

Operating instructions

CNC lathe

L33 CNC



Keep for future reference !

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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 CNC 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 CNC machine.

Therefore, no claims can be derived from 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.

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1 Safety

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 CNC machine,
- 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 operating instructions, please observe

- applicable laws and regulations,
- legal requirements for accident prevention,
- the prohibition, warning and mandatory signs as well as the warning labels on the CNC machine,

ALWAYS KEEP THIS DOCUMENTATION CLOSE TO THE CNC MACHINE.

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



Abb. 1-1: Type plates

1.1 Typographical conventions

- gives additional advices
- calls on you to act
- enumerations

1.2 Safety instructions (warning notices)

1.2.1 Classification of hazards

We classify the safety instructions into different levels. The table below gives an overview of the classification of symbols (pictograms) and signal words for the specific danger and its (possible) consequences.

Pictogram	Signal words	Definition/Consequences
	DANGER!	Imminent danger that will cause serious injury or death to persons.
	WARNING!	Risk: A danger that might cause severe injury or can lead to death.
	CAUTION!	Danger of unsafe procedure that might cause injury to the staff or damage to property.
	ATTENTION!	Situation that could cause damage to the CNC machine and the products and other types of damage. No risk of injury to the staff.
	INFORMATION	Application hints and other important or useful information and notices. No dangerous or harmful consequences for the staff or objects.

In case of specific dangers, we replace the pictogram by



1.2.2 Other pictograms



Forbidden to switch on!



Forbidden to enter the machine!



Forbidden to distinguish with water!



Access forbidden!



Use protective shoes!



Use ear protection!



Use protective glasses!



Warning of suspended loads!



Warning of oxidizing materials!



Warning of explosive!



Warning of danger of slipping!



Protect the environment!



Contact address

1.3 Intended use

WARNING!

In the event of intended use of the CNC machine

- the staff will be endangered,
- the CNC machine and other material property of the operating company will be endangered,
- the correct function of the CNC machine may be affected.



The CNC machine is designed and manufactured to be used for turning cold metals or other non-flammable materials or materials that do not constitute a health hazard by using commercial turning and drilling tools.

Using this machine it is possible to perform dry processing as well as processing by using cooling lubricants. ➡ "Maintenance" on page 46

The limit values of the balances of the tools need to be observed.

The CNC machine must only be installed and operated at a dry and well-ventilated place.

The CNC machine is designed and manufactured to be used in a non-explosive environment.

If the CNC machine is used in any way other than described above, modified without the approval of the company Optimum Maschinen Germany GmbH then the CNC machine is being used improperly.

Intended use

We do not take any liability for damages caused by 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 intended use that you

- observe the limits of performance of the CNC machine,
- observe the operating instructions,
- observe the inspection and maintenance instructions.

WARNING!

Very serious injury due to intended use.

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



1.4 Possible dangers caused by the CNC machine.

The CNC machine has undergone a safety inspection. The construction and design are state-of-the-art.

Nevertheless, there is a residual risk as the CNC machine operates with

- rotating parts,
- electrical voltage and currents,
- compressed air,
- rapid moves,

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

If the CNC machine is used and maintained by staff who are not duly qualified, there may be a risk resulting from incorrect or unsuitable maintenance of the CNC machine.

INFORMATION

The staff involved in assembly, commissioning, operation and maintenance, must

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

In the event of improper use

- there may be a risk to the staff,
- there may be a risk to the CNC machine and other property values,
- the correct function of the CNC machine may be affected.

Always switch off the CNC machine and disconnect it from the mains if you perform cleaning or maintenance works.



WARNING!

The CNC machine may only be used with functional safety devices. Disconnect the CNC machine immediately, whenever you detect a failure in the safety devices or when they are not fitted!

All additional parts of the machine which had been added by the customer need to be equipped with the prescribed safety devices.

As the operating company, this will be your responsibility!

🔗 "Safety devices" on page 12



1.5 Qualification of the staff

1.5.1 Target group

This manual is addressed to

- the operating company,
- operators having sufficient specialist knowledge,
- the maintenance staff.

Therefore, the warning notices refer to both, operation and maintenance staff of the CNC machine.

Determine clearly and make a permanent decision in who will be responsible for the different activities on the CNC machine (operation, retooling, maintenance and repair). Please note the name of the responsible person into an operators log.

INFORMATION

Vague and unclear assignment of responsibilities constitute a safety hazard!

Always lock the main switch after switching off the CNC machine. This will prevent it from being used by unauthorized staff.

The qualifications of the staff 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 expressly 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 staff

Due to his professional training, knowledge and experience as well as his knowledge of relevant regulations the specialist staff is able to perform the assigned tasks and to recognise and avoid any possible dangers himself.

Instructed persons

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



1.5.2 Authorized staff

INFORMATION

Sufficient professional expertise is required in order to work on the CNC machine. No one must work on the machine without having the necessary education, not even for a short while.



We recommend to use the CNC software SYMplus turn 802 S as aid for training puposes as well as for operation.

SYMplus turn is the ideal software supplement for the CNC lathe L33 CNC made by OPTIMUM.

As training software it helps as rapid introduction in the operation of the control Sinumerik 802S. Employees having little CNC experience can learn the basics of the DIN programming by using SYMplus and finally they will be able to write and test programs using 802S cycles.

In particular SYMplus is an easy-to-learn CAD/CAM system which helps you to save programming times, to avoid crashes and to reduce the production time.

WARNING!

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

Only authorized staff may operate the CNC machine!



INFORMATION

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



The operating company must

- train the staff,
- instruct the staff in regular intervals (at least once a year) on
 - all safety standards that apply to the CNC machine,
 - operation of the CNC machine,
 - accepted technical guidelines,
 - possible emergency situations,
- check staff,Äòs state of knowledge,
- document training/instruction in a operation book,
- require staff to confirm participation in training/instructions by means of a signature,
- check whether the staff is working safety- and risk-conscious and observe the operating instructions.

Obligations of the operating company

The operator must

- be specially trained in handling and programming the CNC machine,
- know and understand the program sequence and which effects the individual process parameters will have,
- keep an operator,Äòs log,
 - have read and understood the operating instructions,
 - be familiar with all safety devices and instructions.
- before taking the machine in operation

Obligations of the operator

For work on the following CNC machine components there are additional requirements:

- Electric components or operating materials: Must only be performed by a qualified electrician or person working under the instructions and supervision of a qualified electrician.

Additional requirements for the qualification

1.6 Operator's positions

The operator's position is in front of the CNC machine at the sight windows or on the machine control panel.



Abb. 1-1: Operator's positions

1.7 Safety devices

Use the CNC machine only with properly functioning safety devices.

Stop the CNC machine 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 CNC machine must only be used if you

- have removed the cause of the failure,
- have verified that there is no resulting danger for the staff or objects.

WARNING!

If you bypass, remove or deactivate a safety device in any other way, you are endangering yourself and other staff working with the CNC machine. The possible consequences are

- injuries due to tools, workpieces or fragments hereof which are flying off at high speed,
- contact with rotating or moving parts,
- a fatal electrocution,
- clothes getting caught.

The CNC machine includes the following safety devices:

- a lockable main switch,
- two EMERGENCY STOP push on the machine control panel and on the spindle head,
- a locked, separating protective equipment around the CNC lathe (protective housing with sight windows made of break-proof Makrolon).
- a position switch on the separating protecting unit,
- a position switch on the switch cabinet door.

1.7.1 Lockable main switch

In the position „0“ the lockable main switch can be secured against accidental or non-authorized switching-on by means of a padlock.



When the main switch is switched-off, the current supply is interrupted.

Except for the areas marked by the pictogram in the margin. In these areas there might be voltage, even if the main switch is switched-off.



Abb. 1-1: Main switch

WARNING!

Dangerous voltage even if the main switch is switched-off.

In the areas marked by pictogram in the margin, there might be voltage, even if the main switch is switched off.



1.7.2 EMERGENCY STOP pushbutton

ATTENTION!

The EMERGENCY STOP pushbutton immediately stops the operation of the CNC machine.

Push the EMERGENCY STOP pushbutton only if there is a risk! If the switch is actuated in order to switch off the CNC machine in the standard operation the tool or workpiece might get damaged.

After having actuated the EMERGENCY STOP, turn the knob of the pushbutton to the right in order to restart the machine.

When restarting the machine it is necessary to travel to reference point!

 For switching on and travelling to the reference point, refer to chapter  "SINUMERIK 802S base line" on page 43.



1.7.3 Control technical protection

WARNING!

If you bypass a controller you endanger yourself and other persons working on the CNC machine.

- injuries due to tools, workpieces or fragments hereof which are flying off at high speed,
- contact with rotating parts,
- a fatal electrocution,
- clothes getting caught.

If you bypass a controller in exceptional cases (e.g. during electrical repairs) short term you must continuously monitor the CNC machine during this time.



1.7.4 Prohibition, warning and mandatory signs

INFORMATION

All warning and mandatory signs must be legible. Check them regularly. The labels shown below including safety instructions are attached at the protective housing.

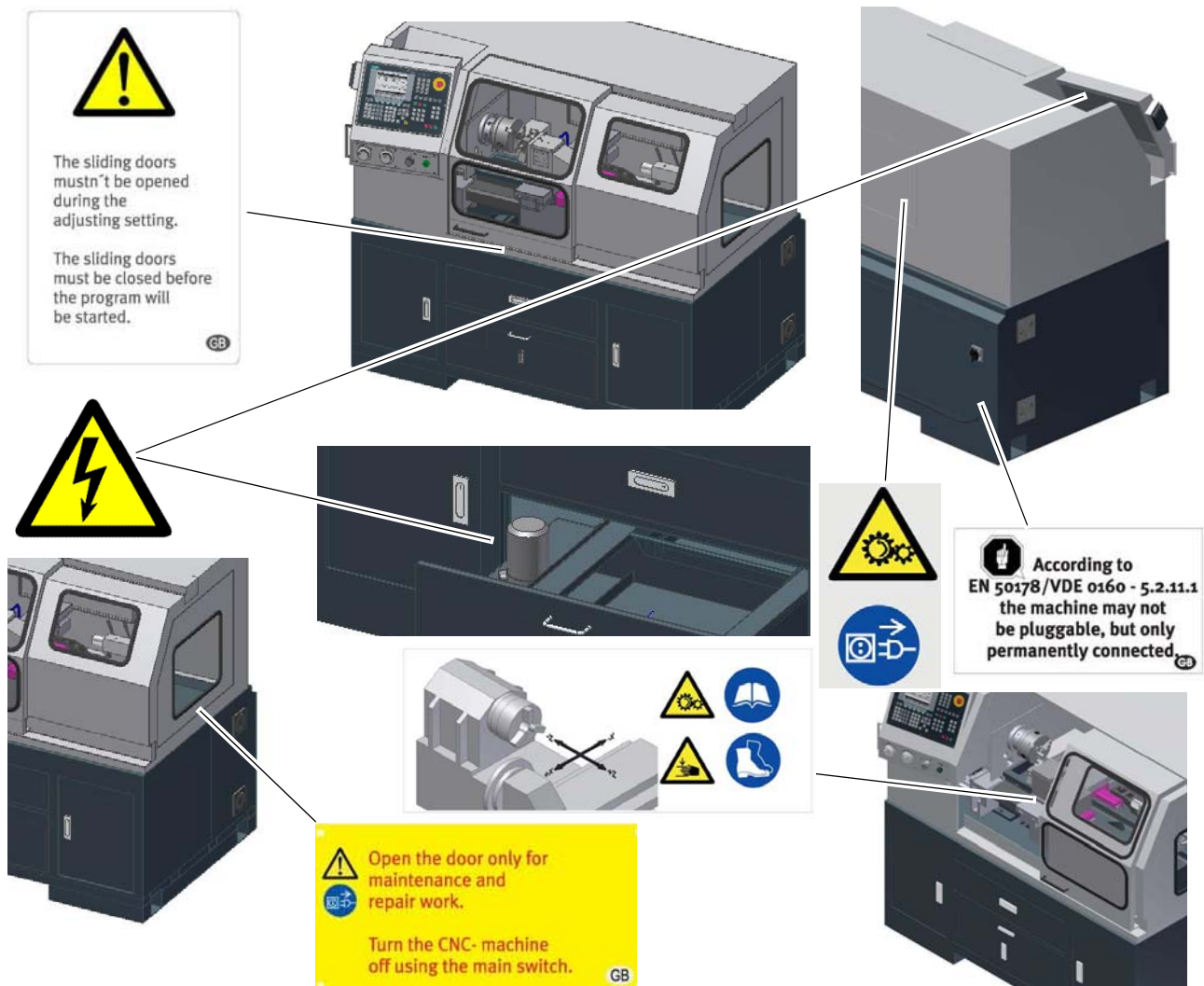


Abb. 1-1: Prohibition, warning and mandatory signs

1.8 Safety check

Check the CNC machine at least once per shift. Inform the person responsible immediately of any damage, defect or change in operating function.

Check all safety devices

- at the beginning of each shift (when the machine is operated continuously),
- once per day (during one-shift operation),
- once per week (when operated infrequently),
- after every maintenance and repair operation.

Check that prohibition, warning and information signs and the labels on the CNC machine

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

INFORMATION

Use the following table for organizing the checks.



General check		
Equipment	Check	OK
Protective covers	Switching function, firmly bolted and not damaged	
Signs, labels	Installed and legible	
Date:	Checked by (signature):	

Functional test		
Equipment	Check	OK
EMERGENCY-STOP pushbutton	After actuating an EMERGENCY STOP pushbutton the CNC machine must be switched off.	
Separating protective equipment around the CNC machine	If the protective equipment is open it must not be possible to start program.	
Date:	Checked by (signature):	

1.9 Personnel protective equipment

For some works you need protective clothing and equipment as personal protective equipment.

Protect your face and eyes. Wear a safety helmet with facial protection during any work, where your face and eyes are exposed to hazards.

Use protective gloves when handling pieces or tools with sharp edges.

Use safety shoes when you position, dismantle 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 protective clothing and equipment is available at the working place.



CAUTION!

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

1.10 Safety during operation

WARNING!

Before activating the CNC machine, double-check that it neither endangers other persons nor causes damage to property.

Avoid unsafe working practice:

- The instructions mentioned in these operating instructions have to be strictly observed during assembly, operation, maintenance and repair.



- Do not work on the CNC machine if your concentration is reduced, for example, because you are taking medication.
- Stay on the CNC machine until the program is terminated.
- Safely and firmly clamp the workpiece before switching on the CNC machine.
- Never change the dosing of the coolant supply during operation.
- Never open the sliding door of the separating protective unit when the CNC program is running.

WARNING!

When chipping magnesian materials (aluminium-/magnesium alloys) spontaneously inflammable or explosive particles (powder, dust, chips) might be generated which might result in a fire and/or an explosion (deflagration).

Magnesium is designated as a dangerous material in the list of dangerous materials and preparations according to §4a of Ordinance of Hazardous Substances.

In case of fire with magnesium only use with appropriate and admitted extinguishes agents. Never extinguish using water. If you extinguish burning magnesium with water it might lead to dangerous reactions (detonating gas). The water would be decomposed to its components hydrogen (H) and oxygen (O).

Only the following extinguishing agents are admitted:

- solid extinguishing agent of the fire class D (fires of metals)
- dry covering salts for magnesium
- a mixture of sand and cast chips
- argon (Ar) or nitrogen (N₂)

If fine mist and smoke is generated in the working room suction unites need to be provided in order to avoid the accumulation of ignitable mixtures and emissions.

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

1.11 Safety during maintenance

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

Report all safety-relevant changes and performance details of the CNC machine. Document all changes, have the operating instructions updated accordingly and train machine operators.

1.12 Disconnecting and lock the CNC machine

Turn the CNC machine off by actuating the main switch before starting any maintenance and repair work.

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

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

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

Place a warning sign on the CNC machine.



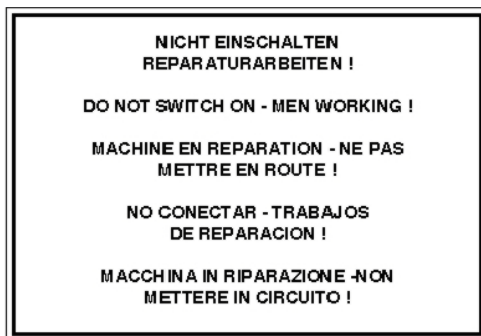


Abb. 1-2: Warning sign

WARNING!

Live parts and moves of machine parts can injure you or others dangerously!
Proceed with extreme care if you cannot switch off the CNC machine on the main switch due to works (e.g. functional control) which need to be performed.



1.12.1 Using lifting equipment

WARNING!

The use of unstable lifting and load suspension gear that might break under load can cause very severe injuries or even death. Observe the accident prevention regulations issued by your Employers Liability Insurance Association or another competent Supervisory authority responsible for your company.

Check that the lifting equipment and load-suspension devices are of sufficient load capacity and are in perfect condition.

Fasten the loads properly.

Do not walk under lifted loads!



1.12.2 Mechanical maintenance work

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

- covers,
- safety instructions and warning signs,
- earth (ground) connections.

If you remove protective or safety devices, re-fit them immediately after the completing the work.

Check if they are working properly!

1.13 Accident report

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

There are many possible causes for "near misses".

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

INFORMATION

We point out the specific dangers when performing works with and on the CNC machine when describing such works.



1.14 Electrical system

Have the machine and/or the electrical equipment checked regularly, at least every six months. Immediately eliminate all defects such as loose connections, defective wires, etc.

A second person must be present during work on live components to disconnect the power in the event of an emergency. Immediately disconnect the CNC machine if there are any anomalies in the power supply!

 "Maintenance" on page 46

1.15 Clamping devices for workpieces and tools

ATTENTION!

Attention when taking over the existing clamping devices. Please check critically if the clamping device is appropriate for your CNC machine.

- Only use clamping devices which have a complete inherent stiffness.
- Contact the manufacturer of the clamping device regarding the reuse of the clamping devices after damages on the clamping devices due to collisions.
- Correctly insert the workpiece and make sure that the machine is in proper working condition.



1.16 Protection of the environment and of waters

The CNC machine is a device to produce, handle and use materials which are hazardous to water according to §19g of the Water Resources Law.

When operating, decommissioning or disassembling the CNC machine or parts hereof, please follow the requirements of the Water Resources Law. Please find detailed information about this topic in the regulation on devices to treat materials which are hazardous to water.



2 Technical data

The following information are the dimensions and indications of weight and the manufacturer, as approved machine data.

2.1 Type plate

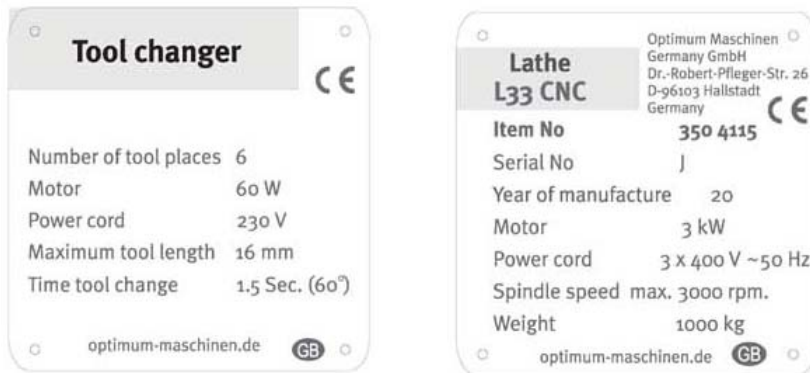


Abb.2-1: Type plate

2.2 Electrical connection

Motor	400 V/ 50Hz/ 3.5 kW
-------	---------------------

2.3 Coolant pump

Power of the coolant pump [W]	40
Tank capacity [l]	50

2.4 Dimensions

Length [mm]	1595
Width [mm]	845
Height [mm]	1560
Total weight [kg]	about 1000
Load capacity of the substructure [kN/m ²]	12

2.5 Working area

Length [mm]	4000
Width [mm]	2750
Height [mm]	2500

2.6 Machine data

Spindle cone	Camlock 1-4"	
Spindle hole [mm]	38	
Distance between centres [mm]	750	
Height of centres [mm]	165	
Bed width [mm]	187	
Speed/Speed stages		
Stage	L	H
Spindle speed [min ⁻¹]	80-1200	500-3000
Torque [Nm]	36	16

2.7 Travel, infeed speed

X-axis [mm]	165
Infeed speed X-axis [mm/min]	2000
Torque X-axis [Nm]	8,4
Z-axis [mm]	600
Infeed speed Z-axis [mm/min]	2000
Torque X-axis [Nm]	10

2.8 Tool changer

Number of tool places	6
Seat height max. [mm]	16

2.9 Tailstock

Tailstock seat [mm]	MT 3
Tailstock - sleeve stroke [mm]	120

2.10 Environmental conditions - operation

Temperature	19 - 21 °C (for optimum turning results) 19 - 21 °C (for operation without malfunctions)
Admissible relative humidity	5...95% no condensation

2.11 Environmental conditions - storage

Temperature	5 - 55 °C
-------------	-----------

2.12 Emissions

The generation of noise emitted by the CNC machine is less than 76 dB(A).

If the CNC machine is installed in an area where various machines are in operation, the noise exposure (immission) on the operator of the CNC machine at the working place may exceed 80 dB(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 the factors influencing production, 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 an interdependence between the degree of the noise emission and the degree of the noise disturbance it is not possible to use it reliably in order to determine if any further measures of precaution are required or not.

