OPTIMUM®
MASCHINEN - GERMANY

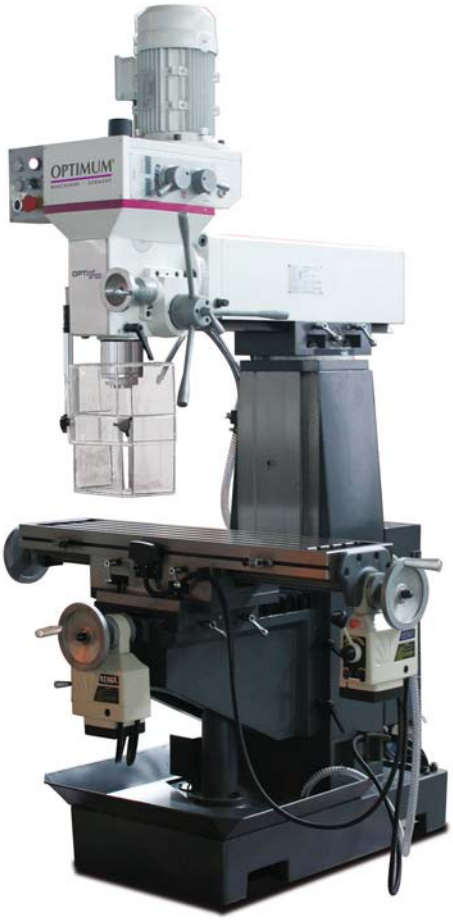
Operating Manual

Version 1.0.2

Drilling- milling machine

OPTImill® MT 50E

Part no. 3336010



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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

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1 Safety

This part of the operating instructions

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

In addition to these operation instructions, please observe

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

Always keep this documentation close to the milling machine.

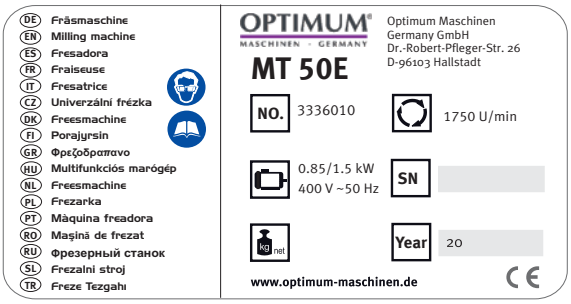
1.1 Glossary of symbols

☞ provides further instructions

➜ calls on you to act

- listings

1.2 Rating plate



1.3 Safety instructions (warning notes)

1.3.1 Classification of hazards

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

Symbol	Alarm expression	Definition / consequence
	**DANGER!**	Impending danger that will cause serious injury or death to people.
	WARNING!	A danger that can cause serious injury or death.
	CAUTION!	A danger or unsafe procedure that can cause personal injury or damage to property.
	**ATTENTION!**	Situation that could cause damage to the milling machine and product, as well as other types of damage. No risk of injury to persons.

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Symbol	Alarm expression	Definition / consequence
	**INFORMATION**	Practical tips and other important or useful information and notes. No dangerous or harmful consequences for people or objects.

In case of specific dangers, we replace the pictogram with


general danger


with a warning of


injury to hands,


hazardous electrical voltage,


rotating parts.

1.3.2 Other pictograms


Activation forbidden!


Do not step into the machine!


Do not extinguish with water!


Do not clean with compressed air!


Access forbidden!


Wear safety shoes!


Use ear protection!


Wear protective glasses!


Wear protective gloves!


Warning: biological hazard!


Warning: suspended loads!


Warning: automatic start-up!


Caution, danger of explosive substances!


Warning: danger of slipping!


Protect the environment!


Contact address

1.4 Intended use

WARNING!

In the event of improper use, the milling machine

- **may be a hazard to personnel,**
- **the machine and other property of the operating company and**

- **the functionality of the milling machine may be compromised.**

The milling machine is designed and manufactured to be used for milling and drilling cold metals or other non-flammable materials or materials that do not constitute a health hazard when commercial milling and drilling tools are used.
Using this machine it is possible to perform dry processing as well as processing by using cooling lubricants.

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

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

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

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, if any constructive, technicalor procedural changes are not performed by the company Optimum Maschinen Germany GmbH.

It is also part of the intended use that you

- the limits of performance of the milling machine are observed,
- the operating manual is observed,
- the inspection and maintenance instructions are observed.

WARNING!

Extremely severe injuries due to non-intended use.

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

1.5 Reasonably foreseeable misuse

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

Any other use has to be discussed with the manufacturer.

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

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

Operators must be qualified.

1.5.1 Avoiding misuse

➜ Use of suitable cutting tools.

➜ Adapting the speed setting and feed to the material and workpiece.

➜ Clamp workpieces firmly and free of vibration.

➜ Risk of fire and explosion due to the use of flammable materials or cooling lubricants. Before processing inflammable materials (e.g. aluminium, magnesium) or using inflammable auxiliary materials (e.g. spirit), you need to take additional preventive measures in order to avoid health risks.

➜ When processing carbons, graphite and carbon-fibre-reinforced carbons, the machine is no longer being used as intended. This causes the warranty to be null and void. When processing carbons, graphite and carbon-fibre-reinforced carbons and similar materials, the machine can be damaged extremely quickly, even if the dusts generated are completely sucked out during the work process.

ATTENTION!

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

WARNING!

Risk of injury caused by flying workpieces.

Clamp the workpiece in the machine vice. Make sure that the workpiece is firmly clamped in the machine vice and that the machine vice is firmly clamped onto the machine table.

➜ Use cooling and lubricating agents to increase the durability of the tool and to improve the surface quality.

➜ Clamp the cutting tools and workpieces on clean clamping surfaces.

➜ Sufficiently lubricate the machine.

WARNING!

Do not use the drill chuck as a milling tool. Never clamp a milling cutter into a drill chuck. Use a collet chuck with 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,

➜ for hard materials commercial cooling / lubricating agents are used.

1.6 Possible dangers caused by the milling machine

The milling machine has been tested for operational safety. The construction and type are state of the art.

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

❍ rotating parts,
❍ electrical voltage and currents,
❍ and an automatic feed.

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

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

INFORMATION

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

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

In the event of improper use

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

Always switch off the milling machine and disconnect it from the mains, when cleaning or maintenance work is carried out.

WARNING!

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

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

This is your responsibility being the operating company! ☞ **Safety devices on page 11**

1.7 Qualification of personnel

1.7.1 Target group

This manual is addressed to

- the operating companies,
- operators having sufficient specialist knowledge,
- the maintenance personnel.

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

Determine clearly and explicitly who will be responsible for the different activities on the milling machine (operation, setting up, maintenance and repair). Please note the name of the responsible person into an operators´s log.

INFORMATION

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 persons.

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

Operator

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

Qualified electrician

With professional training, knowledge and experience as well as knowledge of respective standards and regulations, qualified electricians are able to perform work on the electrical system and recognise and avoid any possible dangers.

Qualified electricians have been specially trained for the working environment, in which they are working and know the relevant standards and regulations.

Qualified personnel

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

Instructed person

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

1.7.2 Authorized persons

INFORMATION

Sufficient expertise is required for working on the milling machine. No one must work on the machine without having the necessary training, not even for a short while.

WARNING!

Inappropriate operation and maintenance of the milling machine constitutes a danger to 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.

Obligations of the operating company

Obligations of the operating company

- train the personnel,
- instruct the personnel in regular intervals (at least once a year) on
  - all safety regulations relevant to the milling machine,
  - operation of the milling machine,
  - generally accepted engineering standards.
  - possible emergency situations,
- check the personnel‘s knowledge level,
- document training/instruction in a operation book,
- require personnel to confirm participation in training/instructions by means of a signature,
- check whether the personnel is working safety and risk-conscious and observes the operating instructions.
- Define and document the machine inspection deadlines in accordance with section 3 of the Factory Safety Order and perform an operational risk analysis in accordance with section 6 of the Safety at Work Act.

Obligations of the user

Obligations of the operator

- have obtained a training regarding the handling of the milling machine,
- keep an operator‘s log,
- before taking the machine in operation
  - have read and understood the operating manual,
  - be familiar with all safety devices and instructions.

Additional requirements regarding the qualification

For work on the following milling machine parts there are additional requirements:

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

1.8 User positions

The operator position is located in front of the milling machine at the inspection window, to the side of the automatic feed for the cross table or on the control panel.

1.9 Safety devices

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

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

This is your responsibility!

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

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

WARNING!

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

- **injuries due to tools, workpieces or fragments hereof which are flying off at high speed,**

- **contact with rotating or moving parts,**
- **fatal electrocution,**
- **pulling-in of clothes.**

WARNING!

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

The milling machine features the following safety devices:

- a lockable main switch,
- an emergency stop push button,
- a spindle guard,
- a milling table with T-slots to fix the workpiece or the clamping device.

1.9.1 Lockable main switch

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

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

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

WARNING!

Dangerous voltage even if the main switch is switched off.

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

1.9.2 Emergency-stop push button

CAUTION!

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

ATTENTION!

If a emergency-stop push button is activated, the drives are stopped with the maximum possible braking torque. The spindle drive continues to run for a while depending on the moment of inertia of all components and the mass of the tool in use.

Press the emergency stop push button only if there is a risk! If this push button is actuated in order to switch off the milling machine in the standard operation the tool or workpiece might get damaged.

After having actuated the emergency-stop mushroom switch, turn the knob of the particular push button to the right in order to restart the machine.

1.9.3 Control technical protection

WARNING!

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

- **injuries due to tools, workpieces or fragments hereof which are flying off at high speed,**
- **contact with rotating parts,**
- **fatal electrocution,**

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❍ **pulling-in of clothes.**

If you temporarily bypass a controller in exceptional cases (e.g. during electrical repairs), you must continuously monitor the milling machine.

1.9.4 Prohibition, warning and mandatory signs

INFORMATION

All warning and mandatory signs must be legible. They must be checked regularly.

1.10 Safety check

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

Check all safety devices

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

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

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

INFORMATION

Organise the checks according to the following table;

General check		
Equipment	**Check**	**OK**
Signs, Markings	Installed and legible	
Date:	**Checked by (signature):**	

Functional check		
Equipment	**Check**	**OK**
Emergency stop push button	After actuating an emergency stop push button the milling machine must be switched off.	
Spindle guard	The spindle drive can only be switched on if the spindle guard is in the machining position.	
Date:	**Checked by (signature):**	

1.11 Personal protective equipment

For certain work personal protective equipment is required.

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

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

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

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

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

CAUTION!

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

1.12 Safety during operation

WARNING!

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

Avoid any unsafe work methods:

- The instructions mentioned in these operating instructions have to be strictly observed during assembly, operation, maintenance and repair.
- Do not work on the milling machine, if your concentration is reduced, for example, because you are taking medication.
- Clamp the workpiece securely and firmly before switching on the milling machine.

WARNING!

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

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

In case of a fire with magnesium, only use appropriate and admitted extinguishing agents. Never extinguish using water. If burning magnesium is extinguished with water, this might lead to dangerous reactions (hydrogen gas). Water would be decomposed in its components hydrogen (H) and oxygen (O).

Only the following extinguishing agents are permissible:

- **solid extinguishing agent of fire class D (fires involving metals)**
- **dry covering salts for magnesium**
- **a mixture of sand and cast chips**
- **argon (Ar) or nitrogen (N_2)**

If fine mist and smoke is generated at the workplace, suction units must be provided in order to avoid the accumulation of ignitable mixtures and emissions.

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

1.13 Safety during maintenance

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

Report all safety relevant changes and performance details of the milling machine or their operational behaviour. Any changes must be documented, the operating instructions updated and machine operators instructed accordingly.

1.14 Switching-off and securing the milling machine

Turn off the main switch of the milling machine before starting any maintenance or repair work.

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

All machine parts as well as all dangerous voltages 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 caution if you
the milling machine due to required works (e.g. functional control).

1.15 Using lifting equipment

WARNING!

The use of unstable lifting and load suspension equipment that might break under load can cause severe injuries or even death. Observe the accident prevention regulations issued by your Employers Liability Insurance Association or other supervisory authorities responsible for your company.

