OPTIMUM®
MASCHINEN - GERMANY

Operating Manual

Version 1.0.2

Lathe

OPTI turn® TM 4010

Part no. 3403041
3403046

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

Dr.- Robert - Pfleger - Str. 26

D-96103 Hallstadt, Germany

Email: info@optimum-maschinen.de

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 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 operation 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.

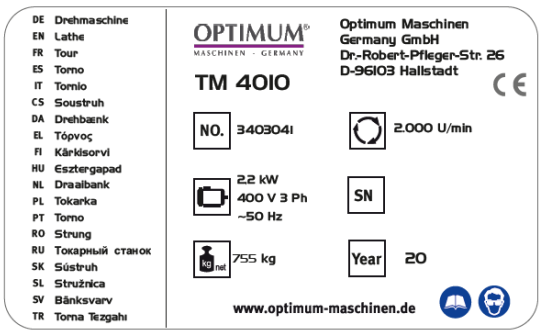
If European standards have not yet been incorporated in the national legislation of the country of destination, the specific applicable regulations of each country must be observed.

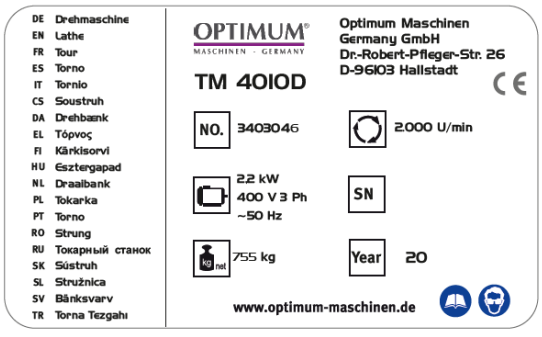
If applicable, necessary measures must be taken to comply with the country-specific regulations before commissioning the lathe.

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 plates





Machine variants:

TM 4010 - without digital path display

TM 4010D - with digital path display

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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 hazards

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 climb onto the machine!

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!

Only switch when stopped!

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 for longitudinal and straight turning of round and regular formed
workpieces in cold metal, their diameter and weight are within the limits of the given specifications. The lathe must only be installed and operated in a dry and ventilated place.

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

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

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

► Technical specification on page 18

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

WARNING!

Extremely 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 operators must be qualified.

1.4.1 Avoiding misuse

- → Use of suitable cutting tools.
- → When working do not generate any continuous chips. Adjust the cutting speed when continuous chips are produced. 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 suitable for attachment kits for cylindrical grinding. When mounting attachment kits for cylindrical grinding, additional protective devices must be fitted.
- → 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.

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 personnel,
- 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!

All additional devices installed by the operator have to be equipped with the prescribed safety devices.

As the operating company, this is your responsibility!

► Safety devices on page 12

1.6 Qualification of personnel

1.6.1 Target group

This manual is addressed to

- the operating companies,
- the operators,
- the maintenance personnel.

Therefore, the warning notes refer to both the operation and maintenance of the lathe.

Determine and indicate clearly who will be responsible for the different activities on the lathe (operation, maintenance and repair).

Unclear responsibilities constitute a safety risk!

Always disconnect the main plug of the lathe and secure the main switch using a lock. This will prevent it from being used by unauthorized persons.

The qualifications of the personnel for the different tasks are mentioned below:

Operator

The operator is instructed by the operating company about the assigned tasks and possible risks in case of improper behaviour. Any tasks performed beyond operation in standard mode may only be performed by an operator if they are described in these instructions and if the operator has been specifically trained to perform them by the operating company.

Qualified electrician

With professional training, knowledge and experience as well as knowledge of respective standards and regulations, qualified electricians are able to perform work on the electrical system and recognise and avoid any possible dangers.

Qualified electricians have been specially trained for the working environment, in which they are working and know the relevant standards and regulations.

Qualified personnel

Due to their professional training, knowledge and experience as well as knowledge of relevant regulations, qualified personnel are able to perform the assigned tasks and to independently recognise and avoid any possible dangers.

Instructed person

Instructed persons were instructed by the operating company regarding the assigned tasks and any possible risks of improper behaviour.

1.6.2 Authorized persons

WARNING!

Inappropriate operation and maintenance of the lathe constitutes a danger for the personnel, objects and the environment.

Only authorized personnel may operate the lathe!

Persons authorized to operate and maintain should be trained technical personnel and instructed by the ones who are working for the operating company and for the manufacturer.

1.6.3 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.

1.6.4 User's obligations

The operator must

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

1.6.5 Additional requirements regarding the qualification

Additional requirements apply for work on electrical components or equipment:

- O Must only be performed by a qualified electrician or person working under the instructions and supervision of a qualifiedelectrician.
- O Before starting work on electrical parts or operating agents, following measures are to be performed in the following order:

→ disconnect all poles,

→ secure against restarting,

→ Ensure 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.

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

- O the cause of the fault has been eliminated,
- O 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:

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

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. Always work carefully and observe the limits of their machining process.

The lathe includes the following safety devices:

- O a lockable main switch,
- O two emergency stop buttons,
- O a lathe chuck protection with position switch,
- O a brake integrated in the drive motor,
- O a protective cover on the headstock with position switch,
- O a protective cover for the lead screw and feed rod,
- O an overload clutch on the feed rod,
- O safety screws for the Camlock bolts on the workpiece holder,
- O a chips shield.

1.9.1 Lockable main switch

In the "0" position, the lockable main switch can be secured against accidental or non-authorised switching on by means of a padlock.

When the main switch is switched off, the power supply to the machine is completely interrupted.

WARNING!

Dangerous voltage even if the main switch is switched off.

The areas marked by the pictogram might contain live parts, even if the main switch is switched off.

1.9.2 Emergency-stop mushroom switch

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. An operational shut-down of the machine must not be executed using the emergency stop mushroom switch.

1.9.3 Protective cover with interlock switch

The headstock of the lathe is equipped with a separating protective cover with interlock switch. The protective cover can only be opened when the main switch of machine is switched off.

The drive only starts when the protective cover is closed.

Turn the main switch off, when the protective cover is to be opened for maintenance or changing of gears.

1.9.4 Lathe chuck protection with position switch

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

1.9.5 Chip guard shield

Polycarbonate windows

Polycarbonate viewing window in chip protection, must be visual inspected by the customer responsible personnel at regular intervals to guarantee the operational safety of the machine.

Polycarbonate viewing panes are subject to an ageing process and are classified as wear parts.

The aging of polycarbonate windows can not be detected by visual inspection. It is therefore necessary to replace the polycarbonate windows after a certain time.

Prolonged exposure from polycarbonate windows to cutting fluids can lead to accelerated ageing, i.e. deterioration of the mechanical properties (brittleness). Coolant vapours, detergents, greases and oils or other corrosive substances from the operator side can also lead to a deterioration of the polycarbonate windows. The result is a reduced retention capability of the polycarbonate viewing pane against chips and potentially flying parts.

1.9.6 Prohibition, warning and mandatory signs

INFORMATION

All warning and mandatory signs must be legible. They must be checked regularly.

1.10 Safety check

Check the lathe at least once per shift. Inform the person responsible immediately of any damage, defects or changes in the operating function.

Check all safety devices

- at the beginning of each shift (with the machine stopped),
- once a week (with the machine in operation),
- after all maintenance and repair work.

Check that prohibition, warning and information signs and the labels on the lathe

- are legible (clean them, if necessary)
- are complete.

INFORMATION

Organise the checks according to the following table;

General check		
Equipment	**Check**	**OK**
Guards	Mounted, firmly bolted and not damaged	
Signs, Markers	Installed and legible	
Date:	**Checked by (signature):**	

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Functional check		
Equipment	**Check**	**OK**
Emergency-stop push 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 may switch on only when the lathe chuck protection is closed.	
Positions switch Protective cover of the headstock	The spindle drive of the lathe must only be switch on if the protective cover of the headstock is closed.	
Date:	**Checked by (signature):**	

1.11 Personnel protective equipment

For certain work personal protective equipment is required.

- O 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.

- O Wear protective gloves when handling pieces with sharp edges.

- O 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).

- O Before starting work make sure that the required personal 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 For your own 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:

Avoid any unsafe work methods:

- O Make sure that your work does not endanger anyone.
- O Clamp the workpiece tightly before activating the lathe.
- O Observe the maximum lathe chuck opening.
- O Wear safety goggles.
- O Do not remove the turning chips by hand. Use a chip hook and / or a hand brush to remove turning chips.
- O Clamp the turning tool at the correct height and with the least possible overhang.
- O Turn off the lathe before measuring the workpiece.
- O 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.
- Observe the accident prevention regulations issued by your Employers Liability Insurance Association or other supervisory authorities applicable to your company.
- Inform the supervisor about all hazards or faults.
- 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.

1.13 Safety during maintenance

Inform the operators in good time of any maintenance and repair works.

Report all safety-relevant changes and performance characteristics of the lathe. Any changes must be documented, the operating instructions updated and machine operators instructed accordingly.

1.13.1 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!

Proceed with extreme caution if you
the lathe by turning off the main switch due to required works (e.g. functional control).

1.13.2 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.

Observe the accident prevention regulations issued by your Employers Liability Insurance Association or other supervisory authorities applicable to your company. Fasten the loads properly. Never walk under suspended loads!

1.13.3 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!

1.14 Accident report

Inform your supervisors and Optimum Maschinen Germany GmbH immediately in the event of accidents, possible sources of danger and any actions which almost led to an accident (near misses).

There are many possible causes for "near misses".

The sooner they are notified, the quicker the causes can be eliminated.

INFORMATION

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

1.15 Electronics

► Qualified electrician on page 11

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 set 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.

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

1.16 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. ► Lubricating and cleaning the lathe chuck on page 60.

2 Technical specification

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

	TM4010	TM4010D
2.1 Electrical connection		
	3 x 400V 2.2 KW ~ 50 Hz (~60Hz)	
2.2 Drive motor		
Power	2.2 KW	
2.3 Work areas		
Height of centres [mm]	200	
Distance between centres [mm]	1000	
Swing diameter over machine bed [mm]	400	
Swing diameter over cross slide [mm]	250	
Main spindle bore [mm]	52	
2.4 Headstock		
Main spindle nose	DIN ISO 702-2 no. 5 - Camlock	
Main spindle morse taper	MT6	
Spindle speeds ~ 50Hz [rpm]	70 - 2000	
Spindle speeds ~ 60Hz [rpm]	84 - 2400	
Gear stages	8	
total speed levels	8	
2.5 Feeds and pitches		
Longitudinal feed [mm/rev]	► Feed speed on page 35	
Cross feed [mm/rev]		
Metric thread [mm / rev]	► Table for thread cutting on page 42	
Inch threads [threads / inch]		
2.6 Slides		
Cross slide travel [mm]	185	
Top slide travel [mm]	98	
2.7 Tailstock		
Quill diameter [mm]	50	
Quill travel [mm]	110	
Taper in the quill	MT4	

	TM4010	TM4010D
2.8 Steady and follow rest		
Steady rest passage min. - max. [mm]	10 - 70	
Follow rest passage min. - max. [mm]	10 - 50	
2.9 Work area, weights		
Keep a work area of at least one metre around the machine free for operation and maintenance.		
Net weight [kg]	755	
2.10 Environmental conditions		
Temperature	5 - 35 °C	
Relative humidity	25 - 80 %	
2.11 Operating material		
Headstock Mobilgear 627 or a comparable oil	approx. 3.5 litres	
Apron gearbox Mobilgear 629 or a comparable oil	approx. 0.25 litres	
Feed gear Mobilgear 629 or a comparable oil	approx. 1.2 litres	
Coolant tank	approx. 10 litres	
Bare steel parts and lubricating nipple,	Acid-free lubricating oil	

2.12 Emissions

The A-weighted sound pressure level L_{pA} is 82 to 84 dB at the operator position and operating conditions according to ISO 8525 without load.

The A-weighted sound power level L_{WA} is 97 to 100 dB.

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.**

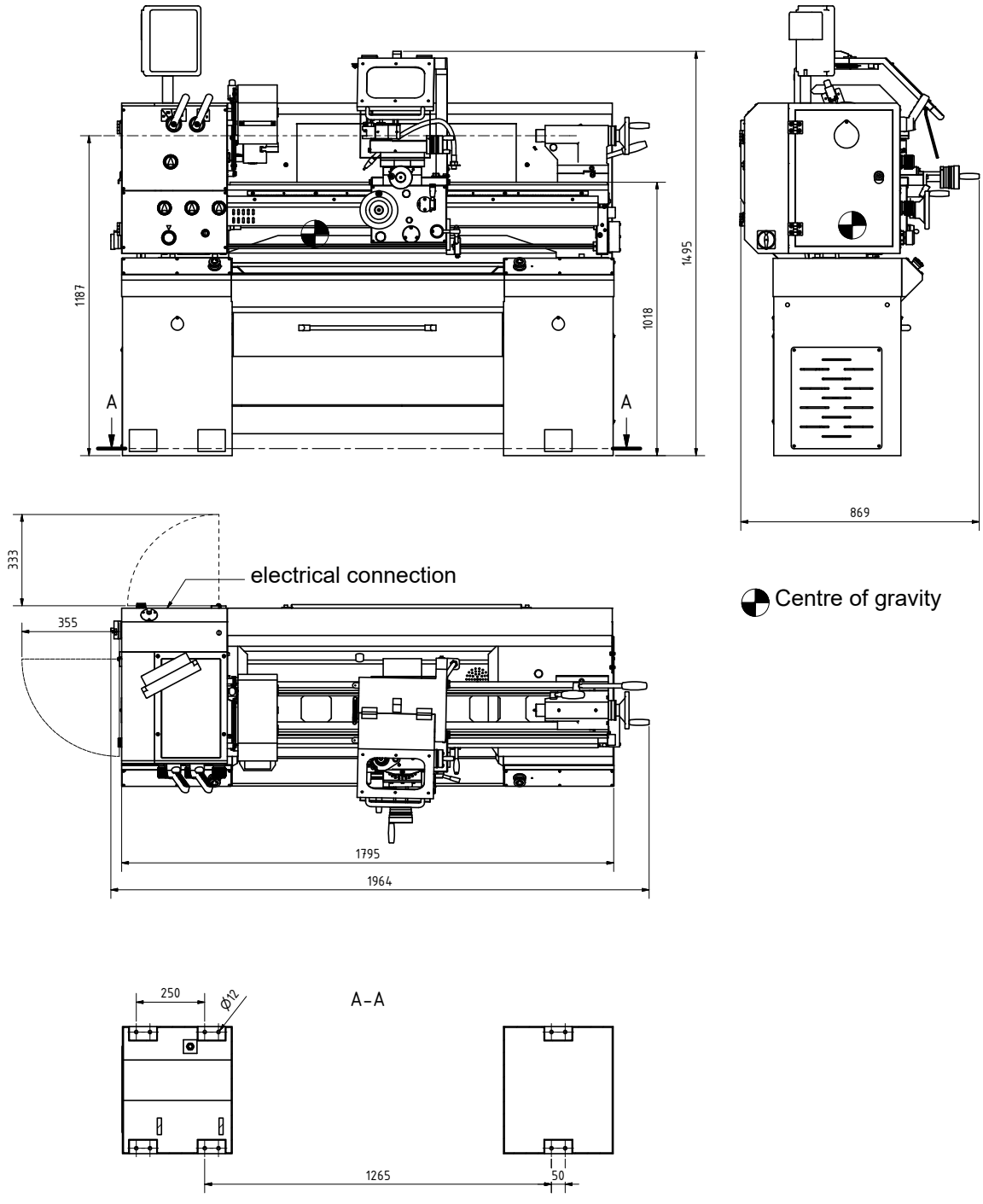
Furthermore, it is possible that the admissible exposure level might be different from country to country due to national regulations.
This information about the noise emission should, however, allow the machine operator to evaluate the hazards and risks more easily.

CAUTION!

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

We generally recommend the use of noise and ear protection.

2.13 Dimensions, installation plan



Img. 2-1: TM4010D

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 Unpacking the machine

INFORMATION

The lathe is delivered pre-assembled.

Transport the lathe in its packing crate to a place near its final installation location with a forklift before unpacking it. If the packaging shows signs of possible transport damage, take the necessary precautions not to damage the machine when unpacking. If any damage is discovered, the carrier and/or shipper must immediately be notified of this fact to establish any claim which might arise.

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.

3.3 Scope of delivery

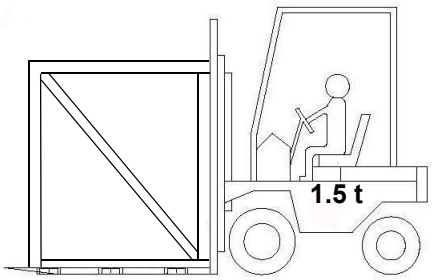
When the lathe is delivered, please check immediately that it has not been damaged during transport.
Also check that no fastening screws have come loose. Compare the scope of delivery with the attached packing list or the delivery note.

3.4 Load attachment points

O Weights

► Dimensions, installation plan on page 21

Weight of the lathe ► Net weight [kg] on page 19

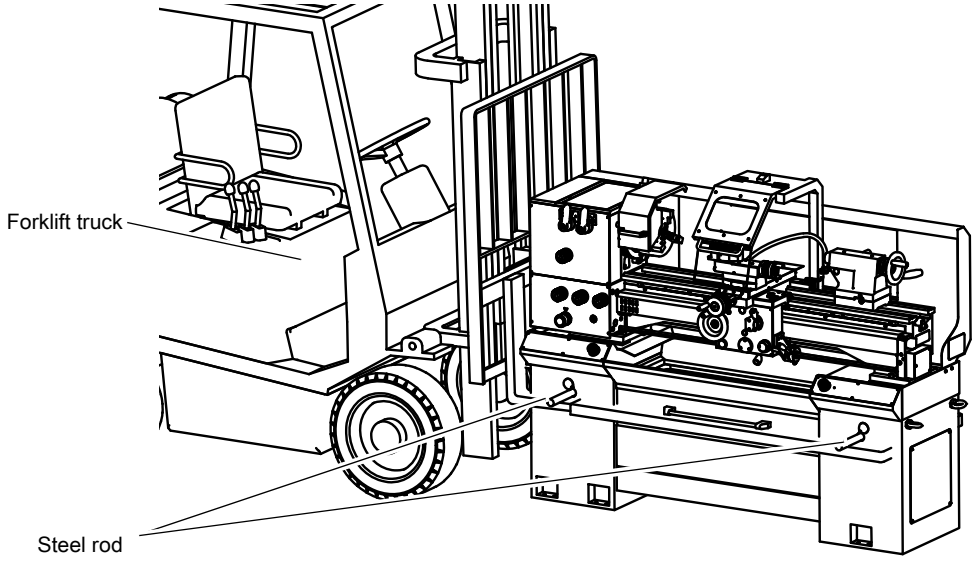


3.4.1 Load suspension point

3.4.2 Gravity of the machine

► Dimensions, installation plan on page 21

3.4.3 Lifting with a forklift

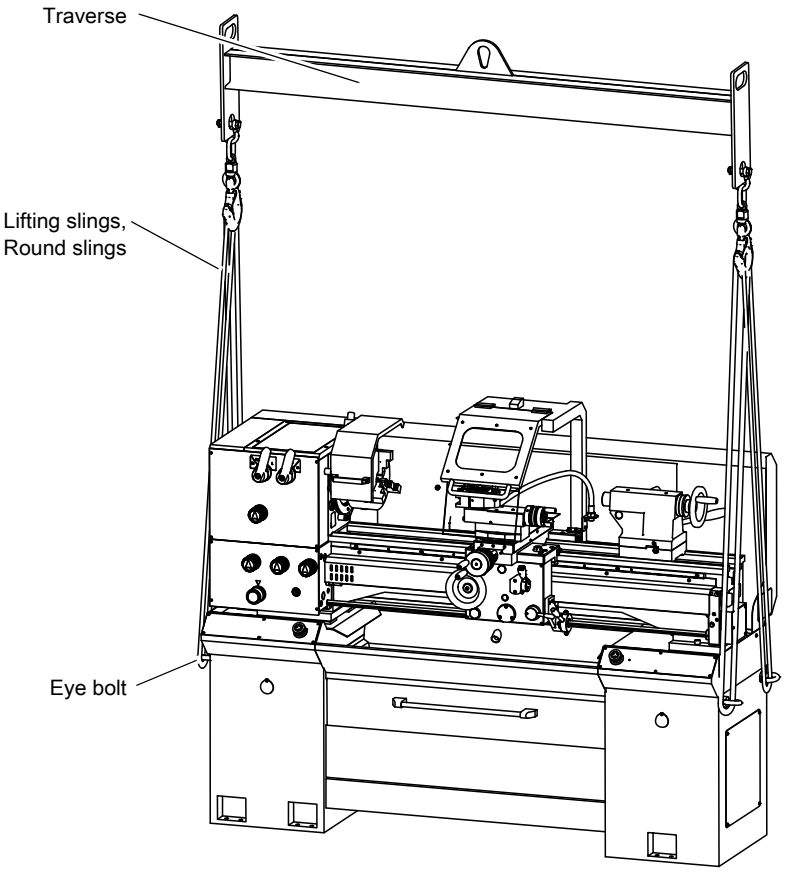


→ Put two steel rods with a diameter of 30 to 34mm (round steel C45, thick - walled tube) and a length of one meter through the holes of the machine substructure.

→ Firmly clamp the tailstock.

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

3.4.4 Lifting by crane



→ Attach one sling to each of the side eyebolts.

→ Firmly clamp the tailstock.

→ Slowly raise the machine using the crane.

3.5 Installation and assembly

3.5.1 Installation site requirements

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 lathe according to the local safety regulations.

The work area for operation, maintenance and repair must not be restricted.

INFORMATION

In order to attain good functionality and a high processing accuracy as well as a long service life of the machine, the place of installation should fulfil certain criteria.

Please observe the following points:

- 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.
- The ground must be suitable for the lathe. Make sure that the floor has sufficient load-bearing capacity and is level.
- The ground must be prepared in such a way that any coolant used cannot penetrate the ground.
- Protruding parts - such as the dog, handles, etc. - must be secured, where necessary, by means of on-site measures so that persons are not endangered.
- Provide enough space for set-up and operating personnel and material transport.
- Also bear in mind accessibility for installation and maintenance works.
- Ensure adequate lighting is available (minimum value: 500 Lux, measured at the tool tip). In the event of a lower level of lighting, additional illumination must be provided, e.g. by means of a separate workplace light.

INFORMATION

The main switch of the lathe must be freely accessible.

3.6 Cleaning the machine

CAUTION!

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.

3.6.1 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 oil of the headstock, gear and apron must be changed 50 hours after being filled for the first time, then annually.

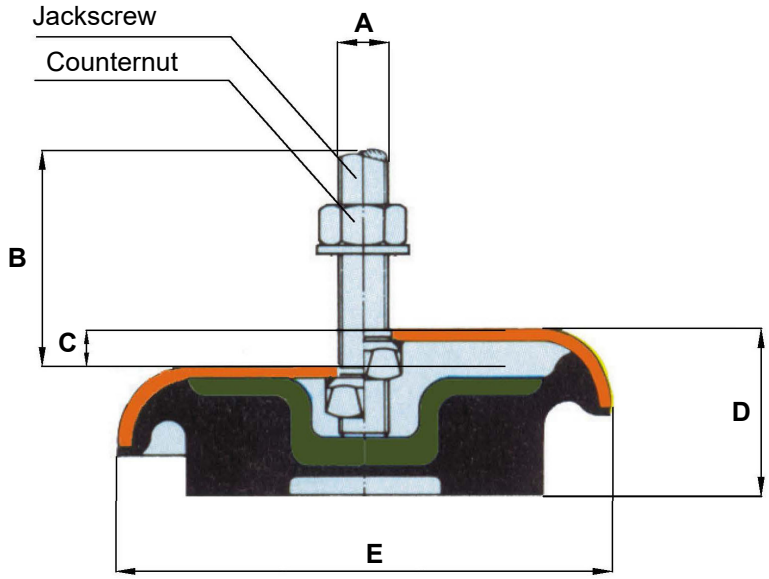
→ Use the oil types recommended in the reference table. This table can be used to compare the characteristics of each different type of oil of your choice.

→ 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.

3.7 Anchor-free assembly

Attaching a solid surface at each contact point between the foundation and machine base or use of vibration dampers type SE1, part no. 3381012 The 6 pcs. SE1 vibration dampers are attached to the through-holes on the machine base. The maximum height adjustment per element is 10mm. Tighten the jackscrew, the vibration damper lifts up.

3.7.1 Vibration-free assembly



	A	B [mm]	C [mm]	D [mm]	E [mm]
SE1	M12	70	10	32	120
SE2	M16	90	12	35	160
SE3	M20	130	12	40	185

3.7.2 Installation with vibration dampers

Optional vibration dampers

Attaching of 6 pieces SE85 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.

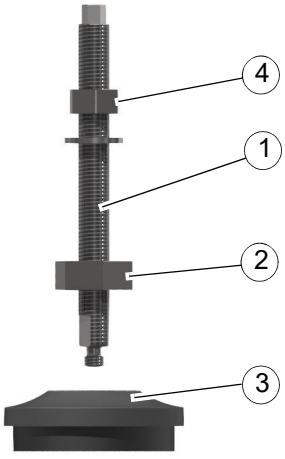
CAUTION!

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!

Lift the machine with suitable lifting gear so that the 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.

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

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

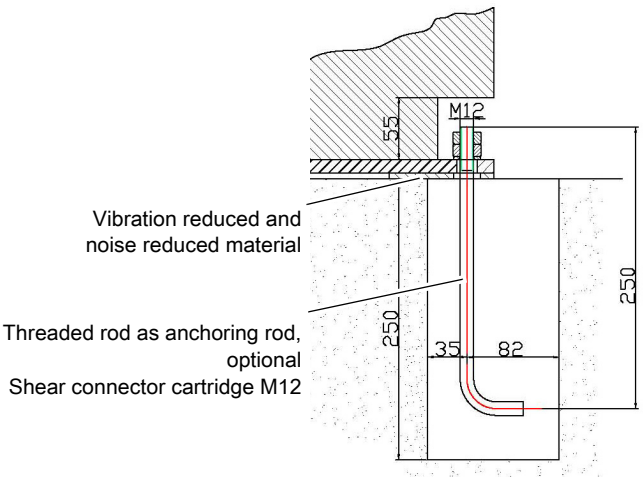


SE85

3.8 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.

► Dimensions, installation plan on page 21



Img.3-1: Drawing of the anchoring

3.9 First commissioning

WARNING!

The first commissioning may only take place 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.

ATTENTION!

Before initially operating the machine, check all screws, fixtures and/or safety devices and tighten up the screws if necessary!

WARNING!

Risk from using improper workpiece clamping materials or operating the machine at an inadmissible speed.

Only use the tool clamping devices (e.g. lathe chuck) that were delivered with the machine or those offered by OPTIMUM as optional equipment.

