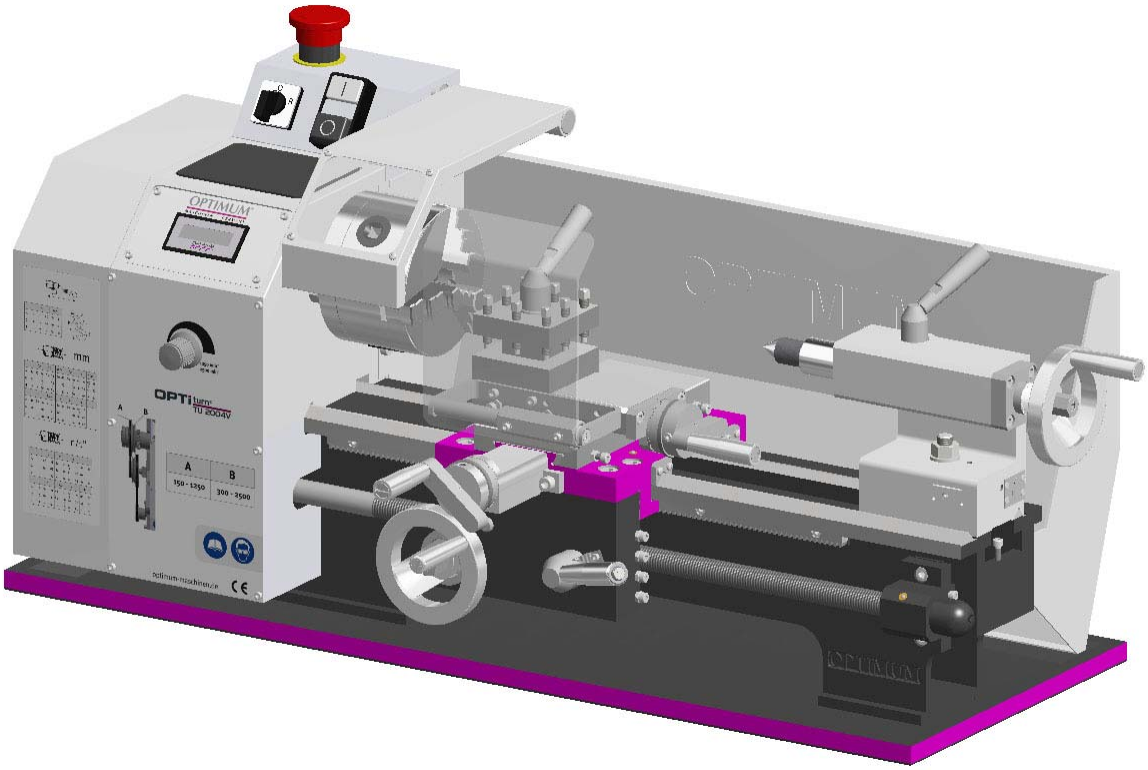
OPTIMUM
MASCHINEN - GERMANY

Operating manual

Version 1.0.3

Lathe

OPTIturn® TU 2004V



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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

Mail: info@optimum-maschinen.de

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1 Safety

Glossary of symbols

☞	gives further advice
➜	calls on you to act
❍	enumerations

This part of the operating instructions

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

In addition to these operation instructions, please observe

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

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

If European standards are not applied at the national legislation of the country of destination, the specific applicable regulations of each country are to be observed.

If necessary, the required measures must be taken to comply with the specific regulations of each country before the lathe is used for the first time.

Always keep this documentation close to the lathe.

INFORMATION

If you are unable to solve a problem using these operating instructions, please contact us for advice:

Optimum Maschinen Germany GmbH
Dr. Robert-Pfleger-Str. 26

D- 96103 Hallstadt

Email: info@optimum-maschinen.de

1.1 Safety instructions (Warning notes)

1.1.1 Classification of hazards

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

Ideogram	Warning alert	Definition / consequence
	**DANGER!**	Threatening danger that will cause serious injury or death to people.
	WARNING!	A danger that might cause severe injury to the personnel or can lead to death.
	CAUTION!	Danger or unsafe procedure that might cause injury to people or damage to property.
	**ATTENTION!**	Situation that could cause damage to the machine and product and other types of damage. No risk of injury to people.
	**INFORMATION**	Application 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 by

general danger

by a warning of

injury of hands,

hazardous electrical voltage,

or

rotating parts.

1.1.2 Other pictograms

Warning danger of slipping!

Caution, danger of explosive substances!

Warning of automatic start-up!

Warning hot surface!

Warning biological hazard!

Switching on forbidden!

Pull the main plug!

Use safety glasses! protection

Use ear protection!

Use protective gloves!

Use protective boots!

Use protective suit!

Protect the environment!

Contact address

1.2 Intended use

WARNING!

In the event of improper use, the lathe

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

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

The lathe is designed and manufactured for straight turning and facing round and regular formed
or regularly shaped three-, six-, or twelve-square workpieces in cold metal, castings and plastics or similarmaterials that do not constitute a health hazard or do not create dust, such as wood, Teflon® etc.

The lathe must only be installed and operated in a dry and well-ventilated place. The clamping of workpieces in the chuck may only be done with the special chuck key.

If the lathe is used in any way other than described above, modified without authorization of , Improper use! 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 or CE conformity will expire due to any constructive technical or procedural changes which had not been performed by the company Optimum Maschinen Germany GmbH.

It is also part of proper use that

- observe the limits of the lathe,
- the operating manual is constantly observed,
- the inspection and maintenance instructions are observed. ☞ "Technical data“ on page 17

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

WARNING!

Heaviest injuries due improper use.

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

INFORMATION

The lathe TU2004V is built according to the standard DIN EN 55011 class B.

The class B (machine tools) is intended to be used in residential facilities, where the power is supplied via a public low voltage supply system.

ATTENTION!

If the lathe is not used as intended or if the safety directives or the operating instructions are ignored the liability of the manufacturer for any damages to persons or objects resulting hereof is excluded and the claim under guarantee is becoming null and void!

1.3 Reasonably foreseeable misuse

Any other use as the one determined under the "Intended use" or any use beyond the described use shall be deemed as not in conformity and is forbidden.

Any other use has to be discussed with the manufacturer.

It is only allowed to process metal, cold and non-inflammable materials with the lathe.

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

The operators must be qualified.

1.3.1 Avoiding misuses

➜ Using suitable cutting tools.
➜ Adapting the speed adjustment and feed to the material and workpiece.
➜ Clamp workpieces firmly and vibration-free.

1.4 Possible dangers caused by the lathe.

The lathe has undergone a safety inspection (analysis of danger with assessment of risks). It has been designed and built on the basis of this analysis using the latest technological advances.

Nonetheless, there remains a residual risk, since the machine operates with

- high revolutions,
- rotating parts,
- with electrical voltages and currents.

We have used construction resources and safety techniques to minimize the health risk to personnel resulting from these hazards.

If the lathe is used and maintained by the staff 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,
- strictly follow these operating instructions.

In the event of improper use

- there may be a risk to the personnel,
- there may be a risk to the machine and other material values,
- the correct function of the lathe may be affected.

Always disconnect the lathe if cleaning or maintenance work is being carried out, or is no longer in use.

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 installations carried out by the operator must incorporate the prescribed safety devices.

This is your responsibility being the operating company!

☞ **"Safety measures during operation“ on page 11**

1.5 Qualification of personnel

1.5.1 Target group

This manual is addressed to

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

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

Always disconnect the machine plug from the mains. This will prevent it from being used by unauthorized persons.

INFORMATION

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

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

In the event of improper use

- there may be a risk to the personnel,
- there may be a risk to the machine and other material values,
- the correct function of the lathe may be affected.

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 which need to be performed beyond the operation in the standard mode must only be performed by the operator if it is indicated in these instructions and if the operating company expressively commissioned the operator.

Electrical specialist

Due to his professional training, knowledge and experience as well as his knowledge of respective standards and regulations the electrical specialist is able to perform works on the electrical system and to recognise and avoid any possible dangers himself.

The electrical specialist is specially trained for the working environment in which he is working and knows the relevant standards and regulations.

Specialist personnel

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

Instructed person

Instructed personnel were instructed by the operating company about the assigned tasks and any possible risks in case of improper behaviour.

1.5.2 Authorized personnel

WARNING!

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

Only authorized personnel may operate the machine!

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.

1.5.3 Obligations of the operating company

The operator must instruct the staff at least once per year regarding

- all safety standards that apply to the machine.
- the operation,
- accredited technical guidelines.

The operator must also

- check personnel‘s state of knowledge,
- document the trainings/instructions,
- require personnel to confirm participation in training/instructions by means of a signature,
- check whether the personnel is working safety- and risk-conscious and observe the operating instructions.

1.5.4 Obligations of the operator

The operator must

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

1.5.5 Additional requirements regarding the qualification

For work on the electric components or operating materials there are additional requirements:

- Must only be performed by a qualified electrician or person working under the instructions and supervision of a qualifiedelectrician.
- Before carrying out work on electrical components or operating units, the following measures must be taken, in the order given.

➜ disconnect all poles.

➜ Secure against switching on.

➜ Check if the machine is zero potential.

1.6 Operators positions

The operator’s position is in front of the machine.

1.7 Safety measures during operation

CAUTION!

Risk due to inhaling of health hazardous dusts and mist.

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.

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 safely avoid health risks.

CAUTION!

Risk of winding-up or cutting damages 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.

1.8 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 activated or has failed, the lathe must only be used if you

- the cause of the failure has been removed,
- you have made sure that there is no existing danger for 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 machine. The possible consequences are

- **injuries may occur due to workpiece or parts of workpieces flying off,**
- **contact with rotating parts,**
- **a fatal electrocution.**

WARNING!

The separating protective equipment which are made available and delivered together with the machine are designed to reduce the risk of workpieces or fractions of them which being expelled, but not to remove them completely. Always work carefully and observe the limits of their machining process.

The lathe includes the following safety devices:

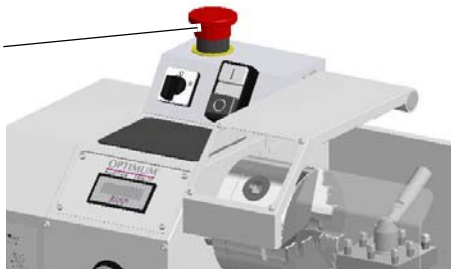
- a EMERGENCY STOP button
- a protective cover on the headstock,
- a special key for the lathe chuck,
- a lathe chuck protection with position switch,

1.9 EMERGENCY-STOP button

The EMERGENCY-STOP button switches the machine off.

Knocking on the emergency stop device triggers an emergency stop.

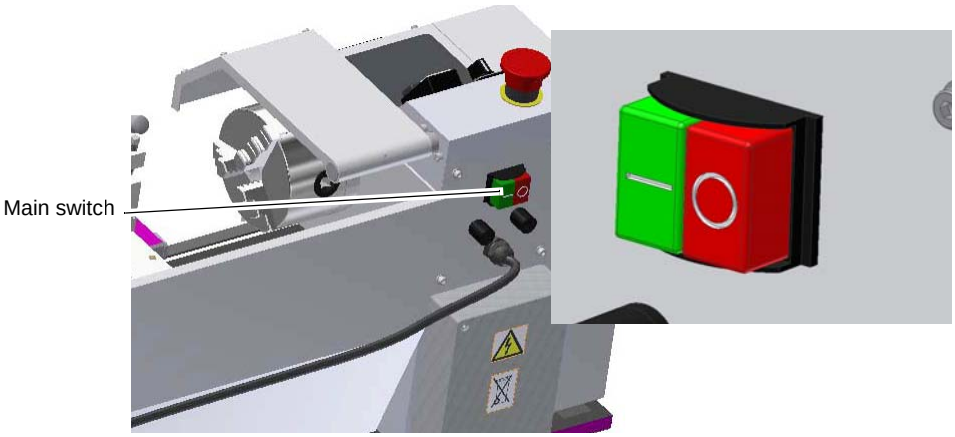
After actuating the button, turn it to the right, in order to restart the machine.



Img.1-1: EMERGENCY-STOP button

1.9.1 Main switch

The lathe is equipped with a main switch. When the main switch is switched off, the power supply to the machine is completely interrupted.



Img.1-2: Main switch

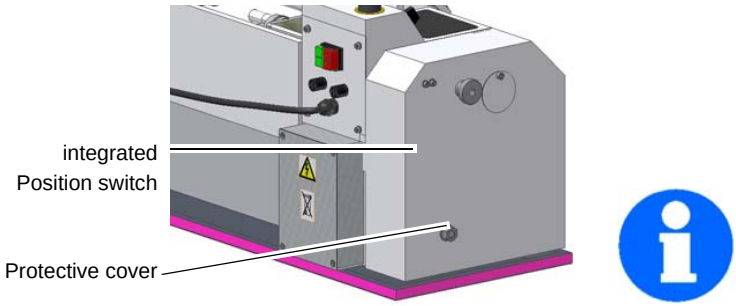
1.9.2 Protective cover with safety switch

The spindle head of the lathe is equipped with a fixed, separating protective cover.

The locked position is monitored by means of an electrical limit switch.

INFORMATION

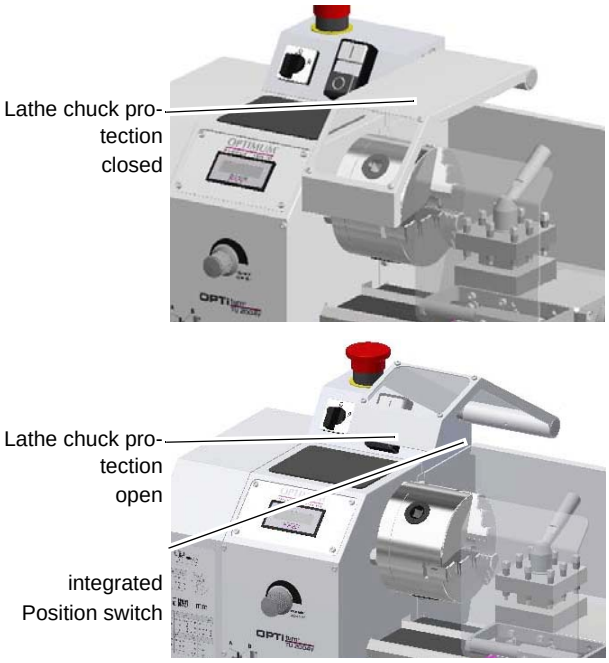
It is not possible to start the machine until the protective cover is closed.



Img.1-3: for the protective cover of the headstock

1.9.3 Lathe chuck protection with position switch

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



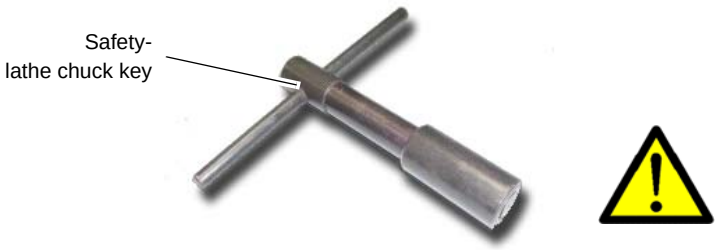
Img. 1-4: Lathe chuck protection

1.9.4 Lathe chuck key

The lathe is equipped with a special key for chucks. Once the lathe chuck key has been released, it is pushed out of the lathe chuck by a spring.

CAUTION!

Only operate the lathe using this key.



Img. 1-5: Lathe chuck key

1.10 Safety check

Check the lathe regularly.

Check all safety devices

- before starting work,
- once a week,
- after every 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 (replace if necessary).

INFORMATION

Use the following table in order to organize the checks.

General check		
Equipment	**Check**	**OK**
Protective covers	Mounted, firmly bolted and not damaged	
Signs, Markings	Installed and legible	
Date:	**checked by (signature):**	

Functional check		
Equipment	**Check**	**OK**
EMERGENCY-STOP switch	When the EMERGENCY STOP push button is activated, the lathe must switch off.	
Lathe chuck key	Once the chuck key has been released, it should be automatically pressed out of the lathe chuck.	
Lathe chuck protection / protective cover headstock	The lathe shall only run with the lathe chuck protection / protective cover headstock closed.	

1.11 Personnel protective equipment

For certain work personal protective equipment is required.

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

Use protective gloves when handling pieces with sharp edges.

During operation of the lathe, the wearing of gloves is prohibited because of the risk of winding up.

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

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

Before starting work, make sure that the prescribed personal protective equipment is available at the workplace.

CAUTION!

Dirty or contaminated personnel protective equipment can cause diseases. Clean it each time after use and once a week.

1.12 For your own safety during operation

WARNING!

Before activating the machine assure yourself that this will neither endanger other persons nor cause damage to equipment.

Avoid any risky working practices:

- Make sure that nobody is endangered by your work.
- Clamp the workpiece tightly before activating the lathe.
- For clamping workpieces, only use the special chuck key supplied.
- Mind the maximum chuck opening.
- Wear safety goggles.
- Do not remove the turning chips by hand. Use a chip hook and / or a hand brush to remove turning chips.
- Clamp the turning tool at the correct height and with the least possible overhang.
- Turn off the lathe before measuring the workpiece.
- The instructions mentioned in these operating instructions have to 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 competent supervisory authority, responsible for your company.
- 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.

We specially point out the specific dangers when working with and on the machine.

1.13 Disconnecting and securing the lathe

- Pull the mains plug before beginning any maintenance or repair work or or switch off the supply voltage to the lathe. All machine components and hazardous voltages and movements are disconnected.
- Attach a warning sign on the machine.

1.14 Using lifting equipment

WARNING!

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

Check that the lifting equipment and load-suspension gears are of sufficient load capacity and are 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.

Never walk under suspended loads!

1.15 Mechanical maintenance work

Remove or install protection safety devices before starting any maintenance work and re-install them once the work has been completed.This includes:

- Covers,
- Safety indications and warning signs,
- earth (ground) connections.

If you remove protection or safety devices, refit them immediately after completing the work.

Check if they are working properly!

2 Technical data

The following information are the dimensions and indications of weight and the manufacturer‘s approved machine data of lathe TU2004V.

2.1 Electrical connection

Connection	230V ; 600 W ~ 50Hz

2.2 Machine data

Height of centres [mm]	100
Max. swing [mm]	200
Max. swing over Cross slide [mm]	110
Distance between centres [mm]	300
1 Spindle speed range infinitely variable [min^{-1}]	150 - 1250
2. Spindle speed range infinitely variable [min^{-1}]	300 - 2500
Spindle flange	☞ "Spindle nose“ on page 31
Spindle taper	MT 3
Passage 3-jaw chuck	20
Travel top slide [mm]	55
Travel cross slide [mm]	120
Tailstock cone	MT 2
Tailstock sleeve travel [mm]	65
Longitudinal feed [mm/revolution]	0.11 and 0.2
Pitch - Metric	0.25|0.4|0.5|0.6| 0.7|0.75|0.8 |1|1.25 |1.5|1.75|2|2.5|3
Pitch - Inches	8 | 10 | 11 | 14 | 16 | 19 | 20 | 22 | 28 | 38 | 40 | 44

2.3 Dimensions

Height / Length / Width [mm]	2.7 “Dimensions, installation plan TU2004V“ on page 19
Total weight [kg]	65

2.4 Operating material

Slideways, lubrication nipples	e.g. machines oil (Mobil Oil, Fina, ...) We recommend the use of weapon oil, weapon oil is acid-, stain- and resin-free.
Change gears	Chain oil (spray box)

2.5 Environmental conditions

Temperature	5 - 35 °C
Humidity	25 - 80 %

2.6 Emissions

The generation of noise emitted by the lathe is less than 75 dB(A).
If the lathe is installed in an area where various machines are in operation, the noise exposure (immission) on the operator of the at the working place may exceed 80dB(A).

INFORMATION

This numerical value was measured on a new machine under proper operating conditions. Depending on the age respectively on the wear of the machine it is possible that the noise behaviour of the machine changes.

