



## Operating manual

Version 1.1.3

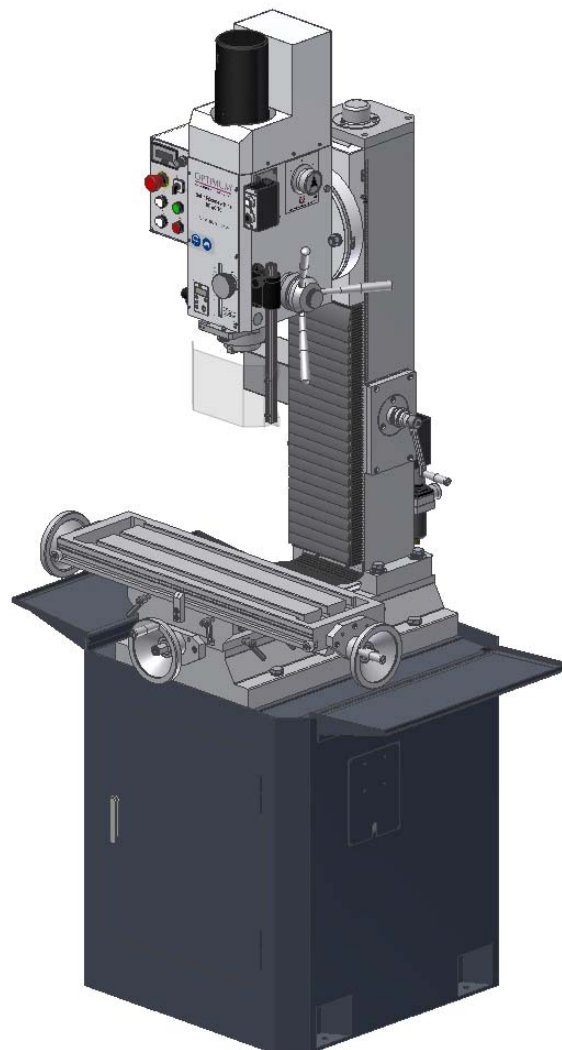
### Mill Drill

**OPTI**mill®  
BF 46Vario

Article no. 333 8458

**OPTI**mill®  
BF 46TC

Article no. 333 84561





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## Preface

Dear customer,

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

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

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

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

### Information

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

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

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

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

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

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

LDS Industries, LLC  
930 W. National Ave.  
Addison, IL 60101  
Tel.: 1-630-785-6437



## 1 Safety

This part of the operating instructions

- explains the meaning and use of the warning references contained in the operating manual,
- explains how to use the lathe properly,
- highlights the dangers that might arise for you or others if these instructions are not obeyed,
- 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 signs 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 lathe.**

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

<b>Milling machine</b>		LDS Industries, LLC 930 W. National Ave. Addison, IL 60101	
<b>BF 46 Vario</b>			
NO.	333 8458	rpm	3100 rpm
3 HP	230 V ~60 Hz	SN	J
1058 lbs		Year	20

<b>Milling machine</b>		LDS Industries, LLC 930 W. National Ave. Addison, IL 60101	
<b>BF 46TC</b>			
NO.	333 84561	rpm	3100 rpm
3 HP	230 V ~60 Hz	SN	J
1,060 lbs		Year	20

### INFORMATION

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

Exclusive USA Agent  
LDS Industries, LLC  
930 W. National Ave.  
Addison, IL 60101  
Tel.: 1-630-785-6437



## 1.2 Safety instructions (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 (ideogram) and the warning signs for each specific danger and its (possible) consequences.

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

In case of specific dangers, we replace the pictogram by





## 1.2.2 Other pictograms

 <p><b>WARNING</b></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><b>WARNING!</b></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><b>WARNING</b></p> <p>Pinch/Entangle Hazard! Keep hands clear of outboard spindle and rotating workpiece to avoid serious injury.</p>	 <p><b>WARNING!</b></p> <p>PINCH/ENTANGLEMENT HAZARD Keep spindle guard in place and hands clear of outboard spindle and rotating workpiece to avoid serious injury.</p>
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**WARNING** 

Read and Understand instruction manual to avoid serious injury. If a manual is not available do not use machine. Call 1-855-813-1043




**Eye injury Hazard!**  
Always wear safety glasses when using this machine.



**WARNING** 

Disconnect power before adjustments, maintenance, or service.




**WARNING** 

**EYE INJURY HAZARD!**  
Always wear safety glasses when using this machine.



Warning of danger of slipping!



Warning risk of stumbling!



Warning hot surface!



Warning biological hazard!



Warning of automatic start-up!



Warning tilting danger!



Warning of suspended loads!



Caution, danger of explosive substances!



Activation forbidden!



Read the operating instructions before commissioning!



Disconnect the mains plug!



Use protective glasses!



Use protective gloves!



Use protective boots!



Use protective suit!



Use ear protection!



Only switch in standstill!



Protect the environment!



Contact address

## 1.3 Proper use

### WARNING!

**In the event of improper use, the mill drill**

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



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 approval of the company Optimum Maschinen Germany GmbH then the mill drill is being used improperly.

We will not be held liable for any damages resulting from any operation which is not in accordance with the intended use.

We 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 mill drill are observed,
- the operating manual is observed,
- the inspection and maintenance instructions are observed.

☞ "Technical data" on page 17

### WARNING!

**Heaviest injuries through improper use.**

**It is forbidden to make any modifications or alternations to the operation values of the mill drill. They could endanger the staff and cause damage to the mill drill.**



### ATTENTION!

**If the mill drill 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 guarantee is becoming null and void!**



## 1.4 Reasonably foreseeable misuses

Any other use as the one determined under the "Intended use" or any use beyond the described use shall be deemed as not in conformity and is forbidden.

Any other use has to be discussed with the manufacturer.

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

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

The operators must be qualified.





### 1.4.1 Avoiding misuses

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

#### ATTENTION!

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



#### WARNING!

#### Risk of injury caused by workpieces flying off.

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



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

It is recommended:

- Insert the drill in a way that it is exactly positioned between the three clamping jaws of the quick action chuck.
- Clamp and mills by means of the collet chuck and the corresponding collets.
- Clamp end face mills by means of shell end mill arbors.

When drilling make sure that

- the suitable speed is set depending on the diameter of the drill,
- the pressure must only be such that the drill can cut without load
- in case of too strong pressure the drill will get worn early or even might break resp. get jammed in the hole. If the drill gets jammed immediately stop the main motor by pressing the emergency stop button,
- for hard materials, e.g. steel, use commercial cooling / lubricating agents,
- generally always drive the turning spindle out of the workpiece.

#### ATTENTION!

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



When milling make sure that

- the corresponding cutting speed is selected,
  - for workpieces with normal strength values, e.g. steel 18-22 m/min,
  - for workpieces with high strength values 10-14 m/min,
  - the pressure is selected in a way that the cutting speed remains constant,
- for hard materials commercial cooling / lubricating agents are used.



## 1.5 Possible dangers caused by the mill drill

The mill drill is state-of-the-art.

Nevertheless, there is a residual risk as the mill drill operates with

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

We have used construction resources and safety techniques to minimize the health risk to persons 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 of the mill drill.

### INFORMATION

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

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

Always disconnect the mill drill from the electrical power supply when performing cleaning or maintenance works.

### WARNING!

**The mill drill may only be used with functional safety devices.**

**Disconnect the mill drill immediately, whenever you detect a failure in the safety devices or when they are not fitted!**

**All additional devices installed by the operator have to be equipped with the prescribed safety devices.**

**This is your responsibility being the operating company!**

👉 "Safety devices" on page 12



## 1.6 Qualification of personnel

### 1.6.1 Target group

This manual is addressed to

- the operating companies,
- the users,
- the staff for maintenance works.

Therefore, the warning notes refer to both, operation and maintenance staff of the mill drill.

Disconnect the mill drill always from the electrical power supply. This will prevent it from being used by unauthorized staff.

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

### Instructed persons

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

### INFORMATION

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

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

In the event of improper use

- there may be a risk to the staff,
- there may be a risk to the mill drill and other material values,
- the correct function of the mill drill may be affected.

### 1.7 Operator positions

The operator's position is in front of the mill drill.

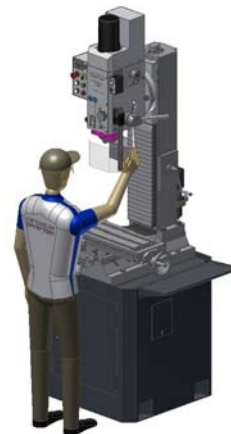


Fig. 1-1: Operator positions

### 1.8 Safety measures during operation

#### CAUTION!

**Risk due to inhaling of health hazardous dusts and mist.**

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

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



#### CAUTION!

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





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

## 1.9 Safety devices

Use the mill drill only with properly functioning safety devices.

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

It is your responsibility!

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

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

### WARNING!

If you bypass, remove or deactivate a safety device in any other way, you are endangering yourself and other staff 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 device 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. Always work carefully and observe the limit values of your chipping process.

### 1.9.1 EMERGENCY STOP impact switch

The EMERGENCY STOP push button switches off the mill drill.



Fig.1-2: EMERGENCY STOP impact switch

### ATTENTION!

The EMERGENCY-STOP push button stops the machine the moment it is activated.

Activate the emergency stop impact switch only in case of danger! If this push button is actuated in order to switch off the mill drill in the standard operation the tool or workpiece might get damaged.

After having actuated the EMERGENCY STOP, turn the knob of the particular push button to the right in order to restart the machine.





## 1.9.2 Lockable main switch

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

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

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

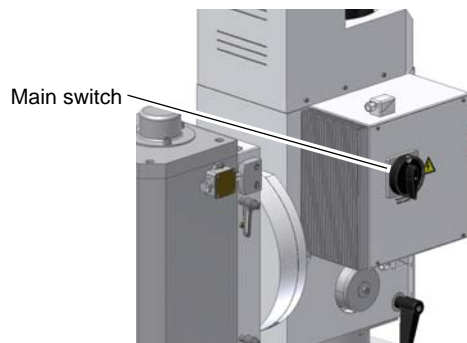


Fig. 1-3: Main switch

### WARNING!

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



## 1.9.3 Protective cover

The drilling / milling head is equipped with a protective cover.

### WARNING!

**Only remove the protective cover when the mains plug of the mill drill is disconnected.**

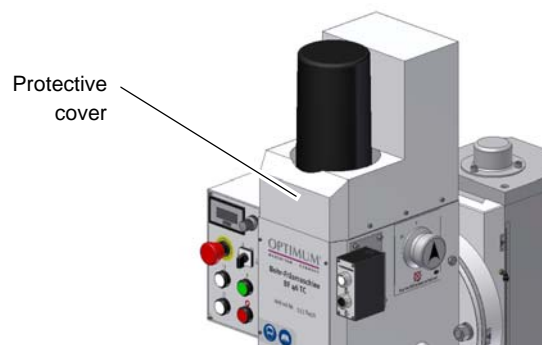


Fig. 1-4: Protective cover

## 1.9.4 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 re-tighten 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 spindle protection is not closed.



Fig. 1-5: Separating protective equipment



## 1.10 Safety check

Check the mill drill in regular intervals.

Check all safety devices

- before each operation,
- once a week (with the machine in operation),
- after every maintenance and repair work.

General check		
Equipment	Check	OK
Protective covers	Mounted, firmly bolted and not damaged	
Signs, Markings	Installed and legible	

Functional check		
Equipment	Check	OK
EMERGENCY STOP impact switch	When the EMERGENCY STOP push button is activated, the mill drill must switch off. Make sure that it is only possible to restart the machine if the EMERGENCY STOP push button is unlocked and the ON switch was activated.	
Separating safety device around the drilling and milling spindle	The mill drill may switch on only when the safety device is closed.	

## 1.11 Personnel protective equipment

For certain work personal protective equipment is required.

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



Use protective gloves when handling pieces with sharp edges.



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



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

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



### CAUTION!

**Dirty or contaminated personnel protective equipment can cause diseases. Clean it each time after use and once a week.**





## 1.12 For your own safety during operation

### WARNING!

**Before activating the mill drill assure yourself that this will neither endanger other persons nor cause damage to equipment.**



Avoid any unsafe working practices:

Make sure that nobody is endangered by your work.

- The instructions mentioned in these operating instructions have to be strictly observed during assembly, operation, maintenance and repair.
- Wear safety goggles.
- Switch off the mill drill before measuring the workpiece.
- Do not work on the mill drill, if your concentration is reduced, for example, because you are taking medication.
- Stay on the mill drill until the working spindle has come to a complete standstill.
- Use the prescribed personnel protective equipment. Make sure to wear a well-fitting work suit and, if necessary, a hairnet.
- Do not use protective gloves during drilling or milling work.
- Disconnect the shock-proof plug from the outlet before replacing the tool.
- Use appropriate auxiliary materials to remove drilling and milling chips.
- Make sure that nobody is endangered by your work.
- Safely and firmly clamp the workpiece before switching on the mill drill.

We specially point out the specific dangers when working with and on the mill drill.

## 1.13 Disconnecting and securing the mill drill

Switch off the mill drill with the main switch before starting any maintenance and repair works.



## 1.14 Using lifting equipment

### WARNING!

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



**Check that the lifting equipment and load-suspension gears are of sufficient load capacity and are in perfect condition.**

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

**Fasten the loads properly.**

**Never walk under suspended loads!**



## 1.15 Position of labels on the mill drill



Fig. 1-6: BF46 Vario | BF46TC





## 2 Technical data

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

<b>2.1</b>	<b>Electrical connection</b>	<b>BF46 Vario</b>	<b>BF46TC</b>
	Motor	3 HP, 230V, 1Ph, 60Hz	
<b>2.2</b>	<b>Drilling-milling capacity</b>	<b>BF46 Vario</b>	<b>BF46TC</b>
	Drilling capacity in steel	1.1" max. diam./28 mm	
	Drilling capacity in cast	1.2" max. diam./30 mm	
	Milling capacity end mill	1.3" max. diam./32 mm	
	Milling capacity milling head	Ø 3.15" max. diam./80 mm	
	Swing	10.24"/ 260mm	
<b>2.3</b>	<b>Spindle seat</b>	<b>BF46 Vario</b>	<b>BF46TC</b>
	Spindle seat	R8 optional ISO 40 (DIN 2080, DIN 69871) MT4	
	Extraction rod (Draw-in rod)	7/16" optional M16 (ISO 40)	
	Quill travel	4.5"/ 115 mm	
<b>2.4</b>	<b>Drill-Mill head</b>	<b>BF46 Vario</b>	<b>BF46TC</b>
	Swivelling	+ / - 45°	
	Gear stages	3	
	Travel of Z axis	21.3"/ 541 mm	
<b>2.5</b>	<b>Cross table</b>	<b>BF46 Vario</b>	<b>BF46TC</b>
	Table length	33.5"/ 850 mm	
	Table width	9.5"/ 240 mm	
	Travel of Y axis	10.2"/ 260 mm	
	Travel of X axis	20.5"/ 520 mm	
	T - slot size / number / distance [mm]	18 mm slots, three	
	Max. load [lbs]	385	
<b>2.6</b>	<b>Working area</b>	<b>BF46 Vario</b>	<b>BF46TC</b>
	Height	86.6"/ 2200 mm	
	Depth	78.7"/ 2000 mm	
	Width	102.4"/ 2600 mm	
	Total weight	1058 lbs./ 480 Kg	



2.7 Speeds	BF46 Vario	BF46TC
Gear stage slow [min <sup>-1</sup> ]	115 - 720 RPM	
Gear stage average [min <sup>-1</sup> ]	324 - 1680 RPM	
Gear stage rapid [min <sup>-1</sup> ]	708 - 3100 RPM	
2.8 Environmental conditions	BF46 Vario	BF46TC
Temperature	40 - 95 °F / 5 - 35 °C	
Humidity	25 - 80%	
2.9 Operating material	BF46 Vario	BF46TC
Gear	Oil quantity 1-3/4 Qts. (1.7 L) 628 Mobil (Vis. 100/150) or a corresponding oil, see also  "Lubricant" on page 71	
Bare steel parts	Mobilux EP 004, acid-free oil, e.g. weapon oil, motor oil	

## 2.10 Emissions

The generation of noise emitted by the mill drill is 80 dB(A).

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

### INFORMATION

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

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



### INFORMATION

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

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

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

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

Furthermore, it is possible that the admissible exposure level might be different from country to country due to national regulations.

This information about the noise emission shall allow the operator of the machine to more easily evaluate the endangering and risks.

### CAUTION!

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

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





### 3 Unpacking and connecting

#### INFORMATION

The mill drill is delivered pre-assembled.



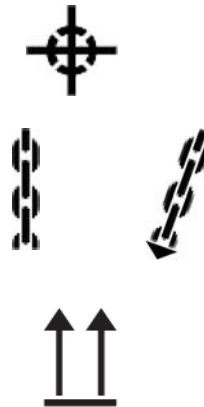
#### 3.1 Scope of delivery

Check immediately upon delivery of the mill drill if there are any transport damages or loosened fastening screws.

Compare the scope of delivery with the packing list.

#### 3.2 Transport

- Centres of gravity
- Load suspension points  
(Marking of the positions for the load suspension gear)
- Prescribed transportation position  
(Marking of the top surface)
- Means of transport to be used
- Weights



#### WARNING!

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



#### WARNING!

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



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

Fasten the loads properly.

Never walk under suspended loads!



## 3.3 Storage

### ATTENTION!

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

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

Follow the instructions and information on the transport case.



- Fragile goods  
(Goods require careful handling)



- Protect against moisture and humid environment  
🗨 "Environmental conditions" on page 18.



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



- Maximum stacking height

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



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

## 3.4 Installation and assembly

### 3.4.1 Requirements regarding the installation site

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

### INFORMATION

In order to attain good functionality and a high processing accuracy as well as a long durability of the machine the installation site should fulfil certain criteria.



**Please observe the following points:**

- The device must only be installed and operated in a dry and well-ventilated place.
- Avoid places nearby machines generating chips or dust.
- The installation site must be free from vibrations also at a distance of presses, planing machines, etc.
- The substructure must be suitable for the mill drill. Also make sure that the floor has sufficient load bearing capacity and is level.
- The substructure must be prepared in a way that possibly used coolant cannot penetrate into the floor.
- Any parts sticking out such as stops, handles, etc. have to be secured by measures taken by the customer if necessary in order to avoid endangerment of persons.



- Provide sufficient space for the staff preparing and operating the machine and transporting the material.
- Also consider that the machine is accessible for setting and maintenance works.
- Provide for sufficient illumination (Minimum value: 500 lux, measured at the tool tip). At little intensity of illumination an additional illumination has to be ensured e.g. by means of a separate workplace lamp.

## INFORMATION

The mains plug of the mill drill must be freely accessible.



### 3.4.2 Load suspension point

#### WARNING!

**Danger of crushing and overturning. Proceed carefully when lifting, installing and assembling the machine.**



- Secure the load-suspension device around the drill-mill head. Use a lifting sling for this purpose.
- Firmly clamp all clamping levers on the mill drill before lifting the mill drill.
- Make sure that the load attachment does not cause damage to components or paint.

### 3.4.3 Assembly

- Check if the underground of the mill drill is level using a spirit level.
- Check if the underground is sufficiently stable and rigid.  
The total weight amounts to 1058 lbs./ 480 Kg.

#### ATTENTION!

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



- Place the mill drill on the provided underground.
- Fix the mill drill in the provided through-holes on the machine foot.  
The attachment points are marked by arrows on the machine foot.

