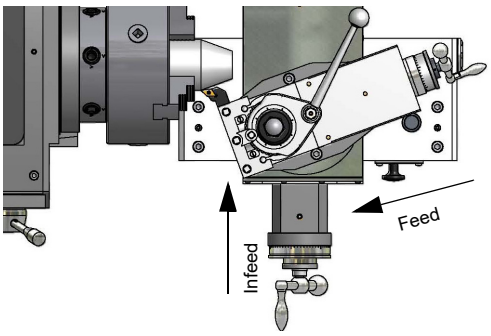
In the facing operation, the tool feeds perpendicular to the axis of rotation of the workpiece. Feed is done manually, using the cross-slide hand wheel. The infeed for cut depth is made with the top slide or lathe saddle.



Img.4-39: Graphic: Face turning

4.22.3 Turning short tapers with the top slide

Short tapers are turned manually with the top slide. Swivel the top slide to the required angle. The infeed is achieved with the cross slide.



Img.4-40: Graphic: Turning tapers

→ Loosen the two clamping screws in the front and in the rear of the top slide.
→ Swivel the top slide.
→ Clamp the top slide again.

4.22.4 Thread cutting

The thread cutting process requires that the operator has a good knowledge of turning and sufficient experience.

INFORMATION

Due to a safety mechanism, it is not possible to use the

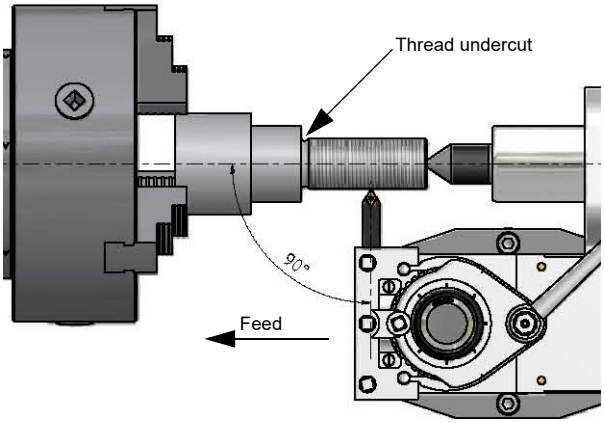
- longitudinal feed via the lead screw and
- cross feed / longitudinal feed with feed rod

at the same time.

NOTES!

Example of an external thread:

- The workpiece diameter must have been turned to the diameter of the desired thread.
- The workpiece requires a chamfer at the beginning of the thread and an undercut at the thread run out.
- The speed must be as low as possible.
- The thread cutting tool must be exactly the same shape as the thread, it must be absolutely rectangular and must be clamped in a way that it coincides exactly with the turning centre.
- The threading engaging lever must be engaged during the whole thread cutting process. This does not apply to thread pitches that can be carried out with the thread gauge.
- The thread is produced in various cutting steps in a way that the cutting tool has to be turned out of the thread completely (with the cross slide) at the end of each cutting step.
- The tool is withdrawn with the lead screw nut engaged and the thread cutting tool disengaged by actuating the "Direction of rotation control lever".
- Stop the lathe and feed the thread cutting tool in low cut depths using the cross slide.



Img.4-41: Illustration: Thread cutting

- Before each passage, place the top slide approximately 0.2 to 0.3 mm to the left and right alternately in order to cut the thread free. In this way, the thread cutting tool cuts only on one thread flank with each passage. Do not execute any more free cutting, just before reaching the full thread depth.

4.23 Cooling lubricant

WARNING!

Ejection and overflowing of coolants and lubricants. Make sure you do not get the cooling lubricants on the floor. Spilled on the floor cooling agents must be removed immediately.

Friction during the cutting process causes high temperatures at the cutting edge of the tool.

The tool should be cooled during the milling process. Cooling the tool with a suitable cooling lubricant ensures better working results and a longer service life of the cutting tool.

INFORMATION

The lathe is lacquered with a one-component paint. Consider this fact when selecting your cooling lubricant.

The company Optimum Maschinen Germany GmbH does not assume any guarantee for subsequent damages due to unsuitable cooling lubricants.

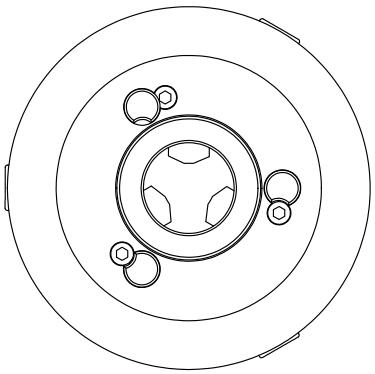
The flashpoint of the emulsion must be higher than 140°C.

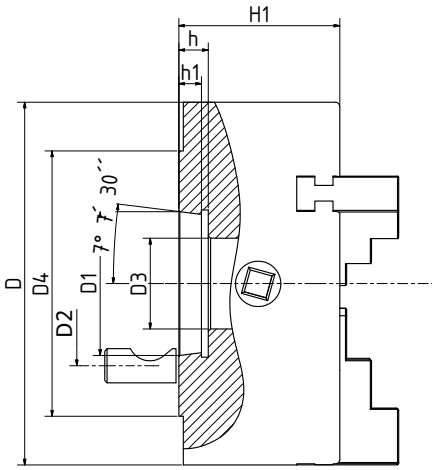
When using non-water-miscible cooling lubricants (oil content > 15%) with a flashpoint, ignitable aerosol air mixtures might develop. There is a potential danger of explosion.

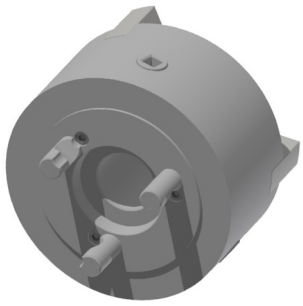
The selection of cooling lubricants and slideway oils, lubricating oils or greases as well as their care are being determined by the machine operator or operating company.

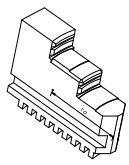
Therefore, Optimum Maschinen Germany GmbH cannot be held liable for machine damages caused by unsuitable coolants and lubricants as well as by inadequate maintenance and servicing of the coolant. In case of problems with the cooling lubricant and the slideway oil or grease, please contact your mineral oil supplier.

4.24 Rotary chuck - K11-160 ISO 702-2







Type		K11-160/D4 (3442761)
Material of the chuck body		Cast steel
Camlock direct fixing (without flange)		DIN ISO 702-2 Size no. 4
Maximum clamping diameter [mm]		160
Lathe chuck passage [mm]		40
max. speed [rpm]		3000
max. static clamping force Σ_S [kN]		24
Maximum torque with lathe chuck key [Nm]		160
Lathe chuck weight [kg]		10
Weight of a jaw [kg] with internal grading		0.318
Mass of chuck jaw set [kg]		0.954
Centrifugal moment M_c for one jaw [kgm] with internal grading		0.0164
Gravity distance r_o of jaw [mm]		40.62
D		160
D1		63.513
D2		82.6
D3		50
D4		117
H_1		71
h		13
h_1		10

4.24.1 Safety instructions

Intended use

This standard product is suitable for clamping workpieces on lathe machines and other rotating tooling machines. Unintended and improper use of the manual chuck may cause danger to life and limb of the operator. The specified maximum technical data must not be exceeded while the manual chuck is in operation! The manual chuck should only be used on the basis of its technical data. This also comprises the observance of the conditions of initial operation, assembly, operation as well as conditions of environment and maintenance provided by the manufacturer.

For each individual clamping task, the permitted rotational speed and the necessary clamping force must be determined according to the respective standards that apply and/or the most up-to-date scientific and technological data (e.g. VDI 3106).

Reasonably foreseeable misuses

Any other use other than that specified under "Intended use" or any use beyond the described use shall be deemed as non-intended use and is not permissible.

Any other use has to be discussed with the manufacturer.

In order to avoid misuse, it is necessary to read and understand the operating instructions before the first commissioning.

The operators must be qualified.

Avoiding misuse

Improper and unintended use of the manual chuck and disregard of the current safety norms and safety regulations can threaten life and limb of the operator. Irrespective of whether our chucks are used under rotation or stationary, it is mandatory to wear protective equipment in accordance with the EC machine guideline, so that loose parts, discharged in case of the chuck or a component malfunctioning, are absorbed by the protective equipment. The machine manufacturer must ensure that there is a sufficient wall thickness of its housing / protection equipment (considering the currently valid directives and standards), because this may cause a threat to the life and limb of the operator in the case of a fracture in the chuck jaws, or when the workpiece gets lost.

CAUTION!

Please observe all appropriate safety measures during the transportation and handling of any chucks of considerable weight.

Recommended threshold values when lifting and carrying loads				
	Reasonable load in kg and frequency of lifting and carrying			
	Occasionally		More frequently	
Age in years	Women	Men	Women	Men
15 - 18	15	35	10	20
19 - 45	15	55	10	30
above 45	15	45	10	25

DANGER!

Regularly check the clamping force by inserting a power meter in the lathe chuck.

CAUTION!

Risk of damages due to incorrect choice of clamping position for chuck jaws on workpiece. If an incorrect clamping position is chosen for the chuck jaws on workpiece, the lathe chuck jaws may be damaged. The external diameter of jaws must not exceed the external diameter of the chuck by more than max. 10%.

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.

- **o Ensure the chuck's axial and concentric runout.**
- **o Check options for remedying imbalances on workpieces.**
- **o Reduce the speed.**
- **o Wear hearing protection.**
- **o If the chuck is involved in a collision, it must be subjected to a crack test before using it again.**

4.24.2 Basic safety instructions

- O The permissible speed (as per VDI 3106) must be calculated for the machining allowance; the maximum guide speed must not be exceeded. The calculated values must be tested by performing a dynamic measurement.
- O The max. guide speed may only be applied with max. introduced actuation force and a chuck that is perfect working condition.
- O If the chuck is involved in a collision, it must be subjected to a crack test before using it again. Damaged parts must be replaced using original spare parts.
- O The chuck may only be mounted and removed, commissioned, operated and maintained by authorised and skilled staff following safety training.
- O We recommend checking the clamping force before starting a new series batch and between maintenance intervals with a clamping force measuring device. Only regular checks guarantee best possible safety.

4.24.3 Optional soft lathe chuck jaws

CAUTION!

The optionally available soft chucks jaws are jaws, which must be stepped according to the application. Unstepped jaws lead to an increased centrifugal torque with a reduced permissible rotational speed of the rotary chuck.

4.24.4 Calculating the required clamping force for a given speed

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 shut-down. Under the influence of rpm, the jaw mass generates an additional centrifugal force. The centrifugal force reduces or increases the initial clamping force depending on whether gripping takes place from the outside in or from the inside out. The sum of the initial clamping force F_{sp0} and the centrifugal force F_c , is the effective clamping F_{sp}.

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

- for gripping from the outside in
+ for gripping from the inside out

Legend			
F_c	Total centrifugal force [N]	M_{cAB}	Centrifugal force of top jaws in [
F_{sp}	Effective clamping force [N]	M_{cGB}	Centrifugal force of base jaws in [

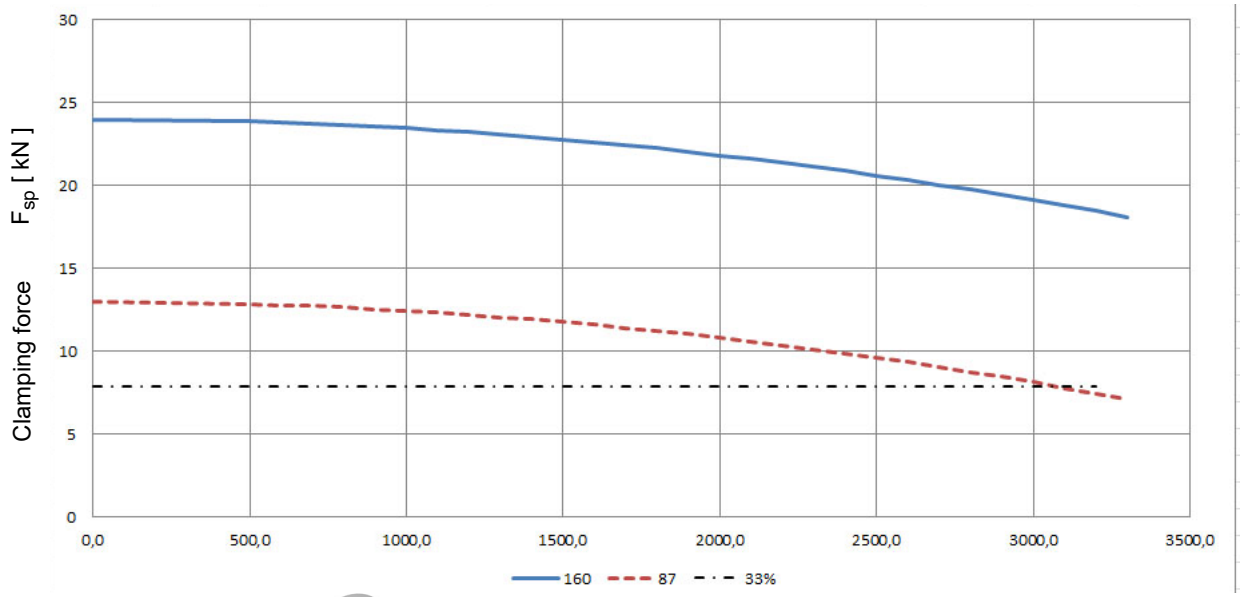
F_{spmin}	Required static clamping force [N	n	Rotational speed [rpm]
F_{sp0}	Initial clamping force [N]	r_s	Center of gravity radius [mm]
F_{spz}	Cutting force [N]	r_{sAB}	Center of gravity radius of top jaw
m_{AB}	Mass of one top jaw [kg]	s_{sp}	Clamping force safety factor
m_B	Mass of chuck jaw set [kg]	s_z	Safety factor for cutting
M_c	Centrifugal force torque [kgm]	Σ_s	Max. Clamping force of the chuck [
1 Newton (N) = 1 kg m/s²			

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 minimum clamping force F_{spmin} Consequently, the workpiece is released in an unchecked manner.

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

4.24.5 Clamping force-speed diagram - Lathe chuck K11-160



Speed n [rpm]

Required minimum clamping force 33 %

Tightening torque with key 87 Nm

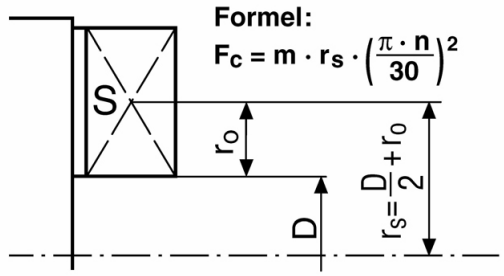
Tightening torque with key max. 160 Nm

The clamping force to speed diagram shows the calculated centrifugal force with the matching jaw design as a function for the speed if the chuck jaws do not protrude beyond the outer diameter of the chuck.

K11-160_ISO-702-2_3442761_ba-integrated_GB.fm

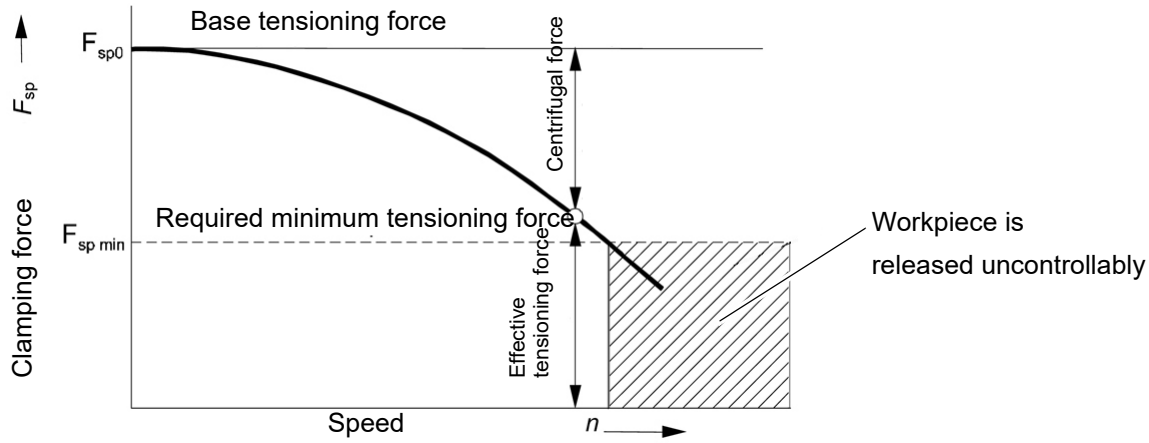
4.24.6 Clamping jaw centrifugal force

To calculate the required tensioning force for processing a workpiece, the centrifugal force of the clamping jaws must be taken into account.



Fc	Centrifugal force in N
m	Mass in kg/set
rs	Centre of gravity distance to the centre of the chuck in metres
n	Speed min^{-1}
r_0	Centre of gravity distance to the clamping jaw

The permissible speeds can be determined in accordance with VDI Guideline 3106 "Determining the permissible speed for lathe chucks (jaw chucks). This guideline also allows for the residual tensioning force at a specified speed to be determined.



The required effective clamping force for machining F_{sp} is calculated from the product of the machining force F_{spz} with the safety factor S_z. This factor takes into account uncertainties in the calculation of the clamping force.

According to VDI 3106, the following also applies here:

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

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 in
+ for gripping from the inside out

ATTENTION!

This calculated force must not be larger than the maximum clamping force Σ_S (24 KN) engraved on the chuck.

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 both on the sum of the masses of all jaws and on the center of gravity radius and the RPM.

ATTENTION!

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

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

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

n is the given speed in r.p.m.. The product $\mathbf{m_B \cdot r_s}$ is described as the centrifugal force torque $\mathbf{M_c}$.

$M_c = m_B \cdot r_s$ [kgm]

In case of chucks 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 base jaws M_{cGB} and the centrifugal torque of 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 data of the lathe chuck.

The centrifugal torque of the top jaws M_{cAB} is calculated.

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

The lathe chuck K11-160 has no base jaws and no top jaws.

Example:

- The centre of gravity radius r_s of the jaw = 0.05160 m (jaw flush with the outer diameter of the chuck)
- Weight of a jaw = 0.318kg
- Centrifugal moment for one jaw

$M_c = 0.318 \text{ kg} \cdot 0.05160 \text{ m} = 0.0164 \text{ kgm}$

- The lathe chuck has 3 jaws.

$= 0.0164 \text{ kgm} \cdot 3 = 0.0492 \text{ kgm}$

- Calculation of the total centrifugal force at a rotational speed of 3000 rpm

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

$$= 0.0492 \text{ kgm} \cdot \left(\frac{3.14 \cdot 3000}{30}\right)^2 = 4850.9 \text{ N} = 4.8 \text{ kN}$$

The total possible clamping force of the chuck at a standstill is $\sum_s$ 24 kN at a tightening torque of 160 Nm with the lathe chuck key.

An effective clamping forceF_{sp} of 19.2 kN remains at the chuck.

$F_{sp} = \sum_s - F_c = 24 \text{ kN} - 4.8 \text{ kN} =$ **19.2 kN**

see ► Clamping force-speed diagram - Lathe chuck K11-160 on page 64
see ► Basic safety instructions on page 63

WARNING!

The greater distance above the chuck surface that clamping occurs, the lower the clamping force will be.

4.24.7 Notes on instruction of operating personnel

We recommend that the business operating our manual chucks makes the operating instructions in particular these section "Safety" available to all persons being in charge of operation, maintenance and repair, with the intention ofacquiring specialised knowledge. We further recommend that the business operator issues internal "operating instructions" which take into account the known qualifications of the operating personnel.

The business operator must guarantee that suitable measures in organisation and instruction are taken to ensure that the appropriate safety rules and regulations are complied with by the persons entrusted with operation, maintenance and repair of the manual chuck.

4.24.8 Lubricating and cleaning the lathe chuck

ATTENTION!

Do not use compressed air to remove dust and foreign substances from the lathe chuck.

Coolant squirts on the lathe chuck and removes the grease from the master jaws. In order to maintain the tensioning force and the long-term accuracy of the lathe chuck, the lathe chuck must be lubricated regularly. Insufficient lubrication will result in malfunctions at reduced tensioning force, which affects the accuracy and causes excessive wear and seizing.

Depending on the chuck type and operating state, the tensioning force of a lathe chuck can decrease by up to 50 percent of the nominal tensioning force.

A presumably securely clamped workpiece can then fall out of the chuck during processing.

Oil the chuck regularly at the oiler. Use additional an lubricant on the toothing of the clamping jaws, which is of high quality and for high pressure bearing surfaces. The lubricant should withstand the coolant and other chemicals.

5 Cutting speeds

5.1 Selecting the cutting speed

The variety of factors makes it impossible to present universal indications about the "correct“ cutting speed.

Tables with reference values about cutting speeds to be set must be evaluated with utmost caution since they only apply for very particular cases. The reference values without cooling (no best values) which are indicated in AWF documents are highly recommended. Furthermore, the tables of reference values of the manufacturers of cutting materials should be evaluated e.g. for hard metal cutting materials the indications of the company Friedrich Krupp Widia-Fabrik, Essen applies.

