OPERATING INSTRUCTIONS
for the
emco-unimat
Model SL
SMALL MACHINE TOOL

Ref EN2 020 Auflage 7606 Englisch

WHO USES THE UNIMAT ?

First of all any resourceful hobbyist, model maker and 'Do-it-yourself' enthusiast, of course. But also in the research laboratory, precision machine and optical workshops, etc. - in fact everywhere that precision and true-to-form models parts have to be turned out - the UNIMAT finds a ready application, thanks to its versatility. The UNIMAT is gaining increasing favour as a medium of instruction : In the physics laboratory it is a readily adaptable appliance - without the need for any supplementary mounting fixture - for centrifugal force tests, for demonstrations in the study of wave mechanics, for colour gyroscopics, rotating mirrors, perforated diaphragms and for many other theoretical tests. And if at any time any of the educational equipment has to be repaired, or some provisional item has to be replaced, the UNIMAT proves doubly valuable !

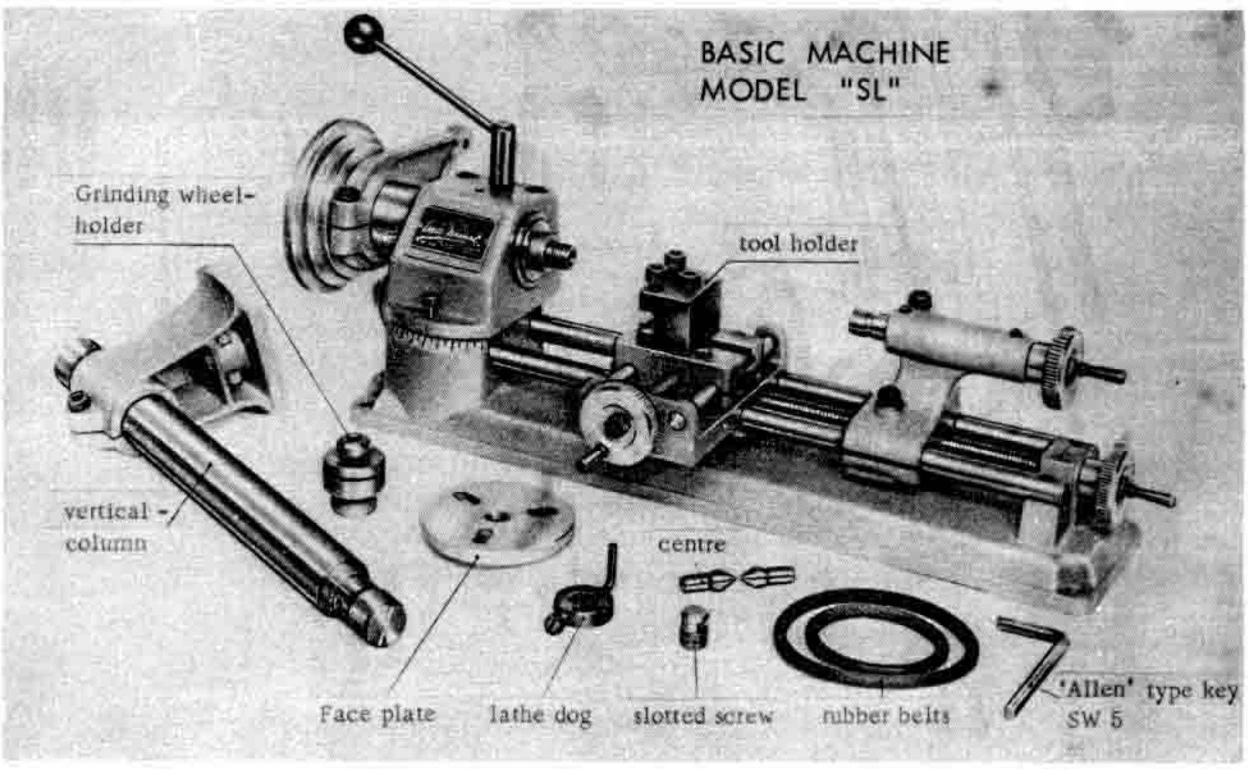
WHAT DOES THE UNIMAT DO ?

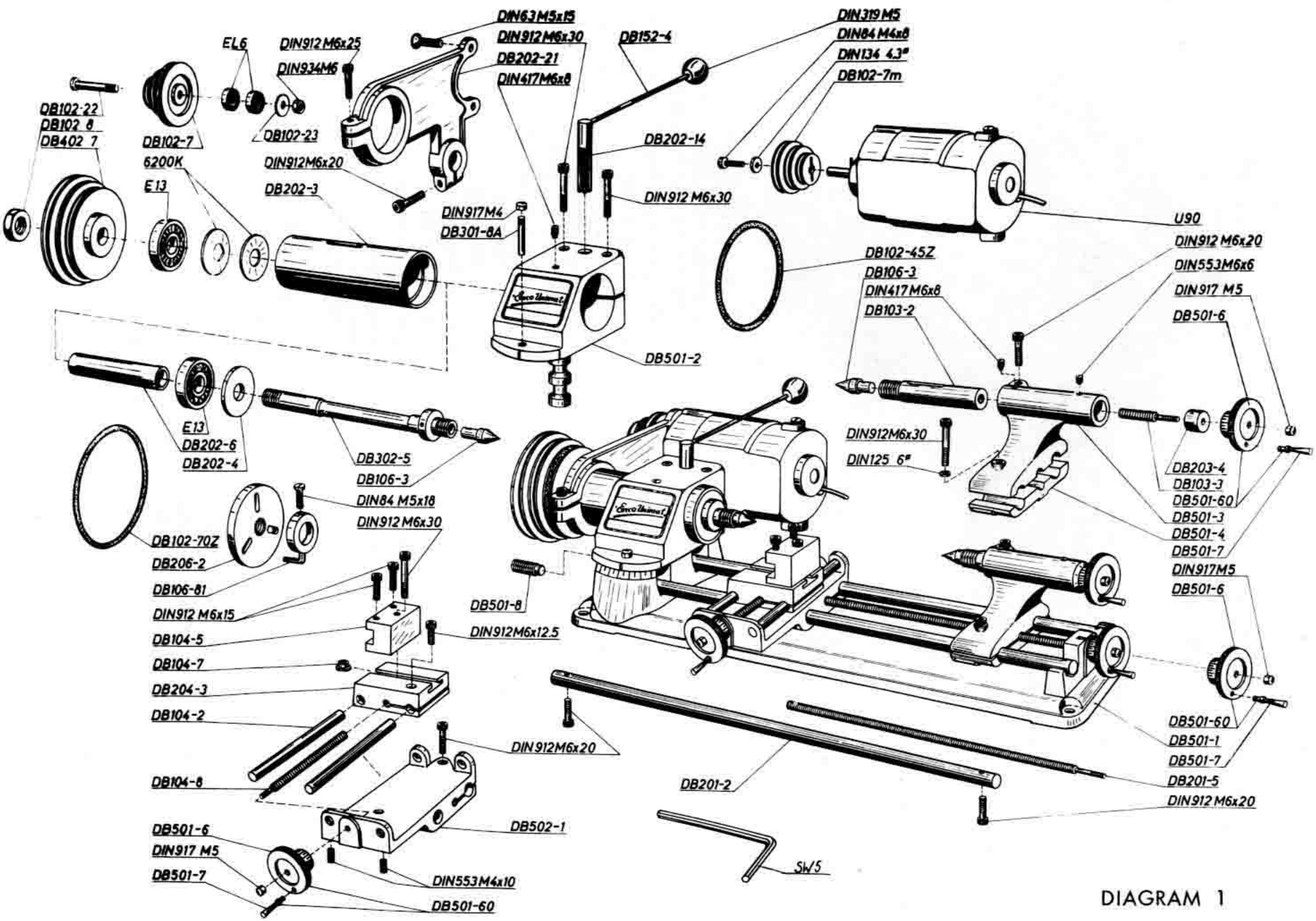
The EMCO - UNIMAT is a universal machine tool in the best sense of the word; all types of metalworking can be carried out expertly and precisely : turning, drilling and milling, thread-cutting, circular sawing and grinding; in addition to this the UNIMAT is also an ideal multi-purpose machine for woodworking and for the processing of synthetic resin and similar materials. By using the appropriate accessories you can carry out fretsawing, keyhole sawing and circular sawing, face and angular grinding, as well as lathe turning.
The motor output is 90 Watts, - power enough to perform all work processes expeditiously.

HOW DOES THE UNIMAT WORK ?

The metalworking expert will, of course, quickly be "au fait" with the various functions of the UNIMAT , but even he, without doubt, will gain enthusiasm for various other application possibilities of the UNIMAT from these operation instructions.
For the beginner, naturally, the basic text of the operating instructions is an indispensable prerequisite of the expert handling of the machine and thus also of satisfactory working results.
With this in mind we wish you -

much pleasure and good results !