#### WARNING!

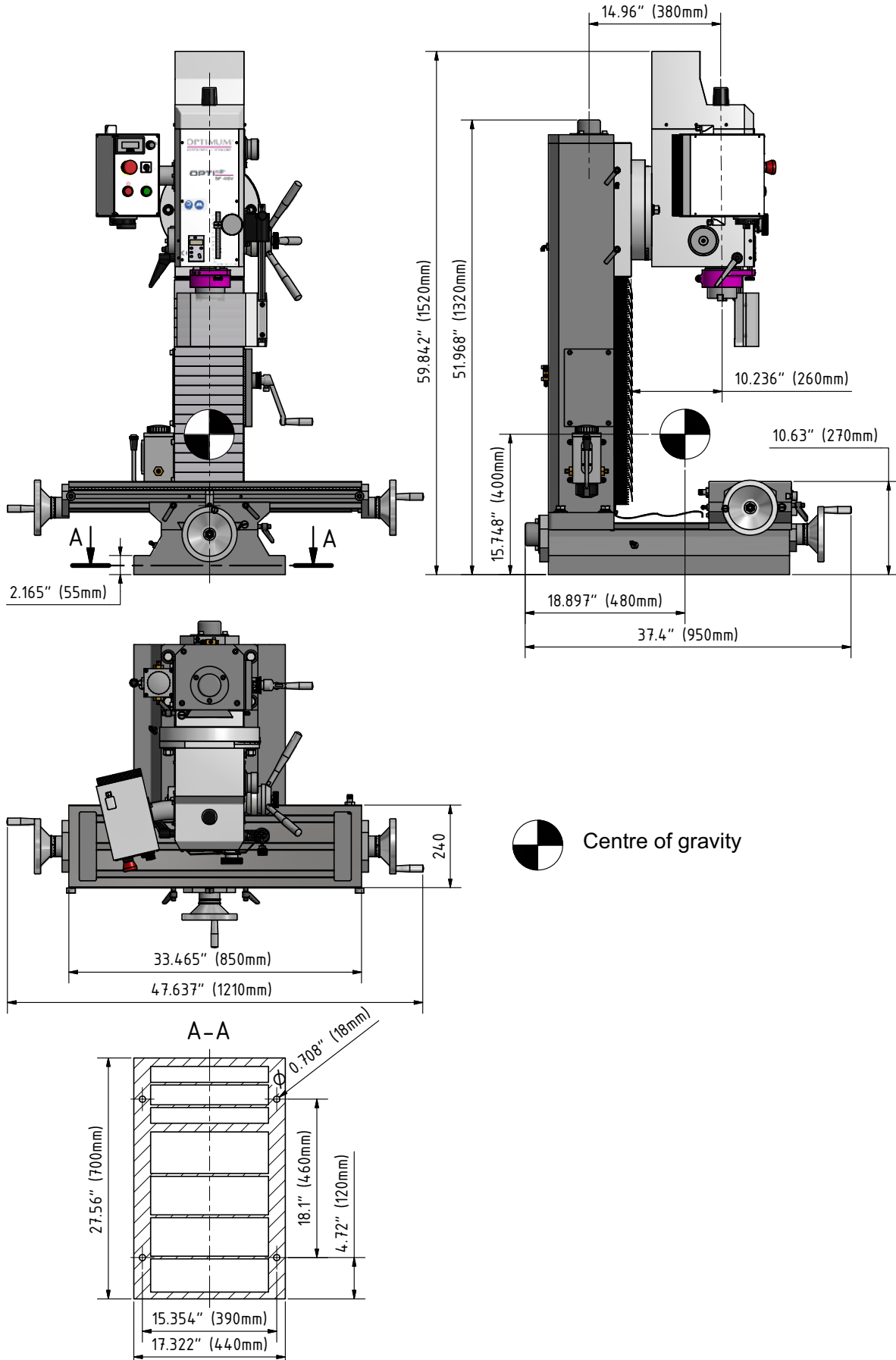
**The condition of the underground and the fixing type of the machine foot to the underground must be in a way that it can bear the loads of the mill drill. The underground must be level. Check if the underground of the mill drill is level using a spirit level.**



Fix the foot of the mill drill to the substructure with the provided through-holes. We recommend you to use shear connector cartridges resp. heavy-duty anchors.

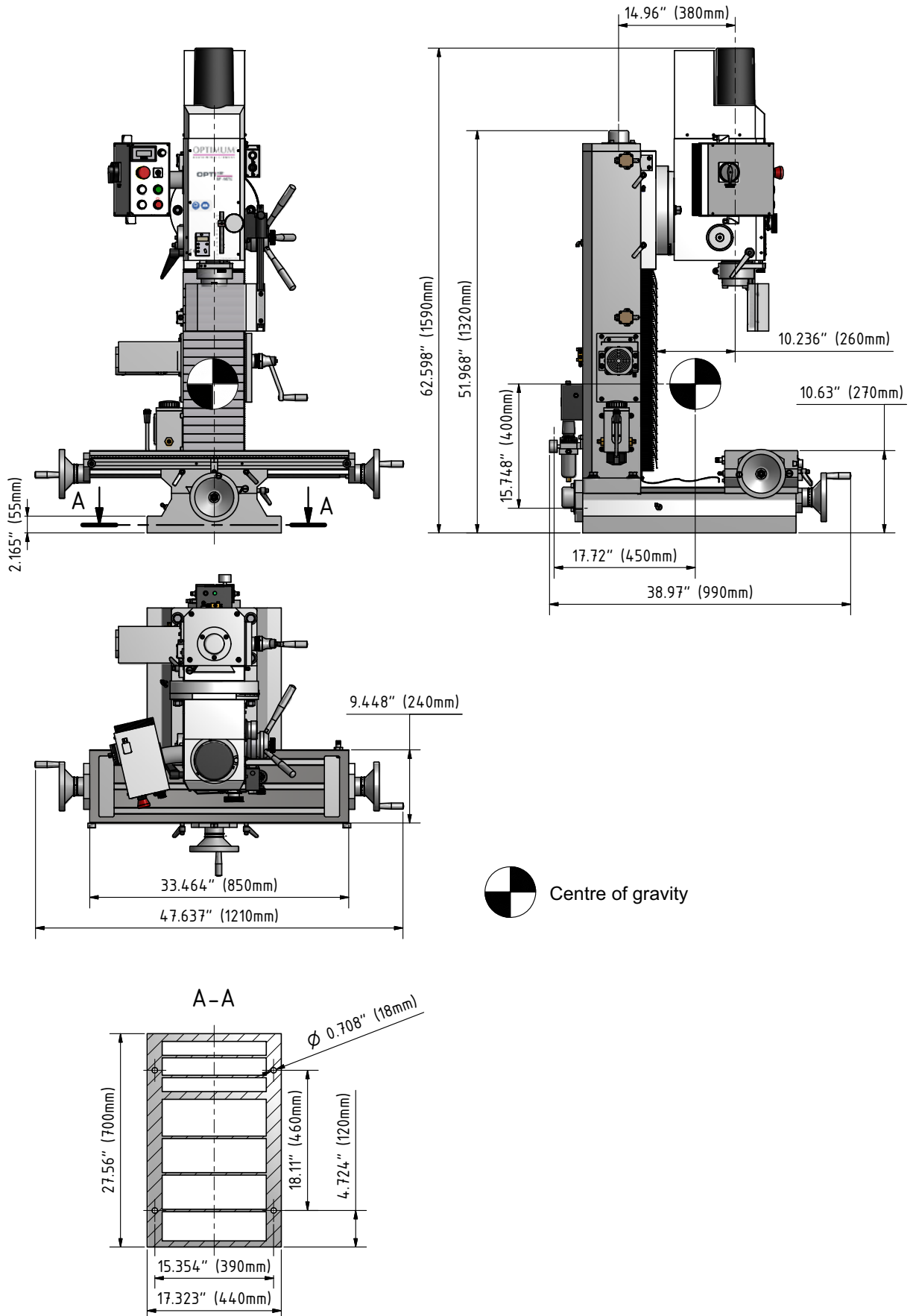


## 3.5 Dimensions, installation plan BF46V



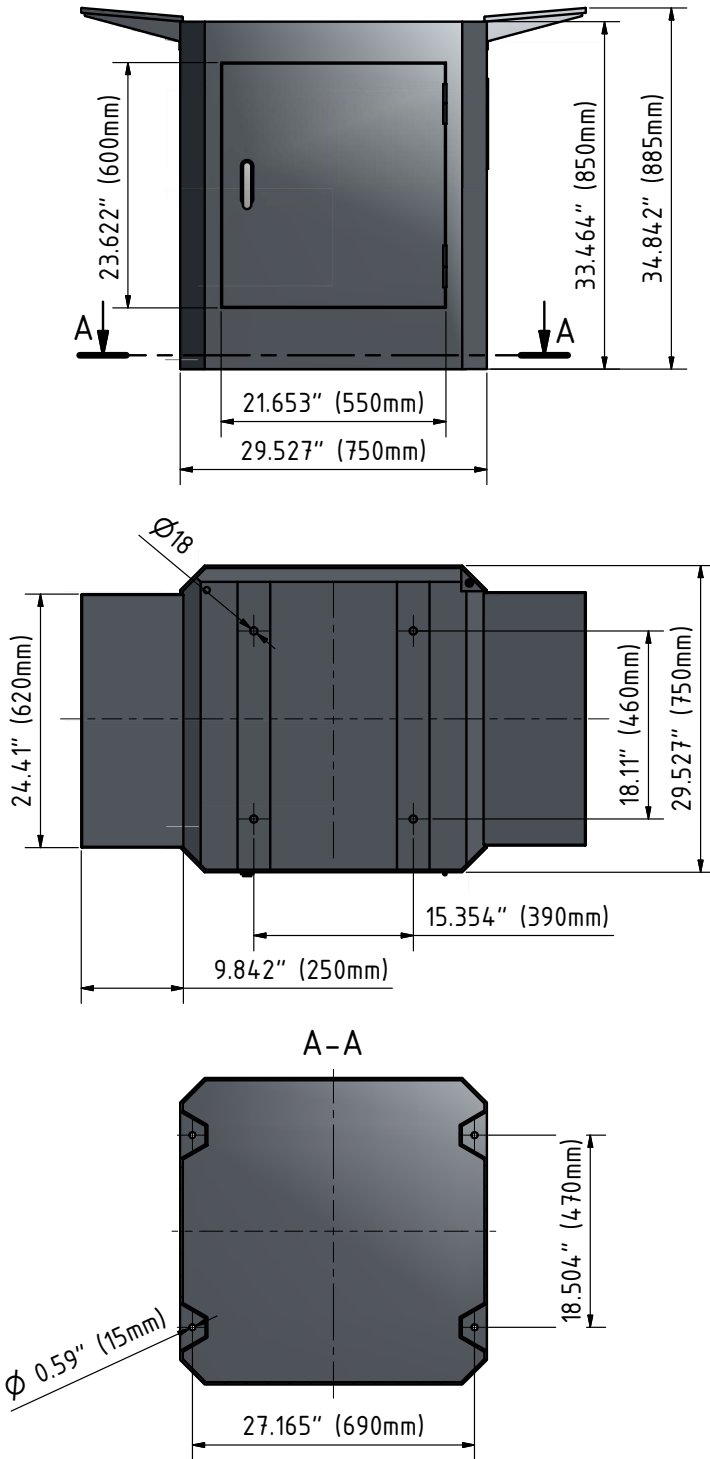


## 3.6 Dimensions, installation plan BF46TC





## 3.7 Installation plan of optional substructure







### 3.8 First commissioning

#### ATTENTION!

Before commissioning the machine check all screws, fixtures resp. safety devices and tighten up the screws if necessary!



#### WARNING!

Risk by using improper tool holders or operating them at inadmissible speeds.

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

Only use tool holders in the intended admissible speed range.

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



#### WARNING!

When first commissioning the mill drill by inexperienced staff you endanger people and the machine.

We do not take any liability for damages caused by incorrectly performed commissioning.

☞ "Qualification of personnel" on page 10



#### 3.8.1 Power supply

→ Connect the electrical supply cable.

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

#### 3.8.2 Cleaning and lubricating

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

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

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

→ Lubricate the mill drill according to the lubricating plan.

☞ "Inspection and maintenance" on page 46

→ Check if all spindles are running smoothly. The spindle nuts are re-adjustable.

→ Disassemble the V-ledges of the cross table and clean the ledges from the anti-corrosive agent. ☞ "V-ledges" on page 49



### 3.8.3 Filling in gear oil

The mill drill is delivered without oil filling. Fill in gear lubricant oil into the drill-mill head and the central lubrication unit.

☞ "Oil change" on page 48



### 3.8.4 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.



### 3.8.5 Compressed air supply on BF46TC

→ Connect the compressed air supply with at least 87 psi (6 bars) to the quick-action coupling of the compressed air maintenance unit.

#### ATTENTION!

In order to ensure a failure-free operation of the machine it is necessary that the required air pressure is continuously applied on the machine at constant quality.



Fig.3-1: Compressed air supply



## 3.9 Optional accessories

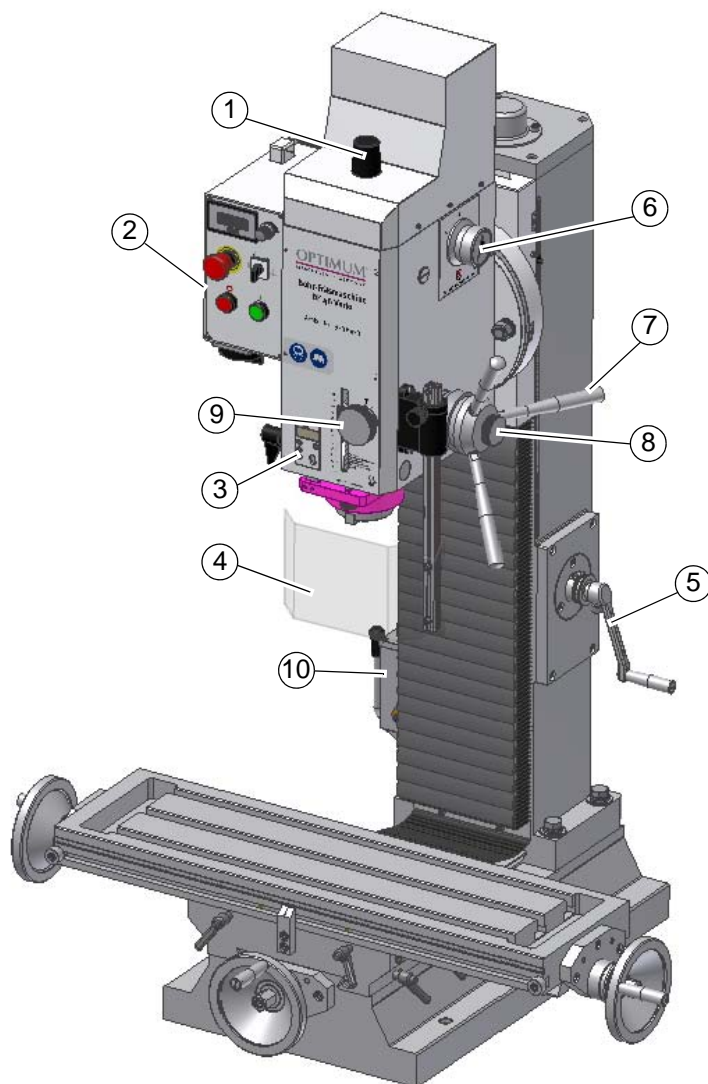
Description	Item No
Machine stand Dimensions ☞ "Installation plan of optional substructure" on page 24	335 3005
Vice 5" Precision Modular	3355553





## 4 Operation

### 4.1 Control and indicating elements BF46V

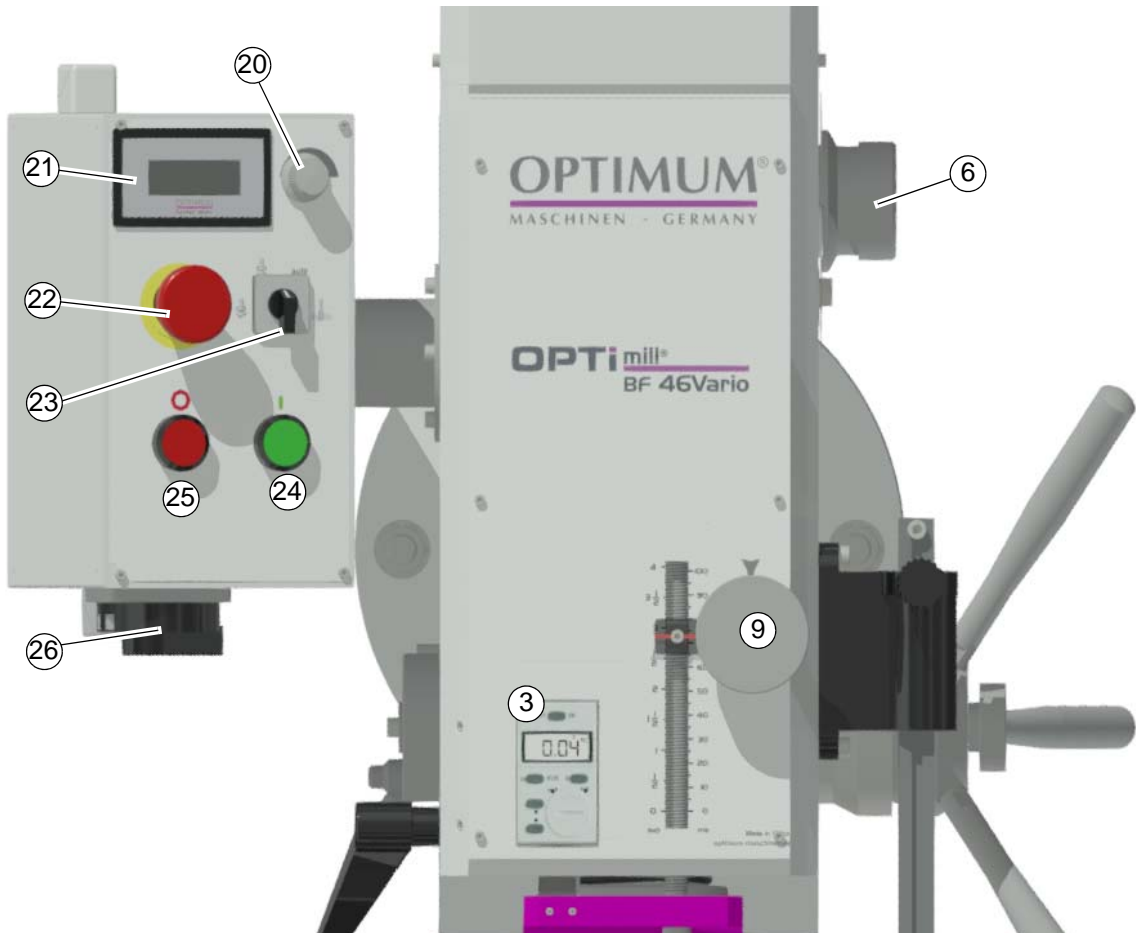


Img.4-1: BF46 Vario | BF46TC

Pos.	Designation	Pos.	Designation
1	Cover of draw-in rod	2	Control panel
3	Digital display fine crossfeed of spindle sleeve	4	Spindle protection
5	Crank for height adjustment of the drill-mill head	6	Selector switch for reduction stage
7	Star grip for spindle sleeve feed	8	Activation of the fine adjustment
9	Fine adjustment of spindle sleeve	10	Central lubrication



## 4.1.1 Control panel



Img. 4-2: Control panel

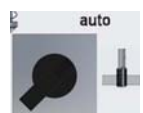
Pos.	Designation	Pos.	Designation
20	Speed control	21	Digital display speed
22	EMERGENCY-STOP	23	Selection switch operating mode ○ Automatic ○ Threading ○ turning direction
24	Push button spindle rotation "ON"	25	Push button spindle rotation "OFF"
26	Main switch	6	Selector switch for reduction stage
3	Digital display fine crossfeed of spindle sleeve	9	Fine adjustment of spindle sleeve

### Selection switch for operating mode

With the selector switch the operating mode „automatic, threading or right-hand respectively left-hand run“ is being selected.

