



Champion 20VS Operation Manual

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1. Safety

This part of the operating manual

- Explains the meaning of use of the warning references contained in the operating manual
- Explains how to use the machine 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 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 machine

European standards must be observed during installation, operation, maintenance and repair of the machine.

If European standards are not applied in the national legislation of the country of destination, the specific applicable regulations of each country must be observed.

Where necessary, the required measures must be taken to comply with the specific regulations of each country before the machine is first used.

Always keep this documentation close to the machine.

1.1 Safety warnings

Special Warnings for this Machine

Warning! There is a risk of the machine accidentally restarting after a power failure, make sure that all of the operation switches are in the off or neutral positions if the power is interrupted.

Warning! Always wear approved eye protection when operating this machine.

1.2 Proper use

In the event of improper use the machine will

- endanger personnel,
- endanger the machine and other material property of the operator,
- may affect proper operation of the machine

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

This machine must only be installed and operated in a dry and well-ventilated place.

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

We do not take any liability for damages caused by improper use. Any such modifications would also render the guarantee null and void.

It is also part of proper use that:

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

1.3 Possible dangers caused by the milling machine

As the machine operates with

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

There is a residual risk with use. We have used construction resources and safety techniques to minimize the risk to health to personnel resulting from these hazards.

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

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

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

- be duly qualified,
- follow this operating manual

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

Warning!

This machine may only be used with the safety devices activated.

Disconnect the machine immediately whenever you detect a failure in the safety devices or when they are not fitted. All additional installations carried out by the operator must incorporate the prescribed safety devices.

1.4 Qualification of personnel

This manual is addressed to

- operators,
- users,
- maintenance staff

The warning notes therefore refer to both operation and maintenance of the milling machine.

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

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

- be duly qualified,
- follow this operating manual

In the event of improper use

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

1.5 Safety devices

Use the milling machine only with properly functioning safety devices.

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

If a device has not been activated or has failed, the milling machine must only be used when

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

Warning!

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

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

The milling machine includes the following safety devices:

- a self-locking emergency stop button
- a protective cover at the drill-mill head

Emergency stop button

The emergency stop button switches the machine off.

Open the cover of the emergency stop button in order to switch the machine on again.

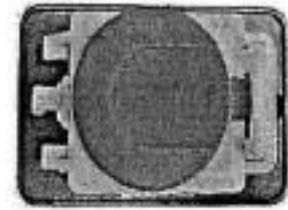


Fig.1-1: EMERGENCY STOP button

Protective cover

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

Warning!

Remove the protective cover after the mains plug of the machine has been pulled.

1.6 Safety check

Check the milling machine regularly

- at the beginning of each shift,
- once a week,
- after every maintenance and repair operation

General Check

Equipment	Check	OK
Protective covers	Mounted, firmly bolted and not damaged	
Labels, markings	Installed and legible	

Run Test

Equipment	Check	OK
Emergency Stop	When the Emergency Stop button is activated, the machine should switch off automatically. A restart will not be possible until the Emergency Stop button has been unlocked and the On switch has been activated.	

1.7 Individual protection gear

For certain work individual protection gear is required.

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

Use protective gloves when handling pieces with sharp edges.

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

Use ear protection if the noise level (inmission) in the workplace exceeds 80 dB (A). Before starting work, make sure that the prescribed individual protection gear is available at the workplace.

Caution!

Dirty or contaminated individual protection gear can cause disease. Clean it after each use and once a week.

1.8 For your own safety during operation

Warning!

Before activating the machine, double check that it will not endanger other people or cause damage to equipment.

Avoid unsafe working practices:

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

In the description of work on the drilling-milling machine we highlight the dangers specific to that work.

1.9 Disconnecting the machine and making it safe

Pull the main plug before beginning any maintenance or repair work.

Warning!

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

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

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

Tighten loads properly.

Never walk under suspended loads!

2. Technical Data

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

Engine power consumption	750W/240V/50Hz
Drilling capacity	16mm
Face milling capacity	63mm
End milling capacity	20mm
Working radius	185mm
Spindle taper	MT2
Spindle stroke	42mm
T-slot size	12mm
Headstock tilt	±90°
Cross travel	160mm
Longitudinal travel	660mm
Vertical travel	290mm
Dimensions	960 x 570 x 970mm
Net weight	113kg

Emissions

The noise level (emission) of the drilling-milling machine ranges below 78 dB(A). If the drilling-milling machine is installed in an area where various machines are in operation, the acoustic influence (inmission) on the user of the drilling-milling machine may exceed 85 dB(A) in the working area.

We recommend the use of soundproofing and ear protection. Remember that the duration of the noise pollution, the type and characteristics of the work area and operation of other machines influence the noise level in the working area.

3. Assembly and Connection

The drilling-milling machine comes pre-assembled.

3.1 Extent of supply

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

Compare the parts supplied with the information on the packaging list.

3.2 Transport

Warning!

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

- Centers of gravity,
- Suspension points,
- Weights,
- Means of transport to be used,
- Prescribed shipping position.

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

Check that the lifting and load-suspension gear has sufficient load capacity and that it is in perfect condition.

Observe the rules for preventing accidents.

Holds the load properly.

Never walk under suspended loads.

3.3 Storage

Improper storage may cause important parts to be damaged or destroyed.

