OPTIMUM®
MASCHINEN - GERMANY

Operating manual

Version 1.4.3

Bohr- Fräsmaschine

OPTImill® BF 16V

3338116

GB

Table of contents

1 Safety
1.1 Type plate ... 5
1.2 Safety instructions (warning notes) ... 6
1.2.1 Classification of hazards ... 6
1.2.2 Other pictograms ... 6
1.3 Intended use ... 7
1.4 Reasonably foreseeable misuses ... 8
1.4.1 Avoiding misuses ... 8
1.5 Possible dangers caused by the drilling-milling machine ... 9
1.6 Qualification ... 9
1.6.1 Target group private users ... 9
1.6.2 Obligations of the User ... 10
1.6.3 Additional requirements regarding the qualification ... 10
1.7 Operator positions ... 10
1.8 Safety measures during operation ... 10
1.9 Safety devices ... 10
1.9.1 EMERGENCY-STOP button ... 11
1.9.2 Protective cover ... 11
1.9.3 Milling chuck protection ... 12
1.10 Safety check ... 12
1.11 Personnel protective equipment ... 12
1.12 For your own safety during operation ... 13
1.13 Switching-off and securing the drilling-milling machine ... 13
1.14 Using lifting equipment ... 13
1.15 Signs on the drilling-milling machine ... 14
1.16 Electronics ... 14

2 Technical data
2.1 Electrical connection ... 15
2.2 Drilling-milling capacity ... 15
2.3 Spindle seat ... 15
2.4 Drill-Mill head ... 15
2.5 Cross table ... 15
2.6 Dimensions ... 15
2.7 Working area ... 15
2.11 Emissions ... 16
2.8 Speeds ... 16
2.9 Environmental conditions ... 16
2.10 Operating material ... 16
2.12 Installation plan BF 16V ... 17
2.13 Installation plan of optional substructure ... 18

3 Delivery, interdepartmental transport and unpacking
3.1 Notes on transport, installation and unpacking ... 19
3.1.1 General risks during internal transport ... 19
3.2 Scope of delivery ... 20
3.3 Installation and assembly ... 20
3.3.1 Requirements regarding the installation site ... 20
3.3.2 Load suspension point ... 20
3.3.3 Assembly ... 21
3.4 First commissioning ... 21
3.4.1 Power supply ... 21
3.4.2 Cleaning and lubricating ... 21
3.4.3 Warming up the machine ... 22

4 Operation
4.1 Control and indicating elements ... 23
4.2 Safety ... 24
4.3 Switching on the drilling-milling machine ... 24
4.4 Inserting a tool ... 24
4.4.1 Use of collet chucks ... 25

BF16V_GBIVZ.fm

4.4.2 Direct clamping into the work spindle 25
4.5 Changing the speed range 25
4.5.1 Selecting the speed 26
4.5.2 Standard values for cutting speeds 26
4.5.3 Standard values for speeds with HSS – Eco – twist drilling 27
4.6 Clamping the workpieces 28
4.7 Feed 28
4.8 Swivelling the drill-mill head 28
4.9 Offset the drill-mill head 29
4.10 Clamping lever 29
4.11 End stops 29

5 Maintenance

5.1 Safety 30
5.1.1 Preparation 30
5.1.2 Restarting 30
5.2 Inspection and maintenance 31
5.3 Repair 32
5.3.1 Customer service technician 32

6 Ersatzteile - Spare parts

6.1 Ersatzteilbestellung - Ordering spare parts 33
6.2 Hotline Ersatzteile - Spare parts Hotline 33
6.3 Service Hotline 33
6.4 Elektrische Ersatzteile - Electrical spare parts 33
6.5 Schaltplan - Wiring diagram 33
6.6 Ersatzteilzeichnungen - Spare part drawings 34
6.7 Schaltplan - Wiring diagram 39

7 Malfunctions

7.1 Malfunctions on the drilling-milling machine 44

8 Appendix

8.1 Copyright 45
8.2 Terminology/Glossary 45
8.3 Change information operating manual 45
8.4 Liability claims for defects / warranty 46
8.5 Storage 47
8.6 Note regarding disposal / options to reuse: 47
8.6.1 Decommissioning 47
8.6.2 Disposal of the packaging of new devices 48
8.6.3 Disposing of the old device 48
8.6.4 Disposal of electrical and electronic components 48
8.6.5 Disposal of lubricants and coolants 48
8.7 Disposal via municipal collection 49
8.8 Product follow-up 49

Preface

Dear customer,

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

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

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

Information

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

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

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

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

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

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

Optimum Maschinen Germany GmbH

Dr.- Robert - Pfleger - Str. 26

D-96103 Hallstadt

Mail: info@optimum-maschinen.de

Internet: www.optimum-maschinen.com

1 Safety

Glossary of symbols

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

This part of the operating instructions

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

In addition to these operation instructions, please observe

- ❍ the applicable laws and regulations,
- ❍ the legal regulations for accident prevention,
- ❍ the prohibition, warning and mandatory signs as well as the warning labels on the drilling-milling machine.

Always keep this documentation close to the drilling-milling machine.

INFORMATION

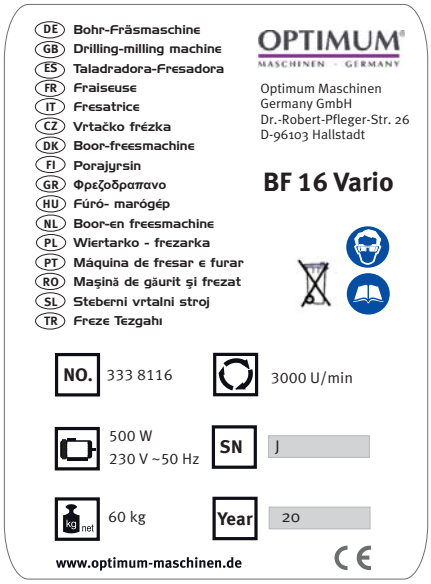
If you are unable to solve a problem using these operating instructions, please contact us for advice:

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

D- 96103 Hallstadt

Email: info@optimum-maschinen.de

1.1 Type plate



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

In case of specific dangers, we replace the pictogram by

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

1.2.2 Other pictograms

Activation forbidden!

Warning of flammable substances!

Warning of suspended loads!

Warning risk of stumbling!

Warning tilting danger!

Warning of automatic start-up!

Warning of biological hazard!

Read the operating instruction!

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Pull the main plug!


Use safety glasses! protection


Use face shield!


Use protective boots!


Use protective suit!


Use ear protection!


Protect the environment!


Contact address

1.3 Intended use

WARNING!

In the event of improper use, the drilling-milling machine

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

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

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

If the drilling-milling machine is used in any way other than described above, modified without the approval of the company Optimum Maschinen Germany GmbH then the drilling-milling machine is being used improperly.

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

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

It is also part of intended use that

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

☞ Technical data on page 15

WARNING!

Heaviest injuries through improper use.

It is forbidden to make any modifications or alterations to the operating values of the drilling-milling machine. These could endanger the staff and cause damage to the drilling-milling machine.

ATTENTION!

If the milling-machine is not used as intended or if the safety directives or the operating instructions are ignored the liability of the manufacturer for any damages to persons or objects resulting hereof is excluded and the claim under 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 milling-machine.

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

The operators must be qualified.

1.4.1 Avoiding misuses

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

For the drilling-milling machine there are conversion kits.

The one who changed the manual controlled BF16V is legally the manufacturer of a new machine due to the significant change in the machine and is therefore responsible for compliance with the requirements of the Machinery Directive and the DIN EN 13128.

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

CAUTION!

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.

WARNING!

Do not use an drill chuck for milling tools. Never clamp a milling cutter into an 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 drilling-milling machine

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

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

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

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

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

INFORMATION

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

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

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

WARNING!

The drilling-milling machine may only be used with functional safety devices.

Disconnect the drilling-milling machine immediately, whenever you detect a failure in the safety devices or when they are not fitted!

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

This is your responsibility being the operating company!

☞ **Safety devices on page 10**

- ❍ there may be a risk to the staff,
- ❍ there may be a risk to the drilling milling machine and other material values,
- ❍ the correct function of the drilling-milling machine may be affected.

1.6 Qualification

1.6.1 Target group private users

The machine can be used in the private domain. The acumen of people in the private sector with training in metal working was taken into consideration for creating this operation manual. Vocational training or further instruction in a metal working profession is a prerequisite for safe operation of the machine. It is essential that the private user is aware of the dangers involved in operating this machine. We recommend visiting a training course in the operation of milling

machines. Your specialist dealer can offer you an appropriate training course. These courses are also offered by adult education centres in Germany.

1.6.2 Obligations of the User

The user must

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

1.6.3 Additional requirements regarding the qualification

Additional requirements apply for work on electrical components or equipment:

- ❍ They must only be performed by a qualified electrician or person working under the instructions and supervision of a qualified electrician.

Before starting work on electrical parts or operating agents, the following actions must be taken in the order given:

- ➜ disconnect all poles,
- ➜ secure against restarting,
- ➜ check that there is no voltage.

1.7 Operator positions

The operator's position is in front of the drilling-milling machine.

1.8 Safety measures during operation

CAUTION!

Risk due to inhaling of health hazardous dusts and mist.

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

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

CAUTION!

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

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

1.9 Safety devices

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

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

It is your responsibility!

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

- ❍ have removed the cause of the failure,
- ❍ have verified that there is no danger resulting for the 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 drilling-milling machine. The possible consequences are

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

The drilling-milling machine includes the following safety devices:

- an EMERGENCY-STOP button,
- a protective cover on the drilling / milling 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 button

The EMERGENCY STOP push button switches off the drilling-milling machine.

☞ Switching on the drilling-milling machine on page 24

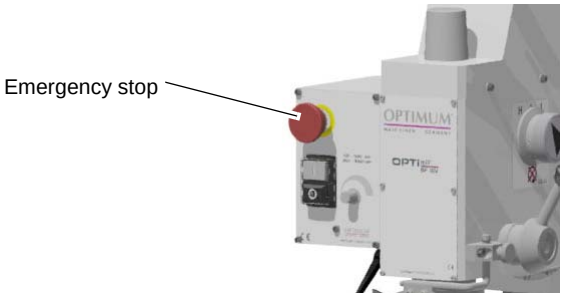

Fig.1-1: EMERGENCY-STOP button

ATTENTION!

The emergency stop push button stops the drilling-milling machine the moment it is activated.

Press the EMERGENCY STOP push button only if there is a risk! If this push button is actuated in order to switch off the drilling-milling machine 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 Protective cover

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

WARNING!

Only remove the protective cover when the mains plug of the drilling-milling machine is disconnected.

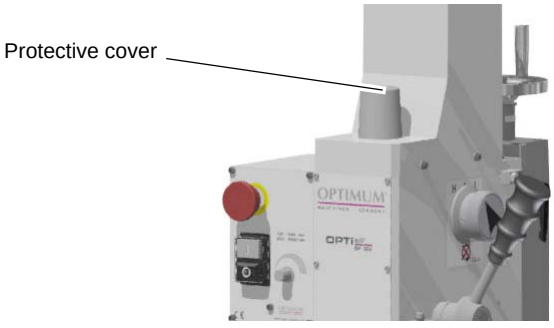

Fig.1-2: Protective cover

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1.9.3 Milling chuck protection

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.