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

Fasten the loads carefully.

Never walk under suspended loads!

1.16 Mechanical maintenance work

Remove or install protection safety devices before starting or after completing any maintenance work; this include:

- covers,
- safety instructions and warning signs,
- grounding cables.

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

Check if they are working properly!

1.17 Accident report

Inform your supervisors 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 quicker the causes can be eliminated.

INFORMATION

We provide information about the specific dangers when working with and on the milling machine in the descriptions for these types of work.

1.18 Electronics

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 machine 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.

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

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

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

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

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).

1.19 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.

1.20 Clamping devices for workpieces and tools

ATTENTION!

Attention when taking over existing clamping devices. Pleased thoroughly check that the clamping device is appropriate for your milling machine.

- **Only use clamping devices with a complete inherent rigidity.**
- **Contact the manufacturer of the clamping device regarding the reuse of clamping devices after damage to the clamping device due to collisions.**
- **Correctly insert the workpiece and make sure that the machine is proper working condition.**

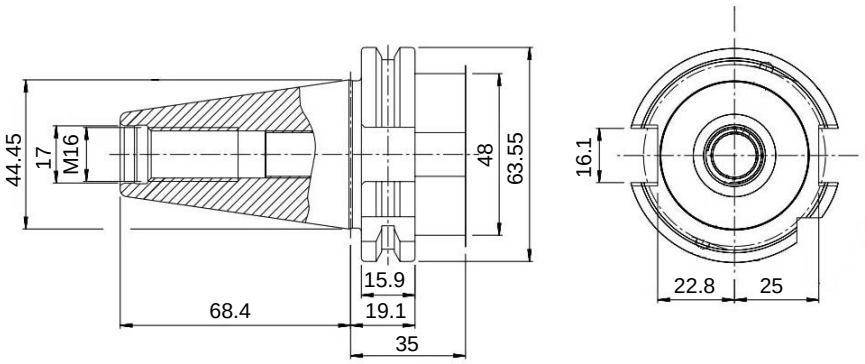
1.21 Environmental protection and water conservation

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

Please follow the requirements of the Water Resources Law when operating, decommissioning or disassembling the milling machine or parts hereof. Detailed information regarding this can be found in the Ordinance on Installations for the Handling of Substances Hazardous to Water (VAwS).

2 Technical specification

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

2.1 Electrical connection	
Total connection	3 x 400V ~ 50Hz (60 Hz)
Fusing performed by the operator	16 A
2.2 Spindle	
Drive motor	0.85 / 1.5 kW Operating mode and duty cycle S6 - 60%
Speed	115 - 1750 rpm
Gear stages / motor stages	4 / 2
Spindle seat	SK40
Draw bar	M16
	
Spindle sleeve travel [mm]	120
Throat [mm]	250 - 650
Distance spindle - table [mm]	60 -360
Inclination of milling head	± 45°
2.3 Cross table	
Table size [mm]	1000 x 240
max. load of cross table [kg]	150
T-slot size / number	14mm / 4
Rotatable	
2.4 Travels	
X axis automatic / manual [mm]	520 / 600
Y axis automatic / manual [mm]	150 / 230
Z axis manual [mm]	400
2.5 Dimensions	
	☞ Installation plan on page 23

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Net weight [kg]	760
2.6 Work area	
Keep a work area of at least one metre around the machine free for operation and maintenance.	
2.7 Coolant equipment	
Power of the cooling lubricant pump [W]	40 W
Capacity cooling lubricant tank [L]	8
Delivery height [meter]	3
2.8 Environmental conditions	
Temperature	19 - 21 °C (for an optimum milling result) permissible range + 10° to + 35°C
Admissible relative humidity	5...90 % no condensation 30% to 90% at 35°C 90 % at 21°C
Compressed air	700...1060 hPa
Environmental conditions - storage	5 - 45 °C

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2.9 Emissions

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

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

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

INFORMATION

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

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

INFORMATION

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

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

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

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

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

CAUTION!

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

We generally recommend the use of noise and ear protection.

3 Delivery, interdepartmental transport, assembly and commissioning

3.1 Notes on transport, installation, commissioning

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

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

WARNING!

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

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

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

WARNING!

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

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

3.1.1 General risks during internal transport

WARNING: TILTING DANGER!

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

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

Warn employees and advise them of the hazard.

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

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

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

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

Careful planning of interdepartmental transport is therefore essential.

3.2 Unpacking the machine

INFORMATION

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

3.3 Accessories

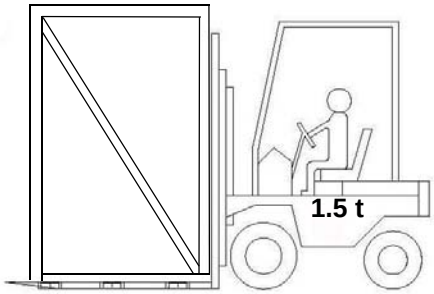
- Draw bar
- Key type drill chuck
- Arbor drill chuck ISO40 / B18
- T-nuts
- Drill drift
- Adapter SK40 - MT3
- Adapter MT3 - MT2
- Operating tool

3.4 Transport

- Weights

☞ Installation plan on page 23

Weight of the milling machine ☞ „ Net weight [kg]“ on page 18



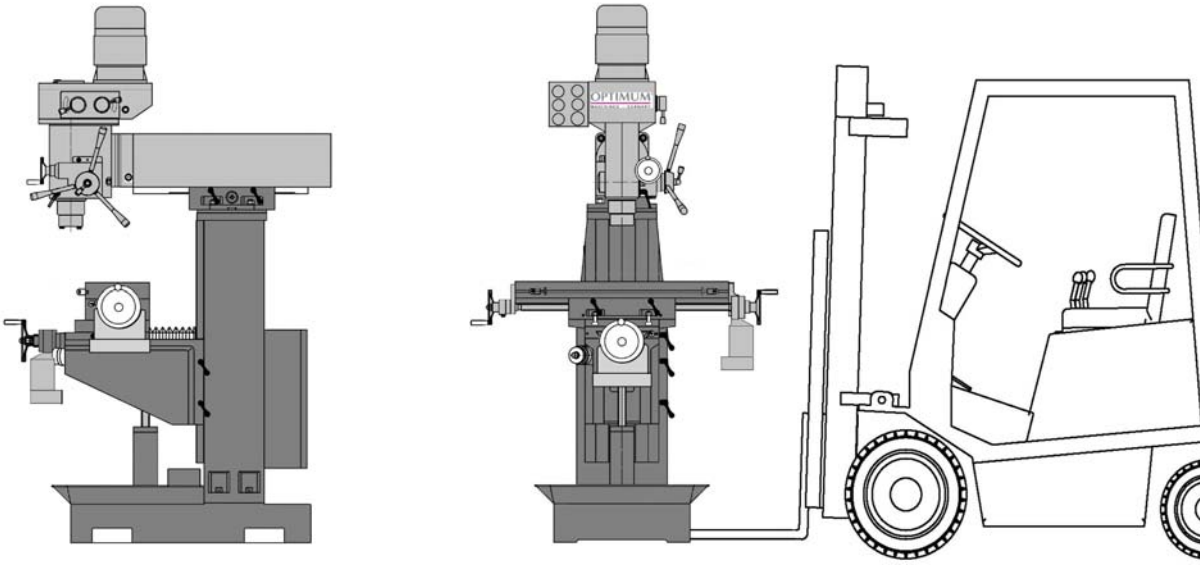
3.5 Load suspension point

WARNING!

Before lifting the milling machine, check that all clamping screws of the milling table and the spindle head are tightened.

The milling machine is lifted with a forklift on the machine base.

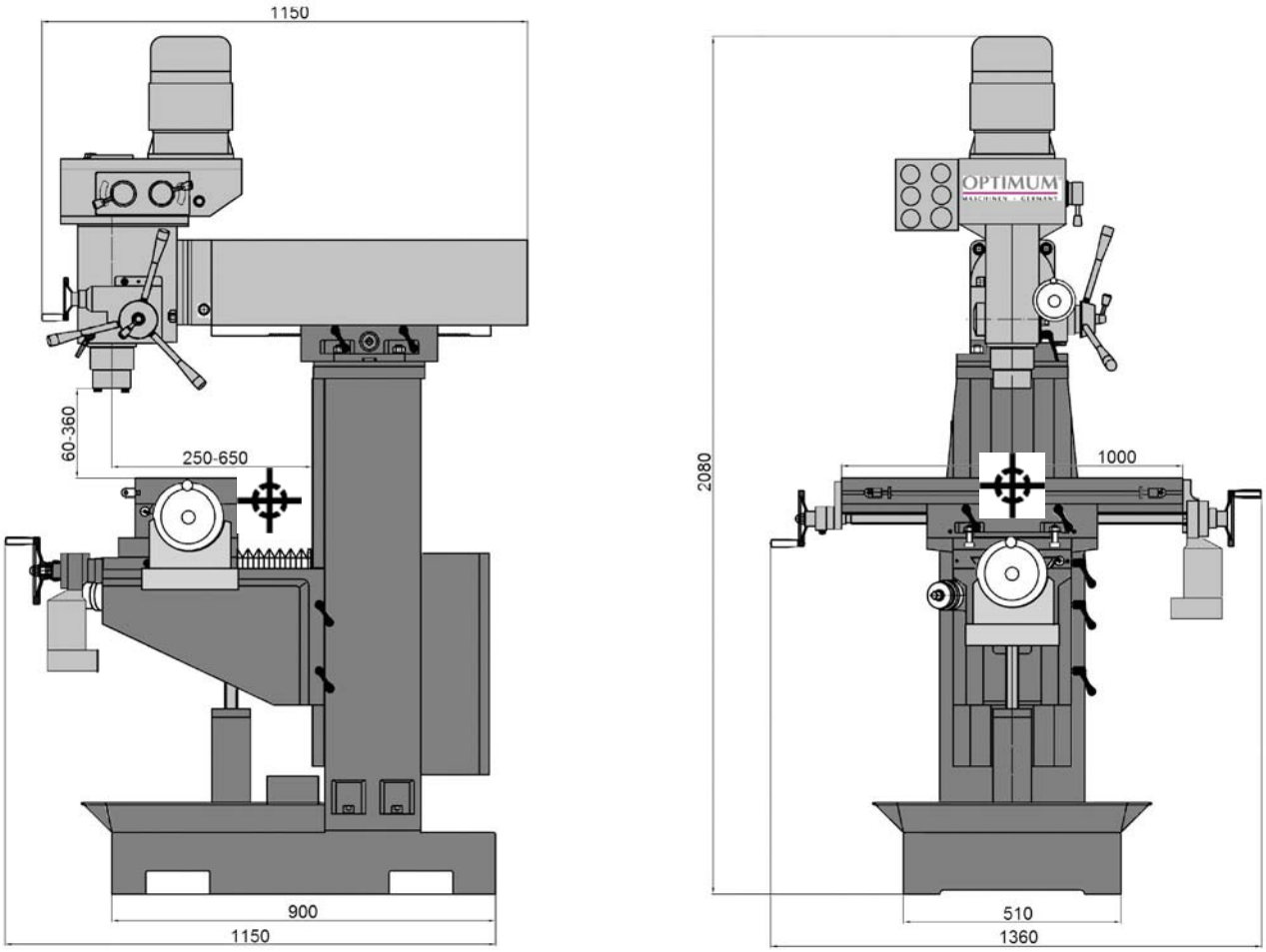
➜ The clamping screws of the milling table and the spindle head bearing must be tightened.



Img. 3-1: Load suspension point

3.6 Set-up and assembly

3.6.1 Installation plan



Center of gravity

3.6.2 Requirements regarding the installation site

Keep a work area of at least one metre around the machine free for operation and maintenance.

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

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

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

INFORMATION

In order to achieve high levels of functionality and machining accuracy, as well as a long service life of the machine, the set-up location should meet certain criteria.

