OPTIMUM®
MASCHINEN - GERMANY

Operating manual

Version 1.2.8

Milling-machine

OPTImill® MT 50

3336005

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Preface

Dear customer,

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

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

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

Information

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

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

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

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

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

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

Optimum Maschinen Germany GmbH

Dr.- Robert - Pfleger - Str. 26

D-96103 Hallstadt

Mail: info@optimum-maschinen.de

Internet: www.optimum-maschinen.com

1 Safety

Glossary of symbols

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

This part of the operating instructions

- ❍ explains the meaning and use of the warning notices included in these operating instructions,
- ❍ defines the intended use of the 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 legal regulations for accident prevention,
- ❍ the prohibition, warning and mandatory signs as well as the warning labels on the milling-machine.

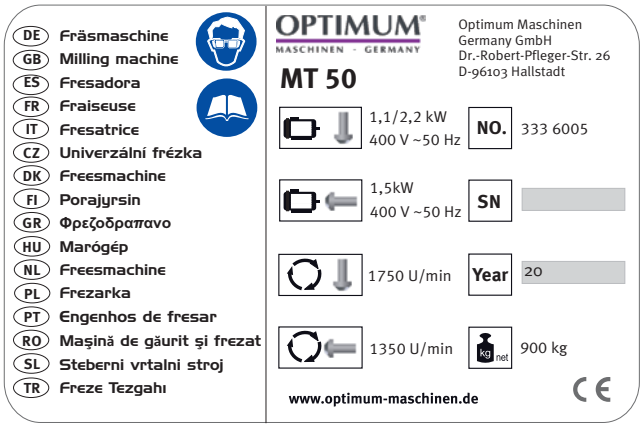
When installing, operating, maintaining and repairing the milling-machine it is necessary to observe the European standards.

With regard to relevant national legislation which has not yet been adjusted to the European standards, the applicable national legislation needs to be observed.

If required it is necessary to take the corresponding measures to comply with the country-specific regulations before commissioning the milling-machine.

Always keep this documentation close to the milling-machine.

1.1 Rating plate



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INFORMATION

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

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

1.2 Safety instructions (warning notes)


Warning danger of slipping!


Warning risk of stumbling!


Warning hot surface!


Warning biological hazard!


Warning of automatic start-up!


Warning tilting danger!


Warning of suspended loads!


Caution, danger of explosive substances!


Activation forbidden!


Read the operating instructions before commissioning!


Disconnect the mains plug!


Use protective glasses!


Use protective gloves!


Use protective boots!


Use protective suit!


Use ear protection!


Only switch in standstill!


Protect the environment!


Contact address

1.2.1 Classification of hazards

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

Ideogram	Warning alert	Definition / consequence
	**DANGER!**	Threatening danger that will cause serious injury or death to people.
	WARNING!	A danger that might cause severe injury to the personnel or can lead to death.
	CAUTION!	Danger or unsafe procedure that might cause injury to people or damage to property.
	**ATTENTION!**	Situation that could cause damage to the milling machine and products and other types of damage. No risk of injury to people.
	**INFORMATION**	Application tips and other important or useful information and notes. No dangerous or harmful consequences for people or objects.

In case of specific dangers, we replace the pictogram by

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

1.2.2 Other pictograms

1.3 Intended use

WARNING!

In the event of improper use, the milling-machine

- **will endanger personnel,**
- **the milling-machine and other material property of the operating company will be endangered,**
- **the correct function of the milling-machine may be affected.**

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

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

The table housing of the cross table included in the scope of delivery can be used as chip and spray guard. If necessary, the chip and splash guard on the milling table can be removed, if this is not required for the operation.

If the milling-machine is used in any way other than described above, modified without the approval of the company Optimum Maschinen Germany GmbH then the milling-machine is being used improperly. We will not be held liable for any damages resulting from any operation which is not in accordance with the intended use.

We expressly point out that the guarantee or CE conformity will expire due to any constructive technical or procedural changes which had not been performed by the company Optimum Maschinen Germany GmbH.

It is also part of intended use that you

- the maximum values for the milling-machine are complied with,
- the operating manual is observed,
- the inspection and maintenance instructions are observed.

☞ Technical data on page 19

WARNING!

Heaviest injuries through improper use.

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

1.4 Reasonably foreseeable misuses

Any other use as the one determined under the "Intended use" or any use

beyond the described use shall be deemed as not in conformity and is forbidden.

Any other use has to be discussed with the manufacturer.

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

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

The operators must be qualified.

1.4.1 Avoiding misuses

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

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 workpieces flying off.

➜ Clamp the workpiece in the machine vice. Make sure that the workpiece is firmly clamped in the machine vice resp. that the machine vice is firmly clamped on 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.
- Correctly adjust the bearing clearance and the guidings.

It is recommended:

- Insert the drill in a way that it is exactly positioned between the three clamping jaws of the quick action chuck.

- Clamp and mills by means of the collet chuck and the corresponding collets.
- Clamp end face mills by means of 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
- in case of too strong pressure the drill will get worn early or even might break resp. get jammed in the hole. If the drill gets jammed immediately stop the main motor by pressing the emergency stop button,
- for hard materials, e.g. steel, use commercial cooling / lubricating agents,
- generally always drive the turning spindle out of the workpiece.

ATTENTION!

Do not use the quick action drill chuck for milling tools. Never clamp a milling cutter into the quick action drill chuck. Use a collet chuck and the corresponding collets for the end mill.

When milling make sure that

- the corresponding 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 in a way that the cutting speed remains constant,

for hard materials commercial cooling / lubricating agents are used.

1.5 Possible dangers caused by the milling-machine

The milling-machine was built using the latest technological advances.

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

- at high speeds,
- with rotating parts and tools,
- with electrical voltages and currents.

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

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

INFORMATION

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

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

Always disconnect the milling-machine from the electrical power supply when performing cleaning or maintenance works.

WARNING !

The milling-machine may only be used with 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 have to be equipped with the prescribed safety devices.

This is your responsibility being the operating company!

☞ **Safety devices on page 13**

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1.6 Qualification of personnel

1.6.1 Target group

This manual is addressed to

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

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

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

Unclear responsibilities constitute a safety risk!

Always lock the main switch after switching off the milling-machine. This will prevent it from being used by unauthorized personnel.

INFORMATION

Unclear responsibilities constitute a safety risk!

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

Operator

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

Electrical specialist

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

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

Qualified personnel

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

Instructed person

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

1.6.2 Authorized personnel

WARNING!

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

Only authorized personnel may operate the milling-machine !

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

1.6.3 Obligations of the operating company

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

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

The operator must also

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

1.6.4 Obligations of the operator

The operator must

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

1.6.5 Additional requirements regarding the qualification

For work on electrical components or equipment, there are additional requirements:

- Must only be performed by an electrical specialist or under the direction and supervision of an electrical specialist.

Before carrying out work on electrical components or operating materials, the following measures must be taken, in the order given.

➜ Disconnect all poles.

➜ Secure against switching on.

➜ Check if the machine is zero potential.

1.7 Operator positions

The operator's position is at the front or on the right front of the milling-machine.

1.8 Safety measures during operation

CAUTION!

Risk due to inhaling of health hazardous dusts and mist.

Dependent on the material which need to be processed and the used auxiliaries dusts and mist may be caused which might impair you health.

Make sure that the generated health hazardous dusts and mist are safely sucked off at the point of origin and is dissipated or filtered from the working area. To do so, use a suitable extraction unit.

CAUTION!

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

Before processing inflammable materials (e.g. aluminium, magnesium) or using inflammable auxiliary materials (e.g. spirit) it is necessary to take additional preventive measures in order to safely avoid health risks.

1.9 Safety devices

Use the milling-machine only with properly functioning safety devices.

Stop the milling-machine immediately if there is a failure on the safety device or if it is not functioning for any reason.

It is your responsibility!

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

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

WARNING!

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

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

The milling machine includes the following safety devices:

- ❍ a lockable main switch,
- ❍ an emergency-stop push button,
- ❍ a separating protective device on the vertical spindle,
- ❍ a milling table with T-slots to fix the workpiece or the clamping device.
- ❍ a removable chip and splash guard on the milling table.

WARNING!

The separating protective equipment which is made available and delivered together with the machine is designed to reduce the risk of workpieces or fractions of them which being expelled, but not to remove them completely. Always work carefully and observe the limit values of your chipping process.

INFORMATION

The table housing of the cross table included in the scope of delivery can be used as chip and splash guard. When using the horizontal mode, the chip and splash guard must be mounted.

1.9.1 Lockable main switch

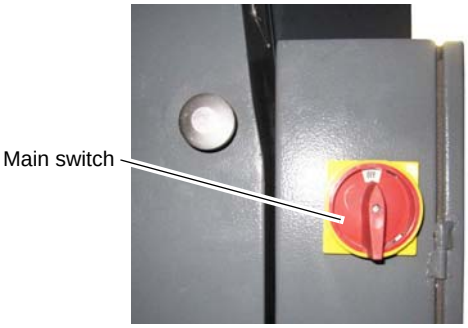
WARNING!

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

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

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

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

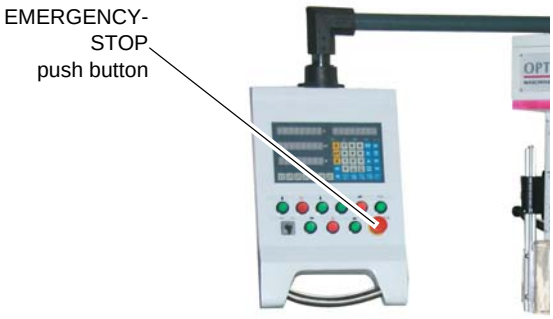


Img.1-1: Main switch

1.9.2 Emergency-stop push button

Turn the knob of the push button to the right in order to be able to restart the machine after having pressed the push button.

Then switch off the main switch and switch it on again.



Img.1-2: emergency-stop push button

1.9.3 Milling table

Seats for T-slots are attached to the milling table.

WARNING!

Risk of injury due to parts flying off at high speed. Securely fix the workpiece on the milling table.

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1.10 Safety check

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

Check all safety devices

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

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

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

INFORMATION

Use the following table in order to organize the checks.

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

Functional check		
Equipment	**Check**	**OK**
Spindle protection	The drive can only be switched on when the spindle protection is in the operating position.	
emergency-stop switch	When the emergency-stop button is activated, the milling-machine should switch off. Make sure that it is only possible to restart the machine if the EMERGENCY STOP push button is unlocked.	
Drives	The spindle drives for horizontal milling and vertical milling can not run simultaneously.	
Date:	**checked by (signature):**	

1.11 Personnel protective equipment

For some works you need personnel protective equipment as protective equipment.

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

Use protective gloves when handling pieces with sharp edges.

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

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

Before starting work make sure that the prescribed personnel protective equipment is available at the working place.

CAUTION!

Dirty or contaminated personnel protective equipment can cause diseases.

Clean it each time after use and once a week.

1.12 Safety during operation

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

WARNING!

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

Avoid any unsafe working practices:

Make sure that nobody is endangered by your work.

- ➜ The instructions mentioned in these operating instructions have to be strictly observed during assembly, operation, maintenance and repair.
- ➜ Switch off the milling machine machine before measuring the workpiece.
- ➜ Do not work on the milling-machine, if your concentration is reduced, for example, because you are taking medication.
- ➜ Observe the accident prevention regulations issued by your Employers Liability Insurance Association or other competent supervisory authority, responsible for your company.
- ➜ Inform the supervisor about all endangerments or errors.
- ➜ Stay on the milling-machine until the movements are completely stopped.
- ➜ Use the prescribed personnel protective equipment. Make sure to wear a well-fitting work suit and, if necessary, a hairnet.
- ➜ Switch off the milling machine on the main switch before changing the tool.
- ➜ Use appropriate auxiliary materials to remove drilling and milling chips.
- ➜ Make sure that nobody is endangered by your work.
- ➜ Safely and firmly clamp the workpiece before switching on the milling machine.
- ➜ Wear when working on the machine no jewelry, watches or rings.

1.13 Safety during maintenance

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

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

1.13.1 Switching-off and securing the milling-machine

Switch off the milling-machine by turning off the main switch before starting any maintenance andrepair work.

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

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

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

Place a warning sign on the milling-machine.

WARNING!

Live parts and moves of machine parts can injure you or others dangerously! Proceed with extreme care if you cannot switch off the milling-machine by turning off the main switch due to required works (e.g. functional control).

1.13.2 Using lifting equipment

WARNING!

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

Check that the lifting equipment and load-suspension gears are of sufficient load capacity and are in perfect condition. Observe the accident prevention regulations issued by your Employers Liability Insurance Association or other competent supervisory authority, responsible for your company. Fasten the loads properly. Never walk under suspended loads!

1.13.3 Mechanical maintenance work

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

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

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

Check if they are working properly!

1.14 Accident report

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

There are many possible causes for "near misses".

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

INFORMATION

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

1.15 Electrical system

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. Disconnect the Drehmaschine immediately if there is a malfunction in the power supply!

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

The operating company responsible for 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.

The inspection prior to initial commissioning is not required if the operator receives confirmation from the manufacturer or installer that the electrical systems and operating equipment comply with the accident prevention regulations, see conformity declaration.

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

1.16 Inspection deadlines

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

2 Technical data

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

2.1 Electrical connection	
Total connected load	4.5 KW / 400V / 50Hz
Motor power horizontal spindle	1.5 kW
Motor power vertical spindle	1.1 / 2.2 kW

2.2 Dimensions	
Spindle seat (horizontal milling, vertical milling)	Taper SK 40
Cross table, model up to serial number J201310355	800mm x 240mm
Cross table, model up to serial number J201310356	1000mm x 240mm
Height	☞ Installation plan on page 22
Width	
Depth	
Total weight	900 kg
Weight including packaging	1050 kg
Dimensions of packaging L x W x H	1290 x 1220 x 2100mm
Max. load of cross table	160 kg
T-slot size / number	14mm / 4

2.3 Adjustment travels/ Slewing ranges/ Distances	
Spindle stroke	120 mm
Traverse path X direction cross table	580 mm
Scaling travel X direction cross table	0.002mm
Traverse path Y direction cross table	200 mm
Scaling travel Y direction cross table	0.002mm
Traverse path Z direction cross table	340 mm
Scaling travel Z direction cross table	0.002mm
Throat vertical spindle	240 - 650 mm
Throat horizontal spindle	0 - 185 mm
Spindle stroke vertical spindle	0 - 120 mm

2.4 Speeds / feeds	
Spindle speed (vertical milling) ~ 50Hz connection	115 rpm - 1750 rpm
Spindle speed (vertical milling) ~ 60Hz connection	140 rpm - 2100 rpm
Gear stages (vertical milling)	8
Spindle speed (horizontal milling) ~ 50Hz connection	60 rpm - 1350 rpm
Spindle speed (horizontal milling) ~ 60Hz connection	70 rpm - 1600 rpm
Gear stages (horizontal milling)	9
Table feed X axis ~ 50Hz connection	24 - 720 mm/min
Table feed X axis ~ 60Hz connection	29 - 864 mm/min
Table feed drive	0.37 kW

2.5 Drilling capacity	
Drilling capacity in steel (S235JR)	30 mm
Continuous drilling capacity in steel (S235JR)	25 mm

2.6 Coolant lubricant system	
Power of the coolant/ lubricant pumps	40 W
Connection pump	400V ~ 50Hz
Tank capacity	12 litres

2.7 Operating material	☞ Lubricant on page 80
Gear oil	Mobilgear 627 (Viscosity class 100) or Mobilgear 629 (Viscosity class 150)
Grease	Commercial bearing grease
Coolant lubricant system	Water mixable, nebular arm, high flash point, nitrite content of the emulsion is less than 20 mg/l

2.8 Environmental conditions	
Temperature	5-35 °C
Humidity	25-28 %

2.9 Emissions

Maximum sound pressure level at 1 m distance from the machine and 1.60 m above the ground according to DIN ISO 8525 is 74 to 79 dB(A).
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 80dB(A).

INFORMATION

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

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

INFORMATION

The mentioned numerical value is the emission level and not necessarily a safe working level.

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

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

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

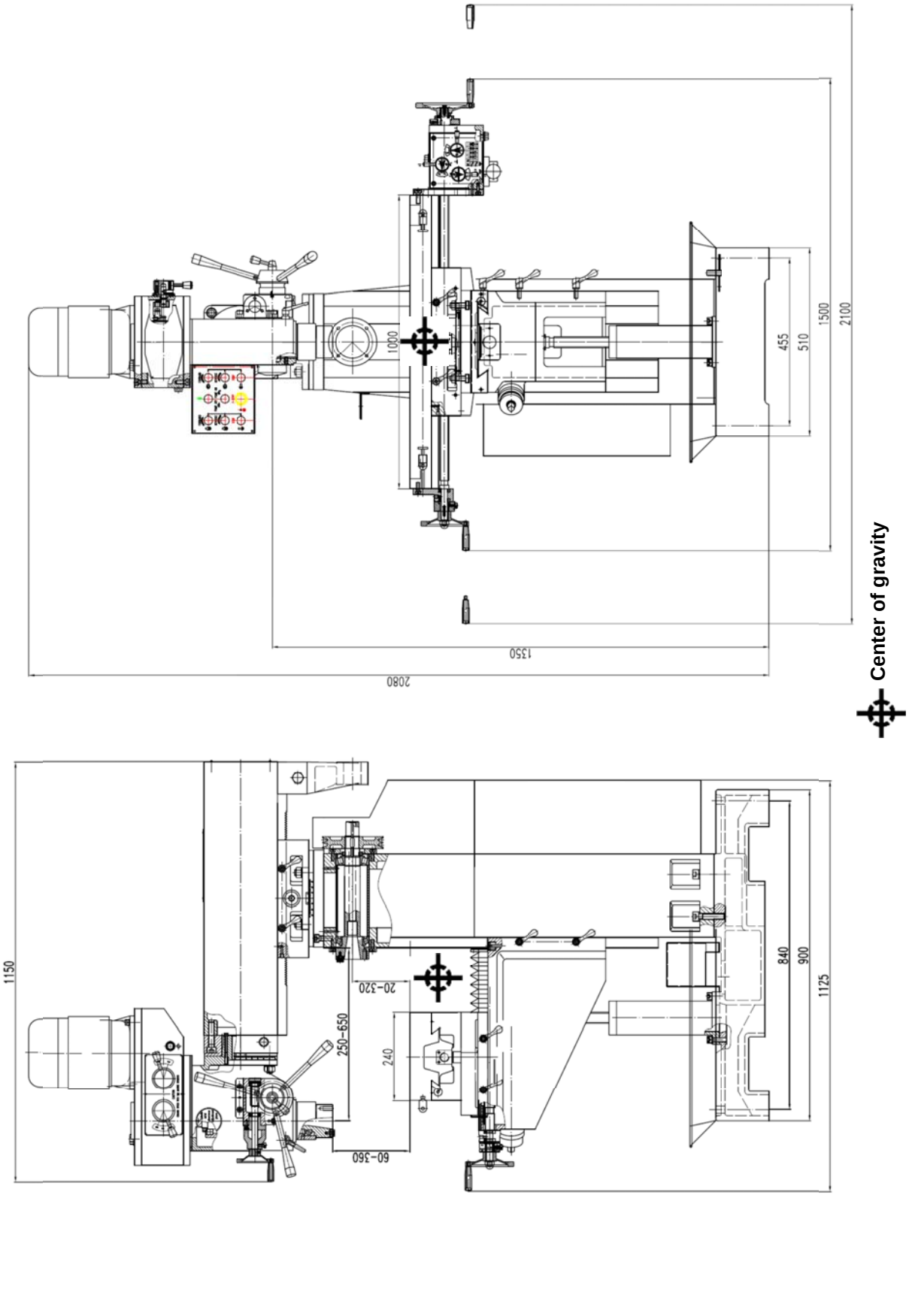
Furthermore, it is possible that the admissible exposure level might be different from country to country due to national regulations.
This information about the noise emission shall allow the operator of the machine to more easily evaluate the endangering and risks.

