

Operating manual

Version 1.4.0

Mill Drill

BF 16V Item No. 9680159



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Preface

Dear customer,

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

Company metal working machines offer a maximum of quality, technically company 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 us.

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

C.H.HANSON
2000 North Aurora Rd.
Naperville,IL 60563
Call 800-827-3398

1 Safety

Glossary of symbols

	gives additional indications
	calls on you to get in action
	enumerations

This part of the operating manual

- explains the meaning and use of the warning references contained in the operating manual,
- explains how to use the mill drill properly,
- highlights the dangers that might arise for you and others if these instructions are not followed,
- tells you how to avoid dangers.

In addition to this operating manual please observe

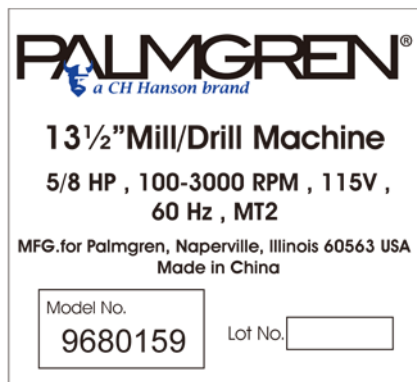
- applicable laws and regulations,
- legal regulations for accident prevention,
- the prohibition, warning and mandatory labels as well as the warning notes on the mill drill.

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

Always keep this documentation close to the mill drill.

If you would like to order another operating manual for your machine, please indicate the serial number of your machine. Please find the serial number on the type plate.

1.1 Type plate



INFORMATION

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

Exclusive USA Agent

C.H.HANSON

2000 North Aurora Rd.

Naperville, IL 60563




Call 800-827-3398



1.2 Safety warnings (warning notes)

1.2.1 Classification of hazards

We classify the safety warnings into various levels. The table below gives an overview of the classification of symbols (pictograms) and warning labels 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!	Risk: a danger that might cause serious injury 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 drilling-milling machine or products and other types of damage. No risk of injury to personnel.
	INFORMATION	Application tips and other important or useful information and notes. No dangerous or harmful consequences for personnel or objects.

In case of specific dangers, we replace the pictogram by



1.2.2 Further pictograms

 <p>WARNING</p> <p>READ and UNDERSTAND instruction manual to avoid serious injury. If a manual is not available, DO NOT use machine. Call 1-800-266-9079</p>	 <p>WARNING!</p> <p>ENTANGLEMENT HAZARD! Tie back long hair, roll up long sleeves, and remove loose clothing, jewelry, or gloves to prevent getting caught in moving parts.</p>	 <p>WARNING</p> <p>Pinch/Entangle Hazard! Keep hands clear of outboard spindle and rotating workpiece to avoid serious injury.</p>	 <p>WARNING!</p> <p>PINCH/ENTANGLEMENT HAZARD Keep spindle guard in place and hands clear of outboard spindle and rotating workpiece to avoid serious injury.</p>
 <p>WARNING</p> <p>Disconnect power before adjustments, maintenance, or service.</p>		 <p>WARNING</p> <p>EYE INJURY HAZARD! Always wear safety glasses when using this machine.</p>	 <p>WARNING</p> <p>Wear gloves while handling caustic solutions</p>



Activation forbidden!



Read the operating manual before the machine is first used!



Pull the mains plug!



Use protective goggles!



Use protective gloves!



Use protective boots!



Wear a safety suit!



Use ear protection!



Protect the environment!



Contact address

1.3 Proper use

WARNING!

In the event of improper use, the mill drill

- will endanger personnel,
- will endanger the mill drill and other material property of the operator,
- may affect proper operation of the mill drill.



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

The mill drill must only be installed and operated in a dry and well-ventilated place.

If the mill drill is used in any way other than described above, modified without the authorization of company or operated with different process data, then it is being used improperly.

We do not take any liability for damages 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 by company will also render the warranty null and void.

It is also part of proper use that

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

☞ „Technical data“ on page 16

WARNING!

Very serious injury due to improper use.

It is forbidden to make any modifications or alterations to the operating values of the mill drill. They could endanger personnel and cause damage to the machine.



CAUTION!

If the table drilling machine is not used as intended or if the safety directives or the operating instructions are ignored the liability of the manufacturer for any damages to persons or objects resulting hereof is excluded and the claim under warranty is becoming null and void!



1.4 Reasonably foreseeable misuse

Any other use or any use beyond the use described under "Proper use" is regarded as improper use and is forbidden.

If it is intended to use the device in any other way as described above, it is necessary to consult the manufacturer.

It is only allowed to work metallic, cold and non-flammable material using the milling machine.

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

The operators must be qualified.

1.4.1 Avoiding misuse

- Using suitable cutting tools.
- Adapting speed settings and feed on the material and on the workpiece.
- Clamp the workpiece firmly and vibration-free.

ATTENTION!

The workpiece must always be fixed in a machine vice, jaw chucks or any other suitable clamping tool such as e.g. clamping claws.



WARNING!

Injuries due to workpieces flying off at high speed

Clamp the workpiece in the machine vice. Make sure that the workpiece is firmly clamped in the machine vice resp. the machine vice is firmly fixed on the machine table.



- Use of cooling and lubricating agents in order to increase the durability of the tool and to improve the surface quality.
- Clamp the cutting tools and the workpieces on clean clamping surfaces.
- Sufficiently lubricate the machine.
- Correctly set the bearing clearance and guidance.

It is recommended to:

- Use the drill in a way that it is exactly located between the three clamping jaws of the quick action chuck.
- Clamp the end mill by means of the collet chuck and the corresponding clamping collets.
- Clamp the end face mill by means of the end mill arbor.

When drilling, please observe that

- It is necessary to set the suitable speed depending on the diameter of the drill,
- The press-on must only be as intense that the drill can cut on no-load,
- If the press-on is too intense, it might result in early tool wear perhaps even tool fracture resp. jamming in the drill hole. If the tool gets jammed, immediately stop the main drive motor by actuating the emergency-stop button,
- For hard materials, e.g. steel, it is necessary to use commercial cooling/lubricating agents,
- Generally always back out the tool from the workpiece while the shaft is turning.

ATTENTION!

Do not use the quick action chuck as milling tool. Do not clamp the milling tool in the quick action chuck in no case. Use a collet chuck and the corresponding collets for the end mill.



When milling, make sure that

- The suitable cutting speed is selected,

- For materials with normal mechanical strength, e.g. steel 18-22 m/min,
- For materials with higher mechanical strength 10-14 m/min,
- The press-on is selected in a way that the cutting speed remains constant, commercial cooling/lubricating agents are used for hard materials.

1.5 Possible dangers caused by the mill drill

The mill drill was built using the latest technological advances.

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

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

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

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

INFORMATION

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

- be duly qualified,
- follow this operating manual.

Disconnect the mill drill whenever cleaning or maintenance work is being carried out.



WARNING!

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

Disconnect the mill drill immediately 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 11



1.6 Qualification of personnel

1.6.1 Target group

This manual is addressed to

- operators,
- users,
- maintenance staff.

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

Always disconnect the mill drill plug from the electrical power supply. This will prevent it from being used by unauthorized personnel.

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

Operator

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



Electrical specialist

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

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

Specialist staff

Due to his professional training, knowledge and experience as well as his knowledge of relevant regulations the specialist staff is able to perform the assigned tasks and to recognise and avoid any possible dangers himself.

Instructed persons

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

INFORMATION

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

- be duly qualified,
- follow this operating manual.

In the event of improper use

- there may be a risk to personnel,
- there may be a risk to the mill drill and other material property,
- the proper operation of the mill drill may be affected.



1.7 User's position

The user must stand in front of the mill drill.

1.8 Safety measures during operation

CAUTION!

Risk due to inhaling of health hazardous dusts and mist.

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

Make sure that the generated health hazardous dusts and mist are safely removed at the point of origin and is dissipated 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).



1.9 Safety devices

Use the mill drill only with properly functioning safety devices.

Stop the mill drill 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 mill 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 mill drill. The possible consequences are:

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



The mill drill includes the following safety devices:

- an EMERGENCY-STOP button,
- a protective cover on the drill-mill head,
- a separating protective equipment on the milling spindle.

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.



1.9.1 EMERGENCY STOP button

The EMERGENCY STOP button switches the mill drill off.

☞ „Starting the mill drill“ on page 25

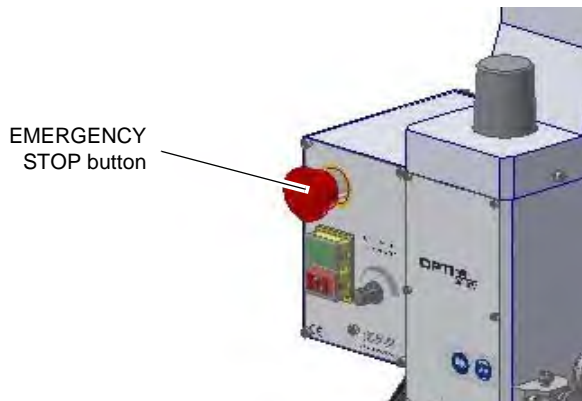


Fig.1-1: EMERGENCY STOP button

ATTENTION!

The EMERGENCY-STOP button switches off the mill drill immediately.

Only press the EMERGENCY-STOP button in case of danger! If the button is actuated in order to stop the mill drill generally you might damage tools or workpieces.



1.9.2 Protective cover

The drill-mill head is fitted with a protective cover.

WARNING!

Remove the protective cover only after the main plug of the drilling-milling machine has been disconnected.

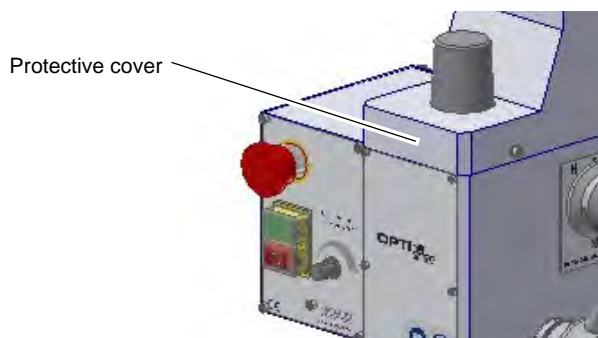


Fig.1-2: Protective cover



1.9.3 Separating protective equipment

Adjust the protective equipment to the correct height before you start working.

