

WAIT!!

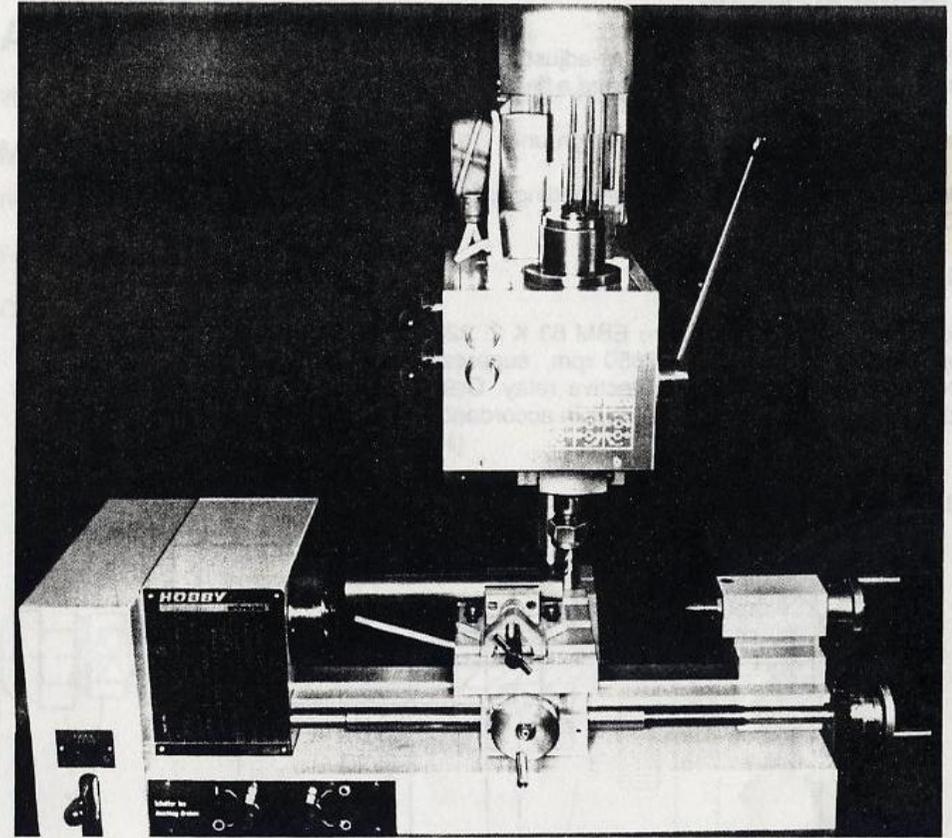
Before putting your new Boring and Milling equipment (known as a BFE for short) into operation please study this manual. It will help you learn all about the functions of this equipment and ensure that you use it safely.

You have acquired an accessory to your precision lathe, which has been built with the same care and precision that you have come to expect of our products.

The general arrangement of the controls and the compact construction of this machine will soon ensure that you use it with confidence.

You will find it worth your while to carry out a few "trial runs" to help you achieve certain skills.

We reserve the right of further developments in the interest of technical advancement; in this way minor deviations can ensue in the illustrations and descriptions.



Technical Specifications

Working Height max.	320 mm
Depth of gap (mid-spindle to column)	180 mm
Column	Dia 60 mm
Drill diameter max.	Dia 10 mm
Mill diameter max.	Dia 16 mm
Work table with 3 T-slots	160 x 125 mm
4 speeds	315/560/900/1600 rpm
Length of stroke of sleeve	50 mm
Motor capacity	250 W (useful power)
	Input 435 W 220 V
	50 Hz AC.
	Fuse 6 Amp

Technical Design

The main spindle is located in re-adjustable backlash-free precision antifriction bearings, with an No. 1 Morse taper and a flange for holding tools and collet chucks.

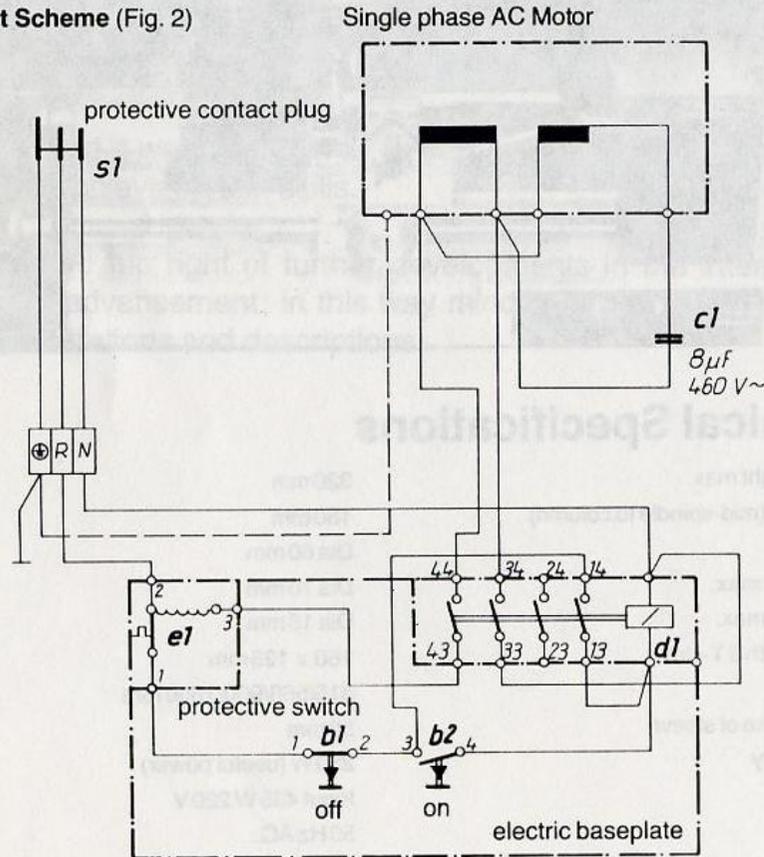
Taper hardened and tempered and ground

Hollow spindle for feeding through loading spindles for milling tools.
(Drill hole Dia 7 mm)

Drive Motor:

Single phase AC motor. Type EBM 63 K 2. 220 V, 50 Hz. Nominal output: 250 W, Input 435 W. Shaft Speed 2850 rpm, suppression of interference with condenser. "No Volt" (switch) motor Protective relay. On-Off Switch: with press button 250V, 10Amp. The electrical installation is in accordance with VDE 0740.

Circuit Scheme (Fig. 2)



Accessories

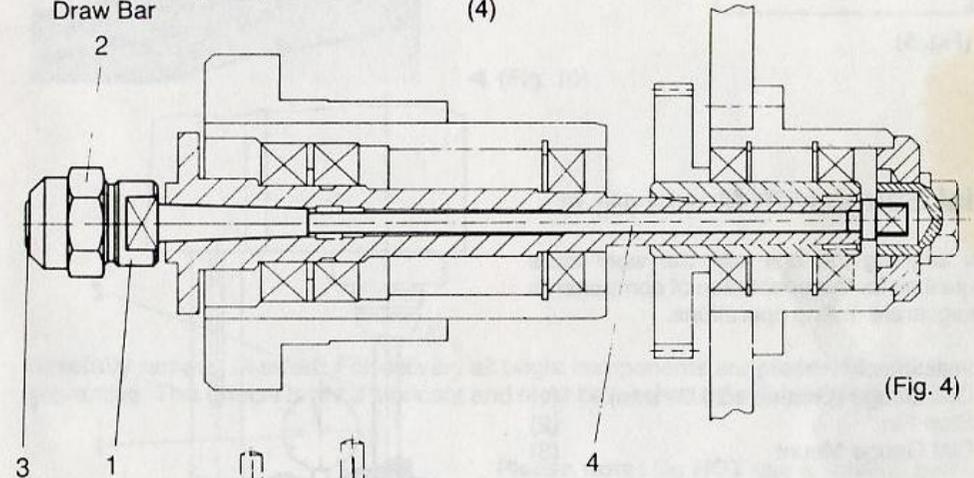
We offer the following special accessories to be used with the BFE:

Milling Chuck

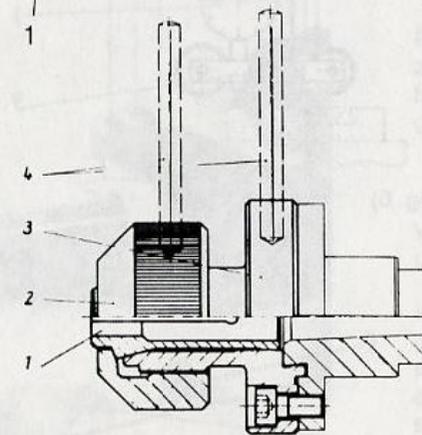
(Fig. 4)

For secure mounting of melling cotters:

- Consisting of
- | | |
|--|-----|
| Mounting body
with No 1 Morse Taper | (1) |
| Clamp nut | (2) |
| Clamp taper (1 set) | (3) |
| Draw Bar | (4) |



(Fig. 4)



(Fig. 4.1.)

Furthermore, instead of this milling cutter chuck, the collet chuck can be attached to the flange of the main spindle.
(see Figure 4.1)

The

KBF coordinate drilling and milling machine

comprises two subassemblies which can be used independent of each other – the BFE 65 drilling and milling unit and the KT 160 × 450 coordinate table.

For a description and illustrations of the drilling and milling unit (also designated BFE), see the operating instructions for this subassembly.

The present operating instructions apply to the KT 160 × 450 coordinate table and deal with the combined use of BFE 65 and KT 160 × 450 as KBF. Note please that the BFE components

foot complete and
work-holding table complete

are not required for the KBF.

