



Operating Manual

Version 1.1.0

Milling machine

☐ **OPTi**mill[®]
MH 35G

Part no. 3338165

☐ **OPTi**mill[®]
MH 35V

Part no. 3338170





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Preface

Dear customer,

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

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

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

Keep these operating instructions in a safe place nearby the machine.

Information

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

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

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

The illustration and information included in the present manual can possibly deviate from the current state of construction of your machine. Being the manufacturer we are continuously seeking for improvements and renewal of the products. Therefore, changes might be performed without prior notice. The illustrations of the machine may be different from the illustrations in these instructions with regard to a few details. However, this does not have any influence on the operability of the machine.

Therefore, no claims may be derived from the indications and descriptions. Changes and errors are reserved !

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

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

Optimum Maschinen Germany GmbH

Dr.- Robert - Pfleger - Str. 26




D-96103 Hallstadt , Germany

Mail: info@optimum-maschinen.de



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 Rating plates

DE Bohr-Fräsmaschine			Optimum Maschinen Germany GmbH Dr.-Robert-Pfleger-Str. 26 D-96103 Hallstadt	
EN Drilling-milling machine				
FR Fraiseuse				
ES Taladradora-Fresadora				
IT Fresatrice				
CS Vrtáčko frézka				
DA Boor-freemaskine				
EL Φρεζοβρανο				
FI Porajärsin				
HU Fúró- marógép				
NL Boor-en freesmaskine		3338165		3100 U/min
PL Wiertarko - frezarka				
PT Máquina de fresar e furar				
RO Maşină de găurit şi frezat				
RU Сверлильно-фрезерный станок				
SK Vrtáčko-frézka				
SL Stebreni vrtalni stroj				
SV Bormning Fräsmaskin				
TR Freze Tezgahi				
				
				www.optimum-maschinen.de

<p>DE Bohr-Fräsmaschine EN Drilling-milling machine FR Foreuse ES Taladradora-Fresadora IT Fresatrice CS Vrtácko frézka DA Boor-freesmaschine EL Φρεζοπαράνο FI Porajyrin HU Fúró-marógép NL Boor-en freesmaschine PL Wiertarko - frezarka PT Máquina de fresar e furar RO Maşină de găurit şi frezat RU Сверлильно-фрезерный станок SK Vrtácko-frézka SL Stebenilni stroj SV Bormning Fräsmaskin TR Freze Tezgahi</p>	 	<div>  </div> <h2 style="margin-top: 10px;">MH 35V</h2> <table border="1" style="width: 100%; height: 100px; margin-top: 10px;"> <tr> <td style="text-align: center; vertical-align: middle;">NO.</td> <td style="text-align: center; vertical-align: middle;">3338170</td> <td style="text-align: center; vertical-align: middle;">  3260 U/min </td> </tr> </table> <table border="1" style="width: 100%; height: 100px; margin-top: 10px;"> <tr> <td style="text-align: center; vertical-align: middle;">  1,5 kW 400 V ~50 Hz </td> <td style="text-align: center; vertical-align: middle;">SN</td> </tr> </table> <table border="1" style="width: 100%; height: 100px; margin-top: 10px;"> <tr> <td style="text-align: center; vertical-align: middle;">  316 kg </td> <td style="text-align: center; vertical-align: middle;">Year</td> </tr> </table> <p style="text-align: center; margin-top: 10px;"> www.optimum-maschinen.de </p>	NO.	3338170	 3260 U/min	 1,5 kW 400 V ~50 Hz	SN	 316 kg	Year
NO.	3338170	 3260 U/min							
 1,5 kW 400 V ~50 Hz	SN								
 316 kg	Year								



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

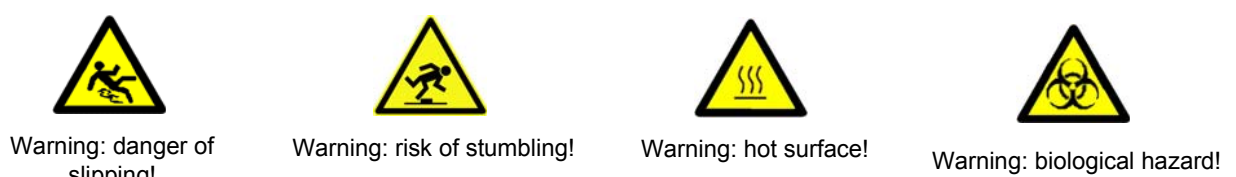
We classify the safety warnings into different categories. The table below gives an overview of the classification of symbols (ideogram) and the warning signs for each specific danger and its (possible) consequences.

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



1.2.2 Other pictograms





Warning: automatic start-up!



Warning: tilting danger!



Warning: suspended loads!



Caution: danger of explosive substances!



Switching on forbidden!



Operating with rotary current plug is not permitted!



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 when commercial milling and drilling tools are used.

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

If the milling machine is used in any way other than described above, or modified without the approval of 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 19



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 adjustment 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.

ATTENTION!

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.

Additional for MH35V

WARNING!

This machine is not intended for use in residential buildings, in which the power supply is provided via a public low voltage supply system. In these areas it may possibly be difficult to guarantee electromagnetic compatibility due to lead bound as well as emitted interferences.



INFORMATION

The milling machine MH35V with frequency converter for regulating the speed are built according to the standard EN 61800-3 class C2.

The machine MH35V is authorized for industrial and commercial use in the business and commercial areas, as well as in industrial areas. The use of the machine in public supply networks requires a different configuration and/or additional measures.

This machine MH35V installed within the domestic environment require supply authority acceptance for connection to the public low-voltage power supply network. Please contact your local supply network provider.

The machine MH35V installed within the category C3 (industrial) environment do not require connection approval.





Overview of the EMC categories:

Categorie C1

- required limit values Class B Group 1 according to EN 55011

Categorie C2

- Required limit values class A Group 1 according to EN 55011, Installation by EMC experts and warning: "This is a product of category C2 according to EN 61800-3. This product may cause radio interference in a residential area. In this case, it may be necessary for the operator to take appropriate action."

Categorie C3

- Required limit values class A group 2 according to EN 55011, whereby these limit values are below those of class A group 1, plus warning: „This type is not suitable for connection to a public low-voltage network supplying residential buildings. When connecting to a public low voltage network, radio frequency interference is expected. "

MH35V	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Categorie	C1	C2	C3	C4
Environment	Residential area Business area Industrial area		Industrial area	
Voltage / Current	< 1000 V			> 1000 V
EMC knowledge	no requirement		Installation and commissioning by an EMC expert	

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

- at 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!

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 14**

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 MH35G 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 expressly 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 company 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 in a genuine emergency. Do not use the emergency stop button to stop the machine during normal operation.





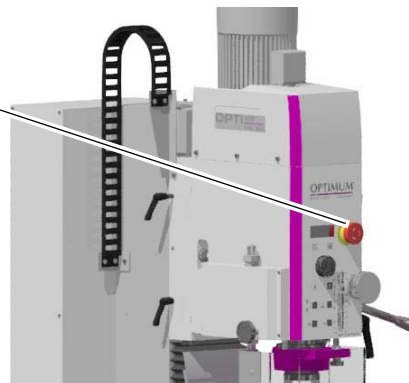
CAUTION!

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 brings the machine to a standstill.

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

Emergency stop
push button



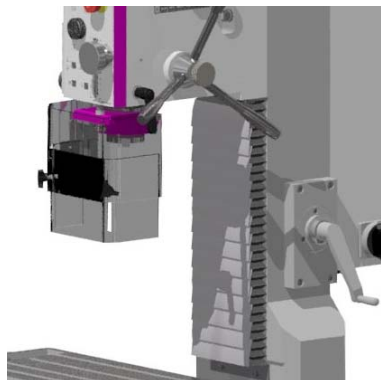
Img. 1-1: Emergency stop button

1.9.2 Lockable master switch

The lockable master switch can be secured in the "0" position by means of a padlock to guard against the milling machine being switched on accidentally or by an unauthorised person.

The power supply is cut off when the master switch is in the off position.

Except for the areas marked by the pictogram in the margin.



Main switch

Img. 1-2: 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.



1.9.3 Stored charge on MH35V

WARNING!

The frequency converter of MH35V contains capacitors that remain charged with a potentially lethal voltage after the machine has been isolated from the mains. If the frequency controller was under power, it must be disconnected from the power supply for at least 10 minutes. Before continuing to work, ensure there is no voltage. Normally, the capacitors are discharged by an internal resistor. In certain unusual error conditions, it is possible that the capacitors are not discharged or that a discharge is prevented by voltage on the adjacent motor connection terminals. If the frequency converter has a technical defect, so that nothing is shown on the display, the capacitors may not be discharged.



1.9.4 Separation guard

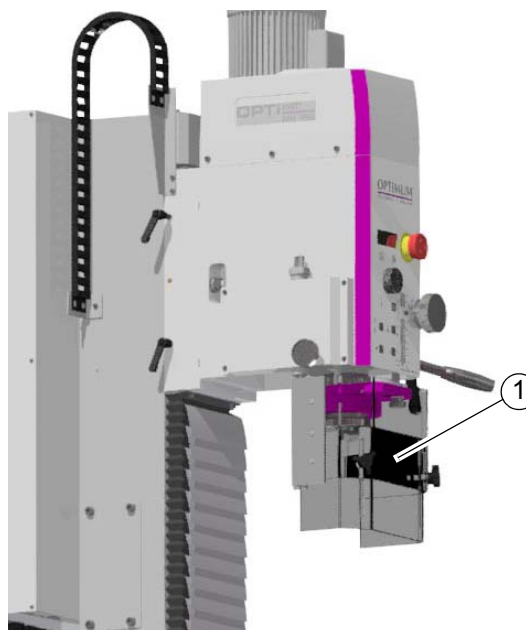
Adjust the guard (1) to the correct height before you start working.

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. 1-3: Separation guard

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 personal 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 Switching-off and securing the milling machine

1.13.1 Lockable 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.

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

The power supply is cut off when the master switch is in the off position.





1.14 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!



1.15 Symbols on the milling machine

Make sure that the mandatory and warning symbols are legible.

1.16 Electrical system

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 certain intervals.

The deadlines must be set so that arising, foreseeable defects can be detected in a timely manner.

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).

1.17 Inspection deadlines

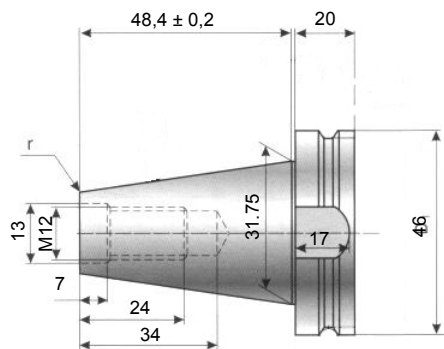
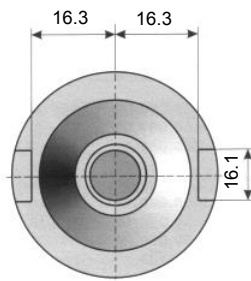
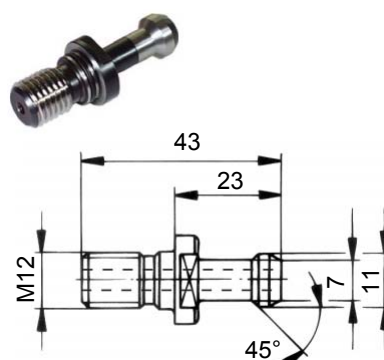
Craftsman or industrial use

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	MH35G	MH35V
		400V	400V
	Milling spindle motor power	1.1 / 1.5 KW	1.5 KW
2.2	Milling capacity	MH35G	MH35V
	Drilling capacity in steel (S235JR) [mm]	max. Ø 32	
	Drilling capacity in steel (S235JR) [mm]	max. Ø 28	
	Max. milling head size [mm]	max. Ø 80	
	Max. end mill cutter size [mm]	max. Ø 28	
2.3	Spindle seat	MH35G	MH35V
	Spindle seat	Tool shank ISO 7388-1 - A 30	
<div><div></div><div></div></div>			
	Pull stud	ISO 7388-3 - JF30-45°	
<div></div>			
Maximum distance between spindle nose - milling table [mm]		0 until 440	



2.4 Drill-mill head	MH35G	MH35V
	Spindle sleeve stroke [mm]	
	90	
	Quill diameter [mm]	
	Ø 68	
	Manual travel Z axis [mm]	
	430	
Throat [mm]		215
Inclination range		± 30°
Z axis handwheel scale		3mm/rev - graduation 0.05mm
2.5 Milling table	MH35G	MH35V
Table length [mm]	750	
Table width [mm]	210	
Max. bearing load	150 kg	
T-slot size/distance/number	12 mm / 63 mm / 3	
X axis travel [mm]	450	
X axis handwheel scale	3mm/rev - graduation 0.05mm	
Y axis travel [mm]	200	
Y axis handwheel scale	3mm/rev - graduation 0.05mm	
2.6 Dimensions	MH35G	MH35V
	Dimensions, balance point on page 26	
Total net weight [kg]	316	306
Total gross weight [kg]	384	374
2.7 Work area	MH35G	MH35V
	Keep a work area of at least one metre around the machine free for operation and maintenance.	
2.8 Speeds	MH35G	MH35V
Speed range / Gear stages / Motor stages [rpm]	220 to 3100 / 6 / 2 (~50Hz connection) 265 to 3720 / 6 / 2 (~60Hz connection) Speed table MH35G (~50Hz connection) on page 35	Speed table MH35V on page 35
Electronic speed range / Gear stages [rpm]	-	50 to 3260 / 6



2.9 Environmental conditions	MH35G	MH35V
Temperature	19 - 21 °C (for an optimum milling result) permissible range + 10° to + 35°C	
Admissible relative humidity	5...90 % no condensation 30% to 90% at 35°C 90 % at 21°C	
Compressed air	700...1060 hPa	
Environmental conditions - storage	5 - 45 °C	
2.10 Operating material	MH35G	MH35V
Gear	Oil quantity 1 litre. Mobilgear 627, ISO VG 100 Viscosity 100 cSt at 40°C or a comparable oil  Lubricant on page 75	
Bare steel parts	Mobilgrease OGL 007 or, Mobilux EP 004, acid-free oil, e.g. weapon oil, motor oil	
2.11 Emissions	MH35G	MH35V
Maximum sound pressure level at 1 m distance from the machine and 1.60 m above the ground.	72 - 76 dB(A)	76 - 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 by the MH35G 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.

The generation of noise emitted by the MH35V is 78 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.



2.12 Tools and tool holding fixtures

CAUTION !

When using tools with larger diameters or at higher speeds!

The balancing of the tools has to amount to

- 0 - 6000 rpm - G 6.3
- from a speed of 6000 rpm - G 2.5

according to DIN / ISO 1940.





3 Delivery, interdepartmental transport, assembly and commissioning

3.1 Notes on transport, installation, commissioning

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

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

WARNING!

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



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

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

WARNING!

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



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

3.1.1 General risks during internal transport

WARNING: TILTING DANGER!

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

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

Warn employees and advise them of the hazard.



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

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

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

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

Careful planning of interdepartmental transport is therefore essential.



3.2 Unpacking

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.

3.3 Installation and assembly

3.3.1 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 (available as an option) 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 the slip resistant floor must be at least R11 according to BGR 181.

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

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

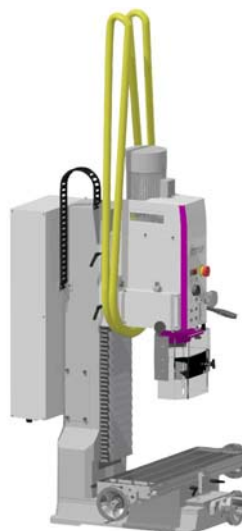
The work area for operation, maintenance and repair must not be restricted.

3.4 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 sling for this purpose.
- ➔ 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.
- ➔ Take care with the centre of gravity of the machine.
 - 📖 Dimensions, balance point on page 26



3.4.1 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 CNC machine.
- The main switch of the machine must be freely accessible.
- The machine must only be installed and operated in a dry and well-ventilated place.
- Avoid places near machines generating chips or dust.



