OPTIMUM®
MASCHINEN - GERMANY

Operating Manual

Version 2.5.1

Milling machine

OPTImill®

MH 20V Part no. 3338131

MH 20VL Part no. 3338132

MH 20VLD Part no. 3338133

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Preface

Dear customer,

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

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

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

Information

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

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

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

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

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

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

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1 Safety

Glossary of symbols

☞	provides further instructions
➜	calls on you to act
❍	listings

This part of the operating instructions

- ❍ explains the meaning and use of the warning notes included in these operating instructions,
- ❍ defines the intended use of the milling 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 operation instructions, please observe

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

When installing, operating, maintaining and repairing the milling machine, the relevant standards must be observed.

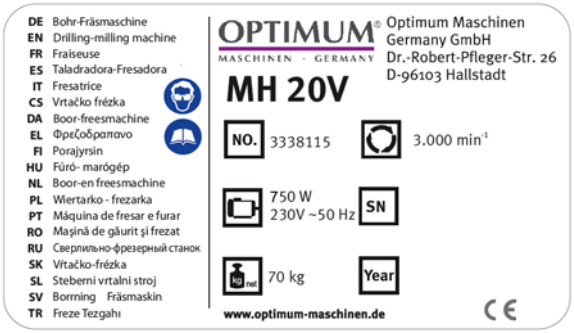
If European standards have not yet been incorporated in the national legislation of the country in question, the specific applicable regulations of each country must be observed.

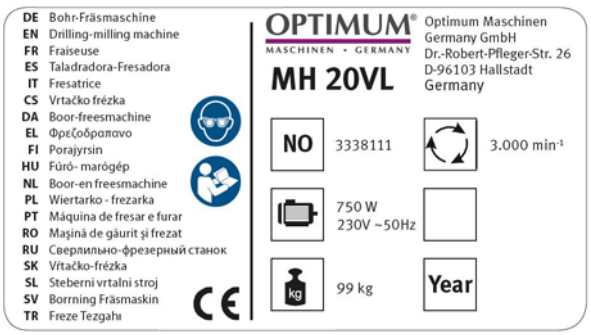
If necessary, relevant measures must be taken to comply with national regulations before commissioning the milling machine.

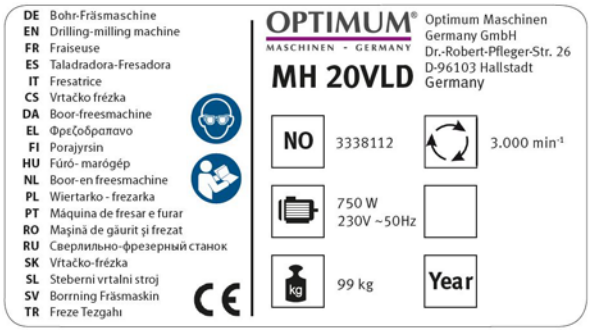
Always keep this documentation close to the milling machine.

If you want to re-order the operating instructions for your machine, please quote the relevant serial number. The serial number can be found on the type plate.

1.1 Type plate







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INFORMATION

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

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

1.2 Safety instructions (warning notes)

1.2.1 Classification of hazards

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

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

In case of specific dangers, we replace the pictogram with

general danger — with a warning of — injury to hands, — hazardous electrical voltage, — or — rotating parts.

1.2.2 Other pictograms

Warning: danger of slipping!

Warning: risk of stumbling!

Warning: hot surface!

Warning: biological hazard!


Warning: automatic start-up!


Warning: tilting danger!


Warning: suspended loads!


Caution, danger of explosive substances!


Switching on forbidden!


Read the operating instructions before commissioning!


Pull out the mains plug!


Wear protective glasses!


Wear protective gloves!


Wear safety shoes!


Wear a protective suit!


Use ear protection!


Only switch during standstill!


Protect the environment!


Contact address

1.3 Intended use

WARNING!

In the event of improper use, the milling machine

- ❍ **may be a hazard to personnel,**
- ❍ **the machine and other property of the operating company and**
- ❍ **the functionality of the milling machine may be compromised.**

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

Using this drilling-milling machine it is possible to perform dry processing as well as processing by using cooling lubricants. The limit values of the balances of the tools and tool holders need to be observed.

The milling machine must only be installed and operated in a dry and well-ventilated areas.

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

The defined conditions of use and performance data must not be changed.

The protective equipment used must be available - unless this is not useful for the setup operation or for maintenance - properly installed, and fully functional. Its position must not be changed, bypassed or made ineffective.

Safety components such as limit switches or other control components must not be put out of operation.

The milling machine must neither be renovated nor modified in any other way.

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

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

We expressly point out that the guarantee will expire, if any constructive, technical or procedural changes are not performed by the company Optimum Maschinen Germany GmbH. It is also part of the intended use that you

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

☞ "Technical specification“ on page 18

WARNING!

Extremely severe injuries due to non-intended use.

It is forbidden to make any modifications or alternations to the operating parameters values of the milling machine. They could pose an accident hazard to persons and cause damage to the milling machine.

1.4 Reasonably foreseeable misuse

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

Any other use must be discussed with the manufacturer.

Only metallic, cold and non-flammable materials may be machined with the milling machine.

In order to avoid misuse, the operating instructions must be read and understood before first commissioning.

Operators must be duly qualified.

1.4.1 Avoiding misuse

- ➜ Use of suitable cutting tools.
- ➜ Adapting the speed setting and feed to the material and workpiece.
- ➜ Clamp workpieces firmly and free of vibration.
- ➜ Risk of fire and explosion due to the use of flammable materials or cooling lubricants. Before processing inflammable materials (e.g. aluminium, magnesium) or using inflammable auxiliary materials (e.g. spirit), you need to take additional preventive measures in order to avoid health risks.
- ➜ When processing plastics, the machine operator must ensure that static electricity generated during the machining process can be discharged easily.
- ➜ When processing carbons, graphite and carbon-fibre-reinforced carbons, the machine is no longer being used as intended. This causes the warranty to be null and void. When processing carbons, graphite and carbon-fibre-reinforced carbons and similar materials, the machine can be damaged extremely quickly, even if the dusts generated are completely sucked out during the work process.

ATTENTION!

The workpiece is always to be fixed by a machine vice, jaw chuck or by another appropriate clamping tool such as for the clamping claws.

WARNING!

Risk of injury caused by flying workpieces.

- ➜ Clamp the workpiece in the machine vice. Make sure that the workpiece is firmly clamped in the machine vice and that the machine vice is firmly clamped onto the machine table.
- ❍ Use cooling and lubricating agents to increase the durability of the tool and to improve the surface quality.

- Clamp the cutting tools and workpieces on clean clamping surfaces.
- Sufficiently lubricate the machine.
- Set the bearing clearance and guides correctly.

Recommendations:

- Insert the drill in a way that it is positioned exactly between the three clamping jaws of the drill chuck.
- Clamp end mills (or shank cutters) in a collet chuck using the corresponding collets.
- Clamp end face mills using shell end mill arbors.

When drilling, make sure that

- the suitable speed is set depending on the diameter of the drill,
- the pressure must only be such that the drill can cut without load,
- if there is too much pressure, the drill will wear quickly and may even break or jam in the borehole. If the drill jams, immediately stop the main motor by pressing the emergency stop button,
- use commercial cooling/lubricating agents for hard materials, e.g. steel and
- generally always back the spindle out of the workpiece while it is still turning.

CAUTION !

Do not use the drill chuck as a milling tool. Never clamp a milling cutter into a drill chuck. Use a collet chuck and appropriate collets for end mills.

When milling, ensure that

- the right cutting speed is selected;
- for workpieces with normal strength values, e.g. steel, 18-22 m/min,
- for workpieces with high strength values, 10-14 m/min,
- the pressure is selected so that the cutting speed remains constant,
- normal trade coolants/lubricants are used for hard materials.

1.5 Possible dangers posed by the milling machine

The milling machine was built using state-of-the-art technology.

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

- high speeds,
- circulating parts and tools and
- electrical voltage and currents.

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

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

INFORMATION

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

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

Always disconnect the milling machine from the electrical power supply before performing cleaning or maintenance tasks.

WARNING!

The milling machine may only be used with fully functional safety devices.

Disconnect the milling machine immediately, whenever you detect a failure in the safety devices or when they are not fitted!

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All additional devices installed by the operator must be equipped with the stipulated safety devices. This is your responsibility being the operating company or private user!
☞ **"Safety devices“ on page 13**

1.6 Qualification

It is indispensable that the operator is suitably qualified for safe use and secure setting and operation of the machine.

1.6.1 Private Users

The MH20V milling machine is also used in the private domain. The acumen of people in the private sector with training in metal working was taken into consideration for creating this operation manual. Vocational training or further instruction in a metal working profession is a prerequisite for safe operation of the machine. It is essential that the private user is aware of the dangers involved in operating this machine. We recommend visiting a training course in the operation of milling machines. Your specialist dealer can offer you an appropriate training course. These courses are also offered by adult education centres in Germany.

1.6.2 Obligations of the User

The user must

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

1.6.3 Craftsman or industrial use

This manual is addressed to

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

Consequently, the warning notes refer both to the use of the milling machine and to its maintenance.

WARNING!

Always isolate the milling machine from the electrical power supply. This will prevent it from being used by unauthorized persons. The qualifications of the personnel for the different tasks are mentioned below:

Operator

The operator has been instructed by the operating company regarding the assigned tasks and possible risks in case of improper behaviour. Any tasks which need to be performed beyond the operation in standard mode must only be performed by the operator, if so indicated in these instructions and if the operator has been expressively commissioned by the operating company.

Qualified electrician

With professional training, knowledge and experience as well as knowledge of respective standards and regulations, qualified electricians are able to perform work on the electrical system and recognise and avoid any possible dangers. Qualified electricians have been specially trained for the working environment, in which they are working and know the relevant standards and regulations.

Qualified personnel

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

Instructed person

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

INFORMATION

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

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

In the event of improper use

- there may be a risk to personnel,
- the milling machine and other property and
- the functionality of the milling machine may be compromised.

1.6.4 Authorized personnel

WARNING!

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

Only authorized personnel may operate the machine!

Authorized operating and maintenance personnel are specialists instructed and trained by the operator and the manufacturer.

1.6.5 Operator's obligations

The operator must instruct personnel at least once a year in

- all safety regulations relevant to the machine,
- its operation and
- generally accepted engineering standards.

The operator must also

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

1.6.6 Obligations of the operator

The user must

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

1.6.7 Additional requirements regarding qualification

The following additional requirements apply for work on electrical components or equipment:

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

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

➜ disconnect all poles,

➜ secure against restarting,

➜ check that there is no voltage.

1.7 User positions

The user position is in front of the milling machine.

1.8 Safety measures during operation

CAUTION!

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

Depending on the materials to be machined and the agents used, dusts and mists can arise that are detrimental to health.

Ensure that the harmful dust and mist generated are safely sucked off at the point of origin and routed away from the working area or filtered. To do so, use a suitable extraction unit.

CAUTION!

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

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

1.9 Safety devices

The milling machine must only be operated with fully functional safety devices.

Stop the milling machine immediately if there is a failure on the safety device or becomes ineffective.

This is your responsibility!

If a safety device has been activated or has failed, the milling machine must only be used if you

- have eliminated the cause of the fault and
- have verified that there is no danger to personnel or objects.

WARNING!

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

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

WARNING!

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

1.9.1 Emergency stop button

CAUTION!

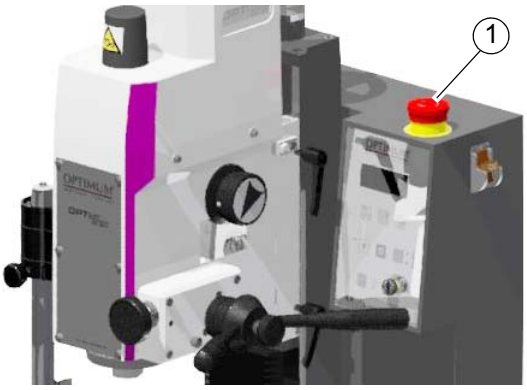
Only press the emergency stop button (1) in a genuine emergency. Do not use the emergency stop button to stop the machine during normal operation.

CAUTION!

The spindle continues to rotate for a while, depending on the moment of inertia of the spindle and the tool in use.

The emergency stop button (1) brings the machine to a standstill.

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



Img.1-1: Emergency stop button

1.9.2 Separation guard

Adjust the guard (2) to the correct height before you start working.
To do so, slacken the clamping screw, set the required height and re-tighten the clamping screw.

There is a switch integrated in the spindle protection mounting which monitors the closed position.

INFORMATION

The machine cannot be started, if the spindle protection is not closed.

Img.1-2: Separation guard

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1.9.3 Main switch

WARNING!

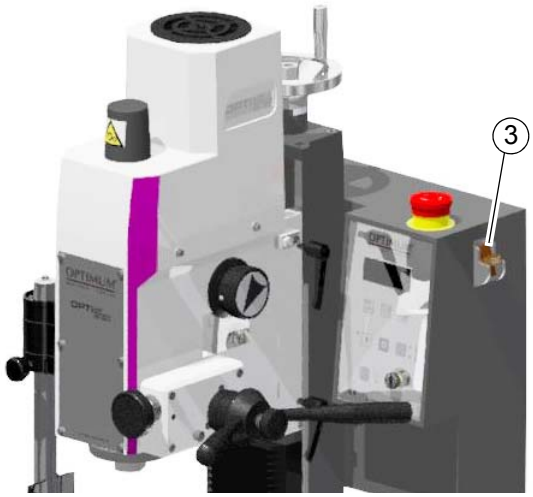
Dangerous voltage even if the main switch is switched off.

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

Switch off the milling machine with the main switch (3) and lock it so it cannot be activated by unauthorised personnel or switched on by accident.

The main switch (3) can be locked by removing the shift lever.

All machine parts as well as all dangerous voltages are switched off. Excepted are only the positions which are marked with the adjoining pictogram.



Img. 1-3: Main switch

1.10 Safety check

Check the milling machine regularly.

Check all safety devices

- before starting work,
- once a week (with the machine in operation) and
- after all maintenance and repair work.

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

Functional check		
Equipment	**Check**	**OK**
Emergency stop button	After the emergency stop button is pressed, the milling machine must switch off. It must only be possible to restart the machine, if the emergency stop button is unlocked and the ON switch has been pressed.	
Separation guard around the drill and milling spindle	The milling machine may switch on only when the guard is closed.	

1.11 Personal protective equipment

For certain work, personal protective equipment is required.

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

Wear protective gloves when handling pieces with sharp edges.

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

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

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

CAUTION!

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

1.12 For your own safety during operation

WARNING!

Before switching the milling machine on, make sure that there is no risk of personal injury or damage to property.

Avoid any unsafe work methods:

Make sure that your operation does not create a safety hazard.

- The rules specified in these operating instructions must be observed during assembly, operation, maintenance and repair.
- Use protective glasses!
- Switch off the milling machine before measuring the workpiece.
- Do not work on the milling machine, if your concentration is reduced, for example, because you are taking medication.
- Stay at the milling machine until the movements have stopped completely.
- Use the specified personal protective equipment. Ensure you wear close-fitting clothing and, if necessary, a hairnet.
- Do not use protective gloves when drilling or milling.
- Turn off the machine before changing the milling tool.
- Use appropriate agents to remove drilling and milling chips.
- Ensure that your work does not create a safety risk.
- Clamp the workpiece securely and firmly before switching on the milling machine.

We specifically point out the dangers in the description of work with and on the drilling machine.

1.13 Using lifting equipment

WARNING!

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

Check to ensure that the lifting and load-suspension equipment are of sufficient load-bearing capability and are in perfect condition.

Observe the accident prevention regulations issued by your Employers Liability Insurance Association or other supervisory authorities applicable to your company.

Fasten the loads carefully. Never walk under suspended loads!

1.14 Symbols on the milling machine

Make sure that the mandatory and warning symbols are legible.

1.15 Electronics

Craftsman or industrial use

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

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

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

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

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

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

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

No check is required before first commissioning, if the manufacturer or installer has confirmed to the operator that the electrical system and operating materials have been procured in accordance with the stipulations of the accident prevention regulations.