Technical data

Length of table	450 mm
Width of table	160 mm
Height	mm
Longitudinal travel	290 mm
Cross travel	140 mm

Feed accuracy in both axes 0.02 mm (graduated collars)

Number of T-slots 3

Width of T-slots 8 mm

Adjustable stops for longitudinal travel

Scales graduated in mm indicating the length of longitudinal and cross travel

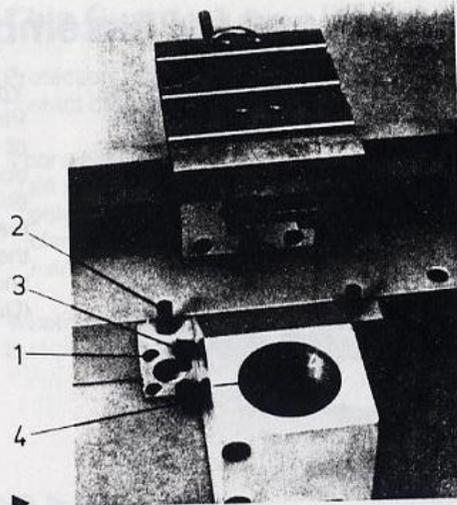
60 mm-diameter hole for column
(of the associated drilling and milling unit)

Accessories:

1 double-ended spanner	11/13 mm
1 double-ended spanner	8/10 mm
1 screw driver	0.8 mm
1 socket-screw wrench	6 mm

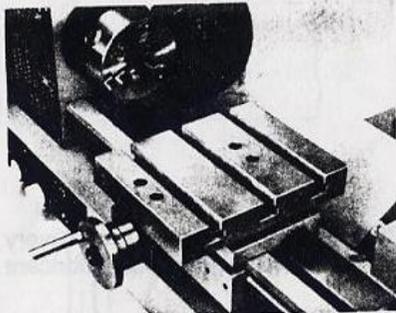
Fig. 1: Coordinate table KT 450 × 160
complete with accessories

Now following Fig. 13 place the leg 1 onto the pin, push it towards the base plate and fix it by means of the 4 screws 1, to the base plate.



(Fig. 13) ▶

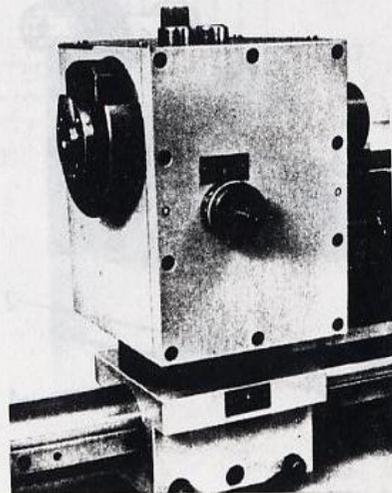
Following Fig. 14 fix the worktable to the cross-slide of the lathe by means of the 4 screws with their retaining washers.



(Fig. 14) ▶

Should you receive your milling and drilling attachment BFE 65 unassembled, the drive head and the column will have to be screwed together (see diagram sub-assembly 07, column page 33).

The column must be fixed to the mounting by using the cylindrical screws (37), the spacer (27) and the t-nuts (33), which are already located in the swivel ring of the drive head. The assembled article is shown in illustration no. 15.



(Fig. 15) ▶

Prazi

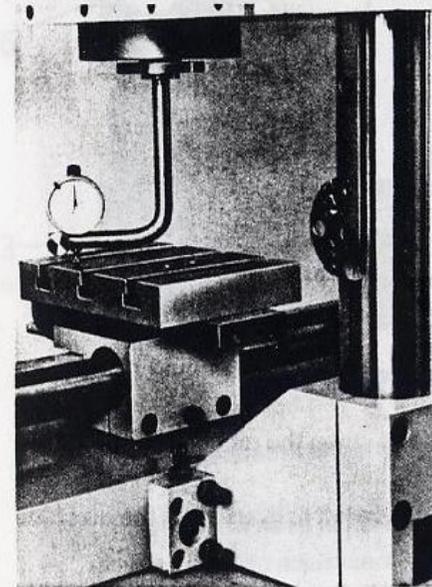
Insert the complete machine into the base and slightly tighten the fastening screws.

Please Note: During this operation, the lathe must be firmly fixed to the table!

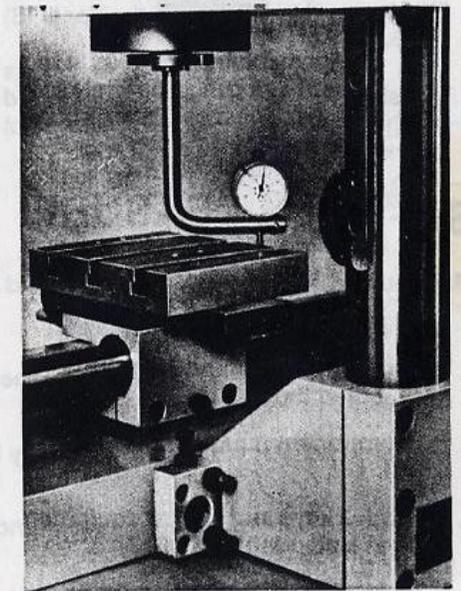
The clamping device or the cutter chuck must be situated on the main spindle and correctly mounted and aligned.

The dial gauge mount with the dial gauge is located in the clamping device or in the cutter chuck as per Fig. 6. The BFE is now carefully turned downwards; the worktable must be centred under the main spindle so that the dial gauge can be placed on the entire worktable as seen in Fig. 18 and 19.

(Fig. 18)



(Fig. 19)



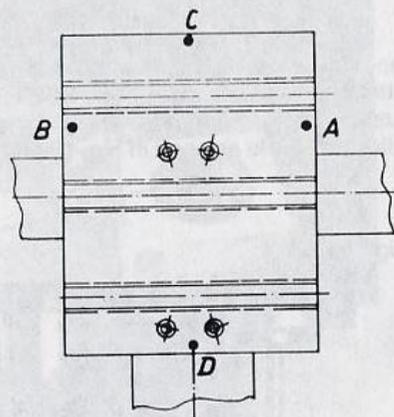
Prazi

Tighten the clamping bolts 7 (see Fig. 20). The locating mark on the swivel ring must stand exactly at nought (0). Lightly tighten the 4 holding screws (Fig. 13).

Using the 2 adjusting screws 2 (situated right and left at the top of the base Fig. 13) line up the column longitudinally to the worktable.

Using the adjusting screws 3 and 4 (Fig. 13) adjust the column transversely to the worktable. Proceed as follows:

1. Twist the spindle with the dial gauge on the points A and B as per Fig. 19a. Swing the column through screws 2 so that a difference of no more than 0.02–0.03 mm is shown on the dial gauge. Tighten the lock nuts.
2. Turn the spindle so that the dial gauge sits on the points C and D. Line up the column by adjusting either the upper (3) or lower (4) screws. The alignment must be as exact as possible. The leg must be firmly screwed to the machine base after successful alignment.



(Fig. 19a)

SAFETY MEASURES

Make sure you follow these tips to avoid any accidents:

- Use a 6 Amp fused plug.
- During service and maintenance operations the machine should be disconnected from the mains.
- Component measurements may only be made when the machine is switched off.
- Chuck keys and similar equipment should not be left in even when the machine is at a standstill.
- Protective glasses should be worn for milling and boring operations; chip guard to be securely placed in position.
- Remove swarf only with a small brush or; never use the fingers to touch tools or rotating parts.
- Do not stop the machine by holding chuck with your hand.
- Do not wear loose clothing; even ties etc. can be dangerous!
- Never leave the machine unsupervised when it is running.

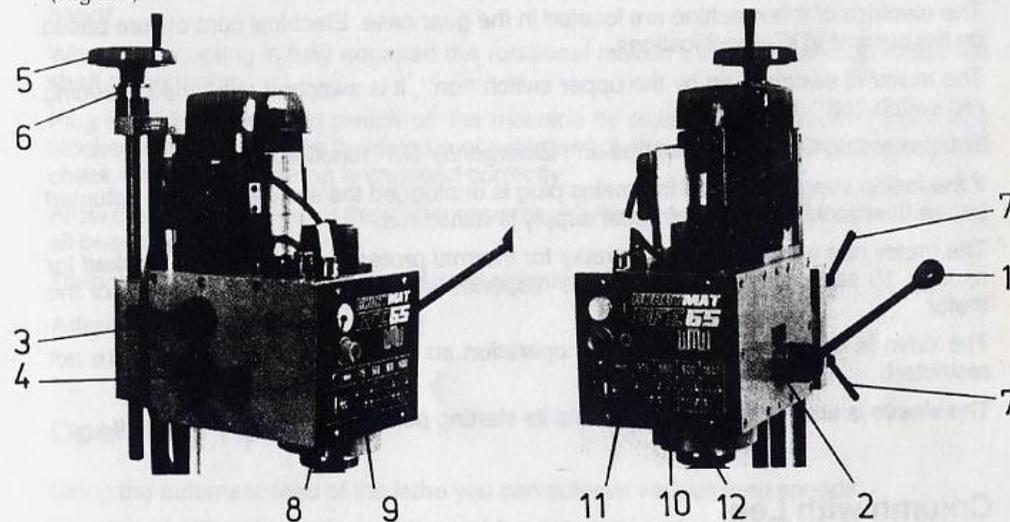
DESCRIPTION OF MACHINE

The boring and milling unit consists of the following main assemblies:

- Gear unit with drive
- Column with leg base
- Worktable (on the carriage of the lathe)
- Electrical equipment

Operating elements see Fig. 20

(Fig. 20)



- 1 Sleeve feed lever
- 2 Depth gauge
- 3/4 Control lever for speed setting
- 5 Handwheel
- 6 Gauge for milling adjustment

- 7 Clamping screws
- 8 Push button "on"
- 9 Push button "off" (emergency stop)
- 10 Speed setting diagram
- 11 Symbol: do not switch while running
- 12 Collet attachment

Gearbox

The switch gear with the sleeve and main spindle is located in a cast aluminium casing. The spindle is driven by a flanged single phase AC motor with operating condenser via a toothed gearing with a coupling. The spur gears are helical gears; the combination of steel and hard fabric guarantees a quiet run with the least possible wear.

The speed is set by means of 2 levers laterally placed on the left, turning the spindle lightly by hand while the machine is at rest.

Please Note: Do not force it!

During drilling operations, the sleeve can be moved downwards by means of the hand lever which can be attached laterally in 6 different positions.

Worktable

The worktable has 3 T-slots to take clamping devices such as

- a machine vice
- a clamp or strap etc.

It is attached to the cross-slide of the lathe instead of the longitudinal slide. So for example during milling operations, the table can be moved via the leadscrew and the cross-slide of the lathe.

Electrical equipment

The electrics of this machine are located in the gear case. Electrical controls are based on the current VDE-specifications.

The motor is switched on by the upper switch "on", it is switched off by the protruding red switch "off" (0).

The protruding Off-switch also has an "Emergency-Off" function.

If the mains supply fails or if the mains plug is unplugged the switch has to be actuated before the machine runs again after supply is reinstated.

The motor has a motor protective relay for thermal protection; switching is blocked for approx. 10 seconds after the machine responds after overloading or blocking of the motor.