To do so, detach the clamping screw, adjust the required height and retighten the clamping screw.

A switch is integrated in the fixture of the spindle protection which monitors that the cover is closed.

INFORMATION

YOU CANNOT START THE MACHINE IF THE DRILL CHUCK PROTECTION IS NOT CLOSED.



Fig. 1-3: Separating protective equipment

1.10 Safety check

Check the mill drill regularly.

Check all safety devices

- before starting work,
- once a week (with permanent operation),
- after every maintenance and repair operation.

General check		
Equipment	Check	OK
Protective covers	Fitted, firmly bolted and not damaged	
Labels, markings	Installed and legible	

Run test		
Equipment	Check	OK
EMERGENCY-STOP button	When the EMERGENCY-STOP button is activated, the mill drill should switch off. A restart will not be possible until the EMERGENCY-STOP button has been unlocked and the ON switch has been activated.	
Separating protective equipment around the drilling and milling spindle	Only switch on the mill drill if the protective equipment is closed.	

1.11 Individual protection gear

For certain work, individual protection gear is required.

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



Use protective gloves when handling pieces with sharp edges.



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



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



Before starting work, make sure that the prescribed individual protection gear is available at the workplace.

CAUTION!

Dirty or contaminated individual protection gear can cause disease.

Clean it after each use and once a week.



1.12 For your own safety during operation

WARNING!

Before activating the mill drill, double check that it will not endanger other personnel or cause damage to equipment.



Avoid unsafe working practices:

- The instructions in this manual must be observed during assembly, handling, maintenance and repair.
- Use protective goggles.
- Turn off the mill drill before measuring the workpiece.
- Do not work on the machine if your concentration is reduced, for example, because you are taking medication.
- Stay by the machine until all rotating parts have come to a halt.
- Use the prescribed protection gear. Make sure to wear a well-fitting work suit and a hair net, if necessary.
- Do not use protective gloves during drilling or milling work.
- Unplug the shockproof plug from the mains before changing the tool.
- Use suitable devices to remove drilling and milling chips.
- Make sure your work does not endanger other personnel.
- Clamp the workpiece tightly before activating the mill drill.

In the description of work on the mill drill we highlight the dangers specific to that work.

1.13 Disconnecting the mill drill

Disconnect the mains plug before beginning any maintenance or repair work.



1.14 Using lifting equipment

WARNING!

Use of unstable lifting equipment and load-suspension devices that break under load can cause very serious injuries or death.

Check that the lifting equipment and load-suspension devices are of sufficient load capacity and 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.

Tighten loads properly.

Never walk under suspended loads!



2 Technical data

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

2.1 Electrical connection	
Motor	0.68 HP, 115V, 1 Ph, 60 Hz
2.2 Drilling-Milling capacity	
Drilling capacity in steel	Ø max. 16mm 5/8"
Milling capacity of end-mill cutter	Ø max. 20mm 3/4"
Milling capacity of inserted-tooth cutter	Ø max. 63mm 2 1/2"
Working radius	175mm 6.89"
2.3 Spindle seat	
Spindle seat	MT2 with 3/8"-16 draw bar
Quill travel	50 mm 2"
2.4 Drill-Mill head	
Swivelling	+ / - 90°
Gearbox stages	2
Z-axis travel	210mm 8 1/4"
2.5 Table	
Table length	400mm 15 3/4"
Table width	120mm 4.72"
Y-axis travel	160mm 6.3"
X-axis travel	220mm 8.66"
T-slot size	10mm 3/8", three
2.6 Dimensions	
Height	795mm 31.3"
Depth	465mm 18.3"
Width	505mm 19.8"
Total weight	60 kg 132 lbs
2.7 Work area	
Height	2000mm 78.7"
Depth	2200mm 86.6"
Width	1500mm 59"
2.8 Speeds	
Gearbox stage slow	100 - 1500 RPM
Gearbox stage fast	200 - 3000 RPM

2.9 Environmental conditions	
Temperature	40 - 95 F
Humidity	25 - 80%
2.10 Operating material	
Gearbox blank steel parts	Mobilgrease OGL 007 or Mobilux EP 004 acid-free oil, e.g. way oil or machine oil.

2.11 Emissions

The noise level (emission) of the mill drill is below 76 dB(A). If the mill drill is installed in an area where various machines are in operation, the acoustic influence (emission) on the operator of the mill drill 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. Furthermore, the degree of noise emission and the degree of noise disturbance are depending on one another it is not possible 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 hearing protection.