CAUTION!

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

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

2.10 Installation plan



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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.

4 Assembly

4.1 Unpacking the machine

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.

4.2 Scope of delivery

Check the milling machine immediately after delivery for transport damage, missing parts and loose locking bolts. Compare the scope of delivery with the attached packing list.

4.3 Installation and assembly

4.3.1 Requirements to the installation site

Organize the working area around the milling-machine according to the local safety regulations.
☞ Dimensions on page 19

The working area for operating, maintenance and repair must not be hindered.

➜ Check if the underground of the milling-machine is level using a spirit level.

➜ Check if the underground is sufficiently stable and rigid.
☞ Total weight on page 19

ATTENTION!

Insufficient rigidity of the foundation leads to the superposition of the vibrations of the milling-machine and of the underground (natural frequency of components). Critical speeds and moves in the axis with displeasing vibrations are rapidly achieved in case of insufficient rigidity of the whole system and will lead to bad milling results.

INFORMATION

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

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4.3.2 Load attachment points

The milling-machine can be lift by means of a sling or on the recess in the mounting foot with the help of a forklift truck.

WARNING!

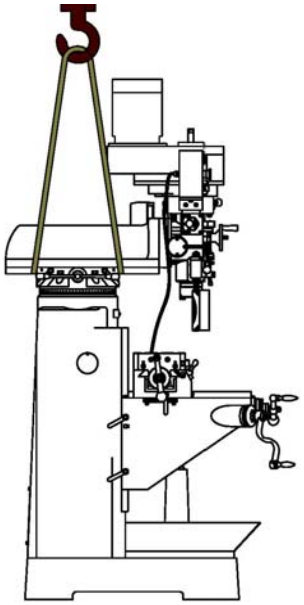
Check if all clamping screws of the spindle head carrier are tightened before lifting the machine.

☞ **Raising / lowering the cross table on page 37**

Alternatively it is possible to lift the milling machine by means of a sling as displayed inAbbildung 4-1.

- ➜ The cross table has to be completely travelled to the machine stand.
- ➜ The spindle head carrier must be positioned as illustrated.
- ➜ The four clamping screws (A) of the spindle head-holder must be tight.
- ➜ Make sure that the load attachment does not cause damage to components or paint.
- ➜ Lift and transport the machine using an appropriate lifting device (crane, etc.).

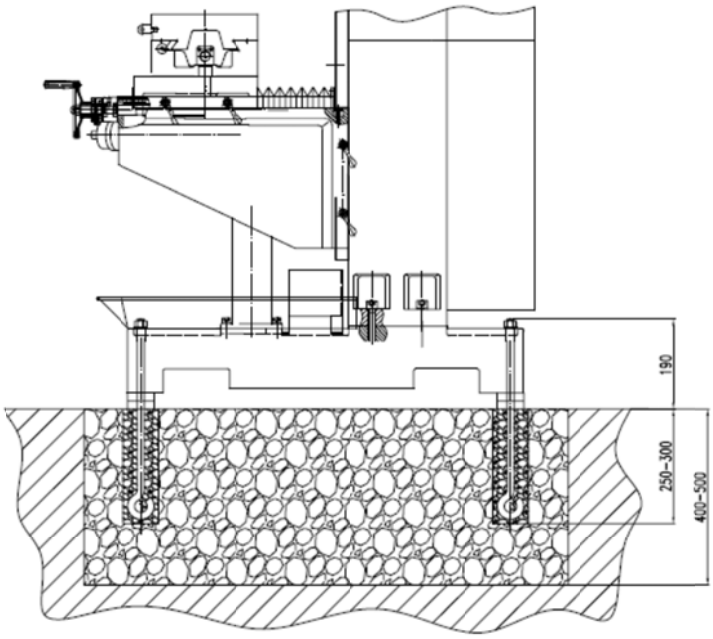
☞ Total weight on page 19



Img.4-1: Example: Lifting at the spindle head carrier using a sling

4.3.3 Installation

The milling-machine is fixed to the floor by four anchor screws which are past through the machine foot. Optionally, 4 vibration damping elements can be used.



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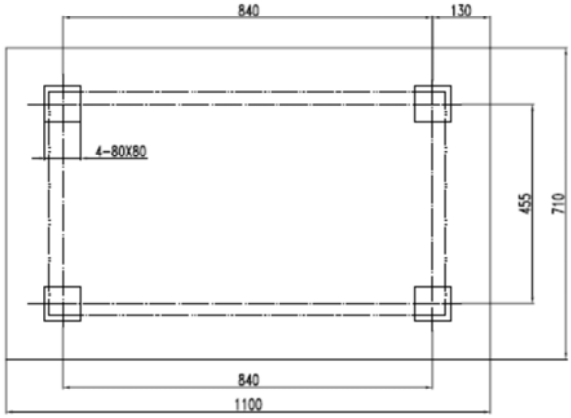


4.3.4 Cleaning and lubricating

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

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

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

4.3.5 Assembly of the chip tray

➜ If it is not yet pre-assembled, assemble the chip tray using the fixing materials include in the scope of delivery.

4.3.6 Functional test

➜ Check if all fixing screws of the milling-machine are tightened.

➜ Check if the clamping screw for slewing as well as the fixing screw of the milling head is well tightened.

➜ Check if all spindles are running smoothly.

4.3.7 Check the filling level of the gear oil

The milling-machine is delivered with gear oil.

➜ Check the filling levels of the gear vertical milling and of the infeed of the X axis.

➜ Fill the container of the gearboxes over the filling port with a standard gear oil.

☞ „Img. 6-6: Filler hole vertical gear“ on page 50

☞ „Img. 6-8: Filler hole feed gear“ on page 51

4.3.8 Refill coolant lubricant

The milling-machine is delivered without coolant lubricant.

➜ Fill in coolant.

ATTENTION!

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

☞ **Coolant lubricant system on page 20**

☞ **Operating material on page 20**

4.4 Electrical connection

CAUTION!

Install the connection cable of the machine in such a way that people will not stumble over it.

The machine is installed and ready to operate. Please check that 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.

➜ Make sure that the existing power supply matches the drilling-milling machine.

➜ The drilling-milling machine must be correctly earthed.

➜ Press the push button for clockwise.

Then the spindle must turn clockwise.

When looking from the top of the machine the spindle must rotate clockwise.

If it rotates anticlockwise two of the three phase conductors must be exchanged.

WARNING!

Works on the electrical equipment must only be performed by an electrical specialist according to the electro-technical rules.

4.5 First commissioning

The machine may only be commissioned after proper installation.

WARNING!

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

ATTENTION!

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

WARNING!

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

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

Only use tool holders in the intended admissible speed range.

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

4.5.1 Warming up the machine

ATTENTION!

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

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

5 Operation

5.1 Safety

Commission the milling-machine only under the following conditions:

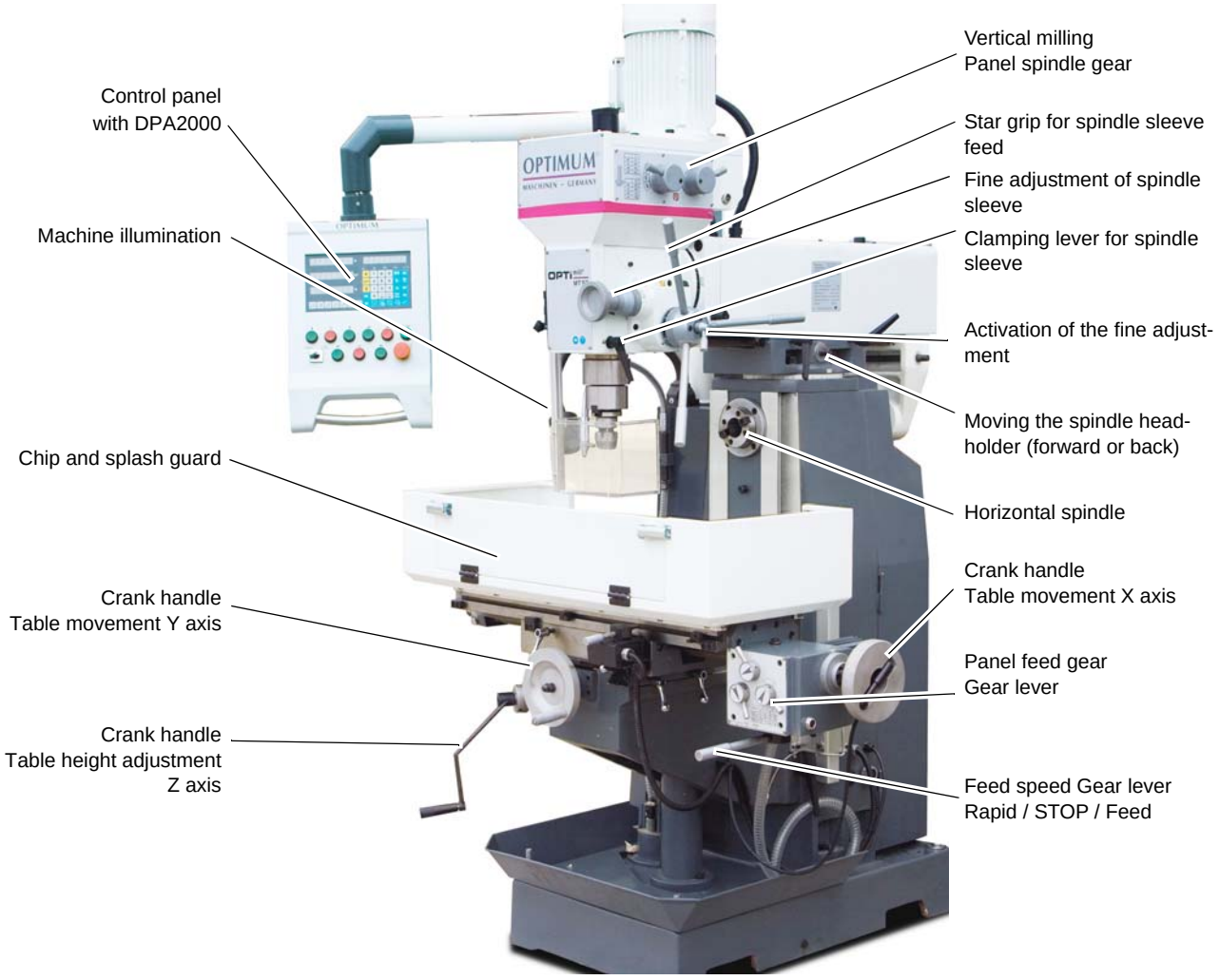
- The milling-machine is in proper working order.
- The milling-machine is used as intended.
- The operating manual is followed.
- All safety devices are installed and activated.

All failures should be eliminated immediately. 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.

Notify the person responsable immediately of any modification.

☞ Safety during operation on page 16

5.2 Control and indicating elements



Img.5-1: MT50

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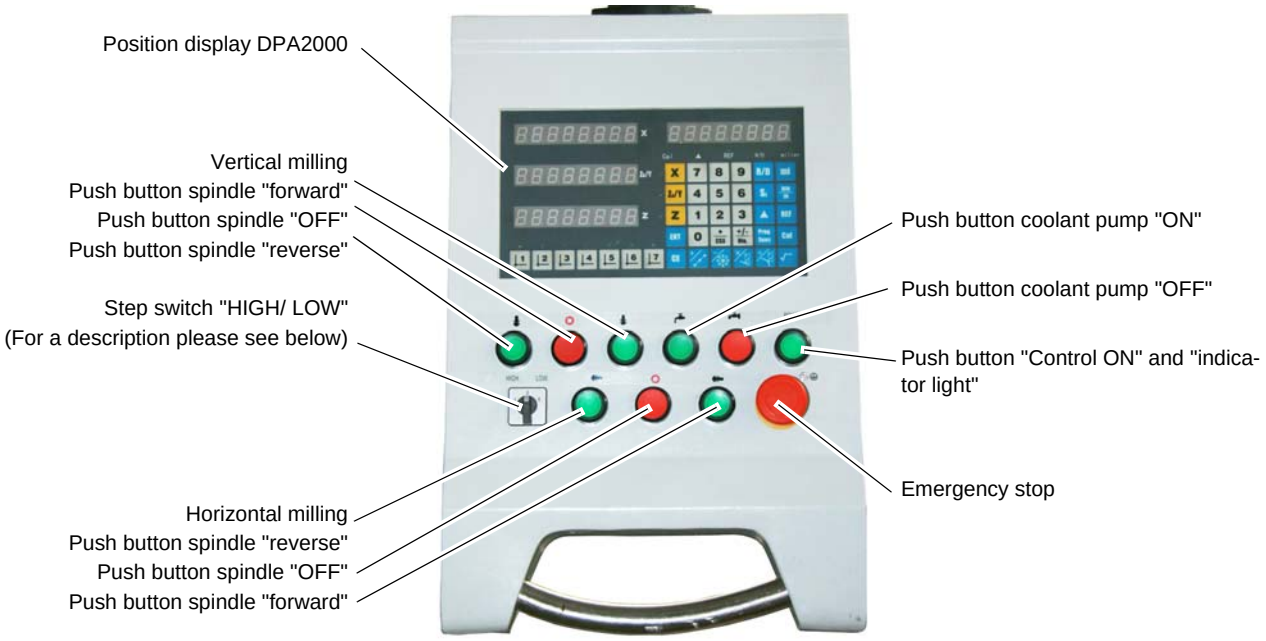
5.2.1 Control panel



Img.5-2: Control panel

5.2.2 Switching elements

Vertical milling

Stage switch "High Speed"/ "Low Speed"

The operating mode "High Speed or Low Speed" is selected by means of the stage switch. The stage switch "High" and "Low" must only be used for vertical milling.

Gear stage "H" (High speed)

Gear stage "L" (Low speed)

Push button spindle "forward"

The push button switches on the rotation of the spindle.

Main switch

The push button "OFF“ switches off the rotation of the spindle.

Push button spindle "reverse"

The push button switches on the rotation of the spindle.

Horizontal milling

Push button spindle "forward"

The push button switches on the rotation of the spindle.

Main switch

The push button "OFF“ switches off the rotation of the spindle.

Push button spindle "reverse"

The push button switches on the rotation of the spindle.

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Push button coolant pump "ON"

Switches the coolant pump on.

Push button coolant pump "OFF"

Switches the coolant pump off.

Push button control "ON" and "Operating control lamp"

Switches the control on.

Main switch

Interrupts or connects the power supply to the machine control.

5.3 Switching on the milling-machine

ATTENTION!

Wait until the milling machine has come to a complete halt before changing the rotation direction using the rotation direction switch.

- ➜ Switch on the main switch.
- ➜ If required, turn the EMERGENCY STOP button to the right in order to release the push button.
- ➜ Close spindle protection system.

INFORMATION

The control can be switched on only when all actuators such as the feed lever is in neutral position.

- ➜ Switch the control on.
- ➜ Press the push button "Start" for vertical milling or horizontal milling and select the rotational direction of spindle. ☞ Switching elements on page 30
- ➜ The milling-machine switches on and turns in the preselected rotation direction.

5.4 Switching off the milling-machine

- ➜ Press the push button "OFF" for vertical milling or horizontal milling.
- ➜ For a long-term standstill of the milling-machine switch it off at the main switch.

5.5 Inserting a tool

The milling spindle is equipped with an SK40 support and a draw-in bar M16.

- ➜ Clean the conical support in the milling head.
- ➜ Clean the taper of your tool.
- ➜ Check if the inserts are firmly seated.
- ➜ Position the tool holder including the tool from the bottom into the tapper support of the milling spindle.
- ➜ Screw the draw-in bar in the cone of the tool holder.
- ➜ Tighten the draw-in nut.

5.6 Speed variation vertical-/ horizontal milling

5.6.1 Horizontal milling

WARNING!

Only remove the protective cover when the mains plug of the milling machine is disconnected from the electrical supply. Close and screw down the protective cover after each change of speed.

➜ Disconnect the machine from the electrical supply.

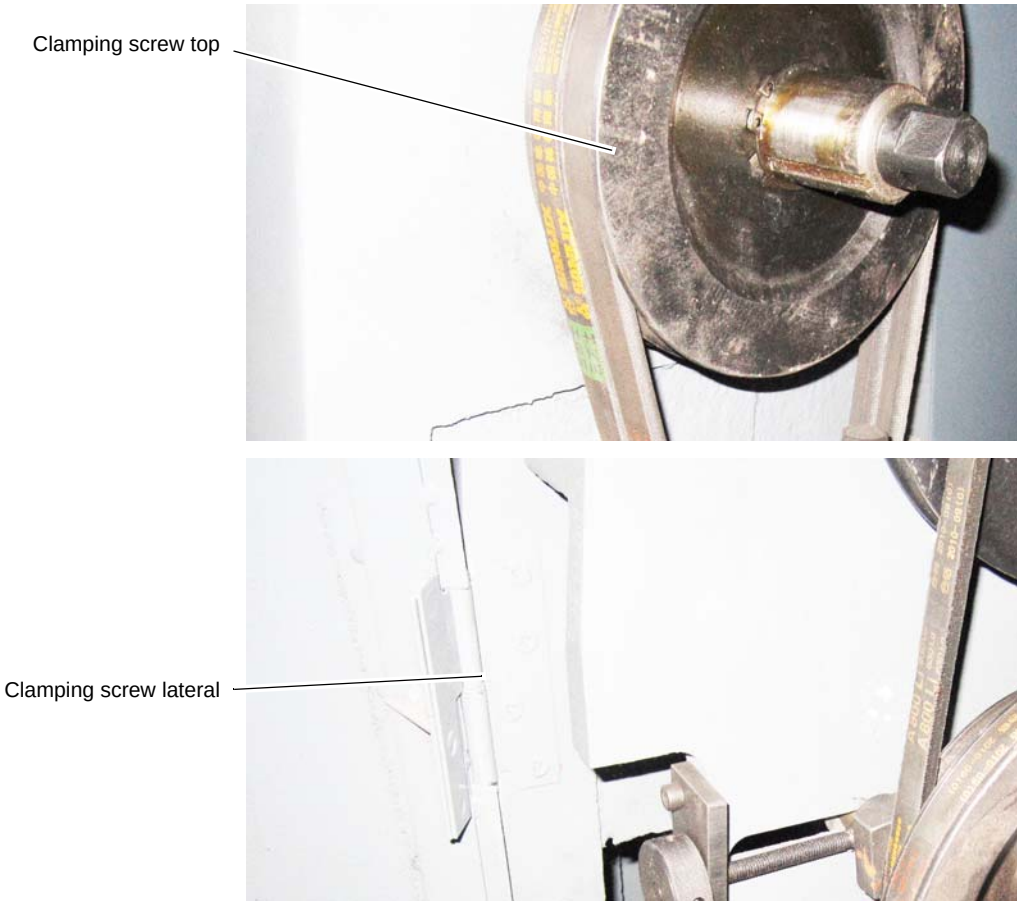
➜ Open the protective cover of the V-belts.

ATTENTION!

Make sure the V-belts have the right tension.

Too heavy or too low tension of the belt can cause damage. The belts are correctly tensioned, when it can be by pressing with the fingers for about 5mm.

➜ Release the clamping screws of the V-belts.



Img.5-3: V-belt horizontal milling

➜ Position the V-belt on the correspondingly required V-belt pulleys.

➜ Retighten V-belts and check V-belt tension.

➜ Close and screw down the cover.

➜ The speed and thus the cutting speed depends on the material of the workpiece, the milling cutter diameter and the cutter type.