### Operation mode automatic

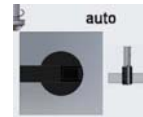
In the automatic mode the engine starts up according to a predefined path over the drilling depth limit of the spindle sleeve and stop at the end position. This way for, the push button Start and Stop does not have to be actuated for repetitive drilling tasks.





## Operation mode thread cutting

In the thread cutting mode the engine automatically starts up according to a predefined path over the drilling depth stop and automatically changes the turning direction as soon as the predefined depth had been achieved. The screw-tap is drawn out of the workpiece.



## Rotation direction switch

Standard operation, selection left-handed or right-handed rotation.



## Potentiometer

Speed setting "VARIO"



## Push button ON

The push button "ON" switches on the rotation of the spindle.



## Push button OFF

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



## Main switch

Interrupts or connects the power supply.



## 4.2 Switching on the mill drill

- Switch on the main switch.
- Close the protective equipment.
- Select the operating mode.
- Select the gear level.
- Set the potentiometer to the lowest speed.
- Actuate push button "Start".
- Set the required speed on the potentiometer.

## ATTENTION!

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



## INFORMATION

At a cold mill drill it is possible that with switching on the machine an overload of the drive occur.

Therefore, allow the mill drill at low speeds depending on environmental conditions to warm up for 10 to 20 minutes before you go to maximum speed.

Also with a quick on and off, this overload occur. Therefore wait for about 3 seconds before you switch on the mill drill again, the capacitors in the controller must first discharged.



## 4.3 Switching off the mill drill

- Press the push button spindle rotation "OFF". For a long-term standstill of the mill drill switch it off at the main switch.



## 4.4 Inserting a tool on BF46V

### 4.4.1 Installation

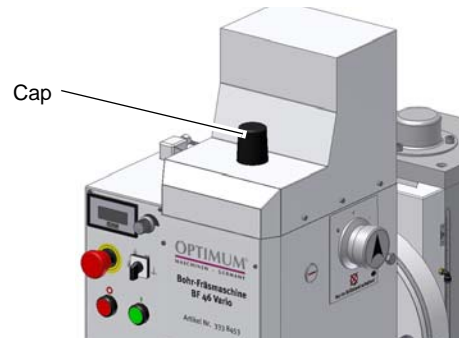
#### CAUTION!

When milling operations are performed the cone seat must always be fixed to the draw-in rod. All cone connections with the taper bore of the work spindle without using the draw-in rod is not allowed for milling operations. The cone connection should be released by the lateral pressure. Injuries may be caused by parts flying off.



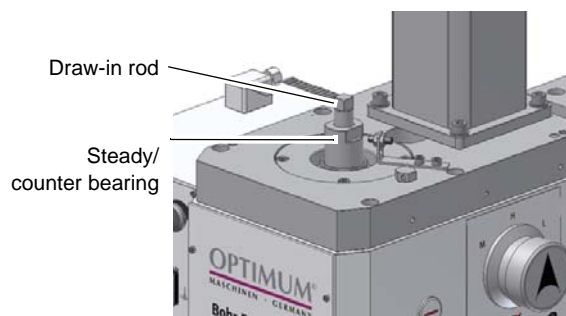
The milling head is equipped with a draw-in rod M16.

- Remove the cap.
- Clean the seat in the spindle / quill.
- Clean the taper of your tool.
- Insert the tool in the spindle / quill.



Img.4-3: Drilling and milling head

- Screw the draw-in bar in the tool.
- Tighten the tool with the draw-in rod and hold the spindle on the counter bearing by means of a wrench.



Img.4-4: Drilling-milling head without cap

### 4.4.2 Unfitting

- Hold the spindle counter bearing with a wrench and loosen the draw-in rod. Continue turning the draw -in rod, so that the tool is squeezed out from the conical collet.

#### ATTENTION!

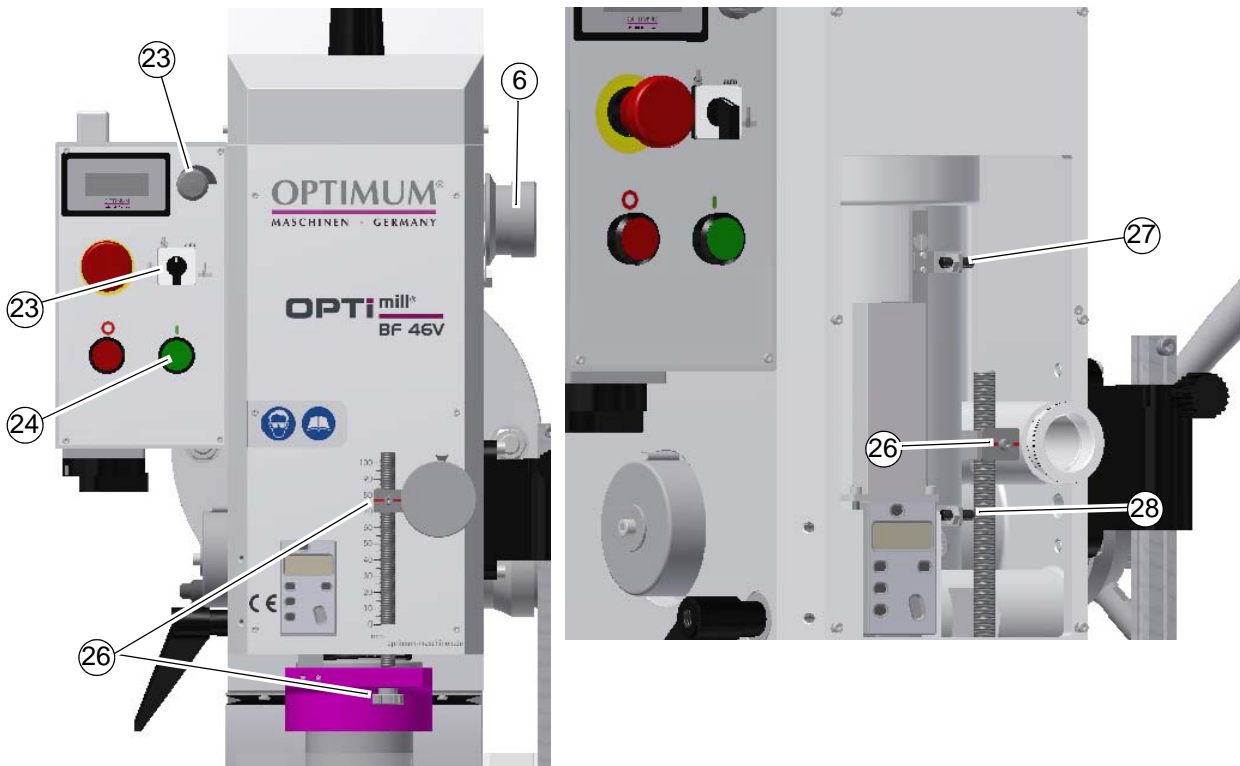
When using an optional MT4 spindle.

When installing a cold morse taper into a heated-up machine those MT seats tend to shrink on the morse taper contrary to the quick-releaser tapers.





## 4.5 Threading



Img.4-5: Operation mode thread cutting

Pos.	Designation	Pos.	Designation
6	Selector switch for reduction stage	20	Speed control
23	Selection switch operating mode ○ automatic ○ threading ○ turning direction	24	Push button spindle rotation "ON"
26	Depth stop	27	Adjustable stop cycle end
28	End position switch turning direction reversal		

- ➔ Set the selection switch mode (23) to "threading" or "automatic".
- ➔ Set the depth stop (26) to the desired depth.
- ➔ Select the smallest speed.
- ➔ Close spindle protection system.
- ➔ Start the rotation of spindle (24).
- ➔ Move the sleeve downward with the sleeve lever until the machine tap cams in the work-piece.

The machine tap turns into the workpiece. As soon as the preset depth is attained, the spindle reverses the direction of rotation at the switch point (28). The machine tap turns out of the work-piece. When the spindle sleeve is completely entered up to the switch point (27) in operation mode "automatic" the rotation of the spindle is stopped. Then it is possible to proceed another threading operation.

### ATTENTION!

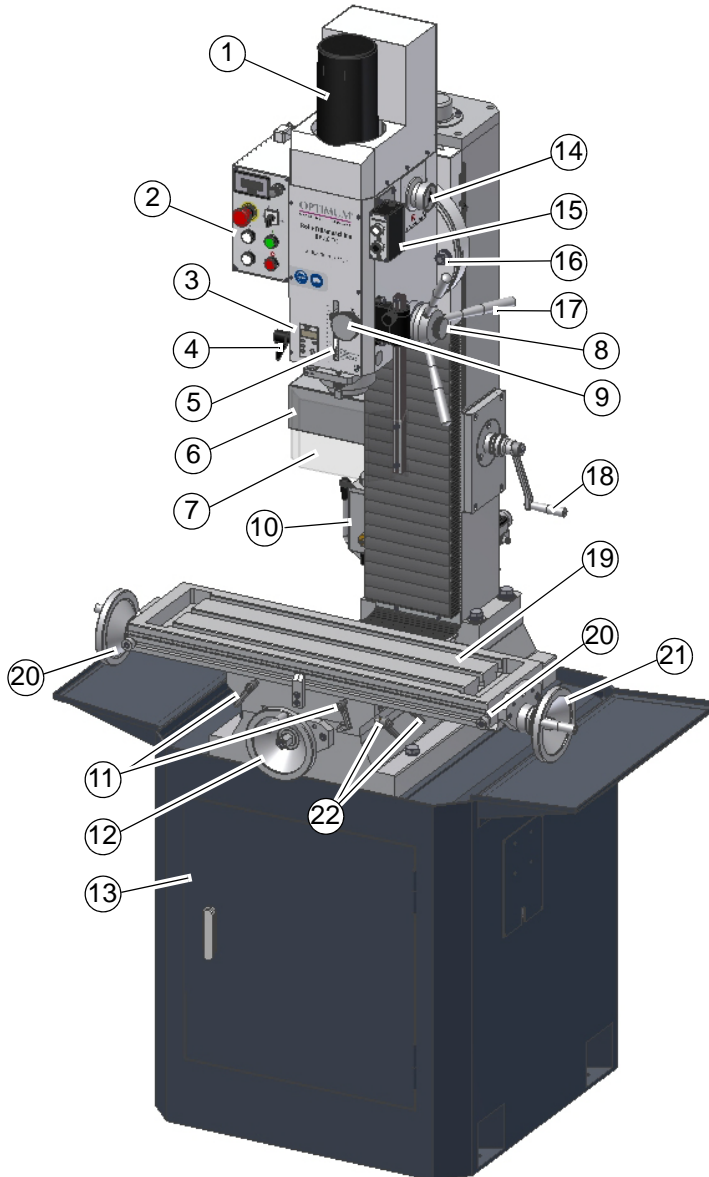
The spindle sleeve must be completely retracted in order to trigger the switch point (27).







## 4.6 Control and indicating elements BF46TC

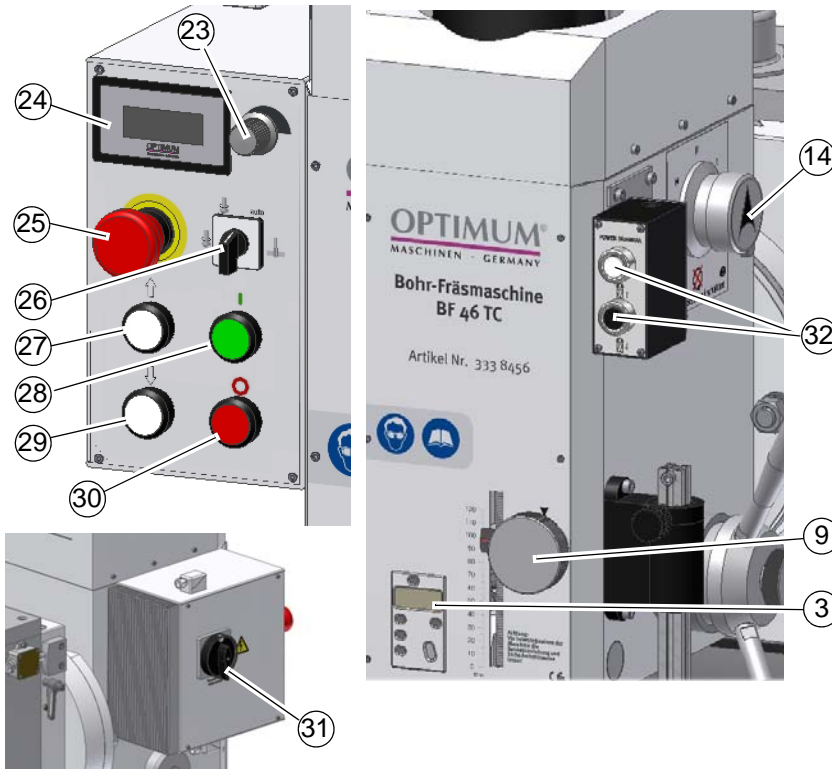


Pos.	Designation	Pos.	Designation
1	Pneumatic tool changer	2	Control panel
3	Digital display fine crossfeed of spindle sleeve	4	Clamping lever for spindle sleeve
5	Meter rule with scale	6	Motor Z-axis feed
7	Spindle protection	8	Activation of the fine adjustment
9	Fine adjustment of spindle sleeve	10	Central lubrication
11	Clamping lever for X-axis	12	Crank handle for saddle slide Y axis
13	Machine base (optionally)	14	Selector switch for reduction stage
15	Control panel tool change "CLAMPING" / "RELEASING"	16	Clamping screw drilling-milling head right



Pos.	Designation	Pos.	Designation
17	Star grip for spindle sleeve feed	18	Crank handle for manual height adjustment of the drilling milling head
19	Cross table	20	Adjustable limit stops
21	Handle of cross slide for X-axis	22	Clamping lever for Y-axis

## 4.6.1 Control panel BF46TC



Pos.	Designation	Pos.	Designation
23	Potentiometer speed control	24	Digital display speed
32	Control panel tool change: ○ Pushbutton "CLAMPING" ○ Pushbutton "RELEASING"	26	Selection switch operating mode ○ automatic ○ threading ○ turning direction
27	Push button Z feed (travelling drilling milling head upward)	28	Push button spindle rotation "ON"
29	Push button Z feed (travelling drilling milling head downward)	30	Push button spindle rotation "OFF"
31	Main switch	14	Selector switch for reduction stage
3	Digital display fine crossfeed of spindle sleeve	9	Fine adjustment of spindle sleeve
25	EMERGENCY-STOP		

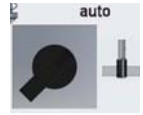


## Selection switch for operating mode

With the selector switch the operating mode „automatic, threading or right-hand respectively left-hand run“ is being selected.

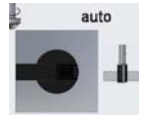
### Operation mode automatic

In the automatic mode the engine starts up according to a predefined path over the drilling depth limit of the spindle sleeve and stop at the end position. This way for, the push button Start and Stop does not have to be actuated for repetitive drilling tasks.



### Operation mode thread cutting

In the thread cutting mode the engine automatically starts up according to a predefined path over the drilling depth stop and automatically changes the turning direction as soon as the predefined depth had been achieved. The screw-tap is drawn out of the workpiece.



### Rotation direction switch

Standard operation, selection left-handed or right-handed rotation.



### Potentiometer

Speed setting "VARIO"



### Push button ON

The push button "ON" switches on the rotation of the spindle.



### Push button OFF

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



### Main switch

Interrupts or connects the power supply.

## 4.7 Switching on the mill drill

- Switch on the main switch.
- Close the protective equipment.
- Select the operating mode.
- Select the gear level.
- Set the potentiometer to the lowest speed.
- Actuate push button "Start".
- Set the required speed on the potentiometer.

### ATTENTION!

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



### INFORMATION

At a cold mill drill it is possible that with switching on the machine an overload of the drive occur.



Therefore, allow the mill drill at low speeds depending on environmental conditions to warm up for 10 to 20 minutes before you go to maximum speed.



Also with a quick on and off, this overload occur. Therefore wait for about 3 seconds before you switch on the mill drill again, the capacitors in the controller must first discharged.

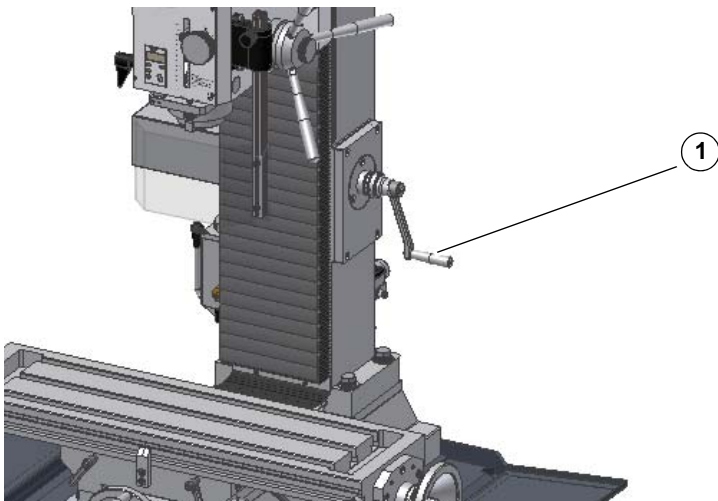
## 4.8 Switching off the mill drill

→ Press the push button "OFF". For a long-term standstill of the mill drill switch it off at the main switch.

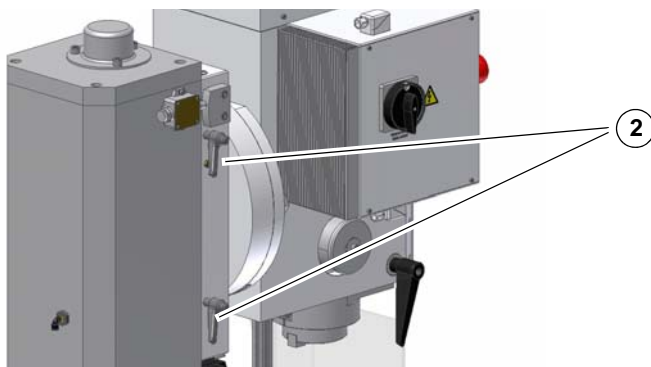
## 4.9 Traveling the drilling milling head (Z-axis) upward respectively downward

It is possible to perform the height adjustment of the drilling milling head by actuating the crank handle or the control panel

### 4.9.1 Traveling the drill-mill head upward respectively downward by actuating the crank handle



Img.4-6: Drilling milling head - height adjustment



Img.4-7: Clamping lever

1	Crank handle
2	Clamping lever

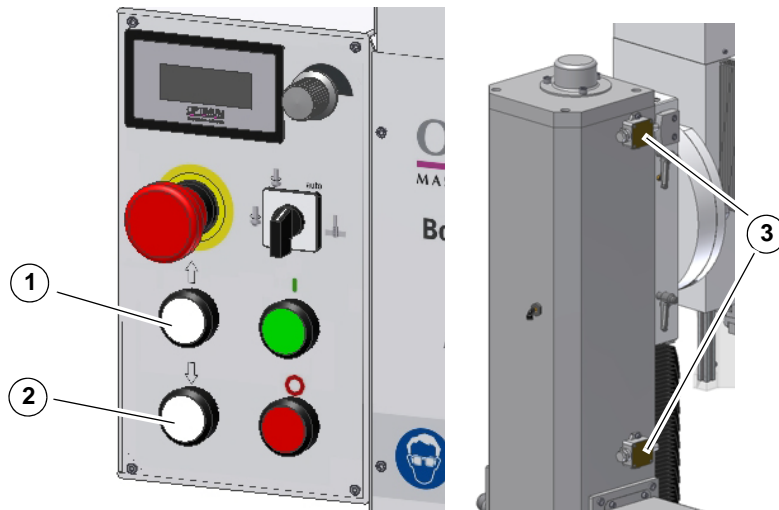
- Release clamping lever (2).
- Engage the handle (1) by pushing it towards the teeth.
- Crank the drilling milling head to the required position.
- Clamp if needed.