2.12 Installation plan BF16 Vario

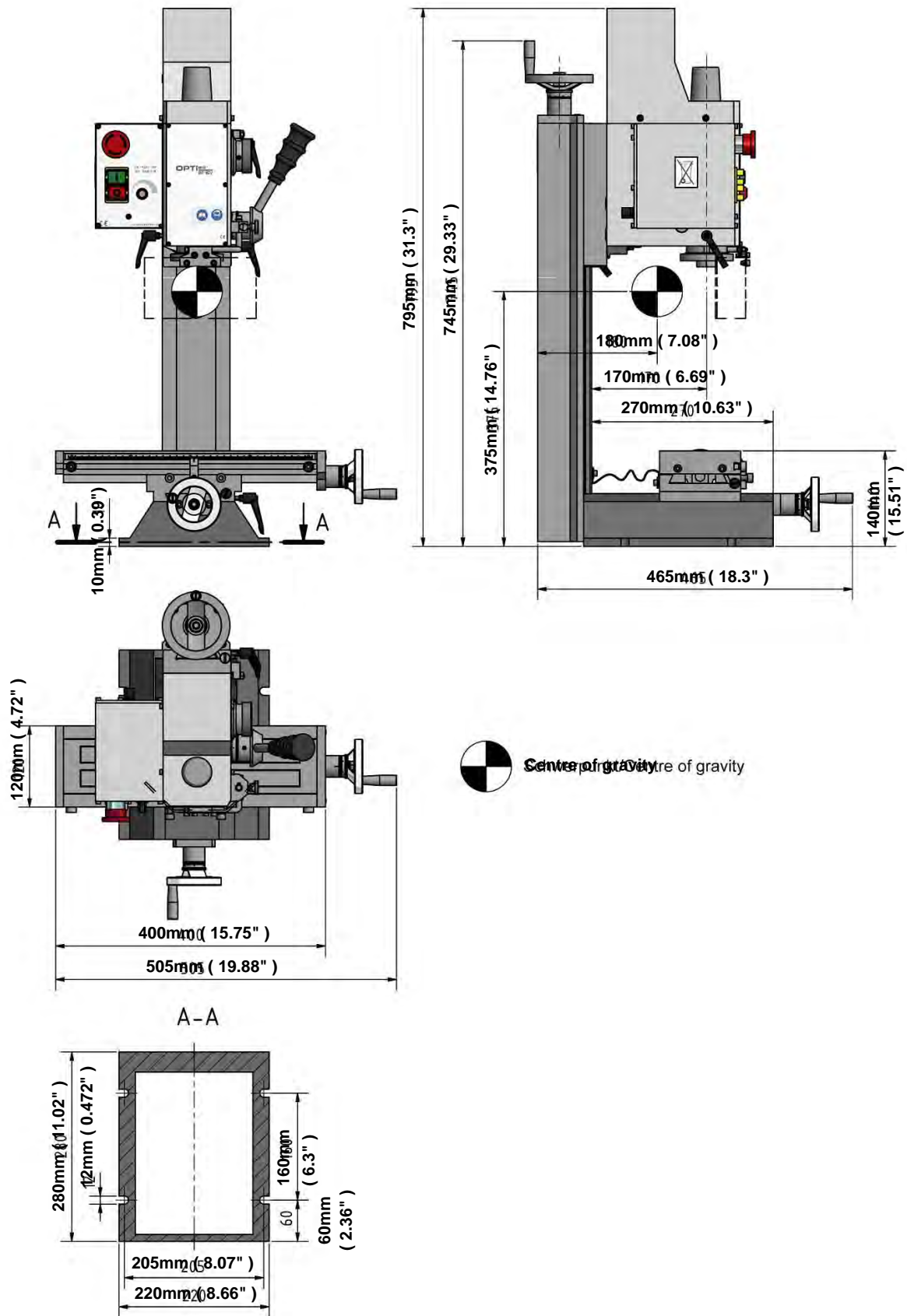


Fig.2-1: Installation plan BF16 Vario

2.13 Installation plan of optional substructure

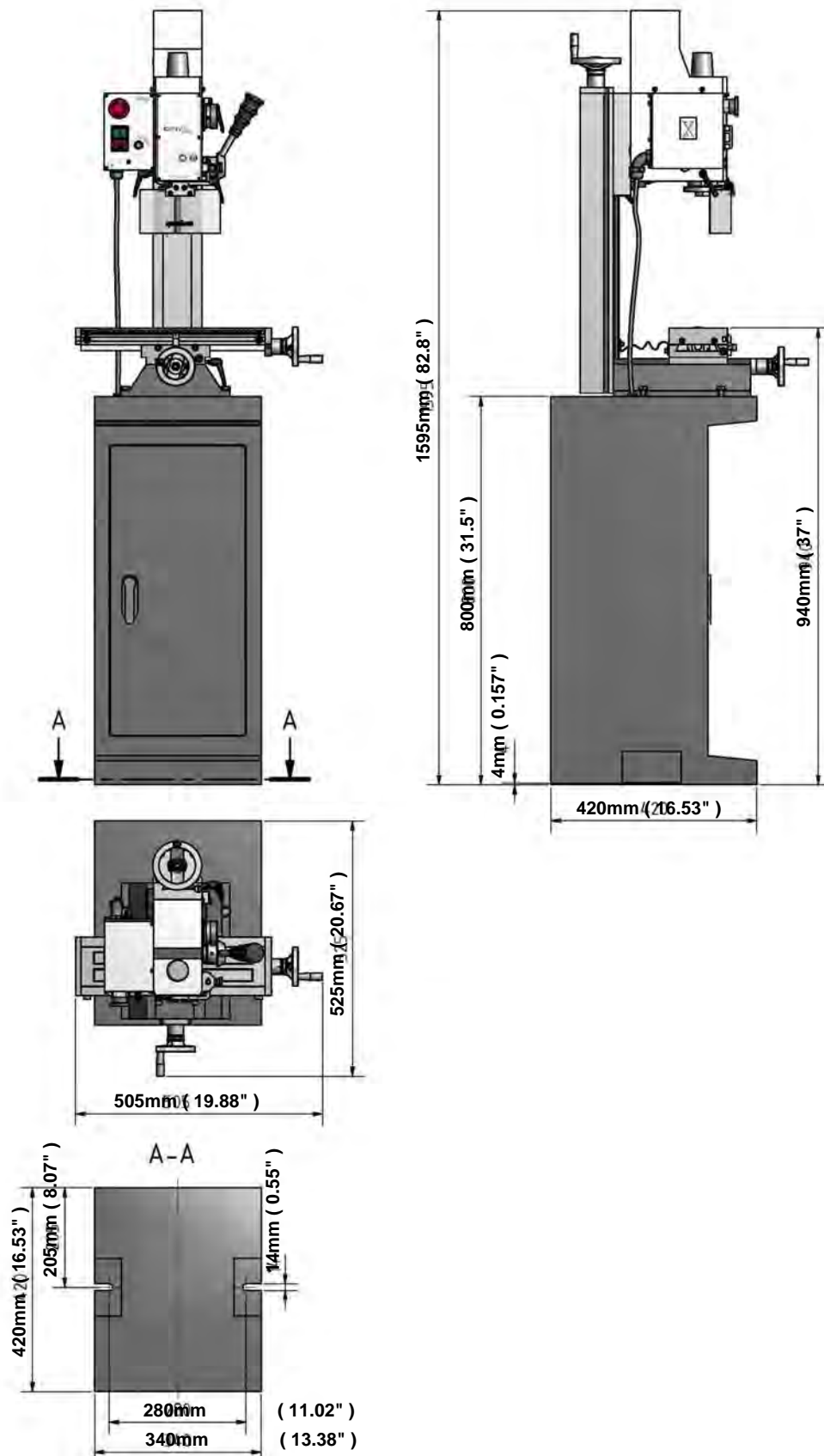


Fig.2-2: stand 3353003

3 Assembly and connection

INFORMATION

The mill drill comes pre-assembled.



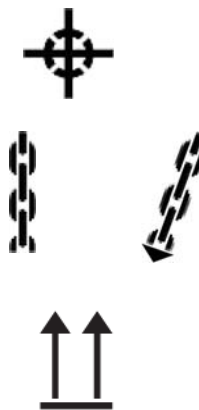
3.1 Extent of supply

When the mill drill is delivered, check immediately that the machine has not been damaged during transport and that all components are included. Also check that no fastening screws have come loose.

Compare the parts supplied with the information on the packaging 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 falling off forklift trucks or other transport vehicles could cause very serious or even fatal injuries. Follow the instructions and information on the transport case.



WARNING!

Use of unstable lifting equipment and load-suspension devices that break under load can cause very serious injury or even death.

Check that the lifting and load-suspension gear has sufficient load capacity and that it is in perfect condition. Observe the rules for preventing accidents issued by OSHA 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
☞ „Environmental 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

3.4 Installation and assembly

3.4.1 Site requirements

Organize the working space around the mill 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 mill 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 personnel.
- 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 main plug of the machine is freely accessible.

- Provide for sufficient illumination (minimum value: 500 lux, measured at the tool tip). In case of little intensity of illumination provide for additional illumination i.e. by a separate work-place illuminator.

INFORMATION

The mains plug of the mill drill has to be freely accessible.



3.4.2 Load suspension point

WARNING!

Danger of crushing and overturning. Proceed with extreme caution when lifting, installing and assembling the machine.



- Secure the load-suspension device around the drill-mill head. Use a lifting sling for this purpose.
- Clamp all the clamping levers at the mill drill before lifting it.
- Make sure that no add-on pieces or varnished parts are damaged due to the load suspension.

3.4.3 Installation

- Check the horizontal orientation of the base of the mill drill with a level.
- Check that the foundation has sufficient floor-load capacity and rigidity.
 - ☞ „Total weight“ on page 16

ATTENTION!

Insufficient rigidity of the foundation leads to the superposition of vibrations between the mill drill and the foundation (natural frequency of components). Insufficient rigidity of the entire milling machine assembly also rapidly causes the machine to reach critical speeds, with unpleasant vibrations, leading to bad milling results.



- Position the mill drill on the intended foundation.
- Attach the mill drill using the provided recesses in the machine base.

☞ „Installation plan BF16 Vario“ on page 18.

3.5 First use

ATTENTION

Before you begin with the commissioning on the machines check that all screws, fasteners and fuses are tight. If necessary they must be tightened.



WARNING!

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



Only use the clamping materials which had been delivered together with the machine or as optional equipment offered by your agent.

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

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

WARNING!

Staff and equipment may be endangered if the mill drill is first used by inexperienced personnel.



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

☞ „Qualification of personnel“ on page 10.

3.5.1 Power supply

- Connect the electrical supply cable.
- Check the fuse protection (fuse) of your electrical supply according to the technical specifications for the total connected load of the mill drill.

3.5.2 Cleaning and lubricating

- Remove the anticorrosive agent applied on the mill drill for transport and storage purposes. We recommend the use of WD40 oil.
- Do not use any solvents, thinners or other cleaning agents which could corrode the varnish on the mill drill. Follow the specifications of the manufacturer of the cleaning agent.
- Lubricate all bright machine parts with non-corrosive lubricating oil.
- Grease the mill drill according to the lubrication chart.
☞ „Inspection and maintenance“ on page 32
- Check smooth running of all spindles.
- Connect the electrical power cable (shockproof plug).

Cleaning the machine

3.5.3 Warming up the machine

ATTENTION!

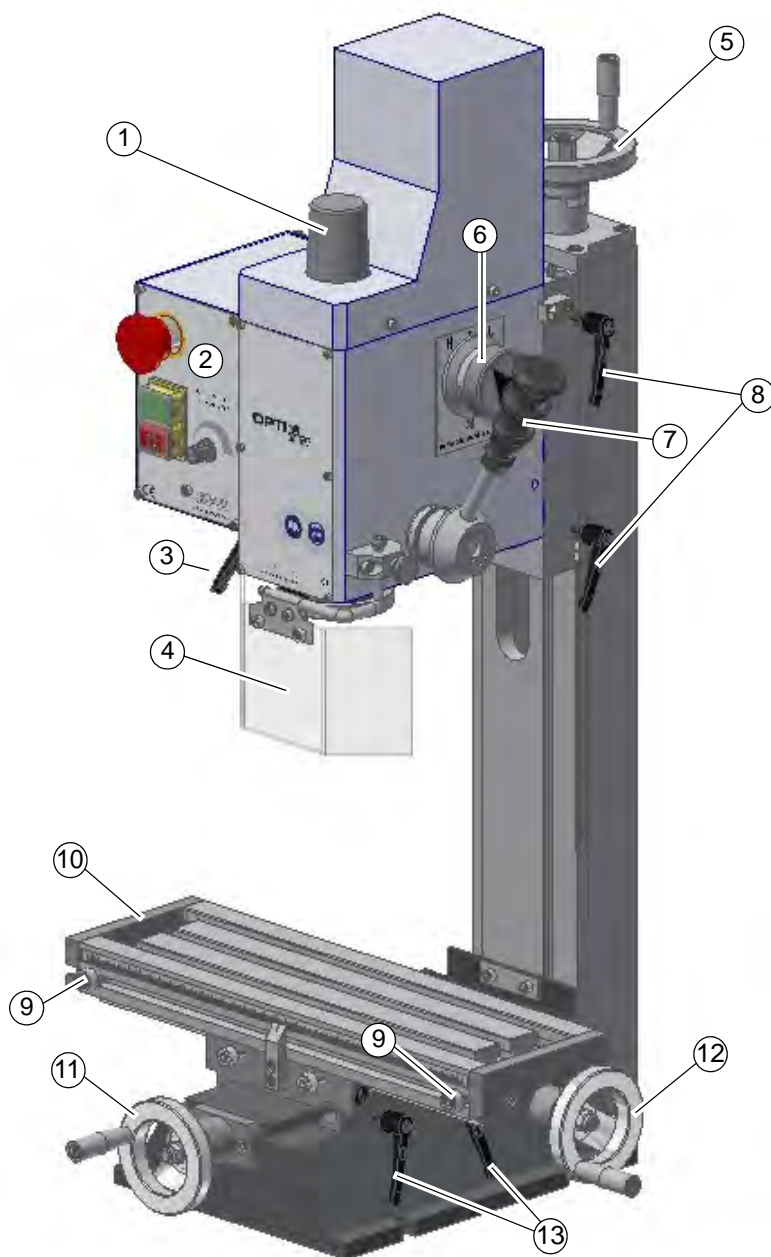
If the mill drill and in particular the milling spindle is immediately operated at maximum load when it is cold it may result in damages.

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



4 Operation

4.1 Control and indicating elements



Pos.	Designation	Pos.	Designation
1	Cover of draw bar	2	Control panel
3	Clamping lever of spindle quill	4	Spindle protection
5	Crank handle drill-mill head	6	Selector switch for gearbox stage
7	Spindle sleeve feed	8	Clamping lever drill-mill head
9	Adjustable stops	10	Table
11	Crank handle cross slide	12	Crank handle longitudinal slide
13	Clamping lever		

4.2 Safety

Use the mill drill only under the following conditions:

- The mill drill is in proper working order.
- The mill drill is used as prescribed.
- The operating manual is followed.
- All safety devices are installed and activated.

All anomalies should be eliminated immediately. Stop the mill drill immediately in the event of any anomaly in operation and make sure it cannot be started up accidentally or without authorization.

☞ „For your own safety during operation“ on page 14.



4.3 Starting the mill drill

By pressing the green button, the machine is switched on.

By pressing the red button, the machine is switched off.

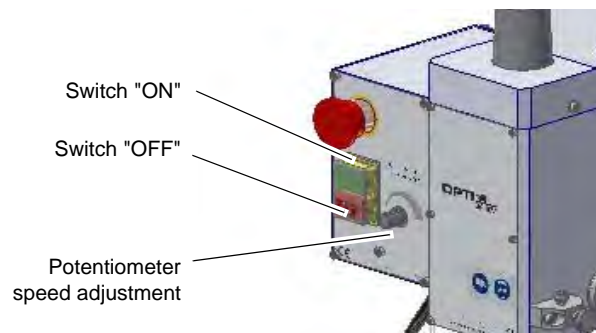


Fig. 4-1: Control panel

The electrical system controls slowly the speed with a ramp to the set value. Wait a little while before you continue with the feed when milling or drilling.

