

NOTE !

The Instruction Manual should be in the keeping of the skilled man who is operating the machine. A complete knowledge and understanding of the machine plus strict adherence to the instructions will ensure trouble-free operation.

MACHINE **No.:**.....

HEADSTOCK **No.:**.....

FEED GEAR **No.:**.....

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SAFETY PRECAUTIONS WHEN TURNING

Observe all general safety precautions!

Use the chuck and cutting guards!

Wear head covering and do not have loose sleeves!

Do not reach over the revolving chuck!

Do not touch revolving machine parts!

Servicing should only be carried out when the machine is stationary!

Before taking off the E—housing cover, the terminal box cover and the front plate on the feed gear, switch off main switch!

When working on bars, tubes etc., which extend beyond the headstock, the protruding part must be covered with a stationary guard over the complete length!

To remove turnings, a swarf hook must be used!

Do not fit or remove turning tools when the machine is running!

Never measure the workpiece when it is rotating!

Always take the chuck key out (even when the machine is stationary)!

Do not leave the machine when it is running!

Do not slow down the chuck or workpiece with your hand!

IMPORTANT OPERATING INSTRUCTIONS

1. Always engage all levers fully, never have them in an intermediate position!
2. All changing of spindle speeds or gears should only be carried out when the machine is stopped!
3. For safety reasons, the shear pins of the leadscrew and the feed shaft are made of pure aluminium alloy. If a pin breaks through overload, only use original pins (Under no circumstance use pins of harder material)!
4. Half-nut lever and cross feed lever are interlocked!
5. After working with a coolant, clean machine and oil slide ways!
6. Do not clean machine with compressed air. Metal chips might get into the slides and bearings!
7. Make sure that the tension of the multi-Vee-belt is correct!
8. Do not hammer the work spindle (precision bearing)!
9. Check according to greasing plan and check all oil levels!
10. When using the toolpost grinder attachment, cover all slides!

Technical Data

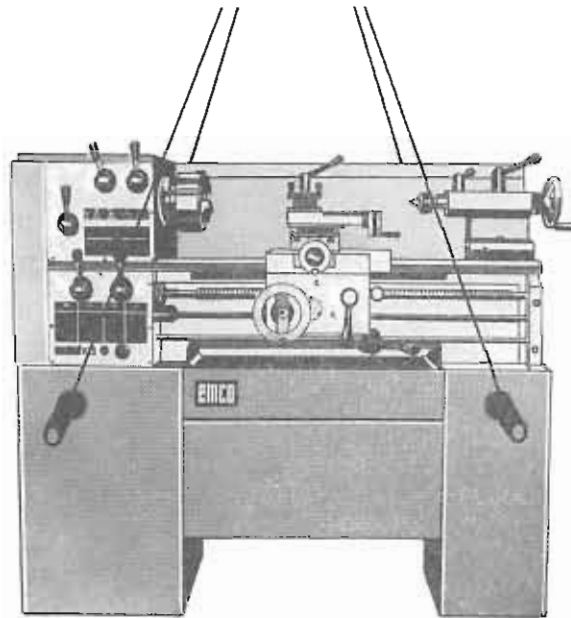
| | | | |
|---------------------------------|----------------------|--------------------------|----------------------------|
| Centre height | 165 mm | | |
| Distance between centres | | | |
| standard type | 650 mm | | |
| special type | 850 mm | | |
| Swing over bed | 330 mm | | |
| Swing over cross slide | 190 mm | | |
| Width of lathe bed | 210 mm | | |
| Travel of top slide | 105 mm | | |
| Travel of cross slide | 190 mm | | |
| Leadscrew dia. | 25 mm | | |
| Leadscrew pitch metric | 6 mm | | |
| inch/type | 1/4" | | |
| Chuck dia. | 160 mm | | |
| Faceplate dia. | 200 mm | | |
| Operating height | 1065 mm | | |
| Required floor space | | | |
| standard type | 1595 mm x 835 mm | | |
| special type | 1795 mm x 835 mm | | |
| Headstock: | | | |
| Hollow spindle | 36 mm | | |
| Spindle taper | 5 MT | | |
| Centre taper | 5 MT | | |
| Spindle nose acc. to DIN 550 22 | Size 4 | | |
| Camlock | Size 4 | | |
| acc. t. ASA B5,9 Type D1 | | | |
| Number of spindle speeds | 8 | | |
| Motor Capacity | 3 HP, 1450 rpm | | |
| Range of Speeds: | 50 - 2000 rpm | | |
| or, optionally | 40 - 1600 rpm | | |
| Tailstock: | | | |
| Spindle dia. | 40 mm | | |
| Morse taper | 3 MT | | |
| Spindle travel | 100 mm | | |
| Cross travel | + 12 mm - 10 mm | | |
| Feeds: | | | |
| 28 longitudinal | 0,045 - 0,8 mm | | |
| 28 cross | 0,0225 - 0,4 mm | | |
| Threads: Metric Machine | | Inch-Type Machine: | |
| number of metric threads | 28/0,4 - 7mm | number of inch threads | 32/4 - 56 threads/ inch |
| number of inch threads | 32/4 - 56 thrad/inch | number of metric threads | 28/0,4 - 7 mm |
| number of module threads | 28/0,2 - 3,5 | number of dia. pitch | 32/8 - 112 |
| number of dia. pitch | 32/8 - 112 | number of module threads | 28/0,2 - 3,5 |

Unpacking the Machine

The lathe is bolted to a pallet by means of 4 bolts (M 16, spanner No. 24) and is delivered in a case or crate. By removing the case or crate and the four bolts, the machine is unpacking. To lift it by crane, take off the 4 cover plates front and insert two round steel bars of at least 45 mm dia. 1500 mm length. When selecting the slings, take into consideration that on the left hand side (headstock) the machine is heavier than on the right hand side. The weight can be partly equalized by moving the slide and the tailstock. Make sure that the sling does not catch on protruding levers or spindles. It should not scrape along varnished surfaces (this can be avoided by padding with rags).

Avoid shocks and bumps.

The easiest and safest way to transport the machine is shown on the sketch below.



Immediately after arrival of the machine, check for transport damages. Check all protruding levers and spindles. Check also, that all parts of the basic machine and accessories ordered, are there.

Basic Machine

Driving plate 160 mm dia., fixed centre 5 MT and 3 MT, driver, set of keys, grease gun.

Setting up the Lathe

In order to ensure precise working, a good foundation for setting up the machine is necessary. The length of the foundation screws depends on the depth of the foundation. Normal anchor screws M 16 or 5/8" can be used. For levelling on the foundation, the lathe has to be set with each leg on 3 steel wedges. (See foundation drawing).

With these wedges the machine can be levelled in both planes to an accuracy of 0,02 - 0,05 mm/m, using a spirit level. Now the foundation screws are grouted in, allowing an adjustment to the machine, if necessary. When the foundation screws are set, the machine can be bolted down. The small deviation, arising from bolting the machine down, can be corrected by further use of the wedges.

Finally the machine and the wedges are concreted to the foundation.

NOTE! Only an accurately lined up machine can give high precision.

Cleaning the Machine

Clean rust preventative from the machine thoroughly with paraffin.

Remove paraffin thoroughly with a soft cloth.

Then oil non-painted parts with acid-free oil.

The sliding parts, e. g. bed slide, cross slide, top slide and tailstock should not be moved until the rust preventative has been removed and the slides thoroughly oiled.

ELECTRICAL EQUIPMENT AND ELECTRICAL CONNECTION

Consisting of: Main switch - lockable with a key

Neozed - fuses

Main contactor

Reversing contactor

Automatic overload relay

Safety switch for gear cover

On - button

Emergency - off button

The electrical equipment is in accordance with VDE 0113/12.73

Technical data of motor: 3-phase a/c motor to IEC

Type of protection IP 54, output 2,2 kW/3HP, type B3, speed 1500 rpm, ED 100%.

Fusing security: below 300 V 25 A
over 300 V 16 A

Instructions for Connecting the Machine

The lathe is delivered without an electric cable.

Insert an electric cable (min. YMM - J4 (5) x 1,5 mm² Cu) through the funnel type cable inlet, remove the terminal cover at the main switch and connect the cable according to diagram.(see pages 27,28).

Replace the terminal cover at the main switch and tighten the clamp on the cable inlet.

PUTTING THE MACHINE INTO OPERATION

Check the voltage and frequency of the mains supply with that shown on the label on the machine.