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

- Characteristics of the working space, 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.



3 Assembly and commissioning

INFORMATION

The CNC machine is completely pre-assembled. It is delivered in a wooden box.



3.1 Delivery volume

Take all parts out of the packaging and compare them to the attached packing list.

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

Check if all parts are firmly seated.

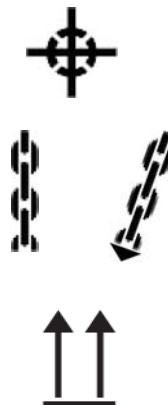
3.2 Transport

WARNING!

Severe or fatal injuries may occur if the machine or 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:



- Centres of gravity
- Load suspension point
(Marking of the positions for the load suspension)
- Prescribed transportation position
(Marking of the top surface)
- Means of transport to be used
- Weights



WARNING!

The use of unstable lifting and load handling equipment 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 regulations for accident prevention.

Fasten the loads properly.

Do not walk under lifted loads!



- ➔ Check the substructure. The substructure has to bear the load. ➔ "Load capacity of the substructure [kN/m²]" on page 19

- Disassemble the lateral parts of the wooden box.
- Transport the CNC machine using an appropriate hoisting device e.g. a forklift truck to the installation site.



Abb.3-1: Example: Transport 1

- Disassemble the hexagon socket screws which are used to fix the machine on the wooden pallet.
- Lift the CNC machine carefully from the wooden pallet using an appropriate hoisting device e.g. a forklift truck.  "Total weight [kg]" on page 19



Abb.3-2: Example: Transport 2

- Take the CNC machine to its firm position using an appropriate hoisting device e.g. lift truck or electric forklifts.

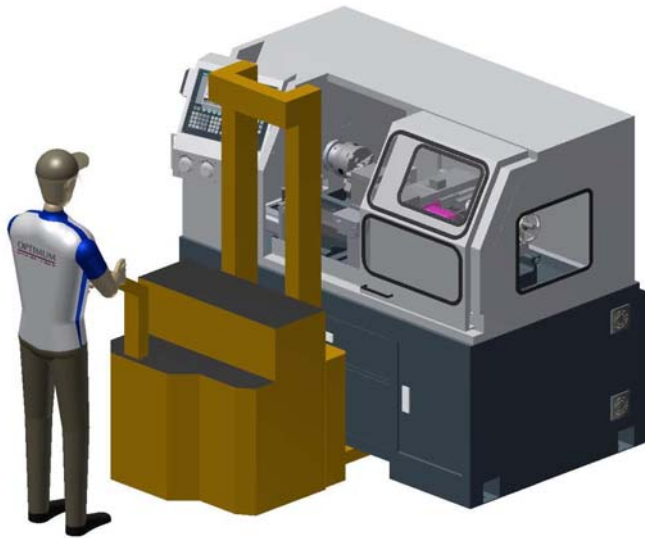


Abb.3-3: Example: Transport 3

- ➔ Make sure that the load handling equipment does not damage any add-on pieces or causes damages to the paintwork.

ATTENTION!

Make sure that the load attachment point is balanced (refer to the centre of gravity).
 ☞ "Installation plan L33 CNC" on page 26

WARNING!

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



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



- 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 one.



Consult Optimum Maschinen Germany GmbH if the CNC machine and accessories are stored for more than three months or are stored under different environmental conditions than those given here. ➡ "Environmental conditions - operation" on page 20

3.4 Installation and assembly

3.4.1 Requirements regarding the installation site

Organize the working area around the CNC machine according to the local safety regulations.

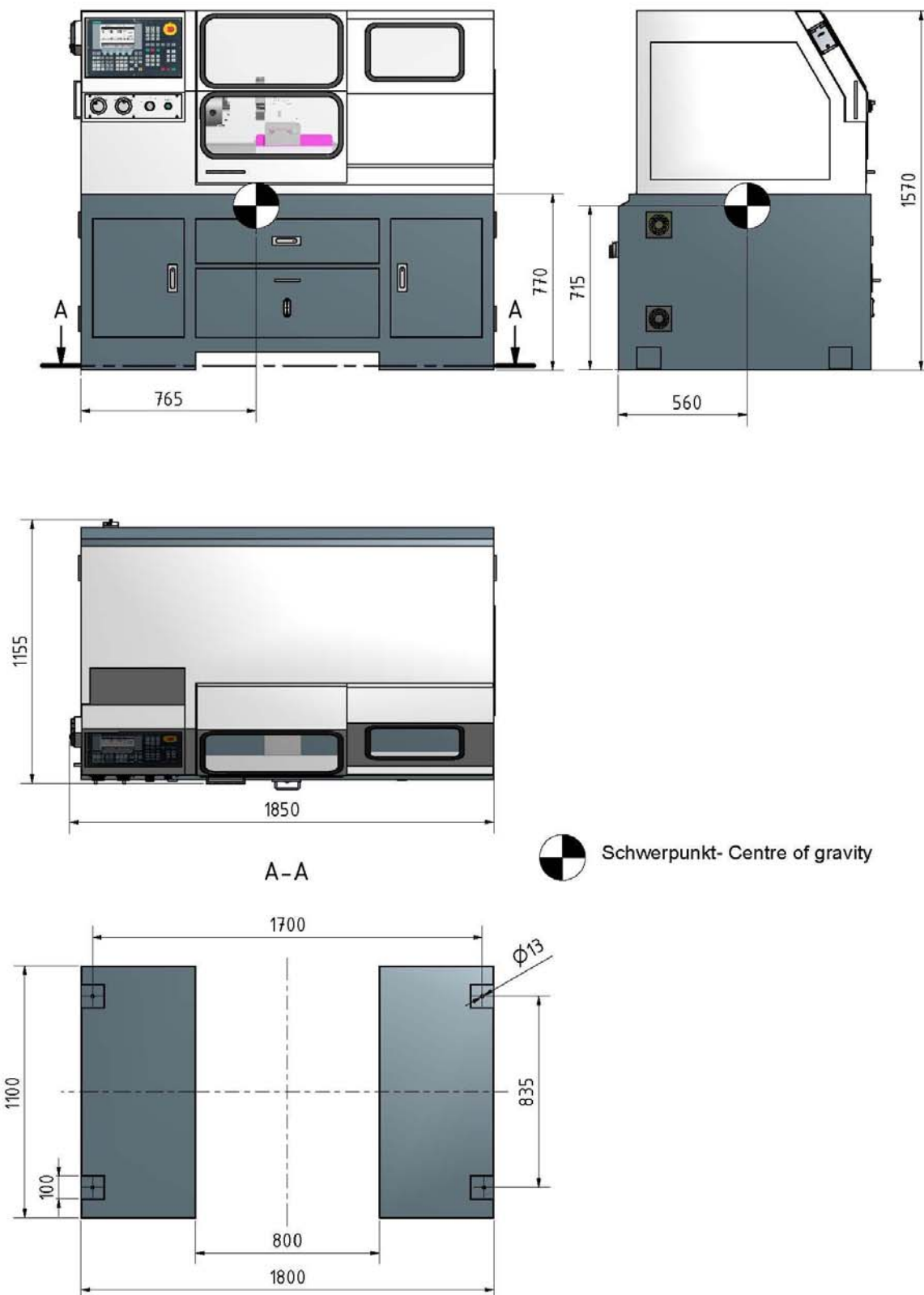
The working area for operation, maintenance and repair must not be hindered. Follow the prescribed safety areas and escape routes according to VDE 0100 part 729 as well as the environmental conditions for the operation of the CNC machine.

INFORMATION

The main switch of the CNC machine must be easily accessible.



3.4.2 Installation plan L33 CNC



3.4.3 Fixing the machine

Anchoring-free assembly

- ➔ If required, use anti-vibration feet (refer to machine accessory SE1/ SE2 item No 3381012/ 3381016) for the machine substructure.
- ➔ Align the CNC machine with a machine spirit level.
- Check the alignment of the machine after a few days of usage.

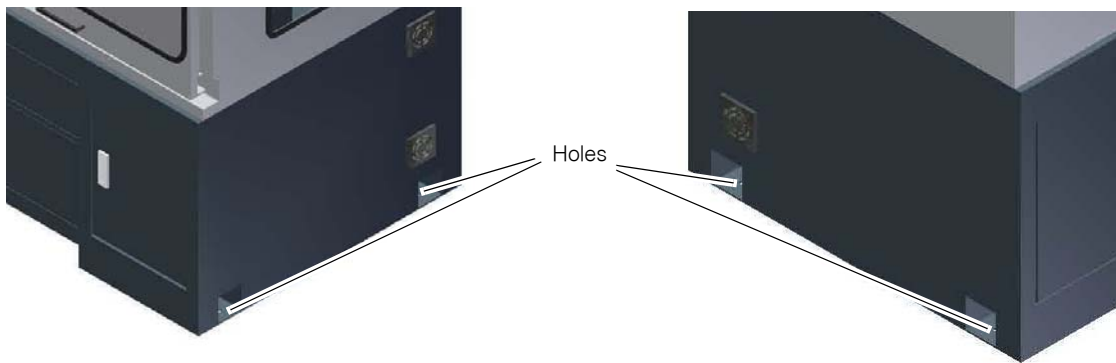


Abb.3-1: Assembly

Anchored assembly

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

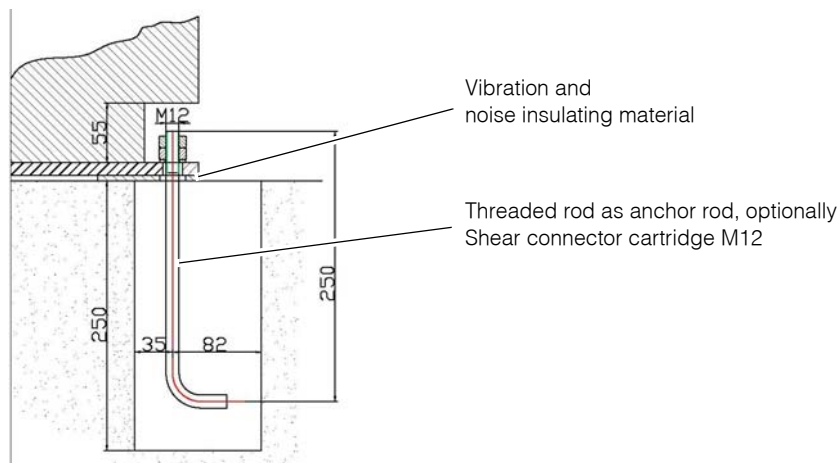


Abb.3-2: Drawing of the anchoring

3.4.4 Alignment of the machine

- ➔ Align the CNC machine on the machine bed by means of a machine spirit level. Use the setscrews in order to perform the required height levelling. ➔ "Fixing the machine" on page 27
- ➔ The slope deviation of all levels must not exceed 0.03mm/1000mm.

ATTENTION!

An insufficient rigidity of the substructure leads to superposition of vibrations between the CNC lathe and the substructure (natural frequency of the components). Critical speeds and moves in the axes with displeasing vibrations are rapidly achieved in case of insufficient rigidity of the whole system and will lead to bad turning results.

- ➔ Control the anchoring on the floor after a few days of use and the correct alignment.



3.4.5 Corrosion protection

- ➔ A corrosion protection is applied on the machine table and on the guiding surfaces for transport and storage. Remove the anti-corrosive agent from the CNC machine before first commissioning. Therefore, we recommend you to use paraffin.

3.4.6 Electrical connection

- ➔ Connect the electrical supply cable.
- ➔ Check the fusing (fuse) of your electrical supply according to the technical instructions regarding the total connected power of the CNC machine.

The guarantee will become null and void if the machine is wrongly connected!

🔧 "Qualification of the staff" on page 10

3.4.7 Refill coolant

The CNC lathe is delivered without coolant.

- ➔ Fill the coolant tank with an appropriate cooling lubricant via the filler hole. 🔧 "Cooling lubricants" on page 47

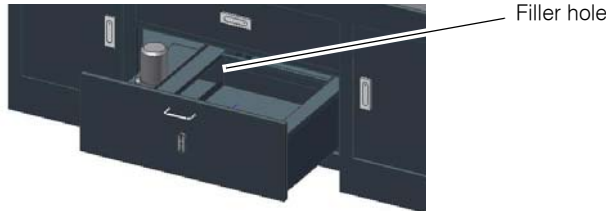


Abb.3-1: Filler hole coolant tank

ATTENTION!

Failure of the pump in case of a dry run. The pump is lubricated by the cooling agent. Do not start up the pump without coolant.



INFORMATION

Use a water soluble environmentally compatible drilling emulsion as coolant procured from the specialized trade.

Make sure that the coolant is properly absorbed.

Respect the environment when disposing of any lubricants and coolants.

- ➔ Follow the manufacturer's disposal instructions.



3.5 Refill oil

The CNC lathe is equipped with a central lubricating system.

INFORMATION

The CNC turning machine is delivered without lubricating oil.



- ➔ Fill the tank with lubricating oil via the filler hole.  "Machine lubricants" on page 47

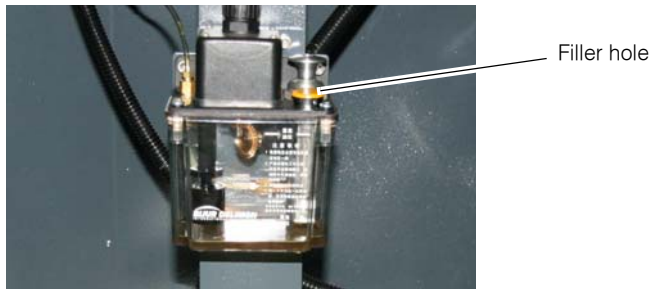


Abb.3-2: Central lubrication system

3.5.1 Warming up the machine

ATTENTION!

Before you begin with the commissioning on the machines check that all screws, fasteners and fuses are tight. If necessary they must be tightened.



ATTENTION!

If the CNC machine and in particular the turning spindle is immediately operated at maximum load when it is still cold, it may result in damages.

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

3.5.2 Passwords

Upon delivery the control SINUMERIK 802S/C base line is protected with a password. In order to be able to change parameters and data of the control it is necessary to enter a password.

- **Menu: Diagnose, Start up, Set password**

Upon delivery the password for the machine operator is: CUSTOMER

Upon delivery the password for Siemens service staff of the control giving them the possibility to change all programmed parameters is: EVENING

Please also refer to  "Control technical protection" on page 13.

3.5.3 Data backup on the control

INFORMATION

The CNC control only provides a "transient working memory" for its internal machine programs losing its contents at the latest after 30 days.

For this reason it is imperatively necessary to perform a data backup after commissioning the machine respectively the machine control.

Furthermore, it is recommended to repeat this data backup in regular intervals.

Please proceed as follows to perform the data backup:

- ➔ Press the keys SHIFT + SYSTEM simultaneously on the operating panel of the control.
- ➔ Then select the menu item "Data backup".
- ➔ Confirm the storage process by pressing the button "O.K.".
- ➔ Please wait until the data backup is completely and confirmed.



4 General information about CNC

4.1 Compensation of geometry

It is necessary to be able to measure any currently actual position of the CNC -controlled axis in order to perform tool moves on workpieces. The measured value is related to a machine fixed zero position and is compared to the target position which is predefined by the programs.

Required knowledge:

- coordinate systems of machine and workpiece
- reference points of the machine, tool and workpiece
- type of distance measurement
- options of dimensioning and dimension compensation

Basics:

For chip removal relative moves between the tool and the workpiece are required. For programming all moves are related to the resting workpiece.

4.2 Coordinate systems on CNC machine tools

Types of coordinate systems

Coordinate systems allow the exact description of all points on a working plane, respectively in an area.

Generally they are divided into

- cartesian coordinate system and
- the polar coordinate system.

4.2.1 Cartesian coordinate system

A cartesian coordinate system also called a rectangular coordinate system possesses two coordinate axes (two-dimensional cartesian coordinate system) or also three coordinate axes (three-dimensional cartesian coordinate system) which are perpendicular to one another in order to exactly describe the points.

On a two-dimensional cartesian coordinate system, e.g. on the X, Y-coordinate system, each point is clearly defined on the plane by indicating the coordinates (X,Y).

The distance from the Y-axis is called the X-coordinate and the distance from the X-axis is called Y-coordinate. Those coordinates may possess positive or negative algebraic signs.

The three-dimensional cartesian coordinate system is required to display and determine the position of special workpieces, e.g. turning parts.

In order to clearly describe a point in the space, three coordinates are required which are named according to the corresponding axes X-, Y- or Z-coordinates.

Such three-dimensional coordinate systems with positive and negative areas on the coordinate axis allow the exact description of any location, e.g. in the working area of a lathe, independent from where the zero point of the workpiece is set.

4.2.2 Polar coordinate system

In the cartesian coordinate system a point is described by e.g. its X- and Y-coordinate. For rotation-symmetric outlines, e.g. circular drilling images the required coordinates can only be calculated with considerable effort.

In the polar coordinate system a point is described by means of its distance (radius r) to the coordinate origin and its angle (α) to the defined axis. The angle (α) is related to the X-axis of the X, Y coordinate system. In opposite direction it is negative.

4.2.3 Machine coordinate system

The machine coordinate system of the CNC machine tool is determined by the manufacturer. It cannot be changed. The position of the origin point for the machine coordinate system, also called machine zero point cannot be changed.

Any tool moves are generally defined in a standardized, right-handed coordinate system.

Turns from +X to +Y are created in +Z direction, which result in a right-handed screw.

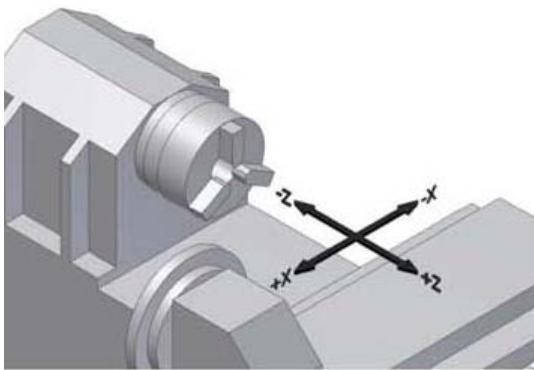


Abb.4-1: Machine coordinate axes taking the lathe as an example

4.2.4 Workpiece coordinate system

The workpiece coordinate system is determined by the programmer. It can be changed. The location of the origin point for this workpiece coordinate system, also called workpiece origin point is generally user-defined.

4.2.5 Rotary axes and secondary axes

NC-machines with rotary table or swivel head

Rotary axis: A B C

Positive turn around X, Y, Z (right-hand-rule)

NC-machines with several feed axes

Secondary axis: U V W

Parallel to the X-,Y-,Z-axis

4.3 Controllable axes of infeed and rotation

The workpiece processing on CNC machine tools requires controllable resp. adjustable feed axes which are driven by servo motors independent from one another. The handwheels which are standard on conventional machines are expendable on modern machine tools.

CNC lathes (see illustration) possess at least 2 controllable resp. adjustable feed axes which are designated by X and Z.

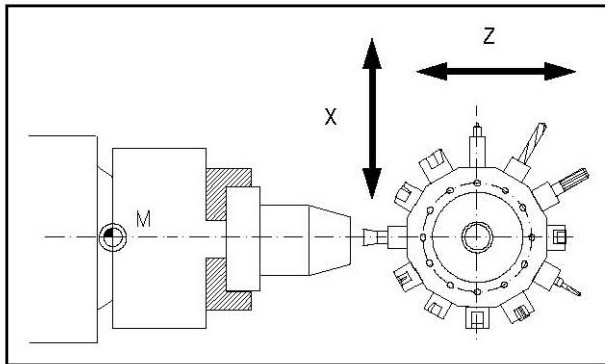


Fig.4-2: Controllable NC axes on a lathe

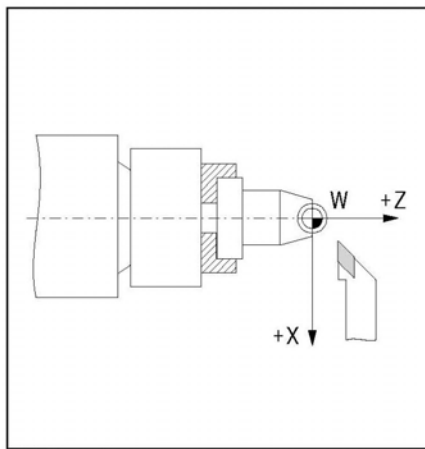


Fig.4-3: Tool in front of the rotation centre

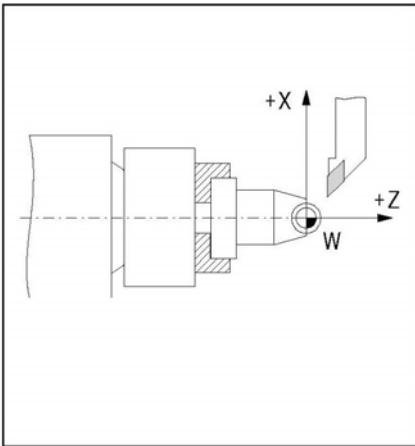


Abb.4-4: Tool behind the rotation centre

On the CNC lathe the working spindle (workpiece support) is determined as Z axis. I.e. the Z axis coincides with the axis of rotation (also refer to figure 26 and 27). The direction of the Z axis is determined in a way that the tool is moving away from the workpiece if it travels in positive axial direction.