Only use tool clamping devices in the intended admissible speed range.

3.10 Electric three-phase connection

→ 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.

3.11 Warming up the machine

ATTENTION!

If the lathe 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.

3.12 Functional check

→ Check that all spindles are running smoothly.

Machine data					
☐ First sample machine ☐ Series machine					
Machine designation: Serial number:		Type: Year of manufacture:		Inspector:	
Viewing					
correct location	o.k ☐ n.o.k ☐		Function of the system	o.k ☐ n.o.k ☐	
Function of the safety devices	o.k ☐ n.o.k ☐		Machine can be switched off	o.k ☐ n.o.k ☐	
Labelling N and PE	o.k ☐ n.o.k ☐		Accessibility of operating resources	o.k ☐ n.o.k ☐	
Trained and instructed operators	o.k ☐ n.o.k ☐		Optical damage	o.k ☐ n.o.k ☐	
Continuity of the protective conductor system					
Measuring point between PE connection and		Measured value (measuring voltage 0.2A or 10A)		Passed	
Motors				Yes ☐ No ☐	
Machine body				Yes ☐ No ☐	
Ad-on parts				Yes ☐ No ☐	
Measurement of the insulation resistance					
Conductor	**Target value**	**Actual value**	**Test voltage**	**All right?**	
L1 -> PE	≥ 1 MΩ		V DC	Yes ☐ No ☐	
L2 -> PE	≥ 1 MΩ		V DC	Yes ☐ No ☐	
L3 -> PE	≥ 1 MΩ		V DC	Yes ☐ No ☐	
N -> PE	≥ 1 MΩ		V DC	Yes ☐ No ☐	
Voltage test (2-fold rated voltage or 1000V)					
Conductor	**Target value**	**Actual value**	**Test voltage**	**All right?**	
L1 -> PE	≥ 1 MΩ		V DC	Yes ☐ No ☐	
L2 -> PE	≥ 1 MΩ		V DC	Yes ☐ No ☐	
L3 -> PE	≥ 1 MΩ		V DC	Yes ☐ No ☐	
N -> PE	≥ 1 MΩ		V DC	Yes ☐ No ☐	
Protection against residual voltage					
Storable charge over 60 µC:				Yes ☐ No ☐	
Measurable voltage 5 seconds after mains disconnection < 60V; value:				o.k ☐ n.o.k ☐	
Exposed parts with discharge time > 1 second and protection class less than IP2X/ IPXXB:				No ☐	
Functional check					
Power supply unit voltage measurement, secondary:		Targetvalue:	Actual value:		OK ☐
Emergency stop / Emergency switching off:					OK ☐
Verification by testing:					OK ☐
Remarks / Miscellaneous:					
Place: **Date:**					
Test passed:		Yes ☐	No ☐		
Signature of inspector					

4 Operation

4.1 Control and indicating elements

Pos.	Designation	Pos.	Designation
1	Selector lever speed adjustment	2	Change wheel and feed table
3	Control panel	4	Feed gear selector switch
5	Chip sump	6	Lathe chuck guard
7	Chip guard shield	8	Machine lighting (underneath the chip guard)
10	Tailstock	11	Digital Position Indicator DPA (TM4010D only)
12	Control panel lathe saddle	14	Rotational direction control lever
15	Lead screw (under cover)	16	Feed rod (under cover)

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 The operating instructions are observed.
- 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.

► For your own safety during operation on page 15

4.2.1 Overview of the control elements

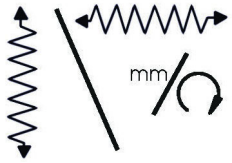
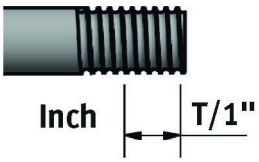
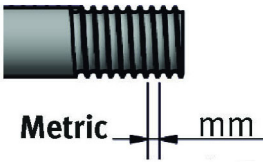
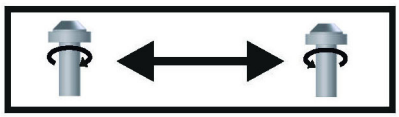
<table>
<tr>
<td> 

lockable main switch</td>
<td> 

Gearbox selector lever - Speed adjustment</td>
</tr>
<tr>
<td> 

Feed adjustment selector switch</td>
<td> 
Control panel on headstock
Control ON
Coolant pump ON / OFF
Machine illumination ON / OFF
Direct run (momentary switch)
Emergency-stop</td>
</tr>
</table>

4.2.2 Control elements

 Crossfeed / Longitudinal feed	 Inch thread [threads / inch]
 Metric thread [mm / spindle revolution]	 mm per spindle revolution
 Feed direction	 Refill oil
 Check filling level	 Rotational direction
 Read the maintenance manual ► Check up, inspection and maintenance on page 56	

4.3 Switching on the machine

→ Switch on the main switch.

O The control lamp for operation must be on.

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

→ Close the lathe chuck protection.

► Malfunctions on page 101

4.4 Switching the machine off

→ Switch off the main switch.

→ 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 back on. ► Disconnecting and securing the lathe on page 15

CAUTION!

The emergency stop button may only be activated in an emergency. You should not use the emergency stop button to stop the machine during normal operation.

4.5 Resetting an emergency stop condition

→ Set the rotational direction control lever to the neutral position.
→ Unlock the emergency stop switch again.
→ Switch the control on.

4.6 Power failure, Restoring readiness for operation

→ Set the rotational direction control lever to the neutral position.
→ Switch the control on.

4.7 Momentary switch, direct run

Use the momentary switch (direct run) to make it easier to engage in gear positions. The spindle begins to rotate providing the direct run button is pressed. The lathe chuck protection must be closed for this. Press the direct run button only short.

4.8 Speed setting

ATTENTION!

Only change the speed when the machine is at a standstill. There are 8 speeds available.

Use the two selector levers to set the speed.

4.8.1 Speed table - Connection ~ 50Hz

	↻/min⁻¹			
	I	II	III	IV
H	1255	2000	755	460
L	190	300	115	70

Img.4-1: ~ 50 Hz

4.8.2 Speed table - Connection ~ 60Hz

	↻/min⁻¹			
	I	II	III	IV
H	1506	2400	906	552
L	228	360	138	84

Img.4-2: ~ 60 Hz

4.9 Turning direction

The rotational direction of the machine is switched with the shift lever. The lathe can only be switched on, when the lathe chuck protection is closed.

→ Move the shift lever down if you want the turning direction to be anti-clockwise.
→ Move the shift lever up if you want the turning direction to be clockwise.

4.10 Feed

ATTENTION!

Only adjust gear settings when the lathe is being completely stopped.

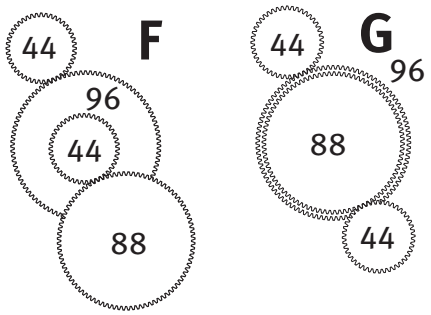
ATTENTION!

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

4.10.1 Feed speed

INFORMATION

Different feed rates require different gear combinations on the change gears. To convert from (F) to (G) and vice versa, the positions of the gearwheels are swapped. All other settings are made on the feed gearbox.



Metric Feeds					
F			G		
AT1X	0,03	0,008	AT1X	0,12	0,032
AT4X	0,04	0,100	AT4X	0,16	0,043
AT8X	0,05	0,013	AT8X	0,2	0,054
AS1X	0,06	0,016	AS2X	0,25	0,068
AS4X	0,08	0,022	BT1X	0,3	0,081
AS7X	0,9	0,024	BZ4X	0,4	0,108
AS8X	0,1	0,027	BT8X	0,5	0,135
AR1X	0,12	0,032	BS1X	0,6	0,162
AR4X	0,16	0,043	BS4X	0,8	0,217
AR8X	0,2	0,054	BS8X	1,0	0,270
BS8X	0,25	0,068	BR2X	1,2	0,325
BR1X	0,3	0,081	BR4X	1,5	0,406
BR4X	0,4	0,108	BR6X	1,8	0,487
BR8X	0,5	0,135	BR8X	2,0	0,541

4.10.2 Feed direction

Use the selector lever (1) to switch the direction of the feed.

→ Turn the selector lever to the left or right according to the symbols for production of longitudinal feed in direction to the spindle head or for the production of a left handed thread.

Img.4-3: Selector lever feed direction

4.10.3 Feed activation

INFORMATION

The lever for longitudinal feed and cross feed is interlocked with the lever for thread cutting. To do this, pull the engagement lever of the lock nut upwards to release the lock.

→ Detach or clamp the clamping screw on the lathe saddle in dependence on the feed used
► „Img.4-13: Lathe saddle tightening screw“ on page 44

→ Activate the automatic cross feed or longitudinal feed on the bed slide.

→ Move the hand wheel of the corresponding slide to facilitate the locking of the engaging lever.

4.11 Tool holder

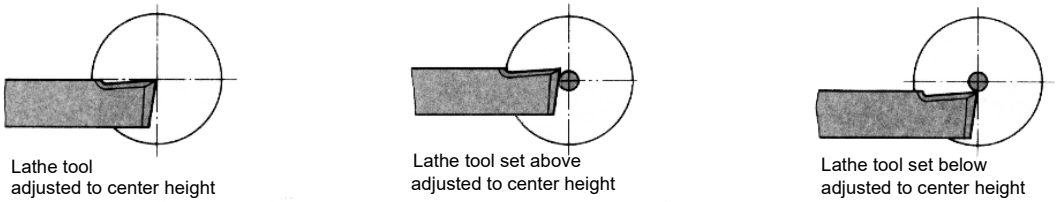
Clamp the lathe tool into the tool holder.

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 center point in order to determine the required height. If necessary, put the steel washers beneath the lathe tool to achieve the required height.

Tool height

For the facing process, the cutting edge of the tool must be exactly aligned with the height of the lathe centre to obtain a shoulder-free face. The facing process is a turning operation in which the turning tool feeds perpendicular to the axis of rotation of the workpiece in order to produce a flat surface. The different methods are
transversal facing, transversal slicing and longitudinal facing.



Img.4-4: Height of tool

Lathe tool angle

ATTENTION!

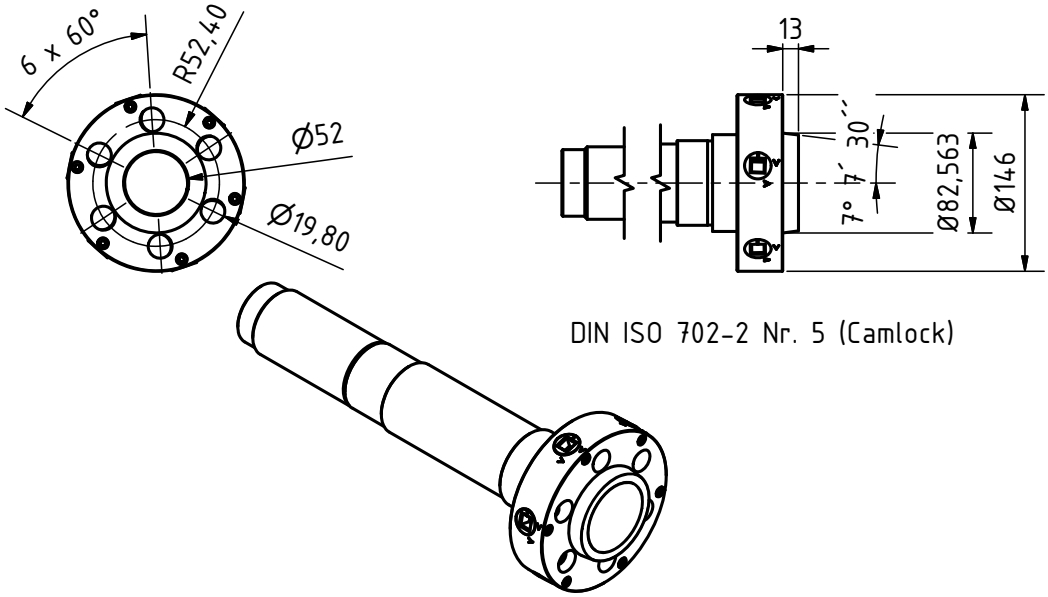
The lathe tool must be clamped with its axis perpendicular to the axis of the workpiece. If it is clamped at an angle, the lathe tool may be sucked into the workpiece.

Lathe tool clamped perpendicular to the axis of the workpiece

Lathe tool clamped at an angle to the feed direction.

Img.4-5: Lathe tool angle

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 nose is designed as a Camlock 5 DIN ISO 702-2 holding fixture.

CAUTION!

Regularly check the closed status of the clamp bolt.

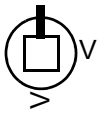
INFORMATION

Mark each workpiece holder for instance by a nick in order to facilitate the recover of the precision of the concentric run and the axial run-out deviation.

4.12.1 Fasten workpiece holder

→ 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.



Marking clamp bolt
“Open position“

Marking clamp bolt
“Closed position“

Img.4-6: Camlock clamp bolt markings

Adjusting the Camlock bolts to the workpiece holder

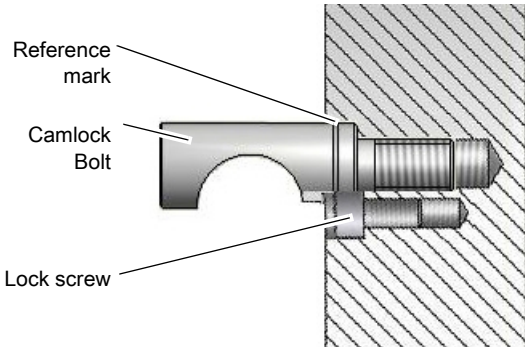
→ Detach the safety screw.

→ Turn the Camlock bolt by one complete revolution
in or out, according to the correction necessary.

→ Mount the safety screw

INFORMATION

The reference mark on each Camlock bolt serves as orientation for the correct adjustment.



Img.4-7: Camlock seat

4.12.2 Lathe chuck

During turning, the workpiece is subject to cutting forces, weight forces and unbalance forces which have to be absorbed by a sufficiently strong clamping force. Massive workpieces with higher degrees of stiffness lead to a considerable loss of clamping force. This loss of clamping force is lower for thin-walled, distortion-sensitive workpieces with less stiffness.

The maximum rotational speed of a lathe chuck may only be applied at maximum actuating force and with perfectly working chucks.

Lathe chucks must be designed for the maximum rotational speed of the machine, the permissible lathe chuck speed with respective jaws and/or top jaws, as well as the maximum measured static clamping force at maximum introduced force must be specified in the operating instructions for the lathe chuck or be indicated on the lathe chuck itself. Replacement lathe chucks must comply with EN 1550 standards. The minimum distance to the machine bed must not be less than 25 mm.

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.

4.12.3 Speed information, maintenance recommendations, reference speed

in accordance with DIN 6386

The reference speed is the number of rotations, at which the mathematical centrifugal force with the corresponding jaw design correlates with the greatest tensioning force when the

machine is at a standstill. The reference speed applies for jaws mounted inside in tiers, whereby they must not protrude past the outer diameter of the chuck.

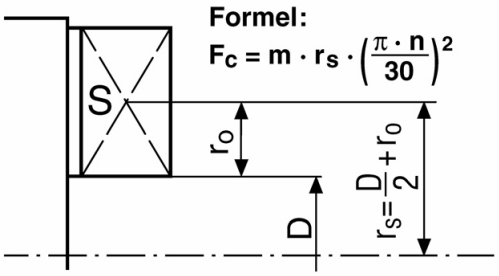
At the determined reference speed, 1/3 of the tensioning force which is available when the machine is at a standstill, is available for clamping the workpiece. The prerequisite is that the clamping chuck is in proper working order.

In general, the labels on the clamping jaws and lathe chuck (perm. speed, max. turning diameter, ...), the information in the respective lathe chuck operating instructions and, for special jaws, the additional information on the respective drawing must be observed.

4.12.4 Influencing factors that significantly impact the tensioning force

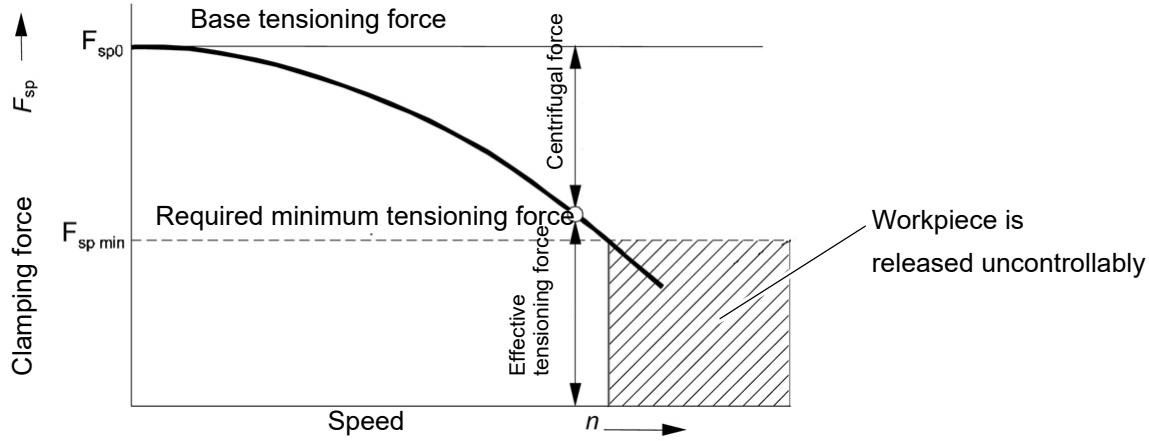
Clamping jaw centrifugal force

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.



4.12.5 Lathe chuck maintenance

A crucial prerequisite for fault-free functionality of a lathe chuck is regular and thorough lubrication of the sliding surfaces. This prevents the reduction of tensioning force and premature wear and tear.

Always observe the manufacturer's maintenance instructions when using replacement lathe chucks.

Coolant squirts on the lathe chuck and removes the grease from the 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 with significantly reduced tensioning force, which affects the accuracy and causes excessive wear and seizing.

Lubricate the installed 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.

We recommend the use of ALTEMP Q NB 50 by Klueber for the lubrication of the sliding surfaces and clamping fixture of the supplied lathe chucks. You may optionally use a lubricant for lathe chucks from other renowned lathe chuck manufacturers.

Clamping jaws and jaw mounting screws are wear and tear parts. The service life is limited. We therefore recommend having them inspected at regular intervals by a specialist (e.g. inspection for cracks using a dye penetration process or magnet powder test (fluxing), eddy current testing, ultrasound testing) and replace if necessary.

4.12.6 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.

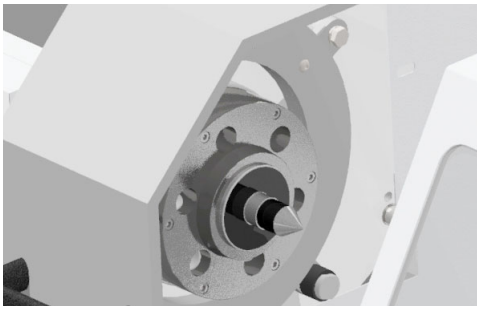
4.12.7 Mounting of workpiece holder

Centring point

→ Clean the taper bore of the lathe spindle holding fixture.

→ Clean the reducing bush and the taper of the centring point.

→ Press the centring point with the reducing bush into the taper bore of the lathe spindle holding fixture.



Img.4-8: Centring point with reducing bush

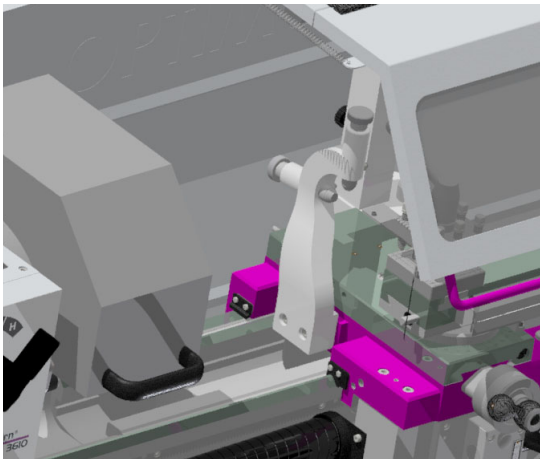
4.13 Mounting of rests

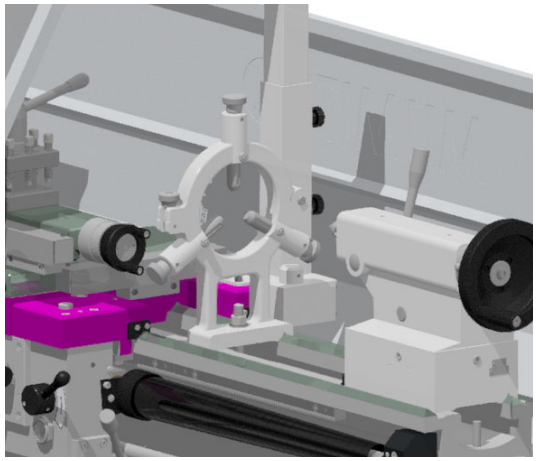
CAUTION!

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.

Use the travelling or fixed steady rest to support long turned parts if the cutting force of the turning tool is likely to cause the turned part to bend.





Img. 4-9: Travelling steady rest

Fixed steady rest

4.14 Adjusting threads

INFORMATION

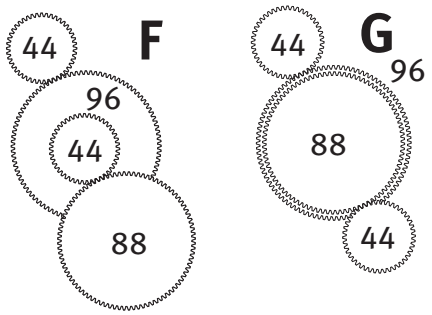
Threads are produced with the lead screw. To do this, press the engagement lever of the lock nut downwards. The feed lever on the bed slide must be deactivated for this. The lever for longitudinal feed and cross feed is interlocked with the lever for thread cutting.

4.14.1 Table for thread cutting

INFORMATION

Different threads require different gear combinations on the change gears. To convert from (F) to (G) and vice versa, the positions of the gearwheels are swapped.

All other settings are made on the feed gearbox.



F		F		G	
AT1W	0,2	RR3W	1,0	BS1W	4,0
AT2W	0,225	AR4W	1,1	BS2W	4,5
AT3W	0,25	AR6W	1,2	BS3W	5,0
AT6W	0,3	BS3W	1,25	BS4W	5,5
AT8W	0,35	AR7W	2,3	BS6W	6,0
AS1W	0,4	AR8W	1,4	BS7W	6,5
AS2W	0,45	BS6W	1,5	BS8W	7,0
AS3W	0,5	BS8W	1,75	BR1W	8,0
AS4W	0,55	BR1W	2,0	BR2W	9,0
AS6W	0,6	BR2W	2,25	BR1W	10,0
AS7W	0,65	BR3W	2,5	BR4W	11,0
AS8W	0,7	BR4W	2,75	BR5W	11,5
BT6W	0,75	BR6W	3,0	BR6W	12,0
AR1W	0,8	BR7W	3,25	BR7W	12,0
AR2W	0,9	BR8W	3,5	BR8W	14,0

mm

F		F		G	
C8RY	56	C2SY	18	C8SY	7
C7RY	52	C1SY	16	C7SY	6 ½
C6RY	48	C8TY	14	C6SY	6
C5RY	46	C7TY	13	C4SY	5 ½
C4RY	44	C6TY	12	C3SY	5
C3RY	40	C5TY	11 ½	C2SY	4 ½
C2RY	36	C4TY	11	C1SY	4
C1RY	32	C3TY	10	C8TY	3 ½
C8SY	28	C2TY	8	C7TY	3 ¼
C7SY	26	C1TY	9	C6TY	3
C6SY	24			C5TY	2 ⅞
C5SY	23			C4TY	2 ¾
C4SY	22			C3TY	2 ½
C3SY	20			C2TY	2 ¼
B2SY	19			C1TY	2

inch

4.15 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

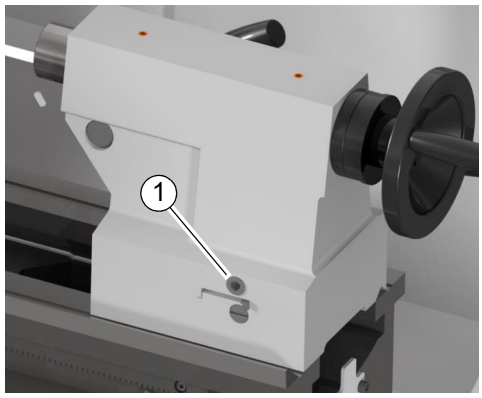
When using different tools, it can happen that you cannot start with the quill marking with scale value 0, because the tool is already ejected in this position by the expulsion flap. In such cases we recommend to start at a value of 10mm and to convert from here on.

4.15.1 Transverse displacement of the tailstock

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

→ Loosen the adjusting screws (1) at the front and rear of the tailstock.

O 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.



Img.4-10: Cross-adjustment of the tailstock

→ Tighten the adjustment screws firmly against each other again.

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.

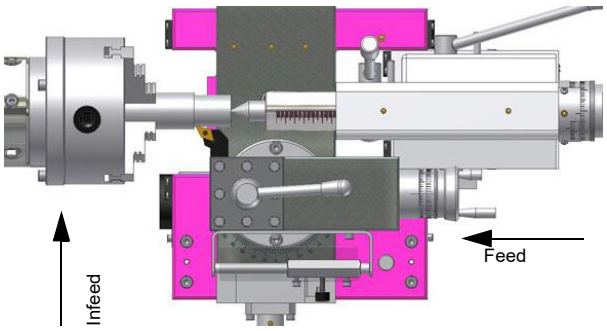
CAUTION!

Check the tailstock and quill clamping when working between centres! Ensure that the locking plate at the end of the lathe bed is firmly in place to prevent the tailstock from being pulled out of the lathe bed unintentionally.

4.16 General operating instructions

4.16.1 Longitudinal turning

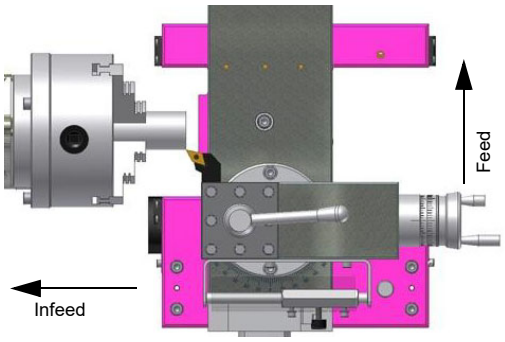
In the straight turning operation, the tool feeds parallel to the axis of rotation of the workpiece. The feed can be either manual - by turning the handwheel on the lathe saddle or the top slide - or by activating the automatic feed. The cross feed for the depth of cut is achieved using the cross slide.