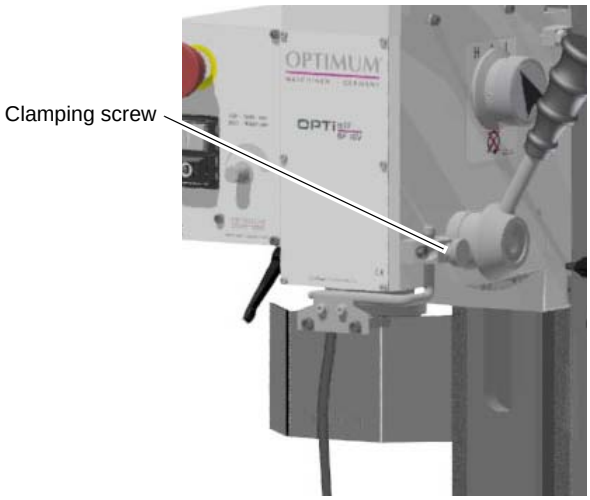

Fig. 1-3: Separating protective equipment

1.10 Safety check

Check the drilling-milling machine 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 push button	When the EMERGENCY-STOP button is activated, the drilling-milling machine should 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 protective equipment around the drilling milling spindle	The drilling-milling machine may switch on only when the safety device is closed.	

1.11 Personnel protective equipment

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

Protect your face and 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 drilling-milling machine assure yourself that this will neither endanger other persons nor cause damage to equipment.

Avoid any risky working practices:

- The instructions mentioned in these operating instructions have to be strictly observed during assembly, operation, maintenance and repair.
- Wear safety goggles.
- Switch off the drilling-milling machine before measuring the workpiece.
- Do not work on the drilling-milling machine, if your concentration is reduced, for example, because you are taking medication.
- Stay on the drilling-milling machine until the working spindle has come to a complete stand-still.
- 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 when drilling or milling.
- 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 drilling-milling machine.

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

1.13 Switching-off and securing the drilling-milling machine

Unplug the main switch before starting any maintenance or repair work.

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 Signs on the drilling-milling machine

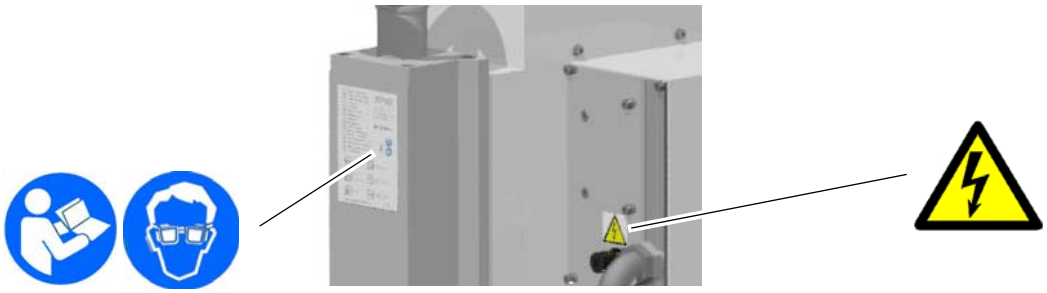

Abb.1-4: BF16 Vario

1.16 Electronics

INFORMATION

Have the machine and/or the electric equipment checked regularly. Immediately eliminate all defects such as loose connections, defective wires, etc.

2 Technical data

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

2.1 Electrical connection	
Motor power consumption	230 V / 50Hz / 500 W
2.2 Drilling-milling capacity	
Drilling capacity in steel [mm]	max. Ø 16
Milling capacity end mill [mm]	max. Ø 20
Milling capacity milling head [mm]	Ø max. 63mm
Throat [mm]	175
2.3 Spindle seat	
Spindle seat	MT 2 / M10
Spindle sleeve stroke [mm]	50 mm
2.4 Drill-Mill head	
Swivelling	+ / - 90°
Reduction stages	2
Z axis travel [mm]	210
2.5 Cross table	
Table length [mm]	400
Table width [mm]	120
Spindle pitch [mm]	2
Y-axis travel [mm]	160
X-axis travel [mm]	220
T - slot size / distance [mm]	10 / 35
2.6 Dimensions	
Height [mm]	795
Depth [mm]	465
Width [mm]	505
Total weight [kg]	62
2.7 Working area	
Height [mm]	2000
Depth [mm]	2200
Width [mm]	1500

2.8 Speeds	
Gear stage slow [min^{-1}]	100 - 1500
Gear stage rapid [min^{-1}]	200 - 3000
2.9 Environmental conditions	
Temperature	5-35 °C
Humidity	25 - 80%
2.10 Operating material	
Gear Bare steel parts	Mobilgrease OGL 007 or Mobilux EP 004 acid-free oil, for example Gun oil, engine oil

2.11 Emissions

The generation of noise in accordance with DIN ISO 8525 emitted by the machine is 78 dB(A) on no-load running at 80% of max. spindle speed, measured at a distance of one meter from the machine and at a height of 1.6m.

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

INFORMATION

This numerical value was measured on a new machine under 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 ope-rator 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.

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2.12 Installation plan BF 16V

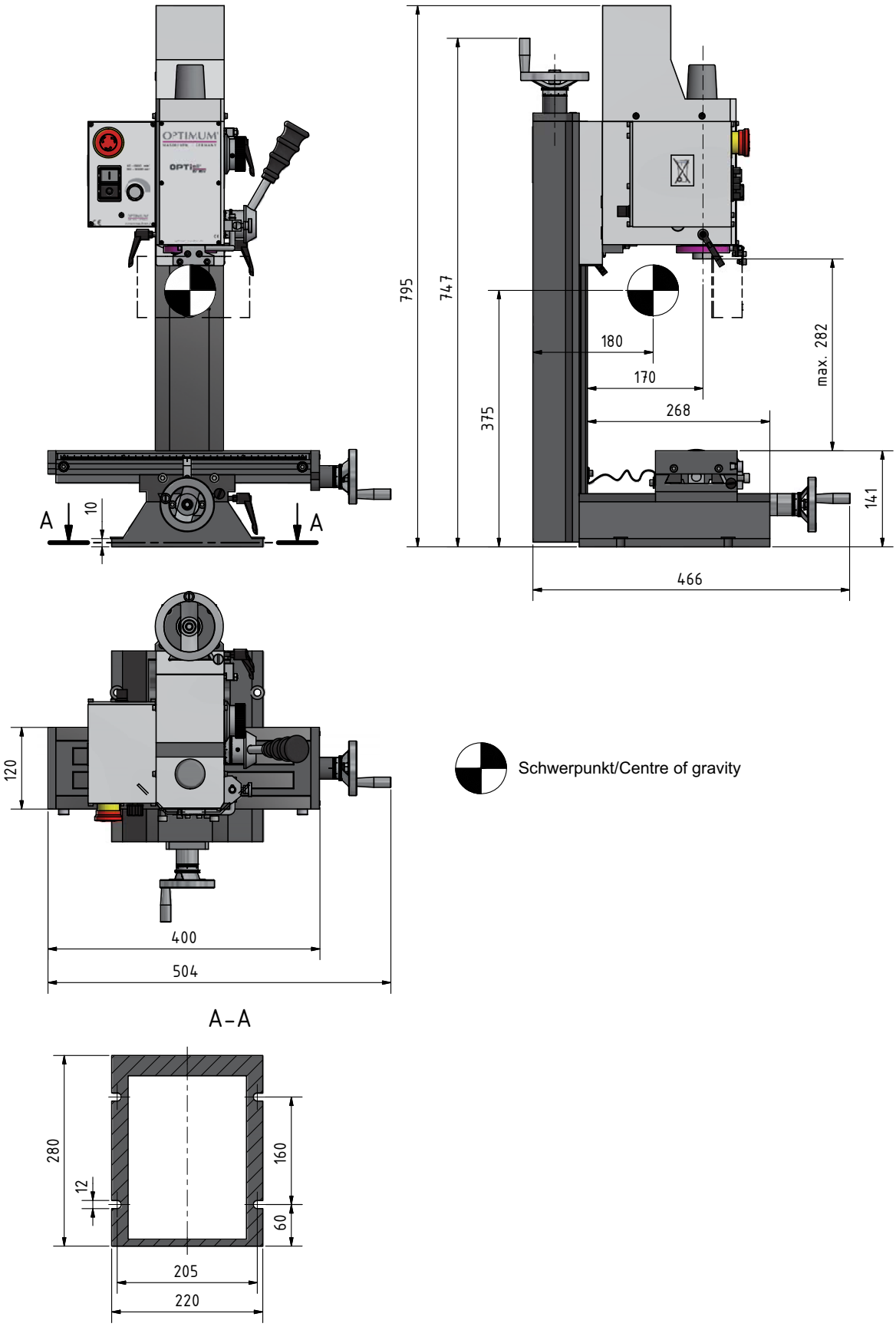

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Abb. 2-1: Installation plan BF 16V

2.13 Installation plan of optional substructure

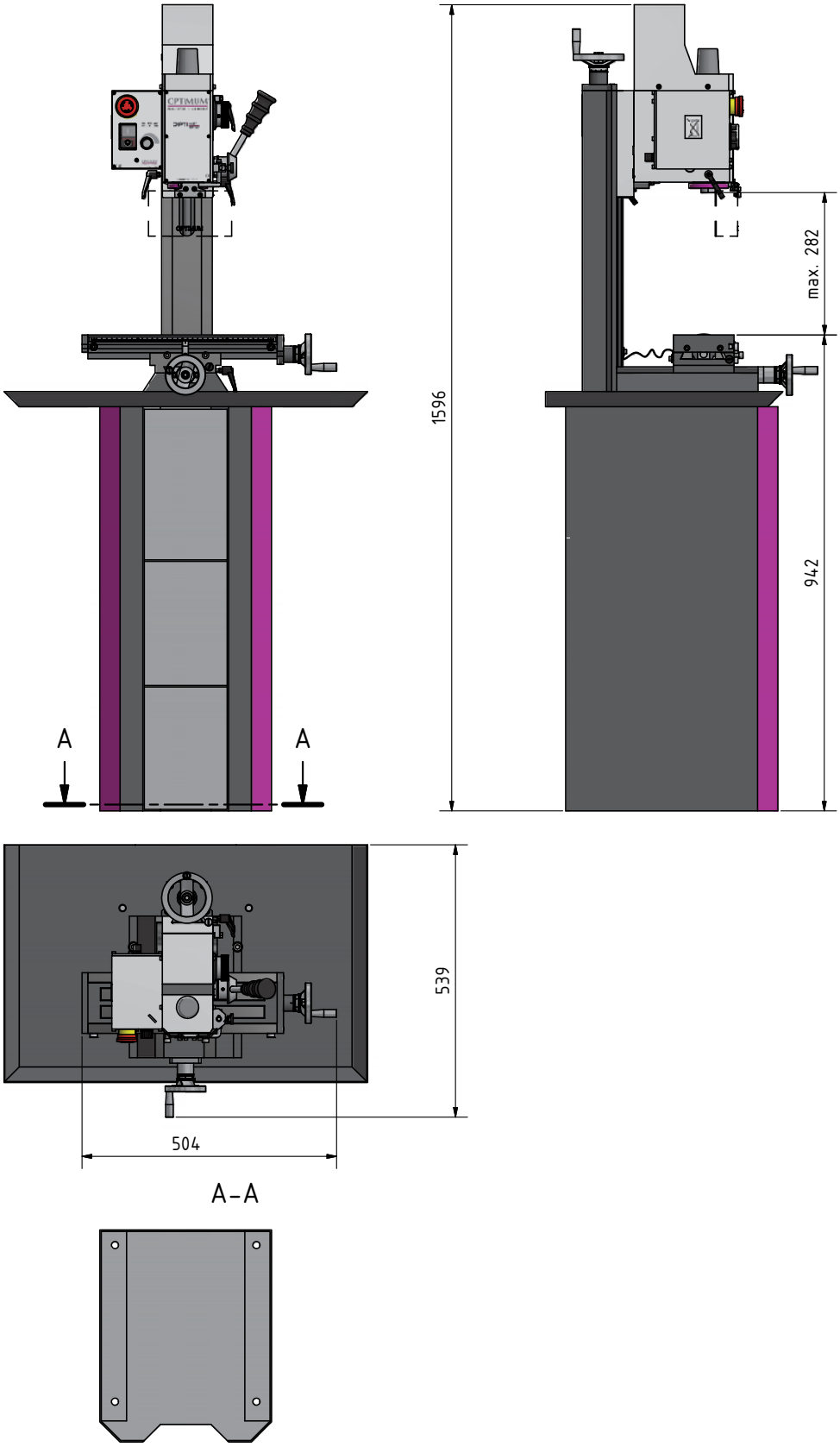

Abb.2-2: Installation plan substructure 3353003

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3 Delivery, interdepartmental transport and unpacking

CAUTION!