Furthermore, the factor of the noise emission is also depending on manufacturing influencing factors, e.g. speed, material and clamping conditions.

INFORMATION

The mentioned numerical value is the emission level and 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 or damping behaviour**,**
- Other noise sources, e.g. the number of machines,
- Other processes taking place in the proximity and the period of time during which the operator is exposed to the noise.

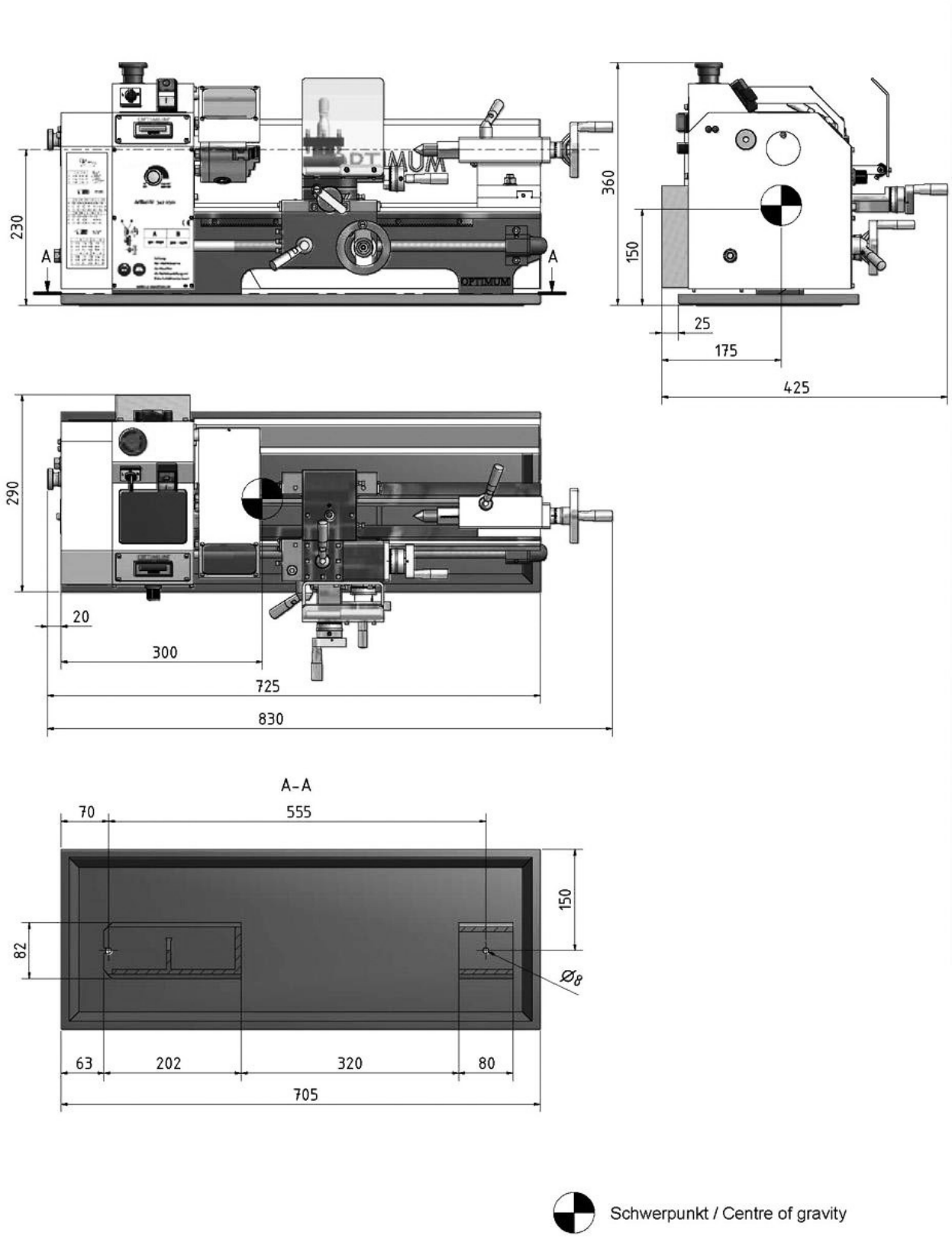
Furthermore, it is possible that the admissible exposure level might be different from country to country due to national regulations.
This information about the noise emission shall allow the operator of the machine to more easily evaluate the endangering and risks.

CAUTION!

Depending on the overall noise exposure and the basic limit values the machine operators must wear an appropriate hearing protection.

We generally recommend to use a noise protection and a hearing protection.

2.7 Dimensions, installation plan TU2004V



Img. 2-1: Dimensions, installation planTU2004V

3 Assembly

INFORMATION

The lathe is delivered pre-assembled. When the lathe is delivered, check immediately before and after unpacking hat the lathe has not been damaged during shipping and that all components are included. Also check that no fastening screws have come loose.

3.1 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.

3.2 Transport

- Centres of gravity

- Load suspension points
  (Marking of the positions for the load suspension point)

- Prescribed transportation position
  (Marking of the top surface)

- Means of transport to be used
- Weights

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 case.

WARNING!

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

Check that the lifting and load suspension gear has sufficient load 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. Never walk under suspended loads!

3.3 Storage

ATTENTION!

In case of wrong and improper storage electrical and mechanical machine components might get damaged and destroyed.

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

Follow the instructions and information on the transport case:

- Fragile goods
  (Goods require careful handling)

- Protect against moisture and humid environment

☞ "Environmental conditions“ on page 17

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

- Maximum stacking height

  Example: not stackable - do not stack a second packing case on top of the first packaging case

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 given here ☞ "Environmental conditions“ on page 17.

3.4 Installation and assembly

3.4.1 Requirements regarding the installation site

ATTENTION!

Before you install the machine let the capacity of the floor loading check by an expert. The floor or ceiling of the hall must carry the weight of the machine plus any additional parts and auxiliary equipment, as well as operator and stockpiled materials. If necessary, the floor must strengthened.

INFORMATION

In order to attain good functionality and a high processing accuracy as well as a long durability of the machine the installation site should fulfil certain criteria.

Please observe the following points:

- The device must only be installed and operated in a dry and well-ventilated place.
- Avoid places nearby machines generating chips or dust.
- The installation site must be free from vibrations also at a distance of presses, planing machines, etc.
- The substructure must be suitable for turning. Also make sure that the floor has sufficient load bearing capacity and is level.
- The substructure must be prepared in a way that possibly used coolant cannot penetrate into the floor.
- Any parts sticking out such as stops, handles, etc. have to be secured by measures taken by the customer if necessary in order to avoid endangerment of persons.
- Provide sufficient space for the staff preparing and operating the machine and transporting the material.
- Also consider that the machine is accessible for setting and maintenance works.
- The mains plug and the main switch of the lathe has to be freely accessible.
- Provide for sufficient illumination (Minimum value: 300 lux).
  In case of little intensity of illumination provide for additional illumination i.e. by a separate workplace illumination.

INFORMATION

The mains plug of the lathe must be freely accessible.

3.4.2 Load suspension point

➜ Fasten the load suspension gear around the lathe bed.

➜ Make sure that you distribute the loads evenly so that the lathe cannot turn over while lifting.

➜ Make sure that no add-on pieces or varnished parts are damaged due to the load suspension.

3.4.3 Installation

WARNING!

Danger of crushing and overturning. The lathe must be installed by at least 2 people.

➜ Check the horizontal orientation of the base of the lathe with a spirit level.

➜ Check that the foundation has sufficient floor-load capacity and rigidity.

ATTENTION!

An insufficient rigidity of the substructure leads to superposition of vibrations between the machine and the substructure (natural frequency of the components). Critical

speeds and moves in the axis with displeasing vibrations are rapidly achieved in case of insufficient rigidity of the whole system and will lead to bad turning results.

➜ Position the lathe on the intended foundation.

➜ Secure the lathe using the through holes with the foundation or substructure.

☞ "Dimensions, installation plan TU2004V“ on page 19

3.5 First commissioning

3.5.1 Cleaning and lubricating

ATTENTION!

Before commissioning the machine check all screws, fixtures resp. safety devices and tighten up the screws if necessary!

WARNING!

When first commissioning the lathe by inexperienced staff you endanger people and the machine.

We do not take any liability for damages caused by incorrectly performed commissioning.

➜ Remove the anti-corrosive agents on the lathe which had been applied for transportation and storage. Therefore, we recommend you to use paraffin.

Clean machine Cleaning

➜ Do not use any solvents, cellulose thinner or any other cleaning agents which might affect the coating of the lathe when cleaning the lathe. Observe the indications and notes of the manufacturer for cleaning agents.

➜ Oil all blank machine parts using an acid-free lubricating oil.

➜ Grease the lathe according to the lubrication chart. ☞ "Inspection and maintenance“ on page 58

Control the function of movable and fixed parts. check

➜ Check if all spindles are running smoothly.

➜ Control if the fastening screws of the lathe chuck are firmly tightened.

➜ Clamp a workpiece into the lathe chuck of the lathe or bring the clamping jaws of the lathe chuck completely together before you switch on the lathe.

➜ Connect the electrical supply cable (safety plug with earthing).

Make sure that the current supply is working correctly

WARNING!

Do not stand directly in front of the lathe chuck when you turn on the machine for the first time.

3.5.2 Warming up the machine

ATTENTION!

If the lathe and in particular the lathe spindle is immediately operated at maximum load when it is cold it may result in damages.

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

3.5.3 Optionally available accessories

WARNING!

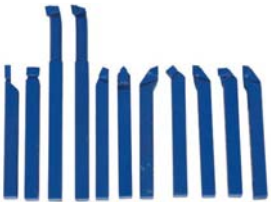
Risk by using improper workpiece clamping materials or by operating the machine with inadmissible speed.

Only use the tool holders (e.g. drill chuck) which were delivered with the machine or which are offered as optional equipment by OPTIMUM.

Only use tool holders in the intended admissible speed range.

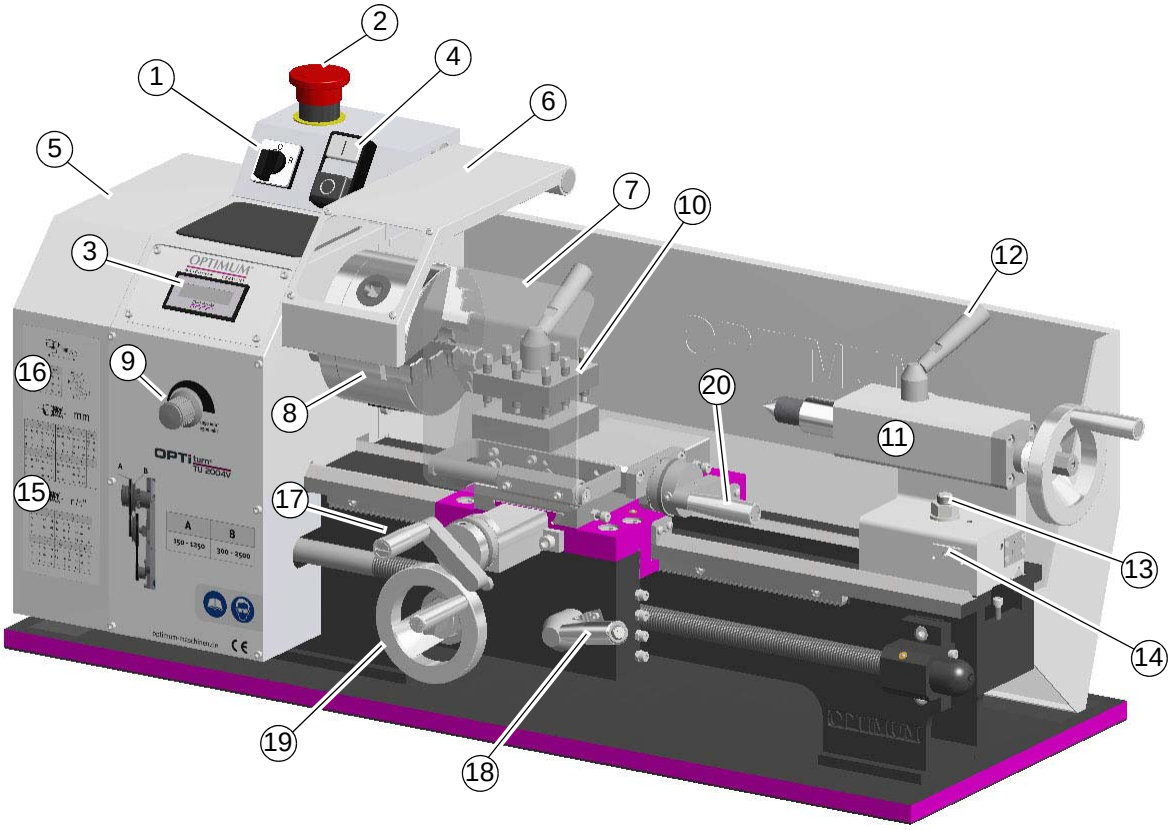
Workpiece clamping materials may only be modified in compliance with the recommendation of OPTIMUM or of the manufacturer of the clamping devices.

Designation:	Item number	
4-jaw chuck 100mm,	344 0711	
flange for 4-jaw chuck 100mm	344 0312	
Face plate Ø 170mm	344 0295	
Follow rest	344 0293	
Steady rest	344 0294	
Set of collet chucks, 1-16mm 15 pieces (ER25)	344 1109	
Collet holder ER 25	344 0305	
Quick change tool holder SWH-AA	338 4311	
Single tool holder 13x50 type D	338 4312	
Set of tools Hard metal indexable inserts 10mm, 7 pieces	344 1111	

Set of tools 8mm, 11 pieces Tipped with hard metal	344 1008	

4 Operation

4.1 Control and indicating elements



Pos.	Designation	Pos.	Designation
1	Turning direction selector	2	Emergency stop button
3	Rotation speed indicator	4	Push button ON / OFF
5	for the protective cover of the headstock	6	Lathe chuck protection
7	Chips shield	8	Lathe chuck
9	Infinitely variable speed adjustment	10	Tool holder
11	Tailstock	12	Clamping screw tailstock sleeve
13	Clamping screw	14	Adjusting screw in the front
15	Thread and feed table	16	Speed table
17	Handwheel cross slide	18	Shift lever automatic feed
19	Handwheel lathe saddle	20	Handwheel top slide

4.2 Safety

Use the lathe only under the following conditions:

- The lathe is in proper working order.
- The lathe is used as prescribed.
- The operating manual is followed.
- All safety devices are installed and activated.

All failures should be eliminated immediately. Stop the 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 Switching elements

Push button ON

The “hand actuated auxiliary switch ON” switches the rotation of the lathe on.

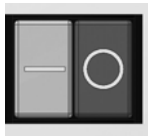
Hand actuated auxiliary switch OFF

The “hand actuated auxiliary switch OFF” switches the rotation of the lathe off.

Speed adjustment

It is possible to set the required speed using the speed adjustment.

Main switch



Interrupts or connects the power supply.

Rotation direction switch

The direction of rotation of the lathe can be switched by actuating the change-over switch.

It is possible to select a speed for each direction of rotation.

- The labelling “R” means right-handed rotation.
- The labelling “L” means left-handed rotation.

ATTENTION!

Wait until the rotation of the spindle has come to complete standstill before changing the direction of rotation by actuating the change-over switch.

A change over of the rotation direction during operation may result in a destruction of the motor and of the rotation direction switch.

INFORMATION

The rotational speed is in a clockwise direction intended low. The clockwise rotation is applied to the backward movement of the bed slide for example for thread cutting operations.

4.2.2 Switching on the machine

CAUTION!

Check that the shift lever is not activated for automatic feed.
Img.4-10: “Shift lever feed "OFF"“ on page 36

By switching on the lathe with high speed setting and activated shift lever, the lathe slide will move with high speed.

ATTENTION!

Turn the potentiometer for speed setting to the lowest possible speed before switching on. The electronics can be damaged when the machine is turned on at full speed setting.

With the ON / OFF - switches the machine is switched. The lathe can only be switched on when the change-over switch is in position "R" or "L".

Rotation direction switch

The direction of rotation of the lathe can be switched by actuating the change-over switch.

- The labelling “R” means right-handed rotation. The lathe chuck rotates counterclockwise.
- The labeling “L” means left-handed rotation. In left-handed rotation the bed slide e.g. moved back for threading. In the "0" position, the motor is switched off.

ATTENTION!

Wait until the machine has come to a complete halt before changing the rotational direction by turning the change-over switch. The machine is switched off when you perform a changing the rotational direction during operation.

➜ Perform basic setting on the lathe (speed stage, feed, etc.).

➜ Check if the protective cover of the lathe chuck and the protective cover are closed – close the protective covers if necessary.

➜ Turn the main switch on.

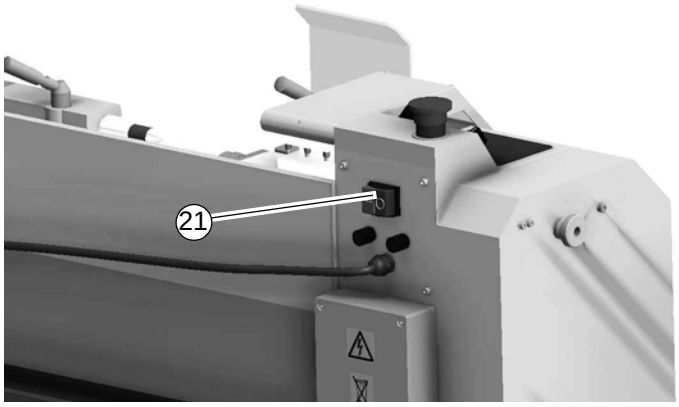
➜ Select the direction of rotation.

➜ Actuate the push button „ON“.

4.2.3 Switching off the machine

➜ Actuate the push button "OFF".

➜ If the machine stands still for a longer period of time, switch off the main switch (21) .



4.2.4 Clamping the tool

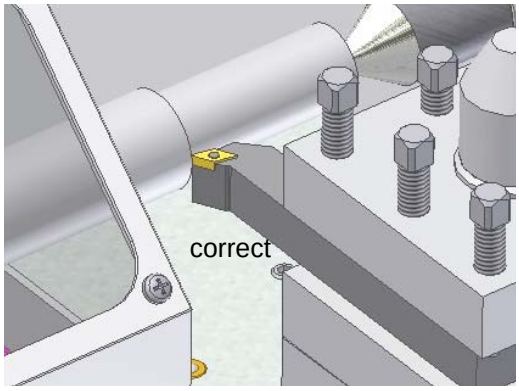
Clamp the lathe tool into the tool holder.

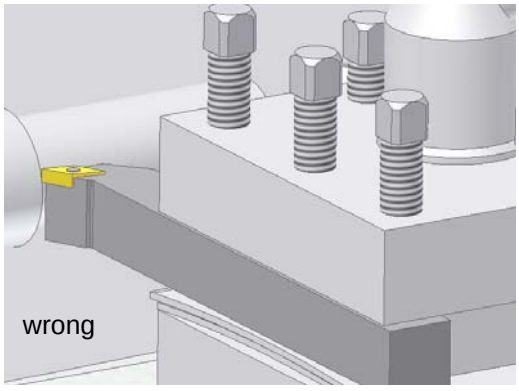
The lathe tool needs to be clamped as short and tight as possible when turning in order to be able to absorb the cutting force well and reliably during the chip formation.

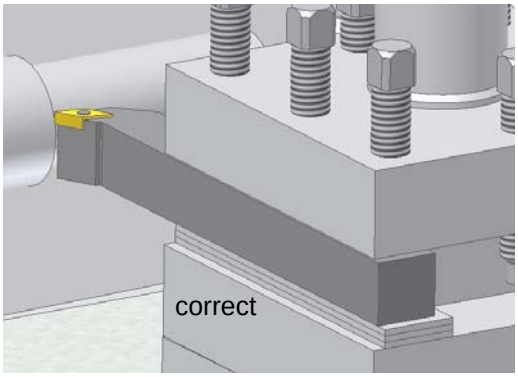
INFORMATION

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 tool to achieve the required height.