- The installation site must be free from vibrations also at a distance of presses, planing machines, etc.
- Provide sufficient space for the personnel preparing and operating the machine and transporting the material.
- Also make sure the machine is accessible for setting and maintenance works.
- ➔ 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.



- ➔ Place the milling machine on the provided foundation.
- ➔ Fix the machine base to the substructure through the holes pre-drilled for this purpose.

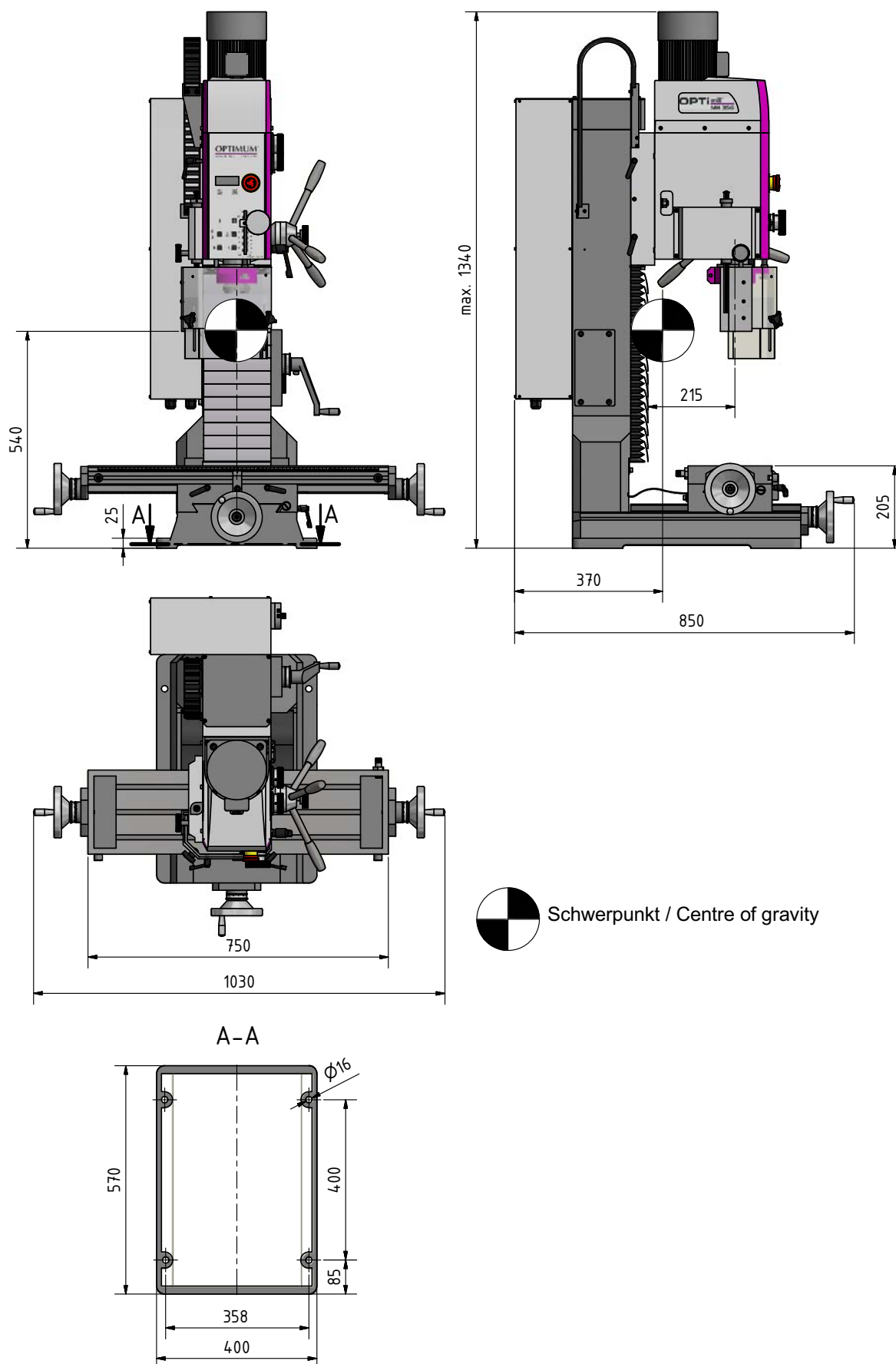
WARNING!

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.

3.5 Dimensions, balance point



MH35G_MH35V_GB_3.fm



3.6 First commissioning

📖 Qualification on page 12

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!



ATTENTION!

Before commissioning the machine, the level of the gearbox must be checked. During the transportation of the machine, oil can come up from the vent hole of the gearbox.



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.



3.7 Lubrication

With the first lubrication and greasing your new machine, oil in the gearbox is filled. Once these operations have been carried out, the machine can be started up.

- ➔ The oil tank of the gearbox must be filled to half way up the sight glass. Filling quantity about 1 liters.
- ➔ The oil must be changed 200 hours after being filled for the first time, then after every 2000 operating hours.
- ➔ Use the oil types recommended in the reference table
📖 Lubricant on page 75. This table can be used to compare the characteristics of each different type of oil of your choice.



3.7.1 Gear



3.8 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 42
- ➔ Check that all spindles are running smoothly. All spindle nuts are re-adjustable.
- ➔ Check the oil level of the spindle gearbox.

INFORMATION

🔧 Lubricant on page 75

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.

3.9 Electrical connection

3.9.1 MH35G and MH35V

CAUTION!

Must only be worked on by a qualified electrician or person working under the instructions and supervision of a qualified electrician.



ATTENTION!

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

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



Correct direction of rotation, observe phase sequence! ➡ **Direction of spindle rotation on page 35**

If necessary, two phase connectors at the three phase current switch (MH35G) or at the connection in the control cabinet must be exchanged. The guarantee will become null and void if the machine is connected incorrectly.

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.

3.9.2 MH35V

WARNING!

Danger to life caused by high leakage currents for an interrupted protective conductor.

The drive components conduct a high leakage current via the protective conductor. Touching conductive parts when the protective conductor is interrupted can result in death or serious injury.

➔ Observe the following notes on the connection for machines with frequency converters.





3.9.3 Regulated drives in connection with residual current devices

Speed-controlled drives are one of the standard equipment in machine and plant construction and perform various tasks. Compared to a simple motor, the electronic rectifiers or converters require some special features for the necessary safety measures for electrical safety. Depending on the application, the use of a fault current protection device, differential current monitoring or insulation monitoring can make more sense.

For electrical safety, DIN VDE 0100-410 (VDE 0100 part 410): 1997-01 "Erection of heavy current installations up to 1000V" is a basic standard. It describes both, the admissible net forms and the necessary protective measures against dangerous body currents. Based on this standard DIN EN 50178 (VDE 0160): 1998-04 "Equipping of heavy current systems with electronic equipment" specifies the protective measures to be applied to controlled drives in more detail. It calls for: "In the case of electronic equipment, the protection of persons against dangerous body currents must be carried out in such a way that a single fault does not cause any danger."

Regulated drives with residual current devices

The TN-S system is the most common network form for the operation of controlled drives. This is done, among other things, for EMV reasons and to avoid vagabonding currents. In accordance with DIN VDE 0100-410 (VDE 0100-410): 1997-01, fault current protective devices (ELCB) can be used as a protective measure against dangerous body currents. According to DIN VDE 0100-482 (VDE 0100 part 482): 2003-06 "Electrical installations of buildings", cables and wiring systems in fire-endangered plants must be protected by ELCBs with a rated differential current of 300 mA. According to IEC 60755, ELCBs differ in the type of fault currents they can detect. In conjunction with electronic devices currents with DC components may occur.

3.9.4 Protection from Dangerous Shock Currents, use of ELCBs

To achieve increased safety in all installation systems, and in power supply ranges for which the installation provisions stipulate or recommend the ELCB devices.

Measure for "Protection from Dangerous Shock Currents", as regulated in DIN VDE 0100 Part 410. All measures are to be mentioned:

- Protection from indirect contact – as protection against fault by shutting down in the event of inadmissibly high contact voltage by short circuit shock on the operating resource.
- Protection from direct contact – as additional protection by shutting down in the event of contact with a live conductor. Dangerous shock currents are shut down within the shortest possible time, if the rated fault current of the circuit breaker is 30 mA (e.g. Domestic environment), for a personal protection system 10 mA (e.g Bathroom).
- Fire prevention – Prevention of the origination of electrically-ignited fires if the rated fault current of the circuit breaker is 300 mA. Operating premises at risk of fire to VdS 2033: 2002-02 300 mA (e.g. Factory halls).

3.9.5 Current in the protective earth conductor - Leakage current

With EMC filters in frequency converters, the leakage current is always greater than 3.5 mA due to physics. Some types of frequency converters also achieve a leakage current of up to 300mA.

Therefore, a fixed earth connection is required and the minimum cross section of the protective earthing conductor must conform to local safety regulations for devices with high leakage current. This is achieved by providing a permanent fixed earthing connection with two independent conductors, each having a cross section the same as the power supply cord or greater.





Preferably, machines with frequency converters are therefore to be permanently connected to a terminal box, otherwise an additional fixed earth connection is required, which is not routed over the plug, and must correspond to at least the cross-section of the cable in the plug.

Since a direct current may be caused by the frequency converter in the protective earthing conductor, if an upstream residual current device (ELCB / RCD) is required in the network, the following guidelines must be followed:



To avoid an operating fault, you need an AC/DC-sensitive ELCB. Be absolutely sure which leakage current security is necessary for dangerous body currents, as regulated in DIN VDE 0100 part 410, at your mains connection.

3.9.6 When the ELCB triggers

- Pulse current - sensitive ELCB type A
ELCB type A independent of rated voltage, for triggering when changing fault currents and pulsing DC fault currents. 
- AC/DC - sensitive ELCB type B
ELCBs of series type B also accept the detection of smooth AC fault currents as well as the detection of fault current shapes of type A; they are therefore suitable for all the circuits mentioned. ELCBs of this series therefore detect all types of fault current according to the triggering characteristic B, i.e. both smooth DC fault currents and also all AC fault currents of all frequencies and mixed frequencies up to 1 MHz are detected and switched off reliably in the event of a fault.  
- Alternating current - sensitive ELCBs of type AC (only alternating current) are unsuitable for frequency converters. Alternating current - sensitive ELCBs of type AC are not customarily used and are no longer permitted in Germany. 

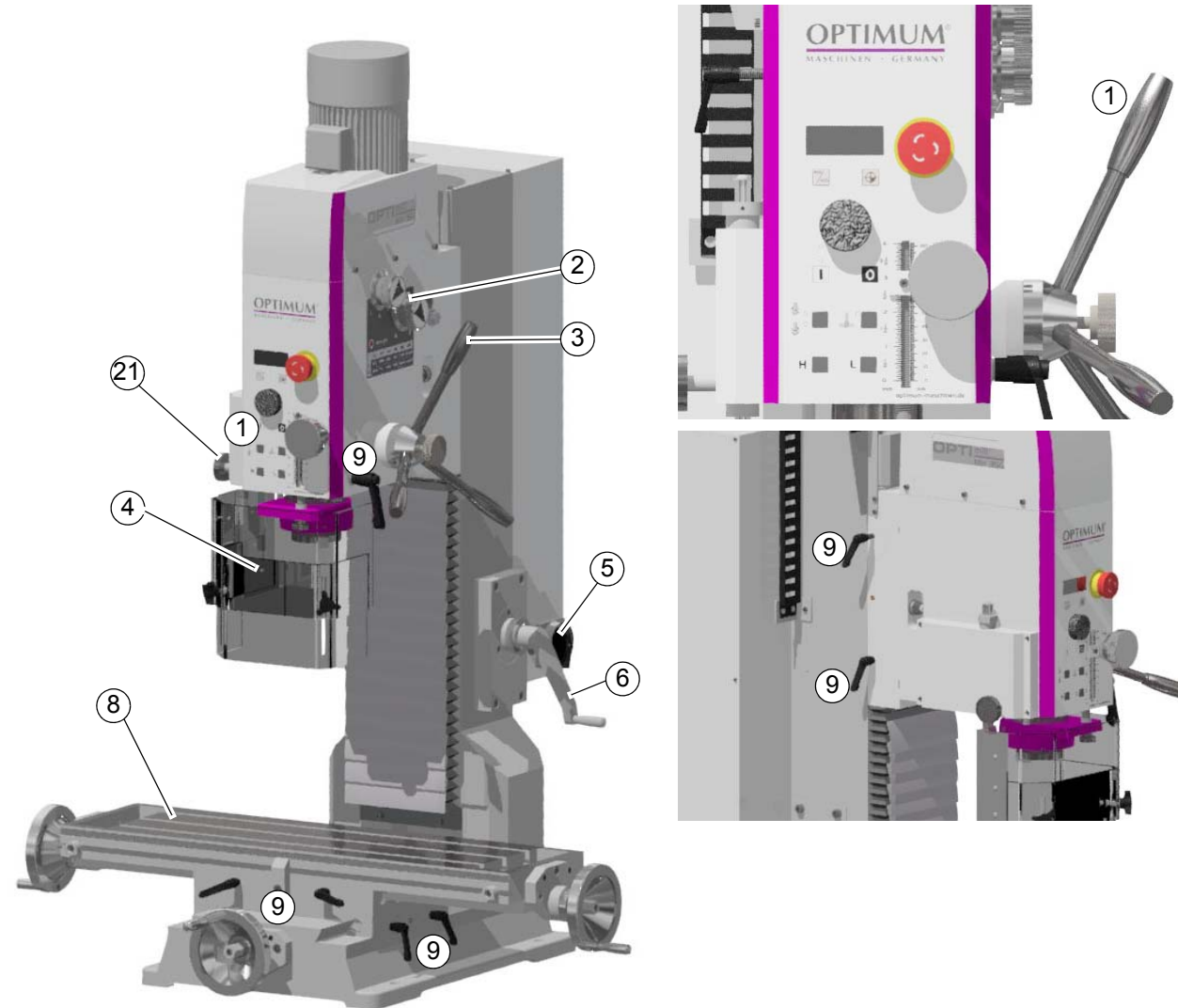
Type B must be used with 3-phase converters.

When using an external EMC filter, to avoid false error shutdowns, a time delay of at least 50 ms is required. The leakage current can exceed the threshold trigger value for an error shutdown if the phases are not switched on at the same time.



4 Operation

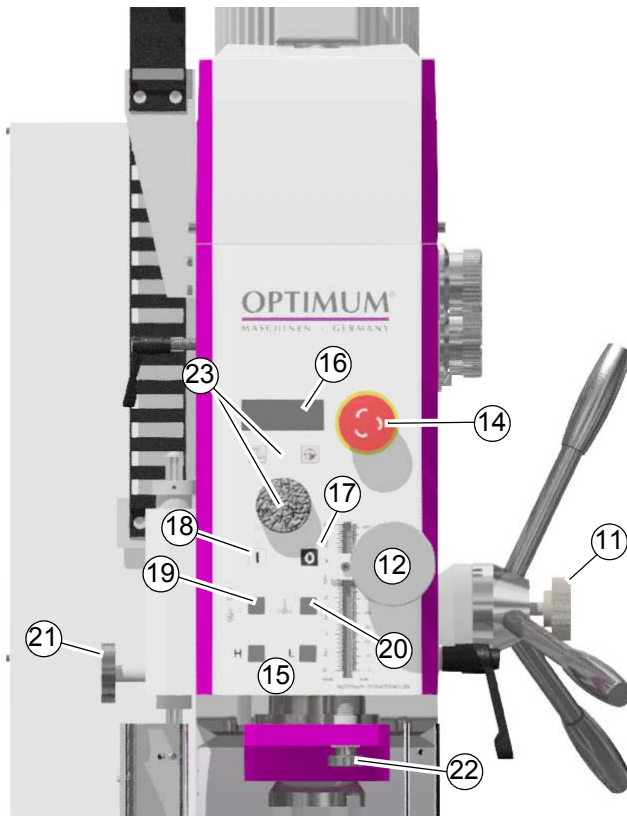
4.1 Control and indicating elements



Pos.	Designation	Item	Designation
1	Control panel ☞ Control panel on page 33	2	Gear switch
3	Quill lever	4	Spindle protection
5	Main switch	6	Milling head height adjustment hand crank
21	Mechanical securing, quick clamping system	8	Milling table
9	Clamping lever		



4.1.1 Control panel



Pos.	Designation	Item	Designation
11	Activation of the fine adjustment	12	Fine adjustment of spindle sleeve
15	Drive motor stage selection (only MH35G)	14	Emergency stop button
17	Spindle rotation OFF	16	Depth display Speed display (only MH35V)
19	Rotational direction ☞ Direction of spindle rotation on page 35	18	Spindle rotation ON
21	Mechanical securing, quick clamping system ☞ Inserting or Removing Tool on page 37	20	Tapping ☞ Tapping on page 37
23	Push buttons <ul style="list-style-type: none"> • Drilling depth mm / inch • Zero point • Speed and function of rotary knob for setting the speed (only MH35V) 	22	Mechanical drill depth stop




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 17



4.3 Switching the milling machine on

- Switch on the master switch.
- Unlock the emergency stop button.
- Set and close the spindle protection.


