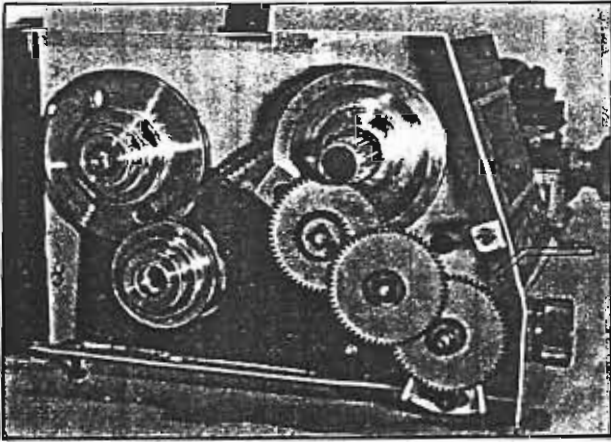


# Lubrication

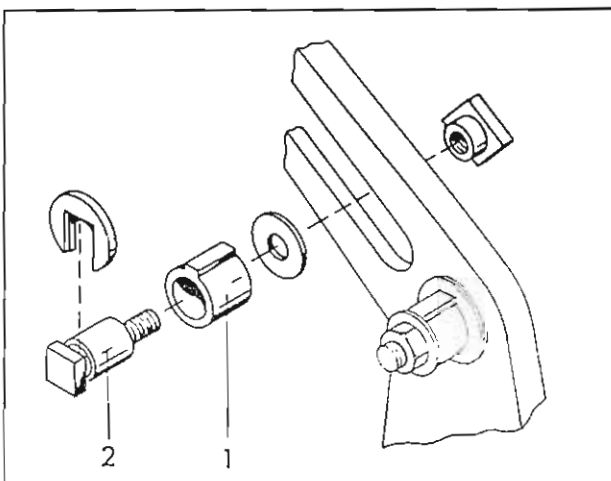
Interval approx. 20 Working Hours

Oil coupling bolt through the opening of the feed housing (1), with an oil can (light machine oil).



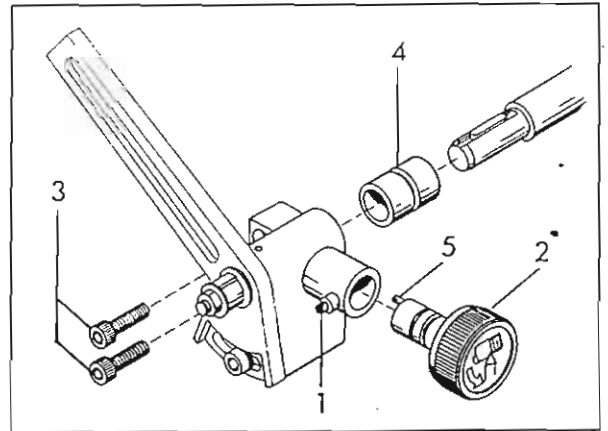
Interval approx. 50 Working Hours

Bushes and bolts (axis Z1,Z2) on the quadrant: remove gears, unscrew bolts. Oil bush (1) and bolt (2).



Interval approx. 200 Working Hours

Coupling in housing:



1. Dismount gears, unscrew set screw (1) until you can pull out the control knob (2).
2. Move longitudinal slide towards spindle stock (for centering lead-screw).
3. Unscrew the 2 allen head screws (3) and remove feed mechanism.
4. Remove coupling (4) from the feed gear housing and lubricate with grease.
5. Re-mounting:
  - Place coupling (4) onto leadscrew and mount feed mechanism housing with the two allen head screws.
  - Insert control knob, so that bolt (5) is in the groove of the coupling; turn set screw (1) until it touches bottom of groove, then turn 1/4 revolution back again.

# Problems – Possible Causes – Remedy

Chattering	Spindle speed is too high or too low	Decrease or increase spindle speed. It could happen that the eigenfrequency is identical with the spindle speed.
	Machine not bolted down	Bolt machine to even workbench
	Too much tool overhang	Clamp tool with smallest overhang possible
	Long or narrow workpiece not supported either by tailstock center or by fixed steady. Workpiece bends through the power generated by the cutting operation.	Support workpiece with tailstock center or fixed steady. Sharpen tool. Increase adjusting angle to 90°.
	Cutting tool dull, or cutter angles not correct	Grind cutting tool
	Main cutting edge not on center height	Adjust cutter to center height
	Play in the slide guideways	Adjust slides playfree
	Increased cutting depth "a"	Reduce cutting depth
	Dull tool	Sharpen tool
	Tool is too pointed	Grind a small radius to the tool point
Machine stopped or speed is reduced strongly	Play in the slide guideways	Adjust slides playfree
	Dull tool	Grind tool
	Spindle speed too high, or cutting depth too large	Reduce spindle speed and cutting depth
	Tailstock center does not fit to center bore	Machine correct center bore, adjust tailstock center into center bore
Workpiece not round	Long or narrow workpiece not supported by tailstock center or fixed steady	Support workpiece
	Drive overloaded, longitudinal slide clamped	Reduce feed and/or cutting depth. Loosen hexagon bolt on longitudinal slide.
Shear pin breaks		

# Drilling – Milling

With the vertical milling and drilling unit, the Compact 5 can be converted into a drilling machine and a universal milling machine.