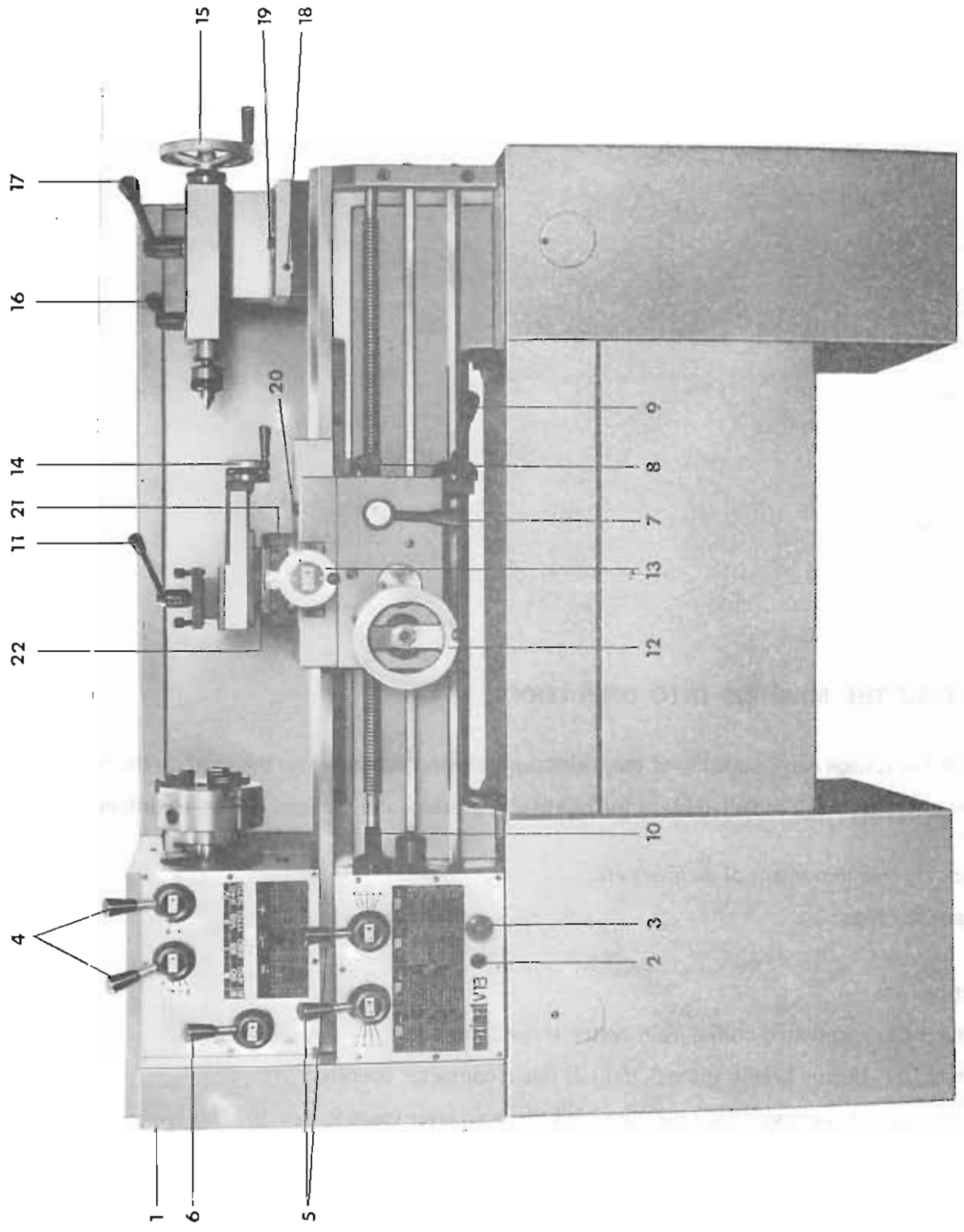
After cleaning, check the oil levels in the headstock, gearbox and carriage. Grease according to Lubrication Plan.

Check for free movement of all levers etc.

Engage all levers.

Starting - Up

1. Use the key to switch on the main switch (page 8, item 1)
2. Press ON - button briefly (page 8, item 2) (Main contactor operates)
3. The machine is engaged for operation with the main lever (page 8, item 9). This lever is engaged in zero position and protected against accidental starting-up.
By pulling the lever against a spring force, it can be swung into the desired position.
Forward rotation of the headstock spindle: swing the lever downwards
Reverse rotation of the headstock spindle: swing the lever upwards.
If the direction of rotation of the headstock spindle is not correct, change over the two phases of the cable from the mains at the main switch (page 27, item a1).
When switching off, the lever has to be brought into zero position with a slight pressure. In this position it is held by the spring force.



CONTROLS etc.

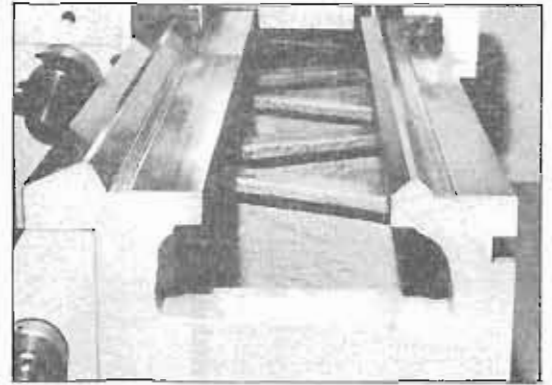
- 1 Lockable main switch
- 2 ON – switch
- 3 Emergency – OFF Switch (after operating the emergency – OFF switch, it can be released by a slight turn to the right. Afterwards press ON – switch)
- 4 Selector levers for headstock spindle speeds
- 5 Selector lever for feeds and pitches
- 6 Feed engage lever
- 7 Half - nut lever
- 8 Feed lever (longitudinal and cross feed). Description carriage apron
- 9 Change lever (motor forward and reverse)
- 10 Coupling, disengageable (see description gearbox)
- 11 Clamping lever for toolholder (adjustable)
- 12 Long slide handwheel
- 13 Cross slide handwheel
- 14 Top slide handwheel
- 15 Tailstock handwheel
- 16 Tailstock spindle clamping lever
- 17 Tailstock locking
- 18 Tailstock cross adjustment screw
- 19 Clamping bolt for tailstock cross adjustment
- 20 Clamping bolt for long slide
- 21 Clamping bolt for cross slide
- 22 Clamping bolt for top slide

GENERAL DESCRIPTION

Lathe Bed

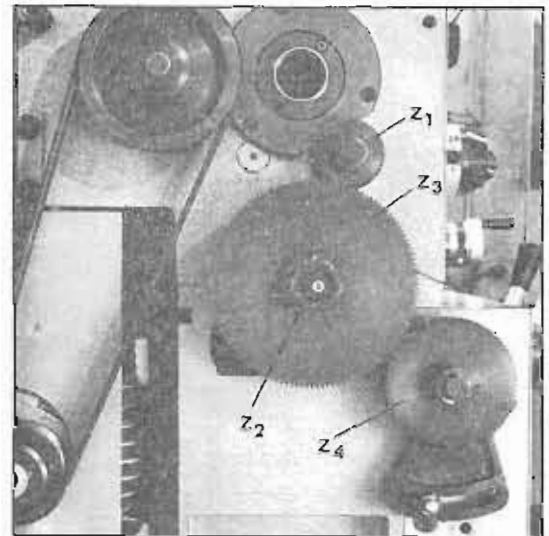
The lathe bed is made of high-grade cast-iron. The combination of high cheeks with strong cross ribs gives a bed, which has low vibration and rigid qualities. Two precision-ground Vee slideways, one for the carriage and one for the tailstock, give accurate travel.

The driving motor is located on the rear of the bed. It is fitted on an adjustable mounting to facilitate easy tensioning of the belt.



Drive

The drive of the main spindle is from a squirrel-cage induction motor to the intermediate shaft of the headstock by means of a multi Vee belt.

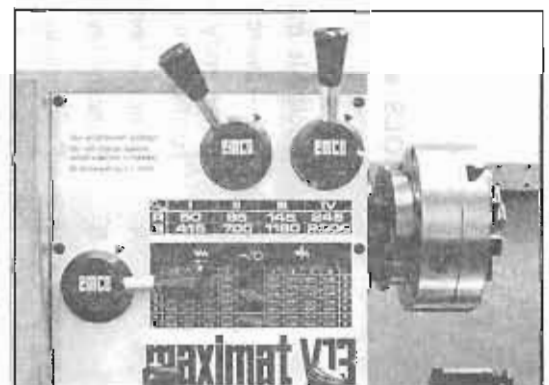


Headstock

The headstock is firmly bolted to the bed and made of vibration-free strongly ribbed, cast iron.

In the headstock the intermediate shaft and the main spindle are in bearings. The main spindle runs on high-accuracy adjustable taper roller bearings. Power is transmitted by hardened, ground gearwheels, which are either fixed or movable and run in an oil bath. The gearwheels are moved by operating two levers, which are positioned in front of the headstock. The forward and reverse gear is positioned in the headstock. Its hardened and ground gearwheels also run in an oil bath.