V_{c60} is the cutting speed at 60 min. service life, V_{c240} according for 240 min. service life. Select V_{c60} for simple, easily replaceable lathe tools; V_{c240} for simple tool sets depending on one another; V_{c480} for complicated tool sets where the tool change requires more time due to the dependencies on one another and the accuracies of the cutting insert. The same considerations apply with regard to maintenance of the tools. It generally applies: High cutting speeds result in low-time chipping, little cutting speeds result in cost-efficient chipping.

5.2 Influences on the cutting speed

$\mathbf{v_c}$ = Cutting speed in [m/min]

t = Service life in [min]

The service life **t** is the period of time in minutes during which the cutting insert performs cutting tasks until it is necessary to re-sharpen it. It is of utmost commercial importance. For the same material **t** is smaller the higher you select the value $\mathbf{v_c}$ e.g. only a few minutes at $\mathbf{v_c}$ = 2000 m/min. Different materials require different $\mathbf{v_c}$ for the same **t** . All considerations of this type require that the other cutting conditions are maintained constant (material, tool and setting conditions). If only one of these condition changes it is also necessary to change $\mathbf{v_c}$ in order to obtain the same **t** . Therefore, only cutting speed tables are reasonable which show all relevant cutting conditions.

5.3 Example for the determination of the required speed on your lathe

The necessary speed is depending on the diameter of the workpiece, of the material to be machined, of the turning tool, as well as of the setting of the turning tool (cutting material) to the workpiece.

Material to be turned: St37

Cutting material (turning tool): Hard metal

Setting angle [k_r] of the turning tool to the workpiece: 90°

selected infeed [f]: about 0.16mm/rev

the cutting speed [V_c] according to the table: 180 meters per minute

diameter [d] of your workpiece: 60mm = 0.06m [meters]

Speed $n = \frac{Vc}{\pi \times d} = \frac{180m}{min \times 3.14 \times 0.06m} = 955$ rpm

Set the speed on your lathe below the calculated speed.

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5.4 Cutting speeds table

Reference values for cutting speeds $\mathbf{v_c}$ in **m/min** when turning high speed steel and hard metal. (Excerpt from VDF 8799, Gebr. Boehringer GmbH, Göppingen)

Material	Tensile strength R_m in N mm²	Cutting material [3]	Infeed *f* in mm/rev. and setting angle k_r [1] [2]																												
			0.063			0.1			0.16			0.25			0.4			0.63			1			1.6			2.5		
			45°	60°	90°	45°	60°	90°	45°	60°	90°	45°	60°	90°	45°	60°	90°	45°	60°	90°	45°	60°	90°	45°	60°	90°	45°	60°	90°
St 34; St 37; C22; St 42	up to 500	High-speed steel							50	40	34.5	45	35.5	28	35.5	28	22.4	28	22.4	18	25	20	16	20	16	12.5	16	12.5	10
		P 10	250	236	224	224	212	200	200	190	180	180	170	160	162	150	140	140	132	125	125	118	112	112	106	100			
St 50; C 35	500...600	High-speed steel							45	35.5	28	35.5	28	22.4	28	22.4	18	25	20	16	20	16	12.5	16	12.5	10	12.5	10	8
		P 10	224	212	200	200			180	170	160	160	150	140	140	132	125	125	118	112	112	106	100	100	95	90			
St 60; C45	600...700	High-speed steel							35.5	28	22.4	28	22.4	18	25	20	16	20	16	12.5	16	12.5	10	12.5	10	8	10	8	6.3
		P 10	212	200	190	190	180	170	170	160	150	150	140	132	132	125	118	118	112	106	106	100	95						
St 70; C60	700...850	High-speed steel							28	22.4	18	25	20	16	12.5	16	12.5	16	12.5	10	12.5	10	8	10	8	6.3	8	6.3	5
		P 10	180	170	160	160	150	140	140	132	125	125	118	112	106	100	95	95	90	85	85	80	75						
Mn-; CrNi-, CrMo- among others alloyed steels	700...850	High-speed steel							25	20	16	20	16	12.5	16	12.5	10	12.5	10	8	11	9	7	9	7	5.6	7.5	6	4.5
		P 10	180	170	160	160	150	140	140	132	125	125	118	112	106	100	95	95	90	85	85	80	75						
	850...1000	High-speed steel							20	16	12.5	16	12.5	10	12.5	10	8	10	8	6.3	8	6.3	5	7.1	5.6	4.5	5.6	4.5	3.6
		P 10	140	132	125	125	118	112	100	95	90	90	85	80	71	67	63	63	60	56	56	53	50						
	1000..1400	High-speed steel							14	11	9	11	9	7	9	7	5.6	7	5.6	4.5	5.6	4.5	3.6	4.5	3.6	2.8	3.6	2.8	2.2
		P 10	80	75	71	71	67	63	63	60	56	56	53	50	50	47.5	45	45	42.5	40	33.5	33.5	31.5						
Rust-resistant steel	600..700	P 10	80	75	71	71	67	63	56	53	50	50	47.5	45	45	42.5	40	33.5	33.5	31.5	31.5	30	28						
Tool steel	1500..1800	High-speed steel							9	7	5.6	5.6	4.5	3.6	4	3.2	2.5												
		P 10	45	42.5	40	40	37.5	35.5	35.5	33.5	31.5	28	26.5	25	25	23.4	22	22	21	20	18	17	16						
Mn - High-carbon steel		P 10	33.5	33.5	31.5	31.5	30	28	28	26.5	25	22	21	20	20	19	18	18	17	16									
GS-45	300..500	High-speed steel							45	35.5	28	35.5	28	22	31.5	25	20	25	20	16	20	16	12.5	16	12.5	10	12.5	10	8
		P 10	150	140	132	118	112	106	106	100	95	95	90	85	85	80	75	75	71	67	67	63	60						
GS-52	500..700	High-speed steel							28	22	18	25	20	16	20	16	12.5	16	12.5	10	12.5	10	8	11	9	7	9	7	5.6
		P 10	106	100	95	95	90	85	85	80	75	75	71	67	67	63	60	60	56	53	53	50	47.5						
GS-15	HB...2000	High-speed steel							45	40	31.5	31.5	28	22	22	20	16	18	16	12.5	12.5	11	9	11	10	8	9	8	6.3
		K20	125	118	112	112	106	106	100	95	95	90	85	85	80	75	75	71	67	67	63	60							
GS-25	HB 2000..2500	High-speed steel							28	25	20	20	18	14	14	12.5	10	11	10	8	9	8	6.3	7.5	6.7	5.3	6	5.3	4.25
		K10	95	90	85	85	80	75	75	71	67	67	63	60	60	56	53	53	50	47.5	47.5	45	42.5	42.5	40	37.5			
GTS-35 GTW-40		High-speed steel							37.5	33.5	33.5	28	26.5	25	22	21	20	18	17	16	12.5	12	11	11	10	10	9	8.5	8
		K10/P10	95	90	85	85	80	75	75	71	67	67	63	60	60	56	53	53	50	47.5	47.5	45	42.5	42.5	40	37.5			
White cast iron	RC420..570	K10	19	18	17	17	16	15	15	14	13.2	13.2	12.5	11.8	11.8	11.2	10.6	10.6	10	9.5	9	8.5	8	8	7.5	7.1			
Cast bronze DIN 1705		High-speed steel							53	50	47.5	47.5	45	42.5	42.5	40	37.5	37.5	35.5	33.5	31.5	30	28	28	26.5	25	25	23.6	22.4
		K 20	315	300	280	280	265	250	250	236	224	224	212	200	200	190	180	180	170	160	160	150	140	140	132	125			
Red brass DIN 1705		High-speed steel							75	71	67	63	60	56	50	47.5	45	40	37.5	35.5	31.5	30	28	28	26.5	25	25	23.6	22.4
		K 20	425	400	375	400	375	355	355	335	315	335	315	300	300	280	265	265	250	236	250	236	224	236	224	212			
Brass DIN 1709	HB 800..1200	High-speed steel							112	106	100	90	85	80	67	63	60	50	47.5	45	37.5	33.5	33.5	26.5	25	23.6			
		K 20	500	475	450	475	450	425	450	425	400	400	375	355	355	335	315	335	315	300	300	280	265	280	265	250			
AL cast DIN 1725	300..420	High-speed steel	125	118	112	100	95	85	75	71	67	56	53	50	42.5	40	37.5	31.5	30	28	25	23.6	22.4						
		K 20	250	236	224	224	212	200	200	190	180	180	170	160	160	150	140	140	132	125	125	118	112	118	112	106	100	95	90
Mg alloy DIN 1729		High-speed steel	850	800	750	800	750	710	750	710	670	670	630	600	630	600	560	600	560	530	600	560	530	560	530	500	530	500	475
		K 20	1600	1500	1400	1320	1250	1250	1180	1120	1120	1120	1060	1000	1000	950	900	900	850	800	800	750	710	710	670	630	630	600	560

1) The entered values apply for a chipping depth of up to 2.24 mm. From 2.24 mm to 7.1 mm the values must be reduced by 1 stage of the row R10 by approximately 20%. From 7.1 mm to 22.4 mm the values must be reduced by 1 stage of the row R5 by approximately 40%.

2) The values $\mathbf{v_c}$ must be reduced by 30 .... to 50% for turning a crust, for removal of cast skin or for sand inclusions.

3) The service life **t** for hard metal P10, K10, K20 = 240 min; for high speed steel SS = 60 min.

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6 Maintenance

In this chapter you will find important information about

- Inspection
- Maintenance
- Repair

of the lathe.

ATTENTION!

Properly performed regular maintenance is an essential prerequisite for

- **operational safety,**
- **failure-free operation,**
- **long durability of the lathe and**
- **the quality of the products which you manufacture.**

Installations and equipment from other manufacturers must also be in good order and condition.

Attention!

Never remove chips or clean the working area of the lathe with compressed air. Cleaning inside the working area using compressed air may cause damages to the lathe.

6.1 Safety

WARNING!

The consequences of incorrect maintenance and repair work may include:

- **Severe injuries of persons working on the lathe,**
- **Damage to the lathe.**

Only qualified personnel should carry out maintenance and repair work on the lathe.

6.1.1 Preparation

WARNING!

Only work on the lathe when the mains plug has been pulled out. Attach a warning label.

6.1.2 Restarting

Before restarting, run a safety check.

► Safety check on page 12

WARNING!

Before starting the lathe, you must check that there is no danger for persons and that the lathe is not damaged.

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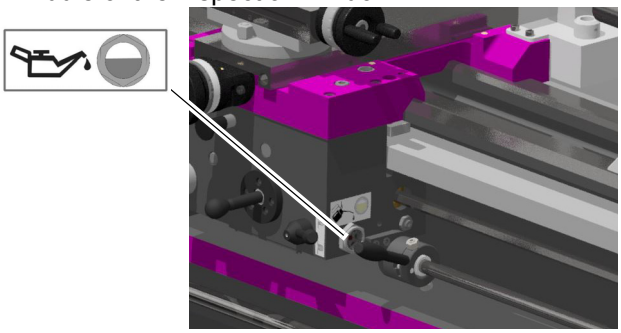
6.2 Inspection and maintenance

The type and level of wear depends to a large extent on the individual usage and operating conditions. Any indicated intervals therefore are only valid for the corresponding approved conditions.

Interval	Where?	What?	How?	Check ✔
Start of work, after each maintenance or repair work	Lathe	► Safety check on page 12		
	Lathe spindle fixture	Check	► Fasten workpiece holder on page 37	
Start of work, Daily	Chip sump and inner space	Cleaning	→ Clean the interior of the lathe and the chip sump. Use a tenterhook to pull out long cips.	
	Apron	Check oil quantity	→ Check the oil level in the apron. Check the oil level using the inspection window. Level max. until the middle of the inspection window. 	

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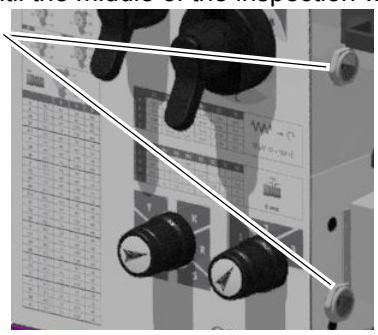
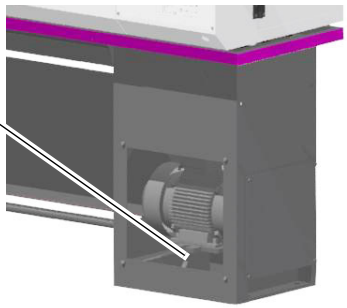
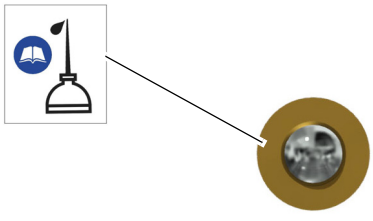
Interval	Where?	What?	How?	Check ✔
weekly		Oiling	→ Oil all bare steel surfaces. → Lubricate the change gears lightly with lithium-based grease lubricating	
	Lathe	Oiling	→ Oil all guide rails.	
	Gear	Fill level control	→ Check the oil level in the feed gear and headstock. Check the oil level using the inspection window. Level max. until the middle of the inspection window.   Img.6-1: Headstock	
For the first time after some operating hours, according to demand.	Spindle drive V-belt	Check Readjusting	The machine was delivered with preloaded drive belt. → After a few hours of operation, it may be necessary to retighten the V-belts as they have stretched due to the new feature. The V-belts are retightened by means of the motor attachment. Retightening the V-belts 	
weekly	Lead screw, Feed rod Tailstock, Lathe saddle, Top slide Cross slide, Change gear train	Oiling	→ Fill all oilers with machine oil.  Img.6-2: Oiler on lathe	

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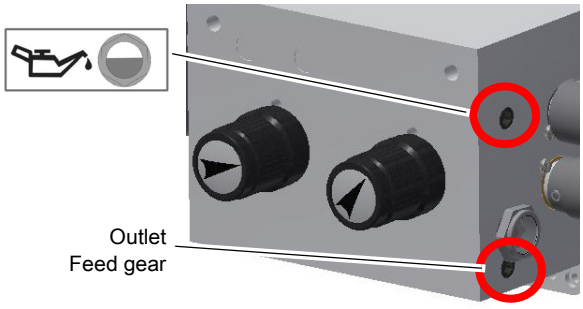
Interval	Where?	What?	How?	Check ✔
at least weekly	Lathe chuck	Lubricating	► Lubricating and cleaning the lathe chuck on page 76	
First after 150 operating hours, then all 2000	Feed gear	Oil change	→ For oil change use an appropriate collecting container with sufficient capacity. → Unscrew the screw from the drain hole. The drain opening is located below the sight glass. → Unscrew the screw from the filler hole. The filling opening is located above the sight glass. → Close the drain hole if no more oil drains. → Fill up to the middle of the reference mark of the oil sight glass into the filler hole using a suitable container. ► Operating material on page 17  Img.6-3: Feed gear	

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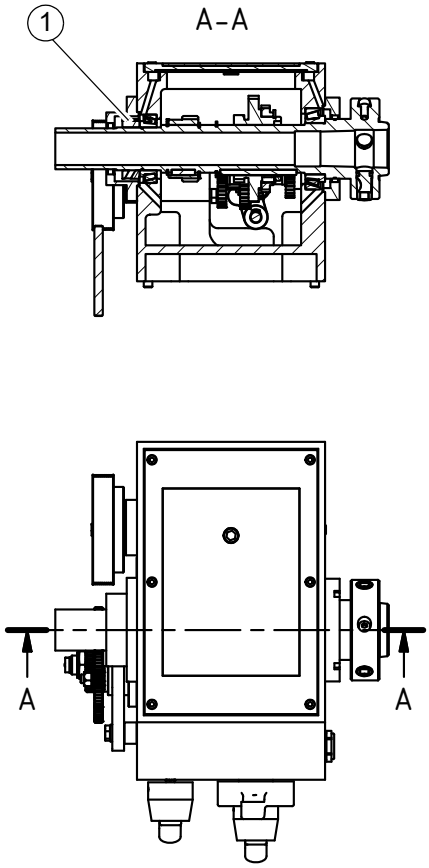
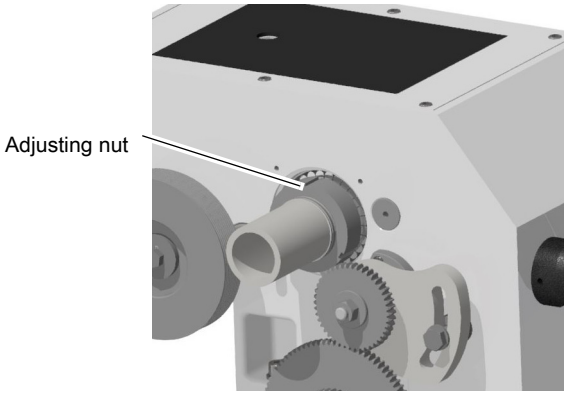
Interval	Where?	What?	How?	Check ✔
When necessary	Spindle bearing	tighten	→ If the initial tension of the tapered roller bearings decreases, retighten it with the adjusting nut.  Img.6-4: Spindle bearing  Img.6-5: Adjusting nut	

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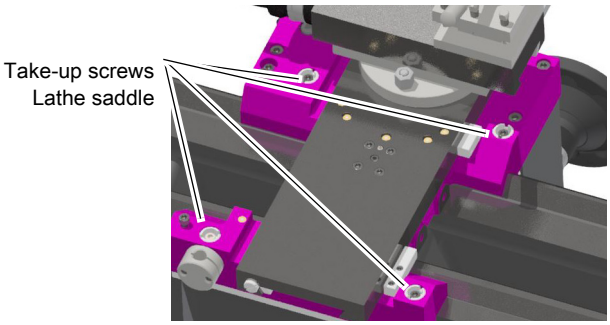
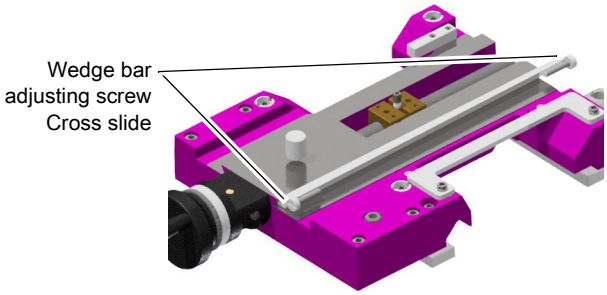
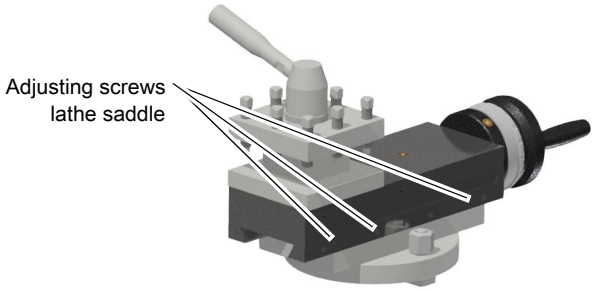
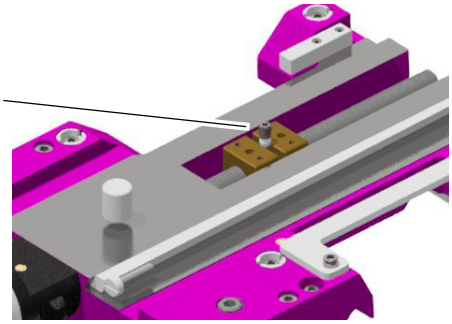
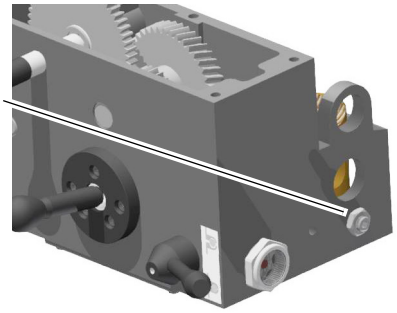
Interval	Where?	What?	How?	Check ✔
When necessary	Slideway lathe saddle	Readjust	Excessive clearance in the slideway can be reduced by readjusting.  Img.6-6: Lathe saddle	
When necessary	Cross slide slideway	Readjusting	Excessive clearance in the slideway can be reduced by readjusting. Turn the adjusting screws to move the wedge bar.  Img.6-7: Cross slide	
When necessary	Top slide slideway	Readjusting	Excessive clearance in the slideway can be reduced by readjusting. Turn the adjusting screws to move the wedge bar.  Img.6-8: Top slide	

Interval	Where?	What?	How?	Check ✔
When necessary	Cross slide spindle nut	Readjusting	Excessive clearance in the spindle nut of the cross slide can be reduced by readjusting. Turn the adjusting screw slightly to spread the spindle nut a little further. Spindle nut adjusting screw for cross slide  Img.6-9: Cross slide	
When necessary	Cross slide spindle nut	Readjusting	Excessive clearance in the guidance of spindle nut of the lead screw can be reduced by readjusting. Spindle nut adjusting screw for lead screw nut  Img.6-10: Apron	

6.3 Recommended wearing parts

V-belt set (2 pcs.) of drive
Wipers on the guide tracks

6.3.1 Lubricating and cleaning the lathe chuck

ATTENTION!