The X axis is positioned vertically on the Z axis. However, its direction is depending on the fact if the tool is positioned in front of or behind the centre of rotation.

4.3.1 Types of zero and reference points

-  **M** Machine zero point
-  **W** Workpiece zero point
-  **R** Reference point
-  **E** Tool reference point

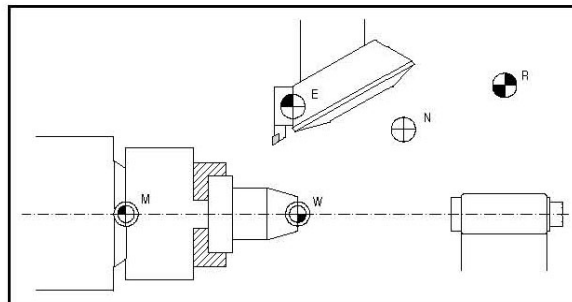


Fig. 4-5: Position of the zero and reference points when turning

Machine zero point M

Each numerically controlled machine tool is working with a machine coordinate system. The machine zero point is the origin of the machine-related coordinate system. Its position is unchangeable and is determined by the machine manufacturer. The machine zero point M on CNC lathes is in general on the centre of the working spindle nose and for CNC vertical milling machines it is above the left diagonal edge of the workpiece carriage.

Reference point R

A CNC machine tool with incremental path measuring system furthermore requires a calibration point which serves at the same time to control the tool and the workpiece movements. This calibration point is designated as reference point R. Its position is exactly determined by a limit switch on each travel axes. The coordinates of the reference point always have the same numerical value related to the machine zero point. It is firmly adjusted in the CNC control. After switching on the machine it is first necessary to travel to the reference point for calibration of the incremental path measuring system on all axes.

4.4 NC mathematics

4.4.1 Basics of the coordinate calculation

For the CNC programming the corresponding points of the outline which are to be machined need to be entered. In most cases if the drawing is suitable for NC purpose, it is possible to directly transfer these coordinate points from the drawing. In some cases it may be necessary to calculate the coordinates.

In the frame of the automation those coordinates are calculated by an NC programming system at external working places and the data are directly transferred to the machine. Therefore, in most cases the NC programming is directly performed on the product (3D pattern) in the construction or in the process engineering department.

For the computer-aided programming the switch and path information are entered on the keyboard in the dialogue of the menu technique.

4.4.2 Parameters of a triangle

In order to calculate the missing coordinates the relations valid for a triangle are very useful. There are several options to describe a triangle. Some of the following parameters e.g. corners, angles or sides are being used.

4.4.3 Angle on a triangle

The angles on a triangle determine the type of triangle. Depending on the size of the individual angles we distinguish between acute-angle, obtuse angle or rectangular triangles.

On triangles the following relation is applied:

the sum of the angles a , b and g in a triangle always amounts to 180° .

$$a + b + g = 180^\circ$$

If two angles are known it is possible to determine the third unknown angle by means of this formula.

Rectangular triangle

The rectangular triangle has a special meaning in the analytic geometry as the sides of such a triangle are having a definite mathematic relation to one another.

On a rectangular triangle the single sides are specially named.

- The longest side is located opposite to the right angle and is named hypotenuse.
- The two sides of the triangle which are forming the right angle are named cathetus.
- The side opposite the angle a is named opposite leg.
- The side adjacent to the angle a is named adjacent leg.

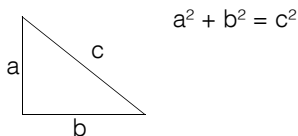
On a rectangular triangle the right angle is described by an quarter circle and a point in the angle.

In a rectangular triangle it applies:

In a rectangular triangle you can calculate the missing leg if the other leg lengths are known. To do so, use the Pythagorean theorem.

The Greek Pythagoras (from about 580 to 496 before Jesus Christ) had been the first person to prove the following mathematic relation which had later on been named the Pythagorean theorem.

The sum of the cathetus square is equal to the hypotenuse square and expressed as a equation:



4.5 Trigonometric functions

The trigonometric functions describe the relations between the angles and the sides of a rectangular triangle. With the help of these trigonometric functions it is possible to calculate the unknown leg lengths with an unknown angle and a known leg. It is depending on which side and which angle are known in order to choose the appropriate trigonometric function e.g. the sinus function, the cosine function or the tangent function.

For the calculation of unknown legs the corresponding equation needs to be transformed as described in the following example:

Known are: the angle and the length of the adjacent leg

Looking for: the length of the opposite leg

It applies: $\tan \alpha = \text{opposite leg} / \text{adjacent leg}$

The results is:

$$\text{opposite leg} = \text{adjacent leg} \times \tan \alpha$$

5 Operation

5.1 Safety

Commission the CNC machine only under the following conditions:

- The CNC machine is in proper working condition.
- The CNC machine is used as intended.
- Follow the operating instructions.
- All safety devices are installed and activated.

All failures should be eliminated immediately. Stop the CNC machine immediately in the event of any failure in operation and make sure that it cannot be started up accidentally or without authorization. Notify the person responsible immediately of any modification.

☞ "Safety during operation" on page 15

5.2 Control- and indicating elements

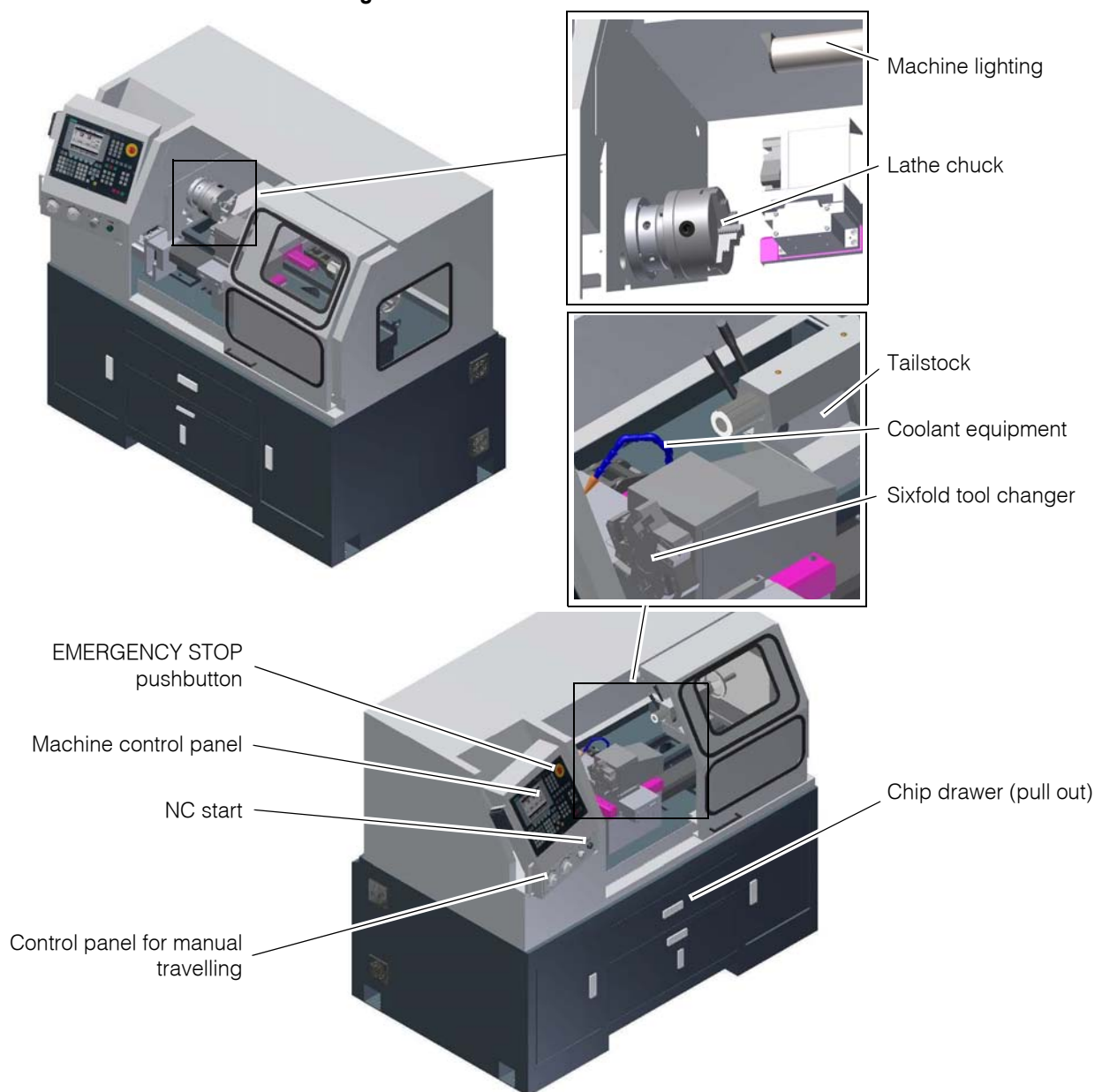


Abb.5-1: L33 CNC

5.3 Operation of the machine control panel

Please refer to the separate instructions of the control manufacturer SIEMENS in the annex of these operating instruction.

5.3.1 Signal lamp

	Pos. No	Colour	Designation
	①	Red	Is illuminated when actuating the emergency stop pushbutton
	②	Orange	Is illuminated in case of failures respectively setting operation such as e.g. if the protective housing is opened
	③	Green	Is illuminated in the operating mode "Automatic mode" resp. during program sequence

5.3.2 Operating the handwheels for manual travelling

Pos.No	Designation	Description
①	Handwheel	Handwheel for manual travelling of the X-axis
②	Rotary switch	Handwheel for manual travelling of the Z-axis
③	Rotary switch	Selector switch to activate the infeed of the X-/Z axis and of the infeed speed (3 stages)
④	Pushbutton	NC start (Power "ON")



5.4 Switch on the CNC machine and travel to the reference point

- ➔ If necessary, unlock both "Emergency Stop pushbuttons".
- ➔ Switch on the main switch.
- ➔ Start the control by pushing the button NC-ON.
- ➔ Then the operating area "Travelling to reference point" is activated. Before making any reference movement make sure that the tailstock is in the basic position (see pictures).
- ➔ Observe the position between the lathe chuck and the lathe slide before starting travelling to the reference point. If necessary, travel to the required position in the "JOG mode". The lathe slide should be positioned at the centre of the machine bed. Then change-over to the "Reference mode".



Abb.5-1: Ground position tailstock

- ➔ Then proceed as described in chapter 2 of the instructions "Operating and programming" of Siemens "Siemens 802S base line" for the further working steps and first travel to the reference point of each axis.

INFORMATION

It is also possible to reference the machine and to travel the axes in the manual mode (JOG mode) when the protective equipment is opened.

Before starting a program connect the separating protective equipment to the CNC machine. Only then change over to the mode "AUTO/MDA".



ATTENTION!

It is not allowed to travel the machine without having travelled to the reference points and having them transferred to the control (machine datum).



INFORMATION

The machine datum is located left - front - bottom.



5.5 Setting

- 🔧 Refer to chapter 3 "Setting" of the instructions "Siemens 802S base line".

INFORMATION

The CNC machine is immediately shut-down during manually controlled respectively automatic operation if the door of the protective housing is being opened.

It is possible to open the door of the protective housing using the K command for the setting mode (JOG mode).



5.5.1 Inserting tool

- ➔ Clamp the lathe tools in the tool holder.
- ➔ The lathe tool must be clamped as short and firm as possible in order to be able to absorb the cutting force well and reliably during chip formation.
- ➔ Adjust the height of the lathe tool. Use the tailstock and the centre point in order to determine the necessary height. If required, position a steel support below the lathe tool in order to maintain the necessary height.

5.5.2 Measuring tools

Measure your tool and enter the data in the tool memory of the CNC machine. The tool is measured outside of the machine.

- ➔ For further working steps, proceed as described in chapter 3 "Enter tools and tool corrections" of the instruction "Setting" for the Siemens 802S base line.

5.5.3 Clamping a workpiece

Lathe chuck

The workpieces must be clamped safely and firmly on the lathe resp. in the lathe chuck before starting the operation. At this, the clamping force should be calculated in a way that it may be guaranteed to take off the workpiece safely and that no damages or deformations occur on the workpiece.

WARNING!

Do not clamp any workpieces which exceed the admissible clamping range of the lathe chuck. The clamping force of the lathe chuck is too little if the clamping range is exceeded. The clamping jaws might get loose.



5.6 Operating modes

Manually controlled operation

The manually controlled operation is allowed in the operating modes "JOG" and "MDA". Refer to chapter 5 "Manually controlled operation" of the instructions "Siemens 802S base line".

Automatic mode

Refer to chapter 6 "Automatic mode" of the instructions "Siemens 802S base line".

5.7 Programming

For further working steps please proceed as described in chapter 7-10 of the instructions "Part programming, system, programming and cycles" of the "Siemens 802S base line".

Manual resp. part programming:

For this kind of programming, the programs must be created manually and enter in the control. The direct programming in the DIN-Code is a complex method which requires lots of skills. Nowadays this task is mostly taken over by CAD/CAM systems which directly create an operating program using a graphical user interface.

Automatic programming:

By means of the CAD/CAM program (for instance a 3D-CAD program including downstream co-processor) construction data are transmitted (semi-)automatically to an executable program. For this kind of programming a 3D model is designed using a PC. By means of an operating sequence which is predefined by the user the motion-sequence of the machine are being calculated. These programs are accessing the tool data base which includes all tool parameters (speed, feed, diameter, etc.). Due to this systematic program structure the user is able to create complete programs within shortest time without having any knowledge of the individual program commands and its syntax.

As aid for training and operation we recommend to use the CNC software SYMplus turn 802 S.

SYMplus turn is the ideal software supplement for the CNC lathe L33 CNC made by OPTIMUM.

As training software it helps for rapid introduction in the operation of the control Sinumerik 802S. Employees having little CNC experience can learn the basics of the DIN programming by using SYMplus and are finally able to write and test programs using 802S cycles.

In particular SYMplus is an easy-to-learn CAD/CAM system which helps you to save programming times, to avoid crashes and to reduce the production time.

5.8 Changing the speed range

ATTENTION!

Wait until the CNC machine has come to a complete halt before changing the speed using the gear switch.



- ➔ Select gear stage.
 - H = rapid (50 - 3000 min⁻¹)
 - L = low (80 - 1200 min⁻¹)
- ➔ Set the speed in the program.
The speed and thus the cutting speed are depending on the material of the workpiece, on the turning tool diameter and on the turning tool type.

Selector switch
Gear stage



📖 6 „Cutting speeds“ auf Seite 41

Abb.5-1: Changing the speed range

5.9 Start program

If necessary the coolant supply is switched on via your CNC program.

WARNING!

Never seize into the machine when a program is running.



CAUTION!

Before starting the programs you have to close the sliding gate of the separating protective equipment.

- ➔ Completely close the separating protective equipment.
- ➔ Change over to the mode "AUTO/MDA"

For further working steps please proceed as described from chapter 5 on of the Siemens 802S base line.

5.10 Switch off the CNC machine

- ➔ Push the EMERGENCY STOP pushbutton.
- ➔ For a long-term standstill of the CNC machine switch it off at the main switch. 📖 "Disconnecting and lock the CNC machine" on page 16

5.11 Operating the central lubrication system

The CNC lathe is equipped with a central lubricating system. The supply can also be performed manually using a pump.

Pump button



Abb.5-2: Central lubrication system

5.12 Data interfaces and current collection

When connecting the data interfaces make sure that the data cable runs to the interface of the control on the shortest possible path. Errors are occurring in the data transfer by electromagnetic radiation (EMC problems).

The control is equipped with the following data interfaces. They are located laterally on the control panel of the CNC lathe.

⚠ INFORMATION

Adapter (for Australia an isolated ground receptacle) required!



Socket for current collection (230V) e.g. for a notebook.

⚠ Warning!

Do not use any devices which require more than 2 A current!

RS232 interface

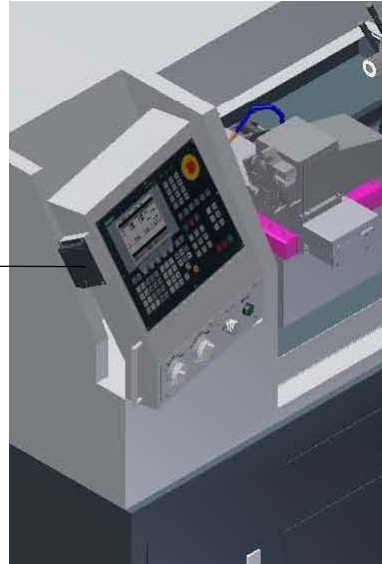
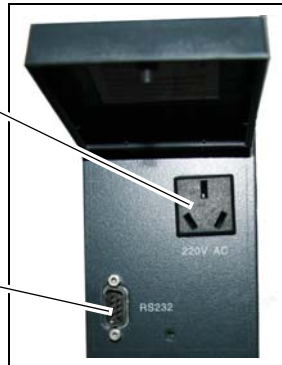


Abb.5-3: Data interface, current collection

Please find information regarding data transfer and interface parameters of the RS232 interface in the description of the control. Refer to chapter 7 "Data transfer via RS232 interface" of the instructions "Siemens 802S base line".

6 Cutting speeds

6.1 Selecting the cutting speed

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

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

The cutting speed at a service life of 60 minutes amounts to v_{c60} accordingly for a service of 240 minutes the cutting speed amounts to v_{c240} . Select v_{c60} for simple, easily replaceable lathe tools; v_{c240} for simple tool sets depending on one another; v_{c480} for complicated tool sets where the tool change requires more time due to the dependencies on one another and the accuracies of the cutting insert. The same considerations apply with regard to maintenance of the tools.

It generally applies: High cutting speeds result in low-time chipping, little cutting speeds result in cost-efficient chipping.

6.2 Influences on the cutting speed

v_c = Cutting speed in [m/min]

τ = Service life in [min]

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

6.3 Example for the determination of the required speed on your lathe.

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

Material to be turned: St37

Cutting material (turning tool): Hard metal

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

selected infeed [f]: about 0.16mm/r

Target value of the cutting speed [v_c] according to the table: 180 meters per minute

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

$$\text{Speed } n = \frac{v_c}{\pi \times d} = \frac{180 \text{ m}}{\text{min} \times 3,14 \times 0,06 \text{ m}} = 955 \text{ min}^{-1}$$

Set the speed on you lathe below the calculated speed.

6.4 Table cutting speeds

Reference values for cutting speeds v_c in m/min when turning high speed steel and hard metal. (Excerpt from VDF 8799, Gebr. Boehringer GmbH, Gd'ppingen).

Material	Tensile strength R_m in N/mm ²	Cutting material ³⁾	Feed f in mm/rev and tool angle k_r (°)															
			0.063				0.1				0.16				0.25			
			45°	60°	90°	45°	60°	90°	45°	60°	90°	45°	60°	90°	45°	60°	90°	45°
St 34, St 37, C22, St 42	250	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
St 50, C 35	500	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
St 60, C45	600	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
St 70, C60	700	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
Mn-, CrNi-, CrNiMo- & other alloyed steels	850...1000	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
Stainless steel	1000...1400	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
Tool steel	1500...1800	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
Mn-high-carbon steel	300...500	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
GS-45	500...700	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
GS-52	500...700	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
GS-15	HB...2000	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
GS-25	2000...2500	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
GTS-35 GTV-40	95	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
Chilled casting	RC420...570	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
Cast bronze: DIN 1705	315	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
Red bronze: DIN 1705	425	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
Brass	HB	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
Cast aluminium DIN 1725	300...420	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
Mg alloy DIN 1729	850	P 10	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224

- The entered values apply for a chipping depth of up to 2.24 mm. From 2.24 mm to 7.1 mm the values must be reduced by 1 stage of the row R10 by approximately 20%. From 7.1 mm to 22.4 mm the values must be reduced by 1 stage of the row R5 by approximately 40%.
- The values ϕ_c must be reduced by 30 to 50% for turning a crust, for removal of cast skin or for sand inclusions.
- The service life τ for hard metal P10, K10, K20 = 240 min; for high speed steel SS = 60 min.

7 SINUMERIK 802S base line

The instructions for the use of the SIEMENS control "Siemens 802S base line" is composed of the following items which are listed at the end of these operating instructions or separately attached to the machine.

