

Operating manual

Version 1.0.3

Geared drill



B50 GSM

29" Item No. 3034504

Keep for future reference!

Table of contents

Preface

C The illustrations of the geared drill might in some details deviate from the illustrations of this operating manual but
h this will have no influence on the operation of the geared drill.

a Any changes in the construction, equipment and accessories are reserved for reasons of enhancement. Therefore,
n no claims may be derived from the instructions and descriptions.

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1 Safety

Glossary of symbols

	gives additional advice
	calls on you to act
	enumerations

This part of the operating manual

- does explain the meaning and how to use the warning references contained in this operating manual,
- does explain how to use the geared drill machine,
- highlights the dangers that might arise for you and others if these instructions are not followed thoroughly,
- informs you on how to prevent dangers.

In addition to this operating manual, please note

- applicable laws and regulations,
- legal regulations for preventing an accident,
- the prohibition, warning and mandatory signs as well as the warning notes on the geared drill machine.

Always keep the operating manual close to the geared drill for further reference.



INFORMATION

If you are not able to solve a problem using this manual, please do not hesitate to contact us for further professional advice:

If you are unable to solve a problem using this manual, please contact us for advice:

Exclusive USA Agent

LDS Industries, LLC

930 W. National Ave.




Addison, IL 60101

Tel.: 1-630-785-6437

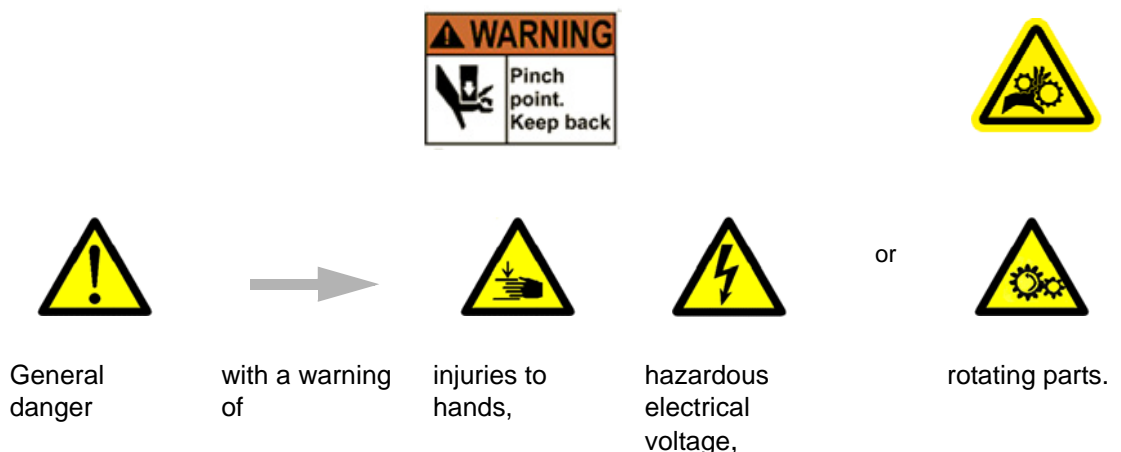
1.1 Safety warnings (warning notes)

1.1.1 Classification of hazards

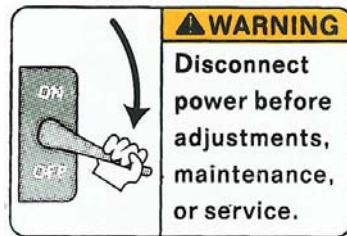
We classify the safety warnings into various levels. The table below gives an overview of the classification of symbols (pictograms) and warning for the specific danger and its (possible) consequences.

Pictogram	Alarm Expression	Definition/Consequences
	DANGER!	Imminent danger that will cause serious injury or death to personnel.
	WARNING!	Hazard: a danger that will cause serious injuries or death to personnel.
	CAUTION!	Danger or unsafe procedure that might cause injury to personnel or damage to property.
	ATTENTION!	Situation that could cause damage to the machine and product and other types of damage. No risk of injury to personnel.
	INFORMATION	Application tips and other important or useful information and warnings. No dangerous or harmful consequences for personnel or objects.

In the case of specific dangers, we replace the pictogram



1.1.2 Other pictograms



Warning of automatic start-up!



Disconnect main power!



Activation forbidden!



Use ear protection!



Use safety shoes!



Use protective gloves!



Wear a safety suit!



Protect the environment!



Use safety glasses!



Contact address

1.2 Proper use



WARNING!

Improper use of the machine

- will endanger personnel,
 - will endanger the machine and other items used by the operator,
- may affect proper operation of the machine.

The geared drill is designed and manufactured for boring cold metals or other non-flammable materials that do not constitute a health hazard. It uses a rotating cutting tool with several cutting edges.

The geared drill must only be used with keyless drill chuck.

Chucks that require a key to secure the bit must not be used on this geared drill.

If the geared drill is used in any way other than described above, or modified without authorization, then the geared drill is being used improperly.

We do not take liability for damage caused by improper use.

We would like to stress that any modifications to the construction, or technical or technological modifications that have not been authorized will also render the warranty null and void.

It is also part of proper use that

- the limits of the geared drill are complied with,
- the instruction manual is observed,
- review and maintenance instructions are observed.

☞ „Technical data“ on page 16



WARNING!

Very serious injury.

It is forbidden to make any modifications or alterations to the operating values of the geared drill! These could endanger personnel and cause damage to the geared drill.

1.3 Possible dangers caused by the geared drill

The geared drill is carried out with the latest technological advances.

Nonetheless, there remains a residual risk, since the geared drill operates with

- high revolutions,
- rotating parts,
- electrical voltage and currents.

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

If the geared drill is used by personnel who are not duly qualified, there may be a risk resulting from incorrect operation or unsuitable maintenance.



INFORMATION

All personnel involved in assembly, commissioning, operation and maintenance must

- be duly qualified,
- follow this instruction manual.

In the event of improper use

- there may be a risk to personnel,
- there may be a risk to machine and other items,

- correct functioning of the geared drill may be affected.

Disconnect the geared drill from the electrical whenever cleaning or maintenance work is being carried out.



WARNING!

The geared drill may only be used with the safety devices activated.

Disconnect the geared drill from the electrical power whenever you detect a failure in the safety devices or when they are not fitted!

All additional installations carried out by the operator must incorporate the prescribed safety devices.

As the machine operator, this will be your responsibility!

👉 „Safety devices“ on page 10

1.4 Qualification of personnel

1.4.1 Target group

This manual is addressed to

- operators,
- users,
- maintenance staff.

The warning notes therefore refer to both operation and maintenance of the geared drill.

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

Vague or unclear assignment of responsibilities constitutes a safety hazard!

Always switch off the main power of the geared drill. This will prevent it being used by unauthorised personnel. Always disconnect the geared drill from the main electrical power.



1.4.2 Authorised personnel



WARNING!

Incorrect use and maintenance of the geared drill causes danger for personnel, objects and the environment.

Only authorised personnel may operate the geared drill!

Personnel authorised to use and perform maintenance are the trained and instructed technical staff working for the operator and manufacturer.

The operator must

Obligations of the operator

- train staff,
- instruct staff regularly (at least once a year) on
 - all safety standards that apply to the machine,
 - operation,
 - accredited technical guidelines,
- check staff's understanding,
- document training/instruction,
- require staff to confirm participation in training/instruction by a signature,
- check whether the staff are aware of safety and of dangers in the workplace and whether they observe the instruction manual.

The user must

Obligations
of the user

- have received training in operation of the geared drill,
- know the function and principle of operation,
- before the machine is first used
 - have read and understood the instruction manual,
 - be familiar with all safety devices and regulations.

Additional
qualification
requi-
rements

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

- Electrical components or equipment: Only an electrician or person working under the instructions and supervision of an electrician.

Before carrying out work on electric components or operating units, the following measures need to be performed in the order given.

- Disconnect main power
- Ensure that the machine cannot be turned on again
- Check that there is no voltage

1.5**User positions**

The user must stand in front of the geared drill.



1.6

INFORMATION

The main power of the geared drill must be freely accessible.

Safety measures during operation**CAUTION!**

Risk due to inhaling health hazardous dusts and mist.

Depending on the material being processed and any additional dusts and mist in the work area, conditions might impair your health.

Make sure that the generated health hazardous dusts and mist are safely removed at the point of origin and are collected and/ or filtered from the working area. Use an appropriate dust collection/ filter unit.

**CAUTION!**

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

Take additional preventive measures in order to safely avoid health hazards before processing flammable materials (e.g. aluminum, magnesium) or before using flammable additives (e.g. solvents).

1.7**Safety devices**

Use the geared drill only with properly functioning safety devices.

Stop the geared drill immediately if there is a failure in the safety device or if it is not functioning for any reason.

It is your responsibility!

If a safety device has been activated or has failed, the geared drill must only be used when

- the cause of the failure has been removed,
- it has been verified that there is no resulting danger for personnel or objects.



WARNING!

If you bypass, remove or override a safety device in any other way, you are endangering yourself and other personnel working with the geared drill. The possible consequences are

- damage or injuries as a result of components or parts of components flying off at high speed,
- contact with rotating parts,
- fatal electrocution.

The geared drill includes the following safety devices:

- EMERGENCY stop button.
- Main lockable switch.
- A drilling table with T-slots to fasten the work piece or a vise.
- Adjustable drill chuck guard with position switch.



WARNING!

The separating protective equipment which is made available and delivered together with the machine is designed to reduce the risk of workpieces or fractions of them which being expelled, but not to remove them completely.

1.7.1 EMERGENCY- STOP button

CAUTION!

After actuating the EMERGENCY-STOP-button the drilling spindle will turn some more seconds depending on the previously set speed.

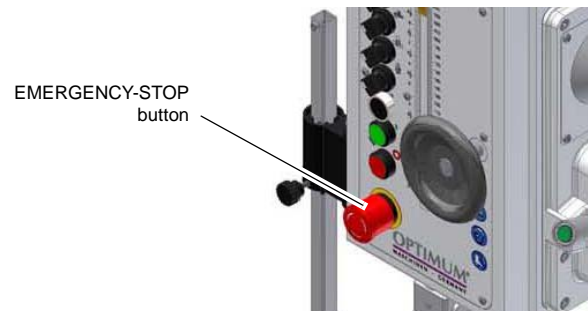


Fig. 1-1: EMERGENCY-STOP button

1.7.2 Main switch

In the "0" position, the lockable switch can be protected with a padlock against unauthorised or accidental activation.

When the main switch is off, the power supply to the motor is cut off.

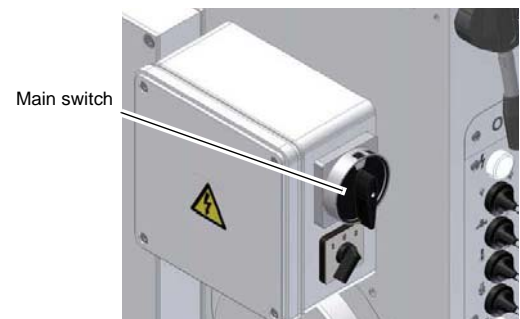


Fig. 1-2: Main switch



Points marked with the pictogram shown here are not included. These points may be live even when the main switch is off.

1.7.3 Drilling table

There are T-Slots in the drilling table for the T-slot nuts.



WARNING!

Risk of injury from parts flying off at high speed. Secure the piece firmly on the drilling table.

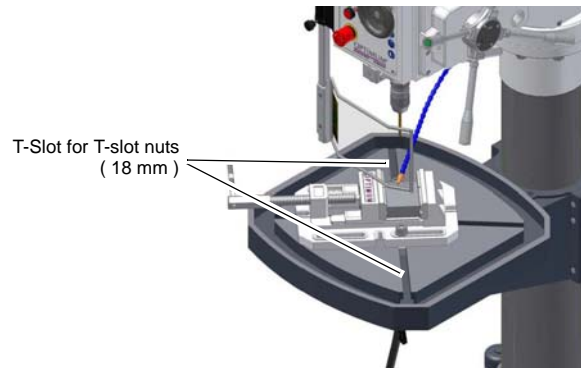


Fig. 1-3: Drilling table

1.7.4 Drill chuck guard

- Adjust the drill chuck guard to the required height.
- Move the drill chuck guard into place before you start drilling.
- The geared drill can only be activated as soon as the drill chuck guard been closed.

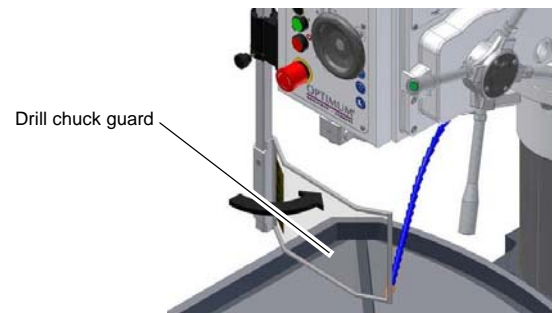


Fig. 1-4: Drill chuck guard

1.7.5 Prohibitive, warning and information labels



INFORMATION

All warning labels must be legible. Check them regularly.

1.8 Safety check

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

Check all safety devices

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

Check that prohibitive, warning and information labels and the markings on the geared drill

- can be identified (if not, clean them),
- are complete.



INFORMATION

Use the following table for checking.

General check		
Equipment	Check	OK
Protective covers	Mounted, firmly bolted and not damaged	
Drill chuck guard		
Labels, markings	Installed and legible	
Date:	Checked by (signature):	

Test run		
Equipment	Check	OK
EMERGENCY stop button	Once the emergency stop button is activated, the geared drill should be switched off.	
Drill chuck guard	The geared drill can only be switched on as soon as the drill chuck guard has been closed.	
Date:	Checked by (signature):	

1.9 Personnel protective equipment

For certain work personnel protective equipment is required. This includes:

- a safety helmet,
- safety glasses or face guard,
- protective gloves,
- safety shoes with steel toe cap,
- ear protection.

Before starting work check that the proper equipment is available in the workplace.



CAUTION!

Dirty or contaminated personnel protective equipment can cause disease.

Clean your personnel protective equipment

- after every use,
- regularly, at least once a week.

Personnel protective equipment for special work



Protect your face and eyes: During all work, and specifically work during which your face and eyes are exposed to hazard, a safety helmet with a face guard should be worn.



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



Wear safety shoes when you position, dismantle or transport heavy components.

1.10 Safety during operation

In the description of work with and on the geared drill we highlight the dangers specific to that work.



WARNING!

Before activating the geared drill, double check that this will not

- **endanger other people**
- **cause damage to equipment.**

Avoid unsafe working practices:

- Make sure your work does not endanger anyone.
- The instructions in this manual must be observed during assembly, handling, maintenance and repair.
- Do not work on the geared drill if your concentration is reduced, for example, because you are taking medication.
- Observe the rules for preventing accidents issued by your association for the prevention of occupational accidents and safety in the workplace or other inspection authorities.
- Inform the inspector of any danger or failure.
- Stay at the geared drill until all rotating parts have come to a halt.
- Use prescribed protective equipment. Make sure to wear a well-fitting work suit and, where necessary, a hairnet.
- Do not use protective gloves during drilling work.

1.11 Safety during maintenance

Inform operators in good time of any repair and maintenance work.

Report all safety relevant changes or performances details of the geared drill. Document all changes, have the operation manual changed accordingly and train the machine operators.

1.11.1 Disconnecting the geared drill and making it safe

Turn the machine off using the main switch before beginning any maintenance or repair work.



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

All machine components and hazardous voltages disconnected. Only the points marked with the pictogram shown here are not included.



Place a warning sign on the machine.

1.11.2 Using lifting equipment

WARNING!



Use of unstable lifting and load suspension gear that breaks under load can cause very serious injuries or even death.

Check that the lifting and load suspension gear

- **is of sufficient load capacity,**
- **is in perfect condition.**

Observe the rules for preventing accidents issued by your association for the prevention of occupational accidents and safety in the workplace or other inspection authorities.

Fasten the loads properly. Never walk under suspended loads!

1.11.3 Mechanical maintenance work

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

- covers,
- safety indications and warning signs,
- earth (ground) connection.

If you remove protection or safety devices, refit them immediately after completing the work. Check if they are working properly!


1.12 Electrical system

Have the machine and/or the electrical equipment checked regularly, and at least every six months.

Eliminate immediately 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 geared drill immediately if there are any problems in the power supply!

 „Maintenance“ on page 38

2 Technical data

The following information gives the dimensions and weight and is the manufacturer's authorised machine data.

2.1 Power connection	
Total connection rate	4 HP, 230V, 3 Ph, 60Hz
Cooling pump	40W, 230V, 60Hz
Permitted voltage tolerance	220V-240V
2.2 Drill capacity	
Drill capacity in steel	Ø 50 mm (1.968")
Tapping in steel	M 42 (1-5/8")
Drill capacity in cast iron	Ø 60 mm (2.362")
Tapping in cast iron	M 50 (1.968")
Working radius	375 mm (14.763")
Spindle travel	230 mm (9.055")
2.3 Spindle	
Spindle taper	MK4 (4 MT)
Spindle feed [in / rev]	6 steps, 0,05 -0, 3mm/ 0.002-0.012"  „Automatic spindle feed“ on page 29
2.4 Drilling table	
Table measurements Length x Width	600 x 600 mm (23.62 x 23.62")
Size of T-slots	18 mm (0.709")
Maximum distance spindle - table	800 mm (31.50")
Work area of base Length x Width	600 x 860 (23.62 x 33.86")
Maximum distance spindle - base	1300 mm (51.19")
Maximum load table column center - spindle	200 - 250 Kg. (440-550 LBS)
Maximum load table column center - base	250 - 300 Kg. (550-660 LBS)
2.5 Work area	
Height	3000 mm (118.11")
Depth	1800 mm (70.87")
Width	1200 mm (47.24")
2.6 Speeds	
Spindle rotating speeds [rpm]	54 - 2090
No. of speeds	18

2.7 Ambient conditions	
Temperature	5 - 35°C (40 - 95 °F.)
Rel. humidity	25 - 80 %
2.8 Operating material	
Gear oil for drilling head gear 2.7 qts	 „Lubricant table“ on page 45
Rack and column of the drill	commercial heavy grease  „Lubricant table“ on page 45
2.9 Coolant system	
Height of pressure	9.75 feet
Tank capacity	5.28 quarts
Rate of flow	31 gallons/ hour

2.10 Emissions

The noise level (emission) of the mill drill machine is below 76 dB(A). If the mill drill machine is installed in an area where various machines are in operation, the acoustic influence (immission) on the operator of the mill drill machine may exceed 85 dB(A).



INFORMATION

This numeric value had been measured on a new machine under conventional operating conditions. Depending on the age or wear of the machine, the noise behavior of the machine might change.

Furthermore, the extent of the noise emission is also depending on manufacturing influence factors, such as speed, material and clamping conditions.



INFORMATION

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

Unless the degree of noise emission and the degree of noise disturbance are depending on one another it is not possible to use it in order to reliably determine if it is necessary to take further preventive measures or not.

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

- Characteristics of the working chamber, e.g. size or damping behavior,
- Other noise sources, e.g. the number of machines,
- Other processes proceeding nearby and the period during which the operator is exposed to the noise.

Consult OSHA, state and local regulations in order to determine compliance, dangers and risks to the operator.

CAUTION!

The machine operator has to wear an appropriate ear protection depending on the overall stress caused by noise and on the basic limit values.

We generally recommend using a sound and ear protection.