Do not use compressed air to remove dust and foreign substances from the lathe chuck.

Coolant squirts on the lathe chuck and removes the grease from the master jaws. In order to maintain the tensioning force and the long-term accuracy of the lathe chuck, the lathe chuck must be lubricated regularly. Insufficient lubrication will result in malfunctions at reduced tensioning force, which affects the accuracy and causes excessive wear and seizing.

Depending on the chuck type and operating state, the tensioning force of a lathe chuck can decrease by up to 50 percent of the nominal tensioning force.

A presumably securely clamped workpiece can then fall out of the chuck during processing.

Lubricate the lathe chuck. Lubricate the lathe chuck at least once per week. The used lubricant should be of high quality and provided for high pressure bearing surfaces. The lubricant should withstand the coolant and other chemicals.

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Numerous different lathe chucks are available on the market which distinguish themselves considerably based on the lubricating method. Follow the operating instructions of the corresponding lathe chuck manufacturer.

6.4 Repair

6.4.1 Customer service technician

For any repair work request the assistance of an authorised customer service technician. Contact your specialist dealer if you do not have customer service's information or contact Stürmer Maschinen GmbH in Germany who can provide you with a specialist dealer's contact information. Optionally, the

Stürmer Maschinen GmbH

Dr.-Robert-Pfleger-Str. 26

D- 96103 Hallstadt

can provide a customer service technician, however, the request for a customer service technician can only be made via your specialist dealer.

If the repairs are carried out by qualified technical personnel, they must follow the indications given in these operating instructions.

Optimum Maschinen Germany GmbH accepts no liability nor does it guarantee against damage and operating malfunctions resulting from failure to observe these operating instructions.

For repairs, only use

- faultless and suitable tools only,
- original parts or parts from series expressly authorised by Optimum Maschinen Germany GmbH.

7 Ersatzteile - Spare parts

7.1 Ersatzteilbestellung - *Ordering spare parts*

Bitte geben Sie folgendes an - *Please indicate the following :*

- Seriennummer - *Serial No.*
- Maschinenbezeichnung - *Machines name*
- Herstellungsdatum - *Date of manufacture*
- Artikelnummer - *Article no.*

Die Artikelnummer befindet sich in der Ersatzteilliste. *The article no. is located in the spare parts list.* Die Seriennummer befindet sich am Typschild. *The serial no. is on the rating plate.*

7.2 Hotline Ersatzteile - Spare parts Hotline

+49 (0) 951-96555 -118

ersatzteile@stuermer-maschinen.de

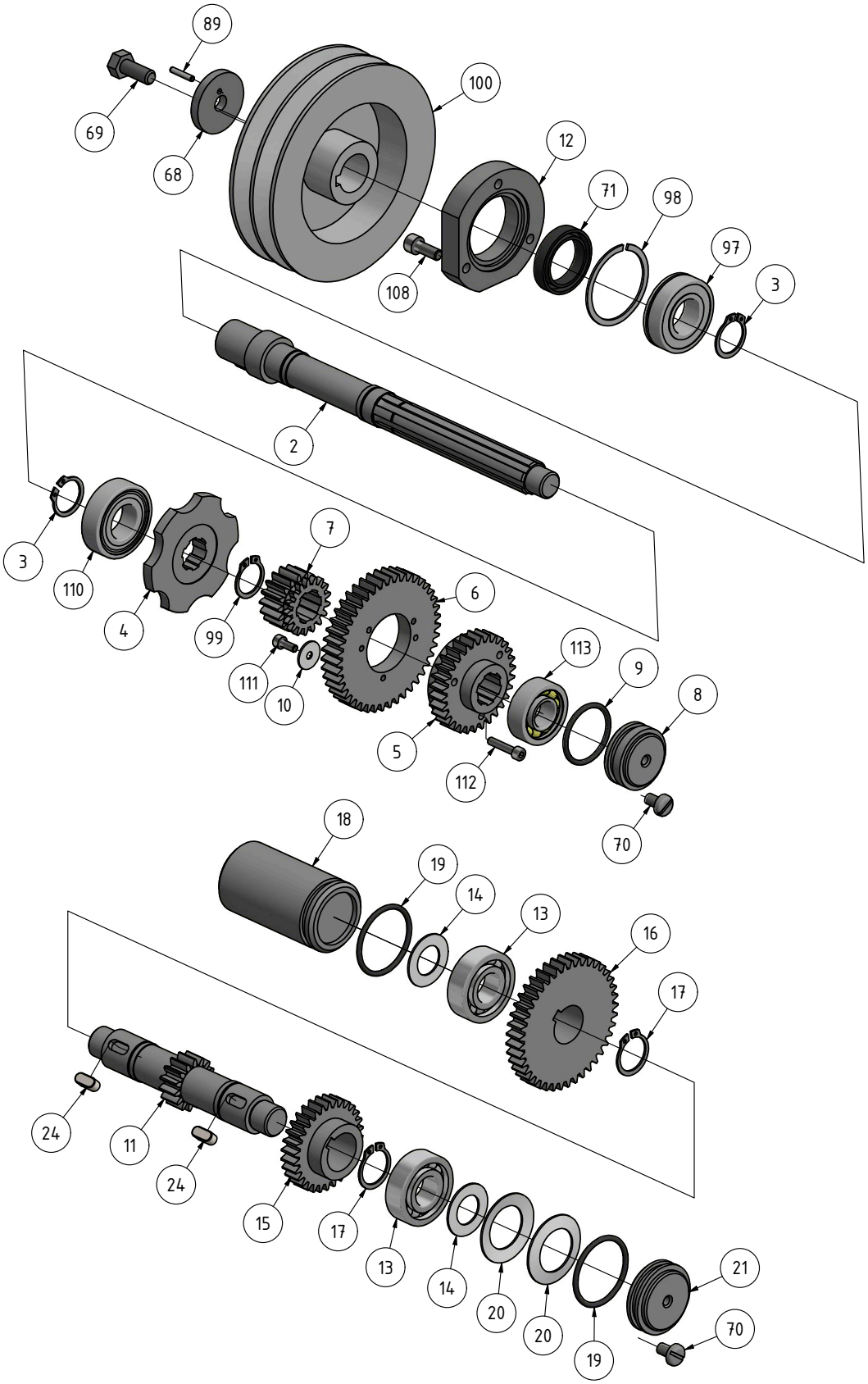
7.3 Service Hotline

+49 (0) 951-96555 -100

service@stuermer-maschinen.de

7.4 Ersatzteilzeichnungen - Spare part drawings

A Spindelgetriebe - Headstock



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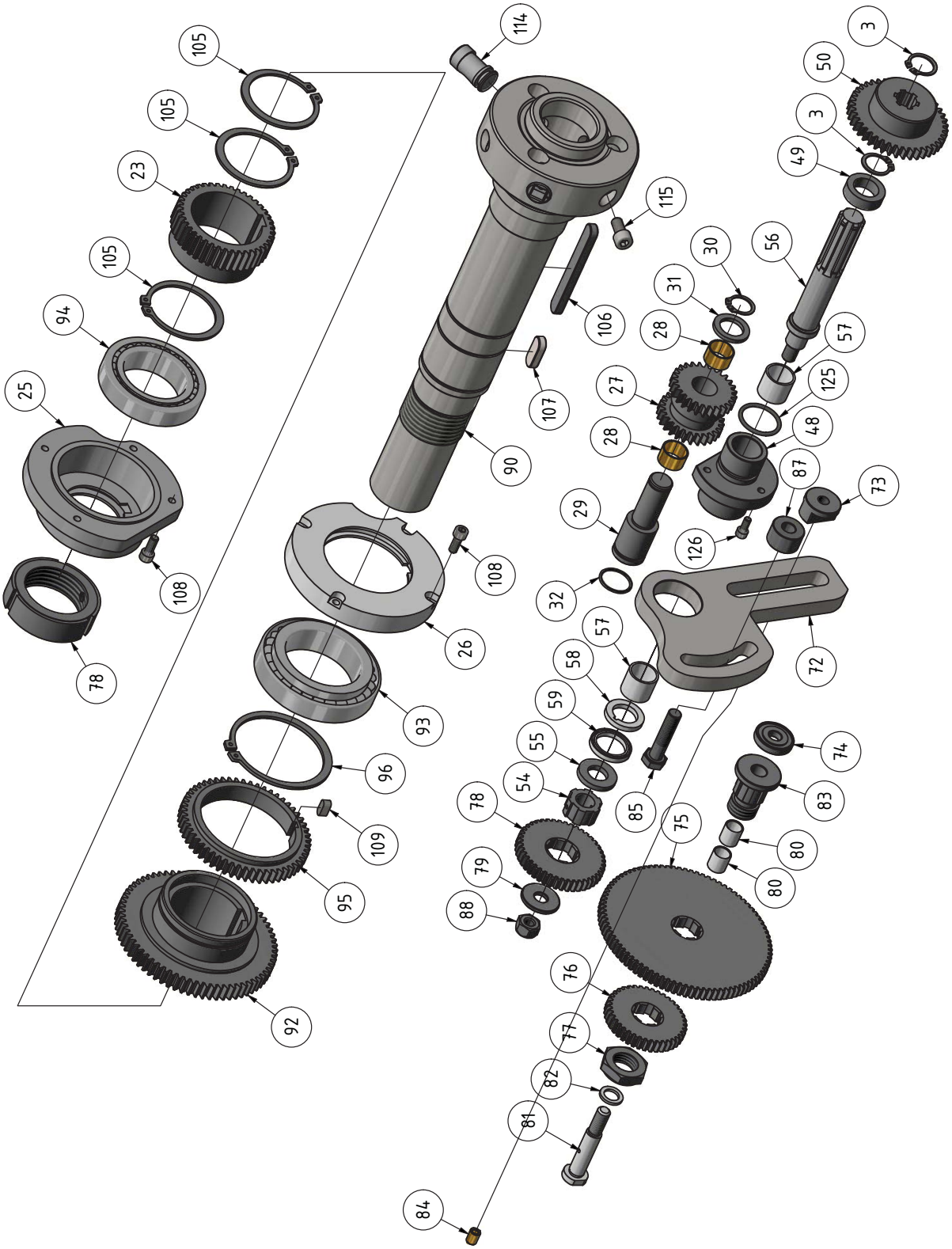
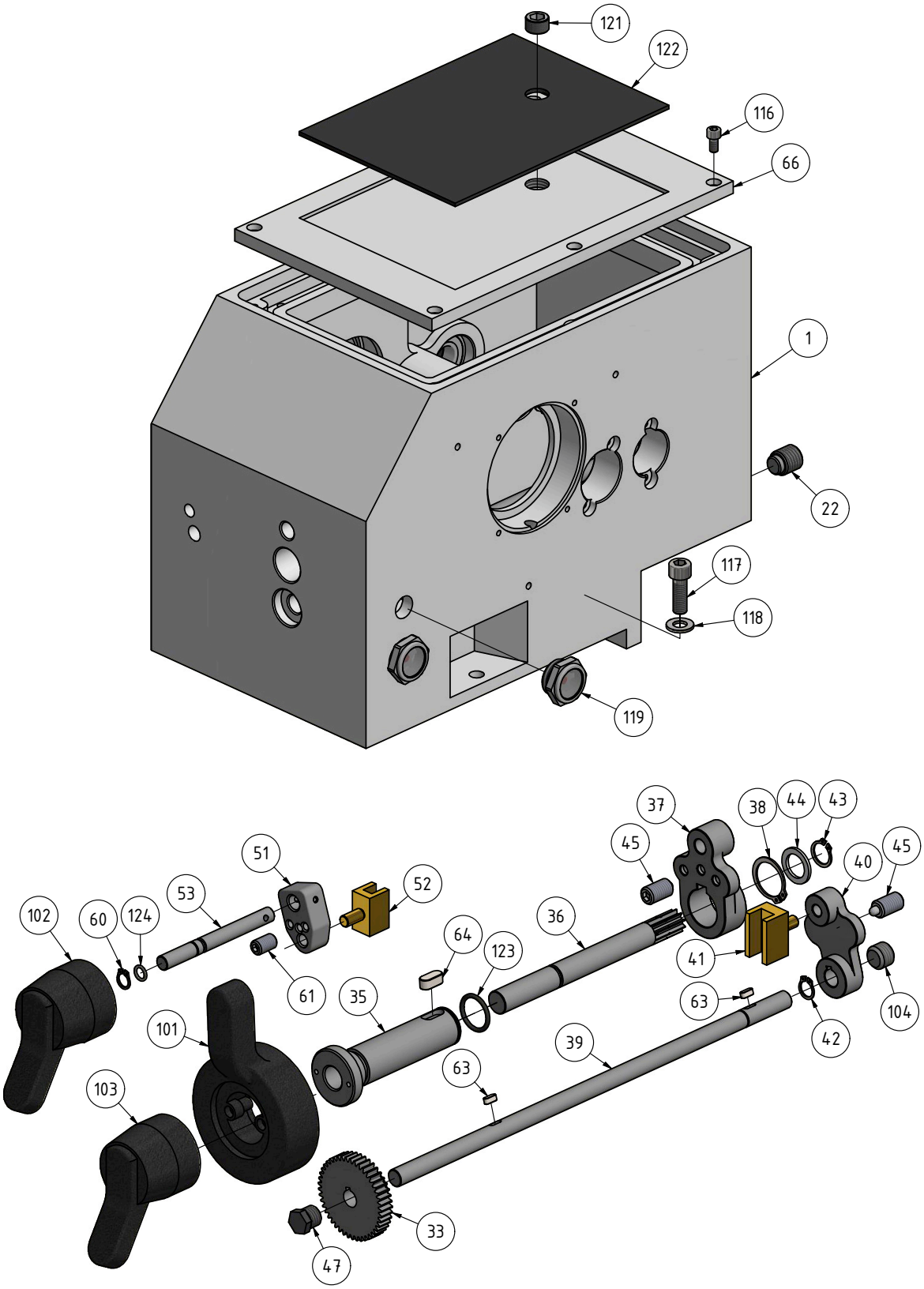
B Spindelgetriebe - Headstock



C Spindelgetriebe - Headstock



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Ersatzteilliste Getriebe Spindelstock - Spare parts list headstock gear					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Gehäuse TM3310	Housing TM3310	1		03403020101
2	Welle TM3310	Shaft TM3310	1		03403020102
3	Sicherungsring	Retaining ring	4	20	
4	Scheibe TM3310	Washer TM3310	1		03403020104
5	Zahnrad TM3310	Gear TM3310	1	29Z	03403020105
6	Zahnrad TM3310	Gear TM3310	1	43Z	03403020106
7	Zahnrad TM3310	Gear TM3310	1		03403020107
8	Verschluss TM3310	Plug TM3310	1		03403020108
9	O-Ring TM3310	O-Ring TM3310	1		03403020109
10	Scheibe TM3310	Washer TM3310	3		03403020110
11	Welle TM3310	Shaft TM3310	1		03403020111
12	Flansch TM3310	Flange TM3310	1		03403020112
13	Kugellager	Ball bearing	2	6203	0406203
14	Scheibe TM3310	Washer TM3310	2		03403020114
15	Zahnrad TM3310	Gear TM3310	1	29Z	03403020115
16	Zahnrad TM3310	Gear TM3310	1	43Z	03403020116
17	Sicherungsring	Retaining ring	2	21	
18	Buchse TM3310	Bushing TM3310	1		03403020118
19	O-Ring TM3310	O-Ring TM3310	2		03403020119
20	Scheibe TM3310	Washer TM3310	2		03403020120
21	Flansch TM3310	Flange TM3310	1		03403020121
22	Ablassschraube TM3310	Drain plug TM3310	1		03403020122
23	Zahnrad TM3310	Gear TM3310	1		03403020123
24	Passfeder	Fitting key	2	6x14	
25	Flansch TM3310	Flange TM3310	1		03403020125
26	Flansch TM3310	Flange TM3310	1		03403020126
27	Zahnrad TM3310	Gear TM3310	1	27	03403020127
28	Buchse TM3310	Bushing TM3310	2		03403020128
29	Welle TM3310	Shaft TM3310	1		03403020129
30	Sicherungsring	Retaining ring	1	18	
31	Scheibe TM3310	Washer TM3310	1		03403020131
32	Ring TM3310	Ring TM3310	1		03403020132
33	Zahnrad TM3310	Gear TM3310	1		03403020133
35	Hülse TM3310	Sleeve TM3310	1		03403020135
37	Platte TM3310	Plate TM3310	1		03403020137
38	Sicherungsring	Retaining ring	1	26	
39	Welle TM3310	Shaft TM3310	1		03403020139
40	Platte TM3310	Plate TM3310	1		03403020140
41	Schaltgabel TM3310	Switch fork TM3310	1		03403020141
42	Sicherungsring	Retaining ring	1	12	
43	Sicherungsring	Retaining ring	1	16	
44	Ring TM3310	Ring TM3310	1		03403020144
45	Drückbolzen TM3310	Pushbolt TM3310	2		03403020145
47	Schraube TM3310	Screw TM3310	1		03403020147
48	Lagerbock TM3310	Bearing block TM3310	1		03403020148
49	Buchse TM3310	Bushing TM3310	1		03403020149
50	Zahnrad TM3310	Gear TM3310	1	42Z	03403020150
51	Platte TM3310	Plate TM3310	1		03403020151
52	Schaltgabel TM3310	Switch fork TM3310	1		03403020152
53	Welle TM3310	Shaft TM3310	1		03403020153
54	Buchse TM3310	Bushing TM3310	1		03403020154
55	Scheibe TM3310	Washer TM3310	1		03403020155
56	Welle TM3310	Shaft TM3310	1		03403020156
57	Buchse TM3310	Bushing TM3310	2	20x23x15	03403020157
58	Ring TM3310	Ring TM3310	1		03403020158
59	Ring TM3310	Ring TM3310	1		03403020159
60	Sicherungsring	Retaining ring	1	10	
61	Drückbolzen TM3310	Pushbolt TM3310	1		03403020161
63	Passfeder	Fitting key	2	4x10	
64	Passfeder	Fitting key	1	8x18	
66	Abdeckung TM3310	Cover TM3310	1		03403020166
68	Scheibe TM3310	Washer TM3310	1		03403020168
69	Sechskantschraube TM3310	Hexagon screw TM3310	1		03403020169
70	Schraube	Screw	4	M6x10	
71	Dichtung TM3310	Seal TM3310	1	26x37x7	03403020171
72	Halter TM3310	Holder TM3310	1		03403020172
73	Klemmmutter TM3310	Clamping nut TM3310	1		03403020173
74	Scheibe TM3310	Washer TM3310	1		03403020174
75	Zahnrad TM3310	Gear TM3310	1	88Z	03403020175
76	Zahnrad TM3310	Gear TM3310	1	40Z	03403020176
77	Sechskantmutter	Hexagon nut	1	M22	
78	Zahnrad TM3310	Gear TM3310	1	44Z	03403020178
79	Scheibe TM3310	Washer TM3310	1		03403020179
80	Buchse TM3310	Bushing TM3310	2		03403020180
81	Schraube TM3310	Screw TM3310	1		03403020181
82	Scheibe TM3310	Washer TM3310	1		03403020182
83	Welle TM3310	Shaft TM3310	1		03403020183
84	Schmiernippel TM3310	Lubrication cup TM3310	1	8	03403020184
85	Sechskantschraube	Hexagon screw	1	M10x45	
87	Buchse TM3310	Bushing TM3310	1		03403020187
88	Sechskantmutter	Hexagon nut	1	M10	