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

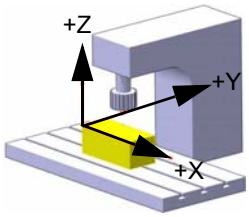
1.16 Inspection deadlines

Craftsman or industrial use

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

2 Technical specification

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

2.1 Electrical connection	
	230V ~ 50Hz ~ 60Hz
Milling spindle motor power	750 W
2.2 Milling capacity	
Drilling capacity in steel (S235JR) [mm]	Ø 16
Drilling capacity in steel (S235JR) [mm]	Ø 12
Max. milling head size [mm]	Ø 52
Max. end mill cutter size [mm]	Ø 20
2.3 Spindle seat	
Spindle seat	MT2
Drawbar	M10
Maximum distance between spindle nose - milling table [mm]	255
2.4 Drill-mill head	
	
Spindle sleeve stroke [mm]	50
Quill diameter [mm]	60
Manual travel Z axis [mm]	210
Throat [mm]	170
Inclination range	± 90°

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2.5 Milling table

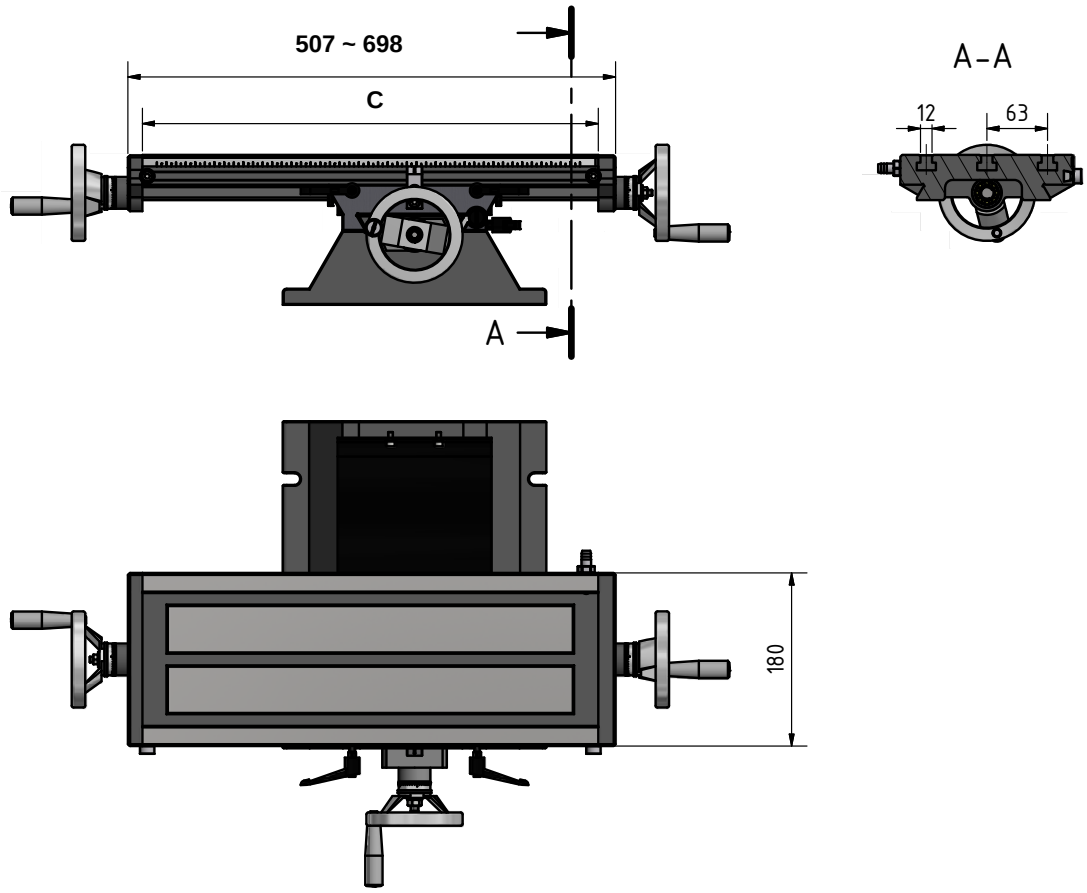

Table length **C** MH20V / MH20VL(D) [mm]	474 / 675
Table width [mm]	180
Maximum load capacity MH20V / MH20VL(D)	50 kg / 40 kg
T-slot size/distance/number	12 / 63 / 3
X axis travel MH20V / MH20VL(D) [mm]	280 / 480
Y axis travel [mm]	175
2.6 Dimensions	
	☞ "Fastening to the Machine Base“ on page 26
Total weight MH20V / MH20VL(D) [kg]	94 / 99
2.7 Work area	
	Keep a work area of at least one metre around the machine free for operation and maintenance.
2.8 Speeds	
Electronic speed range / Gear stages [rpm]	100 - 3000 / 2 (~ 50 Hz 230V +- 1%)
2.9 Environmental conditions	
Temperature	5 - 35 °C

Admissible relative humidity	25-80%
Environmental conditions - storage	-5°~45°
2.10 Operating material	
Gear	Mobilgrease OGL 007 or, Mobilux EP 004 or Mobil XHP, acid-free oil, e.g. weapon oil, motor oil
Bare steel parts	
2.11 Emissions	
Maximum sound pressure level at 1 m distance from the machine and 1.60 m above the ground.	74 dB(A) - 80 dB(A)

Emission measurement

Measurement in operating conditions in accordance with DIN ISO 8525 with surface areas Measurement methods in accordance with DIN 45635.

The generation of noise emitted is 74 dB(A) on no-load running at 80% of max. spindle speed, measured at a distance of one meter from the machine and at a height of 1.6m.

If the milling machine is installed in an area where various machines are in operation, the noise exposure (immission) on the operator of the milling machine at the working place may exceed 80 dB(A).

INFORMATION

This numerical value was measured on a new machine under the operating conditions specified by the manufacturer. The noise behaviour of the machine might change depending on the age and wear of the machine.

Furthermore, the noise emission also depends on production engineering factors, e.g. speed, material and clamping conditions.

INFORMATION

The specified numerical value represents the emission level and does not necessarily a safe working level.

Though there is a dependency between the degree of the noise emission and the degree of the noise disturbance it is not possible to use it reliably to determine if further precaution measures are required or not.

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

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

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

CAUTION!

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

We generally recommend the use of noise and ear protection.

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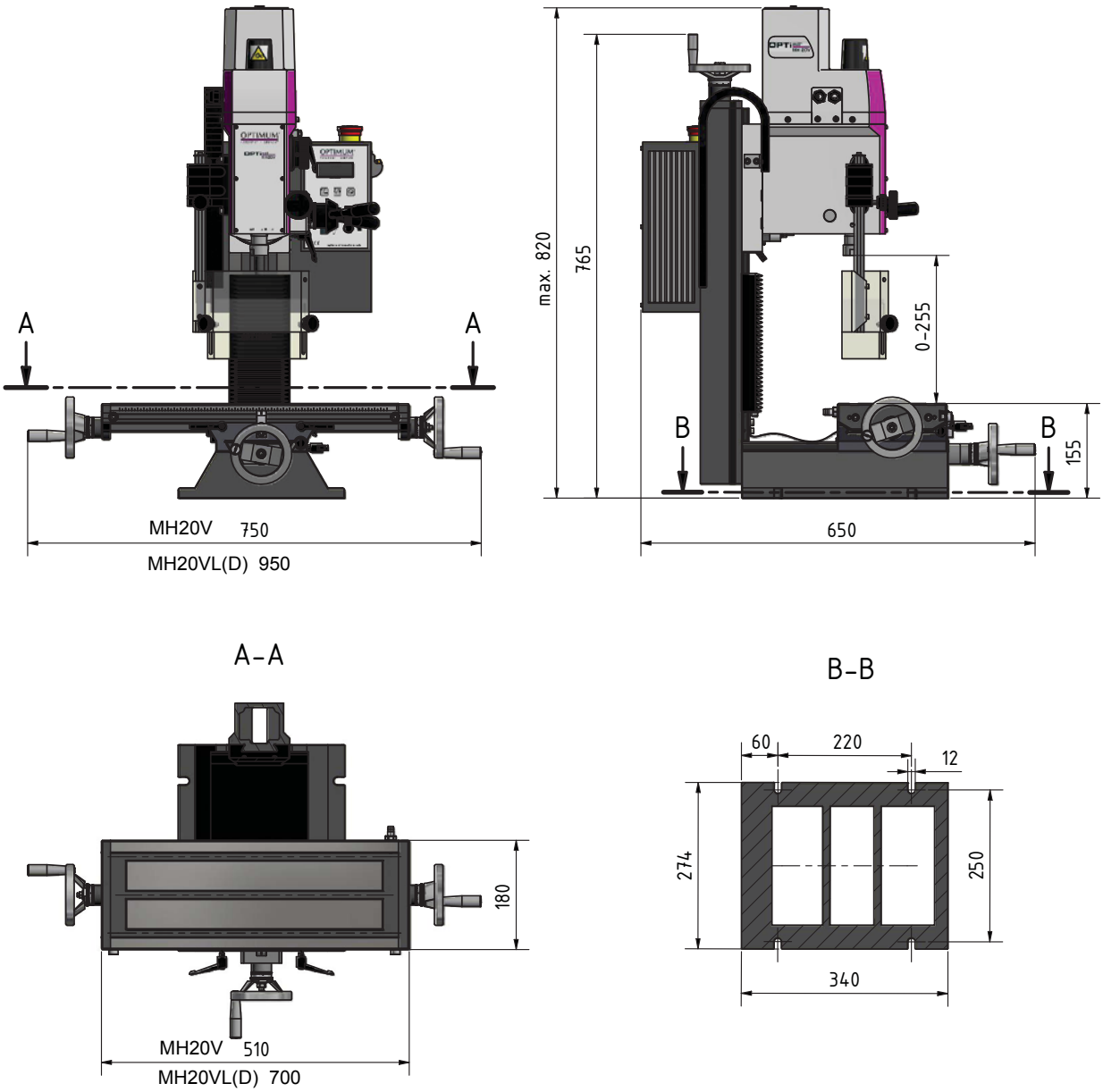
2.12 Dimensions



3 Delivery, interdepartmental transport, assembly and commissioning

3.1 Notes on transport, installation, commissioning

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

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

WARNING!

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

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

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

WARNING!

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

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

3.1.1 General risks during internal transport

WARNING: TILTING DANGER!

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

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

Warn employees and advise them of the hazard.

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

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

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

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

Careful planning of interdepartmental transport is therefore essential.

3.2 Delivery

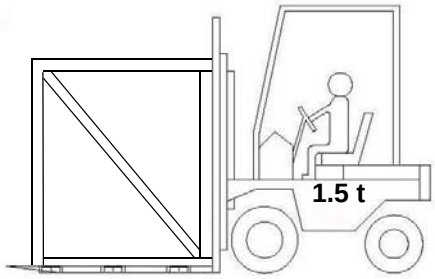
INFORMATION

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

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

Check if all parts are firmly seated.

The machine can be raised with a lift truck or forklift truck underneath the packing case.



3.3 Unpacking

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

Examine the complete machine carefully and check whether all materials, such as shipping documents, instructions and accessories have been delivered with the machine.

3.4 Installation and assembly

3.4.1 Installation site requirements

The power plug of the milling machine must be readily accessible.

The illumination of the workplace must be designed in such a manner that an illumination of 500 Lux is attained at the tool tip.

If this is not guaranteed with the normal installation site lighting, workplace lights must be used.

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

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

3.5 Lifting the machine

WARNING!

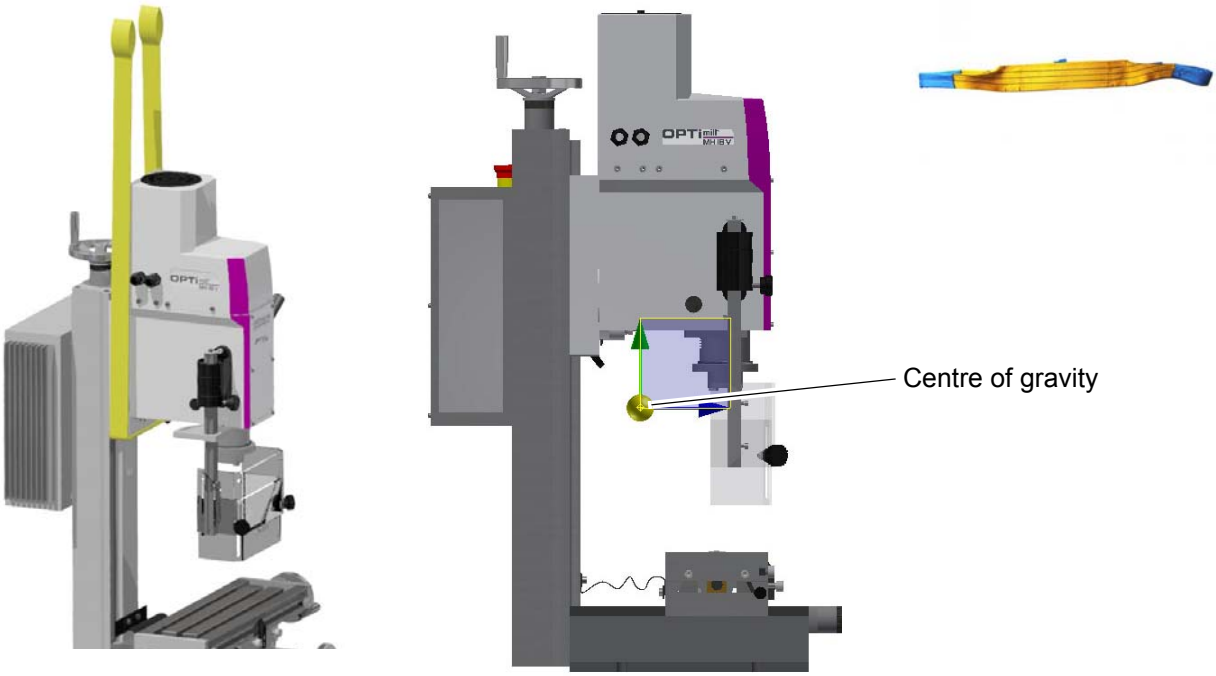
Danger of crushing and overturning. Proceed carefully when lifting, installing and assembling the machine.

➜ Fix the load lifting gear around the drilling-milling head. Use a lifting strap with a width of 30 mm to do this.

➜ Lock all clamping levers on the drilling-milling machine before you lift it.

➜ Make sure that no add-on pieces or varnished parts are damaged due to the load suspension. To prevent the possibility of damage occurring to the cap of the drive and to the milling head, the load step should be selected on the guide of the milling head. The bellows must be removed to do this.

➜ Take care with the centre of gravity of the machine.



3.5.1 Assembly

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

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

➜ Check that the milling machine foundation is horizontal with a spirit level.

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

ATTENTION!

Inadequate rigidity of the foundation will cause interaction of vibrations between the milling machine and the foundation (resonant frequency of the components). If the rigidity of the overall system is insufficient, critical speeds with annoying vibrations will be reached very quickly and lead to bad milling results.

➜ Fasten the machine substructure to the foundation.

➜ Place the milling machine on the provided foundation.

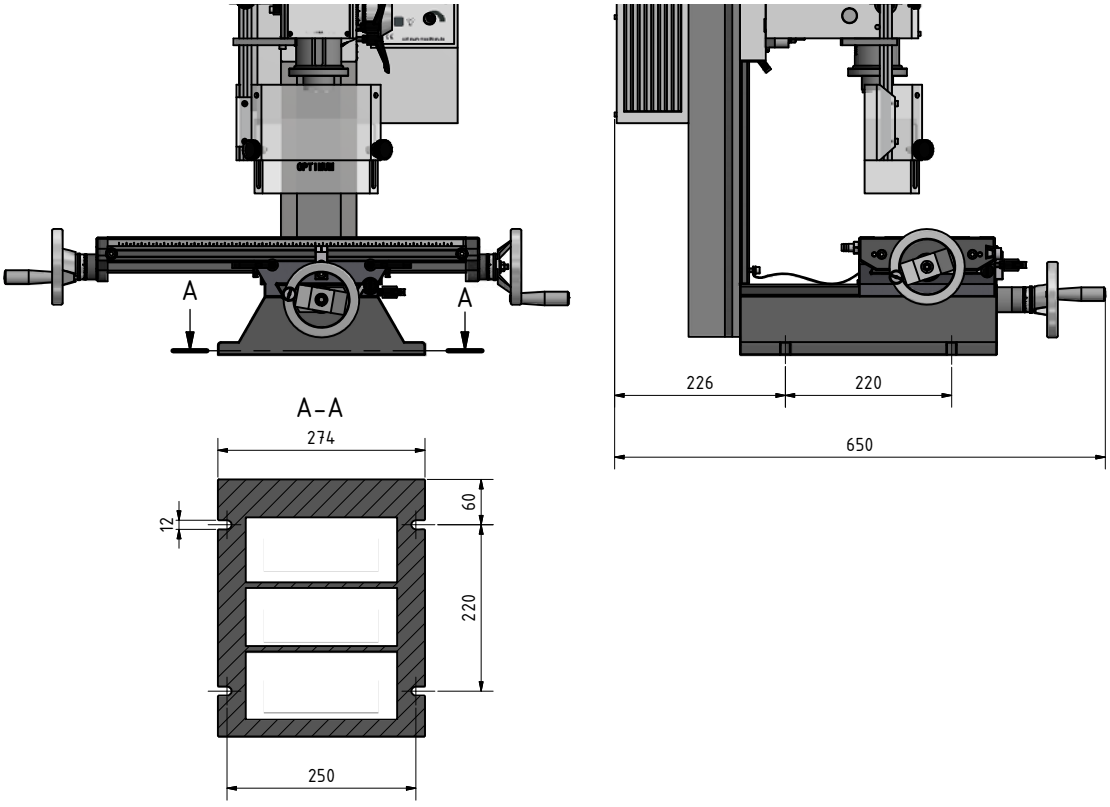
WARNING!

The nature of the foundation and type of fixings used to secure the machine base to the foundation must be capable of absorbing the loads caused by the milling machine. The foundation must be level. Check that the milling machine foundation is horizontal by using a spirit level.

➜ Fix the milling machine to its foundation at the recesses provided on the machine base for this purpose.