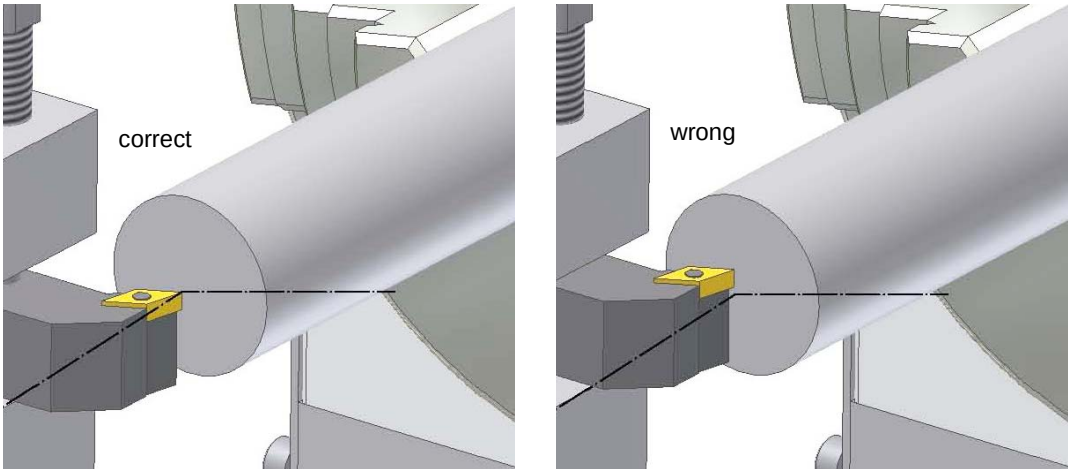






Img. 4-1: Clamping the tool

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. Here it is distinguished between cross-facing, cross-slicing and longitudinal facing.

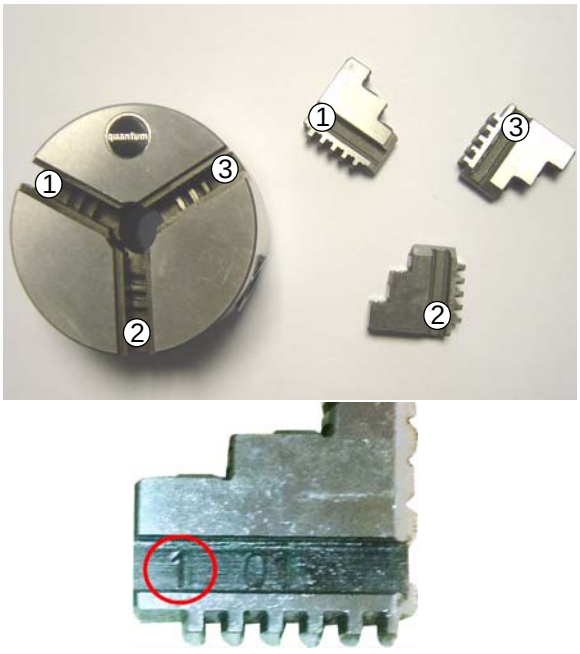


Img. 4-2: Clamping the tool

4.2.5 Replacing the clamping jaws on the lathe chuck

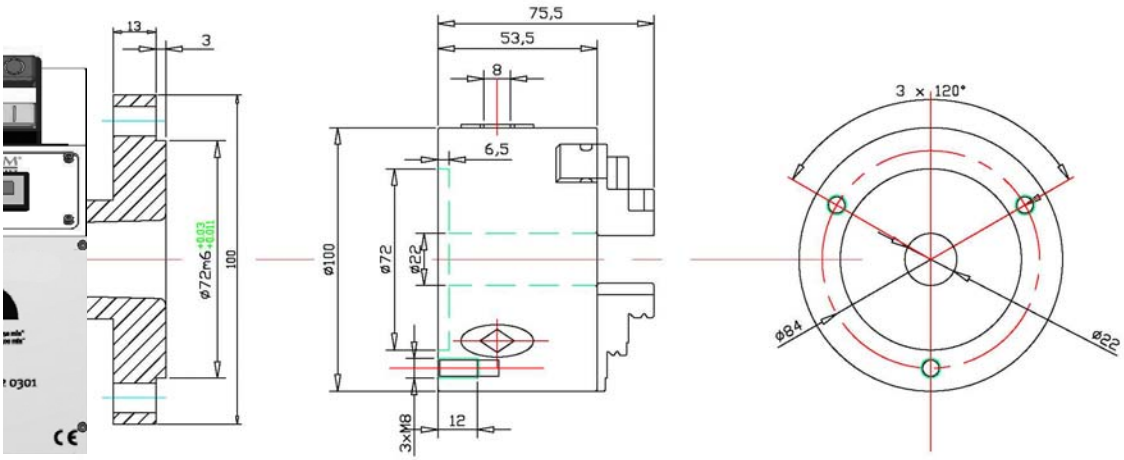
The clamping jaws and the three-jaw chuck are equipped with numbers. Insert the clamping jaws at the correct position and in the right order into the three-jaw chuck.

After the replacement, bring the jaws completely together in order to control if they are inserted correctly.



Img. 4-3: Three-jaw chuck / clamping jaws

4.2.6 Spindle nose



☞ "Optionally available accessories“ on page 24

ATTENTION!

When disassembling the workpiece carrier, it may fall on the engine bed and damage the guide rails. Put a wooden plank or another adequate part on the machine bed in order to avoid damage.

➜ Disconnect the machine from the electrical supply.

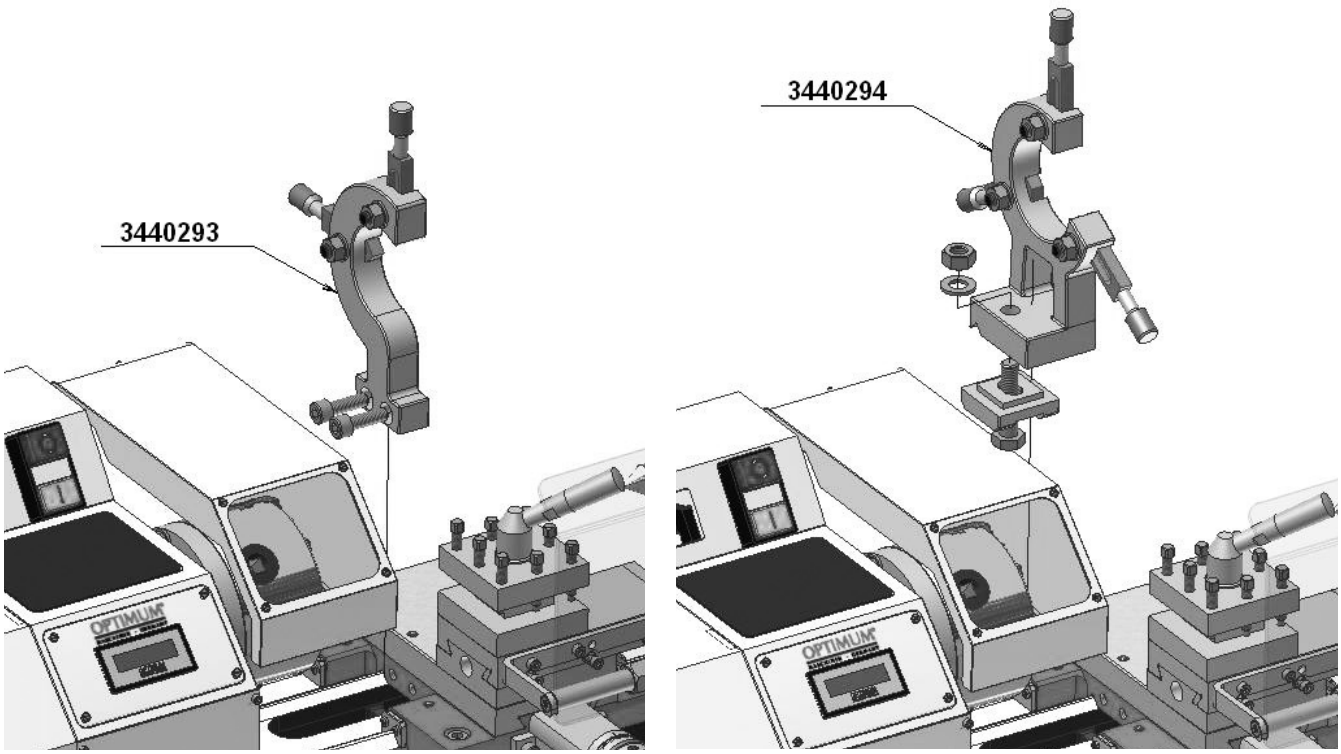
➜ Block the revolutions of the spindle for instance by inserting the square seat of the lathe chuck. Also make sure that the engine bed is not damaged by the arm of the lever.

➜ Loosen the three nuts on the flange of the lathe chuck to disassemble the workpiece carrier.

➜ Take the workpiece holder to the front.

➜ If required, loosen the workpiece carrier by knocking slight with a plastic tip or a rubber mallet.

4.2.7 Mounting of rests



Img.4-4: follow rest steady rest

4.2.8 Use of collet chucks

When using collet chucks to clamp the workpiece higher machining tolerances are available. The exchange of collet chucks for a smaller or larger diameter is simple and can be easily performed.

First, the collect chuck will be pressed into the ring of the union nut and has to rest there byitself. The workpiece will be clamped by fastening the union nut.

Make sure that you are using the correct collet chuck for the corresponding diameter in order to be able to fix the workpiece safety and firmly.

☞ "Optionally available accessories“ on page 24

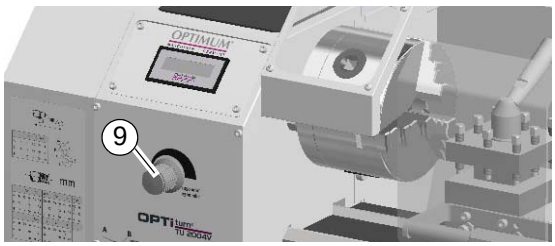
4.3 Speed adjustment

Adjust the speed with the potentiometer.

In order to use another speed range, you must change the position of the synchronous belt on the pulleys.

WARNING!

Unplug the shockproof plug of the lathe before opening the protective cover of the headstock.



A	B
150 - 1250	300 - 2500

Img. 4-5: Speed adjustment

4.3.1 Changing the speed range

- ➜ Unplug the shockproof plug from the mains.
- ➜ Detach the protective cover of the headstock.
- ➜ Screw in the hexagon socket screw (22) , thus the tension of the synchronous belt is being reduced.
- ➜ Lift the upper synchronous belt onto the required wheel diameter.
- ➜ Proceed the other way around to tighten the synchronous belt. The correct tension of the synchronous belt has been reached when you can still bend it approximately 3mm with your index finger.

ATTENTION!

Make sure the tension of the synchronous belt is correct. Excessive or insufficient tension may cause damage.

Img. 4-6: Synchronous belt position change

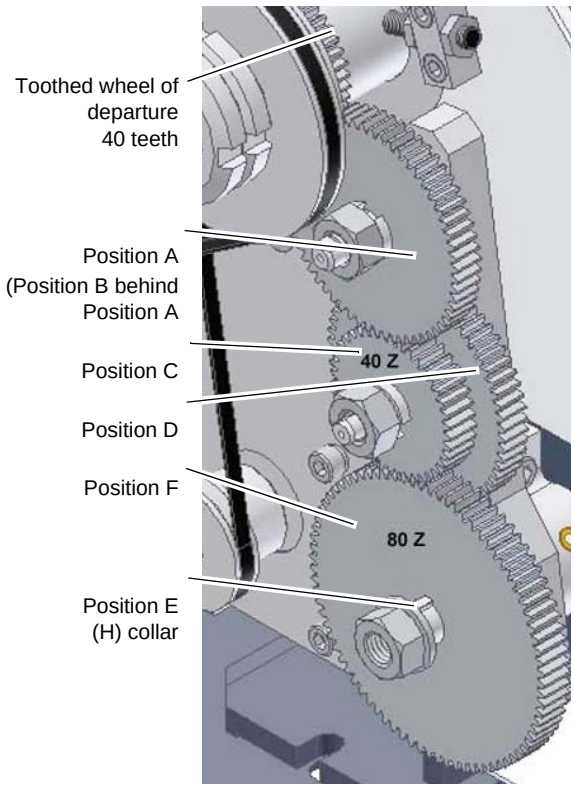
4.4 Adjusting feeds and thread pitches

In order to achieve a change of feed of a certain thread pitch, the change wheels are to be changed according to the table. You will find the complete table on the lathe.

Example:

Thread pitch 1,25mm per revolution			
A	B	52	H
C	D	40	50
E	F	H	80

- The toothed wheel of departure with cams in the toothed wheel A
- The toothed wheel A cams in the toothed wheel C
- The toothed wheel D cams in the toothed wheel F
- H means the vacuity (collar). You may as well use a smaller toothed wheel which does not cam in with any other toothed wheel.



Img. 4-7: Order of the pitch 1,25mm

➜ Unplug the shockproof plug from the mains.
➜ Detach the protective cover of the headstock.
➜ Loosen the locking screw (24) on the quadrant.

➜ Swing the quadrant to the right.

Img.4-8: Locking screw quadrant

Example of the transmission ratio: i

The thread pitch of the lead screw amounts to 2mm.

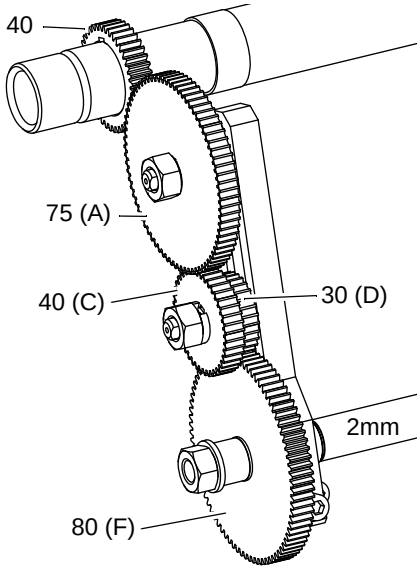
Example of thread pitch: 1,25mm

$$i = 2x\frac{n1xn2xn4}{n2xn3xn5} = 2x\frac{40xAxD}{AxCxF} = 2x\frac{40x66x50}{66x40x80} = 1,25mm$$

Example of thread pitch: 0.75mm

$$i = 2x\frac{n1xn2xn4}{n2xn3xn5} = 2x\frac{40xBxD}{AxDxF} = 2x\frac{40x75x30}{75x40x80} = 0,75mm$$

Thread pitch 0,75mm per revolution			
A	B	75	H
C	D	40	30
E	F	H	80



Img.4-9: Order of the pitch 0,75mm

- ❍ The toothed wheel of departure with 40 teeth cams in the toothed wheel A
- ❍ The toothed wheel A cams in the toothed wheel C
- ❍ The toothed wheel D cams in the toothed wheel F

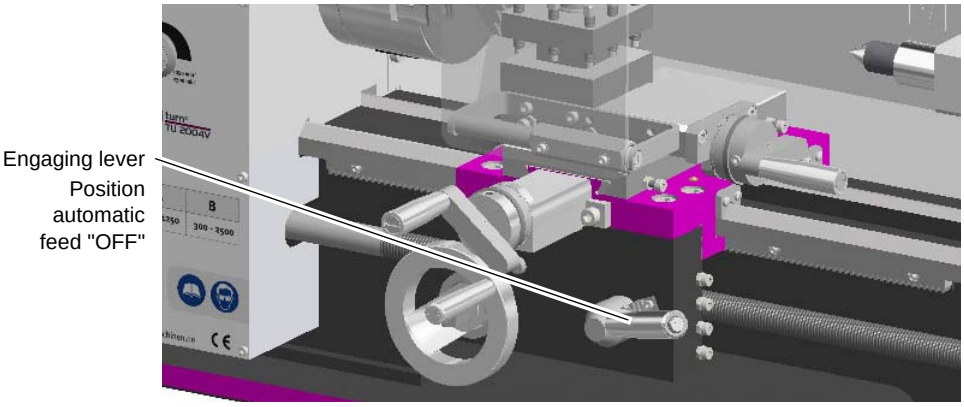
INFORMATION

Metrical threads are indicated as thread pitch. In the example above, the lathe saddle moves by 1.25mm during one turn of the lathe chuck. Inch threads are indicated as number of threads on the length of one inch. The length of one inch amounts to 25.4mm.

4.4.1 Switching on the feed

CAUTION!

By switching on the lathe with high speed setting and activated shift lever, the lathe slide will move with high speed.



Img. 4-10: Shift lever feed "OFF"

CAUTION!

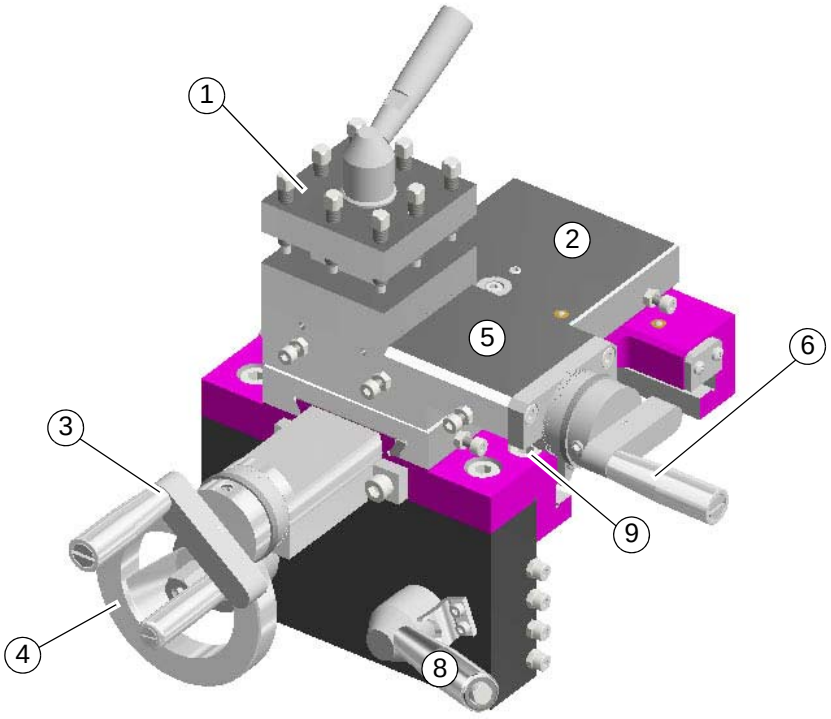
If you switch on the for instance at full speed of 2500min^{-1} with the order of the toothed wheels for thread pitch 1.25mm, the lathe saddle will travel a distance of 52 mm within one second.

Threads are always cut with the least possible speed.

ATTENTION!

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

4.5 Lathe saddle



Pos.	Designation	Pos.	Designation
1	Quadruplicate tool holder	2	Cross slide
3	Handwheel cross slide	4	Handwheel lathe saddle
5	Top slide	6	Handwheel top slide
7	Lathe saddle	8	Feed activation lever
9	Tightening screw lathe saddle		

The handwheel (4) is used to traverse the lathe saddle manually.

The cross slide (2) can be advanced and returned by turning the cross slide handwheel (3).

The top slide (5) supports the quadruple tool holder. The top slide handwheel (6) is used to traverse the top slide manually.

The automatic longitudinal feed and the feed for thread-cutting are activated and deactivated using thefeed activation lever (8). The feed is transmitted via the lead screw nut.

➜ Pull the spring-loaded handle out and push the feed activation lever down. The leadscrew nut is engaged and the automatic longitudinal feed is activated.

➜ Pull the feed activation lever up to stop the automatic longitudinal feed.

INFORMATION

Move the hand wheel (4) of the lathe saddle a little in order to facilitate the locking of the feed activation lever (8).

ATTENTION!

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

➜ Secure the lathe saddle using the tightening screw (9).