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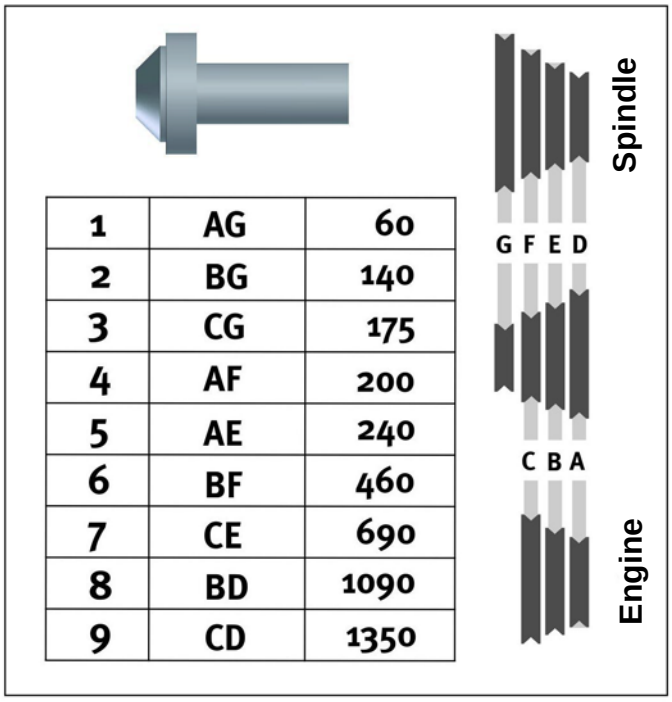
5.6.2 Speed table horizontal milling

Use an open-end wrench in order to be able to open the cover.



1	AG	60
2	BG	140
3	CG	175
4	AF	200
5	AE	240
6	BF	460
7	CE	690
8	BD	1090
9	CD	1350

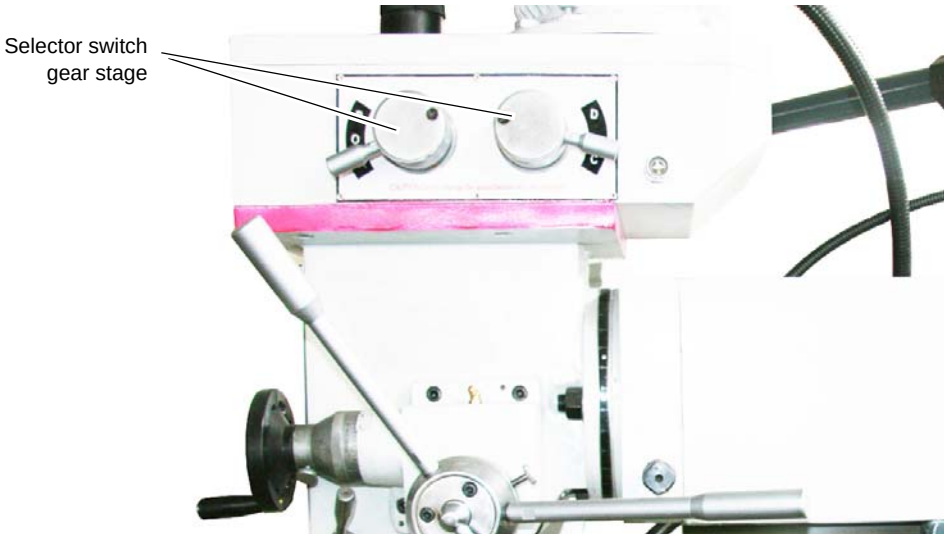
Img.5-4: Speed table horizontal milling ~ 50Hz connection

5.6.3 Vertical milling

ATTENTION!

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

On the drilling-milling head there are two levers to switch over the gear to the desired spindle speed. The speeds indicated in the table are resulting from the electrical speed switch-over ("High Speed" resp. "Low Speed").

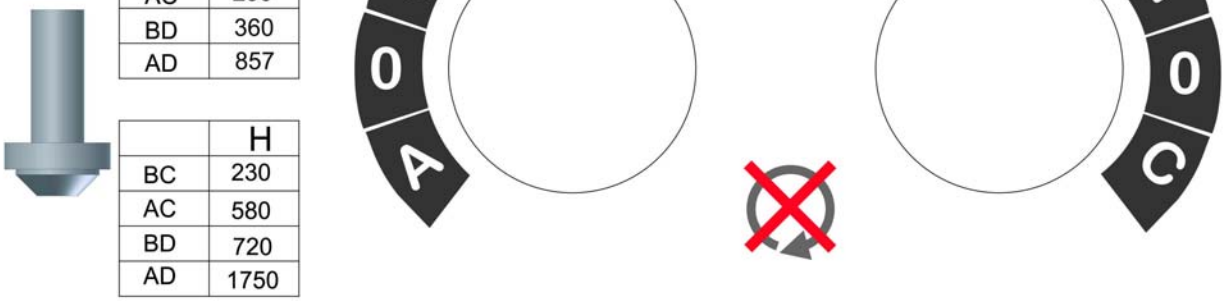


Img.5-5: MT50 view from the right

5.6.4 Speed table vertical milling

	L
BC	115
AC	290
BD	360
AD	857

	H
BC	230
AC	580
BD	720
AD	1750



Img.5-6: Speed table vertical milling ~ 50Hz connection

5.7 Standard values for cutting speeds

[m/min] with high-speed steel and hard metal in upcut milling

Tool	Steel	Grey cast iron	Al alloy age-hardened
Plain mill and side milling cutters [m/min]	10 - 25	10 - 22	150 - 350
Relieved form cutters [m/min]	15 - 24	10 - 20	150 - 250
Inserted -tooth cutter with SS [m/min]	15 - 30	12 - 25	200 - 300
Inserted-tooth cutter with HM [m/min]	100 - 200	30 - 100	300 - 400

The results are the following standard values for speeds in dependence of the milling cutter diameter, cutter type and material.

Tool diameter [mm] plain milling cutter and shell end mill	Steel 10 - 25 m/min	Grey cast iron 10 - 22 m/min	Cured Al alloy 150 - 350 m/min
	Speed [min^{-1}]		
35	91 - 227	91 - 200	1364 - 3183
40	80 - 199	80 - 175	1194 - 2785
45	71 - 177	71 - 156	1061 - 2476
50	64 - 159	64 - 140	955 - 2228
55	58 - 145	58 - 127	868 - 2025
60	53 - 133	53 - 117	796 - 1857
65	49 - 122	49 - 108	735 - 1714

Tool diameter [mm] form cutters	Steel 15 - 24 m/min	Grey cast iron 10 - 20 m/min	Cured Al alloy 150 - 250 m/min
	Speed [min^{-1}]		
4	1194 - 1911	796 - 1592	11937 - 19894
5	955 - 1529	637 - 1274	9549 - 15916
6	796 - 1274	531 - 1062	7958 - 13263
8	597 - 955	398 - 796	5968 - 9947
10	478 - 764	318 - 637	4775 - 7958
12	398 - 637	265 - 531	3979 - 6631
14	341 - 546	227 - 455	3410 - 5684
16	299 - 478	199 - 398	2984 - 4974

INFORMATION

High temperatures are generated at the tip of the tool by the occurring friction heat. The tool should be cooled during the milling process. Cooling the tool with a suitable cooling lubricant ensures better working results and a longer edge life of the cutting tool.

INFORMATION

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

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

5.8 Manual spindle sleeve feed

5.8.1 Rough adjustment

➜ Actuate the quill lever in order to manually lift respectively lower the quill.

❍ You can set the spindle sleeve to a given height using the tightening lever.

INFORMATION

For all movements you must first loosen the tightening lever!

Img.5-7: Spindle sleeve lever

5.8.2 Fine adjustment

➜ Turn the lever clockwise. The spindle sleeve lever moves in direction of the drilling-milling head and activates the coupling of the fine feed.

➜ Turn on the fine feed spindle sleeve in order to move the spindle sleeve.

➜ Turn the hand wheel for fine adjustment.

Img.5-8: Handwheel for fine adjustment

5.9 Swivelling the milling head

ATTENTION!

If the milling head is slewn too far oil might escape from the gear. Therefore, we recommend to slew the milling head only as far as no oil escapes while the vertical spindle is running.

INFORMATION

The gear of the milling machine is located in open reservoirs which have to be connected with the ambient air.

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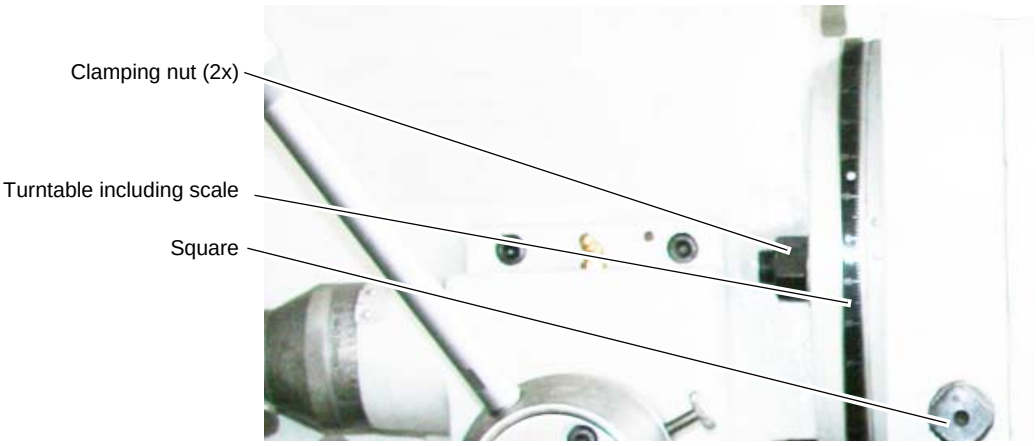
The milling head may be swivelled to the right and to the left.

➜ Release the two nuts in order to clamp the rotary disc.

➜ Turn the square box spanner in order to slew the milling head. Use the scale at the turntable to set the angle.

➜ Clamp the nuts again after adjusting the required angle.



Img.5-9: Swivelling the milling head

5.9.1 Set milling head to the zero position

➜ Loosen the two nuts to clamp the turntable.

➜ Turn the hexagon until the milling head is in the zero position.

ATTENTION!

For a high precise alignment in zero position we recommend you to use a control mandrel which is directly clamped in the spindle and is lower using a gauge.

➜ Clamp the nuts again.

5.10 Raising / lowering the cross table

Manual movement on the Z axis

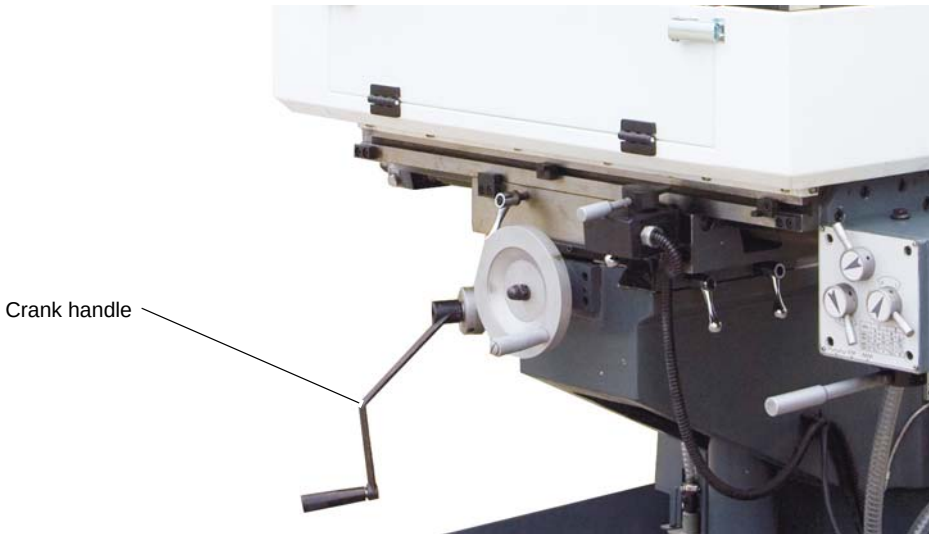
❍ You can raise or lower the cross table using the crank handle.

➜ Loosen the tightening lever.

➜ Engage the crank handle by pushing it towards the clutch.

➜ Turn the handle to the required position for the cross table.

➜ Make sure to tighten the tightening lever again once you have completed the operation.



5.11 Moving the spindle head-holder forward or back

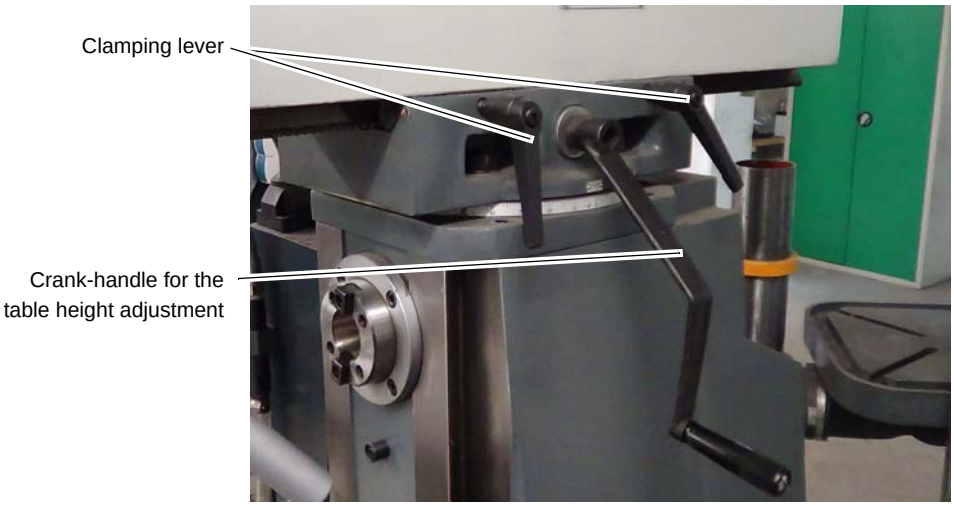
You can move the spindle head-holder forward or back.

Proceed as follows:

➜ Loosen the tightening lever.

➜ Position the spindle head carrier to the desired position using a key above the square tool holder.

➜ Imperatively fasten the clamping screws.



Img.5-10: Moving the spindle head-holder forward or back

5.12 Moving the cross table left or right (X-axis)

There are two ways of moving the cross table on the X axis.

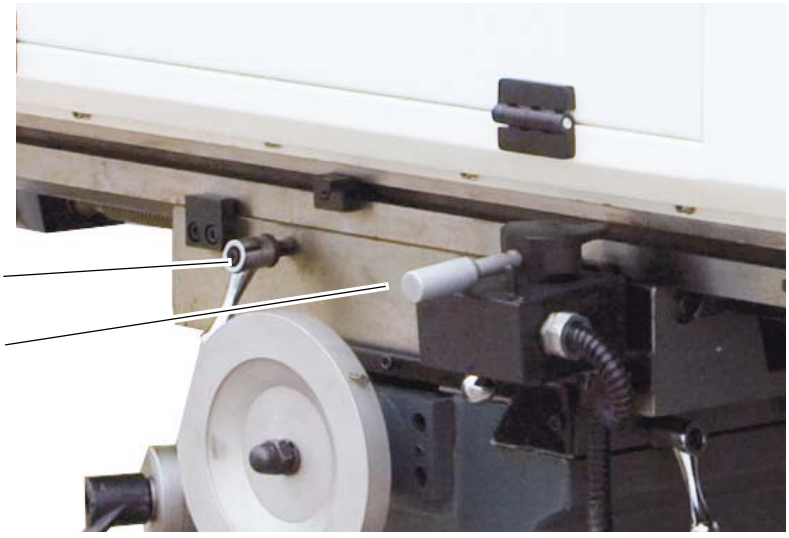
❍ By turning the crank handle on the front table.

❍ Using the automatic table feed.

5.12.1 Manual movement on the X axis

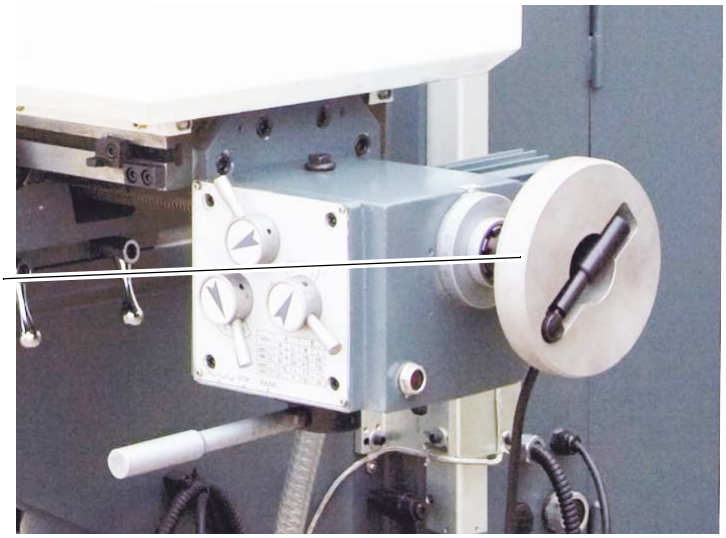
In order to manually move the cross table the clamping levers are released and the table is moved by means of the crank-handle.

➜ Loosen the tightening lever.



Img.5-11: Move cross table in X direction - clamping lever

➜ Engage the crank handle by pushing it towards the clutch.



Img.5-12: Move cross table in X direction - crank-handle

➜ Turn the handle to the required position for the cross table.

➜ Make sure to tighten it again in the required position.

5.12.2 Switch on / off the automatic table feed (X axis)

The clamping levers are released in order to automatically move the cross table and the operating mode "Rapid mode" or "Feed" are selected by means of the selection lever. The movement is performed by means of the direction lever.

ATTENTION!

If the speed of the table feed is changed, the direction lever for the feed must be in neutral middle position (in position „OFF“).

ATTENTION!

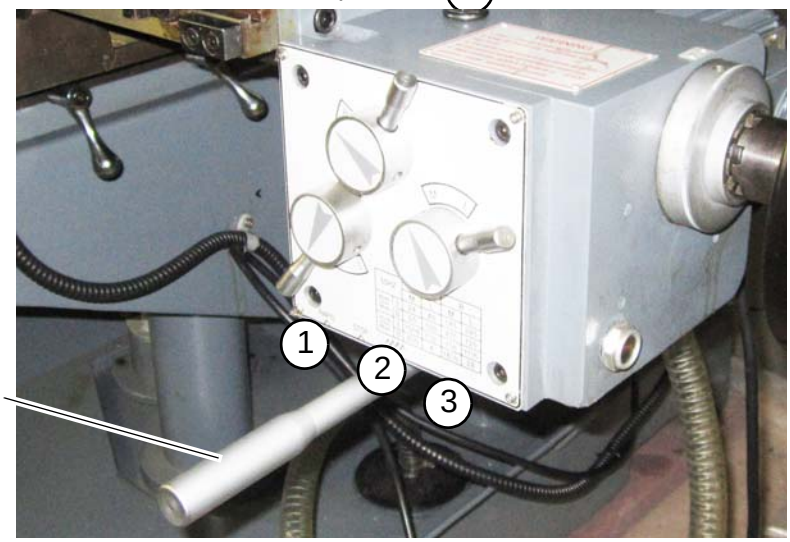
Loosen the locking levers on the cross table. ☞ „Img.5-11: Move cross table in X direction - clamping lever“ on page 39

5.12.3 Switch to the rapid mode

ATTENTION!

The rapid mode only serves to rapidly travel to a position. The rapid mode must not be used as milling feed.

➜ Switch the selection lever for the table feed to the position (1) .



Img.5-13: Selection lever

➜ Loosen the locking levers on the cross table.

➜ In this context, absolutely pay attention that the clamping nuts of the adjustable end stop switch are well tightened.

➜ Set the direction lever (X axis) for the table feed to the desired feed direction.

Img.5-14: Direction lever

➜ Position the direction lever to the neutral centre position if you switch off the "Rapid mode".