2.11 Dimensions

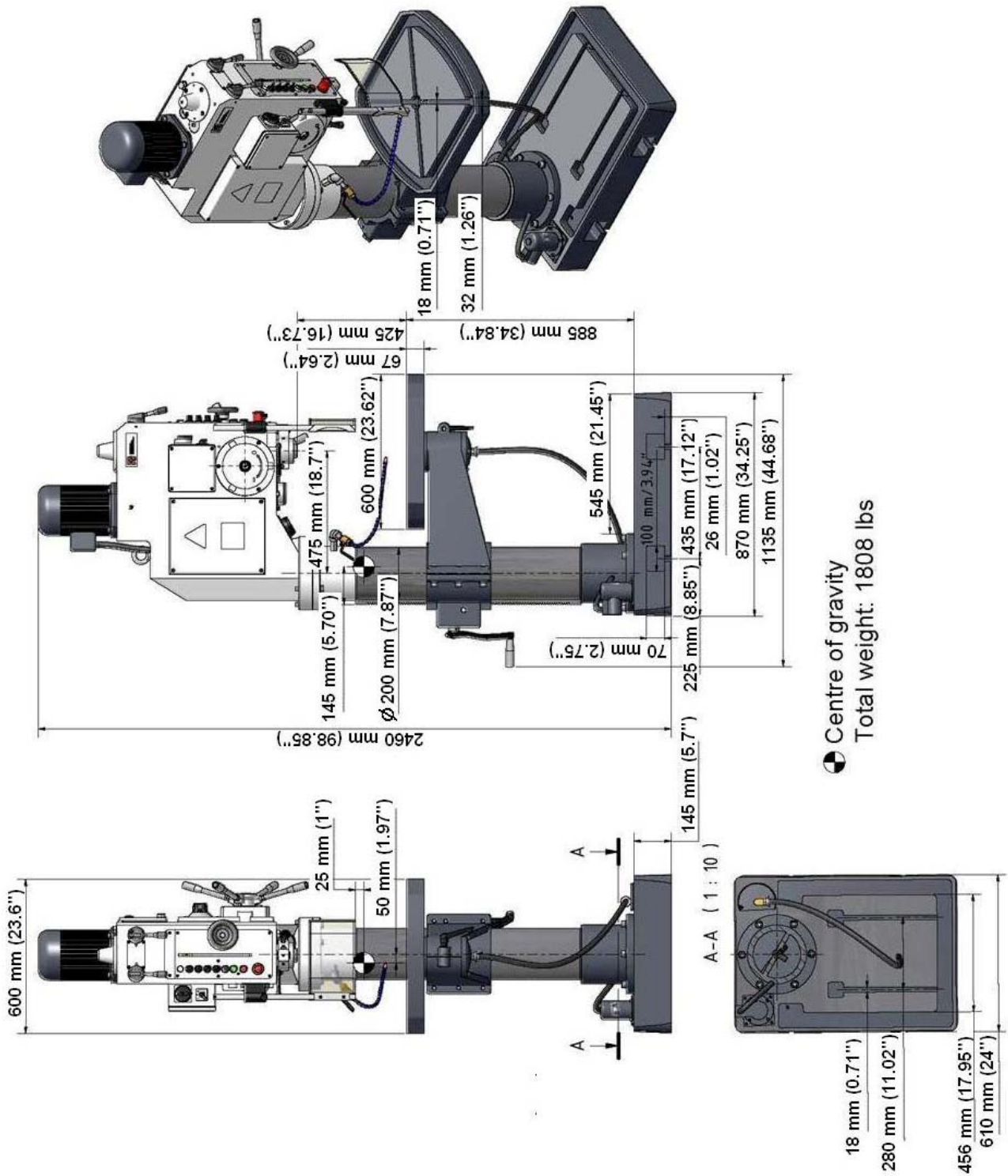


Fig.2-1: B50GSM

3 Assembly



INFORMATION

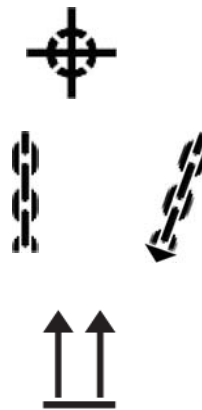
The geared drill is delivered pre-assembled.

3.1 Delivery volume

When the machine is delivered, check immediately that the geared drill has not been damaged during shipping and that all components are included. Also check for loose set screws. Check the components with the packing list.

3.2 Transport

- Center of gravity
- Attachment positions (marking the positions for the attachment position gear)
- Prescribed transport position (marking the top side)
- Means of transportation to be used
- Weights



WARNING!

Machine parts which fall off forklift trucks or other transport vehicles could cause very serious or even fatal injuries. Follow the instructions and information on the box.



WARNING!

Use of unstable lifting and load suspension gear that breaks under load can cause very serious injuries or even death.

Check that the lifting and load suspension gear has sufficient load capacity and is in perfect condition. Observe the rules for preventing accidents issued by your association for the prevention of occupational accidents and safety in the workplace or other inspection authorities.

Hold the loads properly. Never walk under suspended loads!

3.3 Storage



ATTENTION!

Improper storage may cause important parts to be damaged or destroyed. Store packed or unpacked parts only under the following ambient conditions. Please follow the instructions and indications on the transportation box:

- Fragile goods (goods require careful handling)



- Protect against humidity and humid environments
☞ „Ambient conditions“ on page 17.



- Prescribed position of the packaging box (marking the top side – arrows pointing upward)



- Maximum stacking height

Example: non-stackable – do not pile any further packaging boxes on top of the first packaging box



Consult LDS Industries if the geared drill and accessories have to be stored for a period of over three months or under different external conditions than those given here ☞ „Information“ on page 5.

3.4 Installation and assembly

3.4.1 Site requirements

Organize the working space around the geared drill according to the local safety regulations.



INFORMATION

In order to provide for good functionality and high machining accuracy as well as long durability of the machine the site should fulfill certain criteria.

Observe the following items:

- The device must only be installed and operated in dry ventilated places.
- Avoid places nearby machines generating chips or dust.
- The site has to be vibration-free, i.e. at a distance from presses, planing machines, etc.
- The substructure has to be appropriate for geared drill. Also make sure that the load bearing capacity and the evenness of the floor are appropriate.
- The substructure has to be prepared in a way that possibly used coolant cannot penetrate into the ground.

- Protruding parts such as stops, handles, etc. need to be secured by measures provided by the customer if necessary in order to avoid dangers for persons.
- Provide sufficient space for assembly and operating staff as well as for material transport.
- Also allow for accessibility for setting and maintenance works.
- Make sure that the mains power of the milling machine is freely accessible.
- Provide for sufficient illumination (minimum value: 47 Lumens/ft², measured at the tool tip). In case of insufficient intensity of illumination provide for additional illumination i.e. by a separate workplace illuminator.



INFORMATION

The main power of the geared drill has to be freely accessible.

3.4.2

Assembly



WARNING!

Danger of crushing and overturning.

The geared drill must be installed by at least two persons.

3.4.3

Load suspension point

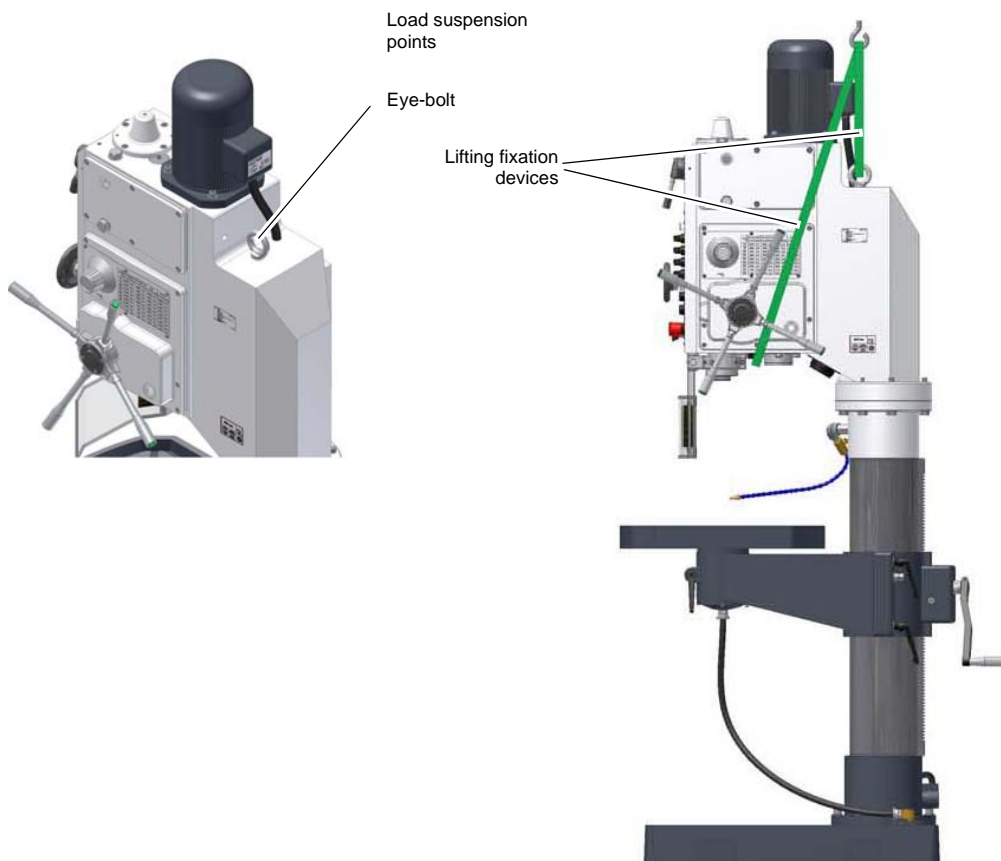


Fig. 3-1: Load suspension point

→ Secure the lifting loop in the eye bolt on the drilling head „Operating material“ on page 17.

3.4.4

Installation

→ Check the horizontal orientation of the base of the geared drill with a level.

3.4.5 Securing

→ Attach the geared drill to the foundation (floor) using the holes in the base. → „Operating material“ on page 17.

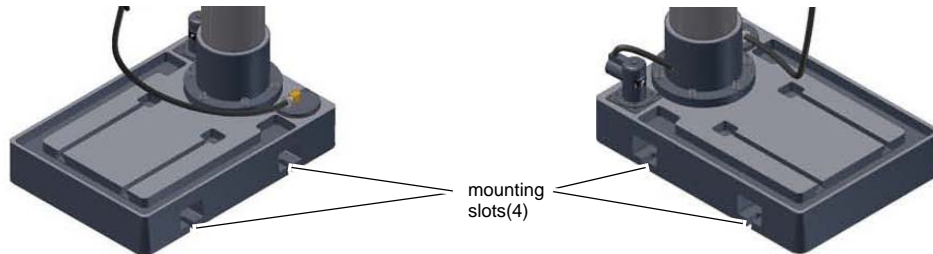


Fig. 3-2: Foot B50 GSM

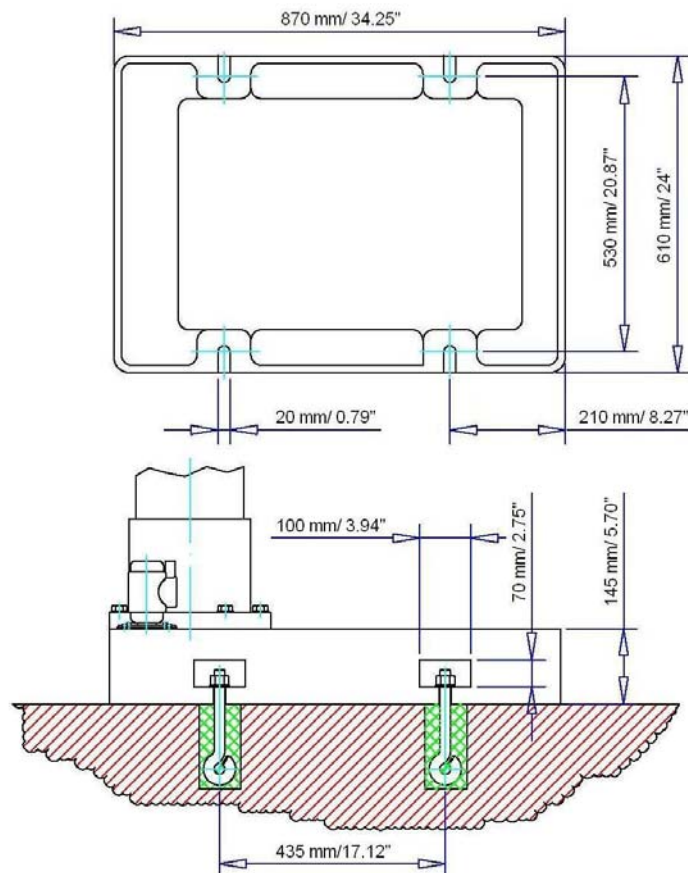


Fig. 3-3: Attachment to the base



ATTENTION!

Tighten the anchor bolt nuts in the geared drill until it is firmly secured and can neither move during operation nor be overturned.

If the anchor bolt nuts are too tight and the foundation (floor) is uneven, the geared drill's base may break.

3.5 First use



WARNING!

Risk by using improper workpiece clamping materials or by operating the machine with inadmissible speed.

Only use the clamping materials (e.g. drill chuck) which had been delivered together with the machine or as optional equipment offered by OPTIMUM.

Use the working clamping materials only in the provided admissible speed range.

Workpiece clamping materials must only be modified according to the recommendations of OPTIMUM or of the clamping material manufacturer.



WARNING!

Personnel and equipment may be endangered if the geared drill is first used by unqualified personnel.

We do not take responsibility for damage caused by incorrect commissioning.



ATTENTION!

The geared drill will be delivered without operating material (oil, coolant). First fill in oil and coolant. ➔ „Lubricant table“ on page 45

3.5.1 Power supply

Connect the main electrical power.

Use the technical information regarding the total connection rate of the machine.



ATTENTION!

Imperatively make sure that all 3 phases (L1, L2, L3) are connected correctly.

Most of the defects on motors are resulting from wrong connections. For instance, if a motor phase is not correctly clamped or connected to the neutral conductor (N).

This may cause:

- That the motor is becoming hot very rapidly
- Increased motor noises.
- The motor has no power.



ATTENTION!

Make sure that the direction of rotation of the drive motor is correct. If the rotational direction switch is switched to the position to perform clockwise rotations (R) the drill spindle needs to rotate clockwise. If necessary, exchange two phase connections.

If your connector plug is equipped with a phase inverter, this is done by turning it by 180°.

If the machine is incorrectly connected the warranty will become null and void.

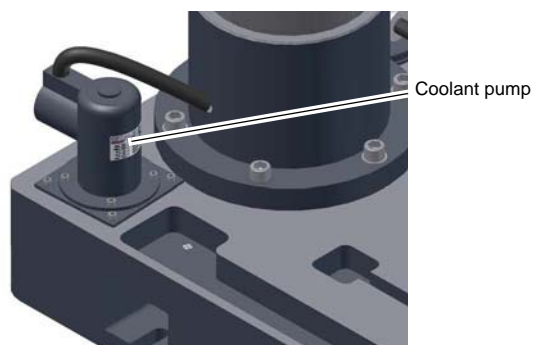


Fig. 3-4: Coolant pump B50 GSM



ATTENTION!

The coolant pump also delivers if it turns into the wrong direction. The pump will become inoperable after a short time if it turns into wrong direction.

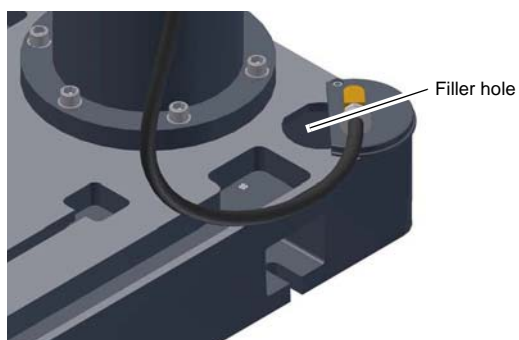




Fig. 3-5: Filler hole

3.5.2 Checks

- Check the geared drill as indicated under  „Safety check“ on page 12
- Check the geared drill as indicated under  „Lubricant table“ on page 45

4 Handling

4.1 Safety

Use the geared drill only under the following conditions:

- The geared drill is in proper working order.
- The geared drill is used as prescribed.
- Follow the instruction manual.
- All safety devices are installed and activated.



All problems should be eliminated immediately. Stop the machine immediately in the event of any abnormality in operation and make sure that it cannot be started up accidentally or without authorisation.

Notify the person responsible immediately of any modification.

☞ „Safety during operation“ on page 14

4.2 Control and indicating elements

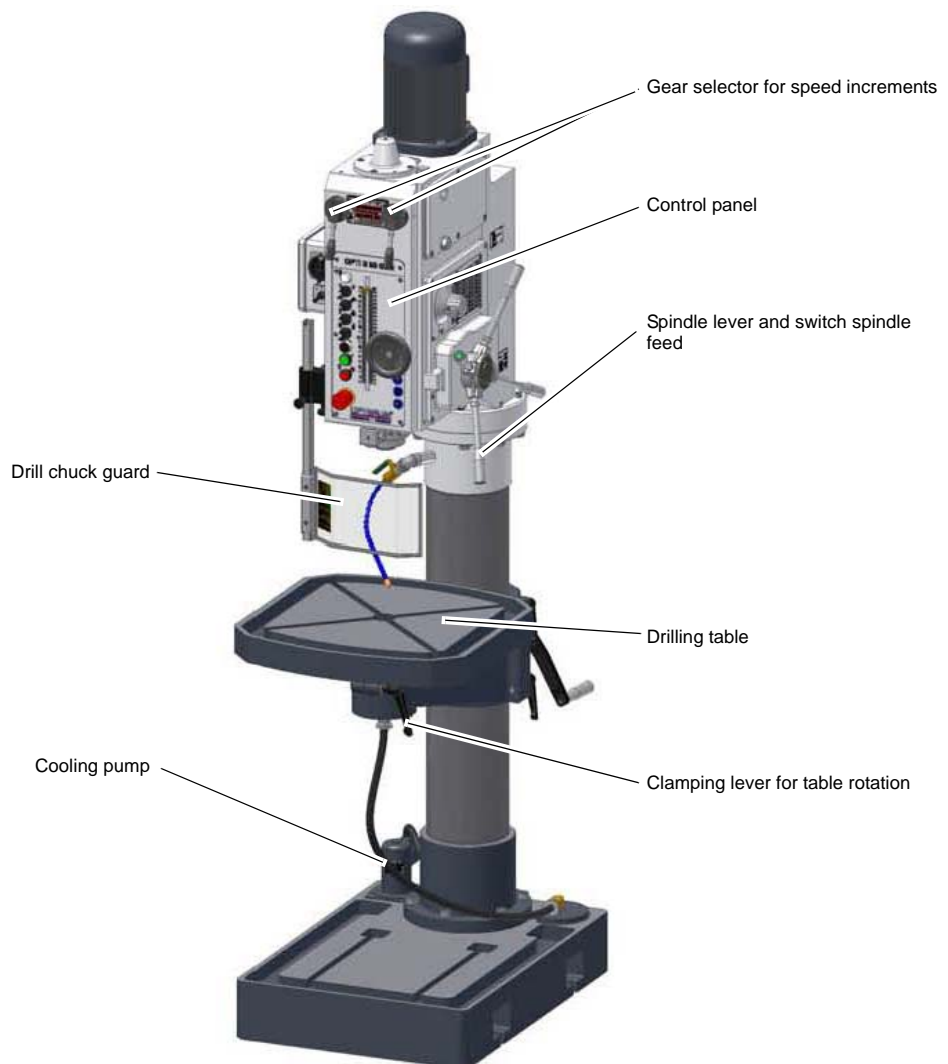


Fig.4-1: Geared drill B50 GSM

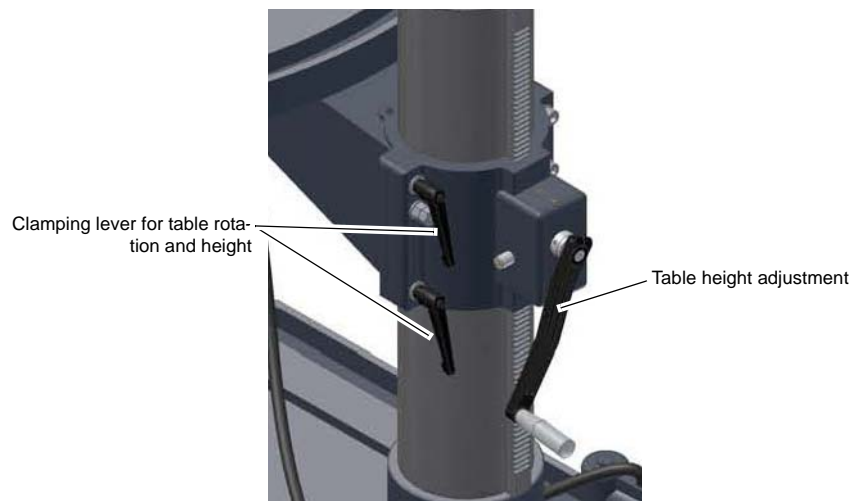


Fig.4-2: Table height adjustment

4.2.1 Control panel

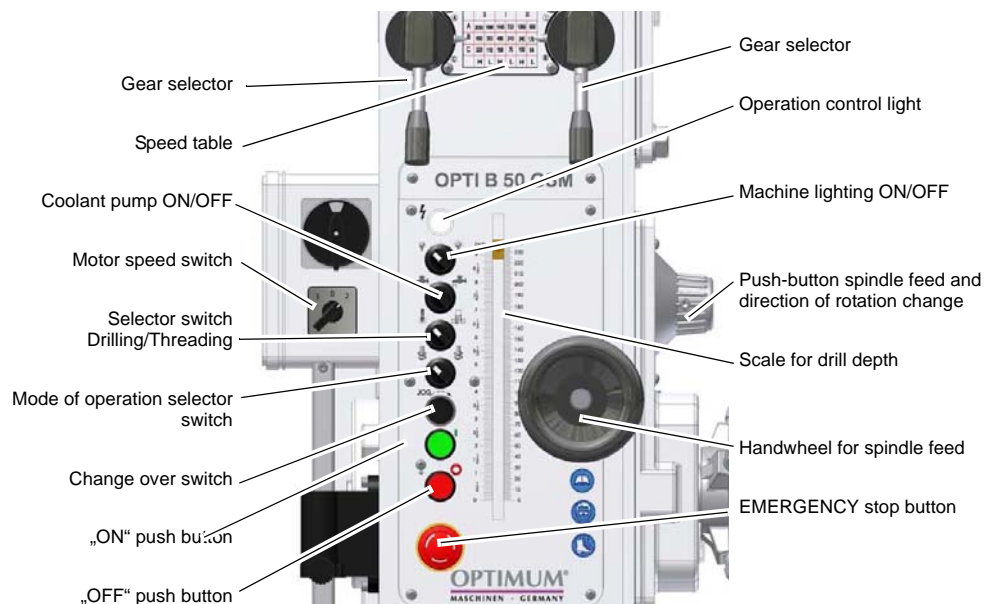


Fig.4-3: Control elements on the control panel



Mode of operation selector switch

With the selector switch the mode of operation is selected „drilling or thread cutting“.