INFORMATION

The machine cannot be started, if the spindle protection is not closed and the locking pin of integrated drill drift is in drifting position.



4.4 Switching the milling machine off

- Switch off the master switch.

 Switching-off and securing the milling machine on page 17

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

A speed change at the MH35G is done by inserting of gear stages and stage selection of the drive motor.

A speed change at the MH35V is continuously adjustable within the gear stage engaged with the rotary knob on the control panel. If necessary switch to speed display on the control panel.



4.7.1 Speed table MH35G (~50Hz connection)

OPTIMUM® MASCHINEN - GERMANY						
	A			B		
	A1	A2	A3	B1	B2	B3
L	220	345	735	470	730	1550
H	440	690	1470	940	1460	3100

Img.4-1:

4.7.2 Speed table MH35V

OPTIMUM® MASCHINEN - GERMANY			
	A		B
	1	2	3
A	50 - 460	70 - 730	150 - 1540
B	95 - 990	150 - 1540	310 - 3260

Img.4-2:

4.7.3 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.

4.7.4 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 MH35G is done by pressing the push button.

A change in the direction of rotation at the MH35V is only possible if the spindle rotates even in its standard direction of rotation.

The standard direction of rotation is clockwise.

🔧 Cleaning and lubrication on page 28





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 to be preferred on the MH35G and synchronous milling is always to be preferred on the MH35V.

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

This instruction manual assumes that the milling machine MH35G and MH35V 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.

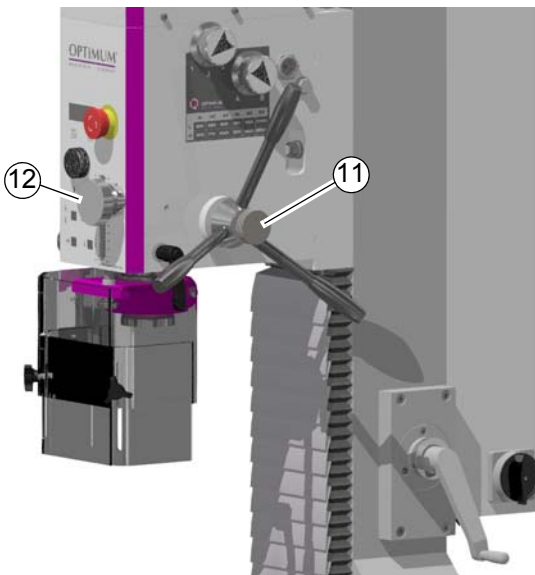
In conventional milling, the work piece moves with the hand cranks on the milling table opposite to the direction of rotation of the milling machine.

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 Spindle quill feed

With the fine feed (12).




→ Turn the handle screw (11) to engage the coupling of the fine feed.






4.10.1 Setting the drilling or tapping depth - Setting the beep

In order to set the depth on the display.

→ Press the tool selection button  and the workpiece zero button  and then release the button  as first.

→ The display will begin to flash.

→ Use the rotary knob to set the required depth  and confirm by pressing.

Drilling:

When the set depth is reached, a warning tone is generated.

Tapping:

When the set depth is reached, a warning tone with spindle reverses direction of rotation is performed.

4.11 Tapping

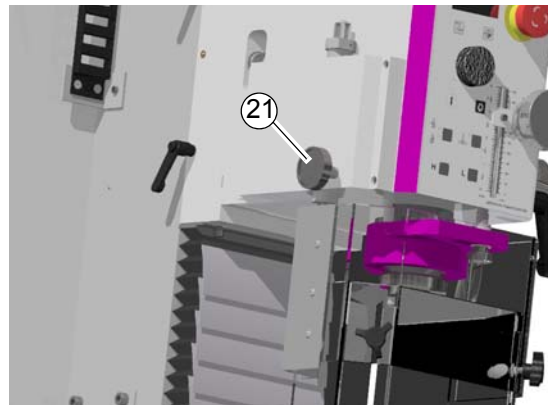
- If necessary, adjust the mechanical drill stop.
- Set the drilling depth on the display to the desired depth.
- Deactivate fine feed spindle - where this has not yet happened.
- Set the lowest speed.
- Set and close the spindle protection.
- Operate the tapping (20) push button.
- The rotation of spindle (18) switches on.

Move the sleeve downward with the sleeve lever until the machine tap cams in the work piece.

The machine tap turns into the workpiece. When the set drilling depth is reached, the spindle reverses direction of rotation. The machine tap turns out of the workpiece.

4.12 Inserting or Removing Tool

- Unlock or lock the mechanical securing (21) of the quick clamping system.

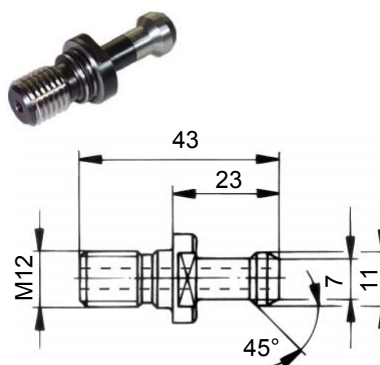


Img.4-3: Mechanical securing, quick clamping system

4.12.1 Inserting

The milling head is equipped with a collet chuck for BT30x45° pull studs.

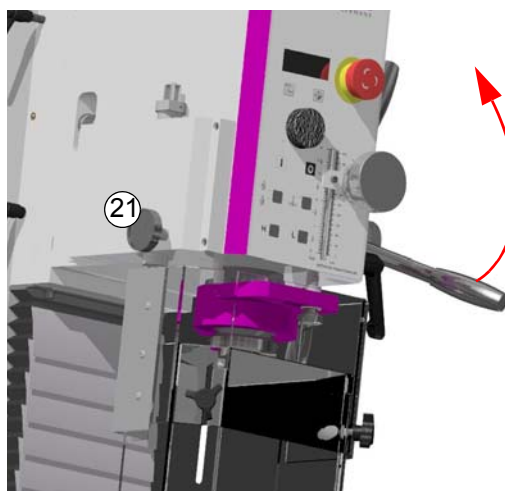
- Screw pull studs into the conical seat.
- Clean seat in the milling spindle.
- Clean cone of the tool.
- Mechanical securing of the quick clamping system (21) to be released.
- Push up the spindle level and place the tool into the spindle.
- Release the spindle lever again.
- Mechanical securing of the quick clamping system (21) to be locked.



Img.4-4: Pull stud

4.12.2 Removing

- Release mechanical securing of the quick clamping system (21).
- Firmly hold the tool.
- Push up the spindle lever.



Img.4-5: Unfitting

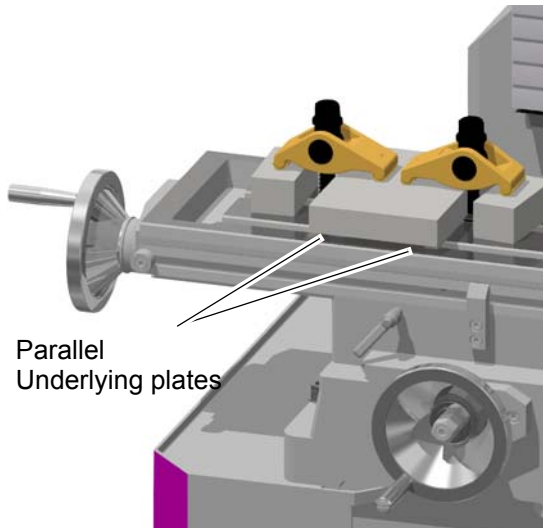


4.13 Clamping the workpieces

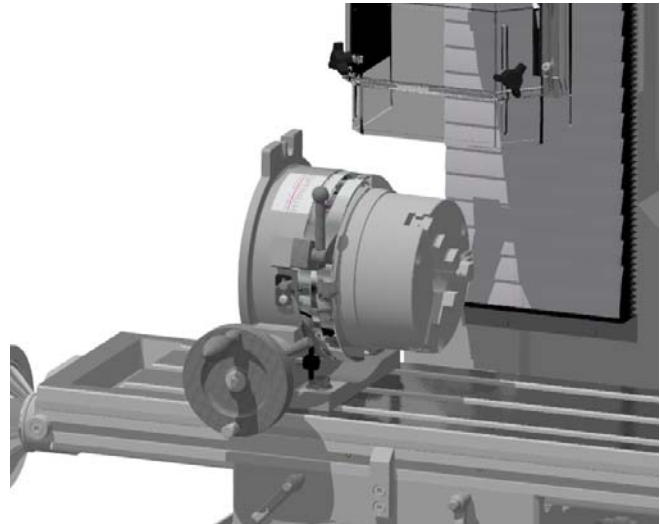
CAUTION!

Injuries can be caused by parts flying off.

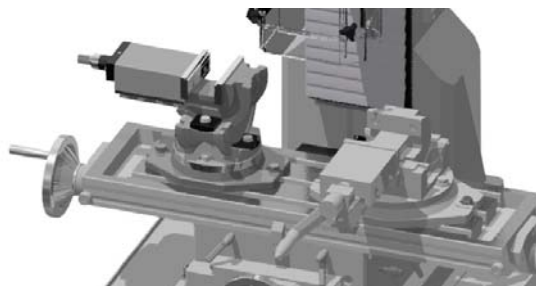
The workpiece must always be secured to the milling table in a machine vice, chuck or with another suitable clamping tool, such as a workholding device (clamping claws).



Workholding device 3352032
+ Parallel underlying plates 3354001



Dividing device 3356200 + Chuck jaw 3356225



Triple axis chuck 3355500
+ Double axis chuck 3354170

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

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

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

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 $k_{c1.1}$ and the chip thickness exponent m_c 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 F_c 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.



4.14 Swivelling the milling head

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

- ➔ Loosen 3 fastening screws on the milling head.
- ➔ Turn the drill-mill head clockwise to the desired position.
- ➔ Retighten the fastening screws.

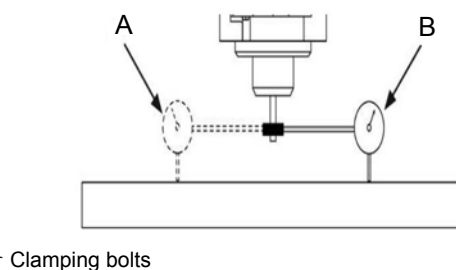
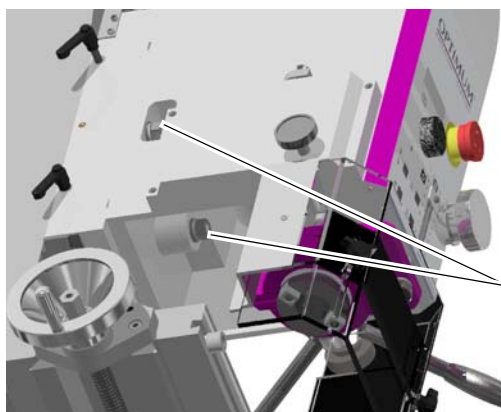
INFORMATION

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.



ATTENTION!

The drill-mill continues significantly further and also swivels in a different direction. By continuing to swivel, gear oil may seep from the ventilation hole.





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.

☞ Switching-off and securing the milling machine on page 17

Attach a warning sign.



5.1.2 Restarting

Before restarting, run a safety check. ☞ Safety check on page 16

WARNING!


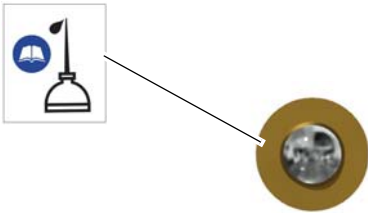
Before starting the milling machine, it is essential that you ensure that this does not constitute a risk to personal safety or damage to the milling machine.



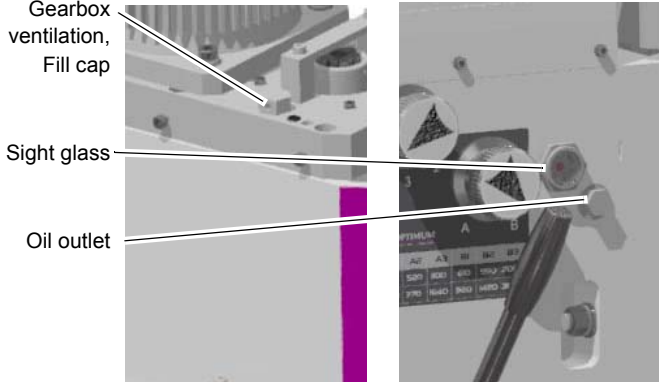
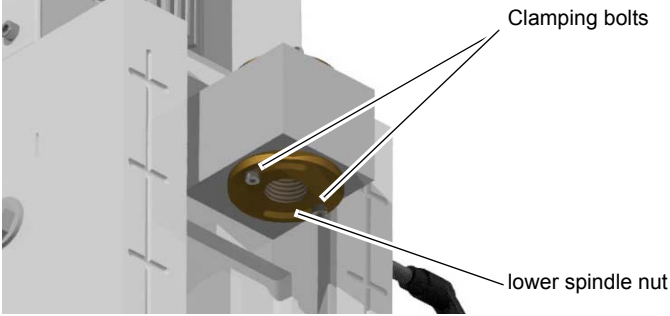


5.2 Inspection and maintenance

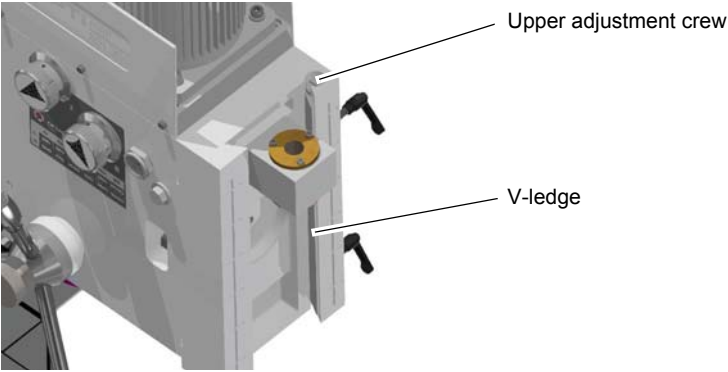
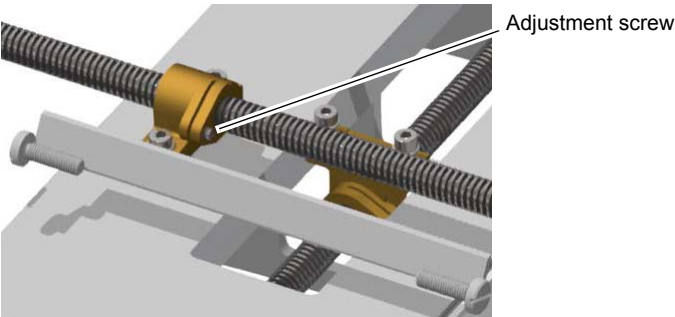
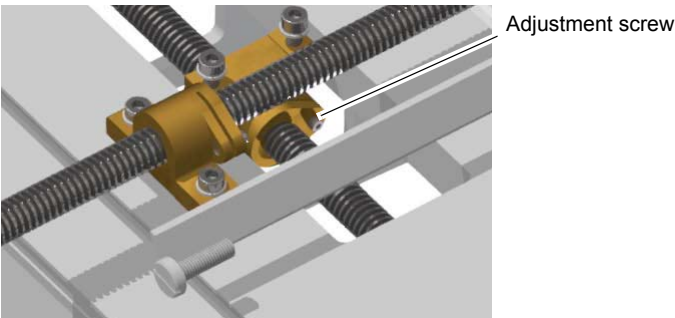
The type and level of wear depends to a large extent on the individual usage and operating conditions. Any indicated intervals therefore are only valid for the corresponding approved conditions.