Injuries caused by parts falling over or off a forklift, pallet truck or transport vehicle. Only use means of transport that can carry the total weight and are suitable for it.

3.1 Notes on transport, installation and unpacking

Improper transport of individual devices and minor machines, unsecured devices and minor machines stacked on top of each other or next to each other in packed or already unpacked condition is accident-prone and can cause damage or malfunctions for which we do not grant any liability or guarantee.

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

3.1.1 General risks during internal transport

CAUTION: DANGER OF TIPPING!

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

Employees must be outside the danger zone, the reach of loads. Warn employees and, if necessary, advise employees of the hazard.

Act responsibly during transport and always consider the consequences. Refrain from daring and risky actions.

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

Before starting the transport check the transport route for possible danger points, unevenness and disturbances as well as for sufficient strength and load capacity.

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

Careful planning of internal transport is therefore essential.

3.2 Scope of delivery

INFORMATION

The drilling-milling machine is pre assembled.

Check immediately upon delivery of the drilling-milling machine if there are any transport damages or loosened fastening screws.

Compare the scope of delivery with the packing list.

3.3 Installation and assembly

3.3.1 Requirements regarding the installation site

Organize the working area around the drilling-milling 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 drilling-milling machine. 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 drilling-milling machine must be freely accessible.

3.3.2 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.
lifting sling.

➜ Firmly clamp all clamping levers on the drilling-milling machine before lifting the drilling-milling machine.

➜ Make sure that the load attachment does not cause damage to components or paint.

BF16V_GB_3.fm

3.3.3 Assembly

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

➜ Check if the underground is sufficiently stable and rigid.
☞ Total weight [kg] on page 15

ATTENTION!

Insufficient rigidity of the foundation leads to the superposition of vibrations between the drilling-milling machine and the foundation (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 drilling-milling machine on the provided underground.

➜ Fix the drilling-milling machine in the provided through-holes on the machine foot.

☞ Installation plan BF 16V on page 17

3.4 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.

It is only allowed to modify tool holding fixtures in compliance with the recommendations of OPTIMUM or the manufacturer of the clamping device.

WARNING!

When first commissioning the drilling-milling machine by inexperienced staff you endanger people and the machine.

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

☞ there may be a risk to the staff, on page 9

3.4.1 Power supply

CAUTION!

Lay the connection cable of the machine so that a stumble of persons is prevented.

➜ 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 drilling-milling machine.

3.4.2 Cleaning and lubricating

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

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

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

➜ Lubricate the drilling-milling machine according to the lubricating plan.
☞ Inspection and maintenance on page 31

➜ Check if all spindles are running smoothly.

➜ Connect the electrical supply cable (safety plug with earthing).

3.4.3 Warming up the machine

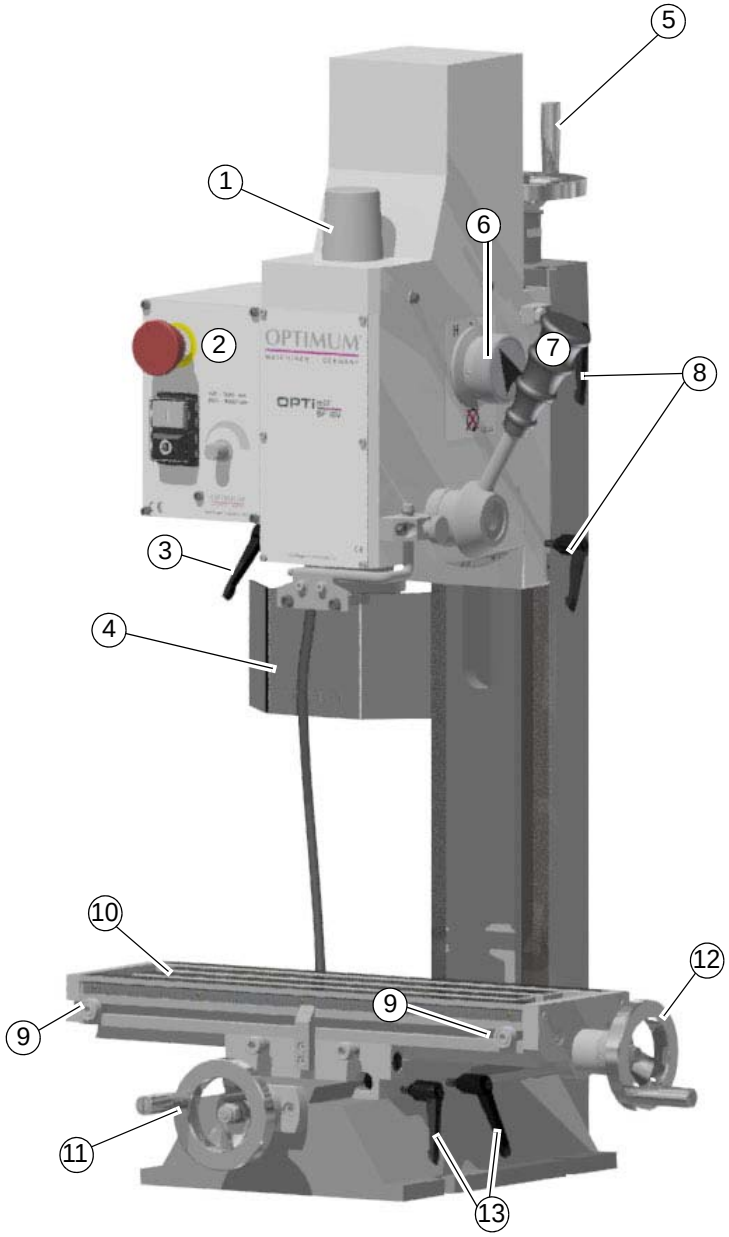
ATTENTION!

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

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

4 Operation

4.1 Control and indicating elements



Pos.	Designation	Pos.	Designation
1	Cover of draw-in rod	2	Control panel
3	Clamping lever for spindle sleeve	4	Drill chuck protection
5	Crank for height adjustment of the drill-mill head	6	Selector switch for reduction stage
7	Spindle sleeve lever	8	Clamping lever drill-mill head
9	Adjustable limit stops	10	Cross table
11	Crank handle for saddle slide	12	Crank handle cross slide
13	Clamping lever		

4.2 Safety

Commission the drilling-milling machine only under the following conditions:

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

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

☞ For your own safety during operation on page 13

4.3 Switching on the drilling-milling machine

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

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

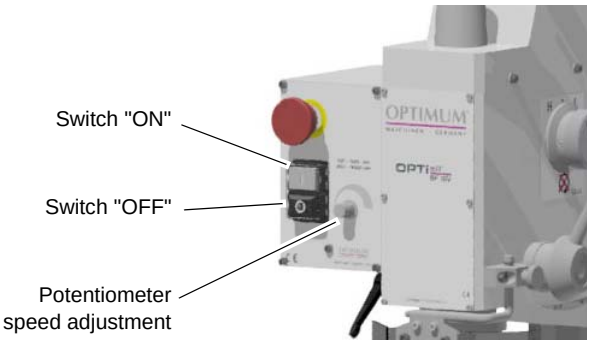


Fig. 4-1: Control panel

The electronics controls the speed slowly to the target value with a ramp. Therefore, please wait a while before you continue milling or drilling with the feed.

4.4 Inserting a tool

The mill head is equipped with an MT 2 seat and a draw-in rod M10.

ATTENTION!

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.

When installing a cold Morse taper in a heat spindle sleeve fix the draw-in rod only hand tight and after a temperature equilibration about 3 - 5 minutes later accordingly stronger.

INFORMATION

This Morse taper holder was intended chosen for your machine, that tools that are normally used on drills also can be used for your machine. Reducing or adapters are not allowed on milling machines.

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.

In the work spindle you may only use tool holding fixtures and clamping tools with Morse taper MT2 and internal screw thread M10 for an interlocking fixture. Reducing bushes is not allowed.

➜ Remove the cap. There is no need to disassemble the motor cover completely.

➜ Clean the conical seat in the mill head.

➜ Clean the taper mandrel of your tool.

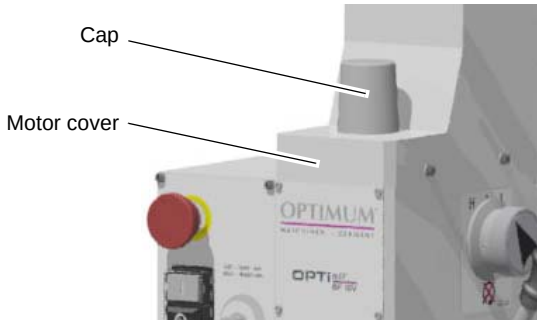


Fig. 4-2: Drilling and milling head

➜ Press the taper mandrel with some push into the seat. If the taper mandrel does not hold by itself, either the taper mandrel or the taper bore of the work spindle are not clean or free of grease.

➜ Use the draw-in tool supplied with the machine.
- Hexagon socket spanner for draw-in rod.
- Hexagon socked spanner for draw-in nut.

➜ Screw the draw-in rod approx. 15 turns into the taper of your tool.

➜ Tighten the draw-in nut.

➜ Follow the same steps in reverse order to extract the tool from the machine.

4.4.1 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 work spindle is equipped with a surface for the hold-up with a fork wrench to unfasten the swivel nut of the colletchuck retainer. 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.

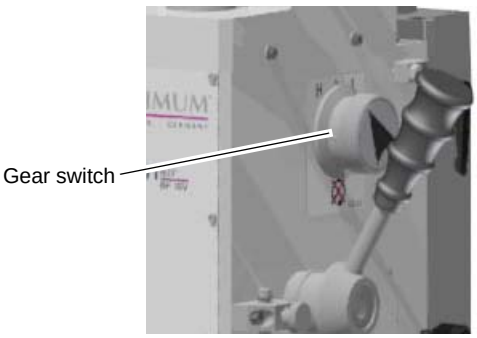
4.4.2 Direct clamping into the work spindle

Tools or collet chucks with a taper shank MT 2 may be clamped directly into the work spindle. For mounting these tools, proceed as described under ☞ Inserting a tool on page 24 . Make sure that the tool is clamped with the draw-in rod.