## Note:

The name "vertical milling and drilling unit" has become well known, but it is not descriptive. It is really a universal milling and drilling unit, since the milling spindle can be used for milling not only vertically, but in any required angle position.

## Index Drilling – Milling

Accessories (summary)	36-37
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# Accessories for milling and drilling attachment



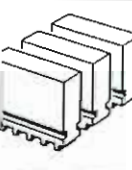
**Three-jaw drill chuck**  
capacity 1 to 8 mm, with M 14x1 mounting thread

Order No. 152 500



**Three-jaw lathe chuck**  
80 mm dia., with scroll, reversible jaws, and tee-handle pinion key

Order No. 200 410



**Set of 3 soft jaws**  
Technical tip: For three-jaw lathe chuck  
Order No. 200-410

Order No. 200 430



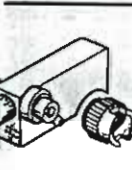
**Support flange**  
Technical tip: For mounting three-jaw lathe chuck  
Order No. 200 410, four-jaw independent chuck  
Order No. 200 360,  
collet attachment Order No. 200 040

Order No. 200 250



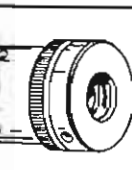
**Facing and boring head (Fly cutter)**  
with 1 ground facing and boring tool, 2 unground tools, operating key

Order No. 150 100



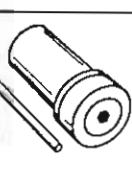
**Vertical fine feed attachment**  
1 division = 0.1 mm

Order No. 151 110



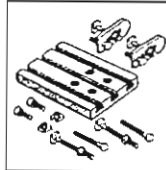
**Collet attachment**  
for collets type ESX-25, gripping capacity  
1.5-14 mm

Order No. 200 050



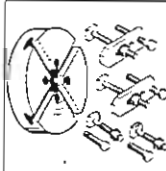
**Cutter arbor**  
for tooth milling cutters and circular saw blade

Order No. 151 070



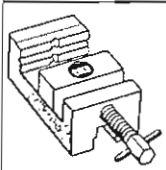
**Milling table**  
with 2 clamps, can be mounted on cross slide for  
fixing or clamping large-surface workpieces

Order No. 150 350



**Clamping plate**  
90 mm dia., with 2 clamps  
Technical tip: Fits on spindle of headstock and dividing  
attachment Order No. 200 320

Order No. 200 360



**Machine vice**  
Clamping range 32 mm  
Width of jaws 46 mm  
Height of jaws 18 mm

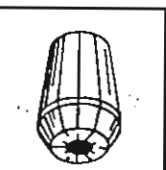
Order No. 200 310



**Dividing attachment**  
with integrated dividing plate for direct dividing. =  
22 possible divisions: 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 15,  
16, 18, 20, 24, 28, 30, 36, 48, 56, 60

Technical tip: Chucking means that can be used -  
Three-jaw lathe chuck Order No. 200 410  
Clamping plate Order No. 200 360  
Four-jaw independent chuck Order No. 200 420  
Collet attachment Order No. 200 040

Order No. 200 320

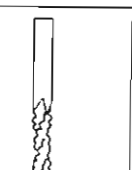


**Set of 14 collets ESX-25**  
in wooden case, gripping capacity from 1.5-14 mm

Order No. 225 000

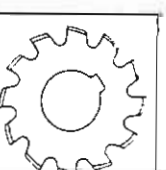
Individual collets ESX-25			
Nominal dia. in mm	Chucking capacity in mm	Shaft dia. in inches	Order No.
2,0	1,5-2,0	1/16-3/64	225 020
2,5	2,0-2,5	1/32	225 025
3,0	2,5-3,0	3/64	225 030
4,0	3,0-4,0	1/8-9/64-1/32	225 040
5,0	4,0-5,0	11/64-1/8	225 050
6,0	5,0-6,0	13/64-7/32-13/64	225 060
7,0	6,0-7,0	1/4-17/64	225 070
8,0	7,0-8,0	9/32-19/64-5/16	225 080
9,0	8,0-9,0	21/64-11/32	225 090
10,0	9,0-10,0	23/64-3/8-23/64	225 100
11,0	10,0-11,0	13/32-27/64	225 110
12,0	11,0-12,0	7/16-29/64-33/64	225 120
13,0	12,0-13,0	31/64-1/2	225 130
14,0	13,0-14,0	33/64-17/32-35/64	225 140