Mode of operation drilling

The auxiliary function of the micro switches in the drilling depth to change the direction of rotation change is deactivated.

Mode of operation thread cutting

The function of the micro switches in the drilling depth and the function of the direction of rotation change by the push-button actuators in the guide lever are activated.



Drilling depth

The geared drill has two micro switches in the drilling depth.

The position of adjustable switching points is adjusted with the drill depth stop screw.

The adjustable switching point switches the automatic spindle feed off. In the mode of operation "thread cutting" it changes the direction of rotation.



Change-over switch

The direction of rotation of the drilling spindle is selected with the change-over switch.



Motor speed switch

With the motor speed switch you can change the speed of the motor.



Push button ON

The push-button ON will start up the rotation of the drilling spindle.



Push buttons in spindle lever

The push-button actuator in the spindle lever switches the spindle feed ON or OFF.

In the mode of operation "thread cutting" where the spindle rotation direction is changed. The spindle feed is switched off.



Push button OFF

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



Coolant pump ON/OFF

Switches the coolant pump On or Off.



Machine lighting ON/OFF

Switches the machine lighting On or Off



Operating control light

This operation control light on the control panel will illuminate when the main switch is on.



Main switch

Interrupts or connects the power supply.

Gear selector

Use the gear selectors to select the speed of the spindle.



ATTENTION!

Changing the speed when the spindle is turning may cause damage to the machine.

- Disconnect the machine before changing speed.
- Wait until the spindle has come to a complete stop.

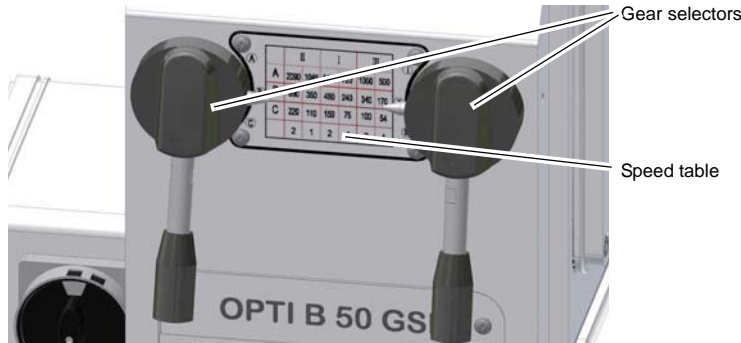


Fig.4-4: Gear selectors



If required, use the rapid break to facilitate the engaging of the indexing position.



INFORMATION

To determine the correct spindle speed, use the speed table on the drill head.

4.3

Drill depth stop

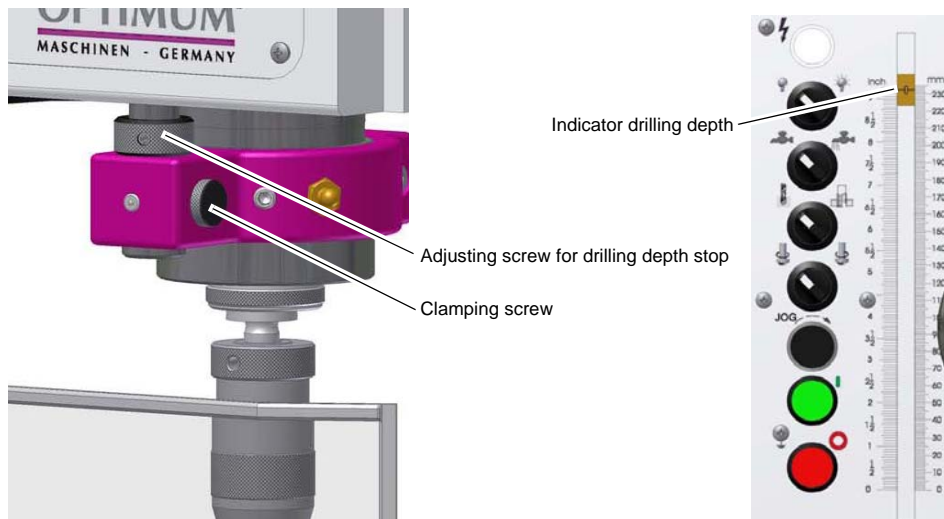


Fig.4-5: Drill depth stop

○ When you are drilling several holes of the same depth you can use the drill depth stop

→ Loosen the clamping screw for drill depth stop and move it to the left or right, until the desired drilling depth is displayed to the indicator.

→ Re-tighten the clamping screw for drill depth stop.

○ The spindle can now only be lowered to the set depth.

4.4

Spindle feed

Spindle feed can be manual or automatic.

4.4.1 Manual spindle feed

Use the spindle lever to move the spindle down. The spindle is returned to its original setting by a spring.

4.4.2 Automatic spindle feed

The forward feed is activated by the push buttons in the spindle sleeve lever. The forward feed is performed electromagnetically. The switching-off of the forward feed is actuated by the drill depth stop or by reactivating the push buttons at the spindle lever.

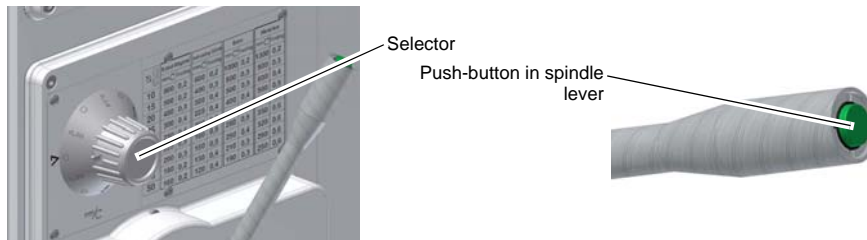


Fig.4-6: Spindle feed speed selector

→ Choose the feed speed of the spindle sleeve using the selector:

- 0,05 mm/ .002" per revolution
- 0,10 mm/ .004" per revolution
- 0,15 mm/ .006" per revolution
- 0,20 mm/ .008" per revolution
- 0,25 mm/ .010 per revolution
- 0,30 mm/ .012" per revolution



INFORMATION

The higher the preset number of revolutions, the greater the feed speed of the spindle. Make sure you set the right speed for the material used and the diameter of the bit.

→ Adjust the drill depth stop  „Drill depth stop“ on page 28.

→ Push the spindle lever upwards. This will activate the spindle feed.

- Once the preset drill depth is reached, the depth stop pushes the feed lever down mechanically, stopping automatic feed of the bit. The drilling spindle is returned to the upper position by the spring.

4.4.3 Handwheel for the fine adjustment of the spindle

→ Turn the selector switch to the position “0”.

→ Turn the handwheel in order to turn the spindle.

→ Set the required position with the handwheel.

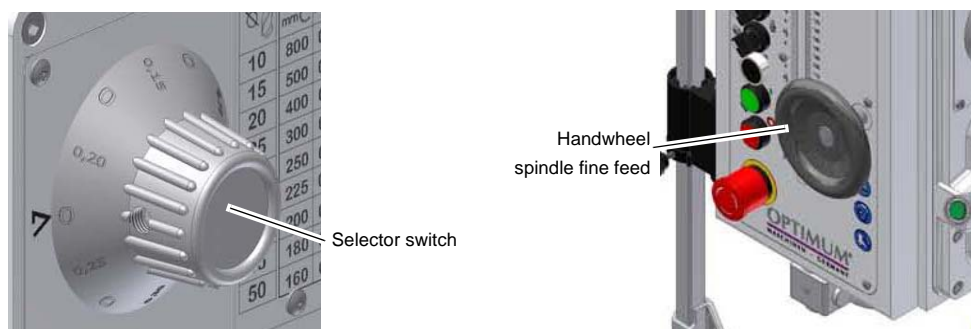


Fig.4-7: Spindle fine feed

4.5 Removing, mounting of drill chucks and drill bits

4.5.1 Removing the drill chuck



WARNING!

Do not perform the following work until the geared drill has been disconnected from the power supply and has been secured.



ATTENTION!

Fasten the tool or the drill chuck.

By the procedure described below, the tapered bolt of the sleeve is loosened. The tool and or the drill chuck fall down.

1 Completion with drill drift

→ Turn the drilling spindle until the openings of the sleeve and of the drilling spindle are superimposed. Switch the gear selector to a higher speed level in order to facilitate the turning of the sleeve.

→ Loosen drill chuck from the drilling spindle using a drift.

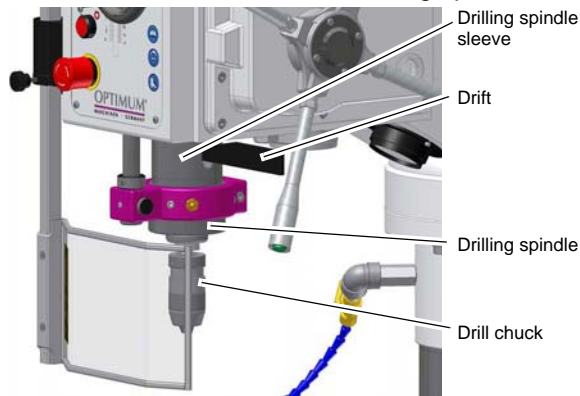


Fig.4-8: Drilling spindle

2 Completion with half-automatic integrated drill drift

→ Move the spindle lever ② a little downward until you can shift the lever ① to the right.



ATTENTION!

Grip the tool or the drill chuck ③ .

By the procedure described below, the tapered hold of the sleeve is loosened. The tool and /or the drill chuck will fall down.

→ Push the spindle lever ② upward.

○ The tapered shank is pushed out of the sleeve.

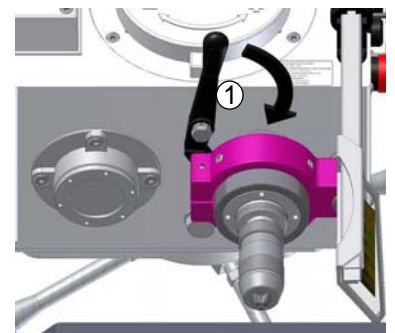


Fig.4-9: Removing

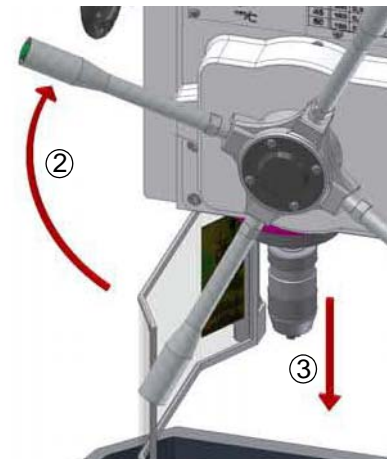


Fig.4-10: Removing

4.5.2 Mounting the drill chuck

- Check or clean the taper seat in the drill spindle and the taper shank of the tool or the chuck.
- Press the chuck into the spindle.



ATTENTION!

Shift the lever ① to the left to its initial position. Otherwise the tool and/or the drill chuck cannot be pushed in.

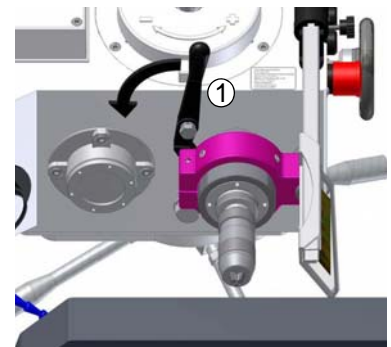


Fig.4-11: Installation

4.6 Liquid cooling system

The friction generated during rotation can cause the edge of the tool to become very hot. Cool the tool during drillings. This will give better results and make the tool last longer.

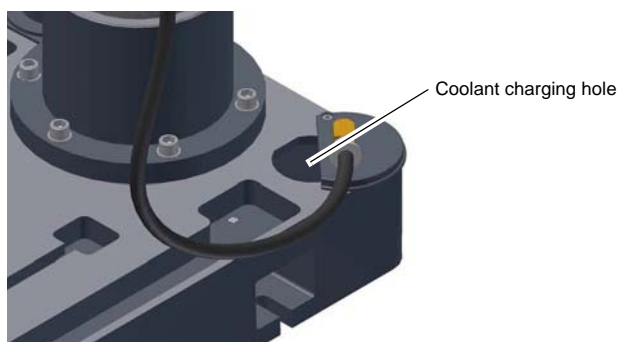


Fig.4-12: Charging hole

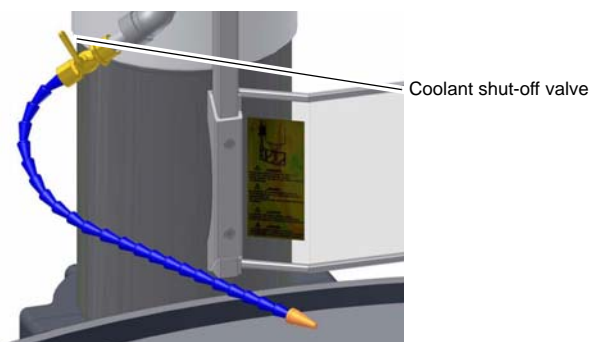


Fig.4-13: Coolant shut-off valve

→ Adjust the flow using the shut-off valve.



ATTENTION!

Failure of the pump in the event of a dry run.

The pump is lubricated by the cooling agent. Do not start up the pump without cooling agent.



INFORMATION

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

Re-use cooling agents and lubricants.



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

Follow the manufacturer's disposal instructions.

4.7

Working with the machine

4.7.1

Preparation



WARNING!

During drilling work you must secure the piece to be drilled firmly, in order to ensure that it is not moved by the bit. Examples of a suitable securing tool include a part-holder bolt or securing clamps.

Put a wooden or plastic board beneath the piece so that you do not drill through to the work table or the part-holder bolt.

If necessary, adjust the required drilling depth using the depth stop to obtain a constant result.

Make sure to use a dust collection unit when working with wood, as sawdust can be a health hazard.

Use a suitable protective mask for any work that generates dust.

→ First, select the speed of the bit. This will depend on the diameter of the bit being used and the material. ☞ „Bit speed table“ on page 33

→ Drilling



WARNING!

Danger of clothing and/or long hair getting caught.

- Make sure to wear a well-fitting work during drilling work.
- Do not use gloves.
- If necessary, wear a hairnet.



CAUTION!

Danger of crushing!

Do not place your hand between the drill head and the spindle. Danger of blows from the spindle levers. There is a return spring to return the spindle to its initial position. Do not release the spindle lever when repositioning the drilling spindle.

Spindle lever

→ When using the manual spindle feed, press it uniformly, but not too hard.

4.7.2 Bit

→ Thin bits break easily. In the case of deep drilling, extract the bit from time to time to remove chips from the drill.

- Add cooling lubricant to reduce friction and prolong the service life of the bit.

4.8 Bit speed table

Guideline speed value [rpm]:

Bit ø	Grey cast iron	Stainless steel	Steel St 37	Aluminium	Bronze
3	2550	1600	2230	9500	8000
4	1900	1200	1680	7200	6000
5	1530	955	1340	5700	4800
6	1270	800	1100	4800	4000
7	1090	680	960	4100	3400
8	960	600	840	3600	3000
9	850	530	740	3200	2650
10	765	480	670	2860	2400
11	700	435	610	2600	2170
12	640	400	560	2400	2000
13	590	370	515	2200	1840
14	545	340	480	2000	1700
16	480	300	420	1800	1500
18	425	265	370	1600	1300
20	380	240	335	1400	1200
22	350	220	305	1300	1100
25	305	190	270	1150	950

4.9 Standard values for speeds with HSC - Eco - twist drill cooling

Material	Bit diameter										Cooling 3)
		2	3	4	5	6	7	8	9	10	
Steel, alloyed, up to 600 N/mm ²	n ¹⁾	5600	3550	2800	2240	2000	1600	1400	1250	1120	E
	f ²⁾	0,04	0,063	0,08	0,10	0,125	0,125	0,16	0,16	0,20	

Constructional steel, alloyed, quenched and subsequently by drawn, up to 900 N/mm ²	n	3150	2000	1600	1250	1000	900	800	710	630	E/Oil
	f	0,032	0,05	0,063	0,08	0,10	0,10	0,125	0,125	0,16	
Constructional steel, alloyed, quenched and subsequent by drawn 1200 N/mm ²	n	2500	1600	1250	1000	800	710	630	560	500	Oil
	f"	0,032	0,04	0,05	0,063	0,08	0,10	0,10	0,125	0,125	
Rust-resistant steel up to 900 N/mm ² e.g. X5CrNi18 10	n	2000	1250	1000	800	630	500	500	400	400	Oil
	f	0,032	0,05	0,063	0,08	0,10	0,10	0,125	0,125	0,16	
1): Speed [n] in rpm											
2): Feed [f] in mm/r											
3): Coolant: E = emulsion; Oil = cutting oil											

- The above figures are standard values. In some cases it may prove to be good if you increase or decrease the value.
- When drilling, do not renounce to use coolant or lubricant.
- For rust-free materials (e.g. VA- or NIR steel sheets) do not work with a center punch as the material might harden and the drills will become quickly blunt.
- The workpieces need to be clamped low inflexibly and stable (vice, screw clamp).