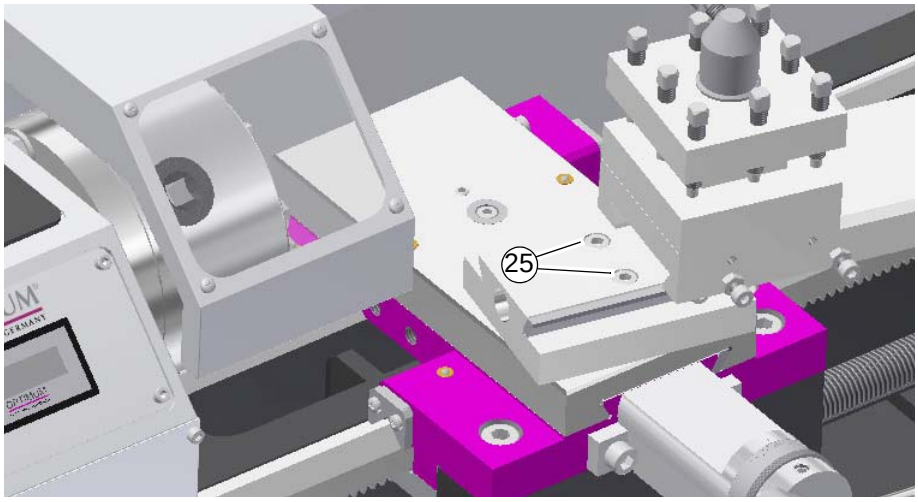
4.5.1 Turning short tapers with the top slide

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

➜ Loosen the hexagon socket screws (25) on the top slide.

➜ Swivel the top slide.

➜ Clamp the top slide again.



4.5.2 Turning tapers with the tailstock

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

➜ Loosen the locking nut of the tailstock.

➜ Unscrew the locking screw approximately half a turn.

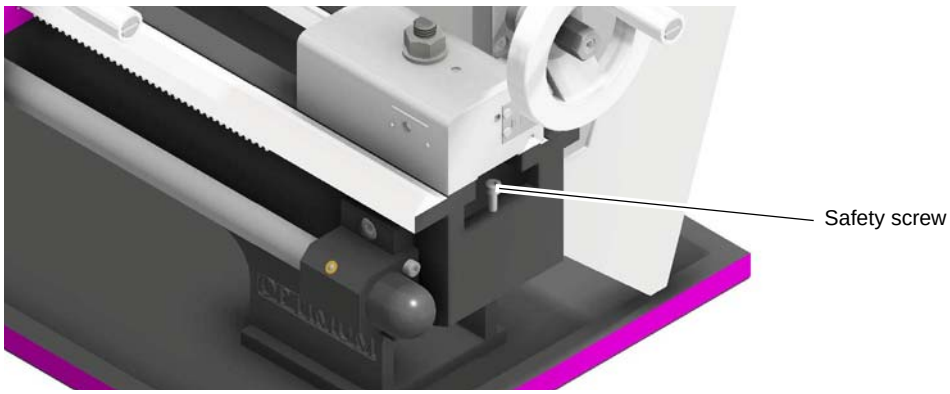
By alternately loosening and tightening the two (front and rear) adjusting screws, the tailstock is moved out of the central position. The desired cross-adjustment can be read off the scale.

➜ First retighten the locking screw and then the two (front and rear) adjusting screws. Re-tighten the adjusting screws of the tailstock.

ATTENTION!

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

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



Img.4-11: Lathe bed

4.5.3 Turning of cones with high precision

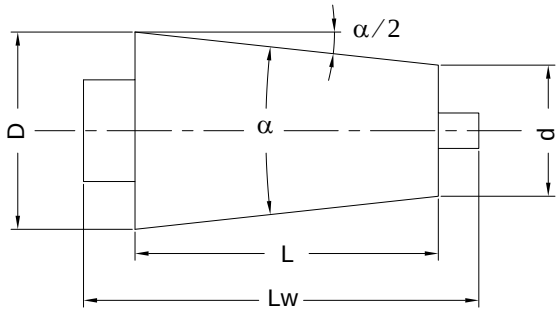


Abb. 4-12: Designation on the cone

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

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

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

Calculation

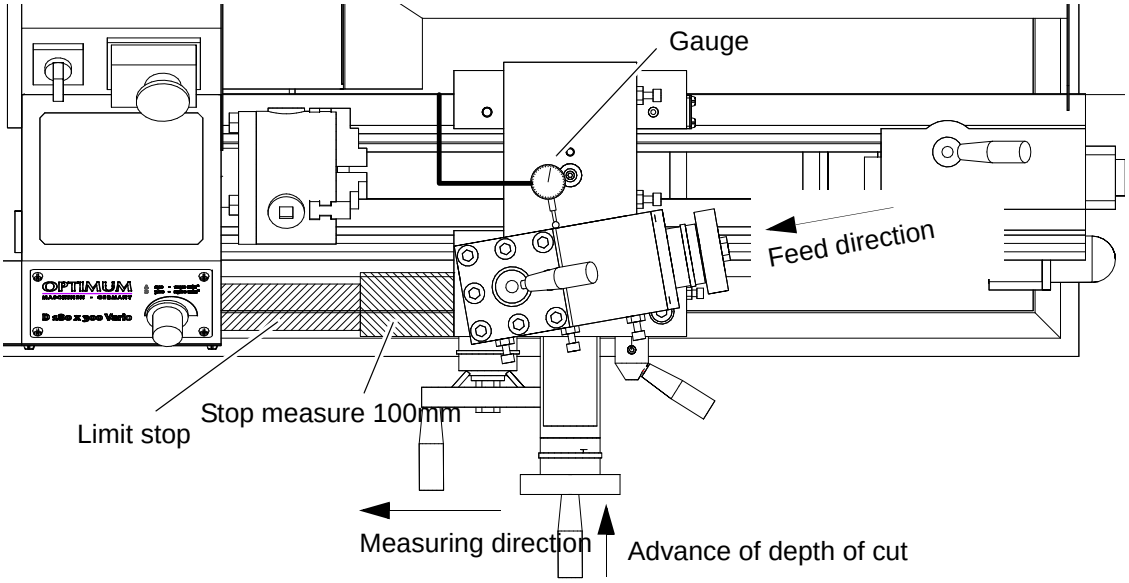
of the offset of the top slide relating to the stop measure with a length of 100mm.

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

by one calculation step (summary)
$Vo = \frac{100mm \times (D-d)}{2 \times L}$
Example: D = 30.0 mm ; d = 24.0 mm ; L = 22.0 mm
$Vo = \frac{100mm \times (30mm-24mm)}{2 \times 22mm} = \frac{100mm \times 6mm}{44mm} = 13,63mm$

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

The infeed is performed with the handwheel of the top slide. The depth of cut is advanced with the handwheel of the cross slide.

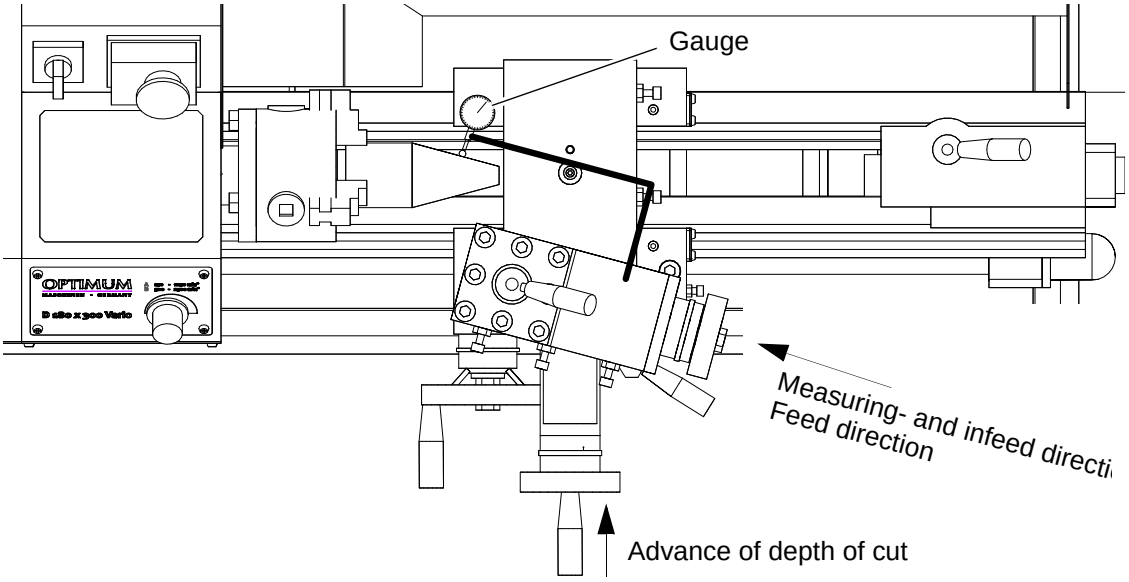


Img.4-13: Cone setting with stop measure

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

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

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



Img.4-14: Cone setting with stop measure

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

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

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

☞ "Designation on the cone“ on page 39

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

Annotation:

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

Calculation

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

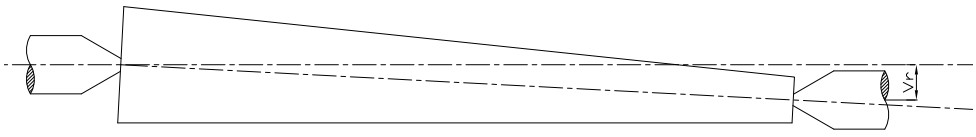
$$Vr_{max} = \frac{Lw}{50}$$

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

Example:

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

$$Vr = \frac{150}{2 \times 40} = 1,875mm \qquad Vr_{max} = \frac{150}{50} = 3mm$$



Img. 4-15: Workpiece between points: Tailstock offset Vr

4.6 Tailstock sleeve

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

The sleeve of the tailstock can a drill chuck used for the recording of drilling and countersinking tools are set.

➜ Clamp the required tool in the tailstock sleeve.

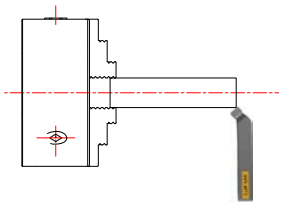
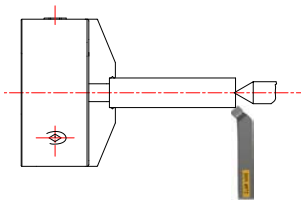
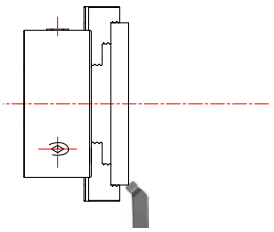
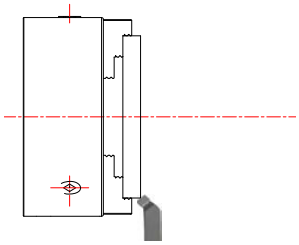
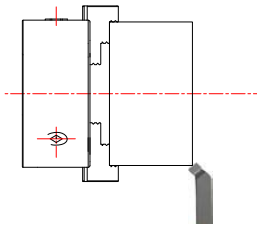
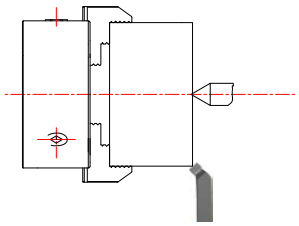
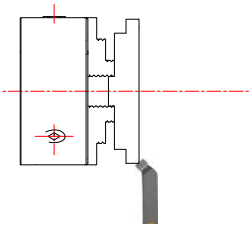
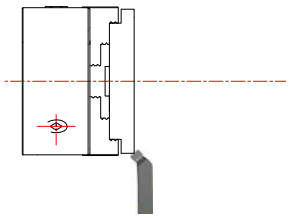
➜ Use the hand wheel to move the sleeve back and forth.

➜ Clamp the sleeve with the clamping lever.

➜ Use the adjustment and / or setting the [mm] - scale on the sleeve.

4.7 Clamping a workpiece into the three jaw chuck

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

wrong		**right**	
	Clamping length too long, overhang too long.		Additional support over center or rest.
	Clamping diameter too large.		Use larger lathe.
	Workpiece is too heavy and clamping grade too short.		Support over center, enlarges clamping grade. Enlarged clamping grades are not available for this three-jaw chuck. Possibly use larger lathe.
	Clamping diameter too short.		Clamp on the largest clamping diameter possible.

4.8 Standard values for cutting data when turning

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

☞ "Cutting speed table“ on page 44

Criteria of the cutting conditions:

Cutting speed: Vc (m/min)

Depth of cut: ap (mm)

Infeed: f (mm/rev)

Cutting speed:

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

$$n = \frac{Vc \times 1000}{d \times 3,14}$$

Speed: n (1/min)

Workpiece diameter: d (mm)

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

Depth of cut:

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

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

Infeed

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

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

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

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

4.9 Cutting speed table

	Turning								Drilling
Materials	Cutting materials								
	HSS	P10	P20	P40	K10	HC P40	HC K15	HC M15/ K10	HSS
non-alloyed steel; steel casting; C45; St37	35 - - 50	100 - - 150	80 - - 120	50 - - 100	- -	70 - - 180	150 - - 300	90 - - 180	30 - - 40
low-alloy steel, steel casting; 42CrMo4; 100Cr6	20 - - 35	80 - - 120	60 - - 100	40 - - 80	- -	70 - - 160	120 - - 250	80 - - 160	20 - - 30
high-alloyed steel; steel casting; X38CrMoV51; S10-4-3-10	10 - - 20	70 - - 110	50 - - 90	- -	- -	60 - - 130	80 - - 220	70 - - 140	8 - - 15
rust-resistant steel X5CrNi1810; X10CrNiMoTi12	- -	- -	- -	- -	30 - - 80	- -	- -	50 - - 140	10 - - 15
grey cast iron GG10 ; GG40	15 - - 40	- -	- -	- -	40 - - 190	- -	90 - - 200	70 - - 150	20 - - 30
cast iron with nodular graphite GGG35 ; GGG70	10 - - 25	- -	- -	- -	25 - - 120	- -	80 - - 180	60 - - 130	15 - - 25
copper, brass	40 - - 90	- -	- -	- -	60 - - 180	- -	90 - - 300	60 - - 150	30 - - 80
aluminium alloys	40 - - 100	- -	- -	- -	80 - - 200	- -	100 - - 400	80 - - 200	40 - - 80

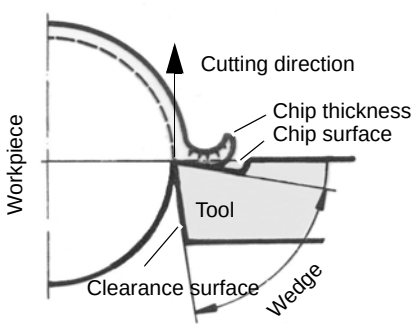
Description of the coated hard metals:

HC P40 = a PVD - coating TiAlN

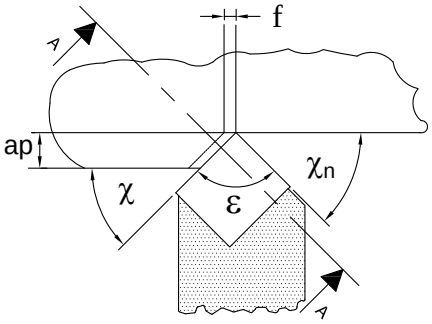
HC K15 = a CVD - coating TiN-Al_2O_3 - TiCN - TiN

HC M15/K10 = CVD - coating TiAiN

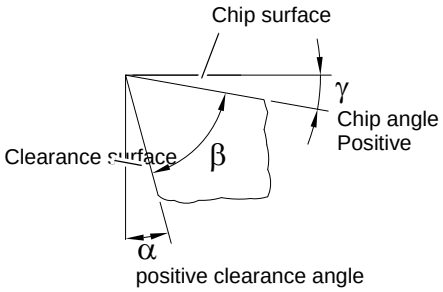
4.10 Terms for the rotating tool



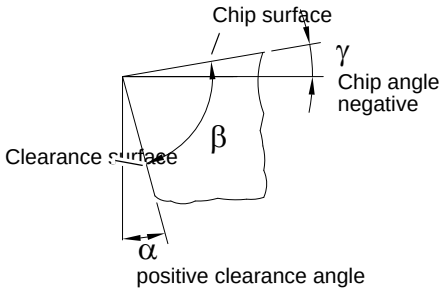
Img. 4-16: Geometrically determined cutter for the separation process



Img. 4-17: Cut and chip size



Img. 4-18: Cut A - A, positive cutter



Img. 4-19: Cut A - A, negative cutter

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

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

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

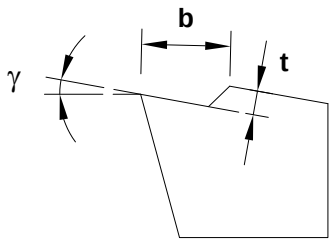
4.10.1 Cutting edge geometry for turning tools

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

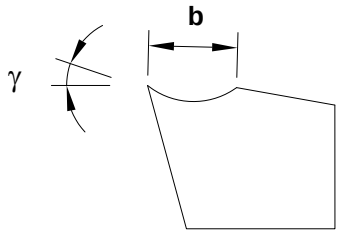
4.10.2 Types of cutting form levels

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

Examples of types of cutting form levels



Img. 4-20: Cutting form level



Img. 4-21: Cutting form level with fillet

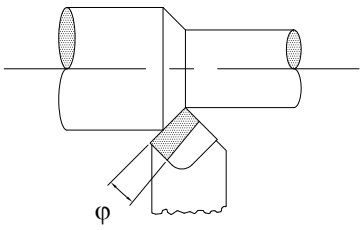
b = 1.0 mm bis 2.2 mm

t = 0.4 mm bis 0.5 mm

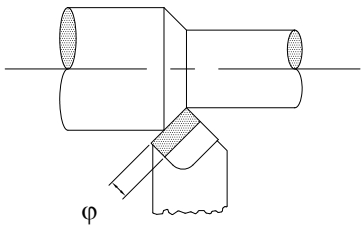
b = 2.2mm with fillet

For infeeds of 0.05 to 0.5mm/U and depths of cut of 0.2mm to 3.0mm.

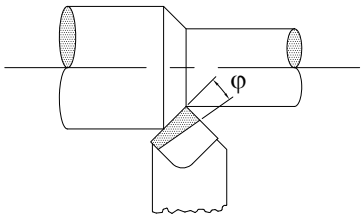
The different apex angles (φ) of the cutting form level need to conduct the chip.



Img. 4-22: Positive apex angle for planing



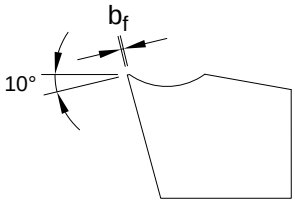
Img. 4-23: Neutral apex angle for planing and roughing



Img. 4-24: Negative apex angle for roughing

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

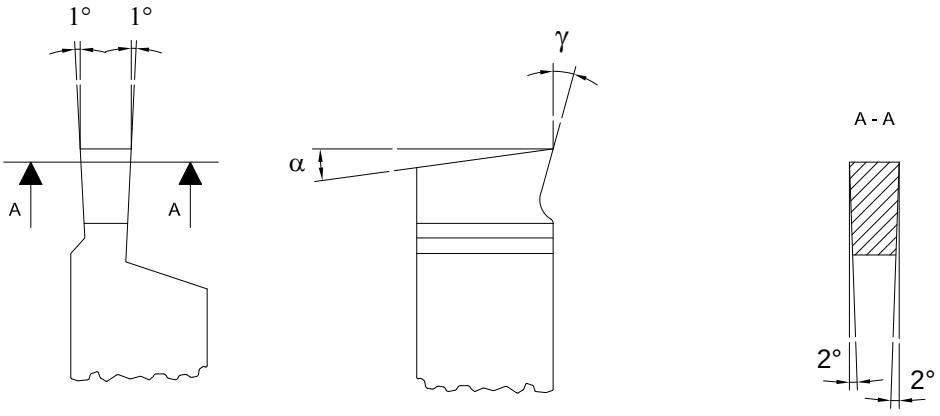
For the roughing, a small chamfer must be produced with the grindstone in order to stabilize the cutting edge against striking chips (b_f = f x 0.8).