4.5 Changing the speed range

ATTENTION!

Wait until the drilling-milling machine has come to a complete halt, before performing any changes on the gear switch.



➜ Turn the gear switch to the position "H" for a speed range of 200 - 3000 min^{-1} .

➜ Turn the gear switch to the position "L" for a speed range of 100 - 1500 min^{-1} .

➜ Adjust the speed with the potentiometer.

4.5.1 Selecting the speed

The correct speed is an important factor for milling. The speed determines the cutting speed by which the cutting edges cut the material. By selecting the correct cutting speed, the service life of the tool is increased and the working result is optimized.

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 you may work at higher speeds then with tools made of high-alloy 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. Tabellenbuch Metall, Europa Lehrmittel, ISBN 3808517220).

The required speed is calculated as follows:

$$n = \frac{V}{\pi \times d}$$

n = speed in min^{-1} (revolutions per minute)

V = cutting speed in m/min (meter per minute)

π = 3,14

d = tool diameter in m (Meter)

4.5.2 Standard values for cutting speeds

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

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

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

Tool diameter [mm] Peripheral and side milling cutters	Steel 10 - 25 m/min	Grey cast iron 10 - 22 m/min	Al alloy cured 150 - 350 m/min
	Speed [min^{-1}]		
35	91 - 227	91 - 200	1365 - 3185
40	80 - 199	80 - 175	1195 - 2790
45	71 - 177	71 - 156	1062 - 2470
50	64 - 159	64 - 140	955 - 2230
55	58 - 145	58 - 127	870 - 2027

60	53 - 133	53 - 117	795 - 1860
65	49 - 122	49 - 108	735 - 1715

Tool diameter [mm] form cutters	**Steel 15 - 24 m/min**	**Grey cast iron 10 - 20 m/min**	**Al alloy cured 150 - 250 m/min**
	Speed [min^{-1}]		
4	1194 - 1911	796 - 1592	11900 - 19000
5	955 - 1529	637 - 1274	9550 - 15900
6	796 - 1274	531 - 1062	7900 - 13200
8	597 - 955	398 - 796	5900 - 9900
10	478 - 764	318 - 637	4700 - 7900
12	398 - 637	265 - 531	3900 - 6600
14	341 - 546	227 - 455	3400 - 5600
16	299 - 478	199 - 398	2900 - 4900

4.5.3 Standard values for speeds with HSS – Eco – twist drilling

Material		Drill diameter									Cooling 3)
		2	3	4	5	6	7	8	9	10	
Steel, unalloyed, up to 600 N/mm²	n 1)	5600	3550	2800	2240	2000	1600	1400	1250	1120	E
	f 2)	0.04	0.063	0.08	0.10	0.125	0.125	0.16	0.16	0.20	
Structural steel, alloyed, quenched and subsequently drawn, up to 900N/mm²	n	3150	2000	1600	1250	1000	900	800	710	630	E/oil
	f	0.032	0.05	0.063	0.08	0.10	0.10	0.125	0.125	0.16	
Structural steel, alloyed, quenched and subsequently drawn, up to 1200 N/mm²	n	2500	1600	1250	1000	800	710	630	560	500	Oil
	f"	0.032	0.04	0.05	0.063	0.08	0.10	0.10	0.125	0.125	
Stainless steels up to 900 N/mm² e.g. X5CrNi18 10	n	2000	1250	1000	800	630	500	500	400	400	Oil
	f	0.032	0.05	0.063	0.08	0.10	0.10	0.125	0.125	0.16	
1): Speed [n] in r/min											
2): Feed [f] in mm/r											
3): Cooling: 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.

4.6 Clamping the workpieces

CAUTION!

Injury by flying off parts.

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

4.7 Feed

with the hand cranks on the milling table.

Note the different forces acting during synchronous milling and conventional milling on the spindles of the milling table. The cutting forces during synchronous milling tend to be that the tool will move into the material.

Conventional milling is always to be preferred over synchronous milling.

Only with recirculating ball screws can the use of synchronous milling be undertaken sensibly.

The forces and backlash occurring in the spindle nuts leads to "chatter marks" on the surface of the work piece in synchronous milling.

In conventional milling, the work piece moves with the hand cranks on the milling table opposite to the direction of rotation of the miller.

In synchronous milling, the work piece moves with the hand cranks on the milling table in the direction of rotation of the miller. A smoother surface is obtained compared with conventional milling. So, machining in synchronous milling should only be used for finishing.

4.8 Swivelling the drill-mill head

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

CAUTION!

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

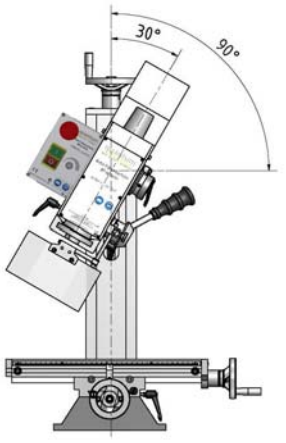


Fig. 4-3: Swivelling the drill-mill head

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➜ Loosen or unscrew the nut of the guide screw.

➜ Hold the drill-mill head. Loosen the clamping screw. Turn the drill-mill head head to the desired position.

➜ Retighten the guide and clamping screw.

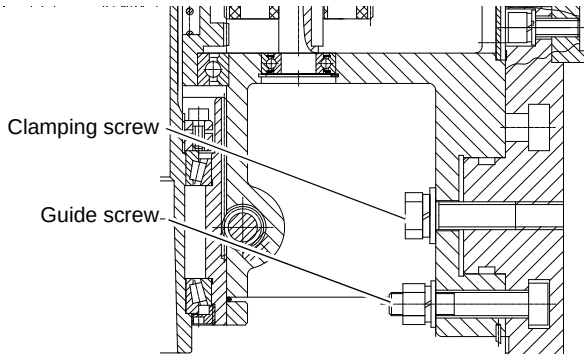

Fig. 4-4: Clamping screw, guide screw

4.9 Offset the drill-mill head

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

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

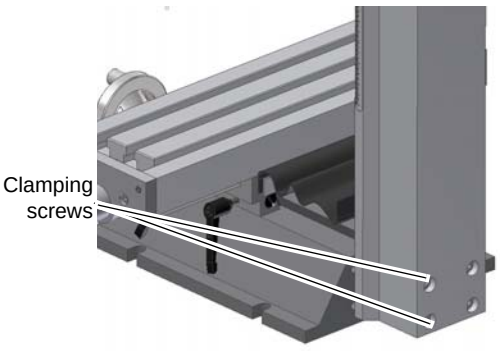

Fig. 4-5: BF 16V

4.10 Clamping lever

The drilling-milling machine is equipped with clamping levers and clamping screws for the respective movement axes.

ATTENTION!

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

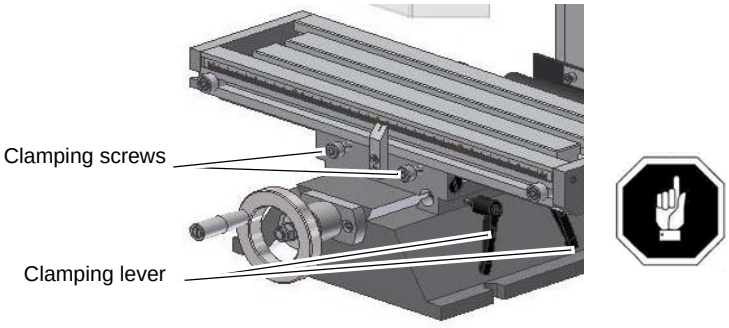

Fig. 4-6: Clamping spots of the cross table

4.11 End stops

The cross table is fitted with two adjustable end stops.

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

Fig. 4-7: End stops X axis

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5 Maintenance

In this chapter you will find important information about

- Inspection
- Maintenance
- Repair

of the drilling-milling machine.

ATTENTION!

Properly performed regular maintenance is an essential prerequisite for

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

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

5.1 Safety

WARNING!

The consequences of incorrect maintenance and repair work may include:

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

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

5.1.1 Preparation

WARNING!

Only carry out work on the drilling-milling machine if it has been disconnected from the mains power supply. Pull the mains plug.

5.1.2 Restarting

Before restarting run a safety check.

☞ Safety check on page 12

WARNING!

Before starting the drilling-milling machine, you must check that there is no danger for persons and that the drilling-milling machine 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	**Drilling-milling machine**	☞ Safety check on page 12	
Start of work, After each maintenance or repair operation	**Dovetail guides**	**Oiling**	➜ Lubricate all slideways.
Every week	**Cross table**	**Oiling**	➜ Oil all bare steel surfaces. Use an acid-free oil, e.g. weapon oil or motor oil.
as required	**Spindle nuts**	**Readjusting**	An extended clearance in the spindles of the cross table can be reduced by readjusting the spindle nuts. 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.
every six months	**Gear drill-mill head**	**Lubricating**	➜ Turn the drill-mill head as described under ☞ Swivelling the drill-mill head on page 28 completely by 90° to the right. ➜ Disassemble the cover plate at the rear. ➜ Lubricate the gearwheels. ☞ Operating material on page 16

INFORMATION

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

5.3 Repair

5.3.1 Customer service technician

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

Stürmer Maschinen GmbH

Dr.-Robert-Pfleger-Str. 26

D- 96103 Hallstadt, Germany

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

If repairs are performed by other qualified technical personnel, they must follow the instructions in this operation manual.

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

For repairs, only use

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

6 Ersatzteile - Spare parts

6.1 Ersatzteilbestellung - *Ordering spare parts*

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

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

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

6.2 Hotline Ersatzteile - Spare parts Hotline

+49 (0) 951-96555 -118

ersatzteile@stuermer-maschinen.de

6.3 Service Hotline

+49 (0) 951-96555 -100

service@stuermer-maschinen.de

6.4 Elektrische Ersatzteile - Electrical spare parts

6.5 Schaltplan - Wiring diagram

Der aktuelle Schaltplan mit Ersatzteilliste befindet sich im Schaltschrank der Fräsmaschine.
The current circuit diagram and spare parts list is located in the control cabinet of the milling machine.