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DIN912 M6x20
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DB501-6
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DB501-7
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DIN553 M4x10
DB501-60

DIAGRAM 1

E M C O   U N I M A T   SL

TECHNICAL DATA :

Lathe	Height of centres over pillars	1 13/32"
	Width between centres	6 3/4"
Drilling and Milling machine	Drill height 3 7/8" Overhang	3 3/8"
	Drill travel	3/4"
Grinding machine	Maximum diameter of grinding wheel	2 3/8"
Motor output	90 Watts 110 or 220 Volts	
	4,000 r.p.m. under load	

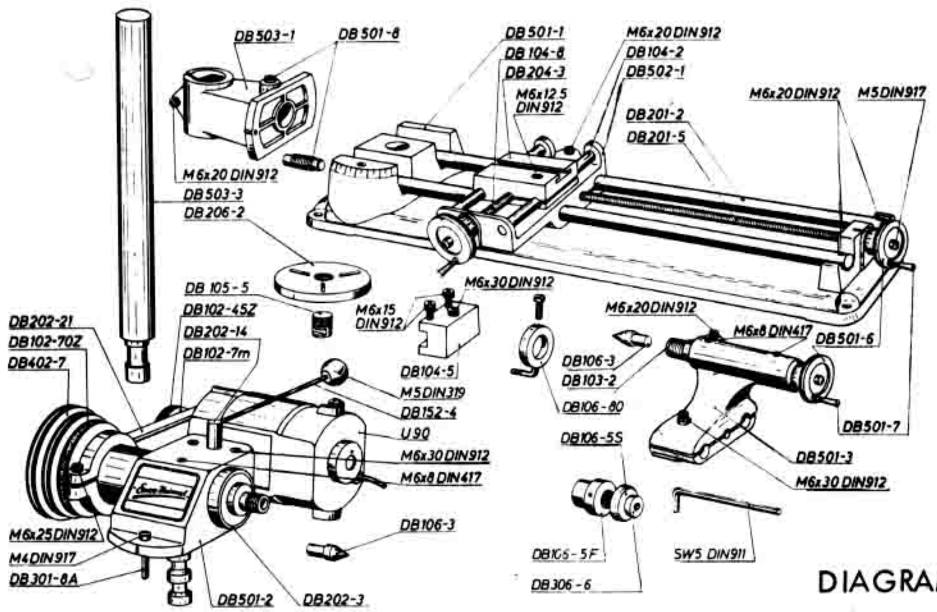


DIAGRAM 2

PART NUMBERS:

DB 102 - 7	Idler pulley
DB 102 - 7 m	Motor pulley
DB 102 - 8	Nut
DB 102 - 22	Bearing bolts
DB 102 - 23	Cover disc
DB 102 - 45 z	Belt
DB 102 - 70 z	Belt
DB 103 - 2	Tailstock sleeve
DB 103 - 3	Drive screw
DB 104 - 2	Guide column
DB 104 - 5	Tool holder
DB 104 - 7	T-nut
DB 104 - 8	Threaded spindle
DB 106 - 3	Centre
DB 106 - 81	Lathe dog
DB 152 - 4	Long locking handle
DB 201 - 2 V	Guide column
DB 201 - 5	Threaded spindle
DB 202 - 3	Spindle head sleeve
DB 202 - 4	Spindle wheel
DB 202 - 6	Distance bush
DB 202 - 14	Pinion
DB 202 - 21	Motor bracket
DB 203 - 4	Guide pin
DB 204 - 3	Carriage
DB 206 - 2	Face plate
DB 301 - 8 A	Marker pin
DB 302 - 5	Main spindle
DB 402 - 7	Belt pulley for spindle
DB 501 - 1	Bed
DB 501 - 2	Headstock
DB 501 - 3	Tailstock
DB 501 - 4	Clamping plate
DB 501 - 6	Hand wheel
DB 501 - 7	Tapered handle
DB 501 - 8	Tension screw
DB 502 - 1	Support
6200 K	Cup spring
SW 5	Allen key
EL 6	Ball bearing
E 13	Ball bearing
U 90	Motor

PLAN DIMENSIONS in mm

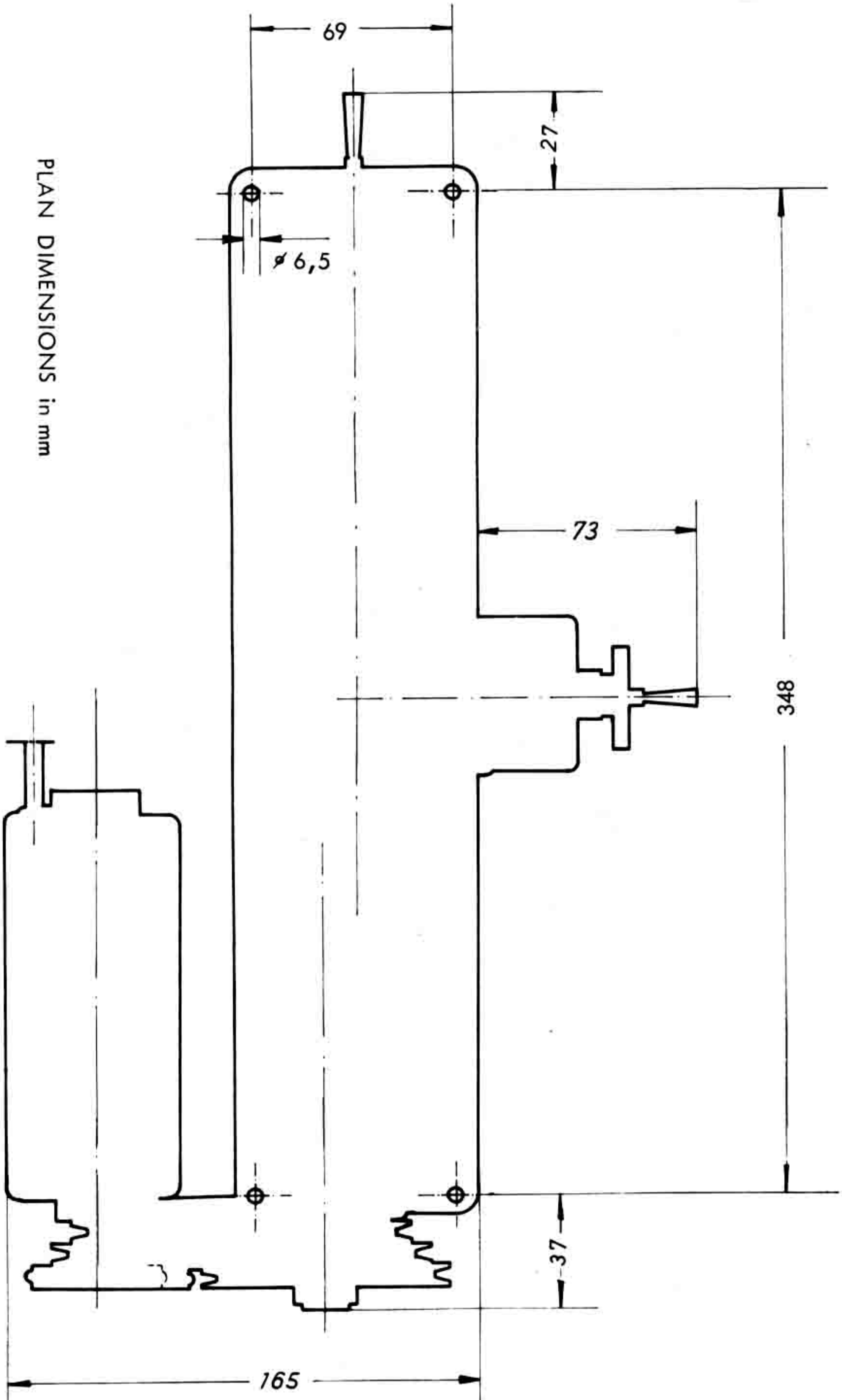
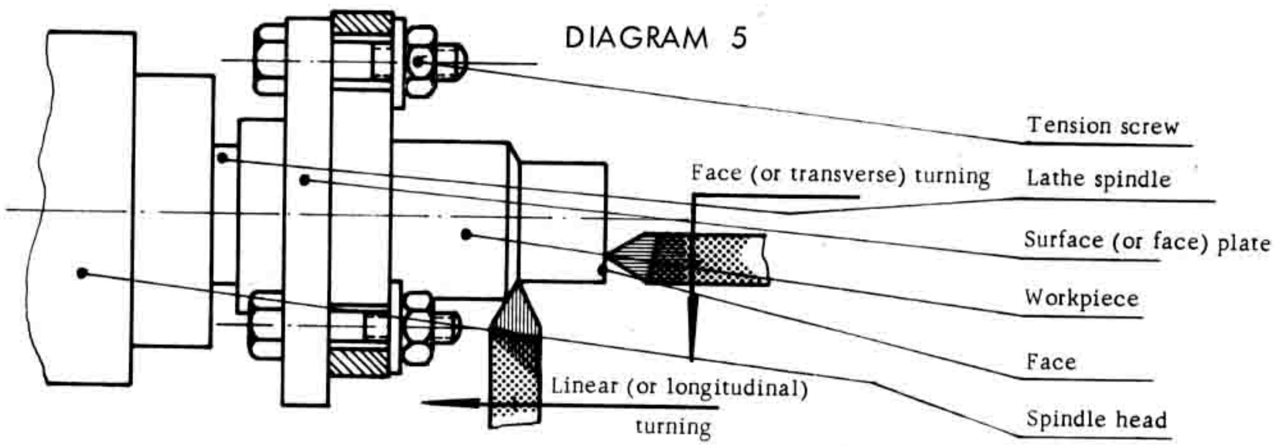


DIAGRAM 3

Basic work procedures on the lathe :

What, in fact, do we understand by turning ?
If we tension a workpiece in a suitable appliance, e.g. between centres, on a surface (or face) plate, in a lathe chuck, or a tensioned clamping device and drive this by means of a motor (over belt pulleys connected to the driving belt), the workpiece rotates with it in the corresponding gear ratio. From this rotary movement of the workpiece we derive the definition "turning." Basically we differentiate between two operating possibilities of the lathe :
On the one hand linear (or longitudinal) turning, by which we understand the circumferential turning down of a workpiece, i.e. to a specific diameter. On the other hand face (or transverse) turning, by which method of turning the face of a workpiece is machined.

DIAGRAM 5



With all lathe turning work care must be taken to ensure that the workpiece is securely tensioned. From time to time you should also check the workpiece to make sure it is firmly held. (Grip the tensioning device with one hand and try to move the workpiece with the other. If the workpiece is loose, thghten up the tensioner.)