7.1 Operation and programming turning

Edition: 08/2003

1. Introduction
2. Switching on, travelling to reference points
3. Setting
4. Manually controlled operation
5. Automatic mode
6. Part programming
7. Services and diagnosis
8. Programming

For any questions regarding the CNC control, please contact:

Siemens AG, A&D techsupport

Phone (+49) 0180 50 50 222

Mailto: techsupport@ad.siemens.de

Siemens AG Hotline, Helpline

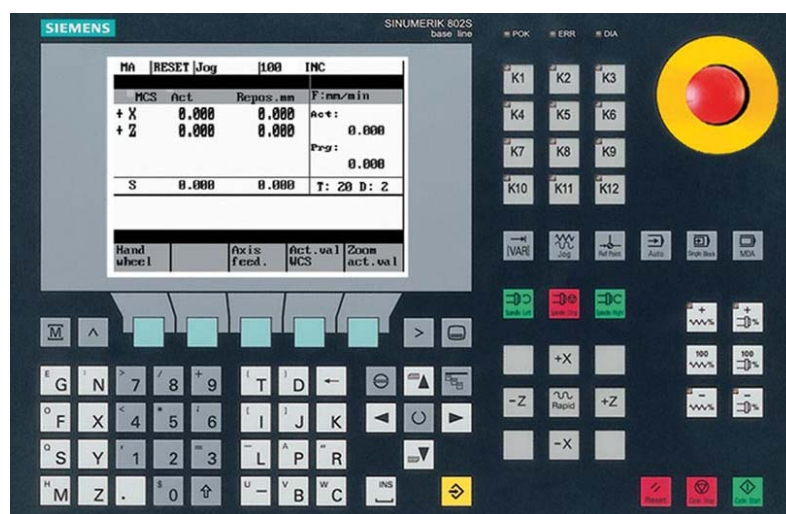
Phone (+49) 0180 50 50 111

8 Machine specific commands and messages

8.1 Machine specific M (K) commands

K6	Coolant pump on/ off
K7	Gear stage L (80-1200)
K8	Gear stage H (500-3000)
K12	Drive On

8.2 Key definition of the CNC full keyboard



	Softkey		Vertical menu
	Machine area key		Acknowledge alarm
	Recall key		Selection key/toggle key
	ETC key		ENTER / input key
	Area switchover key		Shift key
	Cursor UP with shift: page up		Cursor DOWN with shift: page down
	Cursor LEFT		Cursor RIGHT
	Delete key (backspace)		SPACE (INSERT)
	Numerical keys shift for alternative assignment		Alphanumeric keys shift for alternative assignment

Abb.8-1: Operating elements 1

	RESET		SPINDLE START RIGHT Clockwise direction
	NC STOP		SPINDLE STOP
	NC START		RAPID TRAVERSE OVERLAY
	User-defined key with LED		X axis
	User-defined key without LED		
	INCREMENT		Z axis
	JOG		
	REFERENCE POINT		Feedrate override plus with LED
	AUTOMATIC		Feedrate override 100% without LED
	SINGLE BLOCK		Feedrate override minus with LED
	MANUAL DATA		Spindle speed override plus with LED
	SPINDLE START LEFT Counterclockwise direction		Spindle speed override 100% without LED
			Spindle speed override minus with LED

Abb.8-2: Operating elements 2

9 Maintenance

In this chapter you will find important information about

- Inspection
- Maintenance
- Repair

of the CNC machine.

The diagram below shows which tasks falls under these categories.

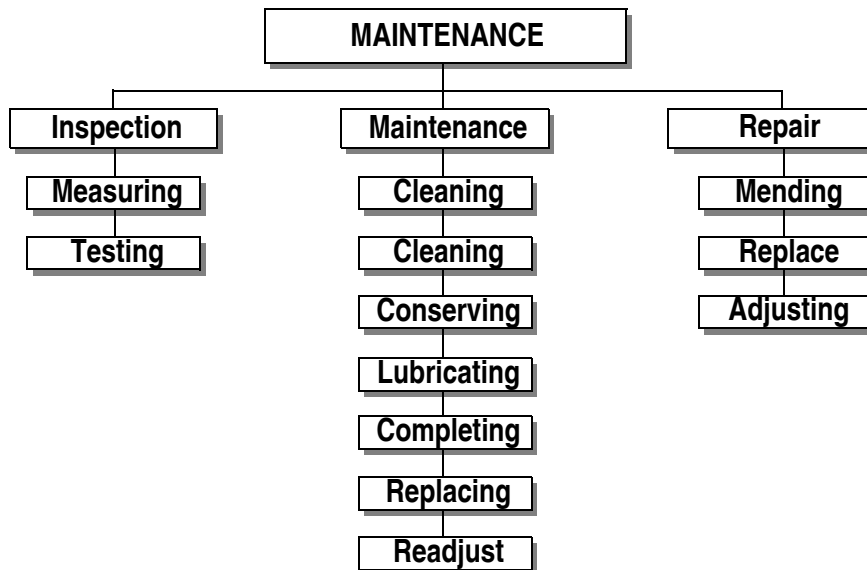


Abb.9-1: Maintenance „Äi Definition according to DIN 31051

ATTENTION!

Properly performed regular maintenance is an essential prerequisite for

- safe operation,
- faulty-free operation,
- long service life of the CNC machine and
- the quality of the products to be manufactured.

Also devices and equipment from other manufacturers have to be in good order and condition.

ENVIRONMENTAL PROTECTION

During work on the coolant equipment please make sure that

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

Clean-up any split liquid or oils immediately, using proper oil absorbents and dispose of them in accordance with current environmental protection regulations.

Collect leakages

Do not re-introduce liquids split outside the system during repair or as a result of leakage from the reserve tank: collect them in a collecting container to be disposed of.

Disposal

Never dump oil or other substances which are harmful to the environment in water inlets, rivers or channels.



Used oils have to be delivered to a collection centre. Consult your supervisor if you do not know where the collection centre is.

9.1 Operating material

9.1.1 Machine lubricants

Only use appropriate lubricants which guarantee a safe operation of the machine.

Recommended lubricant class: ISO V668

Recommended lubricant: guideway oil Mobil Vactra (Oil No. 2)

9.1.2 Cooling lubricants

In order to avoid interferences during operation the water-mixed cooling lubricant and the slideway oil or grease need to be compatible.

INFORMATION

The CNC turning machine is lacquered with a one-component paint. Observe this fact when selecting your coolant.

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

The flashing point of the emulsion must be higher than 140-°C.

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

ATTENTION!

Only the correct selection of an appropriate combination of cooling lubricants and slideway oils as well as the proper care and maintenance of the cooling lubricant can ensure that no problems such as stick-slip effects or deposits are resulting.

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

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

ATTENTION!

For safe functioning of the CNC machine the cooling lubricant needs to be checked at least weekly also during down times with regard to its concentration, pH-value, bacteria and fungal decay.

ATTENTION!

Cooling lubricants and oils for the mechanic and pneumatic system of the machine have to be adjusted referring the water added initially, the cooling lubricant emulsion and the machining task.

We would like to ask you to have the following machine-related properties of the cooling lubricant confirmed in writing by the manufacturer of the cooling lubricant.

- The products need to comply with the current regulations of the law and of the employers liability insurance association.
- Request your manufacturer for cooling lubricants to submit you the documentation for the products such as the product description VKIS and EC safety data sheet. The EC safety data sheet gives you information about the water-hazard class.

They need to be environmentally friendly and working place-friendly. Thus, they need to be free from nitrite, PCB, chlorine and nitrosinable diethanolamin (DEA), according to TRGS 611.



- The manufacturer should be able to submit a certificate concerning skin-tolerance.
- The mineral content according to DIN 51417 should be at least 40% in the concentrate.
- If possible, it should be universally applicable for all chippings and materials.
- Long service life of the emulsion e.g. long-term stable and resistant to bacteria.
- Safe corrosion protection according to DIN 51360/2.
- Re-emulsifiable and not sticking according to VKIS sheet 9: Sticking and residue behaviour.
- It should not attack the varnish of the machine according to VDI 3035.
- It should not attack any machine elements (metals, elastomers).
- Low foaming behaviour of the emulsion.
- It should be as disperse as possible in order to avoid clogging-up at the needle slot screen.

9.2 Safety

WARNING!

Incorrect maintenance and repair work may result in:

- Severe injuries of persons working on the CNC machine,
- Damage to the CNC machine.

Only qualified staff should carry out maintenance and repair work on the CNC machine.

Validation

Check and maintain all safety-relevant stop, control and measuring devices (validation).

Documentation

Record all tests and works in log book.

9.2.1 Preparation

WARNING!

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

🔧 "Disconnecting and lock the CNC machine" on page 16

Attach a warning sign.



9.2.2 Restarting

Run a safety check before restarting the machine.

🔧 "Safety check" on page 14

WARNING!

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



9.3 Inspection and maintenance

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

Interval	Where?	What?	How?	Check ✓
Start of work, after each maintenance or repair operation	CNC lathe	👉 "Safety check" on page 14		
Start of work, daily	Chip tray and interior	Cleaning	Clean the interior of the lathe and the chip tray resp. chip drawer.	
Start of work, daily after each maintenance or repair operation	Lubricant tank Sideway oil	Filling level control	Manually Check the quantity and refill the lubricant tank of the central lubrication system. Refer to 👉 "Machine lubricants" on page 47	
Every week	CNC lathe	👉 "Data backup on the control" on page 29		
		Oiling	Oil all bare steel surfaces. Use an acid-free oil, e.g. weapon oil or motor oil.	
	Coolant lubricating tank	Status control Filling level control	Check the liquid level, concentration, ph-value, bacteria and fungal decay.	
	Coolant lubricant	PH value measuring	Check the ph-value. If required, replace the cooling lubricant.	

Interval	Where?	What?	How?	Check ✓
Every month	Gear belt Drive, Spindle X-/Z-axis	Check Readjust Replace	Check the drive belt on wear and excessive clearance. If required, readjust the gear belt and/or replace it.	
	Oiler	Lubricate	Lubricate all oilers with machine oil, do not use a grease gun or similar greasing equipment. Use the oil bottle in the extent of delivery.	
As required	Chip collection tray	Cleaning	Clean the chip collection tray resp. the chip drawer of the coolant device.	
Run-in phase at least every six months As required	V-strip Axes	Check Testing Readjust	Readjust the V-strips of the axes.	

9.4 Repair

For any repair work request the assistance of a technician of the customer service.

If the repairs are carried out by qualified technical staff, they must follow the indications given in this manual.