The following points should be noted:

- The device must only be installed and operated in a dry and well-ventilated place.
- Avoid places close to machines which cause chips or dust.
- The installation site must be vibration-free, i.e. located away from presses, planing machines, etc.
- The foundation must be suitable for the milling machine. Pay attention also to the load-bearing capacity and evenness of the floor.
- The substructure must be prepared in such a way as to ensure that, if any lubricant is used, it cannot penetrate the floor.
- Protruding parts - such as the dog, handles, etc. - must be secured, where necessary, by means of on-site measures so that persons are not endangered.
- Provide enough space for set-up and operating personnel and material transport.
- Also bear in mind accessibility for installation and maintenance works.
- Ensure adequate lighting is available (minimum value: 500 Lux, measured at the tool tip). In the event of a lower level of lighting, additional illumination must be provided, e.g. by means of a separate workplace light.

INFORMATION

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

3.7 Machine mounting

3.7.1 Anchor-free mounting

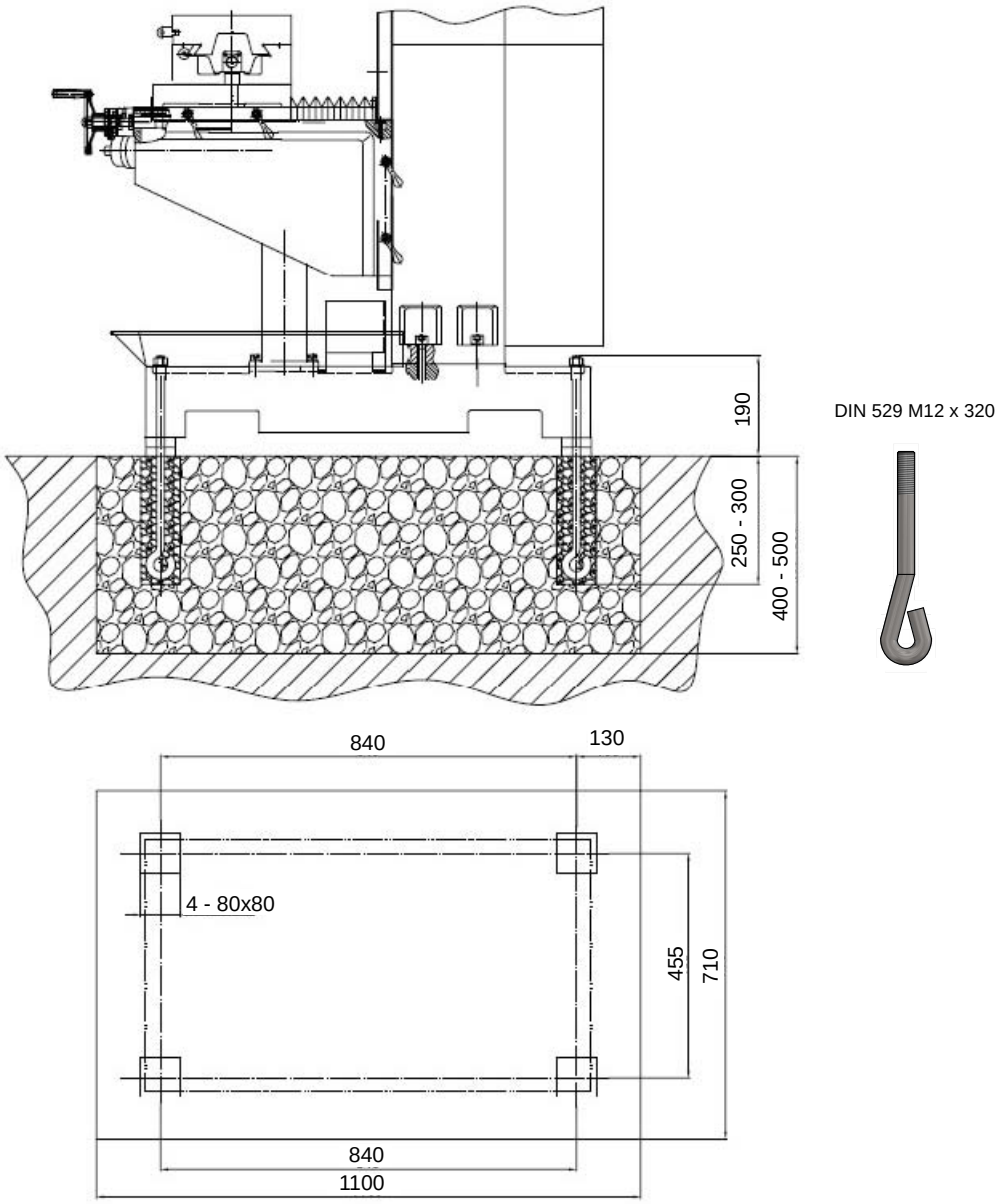
This must be done by laying down a strong base, on each support of the levelling points, between the foundation and the machine foot.

3.7.2 Anchored mounting

Use an anchored mounting to achieve a rigid connection to the substructure. An anchored mounting is always appropriate if the intention is to machine large parts up to the maximum capacity of the drilling-milling machine.

The milling machine is fastened to the floor with four anchor screws DIN 529 M12 x 320 through the machine foot. The anchor screws are not included in the delivery.

The dimensions of the anchor screws are shown in the following drawing.



Img. 3-2: Foundation plan

➜ Drilled core holes with a diameter of 80mm and a depth of 250mm to 300mm are provided in the foundation.

➜ Raise the machine from the floor and centre in the inner drill holes with the anchor screws.

➜ Roughly align the machine.

➜ Fill the drill holes with concrete and allow to set.

Aligning the machine

➜ Place a machine spirit level (0.04mm/m) on the cross table.

➜ Attach washers and nuts to the anchor screws.

➜ Check the alignment of the milling machine with a machine spirit level on the cross table and place base plates underneath the machine foot.

ATTENTION!

All four corners of the machine foot must lie flat. The maximum height difference of the bearing surfaces after tightening the anchor screws should not exceed 0.04mm per 1000mm. We recommend using a machine spirit level to align the milling machine.

➜ The the anchor screw nuts.

➜ Check the alignment of the milling machine again. Re-check the alignment after a few days of use.

3.8 First commissioning

WARNING!

Commissioning should only take place after proper installation of the machine.

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. ☞ **Qualification of personnel on page 10**

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 of the manufacturer of the clamping devices.

ATTENTION!

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

3.9 One-component paint

The machine is lacquered with a one-component paint. Take this criterion into account when selecting your cooling lubricant and cleaning the machine.

A one-component paint with added solvent sets when the solvent evaporates.

As soon as the paint is applied, the solvent escapes into the air. The binding agent becomes felted and a dry film is formed. This process is reversible, i.e. the binding agent can always be re-softened.

A two-component paint also consists of binding agent and solvent. However, the paint only dries when a setting agent is added. This process is not reversible, i.e. the binding agent cannot be re-softened.

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

3.10 Cleaning the machine

ATTENTION!

Do not use compressed air to clean the machine.

Your new milling machine must be completely cleaned after unpacking to ensure that the moving parts and sliding surfaces cannot be damaged when the machine is operated. Prior to delivery, all blank parts and sliding surfaces in each unit are appropriately lubricated to protect against rust in the period before commissioning. Remove all wrappings and clean all surfaces with a degreaser to soften and remove protective greases and coatings.

Wipe all surfaces with a clean cotton cloth and lubricate the milling machine in accordance with the maintenance section ☞ Inspection and maintenance on page 36 before switching on the power and putting the machine into service.

3.11 Lubrication and oil level

During the initial lubrication and greasing of your new milling machine, the oil levels are checked and the machine lubricated after cleaning. Only when this has been done can commissioning of the machine proceed.

☞ Inspection and maintenance on page 36

3.12 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.

3.13 Electrical connection

CAUTION!

Lay the connection cable to the electrical cabinet and the cable of the coded connector from the machine to the electrical cabinet in such a way as to prevent a trip hazard.

WARNING!

The three-phase electrical connection may only be performed by an electrician or under the guidance and supervision of an electrician.

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.

- Min. terminal cross-section per phase and grounding: 1.5 mm^2
- Electric connected load: 2 KVA
- Permissible voltage fluctuations in normal operation: +6% -10% Volt
- Permissible frequency fluctuations: ± 1Hz (50/60 Hz)
- Permissible phase imbalance: 3% or less

ATTENTION!

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

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

ATTENTION!

Check if the drive motor is turning in the correct rotation direction. If necessary, two phase connections must be swapped.

In the event of an incorrect rotation direction, machine components may be damaged.

The guarantee will become null and void if the machine is connected incorrectly.

➜ Check the fusing (fuse) of your electrical supply according to the technical instructions regarding the total connected power of the machine.

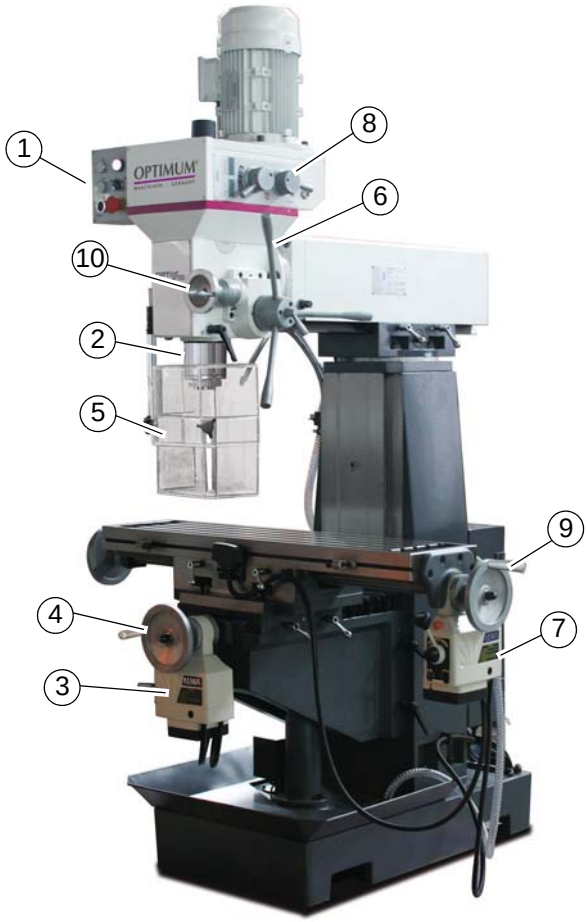
➜ Firmly connect the machine.

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.

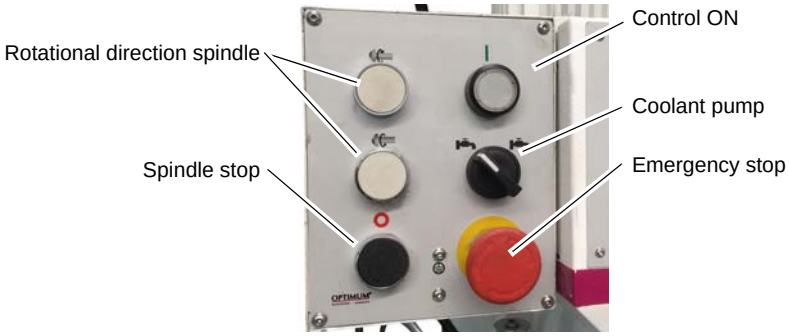
4 Operation

4.1 Overview



Pos.	Designation	Item	Designation
1	Control panel	6	Spindle sleeve lever
2	Spindle	7	Table feed X axis
3	Table feed Y axis	8	Spindle gear
4	Y axis handwheel for cross table	9	X axis handwheel for cross table
5	Spindle guard	10	Quill fine feed

4.1.1 Control panel



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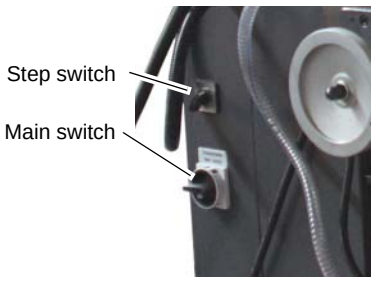
4.2 Switching on the machine



➜ Turn the main switch to the "On" position. The main switch is located on the distribution cabinet.