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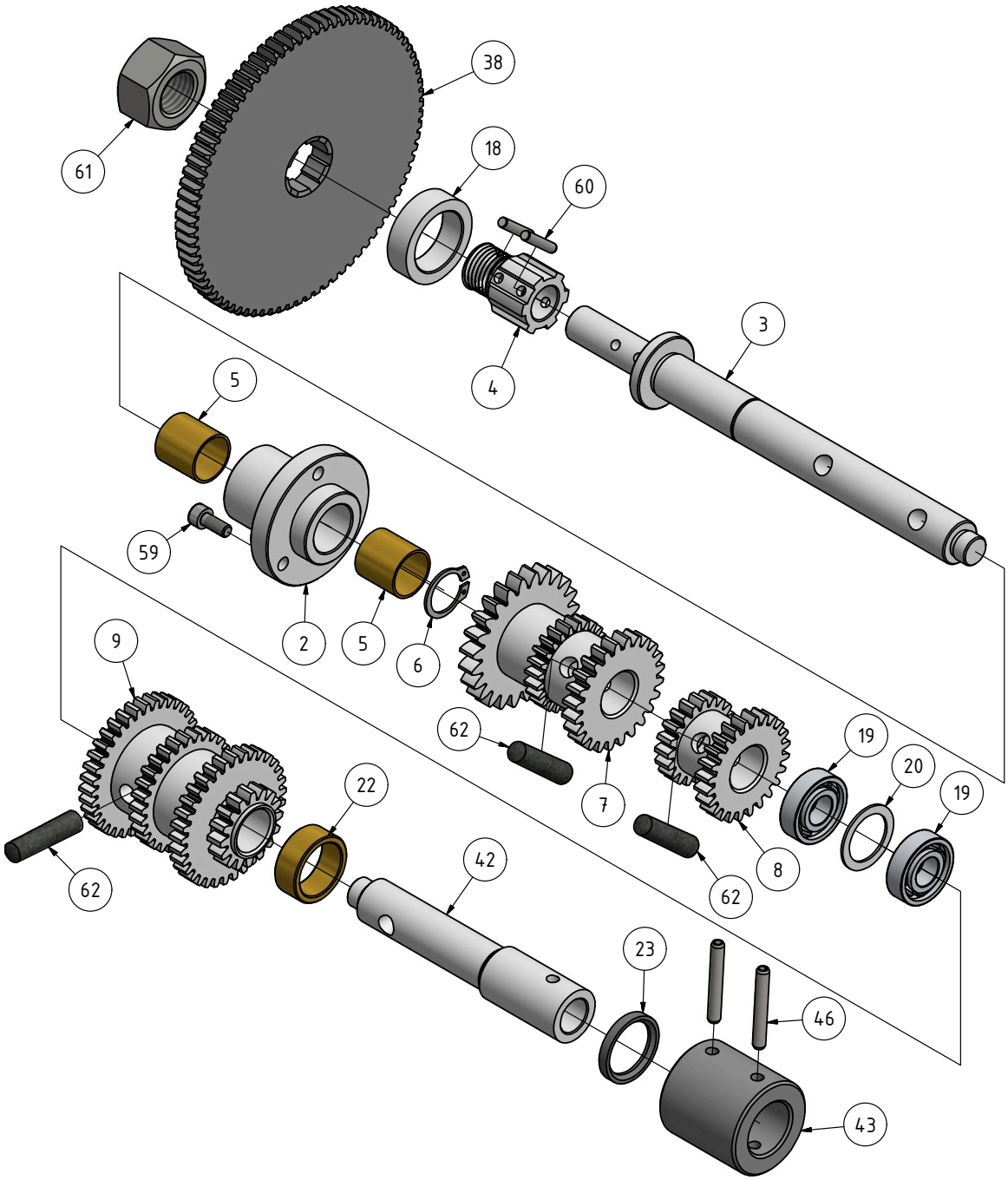
Ersatzteilliste Getriebe Spindelstock - Spare parts list headstock gear					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
89	Federstift	Spring pin	1	3x16	
90	Spindel TM3310	Spindle TM3310	1		03403020190
91	Nutmutter	Groove nut	1	M45x1,5	
92	Zahnrad TM3310	Gear TM3310	1		03403020192
93	Kegelrollenlager	Taper roller bearing	1	32012	04032012
94	Kegelrollenlager	Taper roller bearing	1	32010	04032010
95	Zahnrad TM3310	Gear TM3310	1	55Z	03403020195
96	Sicherungsring	Retaining ring	1	75	
97	Kugellager	Ball bearing	1	6004	0406004
98	Ring TM3310	Ring TM3310	1		03403020198
99	Sicherungsring	Retaining ring	1	19	
100	Riemenscheibe TM3310	V-belt Pulley TM3310	1		03403020100
101	Schalthebel TM3310	Switch lever TM3310	1		03403020101
102	Schalthebel TM3310	Switch lever TM3310	1		03403020102
103	Schalthebel TM3310	Switch lever TM3310	1		03403020103
104	Gewindestift	Grub screw	1	M16x12	
105	Sicherungsring	Retaining ring	3	56	
106	Passfeder	Fitting key	1	12x6x90	
107	Passfeder	Fitting key	1	12x6x28	
108	Innensechskantschraube	Socket head screw	11	ISO 4762 - M6 x 16	
109	Passfeder	Fitting key	1	DIN 6885 - A 6 x 6 x	
110	Kugellager	Ball bearing	1	6004	0406004
111	Innensechskantschraube	Socket head screw	3	ISO 4762 - M4 x 10	
112	Innensechskantschraube	Socket head screw	3	ISO 4762 - M4 x 20	
113	Kugellager	Ball bearing	1	7202	0407202
114	Camlock Bolzen TM3310	Camlock bolt TM3310	3		03403020114
115	Innensechskantschraube	Socket head screw	3	ISO 4762-M8 x 16	
116	Innensechskantschraube	Socket head screw	6	ISO 4762-M6 x 12	
117	Innensechskantschraube	Socket head screw	4	ISO 4762 -M10 x 30	
118	Scheibe	Washer	4	DIN 125 - A 10,5	
119	Ölschauglas TM3310	Oil sight glas TM3310	1		03403020119
121	Verschlussschraube TM3310	Plug screw TM3310	1		03403020121
122	Gummiablage TM3310	Rubber pad TM3310	1		03403020122
123	O-Ring	O-Ring	1	DIN 3771 - 21,2 x 2,65	
124	O-Ring	O-Ring	1	DIN 3771 - 7,5 x 1,8	
125	O-Ring	O-Ring	1	DIN 3771 - 28 x 2,65	
126	Innensechskantschraube	Socket head screw	3	ISO 4762 - M5 x 12	

D Vorschubgetriebe - Feed gear



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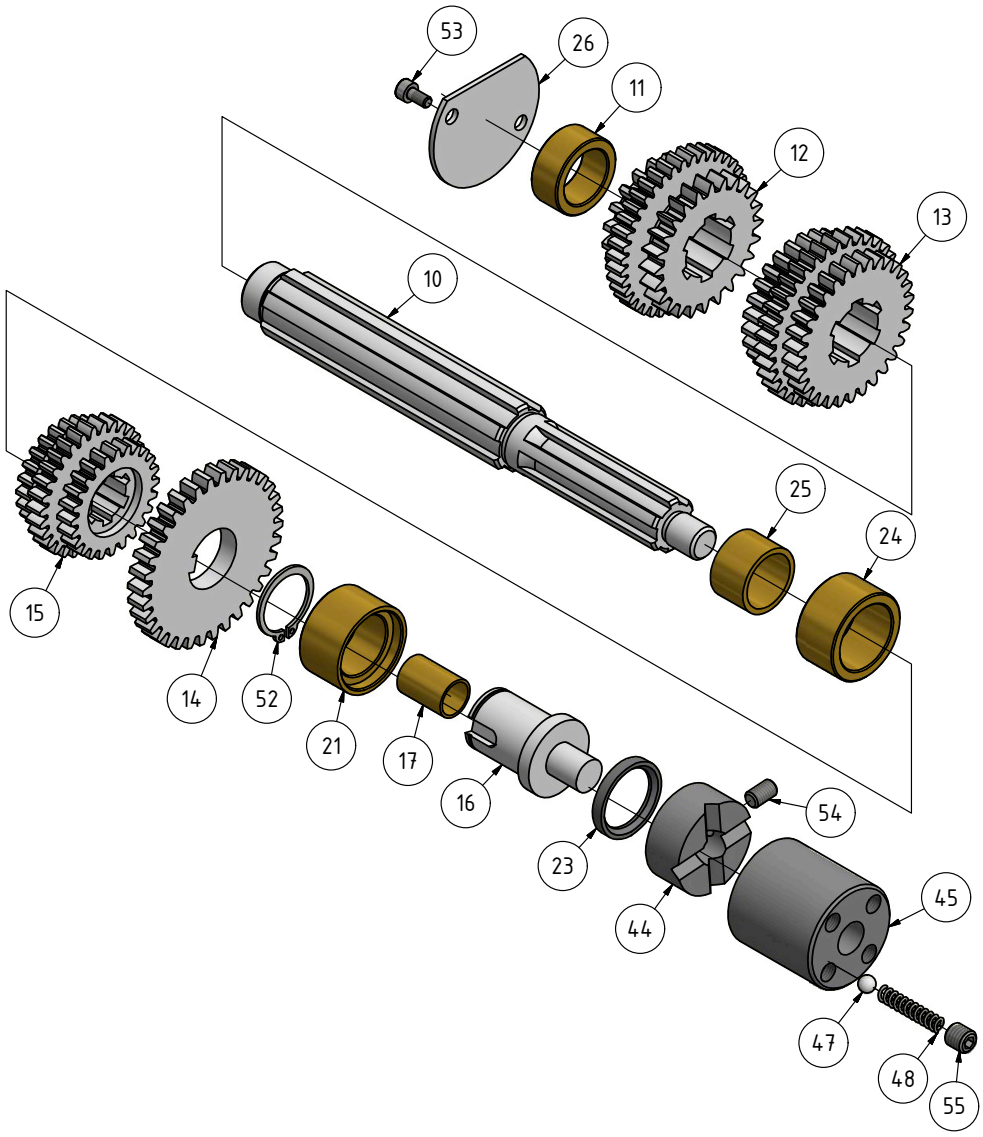
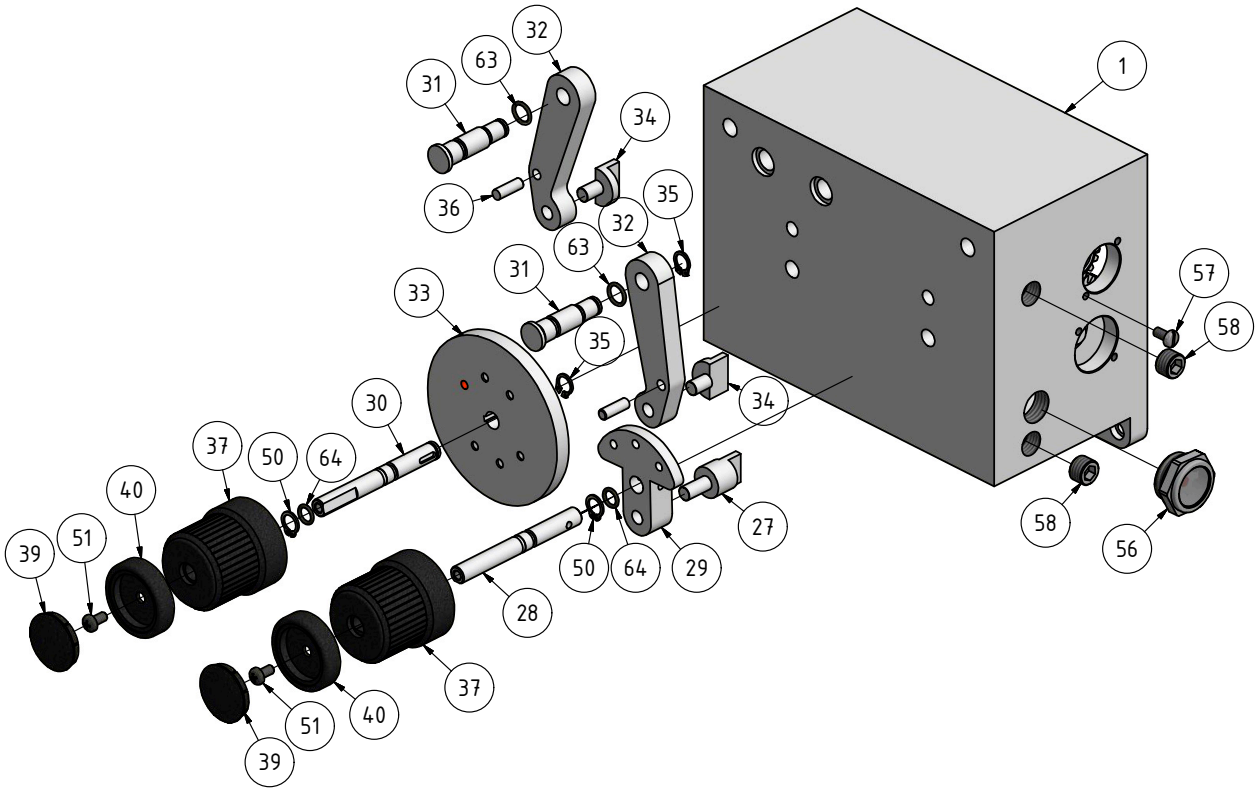
E Vorschubgetriebe - Feed gear



TM3310_parts.fm

F Vorschubgetriebe - Feed gear



Ersatzteilliste Vorschubgetriebe - Spare part list feed gear					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Gehäuse TM3310	Housing TM3310	1		03403020301
2	Lagerbock TM3310	Bearing block TM3310	1		03403020302
3	Welle TM3310	Shaft TM3310	1		03403020303
4	Ritzel TM3310	Pinion TM3310	1		03403020304
5	Buchse TM3310	Bushing TM3310	2	18X20X20	03403020305
6	Sicherungsring TM3310	Retaining ring TM3310	1		03403020306
7	Zahnrad TM3310	Gear TM3310	1		03403020307
8	Zahnrad TM3310	Gear TM3310	1		03403020308
9	Zahnrad TM3310	Gear TM3310	1		03403020309
10	Welle TM3310	Shaft TM3310	1		03403020310
11	Buchse TM3310	Bushing TM3310	1		03403020311
12	Zahnrad TM3310	Gear TM3310	1		03403020312
13	Zahnrad TM3310	Gear TM3310	1		03403020313
14	Zahnrad TM3310	Gear TM3310	1		03403020314
15	Zahnrad TM3310	Gear TM3310	1		03403020315
16	Bolzen TM3310	Bolt TM3310	1		03403020316
17	Hülse TM3310	Sleeve TM3310	1	12X14X20	03403020317
18	Ring TM3310	Ring TM3310	1		03403020318
19	Kugellager	Ball bearing	2	6001	0406001
20	Ring TM3310	Ring TM3310	1		03403020320
21	Buchse TM3310	Bushing TM3310	1		03403020321
22	Ring TM3310	Ring TM3310	1		03403020322
23	Dichtung TM3310	Seal TM3310	2	22X28X4	03403020323
24	Buchse TM3310	Bushing TM3310	1		03403020324
25	Buchse TM3310	Bushing TM3310	1	20X24X15	03403020325
26	Abdeckung TM3310	Cover TM3310	1		03403020326
27	Schaltgabel TM3310	Switch fork TM3310	1		03403020327
28	Welle TM3310	Shaft TM3310	1		03403020328
29	Platte TM3310	Plate TM3310	1		03403020329
30	Welle TM3310	Shaft TM3310	1		03403020330
31	Welle TM3310	Shaft TM3310	2		03403020331
32	Platte TM3310	Plate TM3310	2		03403020332
33	Wahlscheibe TM3310	Dial plate TM3310	1		03403020333
34	Schaltgabel TM3310	Switch fork TM3310	2		03403020334
35	Sicherungsring	Retaining ring	3	10	
36	Stift TM3310	Pin TM3310	2		03403020336
37	Wahlschalter TM3310	Mode switch TM3310	2		03403020337
38	Zahnrad TM3310	Gear TM3310	1		03403020338
39	Abdeckung TM3310	Cover TM3310	2		03403020339

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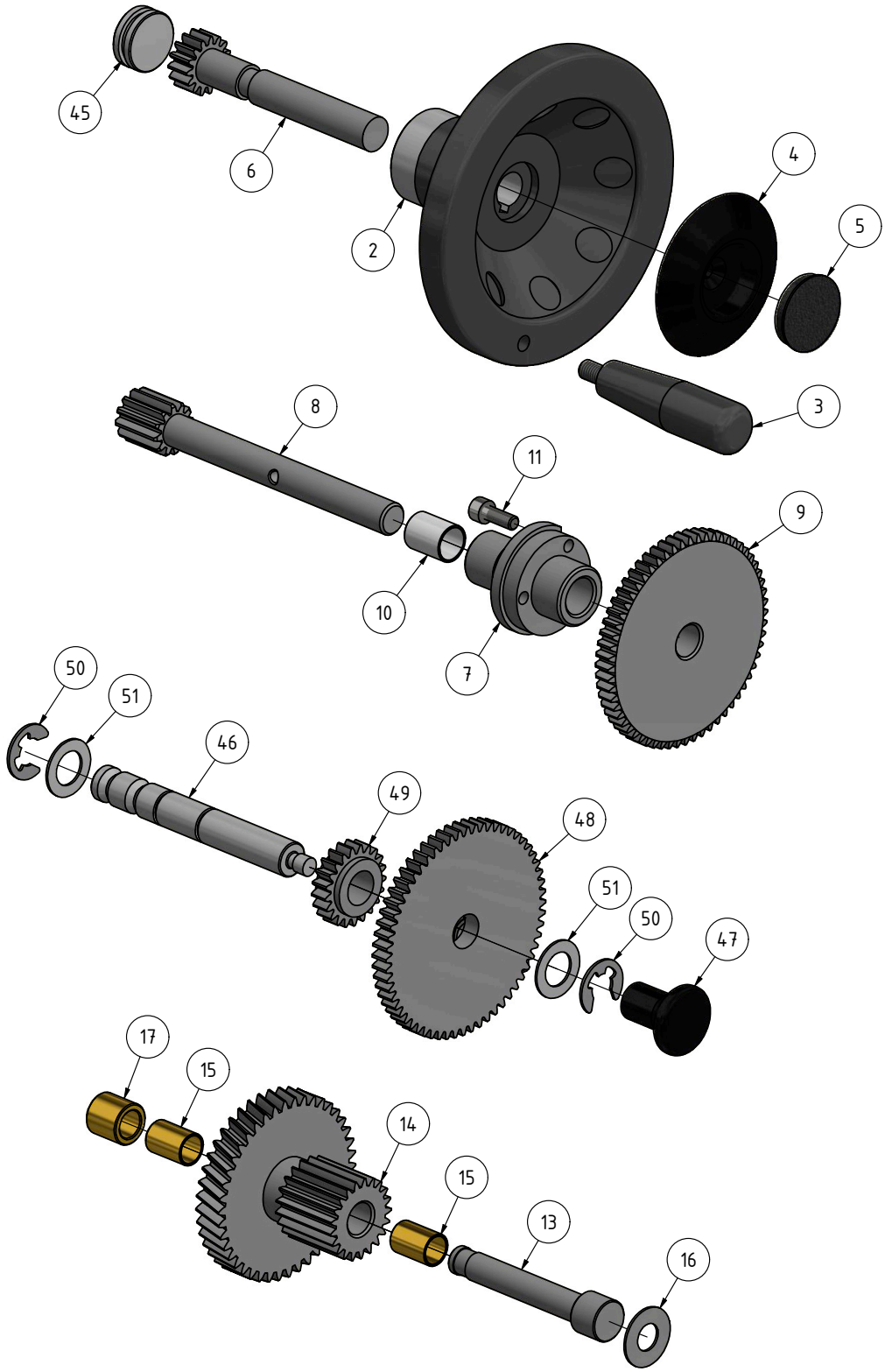
Ersatzteilliste Vorschubgetriebe - Spare part list feed gear					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
40	Buchse TM3310	Bushing TM3310	2		03403020340
42	Welle TM3310	Shaft TM3310	1		03403020342
43	Hülse TM3310	Sleeve TM3310	1		03403020343
44	Kupplung TM3310	Clutch TM3310	1		03403020344
46	Federstift TM3310	Spring pin TM3310	2	5x35	
47	Stahlkugel TM3310	Steel ball TM3310	4		03403020347
48	Feder TM3310	Spring TM3310	4		03403020348
49	Schraube	Screw	1	M8x10	
50	Sicherungsring	Retaining ring	2	DIN 471 - 10x1	
51	Schraube	Screw	2	ISO 7045 - M5 x 10	
52	Sicherungsring	Retaining ring	1	DIN 471 - 22x1,2	
53	Innensechskantschraube	Socket head screw	2	ISO 4762 - M4 x 8	
54	Gewindestift	Grub screw	1	DIN 913 - M6 x 10	
55	Gewindestift	Grub screw	4	DIN 913 - M8 x 8	
56	Ölschauglas TM3310	Oil sight glass TM3310	1		03403020356
57	Schraube	Screw	2	ISO 1580 - M5 x 10	
58	Verschluss TM3310	Plug TM3310	2		03403020358
59	Innensechskantschraube	Socket head screw	3	ISO 4762 - M5 x 12	
60	Zylinderstift	Cylindrical pin	2	ISO 2338 - 4 h8 x 20	
61	Sechskantmutter	Hexagon nut	1	ISO 4032 - M20	
62	Kegelstift	Taper pin	3	ISO 2339 - A - 8 x 35	
63	O-Ring	O-ring	2	DIN 3771 - 10 x 1,8	
64	O-Ring	O-ring	2	DIN 3771 - 8 x 1,8	
65	Halter TM3310	Holder TM3310	1		03403020365