Tensioning of the workpiece :

We differentiate between various methods.
We can clamp the workpiece (a round metal rod) between the centres of the tailstock and the spindle head and ensure by means of a take-up device (in this case the driver) that it is taken up by the surface (or face) plate. (See diagram.) In order that the workpiece may be tensioned between the centres, centre holes must be drilled on the face ends of the workpiece. One can, however, insofar as the workpiece is of suitable shape (e.g. flange-shaped), clamp it to the surface plate. (See Diagram 5). Tensioning is by means of tension screws. After clamping a check is taken by a short trial run that the workpiece runs true and does not hit. It it only touches slightly the error may be corrected by light taps on the workpiece, with the machine stationary. If it touches very much, the workpiece must be re-tensioned.
A workpiece clamped to the surface plate can be transverse - as well as longitudinally turned.
As further methods of clamping the threee-jaw lathe chuck (Order No. 1001) may be mentioned here. The three jaws provide automatic centering, as with a drill chuck.

Now for the work :

As longitudinal turning is one of the simplest operations, we will for the first test turn a

workpiece down to a specific diameter. Take a circular aluminium or brass rod (soft metals are more suitable for the first attempt than steel), of about 3/8 " diameter and with a hacksaw cut it to a length of about 2". Try to make sure that the saw cuts are as far as possible perpendicular to the axis of the rod (i.e. square), as this simplifies the work considerably (if necessary true up the cut faces with a file).

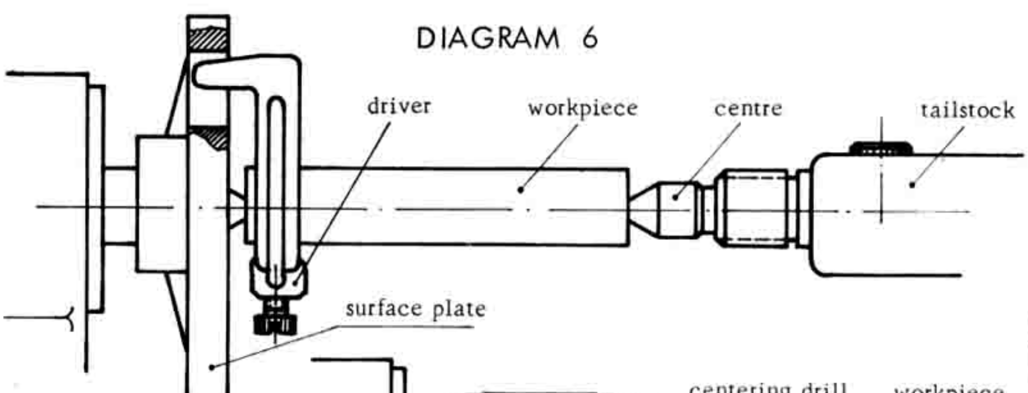
Centering and drilling the centre holes :

So that the workpiece can run true between the tailstock and spindle head centres, centre holes must be drilled at the middle of the two face surface of the workpiece, into which the tips of the tailstock and spindle head centres are inserted. Before a hole is drilled in a workpiece the hole centre must be centre punched, otherwise the drill will run off centre. To centre mark the workpiece clamp it in a vice and locate a centre punch (obtainable from any hardware shop) exactly at the centre point of the face end, making a pot mark by means of a hammer blow, so that the drill can be centred in the indentation. This process is repeated on the other face end.

Drilling the centre holes :

Drilling of the centering holes can be done on the lathe. To do this we unscrew the face plate (see Diagram 7) and in its place screw on a three-jaw drill chuck, available as an accessory (Order No. 1005), insert the centering drill bit into the chuck and clamp it tight with the key. We then insert the centre into the tailstock, hold the workpiece between the centering drill and the centre tip and, after slackening the bottom clamping screw in the tailstock, move it by hand in the direction of the spindle head until the drill contacts the workpiece at the other centering hole. By re-tightening the internal hexagon-headed screw in the base of the tailstock, the latter is firmly clamped to the guide pillars of the lathe bed.

DIAGRAM 6



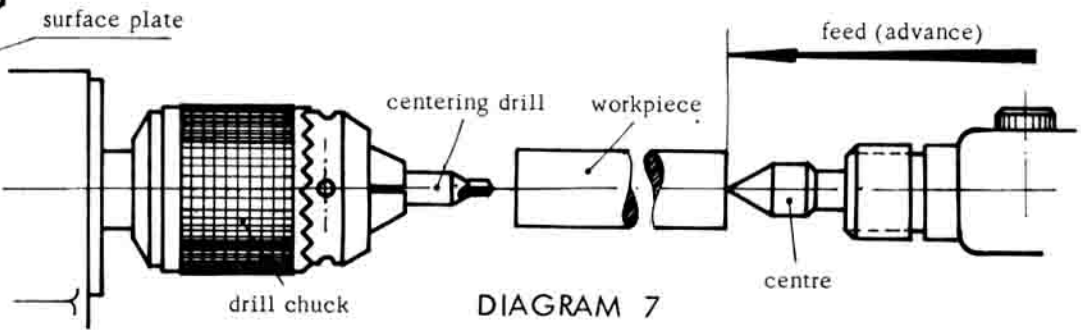


DIAGRAM 7

The workpiece remains clamped between the drill centre on the left hand and the lathe centre on the right hand side, which centres rest in the shallow centering holes. Now unclamp the tailstock sleeve by anti-clockwise turns of the upper clamping screw. If you turn the handwheel on the tailstock to the right, the tailstock sleeve with centre bit inserted in it presses the workpiece up against the rotating drill. With normal drilling, however, the tool is moved up to the

workpiece, but this, as you will surely appreciate, is of no importance to the cutting operation. Then : Switch on the motor, hold the workpiece firmly in one hand and move the tailstock sleeve forward with the other hand. In the same way, after reversing the workpiece, the centering hole is drilled at the other end. This method, without doubt, requires a certain amount of skill and the inexperienced operator will probably not meet with success at the very first attempt.

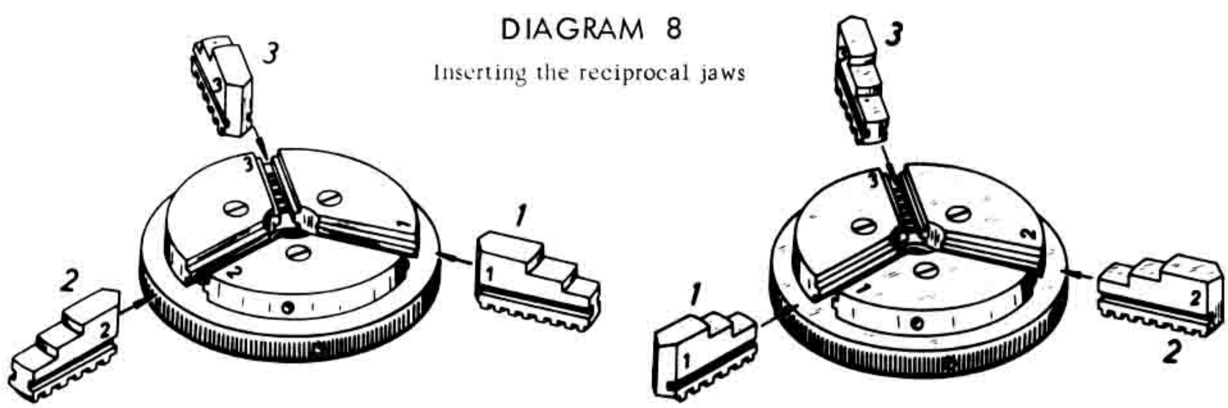
From the point of view of workshop practice this method can only be regarded as a make shift procedure. The correct way in practice of producing a centre hole requires the use of a three-jaw chuck. (Order No. 1001.) This is screwed on to the spindle head sleeve (in the same way as the face plate on the originally mounted lathe), the drill chuck (Order No. 1005) with the drill clamped in comes on the tailstock side, after the centre has been removed. In this case, then, the drill remains stationary and the workpiece is rotated.

Longitudinal turning :

The originally mounted face plate together with its centre bit is re-mounted and the lathe dog firmly clamped to the workpiece by tightening up the fixing screw. The workpiece together with the lathe dog are then tensioned between the centres, so that the pin in the lathe dog rest in a slot in the face plate. Care should be taken that the centres do not grip the workpiece tightly, though of course without any play. Lubricate the centres with oil from time to time. You will note that the centre of the spindle stock rotates conjointly, whilst that of the tailstock remains stationary. Tensioning of the workpiece between the centres is achieved by advancing the tailstock sleeve. After tensioning, re-clamp the tailstock sleeve. In addition, care should be taken that the clamping screw in the spindle head, which secure the spindle head sleeve, are tightened up.

DIAGRAM 8

Inserting the reciprocal jaws



Mounting the tool holder :

The tool holder (Diagram 10) and its T-nut are inserted in the slot of the support and on this the turning tool is tensioned. The tip of the turning tool must locate at the height of the centres. If necessary several small metal shims are placed underneath the turning tool (Diagram 10) The turning tool holder is adjusted so that the turning tool is at right angles to the workpiece (Diagram 9).