➜ Set the step switch to the desired position. The step switch is located on the distribution cabinet.

➜ Set the direction lever for the table feed to the neutral position.

➜ Switch on the control voltage.

4.3 Turning off the machine

CAUTION!

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

➜ Switch the main switch to the position „OFF“ / 0 , lock if necessary.

4.4 Resetting an emergency stop situation

➜ Unlock the emergency stop switch again.

➜ Set the direction lever for the table feed to the neutral position.

➜ Switch on the control voltage.

➜ Switch on the spindle rotation again.

4.5 Power failure, Restoring readiness for operation

➜ Set the direction lever for the table feed to the neutral position.

➜ Switch on the control voltage.

4.6 Inserting tool

The milling spindle is equipped with a SK40 capture and draw bar M16.

➜ Clean the conical seat in the milling head.

➜ Clean the cone of your tool.

➜ Check that the driving blocks are firmly seated.

➜ Put the tool holder with tool from below into the steep taper of the milling spindle.

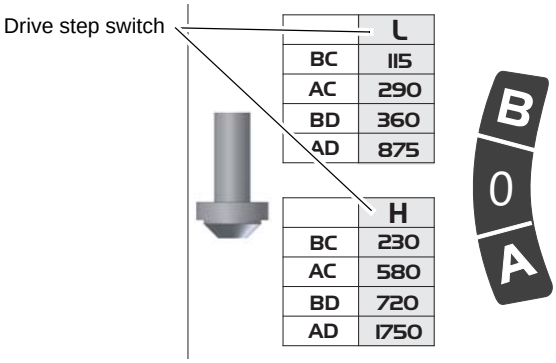
➜ Screw the draw bar in the cone of the tool holder.

➜ Tighten the tightening nut.

4.7 Speed change

Set the gearbox to the desired position at standstill. Set the motor step switch on distribution cabinet to the desired position.

4.7.1 Speed table



Img.4-1: Speed table

4.8 Standard values for cutting speeds

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

Tool	Steel	Grey cast iron	Al alloy case-hard-ened
Plain milling cutters and shell end mills [m/min]	10 - 25	10 - 22	150 - 350
Relieved milling cutters [m/min]	15 - 24	10 - 20	150 - 250
Cutter head with SS [m/min]	15 - 30	12 - 25	200 - 300
Cutter head with HM [m/min]	100 - 200	30 - 100	300 - 400

This results in the following standard speeds, dependent on mill diameter, mill type and material.

Tool diameter [mm] shell end mill, helical milling cutter	Steel 10 - 25 m/min	Grey cast iron 10 - 22 m/min	Al-alloy hard-ened 150 - 350 m/min
	Speed [rpm]		
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 mills	Steel 15 - 24 m/min	Grey cast iron 10 - 20 m/min	Al-alloy hard-ened 150 - 250 m/min
	Speed [rpm]		
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

4.9 Spindle sleeve feed

4.9.1 Manual spindle sleeve feed

➜ 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.

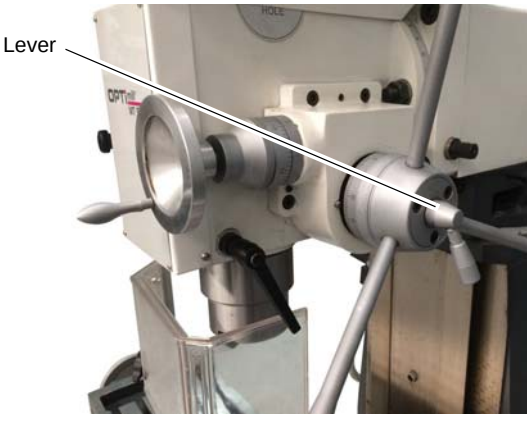
ATTENTION!

For all movements of the spindle sleeve you must first loosen the tightening lever!

4.9.2 Quill fine feed

➜ Turn the lever clockwise. The sleeve lever moves to the spindle head and activates the coupler of the fine feed.

➜ Turn the quill fine feed handwheel in order to move the quill.



Img. 4-2: Fine feed

4.10 Moving the cross table up / down

Manual movement on the Z axis

The height adjustment of the milling table is carried out with the hand crank.

➜ Loosen the clamping lever.

➜ Engage the hand crank by pressing into the coupling.

➜ Position the milling table on desired position using the crank.
➜ Make sure to tighten the clamping lever again once you have completed the operation.

4.11 Moving the cross table left or right

There are two ways of moving the cross table.

❍ By turning the handwheel on the milling table.
❍ With the automatic table feed.

4.11.1 Manual travel

To manually move the cross table, the clamping levers are released and the table is moved with the hand crank.

➜ Loosen the clamping levers.
➜ Engage the hand crank by pressing into the coupling.
➜ Position the milling table on desired position using the crank.
➜ Clamp again if required.

4.11.2 Automatic movement of the X axis and Y axis using the feed motor

The feed motor automatically moves the cross table along the X axis and Y axis.

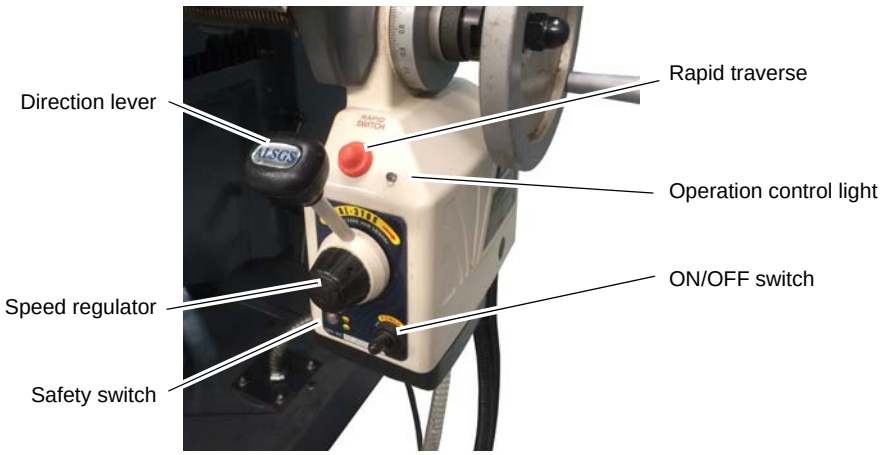
➜ Turn on the ON/OFF switch.
❍ The service light comes on.
➜ Adjust the feed speed using the speed regulator.
➜ Move the direction lever to the direction in which you want the cross table to move.
❍ When the lever is in the central position, the feed motor is halted.
❍ Do not change the motor from L to R during the operation. Wait until it has come to a complete halt.
❍ The end stop switch and the two adjustable stops deactivate the automatic feed when the preset position is reached.
➜ Move the turning direction lever in the required direction.
➜ Press the button for rapid traverse.

Once you release the button the machine will proceed at the preset speed.

WARNING!

When the feed motor is operating in fast motion, do not touch moving parts or rotating parts.

Make sure there are no other people in the danger zone.



Img. 4-3: Feed

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INFORMATION

The circuit is automatically disconnected if a current of 4 A circulates through the safety switch for more than 10 seconds.

To reactivate it, press the safety switch for a moment.

The service light will come on again.

ATTENTION!

During manual operation the limit stops may collide with the end stop switch. This can cause damage to the end stop switch.

4.12 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.

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

➜ Loosen the nuts for clamping the rotary disc maximum of one turn. A complete removal or loosening of the nuts can lead to jamming of the rotary disc.

➜ Rotate the square head in order to set the milling head to max. 45 °. Use the scale on the rotary disc to set the angle.

➜ Clamp the nuts again after adjusting the required angle.

4.12.1 Setting the milling head to zero position

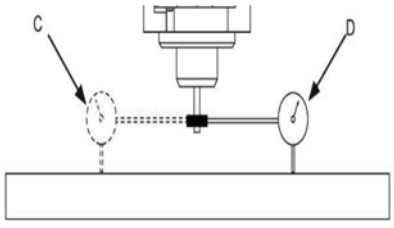
➜ Loosen the nuts to clamp the rotary disc.

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

➜ Retighten the nuts.

INFORMATION

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



4.13 Turning the milling head

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

➜ Loosen the nuts for clamping the rotary disc maximum of one turn. A complete removal or loosening of the nuts can lead to jamming of the rotary disc.

➜ Use the scale on the rotary disc to set the angle.

➜ Clamp the nuts again after adjusting the required angle.

4.14 Turning of the cross table (X axis)

➜ Loosen the clamping screws (4 units).

➜ Position the milling table on desired angle position.

➜ Imperatively fasten the clamping screws.

➜ After completion of the work positioning the cross table back to „0“. If necessary, the cross table must be aligned with a dial indicator again.

➜ Make sure that the clamping screws are tightened.

4.15 Cooling

WARNING!

Discharge and overflow of cooling lubricants and lubricants Ensure that cooling lubricants are not discharged onto the floor. Any cooling lubricants that run onto the floor must be removed immediately.

The coolant delivery is switched on and off via a push button on the control panel.
The amount of cooling lubricant can be regulated using the dosing tap.

The friction generated during rotation can cause the edge of the tool to become very hot.

When milling it is necessary to cool down the tool depending on the material. By cooling with an appropriate coolant lubricant you will achieve a better working result and longer durability of the tool.

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

ATTENTION!

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

INFORMATION

Use a water-soluble environmentally friendly emulsion as cooling lubricant procured from a specialist retailer.

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

Follow the manufacturer’s disposal instructions.

5 Maintenance

In this chapter you will find important information about

- Inspection
- Maintenance
- Repair

of the milling machine.

ATTENTION!

Properly performed regular maintenance is an essential prerequisite for

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

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

5.1 Safety

WARNING!

The consequences of incorrect maintenance and repair work may include:

- **Severe injuries of persons working on the milling machine,**
- **damage to the milling machine.**

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

Validation

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

Documentation

Record all tests and works in a operator's log resp. log book.

5.1.1 Preparation

WARNING!

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

☞ Switching-off and securing the milling machine on page 14. Attach a warning label.

5.1.2 Restarting

Before restarting, run a safety check.

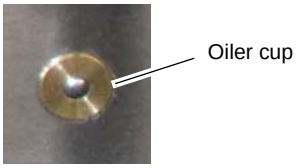
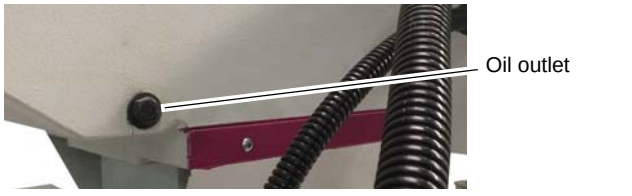
☞ Safety check on page 13

WARNING!

