



**Harrison**

# **Harrison AA**

**13in swing variable speed precision centre lathe**

## **machine manual**

# machine manual

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# Machine Specification (U.S.A)

## 330mm (13in) swing VARIABLE SPEED CENTRE LATHE

630mm MODEL – 630mm (25") between centres

This machine is manufactured to British metric standards throughout.

A left or right hand apron handwheel and either Metric or English drive screws (together with the appropriate micrometer dials) are optional variations.

### summarised specification

<b>Centres</b>	Height . . . . .	167mm (6 $\frac{2}{16}$ " )	<b>Feeds</b>	16 Metric (R.10 Series)	from .015 to .5mm/rev.
	Admits between . . . . .	635mm (25")		16 English . . . . .	from .0005 to .020"/rev.
<b>Swing</b>	Over Bed . . . . .	330mm (13")	Cross-Feeds Half Longitudinal Values		
	Over Cross Slide . . . . .	210mm (8 $\frac{1}{4}$ " )			
	In Gap	Diameter . . . . . 480mm (19")	<b>Cross Slide</b>	Width . . . . .	140mm (5 $\frac{1}{2}$ " )
	Length . . . . . 115mm (4 $\frac{1}{2}$ " )	Travel . . . . .		190mm (7 $\frac{1}{2}$ " )	
<b>Spindle</b>	Bored to Pass . . . . .	38mm $\varnothing$ (1 $\frac{1}{2}$ " $\varnothing$ )	<b>Top Slide</b>	Width . . . . .	82mm (3 $\frac{1}{4}$ " )
	Nose . . . . .	No. 4-D1		Travel . . . . .	92mm (3 $\frac{5}{8}$ " )
		Camlock	<b>Tool</b>	Max. Section . . . . .	16 x 20mm (5/8" x 3/4")
Morse Taper in Nose . . . . .	No. 5	<b>Tailstock</b>		Quill - Diameter . . . . .	42mm (1 $\frac{3}{4}$ " )
in Bush . . . . .	No. 3		- Travel . . . . .	110mm (4 $\frac{3}{8}$ " )	
			- Morse Taper . . . . .	No. 3	
<b>Speeds</b>	Infinitely variable		Set-Over . . . . .	$\pm$ 12mm ( $\pm$ 1/2")	
	ranging from . . . . .	35-3000 rpm			
<b>Motor</b>	(1200 rpm @ 60Hz)	2.2kW 3hp	<b>Weight</b>	630mm Model	
<b>Leadscrew</b>	Diameter . . . . .	28mm (1 $\frac{1}{8}$ " )		630mm (25") Cts . . . . .	610 kg (1350 lb)
	Thread . . . . .	6mm pitch or 4 TPI			
<b>Threads</b>	39 Metric Pitches . . . . .	from 0.1 to 7mm pitch			
	35 English Pitches . . . . .	from 1 to 28 TPI			
	18 Module Pitches . . . . .	from 0.15 to 1.75 mod			
	18 Diametral Pitches . . . . .	from 4 to 28 DP			

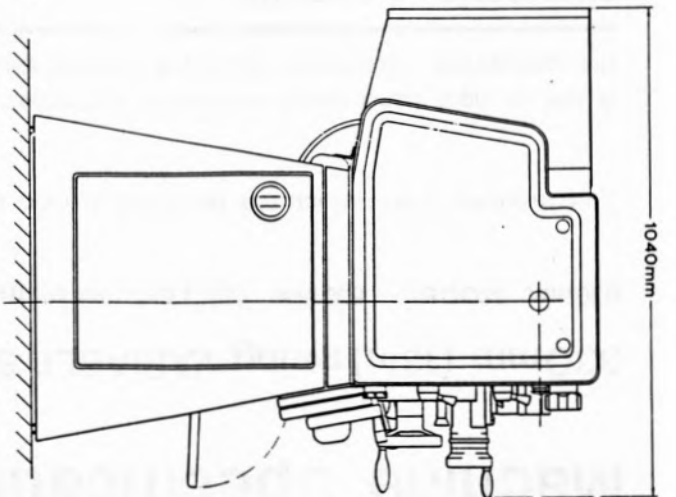
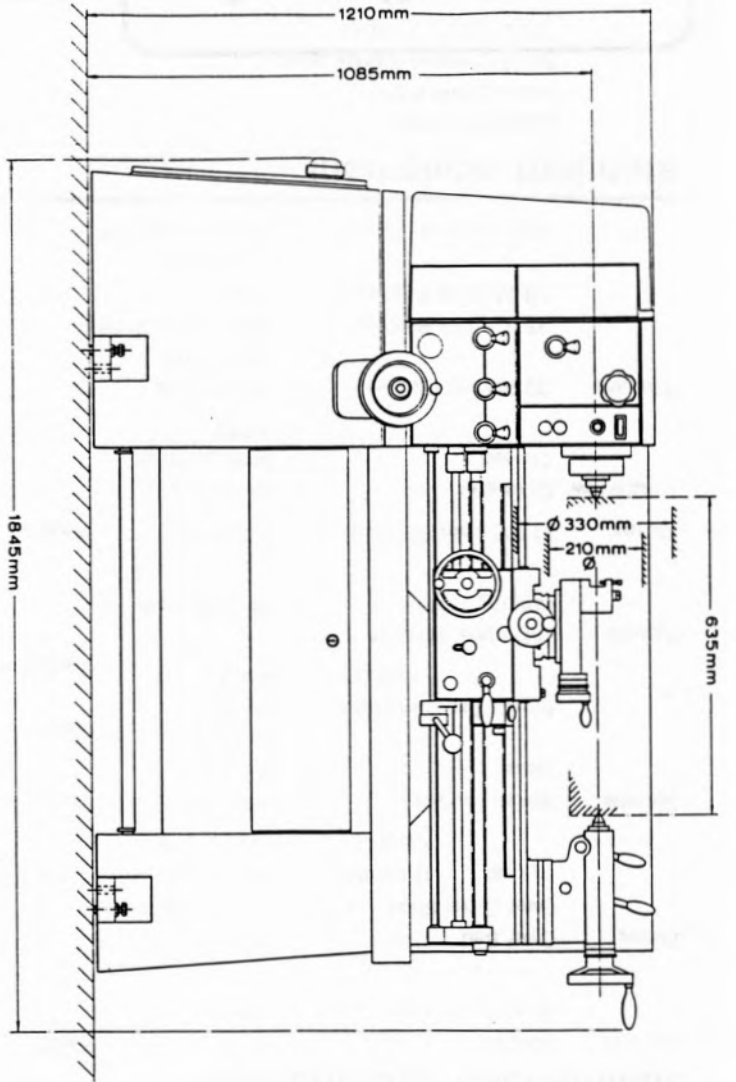
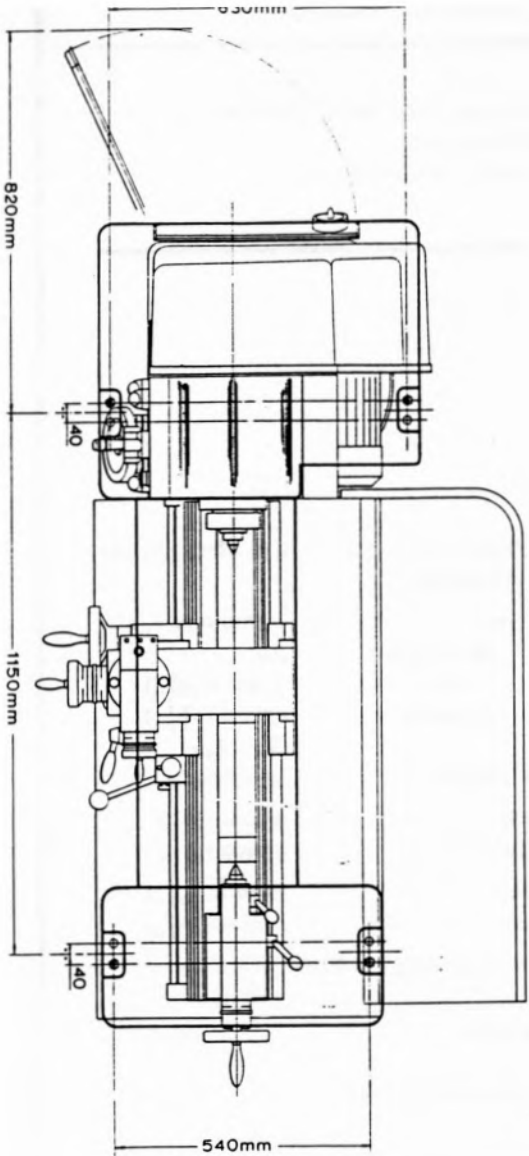
### standard equipment

Single Toolpost  
Work Driver Plate  
No. 5/3 Morse Centre Bush  
2 No. 3 M.T. Centres

Spanners, Keys and Oil Gun  
Machine Manual  
& Standard Inspection Certificate

*Illustrated or specified data is not binding in detail: The manufacturers reserve the right to modify design, specification and price without notice.*

# **Installation**



**GRVS330-001**

## Lifting

The approximate weights of the machine are: -

630mm Model (630mm/25 " between centres) - 610 kg (1350 lbs)

The machine should be lifted using the eye-bolt supplied (SEE GENERAL ARRANGEMENT AND FOUNDATION PLAN) with the apron/saddle assembly positioned, as despatched, towards the tailstock end of the bed.