3.6 Fastening to the Machine Base

3.6.1 Dimensions, recesses for fastening the machine



MH20V_GB_3.fm

3.7 First commissioning

☞ "Qualification“ on page 11

WARNING!

First commissioning may only take place after proper installation.

First commissioned of the milling machine by inexperienced personnel or inexperienced users constitute a risk to personnel and equipment. We do not accept any liability for damages caused by incorrectly performed commissioning.

ATTENTION!

Before commissioning the machine, all bolts, fastenings and protections must be checked and retightened as necessary!

WARNING!

The use of improper tool holders or their operation at inadmissible speeds constitutes a hazard.

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

Only use tool holders in the intended admissible speed range.

Tool holders may only be modified in compliance with the recommendation of OPTIMUM or the clamping device manufacturer.

3.8 Electrical connection

CAUTION!

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

Please verify if the type of current, voltage and protection fuse correspond to the values specified. A protective earth ground wire connection must be available.

❍ Main Fuse 16A.

3.9 Cleaning and lubrication

➜ Remove the anti-corrosive agents which has been applied to the milling machine for transport and storage. We recommend you use paraffin for this purpose.

➜ To clean the milling machine, do not use any solvents, nitro-cellulose thinner or other cleaning agents that could damage the paintwork. Observe the cleaning agent manufacturer's information and notes.

➜ Grease all exposed machine parts using an acid-free lubricating oil.

➜ Lubricate the milling machine in accordance with the lubrication schedule. ☞ "Inspection and maintenance“ on page 38

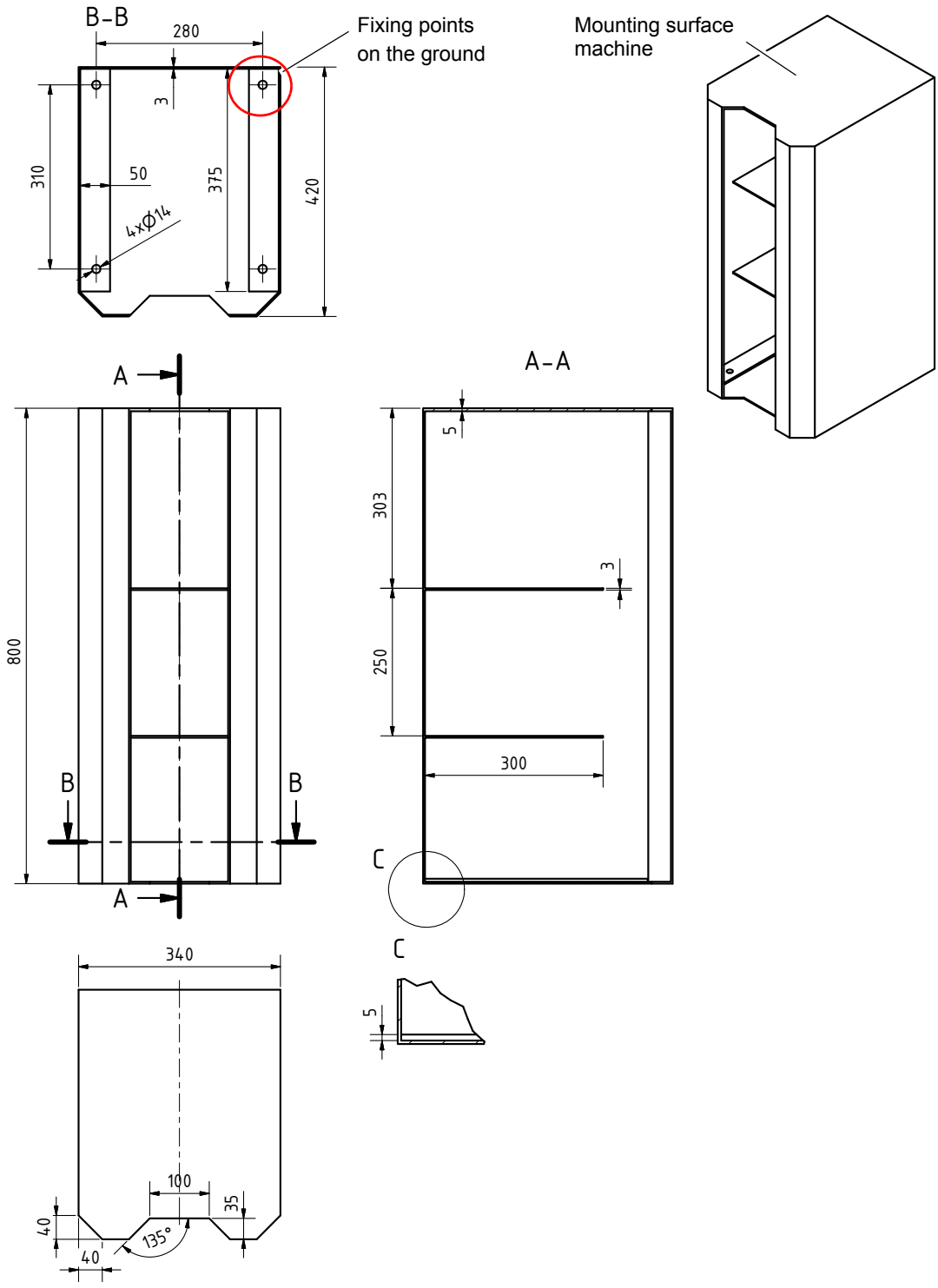
➜ Check that all spindles are running smoothly. All spindle nuts are re-adjustable.

INFORMATION

The milling machine has been painted with varnish. This fact must be taken into account when selecting your cooling lubricant. Optimum Maschinen Germany GmbH does not accept any liability for subsequent damages due to unsuitable cooling lubricants. The flashpoint of the emulsion must be higher than 140°C. When using non-water-miscible cooling lubricants (oil content > 15%) with a flashpoint, ignitable aerosol air mixtures might develop. There is a potential danger of explosion.

3.10 Optional machine base

MSM1 - Item no. 3353000



3.11 Optional digital display DRO5

The optionally available digital display DRO5 can be attached to the side of the control panel with screws. The holes are already drilled there from 2021 onwards. The magnetic holder of the DRO5 included in the scope of delivery is not strong enough to fix the display securely to the control panel.

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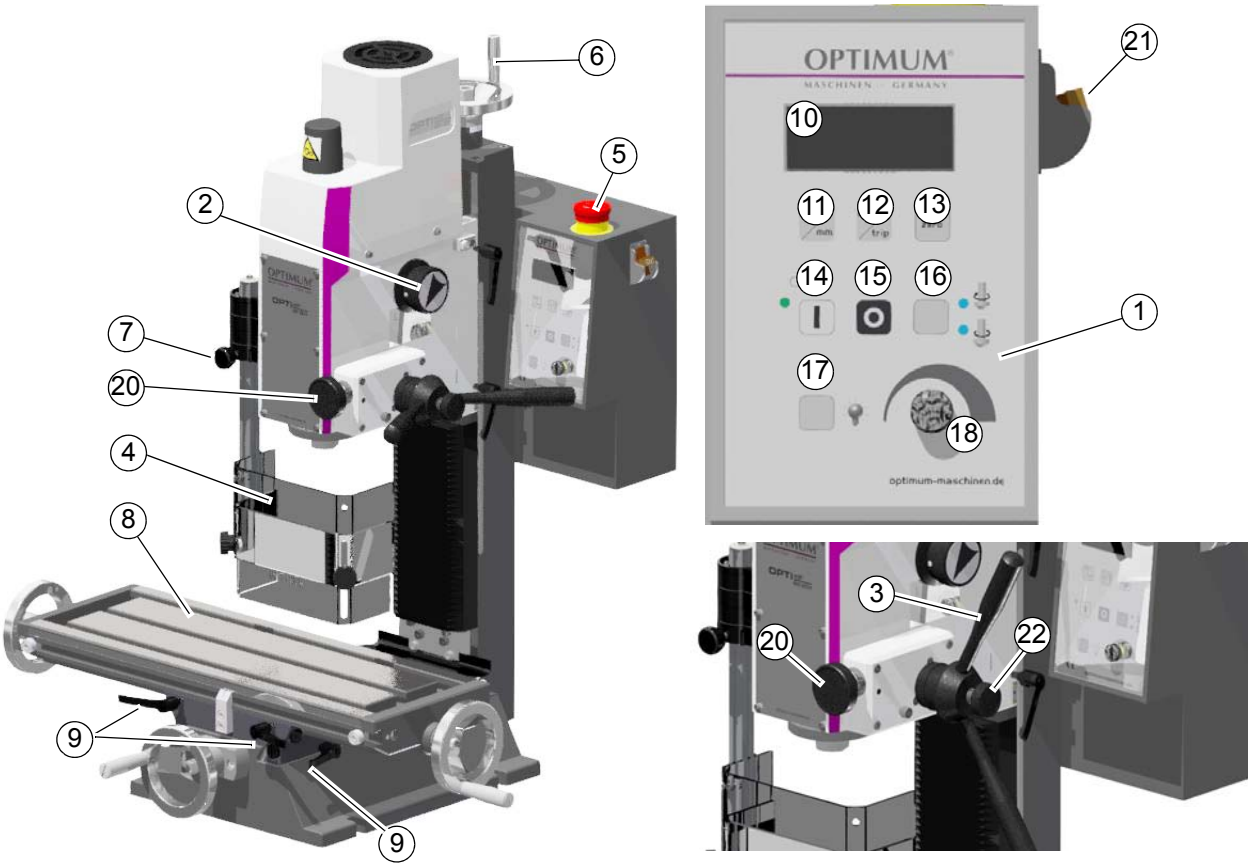
4 Operation

4.1 Control and indicating elements



Pos.	Designation	Item	Designation
1	Control panel	2	Gear switch
3	Spindle sleeve lever	4	Spindle guard
5	Emergency stop button	6	Milling head height adjustment hand crank
7	Spindle protection clamping screw	8	Cross table
9	Clamping lever, Clamping screws	10	Display • Depth display or speed display
11	Switching over display • Millimetres or inches for depth display	12	Switching over display • Speed or depth display of the quill
13	Display depth to zero	14	Spindle rotation ON
15	Spindle rotation OFF	16	Rotational direction spindle
17	Machine illumination ON / OFF	18	Infinitely variable speed adjustment
20	Fine feed of spindle sleeve	21	Main switch
22	Activation of the manual fine feed		

4.2 Safety

The milling machine must only be operated under the following conditions:

- The milling machine is in proper working order.
- The milling machine is used as intended.
- The operating instructions are followed.
- All safety devices are installed and activated.

Eliminate or have all malfunctions rectified promptly. Stop the milling machine immediately in the event of any abnormality in operation and make sure it cannot be started up accidentally or without authorisation.

☞ "For your own safety during operation“ on page 16

4.3 Switching the milling machine on

➜ Select the gear stage
➜ Close the spindle protection system.
➜ Set speed regulator to lowest speed.
➜ Actuate the push button "ON".
➜ Select the direction of rotation.
➜ Set desired speed on the speed regulator.

4.4 Switching off the drilling milling machine

➜ Press the softkey “Off”. For a longer-term standstill, switch it off at the main switch.

CAUTION!

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

4.5 Resetting an emergency stop situation

➜ Unlock the emergency stop switch again.
➜ Switch on the spindle rotation again.

4.6 Power failure, Restoring readiness for operation

➜ Switch on the spindle rotation again.

4.7 Speed setting

4.7.1 Selecting the speed

The correct speed is an important factor for milling. The speed determines the cutting speed by which the cutting edges cut the material. The service life of the tool can be increased and the working result optimized by selecting the correct cutting speed.

The ideal cutting speed basically depends on the workpiece and the tool material. Higher speeds are possible with tools (mills) made from hard metal or cutting ceramics than with tools made from high-alloy high speed steel (HSS). You will achieve the ideal cutting speed by selecting the correct rotation speed by hand.

We recommend using a machining technology paperback
ISBN 978-3-8085-1473-3 (example, only in German language available). In these reference table books you will find all the necessary and additional information. These machining technology reference table books should bridge the gap between the predominantly theory-oriented textbooks and reference & reference table books mostly written with the few theoretical principles in practice.

4.7.2 Gear stage

➜ Changing the gear stage may only be at a standstill.

4.8 Direction of spindle rotation

A change in the direction of rotation at the MH22V is only possible if the spindle rotates even in its standard direction of rotation. The standard direction of rotation is clockwise.

4.9 Feed

with the hand cranks on the milling table.

Note the different forces acting during synchronous milling and conventional milling on the spindles of the milling table. The cutting forces during synchronous milling tend to be that the tool will move into the material.

Conventional milling is always to be preferred over synchronous milling.

Only with recirculating ball screws can the use of synchronous milling be undertaken sensibly.

This instruction manual assumes that the milling machine has been obtained without recirculating ball screws.

The forces and backlash occurring in the spindle nuts leads to "chatter marks" on the surface of the work piece in synchronous milling.

In conventional milling, the work piece moves with the hand cranks on the milling table opposite to the direction of rotation of the milling machine.

In synchronous milling, the work piece moves with the hand cranks on the milling table in the direction of rotation of the milling machine. A smoother surface is obtained compared with conventional milling. So, machining in synchronous milling should only be used for finishing.

4.10 Inserting the tool

4.10.1 Installation

WARNING!

When milling, the seat cone must always be secured with the drawbar. A simple connection with the taper bore of the work spindle without using the drawbar is not permissible for milling. The cone connection is released by lateral pressure. Injuries may be caused by flying parts.

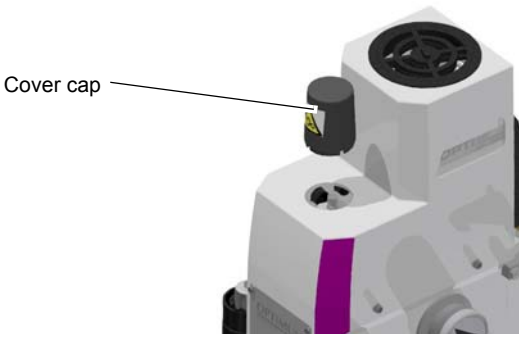
The milling head is fitted with an M10 tie rod.

➜ Remove the cap.

➜ Clean the seat in the spindle / quill.

➜ Clean the cone of your tool.

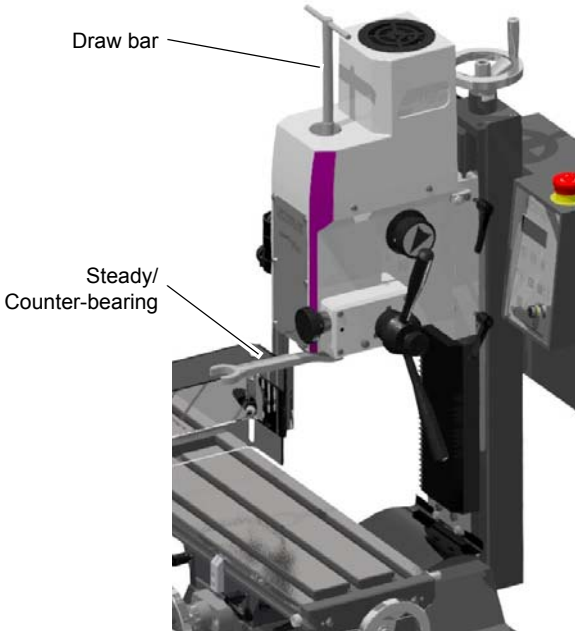
➜ Insert the tool in the spindle / quill.



Img.4-1: Drill-mill head

➜ Screw the draw bar in the tool.

➜ Tighten the tool with the draw bar and hold the spindle on the counter bearing by means of a wrench.



Img.4-2: Drill-mill head

4.10.2 Removing

➜ Hold the spindle on counter bearing with a wrench and loosen the draw bar. Continue turning the tie rod, so that the tool is squeezed out from the conical seat.

ATTENTION!

When installing a cold morse taper into a heated-up machine those MT seats tend to shrink on the morse taper contrary to the steep cone connection.

4.10.3 Use of collets

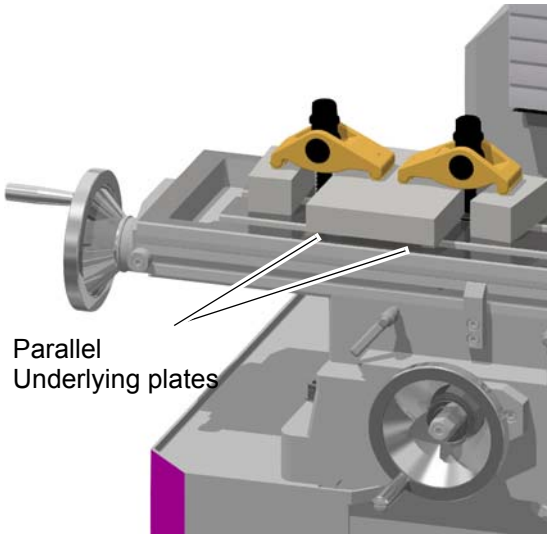
If collets are used to house milling tools, higher machining tolerance can be achieved. The collet may easily and quickly be changed for a smaller or larger end mill with no need to remove the complete tool. The collet is pressed into the ring of the swivel nut and must rest there by itself. By tightening the coupling nut on the tool, the milling cutter is clamped centrally. Make sure that the correct collet is used for each end mill diameter, so that the milling cutter may be fastened securely and firmly.