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

Consult Chester UK if the machine or accessories have to be stored for a period of over three months or under different environmental conditions than those given here.

3.4 Installation and assembly

The work area for operation, maintenance and repair work must not be hindered.

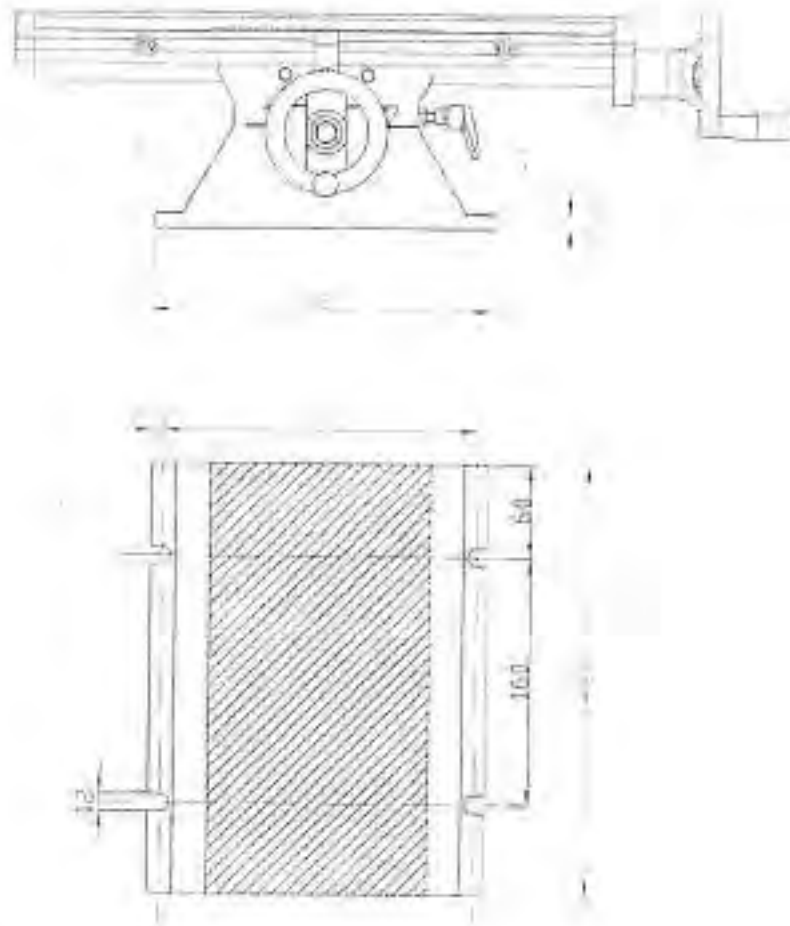
The mains plug of the drilling-milling machine must be freely accessible.

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

- Secure the load-suspension device around the drill-mill head. Use a lifting sling for this purpose.
- Clamp all the clamping levers at the machine before lifting it.
- Make sure that no add-on pieces or varnished parts are damaged due to the load-suspension.
- Check the horizontal orientation of the base of the machine with a spirit level.
- Check that the foundation has sufficient floor-load capacity and rigidity.

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

- Position the drilling-milling machine on the intended foundation.
- Attach the drilling-milling machine using the provided recesses in the machine base.



3.5 First use




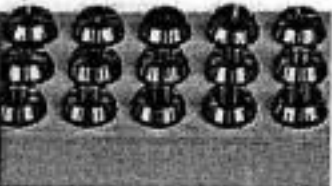


Cleaning and lubricating.

Remove the anticorrosive agent applied on the drilling-milling machine for transport and storage purposes. We recommend the use of kerosene.

Do not use any solvents, thinners or other cleaning agents which could corrode the varnish on the drilling-milling machine. Follow the specifications of the manufacturer of the cleaning agent.

- Lubricate all bright machine parts with non-corrosive lubricating oil
- Grease the machine according to the lubrication chart
- Check smooth running of all spindles. The spindle nuts can be readjusted.
- Check the fuse protection of your power supply against the technical data for the total connection value of the machine.

3.6 Optional accessories

Designation	
Machine substructure	
Set of collet chucks, 5 pieces MK2 / M10 4 / 6 / 8 / 10 / 12 mm directly clamping	
Collet chuck retainer MK2 / M10 (ER25)	
Set of collet chucks 1-16mm 15 pieces (ER25)	
Quick action drill chuck (0-13mm) B16	
Morse taper mandrel MK2 / M10 / B16	
Milling cutter cone seat 16mm / MK2	

Machine vice FMSN 100



Three-axis vice DAS 75
slewable, turnable, inclinable



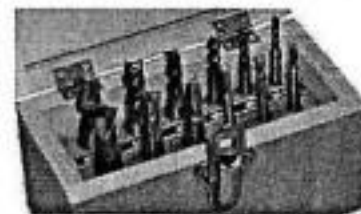
Two-axis vice ZAS 50
slewable, turnable



Clamping tool kit SPW 10



Set of milling cutters 12 pieces (4-5-6-10-12),
double-cut and four-cut, TIN coated



Adapter mounted to engine bed
Lathe D240 / D280



Fixing adapter for high speed motors



Battery 1,55V 145mAh (SR44)
11,6 x 5,4mm

4. Operation

4.1 Safety

Use the drilling-milling machine only under the following conditions.