## Cleaning

Bright surfaces are coated with an anti-corrosive compound at despatch and this must be completely removed using White Spirit or Paraffin (Kerosene) before operating the controls or moving the slides. DO NOT USE CELLULOSE SOLVENTS. Oil the bright surfaces and slideways AFTER CLEANING. (see Lubrication diagram).

## Positioning

Locate the machine on a solid foundation allowing sufficient area for operation and maintenance access. (SEE GENERAL ARRANGEMENT AND FOUNDATION PLAN).

The lathe may be used when free standing, but for maximum performance it should be bolted down.

- (1) Free standing. Position the machine on its foundation and adjust each of the four levelling screws to take an equal share of the weight. Then using an engineer's precision level on the bedways make further adjustments for level conditions.
- (2) Fixed installation. Position the machine over four 12 mm (1/2") diameter foundation bolts, set to suit the base. (SEE GENERAL ARRANGEMENT AND FOUNDATION PLAN).

Accurately level the machine as in (1), then tighten the foundation bolts evenly to avoid distortion and finally re-check for level conditions.

## Electrical Supply

External wiring should be of a permanent character and be undertaken by a competent electrician. Electrical entry is at the rear left-hand end of the cabinet. (SEE GENERAL ARRANGEMENT AND FOUNDATION PLAN).

Line connections should be to the isolator terminals and a substantial earth continuity conductor must be connected to the earth terminal on the panel. (SEE ELECTRICAL WIRING DIAGRAM).

Main spindle rotation must be anti-clockwise (looking from tailstock) for a downward movement of the spindle control lever. Interchanging two line connections should rectify wrong direction of rotation.

continued

## **Lubrication** ( Refer to Lubrication diagram)

Ensure that the headstock, gearbox and apron are filled to the level of the relevant oil sight windows - operate the centralised slideway lubrication system by pulling and releasing the knob at the bottom corner of the apron and oil the cross-slide nut, dials and changewheel stud etc. through the appropriate oil nipples using the oil gun provided.

## **Running-in**

For optimum bearing life and performance it is recommended that high spindle speeds be avoided during the initial life of the machine.

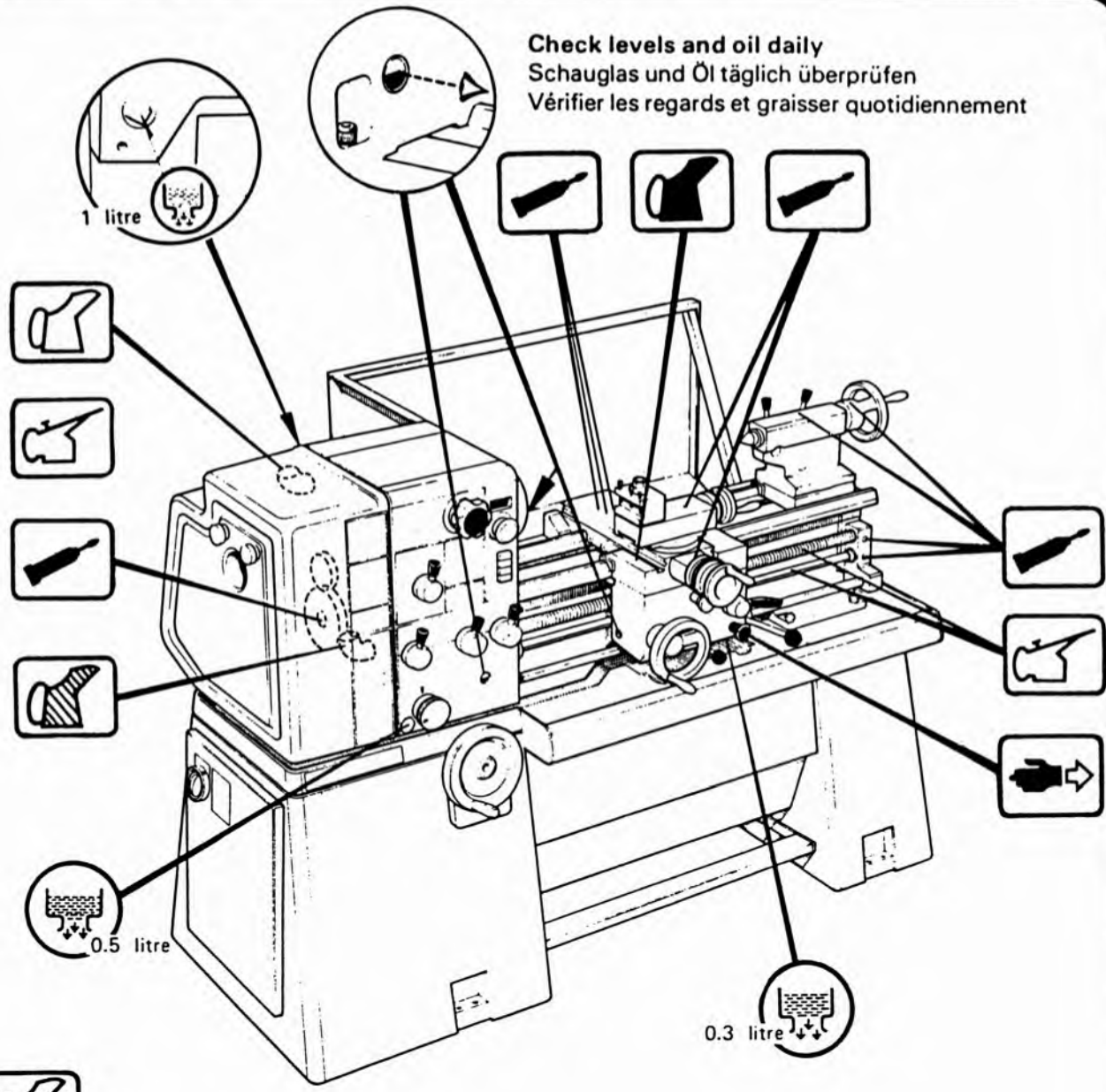
Alternatively a running-in procedure should be adopted as follows:-

Make a low feed rate selection and run the machine light for 3 hours at 540 rpm  
then for 2 hours at 800 rpm  
then for 1 hour at 1200 rpm  
then for 1/2 hour at 2000 rpm

# **Lubrication**



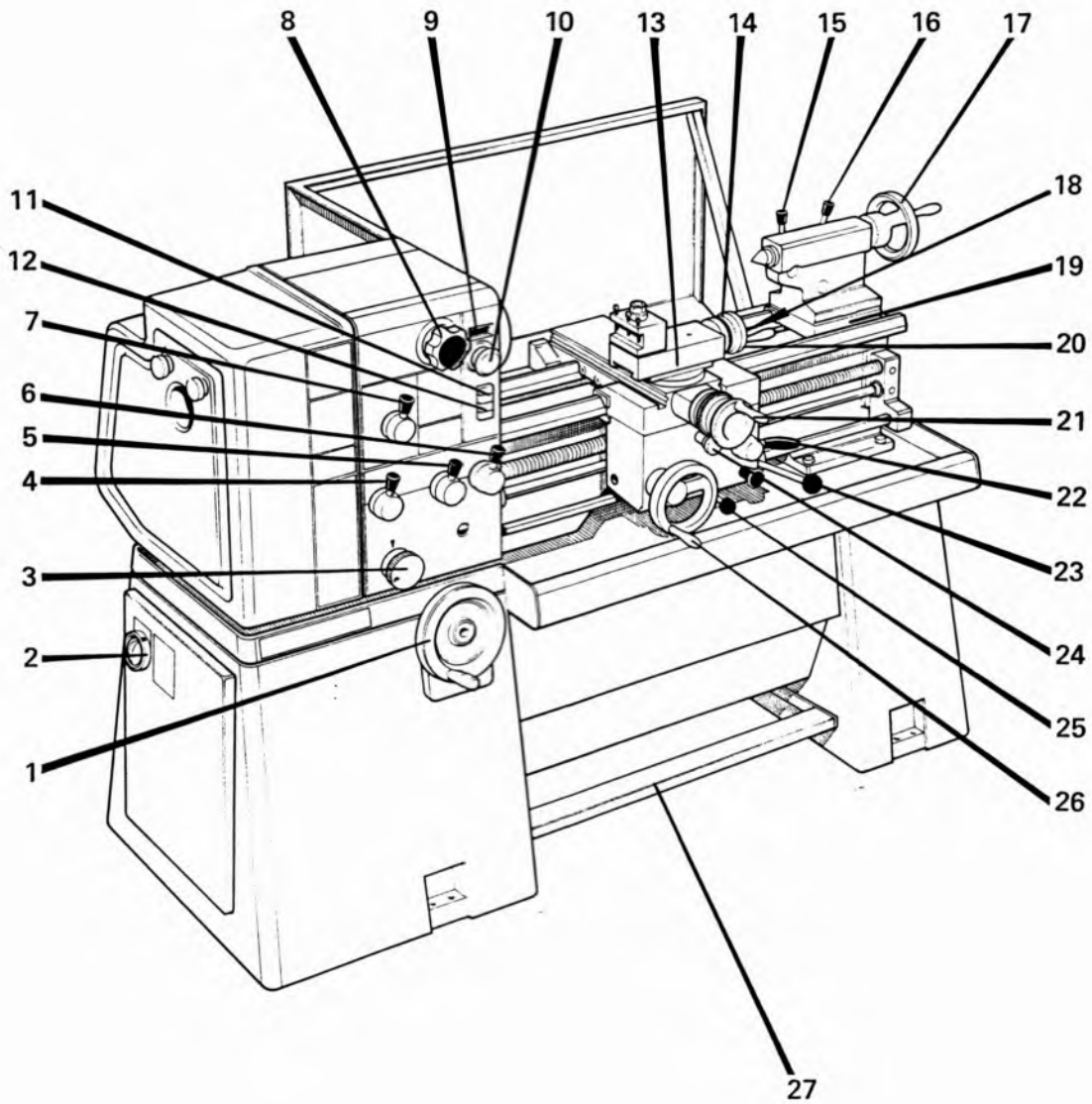
**Check levels and oil daily**  
 Schauglas und Öl täglich überprüfen  
 Vérifier les regards et graisser quotidiennement