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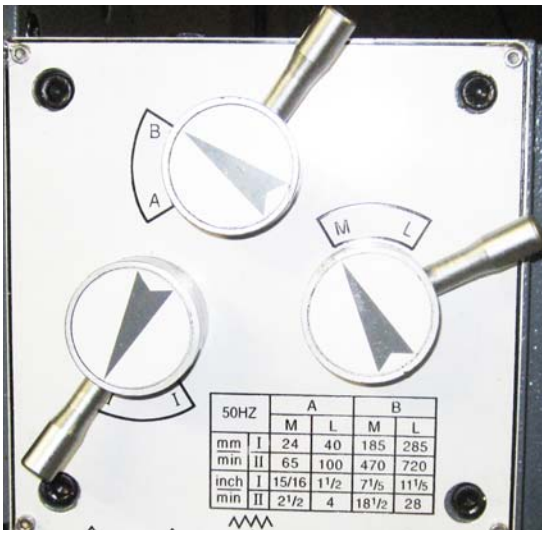
5.12.4 Switching the feed

➜ Adjust the feed speed.

~ 50Hz		A		B	
		M	L	M	L
mm/min	I	24	40	185	285
mm/min	II	65	100	470	720
inch/min	I	15/16	1 1/2	7 1/5	11 1/5
inch/min	II	2 1/2	4	18 1/2	28



~ 50Hz connection

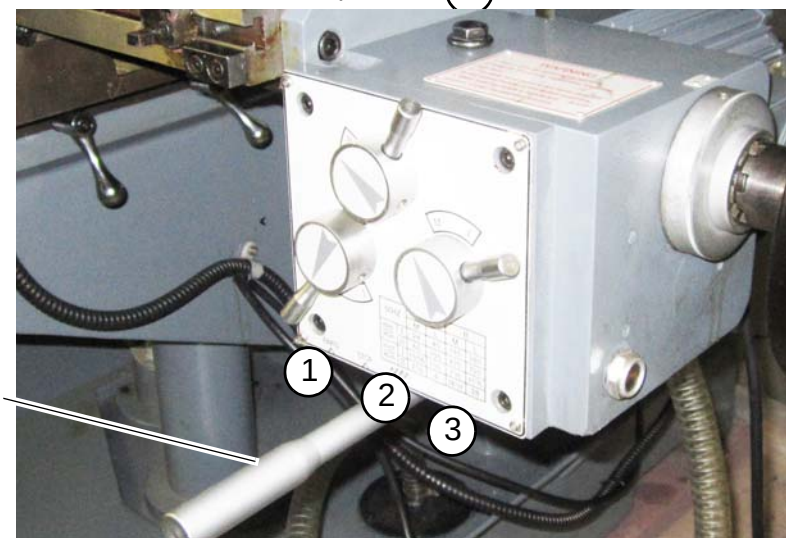
➜ Switch the selection lever for the table feed to the position (3) .

Position "Rapid mode" (1)

Neutral position (2)

Position "Feed" (3)

Selection lever



Img.5-15: Selection lever

➜ Loosen the locking levers on the cross table.

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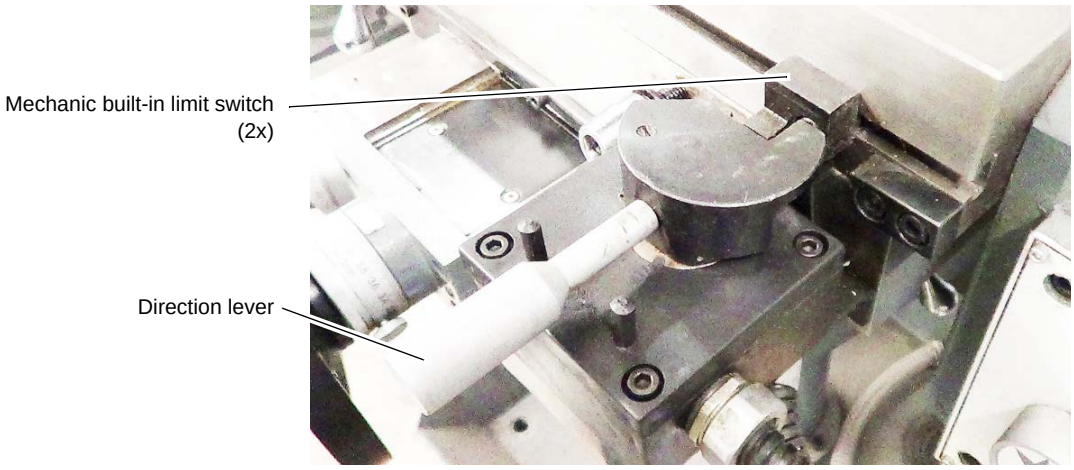
➜ Set the position of the mechanic built-in limit switch.



Img.5-16: Direction lever

➜ Set the direction lever (X axis) for the table feed to the desired feed direction.

➜ Position the direction lever to the neutral centre position if you switch off the "Feed".

5.13 Moving the cross table forward / back (Y axis)

➜ Loosen the tightening lever.

➜ Engage the crank handle by pushing it towards the clutch.

➜ Turn the handle to the required position for the cross table.

Img.5-17: Moving the cross table to the Y-direction

➜ Make sure to tighten it again in the required position.

5.14 Turning the spindle head-holder

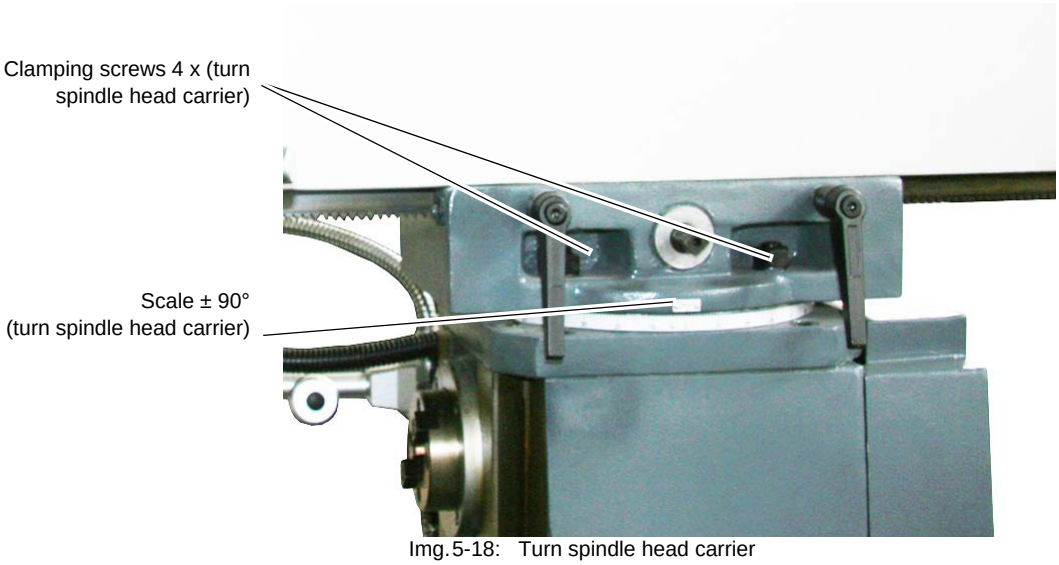
It is possible to rotate the spindle head carrier by ± 180°.
The spindle head support must be turned by 180 ° for horizontal milling to be able to mount the thrust bearing.
Proceed as follows:

➜ If it is necessary to turn the spindle head carrier very far first move the spindle head completely to the front in order to be able to pass the arm of the control panel while slewing.
Img.5-10: „Moving the spindle head-holder forward or back“ on page 38

➜ Loosen the clamping screws (4 units).

➜ Position the spindle head carrier to the desired position by turning it by hand.

➜ Fasten the clamping screws.



Img.5-18: Turn spindle head carrier

5.15 Conversion to horizontal milling

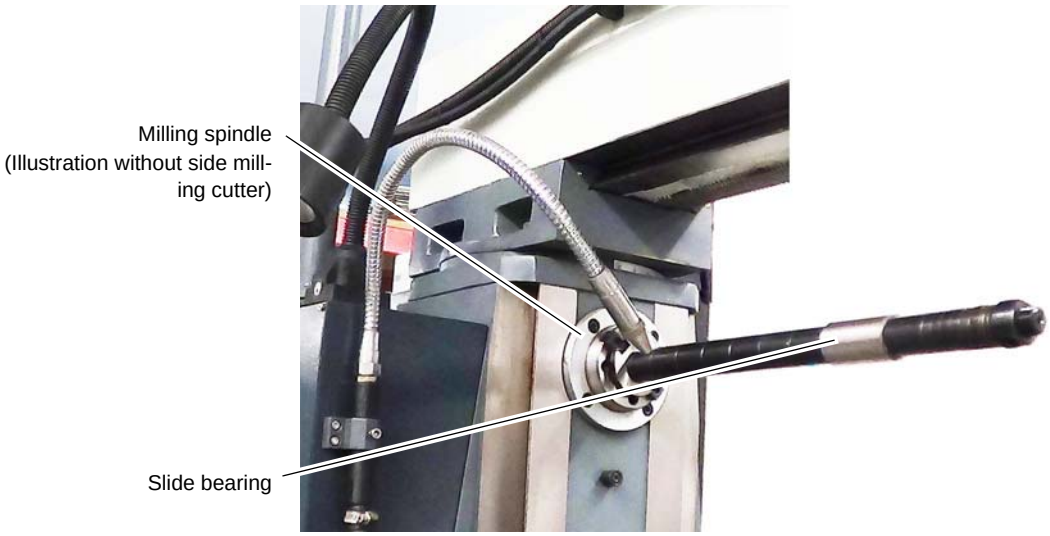
CAUTION!

When horizontal milling the chips and splash guard must be mounted on the milling table.

➜ Mount the side milling cutters to the desired position of the milling spindle.

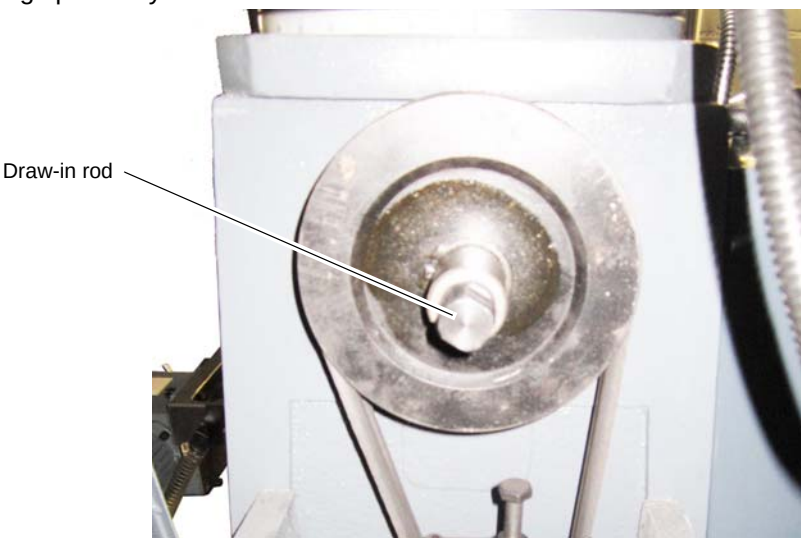
➜ Determine the position of the slide bearing

➜ Turn the spindle head carrier 180°. The milling head vertical milling must be located behind.



Img.5-19: Milling spindle horizontal milling

➜ Fix the milling spindle by means of the draw-in rod



Img.5-20: Draw-in rod horizontal milling

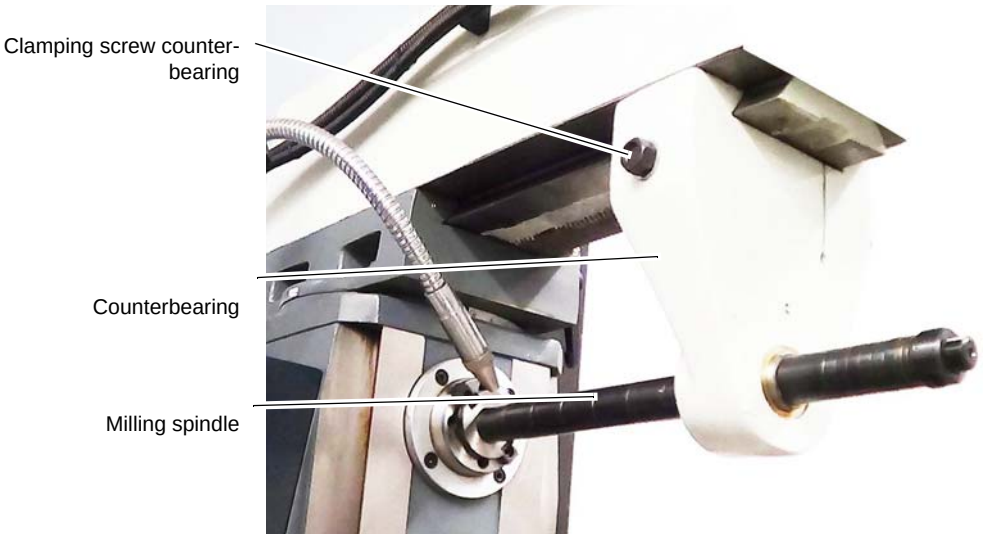
➜ Mount counterbearing.

INFORMATION

If the spindle head carrier is not exactly plugged in to "Zero" it is almost not possible to fix the counterbearing. Therefore if required release the clamping screws by slightly turning the spindle head carrier before plug-in in the counterbearing.

Retighten the clamping screws after plugging them in.

Img. 5-18: „Turn spindle head carrier“ on page 43



Img. 5-21: Counterbearing horizontal milling

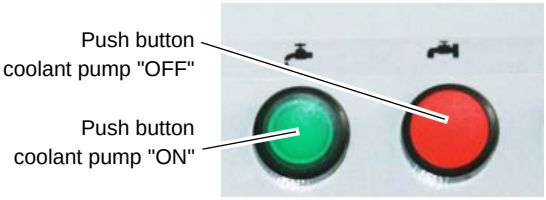
➜ Select speed and position the V-belt at the required position.
☞ Speed table horizontal milling on page 33

5.16 Cooling

WARNING!

Ejection and overflowing of coolants and lubricants. Make sure you do not get the cooling lubricants on the floor. Spilled on the floor cooling agents must be removed immediately.

The coolant supply is switched on and off by means of a push button on the control panel. The amount of cooling agent can be regulated using the dosing tap.



Img. 5-22: Cooling agent selector switch

Due to the rotation movement hight temperatures are generated on the cutting edge of the tool due to occurring friction heat.

When milling it is necessary to cool down the tool depending on the material. Cooling the tool with a suitable cooling lubricant ensures better working results and a longer durability of the cutting tools.

➜Adjust the rate of flow by means of the stop and dosing valve.

ATTENTION!

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

INFORMATION

Use a water soluble environmentally compliant drilling emulsion as coolant procured from the specialised trade. ☞ Coolant lubricant system on page 20

Re-use cooling agents and lubricants.

Respect the environment when disposing of any lubricants and cooling agents.

Follow the manufacturer’s disposal instructions.

6 Maintenance

Properly-performed regular maintenance, cleaning and repair is an essential prerequisite for safe operation, fault-free operation, a long service life of the multifunctional drilling-milling machine and the quality of the products manufactured with it.

6.1 Safety

WARNING!

The consequences of incorrect maintenance and repair work may include:

- **Very serious injury to personnel working on the milling-machine,**
- **damage to the milling-machine.**

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

6.1.1 Measures before repair works

➜ Switch off the machine according to these operating instructions and secure it against unexpected switching on again.

➜ Disconnect the machine from the power supply.

6.1.2 Notes for repair

➜ Observe maintenance dates and activities which are prescribed in the operating instructions.

➜ Observe the procedures of switching on and off which are described in the operating instructions.

➜ A shop equipment suitable for performing repair measures is required.

6.1.3 Measures before switching on again and after repair measures

➜ Before restarting run a safety check.

➜ There must be no dangers for persons.

➜ The milling-machine must not be damaged.

6.2 Cleaning

WARNING!

Only perform cleaning works when the machine is switched off.

Do not use petrol, thinner or compressed air for cleaning tasks.

CAUTION!

Biological and Microbiological hazards in the coolant circuit. Wear protective gloves when the coolant is changed.

➜ At the end of each day's work, remove the workpiece and the clamping gear and clean the table.

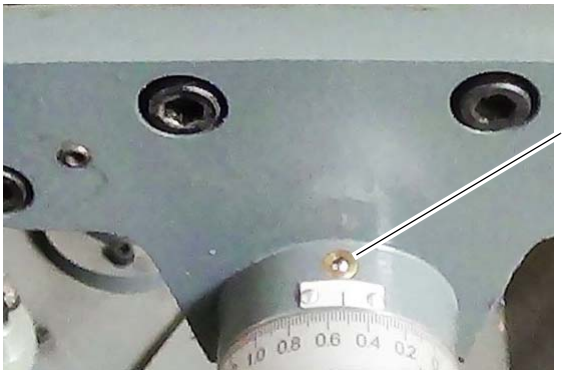
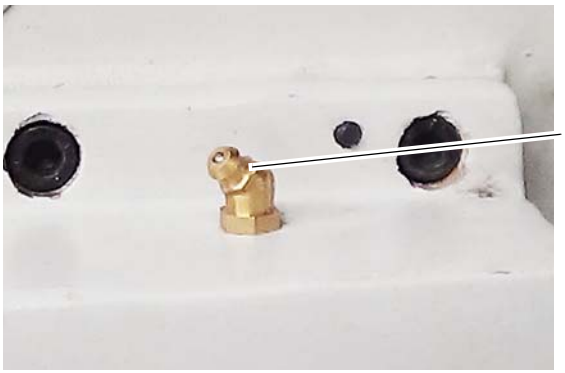
➜ For rough cleaning tasks use a chip hook, a hand brush, vacuum cleaner or slot cleaner.

➜ Remove solings and remaining lubricants with kerosene or special cleaning agents.

➜ afterwards lightly lubricate blank surfaces.

6.3 Inspection and maintenance

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

Interval	Where?	What?	How?
Start of work, after every maintenance or repair work	**Milling-machine**	☞ Safety check on page 15	
Start of work, after every maintenance or repair work	**Mobile machine parts**	Oiling	➜ All mobile machine parts such as guides, feed screws, spindle nuts must be oiled in regular intervals. ➜ Always slightly oil bare surfaces. ➜ Lubricate lifting spindle of the cross table using ball bearing grease. ➜ Oil at these lubricating point positions.  Img. 6-1: Oiler cup ➜ Lubricate at these lubricating point positions.  Img. 6-2: Lubricating nipple

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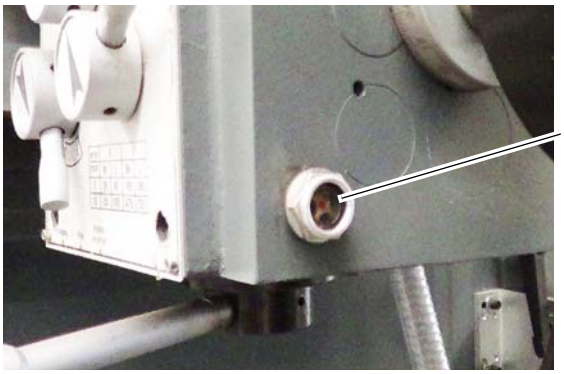
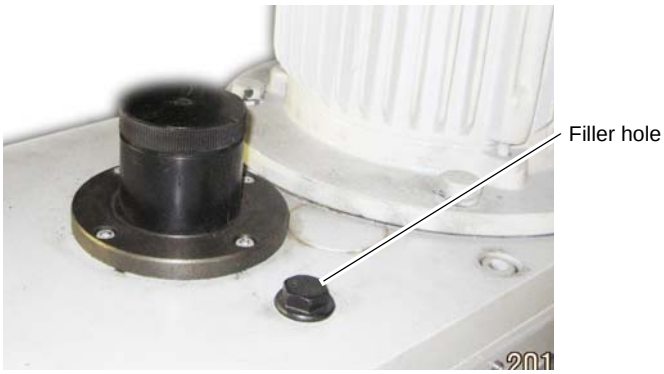
<table>
<tr><th>Interval</th><th>Where?</th><th>What?</th><th>How?</th></tr>
<tr><td rowspan="2">Start of work,
after every maintenance or repair work</td><td>Spindle gear
Vertical milling</td><td rowspan="2">Checking the oil level</td><td>➜ The oil level must at least attain the centre resp. top marking of the oil sight glass.
 