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

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

4.2 Starting the milling machine

Wait until the machine has come to a complete halt before inverting the turning direction using the change-over switch.

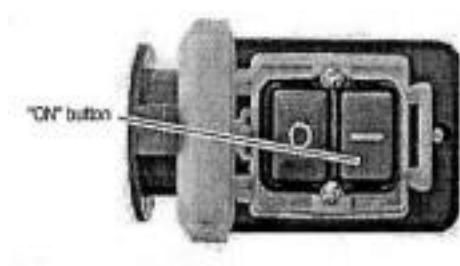


Fig.4-3: ON / OFF button

The speed of the spindle is a little smaller in left-handed motion than in right-handed motion.

- The rotating direction of the milling machine is selected using the change-over switch.
- Press the ON button. The milling machine will be activated and turn in the pre-selected rotating direction.

Turning on the machine

Turn the change-over switch into the '0' position.

4.3 Inserting tools

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 connector should be released by the lateral pressure. Injuries by parts flying off.

In the work spindle you may only use tool holding fixtures and clamping tools with morse taper MK2 and internal screw thread M10 for an interlocking fixture. Reducing bushes is not allowed.

The mill head is equipped with an MT2 seat and a M10 draw-in rod.

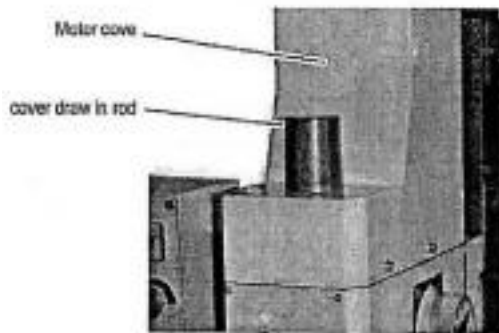


Fig.4-4: Drill-Mill head

- Remove the cover. There is no need to disassemble the motor cover completely
- Clean the conical holding fixture in the mill head.
- Clean the taper of your tool
- Insert the tool into the tool holding fixture

- Screw the draw-in rod into the taper of your tool.
- Tighten the draw-in nut and fix the spindle. Use a wrench to hold the spindle

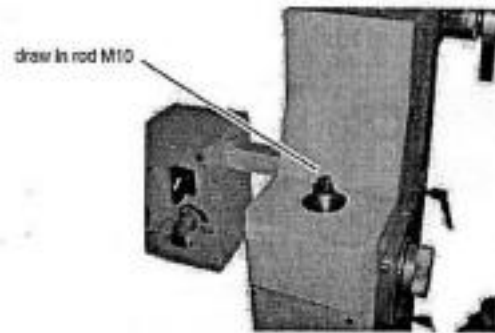


Fig.4-5: Drill-Mill head with motor cover

Removing a tool

- Hold the spindle with the wrench and loosen the draw-in rod. Turn the draw-in rod further so that the tool from the cone admission is squeezed out.

Use of collet chucks

When using collet chucks for the reception of milling tools, a higher operation tolerance is possible. The exchange of the collet chucks for a smaller or larger end mill cutter is performed simply and rapidly and the disassembly of the complete tool is not required.

The work spindle is equipped with a surface for the hold-up with a fork wrench to unfasten the swivel nut of the collet chuck retainer. The collet chuck is pressed into the ring of the swivel nut and must hold there by itself. By fastening the swivel nut on the tool the milling cutter is clamped.

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

4.4 Clamping workpieces

Tools or collet chucks with a MT2 shank may be clamped directly into the work spindle. For mounting these tools, proceed as described in 'inserting tool' above.

Make sure that the tool is clamped with the draw-in rod.

The workpiece is always to be fixed by a machine vice, jaw chuck or other appropriate clamping tool.

4.6 Changing the speed range

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

- Turn the gear switch in the position 'H' for a speed range of 200 – 3000 min
- Turn the gear switch into the position 'L' for a speed range of 100 – 1500 min
- Adjust the speed with the potentiometer. The speed and the cutting speed depends on the material of the workpiece, the milling cutter diameter and the cutting type.

The electronics controls the rotation speed slowly with a ramp to the set point. Therefore, wait briefly before you continue with feed motion while milling or drilling.

4.6 Selecting the speed

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

The 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 with higher speeds than with tools made of high-alloy high speed steel (HSS). You will achieve the correct cutting speed by selecting the correct speed.

For 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.

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 (meters per minute)

π = 3,14

d = tool diameter m (meters)

Standard values for cutting speeds

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

Tool	Steel	Gray cast iron	Age-hardened Al Alloy
Peripheral and side milling cutters	10-25mm	10-22mm	150-350mm
Relieved form cutters	15-24mm	10-20mm	150-250mm
Inserted tooth cutter with SS	15-30mm	12-25mm	200-300mm
Inserted tooth cutter with HM	100-200mm	30-100mm	300-400mm

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

Tool diameter Peripheral and side milling cutters	Steel 10-25m/min	Grey cast iron 10-22m/min	Age hardened Al Alloy 150-250 m/min
35mm	91-227	91-200	1365-3185
40mm	80-199	80-175	1195-2790
45mm	71-177	71-156	1062-2470
50mm	64-159	64-140	955-2230
55mm	58-145	58-127	870-2027
60mm	53-133	53-117	795-1860
65mm	49-122	49-108	735-1715

Tool diameter peripheral and side milling cutters	Steel 10-25m/min	Grey cast iron 10-22m/min	Age hardened Al Alloy 150- 350m/min
35mm	91-227	91-200	1365-3185
40mm	80-199	80-175	1195-2790
45mm	71-177	71-156	1062-2470
50mm	64-159	64-140	955-2230
55mm	58-145	58-127	870-2027
60mm	53-133	53-117	795-1860
65mm	49-122	49-108	735-1715

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

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

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

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

4.7 Manual spindle sleeve feed with the fine feed

Turn the handle screw. The spindle sleeve lever will move towards the drill-mill head and will activate the clutch of the fine feed.