# Tools for vertical milling and drilling attachment



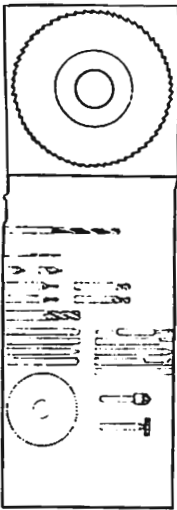
**Heavy-duty end mill**  
high speed steel with roughing tothing, shaft dia.  
8 mm

Order No. 764 200



**Set of 6 gear mills**  
dia. 40 mm. Module 0.5 (No. 1-6)

Order No. 152 110



**Circular saw blade**  
for metal, 60 mm dia.

**Order No. 123 100**

**Tool assortment, large**

15 twist drills, 1-8 mm dia. in steps of 0.5 mm  
2 center drills 1.5 mm dia.  
4 grooving cutters dia. 3, 4, 5, 6 mm  
1 roughing mill dia. 8 mm  
8 turning tools, ground, assorted  
1 turning tool, unground  
1 circular saw blade for metal dia. 60 mm  
1 countersink 90°  
1 T-slot cutter Ø 16x4 mm

**Order No. 152 100**

**Individual gear mills**

Ø 40 mm, module 0,5, No. 1, for 12-13 teeth  
Ø 40 mm, module 0,5, No. 2, for 14-16 teeth  
Ø 40 mm, module 0,5, No. 3, for 17-20 teeth  
Ø 40 mm, module 0,5, No. 4, for 21-25 teeth  
Ø 40 mm, module 0,5, No. 5, for 26-34 teeth  
Ø 40 mm, module 0,5, No. 6, for 35-54 teeth

**Order No. 764 601**  
**Order No. 764 602**  
**Order No. 764 603**  
**Order No. 764 604**  
**Order No. 764 605**  
**Order No. 764 606**

**Tool assortment, small**

1 twist drill each 2, 3, 4, 5 mm dia., 1 center drill 1.5 mm dia.,  
1 countersink 90°, 1 grooving cutter 4 mm dia.,  
1 T-slot cutter 16x4 mm dia.

**Order No. 119 000**

**Service parts set**

2 V-belts, 10 shear pins, 2 washers, 2 grooved pins

**Order No. 200-990**

## Accident Prevention: Milling – Drilling

- + Always follow the rules for accident prevention on page 3!

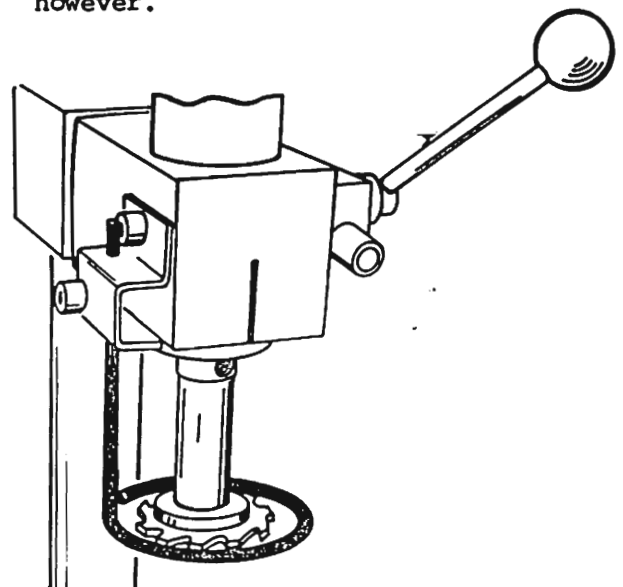
Additional tips:

- + Clamping the workpiece  
When drilling or milling, the workpiece must be clamped securely, in order to prevent the workpiece from being loosened by the cutting force of the tool.  
Clamping tools: machine vice, milling table with clamping shoes, 3-jaw chuck, 4-jaw independent chuck ...
- + Work only with perfectly ground and sharpened tools!
- + Close belt cover before switching on machine.
- + Remove milling and drilling chips only with brush and only when machine is not switched on.
- + Loose clothing and hairs can be especially dangerous! Hair or clothing can easily get caught in the spiral grooves of the millers and drills.