The drive is designed for continuous operation so operating times are therefore not restricted.

The sleeve is always pulled back up into its starting position by a pull-back spring.

Column with Leg

The Column is made of relatively thick-walled, seamless tube. It is accurately ground and has a work guide.

The column is tightly clamped to the leg base which is firmly screwed to the base plate of the lathe.

The column with the attached gearbox can be swivelled by 360° horizontally in the leg after loosening the clamp. The downfeed screw is situated parallel to the column; the entire gear can be vertically adjusted on the column by means of this screw. A gauge allows a reading of 0.02 mm adjustment. The clamping screws should always be tightened after adjustments! In order to be able to swivel the gear, the 2 internal hexagonal bolts situated at the back must be loosened.

The swivel angle can be seen on the markings of the swivel ring.

Putting into Operation

After the machining centre

consisting of a lathe and
a boring and milling unit

has been correctly installed and firmly screwed to a table, the BFE can be put into operation.

- Check for 220 V and 50 Hz.
- The plug must be fitted with 6 Amp. fuse.

Select the lowest spindle speed $n = 315$ rpm by switching the lever in the appropriate way. When switching during a standstill, lightly and slowly twist the main spindle by hand!

When the coupling is fully engaged the rotational motion transmits itself up to the fan shaft of the motor.

Plug in to the mains and switch on the machine by pressing the switch. If there is a blockage of the drive or a building up of noise switch the machine off immediately and check whether the gearing is engaged correctly.

Allow the machine to run at this rpm for approx. 10 minutes so that the lubricant reaches all bearing points fully.

Then the machine can be operated at all speeds.

Attention! Observe the safety hints!

Operating Tips

Using the automatic feed of the lathe you can achieve various feed speeds.

Important: When using the mechanical feed the rotary chuck must be dismantled for safety reasons; the locking ring must be in position!

You would be advised to use the feed of $s = 0.08$ mm/U on the lathe for milling.

You will obtain the following feeds with the existing 4 speeds in mm/min:

Feed Lathe mm/U	Feed Worktable mm/min			
0.08	20	40	80	160
at spindle speeds	250	500	1000	2000

The operator's manual has the necessary information for setting the spindle speeds and the change gears for the appropriate feed.

The feed direction can be altered by switching the rotational direction of the lathe.

Some Important Points of Advice:

- Always keep an eye on tightly clamped tools such as drills, cutters or counterbores
- Clamp all tools securely; especially when clamping with the machine vice make sure the spindle is properly tightened.
- When clamping the work never use a hammer or anything of that kind on the workpieces or wrench; the machine bed is not constructed for blows.

When Milling, Please Note:

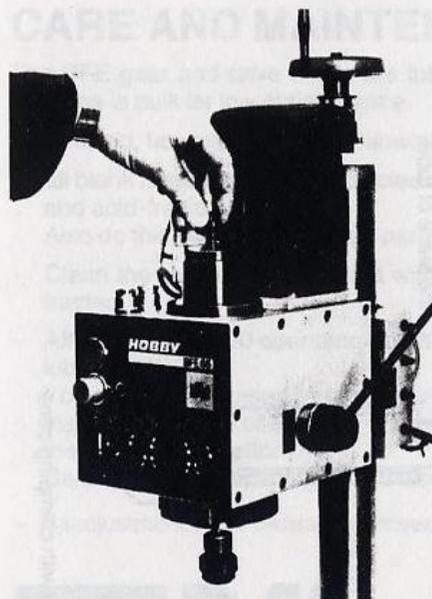
- clamp the sleeve
- choose the rotational speed appropriate to the machining operation
- bring the tool towards the workpiece by means of the handwheel
- switch the BFE drive on and the lathe when appropriate
- engage the tool; set the cutting or loading depth
- **TIGHTEN the CLAMPING SCREWS 7 (Fig. 20)!**
- move the feed by hand and insert the MD 65 coupling lever respectively
- after completing the milling move out the tool while simultaneously loosening the clamping screws
- now you may switch off the drive!

When Drilling with the Drill Chuck, Please Note:

- loosen sleeve clamp
- remove holding clamp attachment
- clean out the inside taper (with a rod and cloth – never with the fingers!)
- drive in the taper and drill chuck
- clamp drill while rotating
- carefully start the drilling!
- if necessary cool the drill with a coolant.

When Switching Off the Machine:

- First of all switch off the feed, then stop the tool!
- after swiveling the drive or the column it is essential that the fixing screws are securely tightened!
- observe the safety instructions!
- when using tools or clamps with No 1 Morse taper proceed as follows:
 - insert tool in the clean taper
 - to remove unscrew locking screw at the top of the flange, insert ejector and remove tool with a short blow.
- when inserting the milling chuck, the chuck should be inserted in the clean taper and when the fixing screw is unscrewed, it should be fixed by means of the tightening spindle.
- during machining operations, the fixing screw should be screwed in again.



(Fig. A)

- during machining operations, the fixing screw should be screwed in again. In this connection, see Fig. 4 on page 3.

Appendix 1

Insertion of the cones into the milling cutter chuck

(see Fig. B and Fig. 4)

You should proceed as follows:

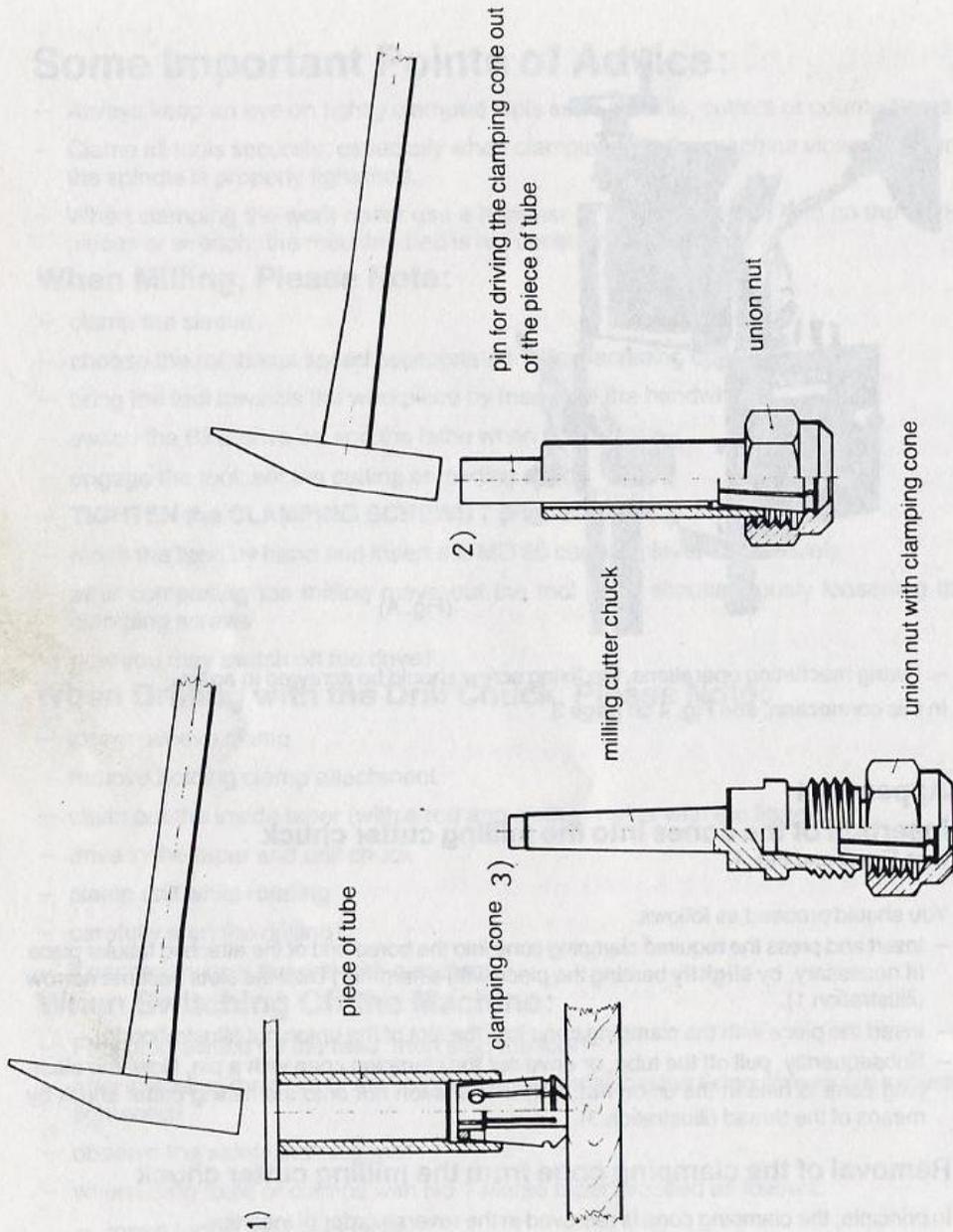
- Insert and press the required clamping cone into the bored end of the attached tubular piece (if necessary, by **slightly** beating the piece with a hammer) Until the slots become narrow (illustration 1).
- Insert the piece with the clamping cone into the slot of the union nut (illustration 2).
- Subsequently, pull off the tube, or drive out the clamping cone with a pin. Now, the clamping cone is held in the union nut. Screw this union nut onto the milling cutter chuck by means of the thread (illustration 3).

Removal of the clamping cone from the milling cutter chuck

In principle, the clamping cone is removed in the reverse order of insertion.

- Unscrew the union nut and screw out the clamping cone/union nut assembly.
- Slip on the tube with its bored end from the rearside and slightly drive it in with a hammer until the clamping cone becomes loose.
- Then, drive out the clamping cone from the rearside through the piece of tube using a mandrel (as in illustration 2, but without inserted union nut).

These operations can be executed with the chucks being inserted.

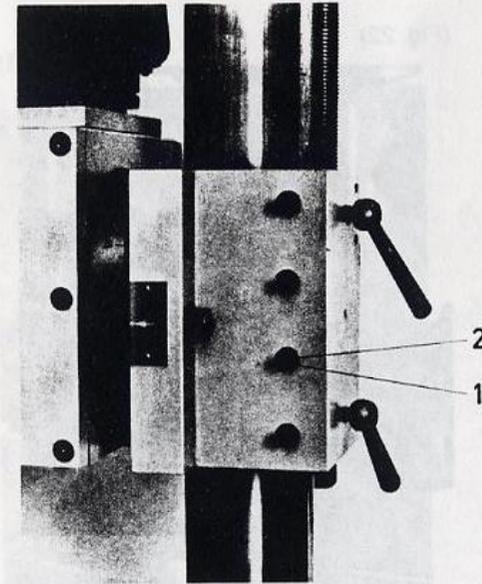


CARE AND MAINTENANCE

The BFE gear and drive motor are lubricated for approx. 1.500 operating hours; the machine is built for low maintenance.