Turn the spindle sleeve fine feed in order to move the spindle sleeve.

4.8 Digital display

Display for spindle sleeve travel.

Measuring range	mm	0-999.99
	inch	0-39.371"
Reading precision	mm	0.01
	inch	0.0004"
Power supply (battery)		Round cell 1.55V 145mAh (SR44) 11.6 x 5.4mm

- ON / O switches the display on and resets the reading of the display to "0"
- mm / in converts the measuring unit from millimeters to inches and viceversa
- OFF switches the display off
- ↑ performs a value increase
- ↓ performs a value decrease

4.9 Swiveling the mill-drill head

Manual spindle sleeve feed with the fine feed

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.

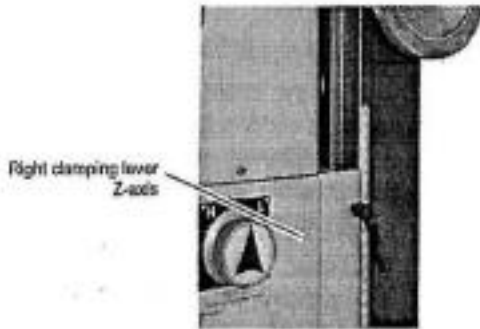
Loosen the handle screw. The spindle lever moves away from the drill-mill head and disengages the clutch of the fine feed.

The mill-drill head may be swiveled to the left.

Caution!

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

4.10 Clamping Levers



The machine is equipped with clamping levers for the Z-Axis movement of the drill-mill head and two clamping levers for the X and Y-Axis movement of the cross table.

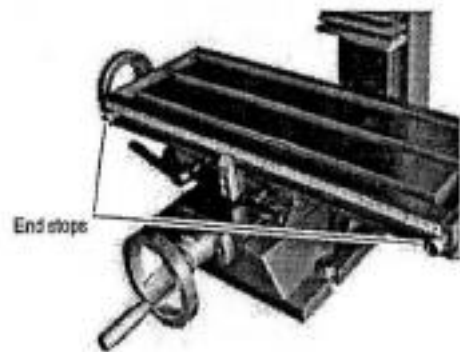
The spindle sleeve is fitted with a clamping lever.

Use the clamping levers to lock the position of the axes during milling or drilling operations.

4.11 End stops

The cross table is fitted with two adjustable end stops on the X-Axis.

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



4.12 Installation on a lathe

The mill head with column can be mounted on a lathe. For fastening an adapter is required. The adapter needs to be fixed to the engine bed. It is not possible to fix it to the lathe slide. The adapter is dimensioned in a way that the middle of the lathe chuck should be reached with the center of the milling spindle (alignment headstock – lathe chuck).

Due to the manufacturing tolerances of castings and the manufacturing tolerances of two different machines it is however not possible to reach the exact center, the adapter may be too long or short.

If required, the adapter is to be milled off or equipped with dummy sheets. When using sheets the complete surface is to be filled.

In order to reduce the support expenditure of the column with milling head during the orientation we recommend you disassemble the milling head off the column. Unscrew the locking screw (safety screw) position 266. Disassemble the milling head off the column by completely loosening the clamping screw and the lead screw and stripping off the milling head.

Control the orientation (90° angle horizontal and vertical) of the column with the reference planes on the engine bed of the lathe.

In order to prevent you from having to reorient the milling head when altering later on, we recommend you to provide the column and the adapter as well as the engine bed with alignment pins. If required, pin the column together with the cross table before disassembling the column.

It is recommended to use hardened straight pins according to DIN 6325 in 8mm or 10mm and a fitting tolerance zone m6. (zB. DIN 6325-8 m6 x 30). These alignment pins have a round cap on one side which facilitates pinning together the parts. When assembled the boring holes must be pilot-drilled to 0.2mm smaller and then rubbed with a reamer also when assembled. Ideally, use a new twist drill with a diameter of 7,8mm for alignment pins of 8mm.

5. Maintenance

In this section you'll find important information about

- Inspection
- Maintenance
- Repair

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



Properly performed regular maintenance is essential for safe operation, faulty-free operation, a long service life of the milling machine, and the quality of products that you manufacture.

Installation and equipment from other manufacturers must also be in optimum condition.

5.1 Safety

The consequences of incorrect maintenance and repair work may include:

- Serious injury to personnel working on the milling machine
- Damage to the milling machine

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

Only carry out work on the milling machine if it has been unplugged from the mains power supply, then pull the plug out.

Restarting

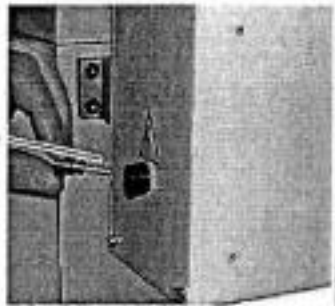
Before restarting the machine run a safety check.