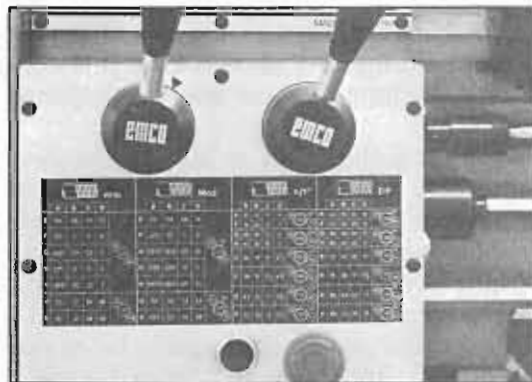
The power transfer between the reverse gear and the change gear is effected by gearwheels which are mounted on a quadrant.



Gear box

The housing is made of cast iron and is fitted on the front of the bed. The gears are moved axially by two levers on the front of the switch gear. By operating these levers, the pitches and feeds can be set according to the chart.

The leadscrew and feed shaft are on the right hand side of the gear box. The leadscrew can be disengaged by means of its coupling and should only be engaged for thread cutting. There is a slipping clutch between the gears and the feed shaft. When a longitudinal or cross feed guide or other impediment is hit, the coupling slips and protects against overload.



Apron

The carriage is fitted to the longitudinal slide. It is made of cast iron and totally enclosed. All gear wheels run in an oil bath.

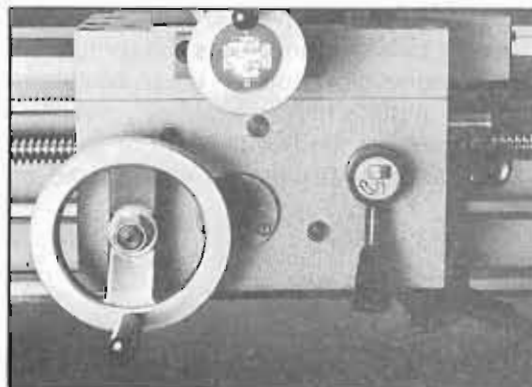
The feed shaft drives the gear wheels in the carriage. The feed is operated by swinging the feed lever upwards (longitudinal feed) or downwards (cross feed). In order to prevent an accidental movement from longitudinal to cross feed, a lock is fitted in the feed lever. Only the direction, which is shown with an arrow-symbol on the feed lever, can be obtained. In order to change to the other feed, the lever has to be turned 180°.

The large longitudinal travel handwheel and the half-nut lever are in a suitable position on the front of the carriage.

By swinging the half-nut lever to the left, the half-nut engages with the leadscrew. The leadscrew feed should only be used for thread cutting, in order to avoid unnecessary wear and loss of precision it.

Half-nut and leadscrew lever are locked against each other.

The driving shaft is under the feed shaft. The lever to switch the machine on and off, or to switch to forward or backward running, is on the right hand side of the carriage. The lever is fitted in such a way, that it is impossible to switch the machine on unintentionally. The lever travels with the long slide and is therefore always in a position to be operated without danger.

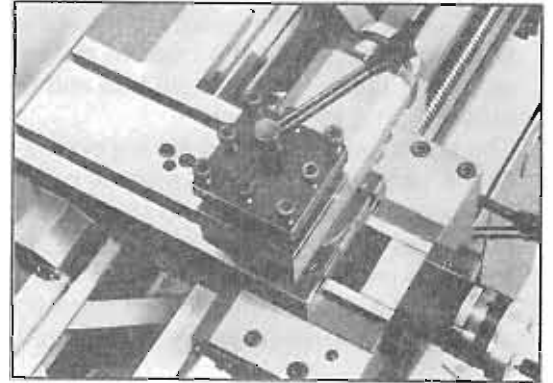


Slide

The long slide runs on the Vee of the bed without play. Because the guide is long, it is extremely accurate. The long slide can easily be adjusted to remove play.

The cross slide runs at 90° on the long slide in a dovetail guide and can easily be adjusted by means of a wedge, to eliminate play. The movement of the cross slide is carried out either by hand or through the cross spindle handwheel. The large scale ring provides accuracy. The long and the cross slide can be locked with a clamping screw and secured against being pushed out of position. (long slide- hex-headed screw, cross slide- allen screw).

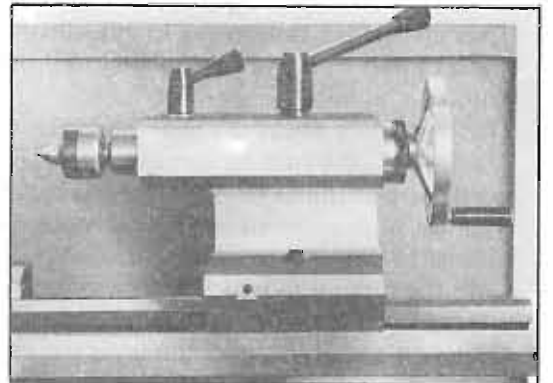
The top slide is mounted onto the cross slide and can be rotated 360° . Here you will find the previously mentioned dovetail guide and wedge. The top slide carries the indexable fourway toolholder.



Tailstock

The tailstock locates on its own Vee guide. It is made of vibration-free high-grade cast iron. For taper turning it can be set-over on the tailstock plate. Clamping of the tailstock is by means of a strong, suitably positioned quick-action tensioning lever. If the lever get into an incorrect position, they can be re-adjusted by means of the hex-headed screws.

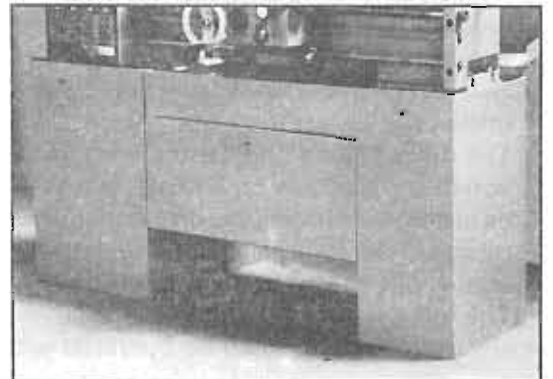
In the tailstock housing is the spindle with a 3MT inside morse taper socket. It can be clamped in position. The spindle is moved axially by a screw which is operated by the handwheel. For precise boring jobs the handle is fitted with a graduated scale.



Machine Stand

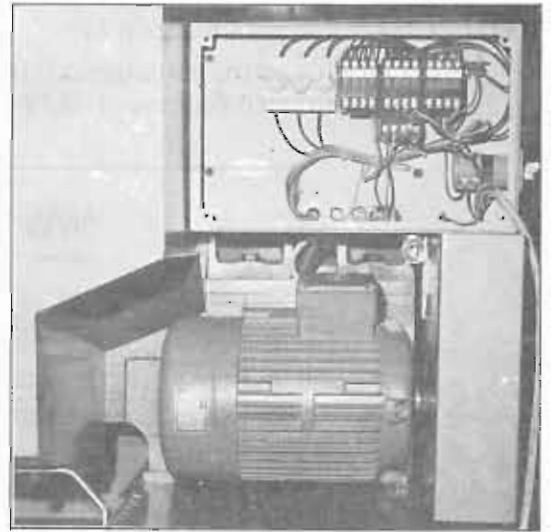
The machine stand is of welded steel construction and is heavily ribbed for strength. In the middle section of the stand there is a lockable tool cupboard.

The container for cuttings and swarf is made in such a way that it is easily emptied and cleaned. When turning with coolant, the swarf container can be pulled out 100 mm to catch the coolant that overflows.