Img.4-11: Graphic: Longitudinal turning

4.16.2 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.

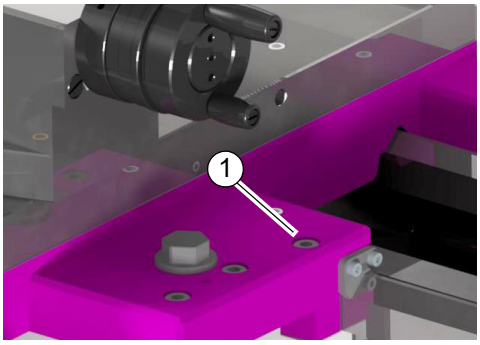


Img.4-12: Graphic: Face turning

4.16.3 Fixing the lathe saddle

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

→ Secure the lathe saddle using the tightening screw.



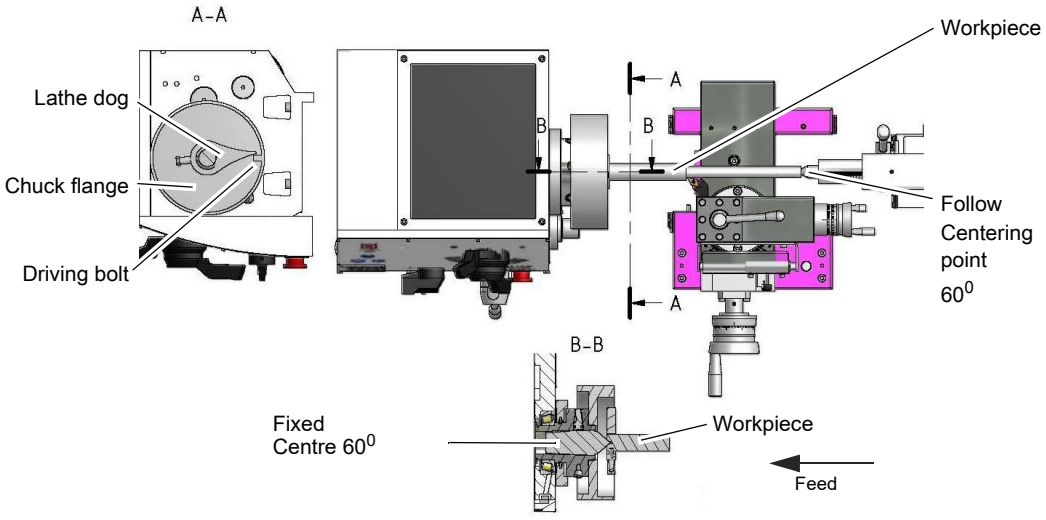
Img.4-13: Lathe saddle tightening screw

4.16.4 Turning between centres

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.

Workpieces that require a high concentricity precision are machined between the centres. For holding purposes, a centre hole is drilled into both plain machined faces of the workpiece.



Img.4-14: Graphic: Turning between centres

The lathe dog is clamped onto the workpiece. The driving bolt, which is screwed into the flange for the lathe chuck, transmits the torque to the lathe dog.

TM4010_TM4010D_GB_4.fm

The fixed centre glides into the centre hole of the workpiece on the spindle nose side. The follow centre glides into the centre hole of the workpiece at the tailstock side.

4.16.5 Turning short tapers with the top slide

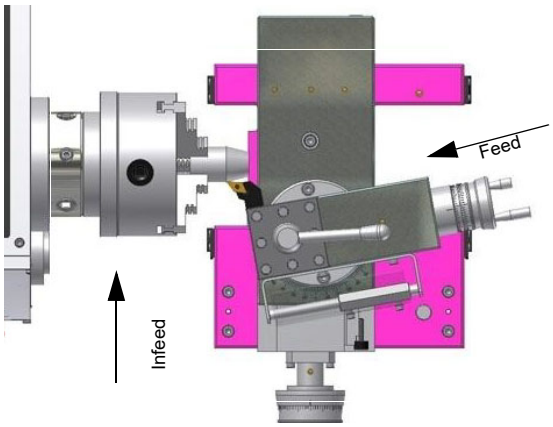
Short tapers are turned manually with the top slide. Swivel the top slide to the required angle. The infeed is achieved with the cross slide.

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

→ Swivel the top slide.

O The desired angle setting can be read off the scale.

→ Clamp the top slide again.



Img.4-15: Graphic: Turning tapers

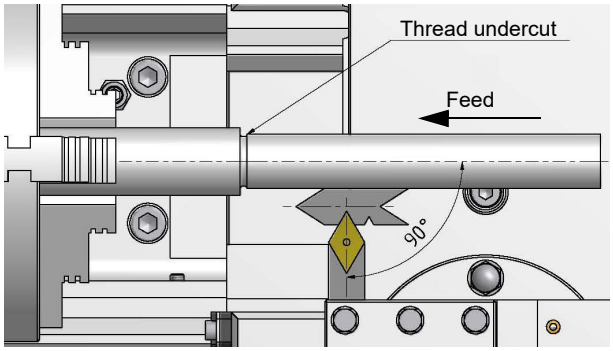
4.16.6 Thread cutting

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

NOTES!

Example of an external thread:

O The workpiece diameter must have been turned to the diameter of the desired thread.
O The workpiece requires a chamfer at the beginning of the thread and an undercut at the thread run out.
O The speed must be as low as possible.
O 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.
O 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.
O 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.
O The tool is withdrawn with the lead screw nut engaged and the thread cutting tool disengaged by actuating the "Direction of rotation control lever".
O Stop the lathe and feed the thread cutting tool in low cut depths using the cross slide.



Img.4-16: Illustration: Thread turning

O 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.

4.16.7 Cooling agent

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

Use a water-soluble and non-pollutant emulsion as a cooling agent.This can be acquired from authorised distributors.

Make sure that the cooling agent is properly retrieved. Respect the environment when disposing of lubricants and coolants. Follow the manufacturer's disposal instructions.

4.16.8 Cooling lubricants

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 flash point, the occurrence of flammable aerosol-air mixtures cannot be ruled out. There is a risk of explosion.

The selection of cooling lubricants and bedway oils, lubricating oils and greases as well as their maintenance is determined by the machine user or operator.

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. If you have problems with the cooling lubricant and bedway oil or grease, please contact your mineral oil company.

4.17 Lathe chuck K11-200/D5

DANGER!

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

DANGER!

The lathe chuck protection is designed to reduce the risk of workpieces or fractions of them being expelled from the machine, but not to remove them entirely.

Always work carefully and observe the limits of the machining process.

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.

4.17.1 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, commissoned, 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.
- O At high speeds, the chuck may only be deployed under a sufficiently dimensioned protective hood.

4.17.2 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 shutdown. 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

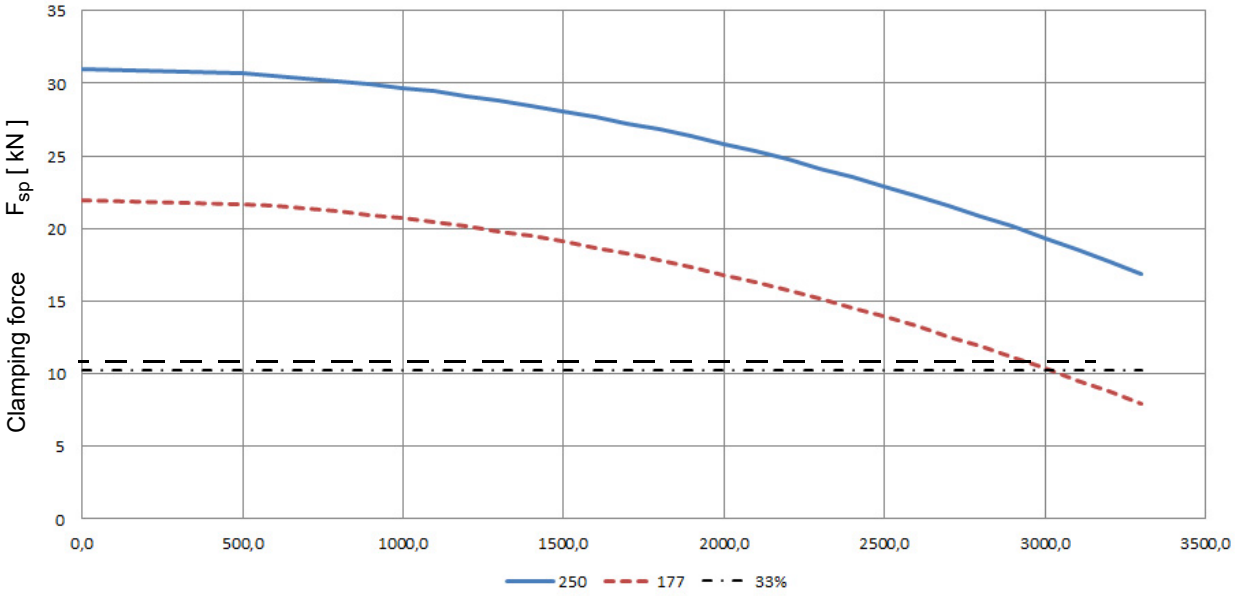
Legend			
F_c	Total centrifugal force [N]	M_{cAB}	Centrifugal force of top jaws in [
F_{sp}	Effective clamping force [N]	M_{cGB}	Centrifugal force of base jaws in [
F_{spmin}	Required static clamping force [N	n	Rotational speed [rpm]
F_{sp0}	Initial clamping force [N]	r_s	Center of gravity radius [mm]
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.

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

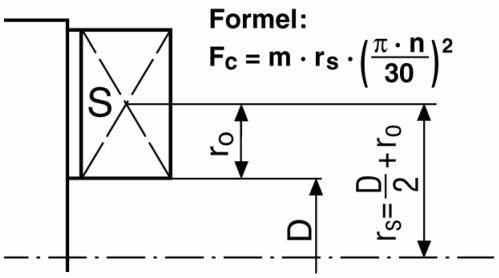
4.17.3 Clamping force-speed diagram - Lathe chuck K11-200/D5



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.

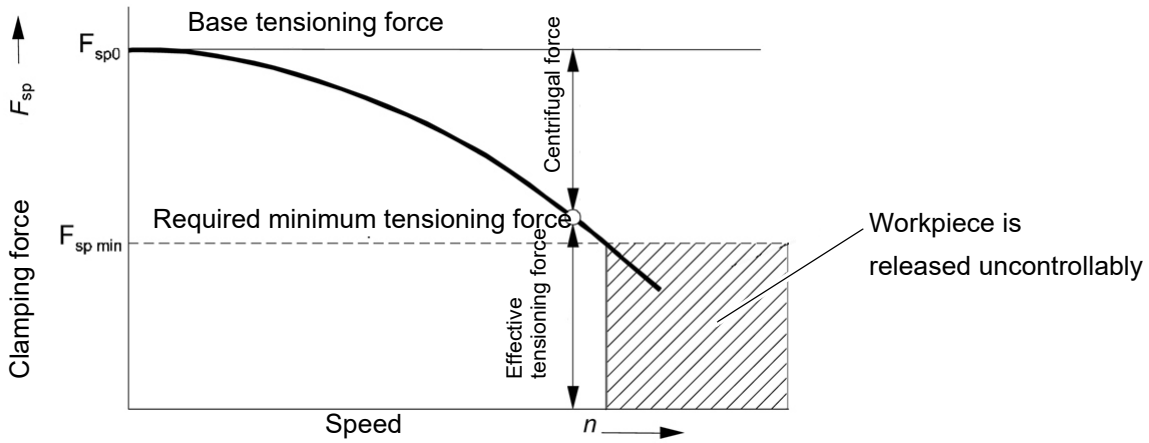
4.17.4 Clamping jaw centrifugal force

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 $\sum S$ (31 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 K11-200 / D5 has no base jaws and no top jaws.

Example:

- The centre of gravity radius r_s of the jaw = 0.0632 m (jaw flush with the outer diameter of the chuck)
- Weight of a jaw = 0.622kg
- Centrifugal moment for one jaw

$M_c = 0{,}622 \text{ kg} \cdot 0{,}0632\text{m} = 0{,}0393 \text{ kgm}$

- The lathe chuck has 3 jaws.

$= 0{,}0632 \text{ kgm} \cdot 3 = 0{,}11793 \text{ kgm}$

- Calculation of the total centrifugal force at a rotational speed of 2000 rpm

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

$$= 0{,}11793 \text{ kgm} \cdot \left(\frac{3{,}14 \cdot 2000}{30}\right)^2 = 5167 \text{ N} = 5{,}1 \text{ kN}$$

The total possible clamping force of the chuck at a standstill is $\sum_s$ 31 kN at a tightening torque of 250Nm with the lathe chuck key.
An effective clamping forceF_{sp} of 25.9 kN remains at the chuck.

$F_{sp} = \sum_s - F_c = 31 \text{ kN} - 5{,}1 \text{ kN} =$ **25,9 kN**

see ► Clamping force-speed diagram - Lathe chuck K11-200/D5 on page 49
see ► Basic safety instructions on page 47

WARNING!

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

4.17.5 Technical data of lathe chuck

Type	K11-200/D5 3442764
Flange	DIN ISO 702-2 no. 5 (Camlock)
maximum clamping diameter [mm]	200
minimum clamping diameter [mm]	13
Lathe chuck passage [mm]	50
max. speed [rpm]	3000
max. static clamping force Σ_S [kN]	31
Maximum torque with lathe chuck key [Nm]	250
Lathe chuck weight [kg]	17
Weight of a jaw [kg]	0.622
Mass of chuck jaw set [kg]	1.866
Centrifugal moment M_c for one jaw [kgm]	0.0393
Gravity distance r_o of jaw [mm]	49.93

4.17.6 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.

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.

6.1 Safety

WARNING!

The consequences of incorrect maintenance and repair work may include:

- **extremely serious injuries to those working on the lathe and**
- **damage to the lathe.**

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

Electrical systems and operating materials may only be installed, modified and repaired by a trained electrician or supervised and under the control of a trained electrician and must comply with electrotechnical regulations.

WARNING!

Do not climb onto or into the machine while working.

6.1.1 Preparation

WARNING!

Only carry out work on the lathe, if the main switch is switched off and secured against restarting by means of a padlock.

☞ Disconnecting and securing the lathe on page 16

Attach a warning sign.

6.1.2 Restarting

Before restarting, run a safety check.

☞ Electronics on page 17
☞ Safety check on page 14

WARNING!

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

6.1.3 Cleaning

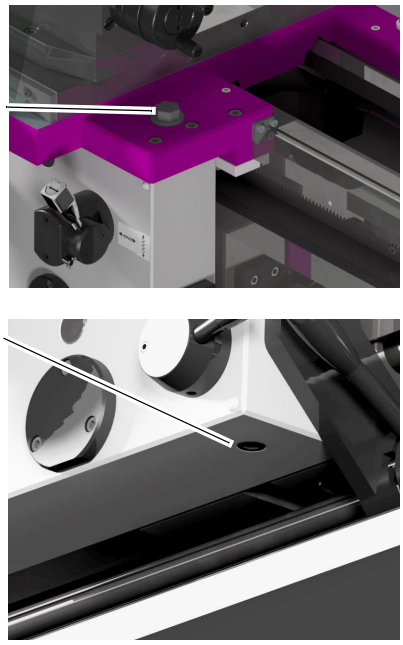
CAUTION!

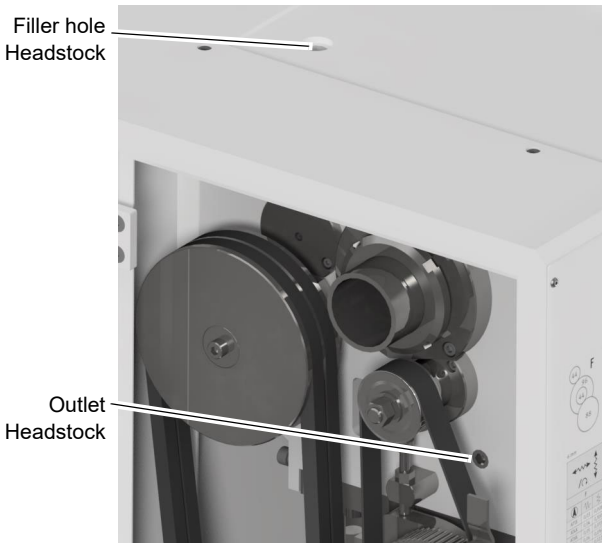
Use a chip hook for removal of chips and wear suitable protective gloves.

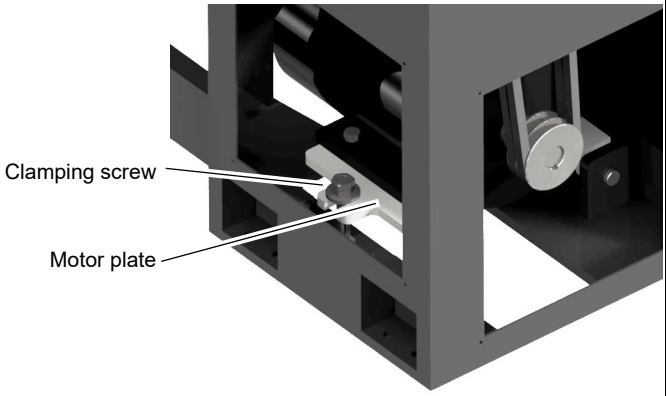
6.2 Check up, inspection and maintenance

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?
Start of work, after every maintenance or repair work	Lathe	☞ Safety check on page 14	
	Lathe	Oiling	➜ Oil all guide rails. ➜ Lubricate the change gears lightly with lithium-based grease lubricating.
	Camlock clamp bolt Lathe spindle fixture	Mounting check	☞ Mounting of workpiece holder on page 40
When necessary	Slideways	Readjust	Excessive clearance in the slideways can be reduced by readjusting the tapered gibs. ➜ Turn the take-up screw clockwise. The tapered gib is moved to the rear and reduces the clearance of the corresponding slideway.
Start of work, after every maintenance or repair work	Feed gear / Apron / Headstock	Visual inspection	➜ Check the oil level in the inspection glass ❍ of the feed gear, ❍ of the apron, ❍ of the headstock. ➜ The oil level must at least attain the centre resp. top marking of the oil sight glass. ☞ Operating material on page 19.

Interval	Where?	What?	How?
at least annually and based on operator's historic values	**Coolant tank**	Replacing, cleaning	☞ Cooling lubricants and tanks on page 62 ☞ Inspection plan for water-mixed cooling lubricants on page 63
First after 200 hours in service, then once a year	**Feed gear**	Oil change	➜ For oil change use an appropriate collecting container with sufficient capacity. ➜ Unscrew the screw from the drain hole. ➜ Unscrew the screw from the filler hole. ➜ 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. Feed gear charging hole Feed gear outlet  Img.6-1: Feed gear openings
	Apron	Oil change	Apron charging hole Apron drain hole  Img.6-2: Apron openings

<table>
<tr><th>Interval</th><th>Where?</th><th>What?</th><th>How?</th></tr>
<tr><td rowspan="2">First after 200 hours in service, then once a year</td><td rowspan="2">Headstock</td><td>Oil change</td><td> 

Img.6-3: Openings headstock</td></tr>
<tr><td>When necessary</td><td>V-belt
check, re-tighten</td><td>Exchange of the V-belt set:
➜ Open the protective cover of change gear.
➜ Remove the protective covers on the rear and underneath the change gears.
➜ Loosen the clamping screw of the motor plate.
➜ Lift the motor plate upwards to release the V-belt pack.
➜ Replace the V-belt pack.
➜ Tighten the tensioning screw on the motor plate until the V-belt pack can still be pushed through by approx. 5 mm with your thumb.
 

Img.6-4: Adjusting equipment V-belt
Tighten the V-belt set as required.
ATTENTION!
Only exchange the complete set of V-belts, never a single one.</td></tr>
</table>

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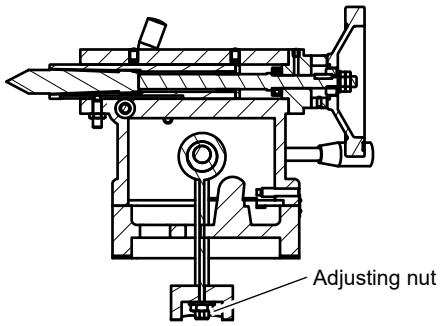
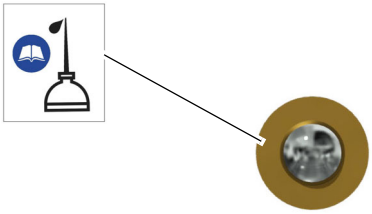
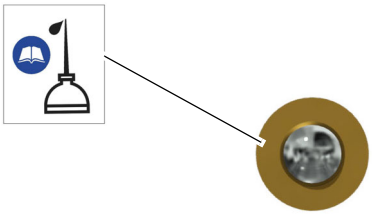
Interval	Where?	What?	How?
weekly	Lathe chuck	Lubricating	☞ Lubricating and cleaning the lathe chuck on page 60
When necessary	Tailstock	tighten	➜ If the tailstock clamping wears off. Shorten the clamping distance by adjusting the nut below the tailstock. 
weekly	Apron	Oiling	➜ Lubricate respectively fill-in all lubricating nipples and oiler cups with machinery oil. 
weekly	Lathe saddle / Cross slide / Top slide / Lead screw / Feed rod / Tailstock	Oiling	➜ Lubricate respectively fill-in all lubricating nipples and oiler cups with machinery oil. 

Interval	Where?	What?	How?
based on operator's historic values in accordance with German DGUV (BGV A3)	Electronics	Electrical inspection	☞ Obligations of the operating company on page 11 ☞ Electronics on page 16

6.3 Recommended wearing parts

Drive V-belt assembly
Drive timing belt on the feed gearbox
Wipers on the guide tracks

6.4 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 at the worm and at the lubricating nipple. 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.

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.

6.5 Repair

6.5.1 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, Germany

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.

The company Optimum Maschinen Germany GmbH does not take any liability nor does it guarantee against damage and operating malfunctions resulting from failure to observe this operating instructions.

For repairs, only use

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

6.6 Cooling lubricants and tanks

CAUTION!

The cooling lubricant can cause diseases. Avoid direct contact with cooling lubricant or parts covered in cooling lubricant.

Cooling lubricant circuits and tanks for water-cooling lubricant mixtures must be completely emptied, cleaned and disinfected as needed, but at least once per year or every time the cooling lubricant is replaced.

If fine chips and other foreign matters are accumulated in the coolant tank, the machine can no longer be correctly supplied with coolant. Furthermore, the lifetime of the coolant pump is reduced.

When processing cast iron or similar materials generating fine chips, cleaning the coolant tank more often is recommended.

Limit values

The cooling lubricant must be replaced, the cooling lubricant circuit and tank emptied, cleaned and disinfected if

- O the pH value drops by more than 1 based on the value during initial filling. The maximum permissible pH value during initial filing is 9.3
- O there is a perceivable change in the appearance, odour, floating oil or increase of the bacteria to more than 10/6/ml
- O there is an increase in nitrite content to more than 20 ppm (mg/1) or nitrate content to more than 50 ppm (mg/1)
- O there is an increase in the N-nitrosodiethanolamine (NDELA) to more than 5 ppm (mg/a)

CAUTION!

Comply with the manufacturer's specifications for mixture ratios, hazardous substances, e.g. system cleaners, including their permissible minimum use times.

CAUTION!

Since the cooling lubricant escapes under high pressure, pumping out the coolant by using the existing cooling lubricant pump via a pressure hose into a suitable tank is not recommended.

ENVIRONMENTAL PROTECTION

During work on the cooling lubricant equipment please make sure that

- ▫ **collector tanks are used with sufficient capacity for the amount of liquid to be collected.**
- ▫ **liquids and oils should not be spilled on the ground.**

Clean up any spilled liquid or oils immediately using proper oil-absorption methods and dispose of them in accordance with current statutory environmental regulations.

Collect leakages

Do not re-introduce liquids spilled outside the system during repair or as a result of leakage from the reserve tank, instead collect them in a collecting container for disposal.

Disposal

Never dump oil or other substances which are harmful to the environment into water inlets, rivers or channels. Used oils must be delivered to a collection centre. Consult your supervisor if you do not know where the collection centre is.

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6.6.1 Inspection plan for water-mixed cooling lubricants

Company: No.: Date: used cooling lubricant			
size to be checked	Inspection methods	Inspection intervals	Procedure and comment
noticeable changes	Appearance, odour	daily	Find and rectify causes, e.g. skim off oil, check filter, ventilate cooling lubricant system
pH value	Laboratory techniques electrometric with pH meter (DIN 51369) Local measurement method: with pH paper (Special indicators with suitable measuring range)	weekly [1)]	if pH value decreases > 0.5 based on initial filing: Measures in accordance manufacturer's recommendations > 1.0 based on initial filing: Replace cooling lubricant, clean cooling lubricant circulation system
Usage concentration	Manual refractometer	weekly [1)]	Method results in incorrect values with tramp oil content
Base reserve	Acid titration in accordance with Manufacturer's recommendation	as required	Method is independent of tramp oil content
Nitrite content	Test sticks method or laboratory method	weekly [1)]	> 20 mg/L nitrite: Replace cooling lubricant or part or inhibiting additives; otherwise NDELA (N-nitrosodiethanolamine) in the cooling lubricant system and in the air must be determined > 5 mg/L NDELA in the cooling lubricant system: Replacement, clean and disinfect cooling lubricant circulation system, find nitrite source and, if possible, rectify.
Nitrate/nitrite content of the preparation water, if this is not removed from the public grid	Test sticks method or laboratory method	as required	Use water from the public grid if there is water from the pubic grid has > 50 mg/l nitrate: Inform the waterworks

[1)] The specified inspection intervals (frequency) are based on continuous operation. Other operational conditions can result in other inspection intervals; exceptions are possible in accordance with Sections 4.4 and 4.10 of the TGS 611.