- 
- 
- 
- 
- 

Mobil	BP	Castrol		Esso	Shell	TEXACO
DTE 24	ENERGOL HLP 32	HYSPIN AWS 32	P.W.L.A.	NUTO H32	TELLUS 37	RANDO HD32
DTE OIL HEAVY MEDIUM	ENERGOL HLP 68 (150)	HYSPIN AWS 68	P.W.L.C.	NUTO H68	TELLUS 68 OR R68	RANDO HD68
DTE OIL EXTRA HEAVY	ENERGOL HP150 (150)	ALPHA ZN220	WLM	NURAY 220	VITREA 220	REGAL R & O 220

## **Operation**



- |                               |  |                                     |
|-------------------------------|--|-------------------------------------|
| 1. VARIATOR HANDWHEEL         | 11. COOLANT PUMP PUSHBUTTONS                       | 19. TAILSTOCK SET-OVER SCREW        |
| 2. MAINS ISOLATOR             | 12. HYDRAULIC PUMP PUSH-BUTTONS                    | 20. CARRIAGE LOCK                   |
| 3. FEED SELECTOR DIAL         | 13. TOP SLIDE LOCK                                 | 21. CROSS TRAVERSE HANDLE           |
| 4. FEED SELECTOR HANDLE       | 14. TOP SLIDE TRAVERSE HANDLE                      | 22. THREADCUTTING ENGAGEMENT        |
| 5. FEED SELECTOR HANDLE       | 15. QUILL LOCK                                     | 23. SPINDLE CONTROL LEVER           |
| 6. FEED SELECTOR HANDLE       | 16. TAILSTOCK CLAMP                                | 24. FEED AXIS SELECTOR              |
| 7. FEED DIRECTION SELECTOR    | 17. QUILL TRAVERSE HANDWHEEL                       | 25. FEED ENGAGE                     |
| 8. SPEED RANGE SELECTOR DIAL  | 18. CROSS-SLIDE LOCK (In R.H. side of cross-slide) | 26. LONGITUDINAL TRAVERSE HANDWHEEL |
| 9. DIGITAL DISPLAY            |  | 27. BRAKE PEDAL                     |
| 10. EMERGENCY STOP PUSHBUTTON |  |                                     |

## Starting the Machine

1. Ensure that lubrication has been carried out in accordance with the Lubrication diagram.
2. Check that the spindle control lever (23) is in the central (STOP) position, the feed engage lever (25) and thread-cutting lever (22) are in the disengaged positions and that the changewheel cover is firmly secured in place.
3. Select - Feed Axis - i.e. cross or longitudinal by means of the apron push-pull knob (24).  
Select - Direction of feed - by means of the headstock lower selector handle (7)  
Select - \*Feed Rate - by referring to the charts on the headstock and selecting (in the sequence listed) the appropriate positions on the gearbox selector dial (3) and handles (4), (5) and (6). (Engagement of the feed gears may be assisted by turning the main spindle).  
Select - \*Speed range by means of selector dial (8).  
**IMPORTANT - Variator handwheel must not be rotated unless spindle is revolving**
4. Switch on the electrical supply at the mains isolator (2) which is the red knob at the L.H. end of the cabinet, when 'SUPPLY ON' will be indicated by four zero's registering on digital display (9).
5. Start the spindle in the direction of rotation required by lifting (FOR REVERSE) or lowering (FOR FORWARD) the "gated" spindle control lever (23) on the apron.
6. Spindle speed in selected range is obtained by rotating variator handwheel (1) until required speed is indicated on digital display (9).
7. Start and stop the feed motion as required by means of the feed engage lever (25).

## Stopping the Machine

The machine may be stopped in the following ways:

- Return the spindle control lever 23 to its central (STOP) position
- OR Depress the full-length foot-brake pedal 27
- OR Press the emergency stop push-button 10

## Operational Notes

- |                             |   |   |
|-----------------------------|---|---|
| CHUCKS                      | - | USE ONLY HIGH SPEED TYPES   |
| FACEPLATES                  | - | NOTE MAXIMUM SPEEDS:-<br>1200 rpm for 300 mm (12") dia.<br>and 800 rpm for 460 mm (18") dia.                    |
| COARSE FEED<br>THREAD RANGE | - | The coarser changewheel combinations 'G'<br>'H' or 'J' should not be used with spindle<br>speeds above 800 rpm. |

### NOTES

- \* Feed selections from the charts automatically disengage the leadscrew drive at the gearbox (i.e. by calling for selector position X) - and for minimum wear the thread indicator dial should be disengaged by swinging the pinion out of mesh with the leadscrew when not in use.

\*\* See Installation instructions (RUNNING-IN) if starting the machine for the first time.

continued

Operational notes continued

Micrometer dials are direct reading (for work piece diameter reduction on the cross-slide) and are of the friction-grip type for easy index settings.

Longitudinal traverse handwheel (26) may be disengaged by pulling it away from the apron face.

Tailstock set over adjustment - is provided in the form of socket screws (19) mounted in each side of the tailstock body, - a similar but 'location-screw' is fitted in the rear face of the body.

Set-over adjustment is made as follows: -

    Unclamp the tailstock - lever (16)

    Slacken the rear 'location-screw' (say one half turn)

Then – Alternatively slacken one set-over screw and tighten the other until the required setting is achieved.

Tighten the rear 'location-screw'

And Re-clamp the tailstock.

## MOUNTING OF CHUCKS, FACEPLATES and other SPINDLE MOUNTED ATTACHMENTS.

Ensure that the location faces on both nose and attachment are scrupulously clean.

Check that all the cams are in the release position (Fig. 1).

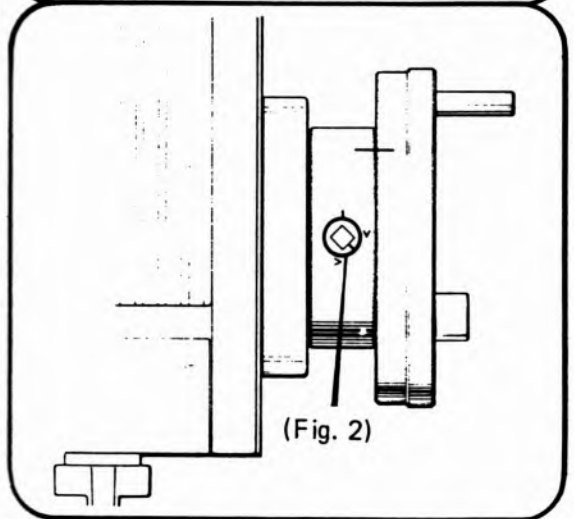
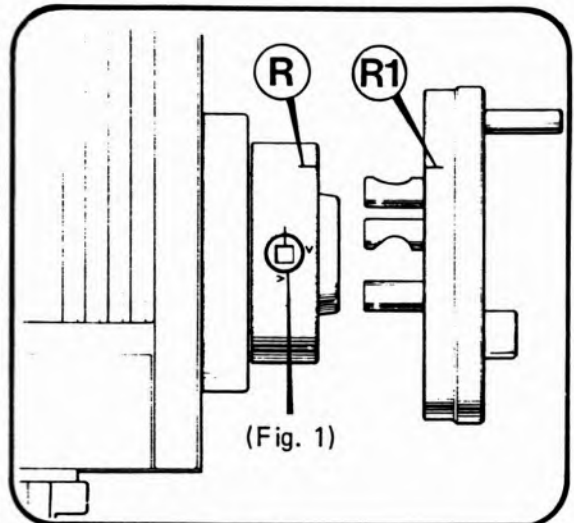
Mount the attachment on to the spindle nose and lock each cam by turning it clockwise using the key provided.

A reference line R1 (Fig. 1) should be scribed on each chuck or faceplate to coincide with the reference line R on the spindle nose. This assists subsequent re-mounting

### NOTE:-

For correct locking conditions each cam must tighten with its index line between the two vee marks on the nose (Fig. 2).

DO NOT INTERCHANGE CHUCKS OR OTHER SPINDLE MOUNTING ITEMS BETWEEN LATHES WITHOUT CHECKING EACH CAM FOR CORRECT LOCKING.