DIAGRAM 9

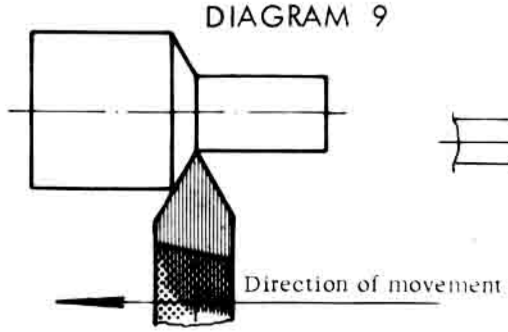
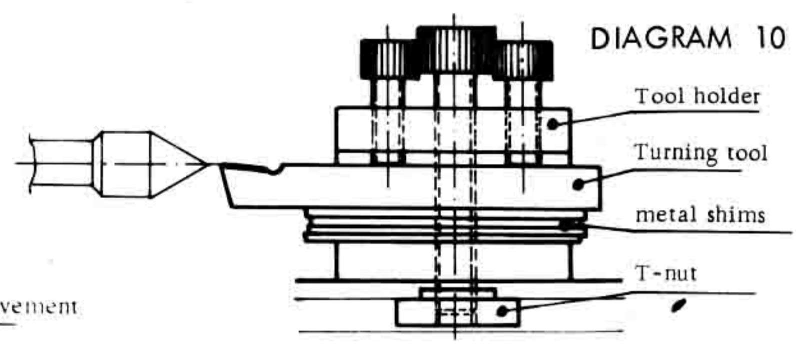


DIAGRAM 10



Types of turning tools :

Each kind of work requires a suitable tool for the purpose. Thus for rough turning, planing, face (transverse) turning, thread cutting, etc. the appropriately shaped turning tools must be selected.
Rough turning tools : The object in rough turning is to remove a large quantity of shaving in a short time.
Planing tools : By planing one attains a smooth surface of the workpiece. For this purpose a planing tool with a rounded off (chamfered) cutting edge is used. Side cutting tools: These are used for transverse turning and for the turning out of sharp angled corners.

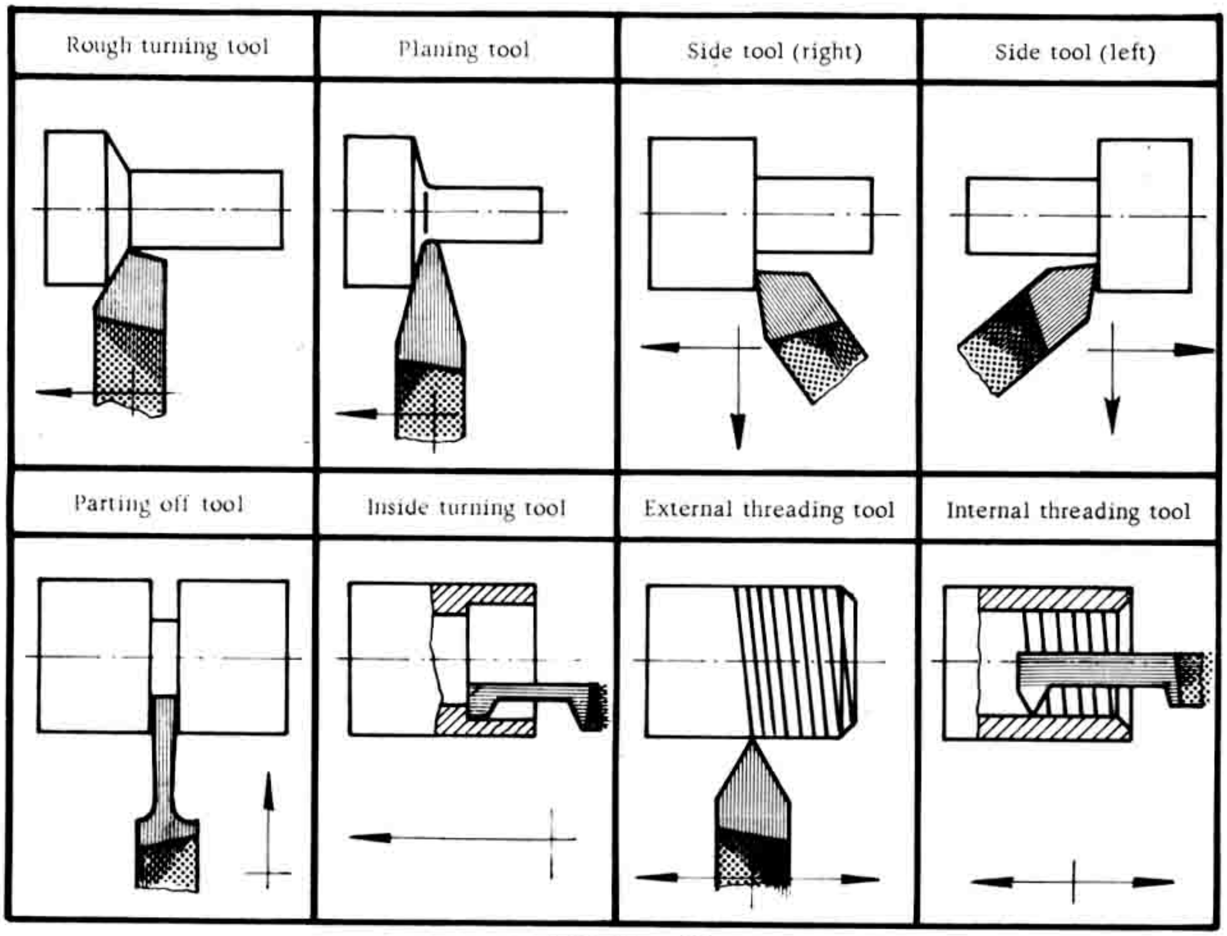


DIAGRAM 11

The initial shaving :

For turning we use the working speeds given in the table. After setting to these you start up the machine with the turning tool lifted. To turn off a thin shaving the turning tool is brought up to the workpiece so that its tip just touches the workpiece following which the support is moved to the right with the cutter tensioned. Movement of the support is done by rotating the handwheel on the longitudinal spindle. The support is moved until such time as the turning tool is located between the centre of the tailstock and workpiece. By rotating the handwheel on the transverse support the depth of shaving is adjusted. (Observe the division scale on the handwheel; by rotating the handwheel one division the turning tool is moved up 0.002"). The actual work movement takes place by rotating the linear spindle handwheel, whereupon the support carrying the turning tool moves up against the spindle head, so removing the shaving. Only after several smaller shavings have been removed in this way and one has become acquainted with the working of the machine, should one go over to bigger shaving depths.

Step turning :

For the next exercise try turning steps of varying diameter.

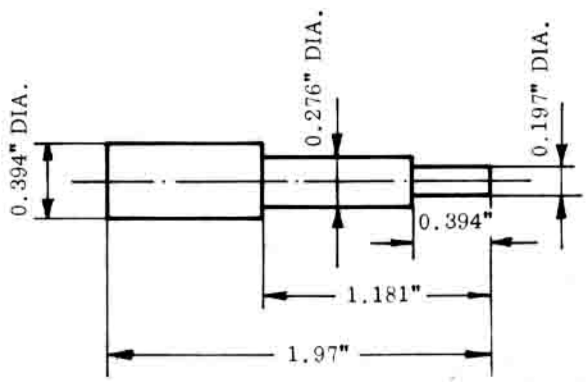


DIAGRAM 12

Based on the above drawing we will make the first step. To do this you move the support back on the tailstock side, set the depth of shaving by the cross spindle (about 0.0197") and move the support against the spindle head in the familiar way by rotating the linear spindle (1.181" according to the drawing.) This procedure is repeated until the diameter of 0.276" has been attained.

The second step is cut in the same way.

For turning longer workpiece to a maximum diameter of 1/4" and when working with a three-jaw lathe chuck, the workpiece can be fed from the left through the centre hole of the spindle.

Face (or transverse) turning :

Not only the convex surface of a cylindrical workpiece, but also its face surface, can be machined on a lathe. The turning of this surface is termed face (or transverse) turning. To face turn, the workpiece must be tensioned on the face plate or in a three-jaw chuck. The tool holder with the clamped-in turning tool is set up in such a way that an angle of 90 degrees is formed between the turning tool and the surface to be machined. The work movement is effected by actuating the transverse spindle and the adjustment of shaving in this case is by the linear spindle.

Use of turning tools :

In the tool box (Order No. 1099) there are 2 turning tools. The right handed Side Tool is for normal linear and transverse turning. The rough turning tool is intended primarily for rough turning, i.e. for the removal of large shavings, prior to precision turning to the exact diameter with the right handed side tool.

The point tool may also be used for the pre- (or rough) turning of face surfaces. It is also used for turning ring grooves. Regrinding of the tools contained in the tool box is only recommended in the case of the experienced home worker or modelmaker.

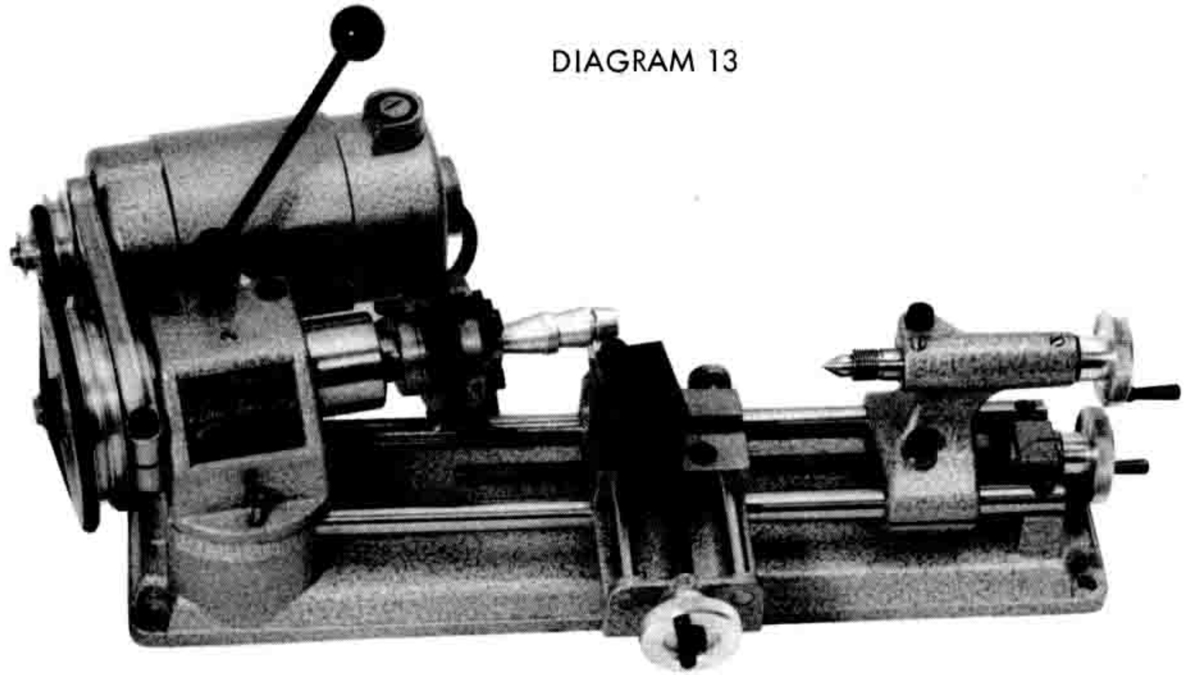
Other tools such as parting off tool, inside turning tool, left handed side tool, external threading tool, internal threading tool can be ordered as extras.