You should, however, note the following points:

- all blank metal parts should be cleaned daily and lightly greased with a non-resinous and acid-free oil.
Also do this with the burnished parts of the machine.
- Clean the sleeve and grease it with a non-resinous and acid free oil when it is retracted.
- After approx. 1.500 operating hours we recommend that you replenish or renew the lubricant.
You would be advised to hand this job over to a service shop. Should you want to inspect the inside of the gear yourself, always open only the left gear cover (see in the operating direction).
Careful! You are opening up the electrics section here! Unplug the unit!
- Readjustment of the clearance between guide slot and column



Appendix 2

To increase the working accuracy, adjust the clearance on the gib of the column (Fig. C). For this purpose, use the adjusting screws 1 which can be easily retightened after the lock nuts 2 have been slackened.

Make sure that they are always firmly tightened after the adjustment.

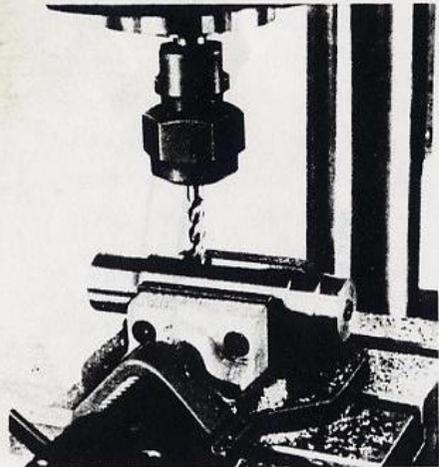
TIPS FOR MACHINING

We should like to demonstrate the versatility and variety of machining possibilities of this system by describing some typical examples of machining.

Milling Keyways (Fig. 21)

The component is clamped in the vice. (It can also be clamped in a solid vee by means of a strap.) The cutter is centred to the shaft with the cross-slide; the feed is caused by the leadscrew or mechanically by the longitudinal feed. (The example shows steel St 42)

(Fig. 21)

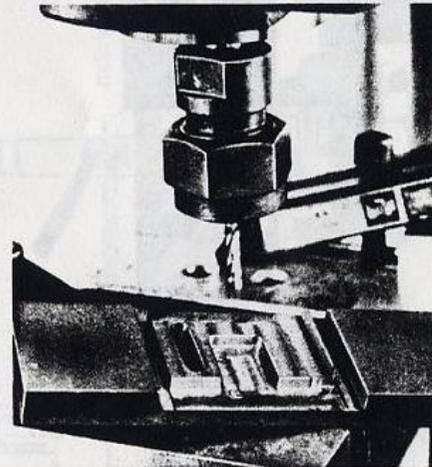


Milling Contoured Parts (Fig. 22)

(Fig. 22)

Precise reading and setting possibilities via the leadscrew and cross-slide make it possible to produce parts of very high precision (± 0.025 mm). (The example shows cast iron)

(Fig. 22)



Milling of Angles and Forms (Fig. 23)

(Fig. 23)

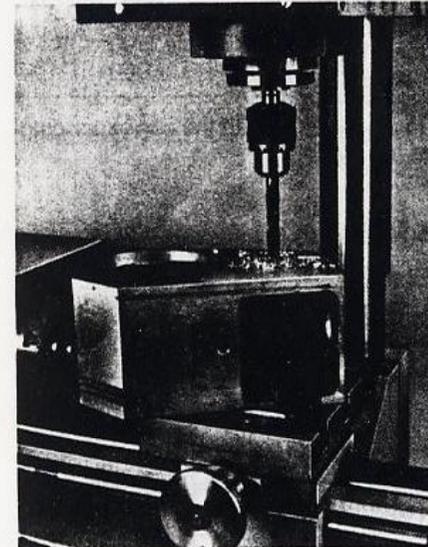
As the milling head can be swivelled in all directions, any angle or slope can be milled on one component (The Example shows an A/Mg alloy)

Drilling of Coordinates (Fig. 24)

(Fig. 24)

Through exact Positioning by means of the MD 65 carriage, you can achieve precise co-ordination of bores on castings, jigs etc. The T-slots in the worktable make the tool clamping very variable.

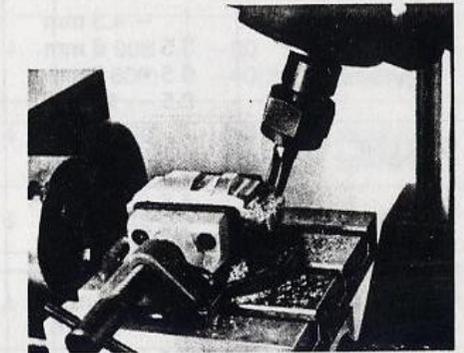
(Fig. 24)



Use of the BFE as a Box-Column Drilling Machine (Fig. 25)

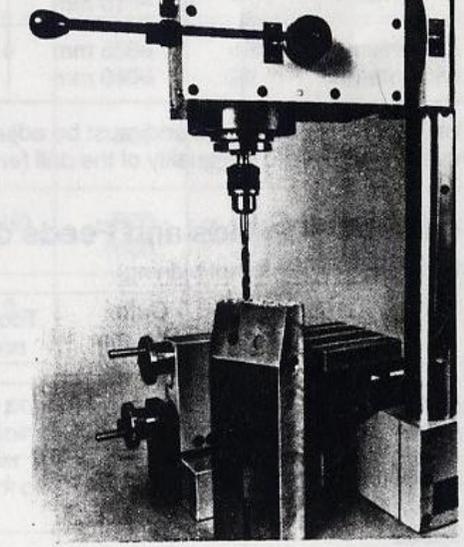
(Fig. 25)

Provided that your machine is firmly fixed to a stable, flat table, you can, as illustrated, carry out certain drilling operations on relatively large pieces.



(Fig. 23) ▲

▼ (Fig. 25)



You will discover other possibilities yourself and you will be able to do anything you please with the machining centre.

Guidelines for the most frequent operations of

BORING and MILLING

appear on the following tables:

Rotational Speeds and Cutting Speeds when Drilling (these guidelines are not binding)

Feed by Hand; SS-Drill

Material	Drill-Dia.	Cutting speed V max (m/min)	Rpm
Steel up to St 50	– 4.3 mm	15.0	1600
	3.5 – 6 mm	16.9	900
	6.5 – 8 mm	14.0	560
	8.5 – 10 mm	9.8	315
Cast Iron	– 2 mm	10.0	1600
	2.5 – 5 mm	14.1	900
	5.5 – 7 mm	12.3	560
	7.5 – 10 mm	9.8	315
Brass Copper	– 4 mm	20.1	1600
	4.5 – 7 mm	19.7	900
	7.5 – 10 mm	17.5	560
Bronze Red brass	– 3 mm	15.0	1600
	3.5 – 6 mm	16.9	900
	6.5 – 10 mm	17.5	560
Aluminium Light metals	– 5 mm	25.1	1600
	– 10 mm	28.3	900

The rotational speeds can and must be adjusted in accordance with the corresponding material quality and the quality of the drill (and material ground).

Rotational Speeds and Feeds during Milling

(these guidelines are not binding)

Material	Cutter Dia. mm	Tooth no.	Rpm/ min	Feed mm/min	Comments
St 34 – 42 C 15 – 35	– 3	4	1600	80 40	roughing finishing
	3.5 – 5	4	900 (1600)	80 40 (20)	roughing finishing
(Maximum Cutting Speed 15 m/min)	5.5 – 9	4	560 900	40 20	roughing finishing
	10 – 16	6	315 560	40 20	roughing finishing
Max. clamping depth a = 1.5 mm					

Rotational Speeds and Feeds during Milling (these guidelines are not binding)

Material	Cutter Dia. mm	Tooth no.	Rpm/ min	Feed mm/min	Comment
Cast iron (max. cutting speed 12 m/min)	– 2.5	4	1600	80 40	roughing finishing
	2.6 – 4.5	4	900 (1600)	–80 –40(20)	roughing finishing
	4.6 – 7.0	4	560 900	40 20	roughing finishing
max. cutting depth a = 1.5 mm	7.1 – 12	6	315 560	40 20	roughing finishing
	Bronze, red brass, copper, brass (max. cutting speed 30 m/min)	– 6	4	1600	80 40
6.5 – 10		4	900 1600	40 20	roughing finishing
10.5 – 16		6	560 900	40 20	roughing finishing
Aluminium, light metal, (max. cutting speed 40 m/min)	– 8	4	1600	80(160) 40	roughing finishing
	8.5 – 14	4(6)	900 1600	40 20	roughing finishing
	14.5 – 16(18)	6	560 900	40 20	roughing finishing
max. clamping depth a = 2.0 mm					

The values given in these tables should be corrected in accordance with materials and type of milling (SS; HSS) and type of machining. When milling cast iron we recommend roughing at a lower speed and with a higher feed. This must be tested. You would be advised to use shank cutters with a minimum of 4 cutting teeth, this will help you achieve clean surfaces.

We do not recommend the use of "two-flute cutters"; fine-toothed tools will also last longer.

The setting up of the machine is also important. A firmly fixed, vibration-free machining centre will give you high quality components.

When milling with shank cutters please note the following:

- The longitudinal carriage must be very tightly geared by means of the clamping and forcing screws.
- There may be no play in the cross-slide; it must fit tightly in the guide!

Should you require more detailed information on the machining of metal and plastics which you cannot find in these booklet, you would be advised to obtain the relevant specialist literature.

Your local specialist will be pleased to advise you.

We wish you lots of success and much fun!