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

5.2 Inspection and maintenance

The type and level of wear depends to a large extent on the individual usage and operating conditions. Any indicated intervals therefore are only valid for the corresponding approved conditions. ☞ Technical specification on page 17

Interval	Where?	What?	How?
Start of work, after every maintenance or repair work	**Milling machine**	☞ Safety check on page 13	
Start of work, after every maintenance or repair work	**Moving 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 the cross table lifting spindle with bearing grease. ➜ Oil at these lubricating point positions.  Img.5-1: Oiler cup
Monthly	**Spindle gear**	Oil level control	➜ The oil level must at least attain the centre resp. top marking of the oil sight glass. 
The first time after 3 month, then every year.	**Spindle gear**	Oil change	➜ Oil quantity about 1 litre, ISO VG68 ➜ 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 will slightly penetrate from the opening. ➜ Unscrew the screw from the drain hole. ➜ Unscrew the screw from the filler hole. ➜ 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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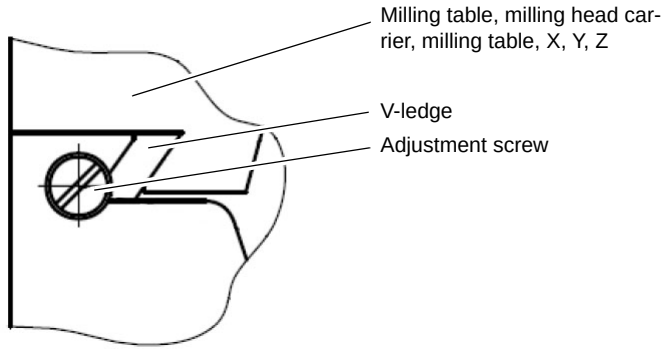
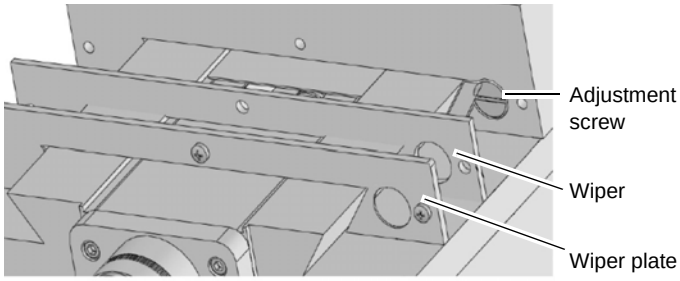
Interval	Where?	What?	How?
When necessary	**Guideways**	Readjusting	➜ Readjust the guides by means of the corresponding V-ledge. ➜ If necessary disassemble the wipers in order to attain the readjusting screws of the corresponding V-ledges. ➜ Use a screwdriver to turn the adjusting screw clockwise until the movement in the respective guideway is still easily possible.  Img.5-2: V-ledge ➜ Dismantle the wiper plate and wiper in order to reach the adjustment screw.  Img.5-3: Y axis V-ledge
As required but at least once per year	**Coolant equipment**	Replacing	➜ Fill in coolant, replace if necessary. ➜ Wash the cooling lubricant pump. ☞ „5.4 Cooling lubricants and tanks“ on page 39 ☞ Inspection plan for water-mixed cooling lubricants on page 40

5.3 Repair

5.3.1 Customer service technician

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

Dr.-Robert-Pfleger-Str. 26

D- 96103 Hallstadt

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

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

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

For repairs, only use

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

5.4 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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5.4.1 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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6 Ersatzteile - Spare parts

6.1 Ersatzteilbestellung - *Ordering spare parts*

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

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

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

6.2 Hotline Ersatzteile - Spare parts Hotline

+49 (0) 951-96555 -118

ersatzteile@stuermer-maschinen.de

6.3 Service Hotline

+49 (0) 951-96555 -100

service@stuermer-maschinen.de

6.4 Ersatzteilzeichnungen - Spare part drawings

A Maschinenfuß und Säule - Base & Column

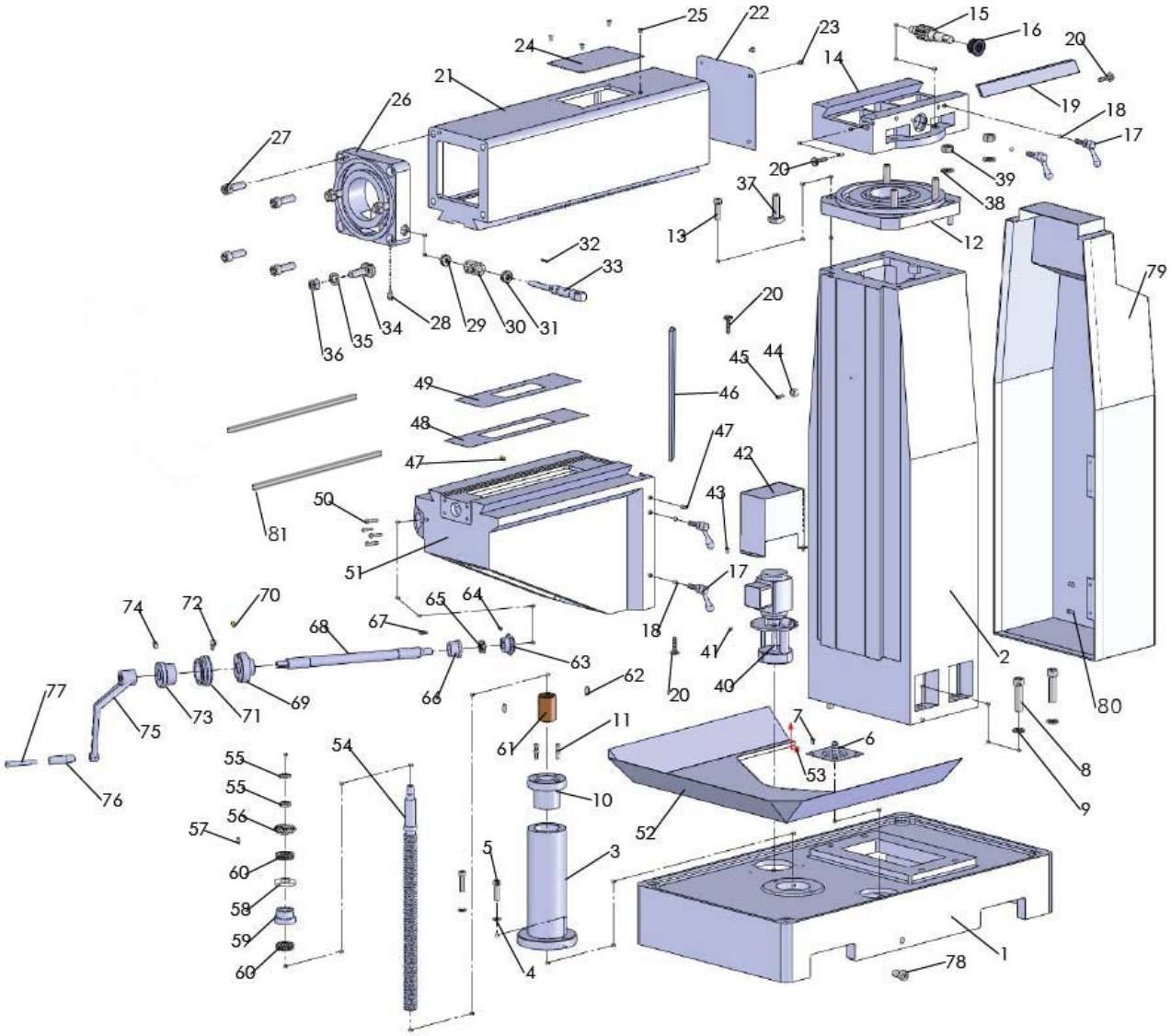

Abb.6-1: Base & Column

MT50E - Maschinenfuß und Säule - Base & Column					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Grundplatte	Base	1		03336010101
2	Säule	Column	1		03336010102
3	Gehäuse Hebeschraube	Elevating Screw Housing	1		03336010103
4	Sicherungsscheibe	Lock Washer	2	10mm	042SR10W
5	Sechskantschraube	Hex Bolt	2	M10 x 45	
6	Anschlussschlauch	Connect Tube	1		
7	Kreuzschlitzschraube	Phlp Hd Scr.	4	M6 x 12	
8	Sechskantschraube	Hex Bolt	4	M16 x 25	

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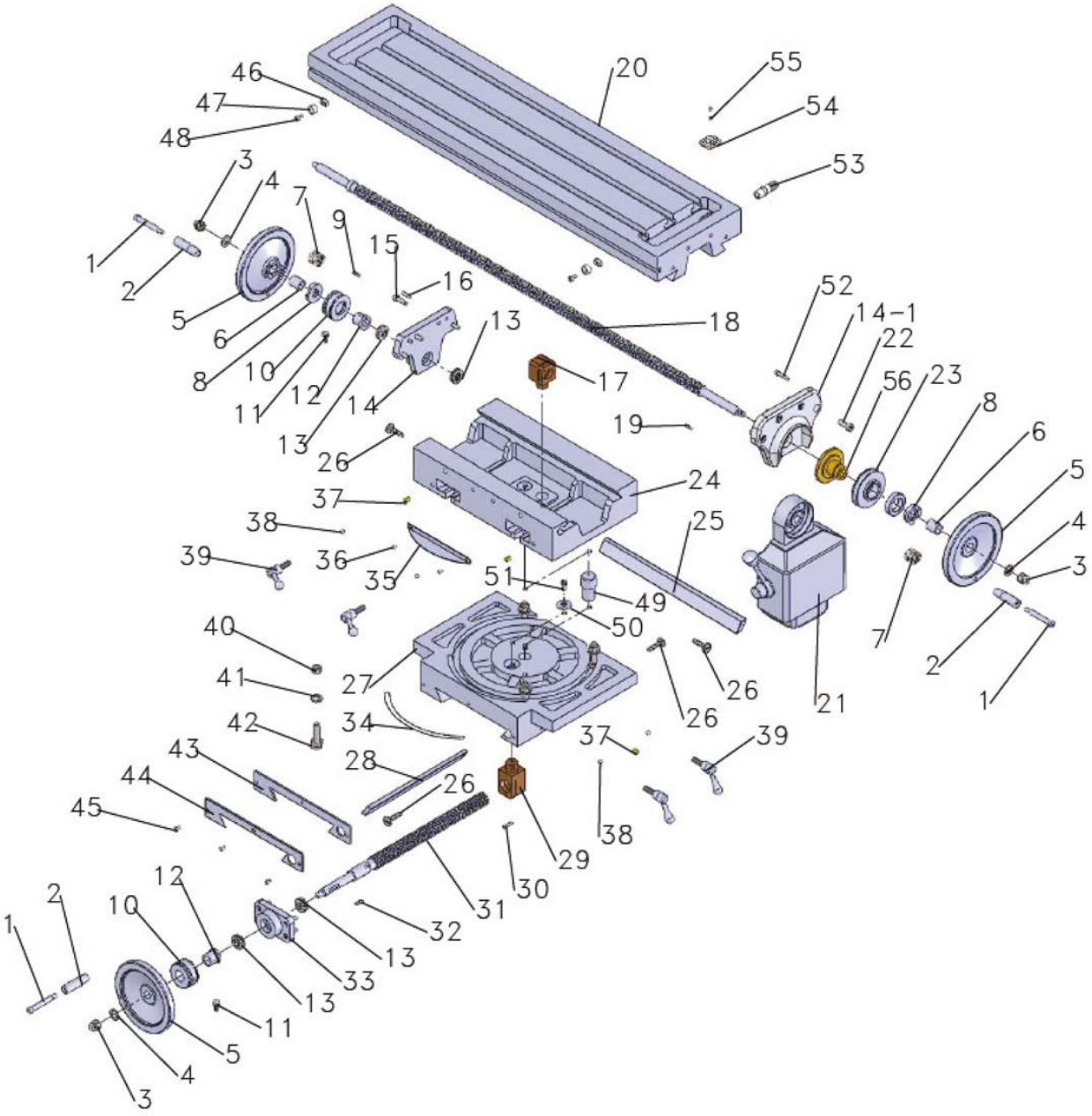
9	Sicherungsscheibe	Lock Washer	4	16mm	042SR16W
10	Manschette	Collar	1		03336010110
11	Innensechskantschraube	Cap Screw	2	M8 x 25	
12	Haltestütze	Hold Support	1		03336010112
13	Innensechskantschraube	Cap Screw	4	M12 x 30	
14	Runde Halterung	Around Bracket	1		03336010114
15	Vorschubwelle	Feed Shaft	1		03336010115
16	Manschette	Collar	1		03336010116
17	Klemmschraube	Clamp Bolt	4	M10 x 53 x 25	03336010117
18	Klemmblock	Clamp Block	4		03336010118
19	Leiste	Gib	1		03336010119
20	Flachkopfschraube	Flat Hd Scr.	4	M8 x 40	
21	Gegenhalter	Overarm	1		03336010121
22	Abdeckung	Cover	1		03336010122
23	Kreuzschlitzschraube	Phlp Hd Scr.	4	M6 x 10	
24	Abdeckung	Cover	1		03336010124
25	Kreuzschlitzschraube	Phlp Hd Scr.	4	M6 x 10	
26	Halteklammer	Hold Bracket	1		03336010126
27	Innensechskantschraube	Cap Screw	4	M16 x 50	
28	Innensechskantschraube	Cap Screw	1	M8 x 20	
29	Kugellager	Ball Bearing	1	51101	04051101
30	Schnecke	Worm	1		03336010130
31	Kugellager	Ball Bearing	1	51102	04051102
32	Passfeder	Key	1	4 x 4 x 20	042P4420
33	Schneckenwelle	Worm Shaft	1		03336010133
34	T-Schraube	T Bolt	3	M16 x 60	
35	Unterlegscheibe	Washer	3	16mm	
36	Sechskantmutter	Hex Nut	3	M16	
37	T-Schraube	T Bolt	4	M16 x 50	
38	Unterlegscheibe	Washer	4	16mm	
39	Sechskantmutter	Hex Nut	4	M16	
40	Kühlmittelpumpe	Coolant pump	1		03336010140
41	Innensechskantschraube	Cap Screw	4	M5 x 12	
42	Schild	Shield	1		03336010142
43	Innensechskantschraube	Cap Screw	2	M5 x 12	
44	Hülse	Sleeve	1		03336010144
45	Schraube	Screw	1	M6 x 18	
46	Leiste	Gib	1		03336010146
47	Öl-Schale	Billiard Oil Cup	4		03336010147
48	Abstreiferplatte	Wiper Plate	1		03336010148
49	Abstreiferplatte	Wiper Plate	1		03336010149
50	Innensechskantschraube	Cap Screw	4	M6 x 25	
51	Tischträger	Knee	1		03336010151
52	Ölwanne	Oil Pan	1		03336010152
53	Innensechskantschraube	Cap Screw	2	M6 x 12	
54	Hubspindel Tisch	Hoist Descend Lead Screw	1		03336010154
55	Rundmutter	Circular Nut	2	M16 x 1.5	03336010155
56	Kegelzahnrad	Conical Gear	1		03336010156
57	Passfeder	Key	1	6 x 6 x 12	042P6612
58	Einstellscheibe	Adjust Washer	1		03336010158
59	Manschette	Collar	1		03336010159
60	Kugellager	Ball Bearing	2	51105	04051105
61	Mutter	Nut	1	42 x 60mm	03336010161
62	Stiftschraube	Set Screw	2	M8 x 20	
63	Kegelzahnrad	Conical Gear	1		03336010163
64	Stiftschraube	Set Screw	1	M6 x 10	
65	Kugellager	Ball Bearing	1	51103	04051103