## 4.10 Threading

as described under "Threading" on page 32

### 4.10.1 Traveling the drill-mill head upward respectively downward using the control panel



Img.4-8: Traveling the drilling milling head upward respectively downward using the control panel

1	Traveling the drilling milling head upward
2	Traveling the drilling milling head downward
3	End switch

→ Press the button (1) in order to travel the drilling milling head upward.

→ Press the button (2) in order to travel the drilling milling head downward.

The end switch (3) limits the vertical movement of the drilling milling head upward respectively downward.

## 4.11 Inserting a tool on BF46TC

### 4.11.1 Installation

#### CAUTION!

**When milling operations are performed the cone seat must always be fixed to the draw-in rod. All cone connections with the taper bore of the work spindle without using the draw-in rod is not allowed for milling operations. The cone connection should be released by the lateral pressure. Injuries may be caused by parts flying off.**



The milling head is equipped with a pneumatic tool changer and a M16 extraction rod (draw in bar).



- Clean the seat in the spindle / quill.
- Clean the taper of your tool.
- Insert the tool in the spindle / quill.

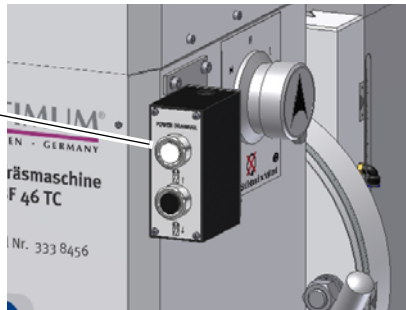


Img.4-9: Installation tool

- Clamp the tool fixture by actuating the pressure switch "Clamping" on the control panel. The fixture will be drawn into the spindle. Press the push button switch until the tool is securely clamped.

### ATTENTION!

Push button "CLAMPING"



Img.4-10: Installation tool

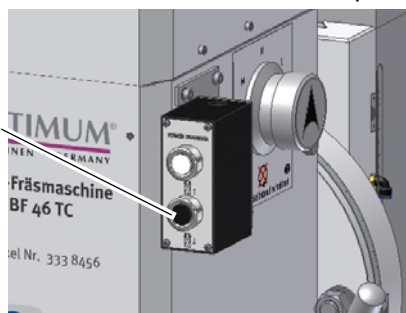
**Make sure that the tool seat is correctly positioned (ISO 40).**

**The tool clamping system must not be activated when the machine is operated.**

### 4.11.2 Unfitting

- Release the tool by actuating the switch "Release". The fixture comes out of the spindle.
- Press the push button switch until the tool is completely detached.

Push button "RELEAS-  
ING"



Img.4-11: Extraction tool



**ATTENTION!**

Hold the tool fixture tight when you detach it. The tool fixture is pressed out of the spindle.

**ATTENTION!**

The tool clamping system must not be activated when the machine is operated.



Img. 4-12: Extraction tool

**ATTENTION!**

When using an optional MT4 spindle.

When installing a cold morse taper into a heated-up machine those MT seats tend to shrink on the morse taper contrary to the quick-releaser tapers.





## 4.12 Safety

Commission the mill drill only under the following conditions:

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

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



☞ "For your own safety during operation" on page 15

## 4.13 Use of collet chucks

When using collet chucks for the reception of milling tools, a higher operation tolerance can be achieved. The exchange of the collet chucks for a smaller or larger end mill cutter is performed simply and rapidly and it is not necessary to disassemble the complete tool. The collet chuck is pressed into the ring of the swivel nut and must rest there by itself. The milling cutter is clamped by fastening the swivel nut on the tool.

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.

☞ "Compressed air supply on BF46TC" on page 26

## 4.14 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.



## 4.15 Changing the speed range

### ATTENTION!

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

- Select gear level
  - H = rapid ( 708 - 3100 RPM )
  - M = middle ( 324 - 1680 RPM )
  - L = low ( 115 - 720 RPM )
- Adjust the speed with the potentiometer. The speed and thus the cutting speed depends on the material of the workpiece, the milling cutter diameter and the cutter type.



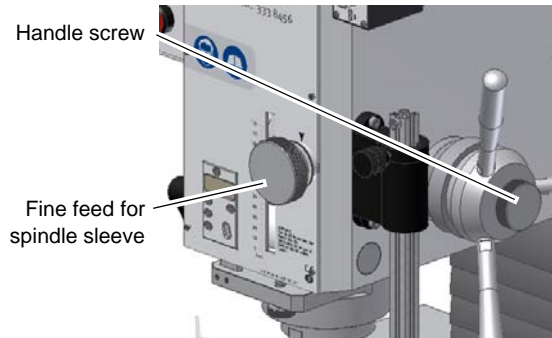
Img.4-13: Drill-Mill head





## 4.16 Manual spindle sleeve feed with the fine feed

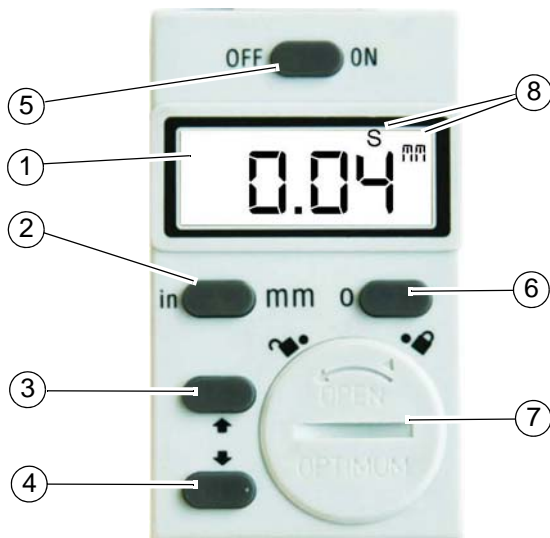
- Turn the handle screw.  
The spindle sleeve lever moves in direction of the drilling-milling head and activates the coupling of the fine feed.
- Turn the spindle sleeve fine feed in order to move the spindle sleeve.



Img.4-14: Handle screw

## 4.17 Digital display for spindle sleeve travel

Measuring range	0 - 999.99mm 0 - 39.371"
Reading precision	0.01mm 0.0004"
Power supply	round cell CR2032 , 3 V 20 x 3,2mm



Pos.	Designation
1	LCD display
2	Shifting mm/inch
3	Performs a value increase in operating mode "S" (Setting)
4	Performs a value decrease in operating mode "S" (Setting)
5	ON/OFF switch
6	Zero position and activation of operation mode "S"
7	Battery bay
8	Display of operation mode "S" and selected unit "mm / inch"



## Operation mode "S"

The operation mode "S" is used to enter and to compensate the mechanical play (backlash) of quill mechanism.

- (1) Display which shows the operating modes "S", "inch" or "mm"
- (2) converts the measuring unit from *millimetres* to *inches* and vice versa.
- (3) ▲, Value increase in operation mode "S"
- (4) ▼, Value decrease in operation mode "S"
- (5) Switches the display ON or OFF.
- Resets the display to the set compensation value "S".

## Enter the offset value of the quill mechanism

- ➔ Press the button (6) for about 2-3 seconds. The operation mode (8) "S" is activated and displayed.
- ➔ Enter the offset value of a quill mechanism, based on your experience with the keys (3) or (4).
- ➔ Stop the operation mode "S" by pressing the button (6) again.

## INFORMATION

Before inserting the new battery, wait about 30 seconds. Please make sure, that the contacts are metallicly bright and free from coverings which result from bleeding or gassing batteries. Grip the new batteries only with plastic forceps, if possible not with the hand due to the formation of oxide and never with metal forceps in order to avoid a short circuit. In most cases the round cell will be inserted into the digital display with the marking upside. After inserting the round cell, the battery compartment has to be closed again.



## 4.17.1 Malfunctions

Malfunction	Cause / possible effects	Solution
Flashing of the display	<ul style="list-style-type: none"><li>• Voltage too low</li></ul>	<ul style="list-style-type: none"><li>• Change battery</li></ul>
Screen doesn't refresh	<ul style="list-style-type: none"><li>• Operation mode "S" is active</li><li>• Disturbance in the circuit</li></ul>	<ul style="list-style-type: none"><li>• Disable the operation mode "S".</li><li>• Remove the battery, wait 30 seconds and reinsert the battery.</li></ul>
No data visible	<ul style="list-style-type: none"><li>• No power supply</li><li>• Battery voltage less than 3V</li></ul>	<ul style="list-style-type: none"><li>• Clean battery contacts</li><li>• Replace battery</li></ul>



#### 4.18 Manual spindle sleeve feed with the spindle sleeve lever

##### ATTENTION!

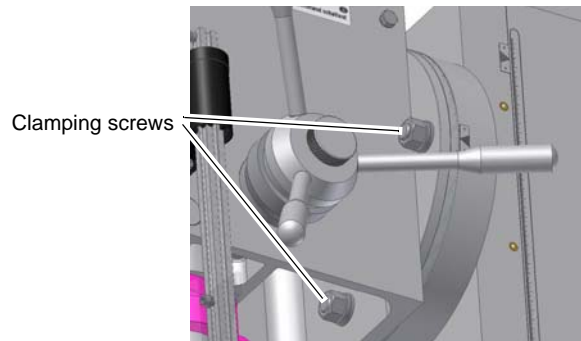
The clutch of the fine feed has to be disengaged before the spindle sleeve lever can be used. Activating the spindle sleeve lever when the fine feed is engaged may damage the clutch.



→ Loosen the handle screw. The sleeve lever moves away from the drilling head and deactivates the coupler of the fine feed.

#### 4.19 Swivelling the drill-mill head

The drill-mill head may be swivelled 45° to the right and to the left. There are to loosen three screws.



Img.4-15: Clamping screws

##### CAUTION!

If the screws are completely unfastened, the drilling-milling head might fall down. When slewing the working head, only unfasten the screws as far as necessary to be able to perform the settings. After having set the slewing angle, retighten the fixing screws.



##### ATTENTION!

The drill-mill head can be rotated much further. When slewing it further on gear oil might escape.



#### 4.20 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 optimised.

The optimum cutting speed mainly depends on the 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:

$$N = \frac{12V}{\pi \times D} = 3.82 \frac{V}{D}$$



## 4.20.1 Standard 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



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

Material		Cutter Diameter (in.)									Coolant <sub>3</sub>
		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 <sup>1</sup>	5.600	3.550	2.800	2.240	2.000	1.600	1.400	1.250	1.120	E
	f <sup>2</sup>	0,0016	0,0025	0,0031	0,0039	0,0049	0,0049	0,0063	0,0063	0,0079	
Structural steel, alloyed, quenched and sub-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 sub-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 above mentioned indications 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 as the material would compact and the drill bit will become rapidly blunt.
- The workpieces need to be tensed in flexibly and stably (vice, screw clamp).

### INFORMATION

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



### INFORMATION

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



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





## 5 Maintenance

In this chapter you will find important information about

- Inspection
- Maintenance
- Repair

of the mill drill

### ATTENTION!

Properly performed regular maintenance is an essential prerequisite for

- operational safety,
- failure-free operation,
- long service life of the mill drill and
- the quality of the products which you manufacture.

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



### 5.1 Safety

#### WARNING!

The consequences of incorrect maintenance and repair work may include:

- Very serious injury to personnel working on the,
- Damage to the mill drill.

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



#### 5.1.1 Preparation

##### WARNING!

Only carry out work on the mill drill if it has been disconnected from the mains power supply.

☞ "Disconnecting and securing the mill drill" on page 15

Attach a warning sign.



#### 5.1.2 Restarting

Before restarting run a safety check.

☞ "Safety check" on page 14

##### WARNING!

Before starting the mill drill, you must check that there is no danger for persons and that the mill drill is not damaged.

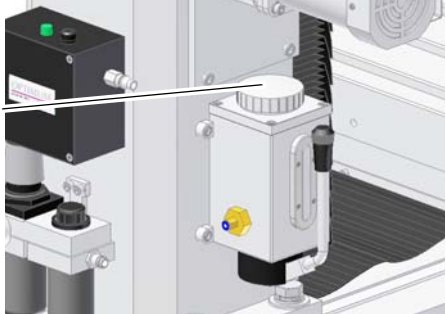
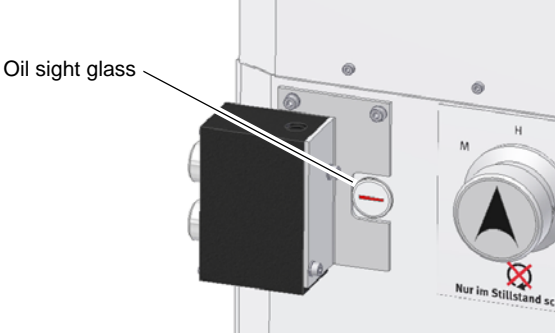


### 5.2 Inspection and maintenance

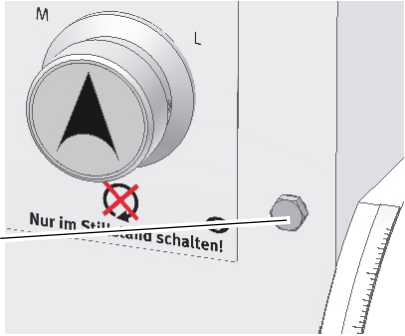
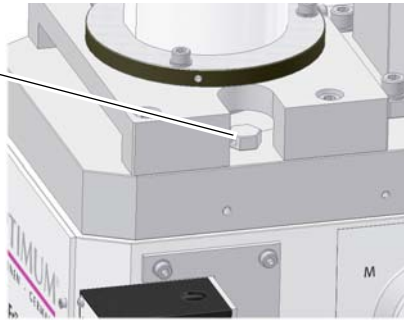
The type and level of wear depends to a large extent on the individual usage and operating conditions. For this reason, all the intervals are only valid for the authorised conditions.

Interval	Where?	What?	How?
Start of work, after every maintenance or repair work	Mill drill	→ ☞ "Safety check" on page 14	



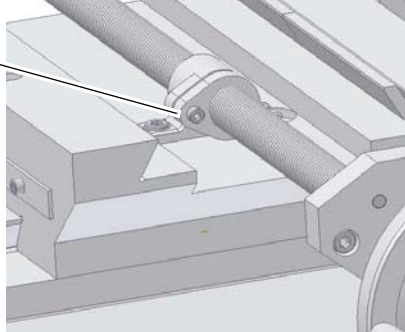
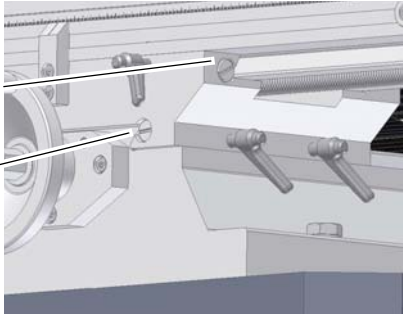
Interval	Where?	What?	How?
Start of work, after every maintenance or repair work	Cross table / drill-mill head	Oiling	<p>→ Actuate the central lubrication of the cross table and of the drill-mill head with five pump strokes. If required refill acid-free oil in the tank of the central lubrication.</p>  <p>Fig.5-1: Central lubrication</p>
Every week	Cross table	Oiling	<p>→ Oil all bare steel surfaces. Use an acid-free oil, e.g. weapon oil or motor oil.</p>
Every week	Gear milling head	Oil level	<p>→ Check the oil level of the gear. The oil level must be in the middle of the sight glass.</p>  <p>Fig.5-2: Oil sight glass gear</p>



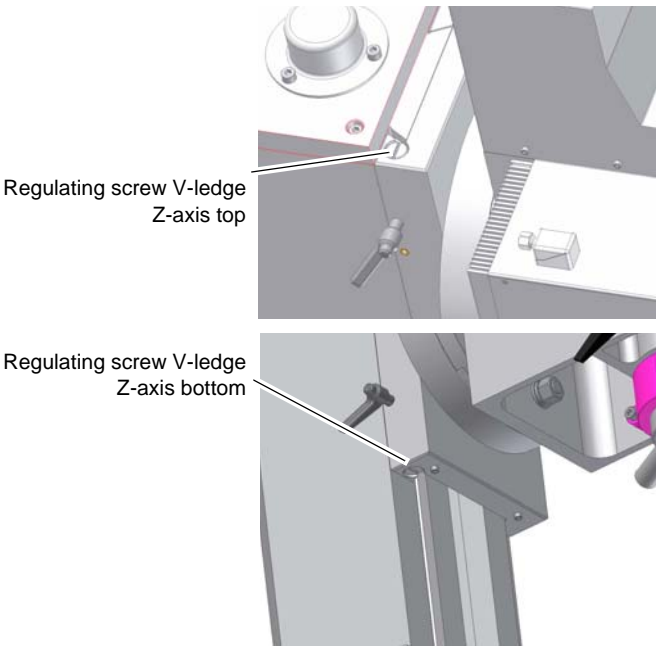
Interval	Where?	What?	How?
<p>First after 200 operating hours, then every 2000 operating hours</p>	<p style="text-align: center;">Gear milling head</p>	<p style="text-align: center;">Oil change</p>	<ul style="list-style-type: none"> <li>→ For oil change use an appropriate collecting tray of sufficient capacity.</li> <li>→ Have the mill drill run for a few minutes, the oil will heat up and will slightly penetrate from the opening.</li> <li>→ Remove the ventilation screw from the gear.</li> <li>→ Remove the oil drain plug.</li> <li>→ Refill the oil over the removed ventilation screw.</li> </ul> <p>Quantity and type of oil: "Operating material" on page 18</p> <div style="text-align: right;">  <p data-bbox="863 875 994 904">Oil drain plug</p> </div> <div style="text-align: right;">  <p data-bbox="719 1055 994 1084">Ventilation screw of the gear</p> </div> <p style="text-align: right;">Fig.5-3: Milling head</p>





Interval	Where?	What?	How?
As required	<b>Spindle nut cross table</b>	Readjusting	<p>An extended clearance in the spindles of the cross table can be reduced by readjusting the spindle nuts.</p>  <p style="text-align: center;">Fig.5-4: Spindle nut X - axis (milling table faded out)</p> <p>The spindle nuts are readjusted by reducing the thread flanks of the spindle nut by means of a regulating screw. Due to the readjustment it is necessary to check if a smooth movement over the whole travel is still given, otherwise the wear is considerably increased due to the friction between the spindle nut and the spindle.</p> <p>The regulating screw of the spindle nut of the Y axis is accessible from the rear side, the regulating screw of the spindle nut of the x axis is accessible from the right or left side of the milling table.</p>
As required	<b>V-ledges</b>	Readjusting X and Y axis	 <p style="text-align: center;">Fig.5-5: Cross table</p> <ul style="list-style-type: none"> <li>➔ Turn the adjusting screw of the respective taper gib front and rear, or left and right in the clockwise direction. The taper gib is continued to push in and reduced by it the gap in the guide way.</li> <li>➔ Check the settings. The corresponding guideway must be more easily moveable but ensure a stable guiding.</li> </ul>



Interval	Where?	What?	How?
As required	V-ledges	Readjusting Z axis:	 <p data-bbox="758 504 1005 548">Regulating screw V-ledge Z-axis top</p> <p data-bbox="758 672 1005 716">Regulating screw V-ledge Z-axis bottom</p> <p data-bbox="925 974 1228 1003">Fig.5-6: Column and mill head</p> <p data-bbox="662 1008 1380 1041">➔ Proceed as described under "Readjusting X and Y axis".</p>

## INFORMATION

The spindle bearing is lifetime-lubricated. It is not necessary to lubricate it again.