Interval	Where?	What?	How?
Start of work, after every main- tenance or repair work	Milling machine	→  Safety check on page 16	
Start of work, after every main- tenance 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 bolts for swivelling the drill head are firmly tightened.
Monthly	Oiler cup	Oiling	→ Lubricate all oiler cups with machine oil, do not use grease guns or the like. 

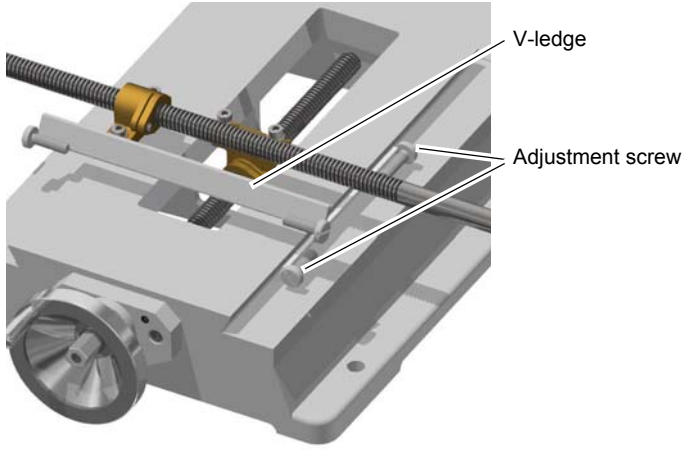


Interval	Where?	What?	How?
the first time after 200 hours of operation, then every 2000 hours	Gear	Refilling oil Oil change	<ul style="list-style-type: none">➔ For oil change use an appropriate collecting tray of sufficient capacity.➔ Remove the filler hole plug.➔ Remove the oil drain plug.➔ If necessary use sealing tape for drain plug.➔ Fill in the open lubricating system of the geared drill about 1 liters of oil.➔ Check if the oil level is correct via the sight glass. The sight glass (oil level dropped) must be half covered.  <p>Img.5-1: Gear oil level</p>
When necessary	Spindle nut Milling head	Readjusting Z axis	<p>An larger amount of backlash in the milling head spindle can be reduced by adjusting the spindle nut. The two-piece spindle nut is adjusted by the lower spindle nut half so that the thread flanks is reduced by rotating. 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.</p>  <p>Img.5-2: Milling head</p>



Interval	Where?	What?	How?
When necessary	Adjustment gib Milling head	Readjusting Z axis	<p>→ Turn the adjustment screw of the gib clockwise. The gib is pushed further inward thus reducing the play in the guide rail.</p> <p>→ Check the settings. The corresponding guide rail must be more easily movable but ensure stable guidance.</p>  <p>Upper adjustment screw</p> <p>V-ledge</p> <p>Img. 5-3: Take-up screws Z axis</p>
	Spindle nut Milling table	Reset X axis	<p>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 a take-up screw. 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.</p>  <p>Adjustment screw</p> <p>Img. 5-4: Milling table</p>
	Spindle nut Milling table	Reset Y axis	 <p>Adjustment screw</p> <p>Img. 5-5: Milling table</p>



Interval	Where?	What?	How?
When necessary	Gibs Milling table	Reset X axis Y axis	<p>→ 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.</p> <p>→ Check the settings. The corresponding guide rail must be more easily movable but ensure stable guidance.</p>  <p>Img. 5-6: X axis / Y axis adjustment screws</p>
based on operator's empirical values in accordance with German DGUV (BGV A3)	Electronics	Electrical inspection	<p>👉 Operator's obligations on page 13</p> <p>👉 Electrical system on page 18</p>

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,
- original parts or parts from series expressly authorised by Optimum Maschinen Germany GmbH.

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 Typschild. *The serial no. is on the rating plate.*

6.2 Hotline Ersatzteile - Spare parts Hotline



+49 (0) 951-96555 -118

ersatzteile@stuermer-maschinen.de



6.3 Service Hotline



+49 (0) 951-96555 -100

service@stuermer-maschinen.de



6.4 Elektrische Ersatzteile - Electrical spare parts

6.5 Schaltplan - Wiring diagram

Der aktuelle Schaltplan mit Ersatzteilliste befindet sich im Schaltschrank der Fräsmaschine.
The current circuit diagram and spare parts list is located in the control cabinet of the milling machine.