Before disconnecting the machine check that there is no danger for personnel and that the machine is undamaged.

5.2 Inspection and maintenance

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

Interval	Where?	What?	How?
Start of work After each maintenance or repair operation	Drilling-Milling Machine	Safety check	Safety check
Start of work After each maintenance or repair operation	Dovetail sideways	Lubricate	Lubricate all sideways
Weekly	Cross-table	Lubricate	Lubricate all blank steel parts. Use acid-free oil, for example engine oil
As required	Spindle nuts	Re-adjust	An increased clearance in the spindles of the cross-table can be reduced by re-adjusting the spindle nuts. The spindle nuts are re-adjusted by reducing the flank of screw thread of the spindle nut with an adjusting screw. By re-adjusting you can assure smooth running of the toolpath, otherwise the wear by friction between spindle nut/spindle would increase considerably.
As required	Taper gib	Re-adjust X and Y Axis	Turn the adjusting screw of the respective taper gib in the clockwise direction. Continue to push in and reduce the gap in the guide way. The respective guide way must be easily mobile from the adjustment, resulting in a stable guidance.
As required	Taper gib	Re-adjust Z Axis	As described above for X and Y Axis.

As required	Machine lighting	Replacement of the halogen bulb	<p>Turn the milling head into a horizontal position to the right. The lamp cover can be easily lifted out around the halogen bulb.</p> <p>Put a small screwdriver into the gap between the bulb socket and lamp cover.</p> <p>Rotate the screwdriver to lift the lamp cover.</p> <p>Remove the bulb covering it with a cloth then replace.</p> <p>Type required: Halogen pin lamp base, Osram 12V- 20W, base G4.</p>
As required	Machine lighting	Replacement of the micro fuse – electronics	
Every six months	Geared drill-mill head	Grease	<p>Swivel the drill-mill head completely to the right (90°).</p> <p>Check that the clamping screws are firmly tightened.</p> <p>Detach the cover plate on the rear side.</p> <p>Lubricate the gear wheels. Make sure that you do not lubricate the clutch of the spindle sleeve fine feed.</p>