### 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 LDS Industries at (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.



## 1 Spare parts

### 1.1 Milling head 1 - 3

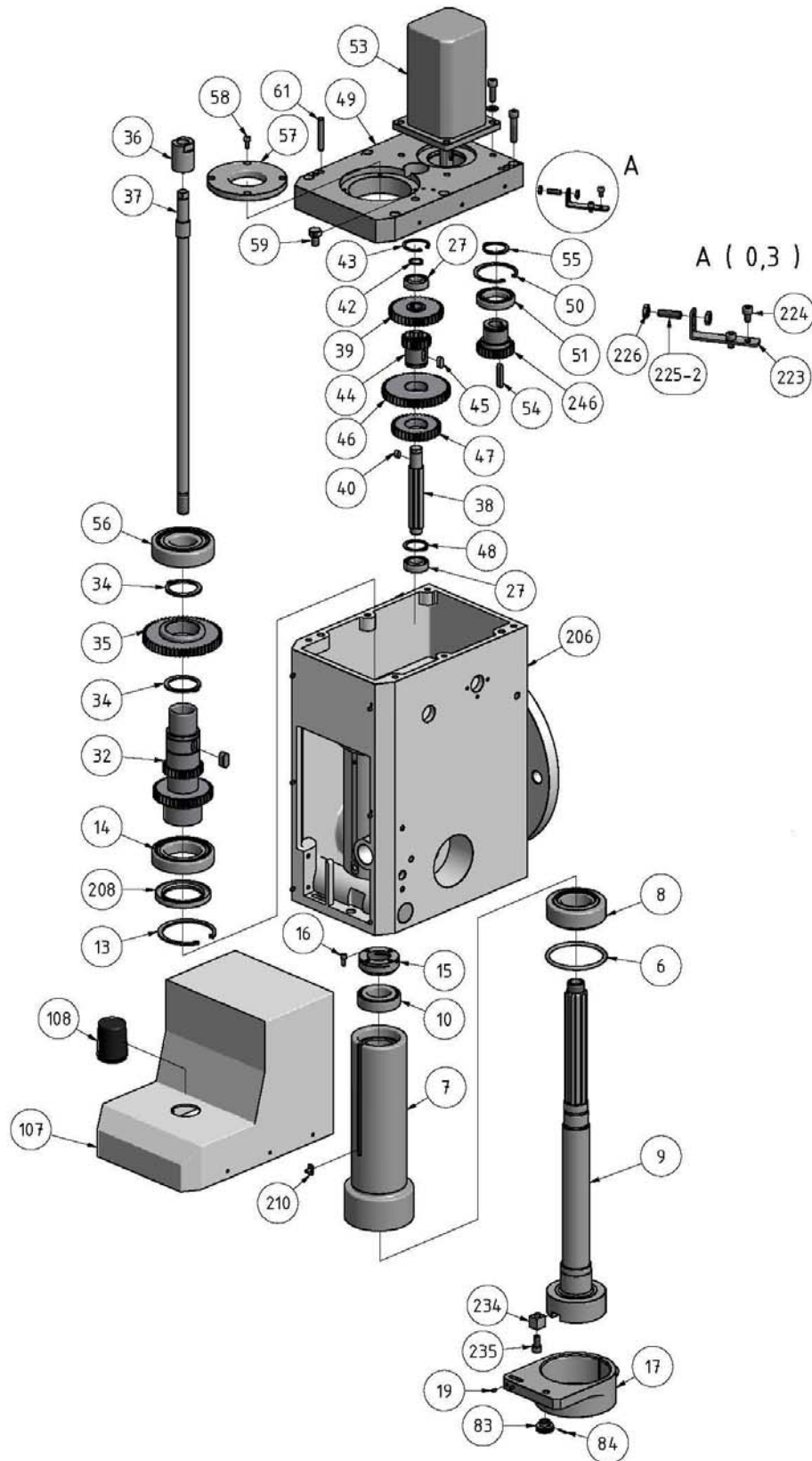


Fig. 1-1: Milling head 1 - 3



## 1.2 Milling head BF 46 TC Vario

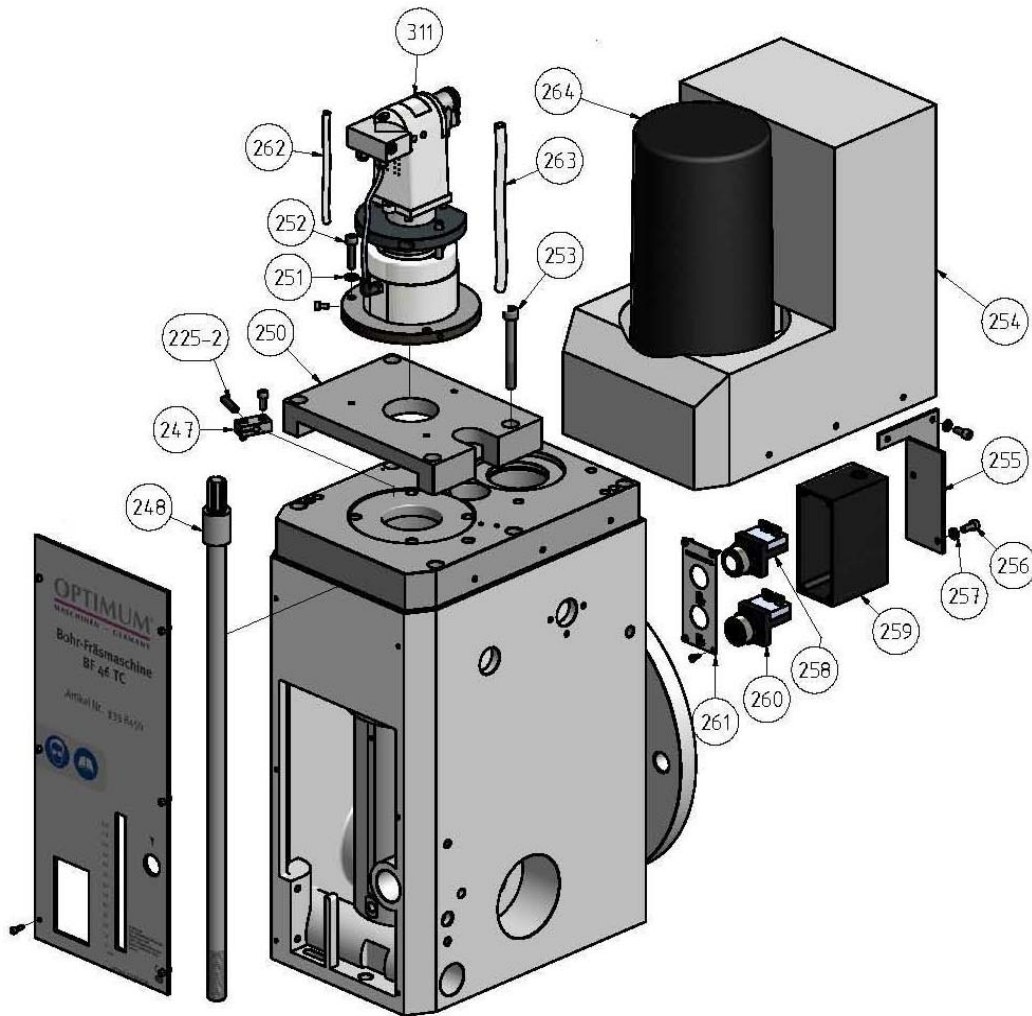


Fig. 1-2: Milling head BF46 TC Vario



## 1.3 Milling head 2 - 3

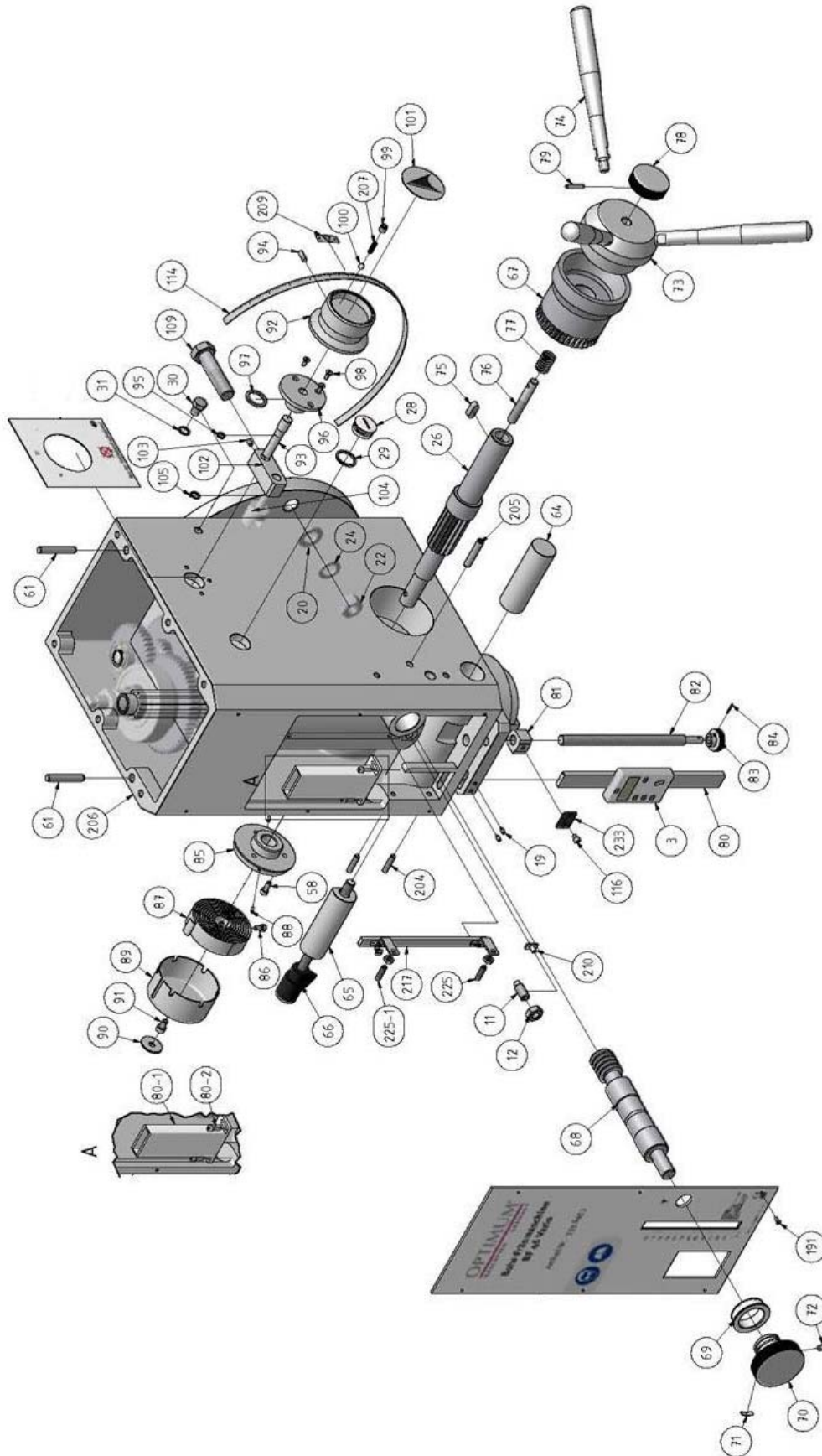


Fig.1-3: Fräskopf - Milling head 2 - 3



## 1.4 Milling head 3 - 3

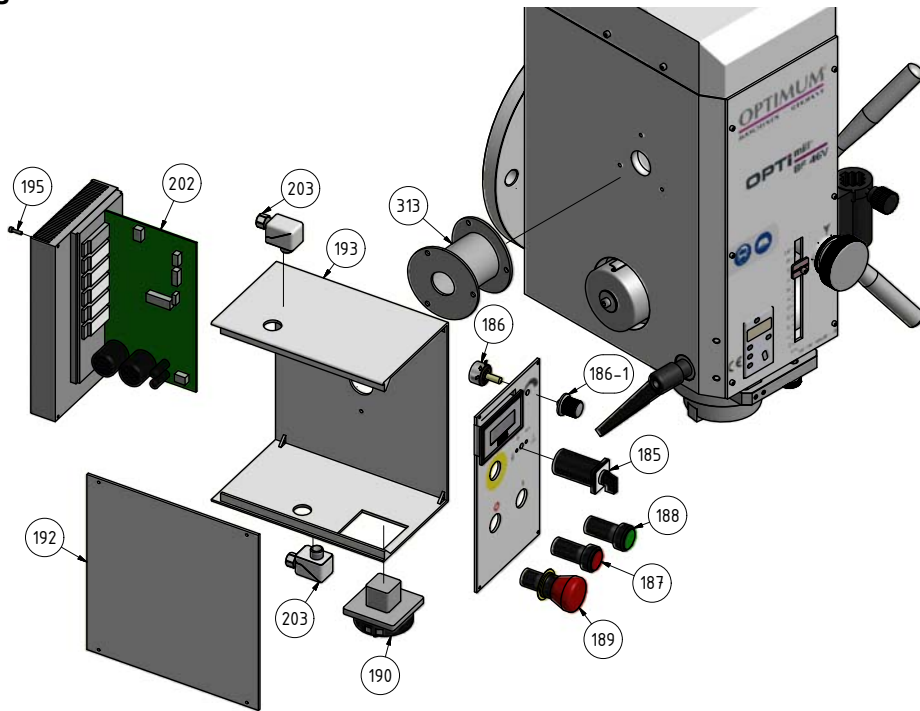


Fig.1-4: Fräskopf - Milling head 3 - 3

## 1.5 Milling head BF46TC

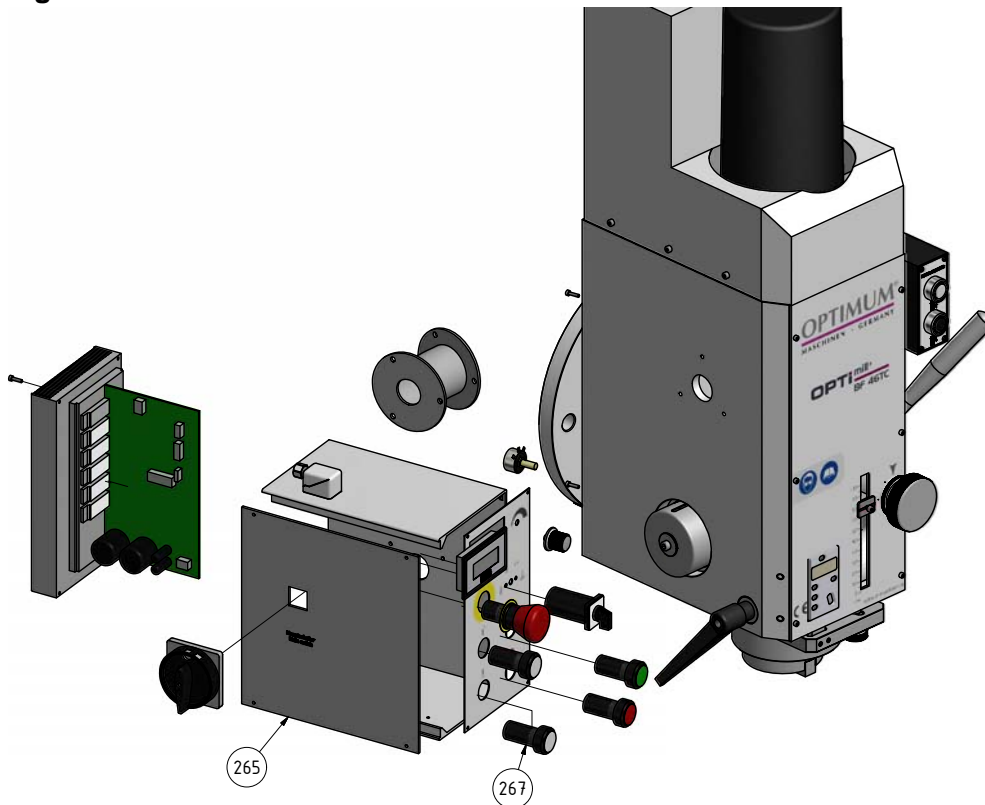