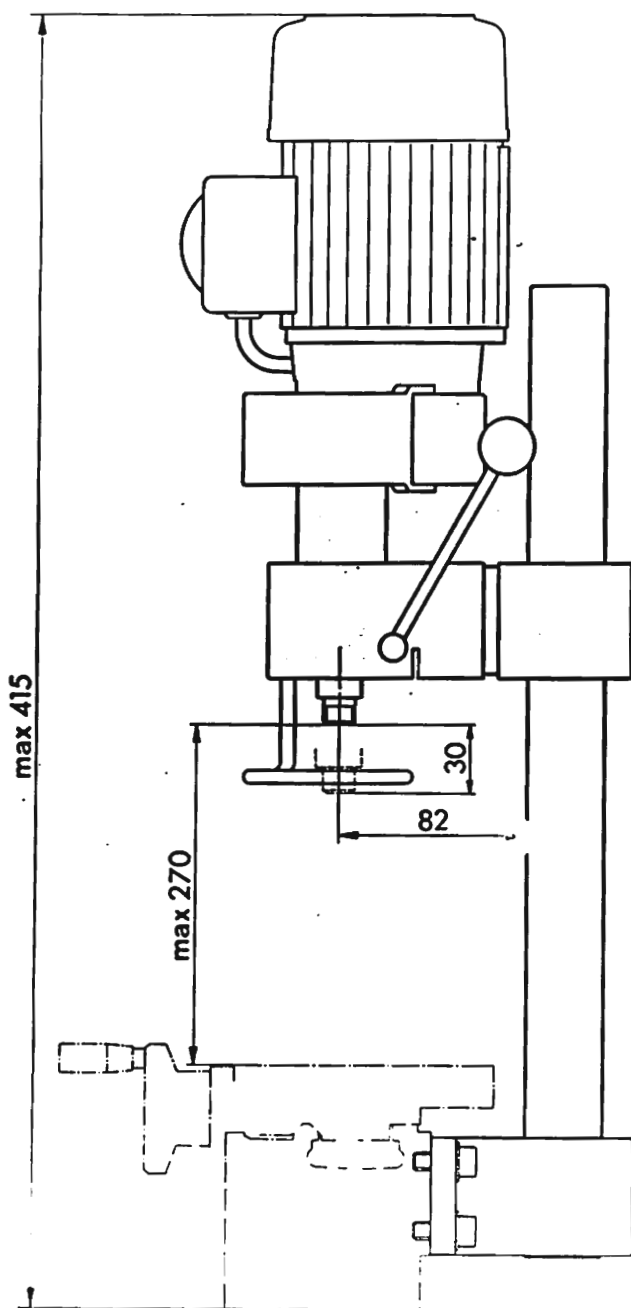
- + Never wear rings when working!
- + Never clean machine while it is running.
- + The milling guard: the ring must be clamped so, that the tool (miller, circular saw blade) is covered when in the uppermost position.

Note:

To enable better illustration, the milling guard is not shown in some drawings. The guard must be mounted, however.



# Technical Data



## Motor:

IEC-standard single-phase motor, dust and splashproof according to IP 44

Input power (P1) 200 W, S3-60 % ID

Output power (P2) 100 W, S3-60 % ID

For voltage and frequency - see label on motor.

Spindle speeds: 380/700/1600 rpm

## Spindle nose (main spindle):

according to factory standard, with M14 x 1 thread.

Weight: 6,5 kg

For dimensions - refer to sketch

## Electrical Connection

The vertical milling and drilling unit may only be plugged into outlets with grounding contacts (a grounding receptical must be available for connection of the machine).

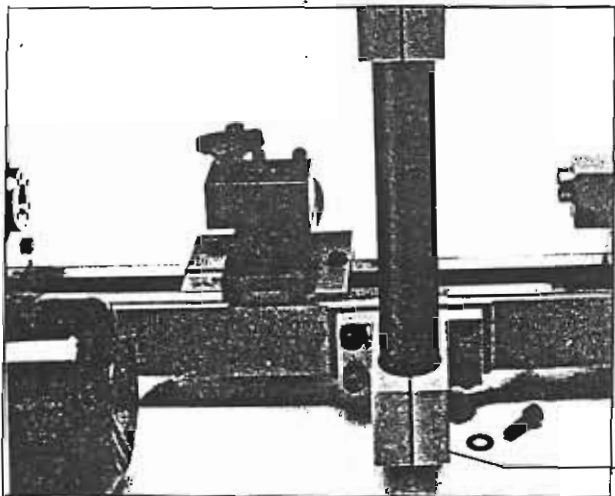
### Mounting the plug:

Due to the different requirements in different countries, the machines are not delivered with plugs everywhere. Mounting of plugs must be carried out professionally!

Clamp the grounding wire (yellow-green) to the grounding contact (symbol  $\oplus$ ). Clamp the other two wires to contact R and N.