Img.6-3: Oil sight glass gear vertical milling</td></tr>
<tr><td>Feed gear</td><td>➜ The oil level must at least attain the centre resp. top marking of the oil sight glass.
 

Img.6-4: Oil sight glass gear feed</td></tr>
</table>

Interval	Where?	What?	How?
First after 3 months then every 6 months	**Spindle gear Vertical milling**	Oil change	➜ For oil change use an appropriate collecting tray of sufficient capacity. ➜ Have the milling spindle run for a few minutes the oil will heat up and easily penetrate from the opening. ➜ Unscrew the screw from the drain hole.  Img. 6-5: Drain hole vertical gear ➜ Unscrew the screw from the filler hole.  Img. 6-6: Filler hole vertical gear ➜ Close the drain hole if no more oil drains. ➜ Fill up to the middle of the reference mark of the oil sight glass into the filler hole using a suitable container.

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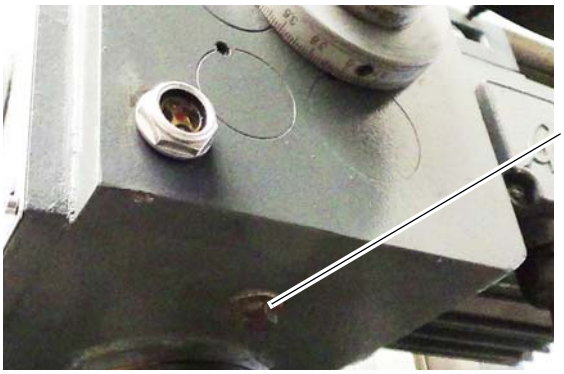
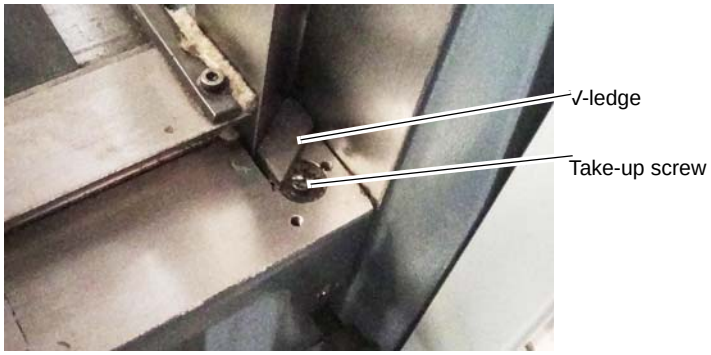
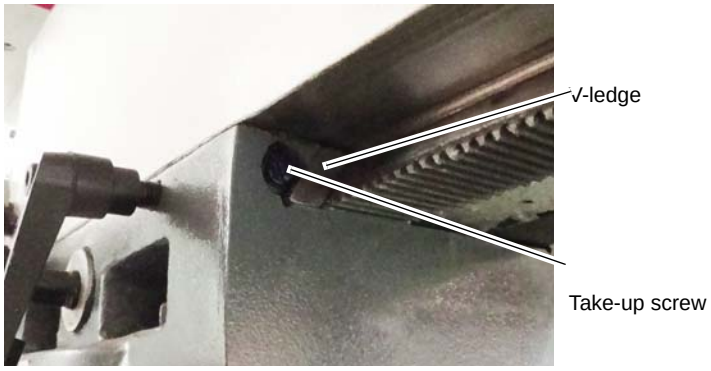
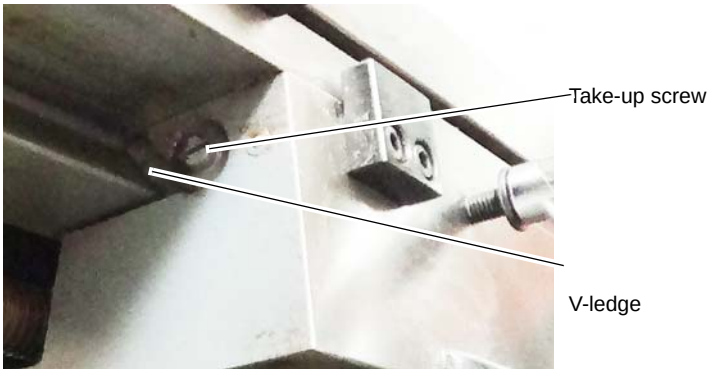
Interval	Where?	What?	How?
First after 3 months then every 6 months	**Feed gear**	Oil change	➜ For oil change use an appropriate collecting tray of sufficient capacity. ➜ Travel the table in the rapid mode to-and-fro the oil heats up and easily penetrates from the drain opening. ➜ Unscrew the screw from the drain hole.  Img.6-7: Drain hole vertical gear ➜ Unscrew the screw from the filler hole.  Img.6-8: Filler hole feed gear ➜ Close the drain hole if no more oil drains. ➜ Fill up to the middle of the reference mark of the oil sight glass into the filler hole using a suitable container.
First after 20 working operations, then every months	**V-belt Horizontal milling**	Check, Readjusting	➜ Check if the V-belts are porous or worn. ➜ Press the finger on the V-belt. The V-belt should push through by about 5 mm at a force of about 30 Newton (3 kg). ☞ „Img.5-3: V-belt horizontal milling“ on page 32

Interval	Where?	What?	How?
as required	**Dovetail guides**	Readjusting	➜ Readjust the guides by means of the corresponding V-ledge. ➜ If necessary disassemble the wipers in order to attain the readjusting screws of the corresponding V-ledges. ➜ Turn the readjusting screw clockwise using a screw-driver until it is only possible to to move the guideway only slightly by means of the handwheel  Img. 6-9: V-ledge Z axis  Img. 6-10: Spindle head-holder  Img. 6-11: V-ledge Y-axis

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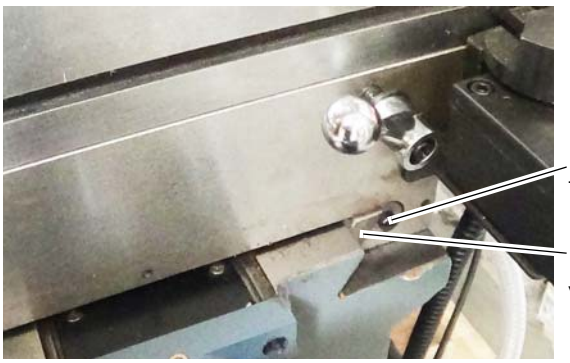
Interval	Where?	What?	How?
			 Img.6-12: V-ledge Z axis
As required but at least once per year	**Coolant equipment**	Replacing	➜ Fill in coolant, replace if necessary ➜ Wash the cooling lubricant pump. ☞ Cooling lubricants and tanks on page 54 ☞ Inspection plan for water-mixed cooling lubricants on page 55

6.4 Cooling lubricants

INFORMATION

The milling-machine is lacquered with a one-component paint. Observe this fact when selecting your cooling lubricant.

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

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

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

6.5 Repair

Request for a service technician of the company Optimum Maschinen Germany GmbH for all repairs or send us the milling- machine.

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

The company Optimum Maschinen Germany GmbH does not take responsibility nor does it guarantee for damages and failures resulting of non-observance of this operating manual.

For repairs only use

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

6.6 Cooling lubricants and tanks

CAUTION!

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

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

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

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

Limit values

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

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

CAUTION!

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

CAUTION!

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

ENVIRONMENTAL PROTECTION

During work on the cooling lubricant equipment please make sure that

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

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

Collect leakages

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

Disposal

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

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6.6.1 Inspection plan for water-mixed cooling lubricants

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

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

Editor:

Signature:

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7 Ersatzteile - Spare parts

7.1 Ersatzteilbestellung - *Ordering spare parts*

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

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

Die Artikelnummer befindet sich in der Ersatzteilliste. *The article no. is located in the spare parts list.* Die Seriennummer befindet sich am Typschild. *The serial no. is on the rating plate.*

7.2 Hotline Ersatzteile - Spare parts Hotline

+49 (0) 951-96555 -118

ersatzteile@stuermer-maschinen.de

7.3 Service Hotline

+49 (0) 951-96555 -100

service@stuermer-maschinen.de

7.4 Elektrische Ersatzteile - Electrical spare parts

7.5 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.

7.6 Säule und Fuß - Column and Base

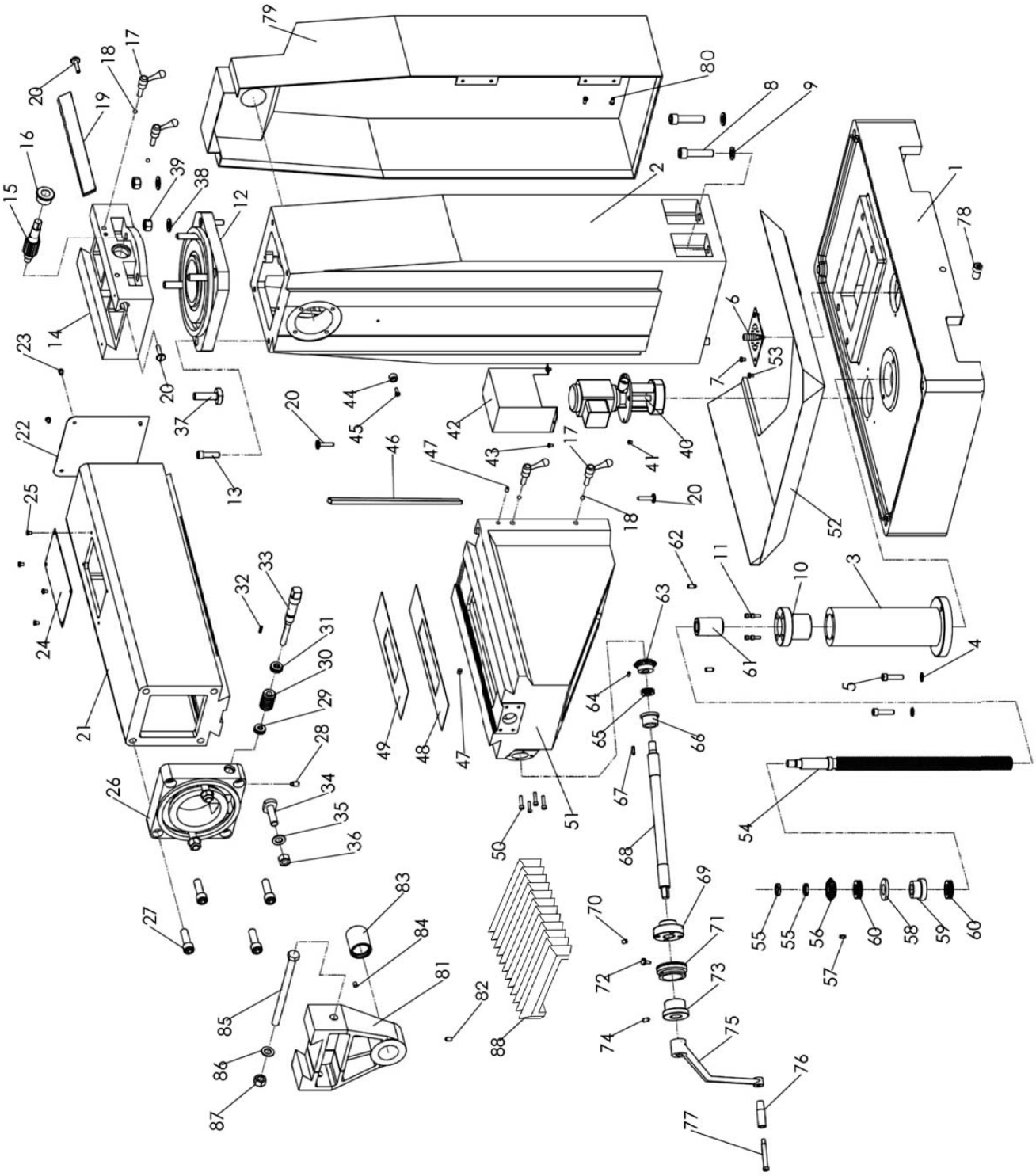

Abb. 7-1: Säule und Fuß - Column and Base

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Ersatzteilliste Säule und Fuß - Spare parts list column and base					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Maschinenfuss	Base	1		03336005101
2	Säule	Column	1		03336005102
3	Hubgehäuse	Elevating Screw Housing	1		03336005103
4	Sicherungsscheibe	Lock Washer	2	10mm	042SR10W
5	Sechskantschraube	Hex Bolt	2	M10-1.5 x 45	
6	Anschlussrohr	Connect Tube	1		
7	Innensechskantschraube	Phlp Hd Scr	4	M6 x 12	
8	Sechskantschraube	Hex Bolt	4	M16-2 x 65	
9	Sicherungsscheibe	Lock Washer	4	16mm	042SR16W
10	Ring	Collar	1		03336005154
11	Kopfschraube	Cap Screw	2	M8-1.25 x 25	
12	Halter	Hold Support	1		03336005112
13	Kopfschraube	Cap Screw	4	M12-1.75 x 30	
14	Halterung	Around Bracket	1		03336005114
15	Vorschubwelle	Feed Shaft	1		03336005115
16	Ring	Collar	1		03336005116
17	Klemmschraube	Clamp Bolt	4	M10-1.5 x 53 x 25	03336005117
18	Klemmblock	Clamp Block	4		
19	Leiste	Gib	1		03336005119
20	Flachkopfschraube	Flat Hd Scr	4	M8-1.25 x 40	
21	Ausleger	Overarm	1		03336005121
22	Abdeckung	Cover	1		03336005122
23	Innensechskantschraube	Phlp Hd Scr	4	M6-.1 x 10	
24	Abdeckung	Cover	1		03336005124
25	Innensechskantschraube	Phlp Hd Scr	4	M6-.1 x 10	
26	Halter	Hold Bracket	1		03336005126
27	Kopfschraube	Cap Screw	4	M16-2 x 50	
28	Kopfschraube	Cap Screw	1	M8 x 20	
29	Kugellager	Ball Bearing	1	51101	04051101
30	Schnecke	Worm	1		03336005130
31	Kugellager	Ball Bearing	1	51102	04051102
32	Passfeder	Key	1	4 x 4 x 20	042P4420
33	Schneckenwelle	Worm Shaft	1		03336005133
34	T-Schraube	T Bolt	3	16-2 x 60	
35	Scheibe	Washer	3	16mm	
36	Sechskantmutter	Hex Nut	3	M16-2	
37	T-Schraube	T Bolt	4	M16-2 x 50	
38	Scheibe	Washer	4	16mm	
39	Sechskantmutter	Hex Nut	4	M16-2	
40	Elektrische Pumpe	Electric Pump	1		0333610036
41	Kopfschraube	Cap Screw	4	M5 x 12	
42	Abdeckung	Shield	1		

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43	Schraube	Cap Screw	2	M5 x 12	
44	Hülse	Sleeve	1		
45	Schraube	Screw	1	M6 x 18	
46	Leiste	Gib	1		03336005146
47	Öler	Billiard Oil Cup	4		
48	Abstreiferplatte	Wiper Plate	1		03336005148
49	Abstreiferplatte	Wiper Plate	1		03336005149
50	Kopfschraube	Cap Screw	4	M6 x 25	
51	Tischträger	Knee	1		03336005151
52	Ölwanne	Oil Pan	1		03336005152
53	Kopfschraube	Cap Screw	2	M6 x12	
54	Hubspindel	Hoist Descend Lead Screw	1		03336005154
55	Rundmutter	Circular Nut	2	M16 x 1.5	
56	Kegelrad	Conical Gear	1		03336005156
57	Passfeder	Key	1	6 x 6 x 12	042P6612
58	Stellscheibe	Adjust Washer	1		
59	Buchse	Collar	1		
60	Kugellager	Ball Bearing	2	51105	04051105
61	Mutter	Nut	1	42 x 60mm	03336005154
62	Gewindestift	Set Screw	2	M8 x 20	
63	Kegelrad	Conical Gear	1		03336005163
64	Gewindestift	Set Screw	1	M6-1 x 10	
65	Kugellager	Ball Bearing	1	51103	04051103
66	Ring	Collar	1		03336005166
67	Passfeder	Key	1	5 x 5 x 20	042P5520
68	Welle	Shaft	1		03336005168
69	Ring	Collar	1		03336005169
70	Kopfschraube	Cap Screw	1	M6-1 x 22	
71	Skalenring	Scale Ring	1		03336005171
72	Rändelschraube	Knurled Thumb Scr	1	M6-1 x10	
73	Ring	Collar	1		03336005173
74	Gewindestift	Set Screw	1		
75	Kurbel	Handle	1		03336005175
76	Griff	Handle	1		03336005176
77	Griffschraube	Handlescrew	1		03336005177
78	Schraube	Screw	1		
79	Hintere Abdeckung	Behind Cover	1		03336005179
80	Flachkopfschraube	Flat Hd Scr	4	M5 x 12	
81	Halter	Support	1		03336005181
82	Gewindestift	Set Screw	1	M8-1.25 x 16	
83	Hülse	Sleeve	1		03336005181
84	Öler	Billiard Oil Cup	1		
85	Spezialschraube	Special Bolt	1	M16-2 x 218	
86	Flache Scheibe	Flat Washer	1	16mm	
87	Sechskantmutter	Hex Nut	1	M16-2	
88	Faltenbalg	Gaiter	1		03336005188