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

For repairs only use

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

10 Ersatzteile - Spare parts - L33 CNC

10.1 Ersatzteilzeichnung Spindelstock 1-3 - Drawing spare parts headstock 1-3

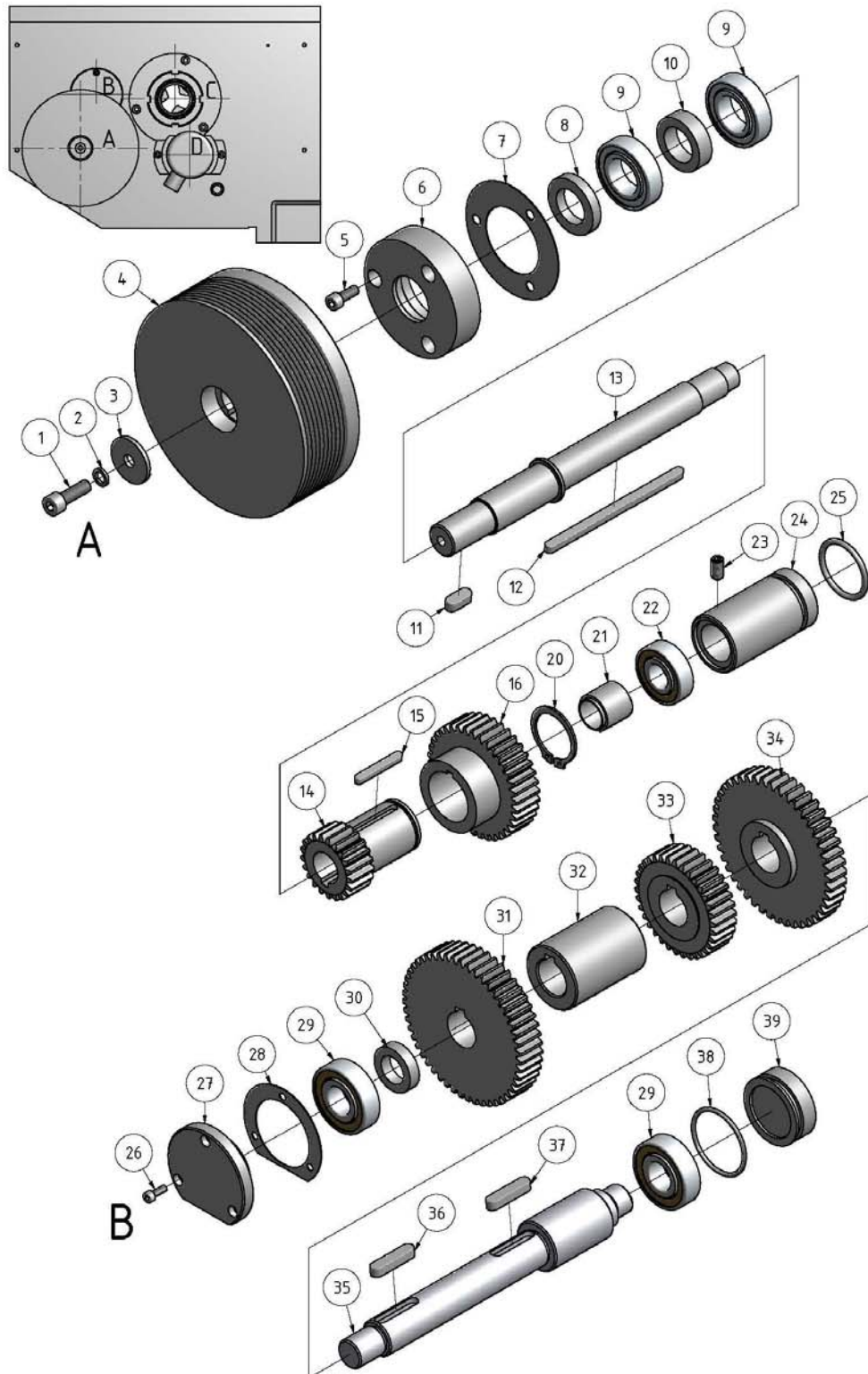


Abb.10-1: Getriebe Spindelstock 1-3 - Headstock gear 1-3

10.2 Ersatzteilzeichnung Spindelstock 2-3 - Drawing spare parts headstock 2-3

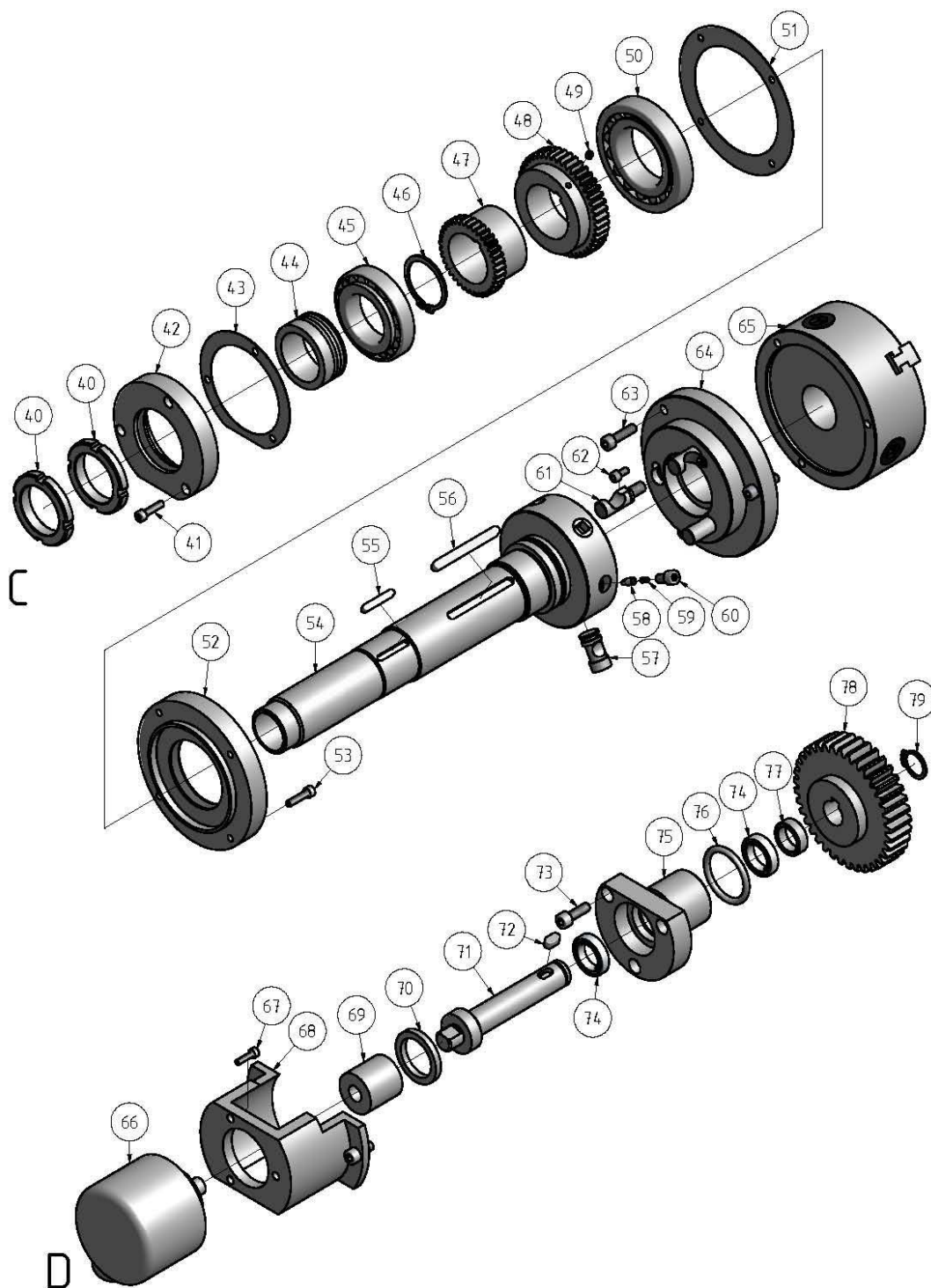


Abb. 10-2: Getriebe Spindelstock 2-3 - Headstock gear 2-3

10.3 Ersatzteilzeichnung Spindelstock 3-3 - Drawing spare parts headstock 3-3

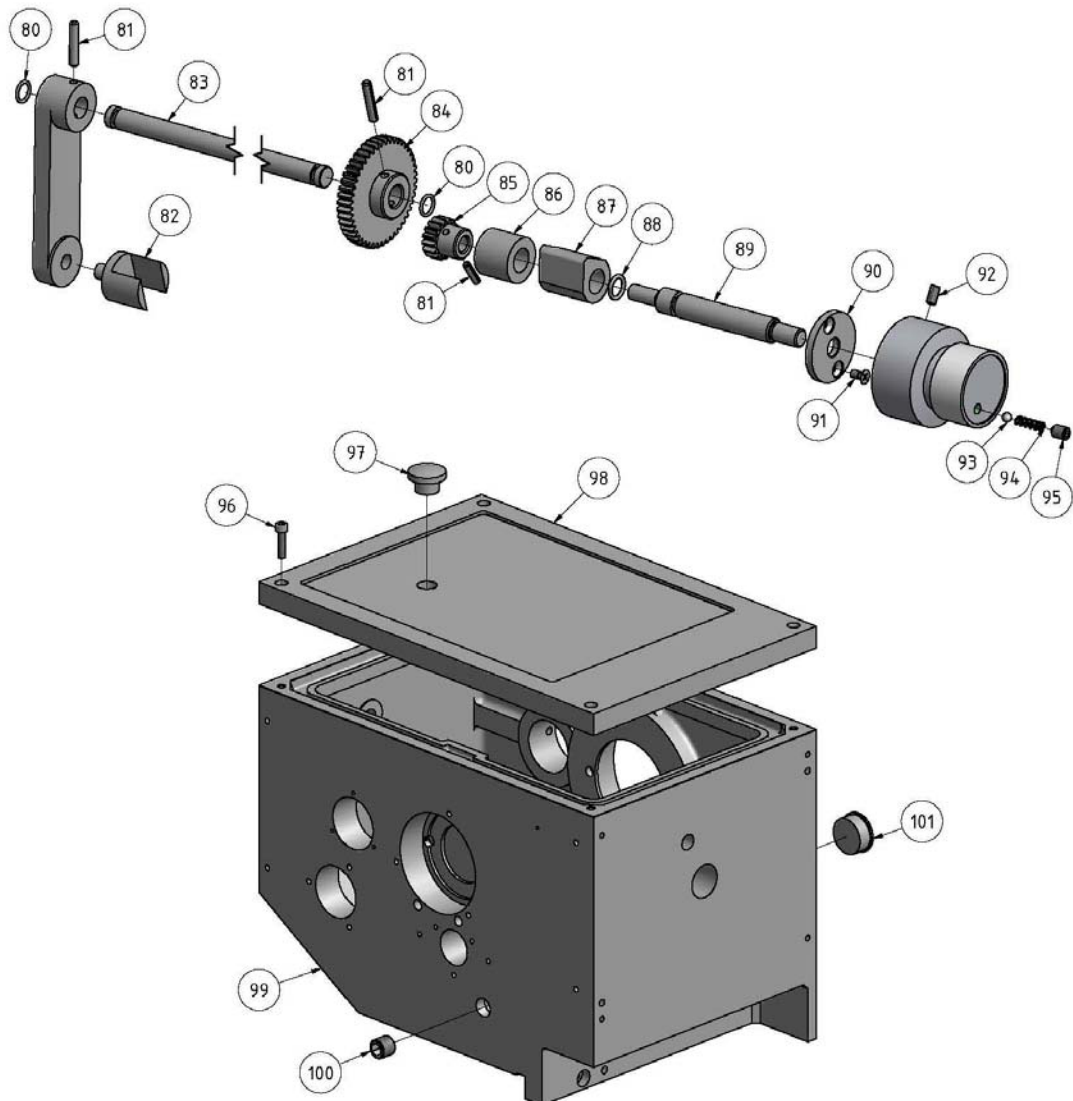


Abb. 10-3: Getriebe Spindelstock 3-3 - Headstock gear 3-3

10.4 Teilliste Spindelstock - Parts list headstock

Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Innensechskantschraube	Socket head screw	17	DIN 4762-M8×25	
2	Scheibe	Washer	1	DIN125/8	
3	Scheibe	Washer	1		0350411503
4	Riemenscheibe	Pulley	1		0350411504
5	Innensechskantschraube	Socket head screw	13	DIN 4762-M6×16	
6	Flansch	Flange	1		0350411506
7	Dichtung	Seal	1		0350411507
8	Ring	Ring	1	40×25×7	
9	Kugellager	Ball bearing	2	6005-2Z	0406005.2R
10	Ring	Ring	1		0350411510
11	Passfeder	Fitting key	1	DIN 6885-8×20	
12	Passfeder	Fitting key	1	DIN 6885-6×50	
13	Welle	Shaft	1		0350411513
14	Zahnrad	Gear	1		0350411514
15	Passfeder	Fitting key	1	DIN 6885-5×40	
16	Zahnrad	Gear	1		0350411516
20	Sicherungsring	Retaining ring	1	DIN 471-35	
21	Buchse	Bushing	1		0350411521
22	Kugellager	Ball bearing	1	6203-2Z	0406203.2R
23	Gewindestift	Grub screw	1	M8×16/GB78-85	
24	Hülse	Sleeve	1		0350411524
25	O-Ring	O-Ring	1	40×3.55/GB-3452	
26	Innensechskantschraube	Socket head screw	3	M4×12/GB70-85	
27	Flansch	Flange	1		0350411527
28	Dichtung	Seal	1		0350411528
29	Kugellager	Ball bearing	4	6204-2Z	0406204.2R
30	Ring	Ring	1		0350411530
31	Zahnrad	Gear	1		0350411531
32	Hülse	Sleeve	1		0350411532
33	Zahnrad	Gear	1		0350411533
34	Zahnrad	Gear	1		0350411534
35	Welle	Shaft	1		0350411535
36	Passfeder	Fitting key	1	28×3.55/GB-3452	
37	Passfeder	Fitting key	2	8×36/GB1096-79	
38	O-Ring	O-Ring	1	42.5×2.65/GB-3452	
39	Buchse	Bushing	1		0350411539
40	Nutmutter	Groove nut	2	M50×1.5	
41	Innensechskantschraube	Socket head screw	6	M6×25-GB70-85	
42	Flansch	Flange	1		0350411542
43	Dichtung	Seal	1		0350411543
44	Buchse	Bushing	1		0350411544
45	Kegelrollenlager	Taper roller bearing	2	30210	04030210
46	Sicherungsring	Retaining ring	1	50/GB894.1-86	
47	Zahnrad	Gear	1		0350411547
48	Zahnrad	Gear	1		0350411548
49	Gewindestift	Grub screw	1	M6×6/GB77-86	
50	Kegelrollenlager	Taper roller bearing	1	30212	04030212
51	Dichtung	Seal	1		0350411551
52	Flansch	Flange	1		0350411552
53	Innensechskantschraube	Socket head screw	7	M6×25-GB70-85	
54	Spindel	Spindle	1		0350411554
55	Passfeder	Fitting key	1	6×40/GB1096-79	
56	Passfeder	Fitting key	1	8×85/GB1079-85	
57	Bolzen	Bolt	1		0350411557
58	Bolzen	Bolt	1		0350411558
59	Feder	Spring	1		0350411559
60	Innensechskantschraube	Socket head screw	3	M8×16-GB70-85	
61	Bolzen	Bolt	3		0350411561
62	Innensechskantschraube	Socket head screw	3	GB 70-85 - M6 x 12	
63	Innensechskantschraube	Socket head screw	3	ISO 4762 - M8 x 30	
64	Flansch	Flange	3		0350411564
65	Dreibackenfutter	3-jaw chuck	1		0350411565
66	Encoder	Encoder	1		0350411566
67	Innensechskantschraube	Socket head screw	3	M3×12/GB70-85	
68	Halterung	Holder	1		0350411568
69	Buchse	Bushing	1		0350411569
70	Ring	Ring	1		0350411570

Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
71	Welle	Shaft	1		0350411571
72	Passfeder	Fitting key	1	5×10/GB1079-86	
73	Innensechskantschraube	Socket head screw	11	M5×16/GB70-85	
74	Kugellager	Ball bearing	2	61802-2Z	04061802.2R
75	Flansch	Flange	1		0350411575
76	O-Ring	O-Ring	1	28×3.55/GB-3452	
77	Ring	Ring	1		0350411577
78	Zahnrad	Gear	1		0350411578
79	Sicherungsring	Retaining ring	1	15/GB894.1-86	
80	O-Ring	O-Ring	2	14×1.9/GB-1235-77	
81	Spannstift	Spring pin	2	5×30 GB879-86	
82	Gabel	Fork	1		0350411582
83	Welle	Shaft	1		0350411583
84	Zahnrad	Gear	1		0350411584
85	Zahnrad	Gear	1		0350411585
86	Buchse	Bushing	1		0350411586
87	Exzenter	Eccentric	1		0350411587
88	O-Ring	O-Ring	1	16×2.4-GB-1235-77	
89	Welle	Shaft	1		0350411589
90	Flansch	Flange	1		0350411590
91	Schraube	Screw	1	M5×10/GB819-85	
92	Gewindestift	Grub screw	1	M6×12/GB77-85	
93	Stahlkugel	Steel ball	1	6	0350411593
94	Feder	Spring	1	1X5X20/GB2089-90	
95	Gewindestift	Grub screw	3	M8×12/GB78-85	
96	Innensechskantschraube	Socket head screw	4	M6×25/GB70-85	
97	Verschlussschraube	Plug screw	3		0350411597
98	Deckel	Cover	1		0350411598
99	Gehäuse	Housing	1		0350411599
100	Ablassschraube	Plug screw	3		03504115100
101	Ölschauglas	Oil gauge glass	1		03504115101

10.5 Ersatzteilzeichnung Z-Achse - Drawing spare parts Z-axis

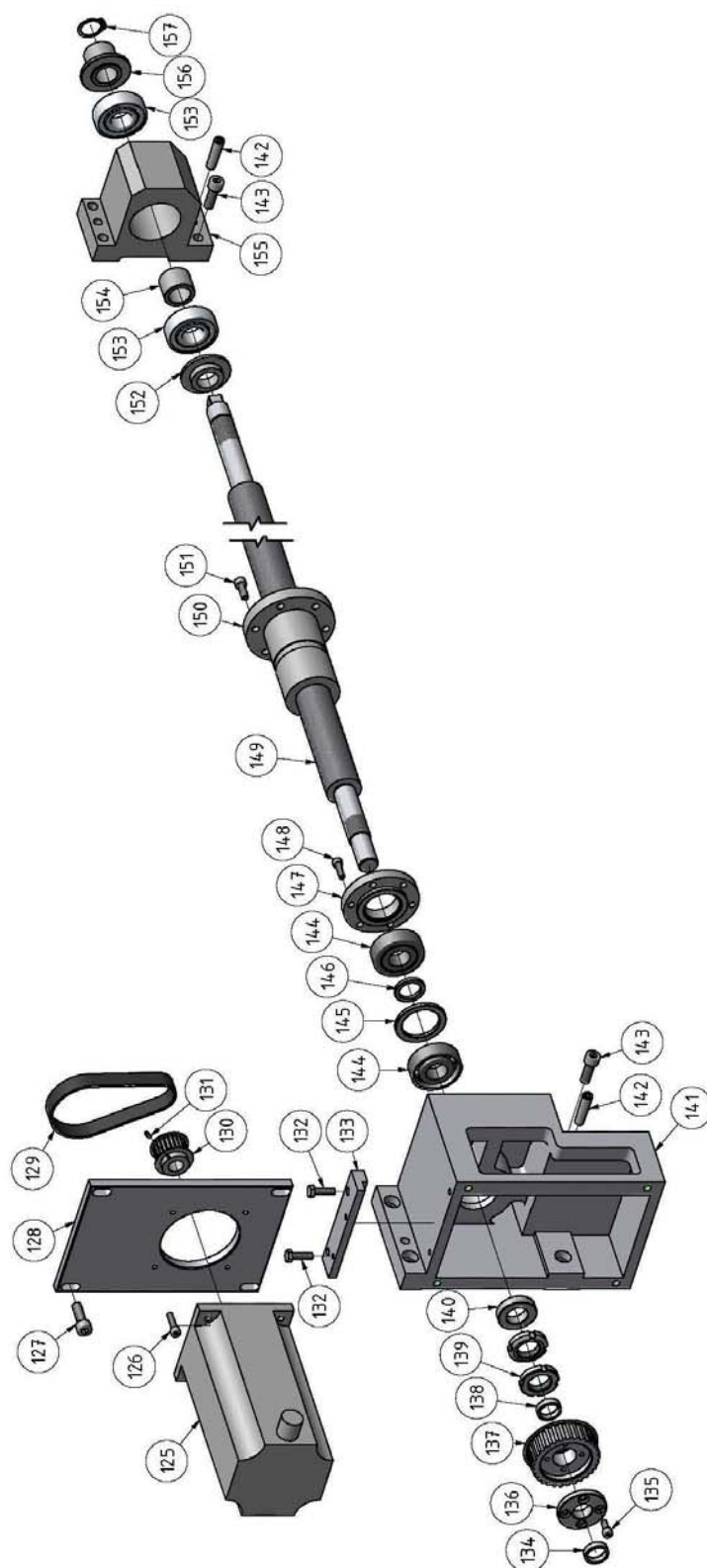


Abb. 10-4: Z-Achse - Z-axis

10.6 Teilliste Z-Achse - Parts list Z-axis

Pos.	Bezeichnung	Designation	Menge Qty.	Grösse Size	Artikelnummer Item no.
125	Schrittmotor	Step motor	2		03504115125
126	Innensechskantschraube	Socket head screw	8	M5×20/GB70-85	
127	Innensechskantschraube	Socket head screw	5	M8×25/GB70-85	
128	Platte	Plate	1		03504115128
129	Zahnriemen	Gear belt	1	280-5M-15	03504115129
130	Riemenscheibe	Pulley	2		03504115130
131	Gewindestift	Grub screw	8	M6×20/GB70-85	
132	Sechskantschraube	Hexagon screw	4	M6×20/GB5781-86	
133	Platte	Plate	1		03504115133
134	Ring		2		03504115134
135	Innensechskantschraube	Socket head screw	4	M5×12/GB70-85	
136	Flansch	Flange	1		03504115136
137	Riemenscheibe	Pulley	1		03504115137
138	Ring	Ring	2		03504115138
139	Nutmutter	Groove nut	2		03504115139
140	Ring	Ring	1		03504115140
141	Gehäuse	Housing	1		03504115141
142	Zylinderstift	Cylindrical pin	1	8×35/GB118-86	
143	Innensechskantschraube	Socket head screw	1	M8×25/GB70-85	
144	Kugellager	Ball bearing	2	7204	0407204
145	Ring	Ring	1		03504115145
146	Ring	Ring	1		03504115146
147	Flansch	Flange	1		03504115147
148	Innensechskantschraube	Socket head screw	11	M5×16/GB70-85	
149	Kugelumlaufspindel	Ball screw	4		03504115149
150	Flansch	Flange	10		03504115150
151	Innensechskantschraube	Socket head screw	13	M6×16/GB70-85	
152	Ring	Ring	2		03504115152
153	Kugellager	Ball bearing	4	6204-2Z	0406204.2R
154	Buchse	Bushing	1		03504115154
155	Lagerbock	Bearing block	1		03504115155
156	Abdeckung	Cover	2		03504115156
157	Sicherungsring	Retaining ring	4	8×35/GB118-86	

10.7 Ersatzteilzeichnung Antrieb - Drawing spare parts drive

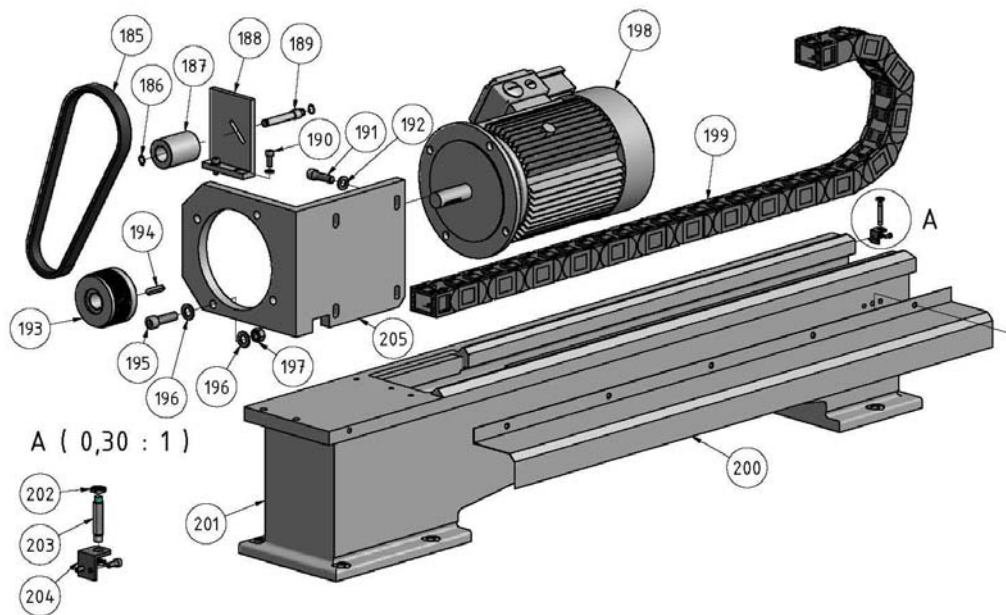


Abb. 10-5: Antrieb - Drive

10.7.1 Teilliste Antrieb - Parts list drive

Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
185	Antriebsriemen	Drive belt	1		03504115185
186	Sicherungsring	Retaining ring	1		03504115186
187	Spannrolle	Tension pulley	1		03504115187
188	Halter	Holder	1		03504115188
189	Welle	Shaft	1		03504115189
190	Innensechskantschraube	Socket head screw	2		03504115190
191	Innensechskantschraube	Socket head screw	4		03504115191
192	Scheibe	Washer	4		03504115192
193	Riemenscheibe	Pulley	1		03504115193
194	Passfeder	Fitting key	1		03504115194
195	Innensechskantschraube	Socket head screw	4		03504115195
196	Scheibe	Washer	8		03504115196
197	Sechskantmutter	Hexagon nut	4		03504115197
198	Motor	Motor	1		03504115198
199	Energiekette	Cable chain	1		03504115199
200	Abdeckung	Cover	1		03504115200
201	Maschinenbett	Machine bed	1		03504115201
202	Sechskantmutter	Hexagon nut	2		03504115202
203	Referenzschalter	Referency switch	1		03504115203
204	Haltewinkel	Bracket	1		03504115204
205	Halter	Holder	1		03504115205