Boring and Milling Unit 2465

Accessory Equipment for the Lathe No. 2450

Table of Sub-Assemblies

Contents:

- Sub-Assemblies:
- 01 - Casing
 - 02 - Switching elements
 - 03 - Main spindle
 - 04 - Shaft I
 - 05 - Shaft II and III
 - 06 - Base, complete; work-holding table, complete
 - 07 - Column assembly, complete
 - 08 - Plates
 - 09 - Electrics

The spare part numbers are in eight units and are made up as follows

(Example):

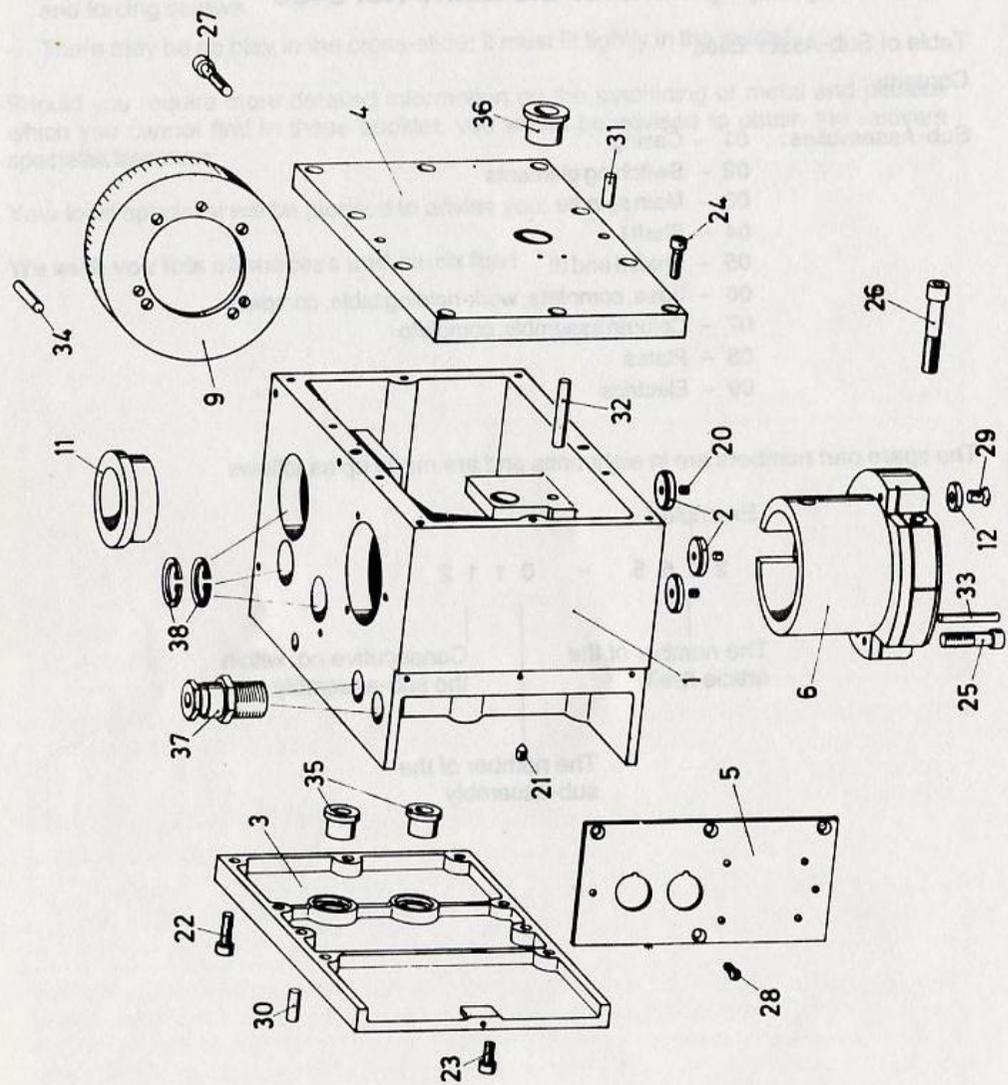
2 4 6 5 - 0 1 1 2

The number of the article itself

Consecutive no. within the sub-assembly

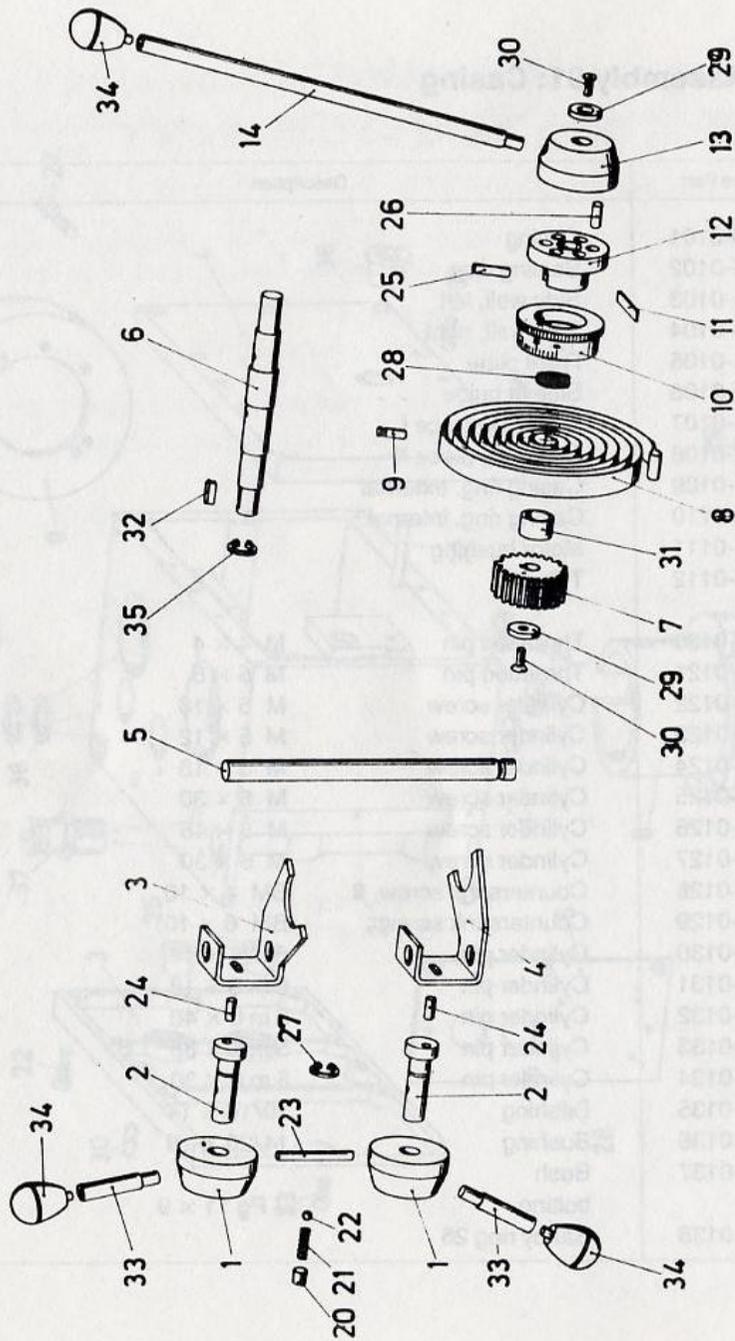
The number of the sub-assembly

Boring and Milling Unit 2455
Accessories Equipment for lathe No. 245



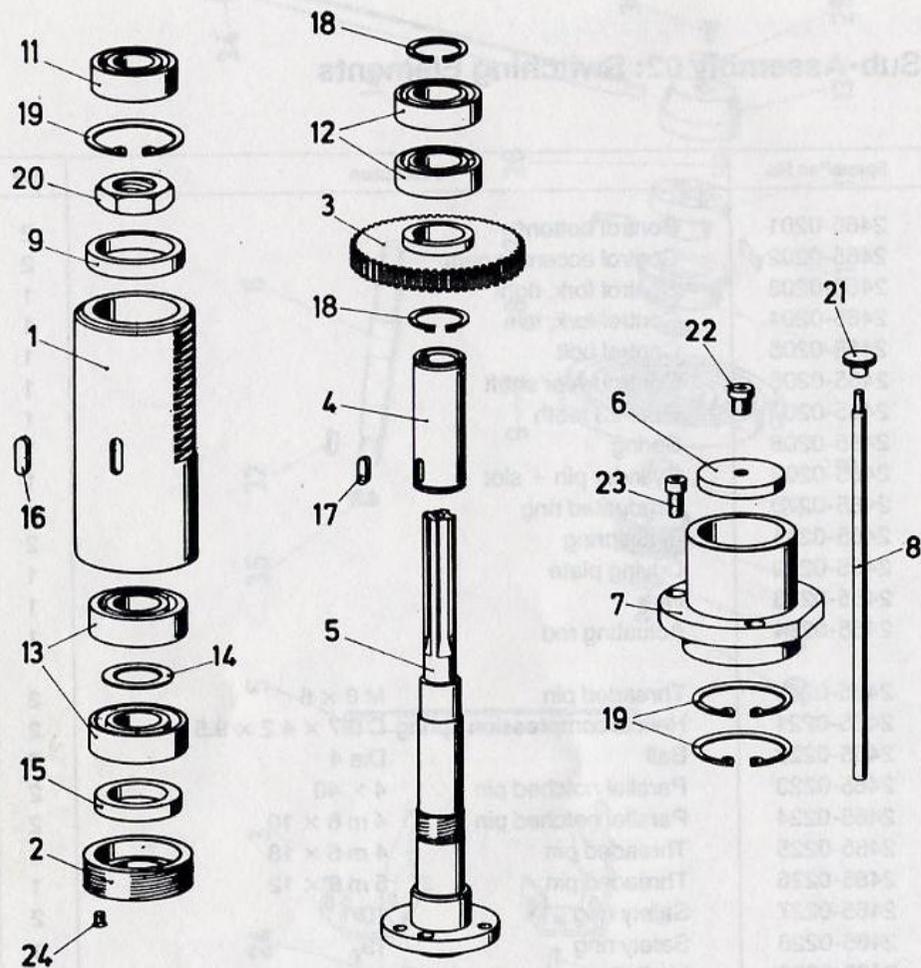
Sub-Assembly 01: Casing

Spare Part	Description	Off	
2465-0101	Casing	1	
2465-0102	Sealing disc	3	
2465-0103	Side wall, left	1	
2465-0104	Side wall, right	1	
2465-0105	Front plate	1	
2465-0106	Sleeve guide	1	
2465-0107	Clamping piece I	1	
2465-0108	Clamping piece II	1	
2465-0109	Casing ring, external	1	
2465-0110	Casing ring, internal	1	
2465-0111	Motor bushing	1	
2465-0112	Trip dog	1	
2465-0120	Threaded pin	M 4 × 4	3
2465-0121	Threaded pin	M 5 × 8	1
2465-0122	Cylinder screw	M 5 × 18	7
2465-0123	Cylinder screw	M 5 × 12	2
2465-0124	Cylinder screw	M 5 × 18	9
2465-0125	Cylinder screw	M 6 × 30	3
2465-0126	Cylinder screw	M 8 × 45	1
2465-0127	Cylinder screw	M 6 × 30	4
2465-0128	Countersunk screw	BM 4 × 10	4
2465-0129	Countersunk screw	BM 6 × 10	1
2465-0130	Cylinder pin	6 m 6 × 18	2
2465-0131	Cylinder pin	6 m 6 × 18	2
2465-0132	Cylinder pin	6 m 6 × 40	1
2465-0133	Cylinder pin	5 m 6 × 36	1
2465-0134	Cylinder pin	6 m 6 × 30	3
2465-0135	Bushing	10/16 × 14	2
2465-0136	Bushing	14/20 × 18	1
2465-0137	Bush		
	bolting	C Pg 11 × 9	2
2465-0138	Safety ring 26		