7.7 Frästisch - Milling table

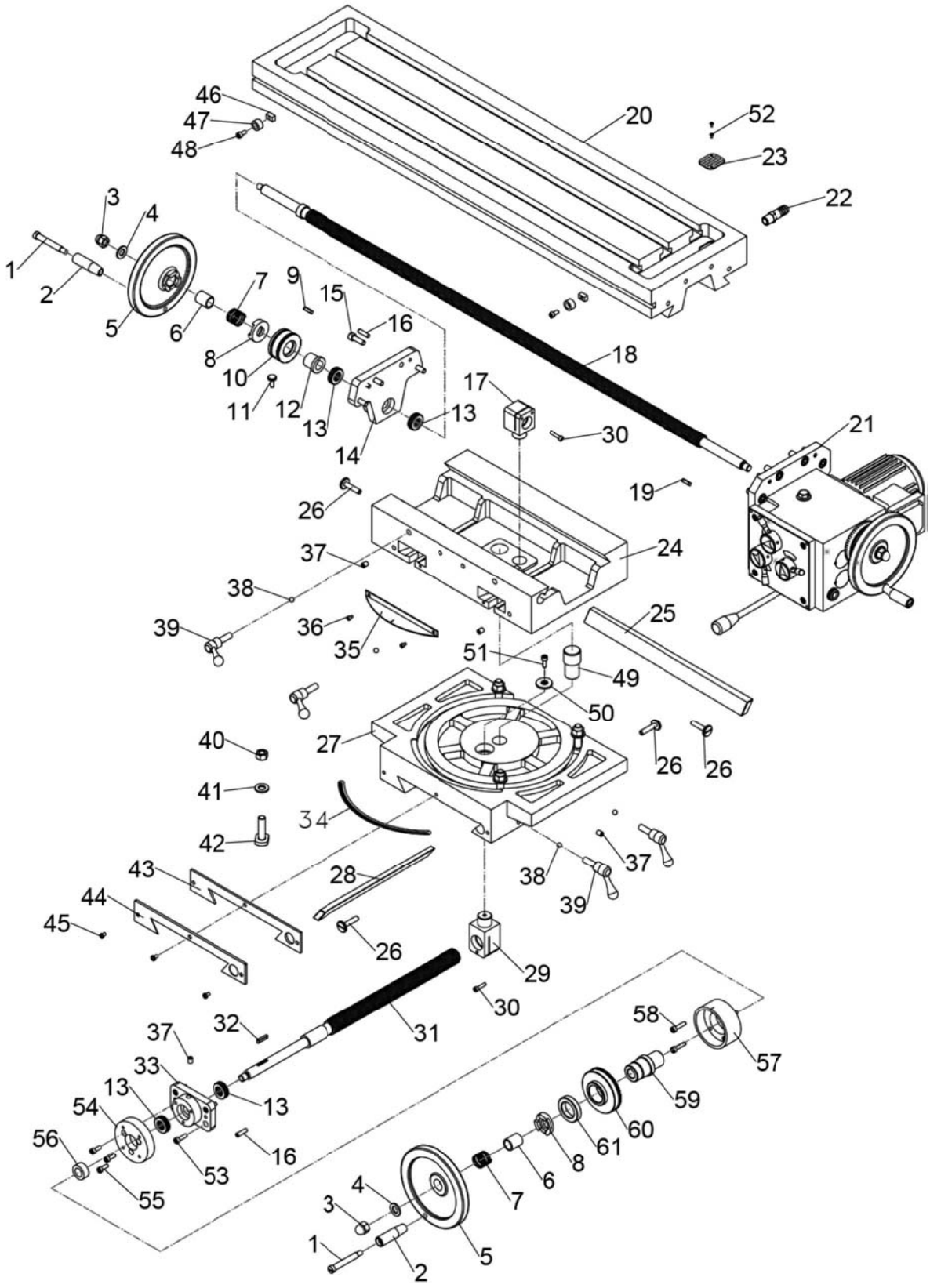

Abb. 7-2: Frästisch - Milling table

MT50_parts.fm

Ersatzteilliste Frästisch - Spare parts list milling table					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Schraube Handgriff	Handle Spindle	3		03336005201
2	Kegelknopf	Taper Knob	3		03336005202
3	Sechskantmutter	Hex Nut	3	M12-1.75	
4	Sicherungsscheibe	Lock Washer	3	12mm	042SR12W
5	Handrad	Hand Wheel	3		03336005205
6	Buchse	Bush	2		03336005206CPL
7	Feder	Spring	2		03336005207
8	Anschluss	Connect	2		03336005208
9	Passfeder	Key	1	5 x 20	042P5520
10	Skalenring	Scale Ring	2		03336005210
11	Kopfschraube	Cap Screw	2	M6-1 x 16	
12	Ring	Collar	2		
13	Kugellager	Ball Bearing	4	51103	04051103
14	Halter	Support	1		03336005214
15	Kopfschraube	Cap Screw	6	M8 x 25	
16	Stift	Pin	2	6 x 25	
17	Spindelmutter	Spindle nut	1		03336005217
17	Spindelmutter	Spindle nut	1		03336005217V2
18	Spindel	Lead Screw	1		03336005218
18L	Spindel lang	Lead screw long	1		03336005218L
19	Passfeder	Key	1	5 x 20	042P5520
20	Frästisch	Table	1		03336005220
21	Vorschub	Power Feed	1		03336005221
22	Anschlussrohr	Connect Tube	1		
23	Screen filter	Spaltfilter	1		03336005223
24	Drehbügel	Rotary Bracket	1		03336005224
25	Leiste	Gib	1		03336005225
26	Einstellschraube	Adjust Screw	3	M8-1.25	03336005226
27	Grundplatte	Center Base	1		
28	Leiste	Gib	1		03336005228
29	Spindelmutter	Spindle nut	1		03336005229
30	Schraube	Screw	3	M5 x 25	
31	Spindel	Lead Screw	1		03336005231
32	Passfeder	Key	1	5 x 30	042P5530
33	Unterstützung	Support	1		03336005233
34	Winkel Skala	Angle Ruler	1		
35	Führung	Guard	1		03336005235
36	Schraube	Screw	2	M5 x 10	
37	Öler	Oil Cup	4	8	0340114
38	Klemmblock	Clamp Block	4		
39	Klemmbolzen	Clamp Bolt	4	M10-1.5 x 53 x 25	
40	Sechskantmutter	Hex Nut	4	M12	

41	Scheibe	Washer	4	12	
42	T-Schraube	T Bolt	4	M12 x 1.75 x 42	
43	Abstreiferplatte	Wiper Plate	1		03336005243
44	Abdeckung Abstreiferplatte	Way Cover	1		03336005244
45	Innensechskantschraube	Phlp Hd Scr	3	M5-.8 x 12	
46	Schraubbügel	Screw Bracket	1		
47	Anschlag	Dog	1		
48	Kopfschraube	Cap Screw	1	M6-1 x 16	
49	Welle	Shaft	1		03336005249
50	Scheibe	Washer	1		
51	Schraube	Screw	1	M6 x 30	
52	Schraube	Screw	2	M4 x 8	
54	Flansch	Retainer	1		03336005254
55	Schraube	Screw	3	M6x16	
56	Buchse	Bush	1		0336005256
57	Hülse	Sleeve	1		03336005257
58	Schraube	Scrdew	4	M6x25	
59	Buchse	Bush	1		03336005259
60	Skalenring	Graduated ring	1		03336005260
61	Einstellmutter	Adjust nut	1		03336005261

7.8 Schaltgetriebe Vertikalfräsen - Transmission gear vertical milling

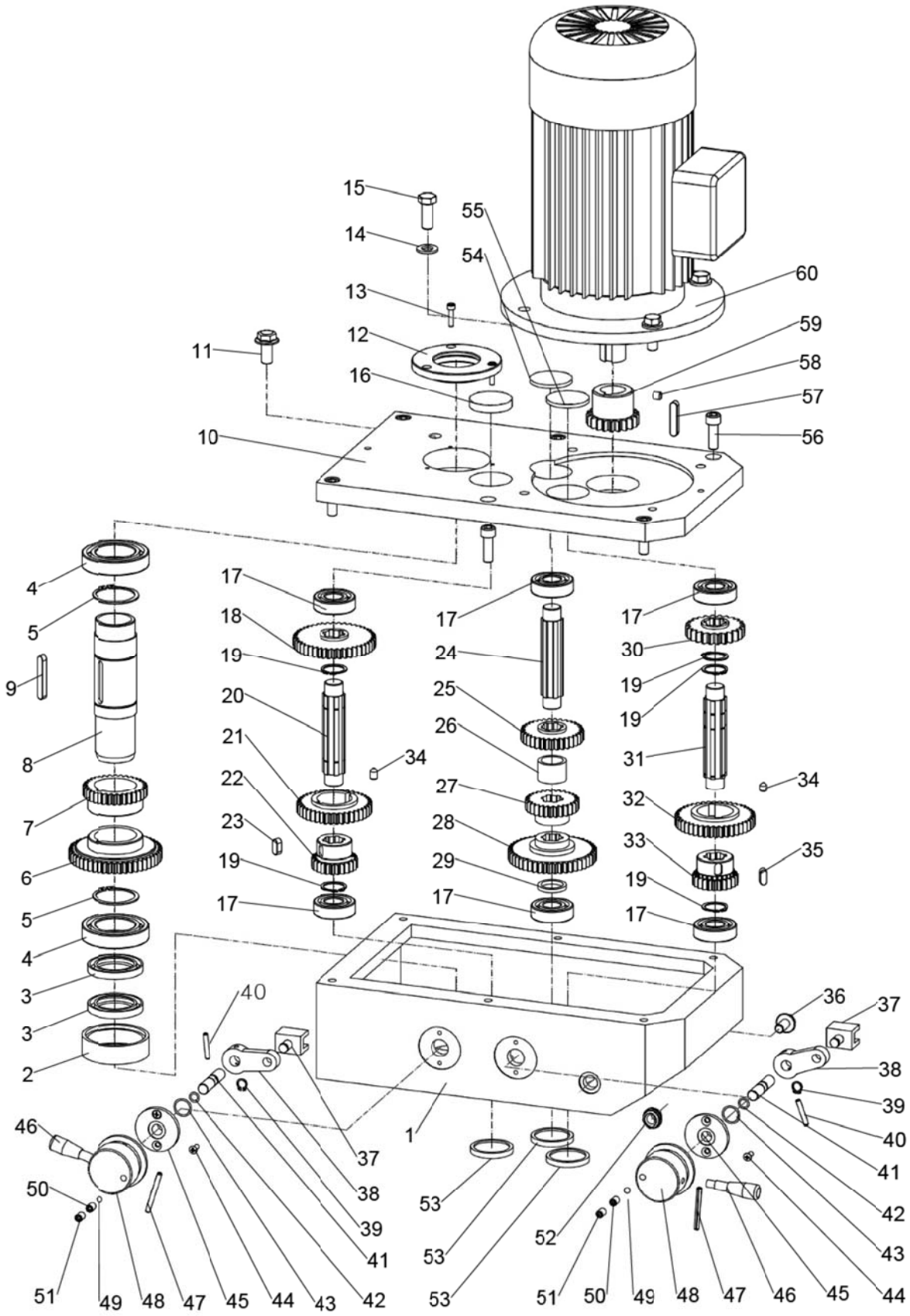

Abb. 7-3: Schaltgetriebe Vertikalfräsen - Transmission gear vertical milling

MT50_parts.fm

Ersatzteilliste Schaltgetriebe Vertikalfräsen- Spare parts list transmission gear vertical milling					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Getriebegehäuse	Gear Case	1		03336005301
2	Ring	Collar	1		
3	Öldichtung	Oil Seal	2	Fb45 x 62 x 8	
4	Kugellager	Ball Bearing	2	6009	0406009R
5	Sicherungsring	Ex Retaining Ring	2	48	042SR48W
6	Zahnrad	Gear	1		03336005306
7	Zahnrad	Gear	1		03336005307
8	Welle	Shaft	1		03336005308
9	Passfeder	Key	1	8 x 50	
10	Kastenabdeckung	Box Cover	1		03336005310
11	Sechskantschraube	Hex Bolt	1	M16 x 1.5	
12	Ring	Collar	1		
13	Schraube	Screw	3	M5 x 15	
14	Scheibe	Washer	4	12	
15	Schraube	Screw	4		
16	Abdeckung	Cover	1		
17	Kugellager	Ball Bearing	6	6204	0406204
18	Zahnrad	Gear	1		03336005318
19	Sicherungsring	Ex Retaining Ring	5	25	042SR25W
20	Antriebswelle	Driving Shaft	1		03336005320
21	Zahnrad	Gear	1		03336005321
22	Zahnrad	Gear	1		03336005322
23	Passfeder	Key	1	8 x 15	
24	Antriebswelle	Driving Shaft	1		03336005324
25	Zahnrad	Gear	1		03336005325
26	Buchse	Bush	1		03336005326
27	Zahnrad	Gear	1		03336005327
28	Zahnrad	Gear	1		03336005328
29	Ring	Ring	1		
30	Zahnrad	Gear	1		03336005330
31	Antriebswelle	Driving Shaft	1		03336005331
32	Zahnrad	Gear	1		03336005335
33	Zahnrad	Gear	1		03336005333
34	Gewindestift	Set Screw	4	M8 x 10	
35	Passfeder	Key	1	8 x 15	
36	Sechskantschraube	Hex Bolt	1	M10 x 1	
37	Hebegabel	Lift Fork	2		03336005337
38	Hebelarm	Rocker Arm	2		03336005338
39	Sicherungsring	Ex Retaining Ring	2	10	042SR10W
40	Stift	Pin	2	5 x 30	
41	Schmale Spindel	Small Spindle	2		

42	Gummiring	Rubber Ring	2	12 x 2	
43	Gummiring	Rubber Ring	2	20 x 2	
44	Schraube	Screw	4	5 x 12	
45	Abdeckung	Cover	2		03336005345
46	Griff	Handle	2		03336005346
47	Stift	Pin	2	5 x 50	
48	Griffsitz	Handle Seat	2		03336005348
49	Stahlkugel	Steel Ball	2	6	042KU06
50	Feder	Spring	3		
51	Gewindestift	Set Screw	2		
52	Ölschauglas	Oil Pointer	1		
53	Abdeckung	Cover	3		
54	Abdeckung	Cover	1		
55	Abdeckung	Cover	1		
56	Schraube	Screw	4	M10 x 30	
57	Passfeder	Key	1	8 x 40	
58	Gewindestift	Set Screw	1	M8 x 10	
59	Zahnrad	Gear	1		03336005359
60	Motor	Motor	1		03336005360

7.9 Riementrieb Horizontalfräsen - Belt drive horizontal milling

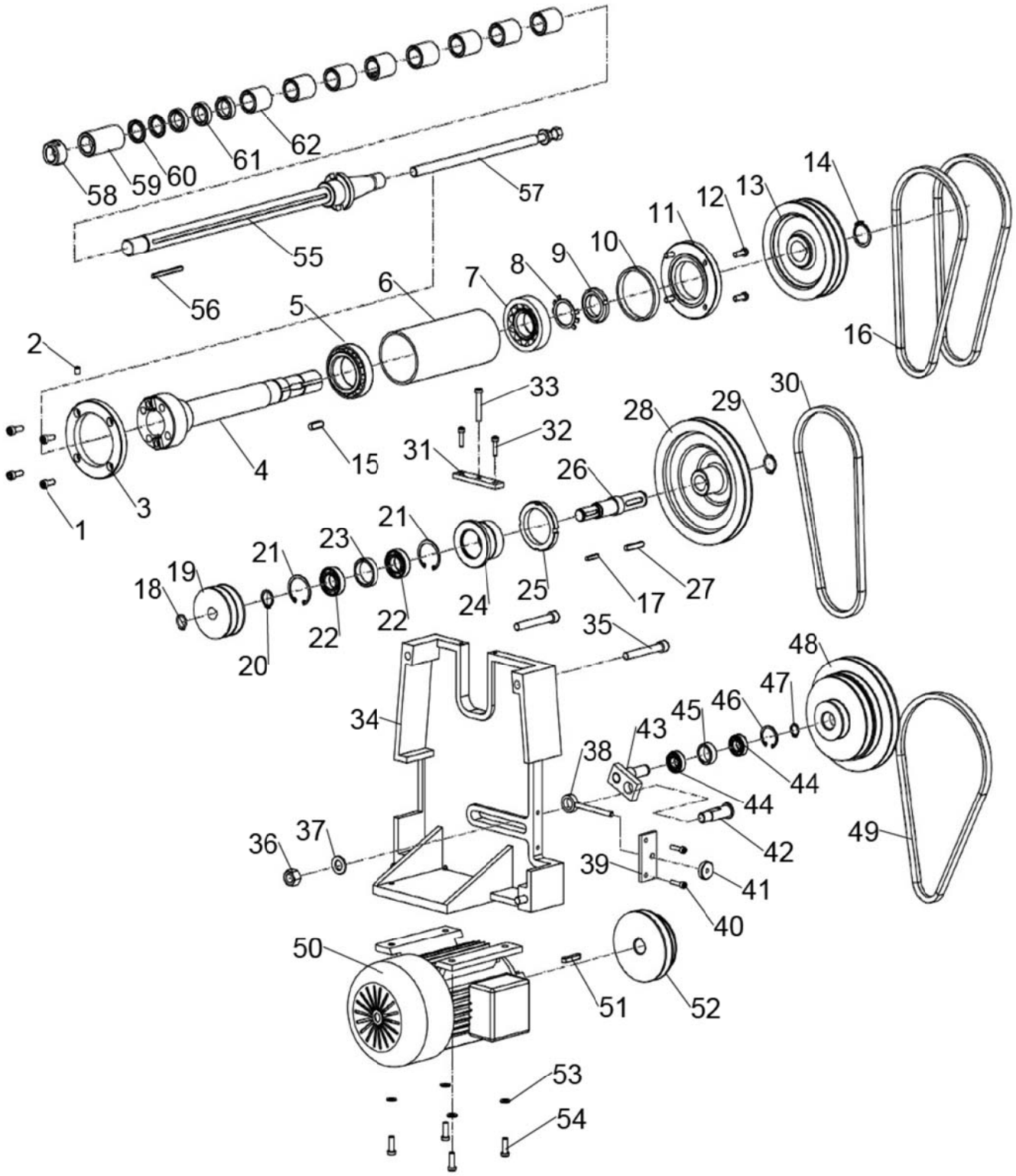

Abb. 7-4: Riementrieb Horizontalfräsen - Belt drive horizontal milling

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Ersatzteilliste Riementrieb Horizontalfräsen - Spare parts list belt drive horizontal milling					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Kopfschraube	Cap Screw	4	M8-1.25 x 25	
2	Öler	Oil Cup	1		
3	Abdeckung	Cover	1		
4	Spindel	Spindle	1		03336005404
5	Kegelrollenlager	Tapered roller bearing	1	32011	04032011
6	Ring	Collar	1		03336005406
7	Kegelrollenlager	Tapered roller bearing	1	30308	
8	Flache Scheibe	Flat Washer	1	39mm	
9	Nutmutter	Slotted Lock Nut	1	M39 x1.5	03336005409
10	Spezialscheibe	Special Washer	1	90 x 4	
11	Abdeckung	Cover	1		03336005411
12	Kopfschraube	Cap Screw	4	M8-1.25 x 25	
13	Spindelriemenscheibe	Spindle Pulley	1		03336005413
14	Sicherungsring	Retaining Ring	1		
15	Passfeder	Key	1	10 x 8 x 30	
16	Keilriemen	V-Belt	2	A838	03336005416
17	Passfeder	Key	1	6 x 30	
18	Sicherungsring	Ext Retaining Ring	1	20	042SR20W
19	Rad	Wheel	1		03336005419
20	Sicherungsring	Ex Retaining Ring	1	25	042SR25W
21	Sicherungsring	Int Retaining	2	47mm	042SR47I
22	Kugellager	Ball Bearing	2	6005	0406005
23	Ring	Collar	1		
24	Ring	Collar	1		
25	Spezialmutter	Special Nut	1	M64 x 2	03336005425
26	kleine Welle	Small Shaft	1		03336005426
27	Passfeder	Key	1	8 x 40	03336005427
28	Riemenscheibe	Pulley	1		03336005428
29	Sicherungsring	Ext Retaining Ring	1	25mm	042SR25W
30	Keilriemen	V-Belt	1	A864	03336005430
31	Halter	Support	1		
32	Kopfschraube	Cap Screw	2	M6-1 x 25	
33	Sechskantschraube	Hex Bolt	1	M8-1.25 x 60	
34	Motorbasis	Motor Base	1		03336005434
35	Kopfschraube	Cap Screw	4	M12-1.75 x 85	
36	Sechskantmutter	Hex Nut	1	M16-2	
37	Flache Scheibe	Flat Washer	1	16mm	
38	Einstellschraube	Adjust Screw	1	M8-1.25	
39	Halter	Support	1		
40	Kopfschraube	Cap Screw	2	M6-1 x 25	
41	Spezialmutter	Special Nut	1	M8-1.25	

42	schmale Welle	Small Shaft	1		03336005442
43	Anschluss	Connect	1		
44	Kugellager	Ball Bearing	2	6003	0406003
45	Ring	Collar	1	Collar	
46	Sicherungsring	Int Retaining Ring	1	35mm	042SR35W
47	Sicherungsring	Ext Retaining Ring	1	17mm	042SR17W
48	Riemenscheibe	Pulley	1		03336005448
49	Keilriemen	V-Belt	1	A800	03336005449
50	Motor	Motor	1		03336005450
51	Passfeder	Key	1	8 x 45	
52	Motorscheibe	Motor Wheel	1		03336005452
53	Sicherungsscheibe	Lock Washer	4	8mm	042SR8W
54	Sechskantschraube	Hex Bolt	4	M8-1.25 x 30	
55	Fräsdorn horizontal	Horizontal Arbor	1		0333600545522CPL
55	Fräsdorn horizontal	Horizontal Arbor	1		0333600545527CPL
56	Passfeder	Key	1		
57	Fräsdorn horizontal	Horizontal Arbor	1		03336005457
58	Mutter Fräsdorn	Arbor Nut	1		
59	Hülse Fräsdorn	Arbor Sleeve	1		
60	Distanzstück Fräsdorn	Arbor Spacer	2		
61	Ring	Collar	3		
62	Hülse Fräsdorn	Arbor Sleeve	8		