G Schlosskasten - Apron



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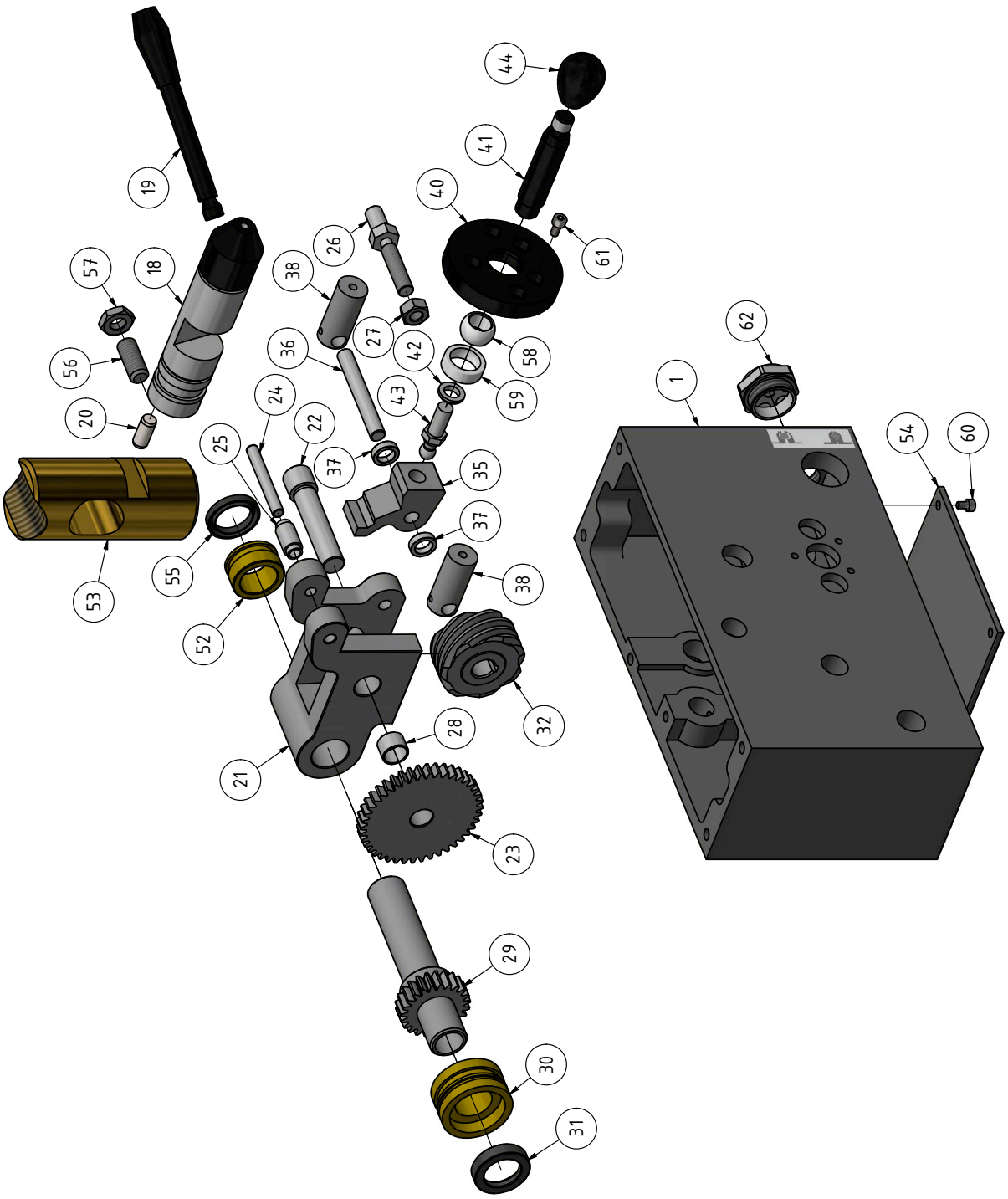
H Schlosskasten - Apron



TM3310_parts.fm

Ersatzteilliste Schlosskasten - Spare part list apron					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
Pos. 1	Gehäuse TM3310D	Housing TM3310D	1		03403020401
Pos. 2	Handrad TM3310D	Handle TM3310D	1		03403020402
Pos. 3	Handgriff TM3310D	Handle grip TM3310D	1		03403020403
Pos. 4	Scheibe TM3310D	Washer TM3310D	1		03403020404
Pos. 5	Verschluss TM3310D	Plug TM3310D	1		03403020405
Pos. 6	Welle TM3310D	Shaft TM3310D	1		03403020406
Pos. 7	Buchse TM3310D	Bushing TM3310D	1		03403020407
Pos. 8	Welle TM3310D	Shaft TM3310D	1	12Z	03403020408
Pos. 9	Zahnrad TM3310D	Gear TM3310D	1	60Z	03403020409
Pos. 11	Innensechskantschraube TM3310D	Socket head screw TM3310D	3	ISO 4762 -M6x16	
Pos. 12	Kegelstift TM3310D	Taper pin TM3310D	1	ISO 2339-6 x 30	
Pos. 13	Welle TM3310D	Shaft TM3310D	1		03403020413
Pos. 14	Zahnrad TM3310D	Gear TM3310D	1	21Z	03403020414
Pos. 15	Hülse TM3310D	Sleeve TM3310D	2	12x14x20	03403020415
Pos. 16	Scheibe TM3310D	Washer TM3310D	2		03403020416
Pos. 17	Hülse TM3310D	Sleeve TM3310D	1		03403020417
Pos. 18	Welle TM3310D	Shaft TM3310D	1		03403020418
Pos. 19	Spannhebel TM3310D	Clamping lever TM3310D	1		03403020419
Pos. 20	Zylinderstift TM3310D	Cylindrical pin TM3310D	1	8x18	
Pos. 21	Führung TM3310D	Guide TM3310D	1		03403020421
Pos. 22	Bolzen TM3310D	Bolt TM3310D	1		03403020422
Pos. 23	Zahnrad TM3310D	Gear TM3310D	1		03403020423
Pos. 24	Welle TM3310D	Shaft TM3310D	1		03403020424
Pos. 25	Hülse TM3310D	Sleeve TM3310D	1		03403020425
Pos. 26	Bolzen TM3310D	Bolt TM3310D	1		03403020426
Pos. 27	Sechskantmutter TM3310D	Hexagon nut TM3310D	1	M8	03403020427
Pos. 28	Buchse TM3310D	Bushing TM3310D	1		03403020428
Pos. 29	Welle TM3310D	Shaft TM3310D	1		03403020429
Pos. 30	Buchse TM3310D	Bushing TM3310D	1		03403020430
Pos. 31	Dichtung TM3310D	Seal TM3310D	1		03403020431
Pos. 32	Schnecke TM3310D	Worm TM3310D	1		03403020432
Pos. 34	Kegelstift TM3310D	Taper pin TM3310D	1	ISO 2339 -5 x 24	
Pos. 35	Block TM3310D	Block TM3310D	1		03403020435
Pos. 36	Welle TM3310D	Shaft TM3310D	1		03403020436
Pos. 37	Ring TM3310D	Ring TM3310D	2		03403020437
Pos. 38	Buchse TM3310D	Bushing TM3310D	2		03403020438
Pos. 40	Scheibe TM3310D	Washer TM3310D	1		03403020440
Pos. 41	Hebel TM3310D	Lever TM3310D	1		03403020441
Pos. 42	Ring TM3310D	Ring TM3310D	1		03403020442
Pos. 43	Stößel TM3310D	Push rod TM3310D	1		03403020443
Pos. 44	Knopf TM3310D	Knob TM3310D	1		03403020444
Pos. 45	Stopfen TM3310D	Plug TM3310D	1		03403020445
Pos. 46	Welle TM3310D	Shaft TM3310D	1		03403020446
Pos. 47	Knopf TM3310D	Knob TM3310D	1		03403020447
Pos. 48	Zahnrad TM3310D	Gear TM3310D	1		03403020448
Pos. 49	Zahnrad TM3310D	Gear TM3310D	1		03403020449
Pos. 50	Sicherungsring TM3310D	Retaining ring TM3310D	2	12	
Pos. 51	Scheibe TM3310D	Washer TM3310D	2	15	
Pos. 52	Buchse TM3310D	Bushing TM3310D	1		03403020452
Pos. 53	Schlossmutter TM3310D	Claps nut TM3310D	1		03403020453
Pos. 54	Abdeckung TM3310D	Cover TM3310D	1		03403020454
Pos. 56	Zylinderstift TM3310D	Cylindrical pin TM3310D	1	M10x25	
Pos. 57	Sechskantmutter TM3310D	Hexagon nut TM3310D	1	M10x25	
Pos. 58	Kugel TM3310D	Ball TM3310D	1		03403020458
Pos. 59	Ring TM3310D	Ring TM3310D	1		03403020459
Pos. 60	Innensechskantschraube TM3310D	Socket head screw TM3310D	6	ISO 4762 -M4 x 6	
Pos. 61	Innensechskantschraube TM3310D	Socket head screw TM3310D	5	ISO 4762 -M4 x 8	
Pos. 62	Ölschauglas TM3310D	Oil sight glass TM3310D	1		03403020462

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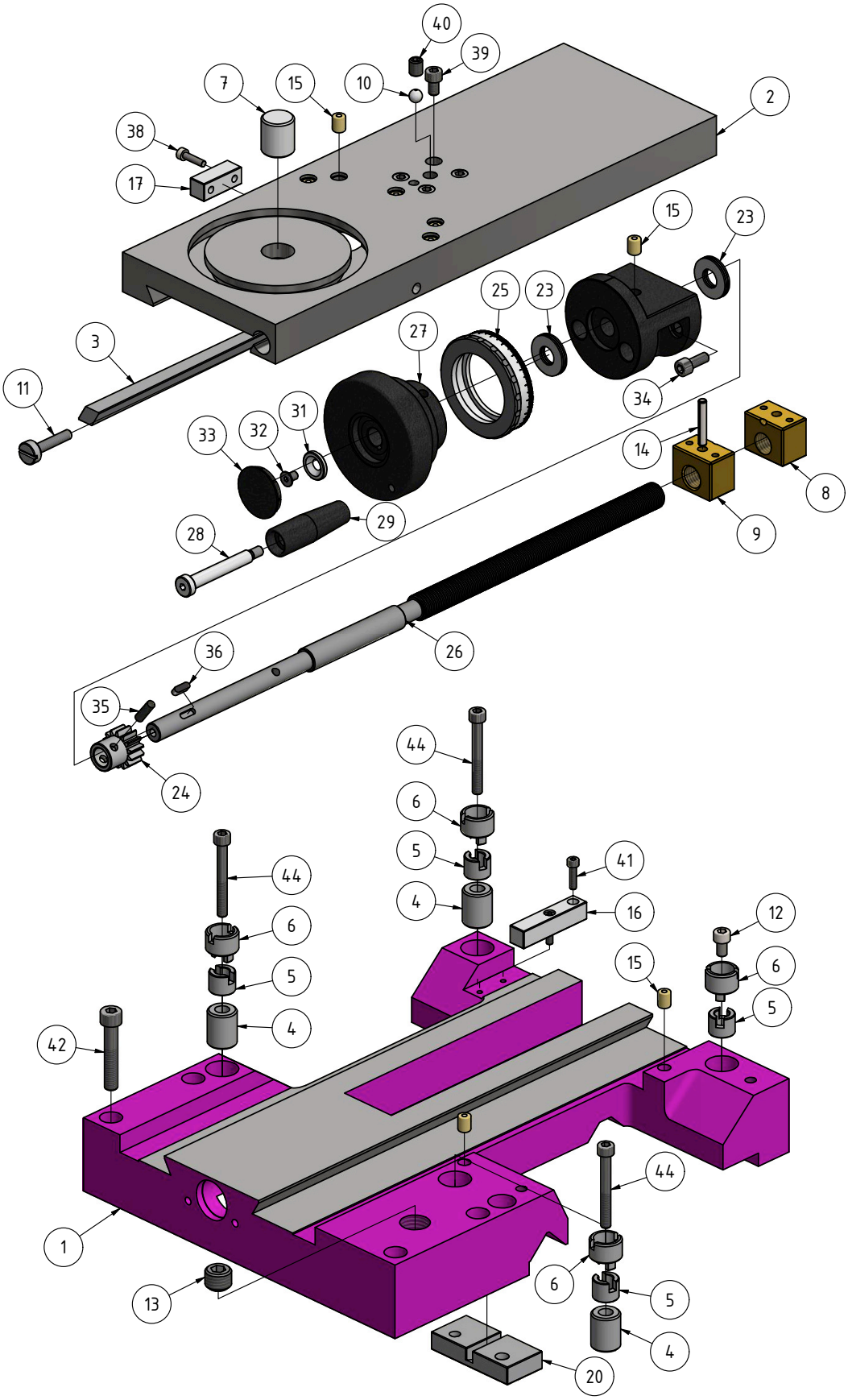
I Planschlitten, Bettschlitten - Cross slide, bed slide



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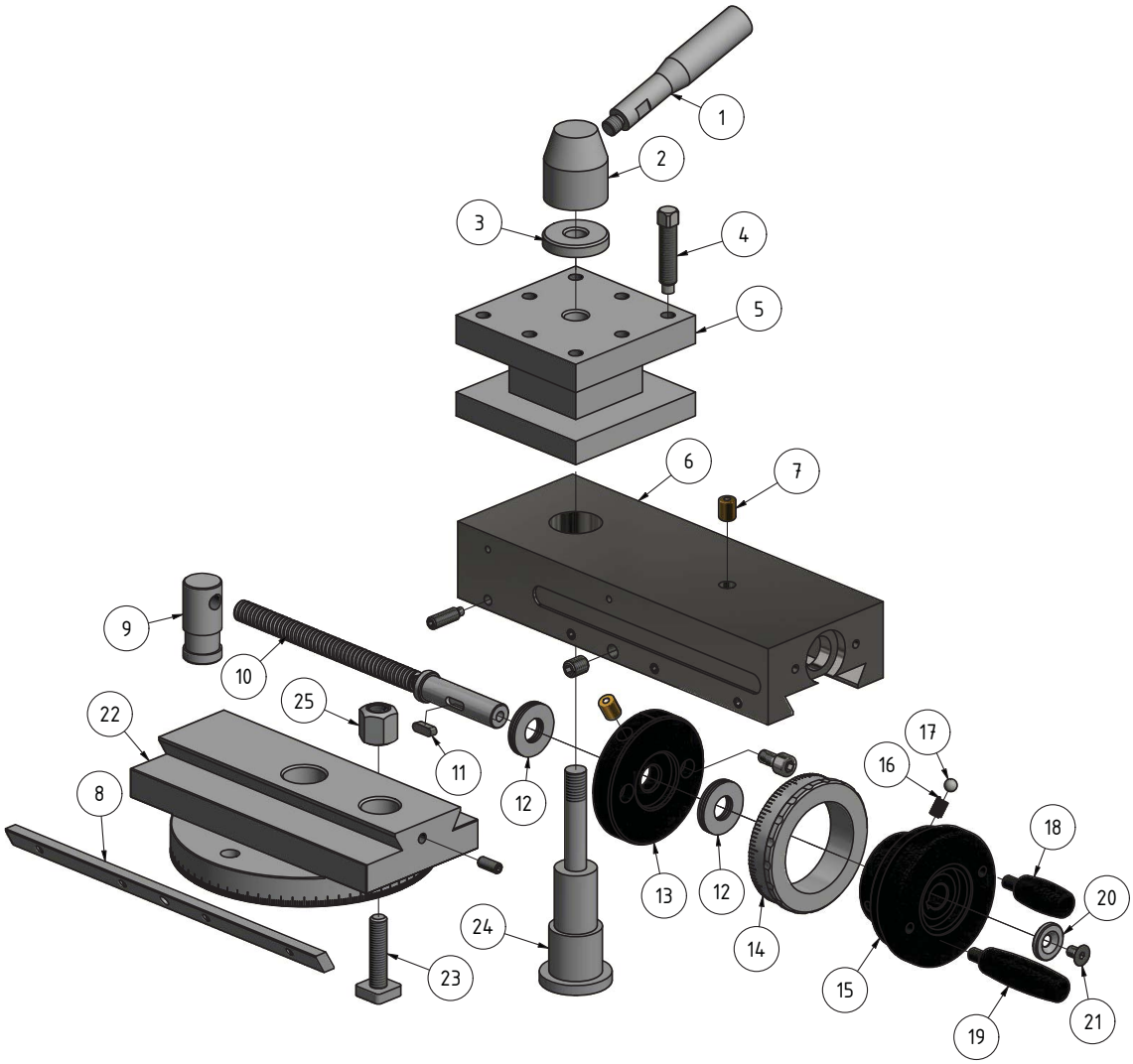
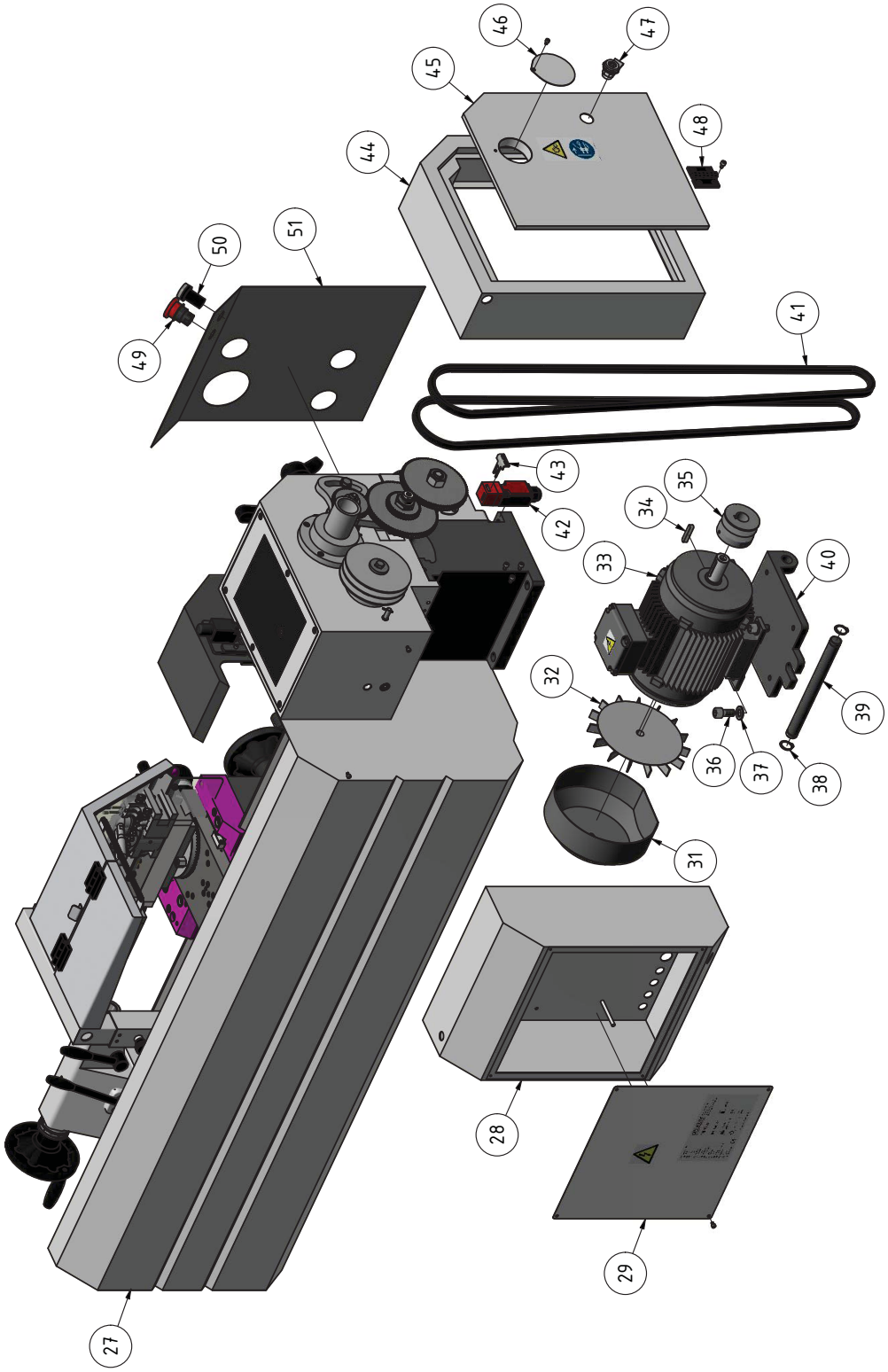
Ersatzteilliste Planschlitten/Bettschlitten - Spare part list cross slide/lathe sadle					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Bettschlitten TM3310	Bed slide TM3310	1		03403020601
2	Planschlitten TM3310	Cross slide TM3310	1		03403020602
3	Keilleiste TM3310	Wedge bar TM3310	1		03403020603
4	Buchse TM3310	Bushing TM3310	4		03403020604
5	Buchse TM3310	Bushing TM3310	4		03403020605
6	Buchse TM3310	Bushing TM3310	4		03403020606
7	Bolzen TM3310	Bolt TM3310	1		03403020607
8	Spindelmutter Teil Rückseite TM3310	Spindle nut part rear side TM3310	1		03403020608
9	Spindelmutter Teil Vorderseite TM3310	Spindle nut part front TM3310	1		03403020609
10	Stahlkugel TM3310	Steel ball TM3310	1		03403020610
11	Einstellschraube TM3310	Setting screw TM3310	2		03403020611
12	Schraube TM3310	Screw TM3310	1	M6x10	
13	Verschlussschraube TM3310	Screw plug TM3310	1		03403020613
14	Spannstift TM3310	Spring pin TM3310	2	5x30	
15	Schmiernippel TM3310	Lubrication pin TM3310	8	8	03403020615
16	Platte TM3310	Plate TM3310	1		03403020616
17	Platte TM3310	Plate TM3310	1		03403020617
20	Platte TM3310	Plate TM3310	1		03403020620
23	Ring TM3310	Ring TM3310	2		03403020623
24	Zahnrad TM3310	Gear TM3310	1		03403020624
25	Skalenring TM3310	Scale ring TM3310	1		03403020625
26	Spindel Planschlitten TM3310	Cross slide spindle TM3310	1		03403020626
27	Handrad TM3310	Handle TM3310	1		03403020627
28	Griffschraube TM3310	Handle screw TM3310	1		03403020628
29	Hülse TM3310	Sleeve TM3310	1		03403020629
31	Scheibe TM3310	Washer TM3310	1		03403020631
32	Schraube	Screw	1	M5x8	
33	Abdeckung TM3310	Cover TM3310	1		
34	Innensechskantschraube	Socker head screw	2	ISO 4762-M6x16	
35	Kegelstift	Taper pin	1	ISO 2339 -5 x 18	
36	Passfeder TM3310	Fitting key TM3310	1	DIN 6885-4x4x12	
37	Halter TM3310	Holder TM3310	1		03403020637
38	Schraube	Screw	2	M4x16	
39	Innensechskantschraube	Socket head screw	4	ISO 4762-M6x10	
40	Gewindestift	Grub screw	1	DIN 913 - M8x10	
41	Innensechskantschraube	Socker head screw	2	ISO 4762 -M4 x 16	
42	Innensechskantschraube	Socker head screw	4	ISO 4762-M8 x 45	
43	Innensechskantschraube	Socker head screw	2	ISO 4762 -M4 x 20	
44	Innensechskantschraube	Socker head screw	4	ISO 4762 -M6 x 50	