## TO ADJUST 'CAMLOCK STUDS'

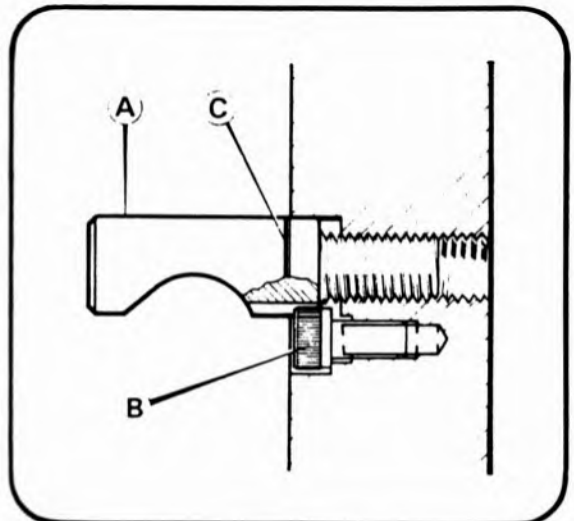
Remove Lockscrew (B).

Turn Stud (A) one full turn, in or out as required.

Re-fit and tighten lockscrew (B).

### NOTE:-

A datum ring (C) is marked on each stud as a guide to the original or initial setting.



## Spindle Nose

**(A) METRIC THREADS on METRIC LEADSCREW MACHINES**  
or  
**ENGLISH THREADS on ENGLISH LEADSCREW MACHINES**

For these threads it is recommended that the "thread indicator dial" be used - this allows the leadscrew nuts to be disengaged at the end of each screwcutting pass, provided that they are re-engaged in accordance with the chart mounted on the front face of the dial unit.

**METRIC LEADSCREW MACHINES**  
**(METRIC THREADS ONLY)**

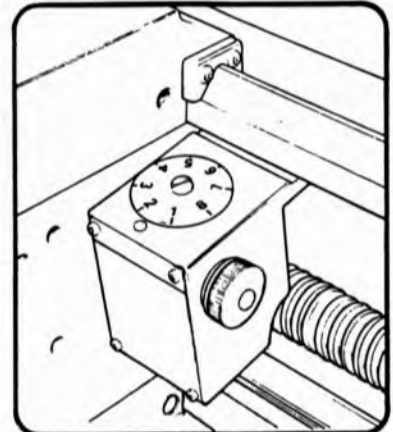
The chart shows:-

- in column 1. mm pitch to be cut.
- in column 2. (☛) The number of teeth in the 'pick-off gear' arranged to mesh with the leadscrew, (this being selected from the stack, stored on the bottom of the dial spindle).
- in column 3. The dial numbers at which the leadscrew nuts may be engaged.

**ENGLISH LEADSCREW MACHINES**  
**(ENGLISH THREADS ONLY)**

The chart shows:-

- in column 1. T.P.I. to be cut.
- in column 2. Dial numbers at which the leadscrew nuts may be engaged.



mm

☛	☛		☛	☛
.225	18 15	4	16 1-8	
.25	16 1-8	4.5	18 15	
.75	16 1-8	5	20 1357	
1	16 1-8	5.5	22 15	
1.25	20 1357	6	16 1-8	
1.5	16 1-8	7	14 15	
1.6	16 1357	8	16 1357	
1.75	14 15	9	18 15	
2	16 1-8	10	20 1357	
2.5	20 1357	11	22 15	
3	16 1-8	12	16 1-8	
3.5	14 15	14	14 15	
				812

ins

2	1-8	8	1-8	22	1-8
2½	15	9	1357	24	1-8
2½	1	10	1-8	26	1-8
3	1357	11	1357	27	1357
3½	1	11½	15	28	1-8
3½	15	12	1-8	30	1-8
4	1-8	13	1357	32	1-8
4½	15	14	1-8	36	1-8
5	1357	16	1-8	40	1-8
6	1-8	18	1-8	44	1-8
7	1357	19	1357	48	1-8
7½	15	20	1-8	56	1-8
					813

**(B) ENGLISH THREADS on METRIC LEADSCREW MACHINES**  
or  
**METRIC THREADS on ENGLISH LEADSCREW MACHINES**

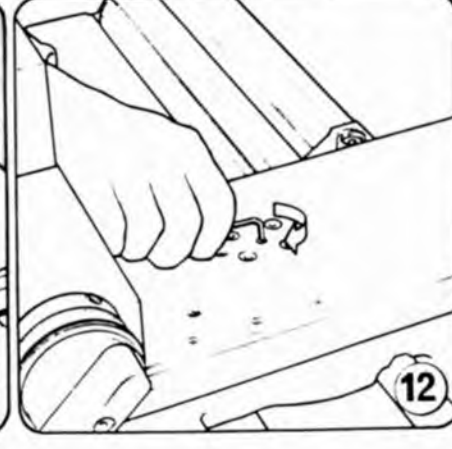
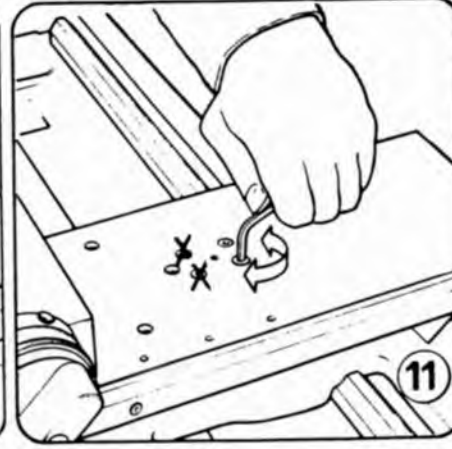
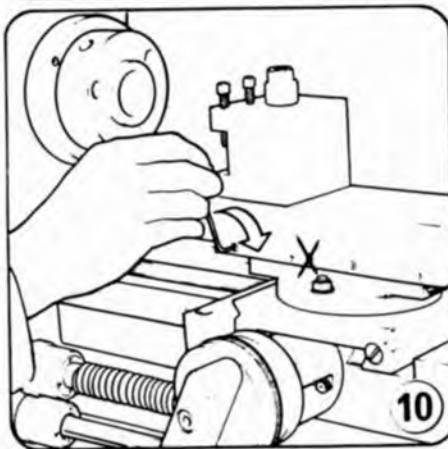
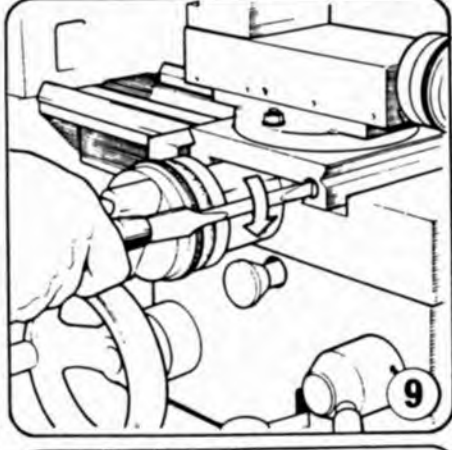
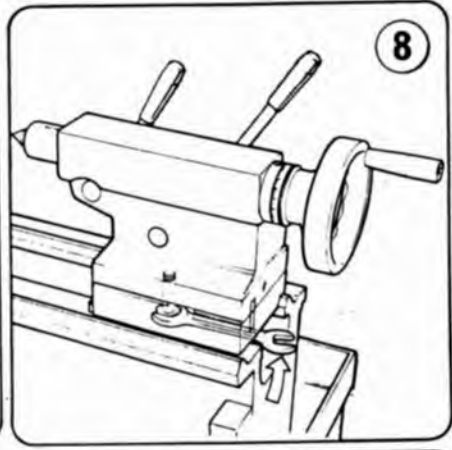
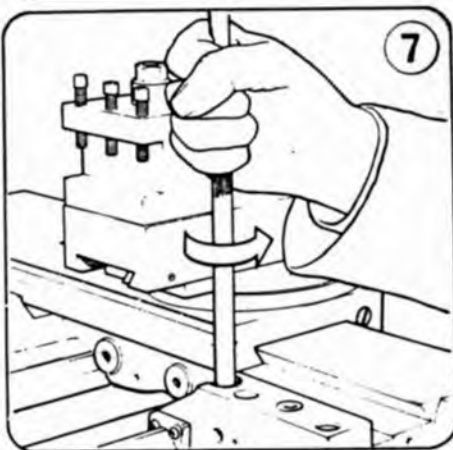
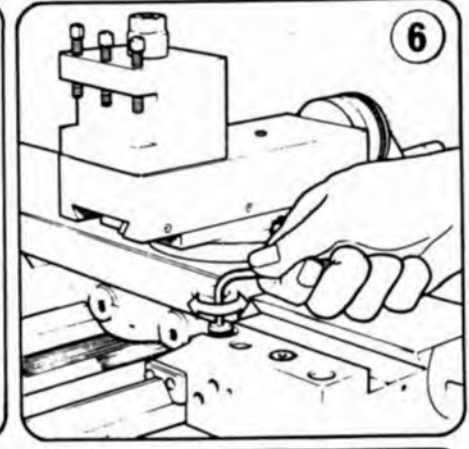
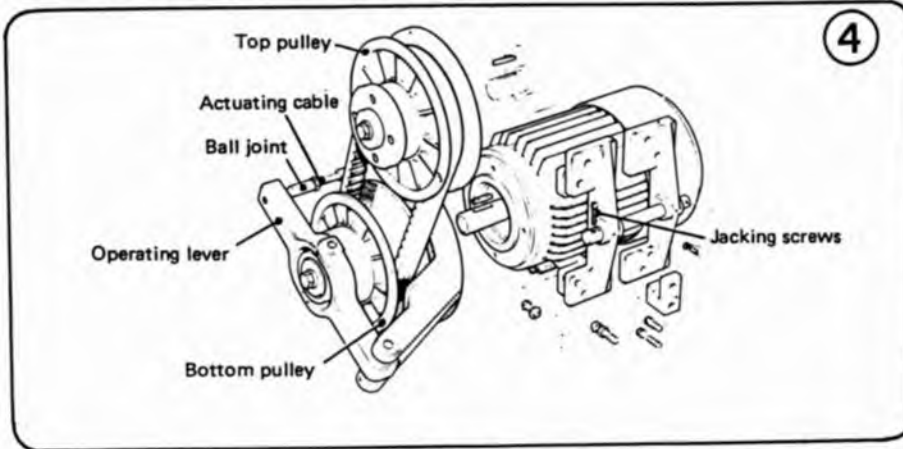
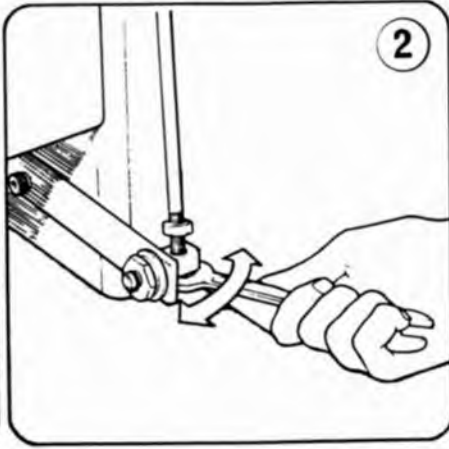
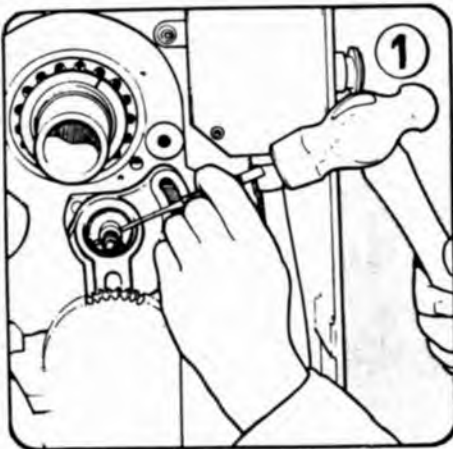
For these threads the leadscrew nuts are kept engaged throughout the cutting of any one thread. This involves reversing the whole drive by means of the spindle control lever 23 at each end of the screwcutting pass whilst at the same time relieving or increasing the cut as required.