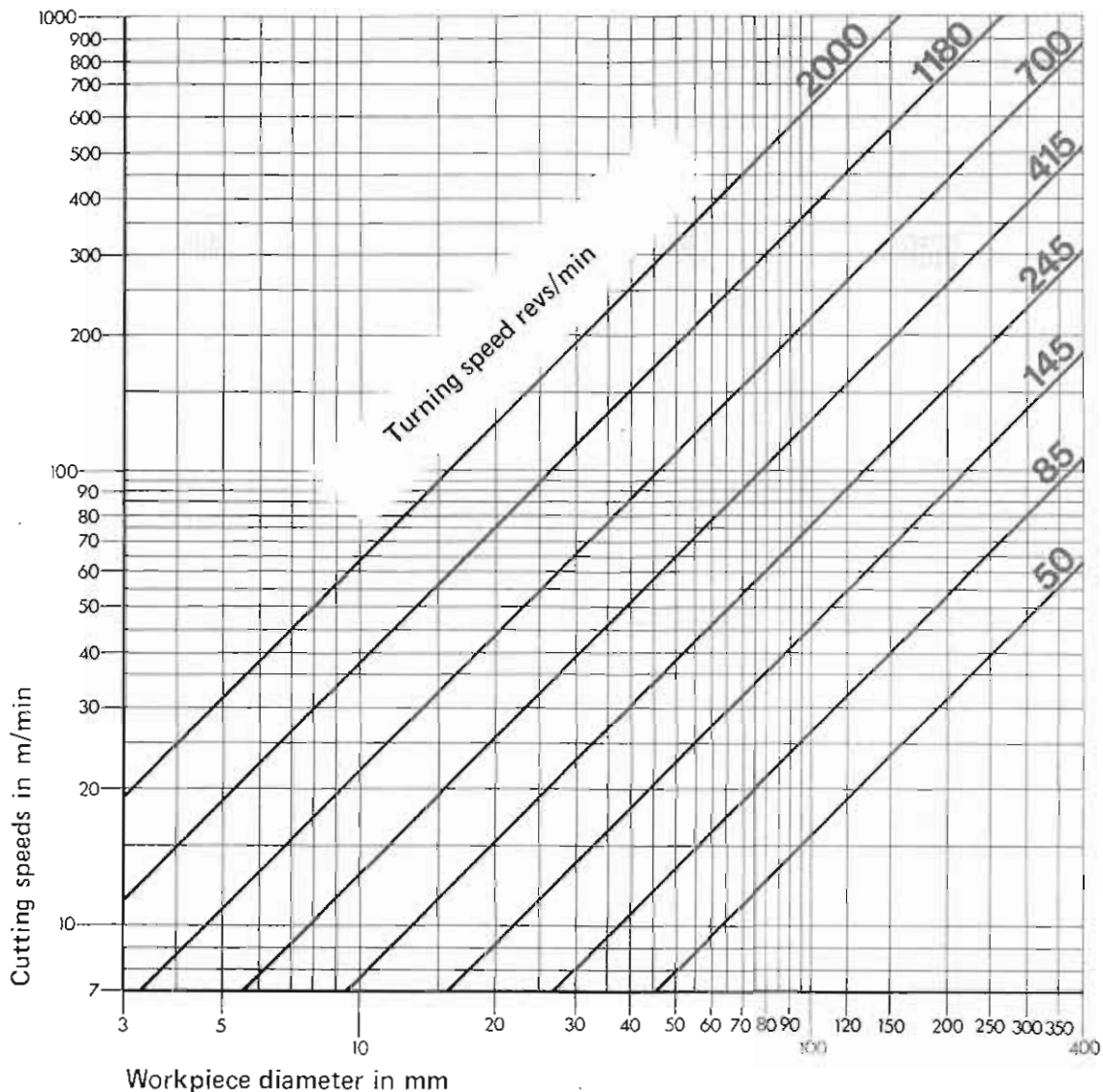


Electrical Equipment

The electrical equipment is housed in a cabinet mounted behind the headstock. The machine is fitted with overload protection. A lockable main switch is located on the left hand side of the cabinet. The lock ensures that the machine cannot be switched on accidentally. The ON button and the emergency OFF button are situated on the front of the gearbox. The limit switches in the gearbox are operated by means of a drive shaft. These control the driving motor via the reversing contactor.



CUTTING SPEEDS








14 FEEDS

The feed table on the headstock gives the feed per rev of the main spindle.

Therefore the following are obtainable:

with metric equipment: 0,045 - 0,787 mm/rev longitudinal 0,023 - 0,406 mm/rev cross

with inch equipment: 0,19 - 2,661 inch/rev longitudinal 0,098 - 1,373 inch/rev cross

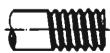

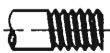







|  | | | | | mm /  | | | | |  | | | | | |
|---|-------|-------|-------|-------|--|-------|-------|-------|-------|---|-------|-------|-------|-------|---|
| | A | B | C | D | | A | B | C | D | | A | B | C | D | E |
| E | 0,045 | 0,090 | 0,180 | 0,360 |  | 0,023 | 0,046 | 0,092 | 0,185 | E | 0,036 | 0,072 | 0,145 | 0,290 | G |
| F | 0,056 | 0,112 | 0,225 | 0,450 | | 0,029 | 0,058 | 0,116 | 0,232 | F | 0,043 | 0,087 | 0,174 | 0,348 | H |
| G | 0,070 | 0,140 | 0,281 | 0,562 | | 0,036 | 0,072 | 0,145 | 0,290 | G | 0,050 | 0,101 | 0,203 | 0,406 | K |
| H | 0,084 | 0,168 | 0,337 | 0,675 | | 0,043 | 0,087 | 0,174 | 0,348 | H | 0,067 | 0,135 | 0,270 | 0,540 | H |
| K | 0,098 | 0,196 | 0,393 | 0,787 |  | 0,034 | 0,069 | 0,139 | 0,278 | H | 0,040 | 0,081 | 0,162 | 0,324 | K |
| H | 0,067 | 0,135 | 0,270 | 0,540 | | 0,034 | 0,069 | 0,139 | 0,278 | H | 0,040 | 0,081 | 0,162 | 0,324 | K |
| K | 0,078 | 0,157 | 0,315 | 0,630 | | 0,040 | 0,081 | 0,162 | 0,324 | K | 0,040 | 0,081 | 0,162 | 0,324 | K |

THREAD CUTTING

In the lever positions C - H with the metric equipment, and C - G with the inch equipment the gearbox runs with a 1 : 1 ratio.

The thread table for Metric, Whitworth, Module and Diametral Pitch is located on the gearbox.

Metric machine

|  mm | | | | |  Mod | | | | |  n/1" | | | | |  DP | | | | | | | | |
|--|-------|------|-----|-----|---|---|-------|-------|------|---|---|----|----|----|--|---|---|----|-----|----|----|----|---|
| A | B | C | D | | A | B | C | D | | A | B | C | D | | A | B | C | D | | | | | |
| E | 0,4 | 0,8 | 1,6 | 3,2 |  | E | Q2 | 0,4 | 0,8 | 1,6 |  | K | 32 | 16 | 8 | 4 |  | K | 64 | 32 | 16 | 8 |  |
| F | 0,5 | 1 | 2 | 4 | | F | Q25 | 0,5 | 1 | 2 | | F | 56 | 28 | 14 | 7 | | F | 112 | 56 | 28 | 14 | |
| G | 0,625 | 1,25 | 2,5 | 5 | | G | Q3175 | 0,625 | 1,25 | 2,5 | | G | 48 | 24 | 12 | 6 | | G | 96 | 48 | 24 | 12 | |
| H | 0,75 | 1,5 | 3 | 6 | | H | Q375 | 0,75 | 1,5 | 3 | | H | 40 | 20 | 10 | 5 | | H | 80 | 40 | 20 | 10 | |
| K | 0,875 | 1,75 | 3,5 | 7 |  | K | Q4375 | 0,875 | 1,75 | 3,5 | G | 36 | 18 | 9 | 4½ | K | 72 | 36 | 18 | 9 | | | |
| H | 0,6 | 1,2 | 2,4 | 4,8 | | H | Q3 | 0,6 | 1,2 | 2,4 | F | 38 | 19 | 9½ | 4¾ | K | 76 | 38 | 19 | 9½ | | | |
| K | 0,7 | 1,4 | 2,8 | 5,6 | | K | Q35 | 0,7 | 1,4 | 2,8 | F | 44 | 22 | 11 | 5½ | K | 88 | 44 | 22 | 11 | | | |
| | | | | |  | | | | | | F | 52 | 26 | 13 | 6½ | F | 104 | 52 | 26 | 13 | | | |

Example

To cut an M 16 thread.

Method:

The pitch for M16 is 2 mm, leadspindle pitch 6mm (see technical data).

From the thread cutting table, under "mm" it shows that the change wheels 40 - 127 - 80 are needed and the levers in position C and F engaged.