Conical (taper) turning:

For tapering, the spindle head is turned through the desired angel (division marking 5-5 degrees) after slackening off the tension screw and removing the marker pin and then re-clamping. If the cone should taper in the direction of the spindle head, the spindle

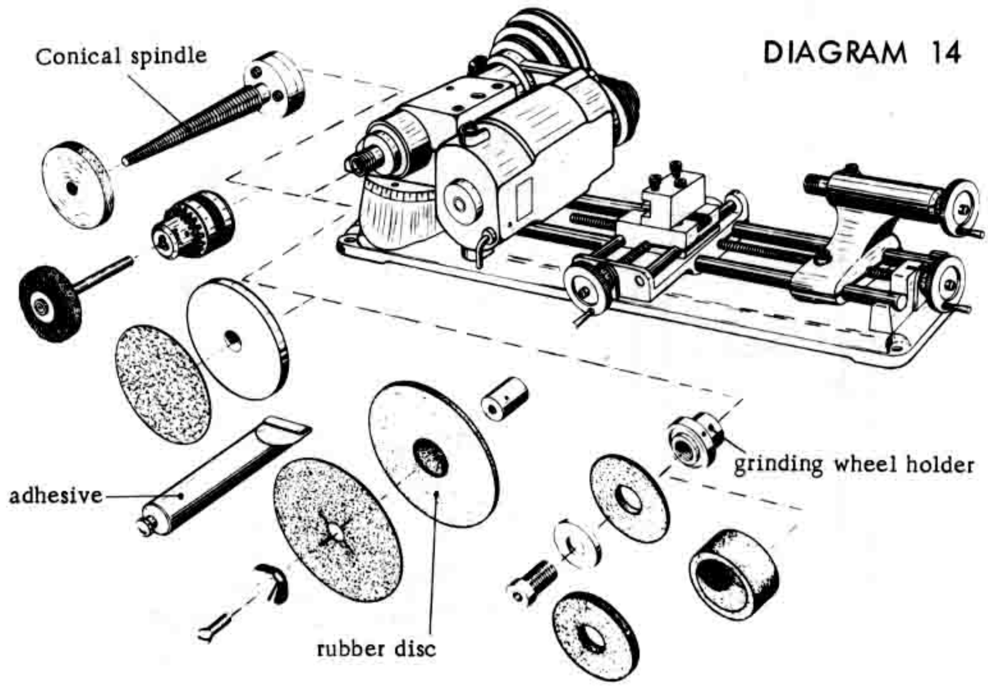
head must be adjusted anti-clockwise. The shaving here is direct on to the workpiece. Conical turning differs only in this respect from linear turning. To realign the spindle head the tension screw is slackened off, the spindle head is turned by hand to zero and recoupled to the marker pin. The tension screw is then tightened.

DIAGRAM 13



The UNIMAT as a grinding machine :

DIAGRAM 14



By mounting a grinding wheel on the grinding wheel holder supplied with the machine and by screwing the same on to the spindle of the spindle head sleeve the UNIMAT has been converted into a useful grinding machine (move tailstock and support right over to the right) and on it all normal grinding work which occurs in workshop practice can be performed. It is desirable to swing the spindle head out 90 degrees, so that on the one hand the grinding wheel is freely accessible and on the other hand the grinding dust does not foul the support guide.
It is expedient to cover the guide columns of the bed with paper. When sharpening tools one should take care to ensure that the angels which the various surfaces of the tool have to one another are retained. In other words, the newly ground surface must lie parallel to that formerly ground-. The beginner should let an expert show him tool grinding, which requires a certain amount of practice.

Surface grinding :

With the aid of a cup wheel simple surface grinding can also be carried out. For this work the tool is simply mounted on the support and clamped by means of a pivoted vice, so that it bears against the grindstone and projects over the support. Adjustment is by means of the linear spindle and the work movement is via the transverse spindle. The spindle head collar must be firmly clamped during grinding. From time to time the grinding wheel must be trued up with a diamond. Blows and knocks on the wheel are to be avoided.

The UNIMAT as a drilling machine :

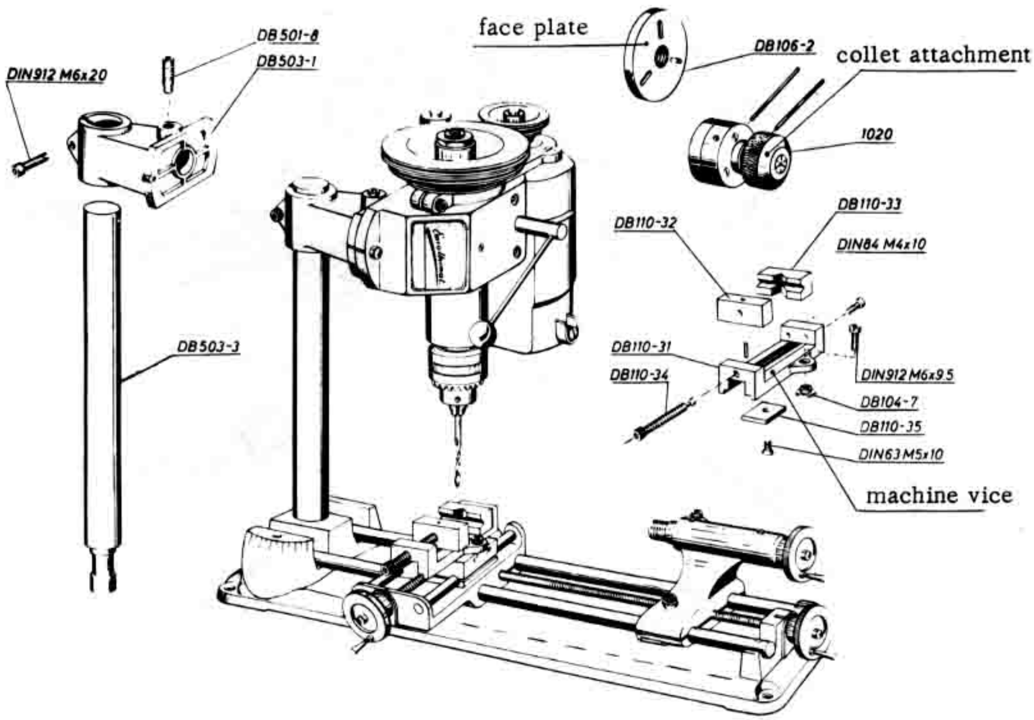


DIAGRAM 15

After slackening the tension screw on the machine bed underneath the belt pulley the complete spindle head and the motor can be lifted out. You can then as you wish, build up either a manual or an upright (or pillar) drilling machine. To make up a hand drilling machine you merely need to screw the drill chuck E 6 G on to the lathe spindle (tightly clamp head sleeve) and for better handling of the equipment secure the clamp head to the headstock.
To produce an upright (or pillar) drilling machine you require the vertical column supplied by us as part of the basic equipment, this being securely clamped by the tension screw to the lathe bed in place of the headstock. Then mount the clamp head on the vertical solumn and tighten it up. Fit the headstock on to the clamp head and clamp securely by means of the tension screw.

Vertical setting of the drill spindle :

For this purpose the surface plate is screwed on to the headstock sleeve in place of the drill chuck, the support slid under the surface plate and thereafter the whole headstock mounted on the support table after slackening off the clamping screw (on the clamp head). The vertical setting thus obtained is secured by fixing the tension screw on the headstock. The headstock can then be remounted at the top and the surface plate and drill chuck reversed. The height of the headstock is adjusted on the drilling column according to the height of the particular work-piece itself is normally laid upon the surface plate which serves as the drilling table, this being secured to the support by means of the grooved (or keyed) screw.
According to requirement oblique holes can also be drilled by distorting the headstock. The drill advance is achieved by slackening the two clamping screws on the headstock and turning down the pinion. (See Diagram 15). It is advantageous only to slacken off the two clamping screws to such an extent that the sleeve does not fall down by its own weight.

The UNIMAT converted in this manner into a drilling machine can also be used in this combination for surface tool grinding (sharpening) by the insertion of grinding tools (bits) or grinding wheels.