4.11 Clamping the workpieces

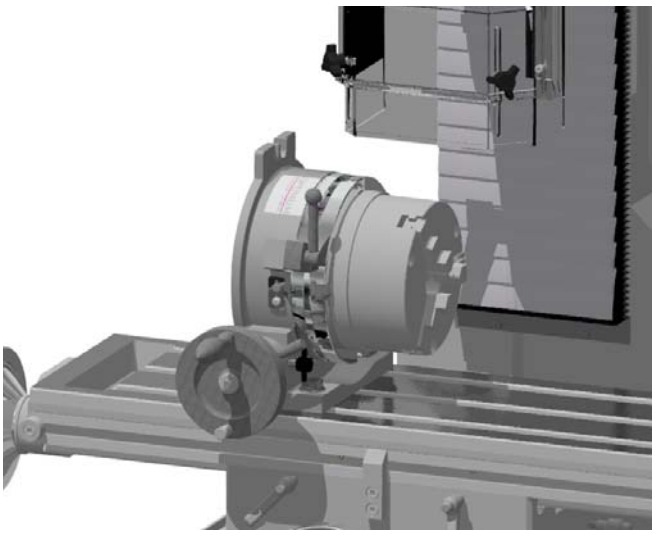
CAUTION!

Injuries can be caused by parts flying off.

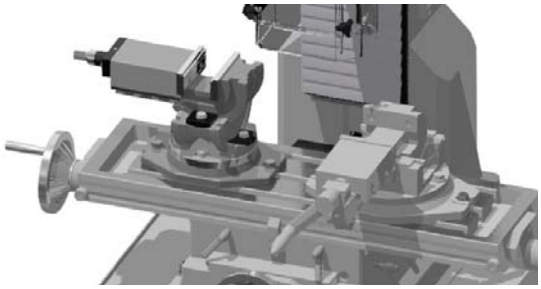
The workpiece must always be secured to the milling table in a machine vice, chuck or with another suitable clamping tool, such as a workholding device (clamping claws).



Workholding device 3352032
+ Parallel underlying plates 3354001



Dividing device 3356200 + Chuck jaw 3356225



Triple axis chuck 3355500
+ Double axis chuck 3354170

4.11.1 Calculation of the Cutting Forces or Necessary Holding Force when Milling

The cutting force Fc arising between the tool and workpiece when milling can be calculated using the Viktor/Kienzle formula:

$$Fc = K \cdot b \cdot h^{(1-m_c)} \cdot k_{c1.1}$$

In this formula, there are 5 factors which are completely unknown without more detailed knowledge. However, these factors can be determined using tables.

The specific cutting force **kc1.1** and the chip thickness exponent **mc** are dependent on the material used. Both parameters are present in tabular reference books and must be investigated for the corresponding material.

Furthermore, for the calculation of the cutting force **Fc** according to the Kienzle equation, the chip width **b**, the chip thickness **h**, and the correction factor **K** are needed.

We recommend using a book of machining technology reference tables.
In such handbooks you will find all the necessary and additional information. Such manuals should bridge the gap between the predominantly theory-oriented textbooks and reference and table books mostly written with the few theoretical principles in practice.

4.12 Swivelling the milling head

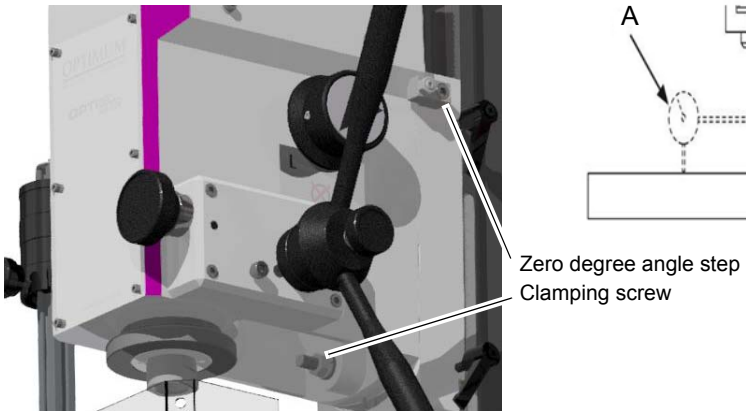
The milling head can be swivelled to the right and to the left.

➜ Loosen the fastening screw on the milling head.
➜ Turn the drill-mill head to the desired position.
➜ Retighten the fastening screw.

INFORMATION

The milling head should be aligned after resetting to the initial position with a dial indicator so that holes can be produced with the spindle sleeve at a right angle.

Set the zero degree angle step using your set-up.



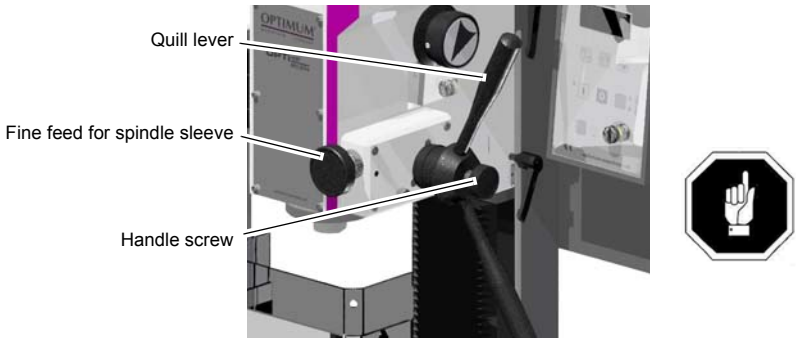
Img.4-3: Swivelling the milling head

4.13 Manual spindle sleeve feed with the fine feed

➜ Turn the handle screw in order to activate fine feed.
➜ Turn the spindle sleeve fine feed in order to move the spindle sleeve.

ATTENTION!

Damage to the mechanics. Always deactivate the fine feed when working with the quill lever.



Img.4-4: Fine feed

4.14 Operation DRO5

- Display: three position display, one speed display
- Counting resolution setting function
- Counting direction setting
- Linear error compensation
- Metric / inches change-over
- LCD display status setting
- Speed mode setting
- Basic value setting

4.14.1 Keyboard (eight keys)

	The selection keys of axes
	Function selection key, enter key.
	Moving key
	Increase or decrease key of the digits

4.14.2 Operations

Axial function

In the normal display state, press (X,Y, Z) key to make the corresponding axial value flash. After flash several times, this axis will be cleared.

If the value of the indicator is blinking, press the corresponding axis button again to cancel the operation.

If the displayed value is in flashing state, press again the function button "PROG" in order to change the fundamental value of the axis.

Modification of the basic value of X, Y, Z

After entering this option, the basic value is highlighted, and the digital bit is located in the flashing state. The ↑ ↓ keys are used for changing the digital bit, the ← → keys are used for selecting the digital bit. After completing the changes, press the "PROG" key to exit the option.

4.14.3 Menu

The operating modes of the menus are nearly same. The ↑ ↓ key move the cursor to the specified options, the "PROG" key is used to select. For optional items, using ↑ ↓ key to select, and using the "PROG" key to exit after completing. For modifying items,
using ↑ ↓ key to modify the digital bit, using ← → key to select the digital bit, using "PROG" key to exit after completing. Pressing the "PROG" key in multilevel menus enters the next level menu.

4.14.4 The main menu

In the normal display state, press and hold the "PROG" key for three seconds to enter the main menu.

LCD display setting

LCD display setting: the secondary menu, press "PROG" key to enter to modify the LED display parameter.

Unit selection

Press "PROG" key to enter the menu, mm/inch as a select.

Language selection

Press "PROG" key to enter the menu, English/German as a select.

Working mode

Press "PROG" key to enter and select,

- X Y/Z0 Z
  Standard display
- X Z+Z0 Z
  for lathes, Z / Z0 axis overlay display, Sum of bedslide + top slide
- 2X Y/Z0 Z
  for lathes, duplicate value in the X axis display.

Decimal point

Selection of decimal places, 2 or 3 decimal places.

Channel setup

Multilevel menus, press the "PROG" key to enter the menu, to modify X Y Z as well as the speed axial parameter.

Operation

The introductions of the main functions.

Save and Exit

Saving new parameters, press the "PROG" key to confirm, then return to the normal display state.

4.14.5 LCD display parameter setting

Contrast

Press the "PROG" key to enter the menu, selection range is 0~31, the increment or decrement is 1.

Backlight

Press the "PROG" key to enter the menu, selection range is 0~63, the increment or decrement is 1.

Test sample

Selection of three different RGB display types.

Press the "PROG" key to enter the menu, selection range is 0~3, the increment or decrement is 1.

Save and Exit

Saving new parameter, press "PROG" key to confirm, then return to the main menu.

4.14.6 Parameter setting of X Y Z-axis and speed axis

X-axis parameter

Three-level menu, press "PROG" key to enter to modify the X-axis parameter.

Y-axis parameter

Three-level menu, press "PROG" key to enter to modify the Y-axis parameter.

Z-axis parameter

Three-level menu, press "PROG" key to enter to modify the Z-axis parameter.

Speed axis parameter

Three-level menu, press "PROG" key to enter to modify the speed axis parameter.

4.14.7 Parameter setting of X-axis

Sensor

Setting of sensor type. Press "PROG" to enter the menu, there are several digital sensor types selectable.

MS100 ; MS200 ; MS500 ; CSA010 ; CSA020 ; CSA050

Use the sensor setting MS200 for reading heads in scope of delivery of DRO5.

Resolution setting

Press "PROG" key to enter and choose.

For sensor type „MS200“ , there are 4 possibilities to choose from. 2µm I 5µm I 10µm I 50µm

Use a resolution of 50 microns for the magnetic tapes with the item no. 3383978 or 3383979 or 3383980 .

Other magnetic tapes from other manufacturers, or magnetic tapes with another item number can have a different resolution.

Setting counting direction

Press the "PROG" key to enter the menu. “+/-“ as a select.

Setting display mode

Press the "PROG" key to enter the menu. "On / Off" as a select.

Linear error compensation

Press the "PROG" key to enter the menu, use ↑ ↓ ← → keys to modify, then press the "PROG" key to exit.

Save and Exit

Saving new parameters, press the "PROG" key to confirm, then return to section 4.14.6

INFORMATION

The parameter setting of Y, Z-axis is the same as X-axis.

4.14.8 Parameter setting of speed axis

Teeth amount of every turn (pulses per rev)

Press "PROG" key to enter, selection range is 1~36, the increment or decrement is 1.

Display mode

Press the "PROG" key to enter the menu, "On / Off" as a select.

Save and Exit

Saving new parameters, press the "PROG" key to confirm, then return to section 4.14.6

5 Maintenance

In this chapter you will find important information about

- Inspection
- Maintenance
- Repair

of the milling machine.

ATTENTION!

Properly performed regular maintenance is an essential prerequisite for

- **operational safety,**
- **failure-free operation,**
- **a long working life of the milling machine and**
- **the quality of the products which you manufacture.**

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

5.1 Safety

WARNING!

The consequences of incorrect maintenance and repair work may include:

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

Maintenance and repair work on the milling machine must be carried out by qualified technical personnel only.

5.1.1 Preparation

WARNING!

Only work on the milling machine if it has been disconnected from the power supply.

Attach a warning sign.

5.1.2 Restarting

Before restarting, run a safety check.

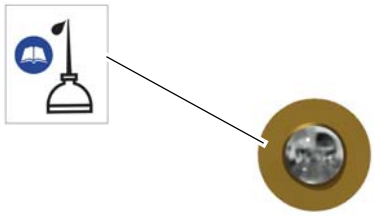
☞ "Safety check“ on page 15

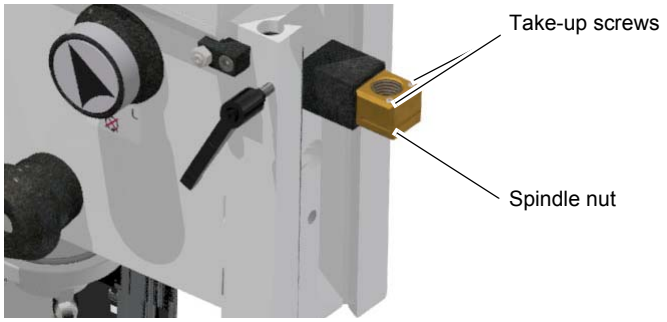
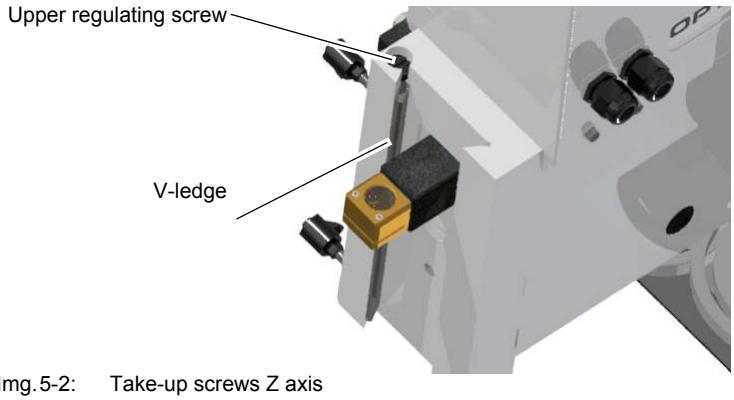
WARNING!

Before starting the milling machine, it is essential that you ensure that this does not constitute a risk to personal safety or damage to the milling machine.

5.2 Inspection and maintenance

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

Interval	Where?	What?	How?
Start of work, after every maintenance or repair work	**Milling machine**	➜ ☞ "Safety check“ on page 15	
Start of work, after every maintenance or repair work	**Dovetail guides**	Oiling	➜ Oil all guide rails.
Every week	**Milling table**	Oiling	➜ Oil all bare steel surfaces. Use acid-free oil.
Monthly	**Clamping bolts Milling head**	firmly tight-ened	➜ Ensure that the clamping bolt for swivelling the drill head is firmly tightened.
Every month	**Oiler cup**	Oiling	➜ Lubricate all oiler cups with machine oil, do not use grease guns or the like. 

Interval	Where?	What?	How?
When necessary	**Spindle nut Milling head**	Readjusting Z axis	An larger amount of backlash in the milling head spindle can be reduced by adjusting the spindle nut. The spindle nut is reset by reducing the thread flanks of the spindle nut with take-up screws. After the reset, it is necessary to check if there is still smooth movement over the entire path, otherwise wear is considerably increased due to friction between the spindle nut and the spindle.  Img.5-1: Milling head
When necessary	**Adjustment gib Milling head**	Reset Z axis	➜ Turn the take-up screws of the gib clockwise. The gib is pushed further inward thus reducing the play in the guide rail. ➜ Check the settings. The corresponding guide rail must be more easily movable but ensure stable guidance.  Img.5-2: Take-up screws Z axis

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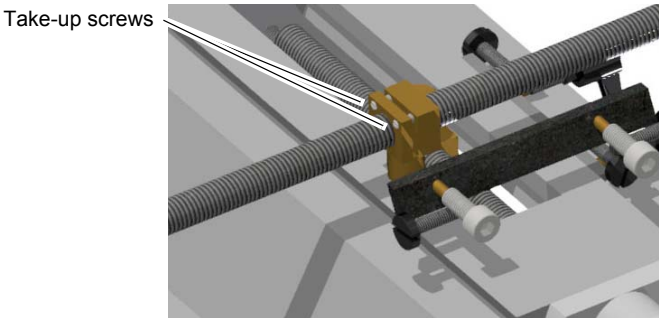
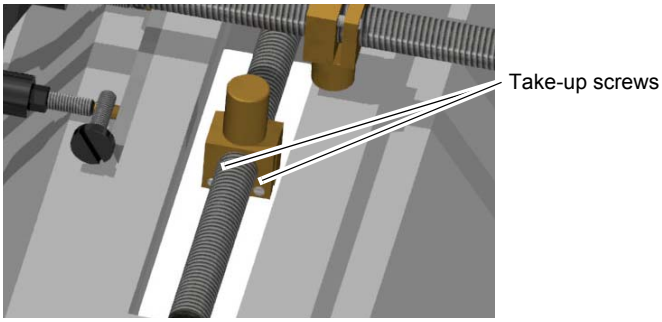
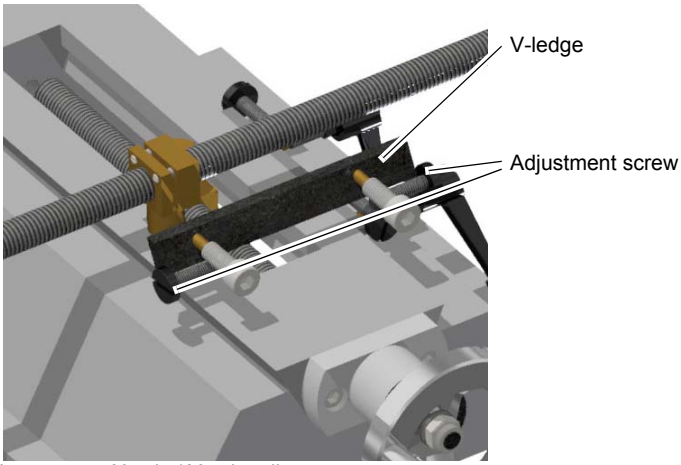
Interval	Where?	What?	How?
	Spindle nut Milling table	Reset X axis	Increased play in the milling table spindles can be reduced by resetting the spindle nuts. The spindle nuts are reset by reducing the thread flanks of the spindle nut by means of take-up screws. After the reset, it is necessary to check if there is still smooth movement over the entire path, otherwise wear is considerably increased due to friction between the spindle nut and the spindle.  Abb.5-3: Milling table
	Spindle nut Milling table	Reset Y axis	 Img.5-4: Milling table
When necessary	**Gibs Milling table**	Reset X axis Y axis	➜ Loosen one screw, turn the other adjustment screw of the gib clockwise. The gib is pushed further inward thus reducing the play in the guide rail. ➜ Check the settings. The corresponding guide rail must be more easily movable but ensure stable guidance.  Img.5-5: X axis / Y axis adjustment screws

Interval	Where?	What?	How?
based on operator's historic values in accordance with German DGUV (BGV A3)	**Electronics**	Electrical inspection	☞ "Operator's obligations“ on page 12 ☞ "Electronics“ on page 17

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5.3 Repair

5.3.1 Customer service technician

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

Stürmer Maschinen GmbH

Dr.-Robert-Pfleger-Str. 26

D- 96103 Hallstadt

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

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

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

For repairs, only use

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

5.3.2 Setting instructions control board

Please find below a description to set the operating parameters, if required after replacement of the control and of the motor.