General Formula for calculating the change wheels: (Text see Fig. Drive)

$$i = \frac{h_1}{h_2} \cdot i_{\text{feed gear}} = \frac{Z_1 \cdot Z_2}{Z_3 \cdot Z_4} \cdot i_{\text{gearing}}$$

- h₁ workpiece pitch
- h₂ leadscrew pitch
- Z₁ number of teeth on driving wheel
- Z₂ number of teeth on driving wheel
- Z₃ number of teeth on driven wheel
- Z₄ number of teeth on driven wheel

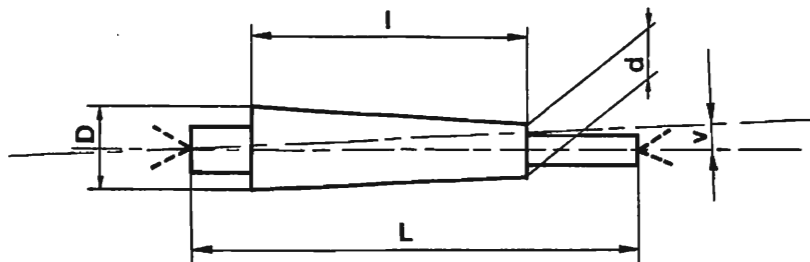
Inch machine

| n/1" | | | | | DP | | | | | mm | | | | | Mod | | | | | | | | |
|------|----|----|----|----|-----|---|-----|----|----|----|-----|---|-------|------|-----|-----|-----|---|--------|-------|------|-----|-----|
| A | B | C | D | | A | B | C | D | | A | B | C | D | | A | B | C | D | | | | | |
| E | 56 | 28 | 14 | 7 | | E | 112 | 56 | 28 | 14 | | E | 0,5 | 1 | 2 | 4 | | E | 0,25 | 0,5 | 1 | 2 | |
| F | 48 | 24 | 12 | 6 | 40 | F | 96 | 48 | 24 | 12 | 63 | G | 0,7 | 1,4 | 2,8 | 5,6 | 127 | G | 0,35 | 0,7 | 1,4 | 2,8 | 96 |
| G | 40 | 20 | 10 | 5 | 127 | G | 80 | 40 | 20 | 10 | 95 | K | 0,875 | 1,75 | 3,5 | 7 | 90 | K | 0,4375 | 0,875 | 1,75 | 3,5 | 90 |
| H | 36 | 18 | 9 | 4½ | 100 | H | 72 | 36 | 18 | 9 | 75 | F | 0,4 | 0,8 | 1,6 | 3,2 | 40 | F | 0,2 | 0,4 | 0,8 | 1,6 | 120 |
| K | 32 | 16 | 8 | 4 | | K | 64 | 32 | 16 | 8 | | K | 0,6 | 1,2 | 2,4 | 4,8 | 96 | K | 0,3 | 0,6 | 1,2 | 2,4 | 100 |
| G | 52 | 26 | 13 | 6½ | 60 | G | 104 | 52 | 26 | 13 | 42 | K | 0,6 | 1,2 | 2,4 | 4,8 | 127 | K | 0,3 | 0,6 | 1,2 | 2,4 | 95 |
| F | 44 | 22 | 11 | 5½ | 80 | F | 88 | 44 | 22 | 11 | 65 | F | 0,625 | 1,25 | 2,5 | 5 | 40 | F | 0,3125 | 0,625 | 1,25 | 2,5 | 120 |
| G | 38 | 19 | 9½ | 4¾ | 90 | G | 76 | 38 | 19 | 9½ | 127 | G | 0,75 | 1,5 | 3 | 6 | 120 | G | 0,375 | 0,75 | 1,5 | 3 | 80 |

TAPER TURNING

Long and thin tapers can be turned between centres using the auto longitudinal feed. The tailstock is set over line to the workpiece axis. The tailstock set-over must not be more than 1/50 of the workpiece length. With a larger set-over the live centre would be overloaded.

Tailstock set-over $v = \frac{D - d}{2} \cdot \frac{L}{l}$

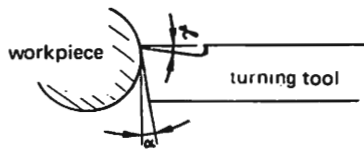


Example: D = 70mm, d = 65mm, L = 400mm, l = 200mm
i. e.

$$v = \frac{70 - 65}{2} \cdot \frac{400}{200} = \frac{5}{2} \cdot 2 = 5 \text{ mm}$$

The relationship of the set-over to the workpiece length L in this example is $\frac{5}{400} = \frac{1}{80}$ smaller than $\frac{1}{50}$.

APPROXIMATE VALUES FOR CUTTING SPEED – CUTTING ANGLE – LUBRICANT



Values valid for dry cutting with:

High - speed steel tools for cutting speed v_{60} (age 60min.)

Carbon tipped tools for cutting speed v_{240} (age 240min.)

Side angle $\chi = 45^\circ$, point angle $\epsilon = 90^\circ$, angle of inclination

$\lambda = 0...8^\circ$,

for light alloy and plastic $\lambda = 5...10^\circ$.

Cutting speed

These values hold good for cuts up to 5mm deep, over 5mm the cutting speed should be reduced by 10 - 20%.

¹⁾ SS = high speed steel S₁ H₁ G₁ = tipped tools E = Cutting emulsion P = paraffin L = air

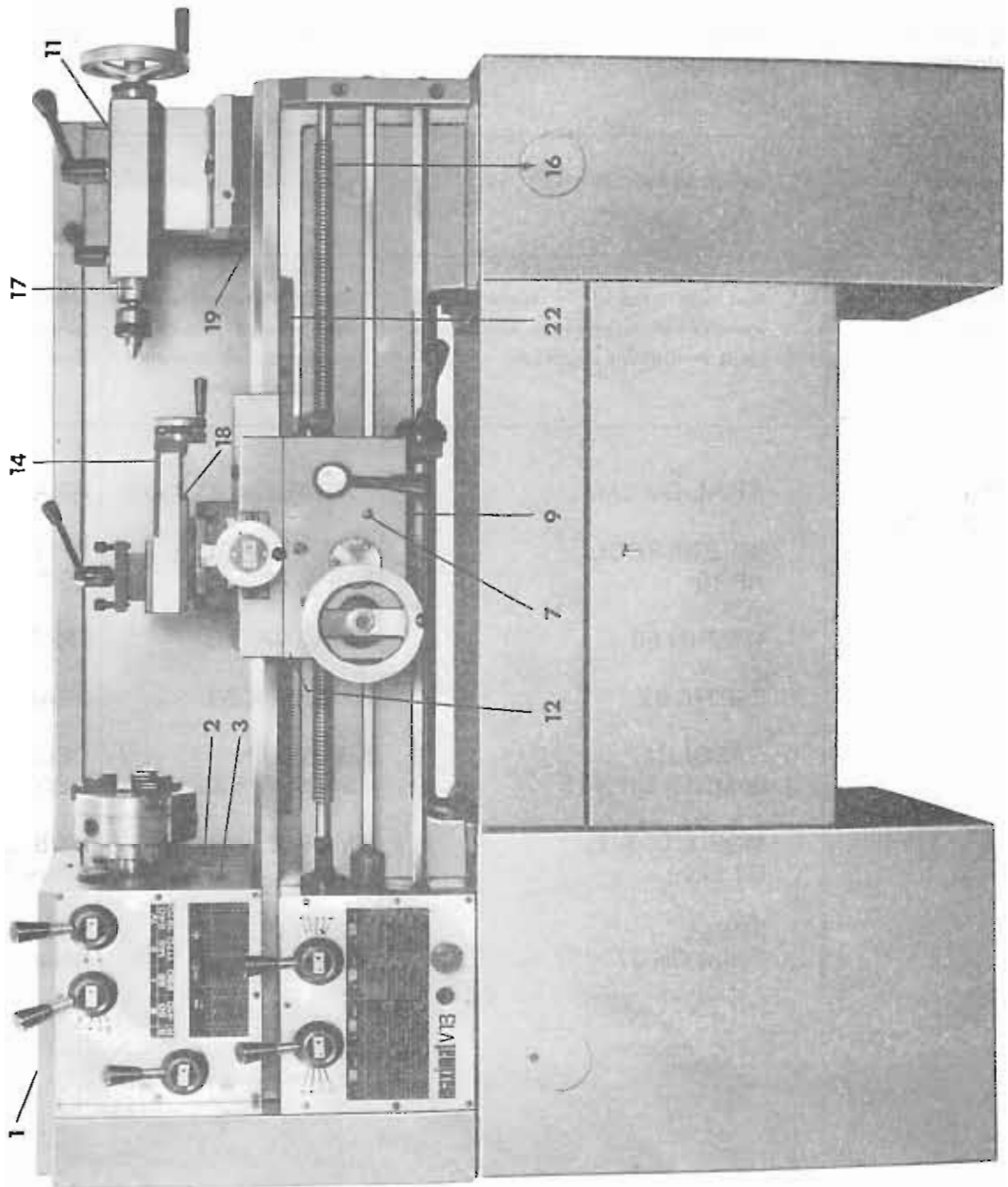
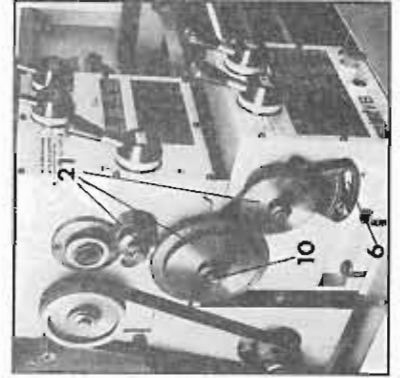
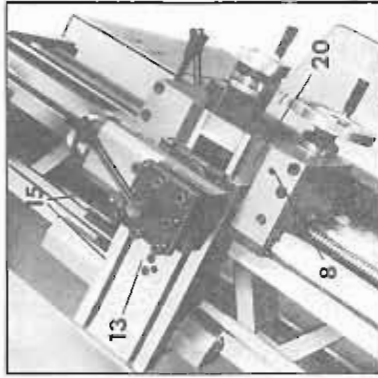
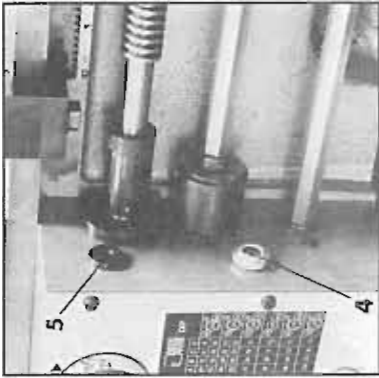
| Workpiece material | Tensile strength in kp/mm ² | ¹⁾ Tool | Cutting angle clearance/top | | Feed in mm/rev. | | | | Coolant and Lubricant | |
|--|--|----------------------|-----------------------------|----------------|--------------------------|-------------|-------------|-------------|---|---------------------------------------|
| | | | α° | γ° | 0,1 | 0,2 | 0,4 | 0,8 | Roughing | Finishing |
| | | | | | cutting speed v m/min | | | | | |
| Steel St 34, St 37, St 42 | up to 50 | SS S ₁ | 8 5 | 14 10 | 280 | 60 236 | 45 200 | 34 170 | E | E or P |
| St 50, St 60 | 50...70 | SS S ₁ | 8 5 | 14 10 | 240 | 44 205 | 32 175 | 24 145 | E | E or P |
| St 70 | 70...85 | SS S ₁ | 8 5 | 14 10 | 200 | 32 170 | 24 132 | 18 106 | E | E or P |
| Cast steel | 50...70 | SS S ₁ | 8 5 | 10 6 | 118 | 34 100 | 25 85 | 19 71 | E | dry |
| Alloyed steel | 85...100 | SS S ₁ | 8 5 | 10 6 | 150 | 24 118 | 17 95 | 12 75 | E | E or P |
| Mn-Steel, Cr-Ni- steel, Cr-Mo-steel | 100...140 | SS S ₁ | 8 5 | 6 6 | 95 | 16 75 | 11 60 | 8 50 | E | E or P |
| other alloyed steels | 140...180 | SS S ₁ | 8 5 | 6 6 | 60 | 9,5 48 | 6 38 | 32 | E | E or P |
| Tool steel | 150...180 | SS S ₁ | 8 5 | 6 6 | 50 | 40 32 | 32 27 | 27 | E | Colza oil or P |
| C.I.20,C.I.25 | hardness Brinell 200...250 | SS H ₁ | 8 5 | 0 | 106 | 32 90 | 18 75 | 13 63 | dry or E | dry |
| Copper alloys | hardness Brinell 80...120 | SS G ₁ | 8 5 | 0 6 | 600 | 125 530 | 85 450 | 56 400 | dry,EorL | dry |
| Cast bronze | | SS G ₁ | 8 5 | 0 6 | 355 | 63 280 | 53 236 | 43 200 | E or L | dry |
| Light alloys aluminium | | SS G ₁ | 12 12 | 30 30 | 400 1320 | 300 1120 | 200 950 | 118 850 | E or P soap spi- rit | E or P soap spi- rit |
| Aluminium alloys (11...13%Si) | | SS G ₁ | 12 12 | 18 18 | 100 224 | 67 190 | 45 160 | 30 140 | E | Oil S II or P |
| Magnesium alloys* | | SS G ₁ | 8 5 | 6 6 | 1000 1800 | 900 1500 | 800 1250 | 750 1060 | dry or with non- combust- ible oil | dry or with non-combustible oil |
| Platics and hard rubber | | SS G ₁ | 12 12 | 10 10 | 300 | 280 | 250 | 224 | dry | dry |
| Bakelite, Novo- text,Pertinax hard plastic | | SS G ₁ | 12 12 | 14 14 | 280 | 212 | 170 | 132 | dry | dry |