The UNIMAT as a milling machine :

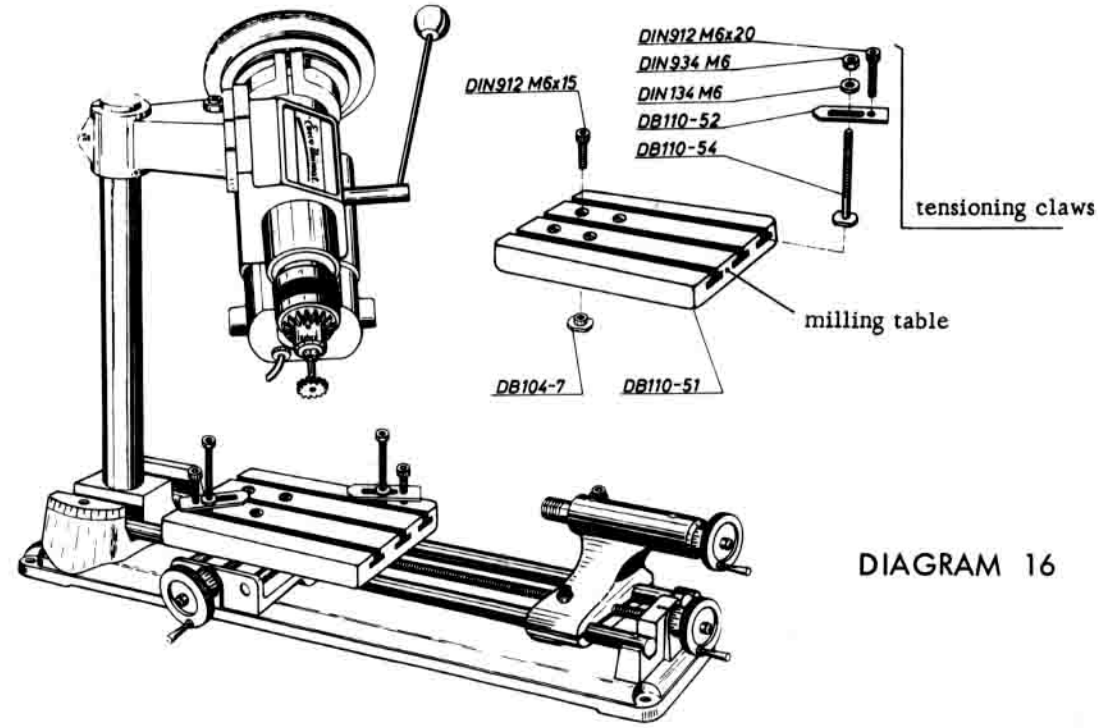


DIAGRAM 16

For milling, the UNIMAT is set up vertically as when used as a drilling machine. The milling cutter is held in the drill chuck screwed on to the spindle head sleeve (for precise tensioning use the collet attachment). According to shape, the workpiece is tensioned in the lathe chuck mounted on the transverse support by means of the grooved (keyed) screw (for round material), in the pivot vice with clamping width up to about 1.064" (for prismatic shapes), or on the milling table (larger and bulky pieces).
Tension screws are supplied with the milling table for workpieces of up to about 1.181" in height. The circular table (Order No. 1261) screwed to the lathe chuck flange may also be used as a milling table with the aid of the grooved (keyed) screw. The workpiece can be fixed on to the circular table with the tensioning claws supplied.
Height setting of the milling cutter is achieved by means of the rack and pinion gearing of the headstock sleeve (Slacken the clamping screw in the headstock, retightening again afterwards). The workpiece is advanced either by means of the transverse support or the linear support. The support, with which the shaving is fed and which does not move during the operation, must be fixed by means of its clamping screw.
The milling cutters contained in the tool box (slot cutter, cylindrical cutter and countersink) constitute universal tools, with which you can carry out all the normal milling work which crops up (vertical and plane milling, groove (or keyway) milling, hole cutting, etc.). By the removal of fine shavings of 0.008" to 0.04", according to material, even the beginner can obtain clean surfaces. The rotating speeds are taken from the speed tabulations.

The Universal Lathe Chuck and its assembly (Order No. 1001):

In the box you will find:
The lathe chuck, a chuck flange, 3 countersunk screws and 2 tension pins.

Fitting the flange to the three-jaw or four-jaw chuck :

Should you receive the chuck with the flange already mounted, the work described in the next paragraphs has already been done by us. The flange must not, therefore, be further machined. Before commencing to fit the UNIMAT Chuck, make sure, that both headstock and tailstock centres are exactly opposite to one another; if this is not so, this setting must be corrected, as explained in the chapter "Conical (taper) turning". Fitting of the chuck can then be proceeded with, the following sequence of operations being observed.

1.) After cleaning the threads of the chuck flange and the spindle nose, screw the flange on to the lathe spindle, as shown in the adjoining diagram (17), taking care that there is no play at the face surface of the flange.

2.) Clamp a point tool in the tool holder and carefully turn down the smaller diameter (turning diameter) of the flange, until the chuck bore (0.669" diameter) may be slid over this without any force, though without any play. Then cleanly face-turn the bearing (contact) surface.
The finished turned flange, after cleaning away the swarf, is lubricated with machine oil, the cleaned lathe chuck is fitted on and screwed firm with the three countersunk screws supplied.

If the chuck flange should have been turned down too small, you will notice this by undue knocking of the chuck. In such case a new chuck flange must be turned, which can always be obtained from us or from a tool shop.
We regret we cannot save you the work of fitting, as completely satisfactory running is only possible by turning the flange on the same machine on which the chuck will be used.

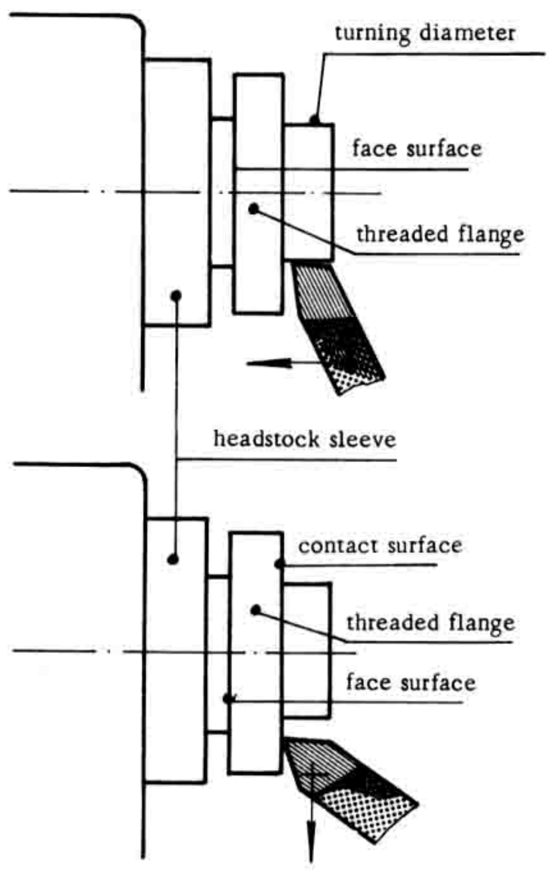


DIAGRAM 17

In the chuck supplied by us the jaws are mounted, stepped outwards. With this arrangement workpieces of smaller diameter (up to about 3/4") can be centrically tensioned from the outside, or ring-shaped or tubular parts from the inside, by means of the stepped guides (of the jaws). If the lathe chuck is to be used for clamping discs or parts of large diameter, the jaws must be mounted in reverse. The jaws are reversed in the following way :
The jaws are unscrewed and cleaned. Thereafter you must turn down the knurled tension ring until the beginning of the spiral thread comes immediately opposite the No. 3 groove of the jaw. Jaw No. 3 is then inserted in reverse and the tension ring rotated, so that this jaw is held firmly.
In the same way jaw No. 2 is then inserted in the guide groove No. 1 and lastly jaw No. 1

in the guide groove No.2. The jaws must then be screwed together at least until they can no longer hit against the guide culumns (pillars) of the UNIMAT.
If the jaws should have to be remounted, as originally, as outwardly stepped jaws, the procedure is the same, except that they are inserted in the numerical sequence 1,2, 3 in the identically numbered guide grooves.
To enable firm tensioning to be achieved, 2 tension pins are supplied with the lathe chuck.

The Four-jaw Lathe Chuck (Order No. 1001a):

With the three-jaw lathe chuck only cylindrical workpiece or symmetrically profiled workpieces (circular material, triangular, hexagonal, twelve-sided material) can be tensioned. The four-jaw lathe chuck has individually adjustable jaws, thus presenting the possibility of tensioning a variety of workpiece profiles - four or eight-sided material and non-symmetrical parts.
For precision machining , cylindrical parts can also be fully centralised in the four-jaw lathe chuck. For the assembly of the Four-jaw Lathe Chuck the same procedure applies as already explained in the previous paragraph "Flanging of the Lathe Chuck".

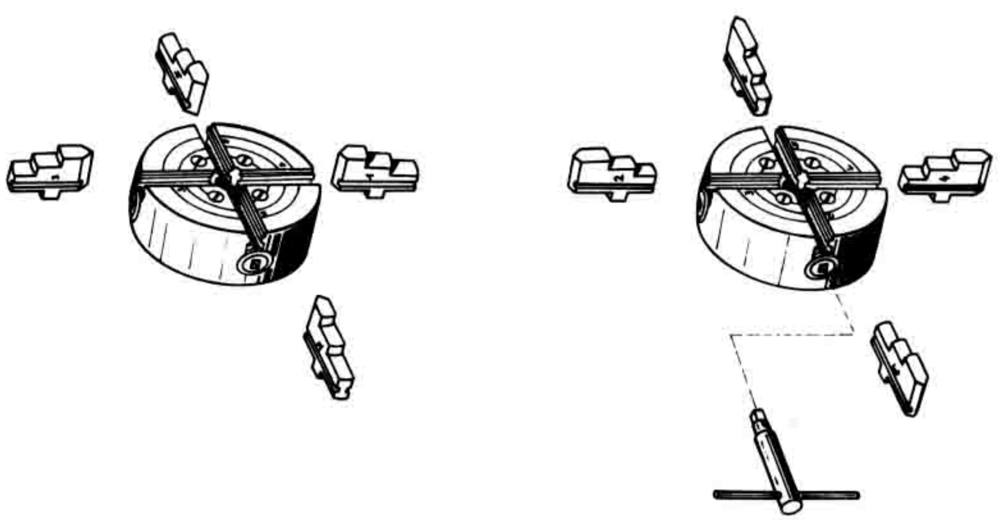


DIAGRAM 18

The Three-jaw Drill Chuck Part No.1005

This is for receiving spiral drills, centre drills, countersinks, milling and grinding cutters. It permits certain, centric tensioning of shank tools of up to 1/4" shank diameter.
For the clamping of workpieces for grinding, milling and drilling we supply a machine vice as an additional accessory.