10.8 Ersatzteilzeichnung X-Achse 1 von 2 - Drawing spare parts X-axis 1 of 2

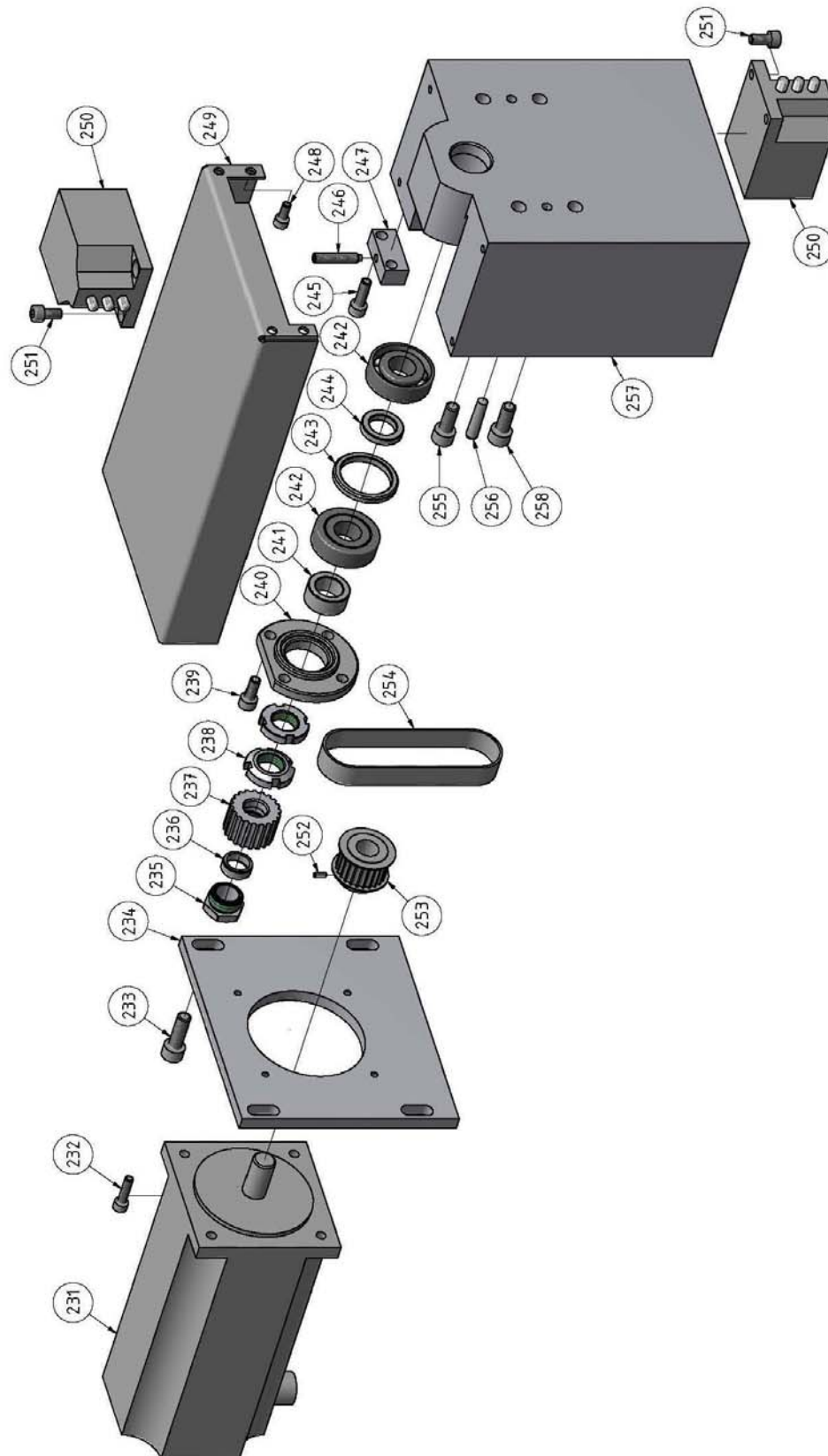


Abb.10-6: X-Achse 1 von 2 - X-Axis 1 of 2

10.9 Ersatzteilzeichnung X-Achse 2 von 2 - Drawing spare parts X-axis 2 of 2

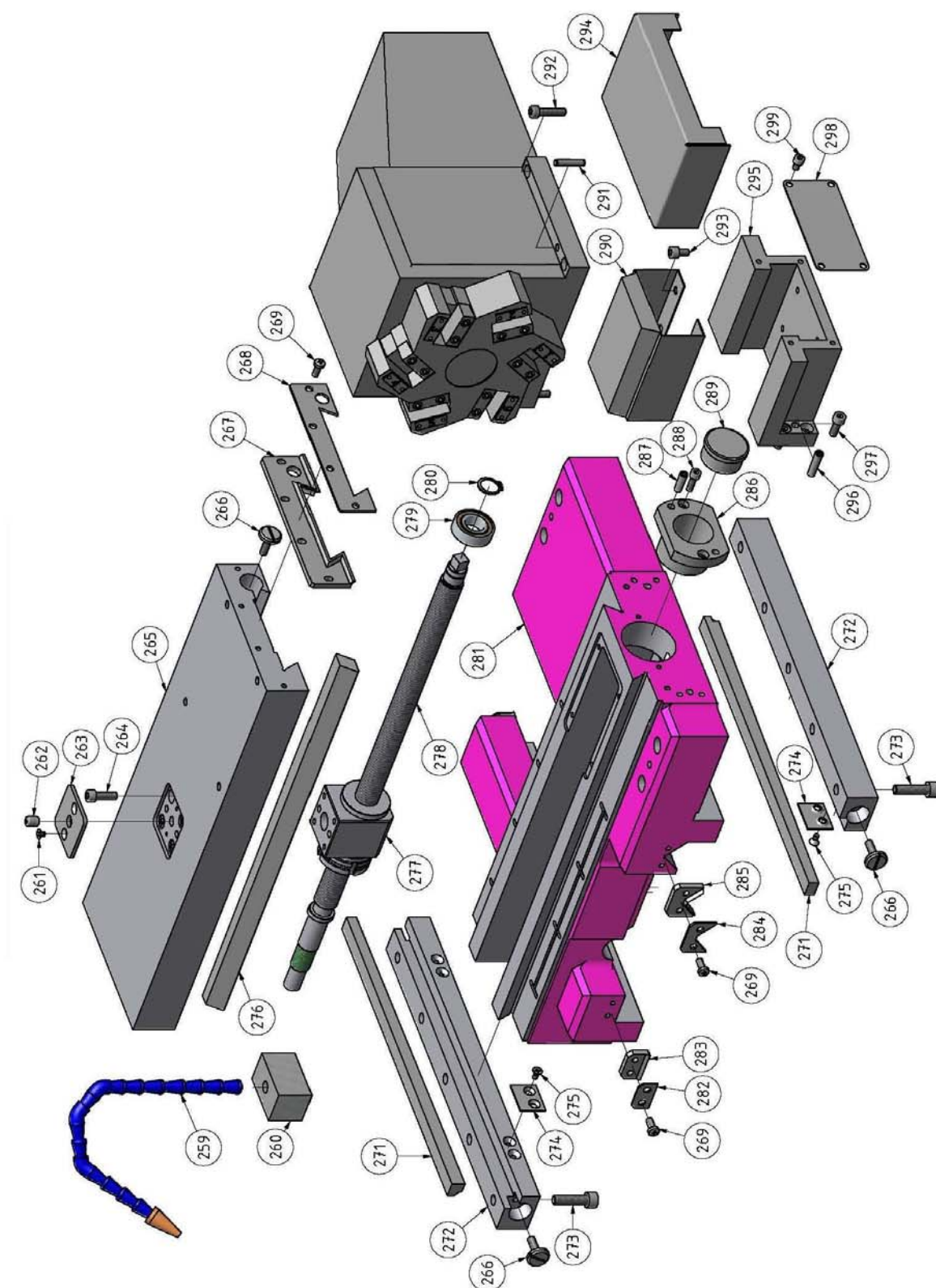


Abb. 10-7: X-Achse 2 von 2 - X-Axis 2 of 2

10.9.1 Teilliste X-Achse - Parts list X-axis

Pos.	Bezeichnung	Designation	Menge Qty.	Grösse Size	Artikelnummer Item no.
231	Schrittmotor	Step motor	2		03504115231
232	Innensechskantschraube	Socket head screw	4	DIN 4762/M5x20	
233	Innensechskantschraube	Socket head screw	17	M8x25/GB70-85	
234	Platte	Plate	1		03504115234
235	Verschlusschraube	Plug screw	1		03504115235
236	Ring	Ring	1		03504115236
237	Synchronscheibe	Synchronising disk	1		03504115237
238	Nutmutter	Grooved nut	2		03504115238
239	Innensechskantschraube	Socket head screw	13	M6x16/GB70-85	
240	Flansch	Flange	1		03504115240
241	Buchse	Bushing	1		03504115241
242	Kugellager	Ball bearing	2	7203	0407203
243	Ring	Ring	1		03504115243
244	Ring	Ring	1		03504115244
245	Innensechskantschraube	Socket head screw	8	M6x20/GB70-85	
246	Gewindestift	Grub screw	2	M6x30/GB79-85	
247	Platte	Plate	1		03504115247
248	Innensechskantschraube	Socket head screw	6	M5x12/GB70-85	
249	Abdeckung	Cover	4		03504115249
250	Referenzschalter	Referency switch	2		03504115250
251	Innensechskantschraube	Socket head screw	9	ISO 4762 - M6 x 12	
252	Gewindestift	Grub screw	2	M3x8 GB78-85	
253	Synchronscheibe	Synchronising disk	2		03504115253
254	Zahnriemen	Gear belt	1	255-5M-15	03504115254
255	Innensechskantschraube	Socket head screw	4	M8x20/GB70-85	
256	Zylinderstift	Cylindrical pin	2	6x30/GB118-86	
257	Lagerbock	Bearing block	1		03504115257
258	Innensechskantschraube	Socket head screw	1	M8x20/GB70-85	
259	Kühlmittelschlauch	Coolant hose	1		03504115259
260	Klotz	Block	1		03504115260
261	Schraube	Screw	1		03504115261
262	Schmiernippel	Lubrication cup	1		03504115262
263	Platte	Plate	1		03504115263
264	Innensechskantschraube	Socket head screw	8	M6x20/GB70-85	
265	Planschlitten	Cross slide	1		03504115265
266	Schraube	Screw	6		03504115266
267	Abstreifer	Wipper	1		03504115267
268	Platte	Plate	1	CL6132-08-02	
271	Keilleiste	Gib	2		03504115271
272	Platte	Plate	1		03504115272
273	Innensechskantschraube	Socket head screw	10	M8x30/GB70-85	
274	Platte	Plate	4		03504115274
275	Schraube	Screw	8	M4x8/GB819-85	
276	Keilleiste	Gib	1		03504115276
277	Schraubenmutter	Screw nut	1		03504115277
278	Kugelumlaufspindel	Ball screw	1		03504115278
279	Kugellager	Ball bearing	1	6003-2Z	0406003.2R
280	Sicherungsring	Retaining ring	1	17/GB894.1-86	
281	Planschlitten	Cross slide	1		03504115281
282	Platte	Plate	1		03504115282
283	Abstreifer	Wiper	2		03504115283
284	Platte	Plate	2		03504115284
285	Abstreifer	Wiper	2		03504115285
286	Aufnahme	Collet	1		03504115286
287	Zylinderstift	Cylindrical pin	2	6x20/GB118-86	
288	Innensechskantschraube	Socket head screw	11	M5x16/GB70-85	
289	Verschluss	Plug	1		03504115289
290	Abdeckung	Cover	2		03504115290
291	Zylinderstift	Cylindrical pin	2	ISO 2338 - 6 h8 x 26	
292	Innensechskantschraube	Socket head screw	4	ISO 4762 - M6 x 25	
293	Innensechskantschraube	Socket head screw	4	M6x10/GB70-85	
294	Abdeckung	Cover	1		03504115294
295	Führung	Guide	1		03504115295
296	Zylinderstift	Cylindrical pin	2	6x26/GB118-86	
298	Abdeckung	Cover	6		03504115298
299	Innensechskantschraube	Socket head screw	4	M5x8/GB70-85	

10.10 Ersatzteilzeichnung Gehäuse - Drawing spare parts housing

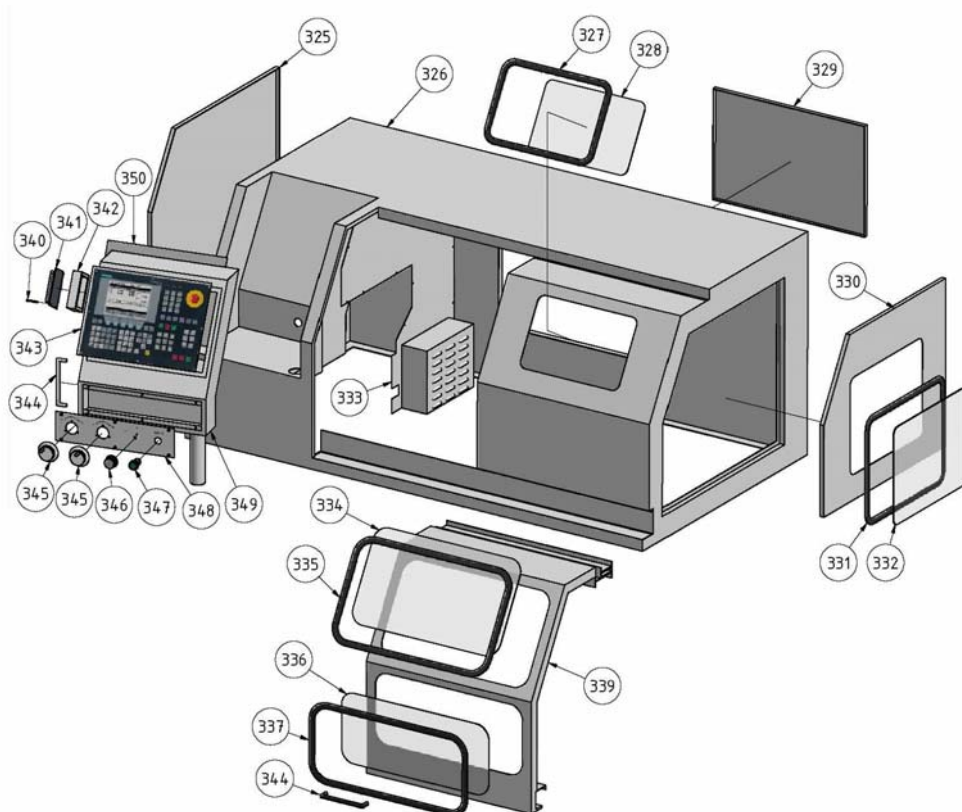


Abb.10-8: Gehäuse - Housing

10.10.1 Teilliste Gehäuse - Parts list housing

Pos.	Bezeichnung	Designation	Menge Qty.	Grösse Size	Artikelnummer Item no.
325	Abdeckung	Cover	1		03504115325
326	Gehäuse	Housing	1		03504115326
327	Dichtung	Seal	1		03504115327
328	Glasscheiben	Glas plate	1		03504115328
329	Abdeckung	Cover	1		03504115329
330	Rahmen	Frame	1		03504115330
331	Dichtung	Seal	1		03504115331
332	Glasscheiben	Glas plate	1		03504115332
333	Abdeckung	Cover	1		03504115333
334	Glasscheiben	Glas plate	1		03504115334
335	Dichtung	Seal	1		03504115335
336	Glasscheiben	Glas plate	1		03504115336
337	Dichtung	Seal	1		03504115337
339	Schiebetür	Sliding door	1		03504115339
340	Innensechskantschraube	Socket head screw	4	ISO 4762 - M4 x 35	03504115340
341	Schnittstelle Siemens	Siemens interface	1		03504115341
342	Adapter	Adapter	1		03504115342
343	Steuerung	Control	1	Siemens 802S base line	03504115343
344	Griff	Grip	2		03504115344
345	Knopf	Knob	2		03504115345
346	Knopf	Knob	1		03504115346
347	Taste	Button	1		03504115347
348	Abdeckung	Cover	1		03504115348
349	Gehäuse Steuerung	Control housing	1		03504115349
350	Abdeckung	Cover	1		03504115350

10.11 Ersatzteilzeichnung Unterbau - Drawing spare parts substruction

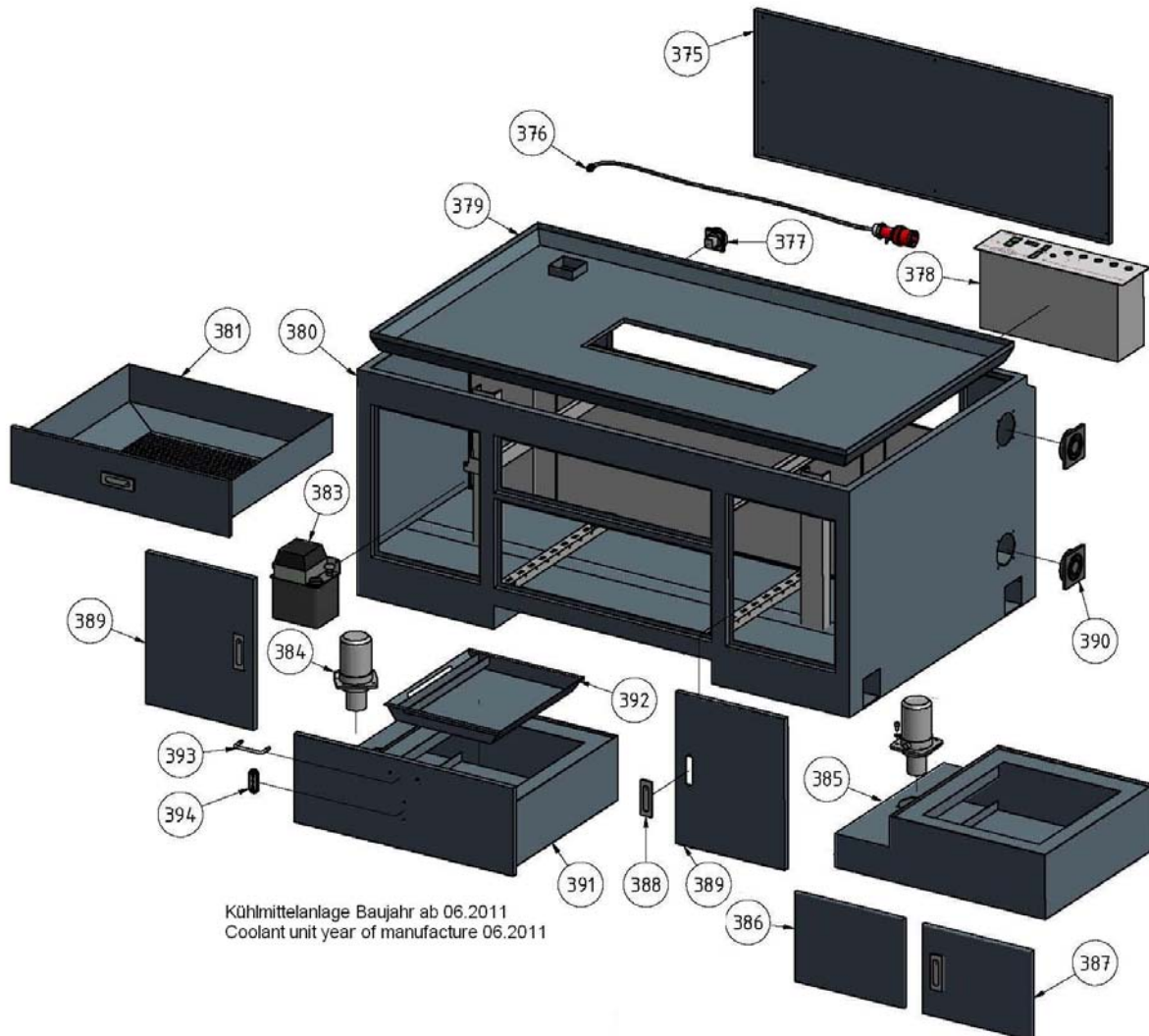


Abb.10-9: Unterbau - Substruction

10.11.1 Teilliste Unterbau - Parts list substruction

Pos.	Bezeichnung	Designation	Menge	Grösse Size	Artikelnummer Item no.
			Qty.		
375	Abdeckung	Cover	1		03504115375
376	Anschlusskabel	Cable connection	1		03504115376
377	Hauptschalter	Main switch	1		03504115377
378	CNC Controller	CNC Controller	1		03504115378
379	Spänewanne	Chip pan	1		03504115379
380	Unterbau	Substruction	1		03504115380
381	Schubfach	Sliding panel	1		03504115381
383	Ölpumpe	Oil pump	1		03504115383
384	Kühlmittelpumpe	Coolant pump	1		03504115384
385	Kühlmittelbehälter	Coolant tank	1		03504115385
386	Tür links	Door left	1		03504115386
387	Tür rechts	Door right	1		03504115387
388	Schloss	Lock	4		03504115388
389	Tür	Door	2		03504115389
390	Lüfter	Fan	4		03504115390
391	Kühlmittelbehälter	Coolant tank	1		03504115391
392	Sieb	Filter	1		03504115392
393	Handgriff	Handle	1		03504115393
394	Schauglas	Sight glass	1		03504115394

10.12 Ersatzteilzeichnung Reitstock - Drawing spare parts tailstock

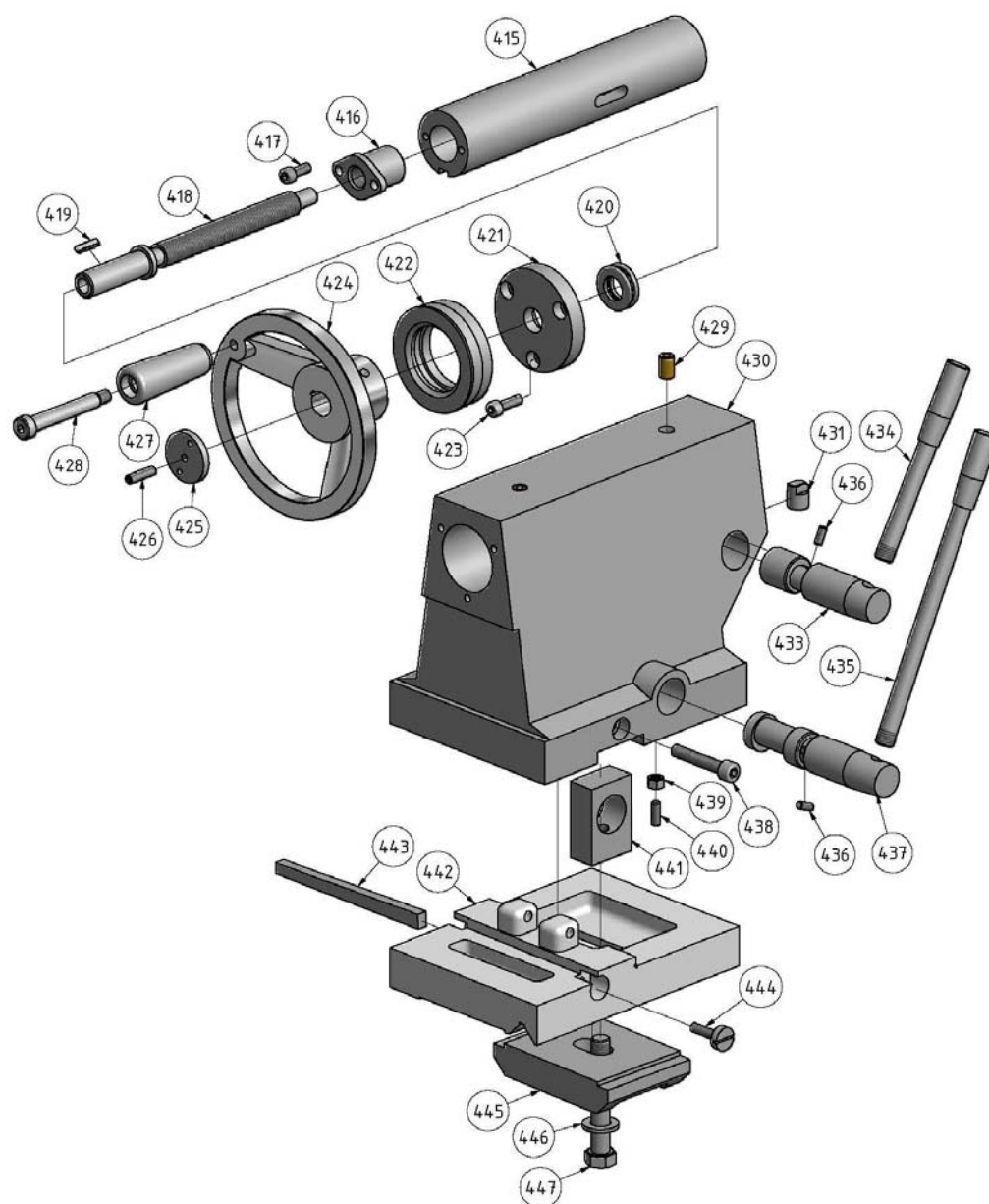


Abb. 10-10: Reitstock - Teilstock

10.12.1 Teilliste Reitstock - Parts list teilstock

Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
415	Pinole	Sleeve	1		03504115415
416	Flansch	Flange	1		03504115416
417	Innensechskantschraube	Socket head screw	2	ISO 4762 - M6 x 16	03504115417
418	Spindel	Spindle	1		03504115418
419	Passfeder	Fitting key	1	4X20	03504115419
420	Kugellager	Ball bearing	1	51103	03504115420
421	Flansch	Flange	1		03504115421
422	Skalenring	Scale ring	1		03504115422
423	Innensechskantschraube	Socket head screw	3	M6X20	03504115423
424	Handrad	Handle	1		03504115424
425	Platte	Plate	1		03504115425
426	Gewindestift	Grub screw	1	M6X25	03504115426
427	Hülse	Sleeve	1		03504115427
428	Schraube	Screw	1		03504115428
429	Schmiernippel	Lubrication cup	2		03504115429
430	Gehäuse	Housing	1		03504115430
431	Klemmbolzen	Binder plug	1		03504115431
433	Welle	Shaft	1		03504115433
434	Hebel	Lever	1		03504115434
435	Hebel	Lever	1		03504115435
436	Gewindestift	Grub screw	2	5X12	03504115436
437	Welle	Shaft	1		03504115437
438	Innensechskantschraube	Socket head screw	2	M8X45	03504115438
439	Sechskantmutter	Hexagon nut	1	M6	03504115439
440	Gewindestift	Grub screw	1	M6X16	03504115440
441	Platte	Plate	1		03504115441
442	Unterteil	Bottom part	1		03504115442
443	Keilleiste	Gib	1		03504115443
444	Schraube	Screw	2		03504115444
445	Klemmstück	Clamping block	1		03504115445
446	Scheibe	Washer	1	12	03504115446
447	Schraube	Screw	1	M12X80	03504115447