Editor:

Signature:

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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 Getriebe Spindelstock 1-6 - Headstock gear 1-6

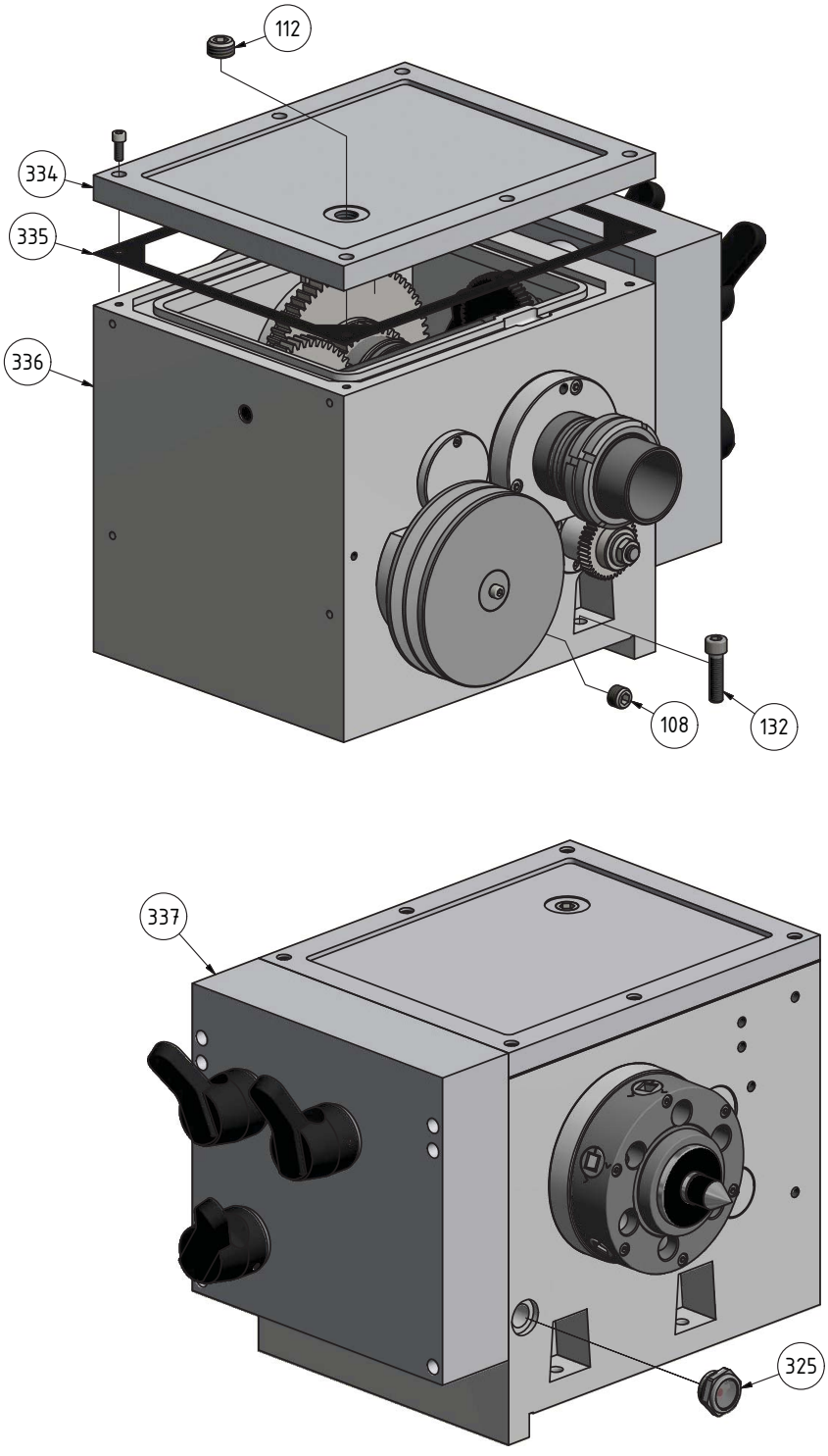

Abb. 7-1: Getriebe Spindelstock 1-6 - Headstock gear 1-6

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B Getriebe Spindelstock 2-6 - Headstock gear 2-6

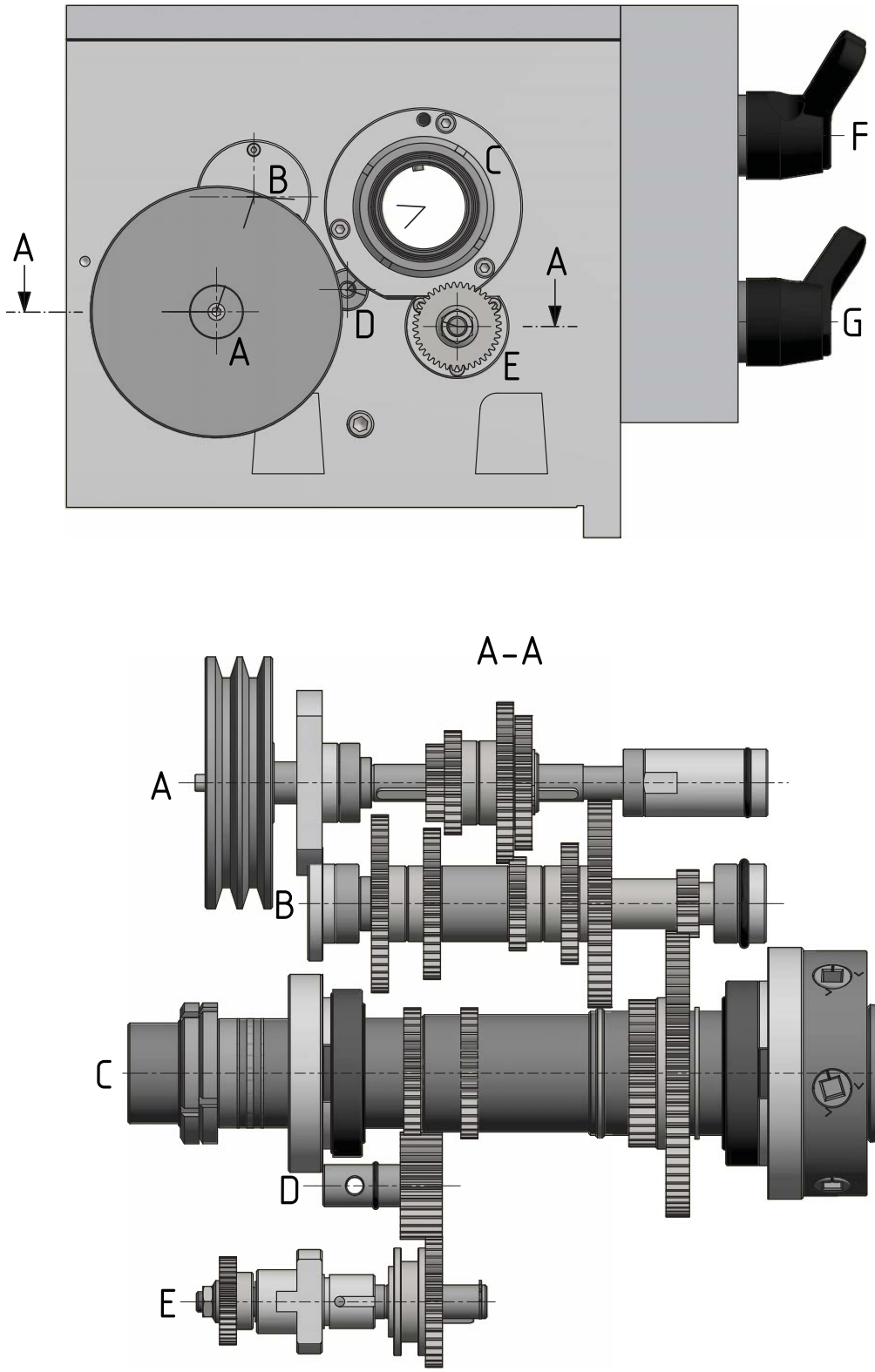

Abb.7-2: Getriebe Spindelstock 2-6 - Headstock gear 2-6

TM4010_TM4010D_parts.fm

C Getriebe Spindelstock 3-6 - Headstock gear 3-6

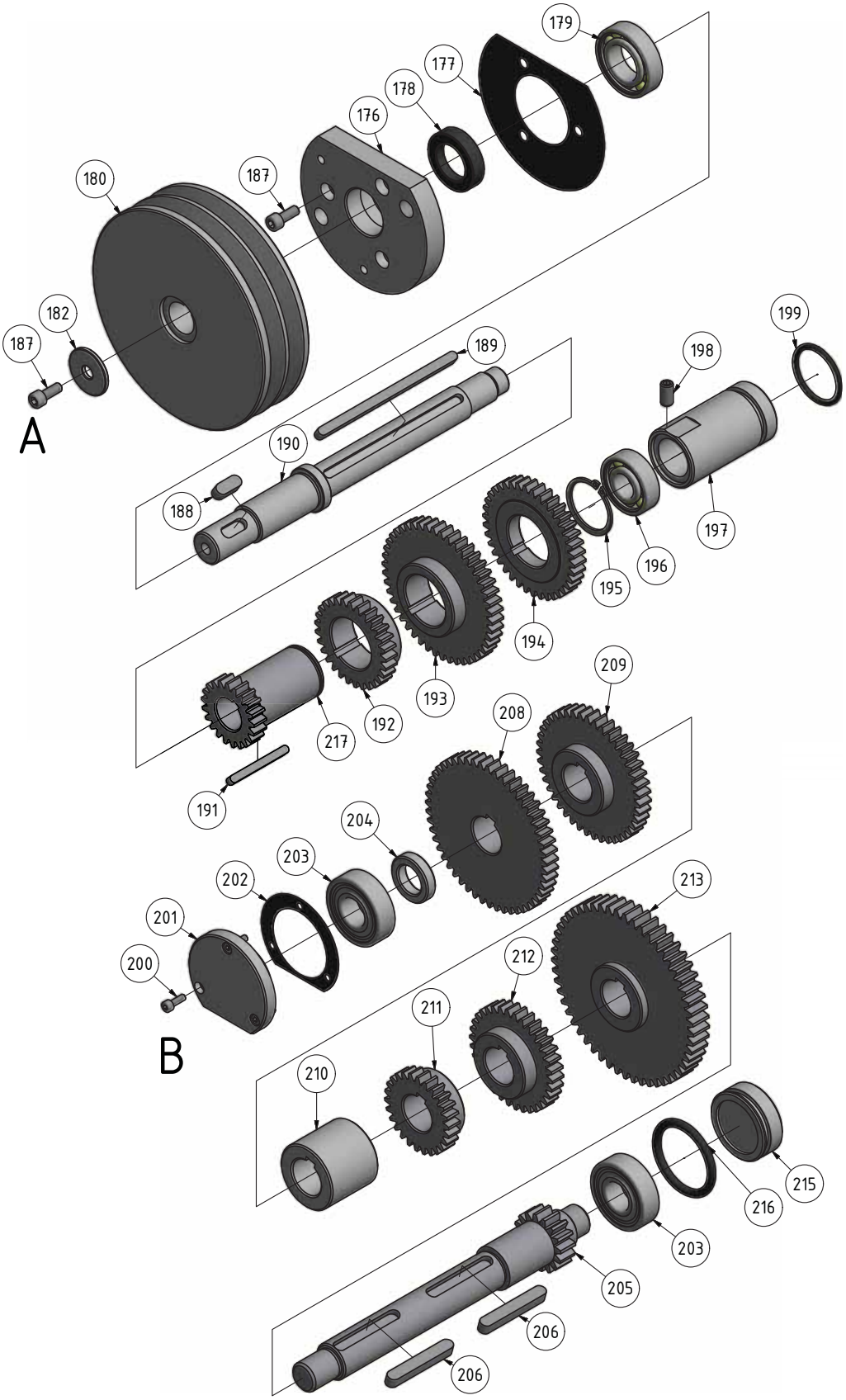

Abb. 7-3: Getriebe Spindelstock 3-6 - Headstock gear 3-6

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D Getriebe Spindelstock 4-6 - Headstock gear 4-6

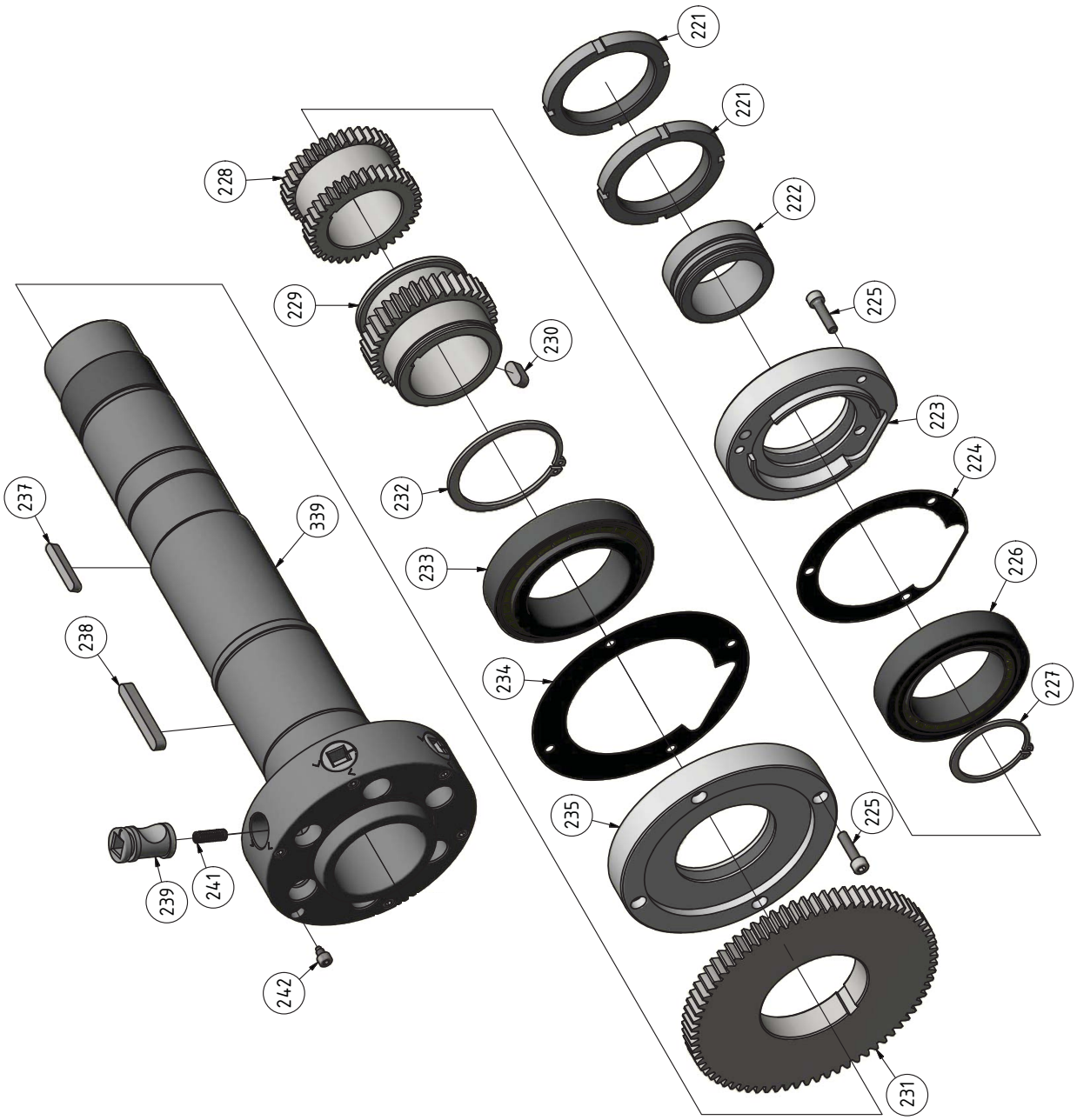

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Abb.7-4: Getriebe Spindelstock 4-6 - Headstock gear 4-6

E Getriebe Spindelstock 5-6 - Headstock gear 5-6

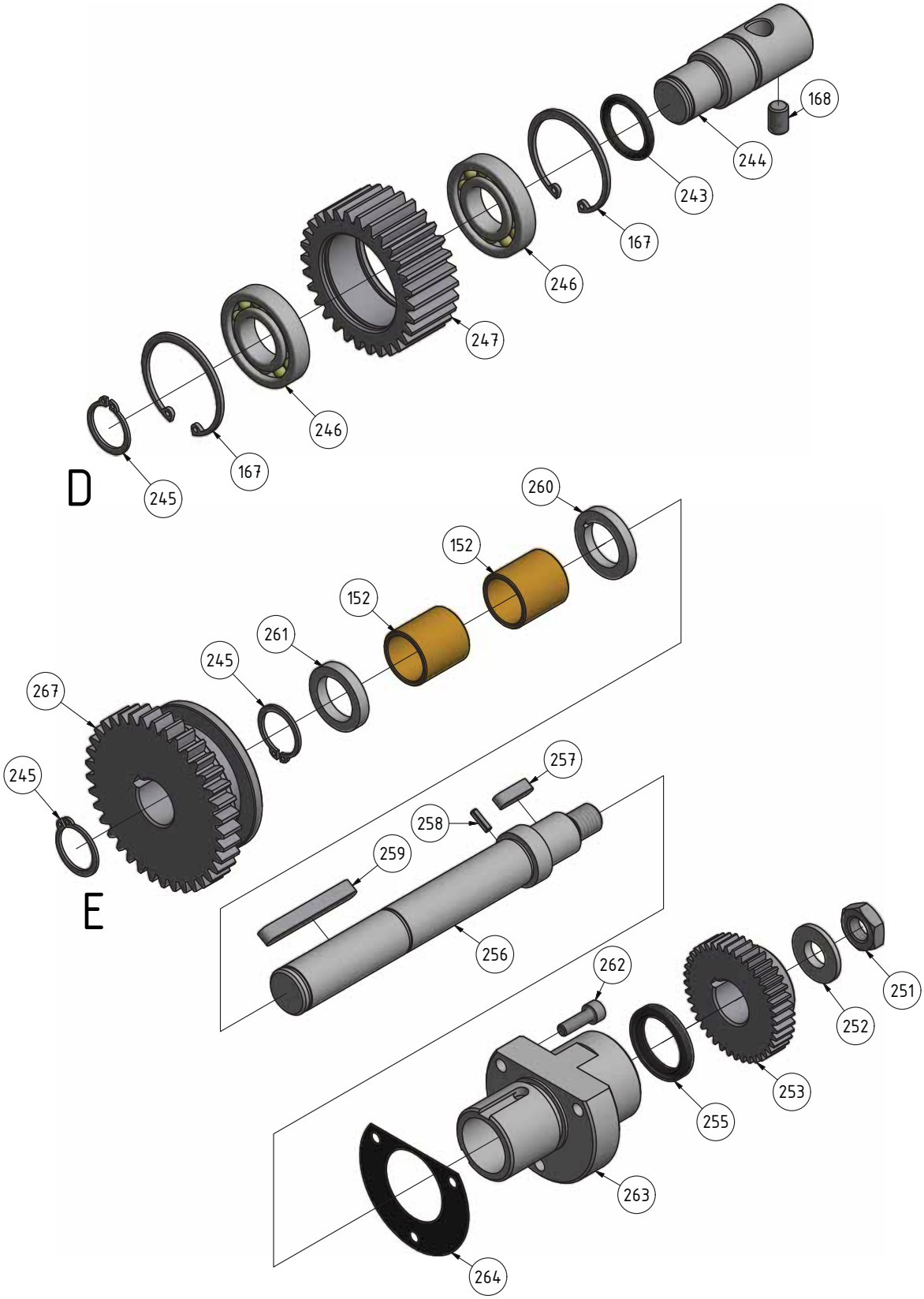

Abb. 7-5: Getriebe Spindelstock 5-6 - Headstock gear 5-6

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F Getriebe Spindelstock 6-6 - Headstock gear 6-6

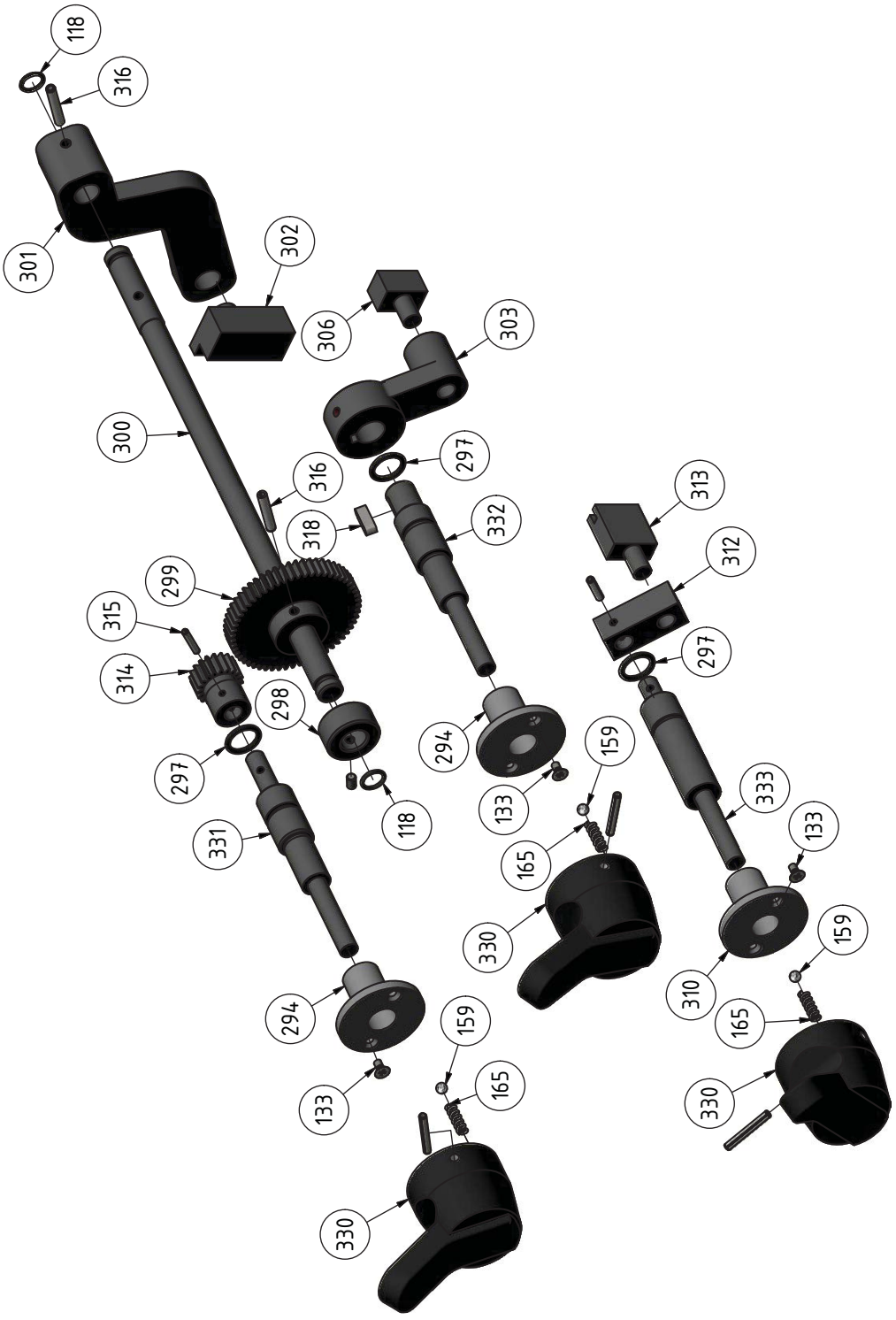

Abb.7-6: Getriebe Spindelstock 6-6 - Headstock gear 6-6

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Ersatzteilliste Spindelstock - Spare parts list headstock					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
108	Ablassschraube	Drain plug	1		034030401108
112	Öleinfüllschraube	Oil plug screw			
118	O-Ring	O-ring	2	10	
132	Innensechskantschraube	Socket head screw	4	M10x40	
133	Senkkopfschraube	Counter sunk screw	2	GB 819-85 - M4x8	
152	Buchse	Bushing	2		
159	Stahlkugel	Steel ball	3	6mm	042KU06
165	Feder	Spring	3		
167	Sicherungsring	Retaining ring	2	DIN 472-42x1,75	042SR42W
168	Gewindestift	Grub screw	1	M8x12	
176	Flansch	Flange	1		034030401176
177	Dichtung	Gasket	1		
178	Dichtring	Gasket	1	RWDR-25x40x10	041254010
179	Kugellager	Ball bearing	1	6005	0406005R
180	Keilriemenscheibe	Pulley	1		034030401180
182	Scheibe	Washer	1		
187	Innensechskantschraube	Socket head screw	8	GB 70-85 - M6 x 16	
188	Passfeder	Fitting key	1	DIN 6885 - A 8 x 7 x 30	
189	Passfeder	Fitting key	1	DIN 6885 - A 6x6x120	
190	Welle	Shaft	1		034030401190
191	Passfeder	Fitting key	1	DIN 6885 - A 5 x 5 x 50	042P5550
192	Zahnrad	Gear	1		034030401192
193	Zahnrad	Gear	1		034030401193
194	Zahnrad	Gear	1		034030401194
195	Sicherungsring	Retaining ring	1	DIN 471 - 35x1,5	042SR35W
196	Kugellager	Bearing ring	1	6203	0406203R
197	Welle	Shaft	1		034030401197
198	Gewindestift	Grub screw	1	GB 80-85 - M8 x 16	
199	O-Ring	O-Ring	1	DIN 3771 - 34,5 x 3,55	
200	Innensechskantschraube	Socket head screw	3	GB 70-85 - M4 x 12	
201	Blindflansch	Cover	1		034030401201
202	Dichtung	Gasket	1		
203	Kugellager	Ball bearing	2	6204	0406204R
204	Scheibe	Washer	1		
205	Welle	Shaft	1		034030401205
206	Passfeder	Fitting key	2		
208	Zahnrad	Gear	1		034030401208
209	Zahnrad	Gear	1		034030401209
210	Buchse	Bushing	1		
211	Zahnrad	Gear	1		034030401211
212	Zahnrad	Gear	1		034030401212
213	Zahnrad	Gear	1		034030401213
215	Abdeckkappe	Cover	1		034030401215
216	O-Ring	O-Ring	1		
217	Zahnrad	Gear	1		034030401217
221	Nutmutter	Nut	2		
222	Ring	Ring	1		
223	Flansch	Flange	1		034010001223
224	Dichtung	Gasket	1		
225	Innensechskantschraube	Socket head screw	7	GB 70-85 - M6 x 25	
226	Kegelrollenlager	Taper roller bearing	1	32014	04032014
227	Sicherungsring	Retaining ring	1	DIN 471 - 50x2	042SR50W
228	Zahnrad	Gear	1		034030401228
229	Zahnrad	Gear	1		034030401229
230	Passfeder	Fitting key	1		
231	Zahnrad	Gear	1		034030401231
232	Sicherungsring	Retaining ring	1		
233	Kegelrollenlager	Taper roller bearing	1	32016	04032016
234	Dichtung	Gasket	1		
235	Frontdeckel	Cover	1		034030401235
237	Passfeder	Fitting key	1		
238	Passfeder	Fitting key	1		
239	Bolt	Bolt	6		
241	Feder	Spring	6		
242	Innensechskantschraube	Socket head screw	6		
243	O-Ring	O-Ring	1		
244	Welle	Shaft	1		034030401244