6.6 Fräsfutterschutz - Mill chuck safety

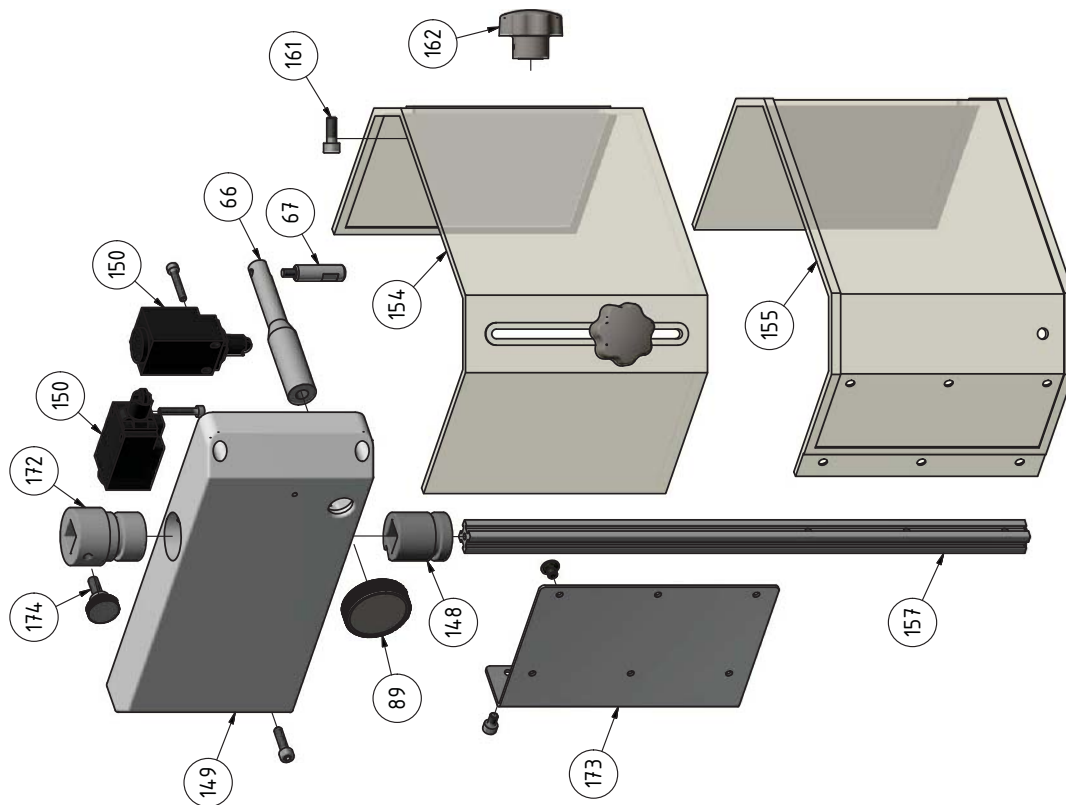


Abb.6-1: Fräsfutterschutz - Mill chuck safety

6.7 Fräskopf - Milling head

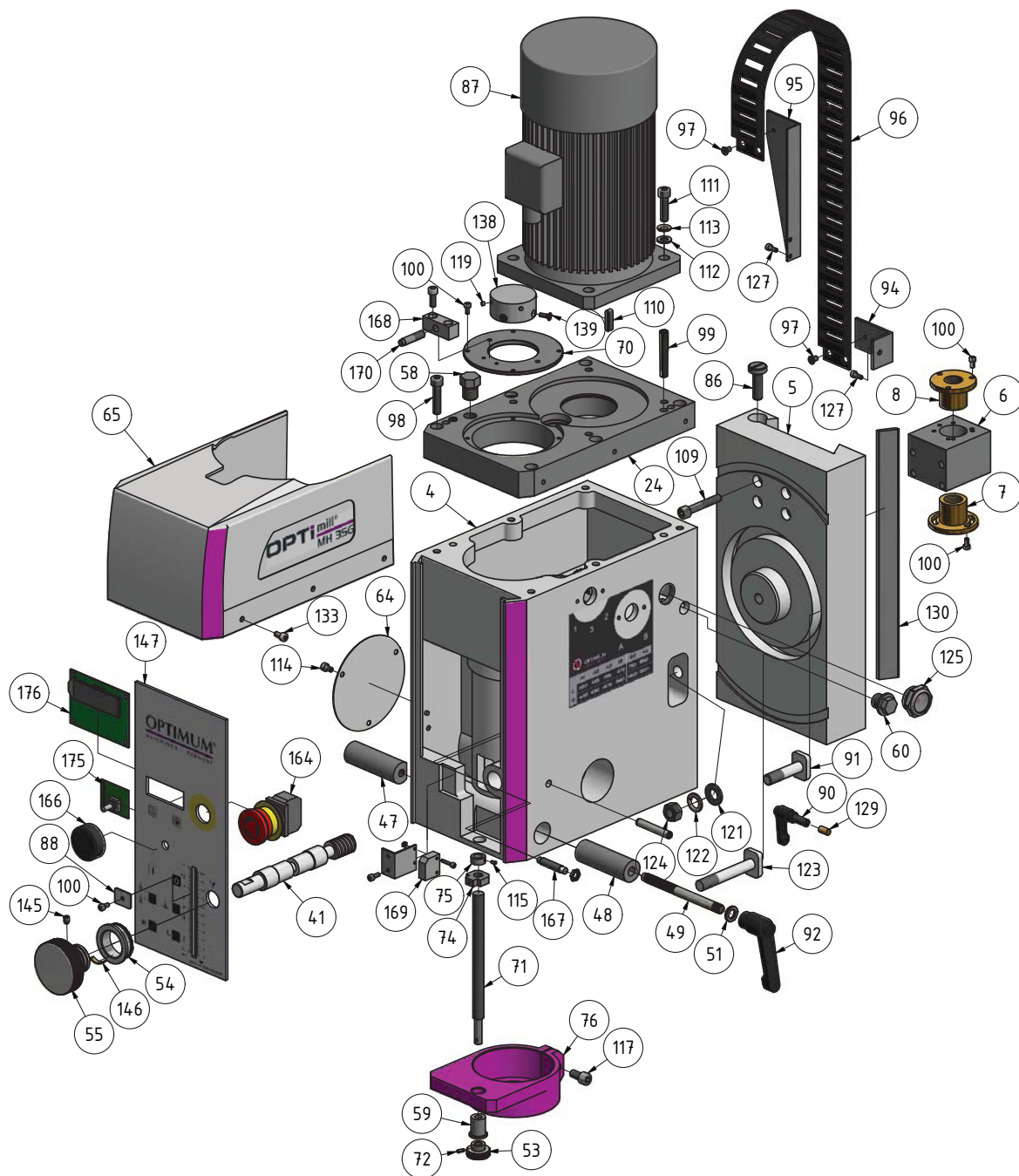


Abb.6-2: Fräskopf - Milling head

6.8 Fräskopf - Milling head

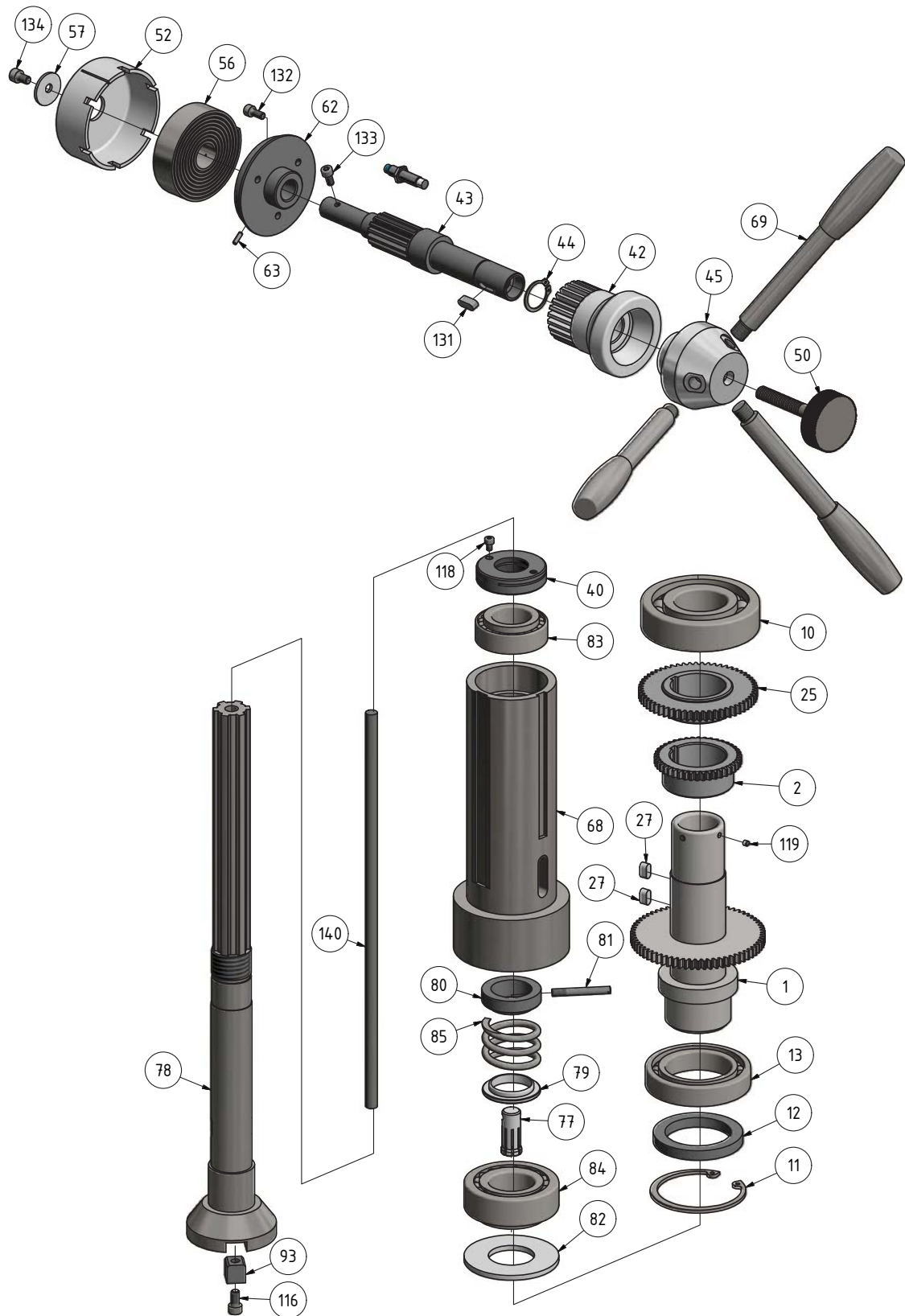


Abb. 6-3: Fräskopf - Milling head

MH35G_MH35V_parts.fm

6.9 Fräskopf - Milling head

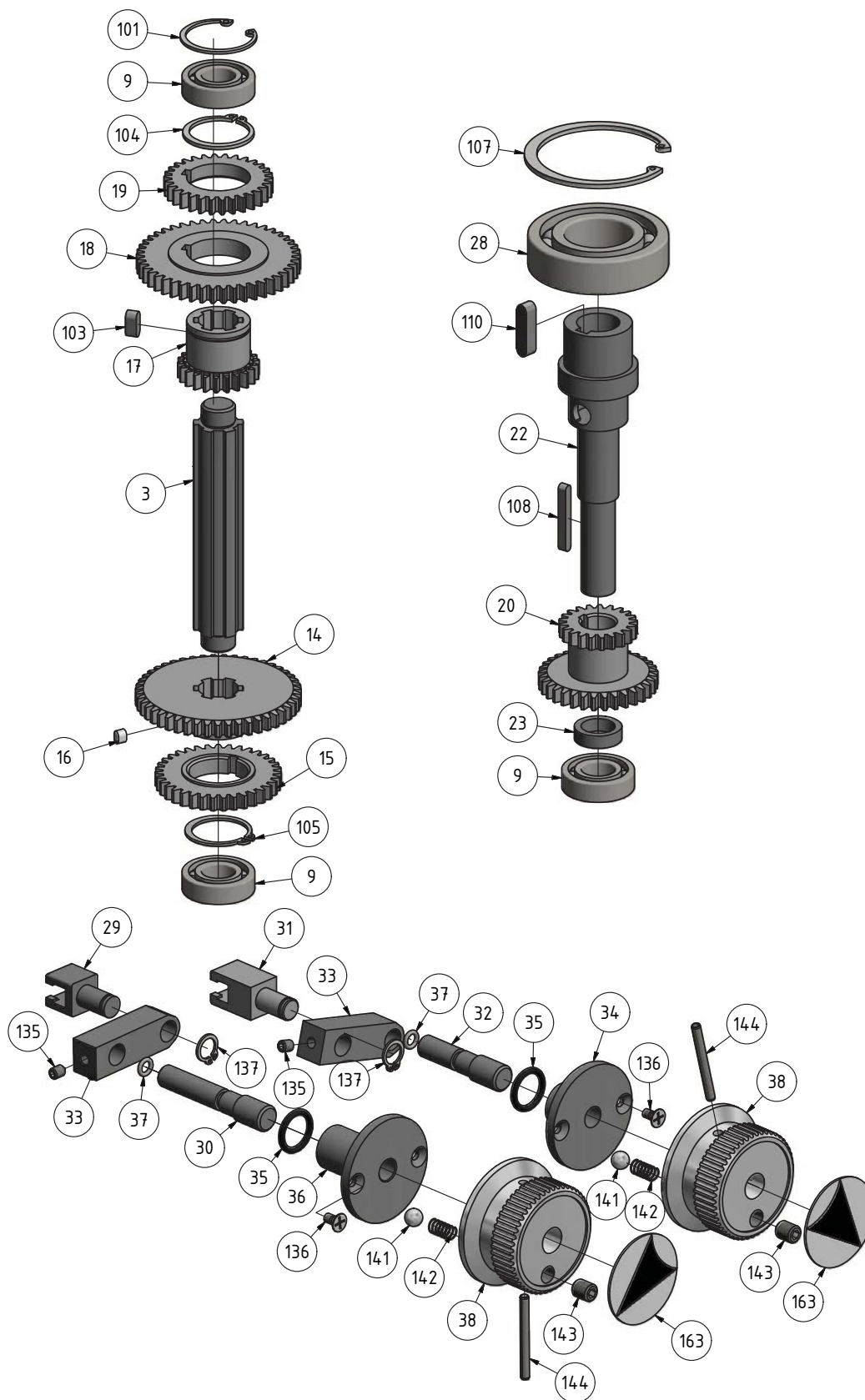


Abb.6-4: Fräskopf - Milling head

MH35G_MH35V_parts.fm

6.10 Schaltschrank - Switch cabinet

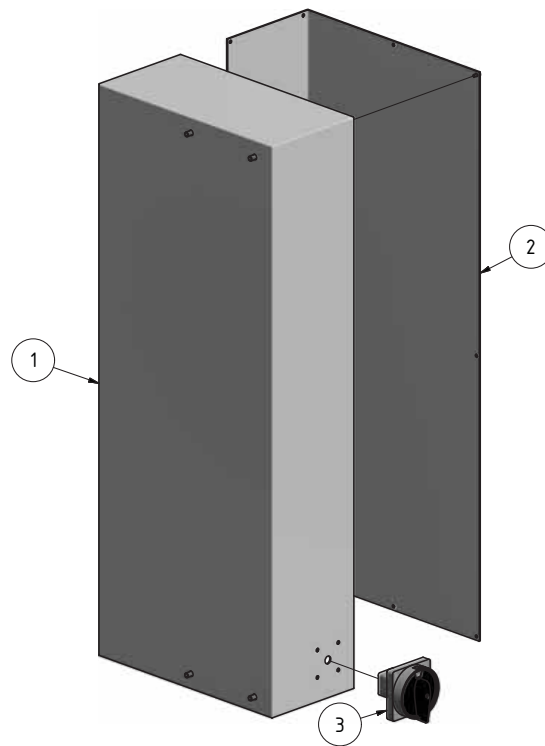


Abb.6-5: Schaltschrank - Switch cabinet

6.11 Säule - Column

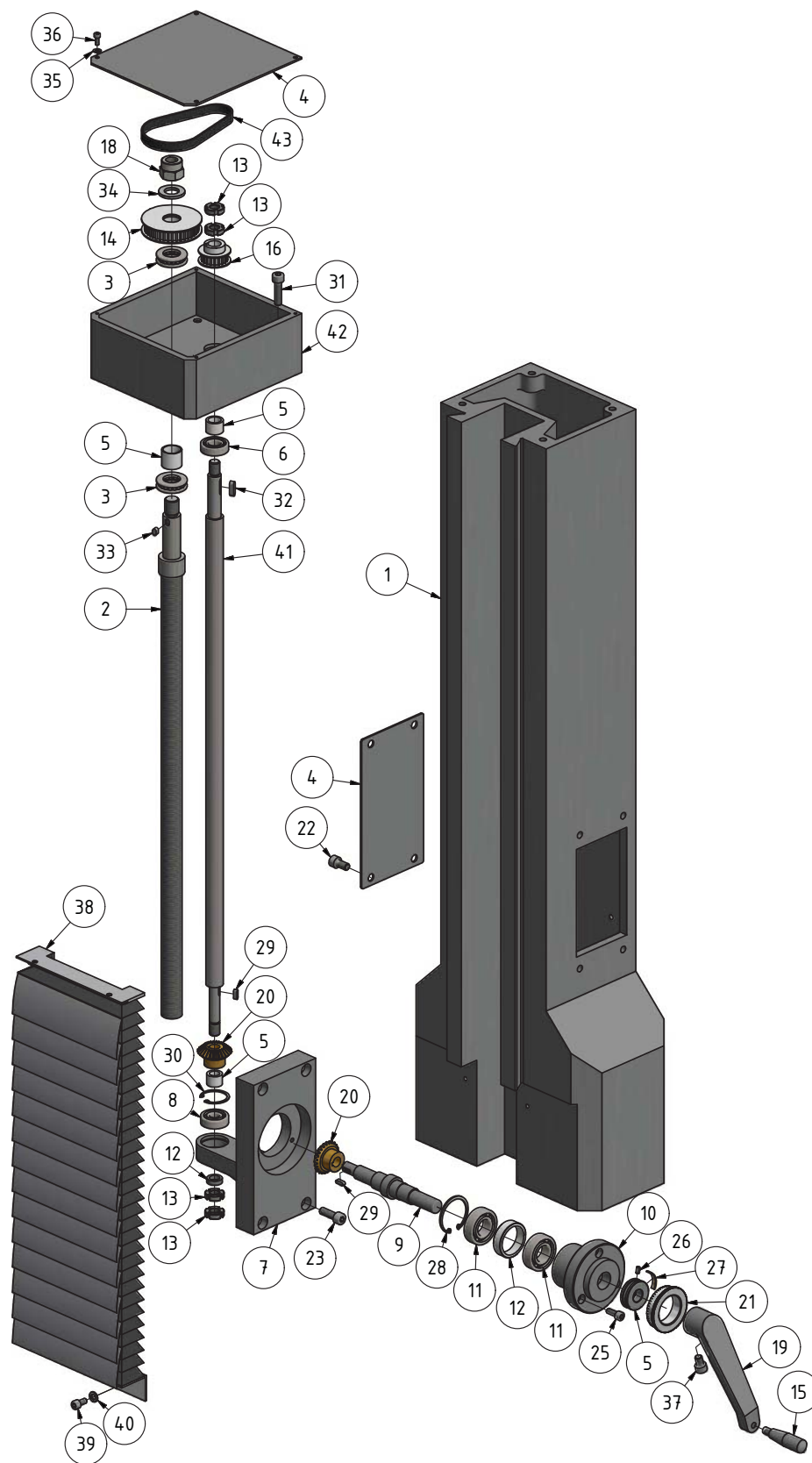


Abb.6-6: Säule - Column

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6.12 Kreuztisch - Cross table

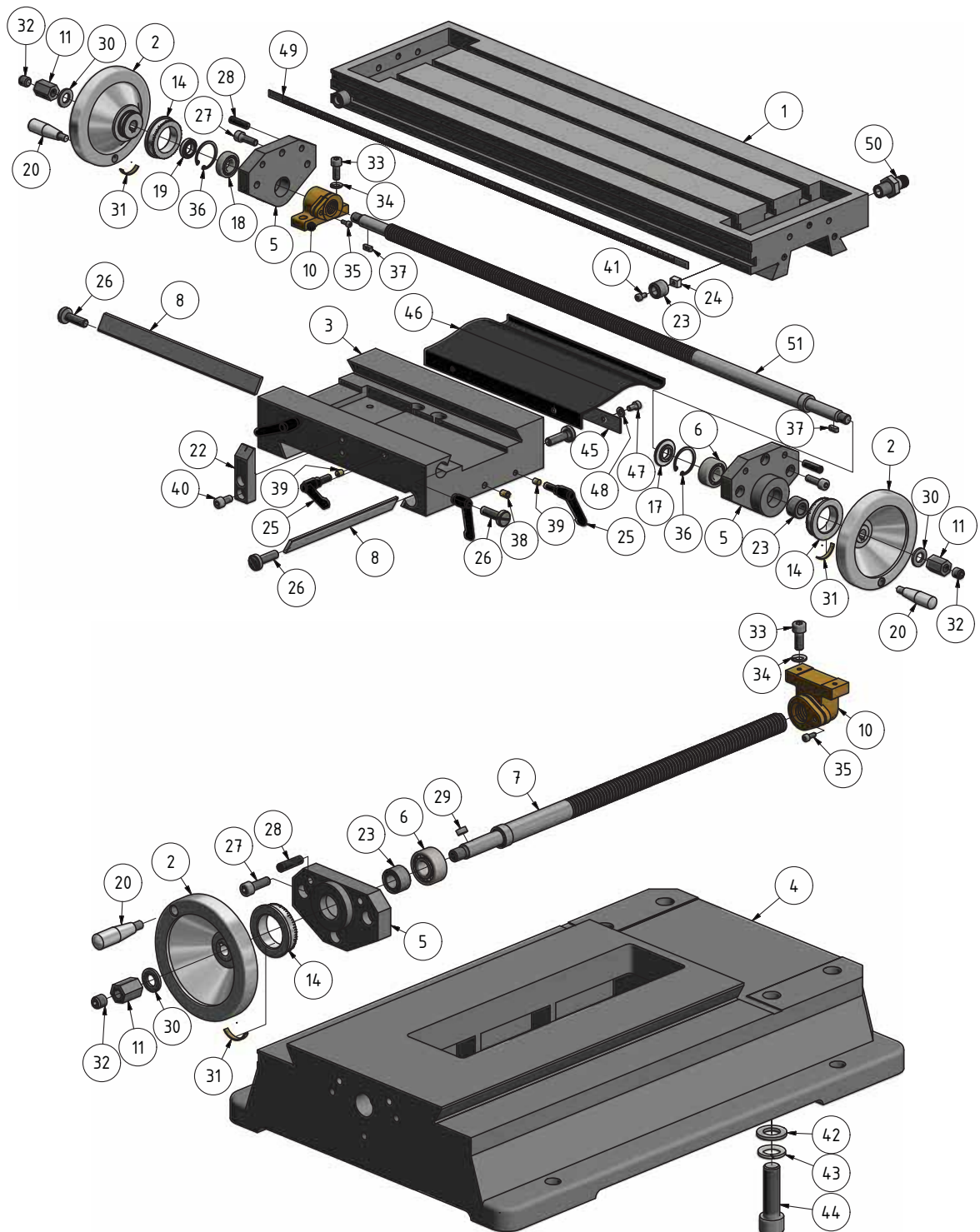


Abb.6-7: Kreuztisch - Cross table

MH35G_MH35V_parts.fm

6.13 Maschinenschilder - Machine labels

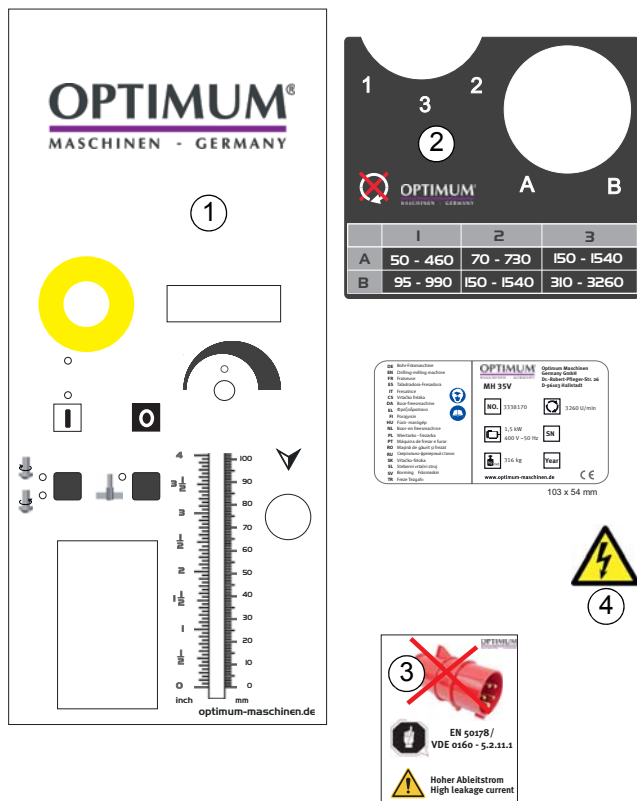


Abb.6-8: Maschinenschilder - Machine labels

6.13.1 Ersatzteilliste - Spare parts list - MH35G | MH35V

Ersatzteilliste Fräskopf - Spare parts list mill head					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
1	Zahnrad	Gear	1		03338165101
2	Zahnrad	Gear	1		03338165102
3	Welle	Shaft	1		03338165103
4	Gehäuse	Housing	1		03338165104
5	Führung	Guide	1		03338165105
6	Gehäuse	Housing	1		03338165106
7	Spindelmutter	Spindle nut	1		03338165107
8	Spindelmutter	Spindle nut	1		03338165108
9	Kugellager	Ball bearing	3	6002	0406002R
10	Kugellager	Ball bearing	1	6308	0406308R
11	Sicherungsring	Retaining ring	1	68	042SR68I
12	Ring	Ring	1		
13	Kugellager	Ball bearing	1	6010	0406010R
14	Zahnrad	Gear	1		03338165114
15	Zahnrad	Gear	1		03338165115
16	Passfeder	Fitting key	1	4x6	042P4410
17	Zahnrad	Gear	1		03338165117
18	Zahnrad	Gear	1		03338165118