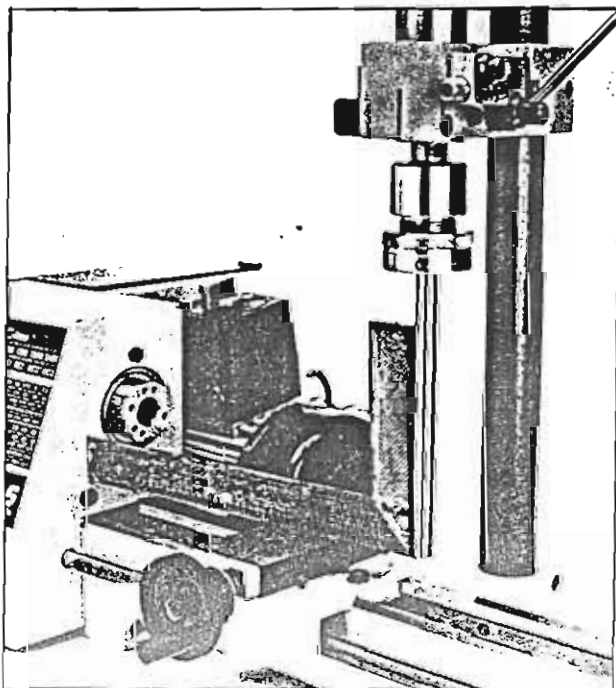
# Mounting the Vertical Unit – Operating Elements

Attach the base to the lathe bed with the 4 socket head screws and washers. Clean contact surfaces thoroughly before mounting.



## Fixing the vertical column

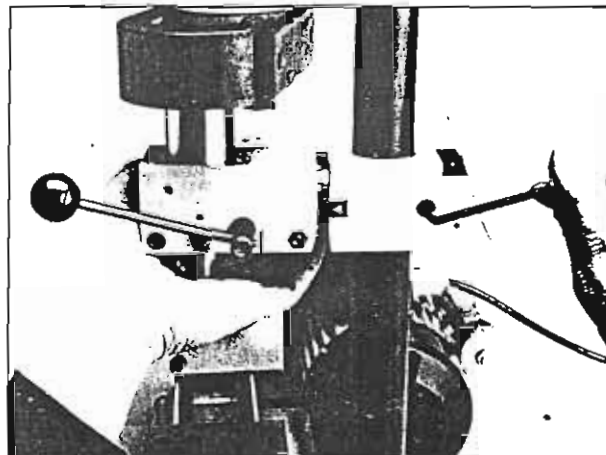
Tighten the two socket head screws (1).



## Vertical adjustment

The base must be clamped so, that the vertical column is at a right angle to the cross slide.

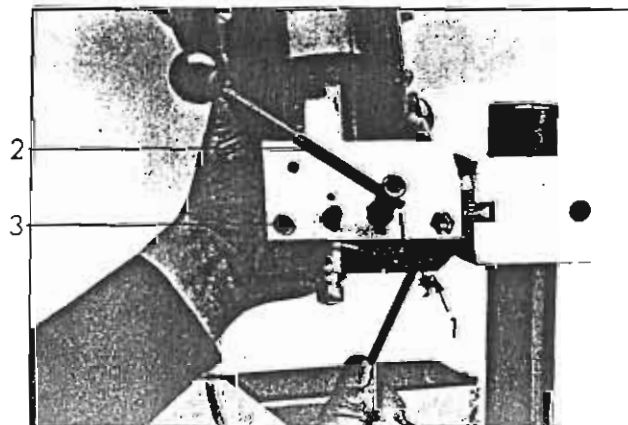
## Height adjustment and turning the vertical unit



Loosen the socket head screw on the clamping head and bring the vertical unit into the required position and height.

❖ The cross slide throat is limited to 50 mm. By clamping the vertical unit in different angles, you can match the working requirements to the cross slide travel.

## Swivelling the quill holder



Loosen socket head screw (1) and swivel the quill holder to the required angle. The graduated scale enables accurate positioning.

❖ Through these turning and swivelling movements, the quill can be set at any required angle.

## Moving the quill

Insert toggle into the bore. By swiveling the toggle, the quill is lowered. A built-in spring returns the quill into the original position.

## Clamping screw for the quill (3)

The quill is fixed with the socket head screw.

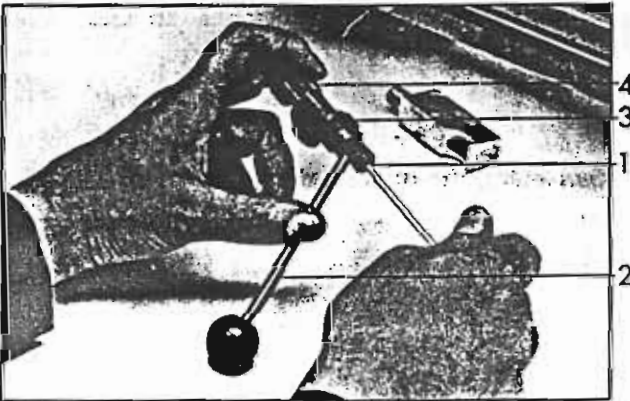
- Always clamp quill when milling,
- never force the toggle.