7.10 Universal Schwenkkopf - Universal swiveling head

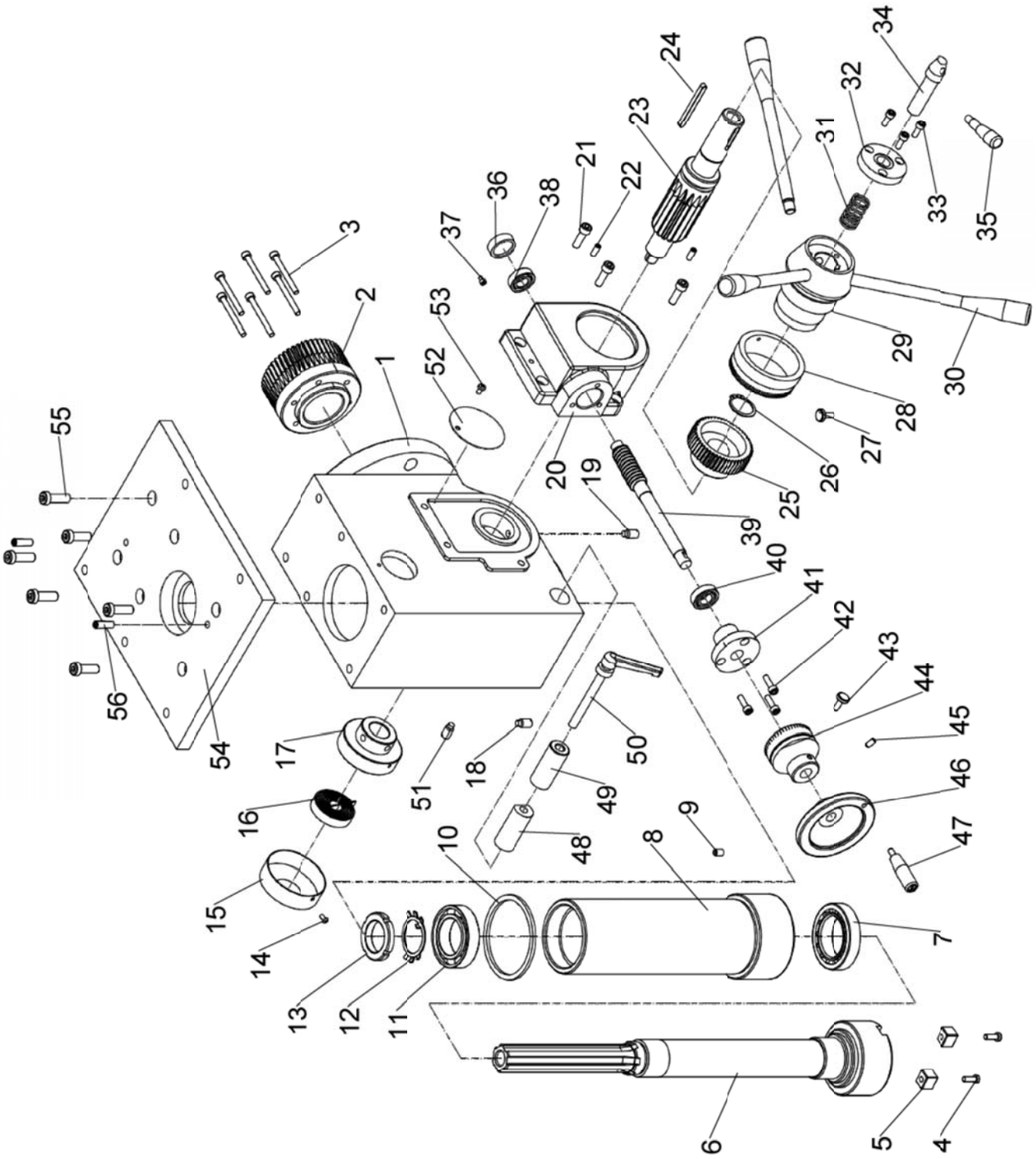

Abb. 7-5: Universal Schwenkkopf - Universal swiveling head

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Ersatzteilliste Universal Schwenkkopf - Spare parts list universal swiveling head					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Spindelgehäuse	Spindle Box	1		03336005501
2	Zahnrad	Gear	1		03336005502
3	Schraube	Screw	6	M6 x 75	
4	Schraube	Screw	2	M6 x 16	
5	Nutenstein	Fixed Key	2		
6	Spindel	Spindle	1		03336005506
7	Kegelrollenlager	Tapered roller bearing	1	32010	04032010
8	Pinole	Sleeve	1		03336005508CPL
9	Öler	Oil Cup	1		
10	Gummischeibe	Rubber Washer	1	90mm	03336005510
11	Kugellager	Ball Bearing	1	6009	0406009R
12	Klemmscheibe	Lock Washer	1	40	
13	Sicherungsmutter	Lock Nut	1	M40 x 1.5	
14	Kopfschraube	Cap Screw	1	M4 x 8	
15	Federabdeckung	Spring Cap	1		
16	Federplatte	Spring Plate	1		03336005516
17	Federgehäuse	Spring Base	1		03336005517
18	Gewindestift	Set Screw	1	M8 x 16	
19	Gewindestift	Set Screw	1	M8 x 16	
20	Gehäuse Handvorschub	Spindle hand feed box	1		03336005520
21	Schraube	Screw	3	M8 x 25	
22	Stift	Pin	2	6 x 25	
23	Vorschubwelle	Feed Shaft	1		03336005523
24	Passfeder	Key	1	8 x 38	
25	Schneckenrad	Helical Gear	1		03336005525
26	Sicherungsring	Ex Retaining Ring	1	30	042SR30W
27	Kopfschraube	Cap Screw	1	M6-1 x 16	
28	Skalenring	Scale Ring	1		03336005528
29	Handhebelaufnahme	Handle Bracket Hub	1		03336005529
30	Handhebelstange	Handle Bar	2		03336005530
31	Feder	Compression Spring	1		03336005531
32	Abdeckung	Cover	1		03336005532
33	Kopfschraube	Cap Screw	3	M6 x 16	
34	Sitz Handgriff	Handle Seat	1	M16 x 2	
35	Handhebel	Handle Bar	1		03336005535
36	Abdeckung	Cover	1		03336005536
37	Schraube	Screw	1	M6 x 12	
38	Kugellager	Ball Bearing	1	6002	0406002R
39	Schnecke	Worm	1		03336005539
40	Kugellager	Ball Bearing	1	6002	0406002R
41	Abdeckung	Cover	1		03336005541
42	Schraube	Screw	3	M6-1 x 20	

43	Kopfschraube	Cap Screw	1	M6-1 x 16	
44	Skalenring	Scale Ring	1		03336005544
45	Schraube	Screw	1	M6-1 x 12	
46	Handrad	Handle Wheel	1		03336005546
47	Handgriff	Handle	1		03336005547
48	Klemmblock	Clamp Block	1		03336005548
49	Klemmblock	Clamp Block	1		03336005549
50	Klemmhebel	Clamp Handle	1		03336005550
51	Gewindestift	Set Screw	2	M10 x 10	
52	Abdeckung	Baffle	1		
53	Schraube	Screw	1	M5 x 10	
54	Abdeckung Gehäuse	Head Box Cover	1		03336005554
55	Schraube	Screw	6	M10 x 30	
56	Stift	Pin	2	8 x 25	

7.11 Vorschubgetriebe X Achse - X axis feed gear

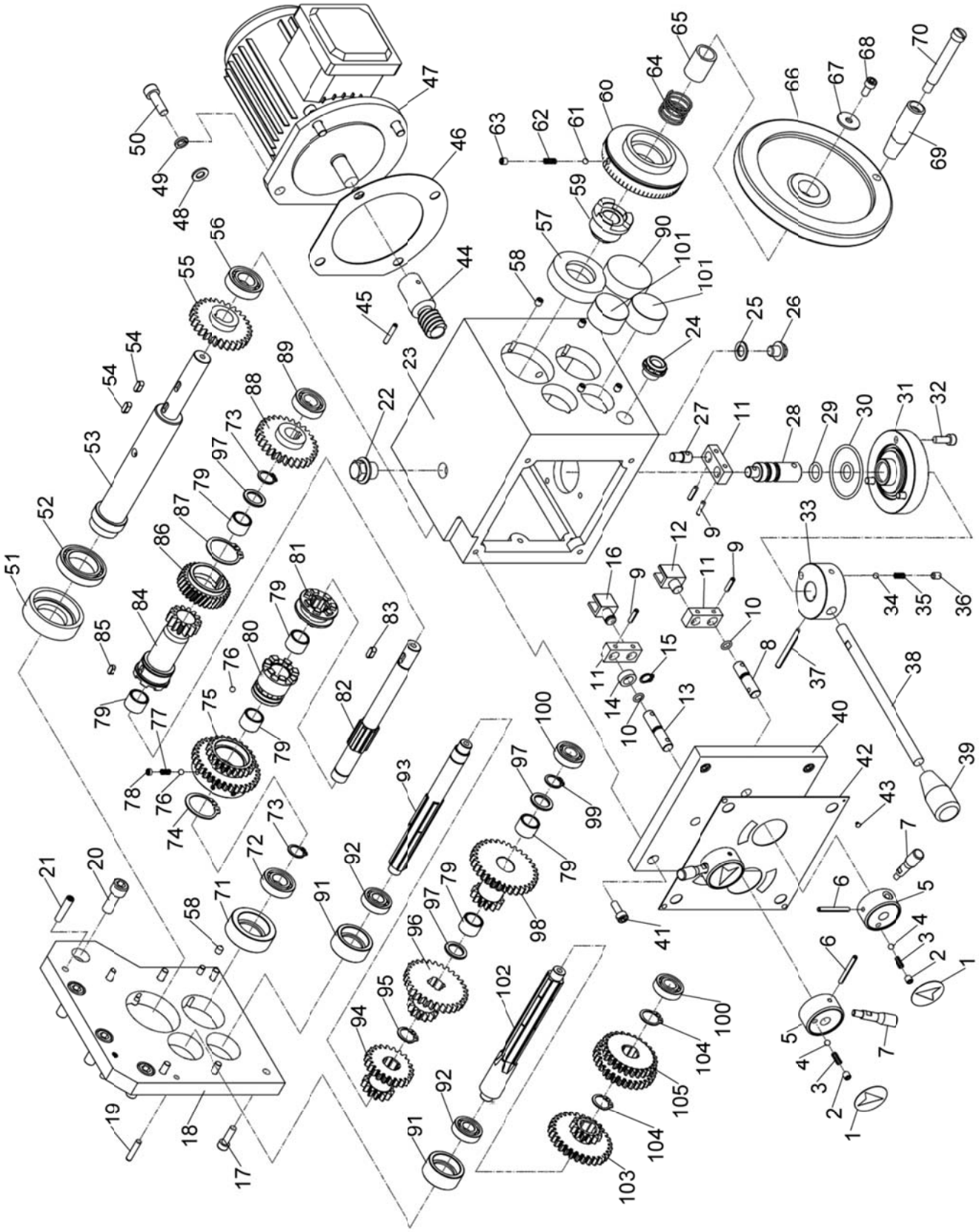

Abb. 7-6: Vorschubgetriebe - Feed gear

Ersatzteilliste Vorschubgetriebe - Spare parts list feed gear					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Anzeigeplatte	Indicator plate	3		03336005601
2	Stiftschraube	Set screw	12	M6 x 6	
3	Druckfeder	Compression spring	3	GB/T2089 1x4x12	
4	Stahlkugel	Steel ball	3	GB/T308 5	042KU47
5	Griff Sitz	Handle seat	3		03336005605
6	Elastischer zylindrischer Stift	Elastic cylindrical pin	3	GB/T879.1 5x35	
7	Hebelgriff	Handle lever	3		03336005607
8	Welle	Shaft	2		03336005608
9	Elastischer zylindrischer Stift	Elastic cylindrical pin	5	GB/T879.1 4x16	
10	O-Ring	O-ring	3	GB/T3452.1 7.1x1.8	
11	Kipphebel	Rocker arm	3		03336005611
12	Schaltgabel	Shifting fork	2		03336005612
13	Welle	Shaft	1		03336005613
14	Manschette	Collar	1		
15	Sicherungsring für Welle	Circlip for shaft	1	GB/T894.1 10	042SR10W
16	Schaltgabel	Shifting fork	1		03336005616
17	Innensechskantschraube	Hex socket head bolt	6	M6x16	
18	Schiebeplatte	Side plate	1		03336005618
19	Kegelbolzen	Taper bolt	2	GB/T117 6x24	
20	Innensechskantschraube	Hex Socket head bolt	4	M10x25	
21	Kegelbolzen	Taper bolt	2	GB/T117 5x24	
22	Ölverschluss	Oil plug	1	M16x1.5	
23	Gehäusekasten	Box	1		03336005623
24	Ölschauglas	Oil gage	1	GB/T1160.2	
25	Aluminiumscheibe	Aluminum washer	1		
26	Ölverschluss	Oil plug	1	JB/T1000 M10x1	
27	Welle	Shaft	1		03336005627
28	Welle	Shaft	1		03336005628
29	O-Ring	O-ring	2	GB/T3452.1 13.2x2.65	03336005629
30	O-Ring	O-ring	1	GB/T3452.1 46.2x2.65	03336005630
31	Flansch	Flange	1		03336005631
32	Innensechskantschraube	Hex Socket head bolt	3	M6x16	
33	Griff Sitz	Handle seat	1		03336005633
34	Stahlkugel	Steel ball	1	GB/T308 5	042KU47
35	Druckfeder	Compression sprin	1	GB/T2089 1x4x12	
36	Stiftschraube	Set screw	1	M6x8	
37	Elastischer zylindrischer Stift	Elastic cylindrical pin	1	GB/T879.1 5x50	
38	Hebelgriff	Handle lever	1		03336005638
39	Kegelknopf	Taper knob	1		03336005639
40	Vordere Abdeckung	Front cover	1		03336005640
41	Innensechskantschraube	Hex Socket head bolt	4	M6x18	

42	Informationsplatte	Information plate	1		03336005642
43	Niet	Rivet	4	GB/T827 2.5x4	
44	Schnecke	Worm	1	m=1.5 z=3	03336005644
45	Elastischer zylindrischer Stift	Elastic cylindrical pin	1	GB/T879.1 5x24	
46	Dichtring	Seal ring	1		03336005646
47	Elektromotor	Electromotor	1	370W 2800rpm	03336005647
48	Unterlegscheibe	Washer	4	8	
49	Federscheibe	Spring washer	4	8	
50	Innensechskantschraube	Hex Socket head bolt	4	M8x20	
51	Lagergehäuse B	Bearing housing B	1		03336005651
52	Lager	Bearing	1	GB/T275 61906	04061906R
53	Welle B	Shaft B	1		03336005653
54	Passfeder	Flat key	2	5x10	042P5510
55	Zahnrad	Gear	1	m=2 z=29	03336005655
56	Lager	Bearing	1	GB/T276 6003	0406003
57	Lagergehäuse B	Bearing housing B	1		03336005657
58	Stiftschraube	Set screw	8	M6x6	
59	Kupplung	Clutch	1		03336005659
60	Wahlscheibe	Graduated dial	1		03336005660
61	Stahlkugel	Steel ball	1	GB/T308 5	042KU47
62	Druckfeder	Compression spring	1	GB/T2089 1x4x12	
63	Stiftschraube	Set screw	1	M6x8	03336005663
64	Feder	Spring	2	GB/T2089 1.6x24x15	03336005664
65	Buchse	Bushing	1		03336005665
66	Handrad	Handwheel	1		03336005666
67	Unterlegscheibe	Washer	1		
68	Innensechskantschraube	Hex Socket head bolt	1	M6x16	
69	Griff Handrad	Handwheel handle	1		03336005669
70	Griff Schritt Schraube	Handle step screw	1		
71	Lagergehäuse E	Bearing housing E	1		03336005671
72	Lager	Bearing	1	GB/T276 6002	0406002R
73	Sicherungsring für Welle	Circlip for shaft	2	GB/T894.1 15	042SR15W
74	Sicherungsring für Welle	Circlip for shaft	1	GB/T894.1 30	042SR30W
75	Zahnrad	Gear	1	m=2 z1=23 z2=33	03336005675
76	Stahlkugel	Steel ball	16	GB/T308 5	042KU47
77	Druckfeder	Compression spring	8	GB/T2089 0.8x4x9	
78	Stiftschraube	Set screw	8	M6x6	
79	Gleitlager	Sliding bearing	6		03336005679
80	Kupplung	Clutch	1		03336005680
81	Kupplung	Clutch	1		03336005681
82	Nutenwelle (B)	Spline shaft (B)	1		03336005682
83	Passfeder	Flat key	1	5x12	042P5512
84	Zahnradwelle	Gear shaft	1	m=2 z=14	03336005684
85	Passfeder	Flat key	1	5x10	042P5510
86	Stirnradgetriebe	Helical gear	1	M=1.5 z=31	03336005686
87	Sicherungsring für Welle	Circlip for shaft	1	GB/T894.1 32	042SR32W