J Oberschlitten - Top slide



Ersatzteilliste Oberschlitten - Spare part list top slide					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
Pos. 1	Spanhebel TM3310D	Clamping lever TM3310D	1		03403020701
Pos. 2	Buchse TM3310D	Bushing TM3310D	1		03403020702
Pos. 3	Scheibe TM3310D	Washer TM3310D	1		03403020703
Pos. 4	Klemmschraube TM3310D	Clamping screw TM3310D	8		03403020704
Pos. 5	Vierfachstahlhalter TM3310D	Quadruple tool holder TM3310D	1		03403020705
Pos. 6	Oberschlitten TM3310D	Top slide TM3310D	1		03403020706
Pos. 7	Schmiernippel TM3310D	Lubrication cup TM3310D	2		03403020707
Pos. 8	Keilleiste TM3310D	Gib TM3310D	1		03403020708
Pos. 9	Spindelmutter TM3310D	Spindle nut TM3310D	1		03403020709
Pos. 10	Spindel TM3310D	Spindle TM3310D	1		03403020710
Pos. 11	Passfeder TM3310D	Fitting key TM3310D	1		03403020711
Pos. 12	Axiallager TM3310D	Thrust bearing TM3310D	2	12x26x4	03403020712
Pos. 13	Lagerbock TM3310D	Bearing block TM3310D	1		03403020713
Pos. 14	Skalenring TM3310D	Scale ring TM3310D	1		03403020714
Pos. 15	Nabe TM3310D	Collet TM3310D	1		03403020715
Pos. 16	Feder TM3310D	Spring TM3310D	3		03403020716
Pos. 17	Stahlkugel TM3310D	Steel ball TM3310D	3		03403020717
Pos. 18	Handhebel TM3310D	Handle lever TM3310D	1		03403020718
Pos. 19	Handhebel TM3310D	Handle lever TM3310D	1		03403020719
Pos. 20	Scheibe TM3310D	Washer TM3310D	1		03403020720
Pos. 21	Schraube TM3310D	Screw TM3310D	1		03403020721
Pos. 22	Führung TM3310D	Guide TM3310D	1		03403020722
Pos. 23	Schraube TM3310D	Screw TM3310D	2		03403020723
Pos. 24	Welle TM3310D	Shaft TM3310D	1		03403020724
Pos. 25	Klemmmutter TM3310D	Clamping nut TM3310D	2		03403020725

K Maschinenbett - Machine bed



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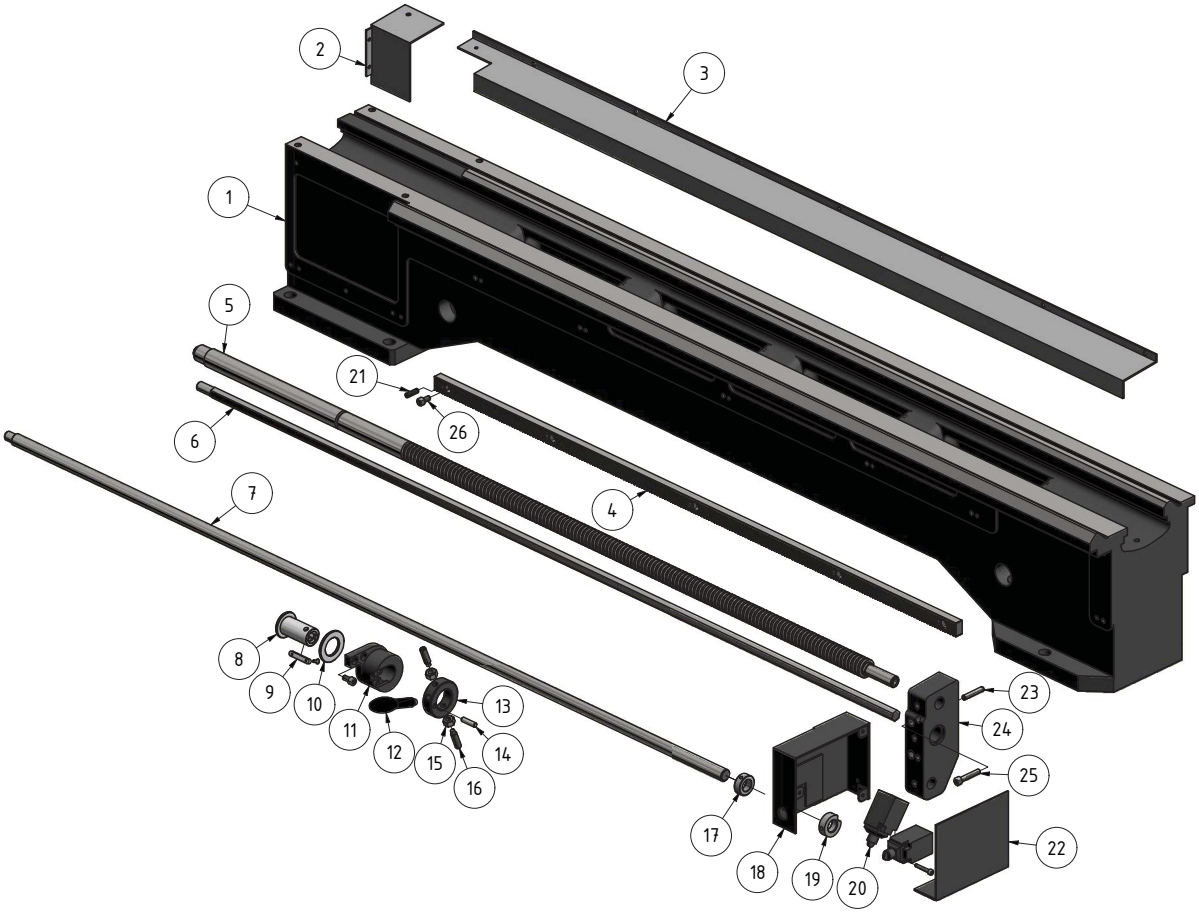
L Maschinenbett - Machine bed



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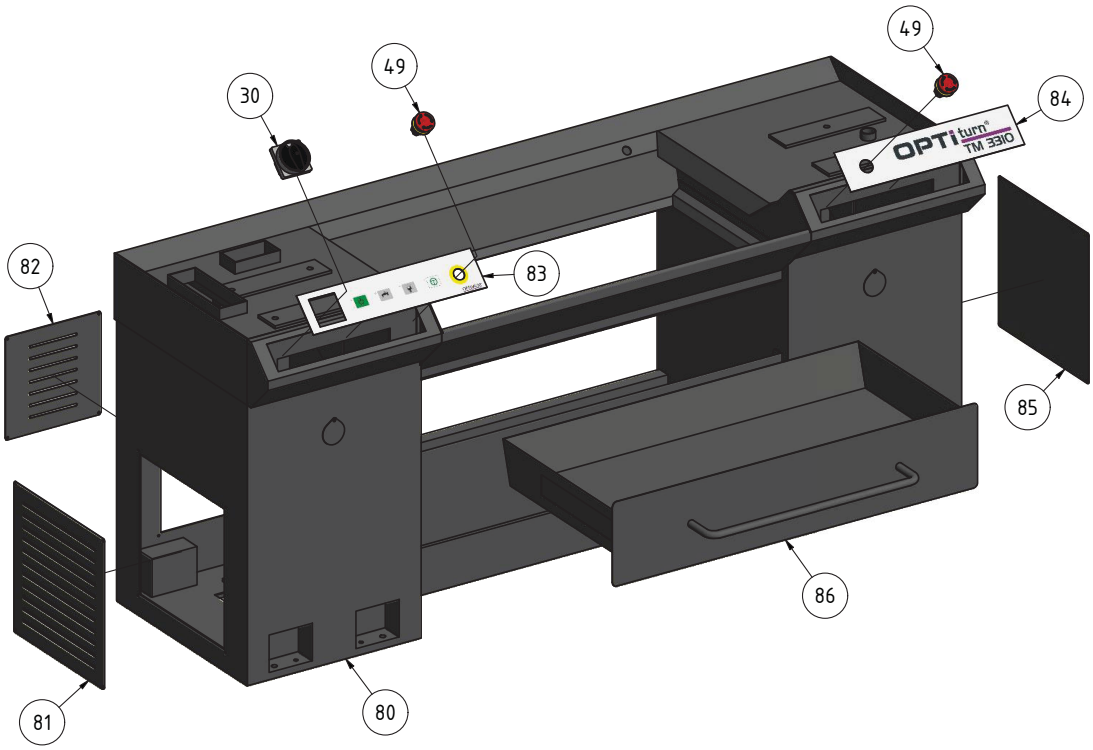

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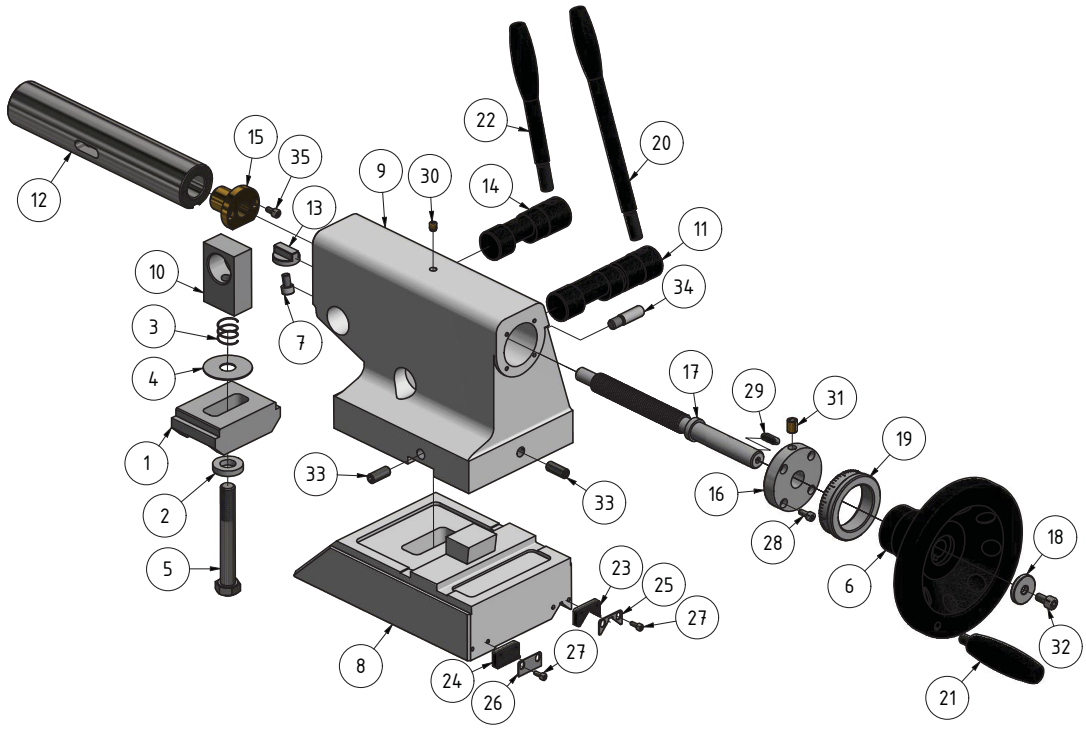
Ersatzteilliste Maschinenbett - Spare part list machine bed					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
Pos. 1	Maschinenbett TM3310D	machine bed TM3310D	1		03403020801
Pos. 2	Abdeckung TM3310D	cover TM3310D	1		03403020802
Pos. 3	Spindelabdeckung TM3310D	spindle cover TM3310D	1		03403020803
Pos. 4	Zahnstange TM3310D	rack TM3310D	1		03403020804
Pos. 5	Spindel TM3310D	spindle TM3310D	1		03403020805
Pos. 6	Spindel TM3310D	spindle TM3310D	1		03403020806
Pos. 7	Schaltstange TM3310D	shift rod TM3310D	1		03403020807
Pos. 8	Buchse TM3310D	socket TM3310D	1		03403020808
Pos. 9	Passfeder TM3310D	fitting key TM3310D	1		03403020809
Pos. 10	Ring TM3310D	ring TM3310D	1		03403020810
Pos. 11	Halter TM3310D	holder TM3310D	1		03403020811
Pos. 12	Hebel TM3310D	levers TM3310D	1		03403020812
Pos. 13	Ring TM3310D	ring TM3310D	1		03403020813
Pos. 14	Zylinderstift TM3310D	cylindrical pin TM3310D	1		03403020814
Pos. 15	Sechskantmutter TM3310D	hexagon nut TM3310D	1		03403020815
Pos. 16	Gewindestift TM3310D	grub screw TM3310D	1		03403020816
Pos. 17	Buchse TM3310D	bushing TM3310D	1		03403020817
Pos. 18	Gehäuse TM3310D	case TM3310D	1		03403020818
Pos. 19	Schaltnocke TM3310D	switching cam TM3310D	1		03403020819
Pos. 20	Endschalter TM3310D	limit switches TM3310D	2		03403020820
Pos. 21	Zylinderstift TM3310D	cylindrical pin TM3310D	5		03403020821
Pos. 22	Abdeckung TM3310D	cover TM3310D	1		03403020822
Pos. 23	Zylinderstift TM3310D	cylindrical pin TM3310D	3		03403020823
Pos. 24	Lagerbock TM3310D	bearing block TM3310D	1		03403020824
Pos. 25	Innensechskantschraube TM3310D	hexagon socket screw TM3310D	3		03403020825
Pos. 26	Innensechskantschraube TM3310D	hexagon socket screw TM3310D	5		03403020826
Pos. 27	Spritzwand TM3310D	splashback TM3310D	1		03403020827
Pos. 28	Schaltkasten TM3310D	control box TM3310D	1		03403020828
Pos. 29	Abdeckung TM3310D	cover TM3310D	1		03403020829
Pos. 30	Hauptschalter TM3310D	main switch TM3310D	1		03403020830
Pos. 31	Motorabdeckung TM3310D	motor cover TM3310D	1		03403020831
Pos. 32	Motorlüfter TM3310D	motor fan TM3310D	1		03403020832
Pos. 33	Motor TM3310D	motor TM3310D	1		03403020833
Pos. 34	Passfeder TM3310D	fitting key TM3310D	1		03403020834
Pos. 35	Riemenscheibe TM3310D	pulley TM3310D	1		03403020835
Pos. 36	Innensechskantschraube TM3310D	hexagon socket screw TM3310D	4		03403020836
Pos. 37	Scheibe TM3310D	washer TM3310D	4		03403020837
Pos. 38	Sicherungsring TM3310D	retaining ring TM3310D	4		03403020838
Pos. 39	Welle TM3310D	shaft TM3310D	1		03403020839
Pos. 40	Motorplatte TM3310D	motor plate TM3310D	1		03403020840
Pos. 41	Keilriemen TM3310D	V-belts TM3310D	2		03403020841
Pos. 42	Schalter TM3310D	switches TM3310D	1		03403020842
Pos. 43	Schalterplatte TM3310D	switch plate TM3310D	1		03403020843
Pos. 44	Gehäuse TM3310D	housing TM3310D	1		03403020844
Pos. 45	Abdeckung TM3310D	cover TM3310D	1		03403020845
Pos. 46	Abdeckung TM3310D	cover TM3310D	1		03403020846
Pos. 47	Schloss TM3310D	lock TM3310D	1		03403020847
Pos. 48	Scharnier TM3310D	hinge TM3310D	2		03403020848
Pos. 49	Not-Halt-Schalter TM3310D	emergency stop button TM3310D	1		03403020849
Pos. 50	Taster TM3310D	push button TM3310D	1		03403020850
Pos. 51	Abdeckung TM3310D	cover TM3310D	1		03403020851
Pos. 52	Bolzen TM3310D	bolts TM3310D	1		03403020852
Pos. 53	Splint TM3310D	cotter pin TM3310D	2		03403020853
Pos. 54	Zylinderstift TM3310D	cylindrical pin TM3310D	1		03403020854
Pos. 55	Sicherungsring TM3310D	retaining ring TM3310D	1		03403020855
Pos. 56	Bolzen TM3310D	bolts TM3310D	1		03403020856
Pos. 57	Bolzen TM3310D	bolts TM3310D	1		03403020857
Pos. 58	Bremsbacken TM3310D	brake shoes TM3310D	1		03403020858
Pos. 59	Sicherungsring TM3310D	retaining ring TM3310D	1		03403020859
Pos. 60	Feder TM3310D	spring TM3310D	1		03403020860
Pos. 61	Bremspedal TM3310D	brake pedal TM3310D	1		03403020861
Pos. 62	Welle TM3310D	shaft TM3310D	1		03403020862
Pos. 63	Welle TM3310D	shaft TM3310D	1		03403020863
Pos. 64	Bolzen TM3310D	bolts TM3310D	1		03403020864
Pos. 65	Exzenter TM3310D	eccentric TM3310D	1		03403020865
Pos. 66	Zylinderstift TM3310D	cylindrical pin TM3310D	1		03403020866
Pos. 67	Schaltnocke TM3310D	switching cam TM3310D	1		03403020867
Pos. 68	Schalter TM3310D	switches TM3310D	1		03403020868
Pos. 69	Sechskantschraube TM3310D	hexagon bolt TM3310D	1		03403020869
Pos. 70	Sechskantmutter TM3310D	hexagon nut TM3310D	1		03403020870
Pos. 71	Bolzen TM3310D	bolts TM3310D	1		03403020871
Pos. 72	Schraube TM3310D	screw TM3310D	2		03403020872
Pos. 73	Spänewanne TM3310D	chip tray TM3310D	1		03403020873
Pos. 74	Abdeckung TM3310D	cover TM3310D	1		03403020874
Pos. 75	Abdeckung TM3310D	cover TM3310D	1		03403020875
Pos. 76	Unterbau TM3310D	substructure TM3310D	1		03403020876
Pos. 77	Metallblech TM3310D	metal sheet TM3310D	1		03403020877
Pos. 78	Spänekasten TM3310D	chip box TM3310D	1		03403020878
Pos. 79	Unterbau TM3310D	substructure TM3310D	1		03403020879
Pos. 80	Unterbau TM3310D	substructure TM3310D	1		03403020880

TM3310_parts.fm

Ersatzteilliste Maschinenbett - Spare part list machine bed					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
Pos. 81	Abdeckung TM3310D	Cover TM3310D	1		03403020881
Pos. 82	Abdeckung TM3310D	Cover TM3310D	1		03403020882
Pos. 83	Platte TM3310D	Plate TM3310D	1		03403020883
Pos. 84	Platte TM3310D	Plate TM3310D	1		03403020884
Pos. 85	Abdeckung TM3310D	Cover TM3310D	1		03403020885
Pos. 86	Spänefach TM3310D	Chip case TM3310D	1		03403020886