DIAGRAM 19

Machine Vice. Order No.1010:

Fixing is by means of two T-nuts in the support, providing a secure tensioning device for all the operations described.
For work procedures, as described in the chapters "Grinding, Drilling and Milling" fixing direct to the support by means of tensioning claws may also be chosen as a simple method of clamping.

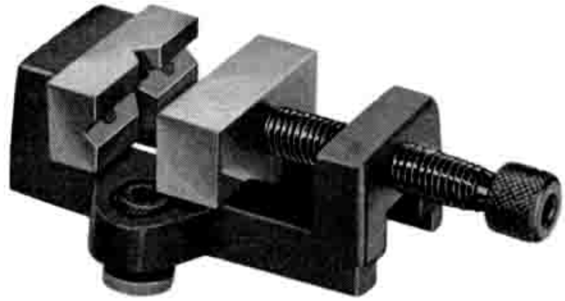


DIAGRAM 20

Milling Table. Order No. 1210 :

The milling table serves primarily for the clamping down of larger and bulky workpieces. By using this special accessory, the UNIMAT becomes an even better milling machine. The milling table has 4 fixing holes, into which two sunk hexagon headed screws with 2 T-nuts can be inserted if desired. The T-nuts are slid into the T-grooves of the transverse (or lateral) support and the table is firmly tensioned by tightening up the sunk hexagon screws. This enables the milling table to be set in the direction of the machine bed, i.e. vertical to it, as well as at an angle of 45° thereto. The type of device chosen for clamping depends both upon the kind of workpiece and on the milling work to be carried out. Clamping of the workpiece is done with the aid of the tensioning claws supplied.
The milling table is also used as a mount for drilling larger workpieces, in place of the surface plate mounted on the support, particulary where it is desirable to secure the workpiece by means of screws. The location of the individual holes can be adjusted for this purpose by means of the longitudinal or lateral support.

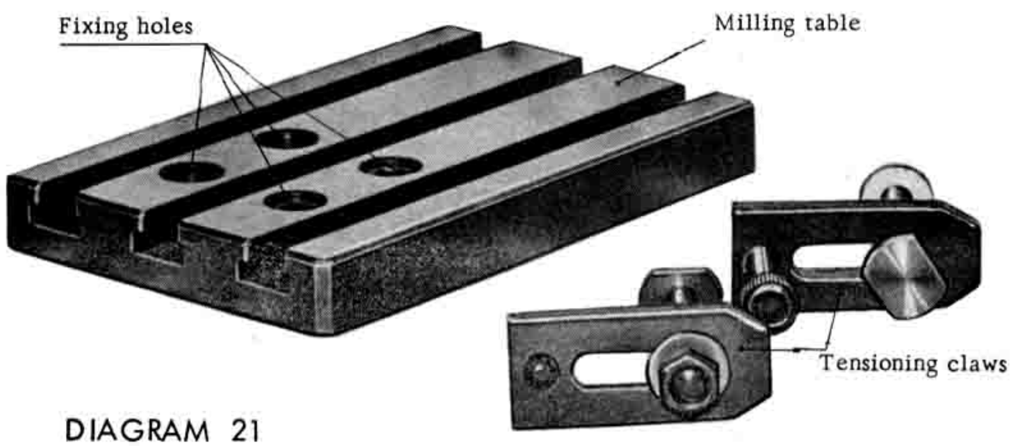


DIAGRAM 21

Flexible Shaft. Order No.1250:

This device is intended for carrying out drilling, grinding, polishing, engraving and similar operations on larger or irregular workpieces, which cannot be executed on the stationary machine. The machine itself is used here purely as a driving unit. The hand spindle has the same spindle nose as the main spindle on the stationary machine, so that all the tools of the standard machine accessory, such as drill chuck, lathe chuck, grinding wheel flange, can also be used here.

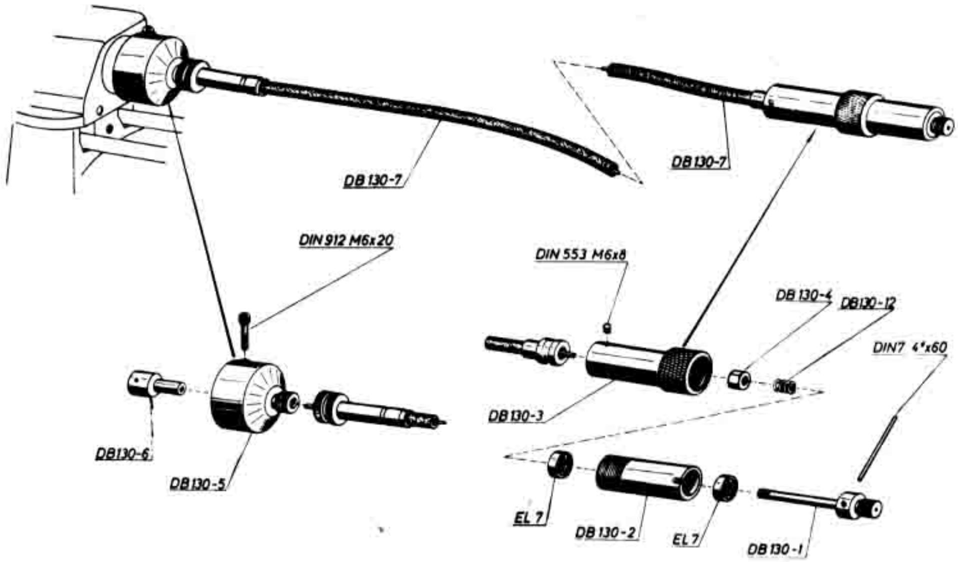


DIAGRAM 22

Assembly of the flexible shaft :

The internally threaded carrying bush (see Diagram 22) is screwed on to the spindle nose of the UNIMAT. Slide the cup over the spindle stock sleeve and securely clamp by means of the clamping screws. Then insert the square head of the flexible shaft into the square hole of the carrier bush and screw the knurled union (or cap nut) of the flexible shaft on to the thread of the cup, thus connecting the shaft securely (against pull-out) to the drive. (No rough milling, use only drills up to 1/8" maximum diameter, speed 3750 r.p.m. maximum). The tool must not jam, otherwise there is a danger of fracturing.

The steady rest. Order No. 1040:

This constitutes an auxilary guide for long, thin diameter turning parts and prevents vibration and knocking of the workpiece. The steady rest is mounted on both guide columns of the bed and firmly clamped. The pass through aperture goes up to 1.378".

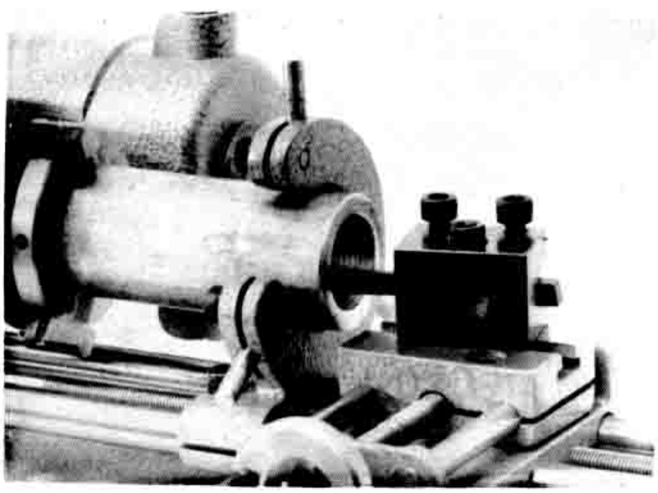


DIAGRAM 24

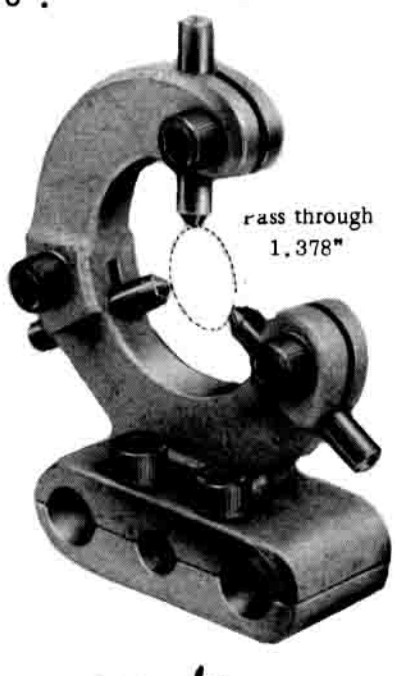
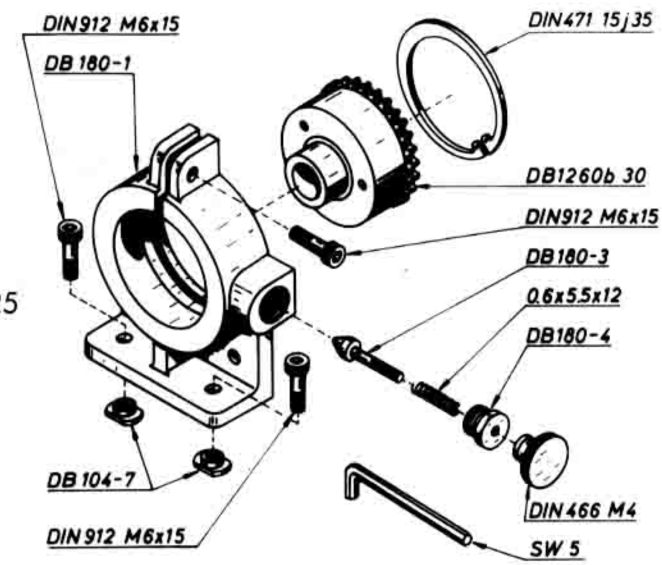


DIAGRAM 23

The Indexing Attachment. Order No. 1260 :

The indexing attachment is secured to the transverse support by means of 2 T-nuts (use the short 'Allen' type key supplied).
Two tensioning positions of the indexing attachment, vertical to each other, on the machine are possible.