## The Vertical Fine Feed Attachment

The vertical fine feed serves for accurate depth adjustment for milling and drilling operations.

### Mounting

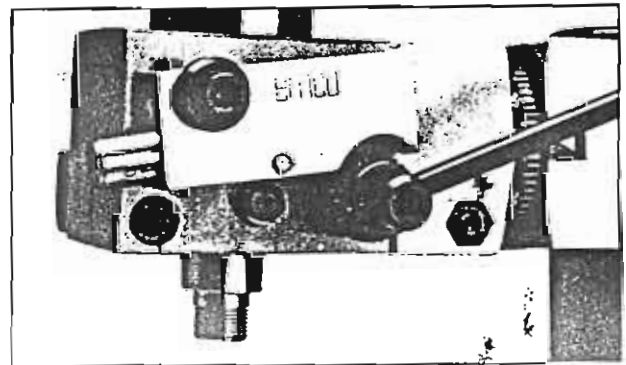
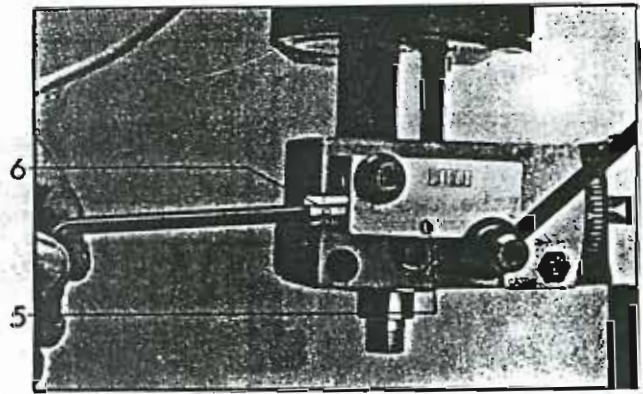
1. Loosen set screw (1), pull out toggle (2) and mount worm wheel (3) onto the pinion (4), re-tighten toggle.



2. Insert pinion into the quill holder.
3. Place centering bolt (5) of the feed unit into the bore and clamp with the socket head screw, so that the worm wheel is engaged with the worm.

### Adjusting

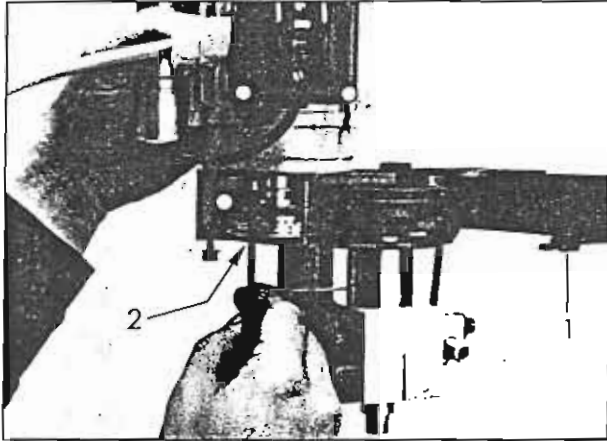
If the worm (6) is turned by one division, the quill moves 0,1 mm.



- If the fine feed is not required, loosen socket head screw and swivel. Worm and worm wheel are not engaged. The pinion can be moved with the toggle.



## Adjusting the Spindle Speed



Open cover (1), loosen socket head screw (2) and swivel motor toward the front. The belt is loosened and can be shifted onto the required pulley combination. Tighten belt and fix socket head screw again.

Note:

Never work with belt cover opened!

## Spindle Speed Chart

The spindle speed during milling and drilling depends on the diameter of the tool (miller, drill) and the type of workpiece material. The values shown below are valid only for sharpened tools.

Diameter of miller or drill (mm)	SPINDLE SPEED Steel	Cast Iron	Aluminium/Brass
to 5	1600	1600	1600
5-10	700	700	1600
10-15	700	360	700
15-20	360	360	700
20-40	360	360	360

# Drilling in General

## Clamping the drill

Drills are clamped in the drill chuck or in the collet chuck.

## Clamping the workpiece

The workpiece is fixed on the top slide or on the dividing attachment, using the appropriate clamping device.

## Spindle speed:

The spindle speed of the drill depends on the diameter of the drill, resp. miller and the material of the workpiece.

## Drill feed:

Drill feed is achieved via the quill.

## Working Tips – Drilling

✦ The smaller the drill, the easier it is that it will break. Drill feed must be carried out with feeling (very carefully).

### Coordinate drilling

✦ With aid of the scale rings on the longitudinal and cross slide handwheels, drilling in accurate coordinates can be carried out.

### Please note:

✦ The scale on the cross slide refers to the diameter of the workpiece during turning. The scale on the cross slide handwheel indicates 2,5 mm after one complete revolution. The slide, however, moves only 1,25 mm.