4.4 Inserting tool

The mill head is equipped with an MT 2 seat and draw bar with 3/8"-16 threads.

CAUTION!

When milling operations are performed the cutting tool must always be secured with draw bar. All cutting tools connections with the taper bore of the work spindle without using the draw bar is not allowed for milling operations. If the draw bar is not used, cutting tool may disengage from spindle seat causing personal injury.

In the work spindle you may only use tool holding fixtures and clamping tools with morse taper MT2 and internal screw thread 3/8"-16 for an interlocking fixture. Use of reducing bushings is not allowed.

- ➔ Remove draw bar cover. There is no need to disassemble the motor cover completely.
- ➔ Clean the Morse taper in the spindle end.
- ➔ Clean the taper mandrel of your tool.

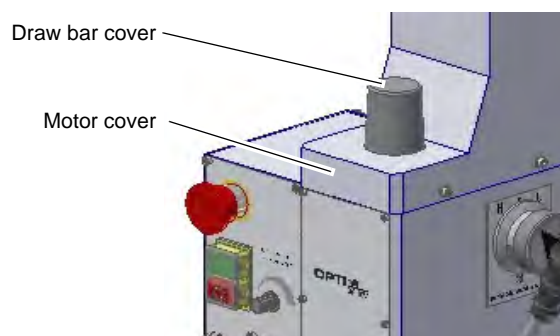


Fig. 4-2: Drill-mill head

- ➔ Press the taper mandrel into the spindle Morse taper seat. If the taper mandrel does not hold by itself, either the taper mandrel or the spindle seat may have not been thoroughly cleaned from grease and debris.




- Use the draw bar supplied with the machine.
 - Hexagon socket spanner for draw bar.
 - Open box wrench for draw bar nut.
- Screw in draw bar into the tool holder mandrel.
- Fully tighten the draw bar using hexagon socket spanner or suitable wrench.
- To extract the tool from the spindle, unscrew the draw bar until tool becomes loose or tool holder is pushed out from the spindle seat.

4.4.1 Use of collet chucks

When using collet chucks for the reception of milling tools, a higher operation tolerance is possible. The exchange of the collet chucks for a smaller or larger end mill cutter is performed simply and rapidly and the disassembly of the complete tool is not required. The work spindle is equipped with a surface for the hold-up with a fork wrench to unfasten the swivel nut of the collet chuck retainer. The collet chuck is pressed into the ring of the swivel nut and must hold there by itself. By fastening the swivel nut on the tool the milling cutter is clamped.

Make sure that the correct collet chuck is used for each milling cutter diameter, so that the milling cutter may be fastened securely and firmly.

4.4.2 Direct clamping into the work spindle

Tools or collet chucks with a taper shank MT2 may be clamped directly into the work spindle. For mounting these tools, proceed as described under  „Inserting tool“ on page 25. Make sure that the tool is clamped with the draw bar.

4.5 Changing the speed range

ATTENTION!

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

- Turn the gear switch in the position "H" for a speed range of 200 - 3000 RPM.
- Turn the gear switch into the position "L" for a speed range of 100 - 1500 RPM.

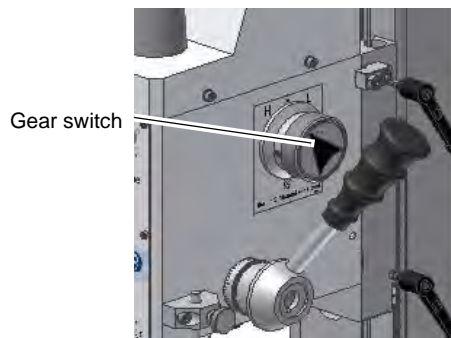


Fig. 4-3: Drill-mill head

- Adjust the speed with the potentiometer.

4.5.1 Selecting the speed

For milling operations, the essential factor is the selection of the correct speed. The speed determines the cutting speed of the cutting edges which cut the material. By selecting the correct cutting speed, the service life of the tool is increased and the working result is optimized.

The company cutting speed mainly depends on the workpiece material and on the material of the tool. With tools (milling cutters) made of hard metal or ceramic insert it is possible to work at higher speeds than with tools made of high-alloyed high-speed steel (HSS). You will achieve the correct cutting speed by selecting the correct speed.

In order to determine the correct cutting speed for your tool and for the material to be cut, you may refer to the following standard values or a table reference book (e.g. Machinery's Handbook ISBN 0-8311-2424-5, Insert Pgs. 30a & 30b (attached)).

The required speed is calculated as follows:

$$\text{RPM} = (12 \times \text{FPM}) / (3.14 \times \text{Diameter}) = 3.82 \times \text{FPM} / \text{Diameter}$$

4.5.2 Standards values for cutting speeds

[FPM] with high-speed steel and hard metal in conventional milling

Tool	Steel	Grey Cast Iron	Age- Hardened Al alloy
Peripheral and side milling (FPM)	33 - 82	33 - 72	492 - 1,148
Relieved form cutters (FPM)	49 - 79	33 - 66	492 - 820
Inserted tooth cutter with SS (FPM)	49 - 79	39 - 82	656 - 984
Inserted tooth cutter with HM (FPM)	328 - 656	98 - 328	984 - 1,312

Given below are standard values for speeds depending on the milling cutter diameter, cutter type and material.

Tool diameter (in.) Peripheral and side milling cutters	Steel	Grey Cast Iron	Age-Hardened Al alloy
	33 - 82 FPM	33 - 72 FPM	492 - 1,148 FPM
	Speed (RPM)		
1.378"	91 - 227	91 - 200	1,365 - 3,185
1.575"	80 - 199	80 - 175	1,195 - 2,790
1.772"	71 - 177	71 - 156	1,062 - 2,470
1.969"	64 - 159	64 - 140	955 - 2,230
2.165"	58 - 145	58 - 127	870 - 2,027
2.362"	53 - 133	53 - 117	795 - 1,860
2.559"	49 - 122	49 - 108	735 - 1,715

Tool diameter (in.) Form cutters	Steel	Grey Cast Iron	Age-Hardened Al alloy
	49 - 79 FPM	33 - 66 FPM	492 - 820 FPM
	Speed (RPM)		
0.1575"	1,194 - 1,911	796 - 1,592	11,900 - 19,000

0.1969"	955 - 1,529	637 - 1,274	9,550 - 15,900
0.2362"	796 - 1,274	531 - 1,062	7,900 - 13,200
0.3150"	597 - 955	398 - 796	5,900 - 9,900
0.3937"	478 - 764	318 - 637	4,700 - 7,900
0.4724"	398 - 637	265 - 531	3,900 - 6,600
0.5512"	341 - 546	227 - 455	3,400 - 5,600
0.6299"	299 - 478	199 - 398	2,900 - 4,900

4.5.3 Standard values for speeds with HSS – Eco – twist drilling (U.S. unit)

Material		Cutter Diameter (in.)									Coolant ³
		0,0787	0,1181	0,1575	0,1969	0,2362	0,2756	0,3150	0,3543	0,3937	
Steel, unalloyed, up to 87,000 PSI	n ¹	5.600	3.550	2.800	2.240	2.000	1.600	1.400	1.250	1.120	E
	f ²	0,0016	0,0025	0,0031	0,0039	0,0049	0,0049	0,0063	0,0063	0,0079	
Structural steel, alloyed, quenched and subse-drawn, up to 130,000 PSI	n	3.150	2.000	1.600	1.250	1.000	900	800	710	630	E/Oil
	f	0,0013	0,002	0,0025	0,0031	0,0039	0,0039	0,0049	0,0049	0,0063	
Structural steel, alloyed, quenched and subse-drawn, up to 174,000 PSI	n	2.500	1.600	1.250	1.000	800	710	630	560	500	Oil
	f	0,0013	0,0016	0,0020	0,0025	0,0031	0,0039	0,0039	0,0049	0,0049	
Stainless steels up to 130,000 PSI e.g., X5CrNi18 10	n	2.000	1.250	1.000	800	630	500	500	400	400	Oil
	f	0,0013	0,0020	0,0025	0,0031	0,0039	0,0039	0,0049	0,0049	0,0063	

1: Speed (n) in RPM

2: Feed Rate (f) in./rev.

3: Coolant: E = Emulsion; Oil = Cutting oil

- The data given above are standard values. In some cases it may be advantageous to increase or decrease these values.
- When drilling, a cooling or lubricating agent should be used.....
- For stainless materials (e.g., VA or NIRO steel sheets) do not center punch because the material might compact and the drill bit will become dull rapidly.
- The workpieces need to be held firmly (using vise, screw clamp, etc.).

INFORMATION

Friction during the cutting process causes high temperatures at the cutting edge of the tool. The tool should be cooled during the milling process. Cooling the tool with a suitable cooling lubricant ensures better working results and a longer edge life of the cutting tool.



INFORMATION

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



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



4.6 Clamping the workpieces

CAUTION!

Injury by flying off parts.

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.



☞ „If the machine is cold such as e.g. directly after having transported the machine it should be warmed up at a spindle speed of only 500 RPM for the first 30 minutes.“ on page 23

4.7 Swivelling the drill-mill head

The drill-mill head may be swiveled 90° to the right and to the left.

CAUTION!

The drill head may tilt to the right or to the left on its own after loosening a screw. Proceed with extreme caution when loosening the clamping joints.

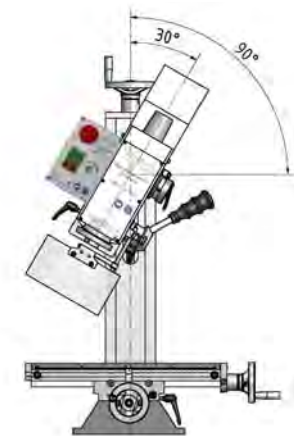


Fig. 4-4: Swivelling the drill-mill head

- Loosen or unscrew the nut of the guide screw.
- Hold the drill-mill head. Loosen the clamping screw. Swivel the drill-mill head into the desired position.
- Retighten the guide and clamping screw.