Fig.1-5: Fräskopf - Milling head BF46 TC Vario



## 1.6 Column

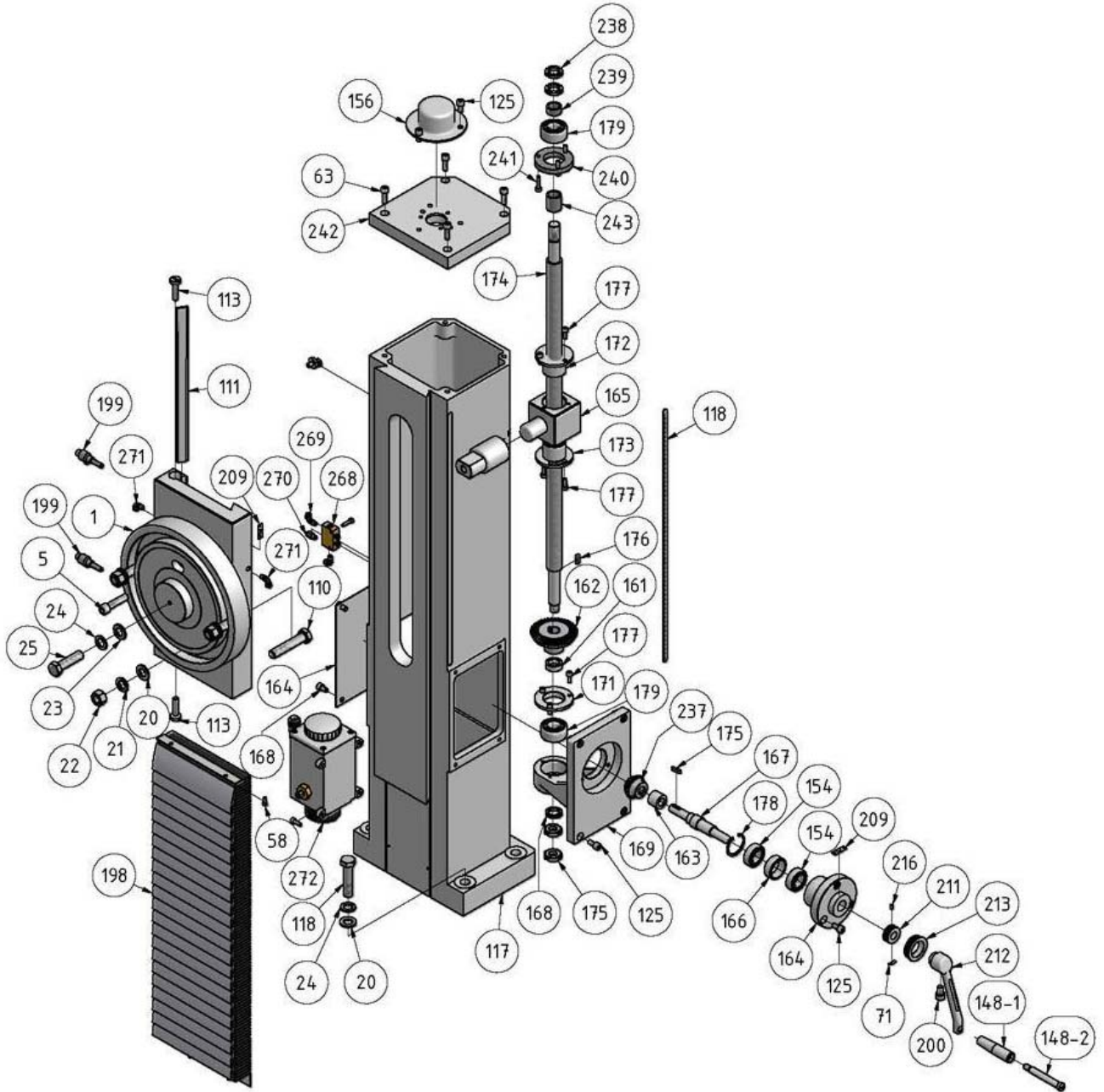


Fig.1-6: Column



## 1.7 Column BF46TC

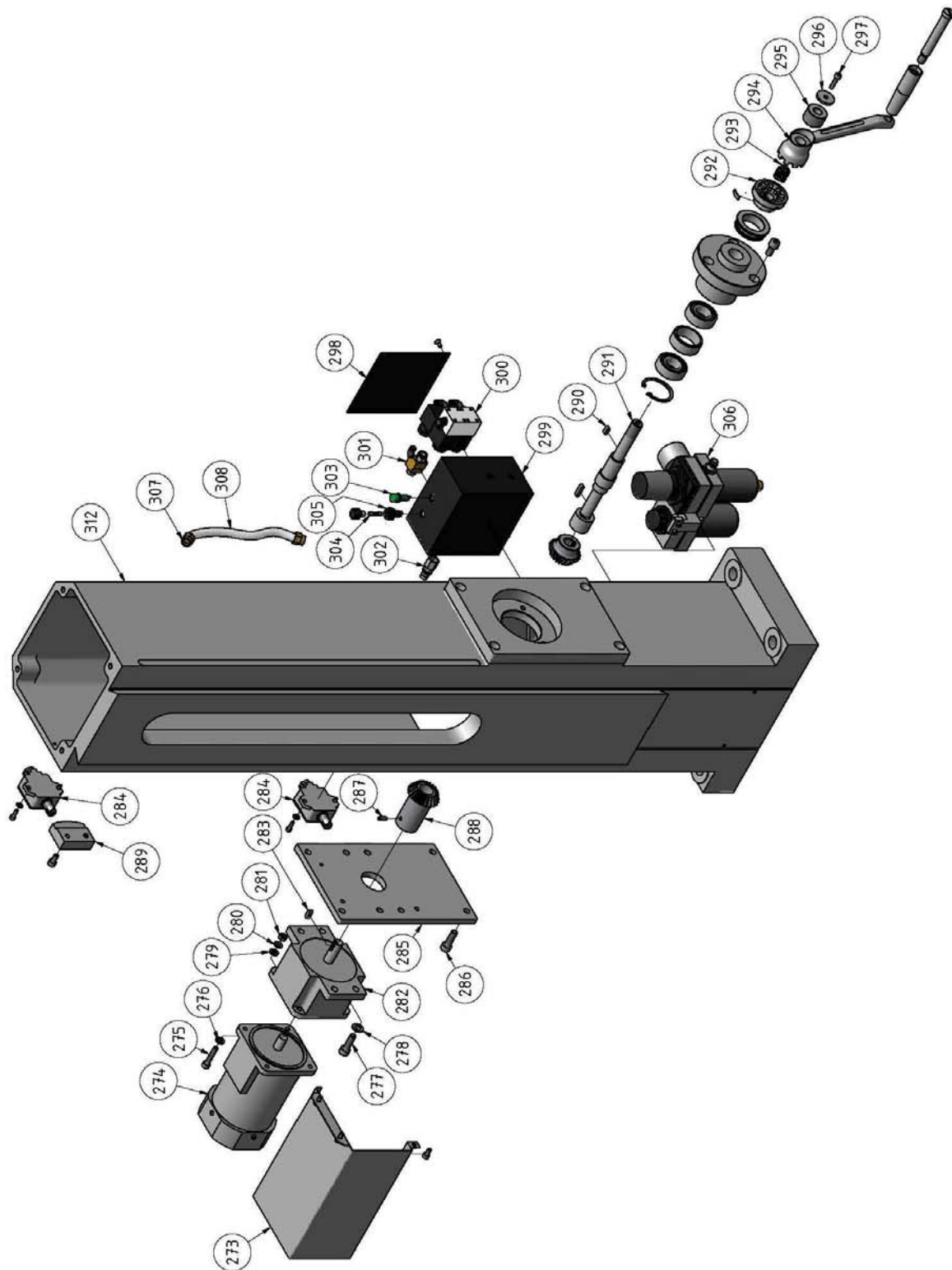


Fig.1-7: Column BF46 TC Vario





## 1.8 Cross table 1 - 2

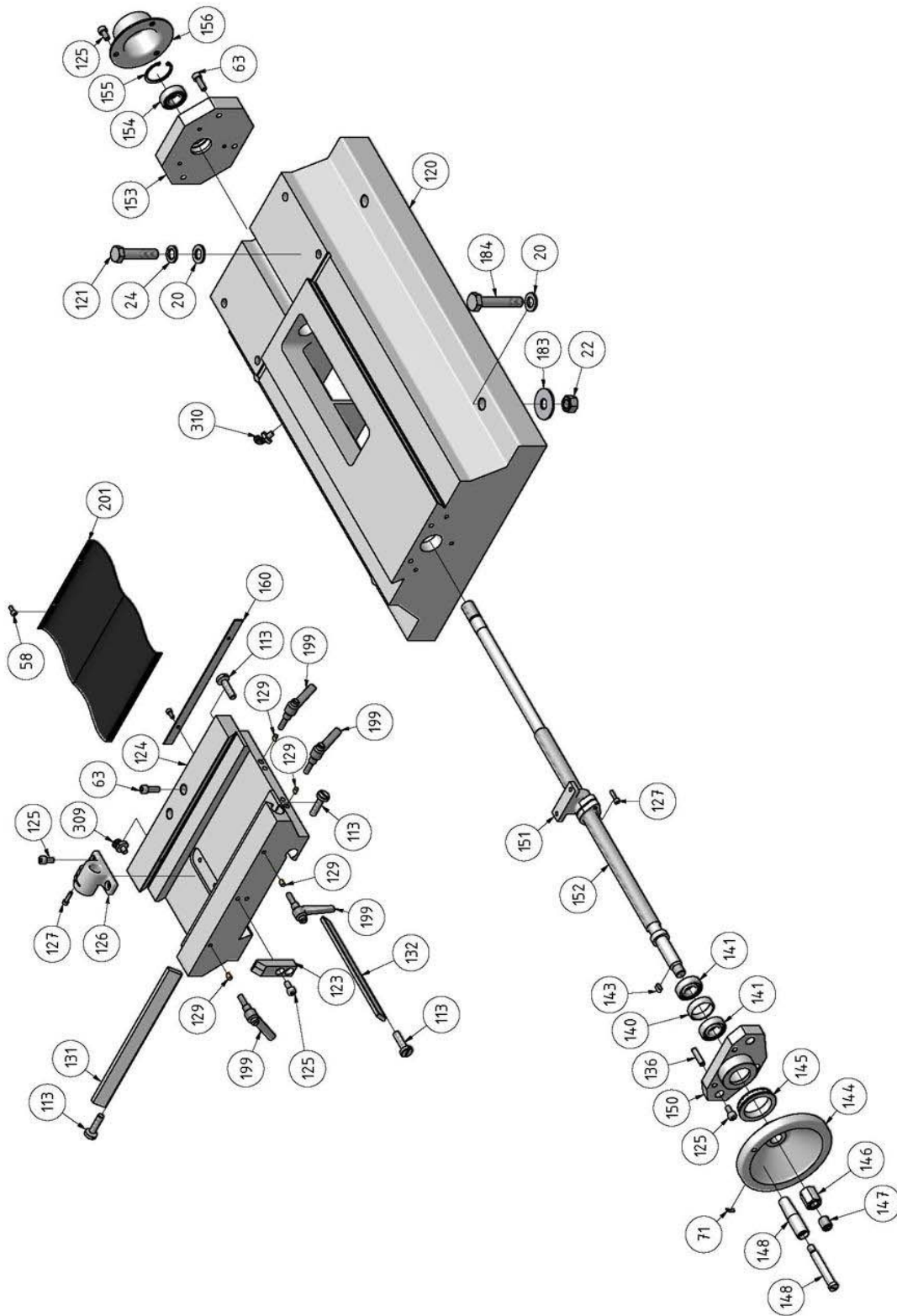


Fig.1-8: Cross table 1 - 2



## 1.9 Cross table 2 - 2

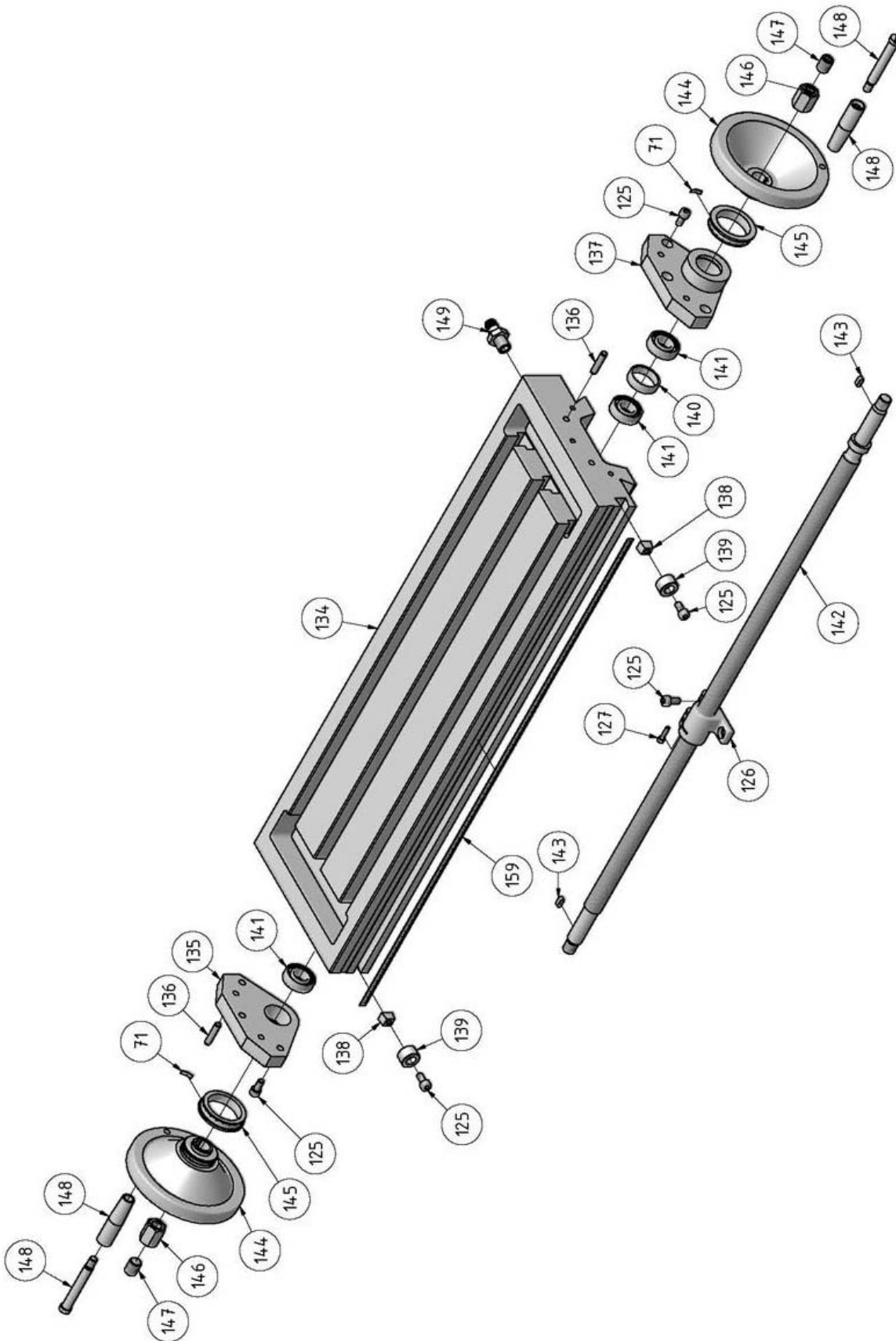


Fig.1-9: Cross table 1 - 2



## 1.10 Protection device

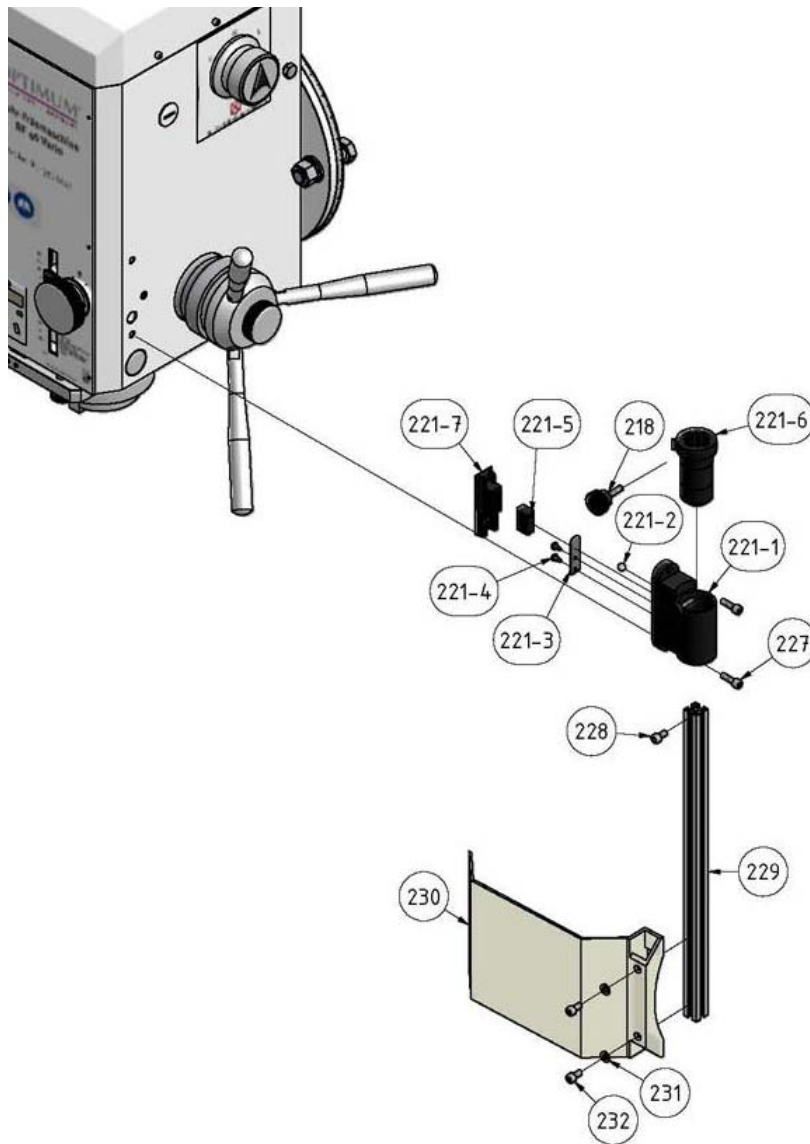


Fig. 1-10: Protection device



## 1.11 Machine stand (option)

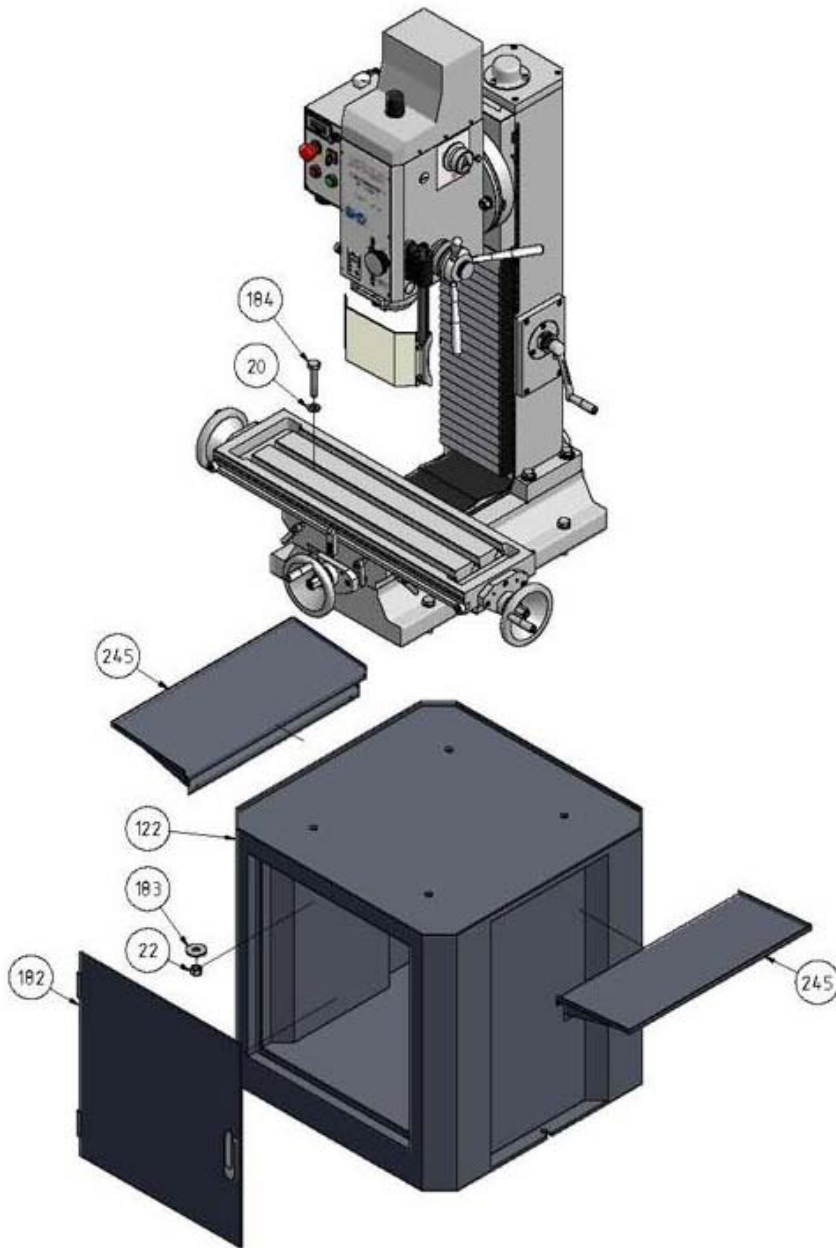


Fig.1-11: Machine stand (option)