✦ Place a wooden or plastic board under the workpiece so that the milling table, machine vice, etc. are not damaged by the drill.

✦ Use the vertical fine feed for accurate depth adjustments.

✦ When drilling deep holes, pull the drill out of the bore regularly, so that drilling chips are removed.

✦ A few drops of oil will decrease the friction of the drill and increase the tool's life.

✦ Wear of the drill can first be seen at the edges of the main cutting surface. Re-sharpen drill in time.

# Milling in General

## Types of Movements

### Main or working movement

The miller does the main or working movement. The cutting edges of the miller penetrate the workpiece and remove material.

### Adjustments

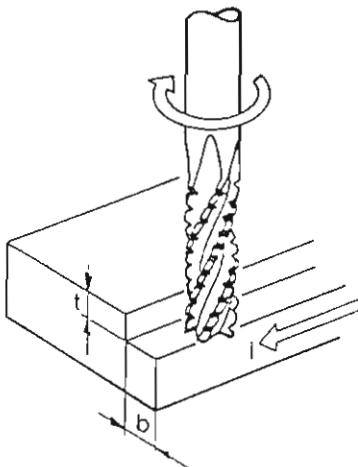
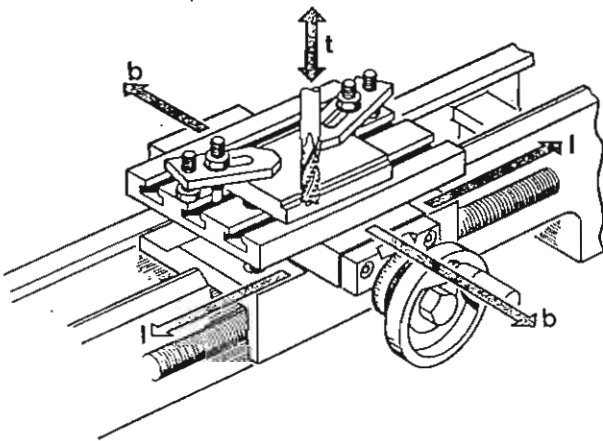
Adjustment of milling depth or width.

### Feed movement

Accomplished by the workpiece.

### Example:

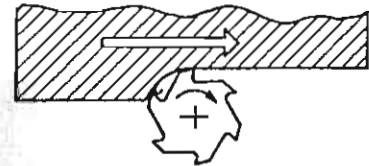
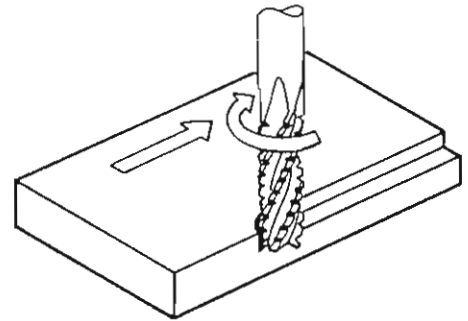
- Main movement is made by miller.
- Adjustment by the cross slide (b)
- Adjustment by the quill (t)
- The feed movement by the longitudinal slide (l)



## Climb Milling (downcut milling) – Conventional Milling (up-milling process)

### Climb milling

Cutting direction of the miller and feed direction of the workpiece are the same.

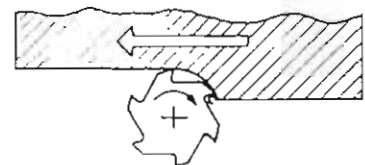
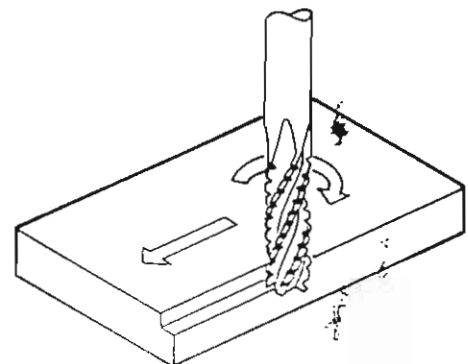


### Conventional milling

Cutting direction of the miller and feed direction of the workpiece are opposite.

### Working tip:

Use conventional milling method on the Compact 5, otherwise there is danger of breaking the miller.