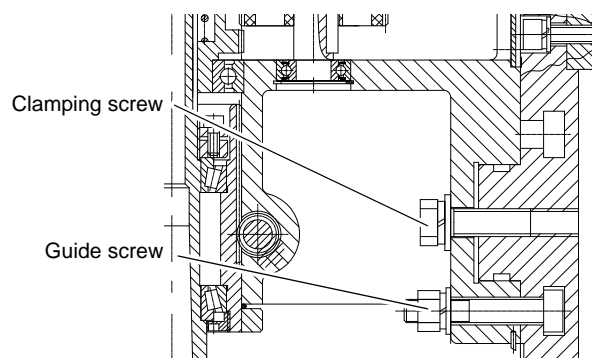


Fig. 4-5: Clamping screw, guide screw

4.8 Offset the drill-mill head

The upright of the drill-mill head may be offset to the right or to the left.

Use the offsetting possibility if the drill-mill head is swivelled to the left or to the right for machining purposes.

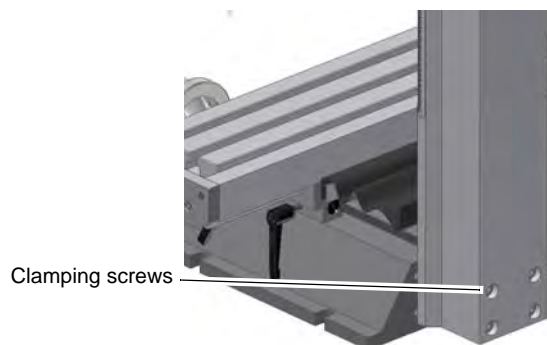


Fig. 4-6: BF 16 Varío

4.9 Clamping levers

The mill drill is equipped with clamping levers and clamping screws for the respective movement axes.

ATTENTION!

Use the clamping levers for locking the position of the axes during drilling or milling operation.

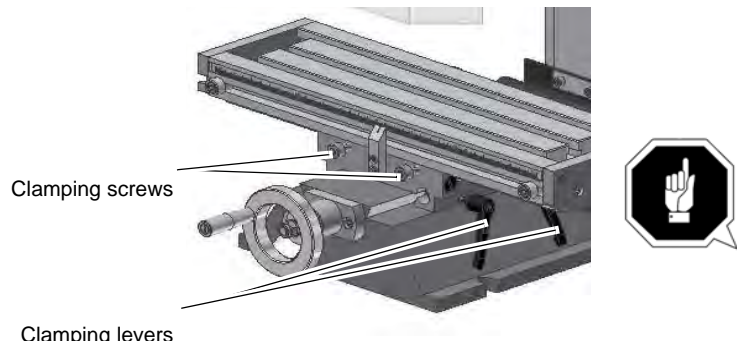


Fig.4-7: Clamping spots of the table

4.10 End stops

The table is fitted with two adjustable end stops.

Use the end stops for limiting the travel in order to warranty the exact repeatability when manufacturing various identical components.

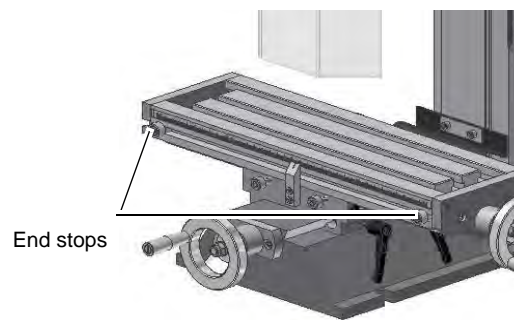


Fig.4-8: End stops X-axis

5 Maintenance

In this chapter you will find important information about

- inspection
- maintenance
- repair

of the mill drill.

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

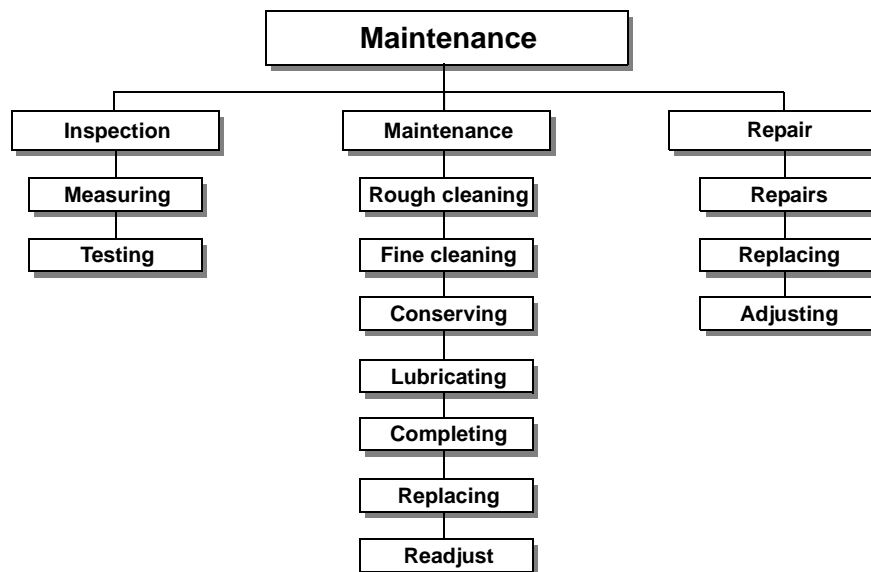


Fig.5-1: Maintenance – tasks

ATTENTION!

Properly performed regular maintenance is an essential prerequisite for

- safe operation,
- faulty-free operation,
- a long service life of the mill drill and
- the quality of the products you manufacture.

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

5.1 Safety

WARNING!

The consequences of incorrect maintenance and repair work may include:

- very serious injury to personnel working on the mill drill,
- damage to the mill drill.

Only qualified staff should carry out maintenance and repair work on the mill drill.

5.1.1 Preparation

WARNING!

Always disconnect mill drill from main power supply when performing maintenance or repair.

☞ „Disconnecting the mill drill“ on page 14

Position a warning sign.



5.1.2 Restarting

Before restarting, run a safety check.

☞ „Safety check“ on page 13

5.2 Inspection and maintenance

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

Interval	Where?	What?	How?
Start of work, after each maintenance or repair oper- ation	Mill Drill	☞ „Individual protection gear“ on page 14	
Start of work, after each maintenance or repair oper- ation	Dovetail slideways	Lubricate	→ Lubricate all slideways.
weekly	table	Lubricate	→ Lubricate all blank steelparts. Use acid-free oil, for example machine oil or way oil.
as required	spindle nuts	Re-adjust	An increased clearance in the spindles of the table can be reduced by re-adjusting the spindle nuts. See spindle nuts on position 66 and 71 ☞ „Spare parts BF16 Vario“ on page 34 The spindle nuts are re-adjusted by reducing the flank of screw thread of the spindle nut with an adjusting screw. By re-adjusting a smooth running move over the whole toolpath is to be assured, otherwise the wear by friction between spindle nut / spindle would increase considerably.
every six months	Geared drill-mill head	Grease	→ Swivel the drill-mill head completely to the right (90°) as described under ☞ „Swivelling the drill-mill head“ on page 29. → Detach the cover plate on the rear side. → Lubricate the gearwheels. ☞ „Operating material“ on page 17

INFORMATION!

The spindle bearing arrangement is continuously lubricated. It is not required to relubricate it.



5.3 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 C.H.HANSON at 1-630-785-6437

Company and C.H.HANSON are not liable for, nor do they warranty 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 company, or its authorized agent.