6.6 Ersatzteilzeichnungen - Spare part drawings

A Fräskopf - Milling head

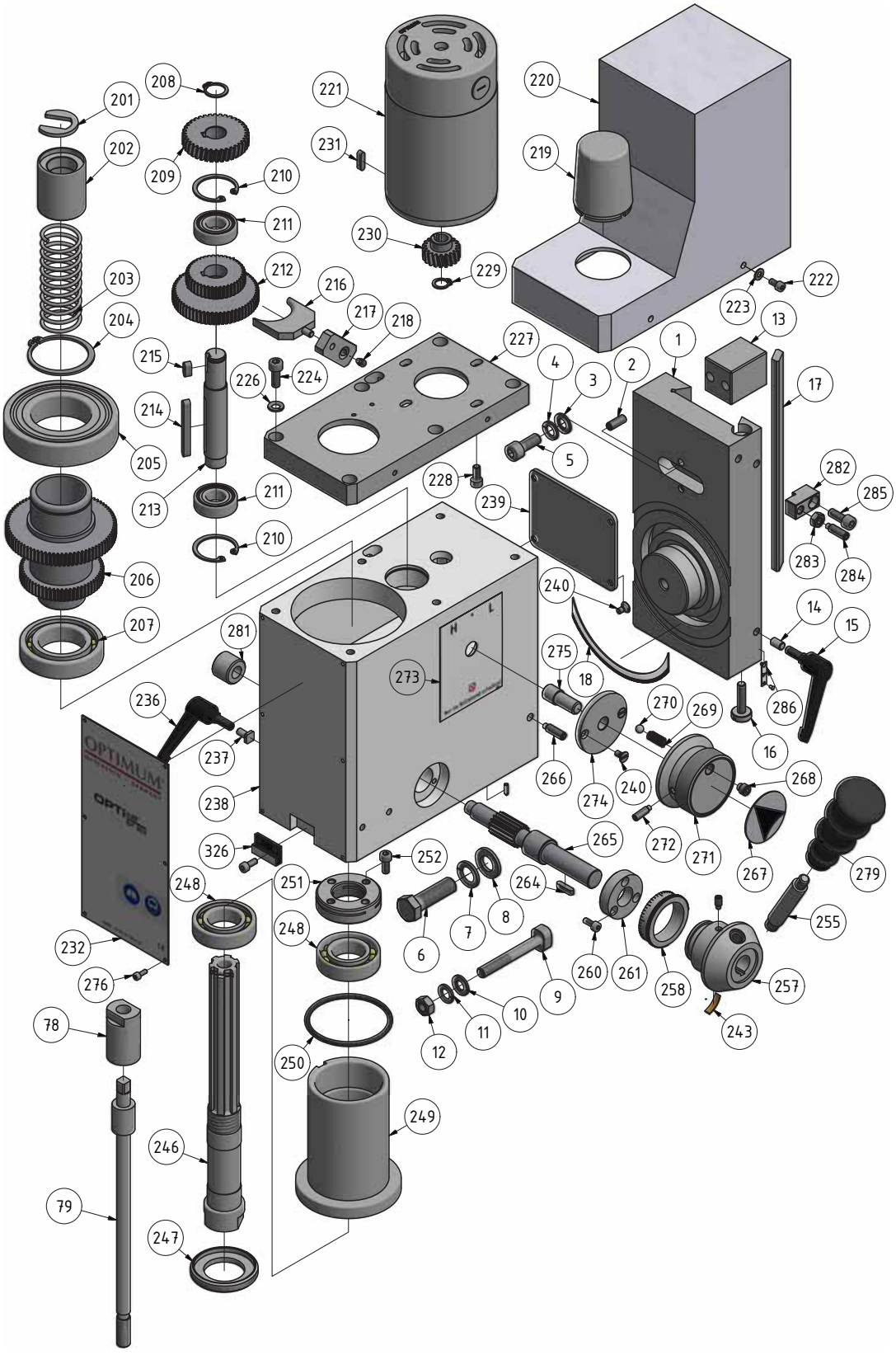

Abb.6-1: Fräskopf - Milling head

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B Säule - Column

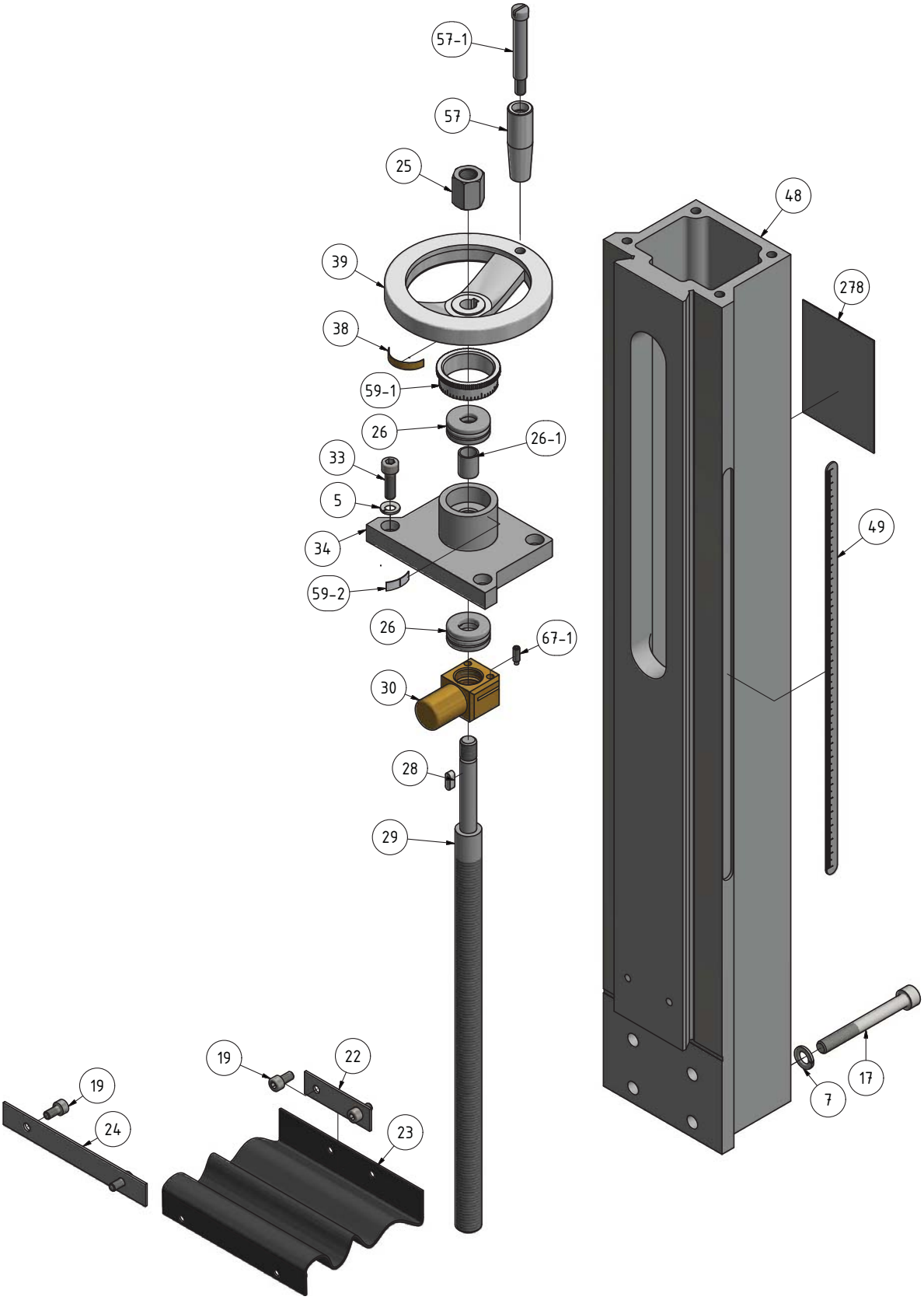

Abb. 6-2: Säule - Column

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C Kreuztisch - Cross table

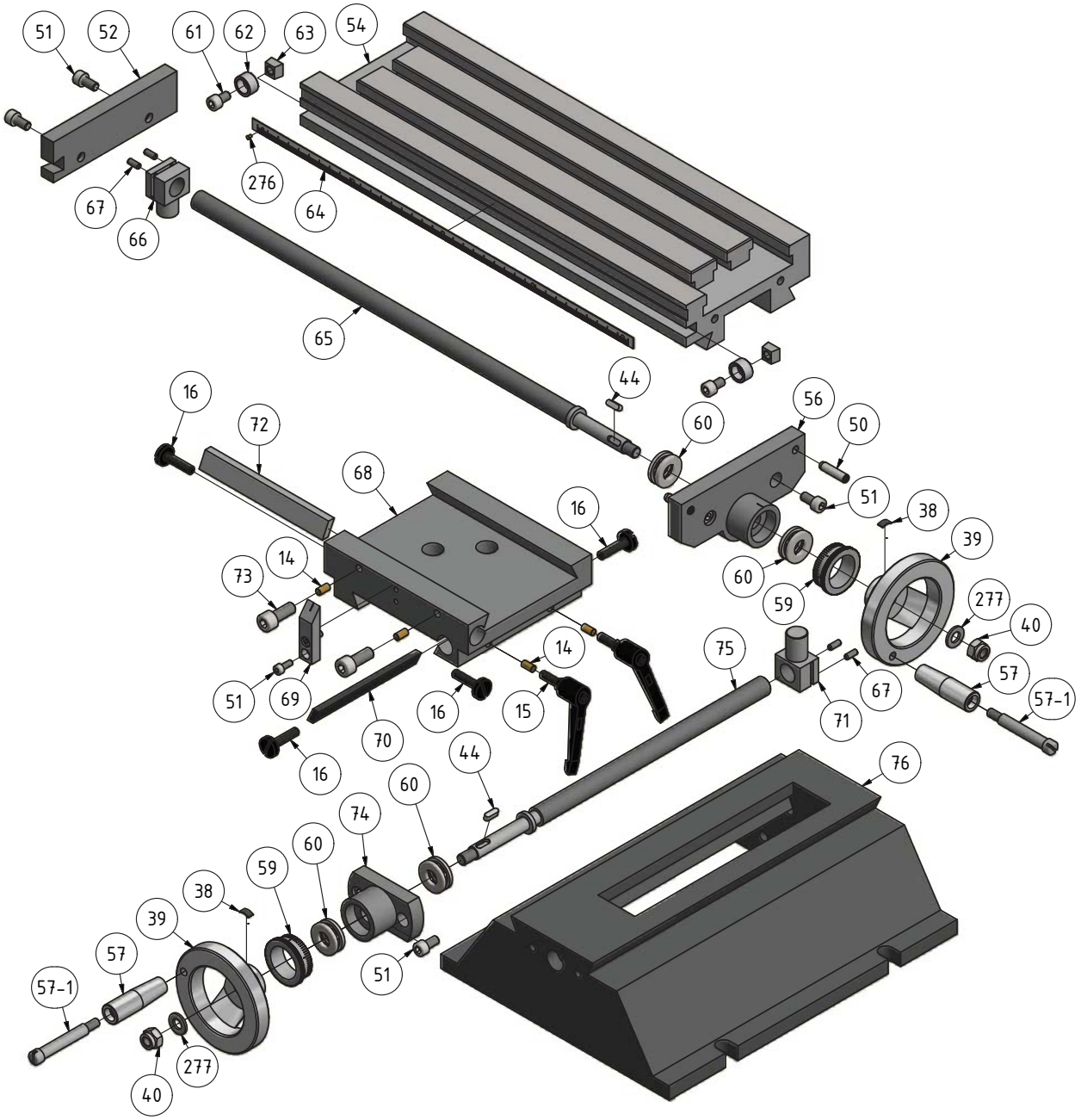

Abb.6-3: Kreuztisch - Cross table

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D Fräsfutterschutz - Milling chuck protection