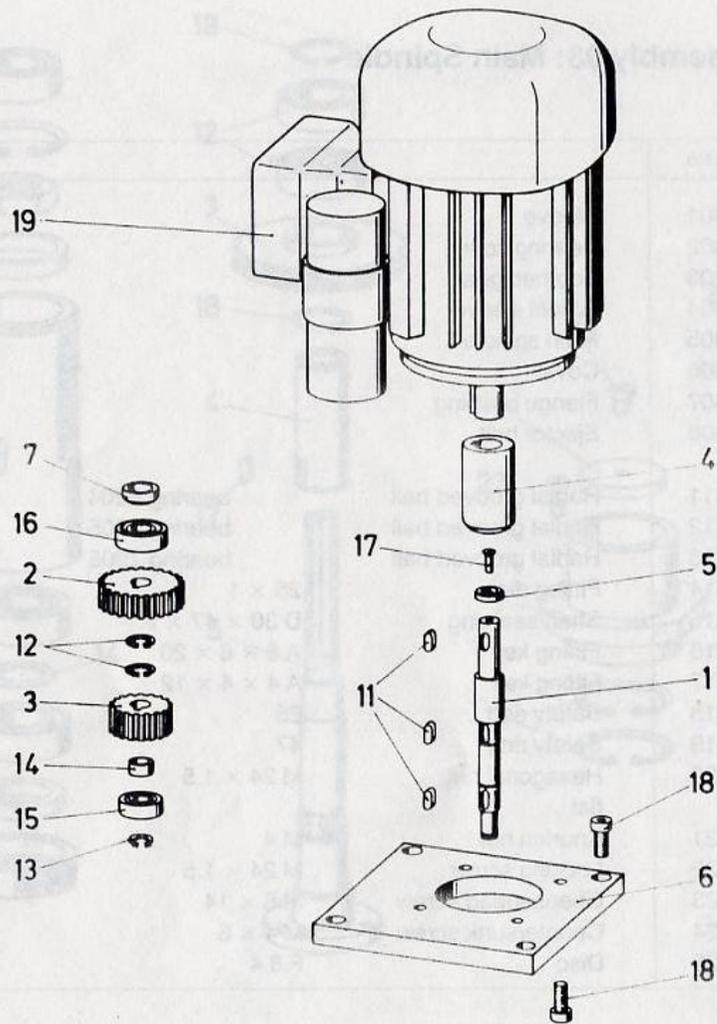
Sub-Assembly 02: Switching Elements

Spare Part No.	Description	Off	
2465-0201	Control button	2	
2465-0202	Control eccentric cam	2	
2465-0203	Control fork, right	1	
2465-0204	Control fork, left	1	
2465-0205	Control bolt	1	
2465-0206	Control lever shaft	1	
2465-0207	Gear 23 teeth	1	
2465-0208	Spring	1	
2465-0209	Cylinder pin + slot	1	
2465-0210	Graduated ring	1	
2465-0211	Leaf spring	2	
2465-0212	Driving plate	1	
2465-0213	Hub	1	
2465-0214	Actuating rod	1	
2465-0220	Threaded pin	M 6 × 6	2
2465-0221	Helical compression spring	C 0.7 × 4.2 × 9.5	2
2465-0222	Ball	Dia 4	2
2465-0223	Parallel notched pin	4 × 40	2
2465-0224	Parallel notched pin	4 m 6 × 10	2
2465-0225	Threaded pin	4 m 6 × 18	1
2465-0226	Threaded pin	5 m 6 × 12	1
2465-0227	Safety ring	10	2
2465-0228	Safety ring	13	1
2465-0229	Limit disc	A 3.2 × 16	2
2465-0230	Countersunk screw	BM 3 × 10	2
2465-0231	Collarless bushing	12/16 × 10	1
2465-0232	Fitting key	A 4 × 4 × 12	1
2465-0233	Actuating rod	A 8 × 32	2
2465-0234	Ball handle	A 20 black	3



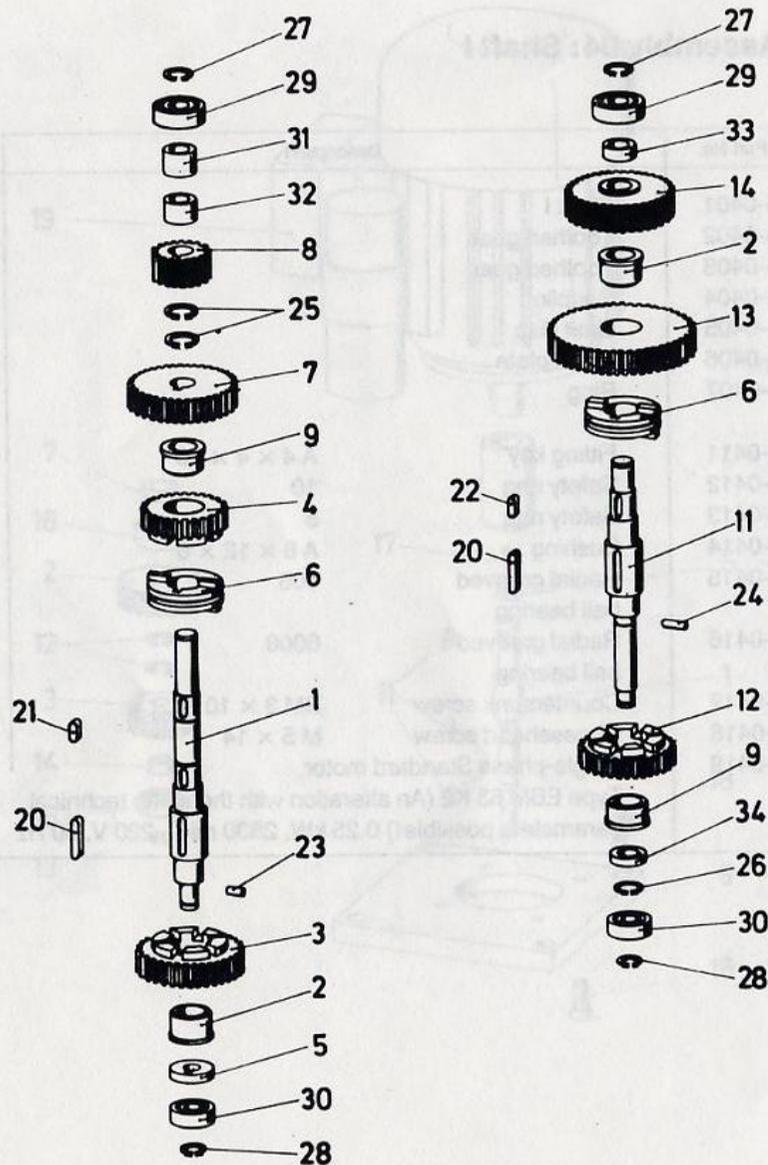
Sub-Assembly 03: Main Spindle

Spare Part No.	Description	Off
2465-0301	Sleeve	1
2465-0302	Bearing cover	1
2465-0303	Toothed gear	1
2465-0304	Wheel sleeve	1
2465-0305	Main spindle	1
2465-0306	Cover	1
2465-0307	Flange bushing	1
2465-0308	Ejector bolt	1
2465-0311	Radial grooved ball bearing 6204	1
2465-0312	Radial grooved ball bearing 6005	2
2465-0313	Radial grooved ball bearing 7205	2
2465-0314	Fitting disc 25 × 1	1
2465-0315	Shaft seal ring D 30 × 47 × 7	1
2465-0316	Fitting key A 6 × 6 × 20	1
2465-0317	Fitting key A 4 × 4 × 12	1
2465-0318	Safety ring 25	2
2465-0319	Safety ring 47	2
2465-0320	Hexagonal nut, flat M 24 × 1.5	1
2465-0321	Knurled nut M 4	1
2465-0322	Locking screw M 24 × 1.5	1
2465-0323	Cheesehead screw M 6 × 14	3
2465-0324	Countersunk screw M 4 × 6	1
2465-0325	Disc F 8.4	1