6 Spare parts BF16 Vario

6.1 Milling head

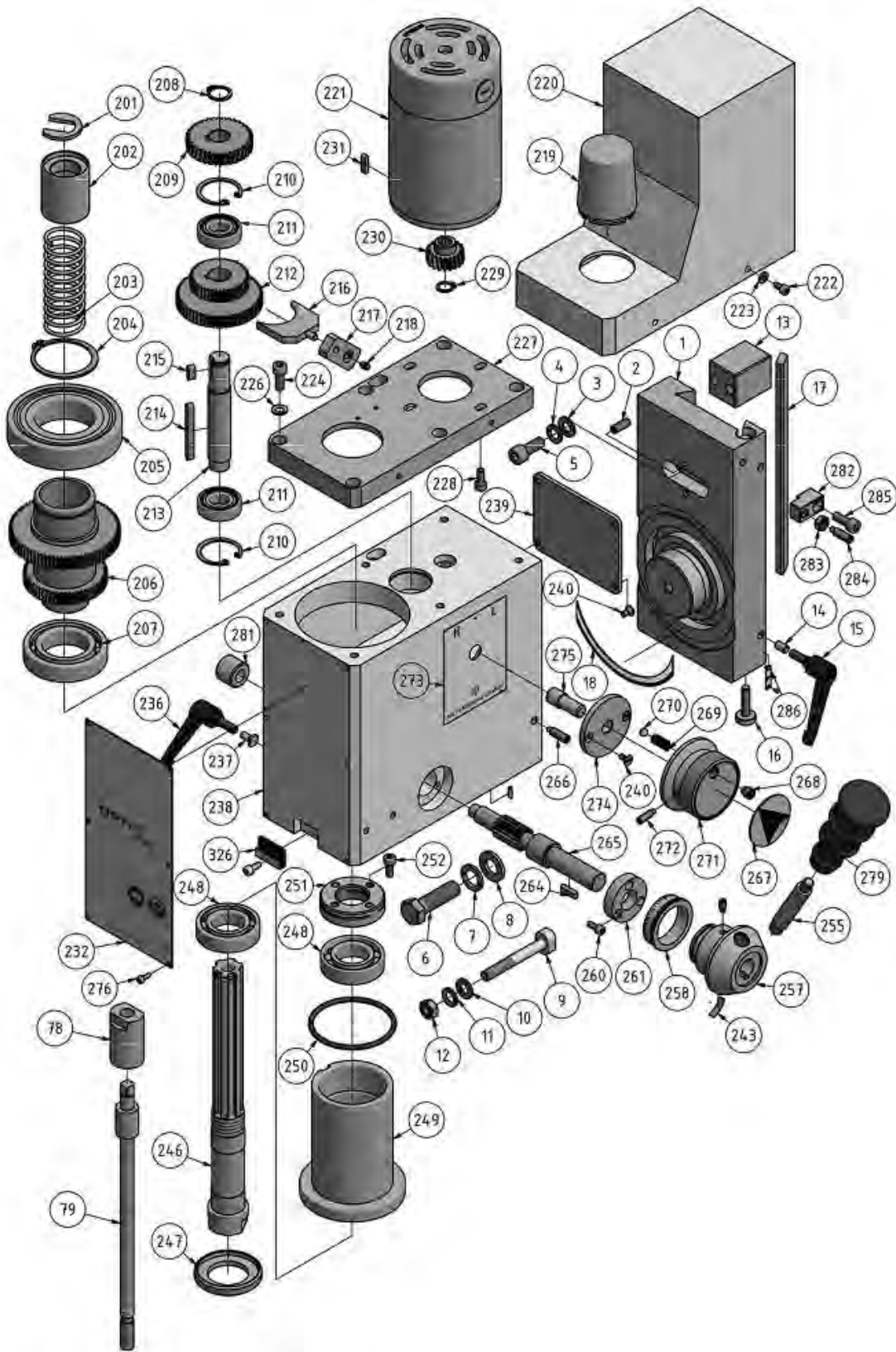


Fig.6-1: Milling head

6.2 Column

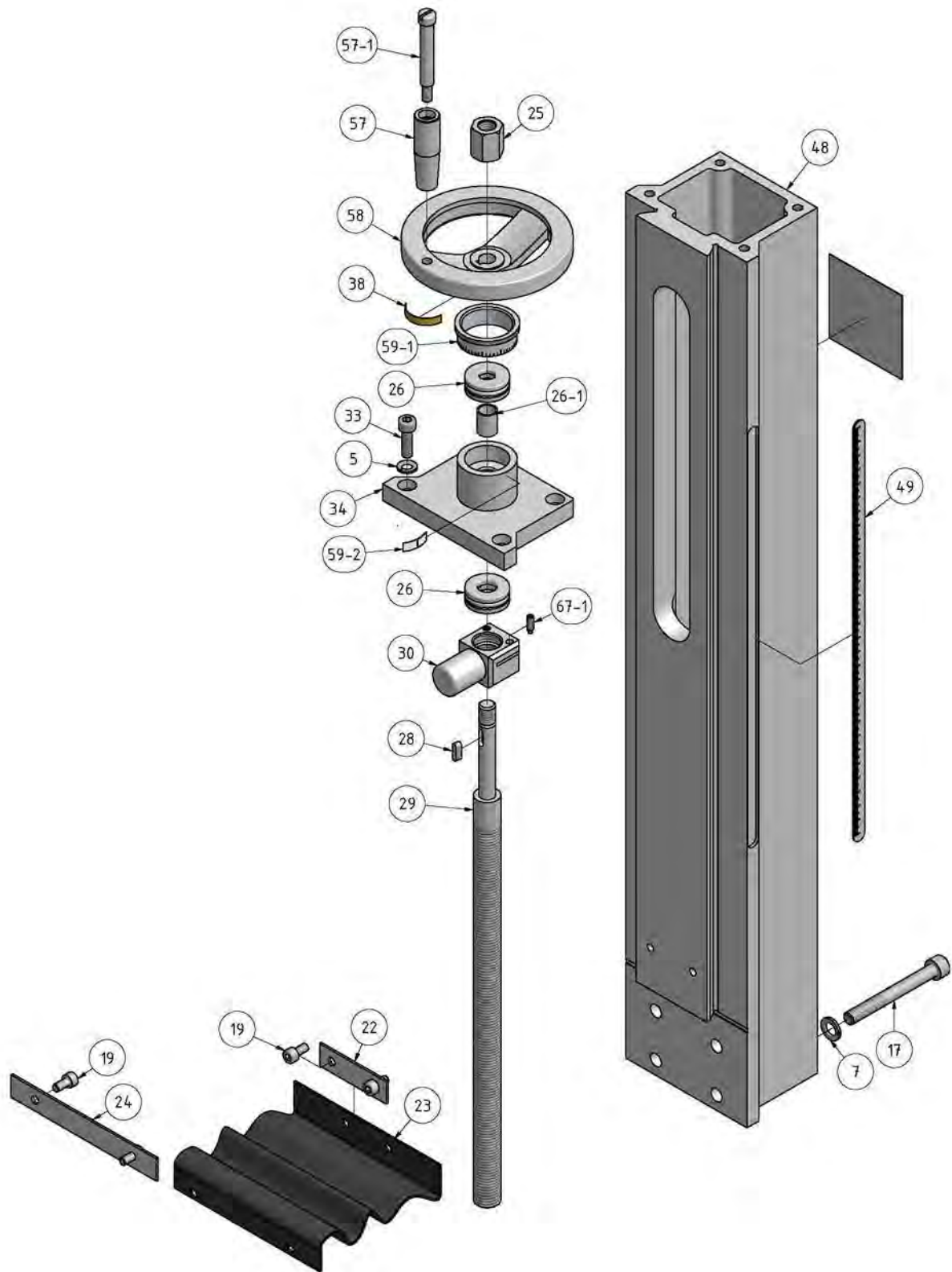


Fig.6-2: column

6.3 Table

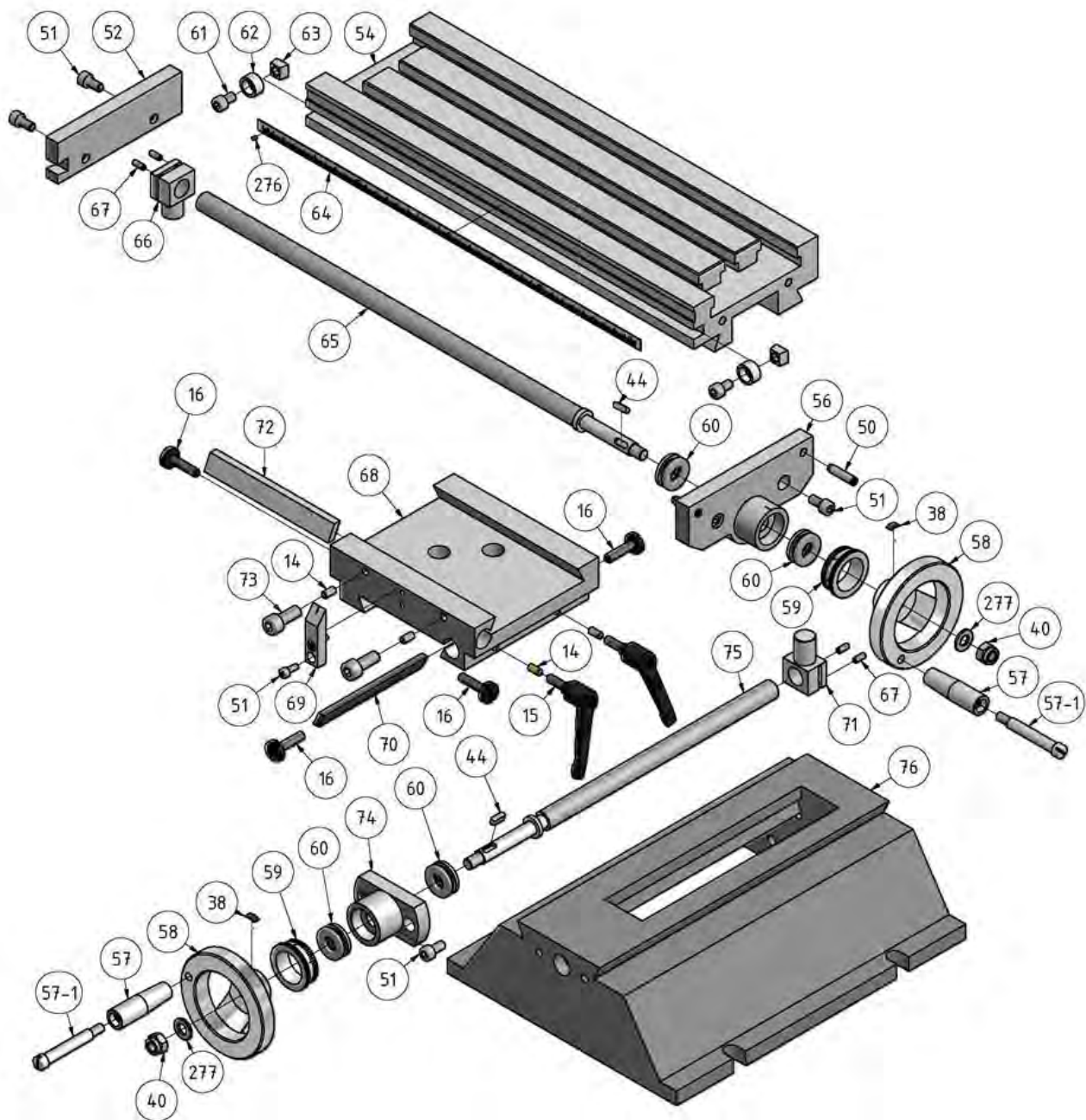


Fig.6-3: table

6.4 Switch box

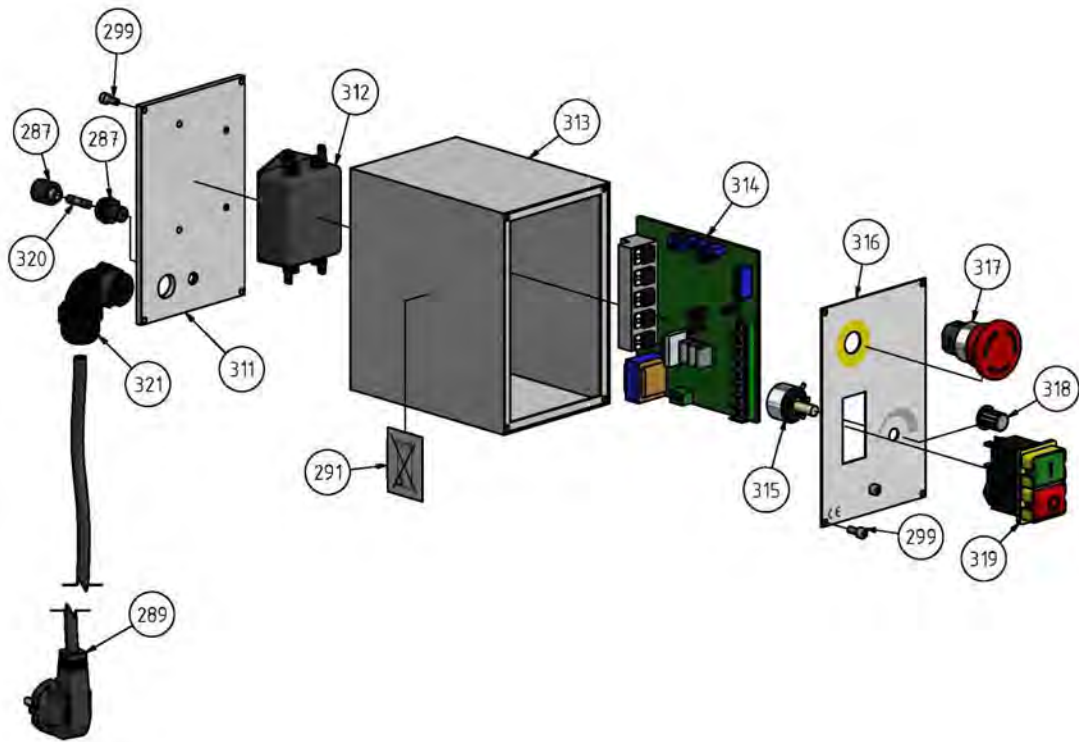


Fig.6-4: switch box

6.5 Milling chuck protection, type one

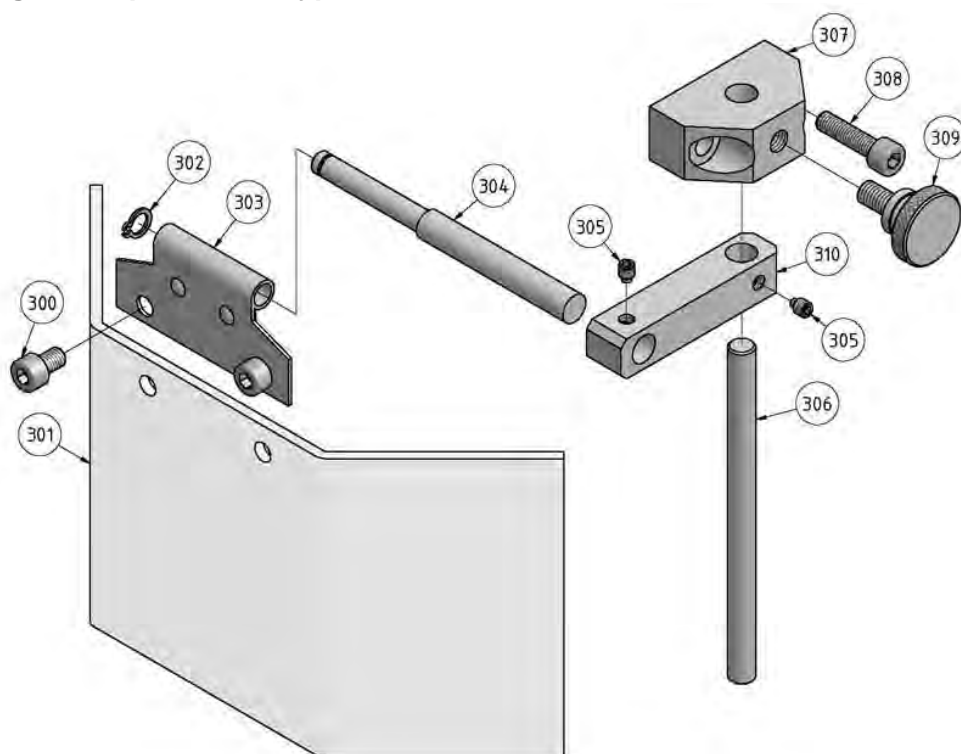


Fig.6-5: milling chuck protection, type one

6.6 Milling chuck protection, type two

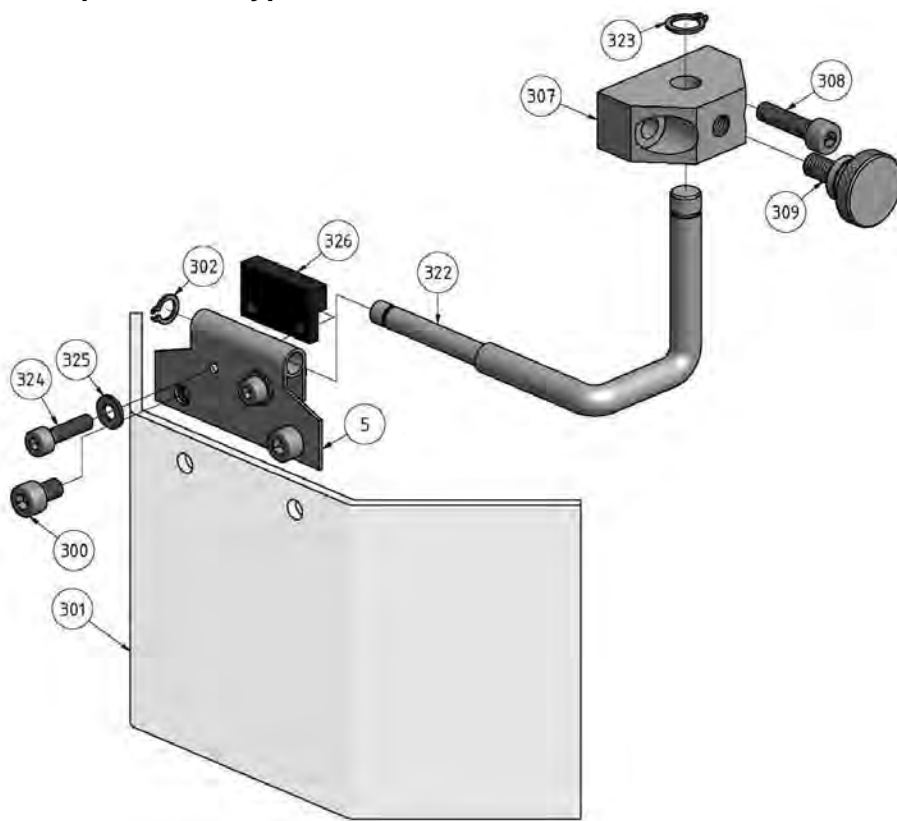


Fig.6-6: milling chuck protection, type two

6.6.1 Spare parts list

Pos.	Description	Qty.	Size	Item no.
1	Connect board	1		0333811601
2	Locking screw	2	M6x16	
3	Washer	2		0333811603
4	Spring washer	6	8	
5	Hexagon socket screw	2	M8x25	
6	Screw	1	M12x40	
7	Spring washer	5	12	
8	Washer	1	12	
9	Screw	1		0333811609
10	Washer	1	10	
11	Spring washer	1	10	
12	Nut	1	M10	
13	Guide piece	1		0333811613
14	Brass pin	5		0333811614
15	Clamping lever	3	DM6x16	0333811615
16	Slotted haed screw	1		0333811616
17	Gib	1		0333811617
18	Angle scale	1		0333811618
19	Hexagon socket screw	12	M5x10	
20	Bellows	1		0333811620
21	Nut	2	M5	
22	Fixing of bellows	1		0333811622
23	Rubber chip cover	1		0333811623
24	Gib	1		0333811624
25	Nut	2	M16x1.5	
26	Bearing	2	51200	04051200
26-1	Bushing	1		03338116261
27	Tapered toothed wheel	1		0333811627
28	Feather key	2	4x16	0333811628
29	Spindle Z-axis	1	inch	0333811629-inch
30	Spindle nut Z-axis	1	inch	0333811630-inch
31	Washer	4	5	
32	Cover cap	1		0333811632
33	Hexagon socket screw	4	M8x20	
34	Cover plate column	1		0333811634
35	Bearing cover	1		0333811635
36	Hexagon socket screw	7	M5x12	
37	Scale ring	1		0333811637
38	Spring piece	4		0333811638
39	Handwheel	1		0333811639
40	Counternut	4		0333811640
44	Key	2	4x12	0333811644
48	Column	1		0333811645
49	Scale Z-axis	1	inch	0333811649-inch
50	Tapered pin	1	A5x25	0333811650
51	Hexagon socket screw	12	M6x16	
52	Bearing block x-axis	1		0333811652
53	Seal	2		0333811653
54	Milling table	1		0333811654
56	Bearing block x-axis	1		0333811656
57	Handle	3	M8x63	0333811657
57-1	Screw	1		03338116571
58	Handwheel	3		0333811658
59	Scale ring	3	inch	0333811659-inch
59-1	Scale ring	1	inch	03338116591-inch
59-2	Scale	1		03338116592
60	Bearing	5	51100	04051100
61	Hexagon socket screw	2	M6x10	
62	Bushing	2		0333811662
63	Sliding block	1		0333811663
64	Scale X-axis	1	inch	0333811664-inch
65	Spindle X-axis	1	inch	0333811665-inch