Img. 4-25: Stabilize cutting edge

Polished section for recessing and cutting off

(for chip angle refer to table)



Img. 4-26: Polished section recessing and cutting off

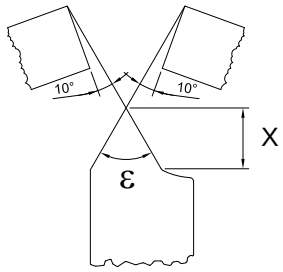
Polished section for threading

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

Also refer to:

- ☞ "Thread types“ on page 50
- ☞ "Pitch angle“ on page 55

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



Img.4-27: Polished section for threading

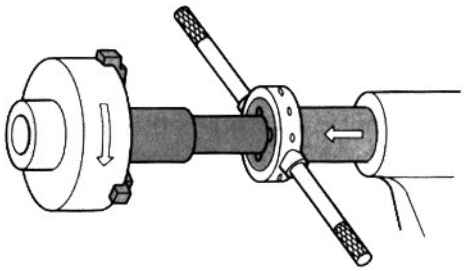
4.11 Tapping of external and internal threads

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

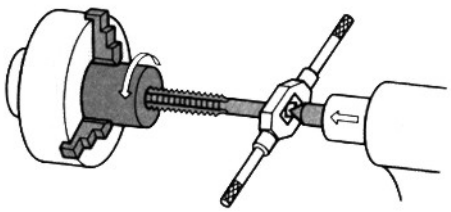
CAUTION!

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

Bolts and nuts with large thread diameters, deviating thread pitches or special types of thread,

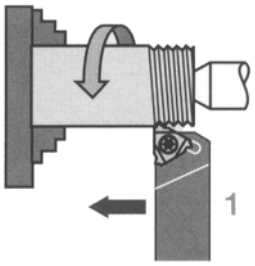


Img.4-28: die

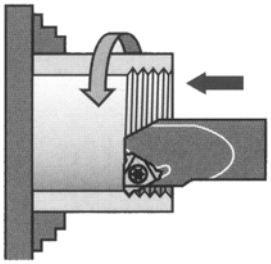


Img.4-29: screw tap

right-handed and left-handed threads may be produced by threading. For this manufacturing there are as well tool holders and drill rods with exchangeable indexable inserts (one-edged or multiple-edged).

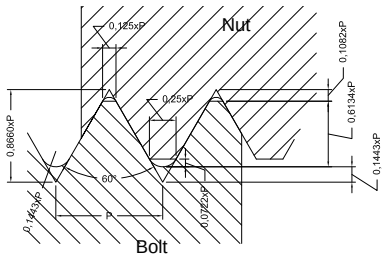
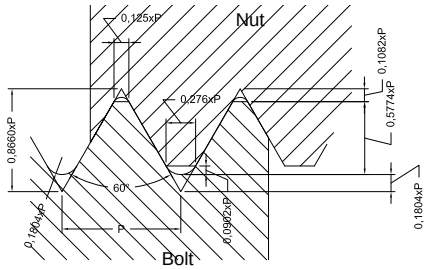
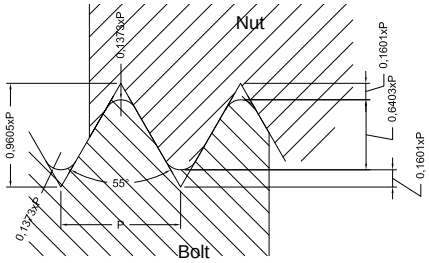
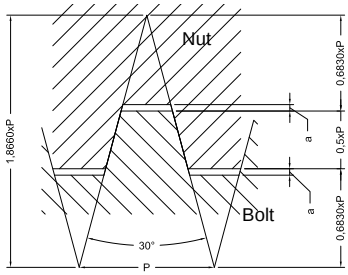
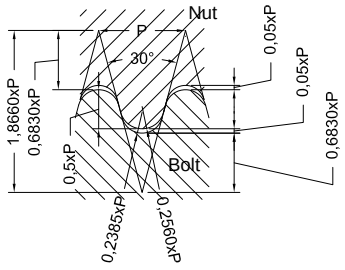


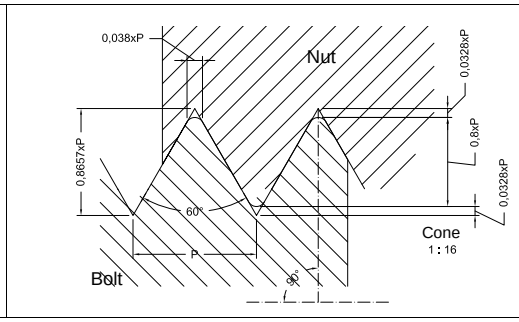
Img. 4-30: Tap external thread



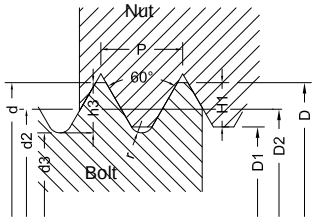
Img. 4-31: tap internal thread

4.12 Thread types

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

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

4.12.1 Metric threads (60° flank angle)



pitch P

depth of thread of the bolt h2=0.6134 x P

depth of thread of the nut H1 = 0.5413 x P

rounding r = 0.1443 x P

flank diameter d2 = D2 =d - 0.6493

core removing hole drill = d - P

flank angle = 60°

Metric coarse-pitch thread

Sizes in mm: preferably use the threads in column 1

Thread denomination d = D		pitch P	Flank diameter d2 = D2	Core diameter		Depth of thread		Rounding r	Core removing hole drill
Column 1	Column 2			Bolt d3	Nut D1	Bolt h3	Nut H1		
M 1		0.25	0.838	0.693	0.729	0.153	0.135	0.036	0.75
	M 1.1	0.25	0.938	0.793	0.829	0.153	0.135	0.036	0.85
M 1.2		0.25	1.038	0.893	0.929	0.153	0.135	0.036	0.95
	M 1.4	0.3	1.205	1.032	1.075	0.184	0.162	0.043	1.1
M 1.6		0.35	1.373	1.171	1.221	0.215	0.189	0.051	1.3
	M 1.8	0.35	1.573	1.371	1.421	0.215	0.189	0.051	1.5
M 2		0.4	1.740	1.509	1.567	0.245	0.217	0.058	1.6
	M 2.2	0.45	1.908	1.648	1.713	0.276	0.244	0.065	1.8
M 2.5		0.45	2.208	1.948	2.013	0.276	0.244	0.065	2.1
M 3		0.5	2.675	2.387	2.459	0.307	0.271	0.072	2.5
	M 3.5	0.6	3.110	2.764	2.850	0.368	0.325	0.087	2.9
M 4		0.7	3.545	3.141	3.242	0.429	0.379	0.101	3.3
M 5		0.8	4.480	4.019	4.134	0.491	0.433	0.115	4.2
M 6		1	5.350	4.773	4.917	0.613	0.541	0.144	5.0
M 8		1.25	7.188	6.466	6.647	0.767	0.677	0.180	6.8
M 10		1.5	9.026	8.160	8.376	0.920	0.812	0.217	8.5
M 12		1.75	10.863	9.853	10.106	1.074	0.947	0.253	10.2

	M14	2	12.701	11.546	11.835	1.227	1.083	0.289	12
M 16		2	14.701	13.546	13.835	1.227	1.083	0.289	14
	M18	2.5	16.376	14.933	15.294	1.534	1.353	0.361	15.5
M 20		2.5	18.376	16.933	17.294	1.534	1.353	0.361	17.5
	M 22	2.5	20.376	18.933	19.294	1.534	1.353	0.361	19.5
M 24		3	22.051	20.319	20.752	1.840	1.624	0.433	21
	M 27	3	25.051	23.319	23.752	1.840	1.624	0.433	24
M 30		3.5	27.727	25.706	26.211	2.147	1.894	0.505	26.5
M 36		4	33.402	31.093	31.670	2.454	2.165	0.577	32
M 42		4.5	39.077	36.479	37.129	2.760	2.436	0.650	37.5
M 48		5.5	44.752	41.866	41.866	3.067	2.706	0.722	43
M 56		5.5	52.428	49.252	49.252	3.374	2.977	0.794	50.5
M 64		6	60.103	56.639	56.639	3.681	3.248	0.866	58

Metric fine-pitch thread

Denomi-nation of thread d x P	Flank diameter d2 = D2	Core diameter		Denomi-nation of thread d x P	Flank diame-ter d2 = D2	Core diameter	
		Bolt	Nut			Bolt	Nut
M2 x 0.2	1.870	1.755	1.783	M16 x 1,5	15.026	14.160	14.376
M2.5 x 0.25	2.338	2.193	2.229	M20 x 1	19.350	18.773	18.917
M3 x 0.35	2.773	2.571	2.621	M20 x 1.5	19.026	18.160	18.376
M4 x 0.5	3.675	3.387	3.459	M24 x 1.5	23.026	22.160	22.376
M5 x 0.5	4.675	4.387	4.459	M24 x 2	22.701	21.546	21.835
M6 x 0.75	5.513	5.080	5.188	M30 x 1.5	29.026	28.160	28.376
M8 x 0,75	7.513	7.080	7.188	M30 x 2	28.701	27.546	27.835
M8 x 1	7.350	6.773	6.917	M36 x 1.5	35.026	34.160	34.376
M10 x 0.75	9.513	9.080	9.188	M36 x 2	34.701	33.546	33.835
M10 x 1	9.350	8.773	8.917	M42 x 1,5	41.026	40.160	40.376
M12 x 1	11.350	10.773	10.917	M42 x 2	40.701	39.546	39.835
M12 x 1.25	11.188	10.466	10.647	M46 x 1.5	47.026	46.160	46.376
M16 x 1	15.350	14.773	14.917	M48 x 2	46.701	45.546	45.835

4.12.2 British thread (55° flank angle)

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

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

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

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

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

Table of the British threads

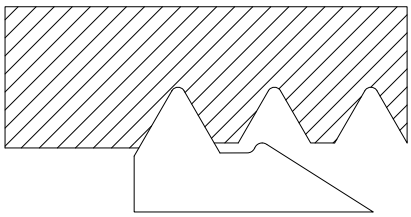
Nominal diameter of the thread		Threads in 1"				Threads in 1"		
		BSW	BSF:	BSP/BSPT		BA-threads		
[Inch]	mm			(R)	D. [mm]	No.		D [mm]
		55° Flank angle				47 1/2° Flank angle		
1/16	1.588	60	-	-		16	134	0.79
3/32	2.382	48	-	-		15	121	0.9
1/8	3.175	40	-	28	9.73	14	110	1.0
5/32	3.970	32	-	-	-	13	102	1.2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

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

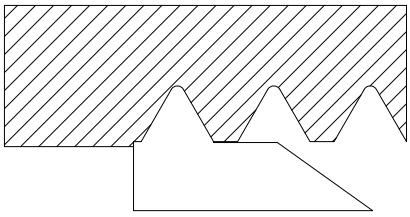
4.12.3 Indexable inserts

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

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



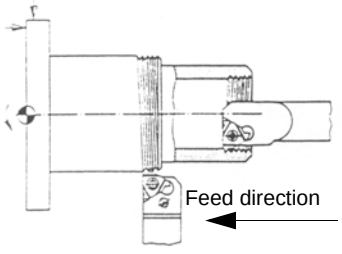
Img. 4-32: partial profile indexable insert



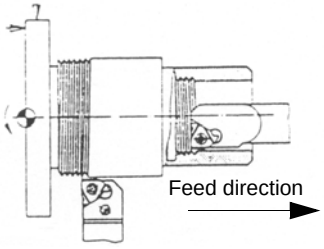
Img. 4-33: full profile indexable insert

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

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



Img. 4-34: right-handed thread with the machine spindle turning to the right



Img. 4-35: left-handed thread with the machine spindle turning to the right

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

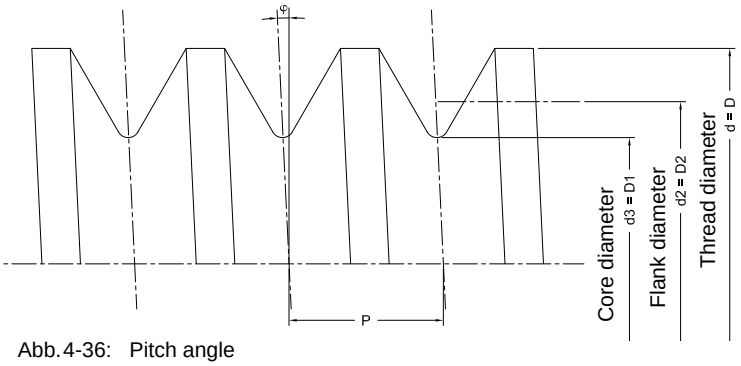


Abb. 4-36: Pitch angle

Pitch angle φ

Pitch P

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

4.12.4 Examples for thread cutting

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

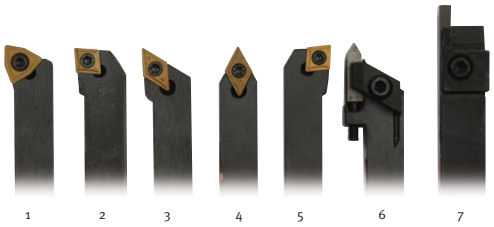
Selecting the tool holder

For lathe TU1503V and TU1804V , TU2004V, turning tool No.6 and for lathe TU2404 , TU2404V, TU2506 , TU2506V, TU2807 , TU2807V turning tool No.13.

Pointing turning tools are also appropriate Fig 6-14: “tip of cutter DIN 4975“ on page 38 with hard metal plates soldered on of the complete set for the lathe TU1503V and TU1804V , TU2004V, 8mm, 11-pieces, item no. 344 1008 and for lathe TU2404 , TU2404V, TU2506 , TU2506V, TU2807 , TU2807V, 8mm, 11-pieces, item no. 344 1108 .

The above mentioned thread turning tools have a point angle of 60°.

Set of turning tools HM 9mm 344 1011
7-pieces with HM indexable inserts
TiN-coated in a wooden case
ISO designation tool holder
Turning tool 1: SWGCR/L0810D05
Turning tool 2: SCLCR/L0810D06
Turning tool 3: SDJCR/L0810D07
Turning tool 4: SDNCN/L0810D07
Turning tool 5: SCLCL0810D06
Turning tool 6: LW0810R/L 04
Turning tool 7: QA0812R/L03



Set of turning tools HM 10mm 344 1111
7-pieces with HM indexable inserts
TiN-coated in a wooden case
ISO designation tool holder
Turning tool 8: SWGCR/L1010E05
Turning tool 9: SCLCR1010E06
Turning tool 10: SDJCR/L1010E07
Turning tool 11: SDNCN/L1010E07
Turning tool 12: SCLCR/L1010E06
Turning tool 13: LW1010R/L04
Turning tool 14: QA1012R/L03

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

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

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

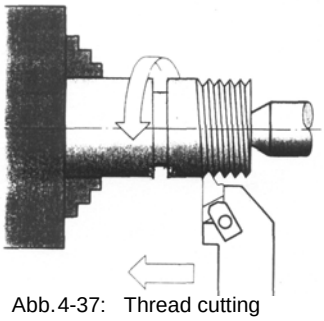


Abb. 4-37: Thread cutting

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

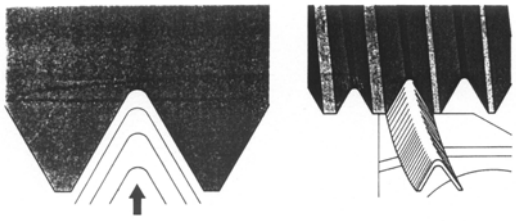


Abb. 4-38: radial infeed

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

The first pass takes place with an infeed of 0.1 - 0.15 mm

For the last pass the infeed shall not be below 0,04mm.

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

For our example 5 to 7 passes are being determined.

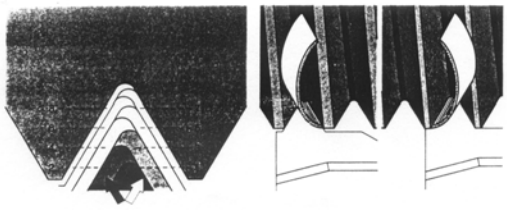


Abb. 4-39: Alternate infeed

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

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

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

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

The cutting point is set just in front of the starting point of the start of the thread by actuating thehandwheel of the bedslide.

The cutting point is set just in front of the starting point of the start of the thread by actuating thehandwheel of the bedslide. With this connection, the adjusted thread pitch is transferred to the bedslide and to the tool holder.

ATTENTION!

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

Starting the threading:

- Radial infeed over the handwheel of the cross slide.
- Turn the change-over, switch to the right
- Start the machine and have the first cutting process run.

ATTENTION!

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

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

4.13 General working advice - coolant

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 edge 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 any lubricants and coolants. Follow the manufacturer's disposal instructions.

5 Maintenance

In this chapter you will find important information about

- Inspection
- Maintenance
- Repairs

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.

5.1 Safety

WARNING!

The consequences of incorrect maintenance and repair work may include:

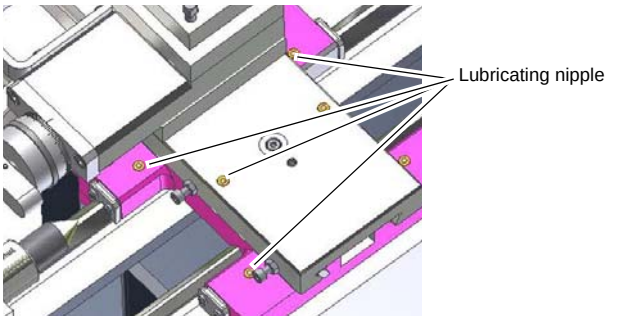
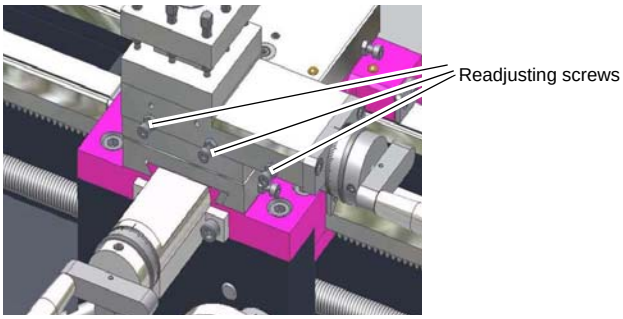
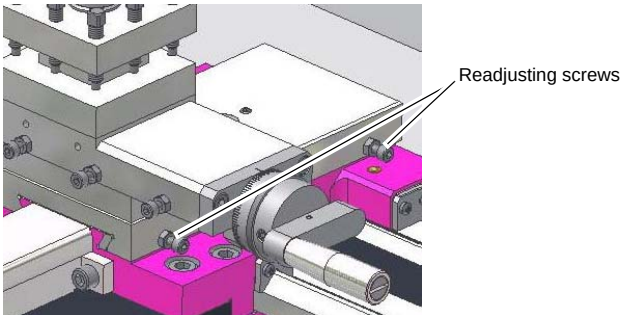
- **Very serious injury to personnel working on the lathe,**
- **Damage to the lathe.**

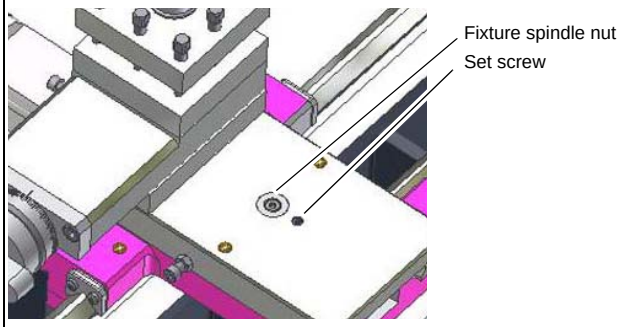
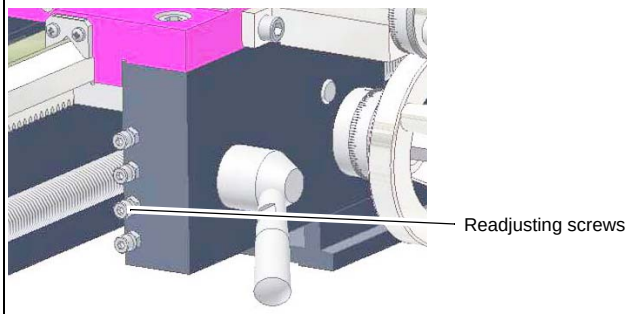
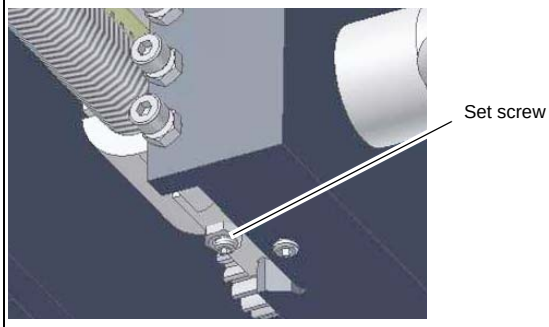
Only qualified personnel should carry out maintenance and repair work on the lathe.