Ersatzteilliste Spindelstock - Spare parts list headstock					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
245	Sicherungring	Retaining ring	3		
246	Kugellager	Ball bearing	2	6004	0406004R
247	Zahnrad	Gear	1		034030401247
251	Sechskantmutter	Hexagon nut	1		
252	Scheibe	Washer	1		
253	Wechselzahnrad	Change gear	1	M1.25x30	034030401253
253-1	Wechselzahnrad	Change gear	1	M1.25x56	0340304012531
253-2	Wechselzahnrad	Change gear	1	M1.25x60	0340304012532
255	Dichtring	Seal ring	1		
256	Welle	Shaft	1		034030401256
257	Passfeder	Fitting key	1		
258	Spannstift	Spring pin	1		
259	Passfeder	Fitting key	1		
260	Scheibe	Washer	1		
261	Ring	Ring	1		
262	Innensechskantschraube	Socket head screw	3		
263	Flansch	Flange	1		034030401263
264	Dichtung	Gasket	1		
267	Zahnrad	Gear	1		034030401267
294	Flansch	Flange	2		034030401294
297	O-Ring	O-ring	3		
299	Zahnrad	Gear	1		034030401299
300	Welle	Shaft	1		034030401300
301	Schaltklaue	Shifting claw	1		034030401301
302	Platte	Plate	1		
303	Schaltklaue	Shifting claw	1		034030401303
306	Platte	Plate	1		
310	Flansch	Flange	1		034030401310
312	Schaltklaue	Shifting claw	1		034030401312
313	Gabel	Fork	1		034030401313
314	Zahnrad	Gear	1		034030401314
315	Spannstift	Spring pin	1		
316	Spannstift	Spring pin	1		
318	Passfeder	Fitting key	1		
325	Ölschauglas	Oil sight glass	1		
326	Reduzierhülse MK6 - MK3	Reducing sleeve MT6 - MT3	1		0340021
330	Schalthebel	Switch lever	3		034030401330
331	Welle	Shaft	1		034030401331
332	Welle	Shaft	1		034030401332
333	Welle	Shaft	1		034030401333
334	Abdeckung	Cover	1		034030401334
335	Dichtung	Seal	1		
336	Gehäuse	Housing	1		034030401336
337	Abdeckung	Cover	1		
338	Zentrierspitze	Center point	1		
339	Spindel	Spindle	1		034030401339

G Maschinenunterbau - Machine base

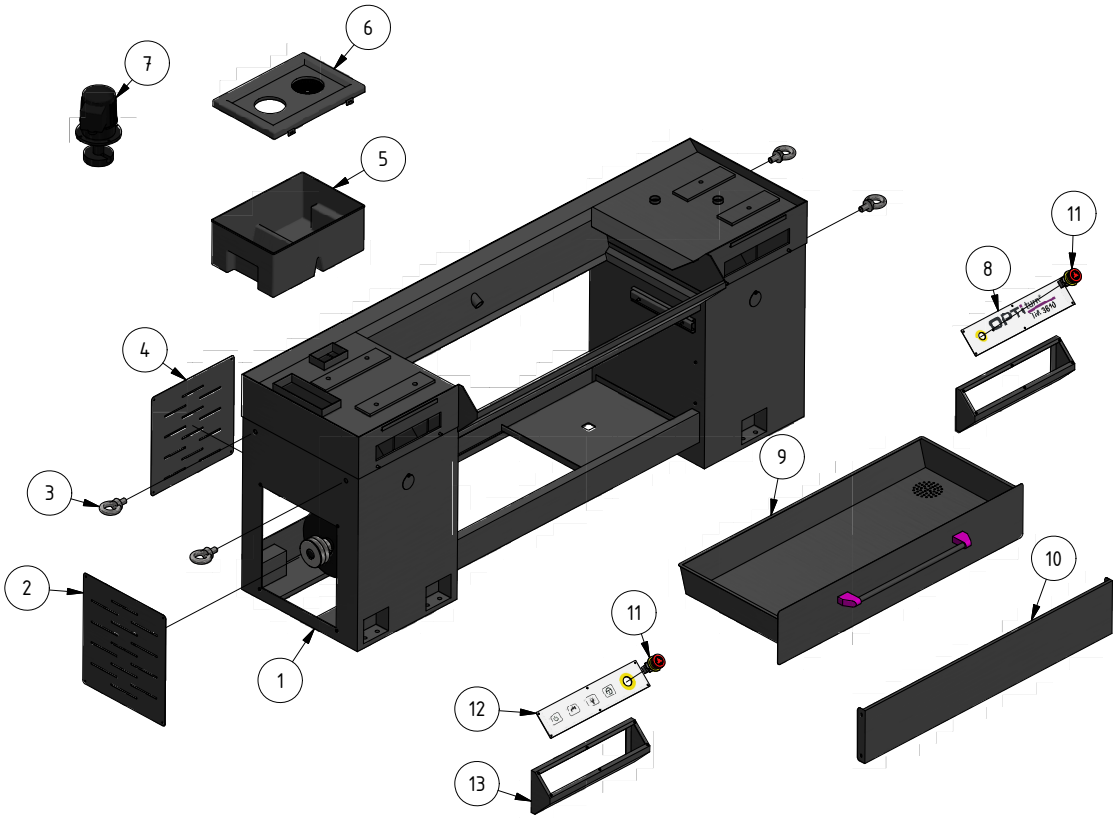


Fig.7-7:

Maschinenunterbau - Machine base					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Grundgestell	Basic frame	1		0340304116001
2	Abdeckung	Cover	1		0340304116002
3	Ringschraube	Eyebolt	4	M16	0340304116003
4	Abdeckung	Cover	1		0340304116004
5	Kühlmitteltank	Coolant tank	1		0340304116005
6	Deckel	Cover	1		0340304116006
7	Motor	Motor	1		0340304116007
8	Blech	Sheet Metal	1		0340304116008
9	Spänewanne	Chip tray	1		0340304116009
10	Abdeckung	Cover	1		0340304116010
11	Not-Halt Schalter	Emergency stop switch	2		0340304116011
12	Blech	Sheet Metal	1		0340304116012
13	Gehäuse	Housing	2		0340304116013

H Maschinenbett - Machine bed

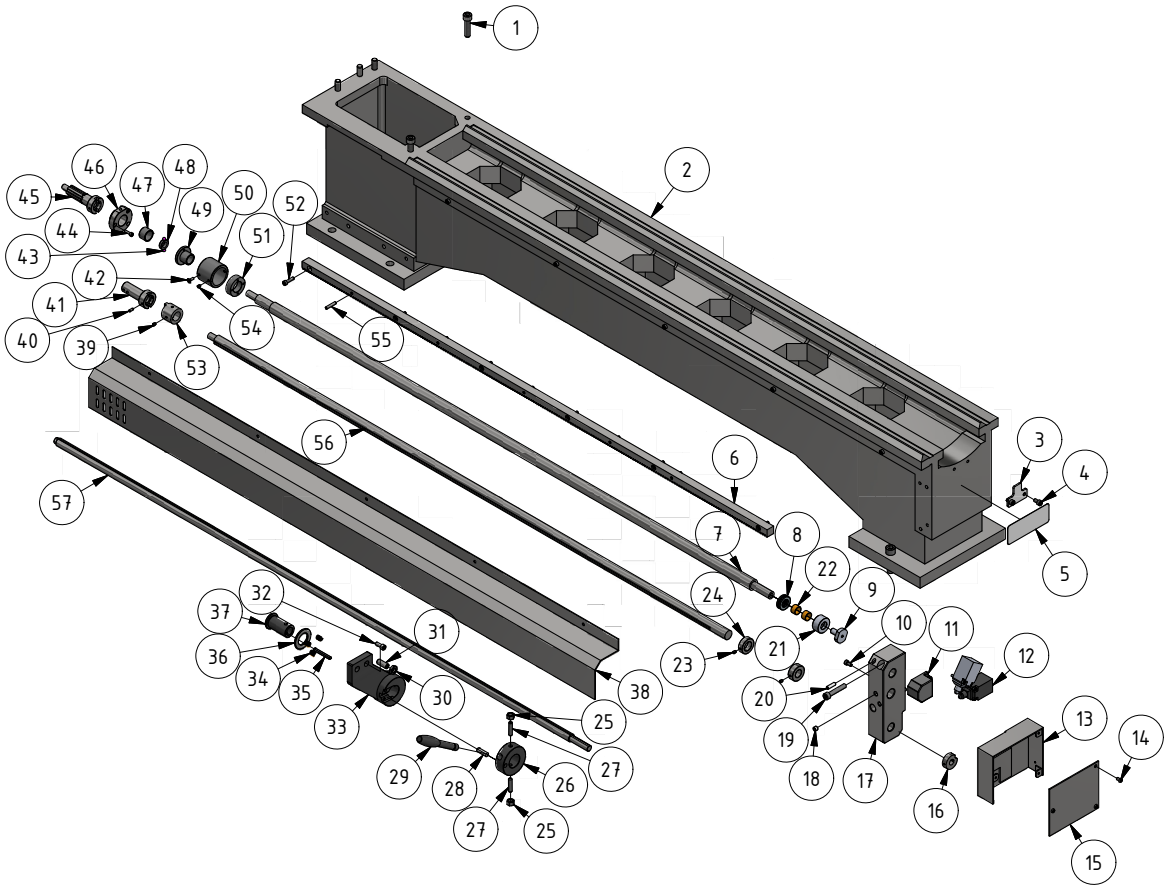
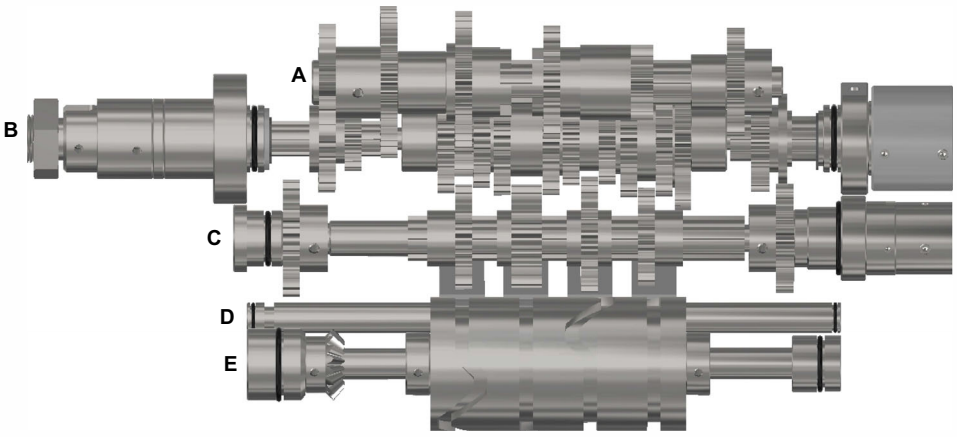


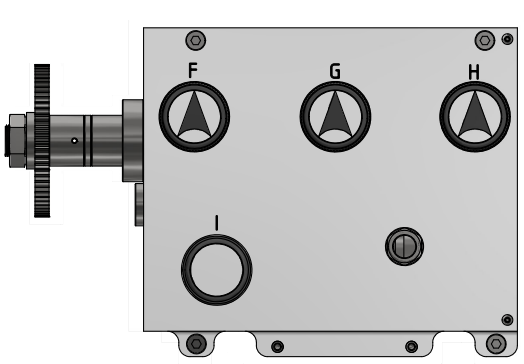
Fig.7-8:

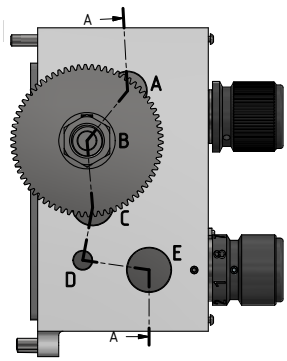
Maschinenbett - Machine bed					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Innensechskantschraube	Socket Head Screw	4	ISO 4762 M10x40	
2	Maschinenbett	Machine bed	1		0340304109002
3	Endanschlag Reitstock	Limit Stop Tailstock	1		0340304109003
4	Innensechskantschraube	Socket Head Screw	2	ISO 4762 M6x10	
5	Blech	Sheet metal	1		0340304109005
6	Zahnstange	Gear rack	1		0340304109006
7	Leitspindel	Lead Screw	1		0340304109007
8	Lager	Bearing	1		0340304109008
9	Flansch	Flange	1		0340304109009
10	Innensechskantschraube	Socket Head Screw	4	ISO 4762 M5x10	
11	Abdeckung	Cover	1		0340304109011
12	Rollenschalter	Roller switch	2		0340304109012
13	Abdeckung	Cover	1		0340304109013
14	Schraube	Screw	3	ISO 7380 M5x8	
15	Abdeckung	Cover	1		0340304109015
16	Ring	Ring	1		0340304109016
17	Bedestigungsblock	Mounting block	1		0340304109017
18	Öler	Oiler	1		0340304109018
19	Innensechskantschraube	Socket Head Screw	2	ISO 4762 M8x45	
20	Passstift	Fitting pin	2	ISO 8734 Ø6x20	
21	Ring	Ring	1		0340304109021
22	Hülse	Sleeve	1		0340304109022
23	Madenschraube	Grub screw	2	ISO 4026 M5x6	
24	Ring	Ring	2		0340304109024
25	Mutter	Nut	2	ISO 4032 M8	
26	Ring	Ring	1		0340304109026
27	Madenschraube	Grub screw	2	ISO 4026 M8x30	
28	Passstift	Fitting pin	1	ISO 8734 Ø8x25	

Maschinenbett - Machine bed					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
29	Hebel	Lever	1		0340304109029
30	Mutter	Nut	1	ISO 4035 M8	
31	Madenschraube	Grub screw	1	ISO 4026 M8x25	
32	Innensechskantschraube	Socket Head Screw	2	ISO 4762 M6x15	
33	Halteplatte	Holding plate	1		0340304109033
34	Feder	Spring	3		0340304109034
35	Passfeder	Feather key	1		0340304109035
36	Scheibe	Disc	1		0340304109036
37	Führungsbuchse	Guide bush	1		0340304109037
38	Spindelabdeckung	Spindle cover	1		0340304109038
39	Madenschraube	Grub screw	2	ISO 4026 M5x6	
40	Madenschraube	Grub screw	1	ISO 4026 M4x10	
41	Hülse	Sleeve	1		0340304109041
42	Schraube	Screw	2	ISO 10642 M4x10	
43	Kugel	Ball	2		0340304109043
44	Innensechskantschraube	Socket Head Screw	3	ISO 4762 M4x15	
45	Hülse	Sleeve	1		0340304109045
46	Ring	Ring	1		0340304109046
47	Hülse	Sleeve	1		0340304109047
48	Ring	Ring	1		0340304109048
49	Flansch	Flange	1		0340304109049
50	Hülse	Sleeve	1		0340304109050
51	Ring	Ring	1		0340304109051
52	Innensechskantschraube	Socket Head Screw	6	ISO 4762 M5x20	
53	Hülse	Sleeve	1		0340304109053
54	Madenschraube	Grub screw	2	ISO 4026 M5x6	
55	Hohlspannstifte	Dowel Pin	5	ISO 8752 Ø5x25	
56	Zugspindel	Feed rod	1		0340304109056
57	Schaltstange	Switch rod	1		0340304109057

I Vorschubgetriebe - Feed gear







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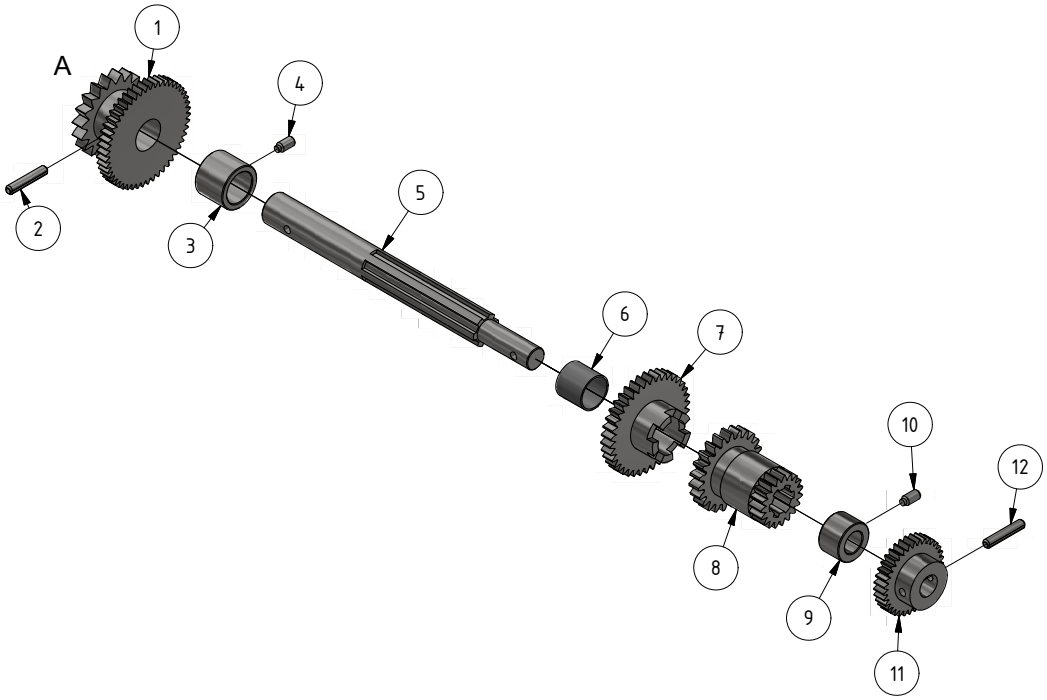

Fig.7-9:

Vorschubgetriebe A - Feed gear A					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Zahnrad	Gear	1		0340304118001
2	Hohlspannstift	Dowel pin	1	ISO 8752 Ø6x30	
3	Hülse	Sleeve	1		0340304118003
4	Madenschraube	Grub screw	1	ISO 4026 M6x12	
5	Welle	Shaft	1		0340304118005
6	Hülse	Sleeve	1		0340304118006
7	Zahnrad	Gear	1		0340304118007
8	Zahnrad	Gear	1		0340304118008
9	Ring	Ring	1		0340304118009
10	Madenschraube	Grub screw	1	ISO 8752 M6x12	
11	Zahnrad	Gear	1		0340304118011
12	Hohlspannstift	Dowel pin	1	ISO 8752 Ø6x30	

J Vorschubgetriebe B - Feed gear B

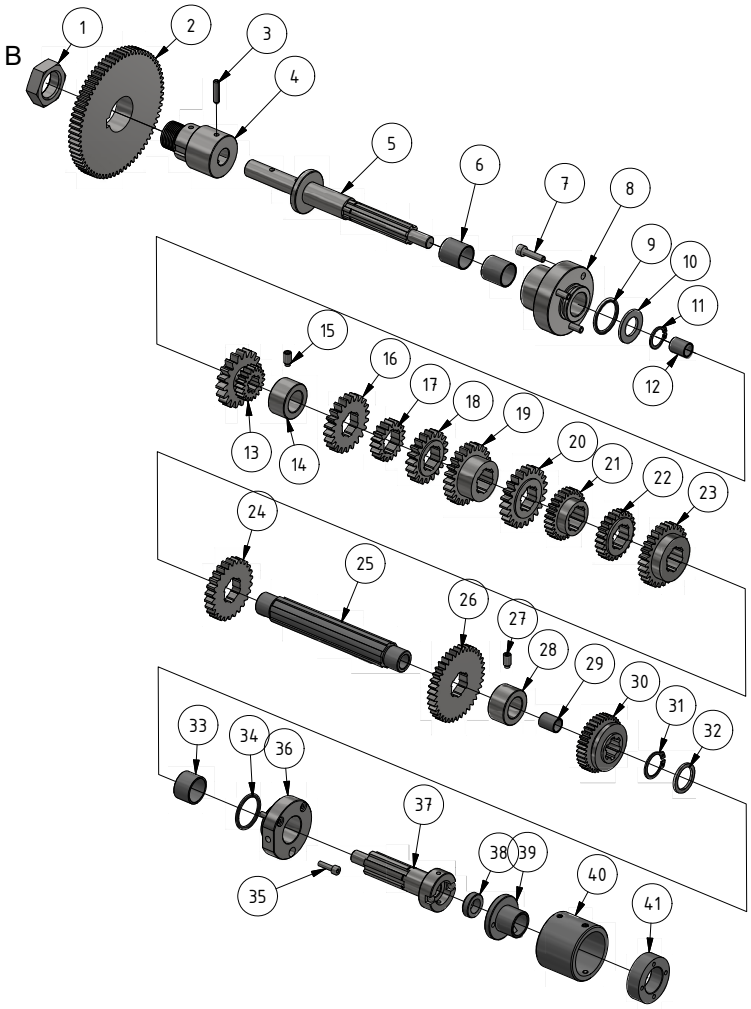

Fig.7-10:

Vorschubgetriebe B - Feed gear B					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Mutter	Nut	1	ISO 4035 M22	
2	Zahnrad	Gear	1		0340304119002
3	Hohlspannstift	Dowel Pin	1	ISO 8752 Ø4x20	
4	Hülse	Sleeve	1		0340304119004
5	Welle	Shaft	1		0340304119005
6	Hülse	Sleeve	2		0340304119006
7	Innensechskantschraube	Socket Head Screw	3	ISO 4762 M5x20	
8	Flansch	Flange	1		0340304119008
9	O-Ring	O-Ring	1	ISO 3601 Ø30x2,5	
10	Unterlegscheibe	Washer	1		0340304119010
11	Sicherungsring	Circlip	1		0340304119011
12	Hülse	Sleeve	1		0340304119012
13	Zahnrad	Gear	1		0340304119013
14	Hülse	Sleeve	1		0340304119014
15	Madenschraube	Grub Screw	1	ISO 4026 M6x12	
16	Zahnrad	Gear	1		0340304119016
17	Zahnrad	Gear	1		0340304119017
18	Zahnrad	Gear	1		0340304119018
19	Zahnrad	Gear	1		0340304119019
20	Zahnrad	Gear	1		0340304119020
21	Zahnrad	Gear	1		0340304119021
22	Zahnrad	Gear	1		0340304119022

Vorschubgetriebe B - Feed gear B					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
23	Zahnrad	Gear	1		0340304119023
24	Zahnrad	Gear	1		0340304119024
25	Welle	Shaft	1		0340304119025
26	Zahnrad	Gear	1		0340304119026
27	Madenschraube	Grub Screw	1	ISO 4026 M6x12	
28	Hülse	Sleeve	1		0340304119028
29	Hülse	Sleeve	1		0340304119029
30	Zahnrad	Gear	1		0340304119030
31	Sicherungsring	Circlip	1		0340304119031
32	Unterlegscheibe	Washer	1		0340304119032
33	Hülse	Sleeve	1		0340304119033
34	O-Ring	O-Ring	1	ISO 3601 Ø30x2,5	
35	Innensechskantschraube	Socket Head Screw	3	ISO 4762 M4x12	
36	Ring	Ring	1		0340304119036
37	Welle	Shaft	1		0340304119037
38	Ring	Ring	1		0340304119038
39	Flansch	Flange	1		0340304119039
40	Hülse	Sleeve	1		0340304119040
41	Ring	Ring	1		0340304119041

K Vorschubgetriebe C - Feed gear C

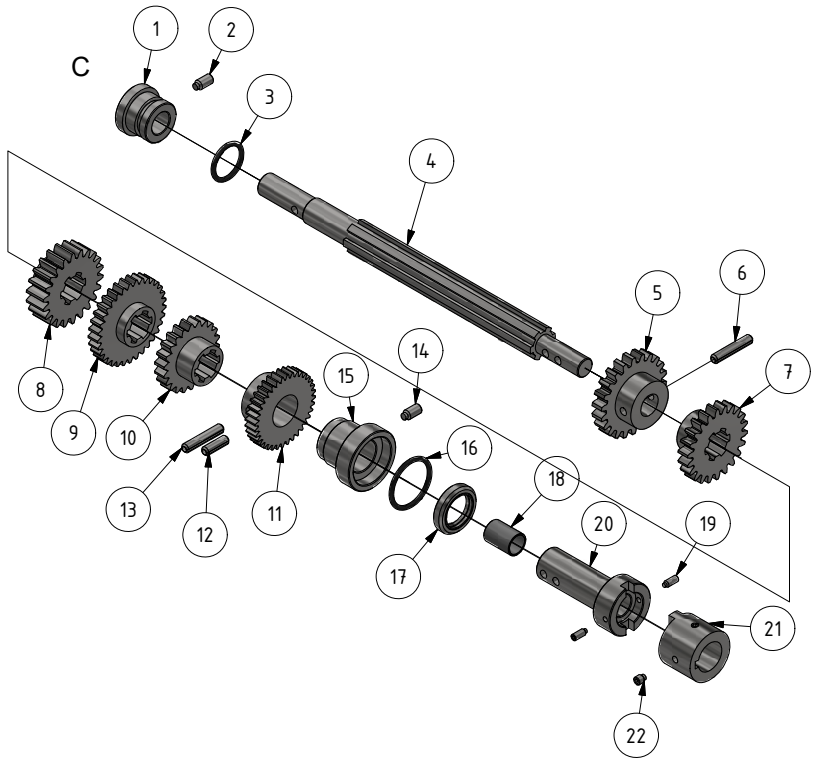

Fig.7-11:

Vorschubgetriebe C - Feed gear C					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Hülse	Sleeve	1		0340304120001
2	Madenschraube	Grub Screw	1	ISO 4026 M6x12	
3	O-Ring	O-Ring	1	ISO 3601 Ø25x2,5	
4	Welle	Shaft	1		0340304120004
5	Zahnrad	Gear	1		0340304120005
6	Hohlspannstift	Dowel Pin	1	ISO 8752 Ø6x30	
7	Zahnrad	Gear	1		0340304120007

Vorschubgetriebe C - Feed gear C					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
8	Zahnrad	Gear	1		0340304120008
9	Zahnrad	Gear	1		0340304120009
10	Zahnrad	Gear	1		0340304120010
11	Zahnrad	Gear	1		0340304120011
12	Hohlspannstift	Dowel Pin	1	ISO 8752 Ø6x18	
13	Hohlspannstift	Dowel Pin	1	ISO 8752 Ø6x30	
14	Madenschraube	Grub Screw	1	ISO 4026 M6x12	
15	Hülse	Sleeve	1		0340304120015
16	O-Ring	O-Ring	1	ISO 3601 Ø33x2,5	
17	Ring	Ring	1		0340304120017
18	Hülse	Sleeve	1		0340304120018
19	Madenschraube	Grub Screw	2	ISO 4026 M4x12	
20	Welle	Shaft	1		0340304120020
21	Hülse	Sleeve	1		0340304120021
22	Madenschraube	Grub Screw	2	ISO 4026 M5x6	