## Working Tips – Milling

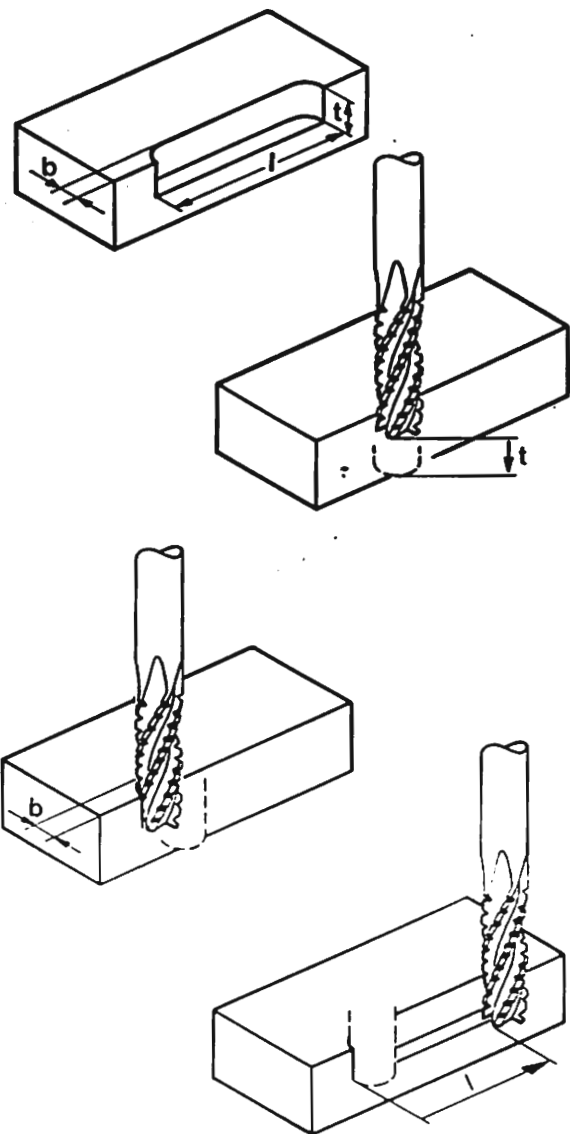
### Clamping points

Tighten all clamping facilities, except that of the feed movement.

#### Example 1

Milling a notch with the heavy duty mill.

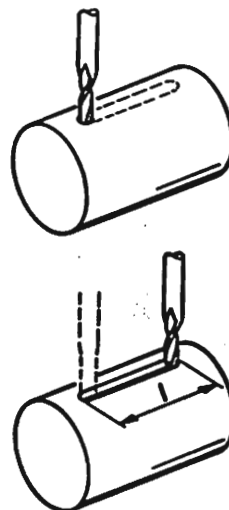
- Set milling depth "t" with the quill, clamp quill.
- Clamp longitudinal slide with cross slide feed to width "b". Clamp cross slide.
- Loosen longitudinal slide clamping, mill the length "l" of the notch.



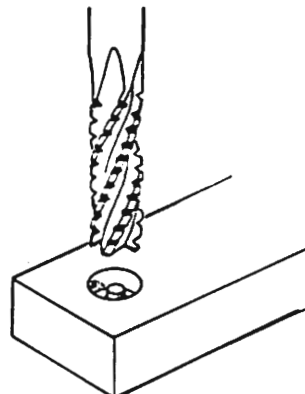
#### Example 2

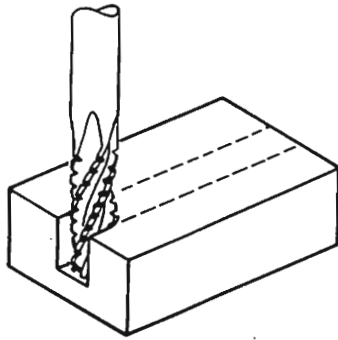
Milling a groove with the grooving cutter.

- Adjust center of axis using the cross slide, clamp cross slide.
- Using quill, mill depth of groove, clamp quill.
- Using longitudinal slide feed mill the length "l" of the groove.



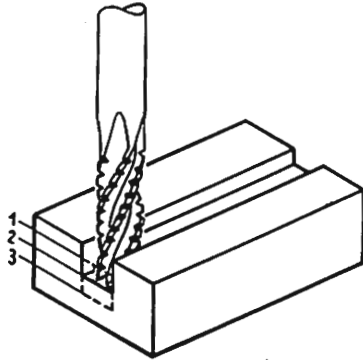
The heavy duty mill has a bore on the face surface. For this reason this miller cannot be inserted in bore and then move in longitudinal or cross direction, since a plug remains in the center and prevents any feed.





### Milling depth – milling feed

If the milling depth and the milling feed are too large/fast, the miller will bend - this means danger of breaking and overloading the machine. When hard materials are used, the load is larger than with softer materials.



### For this reason:

Complete deep grooves in several working steps. Feed must be carried out with feeling.

## Selecting the Spindle Speeds

The selection of the spindle speeds depends on the diameter of the miller resp. drill and not on the size of the workpiece.

### In General:

- The larger the diameter of the miller, the slower the spindle speed.
- The harder the material of the workpiece, the slower the spindle speed.

Diameter of miller or drill (mm)	SPINDLE SPEED Steel	Cast Iron	Aluminium/Brass
to 5	1600	1600	1600
5-10	700	700	1600
10-15	700	380	700
15-20	380	380	700
20-40	380	380	380