* Do not use with water or water mixtures (DANGER OF FIRE!)

LUBRICANTS

List of lubricants and times to be used in accordance with the Lubrication Chart on page 19

| Lubrication Position | Headstock carriage gear box | Slideways | Grease points |
|-------------------------|---|---|--|
| Required Viscosity | approx. 17 cSt (2,5E)/ 50°C | approx. 42 cSt (5,6E)/ 50°C | |
| Properties of lubricant | Non foaming special oils, resistant against ageing corrosion preventing, with good viscosity temperature properties | Special oils, especially able to absorb pressure, corrosion preventing, with stick-slip preventing qualities | Lithium-saponified multi-purpose grease with a high drop point |
| Brands of Lubricant | <p>ARAL Oel CMS</p> <p>BP ENERGOL HP 10</p> <p>HYSPIN 55</p> <p>ESSTIC 42</p> <p>GASOLIN Spezialöl DK 30 S</p> <p>MOBIL D. T. E. Oil Light</p> <p>SHELL Tellus Oel 27</p> | <p>ARAL Oel P 2030 B</p> <p>BP ENERGOL HP 20-C</p> <p>MAGNA BD</p> <p>FEBIS K-53</p> <p>GASOLIN Spezialöl BSL</p> <p>MOBIL VACTRA Oil No. 3</p> <p>SHELL Tonna Oel 33</p> | <p>ARAL Fett HL 2</p> <p>BP ENERGREASE LS 2</p> <p>SPHEEROL AP 2</p> <p>BEACON 2</p> <p>DEGANOL LF or DEGANOL LW 3</p> <p>MOBILUX Grease No. 2</p> <p>SHELL Alvania Fett 2</p> |



LUBRICATION POINTS

- | | | |
|---|--|--|
| <p>1 Headstock (fill thro' cover)</p> <p>2 Oil sight glass on headstock</p> <p>3 Drain plug on headstock</p> <p>4 Oil sight glass on gear box</p> <p>5 Filling screw in gearbox</p> <p>6 Drain plug on gearbox</p> <p>7 Oil sight glass on carriage</p> | <p>8 Filling screw on long slide</p> <p>9 Drain plug on carriage</p> <p>10 Grease nipple on change wheel pins</p> <p>11 Grease nipple on tailstock</p> <p>12 Grease nipple on carriage</p> <p>13 Grease nipple on cross slide</p> <p>14 Grease nipple on top slide</p> | <p>15 2 Grease nipples on long slide</p> <p>16 Leadscrew</p> <p>17 Tailstock spindle</p> <p>18 Top slide ways</p> <p>19 Tailstock ways</p> <p>20 Cross slide ways</p> <p>21 Change gearwheels</p> <p>22 Toothed rack</p> |
|---|--|--|

LUBRICATION TABLE

| Machine part | Lubrication position | Check position | Type of lubrication | Material | Quantity | Frequency |
|--------------------|----------------------|----------------|----------------------|----------|---------------|--|
| Headstock | 1 | 2 | Oil bath | oil | approx. 2l | approx. 500 hours |
| Gear box | 5 | 4 | | oil | approx. 7/16l | |
| Carriage | 8 | 7 | | oil | approx. 7/16l | |
| Change wheel pins | 10 | — | Nipple grease gun | grease | | approx. 24 hours |
| Tailstock | 11 | — | | | | |
| Rack-wheel | 12 | — | | | | |
| Cross spindle nut | 13 | — | | | | |
| Top slide | 14 | — | | | | |
| Long slide | 15 | — | Nipple | oil | | |
| Leadscrew | 16 | — | Oil can | oil | | Several times daily, especially the leadscrew when cutting threads |
| Tailstock spindle | 17 | — | | | | |
| Top slide ways | 18 | — | | | | |
| Tailstock ways | 19 | — | | | | |
| Cross slide ways | 20 | — | | | | |
| Change gear wheels | 21 | — | | | | |
| Toothed rack | 22 | — | Grease gun | grease | | approx. every 48 hours |