5.2 Inspection and maintenance

The type and level of wear depends to a large extent on the individual usage and operating conditions. For this reason, all the intervals are only valid for the authorised conditions.

Interval	Where?	What?	How?
every week	**Machine bed**	Lubricate	Oil all blank machine parts using an acid-free lubricating oil. ☞ "Operating material“ on page 17
	Spindle stock	Testing	Make sure the tension of the synchronous belt is correct. Img. 4-6: “Synchronous belt position change“ on page 34
		Lubricating	Slightly lubricate the change wheels and the lead screw with a lithium grease.

Interval	Where?	What?	How?
every week	**Lathe saddle**	Lubricating	Lubricate the lubricating nipples on the lathe saddle.  Abb.5-1: Lathe saddle
half-yearly	**Spindle stock**	Visual inspection	Control if the synchronous belts are porous or worn.
as required	**Top slide**	Readjusting	Readjust the guide clearance of the top slide.  Abb.5-2: Lathe saddle
as required	**Cross slide**	Readjusting	Readjust the guide clearance of the top slide.  Abb.5-3: Lathe saddle

Interval	Where?	What?	How?
as required	**Spindle nut of the cross slide**	Readjusting	The set screw widens the flanks of screw thread of the spindle nut. If required, turn the set screw only slightly. A too widened set screw will lead to excessive wear.  Abb.5-4: Lathe saddle
as required	**Lead- screw nut**	Readjusting	The clearance of the lead-screw nut for opening and closing may be readjusted.  Abb.5-5: Lathe saddle
as required	**Lead- screw nut**	Readjusting	The locking split of the lead-screw nut may only be adjusted when it is closed. If the locking split is too small or too large this will lead to excessive wear.  Abb.5-6: Lathe saddle

INFORMATION

The work spindle bearing is pre lubricated. It is not necessary to lubricate it again.

5.3 Repairs

For any repair work, get assistance from an employee of 's technical service or send us the lathe.

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

The company Optimum Maschinen Germany GmbH does not take responsibility nor does it guarantee for damages and failures resulting of non-observance of this operating manual. For repairs only use faultless and suitable tools and original spare parts or parts from series expressly authorised by Optimum Maschinen Germany GmbH.