(Threads 'A' may also be cut by this method).

## Thread – cutting

## **Maintenance**





## Changewheel Shear Pin (Fig. 1)

A protection against accidental overload in the end gear train is provided in the form of a shear pin fitted in the splined sleeve on the top changewheel shaft. In the event of replacement being necessary a 4 mm (5/32") diameter x 20 mm (3/4") long mild steel pin should be fitted as follows: -

Remove the hexagon nut, washer and changewheel, pull off the splined sleeve and remove the broken pin parts from both sleeves and shaft. Fit new pin.

NOTE: The pin acts in single shear and will only enter the sleeve from the 'big-hole' side.

## Brake Adjustments (Fig.2 and 3)

Adjustment for wear on the brake pad (which is mounted on the headstock pulley) is made at the pivot connection between the foot brake pedal and the vertical link rod. This is readily accessible from the rear of the machine where adjustment is made by turning the two locknuts on the link rod. A limit switch is mounted on the cabinet higher up the link rod and a slight re-positioning of the contact block may be necessary after adjustment for brake pad wear.

NOTE: The function of the limit switch is to cut-out the motor drive when the brake pedal is operated, i.e. the plunger should be depressed when the brake pedal is in its free position and released at the moment the brake pedal is operated.

## Variable Speed Drive Assembly

The expanding type pulley assembly is designed to operate at 223 mm centres. Any adjustment necessary to maintain this dimension can be made by removing the end drive guard and suitably correcting the motor position by means of the two jacking screws. (Fig. 4).

## Belt Replacement

With the spindle running, set the variator handwheel to within one turn of the minimum speed selection.

Bring the start/stop lever to the stop position and as the motor slows, but before it finally comes to rest, turn the variator handwheel one half turn to further reduce the speed and also to release the tension in the flexible actuator cable.

Remove end drive guard and inner cover plate to gain access to the drive.

Wedge a piece of wood between the tapered driving faces of the top pulley, to prevent closure when the actuating cable is released, taking care not to damage the faces. Beware of the heavy axial spring loading on this pulley. Release the nut locking the actuating cable to the ball joint attached to the operating lever and unscrew joint from the cable thereby allowing the lever to swing clear of motor pulley. Turn top pulley by hand to allow belt to be removed, then fit new belt.

Swing operating lever back into position and screw ball joint on to flexible cable to its original condition ensuring that the projection on the pulley bearing cover is located in the notch on the actuating sleeve.

continued

Remove wood wedge from top pulley.

Rotate the pulleys by hand to ensure correct seating of the belt.

Run the spindle to check that the correct overall speed range of 35 to 3,000R.P.M. can be achieved and if necessary make final adjustment at the ball joint, screwing clockwise for speed increase, anti-clockwise for speed decrease.

Re-clamp locknut on ball joint.

If there is any indication that the actual spindle speed does not correspond to that registered on the digital display then this can be checked by taking a tachometer reading of the spindle. Adjustment of the digital display to correspond to the tachometer reading can be made by the trimming screw incorporated on the printed circuit board situated in the electrical enclosure. It is advisable that any adjustment necessary be carried out by a competent electrician.

## **Saddle Strips** (Fig. 6 and 7)

Wear on the rear and front saddle strips may be accommodated by adjustment of the retaining sleeves located in the top face of the saddle; two for the rear and one each for the two front strips.

The procedure for adjustment is to first release the socket head screw, slightly turn the slotted head sleeve anti-clockwise and then re-clamp the cap screw. Care should be taken to avoid over adjustment; a 30° turn at the sleeve represents approximately 0.1 mm (.004") take up in the strip.

## **Tailstock Bed Clamp** (Fig. 8)

The angular lock position of the bed clamp lever is adjusted by means of the self-locking hexagon headed bolt located on the underside of the tailstock and between the bed ways.

## **Cross-slide** (Fig. 9)

Wear on the taper-gib strip may be adjusted for by clockwise rotation of the slotted head screw on the front face of the cross-slide. The procedure being to first slacken the similar screw at the rear then re-tighten this after adjustment to clamp the strip in its new position.

## **Top Slide** (Fig. 10)

Take up for wear on the top slide strip is by means of the four (self-locking) socket set screws in the front face of the top slide casting.

## **Cross-slide Nut** (Fig. 11 and 12)

Provision is made for the elimination of backlash in the cross-slide nut, the procedure for adjustment being as follows: -

Slightly release, only the rear pair of socket cap head screws in the top face of the cross-slide, turn the centre socket set screw in a clockwise direction as required then re-clamp the two rear cap screws. Care should be taken to avoid over adjustment; a 120° turn at the centre screw represents approximately 0.1 mm (.004") take up of backlash.

## FEEDSHAFT TORQUE LIMITING DEVICE

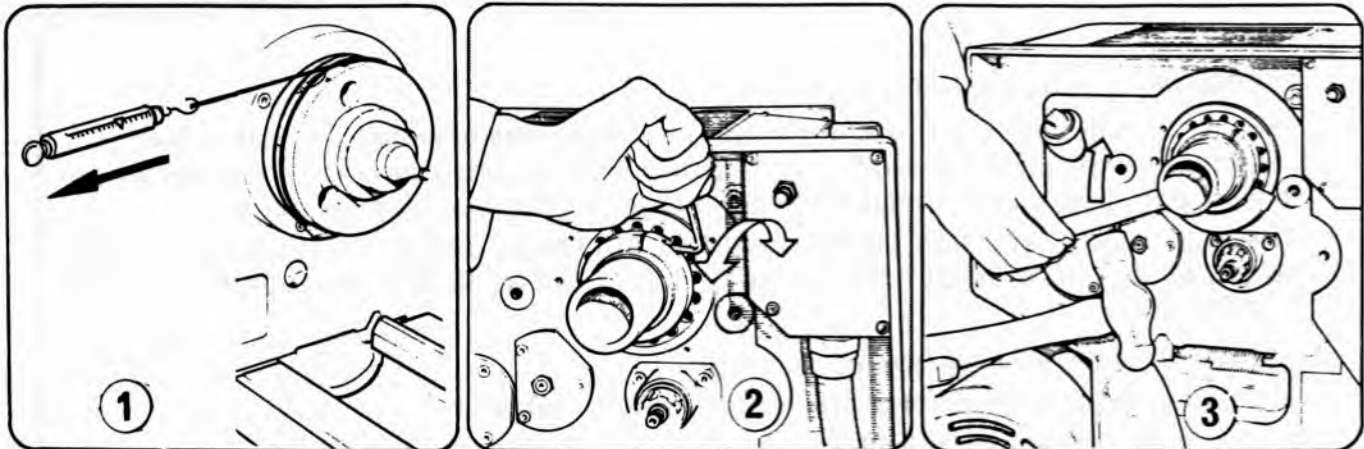
This unit (mounted at the L.H. end of the feedshaft) is provided to protect the gearbox and end drive from damage in the event of a 'collision' during the cutting cycle and is carefully set to a pre-determined slipping torque before the machine is dispatched from our works.