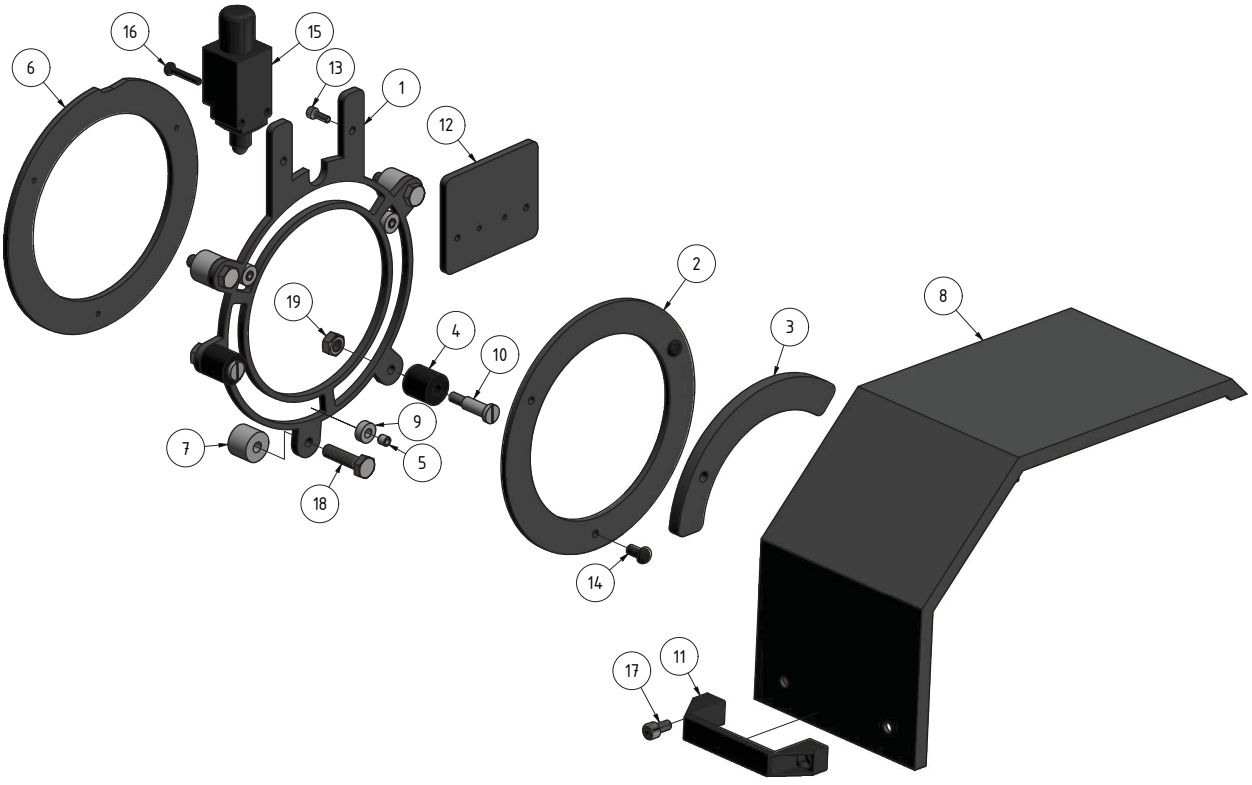
N Reitstock - Tailstock



Ersatzteilliste Reitstock - Spare part list tailstock					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
Pos. 1	Klemmplatte TM3310D	Clamping plate TM3310D	1		03403020901
Pos. 2	Scheibe TM3310D	Washer TM3310D	1		03403020902
Pos. 3	Feder TM3310D	Spring TM3310D	1		03403020903
Pos. 4	Scheibe TM3310D	Washer TM3310D	2		03403020904
Pos. 5	Sechskantschraube TM3310D	Haxagon screw TM3310D	1	ISO 4014 - M12 x 90	
Pos. 6	Handrad	Handwheel	1		03403020906
Pos. 7	Schraube TM3310D	Screw TM3310D	1		03403020907
Pos. 8	Grundplatte TM3310D	Base plate TM3310D	1		03403020908
Pos. 9	Reitstockgehäuse	Tailstock housing	1		03403020909
Pos. 10	Platte TM3310D	Plate TM3310D	1		03403020910
Pos. 11	Welle TM3310D	Shaft TM3310D	1		03403020911
Pos. 12	Pinole TM3310D	Sleeve TM3310D	1		03403020912
Pos. 13	Platte TM3310D	Plate TM3310D	1		03403020913
Pos. 14	Welle TM3310D	Shaft TM3310D	1		03403020914
Pos. 15	Spindelmutter TM3310D	Spindle nut TM3310D	1		03403020915
Pos. 16	Flansch	Flange	1		03403020916
Pos. 17	Spindel TM3310D	Spindle TM3310D	1		03403020917
Pos. 18	Scheibe TM3310D	Washer TM3310D	1		03403020918
Pos. 19	Skalenring TM3310D	Scale ring TM3310D	1		03403020919
Pos. 20	Klemmhebel TM3310D	Clamping lever TM3310D	1		03403020920
Pos. 21	Handhebel TM3310D	Handle lever TM3310D	1		03403020921
Pos. 22	Spannhebel TM3310D	Clamping lever TM3310D	1		03403020922
Pos. 23	Abstreifer TM3310D	Wiper TM3310D	1		03403020923
Pos. 24	Abstreifer TM3310D	Wiper TM3310D	1		03403020924
Pos. 25	Platte TM3310D	Plate TM3310D	1		03403020925
Pos. 26	Platte TM3310D	Plate TM3310D	1		03403020926
Pos. 27	Innensechskantschraube TM3310D	Socket head screw TM3310D	4	ISO 4762 - M3 x 8	03403020927
Pos. 28	Innensechskantschraube TM3310D	Socket head screw TM3310D	4	ISO 4762 -M4 x 10	03403020928
Pos. 29	Passfeder TM3310D	Fitting key TM3310D	1	DIN 6885 -5x5x16	03403020929
Pos. 30	Schmiernippel TM3310D	Lubrication cup TM3310D	1	6	03403020930

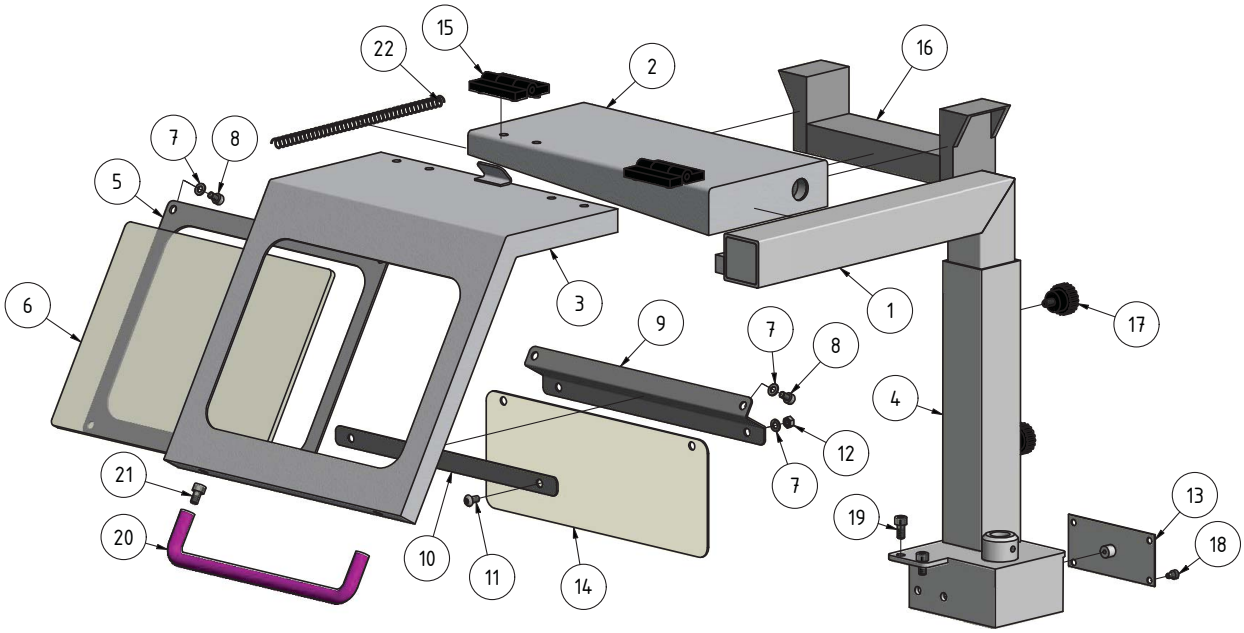
Ersatzteilliste Reitstock - Spare part list tailstock					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
Pos. 31	Schmiernippel TM3310D	Lubrication cup TM3310D	1	8	03403020931
Pos. 32	Innensechskantschraube TM3310D	Socket head screw TM3310D	1	ISO 4762 - M6 x 12	03403020932
Pos. 33	Gewindestift TM3310D	Grub screw TM3310D	3	DIN 913-M8x12	03403020933
Pos. 34	Bolzen TM3310D	Bolt TM3310D	1		03403020934
Pos. 35	Innensechskantschraube TM3310D	Socket head screw TM3310D	2	ISO 4762-M4 x 8	03403020935

O Drehfutterschutz - Lathe chuck protection



Ersatzteilliste Drehfutterschutz - Spare part list lathe chuck cover					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
Pos. 1	Ring TM3310D	Ring TM3310D	1		034030201201
Pos. 2	Ring TM3310D	Ring TM3310D	1		034030201202
Pos. 3	Platte TM3310D	Plate TM3310D	1		034030201203
Pos. 4	Endanschlag TM3310D	Limit stop TM3310D	2		034030201204
Pos. 5	Buchse TM3310D	Bushing TM3310D	3		034030201205
Pos. 6	RIng TM3310D	Ring TM3310D	1		034030201206
Pos. 7	Buchse TM3310D	Bushing TM3310D	3		034030201207
Pos. 8	Drehfutterschutz TM3310D	Lathe chuck cover TM3310D	1		034030201208
Pos. 9	Buchse TM3310D	Bushing TM3310D	3		034030201209
Pos. 10	Schraube TM3310D	Screw TM3310D	2		034030201210
Pos. 11	Handgriff TM3310D	Handle TM3310D	1		034030201211
Pos. 12	Platte TM3310D	Plate TM3310D	1		034030201212
Pos. 13	Schraube TM3310D	Screw TM3310D	2	ISO 4762-M4x12	
Pos. 14	Schraube TM3310D	Screw TM3310D	2	ISO 7380-M6x12	
Pos. 15	Endschalter TM3310D	End switch TM3310D	1		034030201215
Pos. 16	Schraube TM3310D	Screw TM3310D	2	ISO 7045 - M4x25	
Pos. 17	Schraube TM3310D	Screw TM3310D	2	ISO 4762 - M6x12	
Pos. 18	Schraube TM3310D	Screw TM3310D	3	ISO 4017 - M8x30	
Pos. 19	Schraube TM3310D	Screw TM3310D	2	ISO 4032 - M8	

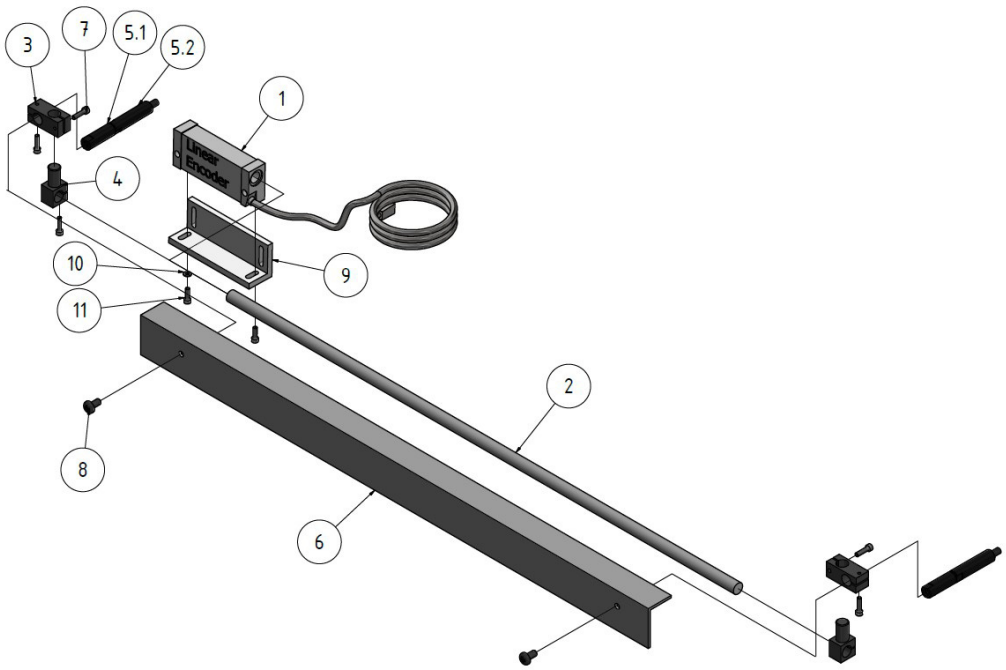
P Späneschutz - Chip cover



Ersatzteilliste Späneschutz - Spare part list chip cover					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Führung	Guide	1		
2	Platte	Plate	1		
3	Späneschutz	Chip guard	1		
4	Halter	Holder	1		
5	Klemmplatte	Clamping plate	1		
6	Schutzglass	Safety glass	1		034020301206
7	Scheibe	Washer	10	5	
8	Schraube	Screw	4	M5	
9	Platte	Plate	1		
10	Klemmplatte	Clamping plate	1		
11	Schraube	Screw	2	M5	
12	Sechskantmutter	Hexagon nut	2	M5	
13	Abdeckung	Cover	1		
14	Flexible Abdeckung	Flexible cover	1		
15	Scharnier	Hinger	2		
16	LED Lampe	LED Lamp	1	DC24V-PGB-221-6W	034020301216
17	Klemmschraube	Clamping screw	2		
18	Innensechskantschraube	Socket head screw	4	ISO 4762 - M4 x 6	
19	Innensechskantschraube	Socket head screw	2	ISO 4762 - M6 x 12	
20	Griff	Handle	1		
21	Innensechskantschraube	Socket head screw	2	ISO 4762 - M6 x 10	
22	Feder	Spring	1		034020301222
CPL	Späneschutz komplett	Chip protection cpl	1		034020301203CPL

7.5 MSSR Linear Encoder - Ersatzteilzeichnungen - Spare part drawings

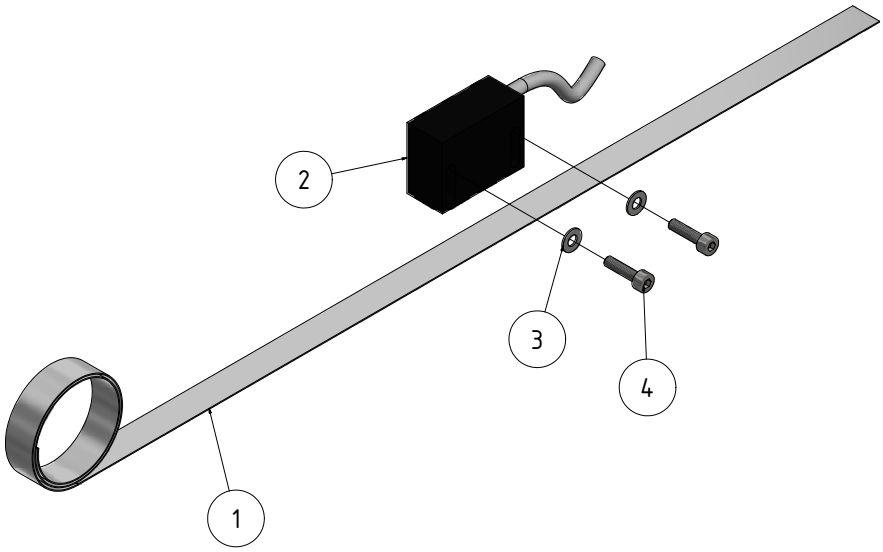
A Großer MSSR Messwandler - Large Linear encoder



Teileliste - Parts list					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
01	Lesekopf	Reading head	1		0338440501
02	Kugelmessleiste	Ball measuring bar	1	verschiedene Längen different lengths	
03	Anschlussblock zur Aufnahme von Maßstab und Vorrichtung	Connection block for holding scale and fixture	2		0338440503
04	Fester Block für Maßstab und Halterung	Fixed block for scale and holder	2		0338440504
05.1	Installationssäule für Maßstab (vorne)	Installation column for scale (front)	2		0338440505-1
05.2	Installationssäule für Maßstab (hinten)	Installation column for scale (rear)	2		0338440505-2
06	Abdeckplatte für Maßstab und Halterung	Cover plate for scale and holder	1	verschiedene Längen different lengths	
07	Schraube M5 x 20	Screw M5 x 20	6	DIN EN ISO 4762 M5 x 20	
08	Schraube M8 x 16	Screw M8 x 16	2	DIN EN ISO 7045 Z M8 x 16	
09	Winkelhalterung	Angle holder	1		0338440509
10	Beilegscheibe	Washer	2	DIN 988 S6	
11	Schraube M6 x 25	Screw M6 x 25	2	DIN EN ISO 4762 M6 x 25	

7.6 Bauteile Magnetsensor - Magnetic sensor components

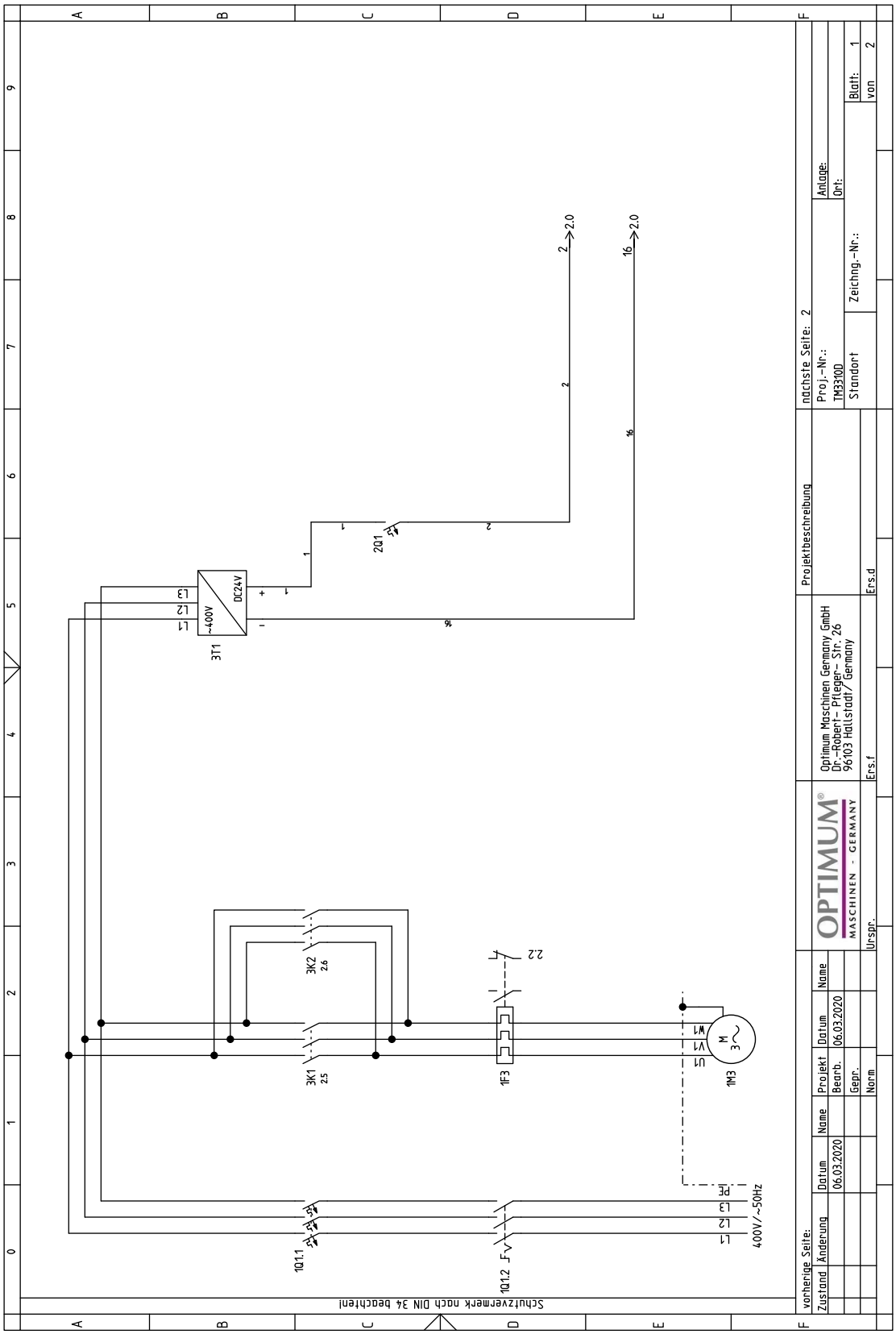
A Magnetsensor - Magnetic sensor



Pos.	Bezeichnung	Description	Grösse Size	Katalog - Artikelnummer Catalogue - Item number
1	Magnetband, 2mm Magnetpolabstand 0,003 mm Zählwertauflösung mit 3384035	Magnetic strip, 2mm magnetic pole distance 0.003mm count resolution with 3384035	1100mm Katalogware 1100mm catalogue item	3383978
			Magnetband pro Meter, Katalogware Magnetic tape per metre, catalogue item	3383980
			2000mm Katalogware 2000mm catalogue item	3383979
2	Magnetsensor für Magnetband Aktiv-Lesekopf, Anschluss-Kabellänge 4 Meter 0,003 mm Zählwertauflösung	Magnetic sensor for magnetic strip Active reading head, connection cable length 4 metres 0.003mm count resolution	CSD203R	3384035
	Magnetsensor für Magnetband Aktiv-Lesekopf, Anschluss-Kabellänge 4 Meter 0,005 mm Zählwertauflösung	Magnetic sensor for magnetic strip Active reading head, connection cable length 4 metres 0.005mm count resolution	CSD205	3384035
3	Beilegscheibe	Washer	DIN EN ISO 7091	
4	Schraube M3x20	Screw M3x20	DIN EN ISO 4762	
	Verlängerungskabel für Sensor	Extension cable for sensor	1 Meter 1 metre	3384040