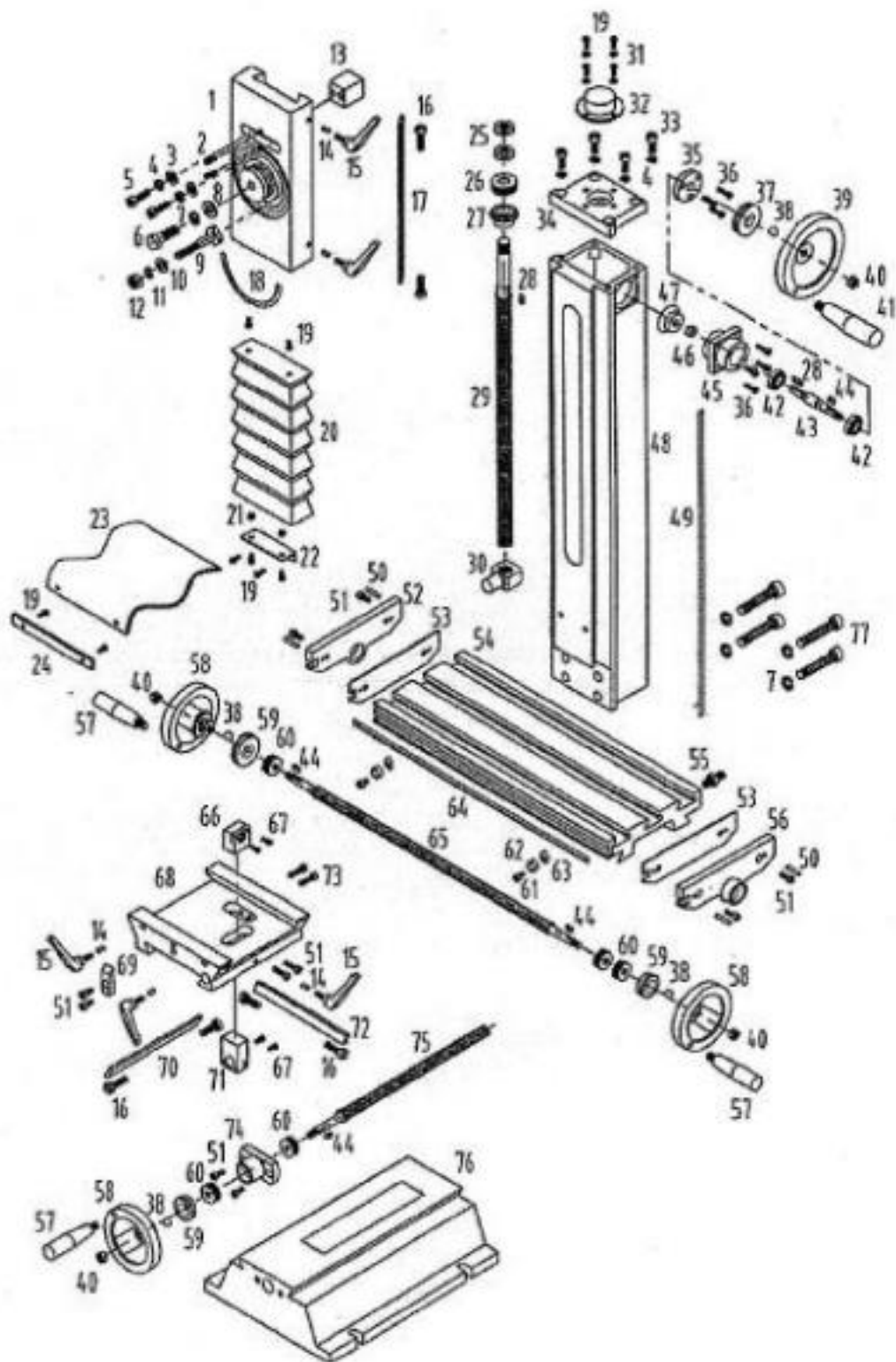
5.3 Repair

Any maintenance work may only be carried out by a specialized company or by a duly trained personnel. Any maintenance work on electrical equipment may only be carried out specialized electrical staff. For any repair work get assistance from our technical service team.

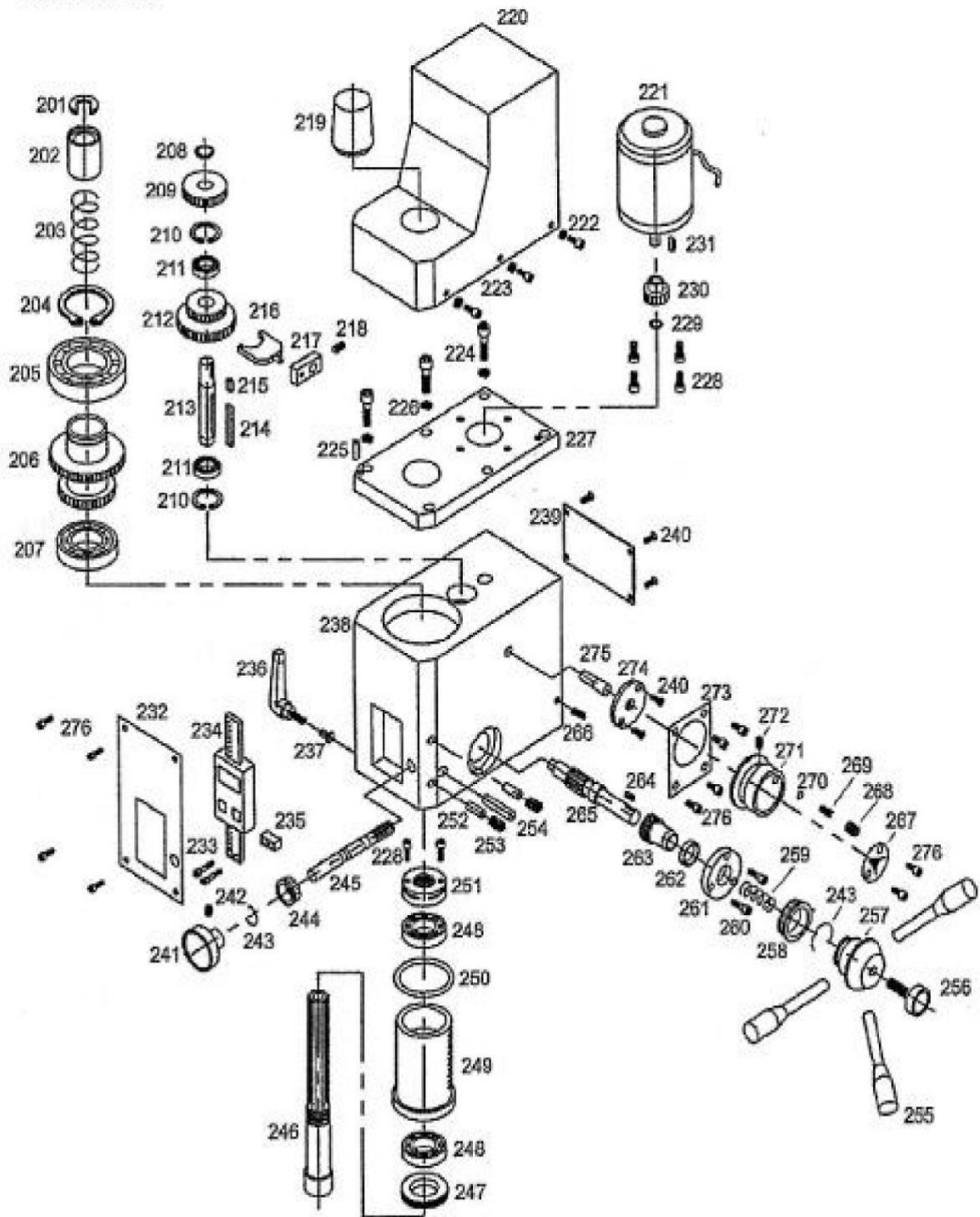
Chester UK Ltd does not take any responsibility nor does it guarantee against damage and operating anomalies resulting from failure to observe this manual.

For repairs only use faulty free and suitable tools, original spare parts or parts authorized by Chester UK Ltd.