19	Zahnrad	Gear	1		03338165119
20	Zahnrad	Gear	1		03338165120
21	Zahnrad	Gear	1		03338165121
22	Welle	Shaft	1		03338165122
23	Ring	Ring	1		03338165123
24	Platte	Plate	1		03338165124
25	Zahnrad	Gear	1		03338165125
27	Passfeder	Fitting key	1	6x12	042P6612
28	Kugellager	Ball bearing	1	6206	0406206R
29	Schaltgabel	Switch fork	1		03338165129
30	Welle	Shaft	1		03338165130
31	Schaltgabel	Switch fork	1		03338165131
32	Welle	Shaft	1		03338165132
33	Platte	Plate	2		03338165133
34	Flansch	Flange	1		03338165134
35	O-Ring	O-Ring	2	15x2.65	
36	Flansch	Flange	1		03338165136
37	O-Ring	O-Ring	2	15x1.8	
38	Wahlschalter	Mode switch	2		03338165138
39	Schraube	Screw	1	M8x35	
40	Klemmmutter	Clamping nut	1		03338165140
41	Welle	Shaft	1		03338165141
42	Hülse	Sleeve	1		03338165142
43	Welle	Shaft	1		03338165143
44	Sicherungsring	Retaining ring	1	22	042SR22I
45	Nabe	Collet	1		03338165145
46	Feder	Spring	1	2x14x40	
47	Klemmbuchse	Clamping bushing	1		03338165147
48	Klemmbuchse	Clamping bushing	1		03338165148
49	Bolzen	Bolt	1		03338165149
50	Rändelschraube	Knurled screw	1		03338165150
51	Ring	Ring	1		
52	Abdeckung	Cover	1		03338165152
53	Rändelmutter	Knurled nut	1		03338165153
54	Skalenring	Scale ring	1		03338165154
55	Rändelschraube	Knurled screw	1		03338165155
56	Rückholfeder	Retaining spring	1		03338165156
57	Scheibe	Washer	1		
58	Entlüftungsschraube	Bleeder screw	1		
59	Buchse	Bushing	1		03338165159
60	Verschlusschraube	Plug screw	1		
61	Bolzen	Bolt	1		
62	Flansch	Flange	1		03338165162
63	Zylinderstift	Cylindrical pin	2		
64	Abdeckung	Cover	1		
65	Abdeckung	Cover	1		03338165165

MH35G_MH35V_parts.fm

66	Hülse	Sleeve	1		
67	Hülse	Sleeve	1		
68	Pinole	Quill	1		03338165168CPL
69	Handhebel	Handle lever	3		03338165169
70	Ring	Ring	1		03338165170
71	Spindel	Spindle	1		03338165171
72	Zylinderstift	Cylindrical pin	1	3x8	
73	Zylinderstift	Cylindrical pin	1	8x50	
74	Platte	Plate	1		03338165174
75	Buchse	Bushing	1		03338165175
76	Aufnahme	Collet	1		03338165176
77	Schnapper	Catcher	1		03338165177
78	Frässpindel	Mill spindle	1		03338165178
79	Ring	Ring	1		03338165179
80	Buchse	Bushing	1		03338165180
81	Bolzen	Bolt	1		
82	Scheibe	Washer	1		
83	Kegelrollenlager	Taper roll bearing	1	33006	04033006
84	Kegelrollenlager	Taper roll bearing	1	33207	04033207
85	Feder	Spring	1		03338165185
86	Klemmschraube	Clamping screw	2		03338165186
87	Spindelmotor	Spindle motor	1	MH 35 G	03338165187
87	Spindelmotor	Spindle motor	1	MH 35 V	03338170187
88	Anzeige	Indicator	1		03338165188
89	Rändelschraube	Knurled screw	1		
90	Klemmhebel	Clamping lever	2		
91	T-Schraube	T-Screw	2		03338165191
92	Klemmhebel	Clamping lever	1		03338165192
93	Nutenstein	Slot nut	2		03338165193
94	Winkel	Angle	1		03338165194
95	Halterung	Holder	1		03338165195
96	Energiekette	Energie chain	1		03338165196
97	Schraube	Screw	4	M8x5	
98	Innensechskantschraube	Socket head screw	5	ISO 4762 - M8 x 35	
99	Kegelstift	Taper pin	2	ISO 8736 - 8x55-St	
100	Innensechskantschraube	Socket head screw	10	ISO 4762 - M4 x 8	
101	Sicherungsring	Retaining ring	1	DIN 472 - 32x1,2	042SR32I
103	Paßfeder	Fitting key	1	A 5 x 5 x 12	042P5512
104	Sicherungsring	Retaining ring	1	DIN 471 - 28x1,5	042SR28I
105	Sicherungsring	Retaining ring	1	DIN 471 - 26x1,2	042SR26I
107	Sicherungsring	Retaining ring	1	DIN 472 - 62 x 2	042SR62I
108	Paßfeder	Fitting key	1	A 4 x 4 x 32	
109	Innensechskantschraube	Socket head screw	4	ISO 4762 - M8 x 50	
110	Paßfeder	Fitting key	1	A 6 x 6 x 25	042P6628
111	Innensechskantschraube	Socket head screw	4	ISO 4762 - M8 x 30	
112	Scheibe	Washer	4	DIN 125 - A 8,4	

113	Federring	Spring ring	4	DIN 128 - A8	
114	Innensechskantschraube	Socket head screw	3	ISO 4762 - M5 x 8	
115	Gewindestift	Grub screw	1	DIN 916 - M3 x 6	
116	Innensechskantschraube	Socket head screw	2	ISO 4762 - M6 x 12	
117	Innensechskantschraube	Socket head screw	1	ISO 4762 - M8 x 16	
118	Innensechskantschraube	Socket head screw	2	ISO 4762 - M4 x 6	
119	Magnet	Magnet	4		
120	Sechskantschraube	Hexagon screw	1	ISO 4017 - M12 x 60	
121	Scheibe	Washer	4	DIN 125 - A 13	
122	Federring	Spring ring	4	DIN 128 - A12	
123	Schraube	Screw	1	M12x50	
124	Sechskantmutter	Hexagon nut	3	ISO 4032 - M12	
125	Ölschauglas	Oil sight glass	1		
127	Innensechskantschraube	Socket head screw	3	ISO 4762 - M4 x 10	
128	Schmiernippel	Lubrication cup	1	8mm	0340114
129	Messingstift	Brass pin	2		
130	Keilleiste	Gib	1		033381651130
131	Paßfeder	Fitting key	1	6 x 6 x 16	042P6616
132	Innensechskantschraube	Socket head screw	3	ISO 4762 - M5 x 12	
133	Innensechskantschraube	Socket head screw	7	ISO 4762 - M5 x 10	
134	Innensechskantschraube	Socket head screw	1	ISO 4762 - M6 x 10	
135	Gewindestift	Grub screw	2	DIN 914 - M5 x 8	
136	Schraube	Screw	4	M4x8	
137	Sicherungsring	Retaining ring	2	DIN 471 - 10x1	042SR10W
138	Sensorring	Sensor ring	1		033381651138
139	Innensechskantschraube	Socket head screw	4	M4x12	
140	Stange	Rod	1		033381651140
141	Stahlkugel	Steel ball	2	8mm	042KU08
142	Feder	Spring	2		
143	Gewindestift	Grub screw	2	DIN 916 - M8 x 10	
144	Spannstift	Spring pin	2	ISO 13337 - 4 x 40	
145	Gewindestift	Grub screw	1		
146	Federblech_	Spring plate	1		
147	Frontabdeckung	Front cover	1	MH35G	03338165L01
147	Frontabdeckung	Front cover	1	MH35V	03338170147
148	Welle	Shaft	1		
149	Abdeckung	Cover	1		033381651149
150	Sicherheitsschalter	Safety switch	2	QKS7	
152	Innensechskantschraube	Socket head screw	1	M5x10	
153	Innensechskantschraube	Socket head screw	3	M4x8	
154	Fräsfutterschutz	Mill chuch safety	1		
155	Fräsfutterschutz	Mill chuch safety	1		
156	Winkel	Angle	1		
157	Aluprofil	Aluminium profiles	1		
158	Scheibe	Washer	1	5	
159	Gewindestift	Grub screw	1	DIN 916 - M4 x 10	

MH35G_MH35V_parts.fm

160	Innensechskantschraube	Socket head screw	4	ISO 4762 - M5 x 16	
161	Schraube	Screw	2		
162	Klemmschraube	Clamping screw	2		
163	Anzeige	Indicator	2		
164	Not-Aus-Schlagschalter	Emergency stop button	1		033381651164
165	Drehzahlanzeige	Rotation speed indicator	1		033381651165
166	Einstellknopf	Ajust knob	1		033381651166
167	Näherungssensor	Proximity sensor	1		
168	Halter	Holder	1		
169	Verfahrensensor	Traversing sensor	1		033381651169
170	Drehzahlsensor	Rotation speed sensor holder	1		033381651170
171	Sicherungsring	Retaining ring	2	24	
172	Platte	Plate	1		
173	Platte	Plate	1		033381651173
174	Klemmschraube	Clamping screw	1		
175	Potentiometer	Potentiometer	1		033381651175
176	Digitalanzeige	Digital display	1		0333818080
CPL	Bohrfutterschutz komplett	Drill Chuck Guard complete	1		033381651149CPL

Ersatzteilleiste Schaltschrank - Spare parts list switch cabinet

Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Schaltschrank	Switch cabinet	1		03338165401
2	Abdeckung	Cover	1		03338165402
3	Hauptschalter	Main switch	1		

Ersatzteilleiste Säule - Spare parts list column

Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Säule	Column	1		03338165201
2	Spindel	Spindle	1		03338165202
3	Axiallager	Thrust bearing	2	51104	04051104
4	Abdeckung	Cover	3		03338165204
5	Buchse	Bushing	4		03338165205
6	Kugellager	Ball bearing	1	6002	0406002R
7	Lagerbock	Bearing block	1		03338165207
8	Kugellager	Ball bearing	1	6201	0406201R
9	Welle	Shaft	1		03338165209
10	Flansch	Flange	1		03338165210
11	Kugellager	Ball bearing	2	6004	0406004R
12	Ring	Ring	2		
13	Nutmutter	Groove nut	4	M12X1.25-N	
14	Zahnscheibe	Gear washer	2		03338165214
15	Handhebel	Handle lever	1		03338165215
16	Zahnscheibe	Gear washer	2		03338165216
17	Gehäuse	Housing	1		
18	Sechskantmutter	Hexagon nut	1	M16	

19	Kurbel	Crank	1		03338165219
20	Kegelrad	Bevel gear	2		03338165220
21	Skalenring	Scale ring	1		03338165221
22	Innensechskantschraube	Socket head screw	4	ISO 4762 - M8 x 16	
23	Innensechskantschraube	Socket head screw	4	ISO 4762 - M8 x 25	
24	Federring	Spring washer	4	DIN 128 - A8	
25	Innensechskantschraube	Socket head screw	3	ISO 4762 - M6 x 16	
26	Gewindestift	Grub screw	1	DIN 916 - M4 x 8	
27	Federblech	Spring plate	1		
28	Sicherungsringe	Retaining ring	1	DIN 472 - 42x1,75	042SR42W
29	Paßfeder	Fitting key	2	A 4 x 4 x 12	042P4412
30	Sicherungsringe	Retaining ring	1	DIN 472 - 32x1,2	042SR32W
31	Innensechskantschraube	Socket head screw	4	ISO 4762 - M8 x 30	
32	Paßfeder	Fitting key	1	A 5 x 5 x 18	042P5518
33	Paßfeder	Fitting key	1	A 5 x 5 x 10	042P5510
34	Scheibe	Washer	1	DIN 125 - A 17	
35	Scheibe	Washer	4	DIN 125 - A 4,3	
36	Innensechskantschraube	Socket head screw	4	ISO 4762 - M4 x 10	
37	Innensechskantschraube	Socket head screw	1	ISO 4762 - M8 x 12	
38	Faltenbalg	Rubber gaiter	1		0333843037
39	Innensechskantschraube	Socket head screw	4	ISO 4762 - M6 x 12	
40	Scheibe	Washer	4	DIN 125 - A 6,4	
41	Spindel	Spindle	1		03338165241
42	Gehäuse	Housing	1		03338165242
43	Zahnriemen	Gear belt	1		0395M11295

Ersatzteilleiste Kreuztisch - Spare parts list cross table

Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Frästisch	Mill table	1		03338165301
2	Handrad	Handle	3		03338165302
3	Führung	Guide	1		03338165303
4	Maschinenfuss	Machine foot	1		03338165304
5	Lagerbock	Bearing block	3		03338165305
6	Kugellager	Ball bearing	2	3202A	0403202A
7	Spindel	Spindle	1		03338165307
8	Keilleiste	Gib	2		03338165308
10	Spindelmutter	Spindle nut	2		03338165310
11	Klemmmutter	Clamping nut	3		
14	Skalenring	Scale ring	3		03338165314
17	Ring	Ring	1		
18	Kugellager	Ball bearing	1	6002	0406002R
19	Buchse	Bushing	1		
20	Handhebel	Handle lever	3		03338165320
22	Zeiger	Indicator	1		03338165322
23	Buchse	Bushing	4		
24	Block	Block	2		