ACCESSORIES

| | |
|--|---|
| Universal lathe chuck for spindle nose taper or spindle nose taper | 160mm dia. 2 x 3 jaws DIN 55022, size 4 ASA B5,9 D1, size 4 |
| Universal lathe chuck for spindle nose taper or spindle nose taper | 160mm dia. 2 x 4 jaws DIN 55022, size 4 ASA B5,9 D1, size 4 |
| Independent chuck, 200mm dia., with 4 independently adjustable jaws for spindle nose taper or spindle nose taper | DIN 55022, size 4 ASA B5,9 D1, size 4 |
| Fixed steady for workpieces | 6 - 100mm dia. |
| Travelling steady for workpieces | 6 - 100 mm dia. |
| Live centre | 3 MT |
| Three-jaw drill chuck | 1 - 16mm dia. |
| Morse taper arbor | 3 MT for drill chuck |
| Thread cutting dia. indicator | |
| Chuck guard | |
| Copying attachment | |
| Taper turning attachment | |
| Adjustable machine lamp | |
| Coolant attachment with single-phase a/c motor | |
| Coolant attachment with three-phase a/c motor | |
| 6 HSS Turning tools 16 x 16 x 120mm, in container | |
| Tip holder with tips | |
| Quick-change tool holder | |
| Change wheels for metric machine: Number of teeth: 30, 50, 60, 63, 65, 70, 75, 95, 110, 120 | |
| Change wheels for inch machine: Number of teeth: 42, 55, 60, 63, 65, 75, 80, 90, 96, 120 | |

MAINTENANCE

Setting the Main Spindle Bearings

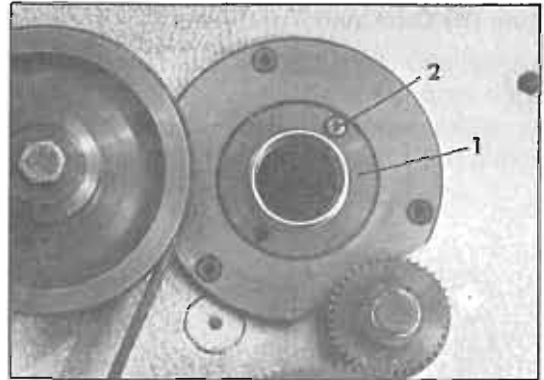
The main spindle is carried in two precision ball bearings. If adjustment is necessary, the cover is taken off after removing the three Allen screws, giving access to the screwed ring.

The locking screw 2 is loosened.

By means of a two-pin key (size 60) turn the screwed ring in a clockwise direction until the spindle can be lightly revolved by hand.

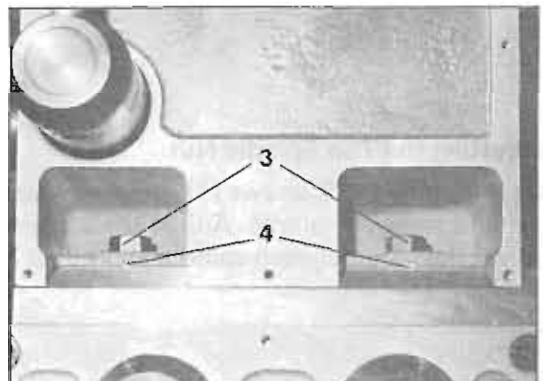
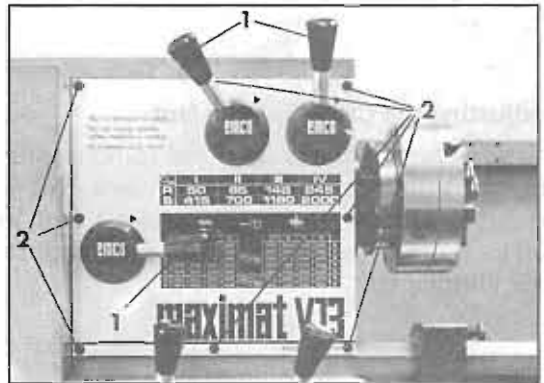
ATTENTION: Gears in 0-setting, sliding wheels in headstock out of contact.

A simple check to find if the spindle is correctly adjusted is to run the spindle on high speed for approx. 1/4 hour. The bearings should both be hand warm. If the bearings are warmer, then they are too tight. If the bearings run cold, then they should be tightened further. Properly adjusted bearings are important, especially for plunge cutting or eccentric turning.



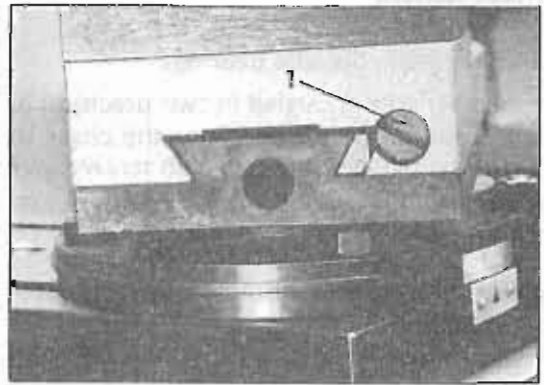
Readjustment of the Headstock on the Bed

Unscrew the three levers (1). Remove the front plate by taking out the 8 allen screws (2). The 4 headstock fixing screws 3 (SW 22) should now be just loosened. The 4 adjusting screws 4 - 2 of which are situated between the electric cabinet and the motor and can be reached by using a long screw driver, should be adjusted until by means of trial turning or use of a mandrel the accuracy shown on the certificate is achieved.



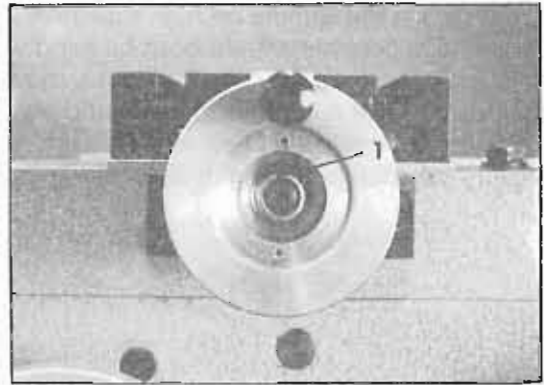
Setting the Cross and Top Slides

The cross and top slides are fitted on dove-tail ways. The gib strip is adjustable. When slides require adjustment, this is carried out by screwing the adjusting screw 1 until all play is removed.



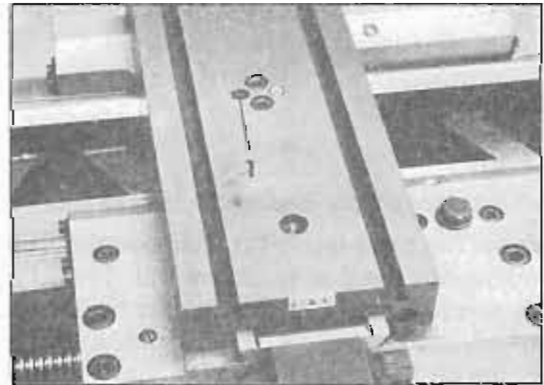
Readjusting the Carriage for Axial Play

When either of the carriage spindles (long or cross) have axial play, remove the two allen screws and the cover of the appropriate handwheel. Then, holding the handwheel, the screw ring (1) is rotated by means of a key (SW 13 for top slide and SW 17 for the cross slide) until all the axial play is taken up.



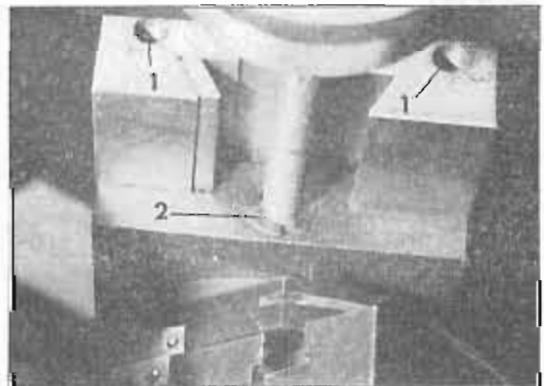
Readjusting the Cross Spindle Nut

If, after adjusting the cross travel spindle (previous paragraph) the nut requires adjustment, this is carried out as follows: tighten the screw 1 with an allen key No. 5 until the play between the spindle and the nut is eliminated.



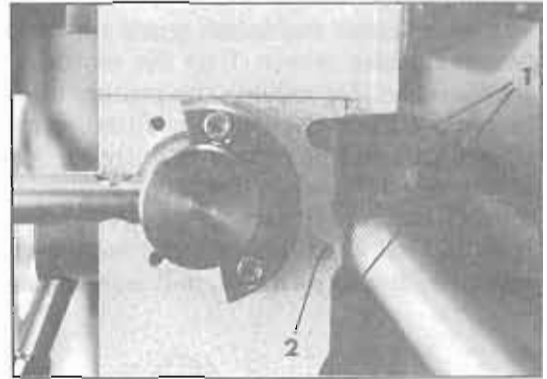
Readjusting the Top Spindle Nut

After removing the 2 screws (1), unscrew the handwheel and screwed spindle. Adjust the screwed ring (2) until the play between spindle and nut is removed.