5 Determining the cutting speed and the speed

5.1 Table cutting speeds / infeed

Material table	Recommended infeed f in mm/revolution					
Material to be processed	Recommended cutting speed Vc in m/min	Drill bit diameter d in mm				
		2...3	>3...6	>6...12	>12...25	>25...50
		Unalloyed construction steels < 700 N/mm ²	30 - 35	0.05	0.10	0.15
Alloyed construction steels > 700 N/mm ²	20 - 25	0.04	0.08	0.10	0.15	0.20
Alloyed steels < 1000 N/mm ²	20 - 25	0.04	0.08	0.10	0.15	0.20
Steels, low stability < 800 N/mm ²	40	0.05	0.10	0.15	0.25	0.35
Steel, high stability > 800 N/mm ²	20	0.04	0.08	0.10	0.15	0.20
non-rust steels > 800 N/mm ²	12	0.03	0.06	0.08	0.12	0.18
Cast iron < 250 N/mm ²	15 - 25	0.10	0.20	0.30	0.40	0.60
Cast iron > 250 N/mm ²	10 - 20	0.05	0.15	0.25	0.35	0.55
CuZn alloy brittle	60 - 100	0.10	0.15	0.30	0.40	0.60
CuZn alloy ductile	35 - 60	0.05	0.10	0.25	0.35	0.55
Aluminum alloy up to 11% Si	30 - 50	0.10	0.20	0.30	0.40	0.60
Thermoplastics	20 - 40	0.05	0.10	0.20	0.30	0.40
Thermosetting materials with organic filling	15 - 35	0.05	0.10	0.20	0.30	0.40
Thermosetting materials with anorganic filling	15 - 25	0.05	0.10	0.20	0.30	0.40

5.2 Speed table

Vc in m/min	4	6	8	10	12	15	18	20	25	30	35	40	50	60	80	100
Drill bit Ø in mm	Speed n in rpm															
1.0	1274	1911	2548	3185	3822	4777	5732	6369	7962	9554	$\frac{1114}{6}$	12739	15924	19108	25478	31847
1.5	849	1274	1699	2123	2548	3185	3822	4246	5308	6369	7431	8493	10616	12739	16985	21231
2.0	637	955	1274	1592	1911	2389	2866	3185	3981	4777	5573	6369	7962	9554	12739	15924
2.5	510	764	1019	1274	1529	1911	2293	2548	3185	3822	4459	5096	6369	7643	10191	12739
3.0	425	637	849	1062	1274	1592	1911	2123	2654	3185	3715	4246	5308	6369	8493	10616
3.5	364	546	728	910	1092	1365	1638	1820	2275	2730	3185	3640	4550	5460	7279	9099
4.0	318	478	637	796	955	1194	1433	1592	1990	2389	2787	3185	3981	4777	6369	7962

Vc in m/min	4	6	8	10	12	15	18	20	25	30	35	40	50	60	80	100
Drill bit Ø in mm	Speed n in rpm															
4.5	283	425	566	708	849	1062	1274	1415	1769	2123	2477	2831	3539	4246	5662	7077
5.0	255	382	510	637	764	955	1146	1274	1592	1911	2229	2548	3185	3822	5096	6369
5.5	232	347	463	579	695	869	1042	1158	1448	1737	2027	2316	2895	3474	4632	5790
6.0	212	318	425	531	637	796	955	1062	1327	1592	1858	2123	2654	3185	4246	5308
6.5	196	294	392	490	588	735	882	980	1225	1470	1715	1960	2450	2940	3920	4900
7.0	182	273	364	455	546	682	819	910	1137	1365	1592	1820	2275	2730	3640	4550
7.5	170	255	340	425	510	637	764	849	1062	1274	1486	1699	2123	2548	3397	4246
8.0	159	239	318	398	478	597	717	796	995	1194	1393	1592	1990	2389	3185	3981
8.5	150	225	300	375	450	562	674	749	937	1124	1311	1499	1873	2248	2997	3747
9.0	142	212	283	354	425	531	637	708	885	1062	1238	1415	1769	2123	2831	3539
9.5	134	201	268	335	402	503	603	670	838	1006	1173	1341	1676	2011	2682	3352
10.0	127	191	255	318	382	478	573	637	796	955	1115	1274	1592	1911	2548	3185
11.0	116	174	232	290	347	434	521	579	724	869	1013	1158	1448	1737	2316	2895
12.0	106	159	212	265	318	398	478	531	663	796	929	1062	1327	1592	2123	2654
13.0	98	147	196	245	294	367	441	490	612	735	857	980	1225	1470	1960	2450
14.0	91	136	182	227	273	341	409	455	569	682	796	910	1137	1365	1820	2275
15.0	85	127	170	212	255	318	382	425	531	637	743	849	1062	1274	1699	2123
16.0	80	119	159	199	239	299	358	398	498	597	697	796	995	1194	1592	1990
17.0	75	112	150	187	225	281	337	375	468	562	656	749	937	1124	1499	1873
18.0	71	106	142	177	212	265	318	354	442	531	619	708	885	1062	1415	1769
19.0	67	101	134	168	201	251	302	335	419	503	587	670	838	1006	1341	1676
20.0	64	96	127	159	191	239	287	318	398	478	557	637	796	955	1274	1592
21.0	61	91	121	152	182	227	273	303	379	455	531	607	758	910	1213	1517
22.0	58	87	116	145	174	217	261	290	362	434	507	579	724	869	1158	1448
23.0	55	83	111	138	166	208	249	277	346	415	485	554	692	831	1108	1385
24.0	53	80	106	133	159	199	239	265	332	398	464	531	663	796	1062	1327
25.0	51	76	102	127	153	191	229	255	318	382	446	510	637	764	1019	1274
26.0	49	73	98	122	147	184	220	245	306	367	429	490	612	735	980	1225
27.0	47	71	94	118	142	177	212	236	295	354	413	472	590	708	944	1180
28.0	45	68	91	114	136	171	205	227	284	341	398	455	569	682	910	1137
29.0	44	66	88	110	132	165	198	220	275	329	384	439	549	659	879	1098
30.0	42	64	85	106	127	159	191	212	265	318	372	425	531	637	849	1062
31.0	41	62	82	103	123	154	185	205	257	308	360	411	514	616	822	1027
32.0	40	60	80	100	119	149	179	199	249	299	348	398	498	597	796	995
33.0	39	58	77	97	116	145	174	193	241	290	338	386	483	579	772	965
34.0	37	56	75	94	112	141	169	187	234	281	328	375	468	562	749	937
35.0	36	55	73	91	109	136	164	182	227	273	318	364	455	546	728	910
36.0	35	53	71	88	106	133	159	177	221	265	310	354	442	531	708	885
37.0	34	52	69	86	103	129	155	172	215	258	301	344	430	516	689	861
38.0	34	50	67	84	101	126	151	168	210	251	293	335	419	503	670	838

Vc in m/min	4	6	8	10	12	15	18	20	25	30	35	40	50	60	80	100
Drill bit Ø in mm	Speed n in rpm															
39.0	33	49	65	82	98	122	147	163	204	245	286	327	408	490	653	817
40.0	32	48	64	80	96	119	143	159	199	239	279	318	398	478	637	796
41.0	31	47	62	78	93	117	140	155	194	233	272	311	388	466	621	777
42.0	30	45	61	76	91	114	136	152	190	227	265	303	379	455	607	758
43.0	30	44	59	74	89	111	133	148	185	222	259	296	370	444	593	741
44.0	29	43	58	72	87	109	130	145	181	217	253	290	362	434	579	724
45.0	28	42	57	71	85	106	127	142	177	212	248	283	354	425	566	708
46.0	28	42	55	69	83	104	125	138	173	208	242	277	346	415	554	692
47.0	27	41	54	68	81	102	122	136	169	203	237	271	339	407	542	678
48.0	27	40	53	66	80	100	119	133	166	199	232	265	332	398	531	663
49.0	26	39	52	65	78	97	117	130	162	195	227	260	325	390	520	650
50.0	25	38	51	64	76	96	115	127	159	191	223	255	318	382	510	637

5.3 Examples to calculatory determine the required speed for your drilling machine

The necessary speed is depending on the diameter of the drill bit, on the material which is being machined as well as on the cutting material of the drill bit.

Material which needs to be drilled: St37

Cutting material (drill bit): HSS spiral bit

Set point of the cutting speed [V_c] according to the table: 40 meters per minute

Diameter [d] of your drill bit: 30 mm = 0.03 m [meters]

Selected infeed [f] according to the table: about 0.35 mm/rev

$$\text{Speed } n = \frac{v_c}{\pi \times d} = \frac{40 \text{ m}}{\text{min} \times 3,14 \times 0,03 \text{ m}} = 425(\text{rpm})$$

Set a speed on your drilling machine which is less than the determined speed.

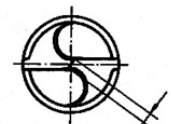
INFORMATION



In order to facilitate the production of larger drill holes they need to be pre-drilled. This way, you reduce the cutting forces and improve the guiding of the drill bit.

The pre-drilling diameter is depending on the length of the chisel edge. The chisel edge does not cut, but it squeezes the material. The chisel edge is positioned at an angle of 55° to the major cutting edge.

As a general rule of thumb it applies: The pre-drilling diameter is depending on the length of the chisel edge.



Chisel edge length 10% of the drill bit - Ø

Recommended working steps for a drilling diameter of 30 mm

Example:

1st working step: Pre-drilling with Ø 5 mm (0.2").

2nd working step: Pre-drilling with Ø 15 mm (0.6").

3rd working step: Drilling with Ø 30 mm (1.2").

6 Maintenance

In this chapter you will find important information about

- Inspection,
- Maintenance,
- Repairs.

The diagram below shows which of these headings each task falls under.

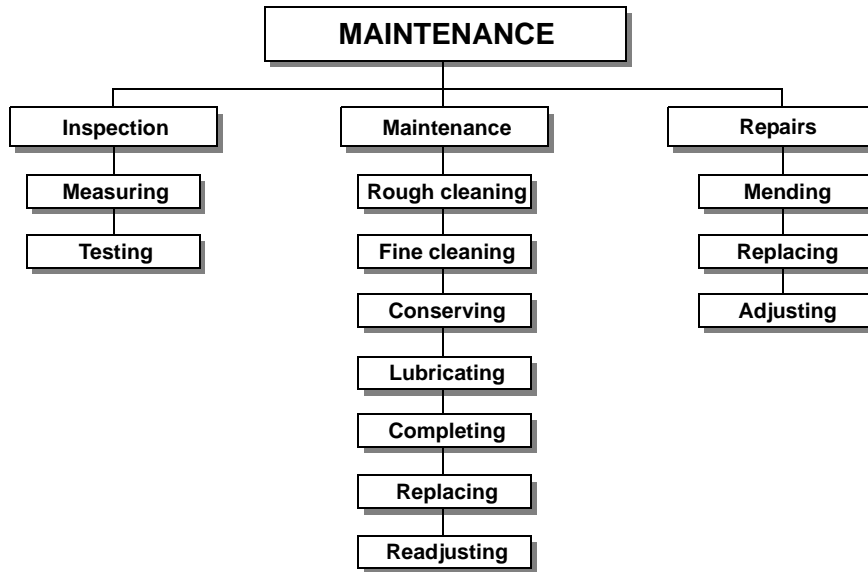


Fig.6-1: Maintenance - Definition according to DIN 31051



ATTENTION!

Properly-performed regular maintenance is an essential prerequisite for

- safe operation,
- fault-free operation,
- long service life of the machine and
- the quality of the products you manufacture.

Installations and equipment of other manufacturers must also be in optimum condition.



ENVIRONMENTAL PROTECTION

During work on the drilling head, make sure that

- collector vessels are used, with sufficient capacity for the amount of liquid to be collected.
- Liquid and oils are not spilt on the ground.

Clean up any liquid or oils immediately using proper oil-absorption methods and dispose of them in accordance with current legal requirements on the environment.

Cleaning up spills

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

Disposal

Never dump oil or other pollutant substances in 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.

6.1 Safety



WARNING!

The consequences of incorrect maintenance and repair work may include:

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

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

6.1.1 Preparation



WARNING!

Only carry out work on the machine if it has been disconnected from the main power supply.

☞ „Safety during maintenance“ on page 14

Place a warning label.

6.1.2 Restarting

Before restarting run a safety check.

☞ „Safety check“ on page 12



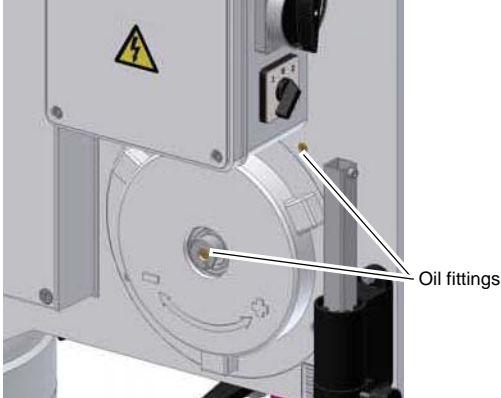
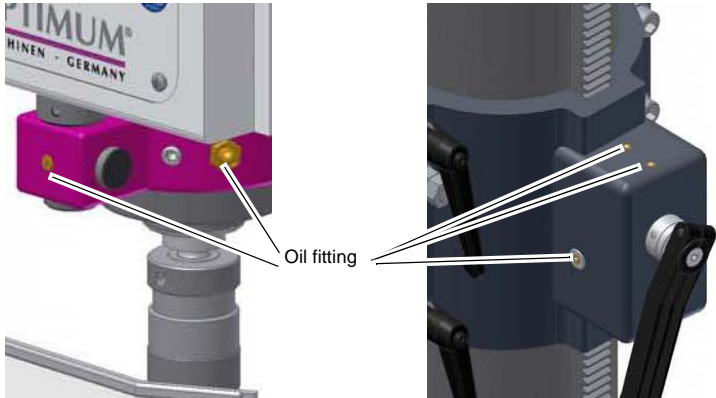
WARNING!


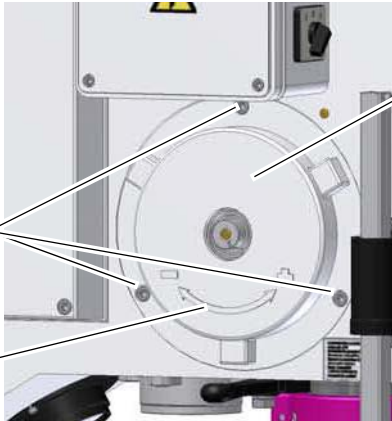
Before connecting the machine you must check that

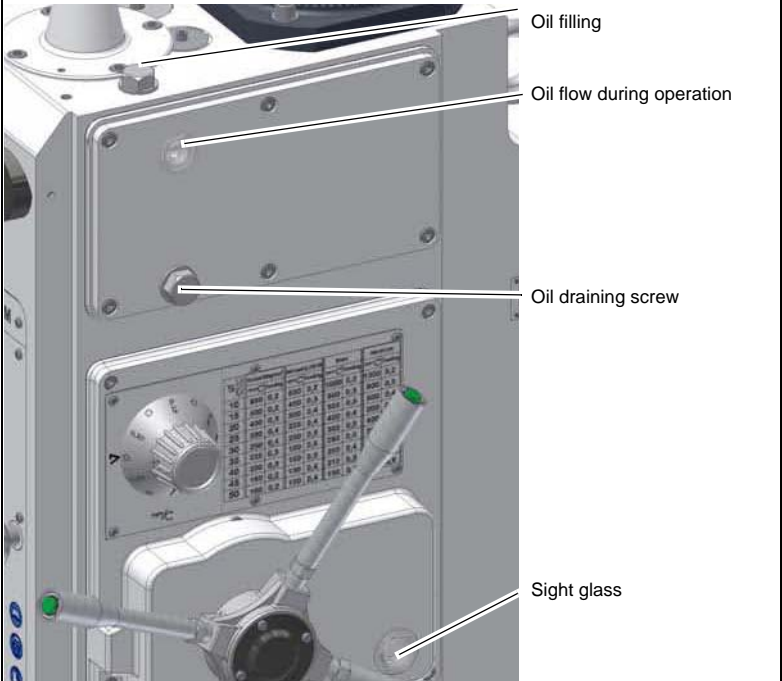

- there is no danger for the staff,
- the machine is undamaged.

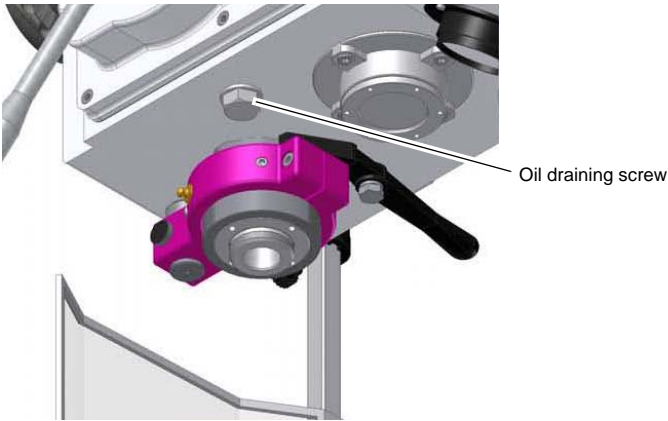
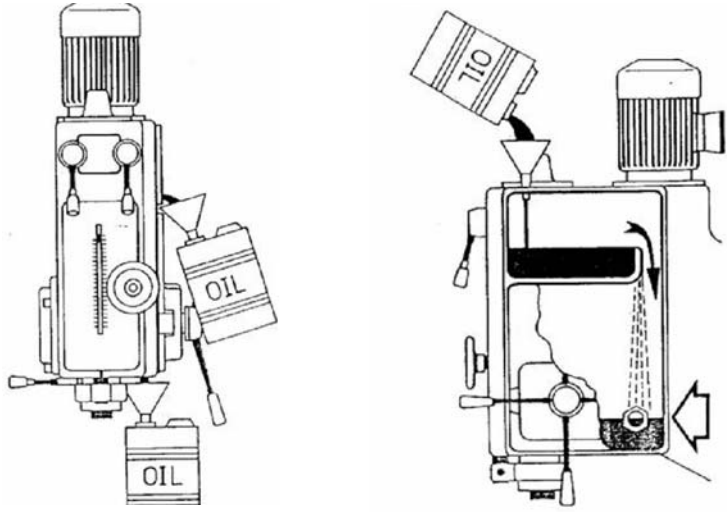
6.2 Inspection and maintenance

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

Interval	Where?	What?	How?
Start of shift after each maintenance or repair operation	Machine		☞ „Safety check“ on page 12
every day	Drilling head, sleeve, support of drilling machine table	Lubricate	<p>→ Lubricate oil the oil fittings</p>  <p>Fig.6-2: Oil fitting on the head</p>
			<p>→ Oil the greasing connections</p>  <p>Fig.6-3: Lubricating nipple of sleeve and support of drilling machine table</p>

Interval	Where?	What?	How?
as required	Spindle return spring	Re-adjust	<p>ATTENTION!</p> <p> Parts may fly off at high speed. For disassembly of the spring housing, make sure that only qualified staff maintains and repairs the machine.</p> <p>If required, re-adjust the spindle return spring.</p> <ul style="list-style-type: none"> → Loosen the hexagon socket screws (3) on the spring housing. → Turn the spring housing in direction "+" by one screw turn. → Retighten the hexagon socket screws (3).  <p>Fig.6-4: Spring housing</p>

Interval	Where?	What?	How?				
<p>Start of shift after every maintenance or repair operation</p>	<p>Drilling head</p>	<p>Oil level of the gear area in drilling spindle sleeve</p>	<p>Fig.6-5: Check the oil level in the sight glass. The sight glass should be half-covered.</p>  <p>Oil filling</p> <p>Oil flow during operation</p> <p>Oil draining screw</p> <p>Sight glass</p> <p>Abb.6-6: Oil level of the gear of the drilling spindle sleeve</p>  <p>DIN 51502 HLP 46 OIL</p> <table border="1"> <tr> <td>ATTENTION! Do not surpass center of visor</td> <td>ACHTUNG! Schauglasmitte nicht überschreiten</td> </tr> <tr> <td>ATTENTION! Ne pas dépasser le niveau</td> <td>ATTENTION! No rebasar el centro del visor</td> </tr> </table> <p>STOP</p> <p>Fig.6-7: Operation diagram</p> <p>ATTENTION! The drill is no transmission equipment (Oil, coolant) is delivered. Complete before start only oil and coolant. Fill the gearbox with gear oil.</p>	ATTENTION! Do not surpass center of visor	ACHTUNG! Schauglasmitte nicht überschreiten	ATTENTION! Ne pas dépasser le niveau	ATTENTION! No rebasar el centro del visor
ATTENTION! Do not surpass center of visor	ACHTUNG! Schauglasmitte nicht überschreiten						
ATTENTION! Ne pas dépasser le niveau	ATTENTION! No rebasar el centro del visor						
			<ul style="list-style-type: none"> → Fill in the open gear lubricating system of drill about 2.7 quarts of oil. → Turn the gear drill. → Check the oil level sight glass. The sight glass (oil removed) operation needs to be covered during the half. 				