5.4 Spare parts drawings



Headstock

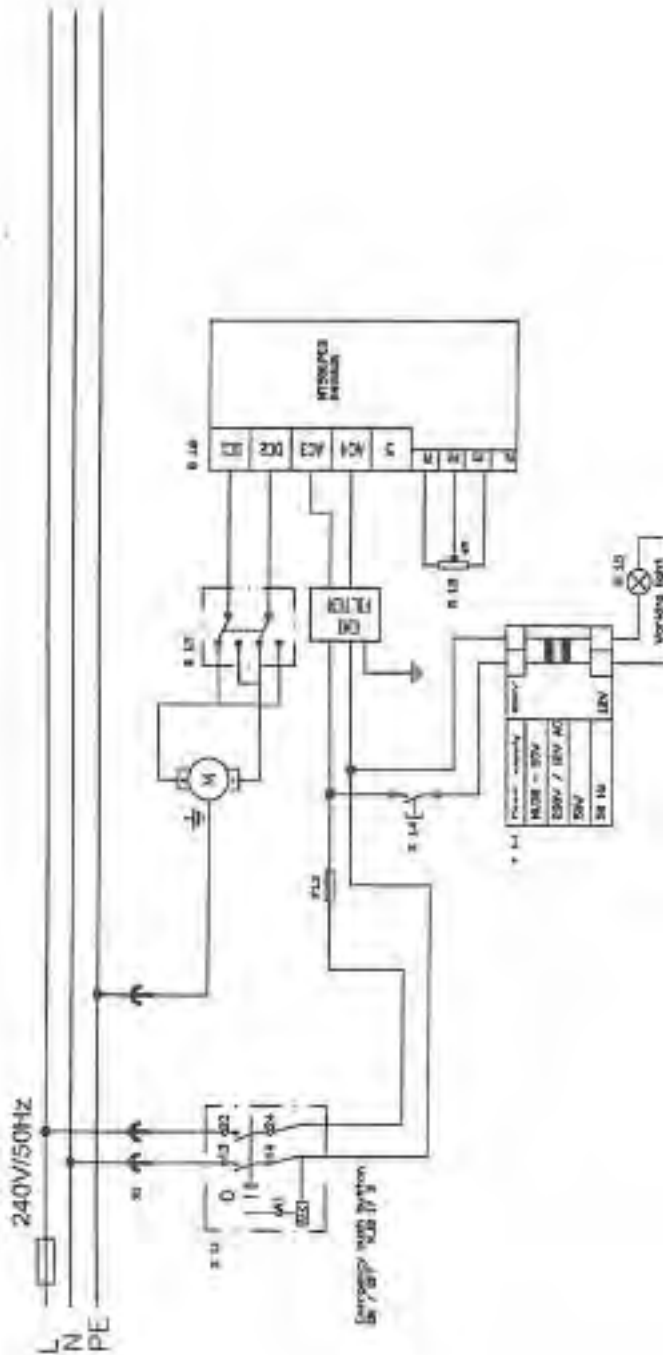


Spare parts list 1

Pos.	Name	Size	Qty	Pos.	Name	Size	Qty
1	Connect board		1	58	Wheel		3
2	Socket head screw set	M6x16	2	59	Dial		3
3	Washer		2	60	Bearing	51200	5
4	Spring washer	8	6	61	Hexagon head cap screw	M6x10	2
5	Hexagon head cap screw	M8x25	2	62	Stopper		2
6	Hexagon nut	M12x40	1	63	Wedgy nut		1
7	Spring washer	12	5	64	Table plate	Standard	1
						Large	
8	Washer	12	1	65	Table lead screw	Standard	1
						Large	
9	Screw		1	66	Table lead screw nut		1
10	Washer	10	1	67	Hexagon head cap screw	M4x20	4
11	Spring washer	10	1	68	Saddle	Standard	1
						Large	
12	Hexagon nut	M10	1	69	Limit plate		1
13	Connect collar		1	70	Gib		1
14	Brass pin		5	71	Lead screw nut		1
15	Adjust locating handle	M6x16	5	72	Gib	Standard	1
						Large	
16	Gib screw		1	73	Hexagon head cap screw	M6x25	2
17	Column screw		1	74	Saddle dial support		1
18	Angle plate		1	75	Lead screw		1
19	Hexagon head cap screw	M5x10	12	76	Base		1
20	Bellows		1	77	Hexagon head cap screw	M12x90	4
21	Hexagon nut	M5	2	201	Position washer		1
22	Bellows bracket		1	202	Spring sleeve		1
23	Rubber splash guard		1	203	Spring	2.5x28x110-3	1
24	Plate		1	204	Retainer ring	45	1
25	Nut	M16x1.5	2	205	Bearing	6209-2RZ	1
26	Bearing	51203	1	206	Gear	Z60/Z80	1
27	Taper gear		1	207	Bearing	7007 AC	1
28	Key	4 x 16	2	208	Retainer ring	15	1
29	Lift lead screw		1	209	Gear	Z46	1
30	Lift lead screw nut		1	210	Retainer ring	32	2
31	Washer	5	4	211	Bearing	6002-2RZ	2
32	Nut collar		1	212	Gear	Z42/Z62	1
33	Hexagon head cap screw	M8x20	4	213	Transmission shaft		1
34	Column cover		1	214	Key	5 x 50	1
35	Bearing cover		1	215	Key	C5 x 12	1
36	Hexagon head cap screw	M5x12	7	216	Fork		1
37	Lift dial		1	217	Fork arm		1
38	Spring piece		4	218	Screw	M5x8	1
39	Wheel		1	219	Cover		1
40	Locking nut		4	220	Motor cover		1
41	Handle	M10x80	1	221	Motor	83ZYT005	1
42	Bearing	6001-2RZ	2	222	Hexagon head cap screw	M4x8	6
43	Lift shaft		1	223	Washer	4	6
44	Key	4x12	2	224	Hexagon head cap screw	M6x14	6
45	Lift bearing base		1	225	Pin	A5x25	2
46	Collar		1	226	Washer	6	6
47	Taper gear		1	227	Fixed cover		1
48	Column		1	228	Hexagon head cap screw	M5x12	6
49	Lift plate		1	229	C-retainer ring	10	1
50	Taper pin	A5x25	1	230	Motor gear	Z25	1
51	Hexagon head cap screw	M6x16	10	231	Key	C4x16	1
52	Table dial support (L)		1	232	Main plate		1
53	Gasket		2	233	Hexagon head cap screw	M3x16	2
54	Cross table		1	234	Digital slide gauge		1
55	Table dial support (R)		1	235	Base		1
56	Handle	M8x63	3	236	Adjust locking handle	M8x20	1