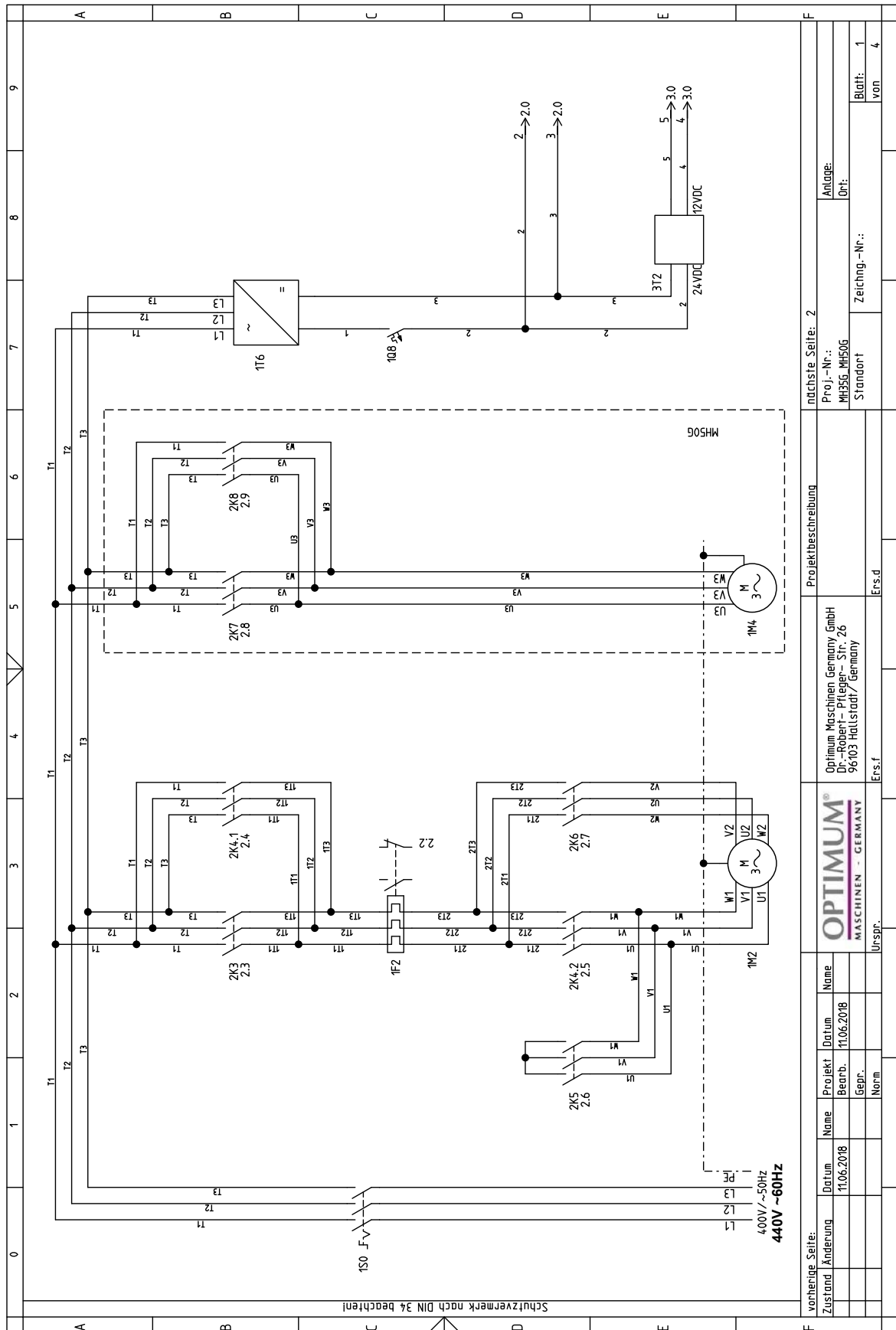
MH35G_MH35V_parts.fm

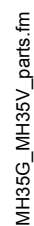
25	Klemmhebel	Clamping lever	4		
26	Klemmschraube	Clamping screw	4		03338165326
27	Innensechskantschraube	Socket head screw	9	ISO 4762 - M8 x 25	
28	Kegelstift	Taper stift	6	ISO 8736 - 8x30	
29	Paßfeder	Fitting key	1	A 5 x 5 x 12	042P5512
30	Scheibe	Washer	3	DIN 125 - A 13	
31	Federblech	Spring platte	3		
32	Gewindestift	Grub screw	3	DIN 4026 - M12 x 12	
33	Innensechskantschraube	Socket head screw	4	ISO 4762 - M8 x 20	
34	Federring	Spring washer	4	DIN 128 - A8	
35	Innensechskantschraube	Socket head screw	2	ISO 4762 - M4 x 10	
36	Sicherungsring	Retaining ring	2	DIN 472 - 35x1,5	042SR35W
37	Paßfeder	Fitting key	2	A 5 x 5 x 14	042P5516
38	Schmiernippel	Lubrication cup	1	8	0340114
39	Messingstift	Brass pin	4		
40	Innensechskantschraube	Socket head screw	2	ISO 4762 - M8 x 16	
41	Innensechskantschraube	Socket head screw	2	ISO 4762 - M5 x 10	
42	Scheibe	Washer	4	DIN 125 - A 17	
43	Federring	Spring washer	4	DIN 128 - A16	
44	Innensechskantschraube	Socket head screw	4	ISO 4762 - M16 x 55	
45	Platte	Plate	1		
46	Gummiabdeckung	Rubber cover	1		03338165346
47	Innensechskantschraube	Socket head screw	2	ISO 4762 - M6 x 12	
48	Scheibe	Washer	2	DIN 125 - A 6,4	
49	Skala	Scale	1		03338165349
50	Anschluss	Plug	1		
51	Spindel	Spindle	1		03338165351

Ersatzteilliste Maschinenschilder - Spare part list machine labels

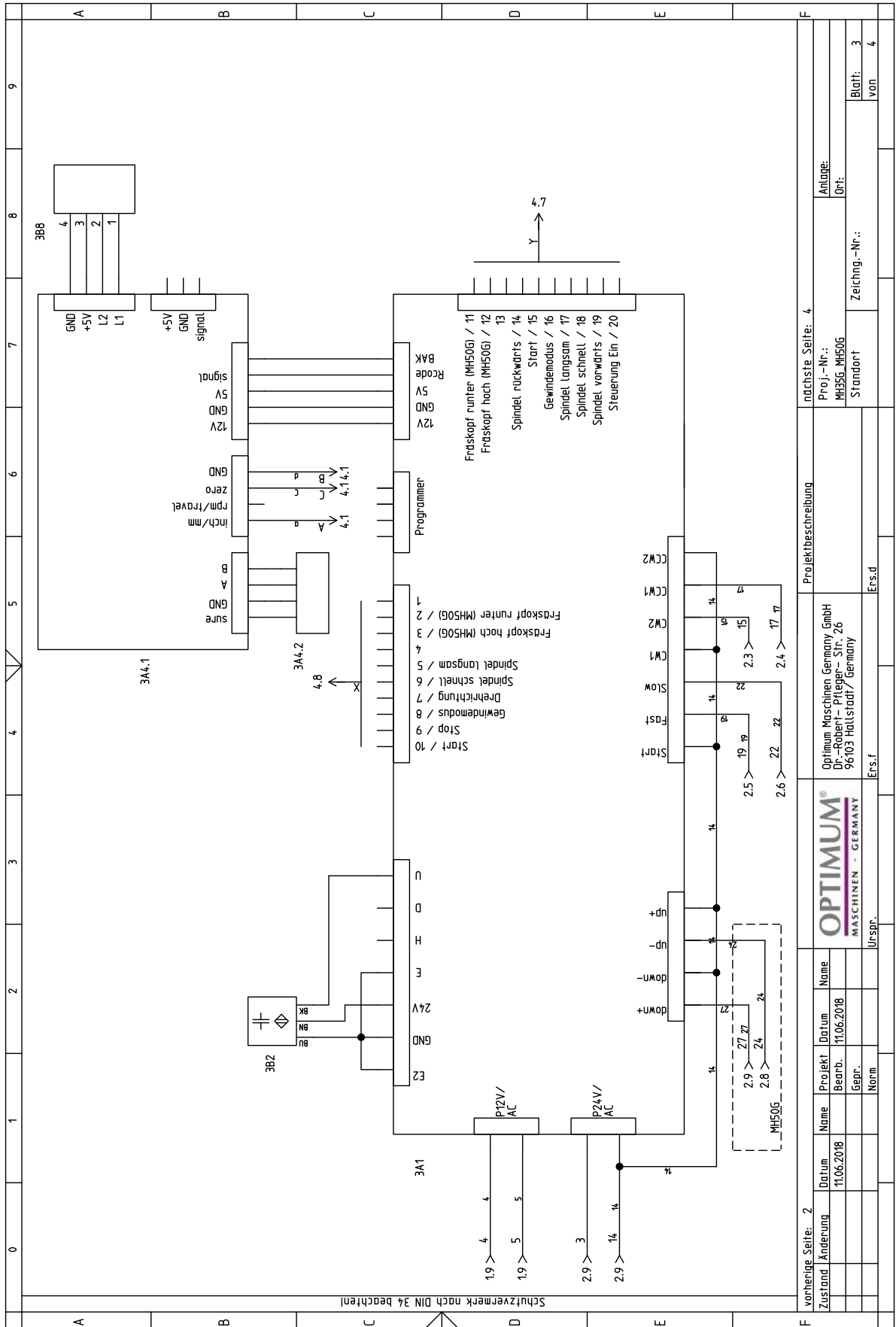
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Frontschild	Front lable	1	MH35G	03338165L01
1	Frontschild	Front lable	1	MH35V	03338170147
2	Drehzahlschild	Rotation speed lable	1	MH35G	03338165L02
2	Drehzahlschild	Rotation speed lable	1	MH35V	03338170L02
3	Sicherheitsschild	Safety lable	1	MH35G + MH35V	03338165L03
4	Sicherheitsschild	Safety lable	1	MH35V	03338170L04

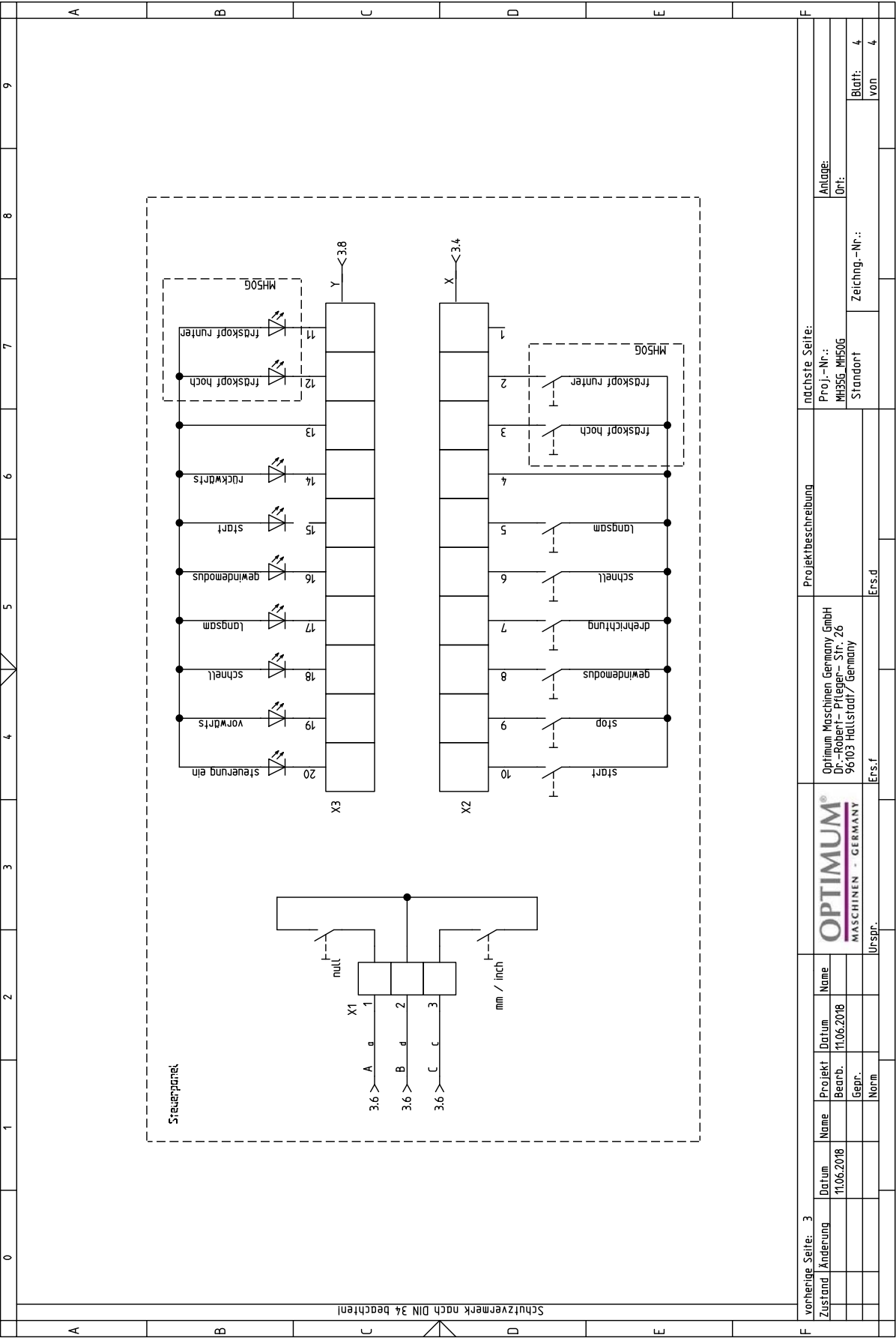
6.14 Schaltplan - Wiring diagram - MH35G





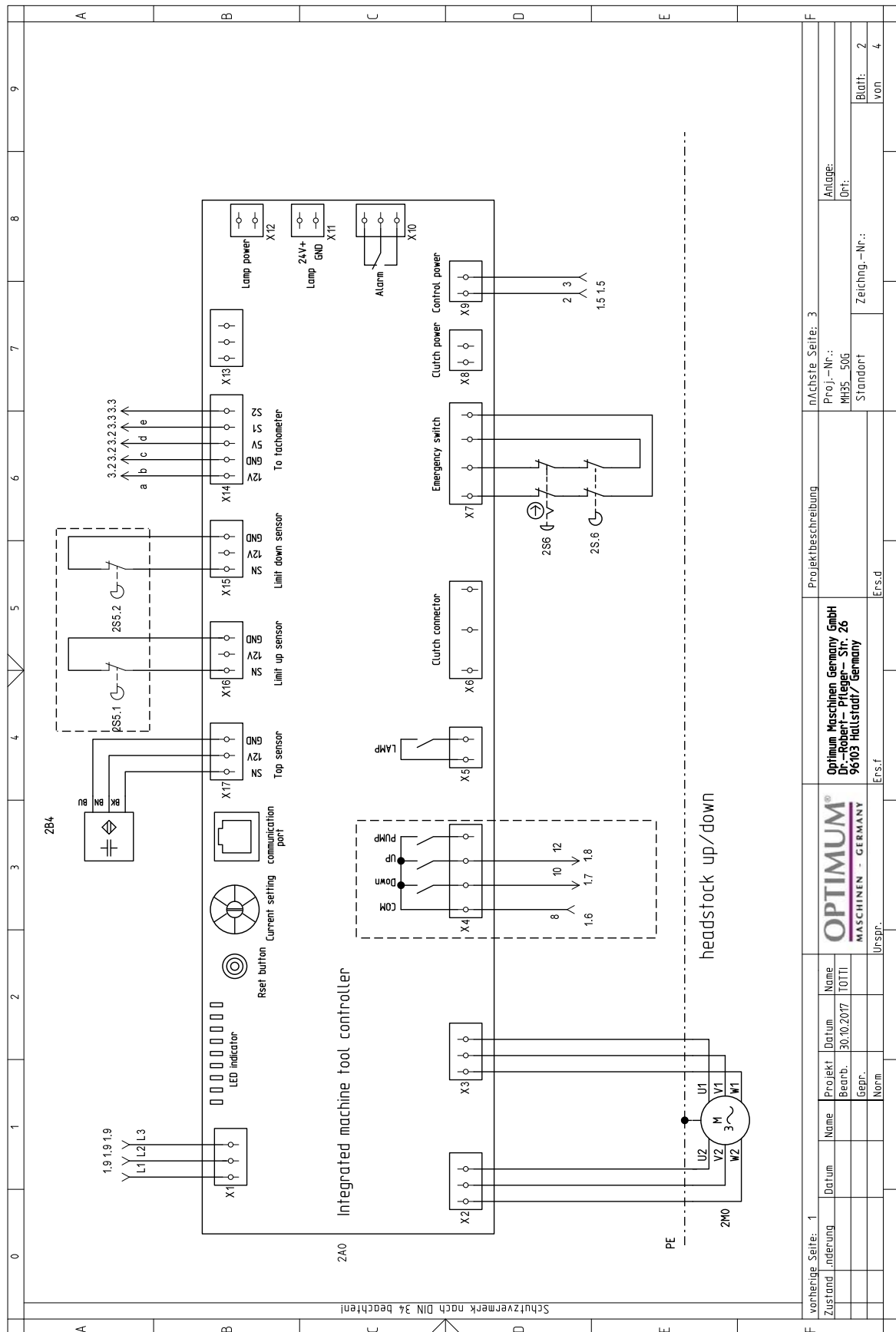
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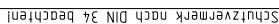