THE USER IS ADVISED NOT TO DISTURB THIS SETTING DURING NORMAL USE OF THE MACHINE, BUT TO CONSULT OUR SERVICE DEPARTMENT IN THE UNLIKELY EVENT OF A PROBLEM.

Adjustment may be achieved however as follows:

1. Slacken the two M4 socket grub screws on the R.H. O.D. of the unit.
2. Turn the inner adjusting ring (clockwise to increase slipping torque) by means of the two holes in the R.H. end face of the unit.
3. Re-tighten the two M4 'Locking' screws, on the O.D. of the shell.

An assessment of the slipping torque can be made by holding the apron handwheel in order to stop the saddle movement whilst the cutting traverse is in operation.



The spindle bearing assembly is carefully set before despatch of the Lathe from our Works which should ensure a high standard of performance without the need for further attention.

THE USER IS ADVISED NOT TO DISTURB THIS SETTING DURING NORMAL USE OF THE MACHINE AND TO CONSULT OUR SERVICE DEPARTMENT IN THE UNLIKELY EVENT OF A BEARING PROBLEM.

WHERE ADJUSTMENT IS UNDERTAKEN THEN IT IS ESSENTIAL THAT THE FOLLOWING PROCEDURES ARE STRICTLY COMPLIED WITH.

#### TO CHECK FOR CORRECT SETTING

Checks should be carried out with the headstock in a warm condition achieved by running at a spindle speed of 800 rpm for approximately ten minutes.

The correct bearing torque setting is 0.9/1.1 Nm (8/10 in lbs) and can be determined as follows (Fig. 1):-

Wrap a length of string approximately three turns around the body of the chuck.

To the free end of the string attach a light spring balance and pull gently until spindle commences to turn, continuing to apply a steady load just sufficient to maintain the spindle in motion and noting the steady load registered on the balance.

Example: Using a 160 mm (6¼ in) chuck, the spring balance reading should be 1.14/1.36 kg (2½/3 lbs).

#### BEARING ADJUSTMENT

Remove end drive guard, changewheels, swing frame and rear bearing cover.

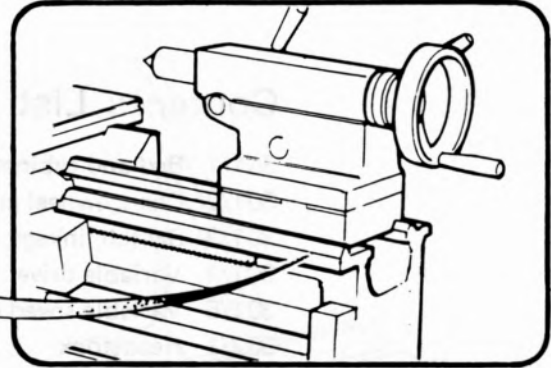
Release locking screw in the bearing adjusting nut, Fig. 2. With the pin-key provided adjust the nut as required - clockwise rotation to increase bearing load, Fig. 3. As over tightening will seriously impair the life of the bearings it is recommended that adjustment be made in increments not exceeding 3 mm (1/8 in) measured on the nut periphery. After each incremental adjustment, the spindle should be run for a few minutes and the bearing load re-checked, as described above.

# Parts Ordering Procedure

1

**Quote:**  
**Machine Serial Number**

which will be found stamped into the front face of the bedways at the tailstock end.



2

Refer to the appropriate assembly and

**Quote:**

**Individual Part Numbers taken direct from the Illustrations**

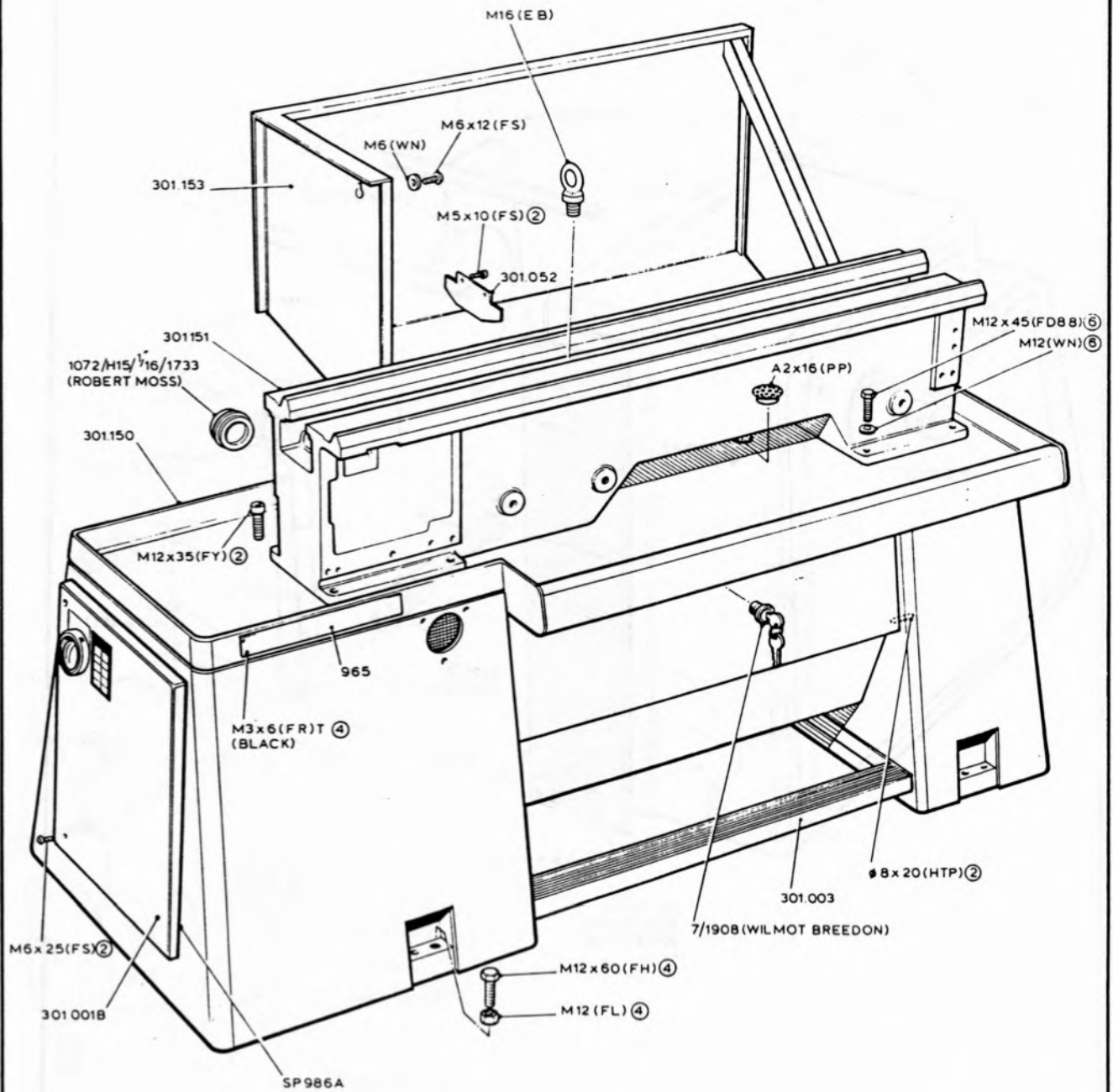
**NOTE:** Quantity used (when other than one) is given in a circle following the Part Number itself.

Standard/Proprietary Parts (i.e. items which can be purchased from local Engineering suppliers) may be identified by the "bracketed" letter code included in the Part Number, and reference to the appendix at the end of this manual will provide a full description of such items.