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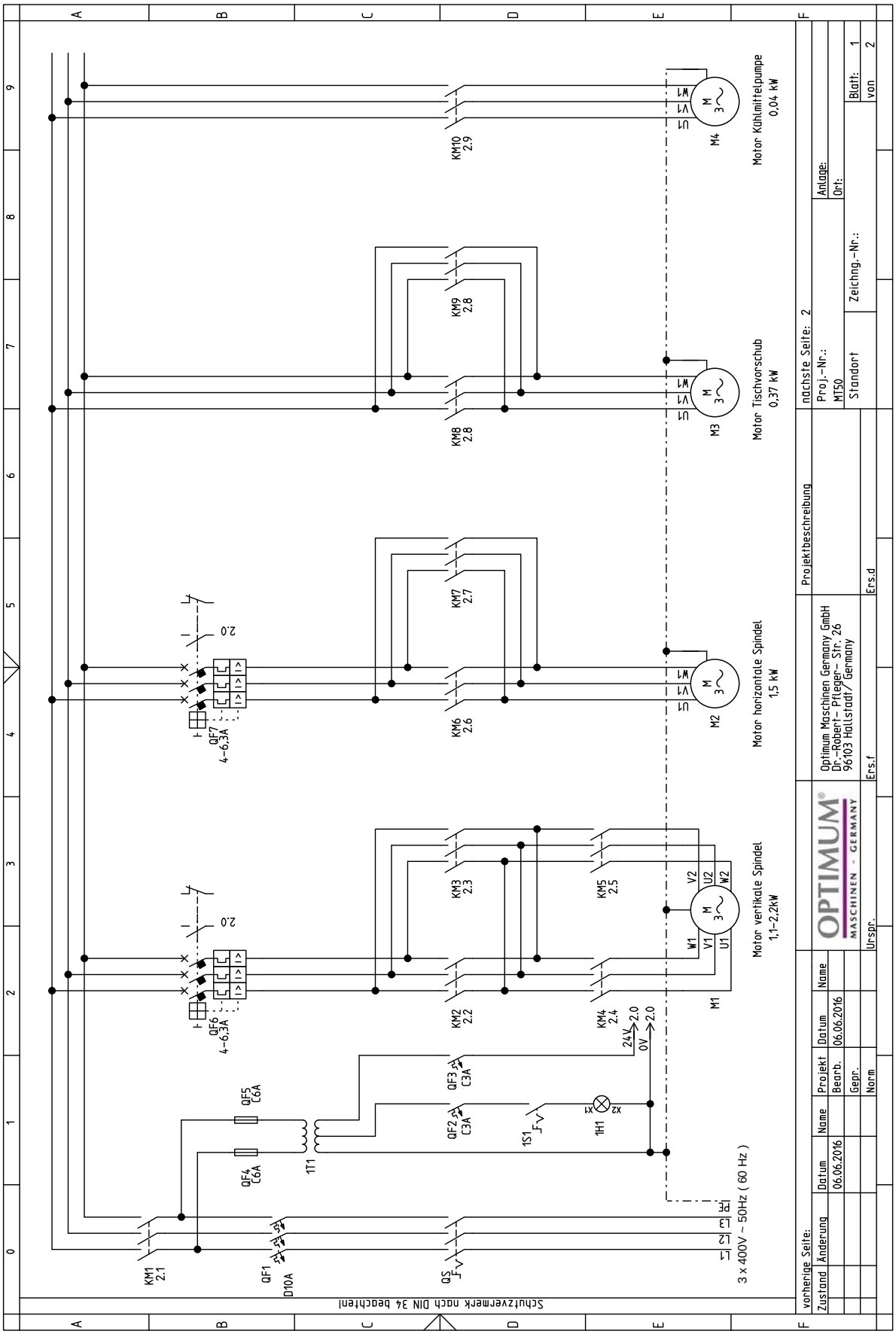
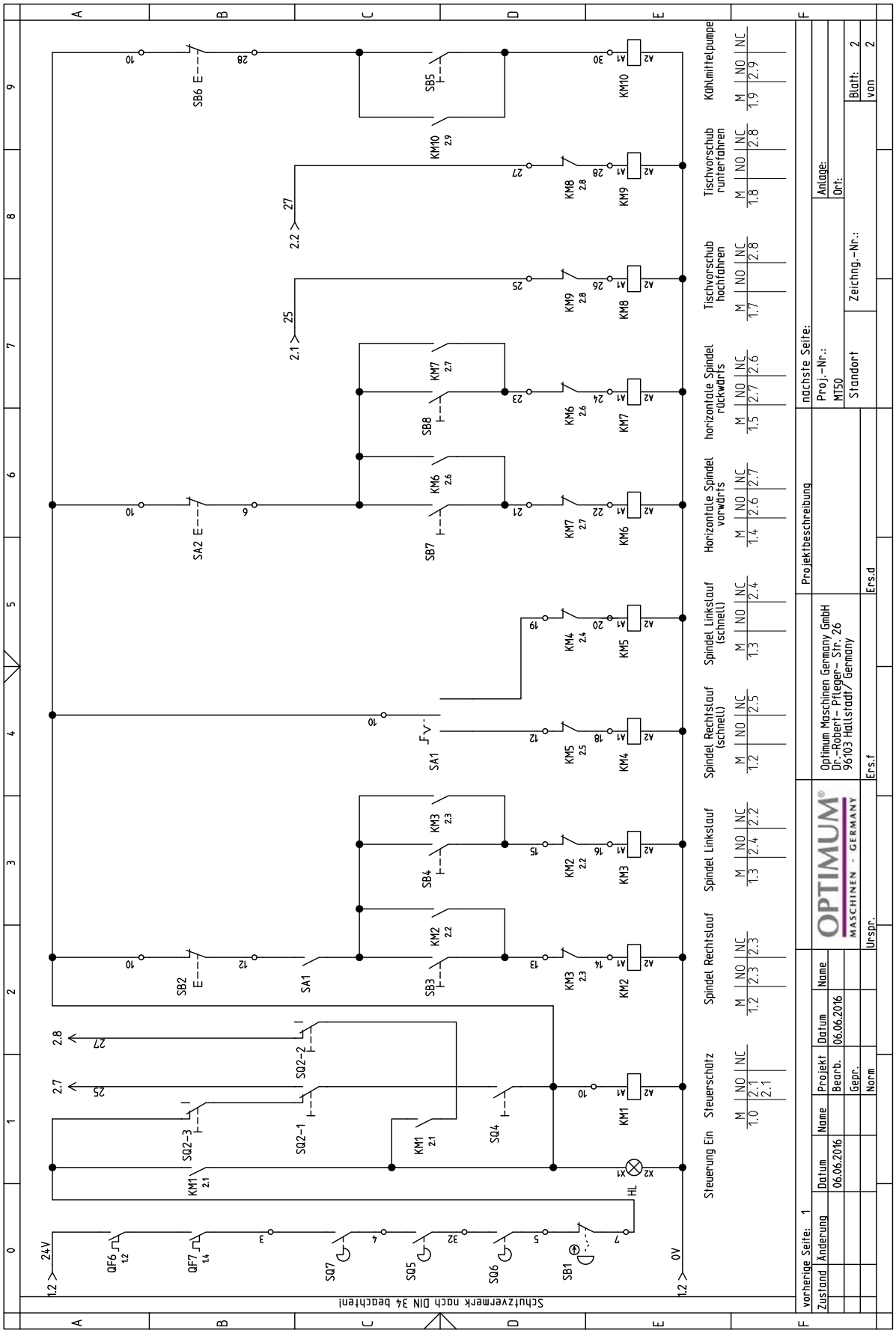
88	Zahnrad	Gear	1	m=2 z=29	03336005688
88	Zahnrad V2	Gear V2	1		03336005688V2
89	Lager	Bearing	1	GB/T276 6002	0406002R
90	Lagergehäuse	Bearing housing	1		
91	Lagergehäuse	Bearing housing	2		
92	Lager	Bearing	2	GB/T276 6001	0406001
93	Nutenwelle (D)	Spline shaft (D)	1		03336005693
94	Zahnrad	Gear	1	m=2 z1=13 z2=23	03336005694
95	Sicherungsring für Welle	Circlip for shaft	1	GB/T894.1 18	042SR18W
96	Zahnrad	Gear	1	m=2 z1=13 z2=31	03336005696
97	Unterlegscheibe	Washer	3		
98	Dreifachzahnrad	Triple gear	1	m=2 z1=13 z2=17 z3=32	03336005698
99	Sicherungsring für Welle	Circlip for shaft	1	GB/T894.1 15	042SR15W
100	Lager	Bearing	2	GB/T276 6001	0406001
101	Lagergehäuse	Bearing housing	2		033360056101
102	Nutenwelle (A)	Spline shaft (A)	1		033360056102
103	Zahnrad	Gear	1	m=2 z1=31 z2=13	033360056103
104	Sicherungsring für Welle	Circlip for shaft	2	GB/T894.1 18	042SR18W
105	Zahnrad	Gear	1	m=2 z1=31 z2=27	033360056105
105	Zahnrad V2	Gear V2	1		033360056105V2
CPL	Getriebe komplett	Feed gear complete	1		033360056CPL

7.12 Schaltplan - Wiring diagram 1-2



7.13 Schaltplan - wiring diagram 2-2



Ersatzteilliste elektrische Bauteile- Spare part list electrical components					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
QF1	Sicherungsautomat	Automatic fuse	1	TECHNI DZ163-63/D10A	
1H1	Maschinenlampe	Machine lamp	1		
1S1	Schalter Maschinenlampe	Machine lamp switch	1		
1T1	Transformator	Transformer	1	JBK5-250	
HL	Lampe Steuerung Ein	Control On lamp	1		
KM1	Hauptsteuerrelais	Main control relays	1	SIEMENS 3TB41-24V	
KM2	Schütz Spindel Rechtslauf	Spindle CW rotation contactor	1	SIEMENS 3TB41-24V	
KM3	Schütz Spindel Linkslauf	Spindle CCW rotation contactor	1	SIEMENS 3TB41-24V	
KM4	Schütz Spindel Rechtslauf schnell	Spindle rapid CW rotation contactor	1	SIEMENS 3TB41-24V	
KM5	Schütz Spindel Linkslauf schnell	Spindle slow CCW rotation contactor	1	SIEMENS 3TB41-24V	
KM6	Schütz horizontale Spindel vorwärts	Horizontal spindle CW rotation contactor	1	SIEMENS 3TB41-24V	
KM7	Schütz horizontale Spindel rückwärts	Horizontales spindle CCW rotation contactor	1	SIEMENS 3TB41-24V	
KM8	Schütz Tischvorschub hochfahren	Table top feed contactor	1	SIEMENS 3TB41-24V	
KM9	Tischvorschub runterfahren	Table down feed contactor	1	SIEMENS 3TB41-24V	
KM10	Schütz Kühlmittelpumpe	Coolant pump contactor	1	SIEMENS 3TB41-24V	
M1	Motor vertikale Spindel	Vertical spindle motor	1	400V/3 Ph/~50 Hz/1,1-2,2 kW	
M2	Motor horizontale Spindel	Horizontal spindle motor	1	Dongtai YL-90L-4	
M3	Motor Tischvorschub	Table feed motor	1	Shanghai LIXIN VDB-12TH	
M4	Motor Kühlmittelpumpe	Coolant pump motor	1	Dongtai YS6332	
QF2	Sicherungsautomat	Automatic fuse	1	TECHNI DZ163-63/3A	
QF3	Sicherungsautomat	Automatic fuse	1	TECHNI DZ163-63/3A	
QF4	Sicherung	Fuse	1	TECHNI DZ163-63/C6A	
QF5	Sicherung	Fuse	1	TECHNI DZ163-63/C6A	
QF6	Motorschutzschalter vertikale Spindel	Vertical spindle overload switch	1	DELIXY DZ108-20/4-6,3A	
QF7	Motorschutzschalter horizontale Spindel	Horizontal spindle overload switch	1	DELIXY DZ108-20/4-6,3A	
QS	Hauptschalter	Main switch	1	JCH13-20	
SA1	Drehrichtungsschalter	Change-over switch	1		
SA2	Taster horizontale Spindel Aus	Horizontale spindle OFF button	1	ZheJiang LA125H-BA42	
SB2	Taster vertikale Spindel Aus	Vertical spindle OFF button	1	ZheJiang LA125H-BA42	
SB6	Taster Kühlmittelpumpe Aus	Coolant pump OFF button	1	ZheJiang LA125H-BA42	
SB1	Not-Halt-Schlagschalter	Emergency stop button	1	ZheJiang LA125H-BS524	
SB3	Taster Spindel vorwärts Ein	Spindle CW rotation ON button	1	ZheJiang LA125H-BD21	
SB4	Taster Spindel rückwärts Ein	Spindle CCW rotation ON button	1	ZheJiang LA125H-BD21	
SB5	Taster Kühlmittelpumpe Ein	Coolant pump ON button	1	ZheJiang LA125H-BD21	
SB7	Taster horizontale Spindel vorwärts Ein	Horizontal spindle CW ON button	1	ZheJiang LA125H-BD21	
SB8	Taster horizontale Spindel rückwärts Ein	Horizontal spindle CCW ON button	1	ZheJiang LA125H-BA21	
SQ2-1	Wechsler	Two-way contact	1		

SQ2-2	Wechsler	Two-way contact	1		
SQ2-3	Wechsler	Two-way contact	1		
SQ4	Steuerung Ein	Control On	1	ZheJiang LA125H-BD21	
SQ5	Sicherheitsschalter Schaltschrank	Electrical cabinet safety switch	1	ZheJiang KW7-0	
SQ6	Sicherheitsschalter Fräsfutterschutz	Spindle safety switch	1	Omron V-152-1C25	
SQ7	Sicherheitsschalter Riemenabdeckung	Belt cover safety switch	1	ZheJiang LXW5-11Q1	

Schmierstoffe Lubricant Lubrifiant	Viskosität Viskosity Viscosité ISO VG DIN 51519 mm²/s (cSt)	Kennzeich-nung nach DIN 51502	ARAL	BP	Esso	Klüber Lubrication	Mobil	Shell	Texaco
Getriebeöl Gear oil Huile de réducteur	VG 680	CLP 680	Aral Degol BG 680	BP Energol GR-XP 680	SPARTAN EP 680	Klüberoil GEM 1-680	Mobilgear 636	Shell Omala 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 Energrease PR-EP 00	FIBRAX EP 370 (Na-verseift)	MICRO-LUBE GB 00	Mobilux EP 004	Shell Alva-nia GL 00 (Li-verseift)	Marfak 00

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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 Alvania R 3 Alvania G 3	Multifak Premium 3
Öle für Gleitbahnen Oils for slideways Huiles pour glissières	VG 68	CGLP 68	Aral Deganit BWX 68	BP Maccurat D68	ESSO Febis K68	LAMORA D 68	Mobil Vactra Oil No.2	Shell Tonna S2 M 68	Way lubricant X 68
Öle für Hochfrequenzspindeln Oils for Built-in spindles Huiles pour broches à haute vitesse	VG 68		Deol BG 68	Emergol HLP-D68	Spartan EP 68		Drucköl KLP 68-C	Shell Omala 68	
Fett für 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	METAFLUX-Fett-Paste (Grease paste) Nr. 70-8508 METAFLUX-Moly-Spray Nr. 70-82 Techno Service GmbH ; Detmolder Strasse 515 ; D-33605 Bielefeld ; (++49) 0521- 924440 ; www.metaflux-ts.de								
Kühlschmiermittel Cooling lubricants Lubrifiants de refroidissement	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		Aral Emusol	BP Sevora	Esso Kutwell		Mobilcut	Shell Adrana	Chevron Soluble Oil B

8 Malfunctions

Malfunction	Cause/ possible effects	Solution
Noise during work	Spindle turning dry Tool blunt or incorrectly secured	Grease spindle Use new tool and check securing (fixed setting of the bit, bit-holder and conical chuck).
Tool "burnt".	Incorrect speed. Chips do not come out of the bore hole. Tool blunt. Operating without cooling agent.	Select another rate, feed too high. Retract tool more often during machining. Sharpen or replace tool. Use cooling agent
Bit tip moves, bore is not circular	Hard fibre in the wood or unequal length of the cutting spiral or angles in the bit Tool deformed	Replace tool
Tool running off-centre or "hopping"	Tool deformed Bearings worn down in the spindle head Spindle head Tool badly secured Defective clamping chuck	Replace tool Have the bearings in the spindle head replaced Secure the tool properly Replace the clamping chuck
Impossible to insert holding taper into the spindle sleeve.	Remove any dirt, grease or oil from the internal conical surface of the spindle sleeve or the grip cone.	Clean surfaces well. Keep surfaces free of grease.
Motor does not start	Motor is wrongly connected Defective fuse	Have it checked by authorised personnel.
Motor is overheating and there is no power	Motor overloaded Insufficient mains voltage Motor badly connected	Reduce feed, disconnect if necessary and have it checked by authorised personnel Have it checked by authorised personnel
Precision of the work deficient	Heavy and unbalanced or deformed work-piece Inexact horizontal position of the part holder	Balance the piece statically and secure without straining Adjust workpiece-holder
Spindle bearing overheating	Bearing worn down Bearing pretension is too high Working at high speeds for a long time	Replace Reduce bearing clearance in the fixed bearing Reduce feed rate

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Malfunction	Cause/ possible effects	Solution
Working spindle rattling on rough work-piece surfaces	Excessive slack in bearing. Working spindle goes up and down. Adjustment strip loose Chuck loose Tool is blunt. The workpiece is not fastened.	Readjust bearing slack or replace bearing Readjust bearing slack (fixed bearing) Adjust strip to the correct slack using the adjusting screw Check, re-tighten. Sharpen or replace tool Clamp the workpiece firmly.

9 Appendix

9.1 Copyright

9.2 Terminology/Glossary

Term	Explanation
Cross table	Bearing surface, clamping surface for the workpiece with X- and Y-axis travel
Taper mandrel	Cone of the drill or of the drill chuck
Workpiece	piece to be milled, drilled or machined.
Draw-in rod	Threaded rod to fix the taper mandrel in the spindle sleeve.
Drill chuck	Drill bit chuck
Collet chuck	Holder for end mill
Drill-Mill head	Upper part of the milling machine
Spindle sleeve	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
Spindle sleeve lever	Manual operation for the drill feed
Quick action - Drill chuck	Drill chuck can be fixed by hand.
Tool	Milling cutter, drill bit, etc.

9.3 Liability claims for defects / warranty

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

- The processing of the liability claims or of the warranty is performed as chosen by OPTIMUM GmbH either directly or through one of its dealers.
  Any defective products or components of such products will either be repaired or replaced by components which are free from defects. The property of replaced products or components passes on to OPTIMUM 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:
  the following circumstances occurred:
  - Using the product beyond the technical options and proper use, in particular due to over-

straining of the machine.
- Any defects arising by one's own fault due to faulty operations or if the operating manual is disregarded.
- Inattentive or incorrect handling and use of improper equipment.
- Non-authorized modifications and repairs.
- Insufficient installation and safeguarding of the machine
- Disregarding the installation requirements and conditions of use.
- Atmospheric discharges, overvoltage and lightning strokes as well as chemical influences.

❍ The following items are as well not subject to the liability or warranty claims:
- Wearing parts and components which are subject to a standard wear as intended such as e.g. V-belts, ball bearings, illuminants, filters, sealings, etc.
- Non reproducible software errors

❍ Any services which OPTIMUM GmbH or one of its agents performs in order to fulfill in the frame of an additional guarantee are neither an acceptance of the defects nor an acceptance of its obligation to compensate. Such services do neither delay nor interrupt the warranty period.

❍ Place of jurisdiction among traders is Bamberg.

❍ If one of the above mentioned agreements is totally or partially inefficient and/or null, it is considered as agreed what is closest to the will of the warrantor and which remains in the framework of the limits of liability and warranty which are predefined by this contract.

9.4 Change information operating manual

Chapter	Short note	new version number
4.3	Information, switching the machine ON	1.1.1
4	Using of chip and splash guard	1.1.2
EC declaration	new standard	1.1.2
2	Larger milling table from serial number J201310356	1.2.0
EC declaration	changed standard	1.2.1
	Digital position display removed, is enclosed separately	1.2.1
4.15	Conversion to horizontal milling, turning 180°	1.2.2
CE	EMC 2014/30/EU & LVD 2014/35/EU	1.2.3
parts	updated spare parts drawings	1.2.4
parts	updated spare parts drawings, Transmission gear vertical milling	1.2.5
2 ; 3; parts	updated spare parts drawings complete, foundation plan, installation plan	1.2.6
Spare parts	Milling table	1.2.7
3	Interdepartmental transport	1.2.8

9.5 Storage

ATTENTION!

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

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

Follow the instructions and information on the transport case:

❍ Fragile goods (Goods require careful handling)

❍ Protect against moisture and humid environment

☞ Environmental conditions on page 20

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

❍ Maximum stacking height
Example: not stackable - do not stack a second packing case on top of the first one.

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

9.6 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
❍ Experiences with the milling-machine, which could be important to other users
❍ Recurring failures

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

D-96103 Hallstadt

Fax +49 (0) 951 - 96555 - 888
Email: info@optimum-maschinen.de

9.7 Note regarding disposal / options to reuse:

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

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

9.7.1 Decommissioning

CAUTION!

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

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

9.7.2 Disposal of the packaging of new devices

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

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

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

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

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

9.7.3 Disposing of the old device

INFORMATION

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

Please note that the electrical devices include lots of reusable materials as well as environmentally hazardous components. Account for separate and professional disposal of the component parts. In case of doubt, please contact your municipal waste management. If appropriate, call on the help of a specialist waste disposal company for the treatment of the material.

9.7.4 Disposal of electrical and electronic components

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

The device includes electric and electronic components and must not be disposed of with the rubbish.

According to the European directive regarding electrical and electronic used devices and the execution of national rights used electrical tools and electrical machines need to be collected separately and be supplied to an environmentally compatible reuse.

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

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

9.7.5 Disposal of lubricants and coolants

ATTENTION!

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

INFORMATION

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

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

9.8 Disposal via municipal collection

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

The sign on the product or on its packing indicates that the product must not be handles as common household waist, but that is needs to be delivered to a central collection point for recycling. Your contribution to the correct disposal of this product will protect the environment and the health of your fellow men. The environment and the health are endangered by incorrect disposal. Recycling of material will help to reduce the consumption of raw materials. Your District Office, the municipal waste collection station or the shop where you have bought the product will inform you about the recycling of this product.

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: MT50

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 with continuously operated axles up to 2 m/min feed and / or with rapid traverse controlled up to 5 m/min by command device with self-acting reset (jogging switch).

The following additional EU directives have been applied:

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

The following harmonized standards were applied:

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

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

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

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

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

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

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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 MT 50 Übersicht

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  - OPTImill MT 50 Ersatzteile
  - OPTImill MT 50 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