7.7 Schaltplan - Wiring diagram

Q



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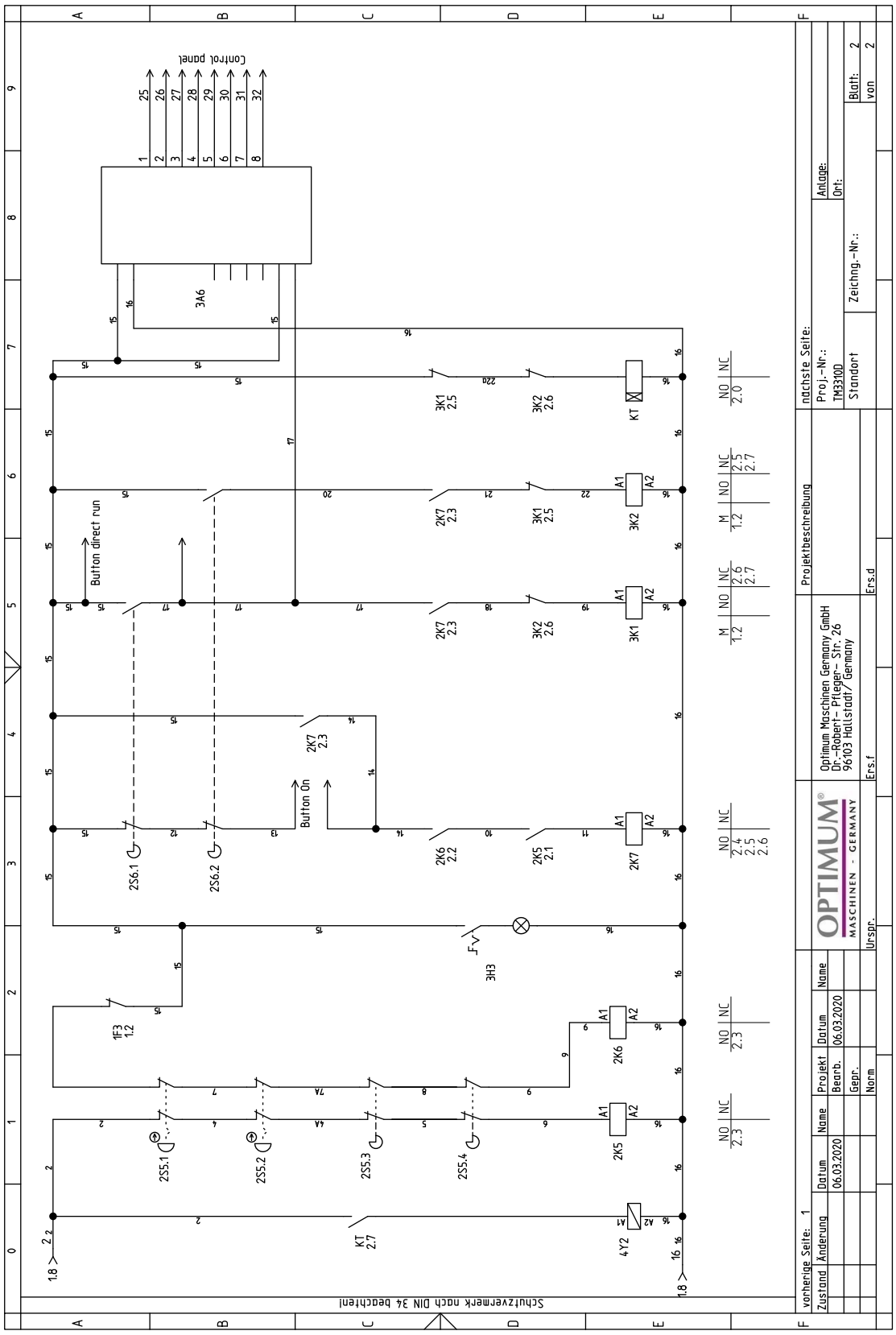
R



TM3310_wiring-diagram.fm

Ersatzteilliste elektrische Bauteile - Spare part list electrical parts					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
	Digitalpositionsanzeige	Digital position display	1	DPA32-3	03403027DPA32
	Digitalpositionsanzeige	Digital position display	1	DPA31Plus for combination of ball measuring bar and magnetic tape only	
1F3	Motorschutzrelais	Motor circuit breaker		Schneider LR2-K0314	
1M3	Spindelmotor	Spindle motor		Y90L-4,400V/3PH/ 50HZ,1.5kW	
1Q1.1	Sicherungsautomat	Circuit breaker		CKDB7-D1036R	
1Q1.2	Hauptschalter	Main switch		ZH-20 AC-3 5E4	
2K5	Relais Sicherheitssteuerung	Relay safety control		MY2N-GS DC24V	
2K6					
2K7	Steuerrelais	Control relay			
2Q1	Sicherungsautomat	Circuit breaker		CKDB7-C0616R	
2S5.1	Not-Aus-Schlagschalter	Emergency-stop pushbutton		KEDU HY-57B-17	
2S5.2					
2S5.3	Schalter Drehfuterschutz	Switch lathe chuck protection		KEDU QKS7-5	
2S5.4	Schalter Fussbremse	Foot brake switch			
2S6.1	Schalter Spindel Linkslauf	Switch spindle anti-clockwise			
2S6.2	Schalter Spindel Rechtslauf	Switch Spindle clockwise rotation			
3K1	Motorschütz Spindel Linkslauf	Motor contactor Spindle anti-clockwise rotation		Schneider LP1K0910BD24V	
3K2	Motorschütz Spindel Rechtslauf	Motor contactor Spindle clockwise rotation			
3T1	Netzteil	Power supply		Delta DRP024V120W3BN	
S	Taster Ein	Button On		LA103(B3)-10DN/36	
S1.1	Meldeleuchte	Signal lamp		CLL-40S06DBS6HM, DC24V	
4Y2	Motorbremse	Motor brake			
3A5	Steuerplatine	Control board			
3H3	Maschinenlampe	Machine lamp			

Schmierstoffe Lubricant Lubrifiant	Viskosität Viskosity Viscosité ISO VG DIN 51519 mm²/s (cSt)	Kennzeichnung nach DIN 51502	ARAL	BP	Esso	Klüber Lubrication	Mobil	Shell	Texaco
Getriebeöl Gear oil Huile de réducteur	VG 680	CLP 680	Aral Degol BG 680	BP Energol GR-XP 680	SPARTAN EP 680	Klüberoil GEM 1-680	Mobilgear 636	Shell Omala S2 GX 680	Meropa 680
	VG 460	CLP 460	Aral Degol BG 460	BP Energol GR-XP 460	SPARTAN EP 460	Klüberoil GEM 1-460	Mobilgear 634	Shell Omala S2 GX 460	Meropa 460
	VG 320	CLP 320	Aral Degol BG 320	BP Energol GR-XP 320	SPARTAN EP 320	Klüberoil GEM 1-320	Mobilgear 632	Shell Omala S2 GX 320	Meropa 320
	VG 220	CLP 220	Aral Degol BG 220	BP Energol GR-XP 220	SPARTAN EP 220	Klüberoil GEM 1-220	Mobilgear 630	Shell Omala S2 GX 220	Meropa 220
	VG 150	CLP 150	Aral Degol BG 150	BP Energol GR-XP 150	SPARTAN EP 150	Klüberoil GEM 1-150	Mobilgear 629	Shell Omala S2 GX 150	Meropa 150
	VG 100	CLP 100	Aral Degol BG 100	BP Energol GR-XP 100	SPARTAN EP 100	Klüberoil GEM 1-100	Mobilgear 627	Shell Omala S2 GX100	Meropa 100
	VG 68	CLP 68	Aral Degol BG 68	BP Energol GR-XP 68	SPARTAN EP 68	Klüberoil GEM 1-68	Mobilgear 626	Shell Omala S2 GX 68	Meropa 68
	VG 46	CLP 46	Aral Degol BG 46	BP Bartran 46	NUTO H 46 (HLP 46)	Klüberoil GEM 1-46	Mobil DTE 25	Shell Tellus S2 MX 46	Anubia EP 46
	VG 32	CLP 32	Aral Degol BG 32	BP Bartran 32	NUTO H 32 (HLP 32)	Klübersynth GEM 4- 32 N	Mobil DTE 24	Shell Tellus S2 MX 32	Anubia EP 32
Hydrauliköl Hydraulic oil Huile hydraulique	VG 32	CLP 32	Aral Vitam GF 32	BP Energol HLP HM 32	NUTO H 32 (HLP 32)	LAMORA HLP 32	Mobil Nuto HLP 32	Shell Tellus S2 M 32	Rando HD HLP 32
	VG 46	CLP 46	Aral Vitam GF 46	BP Energol HLP HM 46	NUTO H 46 (HLP 46)	LAMORA HLP 46	Mobil Nuto HLP 46	Shell Tellus S2 M 46	Rando HD HLP 46
Getriebefett Gear grease Graisse de réducteur		G 00 H-20	Aral FDP 00 (Na-verseift) Aralub MFL 00 (Li-verseift)	BP Energrease PR-EP 00	FIBRAX EP 370 (Na-verseift)	MICROLUB E GB 00	Mobilux EP 004	Shell Alvania GL 00 (Li-verseift)	Marfak 00

Spezialfette, wasserabweisend Special greases, water resistant Graisses spéciales, déperlant			Aral Aralub	Energrease PR 9143		ALTEMP Q NB 50 Klüberpaste ME 31-52	Mobilux EP 0 Mobil Greaserex 47		
Wälzlagerfett Bearing grease Graisse de roulement		K 3 K-20 (Li-verseift)	Aralub HL 3	BP Energrease LS 3	BEACON 3	CENTOPLE X 3	Mobilux 3	Shell Alvania R 3 Alvania G 3	Multifak Premium 3
Öle für Gleitbahnen Oils for slideways Huiles pour glissières	VG 68	CGLP 68	Aral Deganit BWX 68	BP Maccurat D68	ESSO Febis K68	LAMORA D 68	Mobil Vactra Oil No.2	Shell Tonna S2 M 68	Way lubricant X 68
Öle für Hochfrequenzspindeln Oils for Built-in spindles Huiles pour broches à haute vitesse	VG 68		Deol BG 68	Emergol HLP-D68	Spartan EP 68		Drucköl KLP 68-C	Shell Omala 68	
Fett für spezielle Schmierungen an CNC Werkzeugmaschinen (Fließfett) Grease for special lubrication on CNC machine tools Graisse pour lubrification spéciale sur machines-outils CNC	NLGI Klasse 000 NLGI class 000		ARALUB BAB 000	Grease EP 000	Shell Gadus S4 V45AC	CENTOPLE X GLP 500	Mobilux EP 023		Multifak 264 EP 000
Fett für Hochfrequenzspindeln Grease for Built-in spindles Graisse pour broches à haute vitesse	METAFLUX-Fett-Paste (Grease paste) Nr. 70-8508 METAFLUX-Moly-Spray Nr. 70-82 Techno Service GmbH ; Detmolder Strasse 515 ; D-33605 Bielefeld ; (++49) 0521- 924440 ; www.metaflux-ts.de								
Kühlschmiermittel Cooling lubricants Lubrifiants de refroidissement			Aral Emusol	BP Sevora	Esso Kutwell		Mobilcut	Shell Adrana	Chevron Soluble Oil B

8 Malfunctions

8.1 Machine malfunctions

Malfunction	Cause/ possible effects	Solution
Machine does not turn on	o Position switch lathe chuck protection switches the machine off. o Position switch protection cover headstock machine switches off o Emergency-stop switch activated o Motor protection switch has triggered by overloading.	o Check position switch lathe chuck protection, adjust o Check or adjust the position switch of protective cover headstock. o Unlock the emergency-stop switch o Avoid overloading. Activate the motor circuit breaker again. ► Power failure, Restoring readiness for operation on page 32
Motor is hot Motor has no power	o Machine connected incorrectly	o ► Electric three-phase connection on page 26
Feed will stop	o Clutch of the longitudinal feed or cross feed will slip.	o Cutting force too high o If necessary, check clutch and readjust.
Surface of workpiece too rough	o Lathe tool blunt o Lathe tool springs o Feed too high o Radius at lathe tool tip too small	o Resharpen lathe tool o Clamp lathe tool with less overhang o Reduce feed o Increase radius
Flat belt slips through Speed of rotation varies too much	o Flat belt defective, wear down o Tension is too loose	o ► Spindle drive V-belt on page 72
Workpiece becomes conical	o Centre are not aligned (tailstock offset) o Top slide is not exactly set to zero (when turning with the top slide)	o Align the tailstock to the centre o Align the top slide exactly
Lathe rattles	o Feed too high o Spindle bearings have too much clearance.	o Reduce feed o Readjust spindle bearings. ► Spindle bearing on page 74
Centring point runs hot	o Workpiece has expanded	o Loosen tailstock centre
Lathe tool has a short service life	o Cutting speed too high o For large infeed o Insufficient cooling	o Reduce cutting speed o Lower delivery / finishing stock allowance not over 0.5 mm) o More cooling
Flank wear too high	o Clearance angle too small (lathe tool "pushes") o Lathe tool tip not adjusted to centre height	o Increase clearance angle o Correct height adjustment of the lathe tool

Malfunction	Cause/ possible effects	Solution
Cutting edge breaks off	o Wedge angle too small (heat buildup) o Grinding cracks due to improper cooling o Excessive play in the spindle bearings (oscillations occur)	o Set greater wedge angle o Cool uniformly o Have the clearance in the spindle bearing arrangement re-adjusted
Turned thread is wrong	o Lathe tool is clamped incorrectly or grinding has been started the wrong way o Wrong pitch o Wrong diameter	o Set the lathe tool to the centre, grind angle correctly Use 60° lathe tool for metric threads, 55° lathe tool for inch thread o Adjust right pitch o Turn the workpiece to the correct diameter

9 Appendix

9.1 Copyright

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Subject to technical changes without notice.

9.2 Terminology/Glossary

Term	Explanation
Headstock	Housing for the feed gear and the speed gear.
Lead screw nut	Split nut which engages the lead screw.
lathe chuck	Clamping tool for holding the workpiece.
Drill chuck	Drill bit adapter
Lathe saddle	Slide on the slideway of the machine bed which feeds parallel to the tool axis.
Cross slide	Slide on the slideway of the machine bed which feeds parallel to the tool axis.
Top slide	Swivelling slide on the cross slide.
Taper mandrel	Taper of the drill bit, the drill chuck or the centring point.
Tool	Lathe tool, drill bit, etc.
Workpiece	Piece to be turned or machined.
Tailstock	Movable turning aid.
rest	Follow or steady support for turning long workpieces.
Lathe dog	Device or clamping aid for driving pieces to be turned between centres.

9.3 Change information manual

Chapter	Short note	new version no.
0 ; 1 ; 2 ; 3 ; 4 ; 5 ; 6	DC brake instead of mechanical brake, modified machine base, centre distance from 880 to 1000, swing over machine bed from 323 to 330	1.0.1
3	Interdepartmental transport	1.0.2
	DPA replaced with DPA32-3	1.0.3
4.10.1	Thread cutting table inserted	1.0.4
	DPA32 replaced with DPA31Plus	1.0.5
3.7	Information Chip protection transport position	1.0.6

9.4 Liability claims/warranty

Beside the legal liability claims for defects of the customer towards the seller, the manufacturer of the product, OPTIMUM GmbH, Robert-Pfleger-Straße 26, D-96103 Hallstadt, does not grant any further warranties unless they are listed below or were promised in the framework of a single contractual provision.

- O The processing of the liability claims or of the warranty is performed as chosen by OPTIMUM GmbH either directly or through one of its dealers.
  Any defective products or components of such products will either be repaired or replaced by components which are free from defects. Ownership of replaced products or components is transferred to OPTIMUM Maschinen Germany GmbH.
- O The automatically generated original proof of purchase which shows the date of purchase, the type of machine and the serial number, if applicable, is the precondition in order to assert liability or warranty claims. If the original proof of purchase is not presented, we are not able to perform any services.
- O Defects resulting from the following circumstances are excluded from liability and warranty claims:
  - Using the product beyond the technical options and proper use, in particular due to overstraining of the machine.
  - Any defects arising by one's own fault due to faulty operations or if the operating manual is disregarded.
  - Inattentive or incorrect handling and use of improper equipment
  - Unauthorized modifications and repairs
  - Insufficient installation and safeguarding of the machine
  - Disregarding the installation requirements and conditions of use
  - atmospheric discharges, overvoltage and lightning strokes as well as chemical influences
- O The following items are also not subject to liability or warranty claims:
  - Wearing parts and components which are subject to normal and intended wear, such as V-belts, ball bearings, lighting, filters, seals, etc.
  - Non reproducible software errors
- O Any services, which OPTIMUM GmbH or one of its agents performs in order to fulfil any additional warranty are neither an acceptance of the defects nor an acceptance of its obligation to compensate. These services neither delay nor interrupt the warranty period.
- O The court of jurisdiction for legal disputes between businessmen is Bamberg.
- O If any of the aforementioned agreements is totally or partially inoperative and/or invalid, a provision which nearest approaches the intent of the guarantor and remains within the framework of the limits of liability and warranty which are specified by this contract is deemed agreed.

9.5 Storage

ATTENTION!

Incorrect and improper storage might result in damage or destruction of electrical and mechanical machine components.

Store packed and unpacked parts only under the intended environmental conditions.

Follow the instructions and information on the transport box:

- Fragile goods
  (Goods require careful handling)

- Protect against moisture and humid environment

- Prescribed position of the packing case
  (Marking the top surface - arrows pointing up)

- Maximum stacking height

Example: not stackable - do not stack further packing case on top of the first one.

Consult Optimum Maschinen Germany GmbH if the machine and accessories are stored for more than three months or are stored under different environmental conditions than those specified here .

9.6 Dismantling, disassembling, packing and loading

INFORMATION

Please take care in your interest and in the interest of the environment that all component parts of the machine are only disposed of in the intended and admitted way.

Please note that the electrical devices comprise a variety of reusable materials as well as environmentally hazardous components. Please ensure that these components are disposed of separately and professionally. In case of doubt, please contact your municipal waste management. If appropriate, call on the help of a specialist waste disposal company for the treatment of the material.

Please make sure that electrical components are disposed of professionally and in accordance with the statutory provisions.

The machine contains electrical and electronic components and must not be disposed of as household waste. According to the European directive 2011/65/EG regarding disused electrical and electronic devices and the implementation in national law, disused electrical tools and electrical equipment must be stored separately and recycled in an environmentally friendly manner.

As the equipment operator, you should obtain information regarding the authorized collection or disposal system which applies for your company.

Please make sure that electrical components are disposed of professionally and in accordance with legal regulations. Please only dispose of used batteries via the collection boxes in shops or at municipal waste management companies.

9.6.1 Decommissioning

CAUTION!

Disused machines need to be decommissioned in a professional manner in order to avoid later misuse and endangerment of the environment or persons.

- **o Disassemble the machine if required into easy-to-handle and reusable assemblies and component parts.**
- **o Dispose of machine components and operating fluids using the intended disposal methods.**

9.6.2 Dismantling

→ Pull the power cord or disassemble the connection cable and disconnect the connection cable.

9.6.3 Disassembly

→ Drain the oil

- O from the headstock, drain hole
- O from the feed gear, drain hole
- O from the apron, drain hole.

→ Disassemble the drive motor.

9.6.4 Packing and loading

→ Place the machine on 2 palettes to allow for removal transport

9.7 Disposal of new device packaging

All used packaging materials and packaging aids from the machine are recyclable and generally need to be supplied to the material reuse.

The packaging wood can be supplied to the disposal or the reuse.

Any packaging components made of cardboard box can be chopped up and supplied to the waste paper collection.

The films are made of polyethylene (PE) and the cushion parts are made of polystyrene (PS). These materials can be reused after reconditioning if they are passed to a collection station or to the appropriate waste management enterprise.

Only forward the packaging materials correctly sorted to allow direct reuse.

EC - Declaration of Conformity

according to Machinery Regulation 2023/1230 Annex V Part A

The manufacturer / distributor Optimum Maschinen Germany GmbH
Dr.-Robert-Pfleger-Str. 26
D - 96103 Hallstadt, Germany

hereby declares that the following product

Product designation: Hand controlled lathe

Type designation: TM3310 | TM3310D

fulfils all the relevant provisions of the Machinery Regulation specified above and the additionally applied directives (in the following) - including the changes which applied at the time of the declaration.

Description:

Hand controlled lathe without numerical control

The following other EU Directives have been applied:

EMC Directive 2014/30/EC ; Restriction of the use of certain hazardous substances in electrical and electronic equipment 2015/863/EU

The following harmonized standards were applied:

EN ISO 23125: 2015-04 Machine tools - Safety - Turning machines

EN 60204-1: 2019-06 Safety of machinery - Electrical equipment of machines - Part 1: General requirements

EN 13849-1: 2016-06 Safety of machinery - Safety related parts of controls - Part 1: General design principles

EN 13849-2: 2013-02 Safety of machinery - Safety related parts of controls - Part 2: Validation

EN ISO 12100: 2011-03 Safety of machinery - General principles for design - Risk assessment and risk reduction

Name and address of the person authorized to compile the technical file:

Kilian Stürmer, phone: +49 (0) 951 96555 - 800

Kilian Stürmer (CEO, General Manager)
Hallstadt, 2023-11-07

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