L Vorschubgetriebe D-E - Feed gear D-E

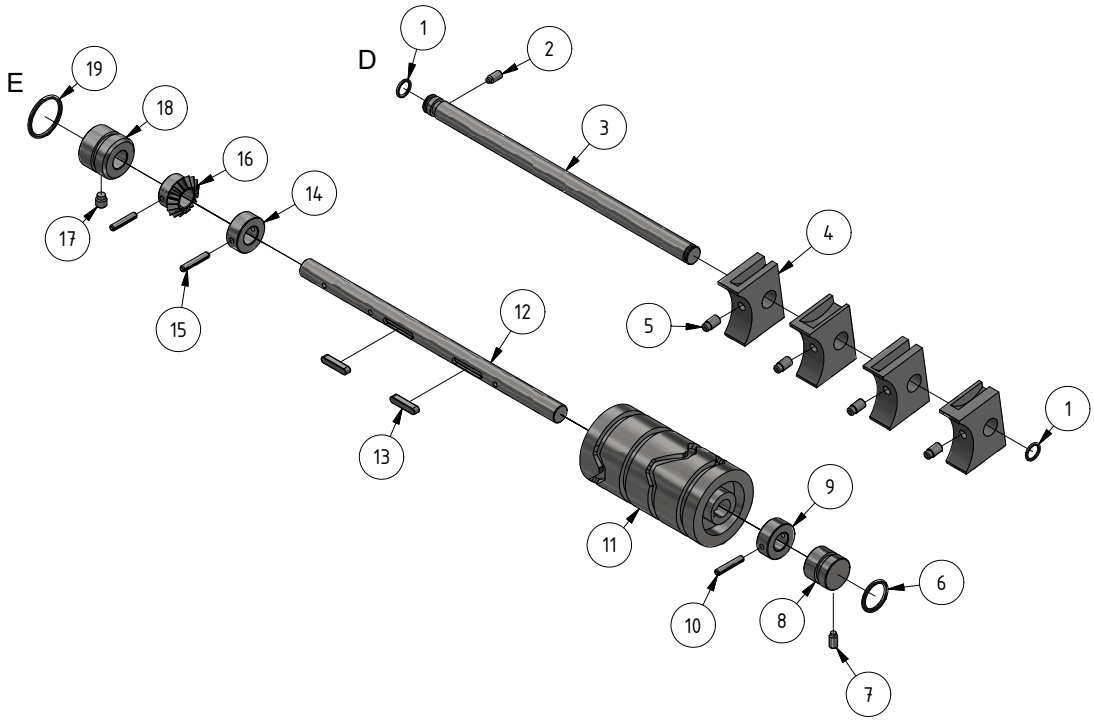

Fig.7-12:

Vorschubgetriebe D-E - Feed gear D-E					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	O-Ring	O-Ring	2	ISO 3601 Ø14x1,5	
2	Madenschraube	Grub Screw	1	ISO 4026 M6x12	
3	Welle	Shaft	1		0340304121003
4	Verstellblock	Adjustment block	4		0340304121004
5	Madenschraube	Grub Screw	4		0340304121005
6	O-Ring	O-Ring	1	ISO 3601 Ø25x2,5	
7	Madenschraube	Grub Screw	1	ISO 4026 M6x12	
8	Stopfen	Plug	1		0340304121008
9	Ring	Ring	1		0340304121009
10	Hohlspannstift	Dowel pin	1	ISO 8752 Ø4x26	

Vorschubgetriebe D-E - Feed gear D-E					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
11	Stellwalze	Adjusting roller	1		0340304121011
12	Kupplung	Clutch	1		0340304121012
13	Passfeder	Feather Key	2		0340304121013
14	Ring	Ring	1		0340304121014
15	Hohlspannstift	Dowel pin	2	ISO 8752 Ø4x24	
16	Zahnrad	Gear	1		0340304121016
17	Madenschraube	Grub Screw	1	ISO 4026 M8x10	
18	Stopfen	Plug	1		0340304121018
19	O-Ring	O-Ring	1	ISO 3601 Ø33x2,5	

M Vorschubgetriebe F-G-H-I - Feed gear F-G-H-I

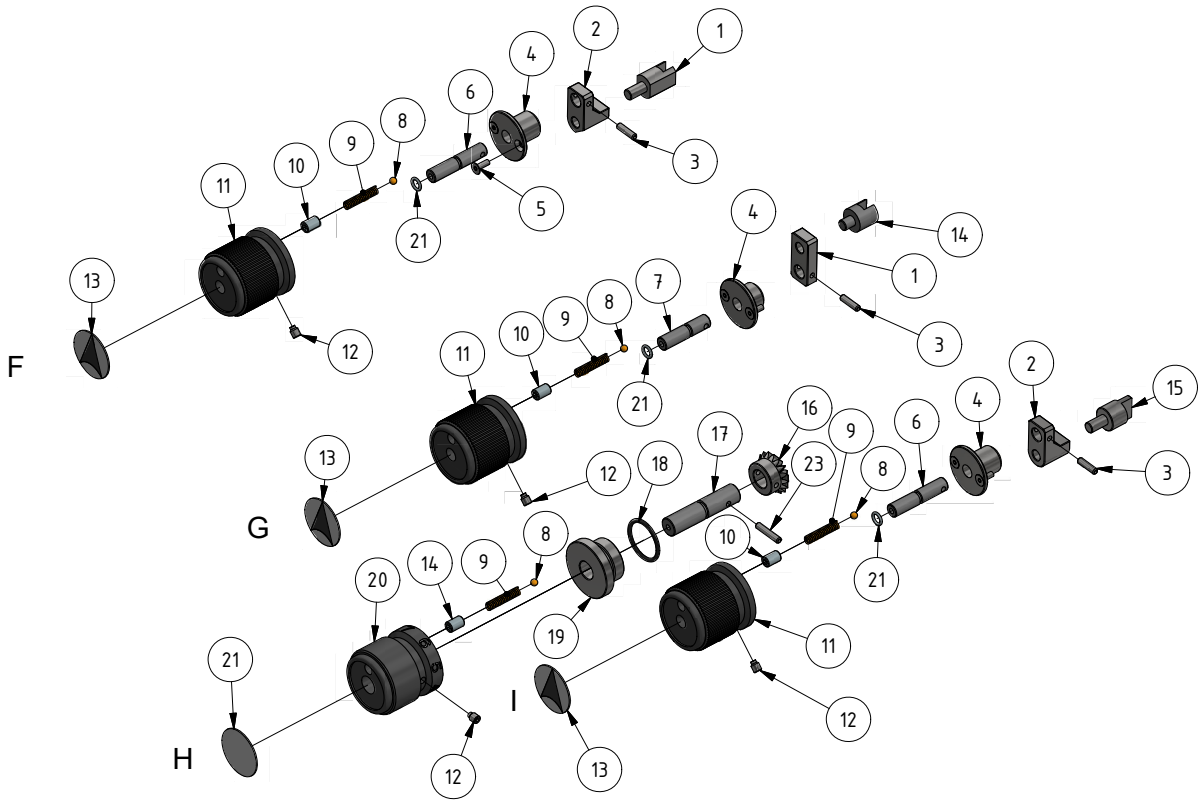

Fig.7-13:

Vorschubgetriebe F-G-H-I - Feed gear F-G-H-I					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Verstellbolzen	Adjustment bolt	1		0340304122001
2	Hebel	Lever	2		0340304122002
3	Hohlspannstift	Dowel pin	3	ISO 8752 Ø4x18	
4	Flansch	Flange	3		0340304122004
5	Schraube	Screw	6	ISO 10642 M4x10	
6	Bolzen	Bolt	2		0340304122006
7	Bolzen	Bolt	1		0340304122007
8	Kugel	Ball	4		0340304122008
9	Feder	Spring	4		0340304122009
10	Madenschraube	Grub Screw	4	ISO 4026 M8x12	
11	Drehknopf	Rotary knob	3		0340304122011
12	Madenschraube	Grub Screw	4	ISO 4026 M6x8	
13	Anzeiger	Indicator	3		0340304122013
14	Verstellbolzen	Adjustment bolt	1		0340304122014

Vorschubgetriebe F-G-H-I - Feed gear F-G-H-I					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
15	Verstellbolzen	Adjustment bolt	1		0340304122015
16	Zahnrad	Gear	1		0340304122016
17	Bolzen	Bolt	1		0340304122017
18	O-Ring	O-Ring	1	ISO 3601 Ø33x2,5	
19	Flansch	Flange	1		0340304122019
20	Drehknopf	Rotary knob	1		0340304122020
21	Anzeiger	Indicator	1		0340304122021
22	Hohlspannstift	Dowel pin	1	ISO 8752 Ø4x24	

N Antrieb Vorschubgetriebe - Feed gear drive

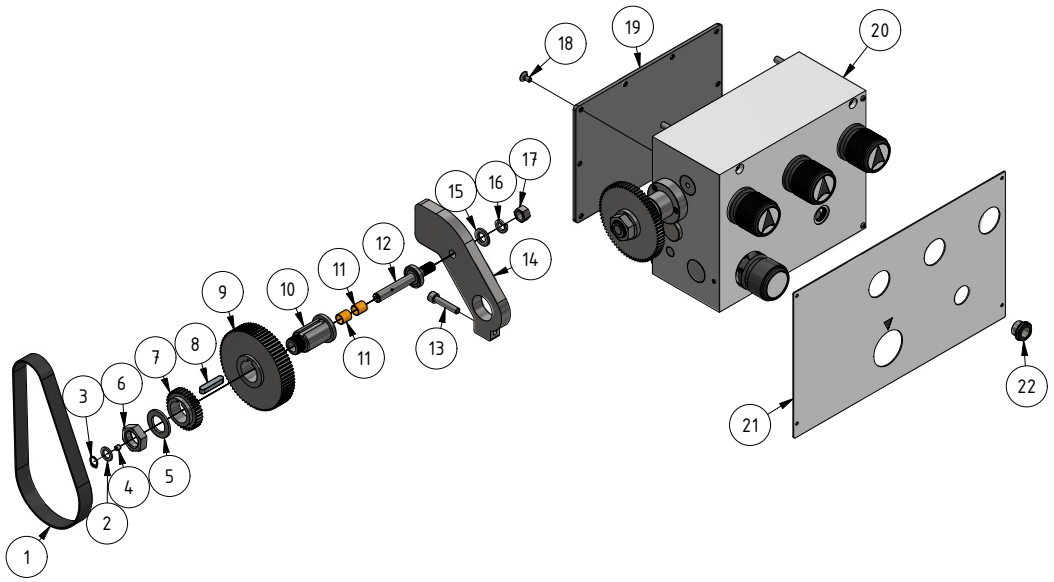

Fig. 7-14:

Antrieb Vorschubgetriebe - Feed gear drive					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Zahnriemen	Timing belt	1		0340304117001
2	Unterlegscheibe	Washer	1		0340304117002
3	Sicherungsring	Circlip	1		0340304117003
4	Öler	Oiler	1		0340304117004
5	Unterlegscheibe	Washer	1		0340304117005
6	Mutter	Nut	1	ISO 4035 M22	
7	Zahnrad	Gear	1		0340304117007
8	Passfeder	Feather Key	1		0340304117008
9	Zahnrad	Gear	1		0340304117009
10	Hülse	Sleeve	1		0340304117010
11	Buchse	Bushing	2		0340304117011
12	Welle	Shaft	1		0340304117012
13	Innensechskantschraube	Socket Head Screw	1	ISO 4762 M8x40	
14	Halteplatte	Holding plate	1		0340304117014
15	Unterlegscheibe	Washer	1		0340304117015
16	Federring	Spring washer	1		0340304117016
17	Mutter	Nut	1	ISO 4032 M12	
18	Schraube	Screw	10	ISO 10642 M6x8	
19	Verschlussplatte	Cover plate	1		0340304117019
20	Getriebegehäuse	Gear box	1		0340304117020
21	Blech	Sheet metal	1		0340304117021
22	Ölschauglas	Oil inspection glass	1		0340304117022

O Schloßkasten - Apron

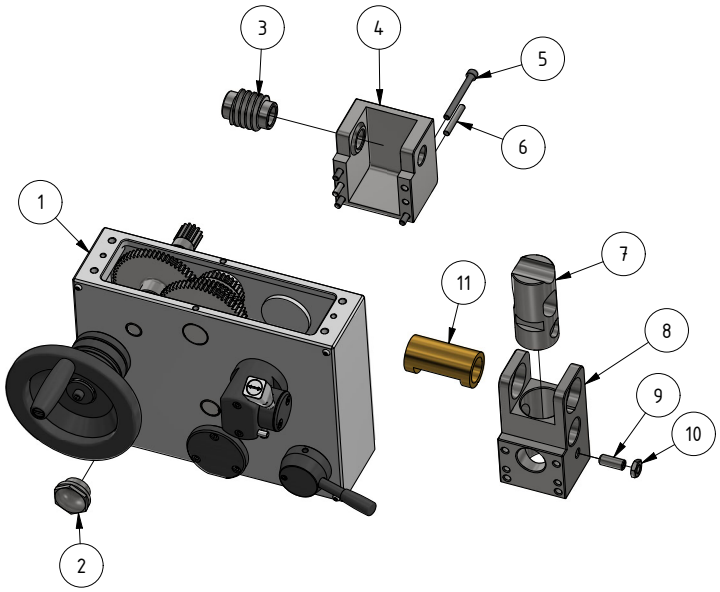

Abb. 7-15:

Schloßkasten - Apron					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Schlosskasten	Gear box	1	3403041	0340304111001
2	Ölschauglass	Oil sight glass	1		0340304111002
3	Getriebeschnecke	Worm gear	1		0340304111003
4	Gehäuse	Housing	1		0340304111004
5	Innensechskantschraube	Socket Head Screw	8	ISO 4762 M6x60	
6	Passstift	Fitting Pin	4	ISO 8734 Ø6x40	
7	Vorschubbolzen	Feed bolt	1		0340304111007
8	Halterung	Bracket	1		0340304111008
9	Madenschraube	Grub screw	1	ISO 4026 M10x25	
10	Mutter	Nut	1	ISO 4035 M10	
11	Buchse	Bushing	1		0340304111011

P Schloßkasten Welle A - Apron shaft A

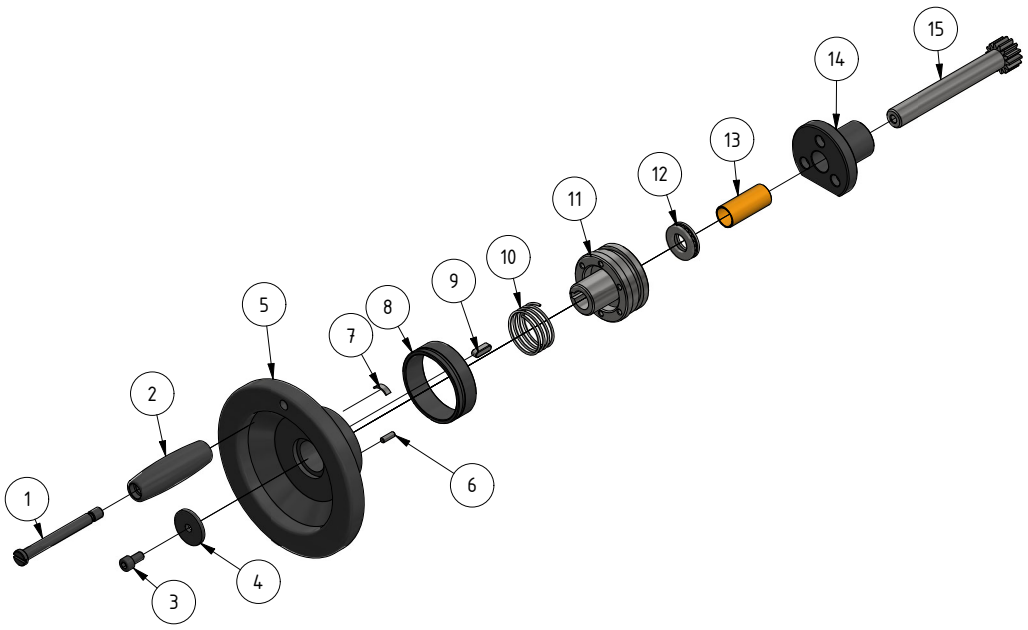

Abb. 7-16:

Schloßkasten Welle A - Apron shaft A					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Griffschraube	Handle Screw	1		0340304112001
2	Griff	Handle	1		0340304112002
3	Innensechskantschraube	Socket Head Screw	1	ISO 4762 M6x12	
4	Unterlegscheibe	Washer	1		0340304112004
5	Handrad	Handwheel	1		0340304112005
6	Passstift	Fitting Pin	1	ISO 8734 Ø4x12	
7	Ringsegment	Ring segment	1		0340304112007
8	Skalenring	Scale ring	1		0340304112008
9	Passfeder	Feather key	1		0340304112009
10	Feder	Spring	1		0340304112010
11	Flansch	Flange	1		0340304112011
12	Lager	Bearing	1		0340304112012
13	Hülse	Sleeve	1		0340304112013
14	Flansch	Flange	1		0340304112014
15	Welle	Shaft	1		0340304112015

Q Schloßkasten Welle B-D - Apron shaft B-D

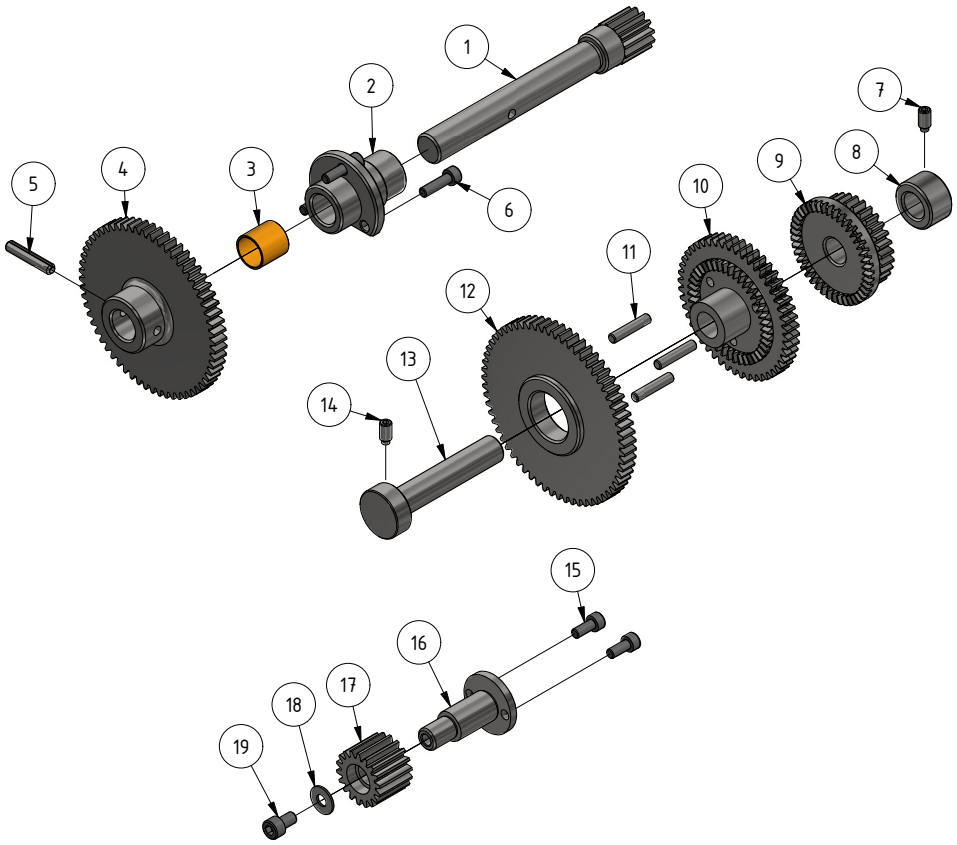

Abb.7-17:

Schloßkasten Welle B-D - Apron shaft B-D					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Welle	Shaft	1		0340304113001
2	Flansch	Flange	1		0340304113002
3	Hülse	Sleeve	1		0340304113003
4	Zahnrad	Gear	1		0340304113004
5	Hohlspannstift	Dowel pin	1		0340304113005
6	Innensechskantschraube	Sockte Head Screw	3	ISO 4762 M5x18	
7	Madenschraube	Grub Screw	1	ISO 4026 M6x12	
8	Ring	Ring	1		0340304113008
9	Zahnrad	Gear	1		0340304113009
10	Zahnrad	Gear	1		0340304113010
11	Passstift	Fitting Pin	3	ISO 8734 Ø5x25	
12	Zahnrad	Gear	1		0340304113012
13	Welle	Shaft	1		0340304113013
14	Madenschraube	Grub Screw	1	ISO 4026 M6x12	
15	Innensechskantschraube	Sockte Head Screw	2	ISO 4762 M5x12	
16	Welle	Shaft	1		0340304113016
17	Zahnrad	Gear	1		0340304113017
18	Unterlegscheibe	Washer	1		0340304113018
19	Innensechskantschraube	Sockte Head Screw	1	ISO 4762 M6x10	

R Schloßkasten Welle E-H - Apron shaft E-H

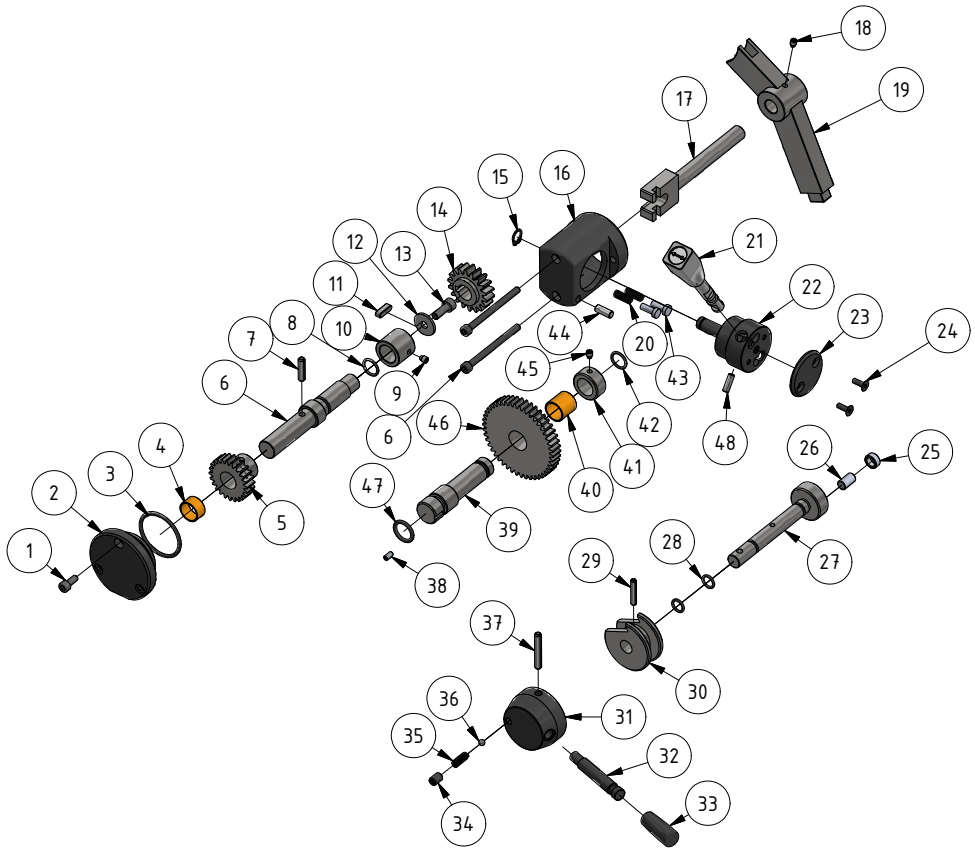

Abb. 7-18:

Schloßkasten Welle E-H - Apron shaft E-H					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Innensechskantschraube	Socket Head Screw	3	ISO 4762 M5x12	
2	Deckel	Cover	1		0340304114002
3	O-Ring	O-Ring	1	ISO 3601 Ø42x2,5	
4	Hülse	Sleeve	1		0340304114004
5	Zahnrad	Gear	1		0340304114005
6	Welle	Shaft	1		0340304114006
7	Hohlsapnnstift	Dowel Pin	1		0340304114007
8	O-Ring	O-Ring	1	ISO 3601 Ø16x1,5	
9	Madenschraube	Grub Screw	1	ISO 4026 M5x6	
10	Ring	Ring	1		0340304114010
11	Passfeder	Feather Key	1		0340304114011
12	Unterlegscheibe	Washer	1		0340304114012
13	Innensechskantschraube	Socket Head Screw	1	ISO 4762 M6x16	
14	Zahnrad	Gear	1		0340304114014
15	Sicherungsring	Circlip	1		0340304114015
16	Gehäuse	Housing	1		0340304114016
17	Welle	Shaft	1		0340304114017
18	Madenschraube	Grub Screw	1	ISO 4026 M5x6	
19	Hebel	Lever	1		0340304114019
20	Feder	Spring	2		0340304114020
21	Hebel	Lever	1		0340304114021
22	Flansch	Flange	1		0340304114022
23	Deckel	Cover	1		0340304114023
24	Schraube	Screw	2	ISO 10642 M4x10	
25	Ring	Ring	1		0340304114025
26	Passstift	Fitting pin	1	ISO 8734 Ø8x16	
27	Welle	Shaft	1		0340304114027
28	O-Ring	O-Ring	2	ISO 3601 Ø13x2	
29	Hohlspannstift	Dowel Pin	1		0340304114029
30	Ring	Ring	1		0340304114030

Schloßkasten Welle E-H - Apron shaft E-H					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
31	Hebelhalter	Lever holder	1		0340304114031
32	Hebel	Lever	1		0340304114032
33	Griff	Handle	1		0340304114033
34	Madenschraube	Grub Screw	1	ISO 4026 M8x10	
35	Feder	Spring	1		0340304114035
36	Kugel	Ball	1		0340304114036
37	Hohlspannstift	Dowel Pin	1		0340304114037
38	Madenschraube	Grub Screw	1	ISO 4026 M4x8	
39	Welle	Shaft	1		0340304114039
40	Hülse	Sleeve	1		0340304114040
41	Ring	Ring	1		0340304114041
42	O-Ring	O-Ring	1	ISO 3601 Ø16x1,5	
43	Federhalter	Spring Pin	2		0340304114043
44	Passstift	Fitting pin	1	ISO 8734 Ø6x15	
45	Madenschraube	Grub Screw	1	ISO 4026 M5x6	
46	Zahnrad	Gear	1		0340304114046
47	O-Ring	O-Ring	1	ISO 3601 Ø20x2,5	
48	Passstift	Fitting pin	1	ISO 8734 Ø5x15	