Interval	Where?	What?	How?
<p>first after 200 hours in service, then after every 2000 hours in service</p>	<p>Drilling head</p>	<p>Changing the oil in the gear of the drilling spindle sleeve</p>	<p>→ Use collector vessels with sufficient capacity to change the oil.</p> <p>→ Unscrew the oil filling screw and oil draining screw.</p>  <p>Fig. 6-8: Oil draining screw</p>  <p>Fig. 6-9: Changing the oil in the gear area of the drilling spindle sleeve.</p> <p>Re-fill the gear with gear oil. Approx consumption. 2.7 quarts. Check the correct level of the oil.</p> <p>☞ „Operating material“ on page 17.</p> <p>☞ „Lubricant table“ on page 45</p>

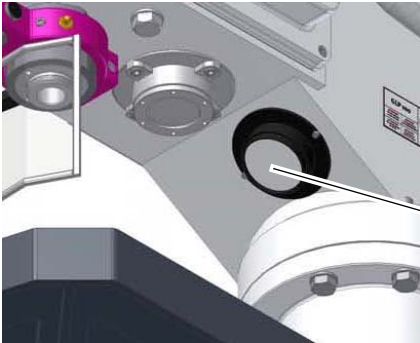
Interval	Where?	What?	How?
every month	Column of drill and rack	Lubricate	<ul style="list-style-type: none"> → Lubricate the drill column regularly with commercial oil → Lubricate the rack regularly with commercial acid-free grease. ☞ „Lubricant table“ on page 45
	Teeth on rack and spindle		<ul style="list-style-type: none"> → Oil the rack (teeth) and spindle teeth regularly with commercial oil.
as required	Liquid cooling system	Cooling pump	<p>The cooling pump is maintenance-free.</p> <ul style="list-style-type: none"> → Replace the cooling agent whenever necessary. → Because cooling agents are used that leave residues, the cooling pump must be washed.
as required	Lighting	Replace light bulb	<p>If the light bulb is defective:</p> <ul style="list-style-type: none"> → Unscrew the glass cover of the machine lighting. → Loosen the light bulb by turning it to the left and slightly push the bulb into the socket (bayonet cap). → Replace the light bulb. → Screw the glass cover on the machine lighting again.  <p style="text-align: right;">Machine lighting</p>

Fig.6-10: Machine lighting

6.3 Repair

Repairs must be carried out only by qualified technical staff; and must follow the instructions and guidelines given in this manual. Should technical assistance be required, contact LDS Industries at 1-630-785-6437.

Optimum Maschinen - Germany and LDS Industries are not liable for, nor do they guarantee against, damage or operating malfunctions resulting from alteration, abuse, lack of maintenance or this product's use for other than its intended purpose. Failure to read and follow this operating manual is not covered.

For repairs only use

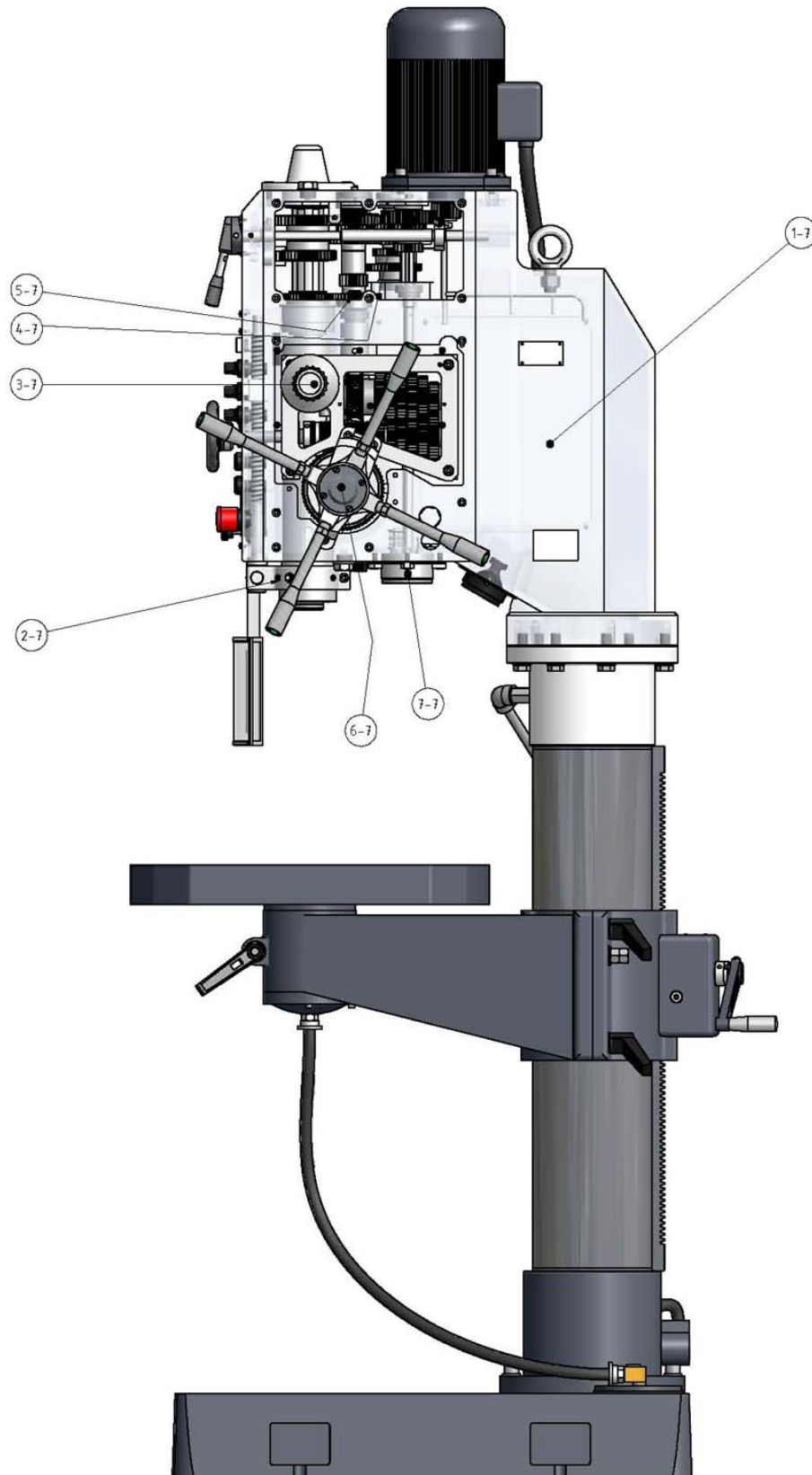
- Proper and suitable tools,
- Parts purchased from Optimum, or its authorized agent.

6.4 Lubricant table

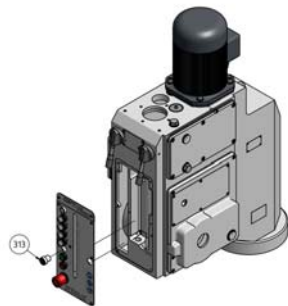
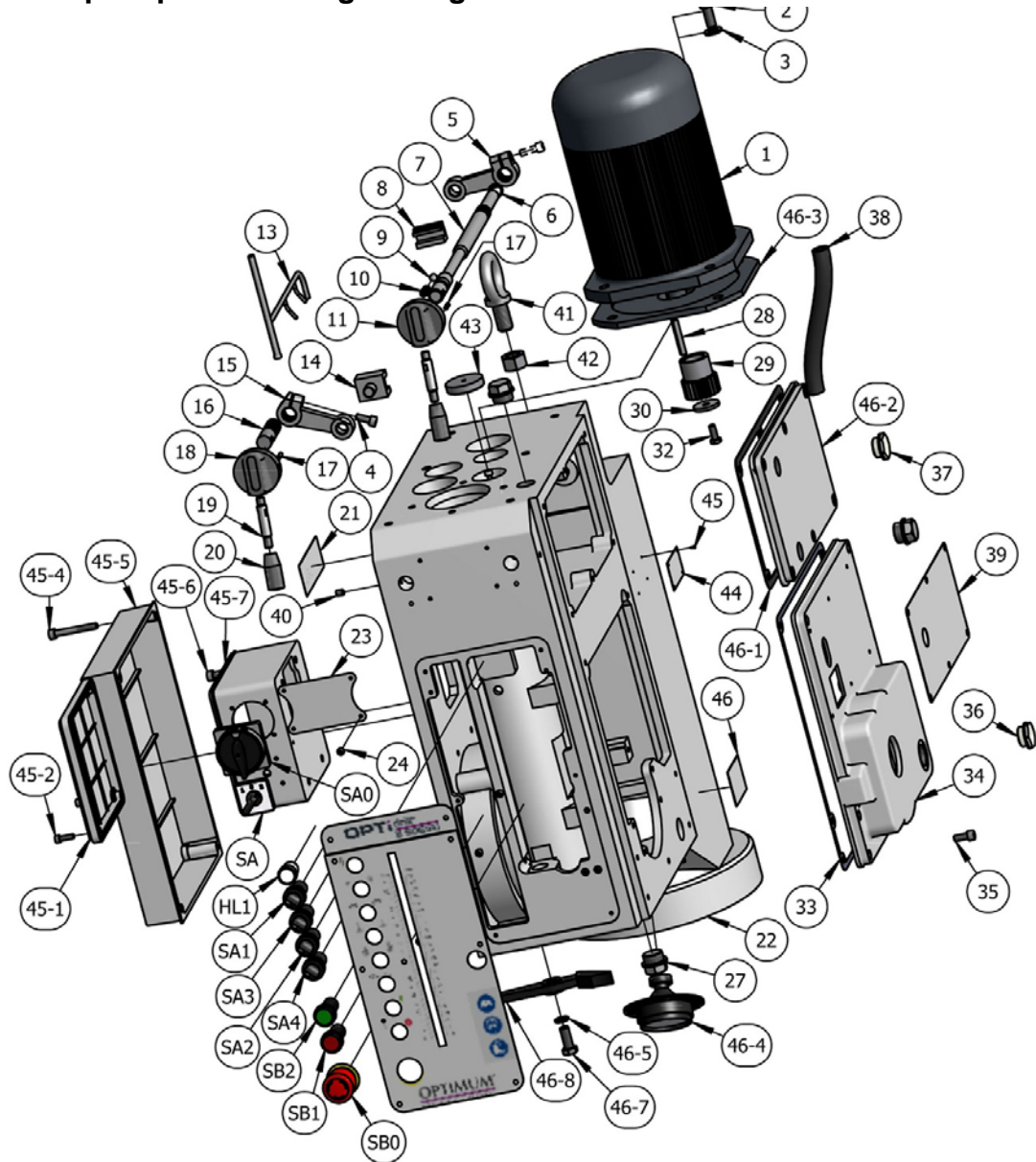
	Apron and general lubricating	Lubricating the guideways	Lubricating with grease
DIN 51502	HLP 46	CGLP 68	K 2K
ISO	HM 46	G 68	XM 2
AGIP	Agip OSO 46	Agip Exidia 68	Agip GR MU 2
ARAL	Aral Vitam GF 46 Aral Vitam DE 46	Aral Deganit B 68	Aralub HL 2 Aralub LF 2
BP	BP Energol HLP 46 BP Energol HLP-D 46	BP Maccurat 68 BP Energol HP-C 68	BP Energrase LS 2
CASTROL	Hyspin AWS 46 Vario HDX	Magna BDX 68	Spheerol AP 2 Grease MT
CEPSA	Hidráulico HM 46	Guías 68	Arga EP 2
CS	CS HLP 46	Zeus G 62	
ELF	Elf Olna-DS-46	ELF Moglia 68	Elf Rolexa 2 Elf Multi
ESSO	Nuto H 46 HLPD OIL 46	Febis K 68	Beacon 2
FINA	Hydran 46 Hydran HLP-D 46	Artac EP 68	Marson L 2
FUCHS	Renolin MR 15 VG 46 Renolin B 15 VG 46	Renep 2VG 68	Renolin FWA 160
MOBIL	Mobil DTE 25 Hydraulic Oil HLPD 46	Mobil Vactra 2	Mobilux 2 Mobilux EP 2
REPSOL	Tellex E 46	Guía 68	Repsol EP 2 Multipurpose 2
SHELL	Tellus Oil 46 Hydrol DO 46	Tonna Oil T 68	Alvania R 2
TEXACO	Rando Oil HD B 46 Alcor DD 46	Way lubricant 68	Multifak 20 Multifak 2
TOTAL	Azolla ZS 46	Drosera MS 68	Mulus 2

7 Spare parts - B50GSM

7.1 Spare parts drawing drilling head



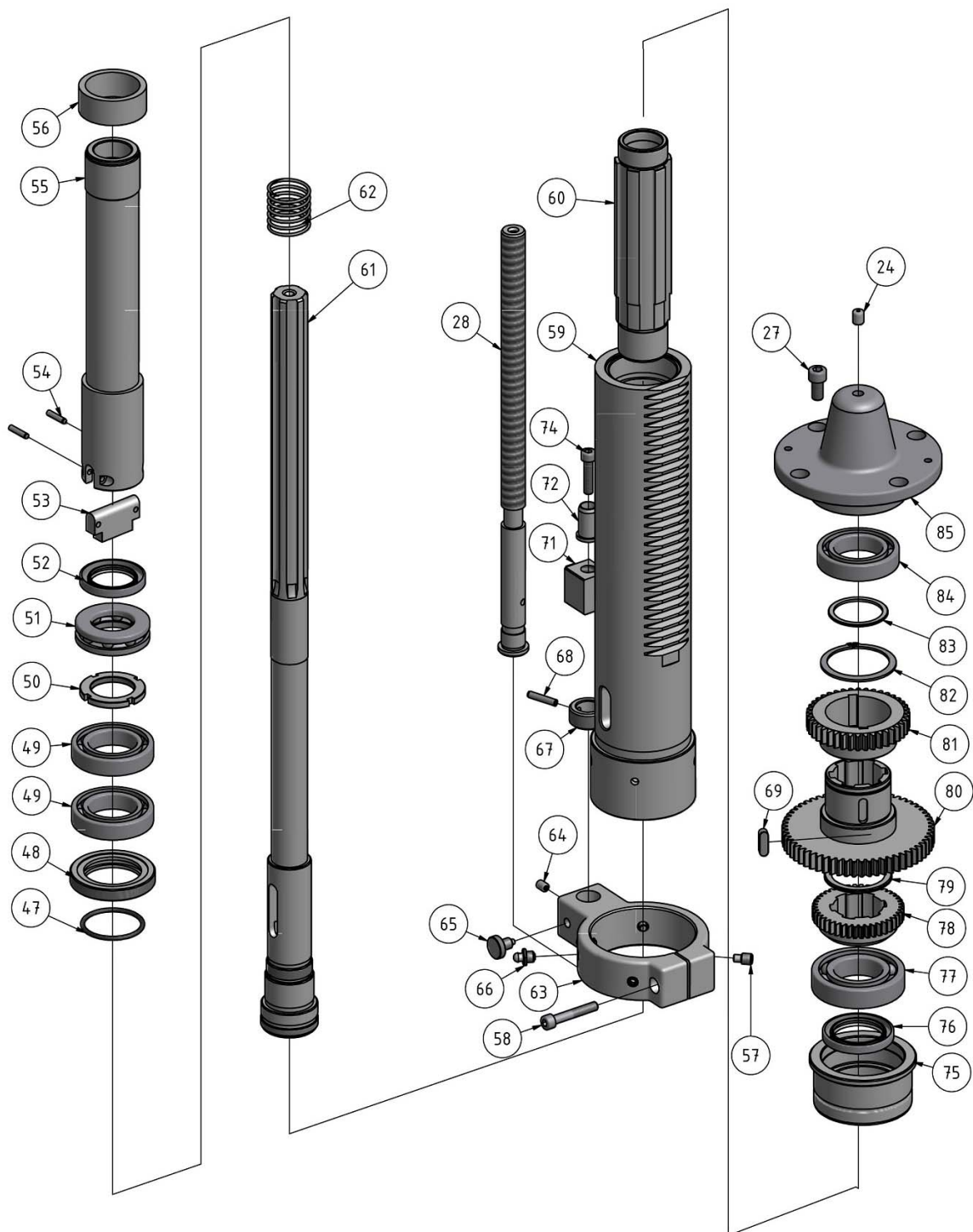
7.2 Spare parts drawing drilling head 1-7



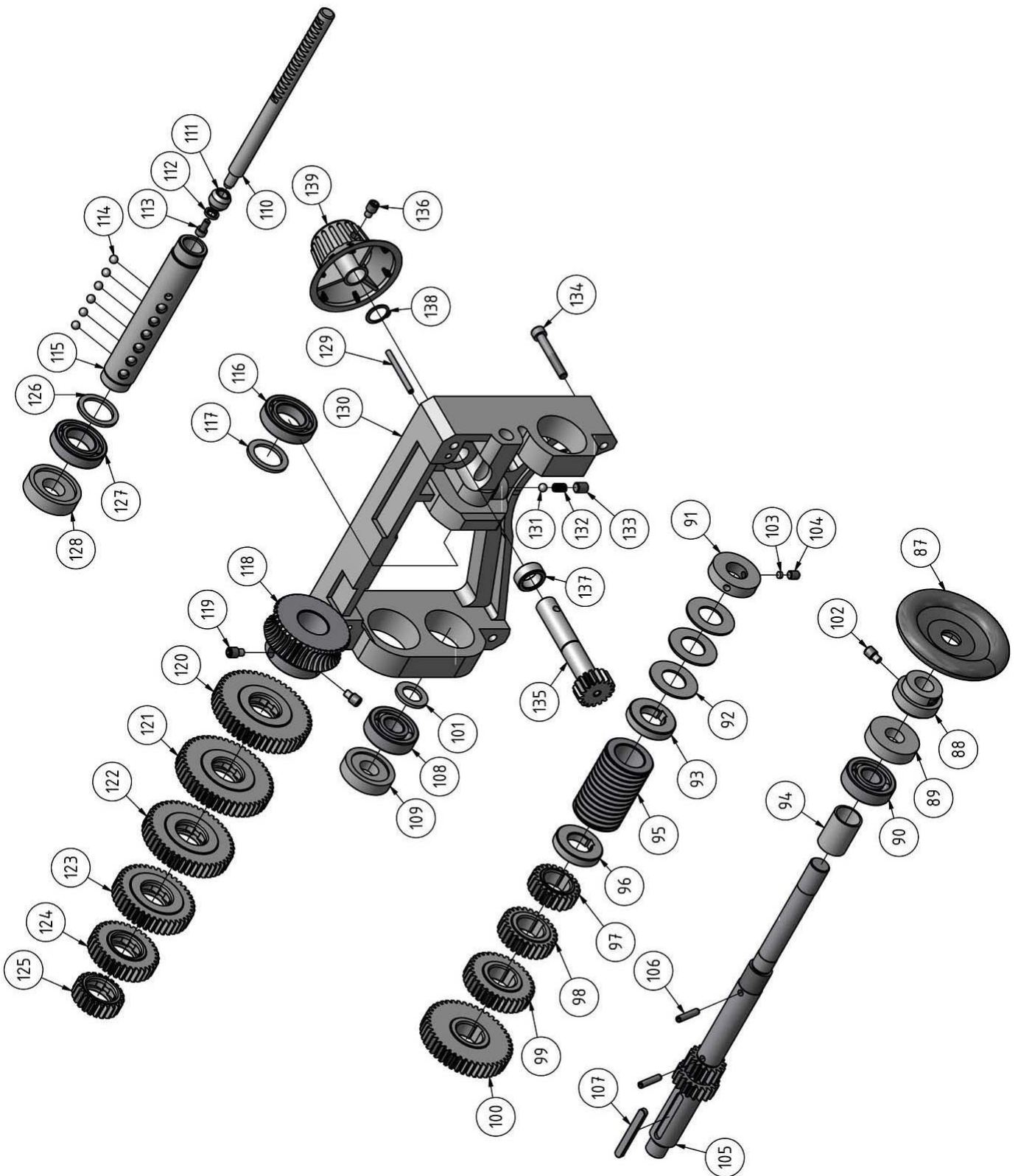
Ersatzteilzeichnung Bohrkopf ab Baujahr 2008 -
Spare parts drawing drilling head from year of construction 2008