66	Manschette	Collar	1		03336010166
67	Passfeder	Key	1	5 x 5 x 20	042P5520
68	Welle	Shaft	1		03336010168
69	Manschette	Collar	1		03336010169
70	Innensechskantschraube	Cap Screw	1	M6 x 22	
71	Skalenring	Scale Ring	1		03336010171
72	Rändelschraube	Knurled Thumb Scr.	1	M6 x 10	
73	Manschette	Collar	1		03336010173
74	Stiftschraube	Set Screw	1		03336010174
75	Griff	Handle	1		03336010175
76	Kegelknopf	Taper Knob	1		03336010176
77	Griffwelle	Handle Spindle	1		03336010177
78	Schraube	Screw	1		03336010178
79	Hintere Abdeckung	Behind Cover	1		03336010179
80	Flachkopfschraube	Flat Hd Scr.	4	M5 x 12	
81	Führung	Guide	2		03336010181

B Frästisch - Milling table



Milling table

MT50E - Frästisch- Milling table					
Pos.	Bezeichnung	Designation	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Griffwelle	Handle Spindle	3		03336010201
2	Kegelknopf	Taper Knob	3		03336010202
3	Sechskantmutter	Hex Nut	3	M12	
4	Sicherungsscheibe	Lock Washer	3	12mm	042SR12W
5	Handrad	Hand Wheel	3		03336010205
6	Buchse	Bush	2		03336010206

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7	Feder	Spring	2		03336010207
8	Anschluss	Connect	2		03336010208
9	Passfeder	Key	1	5X20	042P5520
10	Skalenring	Scale Ring	2		03336010210
11	Innensechskantschraube	Cap Screw	2	M6 x 16	
12	Manschette	Collar	2		03336010212
13	Kugellager	Ball Bearing	4	51103	04051103
14	Halterung	Support	1		
14-1	Halterung	Support	1		033360102141
15	Innensechskantschraube	Cap Screw	6	M8 x 25	
16	Stift	Pin	2	6 x 25	03336010216
17	Spezialmutter	Special Nut	1		03336010217
18	Lange Leitspindel	Long Lead Screw	1		03336010218
19	Passfeder	Key	1	5 x 20	042P5520
20	Tisch	Table	1		03336010220
21	Vorschub Antrieb	Power Feed	1		03336010221
22	Innensechskantschraube	Cap Screw	4	M10 x 25	
23	Skalenring	Scale Ring	1		03336010223
24	Drehbare Halterung	Rotary Bracket	1		03336010224
25	Leiste	Gib	1		03336010225
26	Einstellschraube	Adjust Screw	3	M8	03336010226
27	Mittelbasis	Center Base	1		03336010227
28	Leiste	Gib	1		03336010228
29	Spezialmutter	Special Nut	1		03336010229
30	Schraube	Screw	3	M5 x 25	
31	Lange Leitspindel	Long Lead Screw	1		03336010231
32	Passfeder	Key	1	5 x 30	042P5530
33	Halterung	Support	1		03336010233
34	Winkel, Lineal	Angle Ruler	1		03336010234
35	Schutz	Guard	1		03336010235
36	Schraube	Screw	2	M5 x 10	
37	Öler	Oil Cup	4	8	0340114
38	Klemmblock	Clamp Block	4		03336010238
39	Klemmschraube	Clamp Bolt	4	M10 x 53 x 25	03336010239
40	Sechskantmutter	Hex Nut	4	M12	
41	Unterlegscheibe	Washer	4	12	
42	T-Schraube	T Bolt	4	M12 x 42	
43	Abstreiferplatte	Wiper	1		03336010243
44	Abstreiferblech	Wiper plate	1		03336010244
45	Kreuzschlitzschraube	Phlp Hd Scr.	3	M5 x 12	
46	Schraube der Halterung	Screw Bracket	1		03336010246
47	Anschlag	Dog	1		03336010247
48	Innensechskantschraube	Cap Screw	1	M6 x 16	
49	Welle	Shaft	1		03336010249
50	Unterlegscheibe	Washer	1		03336010250
51	Schraube	Screw	1	M6 x 30	
52	Stift	Pin	2	6 x 25	03336010252
53	Anschlussschlauch	Connect Tube	1		03336010253
54	Spritzschutz	Splash Guard	1		03336010254
55	Schraube	Screw	2	M4 x 8	
56	Zahnrad	Gear	1		03336010256

C Fräskopf - Milling head

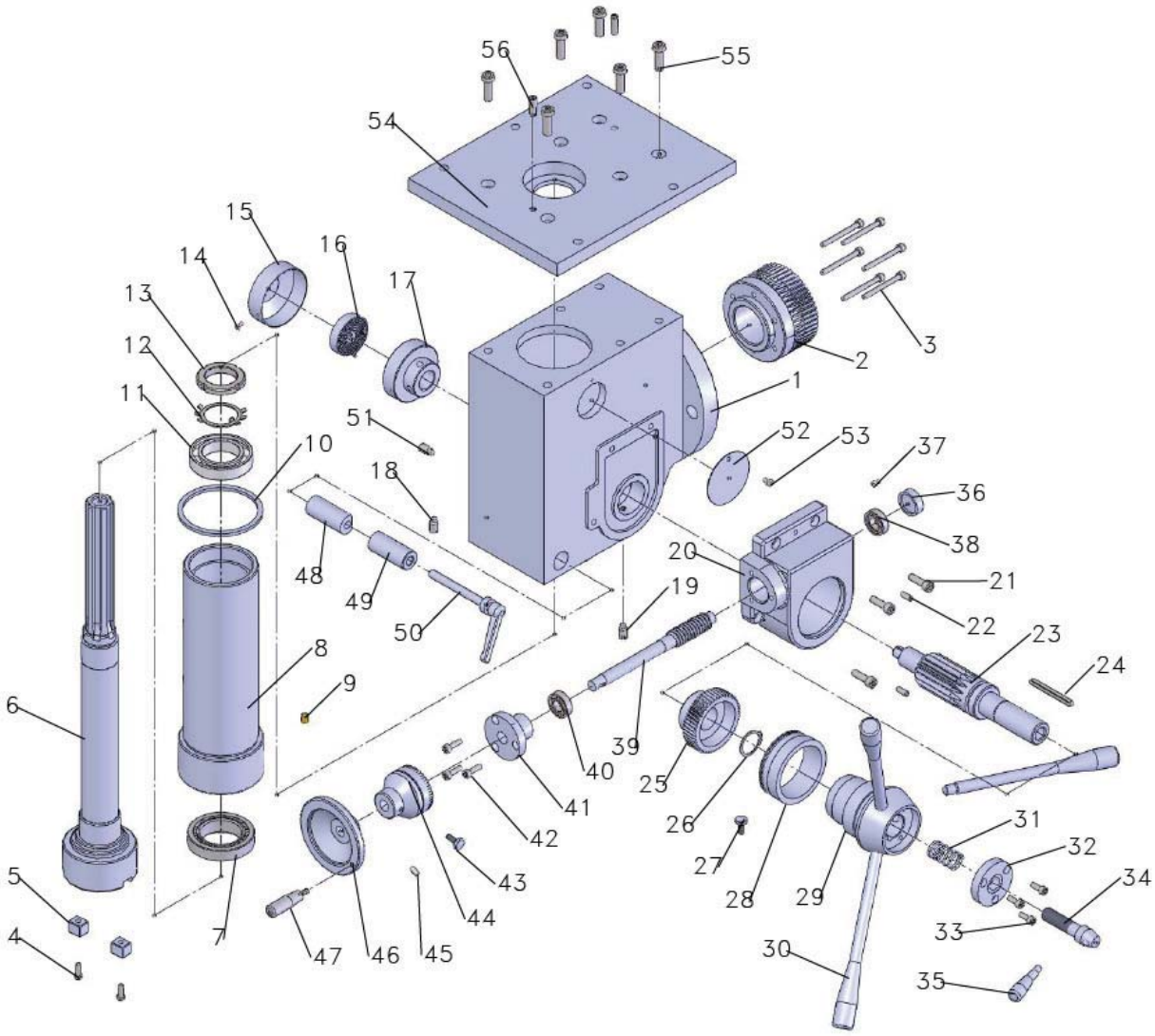


Abb. 6-2: Milling head

MT50E - Fräskopf - Milling head					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Spindelkasten	Spindle Box	1		03336010301
2	Zahnrad	Gear	1		03336010302
3	Schraube	Screw	6	M6 x 75	
4	Schraube	Screw	2	M6 x 16	
5	Nutenstein	Fixed Key	2		03336010305
6	Spindel	Spindle	1		03336010306
7	Kugellager	Ball Bearing	1	32010	04032010
8	Pinole	Sleeve	1		03336010308
9	Öler	Oil Cup	1		03336010309
10	Gummischeibe	Rubber Washer	1	90mm	03336010310
11	Kugellager	Ball Bearing	1	6009	0406009R
12	Sicherungsscheibe	Lock Washer	1	40	042SR40W