## Parts Section

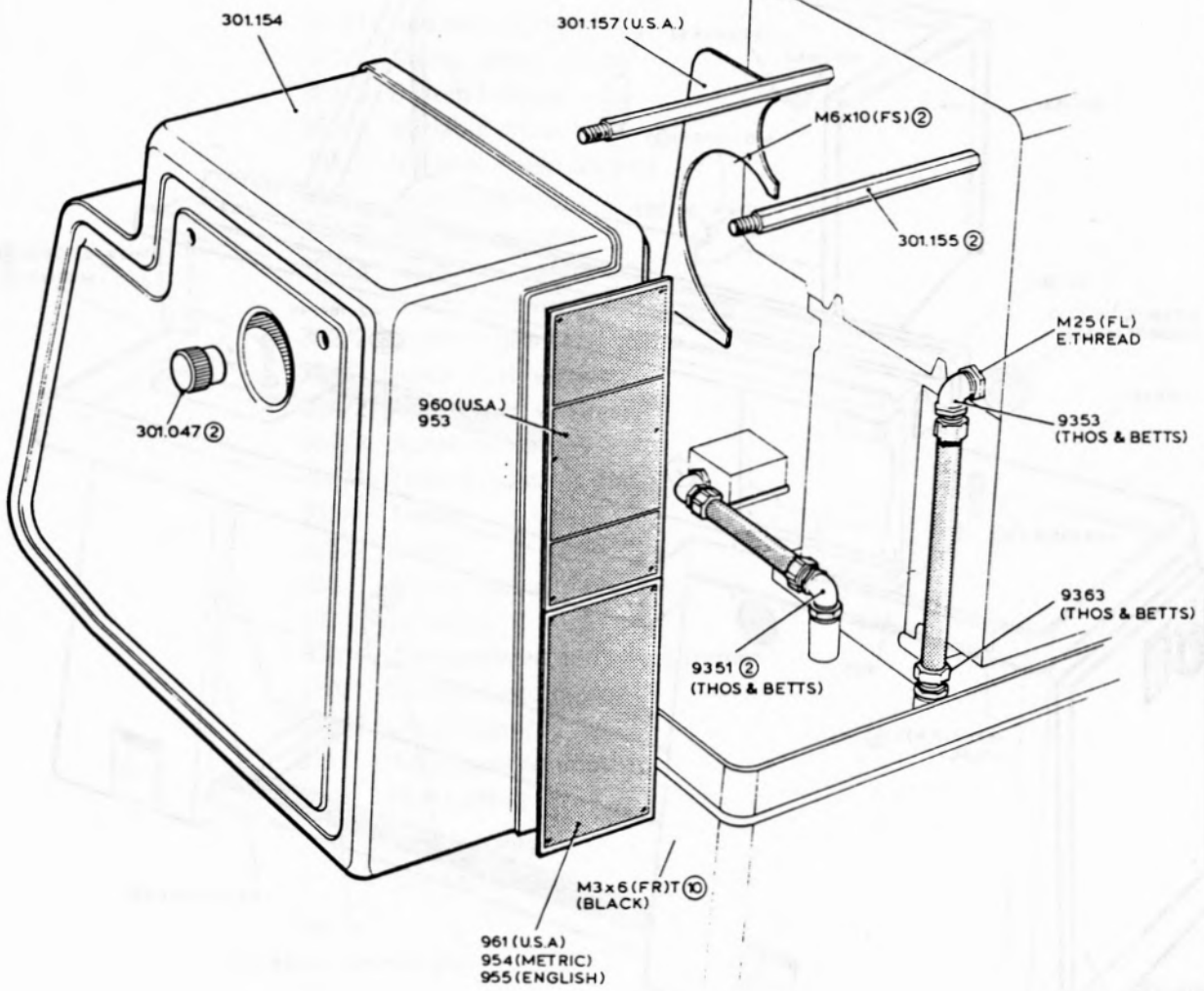
## Contents List

- 301/1 Bed and cabinet
- 301/2 Changewheel guards
- 301/3 Switch linkage
- 301/4 Variable drive
- 301/5 Variable speed control
- 302/1 Headstock
- 302/2 Headstock gears
- 302/3 Headstock controls
- 303/1 Gearbox controls and casting
- 303/2 Gearbox gears and shafts
- 304/1 Apron L.H. version
- 304/2 Apron R.H. version
- 304/3 Apron pump
- 304/4 Thread indicator dial
- 305/1 Saddle
- 305/2 Slides
- 306 Shafts, rack and bracket
- 307 Tailstock
- 308 Changewheels and swing frame
- 310/1 Standard equipment
- 310/2 Chuck guard
- 311 Additional equipment  
(See section list)
- Attachments  
(See section list)