Vmax

This is the potentiometer to set the maximum possible speed of the motor.

The speed of 3000 min^{-1} must not be exceeded since the spindle bearings and your tools might get damaged.

Vmin

This is the potentiometer to set the minimum possible speed of the motor. Make sure that the speed does not fall below 50 min^{-1}.

With reduced speed also the torque (power of the motor) and the cooling will reduce!

Torque

This is the potentiometer to set the torque when readjusting the motor. Depending on the application set the value by which the the control will readjust. If you require less readjustment, turn the potentiometer one to two turns in direction "minus". For a larger readjustment, turn the potentiometer in direction "plus". For thread cutting we recommend little torque.

Slope

This is the potentiometer to set the acceleration time of the motor at the moment when it starts turning. If you require a smoother ramp, turn the potentiometer in direction "plus". In order to achieve a steeper ramp, turn the potentiometer in direction "minus".

CL

This is the potentiometer to set the current limiting as an overload protection for the motor. The current limiting is set by the manufacturer and must not be changed in any way.

WARNING!

The control is charged with high constant-voltage currencies. Please make imperatively sure that the housing will only be opened up in the idle status. Furthermore, make sure that any settings are only being performed when the housing is closed.

General

The spindle trimmers of the potentiometer are designed with 12 gears. This means in order to achieve the corresponding minimum or maximum value, the spindle trimmer needs to be turned 12 times. Due to this high number of gears of the spindle trimmer it is possible to perform a very sensitive setting over the corresponding potentiometer.

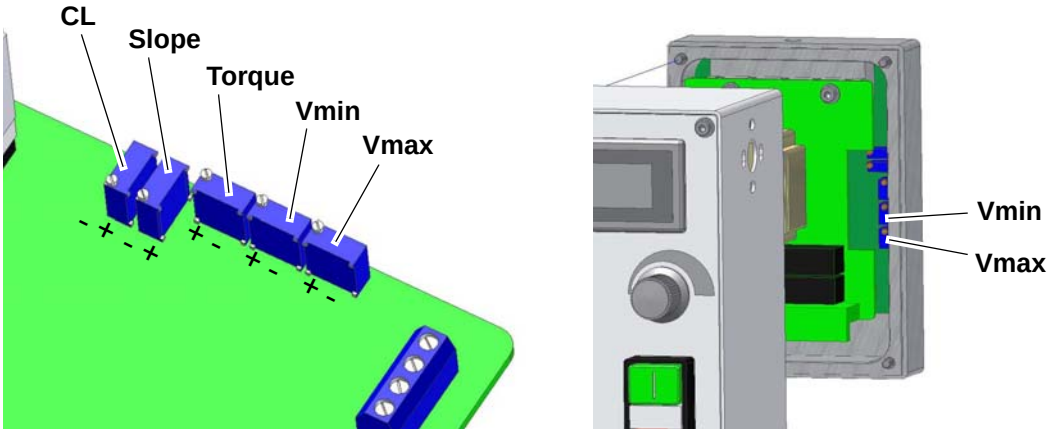
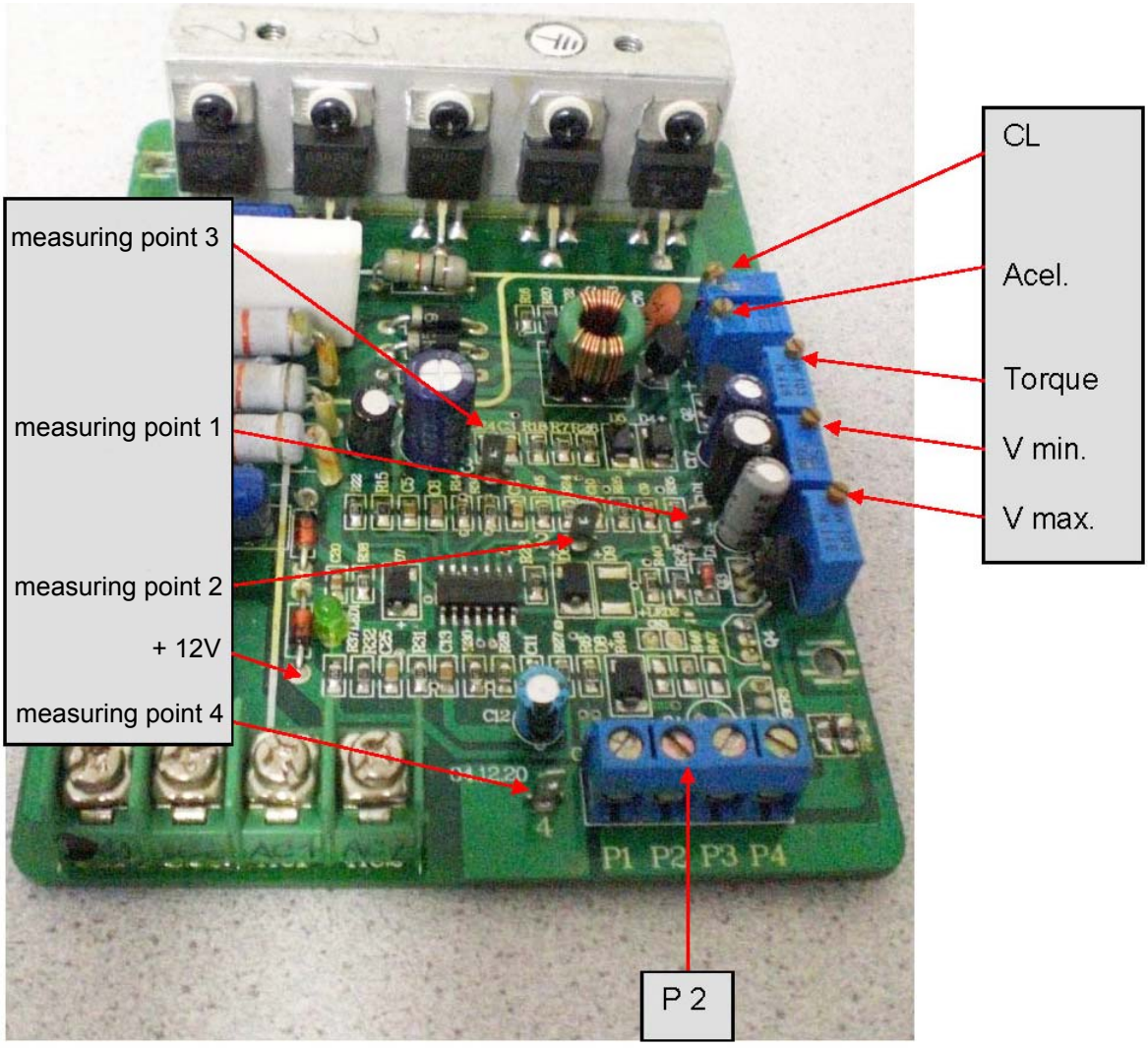


Fig. 5-6: Control board

Potentiometer	Measuring points	Setting value	
CL	4 -> 2	-> 1,40 K Ohm	
Torque	4 -> 3	-> 1,94 K Ohm	
Acel	1 -> P2	-> 40,0 K Ohm	Measuring range min. 1 M Ohm
V max.	+12V -> P4	-> 0,555 K Ohm	Only approximate value, perform setting via speed control.
V min.	4 -> P3	-> 0,757 K Ohm	



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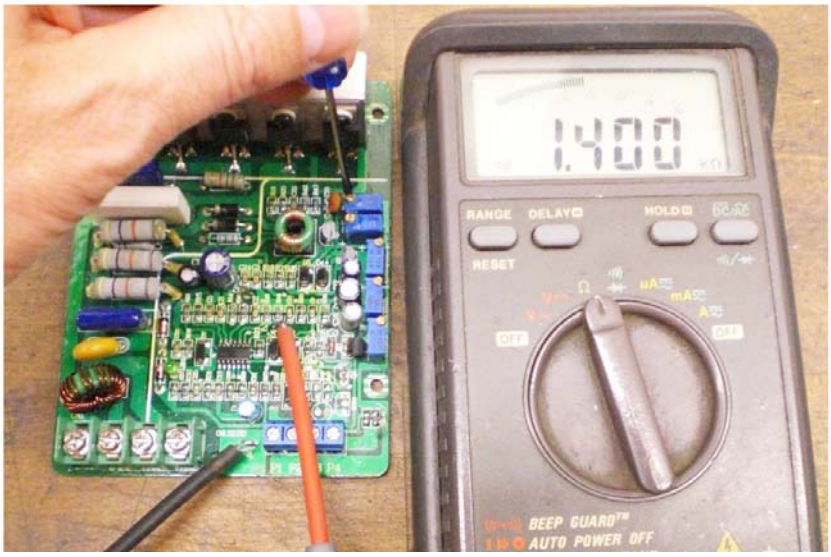
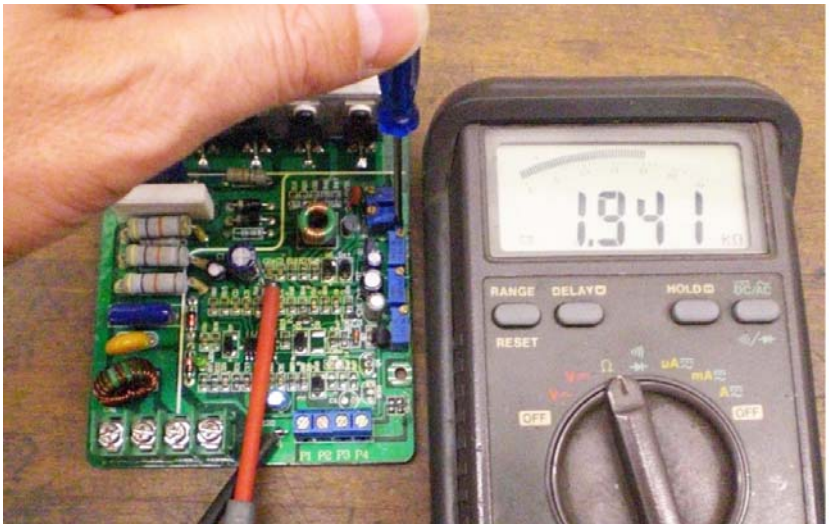
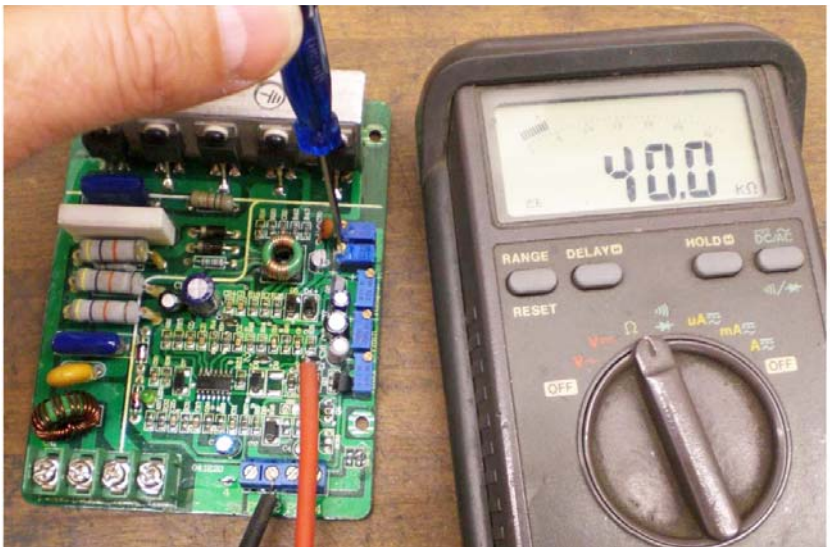
Setting CL



Setting Torque



Setting Acel



6 Ersatzteile - Spare parts

6.1 Ersatzteilbestellung - *Ordering spare parts*

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

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

Die Artikelnummer befindet sich in der Ersatzteilliste. *The article no. is located in the spare parts list.*

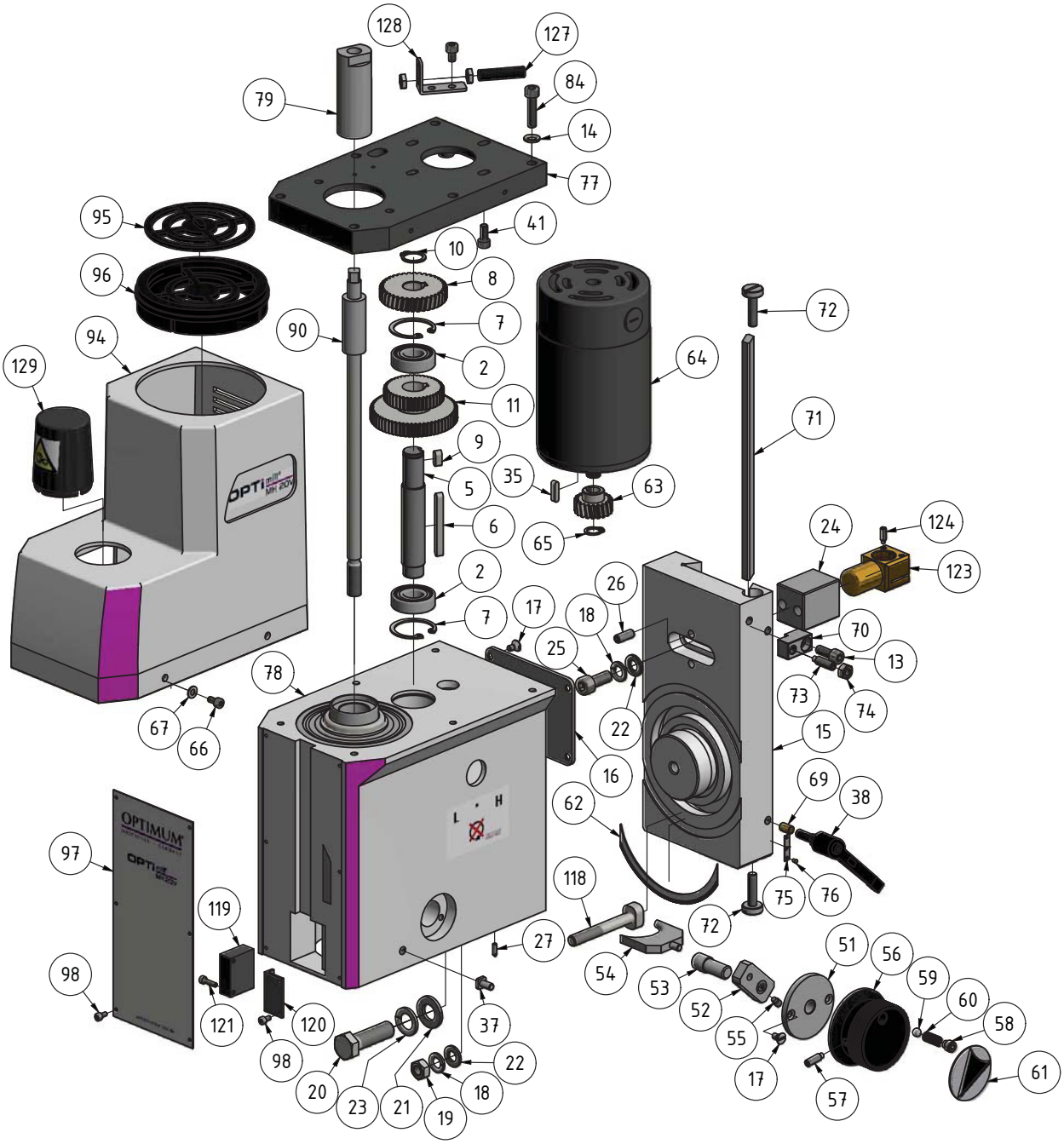
Die Seriennummer befindet sich am Typenschild. *The serial no. is on the type plate.*

6.2 Elektrische Ersatzteile - Electrical spare parts

6.3 Schaltplan - Wiring diagram

Der aktuelle Schaltplan mit Ersatzteilliste befindet sich im Schaltschrank der Maschine oder befindet sich als gedruckte Kopie in dieser Anleitung.
The current circuit diagram and spare parts list is located in the control cabinet of the machine or is located as printed paper in this manual.