Pos.	Name	Size	Qty
237	Oriented pin		1
238	Headstock		1
239	Cover		1
240	Cross recessed head screw	M4x8	6
241	Micro feed knob		1
242	Socket head set screw	M5x6	1
243	Spring piece		2
244	Micro feed dial		1
245	Worm shaft		1
246	Spindle		1
247	Nut		1
248	Bearing	7005AC/P5	2
249	Collar		1
250	O ring	58x2.65	1
251	Clamp nut		1
252	Pin	B4x20	4
253	Socket head screw set	M5x12	4
254	Pin with thread	A6x30	1
255	Handle		3
256	Locking knob		1
257	Feed handle disc		1
258	Feed dial		1
259	Compression spring	1.2x12x25.3	1
260	Hexagon head cap screw	M4x10	3
261	Cover		1
262	Adjust collar		1
263	Helical gear		1
264	Key	4x12	1
265	Up-down gear shaft		1
266	Socket head set screw	M6x20	1
267	Plate		1
268	Socket head set screw	M8x8	1
269	Compression spring	0.8x5x25.3	1
270	Steel ball	6,5	1
271	Locating knob	12x50	1
272	Socket head set screw	M5x16	1
273	Shifting plate		1
274	Locating base		1
275	Shifting shaft		1
276	Hexagon head cap screw	M3x6	10

5.5 Terminal connecting plan for control system



5.5.1 Spare parts list of electrical system

Pos.	Name	Qty.
D 1.8	Steuerplatin	1
T1.4	Transformator 230V / 12V	1
H 1.5	Halogen-38Wsockellempa 12V, 20 W, Sockel G4	1
F1.4	Fuseleistung 1 BA	1
S 1.4	Schalter Ein/Aus Halogenlempa	1

Pos.	Name	Qty.
M	Geochrommotor	1
M - 1	Motorkahle	2
S 1.8	Drehrichtungsschalter ZH-A	1
S1.1	NOF-AUS EIN / AUS KJ0 17B	1
R 1.5	Potentiometer 4,7 K	1
X1	Schutzkontaktstecker	1

6. Anomalies

Problem	Cause / possible effects	Solution
Machine does not start	<ul style="list-style-type: none"> • Start sequenced not followed • Defective fuse 	<ul style="list-style-type: none"> • Check “Starting the machine” page 15 • Have it checked by authorized personnel
Blunt tool	<ul style="list-style-type: none"> • Incorrect speed • The chips have not been removed from the bore hole • Blunt tool • Operating without cooling agent 	<ul style="list-style-type: none"> • Select another speed, feed too high • Retract tool more often • Sharpen and replace tool • Use coolant
Impossible to insert holding taper into the spindle sleeve	<ul style="list-style-type: none"> • Remove any dirt, grease or oil from the internal conical surface of the spindle sleeve or the holding taper • Morse taper does not correspond to MT2 	<ul style="list-style-type: none"> • Clean surfaces well. Keep surfaces free of grease • Use MT2 taper
Motor does not start	<ul style="list-style-type: none"> • Defective fuse 	<ul style="list-style-type: none"> • Have it checked by authorized personnel
Working spindle rattling on rough workpiece surface	<ul style="list-style-type: none"> • Climb not possible under current operating conditions • Clamping levers of the movement axes not tightened • Loose collet chuck, loose drill chuck, loose draw-in rod • Tool blunt • Workpiece loose • Excessive slack in bearing • Splinted shaft worn or worn out • Working spindle goes up and down 	<ul style="list-style-type: none"> • Perform conventional milling machine • Tighten clamping levers • Check, re-tighten • Sharpen or replace tool • Secure the workpiece properly • Re-adjust bearing slack or replacing bearing • Replace pos. 46 & 51 of spare parts list • Re-adjust bearing clearance or replace bearing pos.48 of spare parts list
Fine feed of spindle sleeve does not work	<ul style="list-style-type: none"> • Fine feed is not correctly activated • Clutch of fine feed does not engage, is dirty, smeared, worn or defective 	<ul style="list-style-type: none"> • Manual spindle sleeve feed with the fine feed • Clean, replace