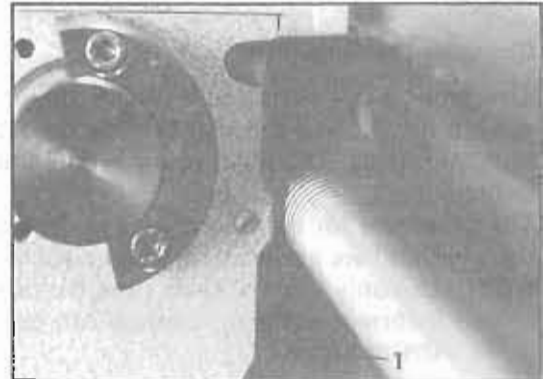
Adjustment of the Half-Nut Guide

Loosen the 2 screws (1) on the right hand side of the apron and adjust the screw (2) until both half-nuts move freely without play. Tighten both screws again.



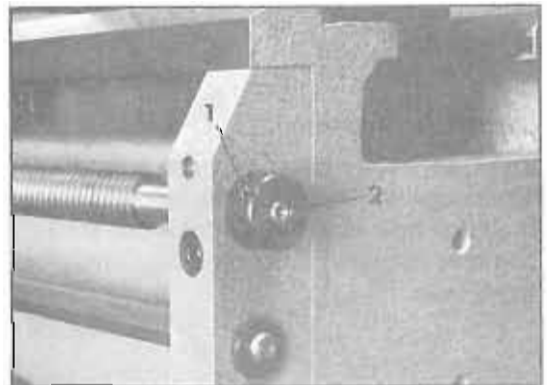
Adjustment of the Half-Nut

By turning the screw 1 anti-clockwise, the play between the nut and leadscrew is reduced. This should be done until the nut fits the leadscrew without play.



Adjustment of Leadscrew Bearings

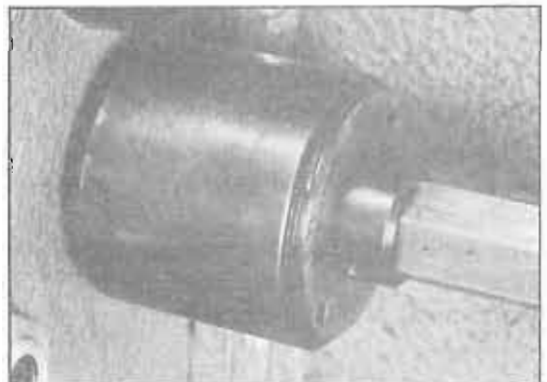
Loosen the screw 1, turn the locking nut 2 by means of a pin (5mm dia.) until all the axial play is removed, but the spindle can be turned lightly by hand.



Setting the Slipping Coupling

An adjustable sliding clutch is fitted at the exit of the drive spindle on the right hand side of gear box. This clutch slips when the long or cross stops are reached or if any other obstruction is struck.

The coupling is set at the works. When fitting a new coupling, the following instructions apply. With a two-pin key No. 35 carefully turn the screwed plate 90° in a clockwise direction. By operating the machine, check if the adjustment is enough. If not, repeat until the correct position is achieved.



Changing and Tensioning the Vee Belt

The wheel cover and splash guard are removed. The two hexheaded screws 1 on the motor mounting plate are loosened. By moving the motor, the old belt can be removed and the new one fitted. Press the motor downwards and re-tighten the screws. A movement of approx. 5mm when the belt is pressed by the finger shows a correct tensioning.

It should be noted that an incorrectly tensioned belt, especially too loose a belt, will wear much quicker.



Changing the Shear Pin

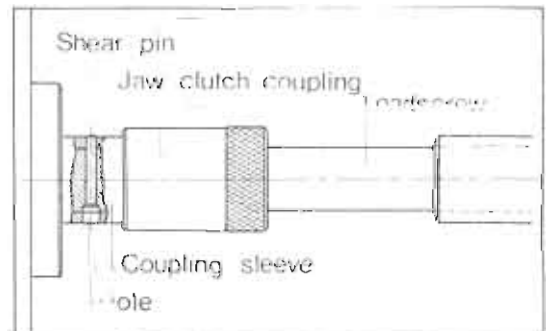
The removal of a shear pin is usually only necessary when it has sheared through overload or after a long time by fatigue. The shear pins are the intended points of breaking.

The shear pins for the leadscrew and drive shaft are the same and are available as original spares.

NOTE! Use only original shear pins. By using pins of incorrect material, damage can be caused to the machine.

Leadscrew Shearpin

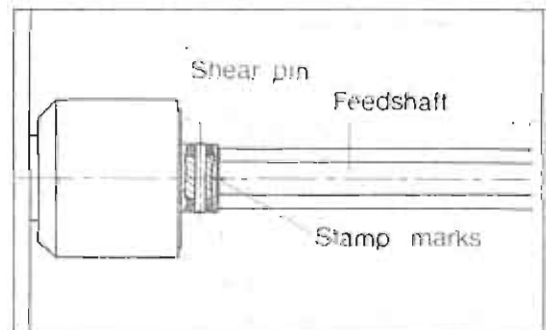
To remove the broken pin, use a 3mm dia. punch. The coupling sleeve and the leadscrew are rotated till the large hole is in line. Knock out the broken pin and hammer the new pin completely into place from the small hole.



Driving Shaft Shearpin

To remove the broken pin, use a 3mm dia. punch. The shaft must be rotated until the hole in the sleeve and shaft are in line.

The sleeve and shaft are marked, for ease in practice. When the two marks are lined up, the broken pin can be removed and a new one fitted.



POSSIBLE TROUBLES AND THEIR ELIMINATION

| Trouble | Possible Reason | Cure |
|--|--|---|
| Machine does not run | Not plugged in; Main switch off; Start button not pressed; Gear wheel cover not correctly in place; Emergency switch was operated; Fuse blown; Motor protection dropped; | According to trouble |
| Machine does not drive | Belt too loose | See page 24 |
| Machine stops | Motor overloaded Power failure or Power cut | Reduce depth of cut |
| Feed fails | Shear pin broken; Cross and bed slides too tight; Quadrant not in position; Coupling too lightly set; | Replacement (see page 24) According to trouble Adjust (see page 23) |
| Vibration when turning | Tool overloaded Tool with too much overhang Tool cutting angle Saddle gib loose Spindle bearing play; Gibs on long travel slide loose; | Reduce cut Reduce cut accordingly Alter cutting angle Adjust gib (see adjustments) Adjust (see adjustments) |
| Workpiece shows conical a) turning in chuck b) between centres | Workpiece not held true; Main spindle not true to slides; Tailstock not in line with headstock | Turn between centres! Adjust headstock (see adjustments) Correct by adjusting cross position of tailstock |
| Scratches on ways of bed | Felt wiper, hard, dry or full of swarf | Clean and soak the felt wiper in oil, or replace |
| Play in Half-nut, cross slide or top slide nuts | Nuts are worn | Adjust (see adjustments) |

SPARES LIST

| GROUP | DESCRIPTION | ORDER NO. | REPLACE after hours | NUMBER |
|------------------------------|-----------------------|---------------|------------------------|--------|
| Headstock | Packing ring | ZOR 80 5058 | 4000 | 1 off |
| | Packing ring | ZOR 80 1824 | 4000 | 1 off |
| | O-ring | ZOR 00 8020 * | 4000 | 5 off |
| | Slider | D1A 030 300 | 4000 | 3 off |
| Mainspindle | Taper roller bearing | ZLG 32 0126 | 4000 | 1 off |
| | Taper roller bearing | ZLG 32 0106 | 4000 | 1 off |
| Countershaft | Grooved ball bearings | ZLG 62 0602 | 4000 | 2 off |
| | Needle bearing | ZLG 79 2520 | 4000 | 1 off |
| | Needle rims | ZLG 76 2917 | 4000 | 2 off |
| Feed gears ? | Packing ring | ZOR 80 2532 | 4000 | 2 off |
| | Packing ring | ZOR 80 2026 * | 4000 | 1 off |
| | O-Ring | ZOR 00 8020 * | 4000 | 2 off |
| Apron | Packing ring | ZOR 80 2026 * | 4000 | 2 off |
| | O-Ring | ZOR 01 3020 | 4000 | 1 off |
| | Half-nut metric | D1A 011 010 | 4000 | 1 off |
| | Half-nut inch | D1B 011 010 | 4000 | 1 off |
| Carriage | Cross nut metric | D1A 000 500 | 4000 | 1 off |
| | Cross nut inch | D1B 000 500 | 4000 | 1 off |
| | Felt wiper | D1A 000 550 | 2000 | 2 off |
| | Felt wiper | D1A 000 560 | 2000 | 2 off |
| Top slide <i>compound</i> | Top nut metric | D1A 050 050 | 4000 | 1 off |
| | Top nut inch | D1B 050 050 | 4000 | 1 off |
| Assemblage | Shear pin | D1A 070 220 | 2000 | 2 off |
| | G.coupling | D1A 180 000 | 4000 | 1 off |
| | Vee belt | ZRM 80 0955 | 2000 | 1 off |