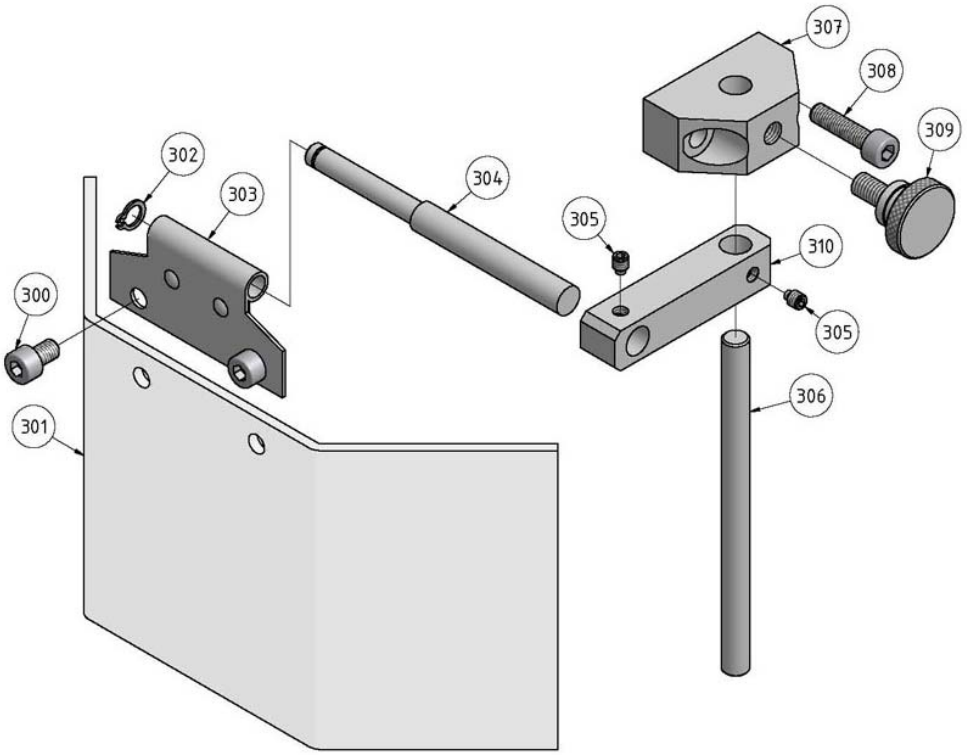

Abb. 6-4: Fräsfutterschutz - Milling chuck protection

E Fräsfutterschutz - Milling chuck protection

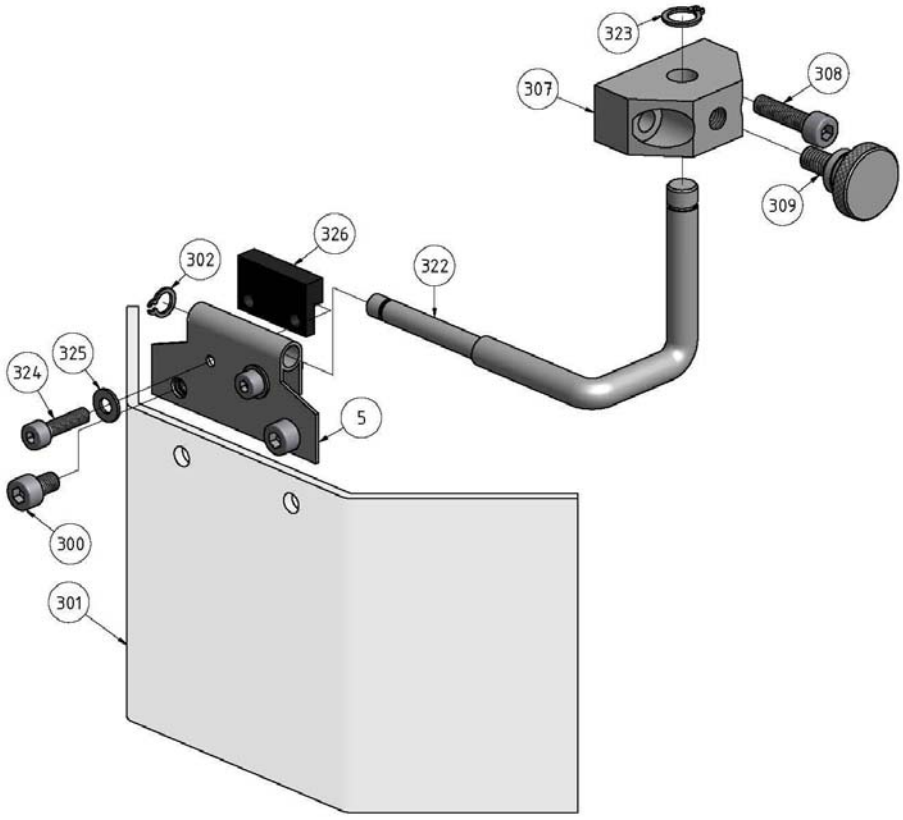

Abb. 6-5: Fräsfutterschutz - Milling chuck protection

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F Schaltkasten - Switch box

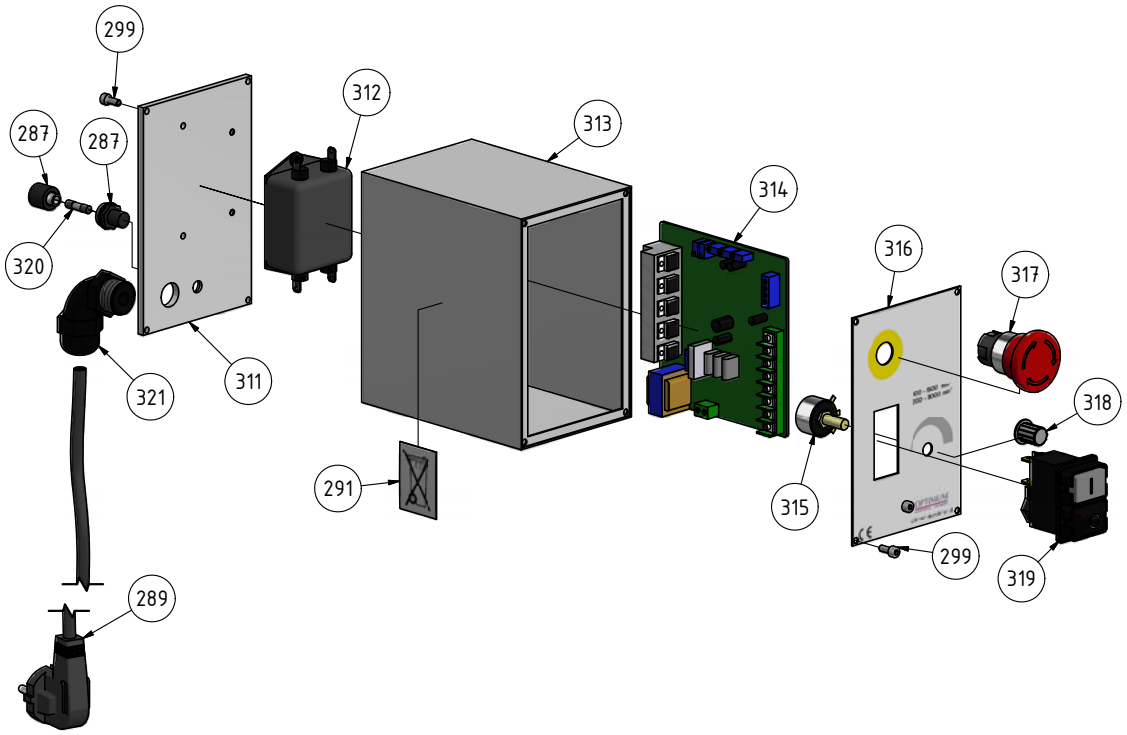

Abb.6-6: Schaltkasten - Switch box

G Maschinenschilder - Machine labels

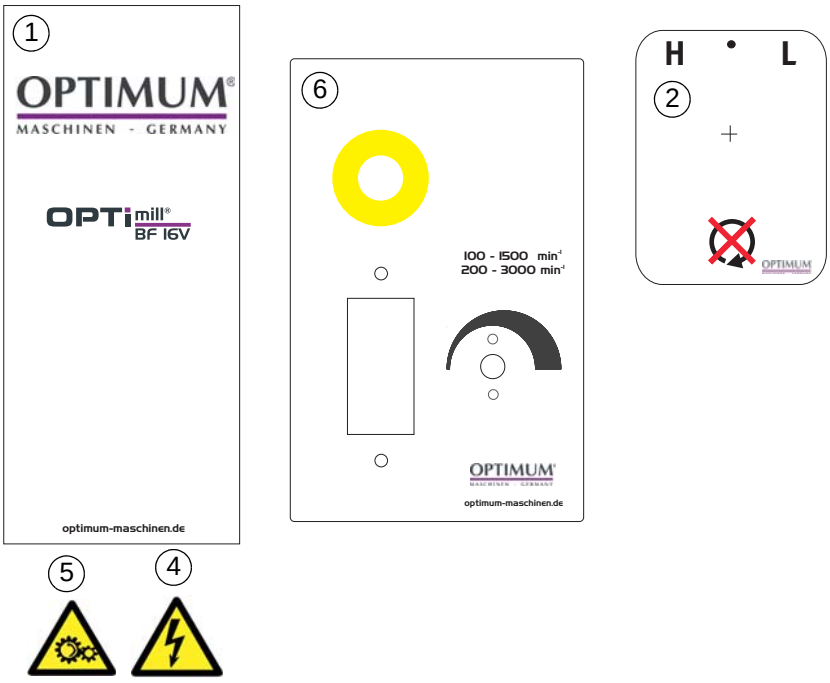

Fig.6-7: Maschinenschilder - Machine labels

6.7 Schaltplan - Wiring diagram

H

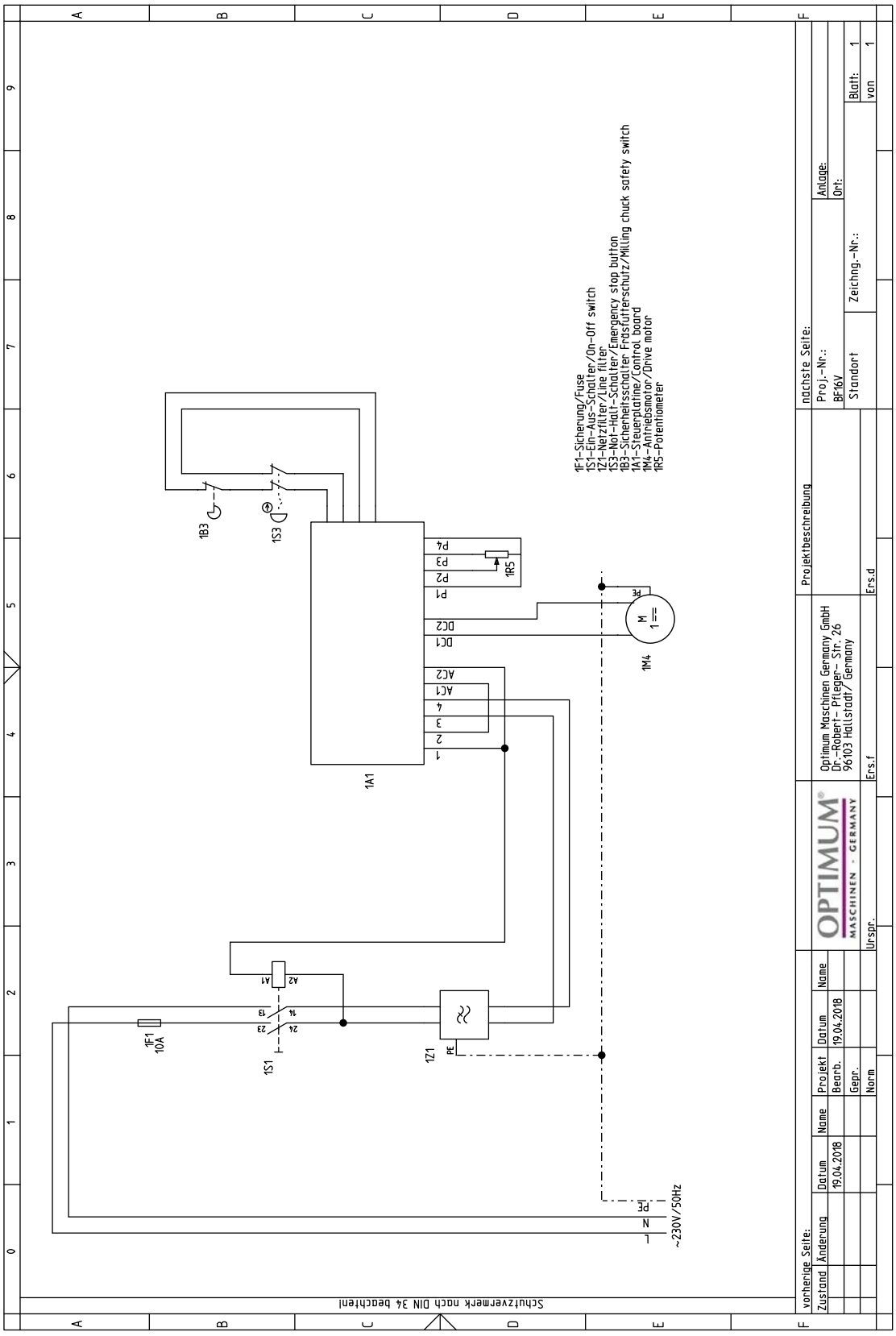

Abb. 6-8: Schaltplan - Wiring diagram

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Ersatzteilliste - Spare parts list

Maschinenschilder - Machine labels					
Pos.	Bezeichnung		Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Frontschild		1		
2	Getriebeschild		1		
3	Maschinenlabel		1		
4	Sicherheitsschild		1		
5	Sicherheitsschild		1		
6	Schild Schaltkasten		1		03338116L06

Ersatzteilliste- Spare parts list					
Pos.	Bezeichnung	Designation	Menge	Grösse	Artikelnummer
			Qty.	Size	Item no.
1	Drehlagerbock	Connect board	1		0333811601
2	Stiftschraube	Locking screw	2	M6x16	
3	Unterlegscheibe	Washer	2		
4	Federscheibe	Spring washer	6	8	
5	Innensechskantschraube	Hexagon socket screw	2	M8x25	
6	Schraube	Screw	1	M12x40	
7	Federscheibe	Spring washer	5	12	
8	Unterlegscheibe	Washer	1	12	
9	Schraube	Screw	1		033381169
10	Unterlegscheibe	Washer	1	10	
11	Federscheibe	Spring washer	1	10	
12	Mutter	Nut	1	M10	
13	Führungsstück	Guide piece	1		0333811613
14	Messingstift	Brass pin	5		0333811614
15	Klemmhebel	Clamping lever	3	DM6x16	0333812015
16	Schlitzkopfschraube	Slotted haed screw	1		0333811616
17	Leiste	Gib	1		0333811617
18	Winkelskala	Angle scale	1		0333811618
19	Innensechskantschraube	Hexagon socket screw	12	M5x10	
20	Faltenbalg	Bellows	1		
21	Mutter	Nut	2	M5	
22	Halterung Faltenbalg	Fixing of bellows	1		
23	Gummi - Späneabdeckung	Rubber chip cover	1		0333811623
24	Leiste	Gib	1		
25	Mutter	Nut	2	M16x1.5	
26	Lager	Bearing	2	51200	04051200
26-1	Buchse	Bushing	1		
27	Kegelzahnrad	Tapered toothed wheel	1		
28	Passfeder	Feather key	2	4x16	042P4416
29	Spindel Z-Achse inkl. Spindelmutter	Spindle Z-axis incl. Spindle nut	1		0333811629
31	Unterlegscheibe	Washer	4	5	
32	Abdeckkappe	Cover cap	1		
33	Innensechskantschraube	Hexagon socket screw	4	M8x20	
34	Abdeckplatte Säule	Cover plate column	1		0333811634
35	Lagerabdeckung	Bearing cover	1		
36	Innensechskantschraube	Hexagon socket screw	7	M5x12	
38	Federstück	Spring piece	4		0333811638
39	Handrad	Handwheel	3		0333811639
40	Kontermutter	Counternut	4	M8	

BF16V_parts.fm

44	Passfeder	Key	2	4x12	042P4412
48	Säule	Column	1		0333811648
49	Skala Z-Achse	Scale Z-axis	1		0333811649
50	Kegelstift	Tapered pin	1	A5x25	
51	Innensechskantschraube	Hexagon socket screw	12	M6x16	
52	Lagerbock X-Achse	Bearing block x-axis	1		0333811652
53	Dichtung	Seal	2		
54	Frästisch	Milling table	1		0333811654
56	Lagerbock X-Achse	Bearing block x-axis	1		0333811656
57	Griff inkl. Schraube	Handle incl. Screw	3	M8x63	0333811657
58	Handrad	Handwheel	1		0333811658
59	Skalenring	Scale ring	3		0333811659
59-2	Skala	Scale	1		
60	Lager	Bearing	5	51100	04051100
61	Innensechskantschraube	Hexagon socket screw	2	M6x10	
62	Hülse	Bushing	2		
63	Nutenstein	Sliding block	1		0333811663
64	Skala X-Achse	Scale X-axis	1		0333811664
65	Spindel X-Achse inkl. Spindelmutter	Spindle X-axis incl. Spindel nut	1		0333811665
67	Innensechskantschraube	Hexagon socket screw	4	M4x20	
67-1	Gewindestift	Grub screw	2	ISO 4028/M4x12	
68	Kreuztischführung	Guide cross table	1		0333811668