Parts drawing drilling head from year of construction 2008

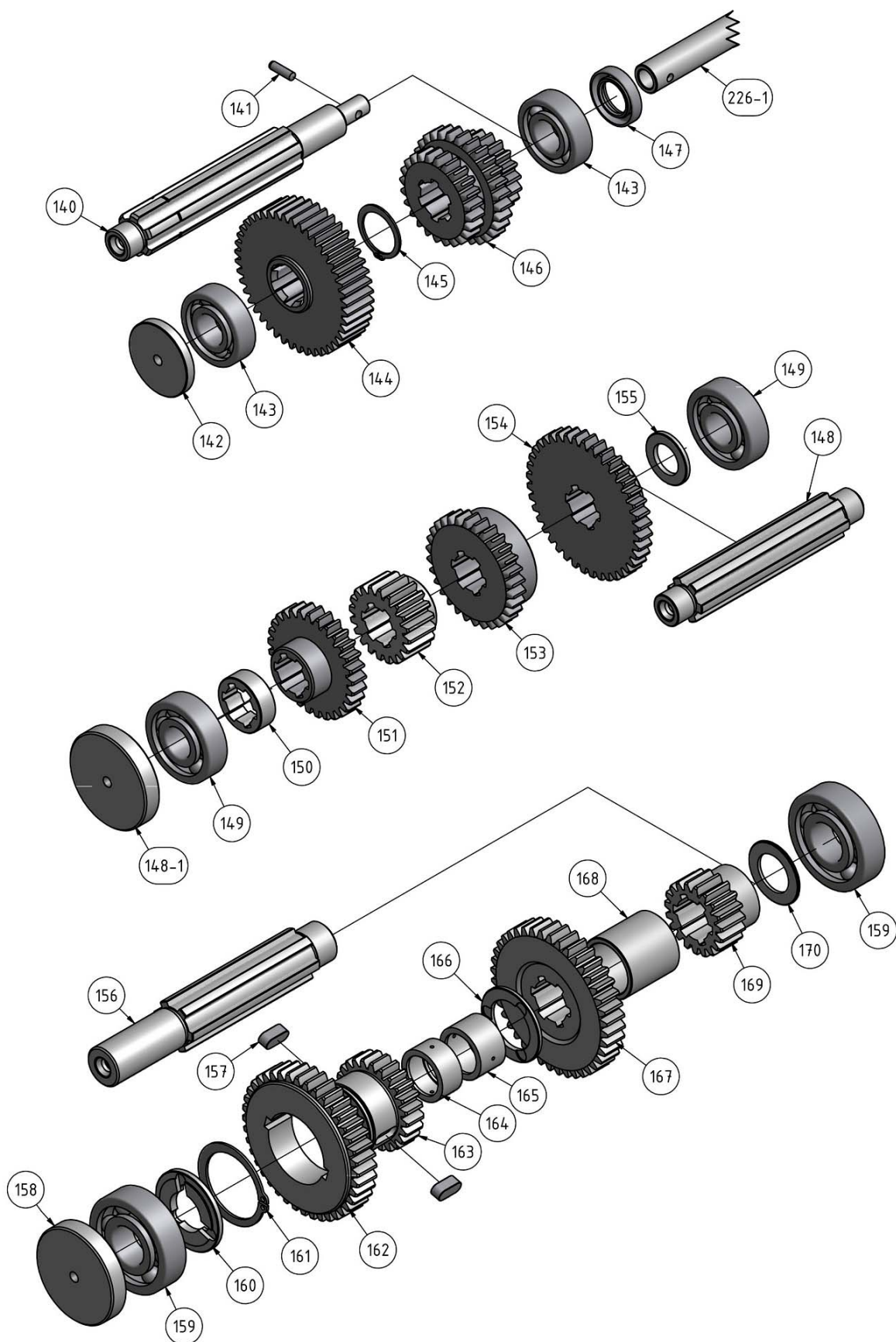
7.3 Spare parts drawing drilling head 2-7



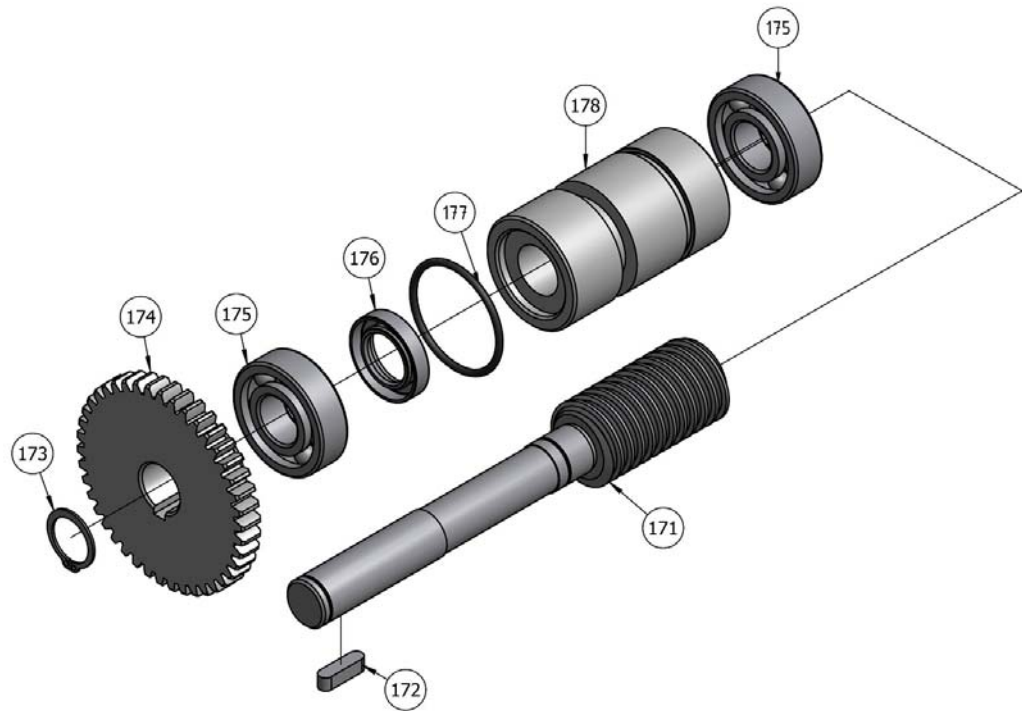
7.4 Spare parts drawing drilling head 3-7



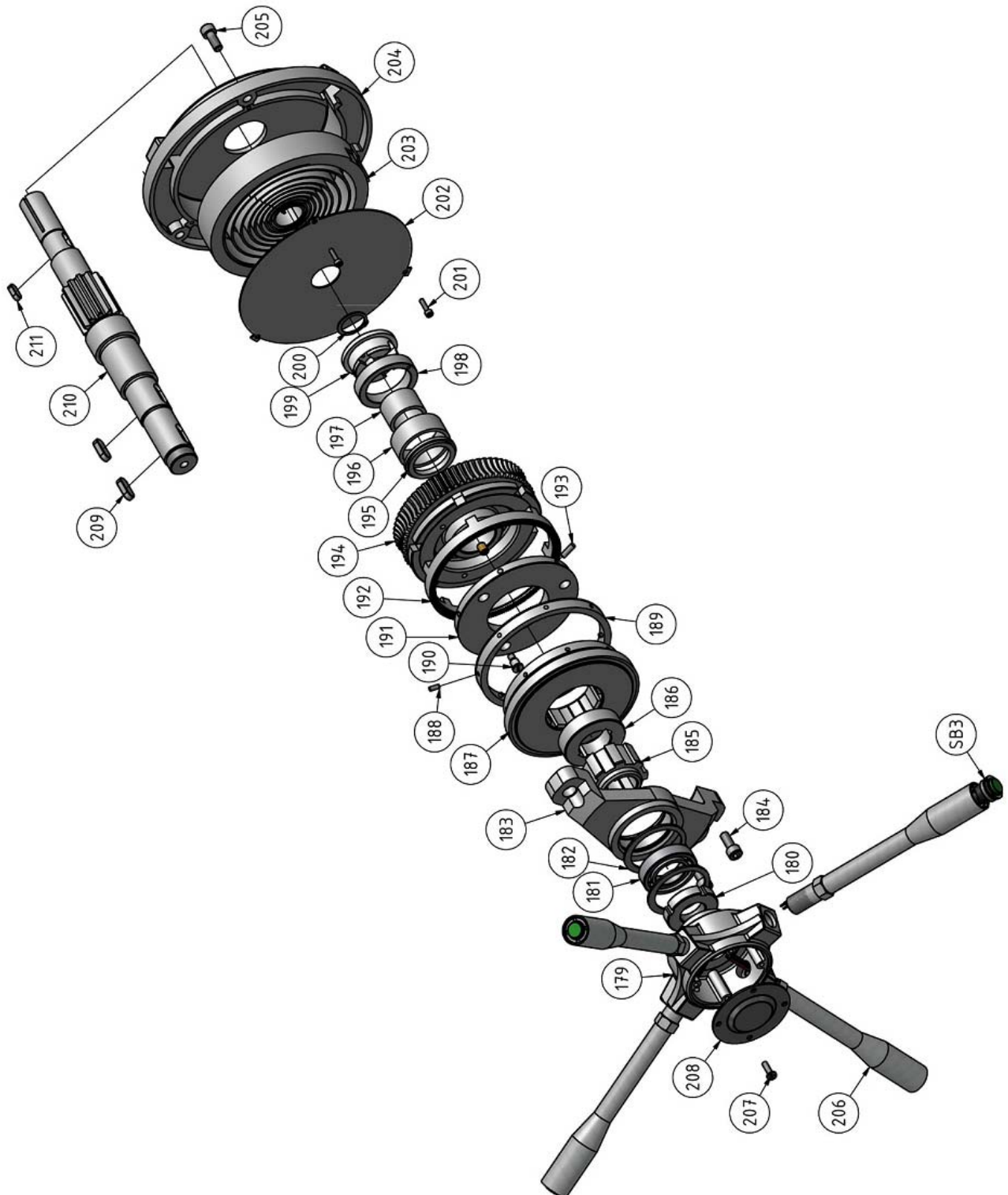
7.5 Spare parts drawing drilling head 4-7



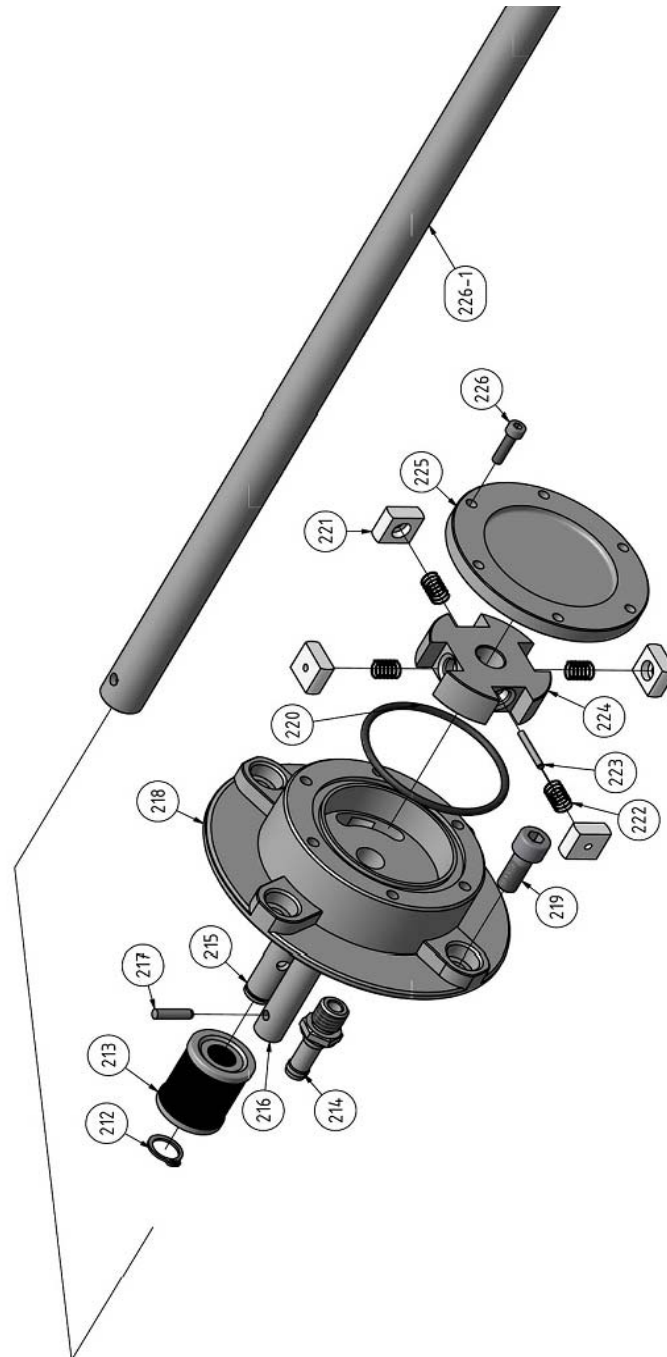
7.6 Spare parts drawing drilling head 5-7



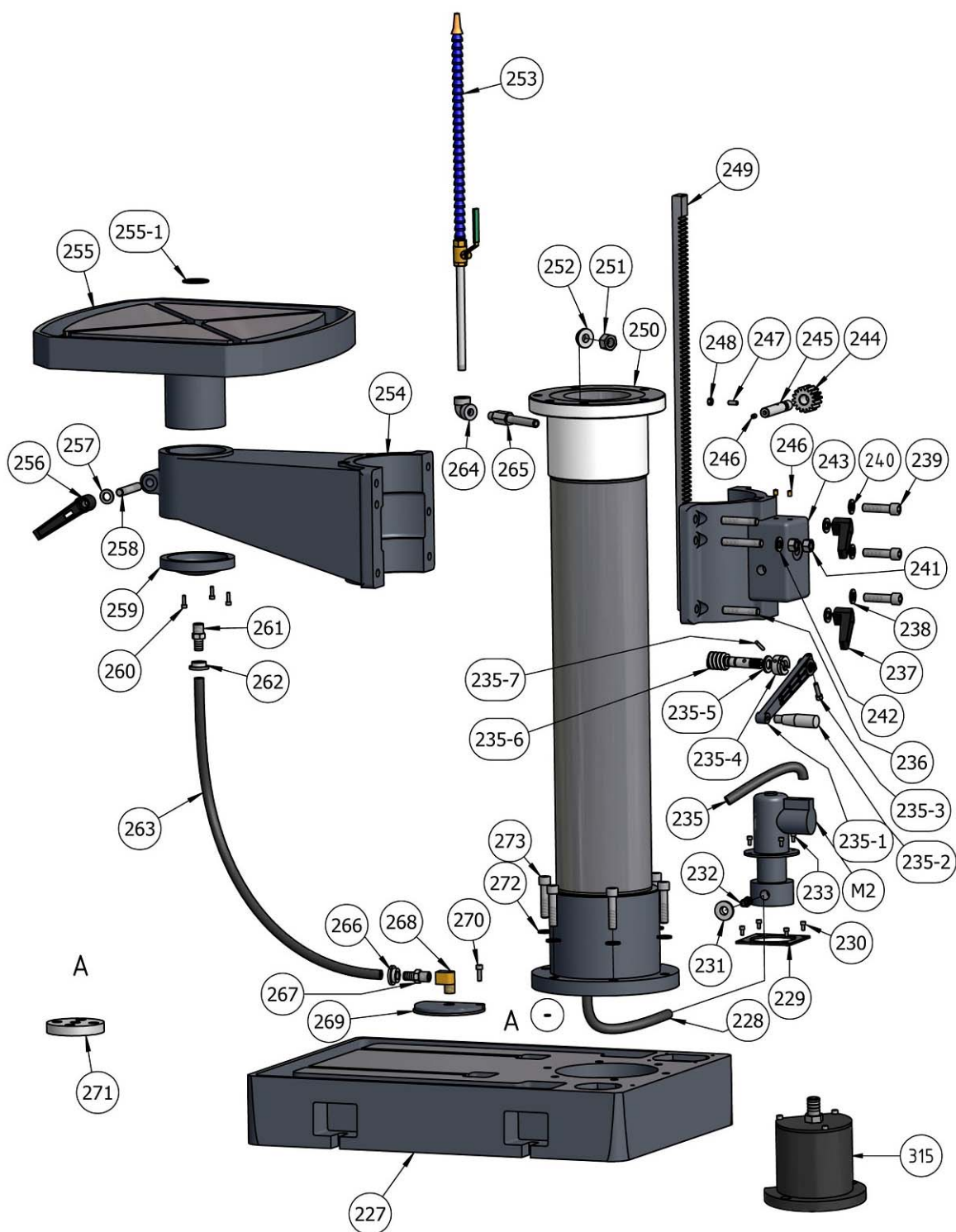
7.7 Spare parts drawing drilling head 6-7