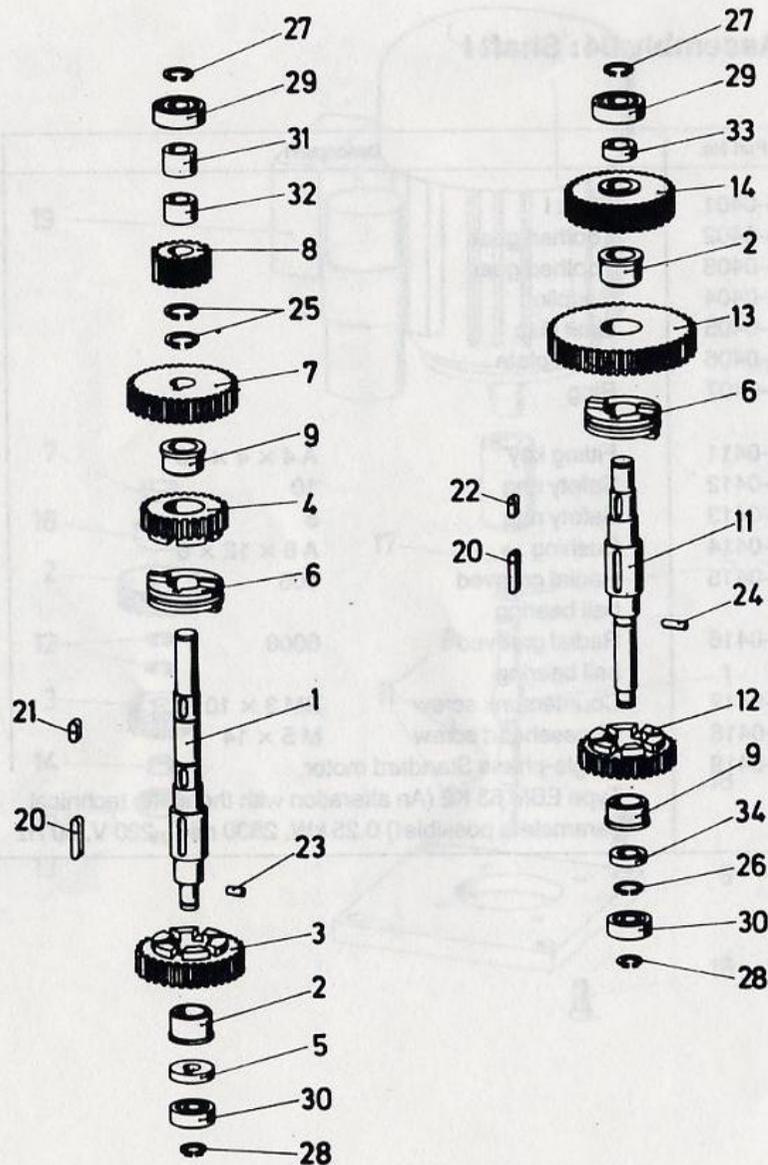
Sub-Assembly 04: Shaft I

Spare Part No.	Description	Off	
2465-0401	Shaft I	1	
2465-0402	Toothed gear	1	
2465-0403	Toothed gear	1	
2465-0404	Coupling	1	
2465-0405	Limit disc	1	
2465-0406	Baffle plate	1	
2465-0407	Ring	1	
2465-0411	Fitting key	A 4 × 4 × 10	3
2465-0412	Safety ring	10	2
2465-0413	Safety ring	8	1
2465-0414	Bushing	A 8 × 12 × 6	1
2465-0415	Radial grooved ball bearing	608	1
2465-0416	Radial grooved ball bearing	6000	1
2465-0417	Countersunk screw	BM 3 × 10	1
2465-0418	Cheesehead screw	M 5 × 14	8
2465-0419	Single-phase Standard motor, Type EBM 63 K2 (An alteration with the same technical parameters possible!) 0.25 kW, 2830 min ⁻¹ , 220 V, 50 Hz		



Sub-Assembly 05: Shafts II and III

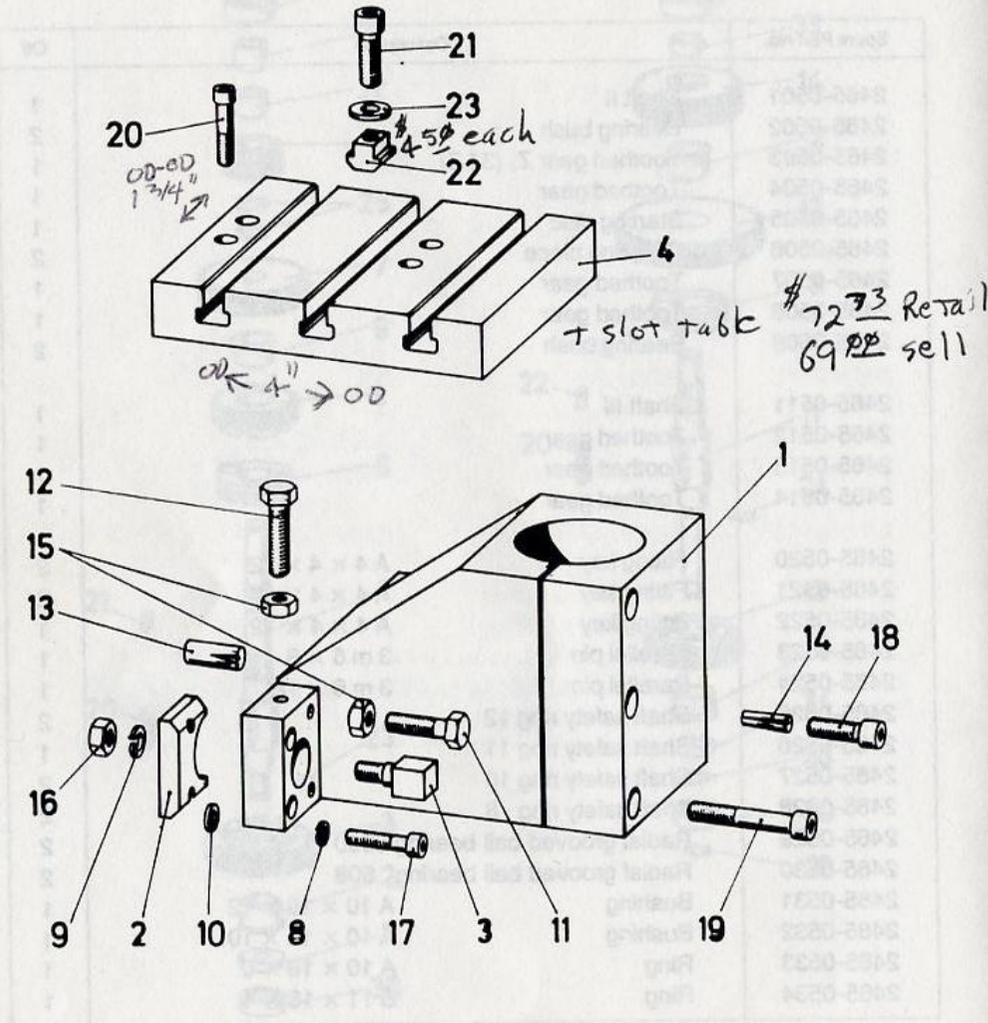
Spare Part No.	Description	Off	
2465-0501	Shaft II	1	
2465-0502	Bearing bush	2	
2465-0503	Toothed gear Z ₄ (34 Z)	1	
2465-0504	Toothed gear	1	
2465-0505	Starting disc	1	
2465-0506	Coupling piece	2	
2465-0507	Toothed gear	1	
2465-0508	Toothed gear	1	
2465-0509	Bearing bush	2	
2465-0511	Shaft III	1	
2465-0512	Toothed gear	1	
2465-0513	Toothed gear	1	
2465-0514	Toothed gear	1	
2465-0520	Fitting key	A 4 × 4 × 22	2
2465-0521	Fitting key	A 4 × 4 × 10	2
2465-0522	Fitting key	A 4 × 4 × 12	1
2465-0523	Parallel pin	3 m 6 × 8	1
2465-0524	Parallel pin	3 m 6 × 12	1
2465-0525	Shaft safety ring 12		2
2465-0526	Shaft safety ring 11		1
2465-0527	Shaft safety ring 10		2
2465-0528	Shaft safety ring 8		2
2465-0529	Radial grooved ball bearing 6000		2
2465-0530	Radial grooved ball bearing 608		2
2465-0531	Bushing	A 10 × 16 × 12	1
2465-0532	Bushing	A 10 × 16 × 10	1
2465-0533	Ring	A 10 × 16 × 6	1
2465-0534	Ring	B 11 × 18 × 4	1