6 Ersatzteile - Spare parts - TU2004V

6.1 Antrieb - Drive

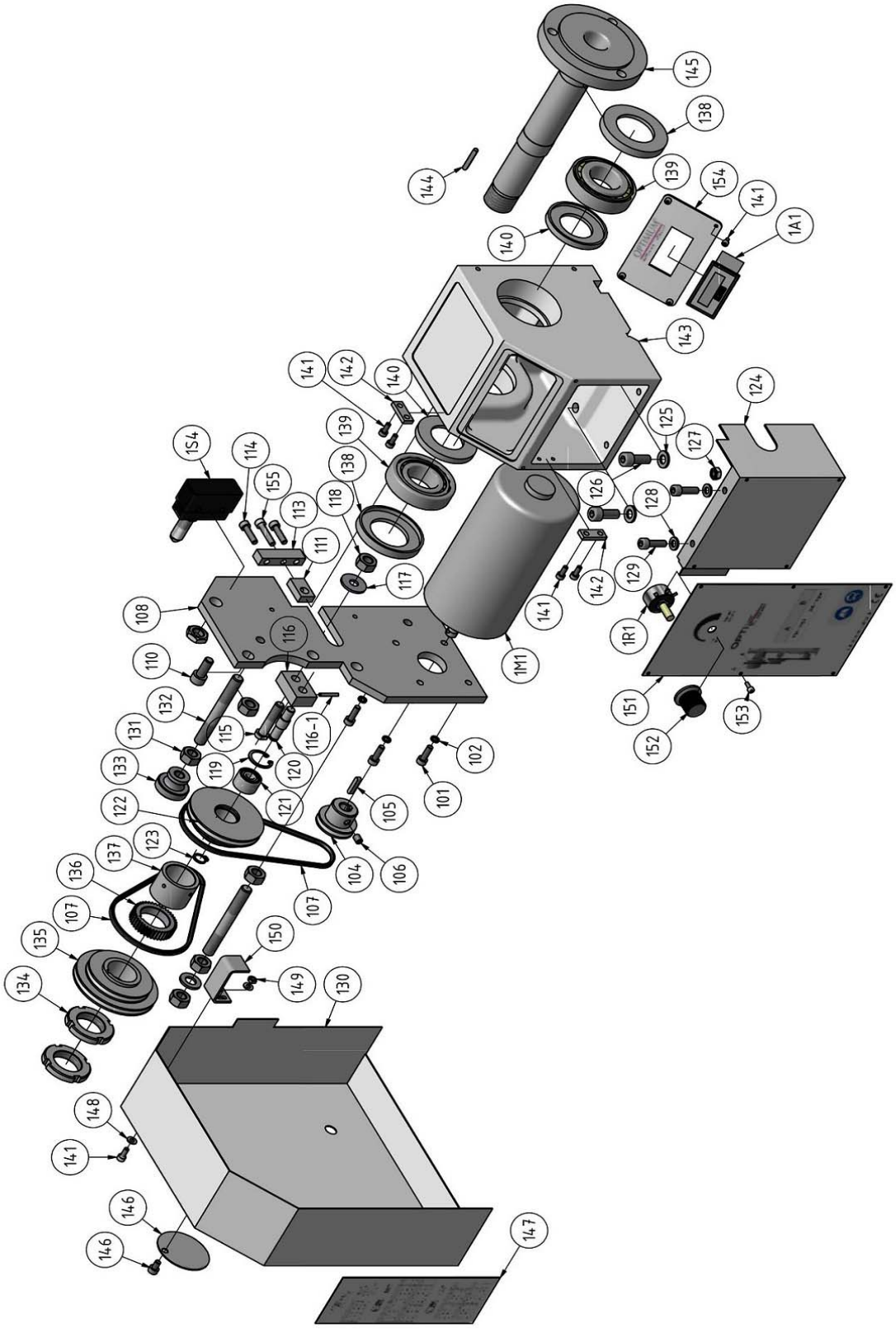


Abb.6-1: Antrieb - Drive

6.2 Oberschlitten und Planschlitten - Top slide and cross slide

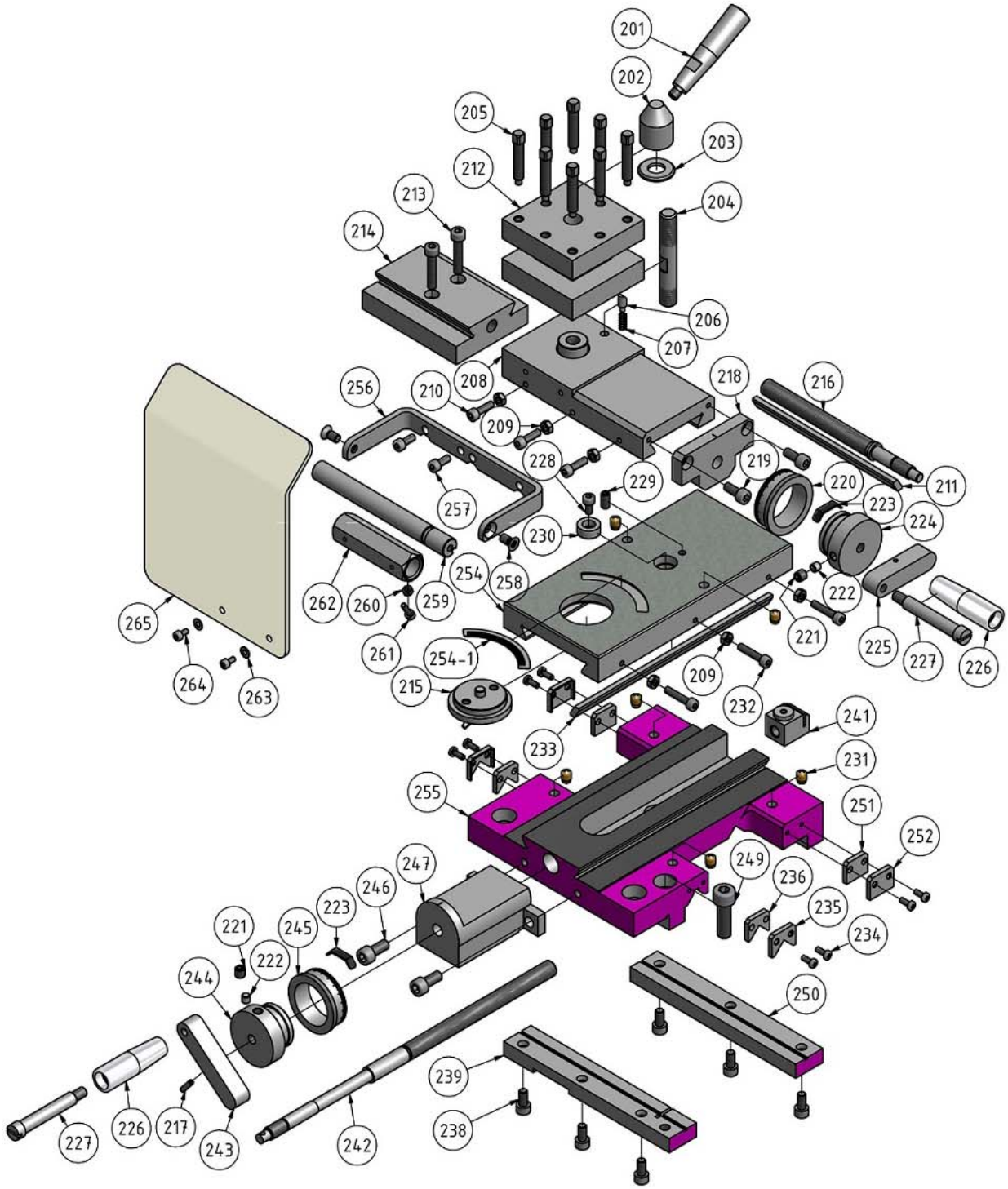


Abb. 6-2: Oberschlitten und Planschlitten - Top slide and cross slide

6.3 Bettschlitten - Lathe saddle

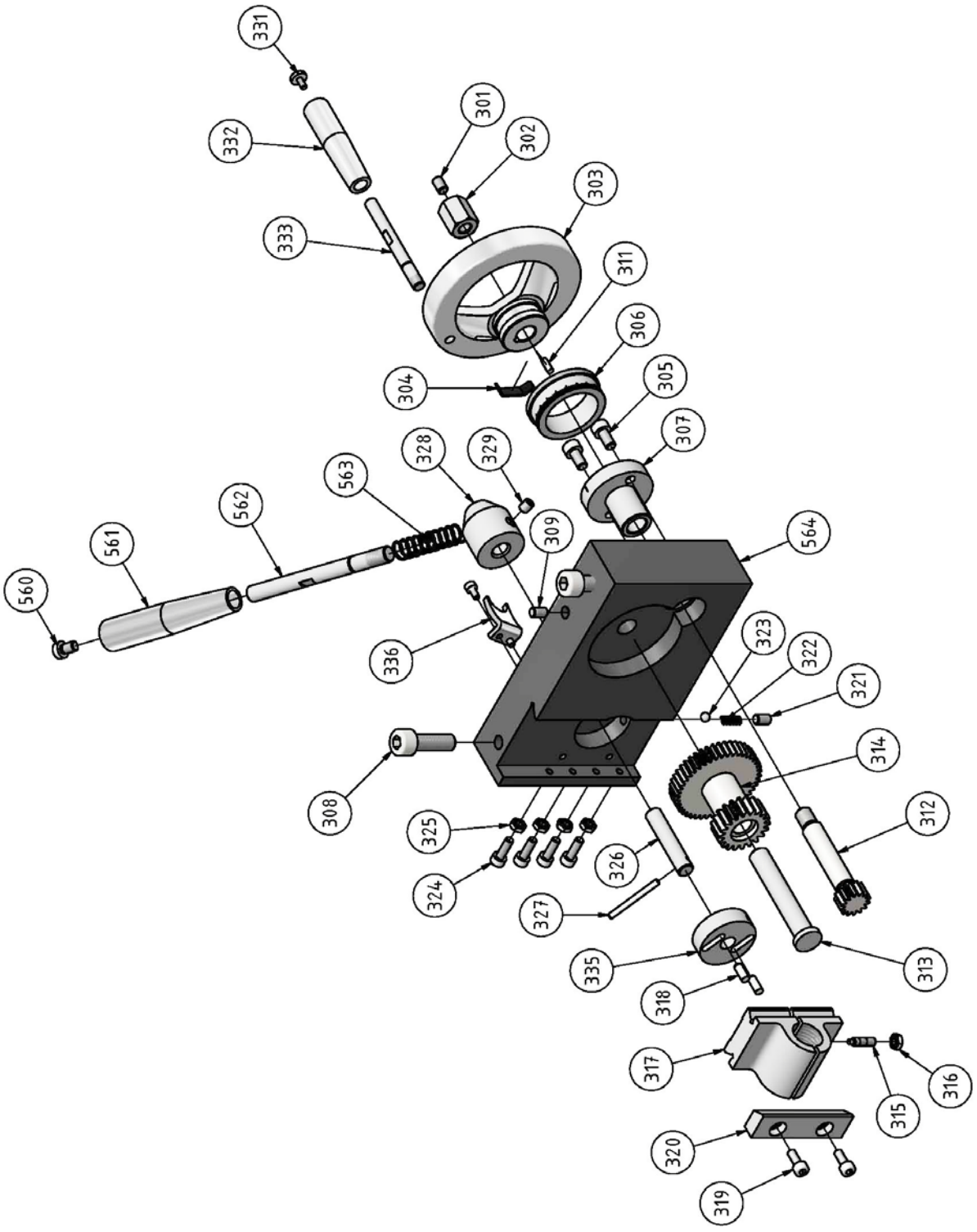


Abb.6-3: Bettschlitten - Lathe saddle

6.4 Maschinenbett - Lathe bed

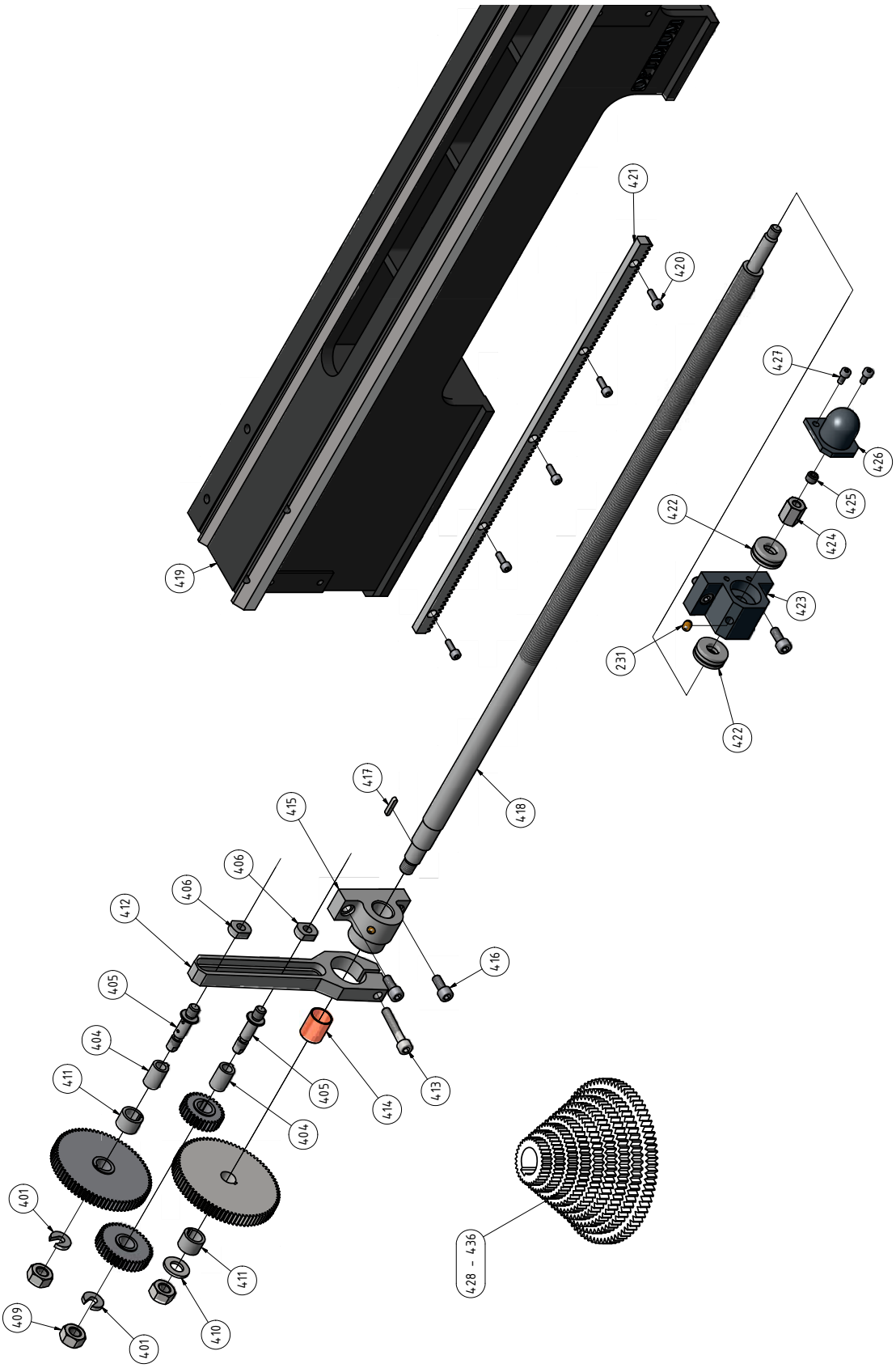


Abb. 6-4: Maschinenbett - Lathe bed

6.5 Reitstock - Tailstock

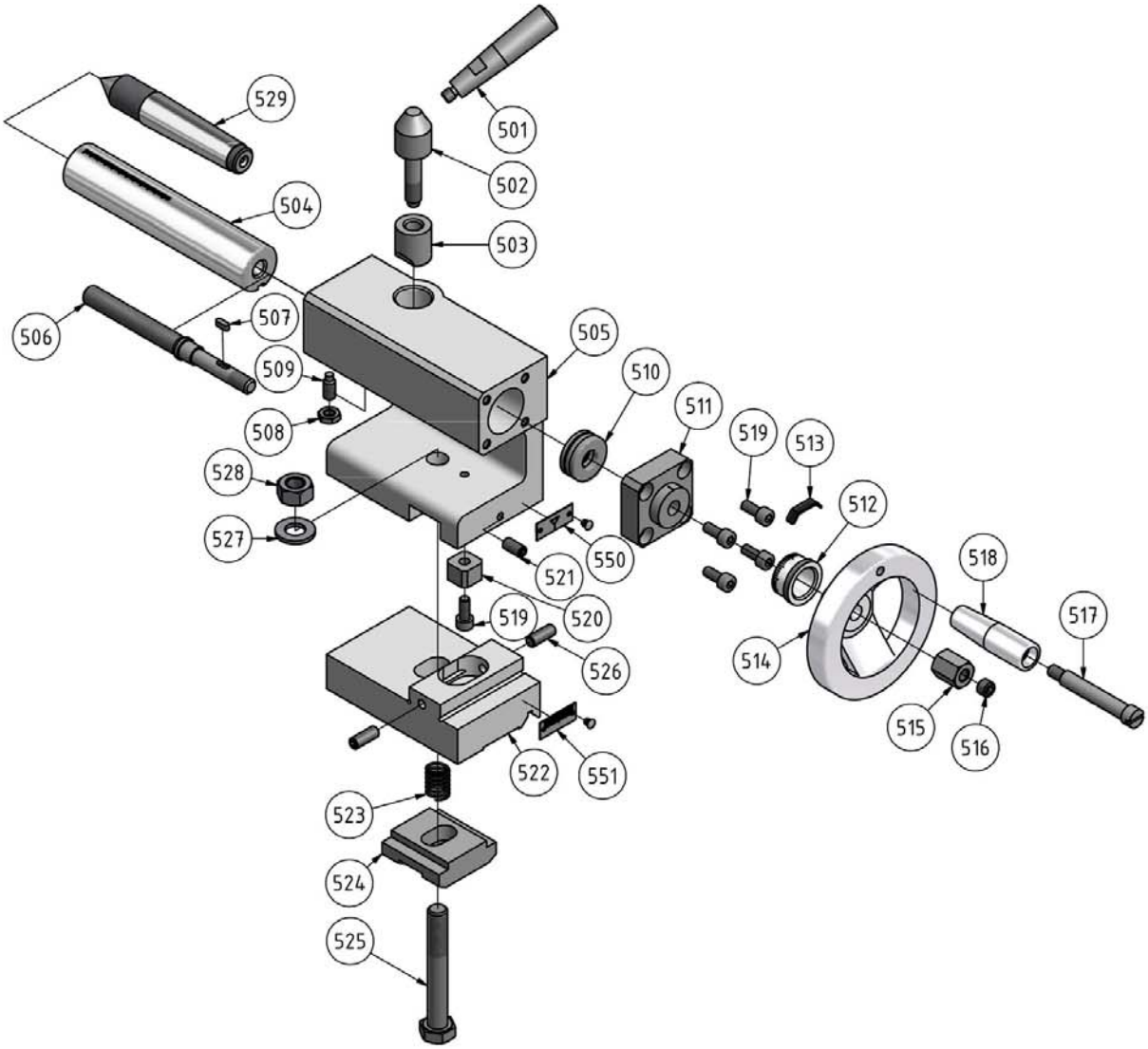


Abb. 6-5: Reitstock - Tailstock

6.6 Zubehör - Accessory

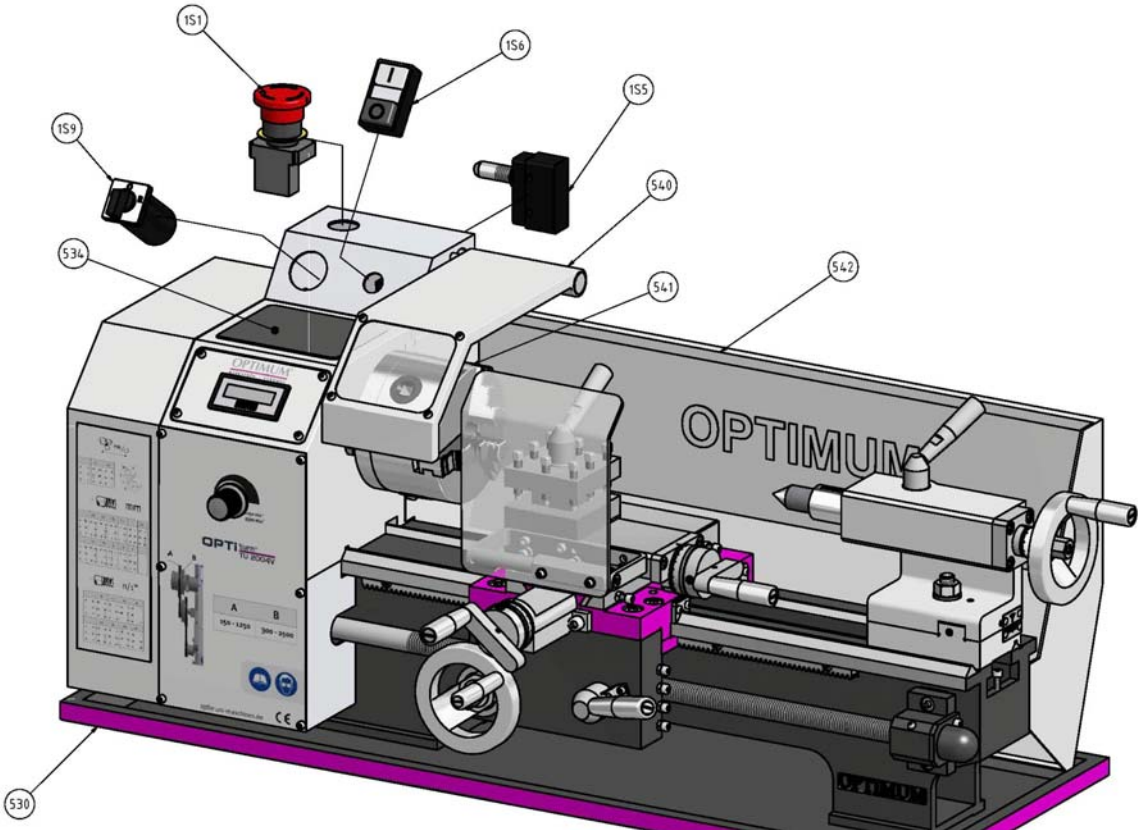


Abb. 6-6: Vorderansicht - Front view

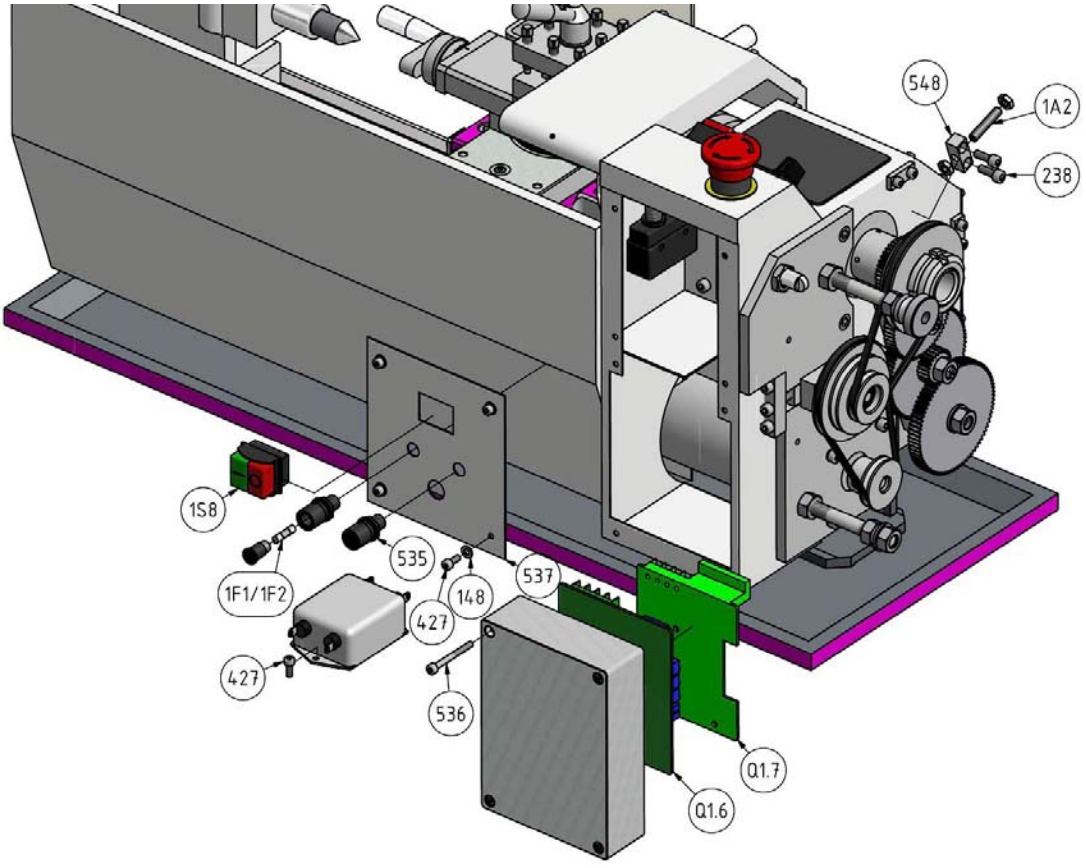


Abb. 6-7: Rückansicht - Rear view

6.7 Schaltplan - Wiring diagram

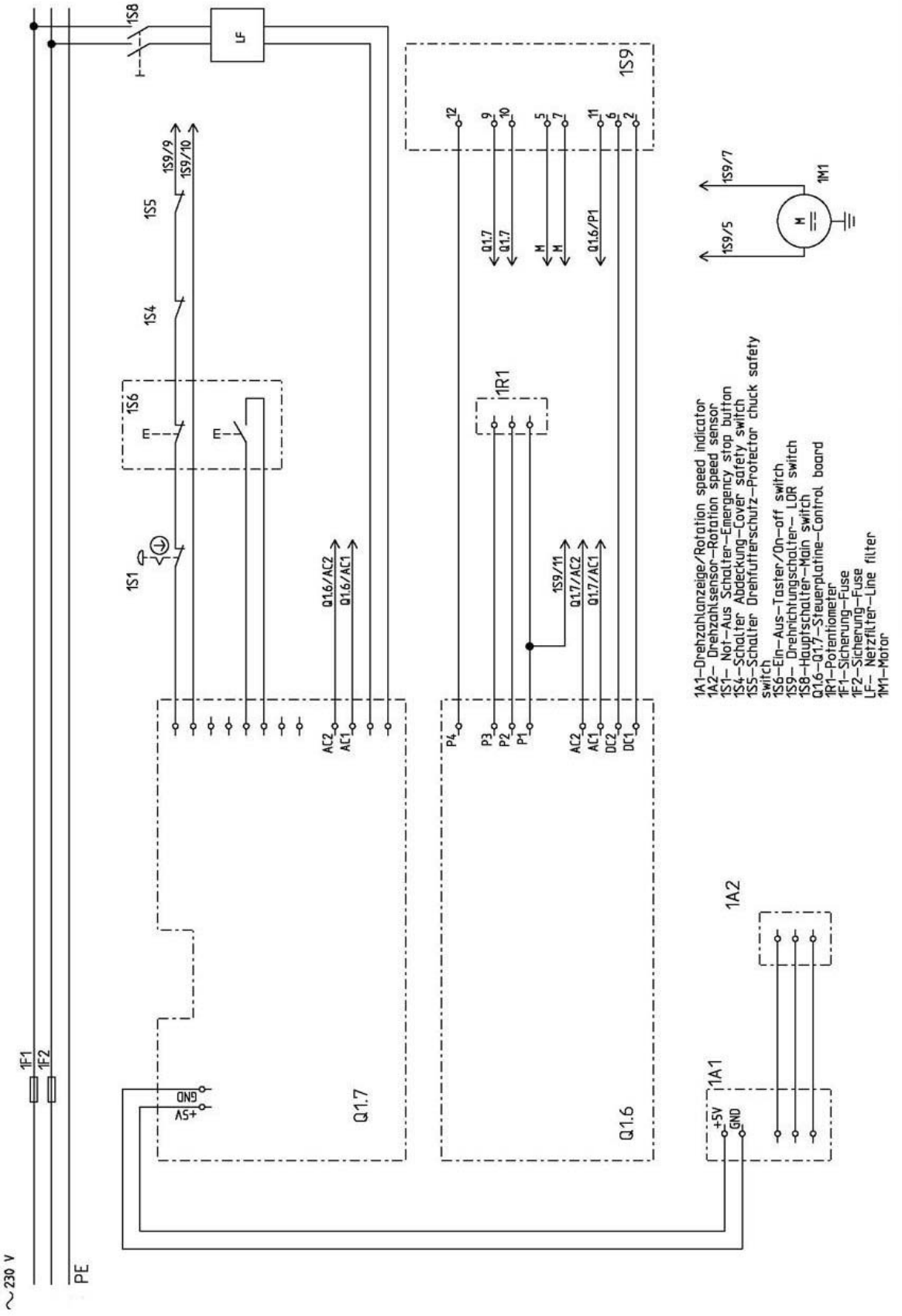


Abb.6-8: Schaltplan - Wiring diagram

6.8 Maschinenschilder - Machine labels

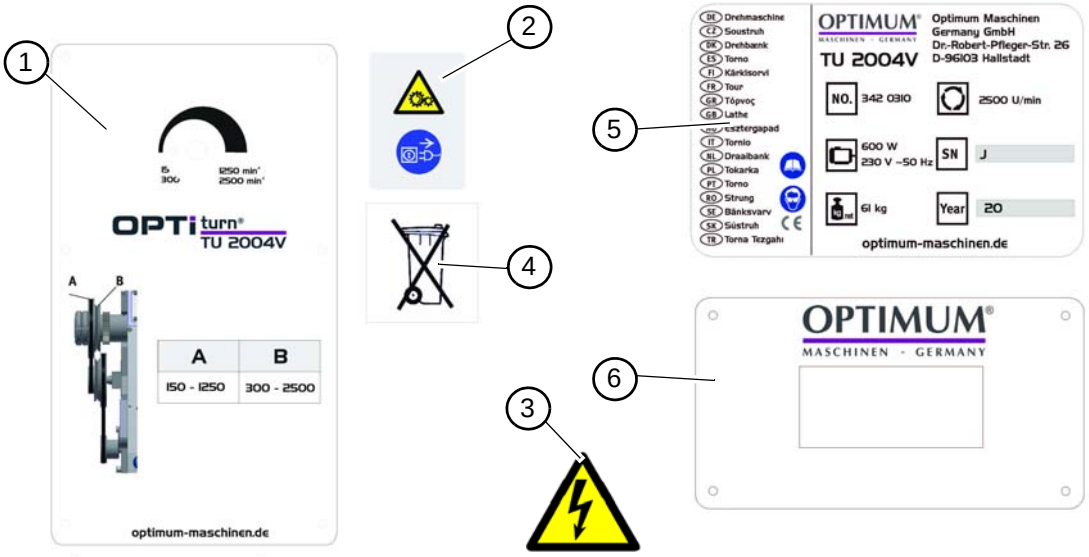


Abb. 6-9: Maschinenschilder - Machine labels

6.8.1 Maschinenschilder - Machine labels

Pos.	Bezeichnung	Designation	Menge Quan-tity	Grösse Size	Artikelnummer Article no.
1	Frontschild	Front label	1		03420310L01
2	Sicherheitsschild	Safety label	1		03420310L02
3	Sicherheitsschild	Safety label	1		03420310L03
4	Hinweisschild	Instruction label	1		03420310L04
5	Typschild	Type plate	1		03420310L05
6	Schild Drehzahlanzeige	Rotation speed indicator	1		03420310L06

6.8.2 Ersatzteilliste - Spare parts list

Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
101	Innensechskantschraube	Hexagon socket screw	4	DIN 912 M5×25	
102	Federring	Split washer	4	DIN 127 5	03420310102
104	Riemenscheibe Motor	Motor pulley	1		03420310104
105	Passfeder	Key	1	DIN 6885-A4x4x20	03420310105
106	Gewindestift	Set screw	1	DIN 915 M6×8	
107	Treibriemen	Drive belt	2	Gates 5M-365	03420310107
108	Trägerplatte	Supporting plate	1		03420310108
109	Scheibe	Washer	3	8	
110	Innensechskantschraube	Hexagon socket screw	3	DIN 912 M8×20	
111	Gleitstein	Sliding nut	1		03420310111
112	Innensechskantschraube	Hexagon socket screw	1	DIN 912 M6 x 30	
113	Gegenlager	Thrust bearing	1		03420310113
114	Innensechskantschraube	Hexagon socket screw	2	DIN 912 M6 x 20	
115	Achse	Axis	1		03420310115
116	Lagerbock	Bearing block	1		03420310116
116-1	Passstift	Alignment pin	1	4x22	034203101161
117	Scheibe	Washer	1	8	
118	Sechskantmutter	Hexagon nut	3	M8	
119	Sicherungsring	Locking ring	1	DIN 471-8 x 0.8	03420310119
120	Zwischenwelle	Countershaft	1		03420310120
121	Rillenkugellager	Deep groove ball bearing	2	608-RZ	040608.2R
122	Riemenscheibe Zwischenwelle	Pulley countershaft	1		03420310122
123	Sicherungsring	Locking ring	1	DIN 471-22 x 1	03420310123
124	Abdeckung	Bottom cover	1		03420310124
125	Scheibe	Washer	4	M8	
126	Schraube	Screw	4	M8x25	
127	Mutter	Nut	2	M5	
128	Scheibe	Washer	2	5	
129	Innensechskantschraube	Hexagon socket screw	2	DIN912/M5x25	
130	Riemenabdeckung	Pulley cover	1		03420310130
131	Mutter	Nut	2	M10	
132	Gewindebolzen	Threaded bolt	2	M10×80	03420310132
133	Rändelmutter	Knurled nut	2	M10	03420310133
134	Nutmutter	Groove nut	2	DIN 1804-M27x1-w	03420310134
135	Riemenscheibe Antrieb	Drive pulley	1		03420310135
136	Zahnrad	Toothed wheel	1	40 theeth	03420310136
137	Hülse	Bushing	1		03420310137
138	Lagerabdeckung	Bearing cover	2		03420310138
139	Kegelrollenlager	Taper roller bearing	2	30206/P5	04030206
140	Lagerabdeckung	Bearing cover	2		03420310140
141	Innensechskantschraube	Hexagon socket screw	4	DIN 912 M4 x 10	
142	Fixierplatte	Fixing plate	2		03420310142
143	Gehäuse Spindelstock	Headstock housing	1		03420310143
144	Passfeder	Key	1	DIN 6885-A3x3x15	03420310144
145	Spindel	Spindle	1		03420310145
146	Innensechskantschraube	Hexagon socket screw	1	DIN 912 M4 x 10	
148	Scheibe	Washer	4	DIN 125/4	
149	Sechskantmutter	Sechskantmutter	2	ISO 4032/M4	
150	Winkel	Angle	1		03420310150
152	Drehknopf	Knob	1		03420310152
153	Innensechskantschraube	Hexagon socket screw	6	DIN 912 M3 x 8	
155	Innensechskantschraube	Hexagon socket screw	1	DIN 912 M5 x 25	
201	Griff	Handle	1		03420310201
202	Klemmmutter	Clamping nut	1		03420310202
203	Unterlagscheibe	Washer	1		03420310203
204	Gewindebolzen	Threaded bolt	1		03420310204
205	Innensechskantschraube	Hexagon socket screw	8	DIN 912 M6 x 25	
206	Rastbolzen	Stop bolt	1		03420310206
207	Feder	Spring	1	∅5x10x ∅1	03420310207
208	Oberschlitten	Top slide	1		03420310208
209	Mutter	Nut	12	M4	
210	Innensechskantschraube	Hexagon socket screw	3	DIN 912 M4×14	
211	Keilleiste	Gib	1		03420310211
212	Vierfachstahlhalter	Tool holder	1		03420310212
213	Innensechskantschraube	Hexagon socket screw	2	DIN 912 M5 x 30	
214	Schwalbenschwanzführung	Dovetail guide	1		03420310214
215	Drehring	Swivel	1		03420310215