69	Anschlag Endlage X-Achse	Limit stop x-axis	1		0333811669
70	Leiste	Gib	1		0333811670
71	Spindelmutter Y-Achse	Spindle nut Y-axis	1		0333811671
72	Leiste	Gib	1		0333811670
73	Innensechskantschraube	Hexagon socket screw	2	M6x25	
74	Lagerbock	Bearing block	1		0333811674
75	Spindel Y-Achse	Spindle Y-axis	1		0333811675
76	Maschinenfuss	Machine base	1		0333811676
77	Innensechskantschraube	Hexagon socket screw	4	M12x90	
78	Buchse	Bushing	1		
79	Anzugsstange	Screw rod	1		03338120114
201	Positionsscheibe	Position disc	1		03338116201
202	Buchse	Bushing	1		03338116202
203	Zugfeder	Tension spring	1	2.5x28x110-3	03338116203
204	Sicherungsgring	Circlip	1	45	03338116204
205	Kugellager	Ball bearing	1	6209-2RZ	0406209
206	Zahnrad	Gear	1	Z60/Z80	03338116206
207	Kugellager	Ball bearing	1	7007AC	04032005
208	Sicherungsgring	Circlip	1	15	042SR15I
209	Zahnrad	Gear	1	(Z46)	03338120209
210	Sicherungsgring	Circlip	2	32	042SR32I
211	Kugellager	Ball bearing	2	6002-2RZ	0406002R
212	Zahnrad	Gear	1	(Z42/Z62)	03338120212
213	Antriebswelle	Shaft	1		03338120213
214	Passfeder	Key	1	5x50	042P5550
215	Passfeder	Key	1	C5x12	042P5512
216	Schaltgabel	Gearshift fork	1		03338116216
217	Arm Schaltgabel	Arm gearshift fork	1		
218	Schraube	Screw	1	M5x8	
219	Abdeckkappe	Cap cover	1		03338120219
220	Motorhaube	Motor cover	1		03338116220
221	Motor	Motor	1		03338116221

222	Innensechskantschraube	Hexagon socket screw	6	M4x8	
223	Unterlegscheibe	Washer	6	4	
224	Innensechskantschraube	Hexagon socket screw	6	M6x14	
226	Unterlegscheibe	Washer	6	6	
227	Fräskopf Gehäusedeckel	Milling head casing cover	1		03338116227
228	Innensechskantschraube	Hexagon socket screw	6	M5x12	
229	C-Sicherungsgring	C-Circlip	1	10	042SR10W
230	Zahnrad	Gear	1	(Z25)	03338116230
231	Passfeder	Key	1	C4x16	042P4416
236	Klemmhebel	Clamping lever	1	DM8x20	03338116236
237	Messingstift	Brass pin	1		03338116237
238	Gehäuse Fräskopf	Housing milling head	1		
238	Gehäuse Fräskopf kpl	Housing milling head cpl.	1		03338116238CPL
239	Abdeckung	Cover	1		03338116239
240	Senkkopfschraube	countersunk head screw	6	M4x8	
243	Federstück	Spring piece	2		
246	Spindel	Spindle	1		03338116246
247	Spindelmutter	Spindle nut	1		
248	Kugellager	Ball bearing	2	32005	04032005
249	Pinole	Pinole	1		03338116249
250	O-ring	O-ring	1	58x2.65	
251	Klemmmutter	Clamping nut	1		03338116246
252	Innensechskantschraube	Hexagon socket screw	1	DIN 4762/M5x12	
255	Griffhebel	Handle lever	1		03338116255
257	Nabe	Hub	1		03338116257
258	Skalenring	Scale ring	1		03338116258
260	Innensechskantschraube	Hexagon socket screw	3	M4x10	
261	Abdeckscheibe	Cover pane	1		03338116261
264	Passfeder	Key	1	4x12	042P4412
265	Schaftritzel	Pinion shaft	1		03338116265
266	Stiftschraube	Locking screw	1	M6x20	
267	Indikator	Indicator	1		
268	Stiftschraube	Locking screw	1	M8x8	
269	Feder	Spring	1	0.8x5x25-3	
270	Stahlkugel	Steel bal	1	6.5	042KU65
271	Wahldrehschalter	Rotary selector	1	12x50	
272	Stiftschraube	Locking screw	1	M5x16	
274	Aufnahmescheibe	Retainer disc	1		03338116274
275	Schaltwelle	Shaft	1		03338116275
276	Niet	Rivet	4		
277	Scheibe	Washer	2	DIN 125/8	
279	Schaltknopf	Knob	1		0300813116
280	Gewindestift	Grub screw	2	DIN4028/M5x10	
281	Buchse	Bushing	1		
282	Führungsstück	Guide piece	1		
283	Sechskantmutter	Hexagon nut	2	ISO 4032/ M6	
284	Gewindestift	Grub screw	2	ISO 4028/M6x20	
285	Innensechskantschraube	Hexagon socket screw	2	DIN 4762/M6x16	
286	Skala	Scale	1		
287	Gehäuse Sicherung kpl.	Housing fuse cpl.	2		0340253
288	Sicherung	Fuse	2		0340252
289	Anschlusskabel	Conesting cable	1		
290	Abdeckung	Cover	1		03338116290
292	Gehäuse Schaltkasten	Housing switch cabinet	1	bis Bj. 2011	03338116292