6.4 Fräskopf - Milling head



6-1: Fräskopf - Milling head

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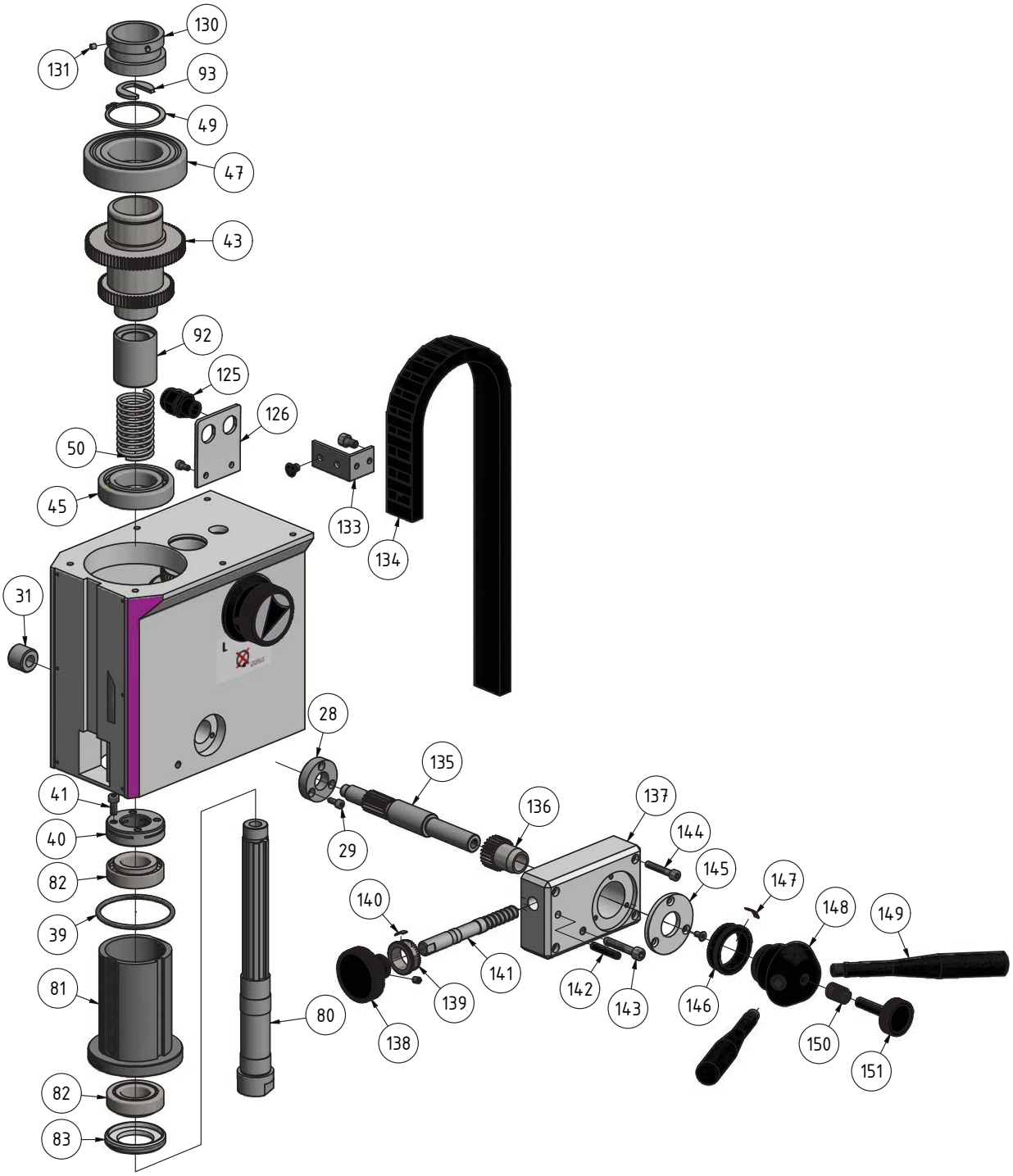
6.5 Fräskopf - Milling head



6-2: Fräskopf - Milling head

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Ersatzteileliste Fräskopf - Spare parts list mill head					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
2	Kugellager	Taper roller bearing	2	6002-2Z	0406002ZZ
5	Welle	Shaft	1		03338115105
6	Passfeder	Fitting key	1	DIN 6885 - A 5 x 5 x 50	042P5550
7	Sicherungsring	Retaining ring	2	DIN 472 - 32 x 1,2	042SR32I
8	Zahnrad	Gear	1		03338115108
9	Passfeder	Fitting key	1	DIN 6885 - A 5 x 5 x 12	042P5512
10	Sicherungsring	Retaining ring	1	DIN 471 - 15x1	042SR15I
11	Zahnrad	Gear	1		03338115111
13	Innensechskantschraube	Socket head screw	1	ISO 4762 - M6 x 16	
14	Federring	Spring ring	6	DIN 128 - A6	
15	Führung	Guide	1		03338115115
16	Abdeckung	Cover	1		03338115116
17	Senkkopfschraube	Screw	6	ISO 2009 - M4 x 8	
18	Federring	Spring ring	3	DIN 128 - A8	
19	Sechskantmutter	Hexagon nut	1	ISO 4032 - M8	
20	Sechskantschraube	Screw	1	ISO 4017 - M12 x 40	
21	Scheibe	Washer	1	DIN 125 - A 13	
22	Scheibe	Washer	3	DIN 125 - A 8,4	
23	Federring	Spring ring	1	DIN 128 - A12	
24	Block	Block	1		03338115124
25	Innensechskantschraube	Socket head screw	2	ISO 4762 - M8 x 20	
26	Gewindestift	Grub screw	2	ISO 4026 - M6 x 16	
27	Zeiger	Indicator	1		
28	Flansch	Flange	1		03338115128
29	Innensechskantschraube	Socket head screw	3	ISO 4762 - M4 x 10	
30	Welle	Shaft	1		03338115130
31	Buchse	Bushing	1		03338115131
32	Skalenring	Scale ring	1		03338115132
33	Nabe	Collet	1		03338115133
34	Federblech	Spring plate	1		
35	Passfeder	Fitting key	2	DIN 6885 - A 4 x 4 x 16	042P4416
36	Gewindestift	Grub screw	1	ISO 4028 - M5 x 10	
37	Führungsstift	Guide pin	1		
38	Spannhebel	Clamping lever	2		03338115138
39	O-Ring	O-Ring	1	DIN 3771 - 58 x 3,55	03402100195
40	Klemmmutter	Clamping nut	1		03338115140
41	Innensechskantschraube	Socket head screw	6	ISO 4762 - M5 x 12	
43	Zahnrad	Gear	1		03338115143
45	Kugellager	Ball bearing	1	7007	04032005
47	Kugellager	Ball bearing	1	6209-2Z	0406209R
49	Sicherungsring	Retaining ring	1	DIN 471 - 45x1,75	042SR45W
50	Feder	Spring	1		03338115150

51	Flansch	Flange	1		03338115151
52	Platte	Plate	1		03338115152
53	Welle	Shaft	1		03338115153
54	Schaltgabel	Switch fork	1		03338115154
55	Gewindestift	Grub screw	1	ISO 4028 - M5 x 8	
56	Wahlschalter	Mode switch	1		03338115156
57	Gewindestift	Grub screw	1	ISO 4028 - M5 x 16	
58	Gewindestift	Grub screw	1	ISO 4028 - M8 x 8	
59	Stahlkugel	Steel ball	1		
60	Feder	Spring	1		
61	Platte	Plate	1		
62	Skala	Scale	1		03338115162
63	Zahnrad	Gear	1		03338115163
64	Motor	Motor	1		03338122221
65	Sicherungsring	Retaining ring	1	DIN 471 - 10x1	042SR10W
66	Innensechskantschraube	Socket head screw	7	ISO 4762 - M4 x 8	
67	Scheibe	Washer	4	DIN 125 - A 4,3	
68	Innensechskantschraube	Socket head screw	8	ISO 4762 - M3 x 8	
69	Druckstück	Pressure piece	2		
70	Block	Block	1		03338115170
71	Keilleiste	Gib	1		03338115171
72	Klemmschraube	Clamping screw	2		03338115172
73	Gewindestift	Grub screw	2	ISO 4028 - M6 x 20	
74	Sechskantmutter	Hexagon nut	1	ISO 4032 - M6	
75	Platte	Plate	1		03338115175
76	Niet	Rivet	2		
77	Motorplatte	Motor plate	1		03338115177
78	Gehäuse	Housing	1		03338115178
79	Hülse	Sleeve	1		03338115179
80	Fräsown spindel	Mill spindle	1	MT2	03338115180
81	Pinole	Sleeve	1		03338115181
82	Kegelrollenlager	Taper roller bearing	2	32005	04032005
83	Klemmmutter	Clamping nut	1		03338115183
84	Innensechskantschraube	Socket head screw	6	ISO 4762 - M6 x 25	
90	Anzugstange	Drawbar	1		03338115190
91	Handhebel	Handle lever	1		03338115191
92	Hülse	Sleeve	1		03338115192
93	Klemmring	Clamping ring	1		
94	Abdeckung	Cover	1		03338115194
95	Schutzgitter	Guard grid	1		03338115195
96	Schutzgitter	Guard grid	1		03338115196
97	Platte	Plate	1		03338115L01
98	Innensechskantschraube	Socket head screw	8	ISO 4762 - M3 x 6	
118	Innensechskantschraube	Socket head screw	1	ISO 4762 - M8 x 60	
119	Verfahrsensor	Travel sensor	1		033381151119
120	Sensorhalter	Sensor holder	1		03338115220

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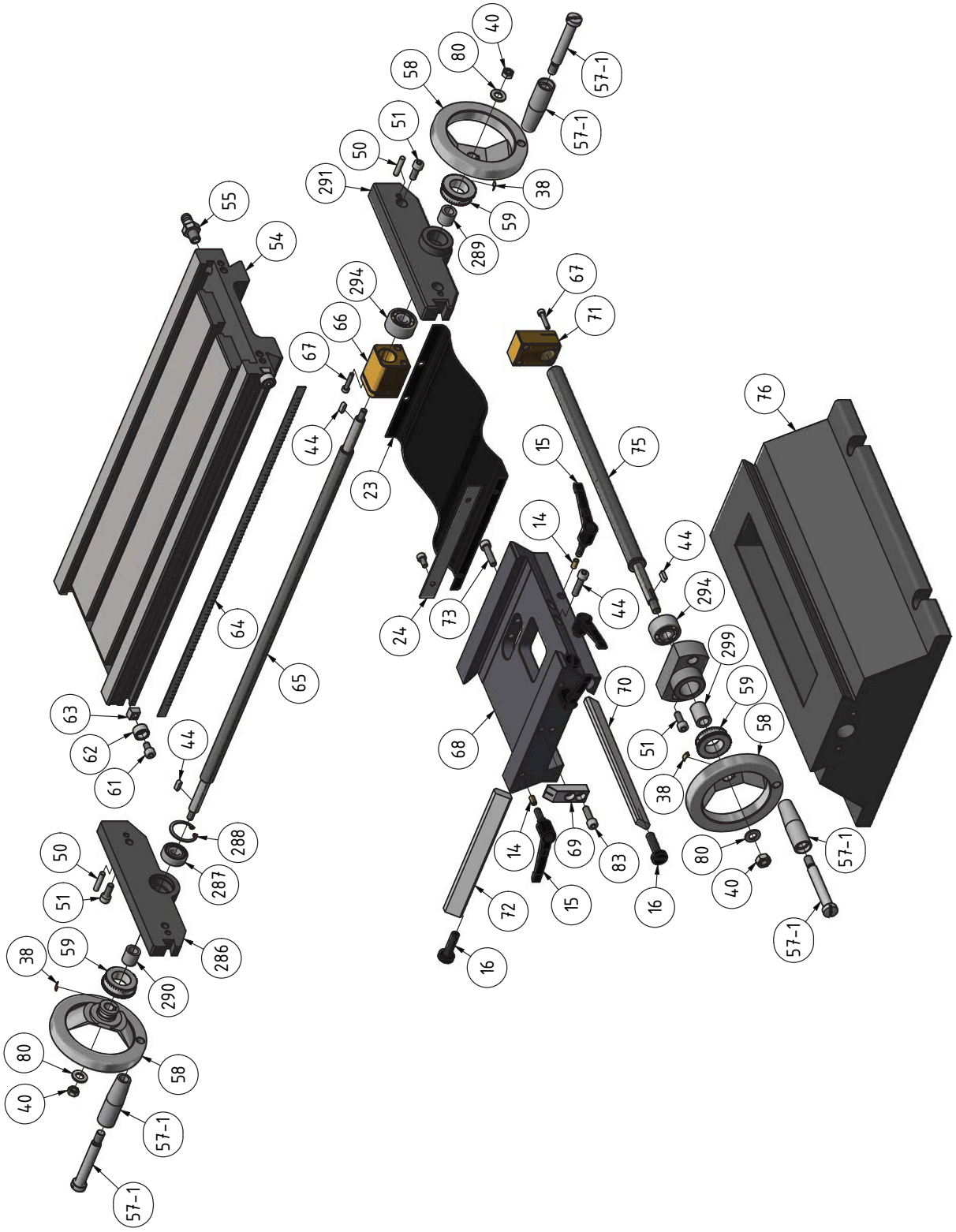
121	Innensechskantschraube	Socket head screw	2	ISO 4762 - M3 x 12	
123	Spindelmutter	Spindle nut	1		033381151123
124	Gewindestift	Grub screw	2	ISO 4028 - M4 x 12	
125	Zugentlastung	Strain relief	2		
126	Platte	Plate	1		033381151126
127	Drehzahlsensor	Rotary speed sensor	1		033381151127
128	Halter	Holder	1		033381151128
129	Abdeckung	Cover	1		033381151129
130	Buchse Signalgeber	Bushing pulse transmittler	1		033381151130
131	Magnet	Magnet	4		033381151131
132	Abdeckung	Cover	1		
133	Halter	Holder	1		033381151133
134	Energiekette	Energie chain	1		033381151134
135	Welle	Shaft	1		033381151135
136	Zahnrad	Gear	1		033381151136
137	Gehäuse	Housing	1		033381151137
138	Einstellknopf	Adjust knob	1		033381151138
139	Skalenring	Scale ring	1		033381151139
140	Federblech	Spring plate	1		033381151140
141	Welle	Shaft	1		033381151141
142	Zylinderstift	Cylindrical pin	1	6x30	
143	Klemmschraube	Clamping screw	1	M6x35	
144	Schraube	Screw	4	M5x35	
145	Flansch	Flange	1		033381151145
146	Skalenring	Scale ring	1		033381151146
147	Federblech	Spring plate	1		033381151147
148	Nabe	Collet	1		033381151148
149	Vorschubhebel	Feed lever	2		033381151149
150	Feder	Spring	1		033381151150
151	Klemmschraube	Clamping screw	1		03338115 151