66	Spindle nut X-axis	1	inch	0333811666-inch
67	Hexagon socket screw	4	M4x20	
67-1	Grub screw	2	ISO 4028/M4x12	
68	Guide table	1		0333811668
69	Limit stop x-axis	1		0333811669

Pos.	Description	Qty.	Size	Item no.
70	Gib	1		0333811670
71	Spindle nut Y-axis	1	inch	0333811671-inch
72	Gib	1		0333811672
73	Hexagon socket screw	2	M6x25	
74	Bearing block	1		0333811674
75	Spindle Y-axis	1	inch	0333811675-inch
76	Machine base	1		0333811676
77	Hexagon socket screw	4	M12x90	
78	Bushing	1		0333811678
79	Screw rod	1	inch	0333811679-inch
201	Position disc	1		03338116201
202	Bushing	1		03338116202
203	Tension spring	1	2.5x28x110-3	03338116203
204	Circlip	1	45	03338116204
205	Ball bearing	1	6209-2RZ	0406209.2R
206	Gear	1	Z60/Z80	03338116206
207	Ball bearing	1	7007AC	0407007.2R
208	Circlip	1	15	03338116208
209	Gear	1	(Z46)	03338116209
210	Circlip	2	32	03338116210
211	Ball bearing	2	6002-2RZ	0406002.2R
212	Gear	1	(Z42/Z62)	03338116212
213	Shaft	1		03338116213
214	Key	1	5x50	03338116214
215	Key	1	C5x12	03338116215
216	Gearshift fork	1		03338116216
217	Arm gearshift fork	1		03338116217
218	Screw	1	M5x8	
219	Cap cover	1		03338116219
220	Motor cover	1		03338116220
221	Motor 115V DC	1	DC motor	03338116221-115V
222	Hexagon socket screw	6	M4x8	
223	Washer	6	4	
224	Hexagon socket screw	6	M6x14	
226	Washer	6	6	
227	Milling head casing cover	1		03338116227
228	Hexagon socket screw	6	M5x12	
229	C-Circlip	1	10	03338116229
230	Gear	1	(Z25)	03338116230
231	Key	1	C4x16	03338116231
232	Front label BF16-US	1	US front label	03338116232-US
236	Clamping lever	1	DM8x20	03338116236
237	Brass pin	1		03338116237
238	Housing milling head	1		03338116238
239	Cover	1		03338116239
240	Countersunk head screw	6	M4x8	
243	Spring piece	2		03338116243
246	Spindle	1		03338116246
247	Spindle nut	1		03338116247
248	Ball bearing	2	7005AC/P5	0407005.2R
249	Pinole	1		03338116249
250	O-ring	1	58x2.65	03338116250
251	Clamping nut	1		03338116251
252	Hexagon socket screw	1	DIN 4762/M5x12	
255	Handle lever	1		03338116255
257	Hub	1		03338116257
258	Scale ring	1	inch	03338116258-inch
260	Hexagon socket screw	3	M4x10	
261	Cover pane	1		03338116261
264	Key	1	4x12	03338116264
265	Pinion shaft	1		03338116265
266	Locking screw	1	M6x20	
267	Indicator	1		03338116267
268	Locking screw	1	M8x8	
269	Spring	1	0.8x5x25-3	03338116269
270	Steel bal	1	6.5	03338116270
271	Rotary selector	1	12x50	03338116271
272	Locking screw	1	M5x16	
274	Retainer disc	1		03338116274
275	Shaft	1		03338116275