S Planschlitten - Cross slide

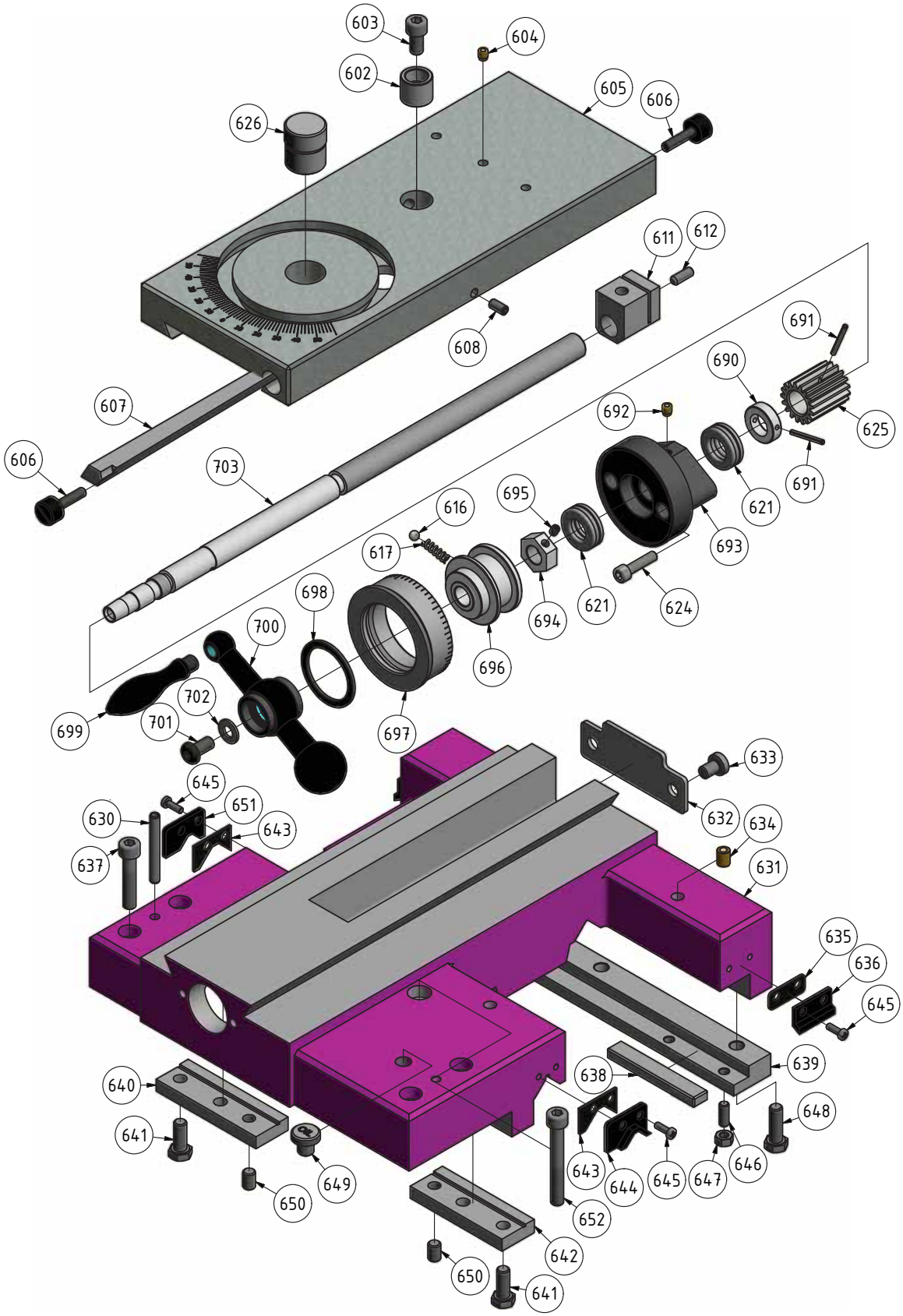

Abb. 7-19: Planschlitten - cross slide

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T Oberschlitten - Top slide

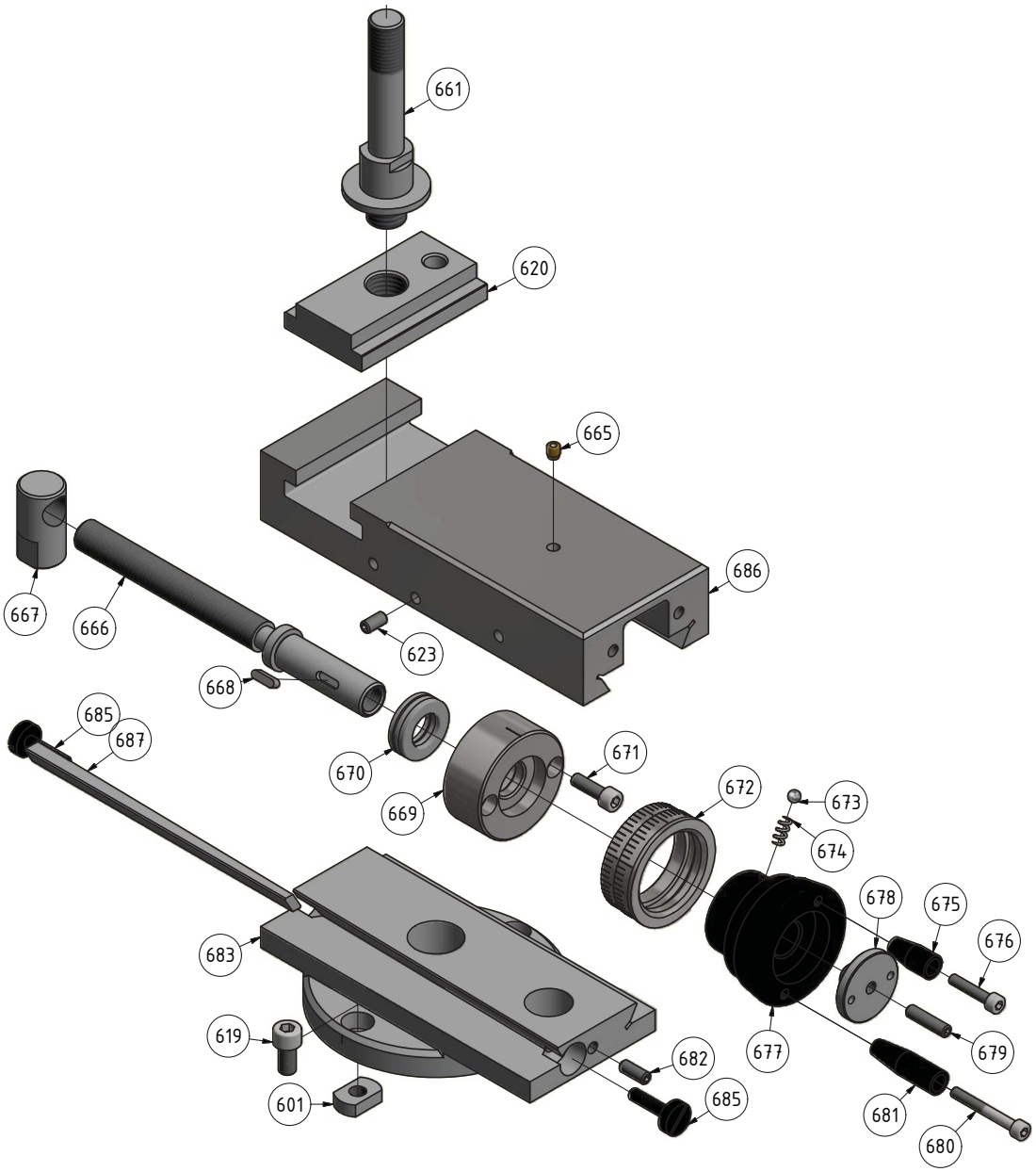

Abb.7-20: Oberschlitten - Top slide

Ersatzteile Planschlitten, Oberschlitten - Spare parts list cross slide, top slide					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
601	Nutenstein	Slot nut	2		
602	Hülse	Bushing	1		
603	Innensechskantschraube	Socket head screw	1	GB 70-85 - M8 x 16	
604	Öler	Oller	3	6mm	0340105
605	Planschlitten	Cross slide	1		034030406605
606	Nachstellschraube Keilleiste	Adjusting screw	2		034030406606
607	Keilleiste	Gib	1		034030406607
608	Gewindestift	Grub screw	1	GB 77-85 - M6 x 12	
611	Spindelmutter	Spindle nut	1		034030406611
612	Gewindestift	Grub screw	1	GB 80-85 - M6 x 16	
616	Stahlkugel	Steel ball	2		
617	Feder	Spring	2		
619	Innensechskantschraube	Socket head screw	2	GB 70-86-M8x16	
620	Führung	Guide	1		034030406620

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Ersatzteile Planschlitten, Oberschlitten - Spare parts list cross slide, top slide					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
621	Rillenkugellager	Ball bearing	1	51102	04051102
623	Gewindestift	Grub screw	1	GB 77-85-N6x12	
624	Innensechskantschraube	Socket head screw	2	GB 70-85 - M6 x 25	
625	Zahnrad	Gear	1		034030406625
626	Bolzen	Bolt	1		
630	Spannstift	Spring pin	2	ISO 13337/6x50	
631	Bettschlitten	Bed slide	1		034030406631
632	Abdeckplatte	Plate	1		
633	Schraube	Screw	2	GB 823-88 - M8 x 12	
634	Öler	Oiler	2	8mm	0340114
635	Abstreifer	Wiper	2		034030406635
636	Halter Abstreifer	Holder	2		034030406636
637	Innensechskantschraube	Socket head screw	4	GB 70-85-N8x40	
638	Nachstellleiste	Gib	2		034030406638
639	Führungsschiene	Guide rail	1		034030406639
640	Führungsplatte	Guide plate	1		034030406640
641	Sechskantschraube	Hexagon screw	4	GB 5783-86 - M8 x 20	
642	Führungsplatte	Guide plate	1		034030406642
643	Abstreifer	Wiper	2		034030406643
644	Halter Abstreifer	Holder	1		034030406644
645	Schraube	Screw	8	GB 823-88 - M4 x 12	
646	Gewindestift	Grub screw	4	GB 77-85 - M6 x 16	
647	Sechskantmutter	Hexagon nut	4	GB 6170-86 - M6	
648	Sechskantschraube	Hexagon screw	3	GB 5783-86 - M8 x 25	
649	Verschraubung	Fitting	1		
650	Gewindestift	Grub screw	4	GB 77-85-M8x12	
651	Halter Abstreifer	Holder	1		034030406651
652	Klemmschraube	Clamping screw	1	GB70-85/M8x60	
661	Gewindebolzen	Bolt	1		
665	Öler	Oiler	1	8mm	0340114
666	Spindel	Spindle	1		034030406666
667	Spindelmutter	Spindle nut	1		034030406667
668	Passfeder	Fitting key	1	DIN 6885 - A 4 x 4 x 14	042P4416
669	Halterung	Holder	1		034030406669
670	Rillenkugellager	Ball bearing	1	51103	04051103
671	Innensechskantschraube	Socket head screw	2	GB 70-85 - M6 x 20	
672	Skalenring	Scale ring	1		034030406672
673	Stahlkugel	Steel ball	2		
674	Feder	Spring	2	0,7x5x9	
675	Kurbelgriff	Handle	1		034030406675
676	Innensechskantschraube	Socket head screw	1	GB 70-85 - M5 x 25	
677	Handrad	Handwheel	1		034030406677
678	Justierkappe	Screw	1		034030406678
679	Gewindestift	Grub screw	1	M6x15	
680	Befestigungsschraube	Screw	1		
681	Kurbelgriff	Handle	1		034030406681
682	Gewindestift	Grub screw	1	GB 80-85 - M6 x 16	
683	Unterteil Oberschlitten	Top slide guide	1		034030406683
685	Stellschraube Keilleiste	Adjusting screw	2		034030406685
686	Oberteil Oberschlitten	Top slide	1		034030406686
687	Keilleiste	Gib	1		034030406687
690	Ring	Ring	1		
691	Federstift	Spring pin	2	3x28	
692	Schmiernippel	Lubrication cup	1	6	0340105
693	Flansch	Flange	1		034030406693
694	Klemmmutter	Clamping nut	1		
695	Gewindestift	Grub screw	1	M5x6	
696	Buchse	Bushing	1		
697	Skalenring	Scale ring	1		034030406697
698	Ring	Ring	1		
699	Handhebel	Handle	1		034030406699
700	Hebel	Lever	1		034030406700
701	Schraube	Screw	1		
702	Scheibe	Washer	1		
703	Spindel	Spindle	1		034030406703
704	Schnellwechselstahlhalter	Quick tool changer	1		
705	Nutmutter	Cap nut	1	M16	

U Reitstock - Tailstock

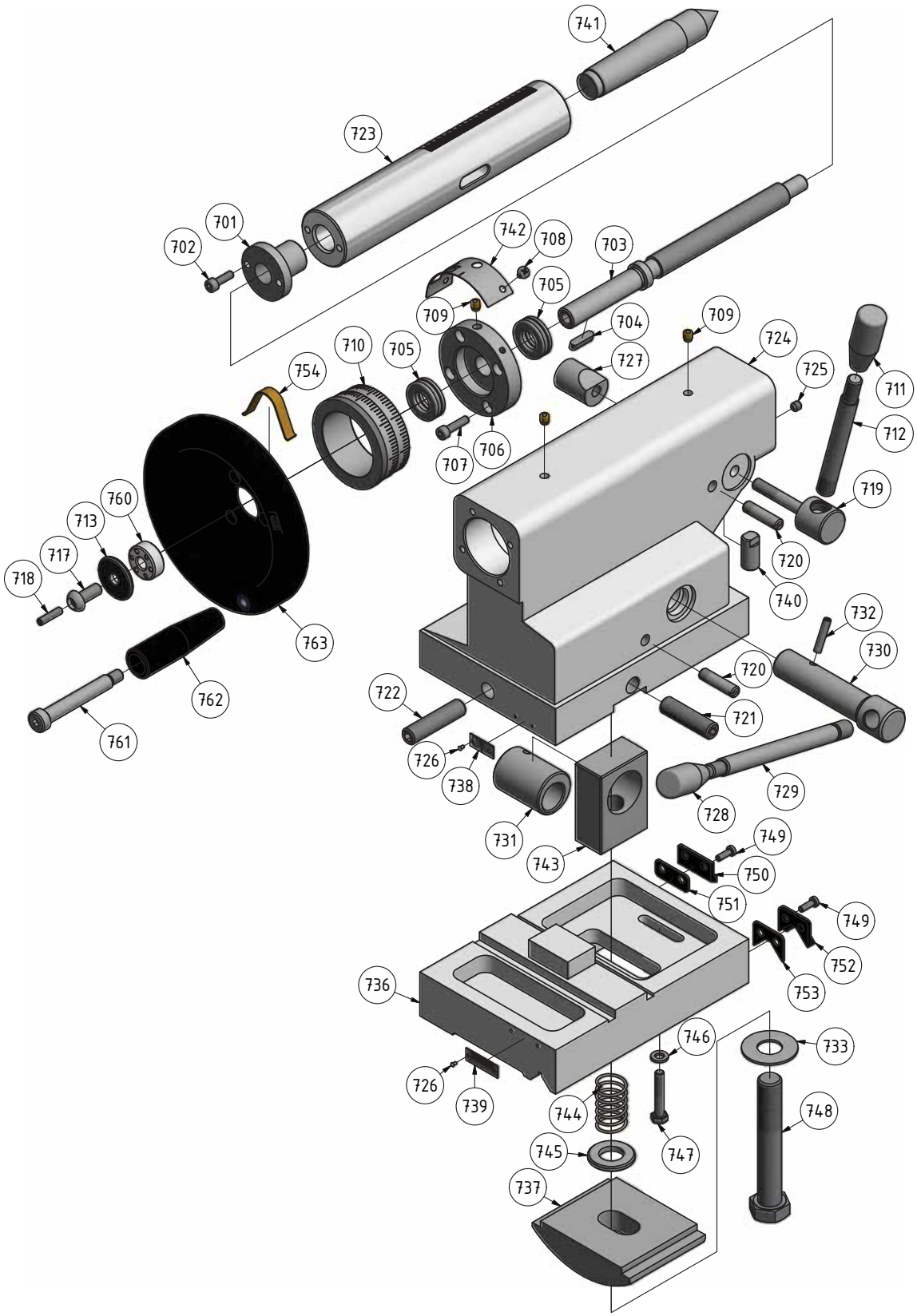

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Abb. 7-21: Reitstock - Tailstock

Ersatzteile Reitstock - Spare parts list tailstock					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
701	Spindelmutter	Spindle nut	1		034030409701
703	Spindel	Spindle	1		034030409703
704	Passfeder	Fitting key	1	DIN 6885 - A 5 x 5 x 20	042P5520
705	Kugellager	Ball bearing	2	51102	04051102
706	Lagerbock	Bearing block	1		034030409706
707	Innensechskantschraube	Socket head screw	4	GB 70-85 - M5 x 20	
708	Gewindestift	Grub screw	1	GB 818-85 - M4 x 5	
709	Öler	Oiler	3	6mm	0340105
710	Skalenring	Scale ring	1		034030409710
711	Griff	Handle	1		
712	Klemmhebel	Lever	1		
713	Scheibe	Washer	1		
717	Justierschraube	Screw	1		034030409717
718	Innensechskantschraube	Grub screw	1	GB 78-85 - M5 x 20	
719	Welle	Shaft	1		034030409719
720	Schraube	Screw	2		
721	Innensechskantschraube	Grub screw	2	GB 78-85 - M12 x 45	
722	Innensechskantschraube	Grub screw	1	GB 78-85 - M12 x 50	
723	Pinole	Pinole	1		034030409723
724	Reitstockkörper	Housing	1		034030409724
725	Gewindestift	Grub screw	1	GB 80-85 - M6 x 6	
726	Niet	Rivet	4		
727	Exzenter	Excenter	1		034030409727
728	Griff	Handle	2		034030409728
729	Hebel	Lever	1		034030409729
730	Welle	Shaft	1		034030409730
731	Exzenter	Excenter	1		034030409731
732	Gewindestift	Grub screw	1	GB 879-86 - 5 x 24	
733	Scheibe	Washer	1		
736	Führungsgrundplatte	Guide plate	1		034030409736
737	Klemmplatte Maschinenbett	Clamping plate	1		034030409737
738	Skala oben	Scale top	1		
739	Skala unten	Scale under	1		
740	Rastbolzen	Locking bolt	1		034030409740
742	Skala Reitstock	Scale tailstock	1		034030409742
743	Aufnahme	Collet	1		034030409743
744	Feder	Spring	1		
746	Scheibe	Washer	1		
747	Sechskantschraube	Hexagon screw	1	GB 5782-86 - M6x35	
748	Sechskantschraube	Hexagon screw	1	GB 5782-86 - M16x100	
749	Sechskantschraube	Hexagon screw	4	GB 823-88 - M4 x 12	
750	Halter Abstreifer	Holder wiper	1		034030409750
751	Abstreifer	Wiper	1		034030409751
752	Halter Abstreifer	Holder wiper	1		034030409752
753	Abstreifer	Wiper	1		034030409753
754	Federblech	Spring sheet	1		
760	Buchse		1		
761	Schraube		1		
762	Hülse		1		
763	Handrad	Handwheel	1		0340304099763

V Feststehehde Lünette - Steady rest

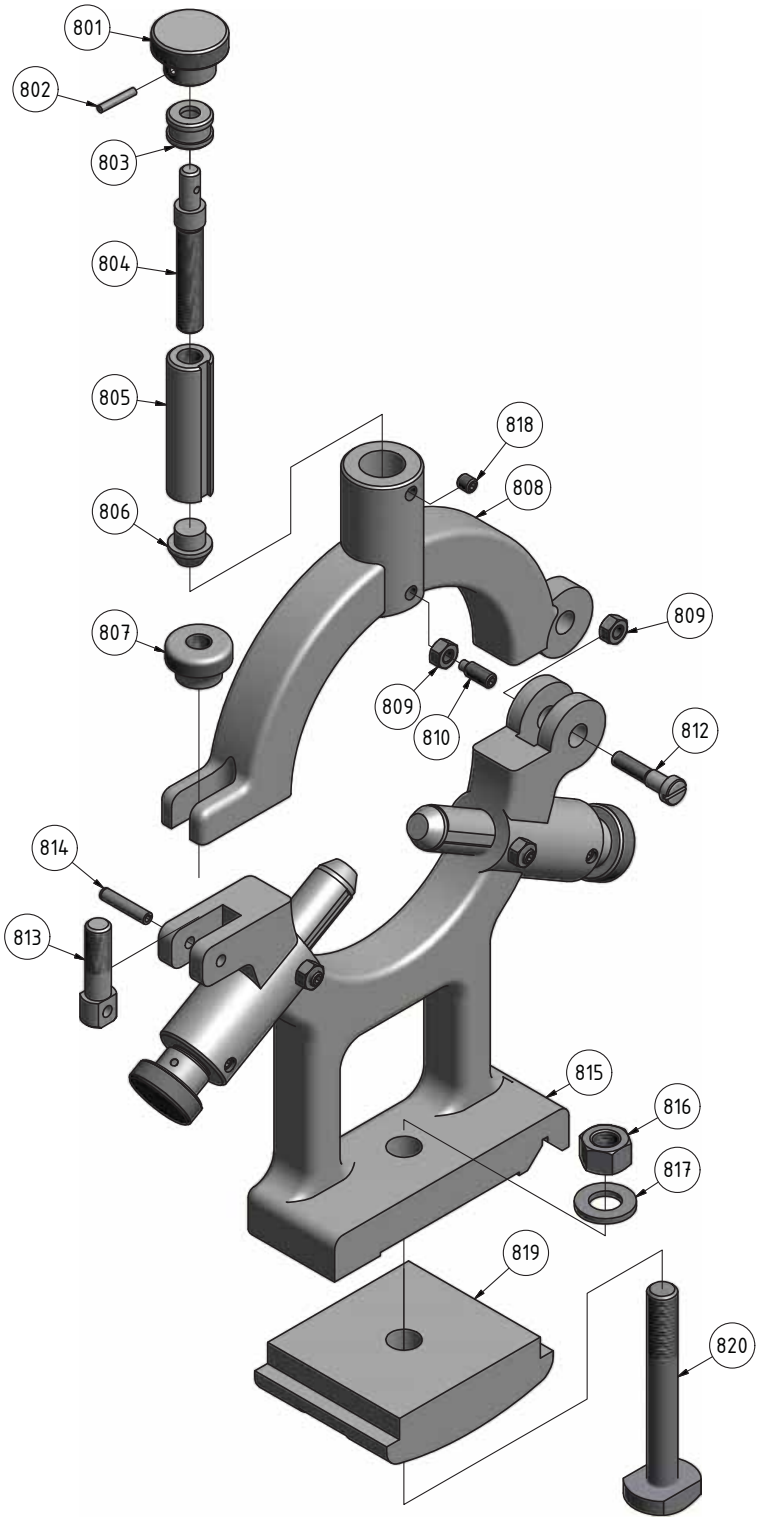

Abb.7-22: Feststehende Lünette - Steady rest

Ersatzteile Feststehende Lünette - Spare parts steady rest					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
801	Rändelgriff	Knurled handle	3		

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Ersatzteile Feststehende Lünette - Spare parts steady rest					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
802	Zylinderstift	Straight pin	3	GB 119-86 - C 3 x 18	
803	Überwurfmutter	Nut	3		
804	Gewindestange	Threaded rod	3		
805	Zentrierhülse	Centering bushing	3		
806	Endstück	End piece	3		
807	Mutter	Nut	1		
808	feststehende Lünette Oberteil	Steady rest upper section	1		
809	Sechskantmutter	Hexagon nut	4	GB 6170-86 - M6	
810	Gewindestift	Grub screw	3	GB 79-85 - M6 x 16	
812	Schraube	Screw	1		
813	Gewindebolzen	Threaded bolt	1		
814	Spannstift	Spring pin	1	GB 879-86 - 5 x 24	
815	feststehende Lünette Unterteil	Follow rest lower part	1		
816	Sechskantmutter	Hexagon nut	1		
817	Scheibe	Washer	1	DIN 125 - A 13	
818	Gewindestift	Grub screw	3	GB 78-85 - M6 x 6	
819	Klemmplatte	Clamping plate	1		
820	Klemmschraube	Clamping screw	1	GB 37-88 - M12x90	
CPL	feststehende Lünette komplett	Steady rest complete			03403040LF

W Mitlaufende Lünette - Follow rest

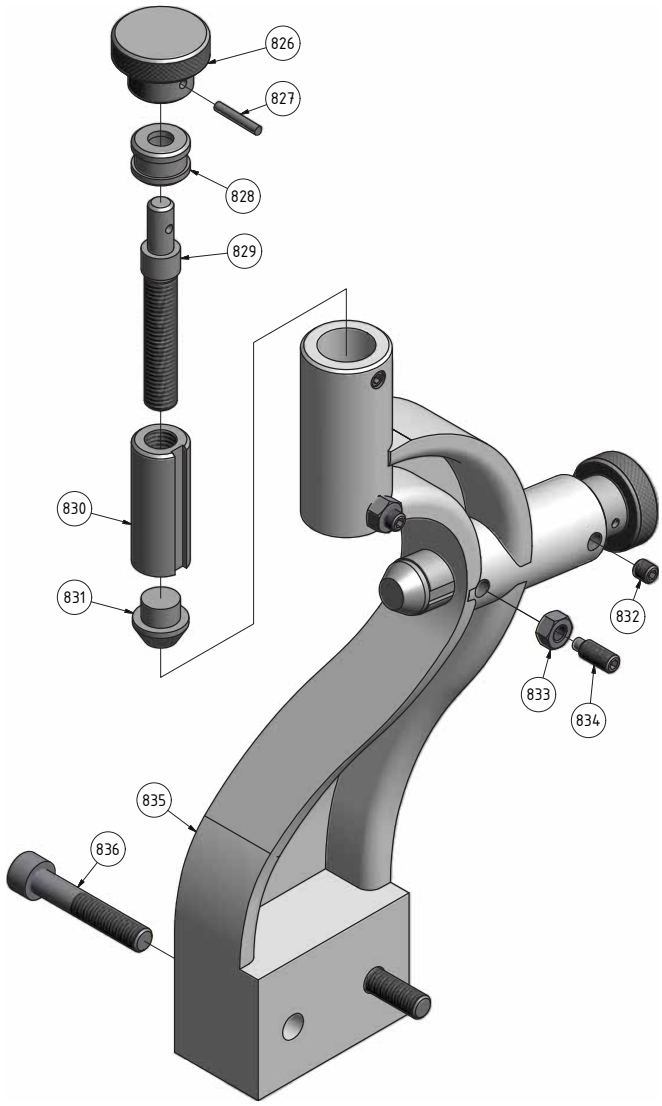

Abb.7-23: Mitlaufende Lünette - Follow rest

Ersatzteile mitlaufende Lünette - Spare parts follow rest					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
826	Rändelgriff	Knurled handle	2		
827	Gewindestift	Grub Screw	2	GB 119-86 - C 3 x 18	
828	Überwurfmutter	Sleeve nut	2		
829	Gewindestange	Threaded rod	2		
830	Zentrierhülse	Centering bushing	2		
831	Endstück	End piece	2		
832	Gewindestift	Grub Screw	2	GB 78-85 - M6 x 6	
833	Sechskantmutter	Hexagon nut	2	GB 6170-86 - M6	
834	Gewindestift	Grub screw	2	GB 79-85 - M6 x 16	
835	Körper mitlaufende Lünette	Body follow rest	1		
836	Innensechskantschraube	Socket head screw	2	GB 70-85 - M8 x 45	
CPL	mitlaufende Lünette komplett	Follow rest complete	1		03403040LM