6.6 Kreuztisch - Cross table



6-3: Kreuztisch - Cross table

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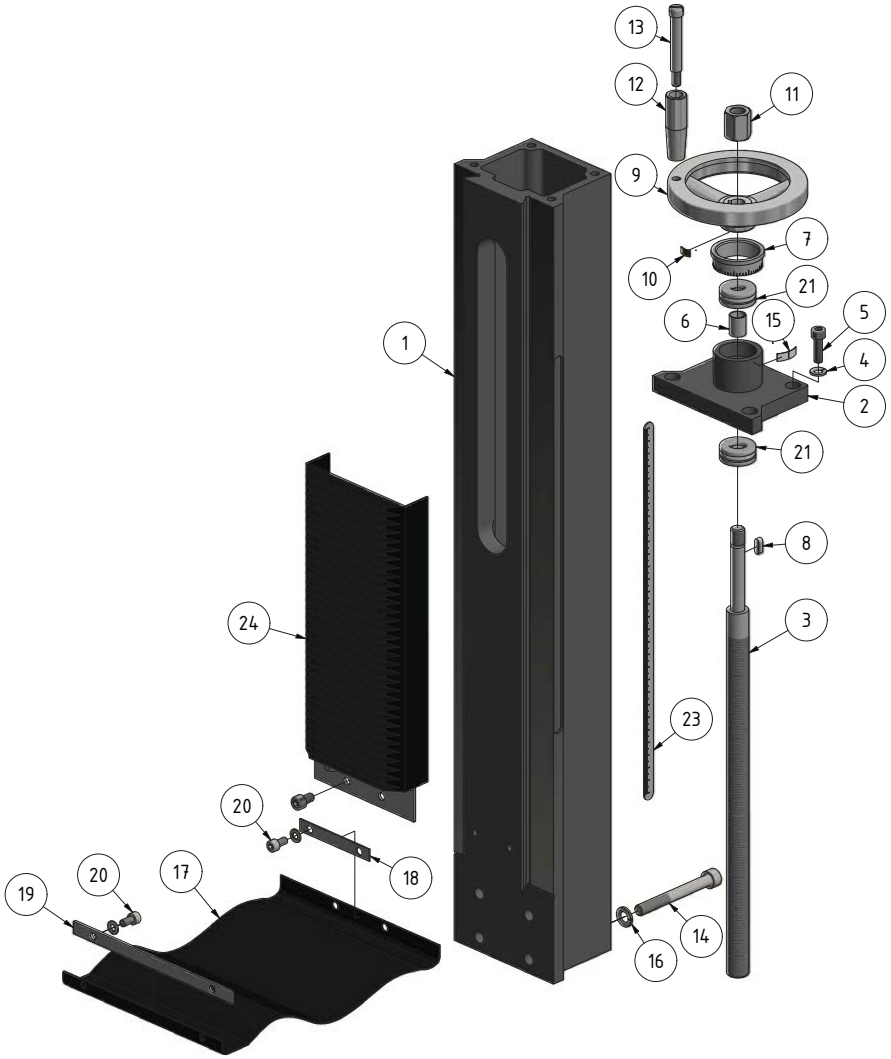
Ersatzteileliste Kreuztisch - Spare parts list cross table					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
14	Messingstift	Brass pin	6		0333812014
15	Klemmhebel	Adjust locating handle	4		0333812015
16	Schraube Keilleiste	Gib screw	6		0333812016
38	Federstück	Spring piece	4		0333812038
23	Gummi - Späneabdeckung	Rubber splash guard	1		0333812023
24	Leiste	Plate	1		0333812024
40	Sechskantmutter	Hexagon nut	4	M8	
44	Paßfeder	Key	5	A 4 x 4 x 12	042P4412
50	Zylinderstift	Cylindrical pin	4	A 5 x 24	
51	Innensechskantschraube	Hexagon head cap screw	11	M6 x 16	
54	Frästisch	Cross table	1	MH20V	0333812054
				MH20VL / MH20VLD	03338111054
55	Eiinschraubverschraubung Schlauchanschluss	Screwing in screw connection hose connector	1	M10 x 1	
57	Griff komplett	Handle complete	3		0333812057-1
58	Handrad Kreuztisch	Handwheel cross table	3		0333812058
59	Skalenring	Scale ring	3		0333812059
61	Innensechskantschraube	Hexagon head cap screw	2	M6 x 10	
62	Hülse Endlagenanschlag X-Achse	Sleeve End position stop X-axis	2		0333812062
63	Rechteckmutter (Nutenstein)	Rectangular nut (slot nut)	2		0333812063
64	Tischskala X-Achse	Table scale X axis	1	MH20V	0333812064
	Tischskala X-Achse	Table scale X axis		MH20VL / MH20VLD	03338111064
65	Spindel X-Achse BF20	Table lead screw X axis	1	MH20V	0333812065
	Spindel X-Achse	Table lead screw X axis		MH20VL / MH20VLD	03338111065
66	Spindelmutter X-Achse	Table lead screw nut x axis	1		0333812066
67	Innensechskantschraube	Hexagon head cap screw	4	M4 x 20	
68	Kreuztischführung	Cross table guide	1		0333812068
69	Anschlag Endlage X-Achse	Limit plate x axis	1		0333812069
70	Keilleiste Y-Achse	Taper gib y axis	1		0333812070
71	Spindelmutter Y-Achse	Lead screw nut y axis	1		0333812071
72	Keilleiste X-Achse	Taper gib x axis	1		0333812072
73	Innensechskantschraube	Hexagon head cap screw	2	GB 70-85	
75	Spindel Y-Achse	Lead screw y axis	1		0333812075
76	Maschinenfuss	Base	1		0333812076
80	Scheibe	Washer	6	8	
83	Innensechskantschraube	Hexagon head cap screw	6	M6 x 12	
287	Rillenkugellager, einreihig	Grooved ball bearing, single-row	1	6000	0406000R
288	Sicherungsring	Snap ring	1	28 x 1,2	042SR28I
290	Distanzhülse	Distance case	1		03338120290
294	Schrägkugellager, zweireihig	Angular contact ball bearings, double row	2	3200	0403200
299	Distanzhülse	Distance case	1		03338120299

6.7 Säule - Column

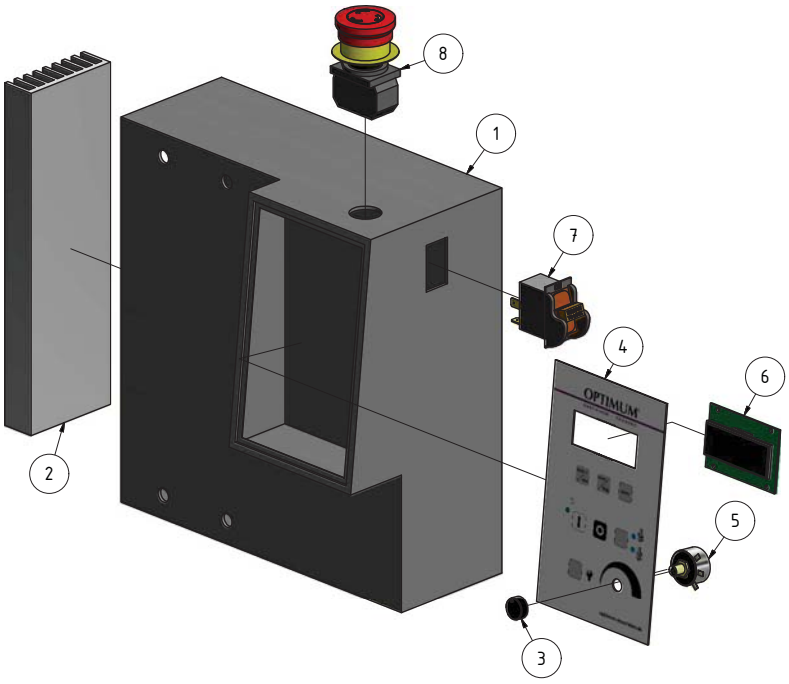


6-4: Säule - Column

Ersatzteileliste Säule - Spare parts list column					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Säule	Column	1		03338115301
2	Lagerbock	Bearing block	1		03338115302
3	Spindel	Spindle	1		03338115303
4	Federring	Spring ring	4	DIN 128 - A6	
5	Innensechskantschraube	Socket head screw	4	ISO 4762 - M6 x 20	
6	Buchse	Bushing	1		03338115306
7	Skalenring	Scale ring	1		03338115307
8	Passfeder	Fitting key	1	DIN 6885 - A 4x4x12	042P4412
9	Handrad	Handle	1		03338115309
10	Federblech	Spring plate	1		
11	Klemmmutter	Clamping nut	1		03338115311
12	Hülse	Sleeve	1		03338115312

13	Schraube	Screw	1		03338115313
14	Innensechskantschraube	Socket head screw	4	ISO 4762 - M8 x 70	
15	Skala	Scale	1		03338115315
16	Federring	Spring ring	4	DIN 128 - A8	
17	Gummiabdeckung	Rubber cover	1		03338115317
18	Platte	Plate	1		03338115318
19	Platte	Plate	1		03338115319
20	Innensechskantschraube	Socket head screw	4	ISO 4762 - M5 x 10	
21	Axiallager	Thrust bearing	2	51200	04051200
23	Skala	Scale	1		03338115323
24	Faltenbalg	Gaiter	1		03338115324

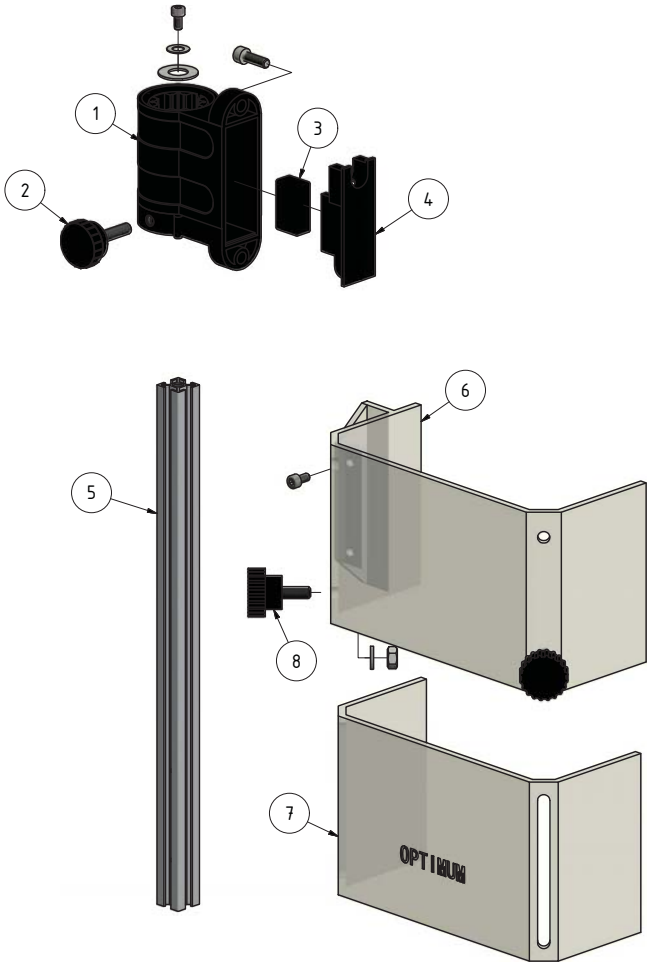
6.8 Schaltbox - Switch box



6-5: Schaltbox - Switch box

Ersatzteileliste Schaltbox - Spare parts list switch box					
Pos.	**Bezeichnung**	**Designation**	**Menge**	**Grösse**	**Artikelnummer**
			Qty.	Size	Item no.
1	Gehäuse	Housing	1		03338115401
2	Kühlplatte	Coolant plate	1		03338115402
3	Einstellknopf	Ajust knob	1		03338115403
4	Steuerung	Control	1		03338115404
5	Potentiometer	Potentiometer	1		0313235
6	Drehzahlanzeige/Tiefenanzeige	Rotation speed display/depth display	1		03338115406
7	Hauptschalter	Main switch	1		03338115407
8	Not-Halt-Schlagschalter	Emergency stop button	1		03338115408

6.9 Fräsfutterschutz - Mill chuck safety



6-6: Fräsfutterschutz - Mill chuck safety

Ersatzteileliste Fräsfutterschutz - Spare parts list milling chuck protection					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Führung	Guide	1		
2	Klemmschraube	Clamping screw	1		
3	Mikroschalter	Micro switch	1		
4	Platte	Plate	1		
5	Alustange	Aluminium rod	1		
6	Futterschutz	Chuck cover	1		
7	Futterschutz	Chuck cover	1		
8	Klemmschraube	Clamping screw	2		

6.10 Maschinenschilder - Machine labels

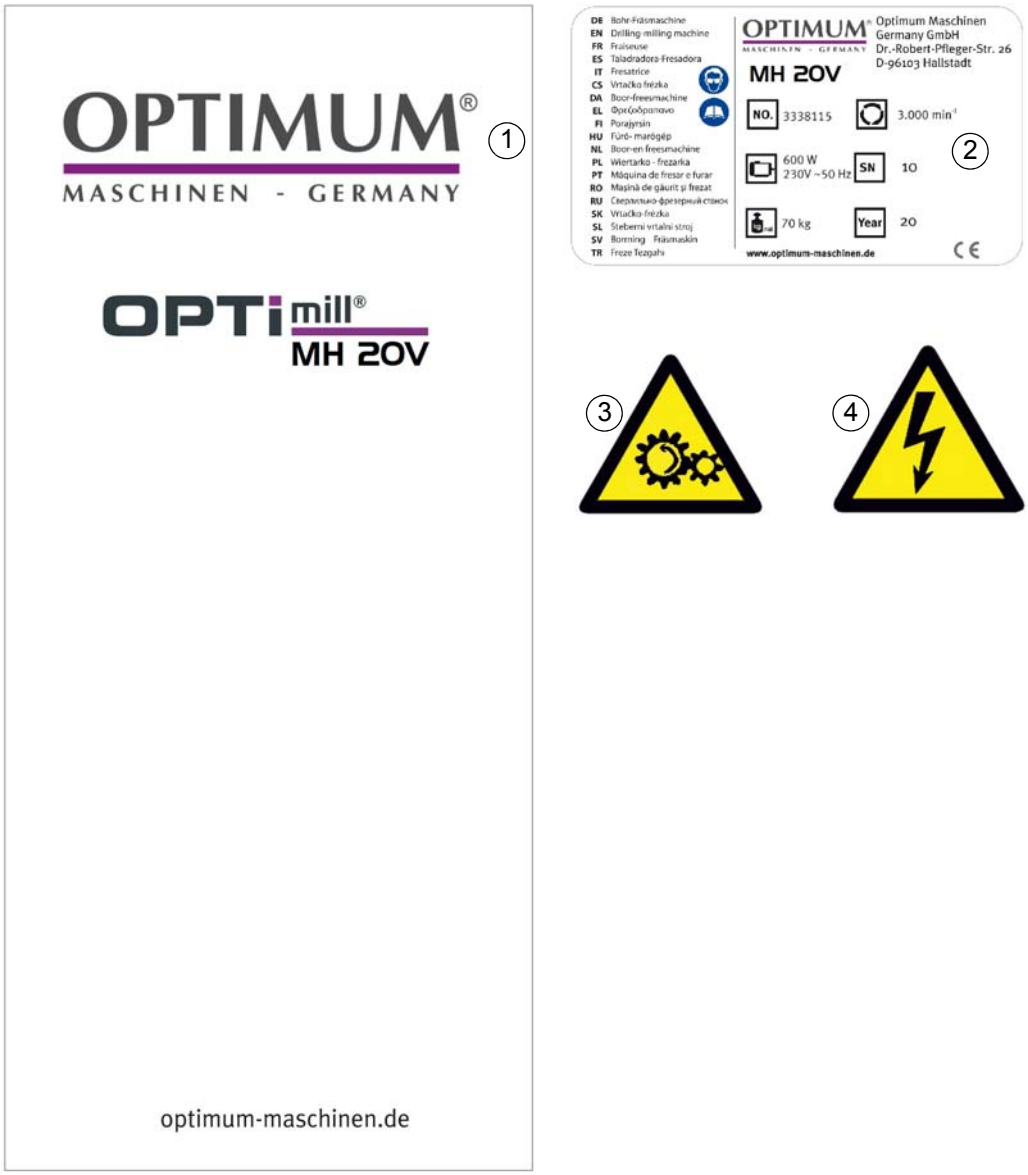
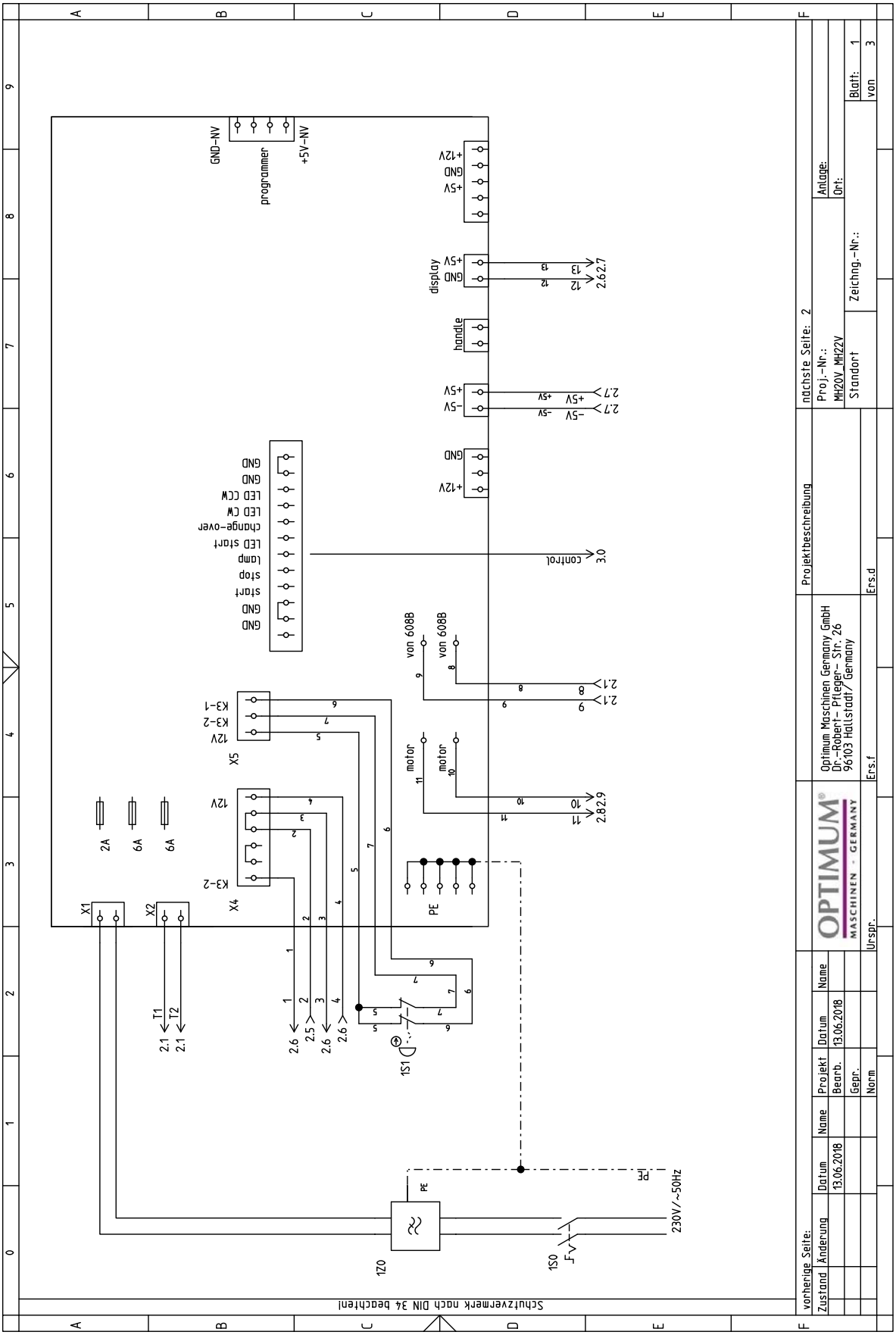