13	Sicherungsmutter	Lock Nut	1	M40 x 1.5	03336010313
14	Innensechskantschraube	Cap Screw	1	M4 x 8	
15	Federgehäuse	Spring housing	1		03336010315
16	Rückholfeder	Spring	1		03336010316
17	Federgehäuse	Spring Base	1		03336010317
18	Stiftschraube	Set Screw	1	M8 x 16	
19	Stiftschraube	Set Screw	1	M8 x 16	
20	Abdeckung	Cover	1		03336010320
21	Schraube	Screw	3	M8 x 25	
22	Stift	Pin	2	6 x 25	03336010322
23	Vorschubwelle	Feed Shaft	1		03336010323
24	Passfeder	Key	1	8 x 38	
25	Stirnradgetriebe	Helical Gear	1		03336010325
26	Sicherungsring	Ex Retaining Ring	1	30	042SR30W
27	Innensechskantschraube	Cap Screw	1	M6 x 16	
28	Skalenring	Scale Ring	1		03336010328
29	Nabe Handgriff	Handle Bracket Hub	1		03336010329
30	Griffstange	Handle Bar	2		03336010330
31	Druckfeder	Compression Spring	1		03336010331
32	Abdeckung	Cover	1		03336010332
33	Innensechskantschraube	Cap Screw	3	M6 x 16	
34	Griff Sitz	Handle Seat	1	M16 x 2	03336010334
35	Griffstange	Handle Bar	1		03336010335
36	Abdeckung	Cover	1		03336010336
37	Schraube	Screw	1	M6 x 12	
38	Kugellager	Ball Bearing	1	6002	0406002R
39	Schnecke	Worm	1		03336010339
40	Kugellager	Ball Bearing	1	6002	0406002R
41	Abdeckung	Cover	1		03336010341
42	Schraube	Screw	3	M6 x 20	03336010342
43	Innensechskantschraube	Cap Screw	1	M6 x 16	
44	Skalenring	Scale Ring	1		03336010344
45	Schraube	Screw	1	M6 x 12	03336010345
46	Handrad	Handle Wheel	1		03336010346
47	Griff	Handle	1		03336010347
48	Klemmblock	Clamp Block	1		03336010348
49	Klemmblock	Clamp Block	1		03336010349
50	Klemmgriff	Clamp Handle	1		03336010350
51	Stiftschraube	Set Screw	2	M10 x 10	
52	Leitblech	Baffle	1		03336010352
53	Schraube	Screw	1	M5 x 10	03336010353
54	Getriebeabdeckung	Head Box Cover	1		03336010354
55	Schraube	Screw	6	M10 x 30	03336010355
56	Stift	Pin	2	8 x 25	03336010356

D Getriebe Fräskopf - Milling head gear

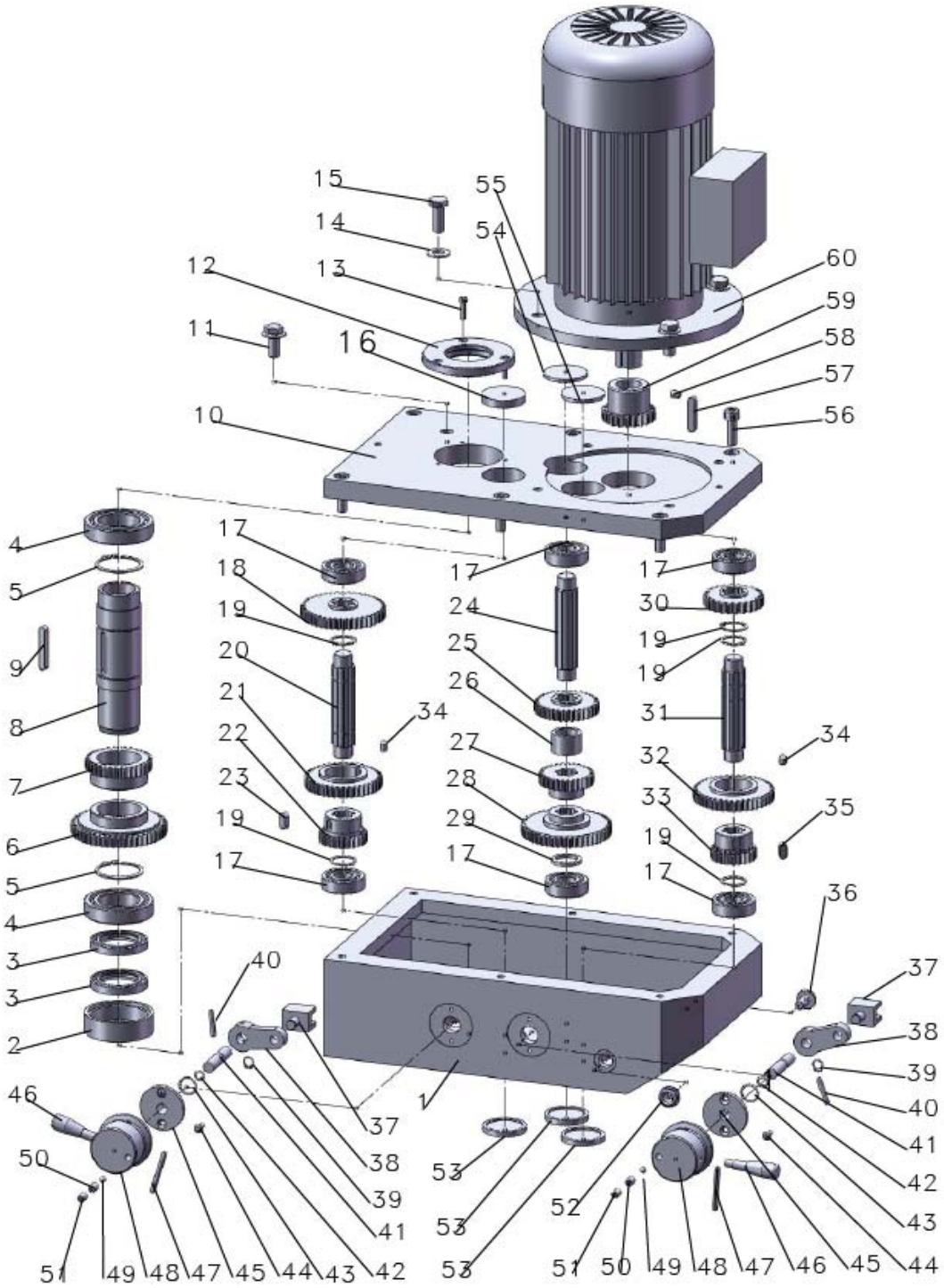


Abb. 6-3: Milling head gear

MT50E - Getriebe Fräskopf - Milling head gear					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Getriebekasten	Gear Case	1		03336010401
2	Manschette	Collar	1		03336010402
3	Öldichtung	Oil Seal	2	Fb45 x 62 x 8	03336010403

4	Kugellager	Ball Bearing	2	6009	0406009R
5	Sicherungsring	Ex Retaining Ring	2	48	042SR48W
6	Zahnrad	Gear	1		03336010406
7	Zahnrad	Gear	1		03336010407
8	Welle	Shaft	1		03336010408
9	Passfeder	Key	1	8 x 50	
10	Gehäusedeckel	Box Cover	1		03336010410
11	Sechskantschraube	Hex Bolt	1	M16 x 1.5	03336010411
12	Manschette	Collar	1		03336010412
13	Schraube	Screw	3	M5 x 15	03336010413
14	Unterlegscheibe	Washer	4	12	
15	Schraube	Screw	4		03336010415
16	Abdeckung	Cover	1		03336010416
17	Kugellager	Ball Bearing	6	6204	0406204
18	Zahnrad	Gear	1		03336010418
19	Sicherungsring	Ex Retaining Ring	5	25	042SR25W
20	Antriebswelle	Driving Shaft	1		03336010420
21	Zahnrad	Gear	1		03336010421
22	Zahnrad	Gear	1		03336010422
23	Passfeder	Key	1	8 x 15	
24	Antriebswelle	Driving Shaft	1		03336010424
25	Zahnrad	Gear	1		03336010425
26	Buchse	Bush	1		03336010426
27	Zahnrad	Gear	1		03336010427
28	Zahnrad	Gear	1		03336010428
29	Ring	Ring	1		03336010429
30	Zahnrad	Gear	1		03336010430
31	Antriebswelle	Driving Shaft	1		03336010431
32	Zahnrad	Gear	1		03336010432
33	Zahnrad	Gear	1		03336010433
34	Stiftschraube	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		03336010437
38	Kipphebel	Rocker Arm	2		03336010438
39	Sicherungsring	Ex Retaining Ring	2	10	042SR10W
40	Stift	Pin	2	5 x 30	03336010440
41	Kleine Spindel	Small Spindle	2		03336010441
42	Gummiring	Rubber Ring	2	12 x 2	03336010442
43	Gummiring	Rubber Ring	2	20 x 2	03336010443
44	Schraube	Screw	4	5 x 12	03336010444
45	Abdeckung	Cover	2		03336010445
46	Griff	Handle	2		03336010446
47	Stift	Pin	2	5 x 50	03336010447
48	Griff Sitz	Handle Seat	2		03336010448
49	Stahlkugel	Steel Ball	2	6	042KU06
50	Feder	Spring	3		03336010450
51	Stiftschraube	Set Screw	2		03336010451
52	Öl Zeiger	Oil Pointer	1		03336010452
53	Abdeckung	Cover	3		03336010453
54	Abdeckung	Cover	1		03336010454
55	Abdeckung	Cover	1		03336010455
56	Schraube	Screw	4	M10 x 30	03336010456
57	Passfeder	Key	1	8 x 40	
58	Stiftschraube	Set Screw	1	M8 x 10	
59	Zahnrad	Gear	1		03336010459
60	Motor	Motor	1		03336010460

E Fräsfutterschutz - Milling chuck protection

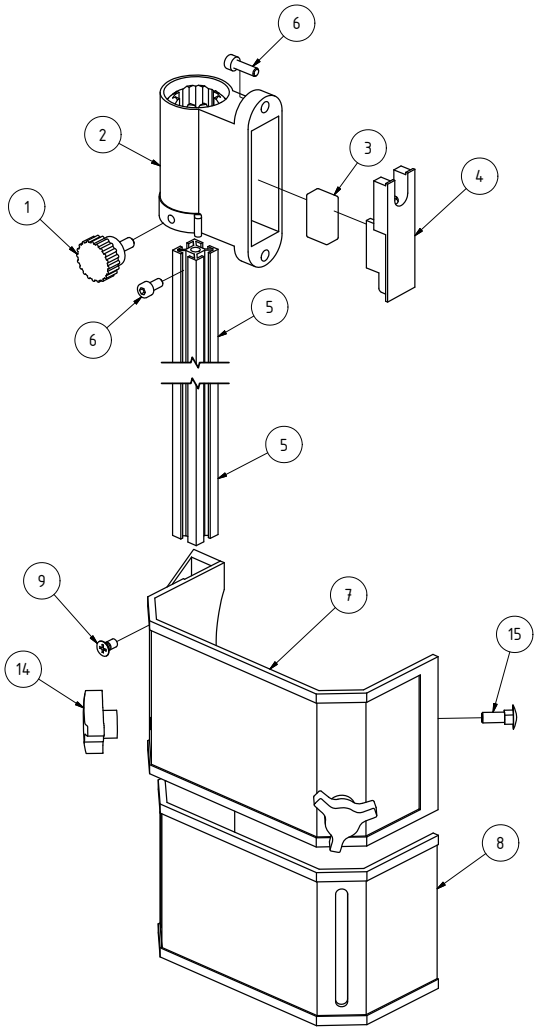
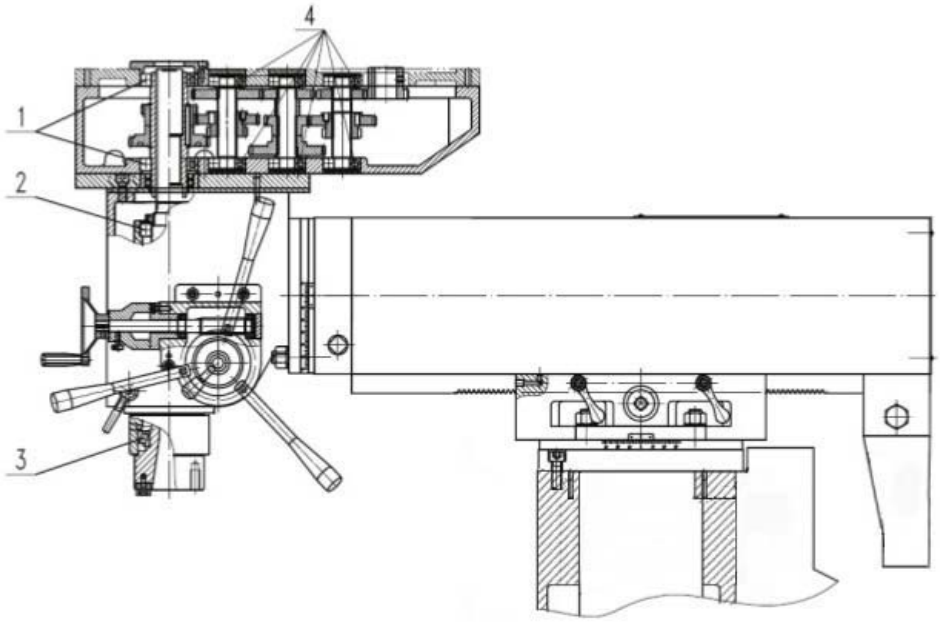