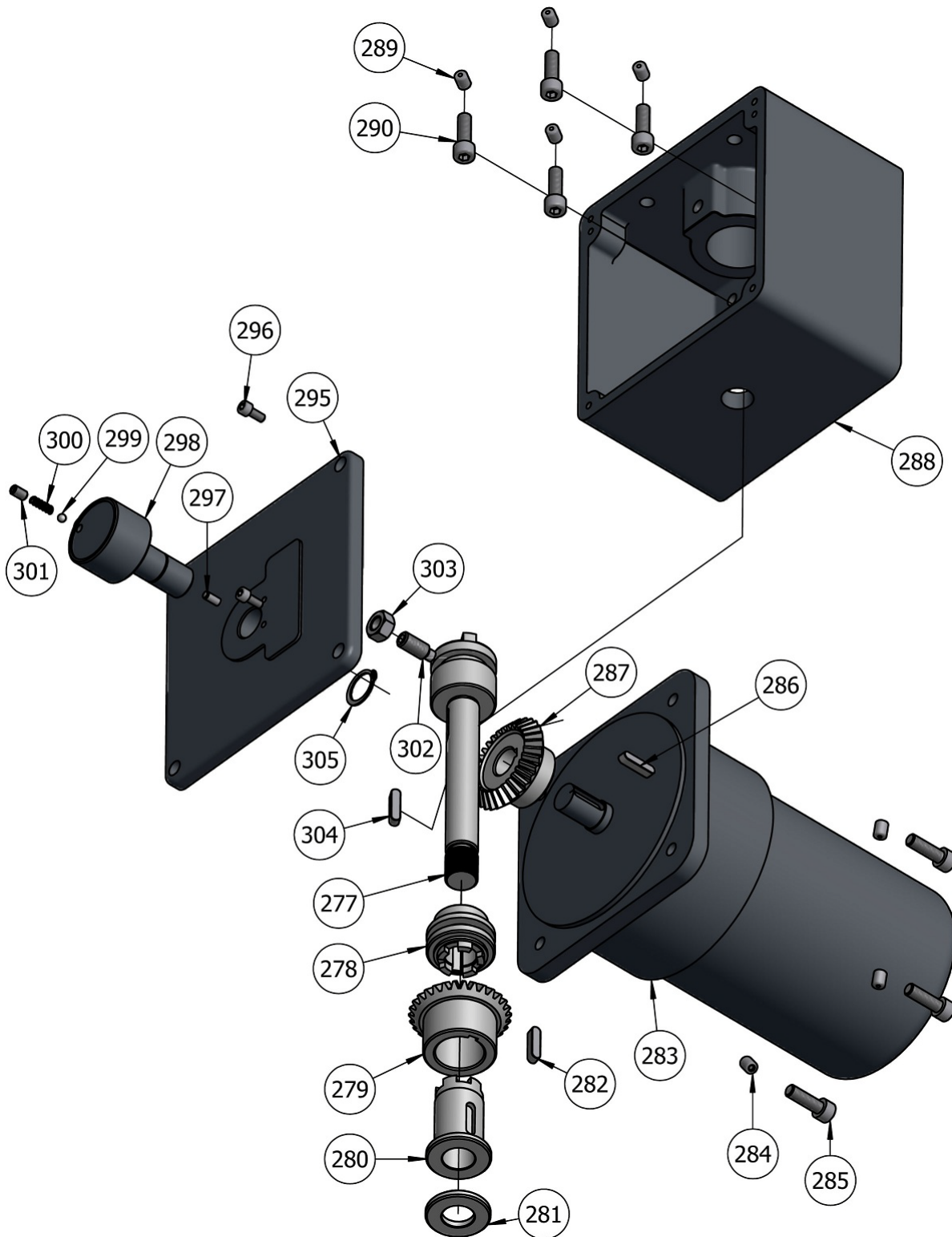
7.8 Spare parts drawing drilling head 7-7



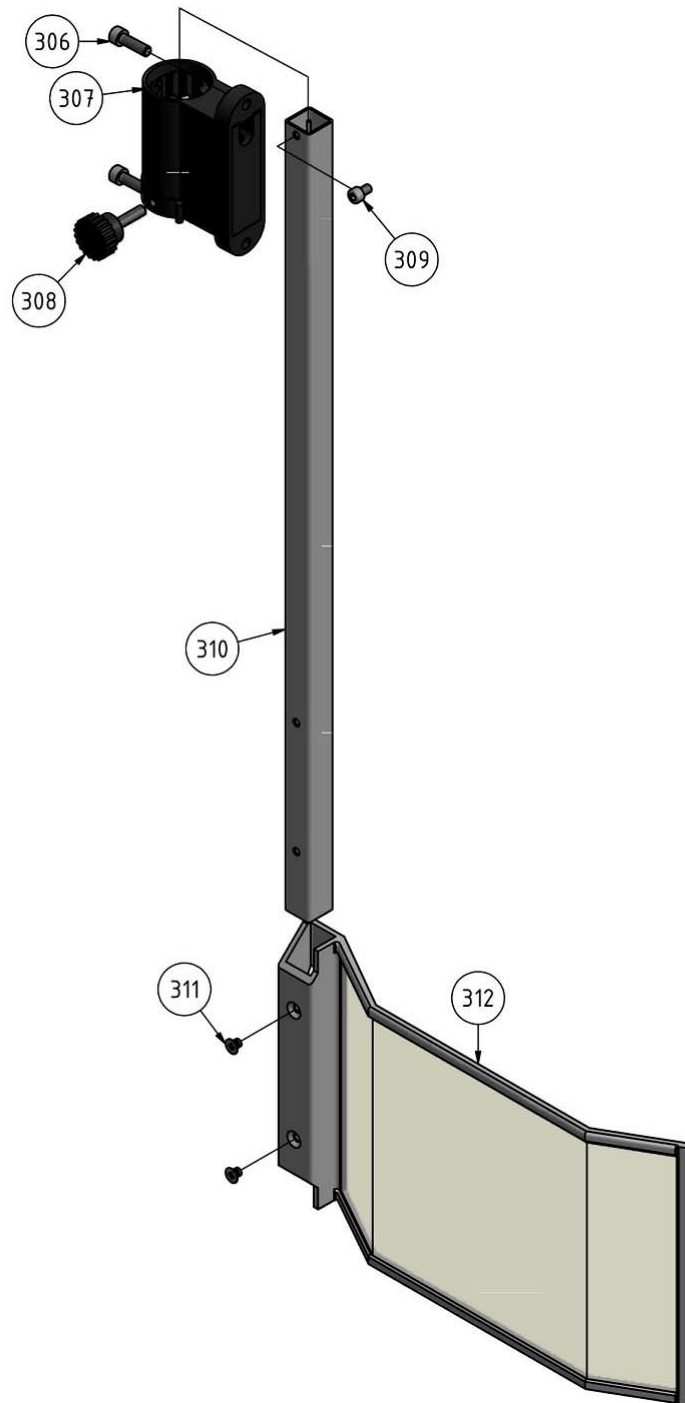
7.9 Spare parts drawing column and drilling table 1-2



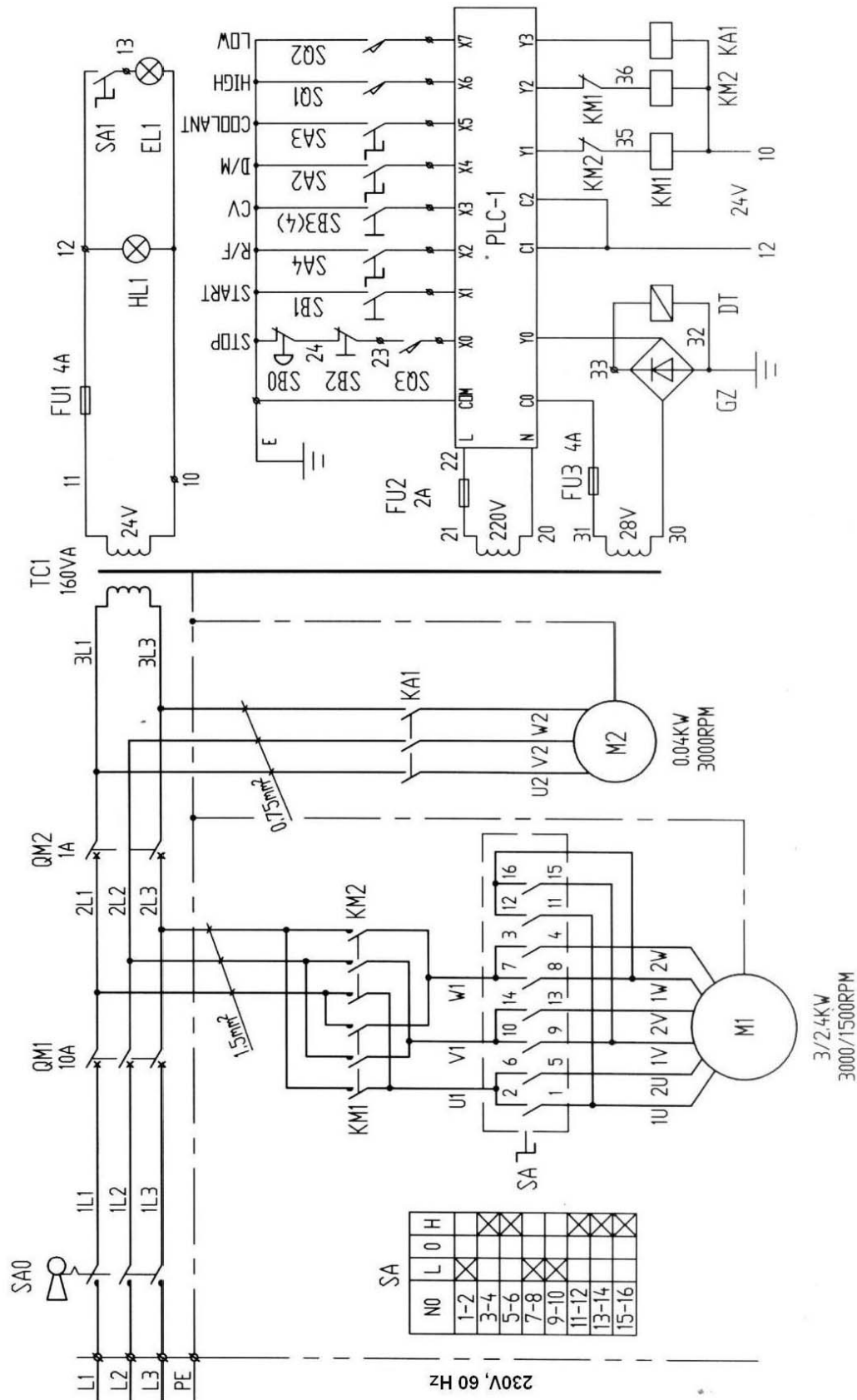
7.10 Spare parts drawing column and drilling table 2-2 (optional)



7.11 Drill Chuck Guard



7.12 Wiring diagram



7.13 Parts list

Pos.	Description	Qty.	Drawing no.	Size	Item no.
2	Socket head screw	4	GB5783-86	M12x30	
3	Washer	4	GB97.1-86	12	
4	Socket head screw	1	GB70-85	M8x25	
5	Right Rock Arm	1	Z5050-03-48	2G200-400	0303450305
6	Blind Plug	1	Z5050-03-49		0303450306
7	Shaft	1	Z5050-03-46		0303450307
8	Right Fork	1	Z5050-03-47	QT400-18	0303450308
9	Ball	2	GB308-84	10	0303450309
10	Compression Spring	2	GB2089-80	1x9x18	0303450310
11	Right Handle Support	1	Z5050-03-45		0303450311
12	Taper pin	2	Z5035-02-39		0303450312
13	Feed Case Lubrication Pipe	1	Z5050-03-54		0303450313
14	Left Fork	1	Z5050-03-44	QT400-18	0303450314
15	Left Rock Arm	1	Z5050-03-43	2G200-400	0303450315
16	Shaft	1	Z5050-03-42		0303450316
17	Spring Pin	2	GB879-86	5x16	0303450317
18	Left Handle Support	1	Z5050-03-41		0303450318
19	Handle	2	Z5035-02-42		0303450319
20	Handle Sleeve	2	GB4141.14-84	BM10x50black	0303450320
21	Sign Board	1	Z5035-03-54		0303450321
22	Drilling head housing	1	Z5050-03-01		0303450322
23	Speed Board	1	Z5050-03-50		0303450323
24	Crossed Pan Head Screw	30	GB818-85	M5x8 black	
25	Board	1	Z5035-03-42		0303450325
26	Label	1	Z5035-03-10		0303450326
27	Hexagon Oil Plug	3	G38-2A	M27x2	0303450327
28	Key	1	GB1096	C8x50	0303450328
29	Gear	1	Z5050-03-03	Z22 m2	0303450329
30	Motor Axle End Washer	1	Z5050-03-04	8	0303450330
31	Lock Washer	1	GB/T862.2-1987		0303450331
32	Hexagon bolt	1	GB5783-86	M8x20	
33	Gasket	1	Z5050-03-52		0303450333
34	Cover	1	Z5050-03-51		0303450334
35	Socket head screw	11	GB70-85	M8x20	
36	Oil glass	1	GB1160.2-86	B20	0303450336
37	Aluminum Oil glass	1	WG-Z5035-02	M27x1.5	0303450337
38	Flexible tube	1		M24x1.5	0303450338
39	Setscrew	2	GB79-86	M8x16	
40	Setscrew	2	GB77-86	M8x10	
41	Eye Bolt	1	GB825-88	BM20	0303450341
42	Hexagon nut	1	GB6170-86	M20	
43	End Cap	1	Z5050-03-36		0303450343
44	Label	1	Z5035-03-59		0303450344
45	Rivet	4	GB827-86	2x5	0303450345
45-1	Cover	1	Z5050-04-06		0303450345-1
45-2	Socket head screw	4	GB70-85	M6x20	
45-4	Socket head screw	4	GB70-85	M8x60	
45-5	Cover	1	Z5050-04-13		0303450345-5
45-6	Socket head screw	4	GB70-85	M8x12	
45-7	Box	1	Z5050-04-05		0303450345-7
46	Oiling Board	1	Z5050-03-128		0303450346
46-1	Gasket	1	Z5050-03-52		0303450346-1
46-2	Cover	1	Z5050-03-51		0303450346-2
46-3	Flange motor	1	Z5050-03-131		0303450346-3
46-5	Lock Washer	1	GB/T862.2-1987	12	0303450346-5
46-7	Hexagon bolt	1	GB5783-86	12x30	0303450346-7
46-8	Lever	1	Z5050-03-59		0303450346-8
47	Sealing Ring	1	GB3452.1-82	51.5x3.55	0303450347
48	Oil seal	1	Z5050-03-111		0303450348
49	Grooved Bearing	2	GB/T276-1994	45x75x16	0303450349
50	Groove nut	1	Z5050-03-126		0303450350
51	Ball Bearing	1	GB/T301-1995	40x68x19	0303450351
52	Oil seal	1	GB13871-1992	40x60x8	

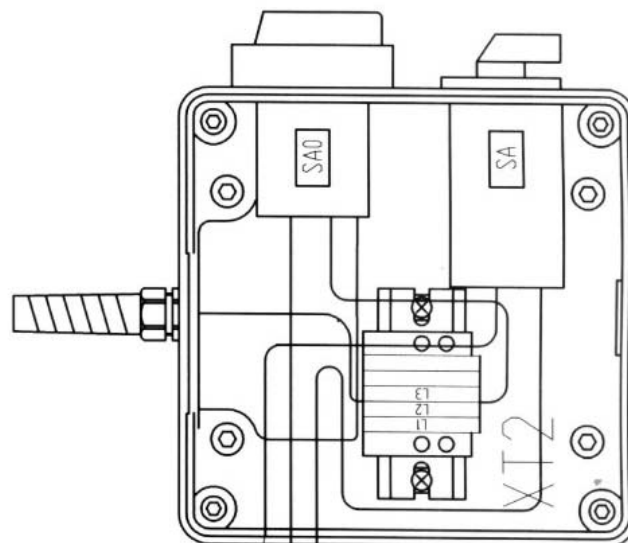
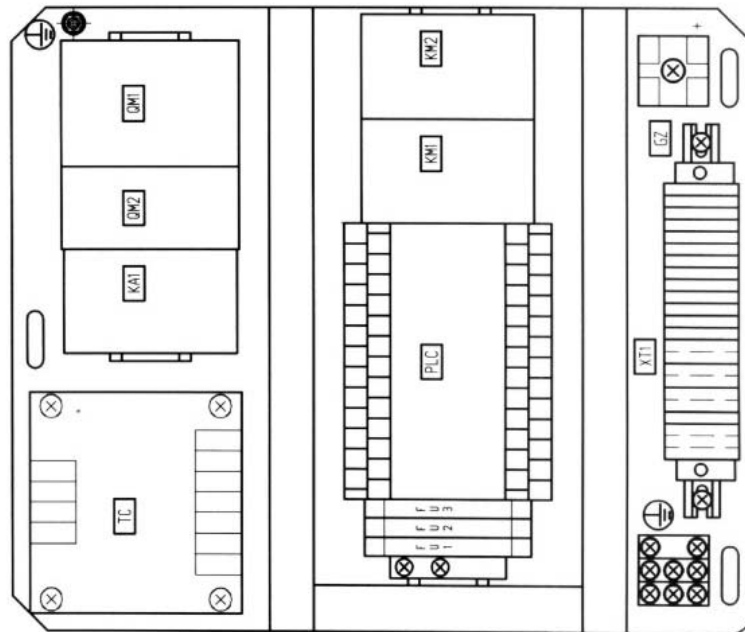
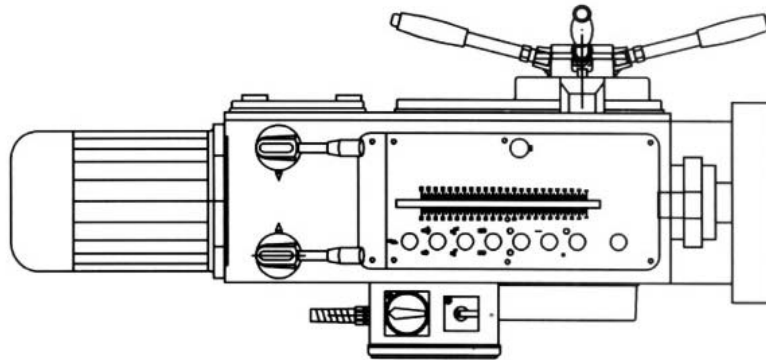
Pos.	Description	Qty.	Drawing no.	Size	Item no.
53	Profile Key	1	Z5050-03-123		0303450353
54	Spring Pin	2	GB879-86	5x24	0303450354
55	Shaft	1	Z5050-03-121		0303450355
56	Support Bush	1	Z5050-03-124		0303450356
57	Lock Screw	4	Z5050-03-81		0303450357
58	Socket head screw	1	GB70-85	M8x50	
59	Pinole	1	Z5050-03-119		0303450359
60	Shaft	1	Z5050-03-29		0303450360
61	Spindle	1	Z5050-03-120		0303450361
62	Compression Spring	1	GB2089-80	2.5x37x70	0303450362
63	Holder	1	Z5050-03-114		0303450363
64	Grease nipple	1	GB1155-79	8	0303450364
65	Lock Screw	1	Z5050-03-113		0303450365
66	Lock Screw	1	Z5050-03-81		0303450366
67	Bushing	1	Z5050-03-115		0303450367
68	Spring Pin	1	GB879-86	6x32	0303450368
69	Key	2	GB1567-79	8x5x25	
70	Threaded rod	1	Z5050-03-116		0303450370
71	Drilling depth stop	1	Z5050-03-118		0303450371
72	Bushing	1	Z5050-03-117		0303450372
73	Socket head screw	4	GB70-85	M10x20	
74	Socket head screw	1	GB70-85	M8x35	
75	Shaft bush	1	Z5050-03-35		0303450375
76	Seal	1	GB13871-1992	45x65x8	0303450376
77	Grooved Bearing	1	GB/T276-1994	45x75x16	0303450377
78	Gear	1	Z5050-03-34	Z=42 m=2	0303450378
79	Spacer	1	Z5050-03-33		0303450379
80	Gear	1	Z5050-03-31	Z=60 m=2.25	0303450380
81	Gear	1	Z5050-03-32	Z=0 m=2.25	0303450381
82	Axle retainer	1	GB894.1-86	60	0303450382
83	Spacer	1	Z5050-03-30		0303450383
84	Grooved Bearing	1	GB/T276-1994	45x75x16	0303450384
85	Bearing block	1	Z5050-03-28		0303450385
86	grease nipple	2	GB1155-79	10	0303450386
87	Hand Wheel	1	Z5050-03-90-1		0303450387
88	Hand Wheel Spacer	1	Z5050-03-90-2		0303450388
89	End Cap	1	Z5050-03-88		0303450389
90	Grooved Bearing	1	GB/T276-1994	20x52x15	0303450390
91	Nut	1	Z5050-03-86		0303450391
92	Dish Spring	3	GB/T1972-1992	25.4x50x2x3.4	0303450392
93	Friction Pad	1	Z5050-03-85		0303450393
94	Spacer	1	Z5050-03-122		0303450394
95	Double Thread Worm	1	Z5050-03-77	Z=2 m=2	0303450395
96	Friction Pad	1	Z5050-03-85		0303450396
97	Gear	1	Z5050-03-69	Z=22 m=2	0303450397
98	Gear	1	Z5050-03-74	Z=26 m=2	0303450398
99	Gear	1	Z5050-03-70	Z=33 m=2	0303450399
100	Gear	1	Z5050-103-71	Z=41 m=2	03034503100
101	Washer	1	Z5050-03-89		03034503101
102	Lock Screw	1	Z5050-03-81		03034503102
103	Washer	1	Z5050-03-87		03034503103
104	Socket Flat Adapter	1	GB77-85	M8x10	
105	Shaft	1	Z5050-03-75		03034503105
106	Spring Pin	2	GB879-86	6x26	03034503106
107	Key	1	GB1567-79	8x5x60	
108	Ball Bearing	1	GB/T292-1994	20x52x15	03034503108
109	End Cap	1	Z5050-03-88		03034503109
110	Rack Shaft	1	Z5050-03-60		03034503110
111	Roller	1	Z5050-03-61		03034503111
112	Washer	1	Z5050-03-62		03034503112
113	Socket head screw	1	GB70-85	M6x16	
114	Ball	18	GB308-84	8	03034503114
115	Hollow shaft	1	Z5050-03-92		03034503115
116	Grooved Bearing	1	GB/T276-1994	30x55x13	03034503116
117	Washer	1	Z5050-03-78		03034503117
118	Worm Gear	1	Z5050-03-76	Z=37 m=1.75	03034503118
119	Lock Screw	3	Z5050-03-81		03034503119
120	Gear	1	Z5050-03-72	Z=48 m=2	03034503120
121	Gear	1	Z5050-03-65	Z=47 m=2	03034503121
122	Gear	1	Z5050-03-66	Z=44 m=2	03034503122
123	Gear	1	Z5050-03-73	Z=39 m=2	03034503123