DIAGRAM 25



With the working axis in the horizontal position, as illustrated, the indexing attachment is used for the milling of all types of gear wheels and the milling of grooves (keyways) in the shell of cylindrical workpieces. With the working axis in the vertical position radial grooves can be milled, dial plates drilled, etc. The indexing possibilities of the index plate supplied by us number 48 maximum, and accordingly the index numbers 2, 3 ,4, 6, 8, 12, 16, 24 and 48 are possible. Should you require other divisions, you can purchase other index plates from us. The indexing possibilities may be seen in the adjoining tabulation.

Tensioning the workpiece in the indexing attachment :

We differentiate between 2 possibilities :
The Universal-Lathe-Chuck (without threaded flange) is used for the tensioning of studs, plates, rings. The lathe chuck is screwed to the indexing attachment with the 3 countersunk screws M4 x 25 (as otherwise on the threaded flange).

The Circular Table. Order No. 1261 :

is secured to the indexing attachment in the same way (with 3 countersunk screws) and serves to tension asymmetrical workpieces by means of tensioning claws. In the round table there are, besides, 3 M6 threaded holes for the insertion of retaining screws (locking screws). These provide a further clamping possibility, particulary for workpieces which are drilled and slotted. The workpiece is secured to the round table by means of M6 screws and shims. It sometime suffices for the screw to be located at the very edge of the workpiece, so that the head of the screw grips the workpiece and tensions it securely.

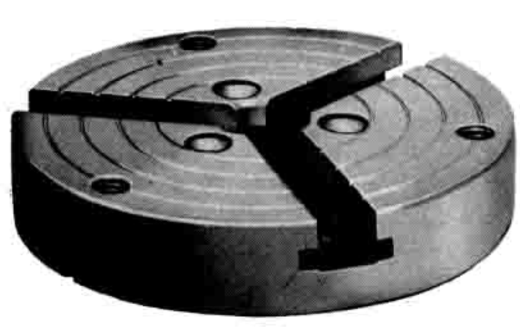


DIAGRAM 26

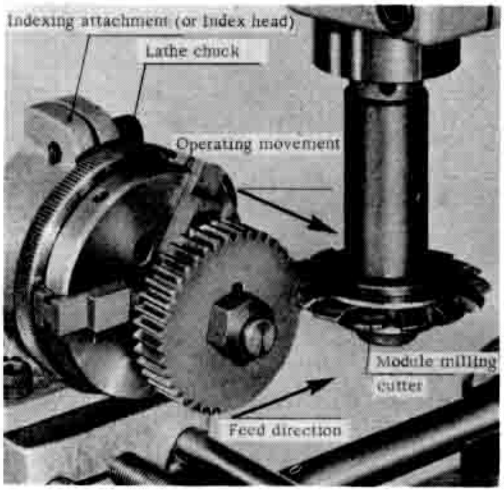


DIAGRAM 27

As an example of work let us explain the milling of spur gear wheels. The UNIMAT is set up as a vertical machine. Mount the indexing attachment, complete with lathe chuck installed thereon on the transverse support in such a manner (see Diagram 27), that the work axis is horizontal. Clamp the workpiece in the universal lathe chuck (gear wheel with shaft can be clamped direct in the chuck, gear wheel without shaft, but drilled, is provided with a drift for working, the drift being clamped in the lathe chuck). Insert the index bolts (Diagram 25) into one of the grooves of the index plate. Fix the index plate with the clamping screws - clamp the tooth shaping cutter on to the tension drift, which is screwed on to the spindle stock sleeve - adjust height with the spindle stock sleeve rack (tooth tip of milling cutter must be at the height of workpiece centre) - clamp spindle stock sleeve.
Set the first shaving by means of the transverse support (milling cutter touching outside diameter of workpiece). Move back workpiece and indexing attachment by means of the transverse support and set depth of teeth by turning the longitudinal spindle. Clamp the longitudinal support firmly during operation (otherwise it will chatter) and with the transverse support mill the bottom land of the tooth.
Second tooth : Move back the workpiece with transverse support - undo the clamping screw - withdraw the index bolts slightly - index again to the desired index amount - let the index bolt rest in the groove and clamp tight - otherwise proceed as before.
Note : By glancing at the clamp slot the number of division marks on the index plate can be seen.
In the position of workpiece and milling cutter decribed other types of work can also be carried out. Milling of keys, hexagons and squares of screw heads, radial grooves (keyways) in plates, etc.

Operations with working axis of index head in vertical position :
(Drilling of dial plates, Face cutting of keyways (grooves), etc.)

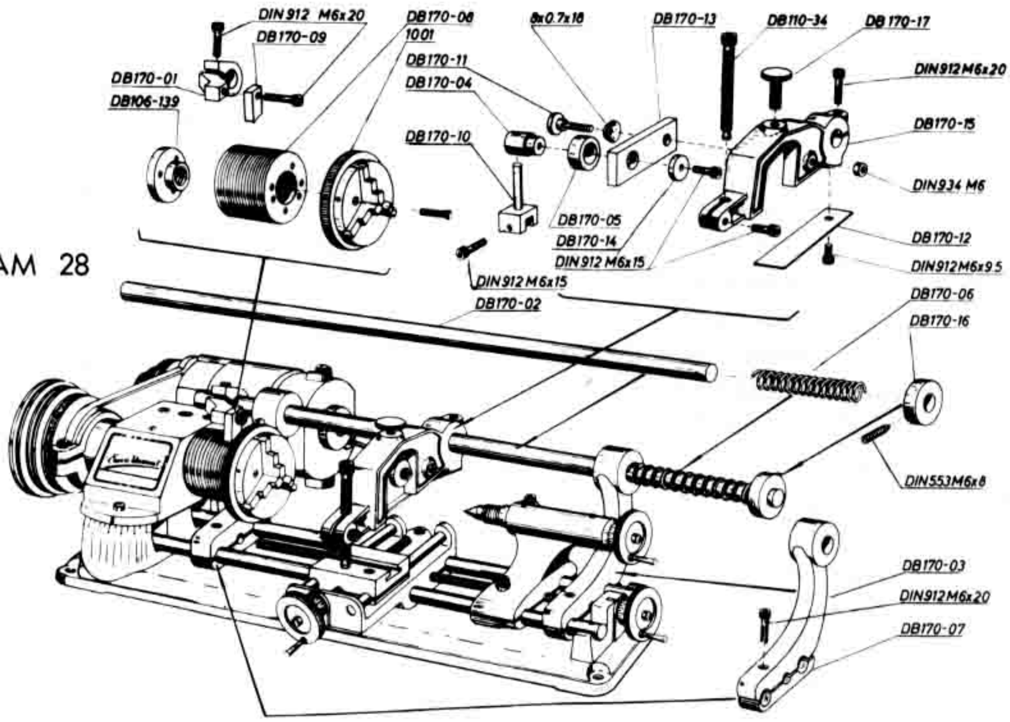
Fix indexing attachment to support with T-nut (same procedure as before, but swing index head through 90 degrees). Clamp workpiece in lathe chuck or on to round table, indexing procedure as for gear wheel milling.
Please note : Before each work procedure always clamp index head firmly.

After removing the snap ring the index plate can be exacted and exchanged for another one. (See tabulation.)

Order No.	Index Plate Number :	Indexing possibilities
1260 b	30	2 3 5 6 10 15 30
1260 c	36	2 3 4 6 9 12 18 36
1260 d	40	2 4 5 8 10 20 40
built-in	48	2 3 4 6 8 12 16 24 48

The Thread Cutting Appliance. Order No. 1270 :

DIAGRAM 28



This is a further auxiliary equipment for the UNIMAT, on which all external and internal threads can be cut. We supply all the associated accessories for it (leaders and followers) (Diagram 28) for the production of various metric or Whitworth thread pitches.

Pitch, metric threads :	0.5	0.7	0.75	0.8	0.9	1.0	1.25	1.5				
Whitworth threads : Threads per inch :	16	18	20	22	24	28	32	36	40	48	50	56

Thread cutters for internal and external threads may be obtained from us. For other shaped threads (trapesium, flat and round threads) appropriately ground cutters must be used.
In addition you will require the Universal Lathe Chuck and chuck flange for clamping the workpiece.
The mounting of the thread cutting appliance will be clear from Diagram 28.

Mount the two angular brackets DB 170-03 on the guide columns of the machine bed. For long workpieces, for which the tailstock must be moved fully to the right you can firmly clamp the right- hand angular holding bracket also to the left of the tailstock on to the guide columns. The Universal-Lathe Chuck must be loosened on the threaded flange and then the chuck flange only screwed on to the spindle head sleeve. Fit the leader on to the chuck flange so that the cup-shaped leader locates over the pushed out spindle head sleeve.(Push the spindle head sleeve right out in the direction of the tailstock.) Then firmly tension the spindle head sleeve again by means of the two clamping screws. Mount the lathe chuck on to the rim of the threaded flange which projects through the leader and secure the chuck and leader with the 3 countersunk screws M4 x 30 to the flange.