## 1.11.1 Spare parts list

Pos.	Description	Qty.	Drawing no.	Size	Article no.
1	Connect board	1	1015119		0333845301
2	Socket head screw	1	ISO 4762	M3 x 10	
3	Digital indicator	1	DQ-02A		0333845303
5	Hexagon screw	1	DIN 912	M12 x 50	
6	O-ring	1	DIN 3771	77.5 x 5.3	0333845306
7	Pinole	1	1015105b		0333845307
	Pinole	1	1015105		
8	Taper roller bearing ISO40	1		33209_Q	04033209
	Taper roller bearing MT4, option	1		33208_Q	
	Spindle R8	1		R8	0333845309y
9	Spindle ISO 40, option	1	1015101_SK40	SK40	0333845309
	Spindle MT4, option	1	1015101_MK4	MK4	
10	Taper roller bearing	1		33007	04033007
11	Set screw	1	DIN 915	M10 x 25	
12	Hexagon nut	1	DIN 934	M10	
13	Snap ring	1	DIN 472	80 x 2.5	0333845313
14	Grooved ball bearing	1		6011-2RZ	0406011.2R
15	Clamping nut	1	1015106		0333845315
16	Hexagon screw	2	DIN 912	M5 x 12	
17	Support	1	1015103b		0333845317
18	Hexagon screw	1	DIN 912	M8 x 20	
19	Set screw	2	DIN 915	M4 x 8	
20	Washer	11	DIN125	A 16	
21	Lock washer	1	DIN 127	A 16	0333845321
22	Hexagon nut	7	ISO 4032	M16	
23	Washer	1	DIN 125-2	17	
24	Lock washer	7	DIN 128	A16	0333845324
25	Hexagon screw	1	ISO 4017	M16 x 60	
26	Pinion shaft	1	1015135		0333845326
27	Grooved ball bearing	2		6003	0406003.2R
28	Oil sight glas	1			0333845328
29	O-ring	1	DIN 3771	20 x 2.65 - N - NBR 70	0333845329
30	Hexagon screw	1	AS 2465	3/8 x 1/2 UNC	0333845330
31	Copper washer	1		10	0333845331
32	Toothed drive shaft	1	1015107		0333845332
33	Key	1	DIN 6885	A10 x 6 x 18	0333845333
34	Snap ring	2	DIN 471	48	0333845334
35	Gear 55	1	1015108		0333845335
36	Holder drawin bar	1	1015141		0333845336
	Drawin bar R8				0333845337y
37	Drawin bar ISO40	1	1015701b	M16	0333845337
	Drawin bar MT4	1	1015701		0333845337MK4
38a	Shaft, year of manufacture to 2011	1	1015113		0333845338a
38	Shaft, year of manufacture from 2011	1			0333845338
39	Gear 37T	1	up to year 2006	straight teeth	0333845339A
39	Gear 37T	1	from year 2006	helical teeth	0333845339
40	Key	1	DIN 6885	A 6 x 6 x 10	0333845340
41	Key	1	DIN 6885	A 6 x 6 x 70	0333845341
42	Snap ring	1	DIN 471	17	0333845342
43	Snap ring	1	DIN472	35	0333845343
44a	Gear, year of manufacture up to 2011	1	1015114		0333845344a
44	Gear, year of manufacture from 2011	1			0333845344
45	Key	1	DIN 6885	A 6 x 6 x 16	0333845345
46	Gear 47	1	1015115		0333845346
47	Gear 33	1	1015116		0333845347
48	Snap ring	1	DIN 471	32	0333845348
49	Milling head housing cover	1	1015109		0333845349
50	Snap ring	1	DIN 472	55	0333845350
51	Grooved ball bearing	2		6307.2R	0406307R
52	Gear wheel	1	1015117	1015117	0333845352
53	Motor	1		Motor 2,2 KW	0333845353
54	Key	1	DIN 6885	A 6 x 6 x 36	0333845354
55	Snap ring	1	DIN 471	32 x 1.5	0333845355
56	Grooved ball bearing	1		6308-2RZ	0406308.2R
57	Bearing cover	1	1015110		0333845357
58	Socket head screw	13	ISO 4762	M5 x 12	
59	Vent screw	1	1015142		0333845359
60	Socket head screw	6	ISO 4762	M8 x 40	
61	Cylindrical pin	2	ISO 8734	8 x 50 - A	0333845361
62	Washer	7	DIN 125	8	
63	Socket head screw	27	ISO 4762	M8 x 25	



Pos.	Description	Qty.	Drawing no.	Size	Article no.
64	Clamping bolt	1	1015138		0333845364
65	Clamping bolt	1	1015139		0333845365
66	Clamping lever	1			0333845366
67	Taper gear wheel 35	1	1015133		0333845367
68	Worm shaft	1	1015129		0333845368
69	Scale ring	1	1015130	inch	0333845369y
70	Knurling tool	1	1015131		0333845370
71	Spring plate	4	D140-04-09		0333845371
72	Set screw	1	DIN 916	M6 x 8	
73	Hub	1	1015134		0333845373
74	Lever	3			0333845374
74	Lever year of manufacture 05/2009	3			03338430227
75	Key	1	DIN 6885	A 8 x 7 x 20	0333845375
76	Threaded rod	1	1015128-2		0333845376
77	Compression spring	1	2x14x30-3	2x14x30-3	0333845377
78	Knurling tool	1	1015128-1		0333845378
79	Spring pin	1	ISO 13337	3 x 25	
80	Measuring ruler digital display	1			0333845380
80-1	Protective cover	1			03338453801
80-2	Socket head screw	!			
81	Drilling depth stop	1	1015122		0333845381
82	Threaded rod	1	1015121		0333845382
83	Knurling tool	1	1015123		0333845383
84	Spring pin	1	ISO13337	3 x 14	
85	Driving disk	1	1015136		0333845385
86	Hexagonal screw with slot	1	ISO 1207	M5 x 10	
87	Return spring	1	1015137		0333845387
88	Screw	2	DIN427	M3 x 10	
89	Return spring housing	1	1015120		0333845389
90	Disk	1	1015140		0333845390
91	Socket head screw	1	ISO 4762	M6 x 10	
92	Choice rotary switch transmission	1	1015132		0333845392
93	Shaft	1	1015127		0333845393
94	Set screw	1	DIN 914	M5 x 16	
95	O-ring	1	DIN 3771	6.9 x 1.8 G	0333845395
96	Support shift fork	1	1015126		0333845396
97	O-ring	1	DIN 3771	20 x 3.55 - N - NBR 70	0333845397
98	Screw	3	ISO 10642	M5 x 10	
99	Set screw	1	DIN 913	M8 x 8	
100	Steel ball	1	GB-T308-1994	6.5	03338453100
101	Position cover choice rotary switch	1	1015506		03338453101
102	Arm shift fork	1	1015125		03338453102
103	Set screw	1	DIN 913	M5 x 8	
104	Shift fork	1	1015124		03338453104
105	Snap ring	1	DIN 471	10 x 1	03338453105
106	Socket head screw	6	ISO 4762	M4 x 8	
107	Motor cover	1	1015111		03338453107
108	Cover cap	1	DM14-01-09		03338453108
109	Hexagon screw	2	ISO 4014	M16 x 65	
110	Hexagon screw	1	ISO 4014	M16 x 80	
111	Taper gib	1	1015119		03338453112
113	Adjusting screw	6	1015002		03338453113
114	Angle scale	1	1015502		03338453114
116	Socket head screw	1	ISO 4762	4762-M4 x 8	
117	Column	1	1015301		03338453117
118	Scale	1	1015503	inch	03338453118y
120	Machine base	1	1015202		03338453120
121	Hexagon screw	4	ISO 4014	M16 x 70	
122	Machine stand, option	1	1015702		3353005
123	Zero point - linear measurement cross table	1	1015204		03338453123
124	Cross table guidance	1	1015210		03338453124
125	Socket head screw	28	ISO 4762	M8 x 16	
126	Spindle nut x-axis	1	1015208	inch	03338453126y
127	Socket head screw	2	ISO 4762	M5 x 20	
128	Grease nipple	8			0340114
129	Brass pin	6			03338453129
131	Taper gib x-axis	1	1015207		03338453131
132	Taper gib y-axis	1	1015215		03338453132
134	Milling table	1	1015209		03338453134
135	Bearing block x-axis	1	1015219		03338453135
136	Cylindrical pin	6	ISO 2338	8 h8 x 35	03338453136
137	Bearing block x-axis	1	1015218		03338453137



Pos.	Description	Qty.	Drawing no.	Size	Article no.
138	Slots stone end stop x-axis	2	1015206		03338453138
139	Bushing end stop x-axis	2	1015205		03338453139
140	Spacer ring x-axis	2	1015220		03338453140
141	Grooved ball bearing	5	6004	6004	0406004.2R
142	Spindle x-axis	1	1015216	inch	03338453142y
143	Key	3	DIN 6885	A 6 x 6 x 14	03338453143
144	Handwheel	3	1015211		03338453144
145	Scale ring	3	1015213	inch	03338453145y
146	Clamping nut	3	1015212		03338453146
147	Set screw	3	DIN 913	M16 x 20	
148	Handle complete	4	JB-T7270.4-1994		03338453148
148-1	Bushing	4			033384531481
148-2	Screw	4			033384531482
149	Screwing in connection coolant drainage	1	1015217		03338453149
150	Bearing block y-axis	1	1015201		03338453150
151	Spindle nut y-axis	1	1015214	inch	03338453151y
152	Spindle y-axis	1	1015203	inch	03338453152y
153	Bearing block y-axis	1	1015221		03338453153
154	Grooved ball bearing	4	6004-2Z	6004-2Z	0406004.2R
155	Snap ring	1	DIN 472	45 x 1.75	03338453155
156	Spindle cover	2	1015222		03338453156
158	Bearing block	1	1015308		03338453158
159	Scale x-axis	1	1015504	inch	03338453159y
160	Plate	1			03338453160
161	Spacer	1	1015302		03338453161
162	Taper gear 42	1	1015303		03338453162
163	Spacer	1	1015305		03338453163
164	Flange	1	1015306		03338453164
165	Spindle nut z-axis	1	1015307		03338453165
166	Spacer	1	1015310		03338453166
167	Shaft	1	1015311		03338453167
168	Disk	1	1015312		03338453168
169	Bearing block z-axis	1	1015313		03338453169
170	Cover plate column	1	1015314		03338453170
171	Bearing cover	1	1015315		03338453171
172	Spindle nut z-axis	1	1015316	inch	03338453172y
173	Spindle nut z-axis	1	1015317	inch	03338453173y
174	Socket head screw	4	ISO 4762	M8 x 12	
175	Key	1	DIN 6885	A 5 x 5 x 20	03338453175
176	Key	1	DIN 6885	A 6 x 6 x 20	03338453176
177	Socket head screw	8	ISO 4762	M6 x 16	
178	Snap ring	2	DIN 472	42 x 1.75	03338453178
179	Skew-angle roller bearing	1		3204 A	0403204A.2R
180	Spindle z - axis	1	1015309	inch	03338453180y
181	Groove nut	2	DIN 1804	M16	03338453181
182	Door machine stand	1	1015702_1		03338453182
183	Washer	4	DIN 9021	17	
184	Hexagonal screw	4	DIN 6914	M16 x 85	
185	Switch R/L	1			03338453185
186	Potentiometer	1			03338453186
186-1	Knob	1			033384531861
187	Push button off	1			03338453187
188	Push button on	1			03338453188
189	Emergency OFF push button	1			03338453189
190	Main switch	1			03338453190
191	Socket head screw with countersunk head	14	ISO 10642	M4 x 6	
192	Electric box - cover	1	1015402		03338453192
193	Electric box - housing	1	1015401		03338453193
194	Electric box - cover	1	BF46-FL223-003		03338453194
195	Socket head screw	4	ISO 4762	M3 x 12	
198	Bellows	1	1015004		03338453198
199	Clamping lever	6			03338453199
200	Socket head screw	1	ISO 4762	M10 x 16	
201	Rubber cover	1			03338453201
202	Control board	1	03338453700		03021303201
203	Strain relief lead switchbox	2			03338453203
204	Set screw	2	DIN 913	M6 x 25	
205	Cylindrical pin	1	ISO 8733	8 x 40	
206	Housing milling head	1	1015104		03338453206
207	Compression spring	1		0.8x5x25-3	03338453207
208	Radial rotary shaft seal	1		CR 55x80x8 HMS4 R	03338453208



Pos.	Description	Qty.	Drawing no.	Size	Article no.
209	Zero point - scale	1	B26-02-27		03338453209
210	Centerring piece pinole	1	B26-02-04		03338453210
211	Center ring scale	1	1015319		03338453211
212	Crank	1	B26-01-09		03338453212
213	Scale	1	1015318	inch	03338453213y
215	Electronic display	1			03338453215
214	Electric box - switch plate	1	1015403		03338453214
216	Threaded pin	1	M6 x 8	M6 x 8	
217	Attaching bracket	1			03338453217
221	Support	1			03338453221
221-1	Housing	1			033384532211
221-2	Steel ball	1			033384532212
221-3	Spring plate	1			033384532213
221-4	Screw	2			033384532214
221-5	Micro switch	1			033384532215
221-6	Aluminium profile admission	1			033384532216
221-7	Cover	1			033384532217
222	Clamping sciew	1			03338453222
223	Attaching bracket	1			03338453223
224	Socket head screw	2			03338453224
225	Sensor end position below	1			03338453225
225-1	Sensor end position top	1			033384532251
225-2	Rotation speed sensor	1			033384562252
226	Nut	4			03338453226
227	Socket head screw	2			03338453227
228	Socket head screw	1			03338453228
229	Aluminium profile	1			03338453229
230	Protection	1			03338453230
231	Washer	2			03338453231
232	Socket head screw	2			03338453232
233	indicator drilling depth stop	1			03338453233
234	Socket piece milling tool	2			03338453234
235	Socket head screw	2	GB 70 - 85	M8 x 16	
237	Taper gear wheel 21 teeth	1	1015304		03338453236
238	Groove nut	2	1015323		03338453238
239	Spacer	1	1015322		03338453239
240	Bearing cover	1	1015320		03338453240
241	Socket head screw	3	GB 70 - 85	M6x25	
242	Bearing block	1	1015308b		03338453242
243	Spacer	1	101531		03338453243
245	Chip tray	2			03338453245
246	Gear	1			03338453246
247	Holder sensor	1			03338456247
248	Drawin bar	1			03338456248
250	Plate	1			03338456250
251	Washer	1		DIN 125/6	
252	Hexagon socket screw	3		DIN 4762-M6x25	
253	Hexagon socket screw	4		DIN 4762-M8x70	
254	Cover	1			03338456254
255	Angle	1			03338456255
256	Hexagon socket screw	3		DIN 4762-M5x12	
257	Washer	3		DIN 125/6	
258	Button On	1			03352394125
259	Switch box	1			03352394123
260	Button Off	1			03352394126
261	Cover switch box	1			03352394127
262	Air tube			4 mm	03338453262
263	Air tube			8 mm	03338456263
264	Cover	1			03338456264
265	Cover	1			03338456265
267	Button	2			03338456267
268	3-way distributor	1			03338456410
269	Plug	2			03338453269
270	Adapter	1			03338453270
271	Plug	1			03338453271
272	Oiler	1			03336020001
273	Cover	1			03338456273
274	Motor	1			03338456274
275	Hexagon socket screw	4		DIN 4762-M6x30	
276	Washer	4		DIN 125/6	
277	Hexagon socket screw	4		DIN 4762-M8x25	





Pos.	Description	Qty.	Drawing no.	Size	Article no.
278	Washer	4		DIN 125/8	
279	Washer	4		DIN 125/6	
280	Spring washer	4		DIN 129/6	
281	Hexagon nut	4		DIN 4032/M6	
282	Gear box	1			03338456282
283	Fitting key	1		DIN 6885/5x5x14	
284	Endswitch	2			03338456284
285	Flange	1			03338456285
286	Hexagon socket screw	4		DIN 4762-M8x25	
287	Grub screw	2		DIN 4026/M5x12	
288	End stop	1			03338456288
289	End stop	2			03338456
290	Fitting key	1		DIN 6885/5x5x12	
291	Shaft	1			03338456291
292	Crown gear	1			03338456292
293	Spring	1			03338456293
294	Crank	1			03338456294
295	Sleeve	1			03338456295
296	Washer	1			03338453296
297	Hexagon socket screw	1		DIN 4762-M5x20	
298	Cover control box	1			0335239488
299	Control box	1			0335239490
300	Electric valve	1			0335239492
301	T-fiting with quick connector	1			0335239497
302	Quick connector	1			03352394122
303	Signal lamp	1			03352394114
304	Fuse	1		4A	03352394116
305	Fuse housing cpl.	1			03338453305
306	Maintenance unit	1			03352394138
307	Quick connector	2			03352394137
308	Air tube			13 mm	03352394135
309	Plug	1			03338453309
310	Plug	1			03338453310
311	Pneumatic cylinder	1			0335239481
312	Column BF46TC Vario	1			03338456312
313	Holder control panel	1			03338430377



## 1.12 Wiring diagram 1 of 2/ BF46, BF46TC

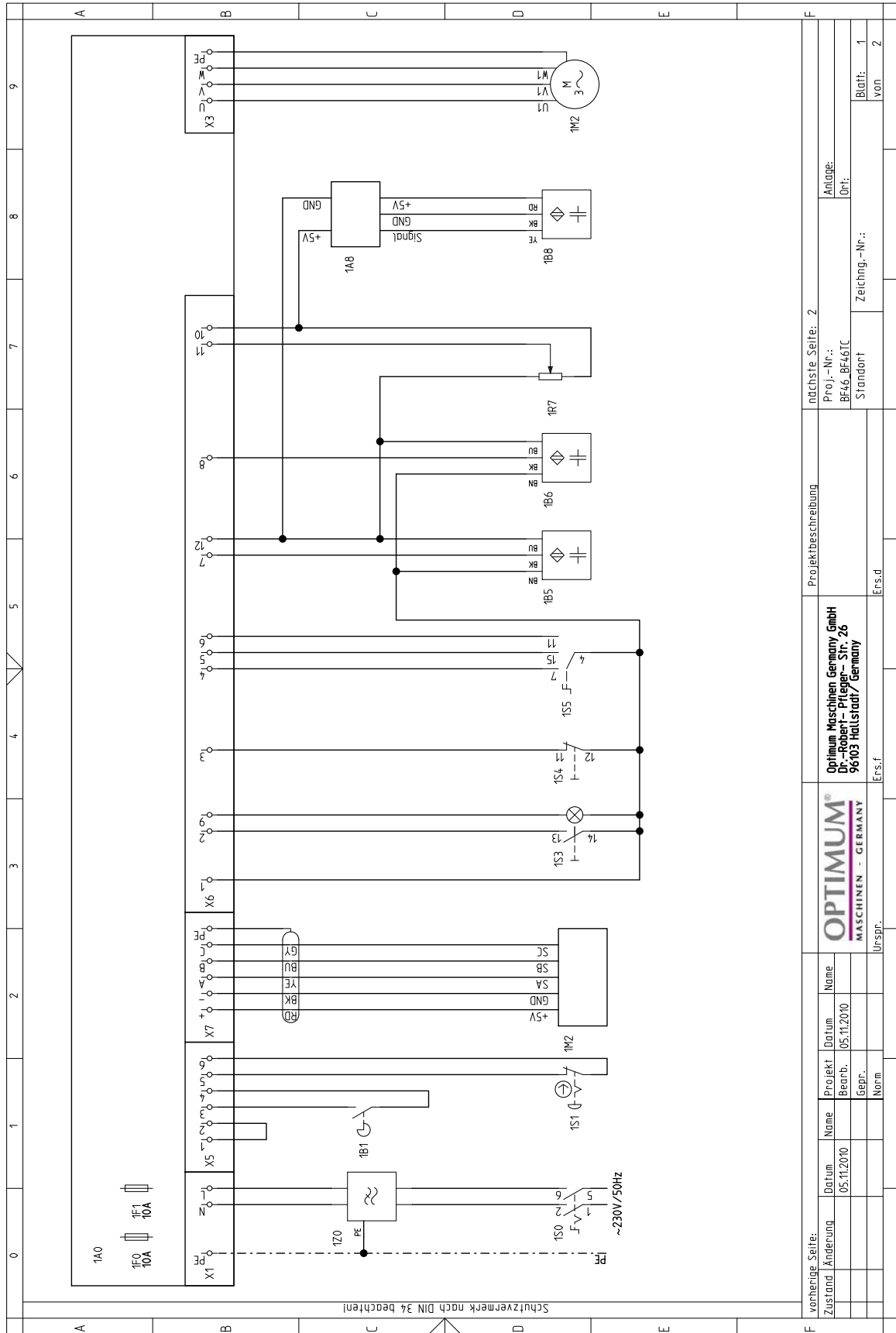


Fig.1-12: Wiring diagram 2 of 2/ BF46, BF46TC

vorherige Seite:		nächste Seite: 2	
Zustand	Projekt	Anlage:	
Änderung	Name	BF46, BF46TC	
Datum	Datum	Standort	Zeichn.-Nr.:
05.11.2010	05.11.2010		1
Bearb.	Gepr.	Blatt:	
		von 2	
Norm		Ers.d	
Urspr.		Ers.f	
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<p>Optimum Maschinen Germany GmbH Dr.-Robert-Pfleger-Str. 26 96103 Hallstadt / Germany</p>			