Abb. 6-4: Fräsfutterschutz - Milling chuck protection

MT50E - Fräsfutterschutz - Milling chuck protection					
Pos.	Bezeichnung	Description	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Rändelschraube	Knurled screw	1	0333609007	
2	Halterung	Fixture	1		0302024149CPL
3	Mikroschalter	Microswitch	1		
4	Platte	Plate	1		
5	Alu- Profil	Aluminium profile	1		
6	Schraube	Screw	2	M5x10	
7	Fräsfutterschutz A	Mill chuck cover A	1		
8	Fräsfutterschutz B	Mill chuck cover B	1		
9	Schraube	Screw	2	M5x10	
14	Rändelmutter	Knurled nut	2		
15	Klemmschraube	Clamping screw	2		
CPL	Futterschutz komplett	Chuck protection complete	1		03336010FS

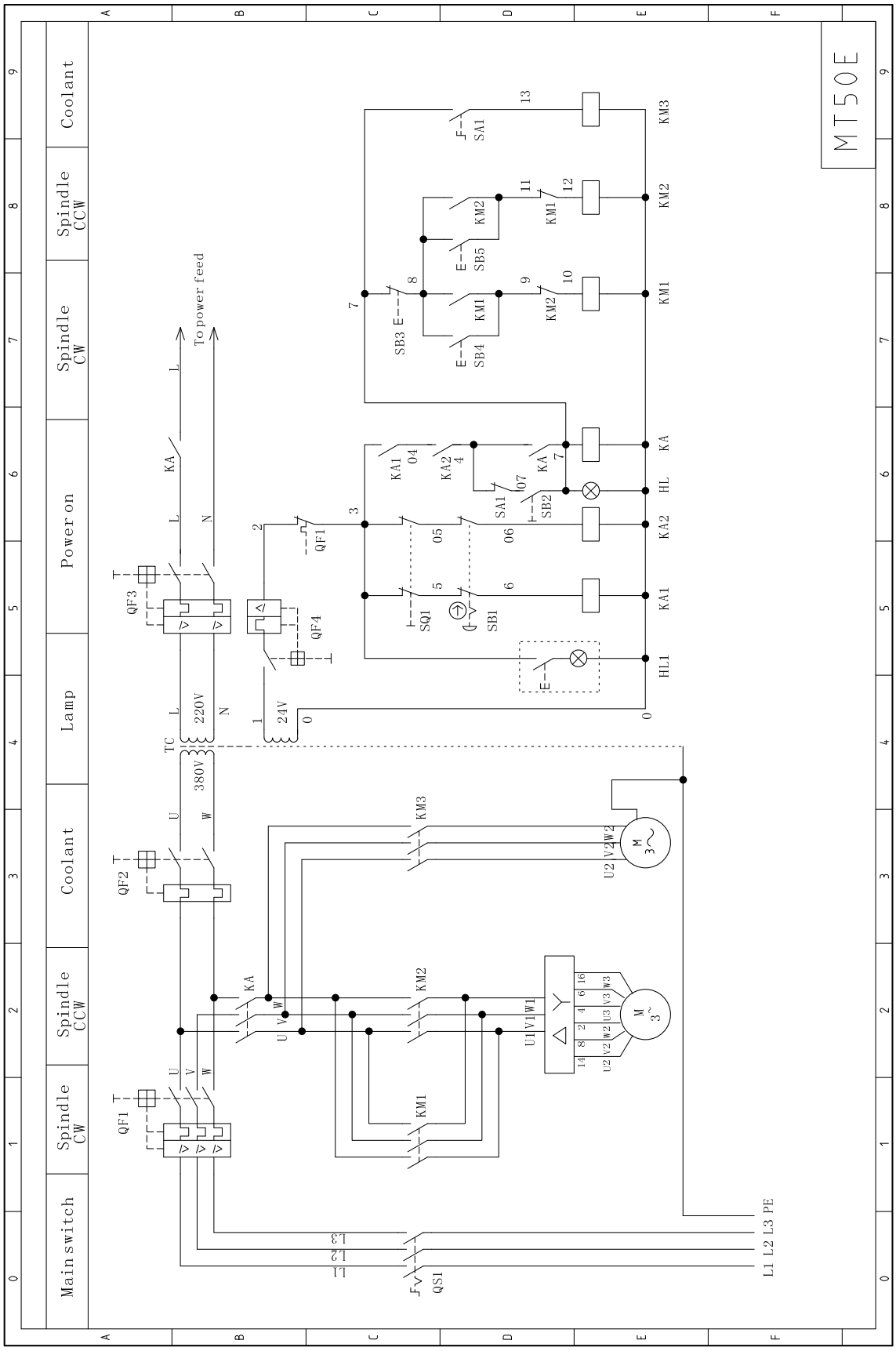
F Lagerübersicht - Bearing overview



Ersatzteilliste Lager - Bearing part list					
Pos.	Bezeichnung	Designation	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Lager	Bearing		6009 / P5	0406009
2	Lager	Bearing		6009 / P5	0406009
3	Lager	Bearing		32010 / P5	04032010
4	Lager	Bearing		6204 / P5	0406204

6.5 Schaltplan - Wiring diagram

G



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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

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

7 Malfunctions

Malfunction	Cause/ possible effects	Solution
Noise during work.	Spindle runs dry. Tool blunt or incorrectly clamped.	Grease spindle Use new tool and check clamping.
Tool "burnt".	Incorrect speed. Chips are not coming out of the drilled hole. Blunt tool. Operating without cooling agent.	Choose a different speed, excessive feed. Retract tool more often during work. Sharpen or replace tool. Use coolant.
Tool running off-centre or "hopping"	Tool deformed Bearings worn down in the spindle head. Tool badly clamped. Defective clamping chuck.	Replace the tool. Have the bearings in the spindle head replaced. Clamp the tool properly. Replace the clamping chuck.
Taper cannot be inserted in quill.	Remove any dirt, grease or oil from the internal conical surface of the spindle sleeve or the taper.	Clean surfaces well. Keep surfaces free from grease.
Motor does not start.	Motor is wrongly connected. Defective fuse.	Have it checked by qualified personnel.
Motor is overheating and there is no power.	Motor overloaded. Insufficient mains voltage. Motor wrong 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 work-piece 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.

Malfunction	Cause/ possible effects	Solution
Rattle the spindle if the workpiece surface is rough.	Excessive slack in bearing. Spindle moves up and down. Adjustment strip loose. Chuck loose. Tool is blunt. The workpiece is not fastened.	Readjust the bearing slack or replace the bearing. Readjust bearing slack (fixed bearing). Adjust strip to the correct slack using the adjusting screw. Check, re-tighten. Sharpen or renew the tool. Clamp the workpiece firmly.

8 Appendix

8.1 Copyright

Optimum Maschinen Germany GmbH

8.2 Changes

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

8.3 Product follow-up

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

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

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

Optimum Maschinen Germany GmbH

Dr.-Robert-Pfleger-Str. 26
D-96103 Hallstadt, Germany

email: info@optimum-maschinen.de

8.4 Liability claims for defects / warranty

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

- The processing of the liability claims or of the warranty is performed as chosen by OPTIMUM GmbH either directly or through one of its dealers.
  Any defective products or components of such products will either be repaired or replaced by components which are free from defects. Title to replaced products or components is transferred to OPTIMUM Maschinen Germany GmbH.
- The automatically generated original proof of purchase which shows the date of purchase, the type of machine and the serial number, if applicable, is the precondition in order to assert liability or warranty claims. If the original proof of purchase is not presented, we are not able to perform any services.
- Defects resulting from the following circumstances are excluded from liability and warranty claims:
  - Using the product beyond the technical options and proper use, in particular due to overstraining of the machine.
  - Any defects arising by one's own fault due to faulty operations or if the operating manual is disregarded.
  - Inattentive or incorrect handling and use of improper equipment
  - Unauthorized modifications and repairs
  - Insufficient installation and safeguarding of the machine
  - Disregarding the installation requirements and conditions of use
  - atmospheric discharges, overvoltage and lightning strokes as well as chemical influences

- Neither are the following items covered by liability or warranty claims:
  - Wearing parts and components which are subject to normal and intended wear, such as V-belts, ball bearings, lighting, filters, seals, etc.
  - Non reproducible software errors
- Any services, which OPTIMUM GmbH or one of its agents performs in order to fulfil any additional warranty are neither an acceptance of the defects nor an acceptance of its obligation to compensate. These services neither delay nor interrupt the warranty period.
- The court of jurisdiction for legal disputes between businessmen is Bamberg.
- If any of the aforementioned agreements is totally or partially inoperative and/or invalid, a provision which nearest approaches the intent of the guarantor and remains within the framework of the limits of liability and warranty which are specified by this contract is deemed agreed.

8.5 Storage

ATTENTION!

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

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

Follow the instructions and information on the transport box:

- **Fragile goods**
  (Goods require careful handling)

- **Protect against moisture and humid environment**

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

- **Maximum stacking height**

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

Consult Optimum Maschinen Germany GmbH if the milling machine and accessories are stored for more than three months or are stored under different environmental conditions than those specified here. ☞ Environmental conditions - storage on page 18

8.6 Advice for disposal / Options of re-use

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

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

8.6.1 Decommissioning

CAUTION !

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

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.

Dispose of machine components and operating fluids using the intended disposal methods.

8.6.2 Disposal of new device packaging

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

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

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

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

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

8.6.3 Disposal of the machine

INFORMATION

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

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

8.6.4 Disposal of electrical and electronic components

Please make sure that the electrical components are disposed of professionally and according to the statutory provisions.

The device is composed of electrical and electronic components and must not be disposed of as household waste. According to the European Directive 2011/65/EU regarding electrical and electronic used devices and the implementation of national legislation, used power tools and electrical machines need to be collected separately and supplied to an environmentally friendly recycling centre.

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

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

8.6.5 Disposal of lubricants and coolants

ATTENTION!

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

INFORMATION

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

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

8.7 Disposal through municipal collection facilities

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

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

8.8 Terminology/Glossary

Term	Explanation
Cross table	Supporting surface, clamping surface for the workpiece with traverse in X and Y directions
Taper mandrel	Tool housing taper, drill taper, drill chuck taper.
Workpiece	piece to be milled, drilled or machined.
Draw bar	Threaded rod to fix the taper mandrel in the quill.
Drill chuck	Drill bit adapter
Collet	Holder for end mill
Drill-mill head	Upper part of the milling machine
Quill	Hollow shaft in which the milling spindle turns.
Milling spindle	Shaft activated by the motor
Drilling table	Supporting surface, clamping surface
Taper mandrel	Cone of the drill or of the drill chuck
Spindle sleeve lever	Manual operation for the drill feed

Term	Explanation
Quick action - Drill chuck	Drill bit adapter can be fixed by hand.
Tool	Milling cutter, drill bit, etc.

8.9 Change information operating manual

Chapter	Short note	new version number
3	Interdepartmental transport	1.0.1
Spare parts	Update of wiring diagram	1.0.2

OPTIMUM®
MASCHINEN - GERMANY

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: MT 50E

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

Description:

Hand-controlled milling machine

The following additional EU Directives have been applied:

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

The following harmonized standards were applied:

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

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

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

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

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

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

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Hallstadt, 2019-12-11

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