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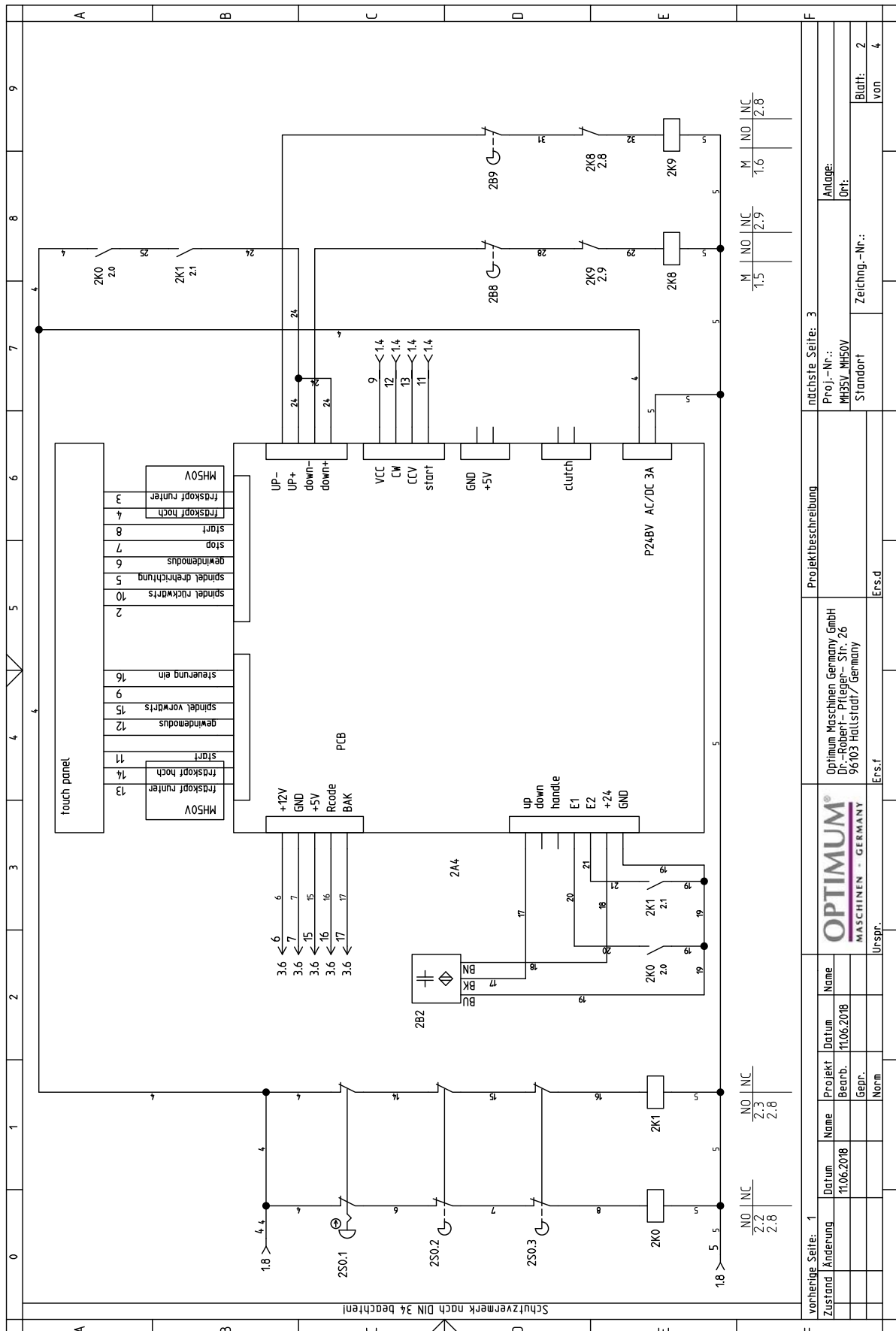
Teilleiste elektrische Komponente, MH35G - Spare part electrical component, MH35G					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1F2	Motorschutzscharter	Motor safety switch	1		
1M2	Spindelmotor	Spindle motor	1		
1M4	Motor Fräskopfverstellung	Motor mill head adjusting	1		
1S0	Hauptscharter	Main switch	1		
1T6	Netzteil	Power pack	1		
2K1	Relais Sicherheitssteuerung	Safety control relay	1		
2K2	Relais Sicherheitssteuerung	Safety control relay	1		
2K3	Schütz Vorwärts	Contacto CW	1		
2K4.1	Schütz Rückwärts	Contacto CCW	1		
2K5	Schütz Dreiecklauf	Contacto triangle run	1		
2K4.2	Schütz Sternlauf	Contacto star running	1		
2K6	Schütz Sternlauf	Contacto star running	1		
1Q8	Sicherungsautomat	Automatical fuse	1		
3A1	Steuerkarte	Control board	1		
3A4.2	Encoder	Encoder	1		
3B2	Startsensor	Start sensor	1		
3B8	Lesekopf	Read head	1		
2S1	Not-Halt-Scharter	Emergency stop button	1		
2S1.1	Sicherheitsscharter Fräsfutterschutz	Chuck cover safety switch	1		
2S1.2	Endscharter Werkzeugaustreiber	Tool changer end switch	1		

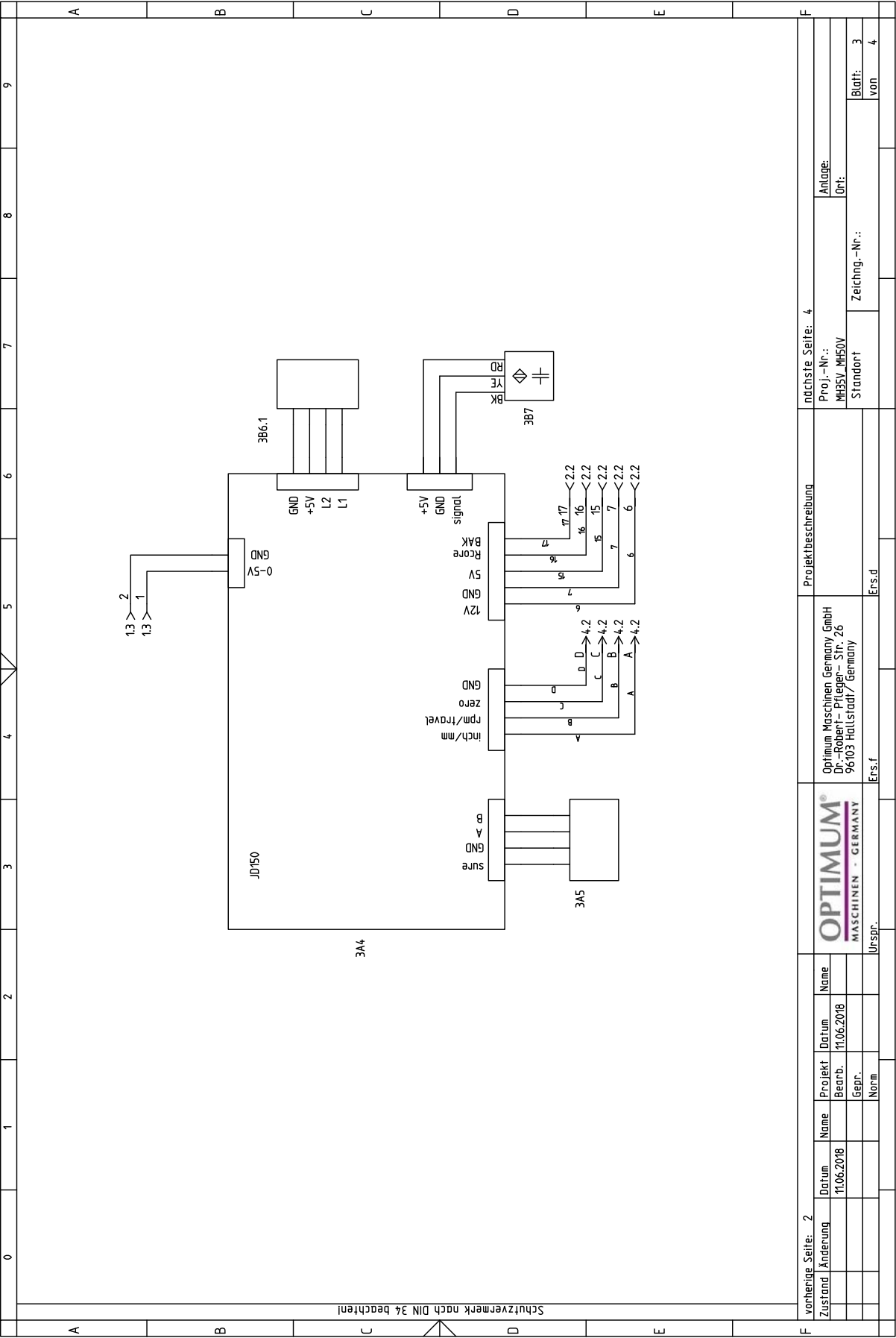




Teilleiste elektrische Komponente, MH35G Integrierte Werkzeugsteuerung - Spare part electrical component, MH35G integrated tool control

Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1S0	Shanghai Index Schalter	Shanghai Index Switch	1		
1K7	positiver Schütz	Positive contactor	1		
1K8	Gegen Schütz	Anti-contactor	1		
1M2	Hubmotor	Lifting motor	1		
1T4	Trafo	Transformer	1		
1F4	Schutzschalter (doppelter Durchgang)	Circuit breaker (double pass)	1		
1F5	Schutzschalter	Circuit Breaker (15)	1		
1F6	Schutzschalter	Circuit breaker (24V)	1		
2A0	Kedu Steuerung	Kedu Controller	1		
2MO	Motor	Motor	1		
2B4	Integrierte Sonde	Embedded probe	1		
2S5.1	Oberer Endschalter	Upper limit switch	1		
2S5.2	Unterer Endschalter	Lower limit switch	1		
2S6	Not-Halt	Emergency stop	1		
2S.6	Schalter Bohrfutterschutz	Drill chuck protection switch	1		
3A1.1	LCD	LCD	1		
3A1.2	Encoder	Encoder	1		
3B4	Magnetlesekopf	Reading head	1		
3A5	Panel	Panel	1		














Teileliste elektrische Komponente, MH35V - Spare part electrical component, MH35V					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1G9	Ventilator	Fan	1		
1M3	Spindelmotor	Spindle motor	1		
1Q9	Sicherungsautomat	Automatic fuse	1		
1S0	Hauptschalter	Main switch	1		
1T7	Netzteil	Power pack	1		
1L0	Drossel	Inductor	1		033381701L0
1U2	Frequenzumrichter	Frequency converter	1		
1Z0	Netzfilter	Line filter	1		
2A4	Steuerplatine	Control board	1		033381702A4
2B2	Startsensor	Start sensor	1		
2S1	Not-Halt-Schalter	Emergency stop button	1		
2S1.1	Sicherheitsschalter Fräsfutterschutz	Chuck cover safety switch	1		
2S1.2	Endschalter Werkzeugaustreiber	Tool changer end switch	1		
3A4	Steuerpanel	Control panel	1		
3B6.1	Lesekopf	Read head	1		
3B7	Drehzahlsensor	Speed sensor	1		
3A5	Encoder	Encoder	1		

oil-compare-list.fm

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

Spezialfette, wasserabweisend Special greases, water resistant Graisses spéciales, déperlant			Aral Aralub	Energrease PR 9143		ALTEMP Q NB 50 Klüberpaste ME 31-52	Mobilux EP 0 Mobil Greaserex 47		
Wälzlagerfett Bearing grease Graisse de roulement		K 3 K-20 (Li-verseift)	Aralub HL 3	BP Energrease LS 3	BEACON 3	CENTO- PLEX 3	Mobilux 3	Shell Alva- nia R 3 Alva- nia G 3	Multifak Pre- mium 3
Öle für Gleitbahnen Oils for slideways Huiles pour glissières	VG 68	CGLP 68	Aral Deganit BW 68	BP Maccurat D68	ESSO Febis K68	LAMORA D 68	Mobil Vactra Oil No.2	Shell Tonna S2 M 68	Way lubri- cant X 68
Öle für Hochfrequenzspindeln Oils for Built-in spindles Huiles pour broches à haute vitesse	VG 68		Deol BG 68	Emergol HLP-D68	Spartan EP 68		Drucköl KLP 68-C	Shell Omala 68	
Fett für Zentralschmierung (Fließfett) Grease for central lubrication Graisse pour lubrification centrale	NLGI Klasse 000 NLGI class 000		ARALUB BAB 000	Grease EP 000	Shell Gadus S4 V45AC	CENTO- PLEX GLP 500	Mobilux EP 023		Multifak 264 EP 000
Fett für Hochfrequenzspindeln Grease for Built-in spindles Graisse pour broches à haute vitesse	<p>METAFLUX-Fett-Paste (Grease paste) Nr. 70-8508</p> <p>METAFLUX-Moly-Spray Nr. 70-82</p> <p>Techno Service GmbH ; Detmolder Strasse 515 ; D-33605 Bielefeld ; (++49) 0521- 924440 ; www.metaflux-ts.de</p>								
Kühlschmiermittel Cooling lubricants Lubrifiants de refroidissement	<p>Schneidöl Aquacut C1, 10 L Gebinde, Artikel Nr. 3530030 EG Sicherheitsdatenblatt http://www.optimum-daten.de/data-sheets/Optimum-Aquacut_C1-EC-datasheet_3530030_DE.pdf</p>		Aral Emusol	BP Sevora	Esso Kutwell		Mobilcut	Shell Adrana	Chevron Soluble Oil B



7 Malfunctions

7.1 Milling machine malfunctions

Malfunction	Cause/ possible effects	Solution
Tool "burnt".	<ul style="list-style-type: none"> • Incorrect speed. • Chips are not coming out of the drilled hole. • Blunt tool. • Operating without cooling agent. 	<ul style="list-style-type: none"> • Choose a different speed, excessive feed. • Withdraw the tool more frequently. • Sharpen or replace tool. • Use coolant.
Taper cannot be inserted in quill.	<ul style="list-style-type: none"> • Remove any dirt, grease or oil from the internal conical surface of the spindle sleeve or the taper. • Screwed pull stud? 	<ul style="list-style-type: none"> • Clean surfaces well. Keep surfaces free from grease. • Pull stud on page 19
Motor does not start.	<ul style="list-style-type: none"> • Defective fuse. • Circuit breaker 	<ul style="list-style-type: none"> • Have it checked by qualified personnel.
Rattle the spindle if the workpiece surface is rough.	<ul style="list-style-type: none"> • Upcut mill machining not possible under the current operating conditions. • Clamping lever of the movement axes not tightened. • Loose collet chuck, loose drill chuck, mechanical security tool clamping system not engaged. • Tool is blunt. • The workpiece is not fastened. • Excessive slack in bearing. • Spindle moves up and down. 	<ul style="list-style-type: none"> • Perform conventional milling. • Tighten the clamping lever. • Check, enable mechanical security tool clamping system. • 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.
Fine feed of the spindle sleeve does not work	<ul style="list-style-type: none"> • Fine feed is not correctly activated. • Coupling of the fine feed does not cam-in, is soiled, blurred, worn, defective 	<ul style="list-style-type: none"> • Spindle quill feed on page 36 • Clean, replace.
Earth leakage circuit breaker trips	<ul style="list-style-type: none"> • EMC filter in the frequency converter. Not correct type of RCCB in MH35V 	<ul style="list-style-type: none"> • When the ELCB triggers on page 31



8 Appendix

8.1 Copyright

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Subject to technical changes without notice.

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.
Drawbar	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 manual

Chapter	Short summary	new version number
2 ; 4.3	Speed range MH35V; Switching the machine on	1.0.1
parts	Spare part drawings	1.0.2
1.1 ; CE	Update of rating plate MH35V ; Update CE declaration	1.0.3
3 ; 4.7.1	Interdepartmental transport+ speed tables + Circuit diagram integrated tool control MH35G_MH50G	1.1.0



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. Ownership of 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.

The following items are also not subject to liability or warranty claims:

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

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 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.
- Drain the oil from the gear box.

8.7.4 Packing and loading

- Place the machine on a pallet for removal.
☞ Lifting the machine on page 24

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 it 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 send us the following information:

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

Optimum Maschinen Germany GmbH

Dr.-Robert-Pfleger-Str. 26

D-96103 Hallstadt

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: MH35G

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: 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

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



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: MH35V

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: 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 A

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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Quellenverzeichnis von Ihrem Fachhändler Metallbau Mehner

Optimum Fräsmaschinen und CNC Fräsmaschinen:
Optimum OPTImill MH35 Übersicht

- OPTImill MH 35 G / V
 - OPTImill MH 35 G/V Ersatzteile
 - OPTImill MH 35 G/V Zubehör
- CNC OPTImill MH 35 V
 - OPTImill MH 35 G/V Ersatzteile
 - OPTImill MH 35 G/V Zubehör
- OPTImill Zubehör

Ihr Ersatzteil nicht in den Listen?

Direkt zum >>**Formular Download**<<. Tragen sie Ihr Maschinenmodell, samt Bauteil und Artikelnr. ein und wir unterbreiten Ihnen ein Angebot.

Allgemeine Betriebsmittel

- Öle und Schmiermittel
- Minimalmengenschmierung

Weitere interessante Verweise

- Bohrmaschinen / CNC Steuerungen
- Drehmaschinen / CNC Drehmaschinen
- Drucklufttechnik / Kompressoren