10.13 Ersatzteilzeichnung Werkzeugwechsler 1-2 - Drawing spare parts tool changer 1-2

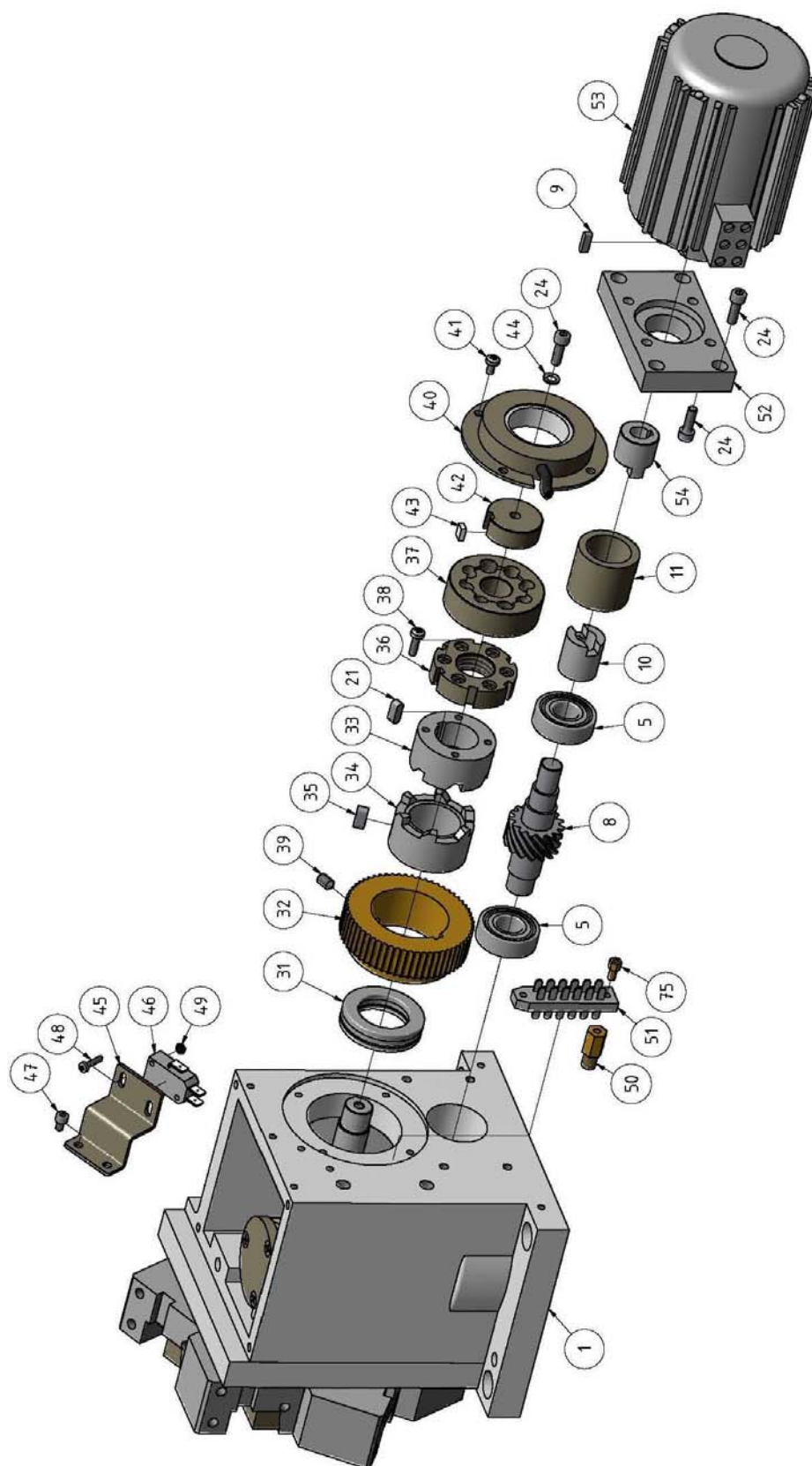


Abb. 10-11: Werkzeugwechsler 1-2 - Tool changer 1-2

10.14 Ersatzteilzeichnung Werkzeugwechsler 2-2 - Drawing spare parts tool changer 2-2

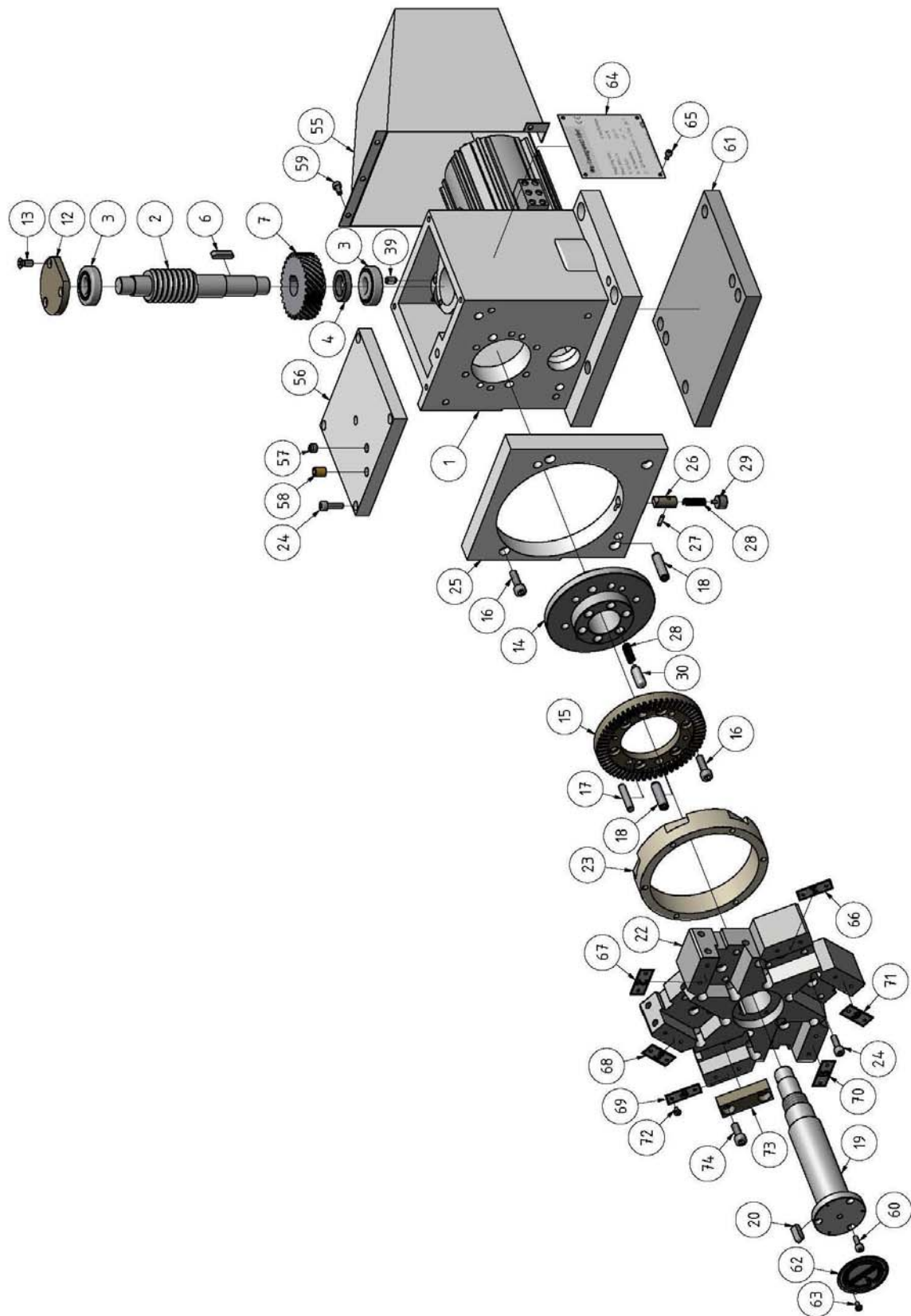


Abb.10-12: Werkzeugwechsler 2-2 - Tool changer 2-2

10.14.1 Teilliste Werkzeugwechsler - Parts list tool changer

Pos.	Bezeichnung	Designation	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Gehäuse	Housing	1		03504115501
2	Welle	Shaft	1		03504115502
3	Kegelrollenlager	Taper roller bearing	2	A 4059_A 4138	03504115503
4	Abstandsring	Spacer	1		03504115504
5	Kugellager	Ball bearing	2	6202-2RSL	0406202.2R
6	Passfeder	Fitting key	1	DIN 6885 - A 5 x 5 x 20	
7	Zahnrad	Gear	1		03504115507
8	Welle	Shaft	1		03504115508
9	Passfeder	Fitting key	2	DIN 6885 - A 4 x 4 x 14	
10	Kupplung	Clutch	1		03504115510
11	Buchse	Bushing	1		03504115511
12	Deckel	Cover	1		03504115512
13	Schraube	Screw	3	ISO 7046-1 - M5 x 12	
14	Flansch	Flange	1		03504115514
15	Zahnscheibe	Crown gear	1		03504115515
16	Innensechskantschraube	Socket head screw	10	ISO 4762 - M6 x 20	
17	Zylinderstift	Cylindrical pin	2	ISO 2338 - 6 h8 x 30 - B	
18	Zylinderstift mit Gewinde	Cylindrical pin with thread	4	ISO 8735 - 8 x 30 - A	
19	Welle	Shaft	1		03504115519
20	Passfeder	Fitting key	1	DIN 6885 - A 6 x 6 x 18	
21	Passfeder	Fitting key	1	DIN 6885 - A 5 x 5 x 14	
22	Werkzeugaufnahme	Tool holder	1		03504115522
23	Ring	Ring	1		03504115523
24	Innensechskantschraube	Socket head screw	19	ISO 4762 - M5 x 16	
25	Abdeckung	Cover	1		03504115525
26	Rastbolzen	Locking pin	1		03504115526
27	Bolzen	Bolt	1		03504115527
28	Feder	Spring	7		03504115528
29	Schraube	Screw	1		03504115529
30	Sperrbolzen	Locking pin	6		03504115530
31	Axiallager	Axial bearing	1	51106	04051106
32	Schneckenrad	Worm gear	1		03504115532
33	Kupplungsstück	Clutch piece	1		03504115533
34	Kupplungsstück	Clutch piece	1		03504115534
35	Passfeder	Fitting key	1	DIN 6885 - A 6 x 6 x 14	03504115535
36	Wellenmutter	Shaft nut	1		03504115536
37	Lochscheibe	Breaker plate	1		03504115537
38	Schraube	Screw	2	DIN 7985 - M4x14	
39	Gewindestift	Grub screw	2	ISO 4027 - M6 x 10	
40	Flansch	Flange	1		03504115540
41	Schraube	Screw	4	DIN 7985 - M4x8	
42	Buchse	Bushing	1		03504115542
43	Magnet	Magnet	1		03504115543
44	Federring	Spring ring	1	DIN 128 - A5	
45	Halter	Holder	1		03504115545
46	Mikroschalter	Microswitch	1		03504115546
47	Innensechskantschraube	Socket head screw	2	ISO 4762 - M4 x 6	
48	Schraube	Screw	2	DIN 7985 - M3x14	
49	Sechskantmutter	Hexagon nut	2	ISO 4035 - M3	
50	Bolzen	Bolt	2		03504115550
51	Klemmleiste	Clamping gib	1		03504115551
52	Motorplatte	Motor plate	1		03504115552
53	Motor	Motor	1		03504115553
54	Kupplungsstück	Clutch piece	1		03504115554
55	Abdeckung	Cover	1		03504115555
56	Deckel	Cover	1		03504115556
57	Gewindestift	Grub screw	1	ISO 4026 - M8 x 6	
58	Schmiernippel	Lubrication cup	2	8mm	03504115558
59	Innensechskantschraube	Socket head screw	5		03504115559
60	Innensechskantschraube	Socket head screw	3		03504115560
61	Platte	Plate	1		03504115561
62	Abdeckung	Cover	1		03504115562
63	Schraube	Screw	3	DIN 7985 (H) - M3x6-H	
64	Label	Label	1		03504115564
65	Innensechskantschraube	Socket head screw	4	ISO 4762 - M3 x 6	
66	Platte 1	Plate 1	1		03504115566
67	Platte 2	Plate 2	1		03504115567

Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
68	Platte 3	Plate 3	1		03504115568
69	Platte 4	Plate 4	1		03504115569
70	Platte 5	Plate 5	1		03504115570
71	Platte 6	Plate 6	1		03504115571
72	Schraube	Screw	12	DIN 7985 - M3x5	
73	Klemmplatte	Clamping plate	6		03504115573
74	Innensechskantschraube	Socket head screw	12	ISO 4762 - M6 x 16	
75	Schraube	Screw	2		03504115575

10.15 Maschinenschilder - Machine labels



Abb. 10-13: Maschinenschilder - Machine labels

10.15.1 Maschinenschilder - Machine labels

Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Quan- tity	Size	Article no.
1	Frontschild	Front label	1		03504115L01
2	Schild Getriebe	Gear box label	1		03504115L02
3	Frontschild	Front label	1		03504115L03
4	Sicherheitsschild	Safety label	1		03504115L04
5	Schild Werkzeugwechsler	Tool changer label	1		03504115L05
6	Hinweisschild	Instruction label	1		03504115L06
7	Maschinenschild	Machine label	1		03504115L07
8	Hinweisschild	Instruction label	1		03504115L08
9	Hinweisschild	Instruction label	1		03504115L09
10	Sicherheitsschild	Safety label	1		03504115L010
11	Hinweisschild	Instruction label	1		03504115L011
12	Hinweisschild	Instruction label	1		03504115L012
13	Hinweisschild	Instruction label	1		03504115L013

11 Electrical equipment

11.1 Components of the switch cabinet

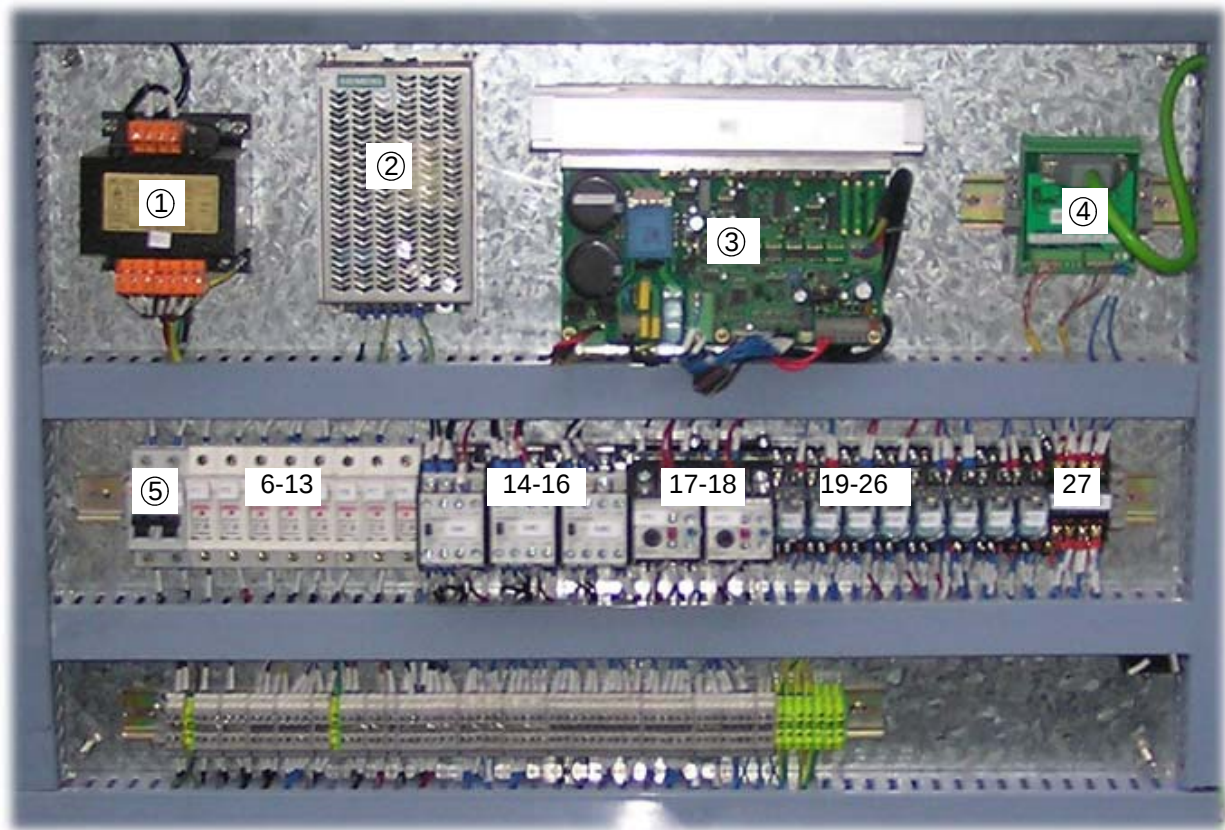
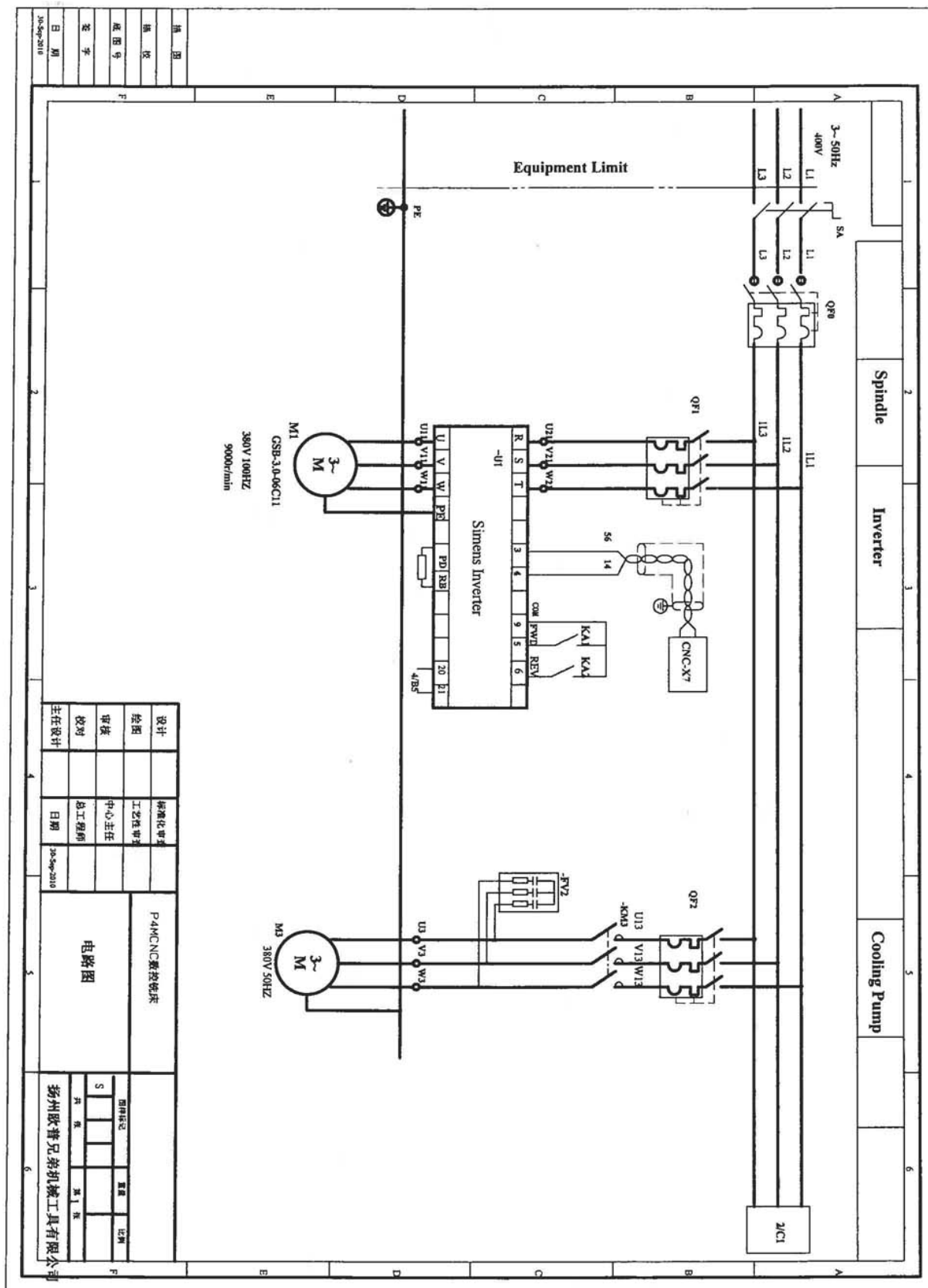