Pos.	Description	Qty.	Size	Item no.
276	Rivet	4		
277	Washer	2	DIN 125/8	
279	Knob	1		03338116278
280	Grub screw	2	DIN4028/M5x10	
281	Bushing	1		03338116281
282	Guide piece	1		03338116282
283	Hexagon nut	2	ISO 4032/ M6	
284	Grub screw	2	ISO 4028/M6x20	
285	Hexagon socket screw	2	DIN 4762/M6x16	
286	Scale	1		03338116286
287	Housing fuse cpl.	2		03338116287
288	Fuse	2		03338120F1
289	Connecting cable	1	US plug	03338116289-US
290	Cover	1		03338116290
292	Housing switch cabinet	1		03338116292
293	Control board	1		03338120Q1.6
294	Line filter	1		03338116294
295	Potentiometer	1		03338120R1.5
296	label switch cabinet	1		03338116296
297	Knob	1		03338420301
298	On-Off switch with EMERGENCY STOP function	1		0320299
299	Hexagon socket screw	12	DIN 4762/M4x10	
300	Hexagon socket screw	2	DIN 4762/M5x8	
301	Milling chuck protection	1		03338116301
302	Retaining ring	1	DIN 471/6	
303	Bracket	1		03338116303
304	Shaft	1		03338116304
305	Grub screw	2	ISO 4028/M4x5	
306	Rod	1		03338116306
307	Holder	1		03338116307
308	Hexagon socket screw	2	DIN 4762/M5x20	
309	Locking screw	1		03338116309
310	Guide piece	1		03338116310
	Accessory box cpl.	1		0333811600
311	Plate	1		03338116311
312	Line filter	1		03338116312
313	Housing	1		03338116313
314	Control board	1	115V – 60Hz	03338116314-60Hz
315	Potentiometer	1	4K7	03338120R1.5
316	Switch box label BF16-US	1	US switch box label	03338116316-US
317	Emergency stop button	1		03338120S1.2
318	Knob	1		03338120301
319	On-Off switch	1	KJD17B/120V	0342025108-120V
320	Fuse	1	20AL 250VAC	03338116320-60Hz
321	Cord grip	1		03338116321
322	Bracket	1		03338116322
323	Retaining ring	1		03338116323
324	Hexagon socket screw	2		03338116324
325	Washer	2		03338116325
326	Reedkontakt cpl.	1		0302024192

6.7 Wiring diagram

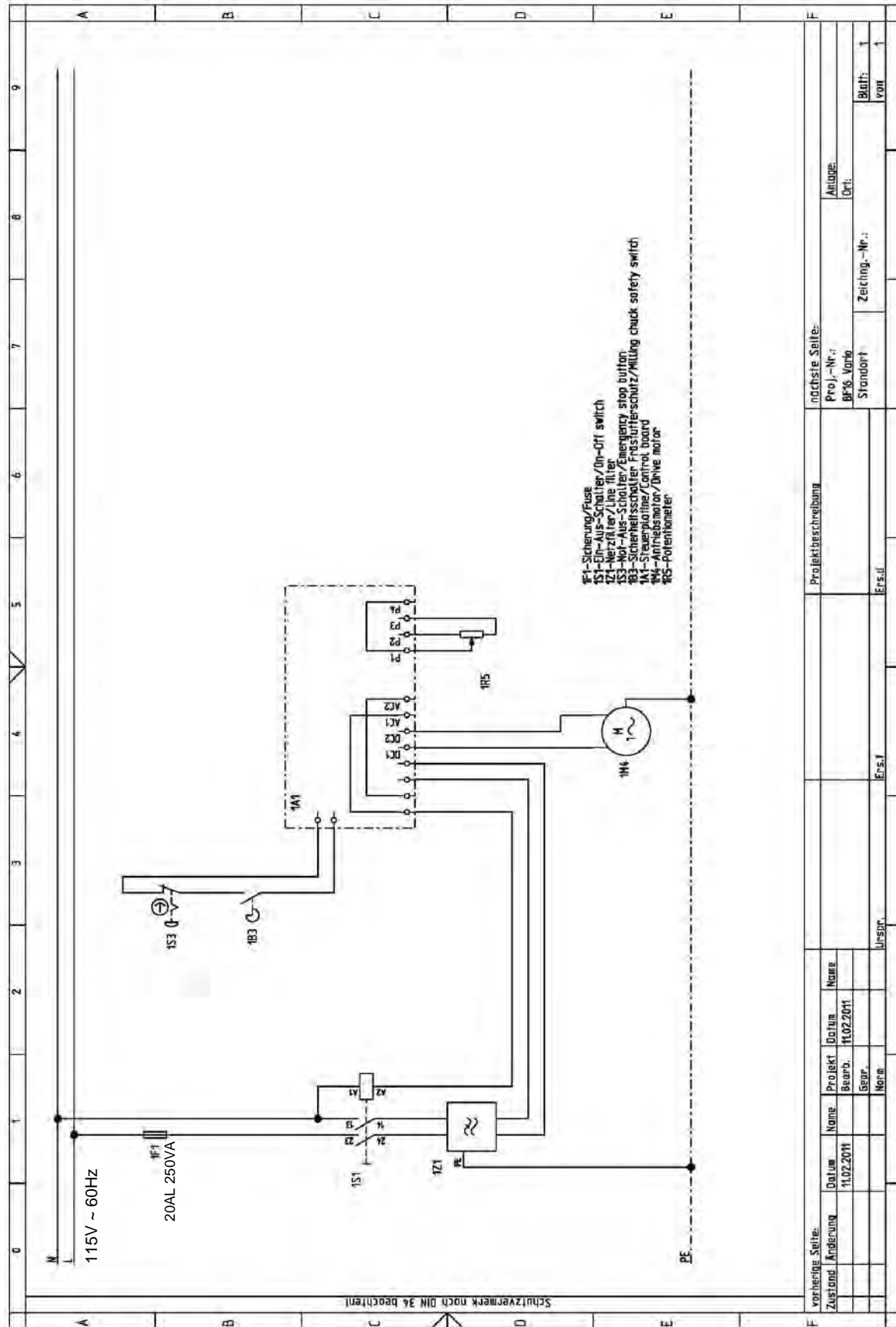


Fig.6-7: wiring diagram

7 Troubleshooting the mill drill

Problem	Cause/ possible consequences	Solution
The mill drill does not start.	<ul style="list-style-type: none"> • Defective fuse. 	<ul style="list-style-type: none"> • Have it checked by authorized personnel.
Tool „burnt“.	<ul style="list-style-type: none"> • Incorrect speed. • The chips have not been removed from the hole. • Tool blunt. • Operating without cooling. 	<ul style="list-style-type: none"> • Select different speed, feed too high. • Retract tool more often. • Sharpen and replace tool. • Use cooling agent.
Impossible to insert holding taper into the spindle sleeve.	<ul style="list-style-type: none"> • Remove dirt, grease or oil from the internal conical surface of the spindle sleeve or the holding taper. • Morse taper does not correspond MT2 with 3/8"-16 draw bar. 	<ul style="list-style-type: none"> • Clean surfaces well. Keep surfaces free of grease. • Use Morse taper MT2 with 3/8"-16 draw bar
Motor does not start.	<ul style="list-style-type: none"> • Defective fuse. 	<ul style="list-style-type: none"> • Have it checked by authorized personnel.
Working spindle rattling on rough workpiece surface.	<ul style="list-style-type: none"> • Climb milling machining not possible under the current operating conditions. • Clamping levers of the movement axes not tightened. • Loose collet chuck, loose drill chuck, loose draw bar. • Tool blunt. • Workpiece loose. • Excessive slack in bearing. • Spindle shaft worn or worn out. • Working spindle goes up and down. 	<ul style="list-style-type: none"> • Perform conventional milling machining. • Tighten clamping levers. • Check, re-tighten. • Sharpen or replace tool. • Secure the workpiece properly. • Re-adjust bearing clearance or replace bearing. • Replace pos. 246 and 251 of spare parts list 2. • Re-adjust bearing clearance or replace bearing pos. 248 spare parts list 2.

8 Appendix

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8.2 Terminology/ Glossary

Term	Explanation
Table	Bearing surface, clamping surface for the workpiece with X and Y axis travel.
Taper mandrel	Taper of the tool seat, taper of the bit or the drill chuck.
Workpiece	Piece to be milled, drilled or machined.
Draw bar	Threaded bar for fastening the taper mandrel in the spindle sleeve.
Drill chuck	Device for holding the bit.
Collet chuck	Holding fixture for end mill cutters.
Drill-mill head	Upper part of the milling-drilling machine.
Spindle sleeve	Hollow shaft in which the milling spindle turns.
Milling spindle	Shaft activated by the motor.
Drilling table	Bearing surface, clamping surface.
Taper mandrel	Cone of the bit or drill chuck.
Spindle sleeve lever	Manual control for activating the bit.
Quick-action drill chuck	Manually tightenable bit holding fixture.
Workpiece	Piece to be turned or machined.
Tool	Milling cutter, drill bit, counterstick, etc..

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