TM4010_TM4010D_parts.fm

X Drehfutterschutz - Chuck protection

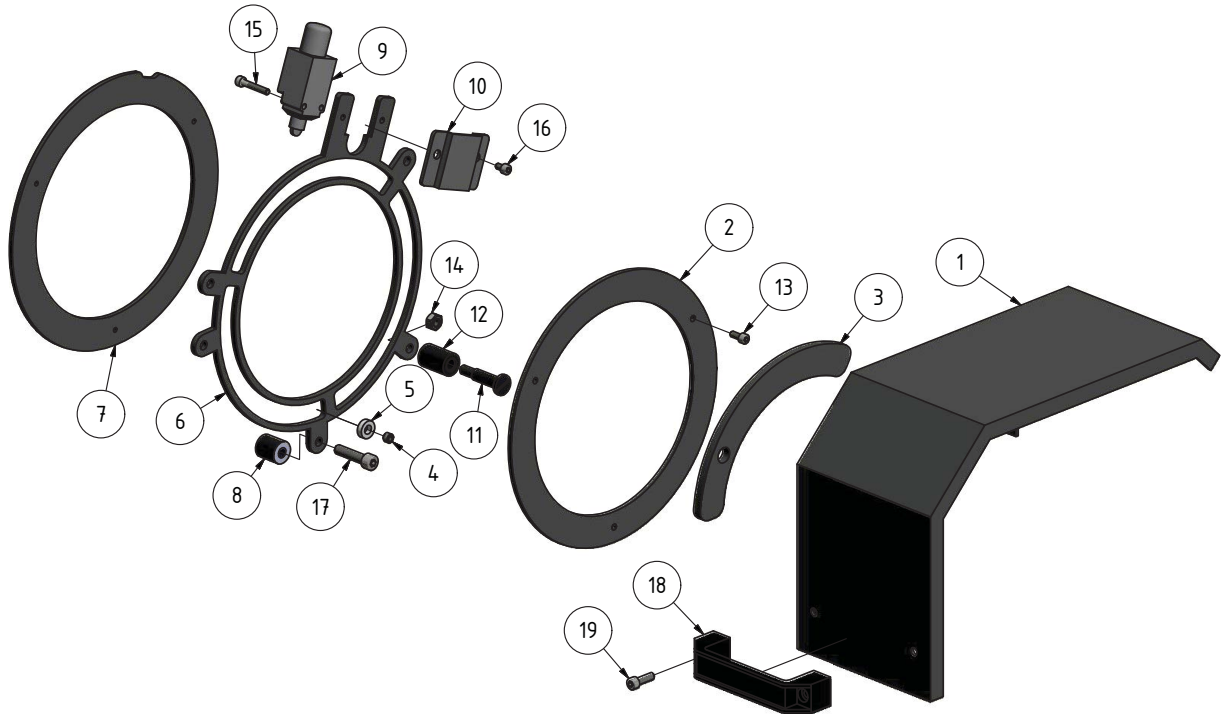

Abb. 7-24: Drehfutterschutz - Chuch protection

Ersatzteile Drehfutterschutz - Spare parts chuck protection					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Drehfutterschutz	Lathe chuck cover	1		
2	Ring	Ring	1		
3	Platte	Plate	1		
4	Buchse	Bushing	3		
5	Lager	Bearing	3		
6	Aufnahme	Collet	1		
7	Ring	Ring	1		
8	Buchse	Bushing	3		
9	Schalter	Switch	1		
10	Platte	Plate	1		
11	Schraube	Screw	2		
12	Endanschlag	Limit stop	2		
13	Innensechskantschraube	Socket head screw	3	ISO 4762 - M5 x 12	
14	Sechskantmutter	Hexagon nut	2	ISO 4032 - M8	
15	Innensechskantschraube	Socket head screw	2	ISO 4762 - M5 x 30	
16	Innensechskantschraube	Socket head screw	2	ISO 4762 - M5 x 8	
17	Innensechskantschraube	Socket head screw	3	ISO 4762 - M8 x 35	
18	Handgriff	Handle	1		
19	Innensechskantschraube	Socket head screw	2	ISO 4762 - M6 x 20	
CPL	Futterschutz komplett	Chuck protection complete	1		03403040FS

Y Späneschutz - Chip protection

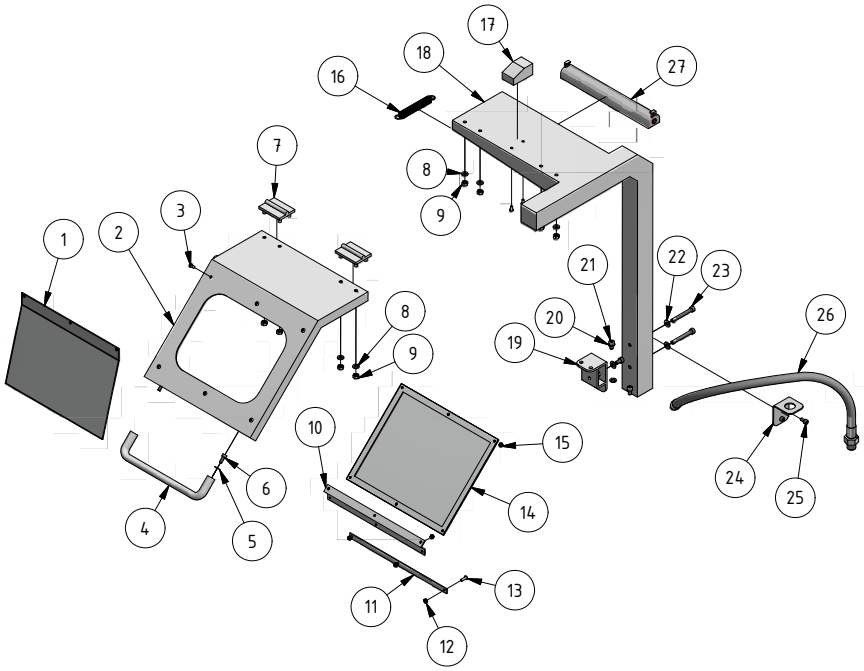

Fig.7-25:

Späneschutz - Chip protection					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Späneschutz	Chip protection	1		0340304115001
2	Fensterrahmen	Window frame	1		0340304115002
3	Schraube	Screw	6	ISO 7380 M4x12	
4	Handgriff	Handle	1		0340304115004
5	Unterlegscheibe	Washer	2	ISO 7089 M5	
6	Innensechskantschraube	Socket Head screw	2	ISO 4762 M5x12	
7	Scharnier	Hinge	2		0340304115007
8	Unterlegscheibe	Washer	8	ISO 7089 M5	
9	Mutter	Nut	8	ISO 4032 M5	
10	Leiste	Bar	1		0340304115010
11	Leiste	Bar	1		0340304115011
12	Mutter	Nut	3	ISO 4032 M4	
13	Schraube	Screw	3	ISO 7380 M4x12	
14	Scheibe	Window	1		0340304115014
15	Mutter	Nut	6	ISO 4032 M4	
16	Feder	Spring	1		0340304115016
17	Anschlag	Limit stop	1		0340304115017
18	Halterung	Holder	1		0340304115018
19	Haltewinkel	Mounting bracket	1		0340304115019
20	Unterlegscheibe	Washer	3	ISO 7089 M6	
21	Innensechskantschraube	Socket Head screw	3	ISO 4762 M6x10	
22	Unterlegscheibe	Washer	2	ISO 7089 M6	
23	Innensechskantschraube	Socket Head screw	2	ISO 4762 M6x50	
24	Haltewinkel	Mounting bracket	1		0340304115024
25	Innensechskantschraube	Socket Head screw	2	ISO 4762 M5x10	
26	Flexibler Metallkühlmittelschlauch	Flexible metal coolant hose	1		0340304115026
27	LED Maschinenleuchte	LED machine light	1		0340304115027

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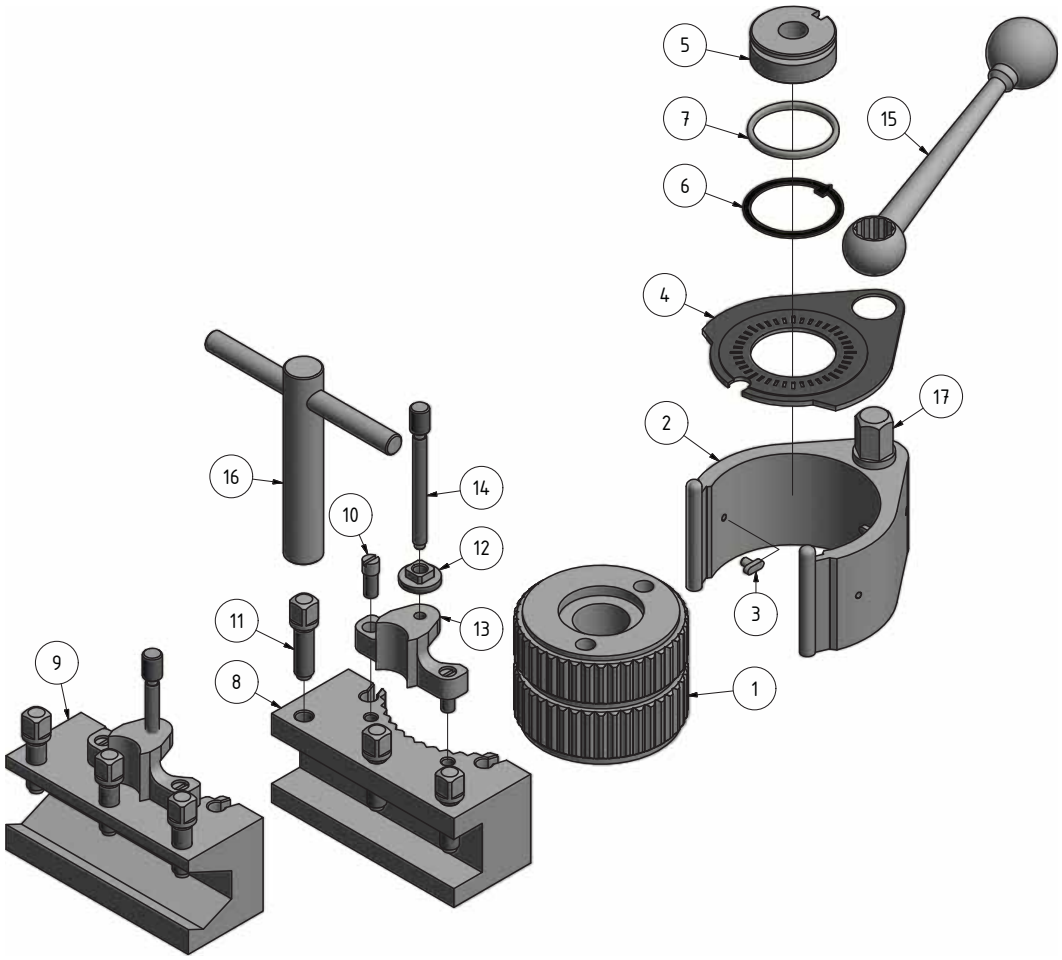
SWH 3-E

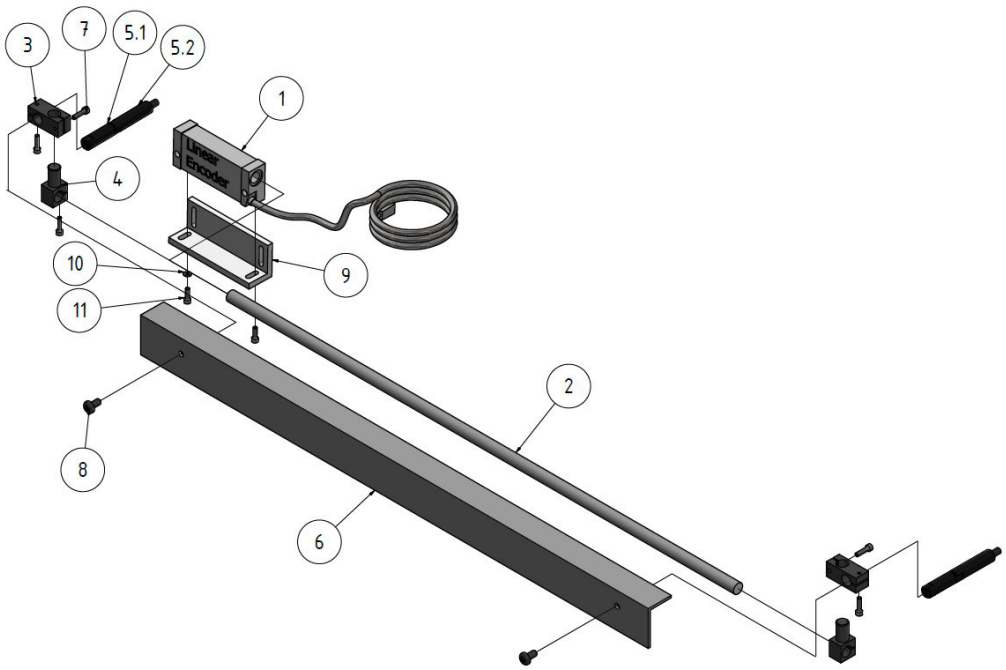


SWH 3-E					
Pos.	Bezeichnung	Designation	Menge Qty.	Größe Size	Artikelnummer Item no.
1	Zahnkranz	Crown gear	1		0338430301
2	Schnellwechselaufnahme	Quick-action collet	1		0338430302
3	Nutenstein	Slot nut	3		0338430303
4	Anzeige-Skala	Indicator scale	1		0338430304
5	Zentrierscheibe	Centering washer	1		0338430305
6	Führungsstück	Guide piece	1		0338430306
7	Feder	Spring	1		0338430307
8	Werkzeughalter Vierkantmeißel Typ D	Holder square tool, Typ D	1		3384304
9	Werkzeughalter Rundmeißel Typ H	Holder round tool, Typ H	1		3384322
10	Zylinderschraube	Head cap screw	4	32G-5/32	0338430310
11	Klemmschraube	Locking screw	6	M7x30	0338430311
12	Kontermutter	Counter nut	2	32G-5/32	0338430312
13	Oberteil-Höhenverstellung	Top adjustment of height	2		0338430313
14	Höhenverstellschraube	Screw adjustment of height	2	32G-5/32	0338430314
15	Ringschlüssel	Ring spanner	1		0338430315
16	Vierkantschlüssel	Square socket key	1		0338430316
17	Exzenter	Eccentric	1		0338430317

SWH3_parts.fm

7.5 MSSR Linear Encoder - Ersatzteilzeichnungen - Spare part drawings

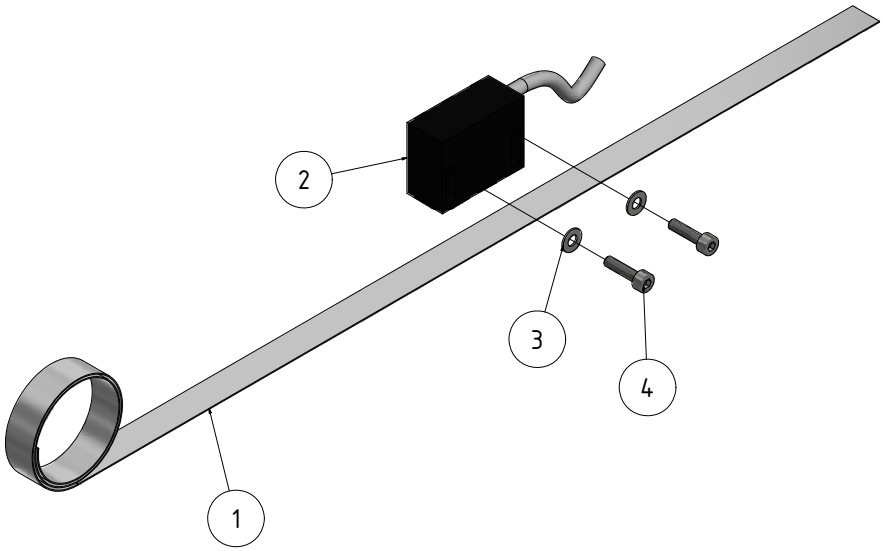
A Großer MSSR Messwandler - Large Linear encoder



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

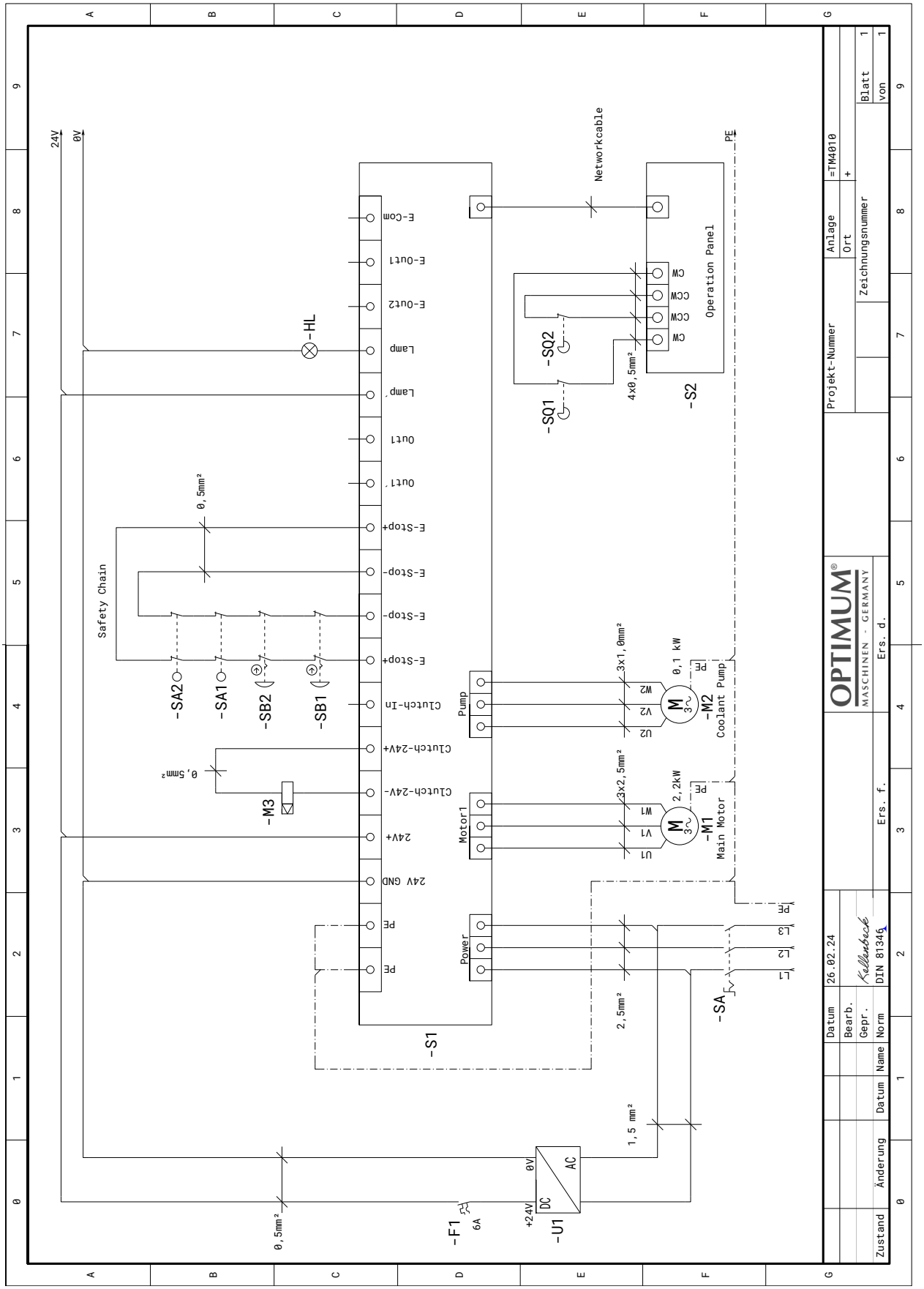
A Magnetsensor - Magnetic sensor



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

Sensor-components.fm

7.7 Schaltplan - Wiring diagram



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Ersatzteilliste elektrische Bauteile - Spare part list electrical components					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
U1	AC / DC Transformator	AC / DC transformer	1	230V AC / 24V DC	03403030U1
F1	Sicherungsautomat	Circuit breaker	1		03403030F1
HL	Meldeleuchte	Indicator light	1		03403030HL
M1	Antriebsmotor Spindel	Spindle motor	1		03403030M1
M2	Motor Kühlmittelpumpe	Coolant pump motor	1		03403030M2
M3	Kupplung	Clutch	1		03403030M3
SA	Hauptschalter	Main switch	1		03403030SA
SA1	Schalter Drehfutterschutz	Rotary chuck guard switch	1		03403030SA1
SA2	Schalter Wechselradabdeckung	Change wheel cover switch	1		03403030SA2
SB1 / SB2	Not-Halt Schalter	Emergency stop switch	2		03403030SB1
S1	Integrierte Maschinensteuerung	Integrated machine control system	1		03403030S1
S2	Drucktasten Bedienpanel	Push buttons Control panel	1		03403030S2
	Digitale Positionsanzeige	Digital position display	1	TM4010D only	

Schmierstoffe Lubricant Lubrifiant	Viskosität Viskosity Viscosité ISO VG DIN 51519 mm²/s (cSt)	Kennzeichnung nach DIN 51502	ARAL	BP	Esso	KLÜBER LUBRICATION	Mobil		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	• Position switch lathe chuck protection switches the machine off. • Position switch protection cover headstock machine switches off • EMERGENCY-STOP mushroom switch activated	• Check position switch lathe chuck protection, adjust • Check or adjust the position switch of protective cover headstock. • Unlock the emergency-stop mushroom switch
Indicator light is not lit	• Control transformer is defective • Indicator light is defective	• Replace the transformer • Replace indicator light
Machine illumination does not work	• Control transformer is defective	• Replace the transformer
Motor hums	• Fuse is defective	• Replace the fuse
Surface of workpiece too rough	• Lathe tool blunt • Lathe tool springs • Feed too high • Radius at lathe tool tip too small	• Resharpen lathe tool • Clamp lathe tool with less overhang • Reduce feed • Increase radius
V-belt squeaks V-belt slips	• V-belt wear down • V-belt tension is too loose	☞ V-belt check, re-tighten on page 58
Speed of rotation varies too much	• V-belt wear down • V-belt tension is too loose	☞ V-belt check, re-tighten on page 58
Workpiece becomes conical	• Centre are not aligned (tailstock offset) • Top slide is not exactly set to zero (when turning with the top slide)	• Align the tailstock to the centre • Align the top slide exactly
Lathe rattles	• Feed too high • Main bearings have clearance	• Reduce feed • Have the main bearings readjusted
Centring point runs hot	• Workpiece has expanded	• Loosen tailstock centre
Lathe tool has a short service life	• Cutting speed too high • For large infeed • Insufficient cooling	• Reduce cutting speed • Lower delivery / finishing stock allowance not over 0.5 mm) • More cooling
Flank wear too high	• Clearance angle too small (lathe tool "pushes") • Lathe tool tip not adjusted to centre height	• Increase clearance angle • Correct height adjustment of the lathe tool
Cutting edge breaks off	• Wedge angle too small (heat buildup) • Grinding cracks due to improper cooling • Excessive play in the spindle bearings (oscillations occur)	• Set greater wedge angle • Cool uniformly • Have the clearance in the spindle bearing arrangement re-adjusted
Turned thread is wrong	• Lathe tool is clamped incorrectly or grinding has been started the wrong way • Wrong pitch • Wrong diameter	• Set the lathe tool to the centre, grind angle correctly Use 60° lathe tool for metric threads, 55° lathe tool for inch thread • Adjust right pitch • Turn the workpiece to the correct diameter

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9 Appendix

9.1 Copyright

9.2 Terminology/Glossary

Term	Explanation
Headstock	Housing for the feed gear and the synchronous belt pulleys.
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 lathe saddle which moves transversely 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.
2	Changed Feed values	1.0.1
4.10.1 ; 4.14.1	Feed and thread table inserted	1.0.2

9.4 Liability claims/warranty

Besides 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 as part of a single contractual provision.

- Liability or warranty claims are processed at OPTIMUM GmbH's discretion 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 a standard wear as intended such as e.g. V-belts, ball bearings, illuminants, filters, sealings, 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:

- O Fragile goods
  (Goods require careful handling)

- O Protect against moisture and humid environment

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

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O 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 2002/96/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 ► „ Headstock“ on page 58
- O from the feed gear, drain hole ► „ Feed gear“ on page 57
- O from the apron, drain hole ► „ Apron“ on page 57

→ Disassemble the drive motor.

9.6.4 Packing and loading

→ Place the machine on 2 palettes to allow for removal transport
► Load attachment points on page 23

→ Bolt the machine to the through holes of the machine base with the pallets.

→ Dismantle the splash guard.

→ Tense up the machine with tensioning belts on the machine bed.

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.

9.8 Disposal of lubricants and cooling lubricants

ATTENTION!

Please imperatively make sure to dispose of the used coolant and lubricants in an environmentally compatible manner. Observe the disposal instructions of your municipal waste management companies.

INFORMATION

Used coolant emulsions and oils should not be mixed since it is only possible to reuse oils without pre-treatment when they have not been mixed.

The disposal instructions for used lubricants are made available by the manufacturer of the lubricants. If necessary, request the product-specific data sheets.

9.9 Disposal via municipal collection facilities

Disposal of used electrical and electronic components
(Applicable in the countries of the European Union and other European countries with a separate collecting system for those devices).

The sign on the product or on its packing indicates that the product must not be handled as common household waste, but that is needs to be disposed of at a central collection point for recycling. Your contribution to the correct disposal of this product will protect the environment and the public health. Incorrect disposal constitutes a risk to the environment and public health. Recycling of material will help reduce the consumption of raw materials. For further information about the recycling of this product, please consult your District Office, municipal waste collection station or the shop where you have purchased the product.

9.10 Product follow-up

We are required to perform a follow-up service for our products which extends beyond shipment.

We would be grateful if you could send us the following information:

- Modified settings
- Any experiences with the lathe which might be important for other users
- Recurring malfunctions

Optimum Maschinen Germany GmbH
Dr.-Robert-Pfleger-Str. 26
D-96103 Hallstadt, Germany
Fax +49 (0) 951 - 96 555 - 888
email: info@optimum-maschinen.de

OPTIMUM®
MASCHINEN - GERMANY

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: TM4010
TM4010D

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, 2024-05-31

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