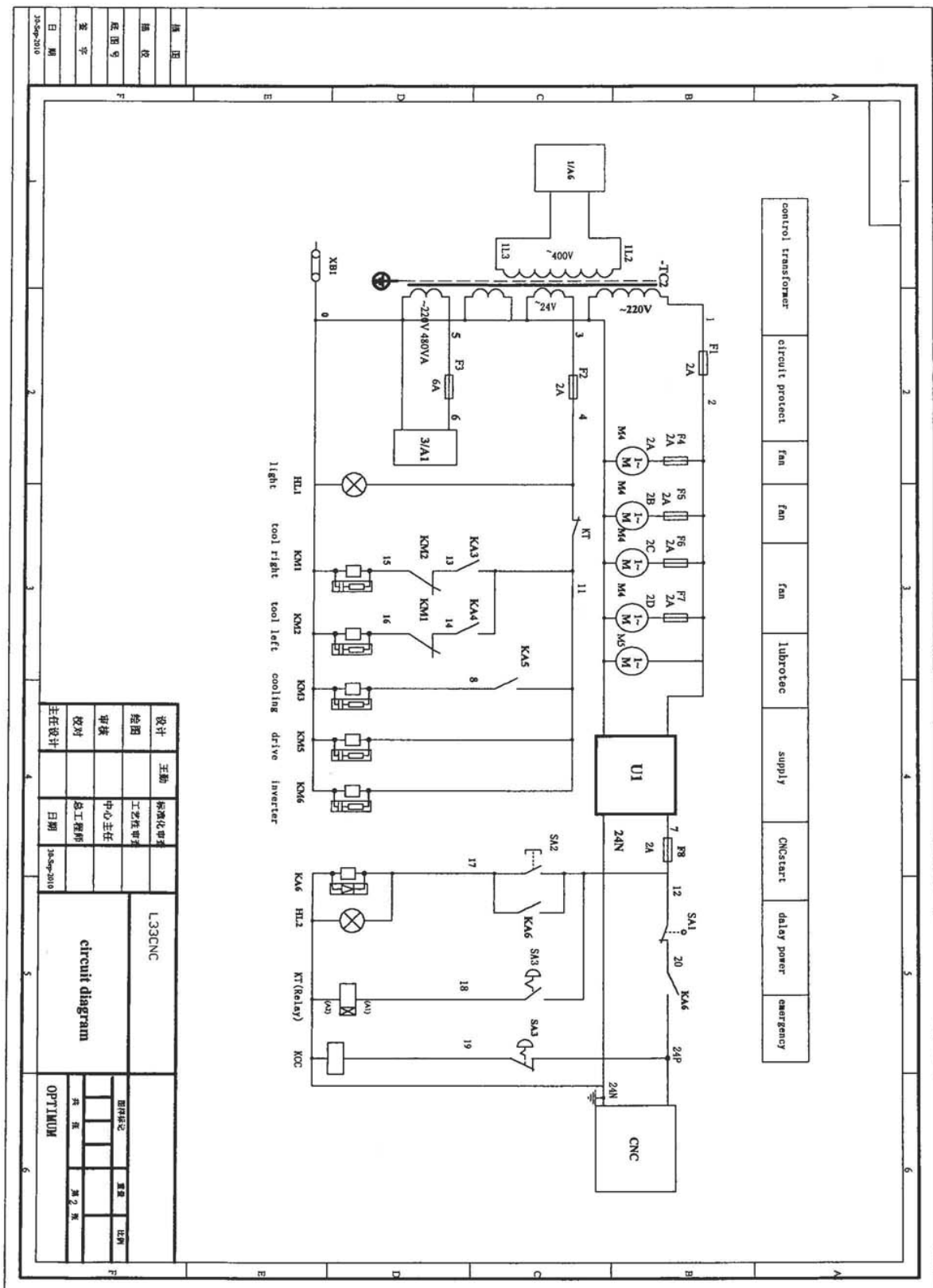
Abb. 11-1: Elektrik L33 CNC - Electrical system L33 CNC

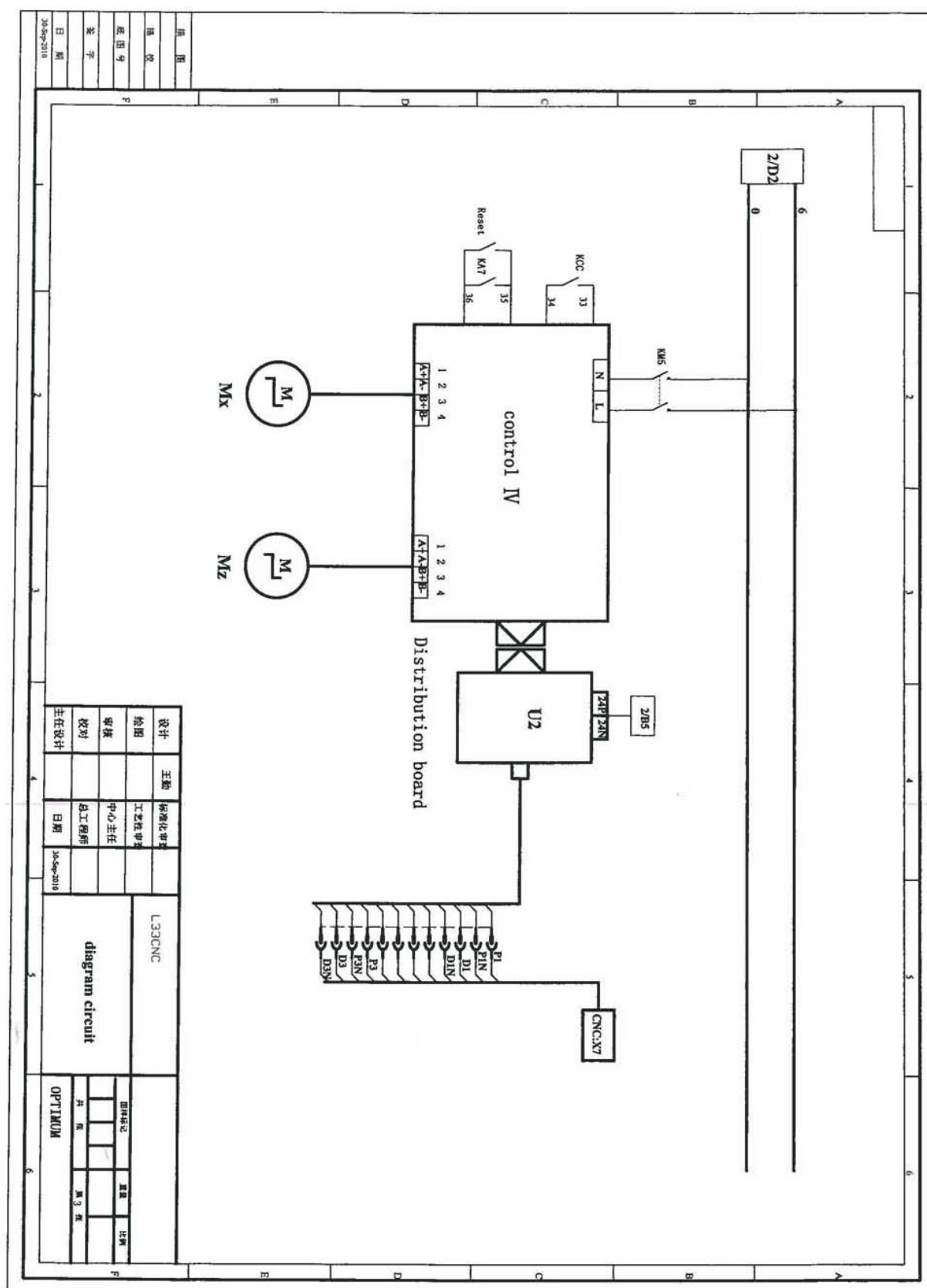
11.2 Teileliste - Parts list

Pos.	Bezeichnung	Designation	Menge	Größe	Artikelnummer
			Qty.	Size	
1	Transformator	Transformer	1		035041101T1
2	Steuermodul	Control module	1		035041101A1
3	Brushlesscontroller	Brushless controller	1		035041101A2
4	Umsetzer Siemens auf Optimum Controller	Inverter from Siemens to Optimum controller	1		035041101A3
5	Sicherungsautomat	Automatic fuse	1		035041101F1
6-13	Sicherung	Fuse	8		035041101F2
14-16	Protective	Contact	3		035041101K1
17-18	Motorschuttschalter	Motor protective switch	2		035041101K2
19-26	Relais	Relay	8		035041101K3
27	Protective	Contact			035041101K4

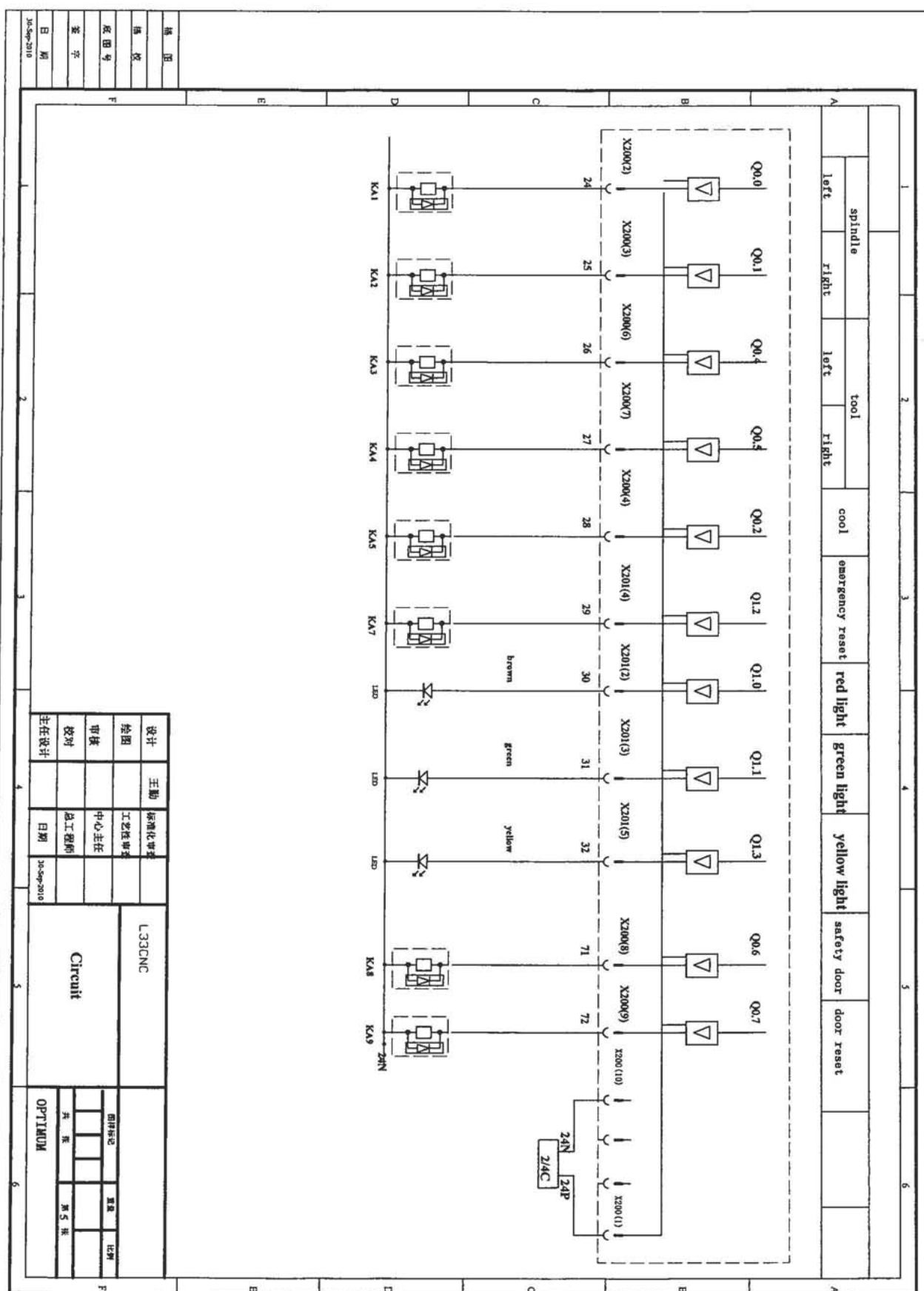
11.3 Wiring diagrams

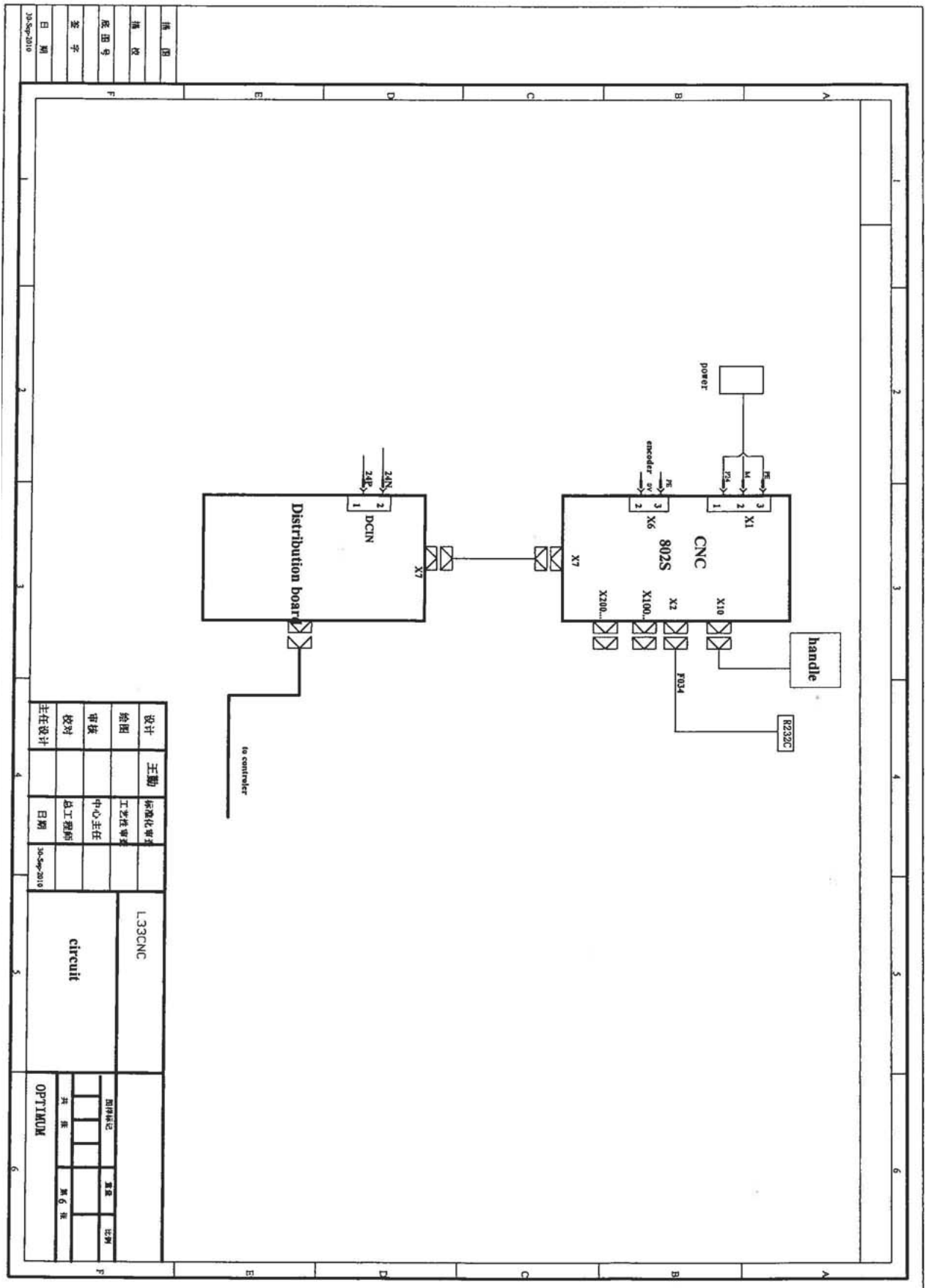
















12 EC - Declaration of Conformity

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

hereby declares that the following product,

Product designation: CNC lathe

Type designation: L33 CNC

Serial number: _ _ _ _ _

Year of construction: 20__

complies with all relevant regulations of the **machines directive (2006/42/EC)** .

Furthermore, the machine complies with all regulations of the directive **electrical equipment (2006/95/EC)** and **electromagnetic compatibility (2004/108/EC)**.

The following harmonized standards were applied:

DIN EN 12100-1:2003/A1:2009 Safety of machinery - basic concepts, general principle for design, Part 1: basic terminology, methodology

DIN EN 12100-2:2003/A1:2009 Safety of machinery - basic concepts, general principle for design, Part 2: technical principles and specifications

DIN EN 60204-1 Safety of machinery - electrical equipment of machines, Part 1: general requirements

The following technical standards were applied:

EN 12415 Safety of machine tools - small numerically controlled turning machines and turning centres

EN 12840 Safety of machine tools - manually controlled turning machines with or without automatic control

DIN 66025-1, Edition:1983-01 Numerical control of machines, format; general requirements

DIN 66025-2, Edition:1988-09 Industrial automation; numerical control of machines; format, preparatory and miscellaneous functions

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Kilian Stürmer

Hallstadt, 13. Dezember 2011

13 Annex

13.1 Copyright

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13.2 Changes

Any changes in the construction, equipment and accessories are reserved for reasons of enhancement. Therefore, no claims may be derived from the indications and descriptions. Errors excepted!

13.3 Product follow-up

We have a follow-up service for our products which extends even beyond shipment.

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

- Modified settings
- Experiences with the CNC machine, which could be important to other users
- Recurring failures
- Difficulties with the documentation

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Technical hotline:

Phone: +49 (0) 900 - 19 68 220 (subject to charge: 0,49 €/min if calling from the German fixed network)

Fax.: (+49) 0 951 / 96822 - 22

e-mail: info@optimum-maschinen.de

13.4 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 individual 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 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 from the following circumstances are excluded from liability and warranty claims:
 - Using the product beyond the technical options and proper use, in particular due to overstraining of the machine
 - Any defects arising by one's own fault due to faulty operations or if the operating manual is disregarded
 - Inattentive or incorrect handling and use of improper equipment
 - Non-authorised 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 servants performs in order to fulfil 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.

13.5 Advice for disposal / Options of re-use

Please dispose of your machine in an environmentally friendly way, not by disposing of the waste not in the environment, but by acting in a professional way.

Please do not throw away the packaging and the used machine later on, but dispose of your material according to the guidelines established by your municipality or by the responsible waste management company.

13.5.1 Decommissioning

CAUTION!

Immediately decommission used machines in order to avoid later misuse and endangering of the environment or of persons.

Disconnect the machine from the mains.

Cut the connecting cable into two.

Remove all operating materials from the used device which are harmful to the environment.



If required, remove the batteries and accumulators.

If required, disassemble the machine into easy-to-handle and usable components and parts.

Supply the machine components and operating materials to the provided disposal routes.

13.5.2 Disposal of the packaging of the new machine

All used packaging materials and packaging aids of the machine are recyclable and generally need to be transported to the material recycling.

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

It is possible to crush any packaging material made of cardboard and supply it to the waste paper collection.

The films are made of polyethylene (PE) and the upholstery parts are made of polystyrene (PS). It is possible to re-use these materials after reconditioning, if you supply them to the collection station or to the responsible waste management company.

Supply the packaging material only correctly sorted, so that it is possible to directly supply it to the reprocessing.

13.5.3 Disposal of the used machine

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 electrical devices include a number of reusable materials as well as components which are harmful to the environment. Please help that these components are disposed of separately and professionally. In case of doubt, please contact your municipal waste management company. If necessary contact a specialised waste disposal centre to get help for the disposal.

13.5.4 Disposal of electrical and electronic components

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

The machine is composed of electrical and electronic components and must not be disposed of as household waste. According to the European directive 2002/96/EC regarding electrical and electronic used devices and the implementation of national legislation used power tools and electrical machines need to be collected separately and supplied to an environmentally friendly recycling centre.

Being the machine operator, you should gather information regarding the authorised collection or disposal system which applies for your company.

Please make sure that batteries and/or accumulators are disposed of in a professional way and according to the legal regulations. Please throw empty accumulators only into the collection boxes of retail markets or municipal waste disposal companies.

13.5.5 Disposal of lubricants and cooling lubricants

ATTENTION!

Please imperatively make sure that the used coolants and lubricants are disposed of in an environmentally friendly way. Observe the disposal advices of your municipal waste management companies.



INFORMATION

Do not mix up used coolant emulsions and oils, since used oils are only recyclable if they had not been mixed up.

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



13.6 Disposal via municipal collecting points

Disposal of used electric and electronically devices

(Applicable in the countries of the European Union and other European countries with a separate collecting system for such devices).

The sign on the product or on its packing indicates that the product must not be handled as common household waste, but that it 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 fellowmen. 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.

13.7 RoHS, 2002/95/EC

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

13.8 Terminology/Glossary

Term	Explanation
CAD	C omputer A ided D esign
CAM	C omputer A ided M anufacturing
CAP	C omputer A ided P lanning
CNC	C omputerised N umerical C ontrol
NC	N umerical C ontrol
Machine control panel	Control panel, keyboard and screen of the CNC machine
Separating protective equipment	Cover, housing
Step motor	Synchronous motor where the rotor (turnable piece of the motor with a shaft) can be turned targeted around an angle if the triggered stator spools (non-turnable piece of the motor) is well selected.

Term	Explanation
Servo motor	A motor which can travel to different predetermined positions and will maintain there. In this case, the position is an angular position of a rotatory motor and for a linear motor there is a linear positioning. The starting-up and maintaining of the predetermined position is performed by means of a control.
Headstock	Housing for the feed gear and for the pulleys for toothed belts.
Lead-screw nut	Parted nut which cams in the leading spindle.
Lathe chuck	Clamping tool to hold the workpiece.
Drill chuck	Drill bit chuck
Lathe slide	Slide on the guideways of the machine bed in longitudinal direction of the tool axis.
Cross slide	Slide on the table saddle to move transversally to the tool axis.
Top slide	Turnable slide on the cross slide.
Taper mandrel	Cone of the drill, of the drill chuck of the centre point.
Tool	Turning tool, drill, etc.
Workpiece	Part to be turned, part to be machined.
Tailstock	Adjustable turning aid.
Steady rest	Follow or steady support for turning long workpieces
Lathe dog	Equipment, clamping aid to take turning parts when turning between centres.

13.9 Error reports

700016	Drive not ready
700018	Door open
700019	Tailstock not in the ground position (switch actuated)

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