CPL	Schaltkasten kpl.	Switch box cpl.	1		03338116292CPL
293	Steuerkarte	Control board	1	bis Bj. 2011	03338120Q1.6
294	Netzfilter	Line filter	1		
295	Potentiometer	Potentiometer	1		03338120R1.5
296	Label Schaltkasten	label switch cabinet	1		03338116296
297	Drehknopf	Knob	1		0340255
298	Ein-Aus-Schalter mit NOT-Halt Funktion	On-Off switch with EMERGENCY STOP function	1		0320299
299	Innensechskantschraube	Hexagon socket screw	12	DIN 4762/M4x10	
300	Innensechskantschraube	Hexagon socket screw	2	DIN 4762/M5x8	
301	Fräsfutterschutz	Milling chuck protection	1		03338116301CPL
302	Sicherungsring	Retaining ring	1	DIN 471/6	
303	Bügel	Bracket	1		
304	Welle	Shaft	1		
305	Gewindestift	Grub screw	2	ISO 4028/M4x5	
306	Stange	Rod	1		
307	Halter	Holder	1		
308	Innensechskantschraube	Hexagon socket screw	2	DIN 4762/M5x20	
309	Stellschraube	Locking screw	1		
310	Führungsstück	Guide piece	1		
	Fräsfutterschutz kpl.	Milling chuck protection cpl.	1		03338116301cpl
	Zubehör kplt.	Accessory box cplt.	1		0333811600
	Pinole kpl	Pinole cpl.	1		03338116249cpl
311	Platte	Plate	1		03338116311
312	Netzfilter	Line filter	1		
313	Gehäuse	Housing	1		03338116313
314	Steuerplatine	Control board	1	ab Bj. 2011	03338116314
315	Potentiometer	Potentiometer	1	4K7	03338120R1.5
317	NOT-Halt Schalter	Emergency stop button	1		0460058
318	Knopf	Knob	1		0340285
319	Ein-Aus-Taster	On-Off button	1	KJD-17B	0342025108
321	Zugentlastung	Cord grip	1		
322	Bügel	Bracket	1		
323	Sicherungsring	Retaining ring	1		
324	Innensechskantschraube	Hexagon socket screw	2		
325	Scheibe	Wacher	2		
326	Reedkontakt Kpl.	Reedkontakt cpl.	1		0302024192
Elektrische Ersatzteilliste- Electrical parts list					
1Z1	Netzfilter	Line filter	1		03338116Z1
1F1	Sicherung	Fuse	1	10A	03338116320
1S1	Ein-Aus-Taster	On-Off button	1	KJD-17B	0342025108
1A1	Steuerplatine	Control board	1		03338116314
1M4	Antriebsmotor	Drive motor	1		03338116221
1R5	Potentiometer	Potentiometer	1	4K7	03338120R1.5
1B3	Schalter Fräsfutterschutz	Mill chuck switch	1		0302024192
1S3	Not-Halt-Schalter	Emergency-stop button	1		03338120S1.2

7 Malfunctions

7.1 Malfunctions on the drilling-milling machine

Malfunction	Cause/ possible effects	Solution
The drilling-milling machine does not start	• The spindle guard is not closed. • Defective fuse	• Check the closed position. Does the microswitch click ? • Have it checked by authorised personnel.
Tool "burnt".	• Incorrect speed. • The filings have not been removed from the bore hole. • Tool blunt. • Operating without cooling agent.	• Select another rate, feed too high. • Pull out tool more often. • Sharpen or replace tool. • Use cooling agent
Impossible to insert grip cone into the spindle sleeve.	• Remove any dirt, grease or oil from the internal conical surface of the spindle sleeve or the grip cone. • Morse taper does not correspond MT 2 / M10	• Clean surfaces well Keep surfaces free of grease. • Use Morse taper MT 2 / M10
It is not possible to push-out the taper.	• Taper is shrinked on the Morse taper.	• Let the machine run at highest speed for two minutes in order to warm it up and then retry to disassemble the taper. ☞ Inserting a tool on page 24
Motor does not start	• Defective fuse.	• Have it checked by authorised personnel.
Working spindle rattling on rough piece surfaces	• Climb milling machining not possible under the current operating conditions. • Clamping lever of the movement axes not tightened. • Loose collet chuck, loose drill chuck, loose draw-in rod. • Tool blunt. • The workpiece is not fastened. • Excessive slack in bearing. • Splined shaft (6-way dog) is worn or worn out • Working spindle moves up and down	• Perform conventional milling. • Tighten clamping lever • Check, re-tighten. • Sharpen or replace tool • Clamp the workpiece firmly. • Readjust bearing slack or replace bearing • Replace pos. 246 and 251 of spare part list 2 • Re-adjust bearing clearance or replace bearing pos. 248 spare parts list 2.

8 Appendix

8.1 Copyright

8.2 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 drilling-milling machine
Spindle sleeve	Hollow shaft in which the milling spindle turns.
Milling spindle	Shaft activated by the motor
Drilling table	Supporting surface, clamping surface
Taper mandrel	Cone of the drill or of the drill chuck
Spindle sleeve lever	Manual operation for the drill feed
Quick action - drill chuck	Drill chuck can be fixed by hand.
Workpiece	Piece to be drilled or machined.
Tool	Milling cutter, drill bit, etc.

8.3 Change information operating manual

Chapter	Short note	new version number
Spare parts	modified switch box	1.3.8
EC declaration	changed standard	1.3.9
2	new installation plan for new base	1.4.0
CE	EMC 2014/30/EU & LVD 2014/35/EU	1.4.1
4.11 ; 4.7	Removed ; Added	1.4.2
3	Interdepartmental transport	1.4.3

8.4 Liability claims for defects / warranty

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

- The processing of the liability claims or of the warranty is performed as chosen by OPTIMUM GmbH either directly or through one of its dealers.
  Any defective products or components of such products will either be repaired or replaced by components which are free from defects. The property of replaced products or components passes on to OPTIMUM Maschinen Germany GmbH.
- The automatically generated original proof of purchase which shows the date of purchase, the type of machine and the serial number, if applicable, is the precondition in order to assert liability or warranty claims. If the original proof of purchase is not presented, we are not able to perform any services.
- Defects resulting of the following circumstances are excluded from liability and warranty claims:
  - Using the product beyond the technical options and proper use, in particular due to overstraining of the machine.
  - Any defects arising by one's own fault due to faulty operations or if the operating manual is disregarded.
  - Inattentive or incorrect handling and use of improper equipment.
  - Non-authorized modifications and repairs.
  - Insufficient installation and safeguarding of the machine
  - Disregarding the installation requirements and conditions of use.
  - Atmospheric discharges, overvoltage and lightning strokes as well as chemical influences.
- The following items are as well not subject to the liability or warranty claims:
  - Wearing parts and components which are subject to a standard wear as intended such as e.g. V-belts, ball bearings, illuminants, filters, sealings, etc.
  - Non reproducible software errors
- Any services which OPTIMUM GmbH or one of its agents performs in order to fulfill in the frame of an additional guarantee are neither an acceptance of the defects nor an acceptance of its obligation to compensate. Such services do neither delay nor interrupt the warranty period.
- Place of jurisdiction among traders is Bamberg.
- If one of the above mentioned agreements is totally or partially inefficient and/or null, it is considered as agreed what is closest to the will of the warrantor and which remains in the framework of the limits of liability and warranty which are predefined by this contract.

8.5 Storage

ATTENTION!

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

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

Follow the instructions and information on the transport case.

- Fragile goods (Goods require careful handling)

- Protect against moisture and humid environment.

- 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.

8.6 Note regarding disposal / options to reuse:

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

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

8.6.1 Decommissioning

CAUTION!

Used devices need to be decommissioned in a professional way in order to avoid later misuses and endangerment of the environment or persons.

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

8.6.2 Disposal of the packaging of new devices

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

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

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

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

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

8.6.3 Disposing of the old device

INFORMATION

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

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

8.6.4 Disposal of electrical and electronic components

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

The device includes electric and electronic components and must not be disposed of with the rubbish. According to the European directive 2002/96/EG regarding electrical and electronic used devices and the execution of national rights used electrical tools and electrical machines need to be collected separately and be supplied to an environmentally compatible reuse.

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

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

8.6.5 Disposal of lubricants and coolants

ATTENTION!

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

INFORMATION

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

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

8.7 Disposal via municipal collection

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

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

8.8 Product follow-up

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

We would be grateful if you could send us the following information:

- Modified settings
- Experiences with the drilling-milling machine, which could be important to other users
- Recurring failures

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Email: info@optimum-maschinen.de

OPTIMUM®
MASCHINEN - GERMANY

EC Declaration of Conformity

according to Machinery directive 2006/42/EC, Annex II 1.A

The manufacturer / distributor Optimum Maschinen Germany GmbH
Dr.-Robert-Pfleger-Str. 26
D - 96103 Hallstadt, Germany

hereby declares that the following product

Product designation: Hand-controlled drilling and milling machine

Type designation: BF16 Vario

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

Description:

Hand-controlled drilling and milling machine

The following additional EU Directives have been applied:

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

The following harmonized standards were applied:

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

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

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

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

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

EN 50370-2 - Electromagnetic compatibility (EMC) - Product family standard for machine tools - Part 2: Immunity

EN 55011:2016 + A1:2017 - Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement - class B

EN 61000-3-2:2015-03 - Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A per phase)

EN 61000-3-3:2014-03 - Electromagnetic compatibility (EMC) - Part 3-3: Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current <= 16 A per phase and not subject to conditional connection

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

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Kilian Stürmer (CEO, General Manager)
Hallstadt, 2020-11-09

BF16V_CE_en.fm

Index

A
Assembly 21
C
Changing the speed range 25
Clamping a tool 24
Clamping lever 29
Cleaning and lubricating 21
Commissioning 21
Copyright 45
Customer service 32
Customer service technician 32
D
Dimensions 15
Disposal 49
Drilling-milling capacity 15
E
End stops 29
Environmental conditions 16
F
First commissioning 21
H
Hotline Ersatzteile 33
L
Lifting equipment 13
Load suspension point 20
M
Malfunctions 44
Milling chuck protection 12
Misuse 8
O
Obligations
User 10
P
Power supply 21
Protective cover 11
Q
Qualification
of the user 9
S
Scope of delivery 20
Service Hotline 33
Shifting the drill-mill head 29
Spare parts Hotline 33
Specialist dealer 32
Speed range 25
Speeds 16
Spindle seat 15
Storage and packaging 20
Switching the machine ON 24
Swivelling the drill-mill head 28
T
Target group
private users 9
Technical data
Emissions 16
Environmental conditions 16
Speeds 16
Spindle seat 15
Technical Details
Dimensions 15
Drilling-milling capacity 15
Working area 15
W
Warming up the machine 22
Working area 15

BF16V_GBSIX.fm

Quellenverzeichnis von Ihrem Fachhändler Metallbau Mehner

Optimum Fräsmaschinen und CNC Fräsmaschinen:
Optimum OPTImill BF 16V Übersicht

- OPTImill BF 16V
  - OPTImill BF 16V Ersatzteile
  - OPTImill BF 16V Zubehör

- OPTImill Zubehör

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- Drucklufttechnik / Kompressoren