Pos.	Bezeichnung	Designation	Menge Qty.	Grösse Size	Artikelnummer Item no.
216	Spindel	Spindle	1		03420310216
217	Spannstift	Dowel pin	2	3x12	03420310217
218	Lagerbock	Bearing block	1		03420310218
219	Innensechskantschraube	Hexagon socket screw	2	DIN 912 M5 x 12	
220	Skalenring	Scale ring	1		03420310220
221	Gewindestift	Set screw	2	DIN 915 M6 x 6	
222	Stift	Pin	2		03420310222
223	Federblech	Spring steel sheet	2		03420310223
224	Führungsscheibe	Guiding disk	2		03420310224
225	Hebel	Lever	1		03420310225
226	Griffhülse	Handle	2		03420310226
227	Befestigungsschraube	Fixing screw	2		03420310227
228	Innensechskantschraube	Hexagon socket screw	1	DIN 912 M4×8	
229	Gewindestift	Set screw	1	DIN 914 M5 x 10	
230	Hülse	Bushing	1		03420310230
231	Öler	Oiler	6	D=6mm	03420310231
232	Innensechskantschraube	Hexagon socket screw	3	DIN 912 M4×20	
233	Kelleiste	Gib	1		03420310233
234	Linsenkopfschraube	Tallow-drop screw	8	M3 x 8	
235	Halter Abstreifer	Holder stripper	2		03420310235
236	Abstreifer	Stripper	2		03420310236
238	Innensechskantschraube	Hexagon socket screw	6	DIN 912 M5×10	
239	Befestigungsschiene	Fastening gib	1		03420310239
240	Innensechskantschraube	Hexagon socket screw	6	M4 x 10	
241	Spindelmutter	Spindle nut	1		03420310241
242	Spindel	Spindle	1		03420310242
243	Hebel	Lever	1		03420310243
244	Führungsscheibe	Guide disk	1		03420310244
245	Skalenring	Scale ring	1		03420310245
246	Innensechskantschraube	Hexagon socket screw	2	DIN 912 M6×50	
247	Lagerbock	Bearing block	1		03420310247
249	Innensechskantschraube	Hexagon socket screw	1	DIN 912 M8×25	
250	Befestigungsschiene	Fixing gib	1		03420310250
251	Abstreifer	Stripper	2		03420310251
252	Halter Abstreifer	Holder stripper	2		03420310252
254	Planschlitten	Cross slide	1		03420310254
254-1	Skala	Scale	1		034203102541
255	Bettschlitten	Bed slide	1		03420310255
256	Bügel	Holder	1		03420310256
257	Innensechskantschraube	Hexagonal socket screw	2	GB70-85/M4x10	
258	Schraube	Screw	2	M5x10	
259	Welle	Shaft	1		03420310259
260	Sechskantmutter	Hexagonal nut	1	GB6170-86/M3	
261	Innensechskantschraube	Hexagonal socket screw	1	GB70-85/M3x10	
262	Sechskanthülse	Hexagonal case	1		03420310262
263	Scheibe	Washer	2	GB77.1-85/3	
264	Innensechskantschraube	Hexagonal socket screw	2	GB70-85/M3x6	
265	Späneschutzschild	Splinter shield	1		03420310265
301	Gewindestift	Set screw	1	DIN 9124 M8 x 8	
302	Befestigungsmutter Handrad	Fixing nut handwheel	1	M8 H=16mm	
303	Handrad	Handwheel	1		03420310303
304	Federblech	Spring steel sheet	1		03420310304
305	Innensechskantschraube	Hexagon socket screw	2	DIN 914 M5×10	
306	Skalenring	Scale ring	1		03420310306
307	Gleitlagerung	Track bed shaft	1		03420310307
308	Innensechskantschraube	Hexagon socket screw	2	DIN 912 M8×25	
309	Gewindestift	Set screw	1	DIN 914 M5×8	
311	Passfeder	Key	1	DIN 6885-A3x3x8	03420310311
312	Zahnwelle	Gear shaft	1	14 theeth, module 1	03420310312
313	Welle	Shaft	1		03420310313
314	Zahnradkombination	Gear combination	1	44/21 theeth, module 1 / 1,25	03420310314
315	Gewindestift	Set screw	1	DIN 914 M4×35	
316	Mutter	Nut	1	M4	
317	Schlossmutter	Apron nut	1		03420310317
318	Passstift	Alignment pin	2	∅4 x 10	
319	Innensechskantschraube	Hexagon socket screw	2	DIN 912 M4×10	
320	Nachstellleiste	Gib	1		03420310320
321	Gewindestift	Set screw	1	DIN 913 M6×8	

Pos.	Bezeichnung	Designation	Menge Qty.	Grösse Size	Artikelnummer Item no.
322	Feder	Spring	1	∅0.6× ∅3.5×12	03420310322
323	Stahlkugel	Steel ball	1	∅ 4.5	03420310323
324	Innensechskantschraube	Hexagon socket screw	4	DIN 912 M4×12	
325	Mutter	Nut	4	M4	
326	Welle	Shaft	1		03420310326
327	Spannstift	Dowel pin	1	DIN 1481 3×30	03420310327
328	Drehknopf	Turning knob	1		03420310328
329	Gewindestift	Set screw	1	DIN 914 M5×6	
331	Schraube	Screw	1		03420310331
332	Hülse	Sleeve	1		03420310332
333	Welle	Shaft	1		03420310333
334	Sicherungsring	Retaining ring	1		03420310334
335	Scheibe	Washer	1		03420310335
336	Rastblech	Locking plate	1		03420310336
401	Sicherungsscheibe	Locking wahser	2		03420310401
404	Hülse	Bushing	2		03420310404
405	Achswelle	Axle shaft	2		03420310405
406	Nutenstein	Nut stone	2	M8	03420310406
409	Mutter	Nut	1	M10	
410	Scheibe	Disk	1	10	
411	Hülse	Bushing	1		03420310411
412	Wechselradschere	Change gear shear	1		03420310412
413	Innensechskantschraube	Hexagon socket screw	1	DIN 912 M6×35	
414	Gleitlager	Slide bearing	1		03420310414
415	Lagerbock	Bearing block	1		03420310415
416	Schraube	Screw	4	M6×14	
417	Passfeder	Key	1	DIN 6885-A3x3x16	03420310417
418	Leitspindel	Leadscrew	1		03420310418
419	Maschinenbett	Bed	1		03420310419
420	Innensechskantschraube	Hexagon socket screw	5	DIN 912 M4×12	
421	Zahnstange	Rack	1		03420310421
422	Axial- Rillenkugellager	Axial deep groove ball bearing	2	51100	04051100
423	Lagerbock	Bearing block	1		03420310423
424	Befestigungsmutter	Fixing nut	1		03420310424
425	Stellschraube, Gewindestift	Adjusting screw set screw	1	DIN 915 M8×6	
426	Schutzabdeckung	Protective cover	1		03420310426
427	Innensechskantschraube	Hexagon socket screw	2	DIN 912 M4×10	
428 -436	Zahnrad	Gear	2	80 teeth, module 1	0342031080Zmodule1
	Zahnrad	Gear	1	75 teeth, module 1	0342031075Zmodule1
	Zahnrad	Gear	1	66 teeth, module 1	0342031066Zmodule1
	Zahnrad	Gear	2	60 teeth, module 1	0342031060Zmodule1
	Zahnrad	Gear	1	52 teeth, module 1	0342031052Zmodule1
	Zahnrad	Gear	1	50 teeth, module 1	0342031050Zmodule1
	Zahnrad	Gear	1	40 teeth, module 1	0342031040Zmodule1
	Zahnrad	Gear	1	35 teeth, module 1	0342031035Zmodule1
	Zahnrad	Gear	1	33 teeth, module 1	0342031033Zmodule1
	Zahnrad	Gear	1	30 teeth, module 1	0342031030Zmodule1
	Zahnrad	Gear	1	20 teeth, module 1	0342031020Zmodule1
501	Klemmhebel	Clamping lever	1		03420310501
502	Klemmschraube	Clamping screw	1		03420310502
503	Klemmhülse	Clamping bushing	1		03420310503
504	Reitstockpinole	Pinole	1		03420310504
505	Reitstockgehäuse	Tailstock housing	1		03420310505
506	Reitstockspindel	Tailstock spindle	1		03420310506
507	Passfeder	Key	1	DIN 6885-A3x3x8	03420310507
508	Mutter	Nut	1	M6	
509	Gewindestift	Set screw	1	DIN 915 M6×14	
510	Axial- Rillenkugellager	Axial deep groove ball bearing	1	51100	04051100
511	Lagerbock	Bearing block	1		03420310511
512	Skalenring	Scale ring	1		03420310512
513	Federblech	Spring steel sheet	1		03420310513
514	Handrad	Handwheel	1		03420310514
515	Befestigungsmutter	Fixing nut	1	M8 H=16mm	
516	Gewindestift	Set screw	1	DIN 914 M8 x 6	
517	Befestigungsschraube	Fixing screw	1		03420310517
518	Griff	Grip	1		03420310518
519	Innensechskantschraube	Hexagon socket screw	5	DIN 912 M5×12	
520	Anschlag	Stop	1		03420310520

Pos.	Bezeichnung	Designation	Menge Qty.	Grösse Size	Artikelnummer Item no.
521	Gewindestift	Set screw	2	DIN 915 M6×12	
522	Reitstock Unterteil	Tailstock bottom part	1		03420310522
523	Feder	Spring	1	1×12×L	03420310523
524	Klemmplatte	Clamping plate	1		03420310524
525	Sechskantschraube	Hexagon screw	1	DIN 931 M10×70	
526	Gewindestift	Set screw	2	DIN 915 M6×16	
527	Scheibe	Washer	1	10	
528	Mutter	Nut	1	M10	
529	Mitlaufende Körnerspitze	Revolving centre	1		03420310529
530	Spänewanne	Chip tray	1		03420310997
534	Gummiablage/ Werkzeug	Rubber place for tools	1		03420310631
535	Sicherungsgehäuse	Fuse housing	2		03420310535
536	Innensechskantschraube	Hexagon socket screw	4	DIN 912 M4×45	
537	Abdeckung	Cover	1		03420310537
540	Drehfutterschutz	Protection lathe chuck	1		0342031000
541	Dreibackenfutter	3-jaw chuck	1		03420310639
542	Spritzwand	Rear splash guard	1		03420310998
545	Abdeckung	Cover	1		03420310545
548	Halter	Holder	1		03420310548
549	E-Box	E-Box	1		03420310549
550	Skala oben	Scale top			03420310550
551	Skala unten	Scale below			03420310551
560	Zylinderschraube mit Schlitz	Slotted cheese head screw	1		03420310560
561	Griff Einrückhebel	Handle engaging lever	1		03420310561
562	Welle Einrückhebel	Shaft engaging lever	1		03420310562
563	Feder	Spring	1		03420310563
564	Schlosskasten Handrad linke Hand	Apron handwheel left hand	1		03420310564
Ersatzteilliste Elektrik/ Spare parts electrical					
1A1	Drehzahlanzeige	Rotation speed indicator	1		03020245167
1A2	Drehzahlsensor	Rotation speed sensor	1		03338120279
1S1	Not-Aus-Schalter	Emergency stop button	1		03338120S1.2
1S4	Schalter Abdeckung	Cover safety switch	1		0460015
1S5	Drehfutterschutz	Protector chuck safety switch	1		0460015
1S6	Ein-Aus-Taster	On-off switch	1		03338120S1.3
1S8	Hauptschalter	Maim switch	1		03338120S1.1
1S9	Drehrichtungschalter	Change-over switch	1		0460009
Q1,6	Steuerplatine	Control board	1		03338120Q1.6
Q1,6	Steuerplatine	Control board	1		03338120Q1.7
1R1	Potentiometer	Potentiometer	1		03338120R1.5
1F1/ 1F2	Sicherung	Fuse	2		034203101F1
LF	Netzfilter	Line filter	1		03420310LF
1M1	Motor	Motor	1		03420310103
					03420310M1
Teile ohne Abbildung - Parts without illustration					
	Drehfutterschlüssel	Key for lathe chucks	1		0340200
	Zubehör kplt.	Accessory box cpl.	1		03420310000
	Oberschlitten kplt.	Top slide cpl.	1		03420310999
	Wechselradsatz kplt.	Change gear set cpl.	1		03420310437
	Reitstock kplt.	Tailstock cpl.	1		03420310996

7 Malfunctions

7.1 Malfunctions on the lathe

Malfunction	Cause/ possible effects	Solution
Surface of workpiece too rough	• Tool blunt • Tool springs • Feed too high • Radius at the tool tip too small	• Resharpen tool • Clamp tool with less overhang • Reduce feed • Increase radius
Workpiece becomes conical	• Top slide is not exactly set to zero (when turning with the top slide)	• Set top slide to exact zero position
Lathe is chattering	• Feed too high • Main bearings have clearance	• Reduce feed • Have the main bearings read-justed
Center runs hot	• Workpiece has expanded	• Loosen tailstock center
Tool has a short edge life	• Hard casting skin • Cutting speed to high • Crossfeed to high • Insufficient cooling	• First break casting skin • Reduce cutting speed • Lower crossfeed (smooth finish allowance not over 0,5 mm) • More coolant
Flank wear too high	• Clearance angle too small (tool "pushes") • Tool tip not adjusted to center height	• Increase clearance angle • Correct height adjustment of the tool
Cutting edge breaks off	• Wedge angle too small (heat buildup) • Grinding cracks due to wrong cool-ing • Excessive clearance in the spin-dle bearing arrangement (vibra-tions)	• Increase wedge angle • Cool uniformly • Have the clearance in the spindle bearing arrangement re-adjusted. If necessary, replace the tapered roller bearings.
Cut thread is wrong	• Tool is clamped incorrectly or has been started grinding the wrong way • Wrong pitch • Wrong diameter	• Adjust tool to the center • Grind angle correctly • Adjust right pitch • Turn the workpiece to the correct diameter

8 Appendix

8.1 Copyright

This document is copyright. All derived rights are also reserved, especially those of translation, re-printing, use of figures, broadcast, reproduction by photo-mechanical or similar means and recording in data processing systems, neither partial nor total.

Subject to technical changes without notice.

8.2 Terminology/Glossary

Term	Explanation
Spindle stock	Housing for the feed gear and the synchronous belt pulleys.
Lathe chuck	Clamping tool for holding the workpiece.
Drill chuck	Drill bit chuck
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 bid, the drill chuck or the center.
Tool	Cutting tool, 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 centers.

8.3 Change information operating manual

Chapter	Short note	new version number
4.6.1	Feed, mechanical end stops	1.0.1
4	Update pictures	1.0.1
6	Update spare parts, handwheel lathe saddle-left hand	1.0.1
4	Updated figure, e.g. change gears	1.0.2
CE	Updated standards CE Declaration	1.0.3

8.4 Liability claims for defects / warranty

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

- The processing of the liability claims or of the warranty is performed as chosen by OPTIMUM GmbH either directly or through one of its dealers.
  Any defective products or components of such products will either be repaired or replaced by components which are free from defects. The property of replaced products or components passes on to OPTIMUM Maschinen Germany GmbH.
- 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.
- Defects resulting of 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.
  - Non-authorized 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.
- The following items are as well not subject to the 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
- Any services which OPTIMUM GmbH or one of its agents performs in order to fulfill in the frame of an additional guarantee are neither an acceptance of the defects nor an acceptance of its obligation to compensate. Such services do neither delay nor interrupt the warranty period.
- Place of jurisdiction among traders is Bamberg.
- If one of the above mentioned agreements is totally or partially inefficient and/or null, it is considered as agreed what is closest to the will of the warrantor and which remains in the framework of the limits of liability and warranty which are predefined by this contract.

8.5 Note regarding disposal / options to reuse:

Please dispose of your device environmentally friendly by disposing of scrap in a professional way.

Please neither throw away the packaging nor the used machine later on, but dispose of them according to the guidelines established by your city council/municipality or by the corresponding waste management enterprise.

8.5.1 Decommissioning

CAUTION!

Used devices need to be decommissioned in a professional way in order to avoid later misuses and endangerment of the environment or persons.

- **Pull off the mains plug.**
- **Cut the connection cable.**
- **Remove all environmentally hazardous operating fluids from the used device.**
- **If applicable remove batteries and accumulators.**
- **Disassemble the machine if required into easy-to-handle and reusable assemblies and component parts.**
- **Supply the machine components and operating fluids to the provided disposal routes.**

8.5.2 Disposal of the packaging of new devices

All used packaging materials and packaging aids of 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 forwarded to a collection station or to the appropriate waste management enterprise.

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

8.5.3 Disposing of the old device

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 include lots of reusable materials as well as environmentally hazardous components. Account for separate and professional disposal of the component parts. 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.

8.5.4 Disposal of electrical and electronic components

Please make sure that the electrical components are disposed of professionally and according to the legal regulations.

The device includes electric and electronic components and must not be disposed of with the rubbish. According to the European directive 2002/96/EG regarding electrical and electronic used devices and the execution of national rights used electrical tools and electrical machines need to be collected separately and be supplied to an environmentally compatible reuse.

Being the machine operator you should obtain information regarding the authorized collection or disposal system which applies for your company.

Please make sure that the batteries and/or accumulators are disposed of in a professional way according to the legal regulations. Please only throw discharged batteries in the collection boxes in shops or at municipal waste management companies.

8.5.5 Disposal of lubricants and coolants

ATTENTION!

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

INFORMATION

Used coolant emulsions and oils should not be mixed up since it is only possible to reuse used oils which had not been mixed up without pre-treatment.

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

8.6 Disposal via municipal collection

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 handles as common household waist, but that is needs to be delivered to a central collection point for recycling. Your contribution to the correct disposal of this product will protect the environment and the health of your fellow men. The environment and the health are endangered by incorrect disposal. Recycling of material will help to reduce the consumption of raw materials. Your District Office, the municipal waste collection station or the shop where you have bought the product will inform you about the recycling of this product.

8.7 RoHS, 2002/95/EC

The sign on the product or on its packing indicates that this product complies with the European guideline 2002/95/EC.

8.8 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 failures

Optimum Maschinen Germany GmbH
Dr.-Robert-Pfleger-Str. 26

D-96103 Hallstadt

Fax +49 (0) 951 - 96 555 - 888
Email: info@optimum-maschinen.de

CE

EC Declaration of Conformity

Machinery Directive 2006/42/EC Annex II 1.A

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

hereby declares that the following product,

Designation of the machine:	Lathe
Type of machine:	TU2004V
Serial number:	_ __ __ __ __
Year of manufacture:	20__

Manual geared drill for private persons as well as for craft and industrial plants which meets all the relevant provisions of the above mentioned Directive 2006/42/EC as well as the other directives applied (below) including their amendments in force at the time of declaration. The following other EU Directives have been applied: EMC Directive 2014/30/EC, Low Voltage Directive 2006/95/EC

The safety objective meet the requirement of EC Directive 2006/95/EC

The following harmonized standards were applied:

EN 1037:1995+A1:2008 Safety of machinery - Prevention of unexpected start-up

EN 1088:1995+A2:2008 Safety of machinery - Interlocking devices associated with guards - Principles for design and selection

EN ISO 23125:2010 - Machine tools - Safety - Turning machines (ISO 23125:2010 + Amd. 1:2012)

DIN EN 55011 2009/A1:2010 Industrial, scientific high frequency equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement

EN 50581:2012 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

EN 60204-1:2006/AC: 2010 Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1:2005 (modified))

EN ISO 12100:2010 Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)

EN ISO 13857:2008 Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs

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