Abb. 6-7: Maschinenschilder - Machine labels

Ersatzteilliste Maschinenschilder - Spare part list machine labels					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Article no.
1	Frontschild	Front lable	1		03338115L01
2	Maschinenlabel	Machine lable	1		03338115L02
3	Sicherheitsschild	Safety lable	1		03338115L03
4	Sicherheitsschild	Safety lable	1		03338115L04

6.11 Schaltplan - Wiring diagram



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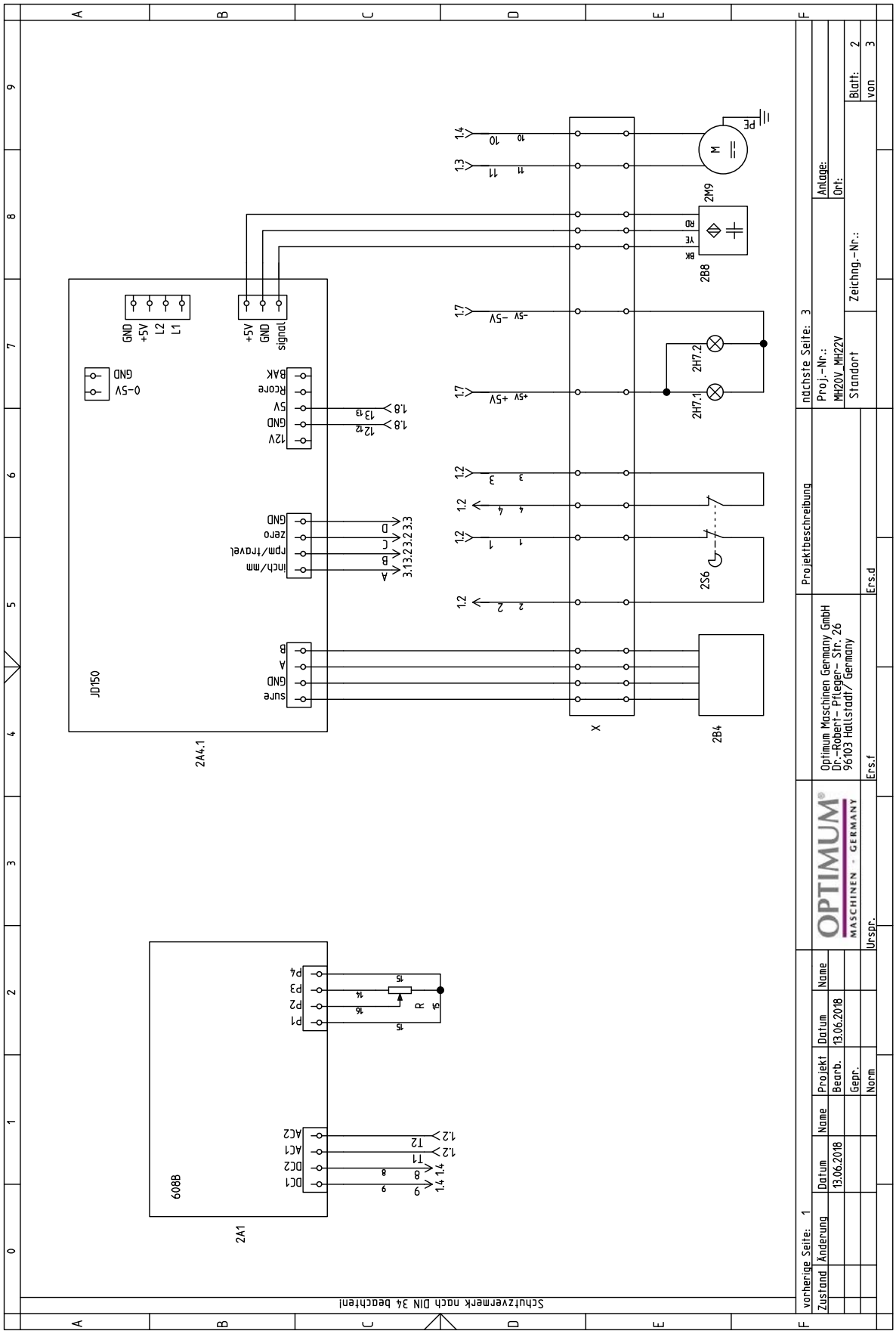
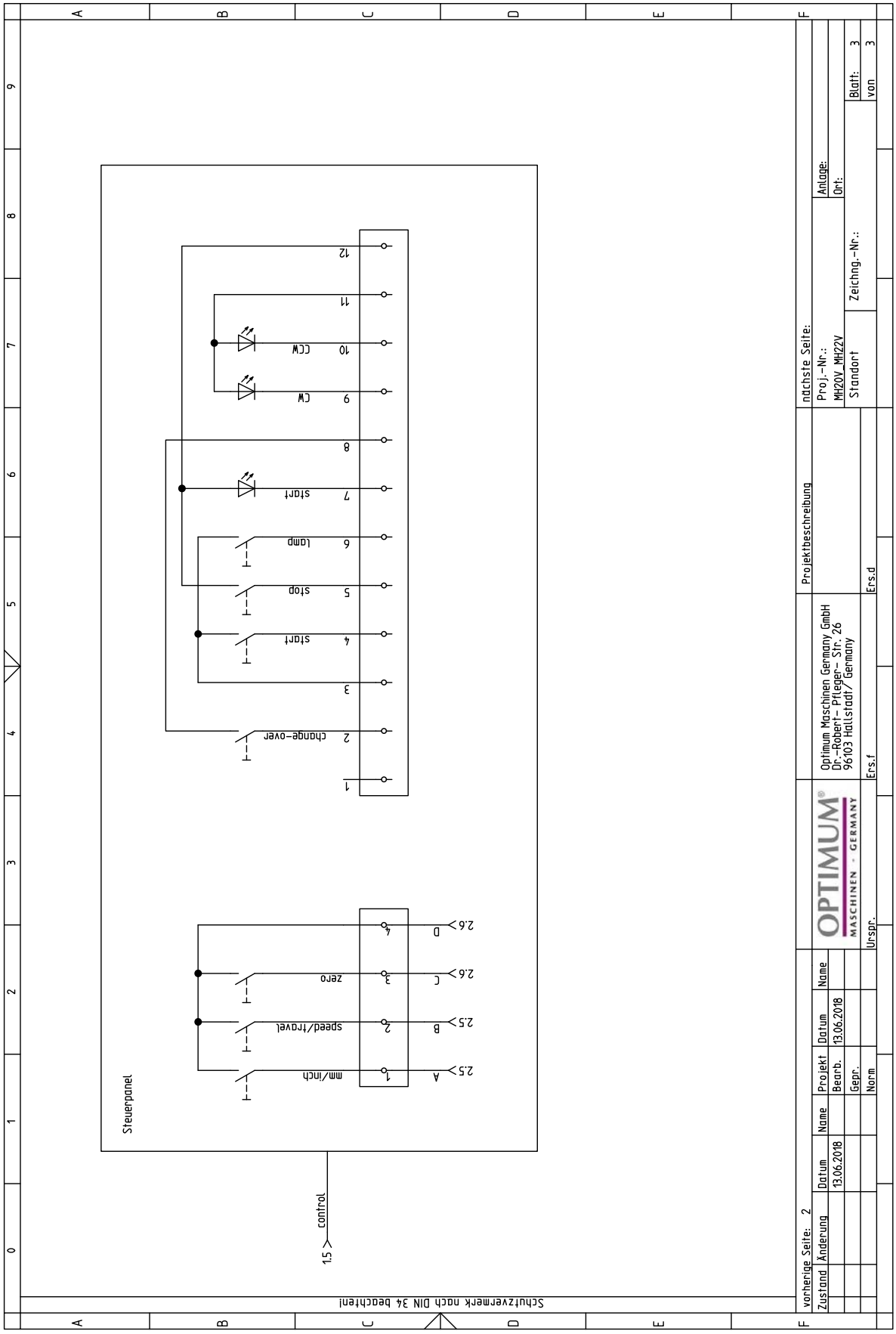


MH20V_parts.fm



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Ersatzteileliste Elektrik - Spare parts list electrical components					
Pos.	**Bezeichnung**	**Designation**	**Menge**	**Grösse**	**Artikelnummer**
			Qty.	**Size**	**Item no.**
1Z0	Netzfilter	Line filter	1		
1S0	Hauptschalter	Main switch	1		
1S1	Not-Halt Schalter	Emergency-stop button	1		
2S6	Sicherheitsschalter Fräsfutterschutz	Safety switch for chuck protection	1		
2A1	Steuerkarte 608B	Control board 608B	1		
1M3	Antriebsmotor	Drive motor	1		03338122221
2H7	Maschinenlampe komplett	Machine lamp complete	1		033381152H7
2H7.1/2H7.2	Maschinenlampe	Machine lamp	2	Osram 12V - 10W, G4	
2R3	Potentiometer	Potentiometer	1		
2B4	Verfahrsensor	Travel sensor	1		
2A4.1	Drehzahlanzeige/Tiefenanzeige	Rotation speed display/depth display	1		
2B8	Drehzahlsensor	Speed sensor	1		
	Sicherung	Fuse	2	6A	
	Sicherung	Fuse	1	2A	

7 Malfunctions

7.1 Milling machine malfunctions

Malfunction	Cause/ possible effects	Solution
Tool "burnt".	• Incorrect speed. • Chips are not coming out of the drilled hole. • Blunt tool. • Operating without cooling agent.	• Choose a different speed, excessive feed. • Withdraw the tool more frequently. • Sharpen or replace tool. • Use coolant.
Taper cannot be inserted in quill.	• Remove any dirt, grease or oil from the internal conical surface of the spindle sleeve or the taper.	• Clean surfaces well. Keep surfaces free from grease. ☞ "Spindle seat“ on page 18
Motor does not start.	• Defective fuse. • Circuit breaker	• Have it checked by qualified personnel.
Rattle the spindle if the work-piece surface is rough.	• Upcut mill machining not possible under the current operating conditions. • Clamping lever of the movement axes not tightened. • Tool is blunt. • The workpiece is not fastened. • Excessive slack in bearing. • Spindle moves up and down.	• Perform conventional milling. • Tighten the clamping lever. • Sharpen or renew the tool. • Clamp the workpiece firmly. • Readjust the bearing slack or replace the bearing. • Readjust the bearing slack or replace the bearing.
The quill lever cannot be moved.	• Fine feed of the quill is activated.	• Deactivate fine feed. ☞ "Manual spindle sleeve feed with the fine feed“ on page 34

8 Appendix

8.1 Copyright

8.2 Terminology/Glossary

Term	Explanation
Milling table	Supporting surface, clamping surface for the workpiece with traverse in X and Y directions
Taper mandrel	Tool housing taper, drill taper, drill chuck taper.
Workpiece	piece to be milled, drilled or machined.
Tie rod	Threaded rod to fix the taper mandrel in the quill.
Tool - quick clamping system	System with collet instead of a drawbar.
Drill chuck	Drill bit adapter
Collet	Holder for end mill
Drill-mill head	Upper part of the milling machine
Quill	Hollow shaft in which the milling spindle turns.
Milling spindle	Shaft activated by the motor
Drilling table	Supporting surface, clamping surface
Taper mandrel	Cone of the drill or of the drill chuck
Quill lever	Manual operation for the drill feed
Quick action - drill chuck	Drill bit adapter can be fixed by hand.
Workpiece	Part to be drilled, part to be machined.
Tool	Milling cutter, drill bit, etc.
Emergency stop	Stops the operation of a machine.
Emergency switch-off	Interrupts the power supply to the machine.

8.3 Change information operating manual

Chapter	Short summary	new version number
2 , 4 , 6	Quick tool system BT20 replaced with drawbar	1.0.1
1, 2 , DRO5 , parts	Enhanced by MH20VL and MH20VLD (DRO5)	2.0
4.10.1	Updating of the illustrations	2.0.1
0, 1 , 4 , 7 , parts	Milling head with fine feed for spindle sleeve + new item no. on frontpage	2.5.0
3 ; 3.11	Interdepartmental transport ; Holes for DRO on Panel	2.5.1

8.4 Liability claims/warranty

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

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. Title to replaced products or components is transferred to OPTIMUM Maschinen Germany GmbH.

The automatically generated original proof of purchase which shows the date of purchase, the type of machine and the serial number, if applicable, is the precondition in order to assert liability or warranty claims. If the original proof of purchase is not presented, we are not able to perform any services.

Defects resulting from the following circumstances are excluded from liability and warranty claims:

- Use of the product beyond the technological capability and intended use, in particular due to overloading of the machine.
- Damage caused personally through incorrect use or failure to observe our operating instructions,
- negligent or incorrect handling and use of improper operating materials.
- Unauthorized modifications and repairs.
- Insufficient installation and safeguarding of the machine.
- Disregarding the installation requirements and conditions of use.
- Atmospheric discharges, overvoltage and lightning strokes as well as chemical influences.

Neither are the following items covered by liability or warranty claims:

- Wearing parts and components which are subject to normal and intended wear, such as V-belts, ball bearings, lighting, filters, seals, etc.
- Non reproducible software errors

Any services, which OPTIMUM GmbH or one of its agents performs in order to fulfil any additional warranty are neither an acceptance of the defects nor an acceptance of its obligation to compensate. These services neither delay nor interrupt the warranty period.

The court of jurisdiction for legal disputes between businessmen is Bamberg.

If any of the aforementioned agreements is totally or partially inoperative and/or invalid, a provision which nearest approaches the intent of the guarantor and remains within the framework of the limits of liability and warranty which are specified by this contract is deemed agreed.

8.5 Advice for disposal / Options of reuse:

Please dispose of your equipment in an environmentally friendly manner, by not placing waste in the environment but in a professional manner.

Please do not simply throw away the packaging and later the disused machine, but dispose of both in accordance with the guidelines laid down by your city council/local authority or by an authorised disposal company.

8.6 Storage

ATTENTION!

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

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

Follow the instructions and information on the transport box:

- Fragile goods
  (Goods require careful handling)

- Protect against moisture and humid environment

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

- Maximum stacking height

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

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

8.7 Dismantling, disassembling, packing and loading

INFORMATION

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

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

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

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

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

Please make sure that the electrical components are disposed of professionally and according to the legal regulations. Please only throw depleted batteries in the collection boxes in shops or at municipal waste management companies.

8.7.1 Decommissioning

CAUTION!

Disused equipment must be decommissioned in a professional manner in order to avoid later misuse and danger the environment or persons.

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

8.7.2 Dismantling

➜ Pull the power cord or unplug the connection cable and disconnect the connection cable.

8.7.3 Disassembly

➜ Remove the drive motor.

8.7.4 Packing and loading

➜ Place the machine on a pallet for removal.
☞ "Lifting the machine“ on page 25

8.8 Disposal of new device packaging

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

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

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

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

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

8.9 Disposal of lubricants and cooling lubricants

ATTENTION!

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

INFORMATION

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

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

8.10 Disposal via municipal collection facilities

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

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

8.11 Product follow-up

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

We would be grateful if you could inform us of the following:

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

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

EC Declaration of Conformity

according to Machinery directive 2006/42/EC, Annex II 1.A

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

hereby declares that the following product

Product designation:	Hand-controlled milling machine
Type designation:	MH20V | MH20VL | MH20VLD

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

Description:

Hand-controlled milling machine

The following additional EU Directives have been applied:

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

The following harmonized standards were applied:

EN 13128:2001+A2:2009/AC:2010 Safety of machine tools - Milling machines (including boring machines)

EN 60204-1:2014 - Safety of machinery - Electrical equipment of machines - Part 1: General requirements

EN 13849-1:2015 - Safety of machinery - Safety related parts of controls - Part 1: General design principles

EN 13849-2:2012 - Safety of machinery - Safety related parts of controls - Part 2: Validation

EN ISO 12100:2013 - Safety of machinery - General principles for design - Risk assessment and risk reduction

EN 50370-2 - Electromagnetic compatibility (EMC) - Product family standard for machine tools - Part 2: Immunity

EN 55011:2014-11 - Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement - class B

EN 61000-3-2:2015-03 - Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A per phase)

EN 61000-3-3:2014-03 - Electromagnetic compatibility (EMC) - Part 3-3: Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current <= 16 A per phase and not subject to conditional connection

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

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

Kilian Stürmer (CEO, General Manager)
Hallstadt, 2019-12-11

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  - OPTImill MH 20 Ersatzteile
  - OPTImill MH 20 Zubehör

- CNC OPTImill MH 20 V / MH 20 VL / MH 20 VLD
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