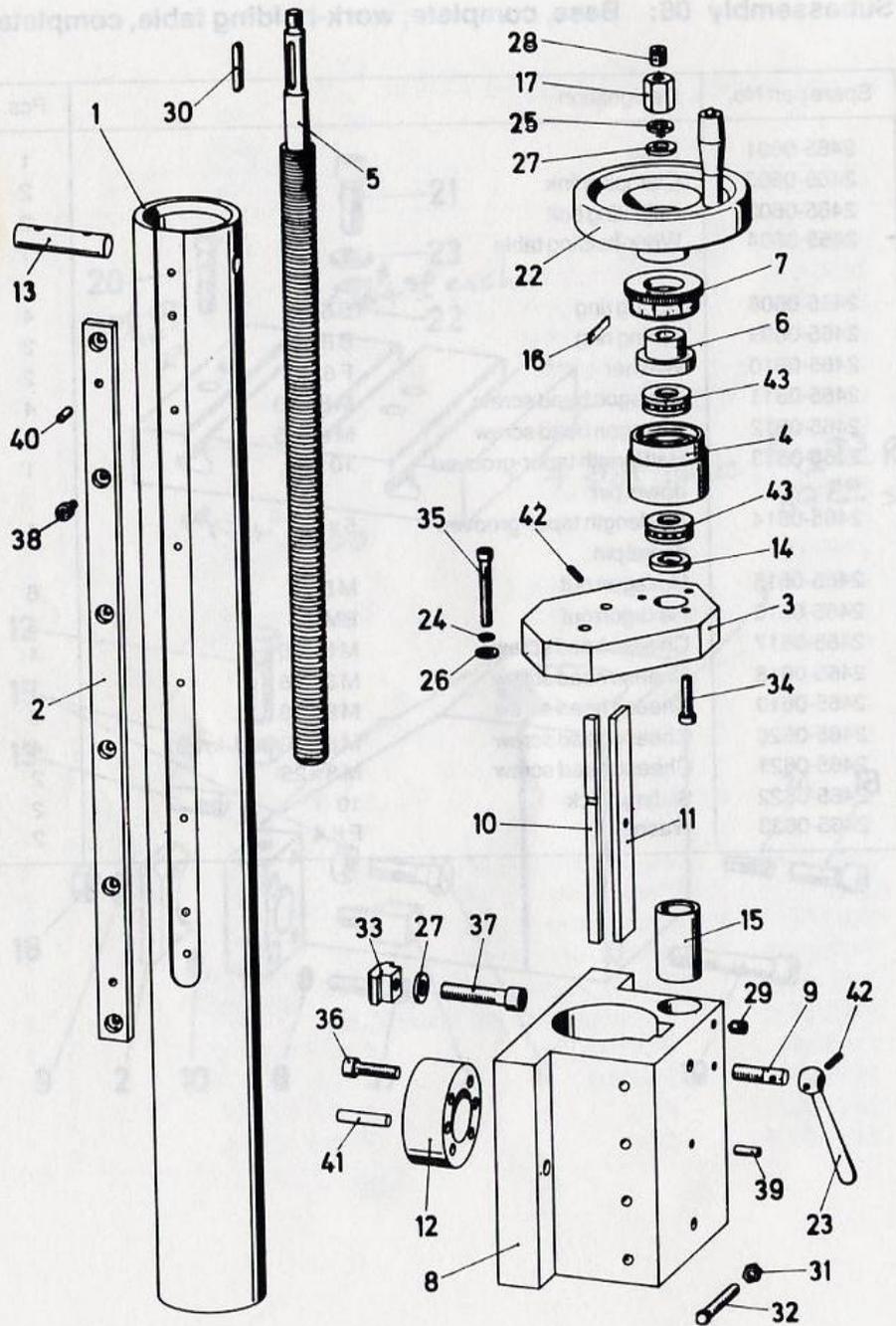
Sub-Assembly 05: Shafts II and III

Spare Part No.	Description	Off	
2465-0501	Shaft II	1	
2465-0502	Bearing bush	2	
2465-0503	Toothed gear Z ₄ (34 Z)	1	
2465-0504	Toothed gear	1	
2465-0505	Starting disc	1	
2465-0506	Coupling piece	2	
2465-0507	Toothed gear	1	
2465-0508	Toothed gear	1	
2465-0509	Bearing bush	2	
2465-0511	Shaft III	1	
2465-0512	Toothed gear	1	
2465-0513	Toothed gear	1	
2465-0514	Toothed gear	1	
2465-0520	Fitting key	A 4 × 4 × 22	2
2465-0521	Fitting key	A 4 × 4 × 10	2
2465-0522	Fitting key	A 4 × 4 × 12	1
2465-0523	Parallel pin	3 m 6 × 8	1
2465-0524	Parallel pin	3 m 6 × 12	1
2465-0525	Shaft safety ring 12		2
2465-0526	Shaft safety ring 11		1
2465-0527	Shaft safety ring 10		2
2465-0528	Shaft safety ring 8		2
2465-0529	Radial grooved ball bearing 6000		2
2465-0530	Radial grooved ball bearing 608		2
2465-0531	Bushing	A 10 × 16 × 12	1
2465-0532	Bushing	A 10 × 16 × 10	1
2465-0533	Ring	A 10 × 16 × 6	1
2465-0534	Ring	B 11 × 18 × 4	1

Subassembly 06: Base, complete; work-holding table, complete

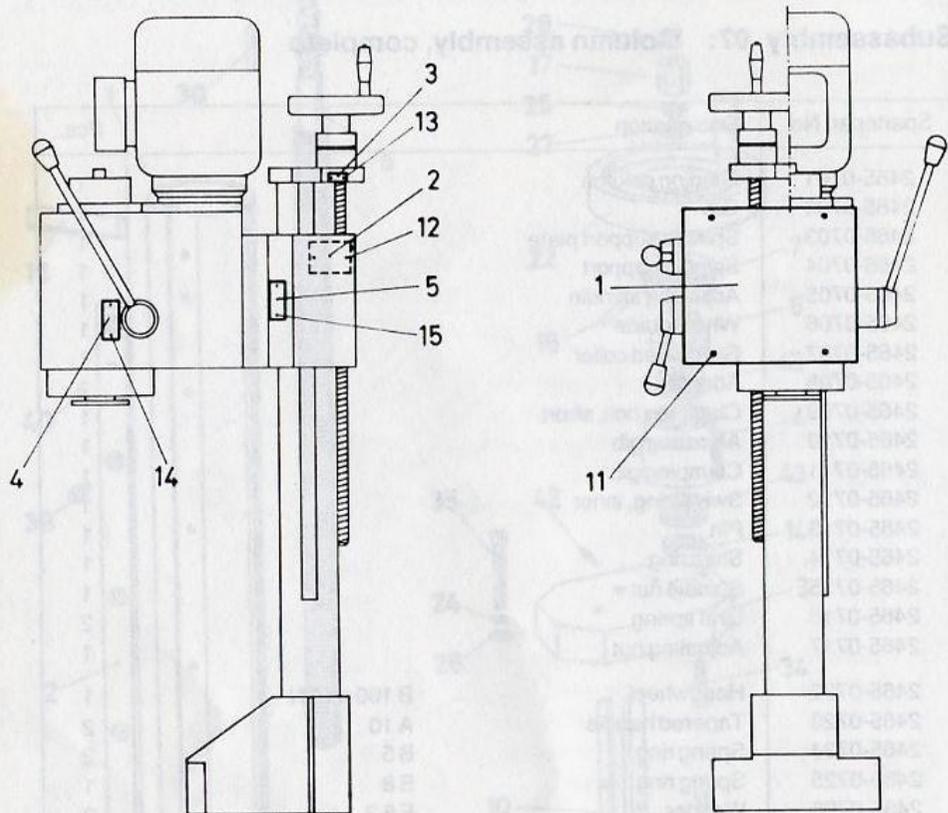


Spare part No.	Designation	Pcs.	
2465-0601	Base	1	
2465-0602	Clamping link	2	
2465-0603	Adjusting bolt	2	
2465-0604	Work-holding table	1	
2465-0608	Spring ring	B 6	4
2465-0609	Spring ring	B 8	2
2465-0610	Washer	F 6.4	2
2465-0611	Hexagon head screw	M 8 x 30	4
2465-0612	Hexagon head screw	M 8 x 35	2
2465-0613	Half length taper-grooved dowel pin	10 x 25	1
2465-0614	Full length taper-grooved dowel pin	5 x 22	1
2465-0615	Hexagon nut	M 8	6
2465-0616	Hexagon nut	BM 8	2
2465-0617	Cheese head screw	M 6 x 30	4
2465-0618	Cheese head screw	M 8 x 26	1
2465-0619	Cheese head screw	M 8 x 50	2
2465-0620	Cheese head screw	M 8 x 30 (red. to 28)	4
2465-0621	Cheese head screw	M 8 x 25	2
2465-0622	Sliding block	10	2
2465-0623	Washer	F 8,4	2



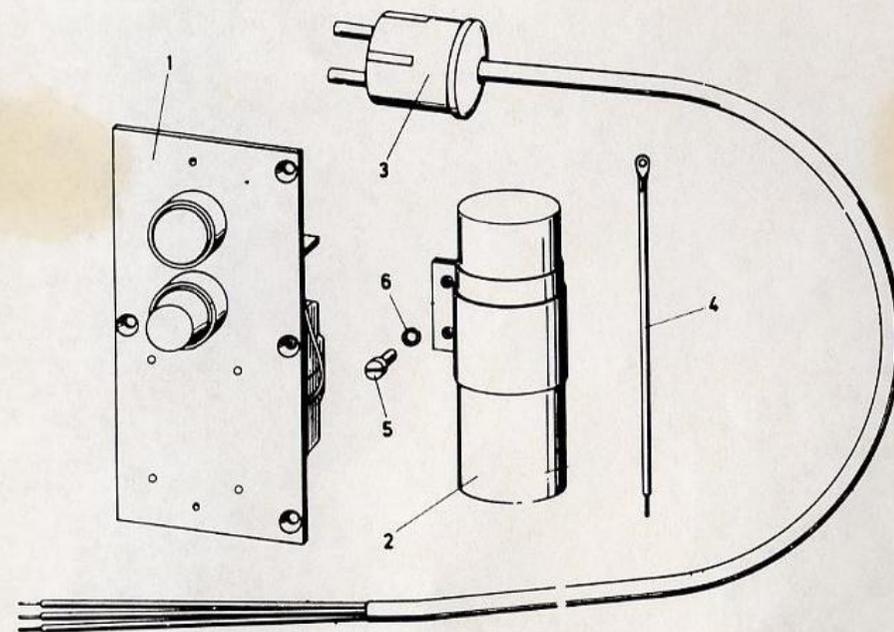
Subassembly 07: Column assembly, completo

Spartepart No.	Designation	Pcs.	
2465-0701	Guiding column	1	
2465-0702	Gib	1	
2465-0703	Spindle support plate	1	
2465-0704	Spindle support	1	
2465-0705	Adjusting spindle	1	
2465-0706	Wheel guide	1	
2465-0707	Graduated collar	1	
2465-0708	Adapter	1	
2465-0709	Clamping bolt, short	1	
2465-0710	Adjusting gib	1	
2465-0711	Clamping gib	1	
2465-0712	Swivel ring, inner	1	
2465-0713	Pin	1	
2465-0714	Shim ring	1	
2465-0715	Spindle nut	1	
2465-0716	Leaf spring	2	
2465-0717	Adjusting nut	1	
2465-0722	Handwheel	B 100 x 10 N	1
2465-0723	Tapered handle	A 10	2
2465-0724	Spring ring	B 5	2
2465-0725	Spring ring	B 8	1
2465-0726	Washer	F 5,3	2
2465-0727	Washer	F 8,4	3
2465-0728	Headless pin	M 8 x 8	1
2465-0729	Headless pin	M 5 x 8	2
2465-0730	Feather key	A 3 x 3 x 28	1
2465-0731	Hexagon nut	BM 5	4
2465-0732	Square-head screw	M 5 x 40	4
2465-0733	Sliding block	10	2
2465-0734	Cheese head screw	M 4 x 22	3
2465-0735	Cheese head screw	M 5 x 40	2
2465-0736	Cheese head screw	M 6 x 25	4
2465-0737	Cheese head screw	M 8 x 40	2
2465-0738	Cheese head screw	BM 5 x 8	6
2465-0739	Parallel pin	4m 6 x 14	1
2465-0740	Parallel pin	5m 6 x 10	2
2465-0741	Parallel pin	6m 6 x 30	2
2465-0742	Full length parallel-grooved dowel pin	2,5 x 14	2
2465-0743	Deep groove ball thrust bearing	51101	2



Sub-Assembly 08: Nameplates

Spare Part No.	Description	Off	
2465-0801	Operating plate	1	
2465-0802	Type plate	1	
2465-0803	Sign for feeding rate	1	
2465-0804	Sign for zero marking	2	
2465-0805	Nameplate	1	
2465-0811	Parallel screw	BM 4 × 4	4
2465-0812	Roundhead screw	2 × 6	2
2465-0813	Roundhead screw	2 × 6	2
2465-0814	Roundhead screw	2 × 6	2
2465-0815	Roundhead screw	2 × 6	2



Sub-Assembly 09: Electrics

Spare Part No.	Description	Off	
2465-0901	Front panel with unit structure		
2465-0902	Condenser with clamp		
2465-0903	Connecting lead compl.		
2465-0904	Interconnection compl.		
2465-0905	Parallel screw	M 4 × 12	2
2465-0906	Spring ring	A 4	2