## 1.13 Wiring diagram 2 of 2/ BF46TC

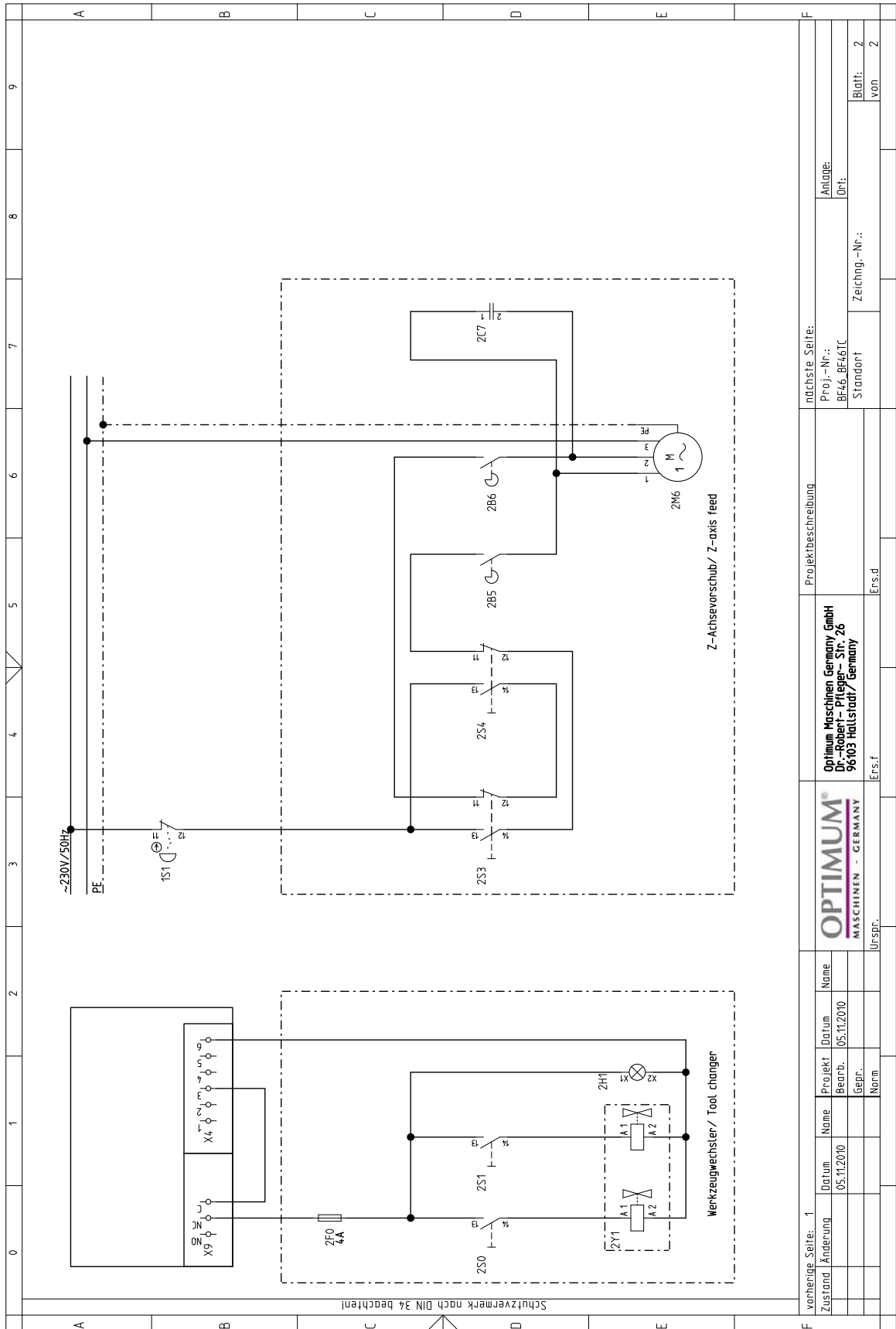


Fig.1-13: Wiring diagram 2 of 2/ BF46TC

vorherige Seite: 1		nächste Seite:	
Zustand / Änderung	Datum	Projekt / Name	Projektbeschreibung
	05.11.2010	Bearb. / 05.11.2010	Proj.-Nr.: BF46_BF46TC
		Gepr. /	Standort
		Norm /	Zeichnung-Nr.:
		Ur-Spr. /	Ort:
		Ers.f /	Blatt: 2
		Ers.d /	von 2



## 1.13.1 Parts list electrical components BF46 Vario, BF46TC Vario

Pos.	Description	Qty.	Size	Article no.
Parts list electrical komponents for BF46 Vario, BF46TC Vario				
1S0	Main switch	1	LW8GS-20104-2/660V,20A	03338453190
1A0	Brushlesscontroller	1		03021303201
1F0	Fuse	1	10A	033384531F0
1Z0	Line filter	1		033384531Z0
1B1	Milling chuck safety switch	1		0302024153-4
1S1	Emergency-Stop button	1	LA103/10A, 660V	03338453189
1F1	Fuse	1	10A	033384531F0
1M2	Drive motor	1		0333845353
1S3	Button On	1	LA103XD-22/36V,10A	03338430386
1S4	Button Off	1	LA103	03338453187
1S5	Functional switch	1	Kraus&Naimer/ F89580/001	03338453185
1B5	Upper end position sensor	1		03021303225
1B6	Lower end position sensor	1		03021303230
1R7	Potentiometer	1	WX14-12/4K7	03338120R1.5
1B8	Speed sensor	1		033384532252
1A8	Rotation speed indicator	1	SN100304	03338120P1.3
Parts list electrical components only for BF46TC Vario				
2S0	Button tool changer	1	SHAN-HO/ 6A, 250V AC	03352394125
2F0	Fuse	1	4A	03352394116
2S1	Button tool changer	1	SHAN-HO/ 6A, 250V AC	03352394126
2H1	Work light	1	24V	03352394114
2Y1	Solenoid valve	1	Amisco 24V, 5A	0335239492
2S3	Button feed z-axis	1	LA130/ 400V, 12A	03338453267
2S4	Button feed z-axis	1	LA130/ 400V, 12A	03338453267
2B5	Endswitch	1	Delixi 220V/3A	03338453284
2M6	Z-axis feed motor	1	220V, 120W, 0,95A, 1350 rpm	03338453274
2B6	Endswitch	1	Delixi 220V/3A	03338453284
2C7	Capacitor	1	7µF/150V	033384562C7



## 1.14 Lubrication diagram

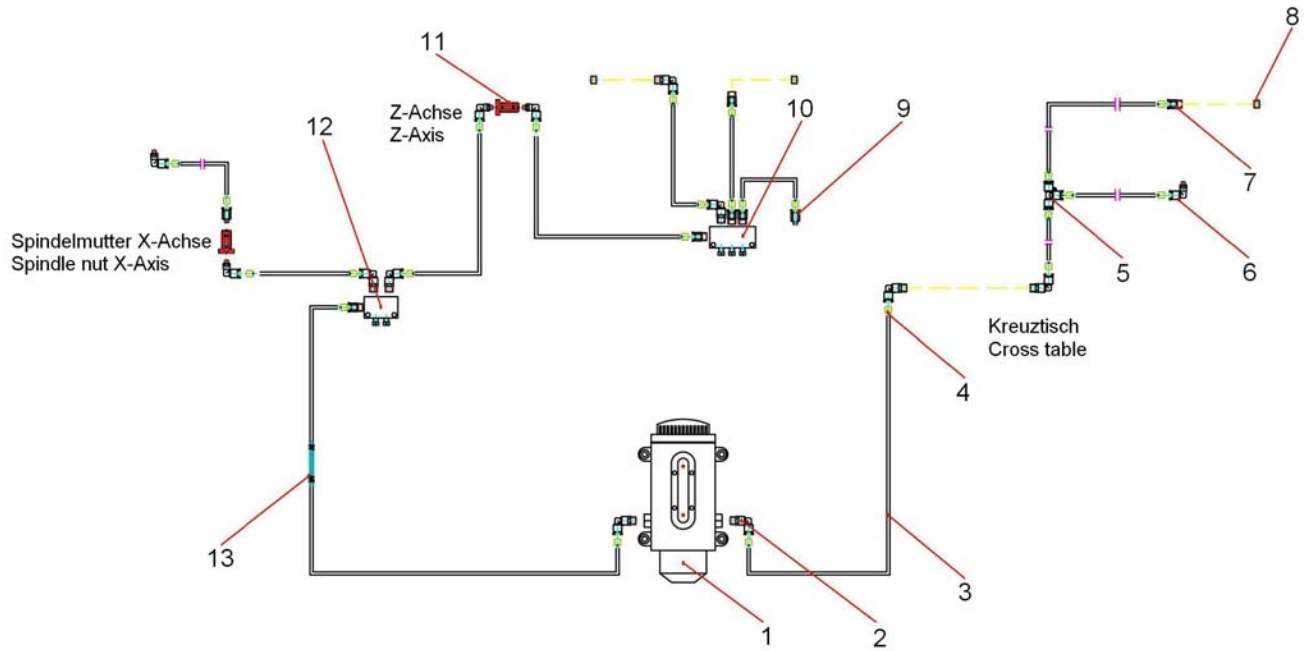


Fig.1-14: Lubrication diagram








### 1.14.1 Lubricating unit

Pos.	Description	Qty.	Size	Article no.
1	Oiler	1		03336020001
2	L- Connector	8	M10x1	03338456402
3	Oil tube		4mm	03338456403
4	Protecting cap	14		03338456404
5	T- Connector	1		03338456405
6	L- Connector	2		03338456406
7	Series connection	2	M10x1	03338456407
8	Screwing	3	M10x1	03338456408
9	Series connection	1		03338456409
10	Manifold	1		03338456410
11	Connector screw	1		03338456411
12	Manifold	1		03338456412
13	Tube protection			03338456413

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Lubricant	Viskosity ISO VG DIN 51519 mm <sup>2</sup> /s (cSt)	Designation according DIN 51502							
Gear oil	VG 680	CLP 680	Aral Degol BG 680	BP Energol GR-XP 680	SPARTAN EP 680	Klüberoil GEM 1-680	Mobilgear 636	Shell Omala 680	Meropa 680
	VG 460	CLP 460	Aral Degol BG 460	BP Energol GR-XP 460	SPARTAN EP 460	Klüberoil GEM 1-460	Mobilgear 634	Shell Omala 460	Meropa 460
	VG 320	CLP 320	Aral Degol BG 320	BP Energol GR-XP 320	SPARTAN EP 320	Klüberoil GEM 1-320	Mobilgear 632	Shell Omala 320	Meropa 320
	VG 220	CLP 220	Aral Degol BG 220	BP Energol GR-XP 220	SPARTAN EP 220	Klüberoil GEM 1-220	Mobilgear 630	Shell Omala 220	Meropa 220
	VG 150	CLP 150	Aral Degol BG 150	BP Energol GR-XP 150	SPARTAN EP 150	Klüberoil GEM 1-150	Mobilgear 629	Shell Omala 150	Meropa 150
	VG 100	CLP 100	Aral Degol BG 100	BP Energol GR-XP 100	SPARTAN EP 100	Klüberoil GEM 1-100	Mobilgear 627	Shell Omala 100	Meropa 100
	VG 68	CLP 68	Aral Degol BG 68	BP Energol GR-XP 68	SPARTAN EP 68	Klüberoil GEM 1-68	Mobilgear 626	Shell Omala 68	Meropa 68
	VG 46	CLP 46	Aral Degol BG 46	BP Bartran 46	NUTO H 46 (HLP 46)	Klüberoil GEM 1-46	Mobil DTE 25	Shell Tellus S 46	Anubia EP 46
	VG 32		Aral Degol BG 32	BP Bartran 32	NUTO H 32 (HLP 32)	LAMORA HLP 32	Mobil DTE 24	Shell Tellus S 32	Anubia EP 32
Gear grease		G 00 H-20	Aral FDP 00 (Na-verseift) Aralub MFL 00 (Li-ver- seift)	BP Energ grease PR-EP 00	FIBRAX EP 370 (Na-ver- seift)	MICRO- LUBE GB 00	Mobilux EP 004	Shell Alvania GL 00 (Li- verseift)	Marfak 00
Bearing grease		K 3 K-20 (Li- verseift)	Aralub HL 3	BP Energ grease LS 3	BEACON 3	CENTO- PLEX 3	Mobilux 3	Shell Alvania R 3 Alvania G 3	Multifak Premium 3



## 2 Malfunctions

Malfunction	Cause / possible effects	Solution
The mill drill does not start	<ul style="list-style-type: none"> <li>Power-on sequence ignored.</li> </ul>	<ul style="list-style-type: none"> <li> "Switching on the mill drill" on page 30 and  "Switching on the mill drill" on page 35</li> <li>Have it checked by authorised personnel.</li> </ul>
Tool "burnt".	<ul style="list-style-type: none"> <li>Incorrect speed.</li> <li>Chips do not come out of the bore hole</li> <li>Tool blunt.</li> <li>Operating without cooling agent.</li> </ul>	<ul style="list-style-type: none"> <li>Select another rate, feed too high.</li> <li>Pull out tool more often. Sharpen or replace tool.</li> <li>Use cooling agent</li> </ul>
Impossible to insert grip cone into the spindle sleeve.	<ul style="list-style-type: none"> <li>Remove any dirt, grease or oil from the internal conical surface of the spindle sleeve or the grip cone.</li> </ul>	<ul style="list-style-type: none"> <li>Clean surfaces well</li> <li>Keep surfaces free of grease.</li> </ul>
It is not possible to push-out the taper.	<ul style="list-style-type: none"> <li>Optional MT4 taper is shrunk on the Morse taper.</li> </ul>	<ul style="list-style-type: none"> <li>Let the machine run at highest speed for two minutes in order to warm it up and then retry to disassemble the taper.</li> </ul>
Motor does not start	<ul style="list-style-type: none"> <li>Defective fuse.</li> </ul>	<ul style="list-style-type: none"> <li>Have it checked by authorised personnel.</li> </ul>
Working spindle rattling on rough piece surfaces	<ul style="list-style-type: none"> <li>Climb milling machining not possible under the current operating conditions.</li> <li>Clamping lever of the movement axes not tightened.</li> <li>Loose collet chuck, loose drill chuck, loose draw-in rod.</li> <li>Tool is blunt.</li> <li>The workpiece is not fastened.</li> <li>Excessive slack in bearing.</li> <li>Working spindle goes up and down.</li> </ul>	<ul style="list-style-type: none"> <li>Perform conventional milling.</li> <li>Tighten clamping lever</li> <li>Check, re-tighten.</li> <li>Sharpen or replace tool</li> <li>Clamp the workpiece firmly.</li> <li>Readjust bearing slack or replace bearing</li> <li>Readjust bearing slack or replace bearing</li> </ul>
Fine feed of the spindle sleeve does not work	<ul style="list-style-type: none"> <li>Fine feed is not correctly activated.</li> <li>Coupling of the fine feed does not cam-in, is soiled, blurred, worn, defective</li> </ul>	<ul style="list-style-type: none"> <li> "Manual spindle sleeve feed with the fine feed" on page 41</li> <li>Clean, replace.</li> </ul>
Digital display	<ul style="list-style-type: none"> <li> "Malfunctions" on page 42</li> </ul>	





## 3 Appendix

### 3.1 Copyright

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Subject to technical changes without notice.

### 3.2 Terminology/Glossary

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



## 3.3 LIMITED WARRANTY

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**Manufactured for OPTIMUM, LDS Industries, LLC, 930 W. National Ave. Addison, IL 60101, Tel.: 1-630-785-6437**



CE

## EC - Declaration of Conformity



Machinery Directive 2006/42/EC Annex II 1.A

**The manufacturer /  
retailer:** Optimum Maschinen Germany GmbH  
Dr.-Robert-Pfleger-Str. 26  
D- 96103 Hallstadt

**hereby declares that the following product,**

**Type of machine:** Drilling-milling machine

**Type designation:** BF46V ; BF46TC

**Serial number:** \_ \_ \_ \_ \_

**Year of manufacture:** 20\_\_

Manual geared drill with with frequency converter for speed control for private persons as well as for craft and industrial plants which meets all the relevant provisions of the above mentioned Directive 2006/42/EC as well as the other directives applied (below) including their amendments in force at the time of declaration. The following other EU Directives have been applied: EMC Directive 2014/30/EC, Low Voltage Directive 2014/35/EC

The safety objective meet the requirement of EC Directive 2006/95/EC

**The following harmonized standards were applied:**

EN 1037:1995+A1:2008 Safety of machinery - Prevention of unexpected start-up

EN ISO 14119 Safety of machinery - Interlocking devices associated with guards - Principles for design and selection

EN 61800-5-1 Adjustable speed electrical power drive systems 2008-04 + correction 2

EN 61800-3:2012-09 Adjustable speed electrical power drive systems + correction 1

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

EN 50581:2012 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

EN 60204-1:2006/AC: 2010 Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1:2005 (modified))

DIN EN 55011 class A: 2003-08 Industrial, scientific radio-frequency equipment

EN ISO 12100:2010 Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)

EN ISO 13857:2008 Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs

Responsible for documentation: Kilian Stürmer, phone: +49 (0) 951 96555 - 800

Address: Dr.-Robert-Pfleger-Str.26D - 96103 Hallstadt

Kilian Stürmer Hallstadt, 2015-01-16  
(CEO, General manager)



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