Pos.	Description	Qty.	Drawing no.	Size	Item no.
124	Gear	1	Z5050-03-67	Z=33 m=2	03034503124
125	Gear	1	Z5050-03-68	Z=22 m=2	03034503125
126	Washer	1	Z5050-03-79		03034503126
127	Grooved Bearing	1	GB/T276-1994	30x55x13	03034503127
128	End Cap	1	Z5050-03-80		03034503128
129	Spring Pin	2	GB879-86	5x16	03034503129
130	Feed Support	1	Z5050-03-02		03034503130
131	Ball	1	GB308-84	8	03034503131
132	Compression Spring	1	GB2089-80	1x7x20	03034503132
133	Socket Flat Adapter	1	GB77-85	M10x10	03034503133
134	Socket head screw	4	GB70-85	M6x16	03034503134
135	Gear shaft	1	Z5050-03-63	Z=17 m=2	03034503135
136	Lock Screw	1	Z5050-03-81		03034503136
137	Spacer	1	Z5050-03-64		03034503137
138	Axle Retainer	1	GB894.1-86	20	03034503138
139	Selector wheel	1	Z5050-03-84		03034503139
140	Gear shaft	1	Z5050-03-07		03034503140
141	Spring Pin	1	GB879-86	5x18	03034503141
142	End Cap	1	Z5050-03-05		03034503142
143	Grooved Bearing	2	GB/T276-1994	20x47x14	03034503143
144	Gear	1	Z5050-03-06	Z=44 m=2	03034503144
145	Axle Retainer	1	GB894.1-86	28	03034503145
146	Gear	1	Z5050-03-08	Z=24-29-19	03034503146
147	Frame Oil Seal	1	GB13871-1992	20x35x7	03034503147
148	Teeth Axle	1	Z5050-03-11		03034503148
148-1	End Cap	1	Z5050-03-10		03034503148-1
149	Grooved Bearing	2	GB/T276-1994	25x62x17	03034503149
150	Spacer Ring	1	Z5050-03-12		03034503150
151	Gear	1	Z5050-03-13	Z=36 m=2.25	03034503151
152	Gear	1	Z5050-03-14	Z=20 m=2.25	03034503152
153	Gear	1	Z5050-03-15	Z=30 m=2.25	03034503153
154	Gear	1	Z5050-03-16	Z=40 m=2.25	03034503154
155	Spacer	1	Z5050-03-17		03034503155
156	Gear shaft	1	Z5050-03-19		03034503156
157	Key	2	GB1096-79	8x18	03034503157
158	End Cap	1	Z5050-03-18		03034503158
159	Grooved Bearing	2	GB/T276-1994	25x62x17	03034503159
160	Spacer	1	Z5050-03-20		03034503160
161	Support Bush	1	GB894.1-86	45	03034503161
162	Gear	1	Z5050-03-22	Z=40 m=2.25	03034503162
163	Gear	1	Z5050-03-21	Z=24 m=2.25	03034503163
164	Grooved Bearing	1	GB/T276-1994	25x33x16	03034503164
165	Grooved Bearing	1	GB/T276-1994	25x33x20	03034503165
166	Spacer	1	Z5050-03-23		03034503166
167	Gear	1	Z5050-03-24	Z=40 m=2.25	03034503167
168	Spacer	1	Z5050-03-25		03034503168
169	Gear	1	Z5050-03-26	Z=19 m=2.25	03034503169
170	Washer	1	Z5050-03-27		03034503170
171	Worm	1	Z5050-03-37		03034503171
172	Key	1	GB1096-79	6x22	03034503172
173	Axle Retainer	1	GB894.1-86	20	03034503173
174	Gear	1	Z5050-03-39	Z42 m2	03034503174
175	Grooved Bearing	2	GB/T276-1994	20x47x14	03034503175
176	Seal	1	GB13871-1992	20x35x7	03034503176
177	Sealing Ring	1	GB3452.1-82	42.5x2.65	03034503177
178	Bushing	1	Z5050-03-40		03034503178
179	Handle Seat	1	Z5050-03-95		03034503179
180	Round Nut	1	Z5050-03-94		03034503180
181	Grooved Bearing	1	GB/T276-1994	6006	??????????
182	Retainer	2	GB893.1-86	55	03034503182
183	Bearing Holder	1	Z5050-03-96		03034503183
184	Socket head screw	3	GB70-85	M8x20	
185	Spline Bush	1	Z5050-03-97		03034503185
186	Spacer	1	Z5050-03-103		03034503186
187	Spacer	1	Z5050-03-101		03034503187
188	Cylindrical Pin	8	GB119-86	4x10	
189	Connection Ring	1	Z5050-03-102		03034503189
190	Screw	3	Z5050-03-125		03034503190
191	Washer	1	Z5050-03-100		03034503191
192	Connector ring	1	Z5050-03-99		03034503192
193	Cylindrical Pin	6	GB119-86	5x16	

Pos.	Description	Qty.	Drawing no.	Size	Item no.
194	Worm gear	1	Z5050-03-98		03034503194
195	Spacer	1	Z5050-03-104		03034503195
196	Needle Bearing	1	GB/T290-1998	HK4520	????????
197	Needle Bearing	1	GB/T290-1998	HK3020	????????
198	Bushing	1	Z5050-04-18-7		03034503198
199	Bushing	1	Z5050-04-18-6		03034503199
200	Axle Retainer	1	GB894.1-86	25	03034503200
201	Crossed Pan Head Screw	3	GB818-85	M4x6	
202	Cover	1	Z5050-03-108	1.5	03034503202
203	Return spring	1	Z5050-03-107		03034503203
204	Spring cover	1	Z5050-03-106		03034503204
205	Socket head screw	3	GB70-85	M8x16	
206	Spindle sleeve handle	4	Z5050-04-09		03034503206
207	Crossed Pan Head Screw	4	GB818-85	M5x16	
208	Cover	1	Z5050-03-93		03034503208
209	Key	2	GB1567-79	10x6x25	
210	Pinion shaft	1	Z5050-03-105	Z13,m3	03034503210
211	Key	1	GB1567-79	8x5x18	
212	Axle Retainer	1	GB894.1-86	12	
213	Filter unit	1	Z5050-03-58-08		03034503213
214	Fitting	1	Z5050-03-58-04		03034503214
215	Fitting	1	Z5050-03-58-02		03034503215
216	Shaft	1	Z5050-03-58-03		03034503216
217	Spring Pin	1	GB897-86	4x18	
218	Lubrication Pump	1	Z5050-03-58-01		03034503218
219	Socket head screw	4	GB70-85	M8x16	
220	Sealing Ring	1	GB3452.1-82	60x2.65	
221	Sliding block	4	Z5050-03-58-06		
222	Spring	4	GB2089-80	0.5x7x16	03034503222
223	Spring Pin	1	GB897-86	2.5x20	
224	Regulator	1	Z5050-03-58-07		03034503224
225	Cover	1	Z5050-03-58-05		03034503225
226	Socket head screw	6	GB70-85	M4x16	
226-1	Pipe	1	Z5050-03-09		03034503226-1
227	Base	1	Z5050-01-01		03034503227
228	Cooling tube	1		16x1.5 l=1450	03034503228
229	Plate	1	Z5035-07-06		03034503229
230	Screw	4	GB/T70	M6x12	
231	Fitting	1	JB/T8870		03034503231
232	Tupe connector	1	Z5035-07-05		03034503232
233	Screw	4	GB/T70	M6x12	
235	Cooling tube	1		16x1.5	03034503235
235-1	Crank	1	Z5050-01-09	2G400	03034503235-1
235-2	Handle	1	GB/T 4141.5	M10x80	
235-3	Screw	1	GB/T 70	M8x30	
235-4	Bushing	1	Z5050-01A-25	Buchse	03034503235-4
235-5	Gasket	1	Z5050-01A-13		03034503235-5
235-6	Worm	1	Z5050-01A-07		03034503235-6
235-7	Spring Pin	1	GB879-86	6x35	
236	Stud	3	GB/T898	M6x60	
237	Lock Handle	2	HY8310.12-3	A-M16x114	03034503237
238	Washer	3	GB/T97.1	16	
239	Screw	3	GB/T5782	M16x65	
240	Washer	2	GB/T97.1	16	
241	Nut	2	GB/T6170	M16	
242	Washer	1	GB/T97.1	16	
243	Bracket	1	Z5050-01A-26		03034503243
244	Gear	1	Z5050-01-10		03034503244
245	Shaft	1	Z5050-01A-27		03034503245
246	Grease nipple	1	JB/T7940.4	8	03034503246
247	Screw	1	GB/T78	M8x20	
248	Nut	1	GB/T6170	M8	
249	Rack	1	Z5050-01-06		03034503249
250	Column	1	Z5050-01-02		03034503250
251	Washer	1	JB/T8870	22-32	03034503251
252	Nut	1	GB/T6171	M20x2	
253	Flexible cooling Pipe	1	JB/TGQ0627-88	G3/8?	03034503253
254	Table support	1	Z5050-01A-03		03034503254
255-1	Screen	1	Z5050-01-14		03034503255-1
255	Table	1	Z5050-01-04		03034503255
256	Lock Handle	1	HY8310.12-3	A-M16x114	03034503256

Pos.	Description	Qty.	Drawing no.	Size	Item no.
257	Washer	1	GB/T97.1	16	
258	Thread rod	1	GB/T898	M16x75	
259	Plate	1	Z5050-01-05		03034503259
260	Screw	3	GB/T70	M6x20	
261	Pipe Connector	1	Z5035-07-03		03034503261
262	Fitting	1	JB/T8870	22-32	03034503262
263	Coolant tube	1		16x1.5 l=1500	03034503263
264	Elbow	1	GB/T3289.2	G3/8	03034503264
265	Fitting	1	Z5050-01-11		03034503265
266	Fitting	1	JB/T8870	22-32	03034503266
267	Pipe Connector	1	Z5035-07-03		03034503267
268	Elbow	1	GB/T3289.2	2G1/2?	03034503268
269	Plate	1	Z5035-07-04		03034503269
270	Screw	1	GB/T70	M8x25	
271	Screen	1	Z5050-01-15		03034503271
272	Washer	6	GB/T97.1	16	
273	Screw	6	GB/T5782	M16x70	
277	Shaft	1	Z5050-01A-24		03034503277
278	clutch	1	Z5050-01A-22		03034503278
279	Taper Gear	1	Z5050-01A-19		03034503279
280	Shaft	1	Z5050-01A-21		03034503280
281	Washer	1	Z5050-01A-20		03034503281
282	Key	1	GB1096-79	6x25	
283	Motor	1	GLF18-180-30		03034503283
284	Spring Washer	4	GB93-85	8	
285	Socket head screw	4	GB70-85	M8x25	
286	Key	1	GB1096-79	6x25	03034503286
287	Taper Gear	1	Z5050-01A-23		03034503287
288	Case	1	Z5050-01A-26		03034503288
289	Spring Washer	4	GB93-86	8	
290	Socket head screw	4	GB70-85	M8x25	
295	Cover	1	Z5050-01A-18		03034503295
296	Socket head screw	4	GB70-85	M5x12	
297	Cylindrical Pin	1	GB119-86	5x12	
298	Hand wheel	1	Z5050-01A-17		03034503298
299	Ball	1	GB308-89	5	03034503299
300	Compression Spring	1	GB2089-80	1x4x20	03034503300
301	Socket Flat Adapter	1	GB77-85	M6x10	
302	Socket Cap Adapter	1	GB79-86	M10x25	
303	Nut	1	GB6170-85	M10	
304	Key	1	GB1096-79	6x25	03034503304
305	Retainer	1			03034503305
306	Socket head screw	1			03034503306
307	Holder	1			03034503307
308	Knurled screw	1			03034503308
309	Socket head screw	1			03034503309
310	Aluminum profile	1			03034503310
311	Socket head screw	2			03034503311
312	Drill chuck protection	1			03034503312
313	Press button	1			03034503313
314	Switch plate	1			03034503314

7.14 Electrical terminal diagram



7.14.1 Spare parts electrical components

Pos.	Description	Specification	Function	Item no.
SA0	Main switch	LW8GS-25/0402	Main power On/Off	03034503SA0
SA	Switch	LW8PS-25/4D503	Drilling speed selection High/Low	03034503SA
	CONTACT	L O H		
	1-2			
	3-4			
	5-6		2-6	
	7-8		3-7	
	9-10		10-14	
	11-12		8-12-16	
	13-14			
15-16				
KM1.KM2	AC contactor	CJX-d1801 24V	Power control reverse control	03034503KM
KA1	Relay	CJX3-40d24V	Cooling motor control	03034503KA1
TC1	Transformer	JBK5-160	Control voltage	03034503TC1
	230V / 24V 75VA			
	400V / 28V 75VA			
	200V 10VA			
HL1	Pilot lamp	CL-100W	Power lamp	03034503HL1
SA1	Switch	C2SS2-10B-10	Working lamp control	03034503SA1
SA2	Switch	C2SS2-10B-10	Switch mode of operation choice	03034503SA2
SA3	Switch	C2SS2-10B-10	Cooling pump On/Off	03034503SA3
SA4	Switch	C2SS2-10B-10	Change over switch, left, right	03034503SA4
SB0	Emergency stop button	C2SS2-10B-10	Emergency stop	03034503SB0
SB1	Stop button	C2SS2-10B-10	Start	03034503SB1
SB2	Start button	C2SS2-10B-10	Stop	03034503SB2
SB3	Lever button		Feed button	03034503SB3
M1	Main motor 3.0/2.4KW	YAL100L2-2/4B5; 400V50HZ	Spindle drive	03034503M1
M2	Cooling pump motor	AYB-12 400V50HZ; OUT M201.5	Coolant	03034503M2
QM1	Circuit breakers	DZ47-63 3PD10	Top limit switch	03034503QM1
QM2	Circuit breakers	DZ47 2P D1	Button limit switch	03034503QM2
PLC-1	PLC		Logical control	03334400PLC
FU1.FU2.FU3	Fuse	UL-UK5-HES1	Top limit switch	03034503FU
GZ	AC-DC Inverter	KMPC25-10	AC-DC Inverter	03034503GZ
SQ1.SQ2	Limit switch	LW5-11Q1	High / Low selection control	03034503SQ
SQ3	Limit switch	LXW16-5/1C2	Safe protection	03034503SQ3
EL1	Working lamp		Working lamp	03034503EL1
DT	Electromagnetic tooth retaining brake	DA24V		03034503DT

8 Troubleshooting

Problem	Cause / possible effects	Solution
Noise during work	<ul style="list-style-type: none"> Spindle turning dry Tool dull incorrectly secured 	<ul style="list-style-type: none"> Grease spindle Use new tool and check securing (fixed setting of the bit, drill chuck and conical chuck).
Bit "burnt"	<ul style="list-style-type: none"> Incorrect speed The chips have not been removed from the bore hole Bit dull Operating without cooling agent 	<ul style="list-style-type: none"> Select another rate, feed high Extract bit more often Sharpen or replace bit Use cooling agent
Bit tip moves, bore is not circular.	<ul style="list-style-type: none"> Hard material in the workpiece Unequal length of the cutting spiral or angles in the bit Bit deformed 	<ul style="list-style-type: none"> Replace bit
Defective bit	<ul style="list-style-type: none"> No support used 	<ul style="list-style-type: none"> Place a wooden board beneath the piece and secure them to one another
Bit running off-centre or "hopping"	<ul style="list-style-type: none"> Bit deformed Bearings worn in drilling head Bit badly secured Defective bit-holder 	<ul style="list-style-type: none"> Replace bit Have the bearings in the drilling head replaced Secure the bit properly Replace the bit-holder
Impossible to mount drill chuck	<ul style="list-style-type: none"> Dirt, grease or oil on the inner taper surface of the drilling head spindle 	<ul style="list-style-type: none"> Clean surface well Keep surface free of grease
Motor does not start	<ul style="list-style-type: none"> Motor badly connected Defective fuse 	<ul style="list-style-type: none"> Have it checked by authorised personnel
Overheating of the motor and lack of power	<ul style="list-style-type: none"> Motor overloaded Insufficient mains voltage Motor badly connected 	<ul style="list-style-type: none"> Reduce feed, disconnect if necessary and have it checked by authorised personnel Have it checked by authorised personnel
Precision of the work deficient	<ul style="list-style-type: none"> Heavy and unbalanced or deformed part Inexact horizontal position of the part holder 	<ul style="list-style-type: none"> Balance the piece statically and secure without straining Adjust part-holder
Drilling spindle does not return to initial position	<ul style="list-style-type: none"> Failure of spindle return spring Locking bolt inserted 	<ul style="list-style-type: none"> Check spindle return spring and replace if necessary Remove locking bolt
Impossible to move the drilling spindle downwards	<ul style="list-style-type: none"> Locking bolt inserted Drill depth adjustment not released 	<ul style="list-style-type: none"> Pull out locking bolt Release drill depth adjustment
Spindle bearing overheated	<ul style="list-style-type: none"> Bearing worn Excessive preloading of the bearing Working at high rate for a long time 	<ul style="list-style-type: none"> Replace Reduce bearing slack for fixed Reduce bit speed/feed

Problem	Cause / possible effects	Solution
Working spindle rattling on rough piece surfaces	<ul style="list-style-type: none"> • Excessive slack in bearing • Working spindle goes up and down • Adjustment strip loose • Chuck loose • Tool dull • Piece loose 	<ul style="list-style-type: none"> • Re-adjust bearing slack or replace bearing • Re-adjust bearing slack (fixed bearing) • Adjust gib to the correct slack using the adjusting screws • Check, re-tighten • Sharpen or replace tool • Secure the piece properly

9 Appendix

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9.2 Terminology/Glossary

Item	Explanation
Drift	Tool for removing the bit or the drill chuck from the bit holder spindle.
Drill chuck	Fixture for holding the bit.
Drilling head	Upper part of the geared drill.
Drilling spindle	Fixed hollow shaft in which the spindle turns.
Spindle	Shaft activated by the motor.
Drilling table	Support and fastening surface.
Taper size	Taper shank of the bit or drill chuck.
Spindle lever	Manual control for advancing the bit.
Keyless chuck	Drill chuck which does not use a key.
Piece	Piece to be drilled or machined.
Tool	Bit, countersink, etc.
Locking bolt	Bolt for holding the drilling spindle at a given height for removing the chuck or tool.

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