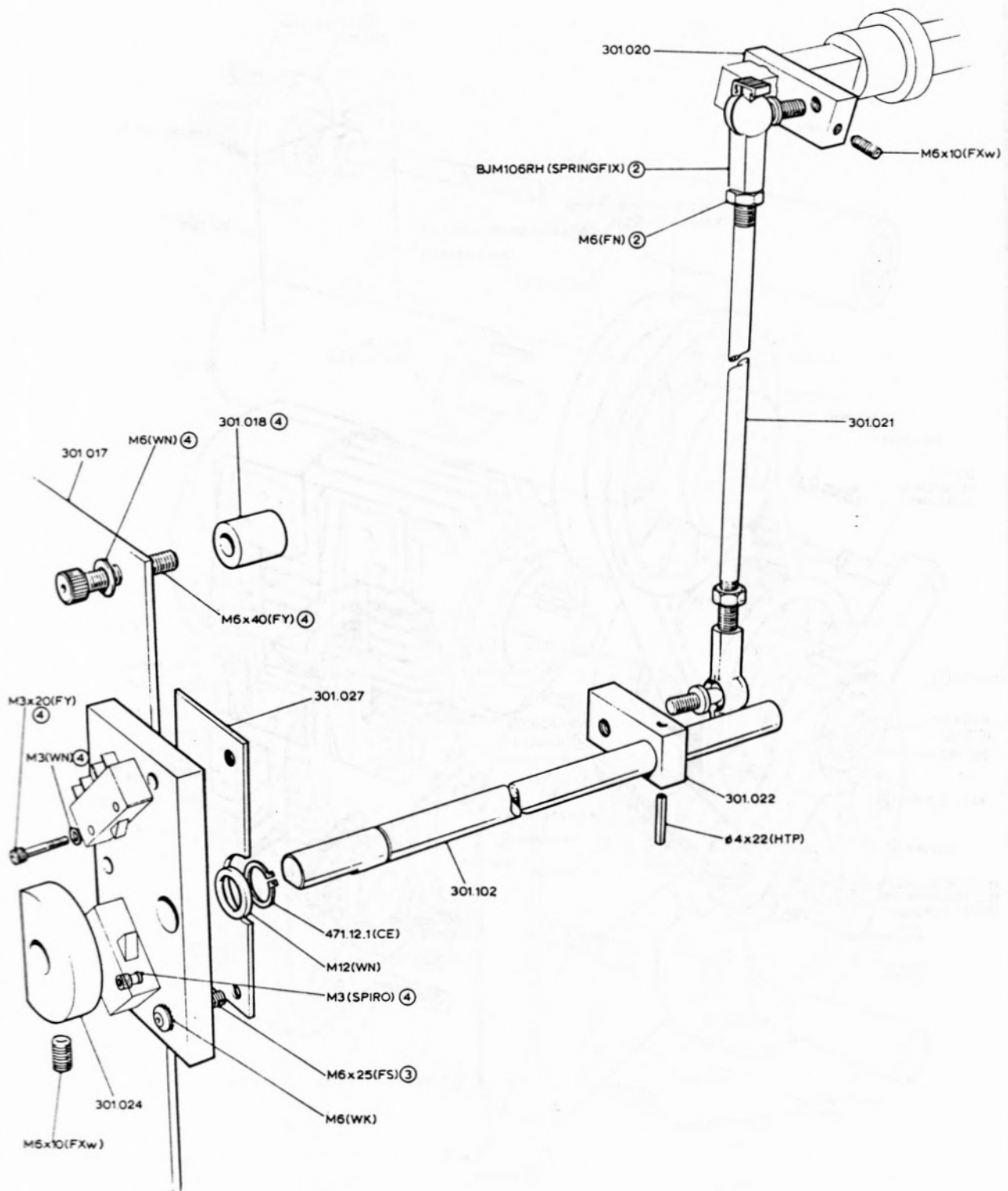


301/1

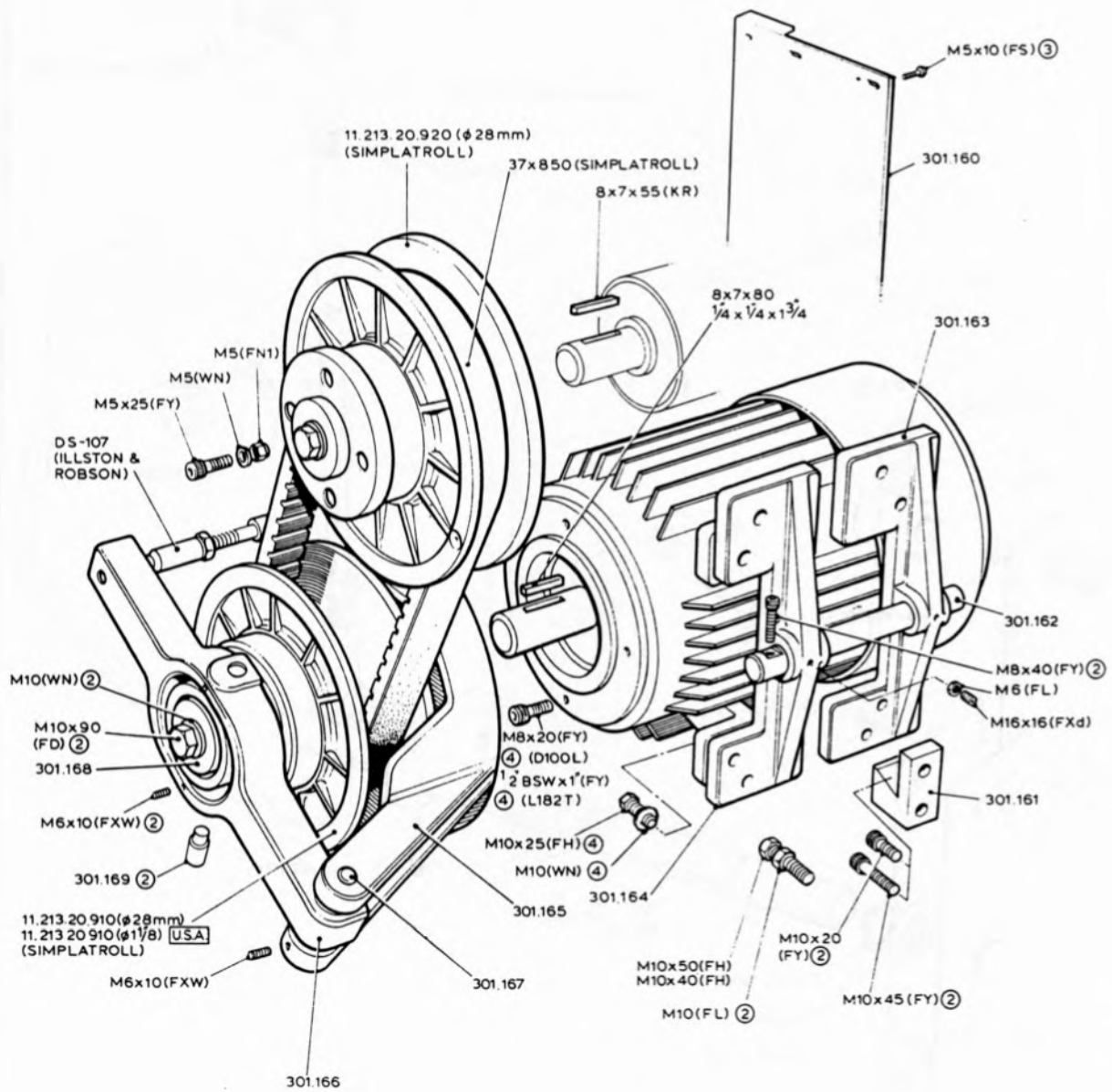




301/2

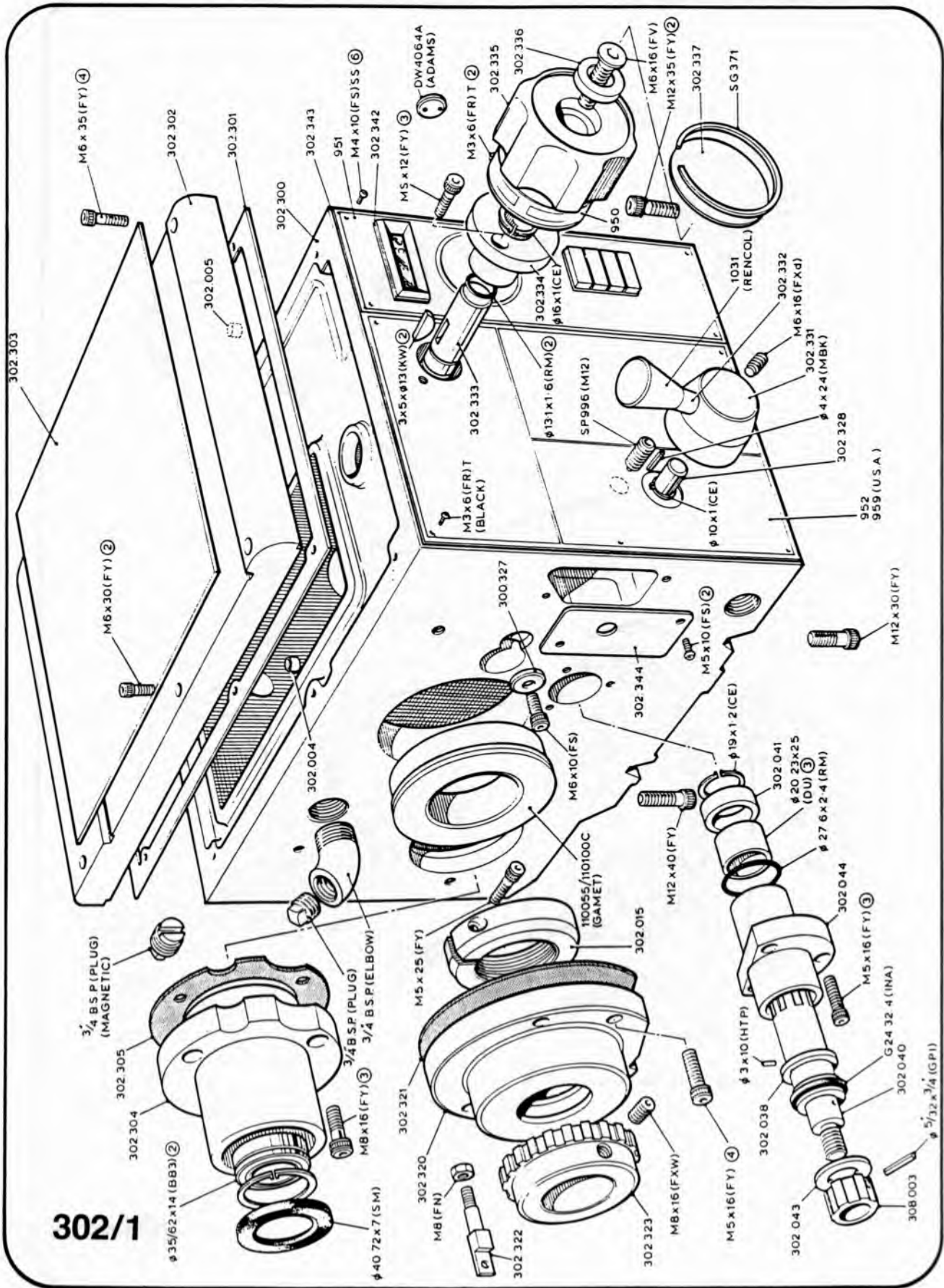


301/3



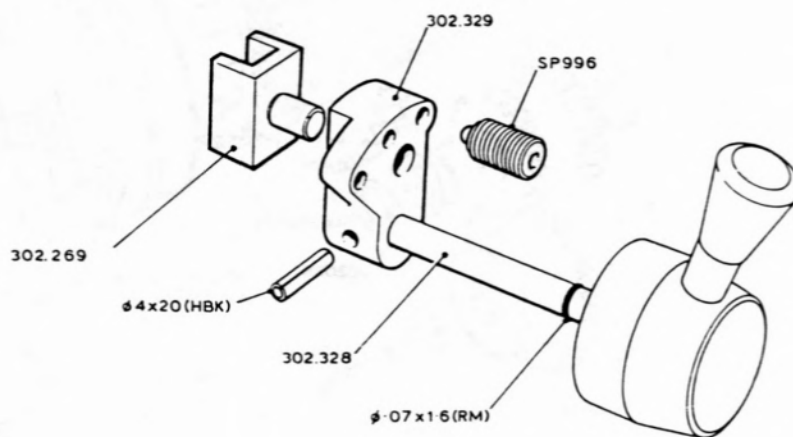
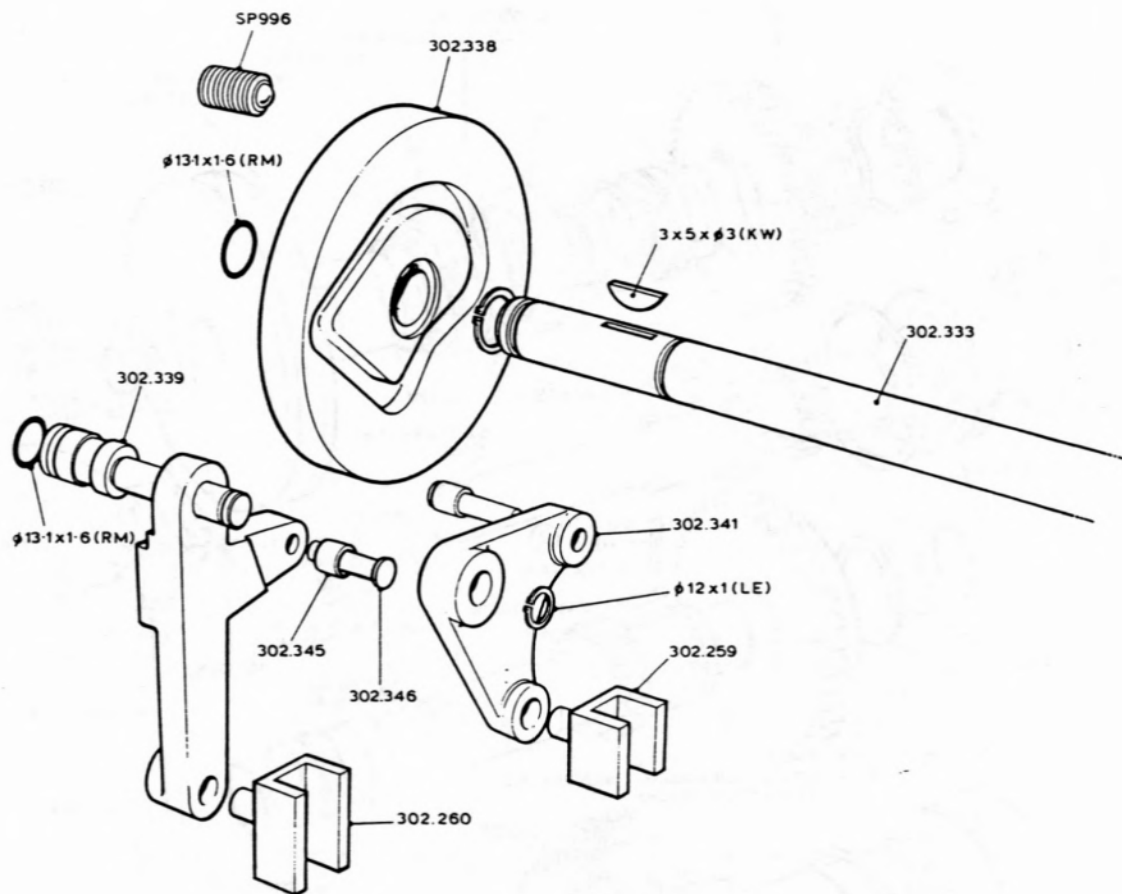
301/4



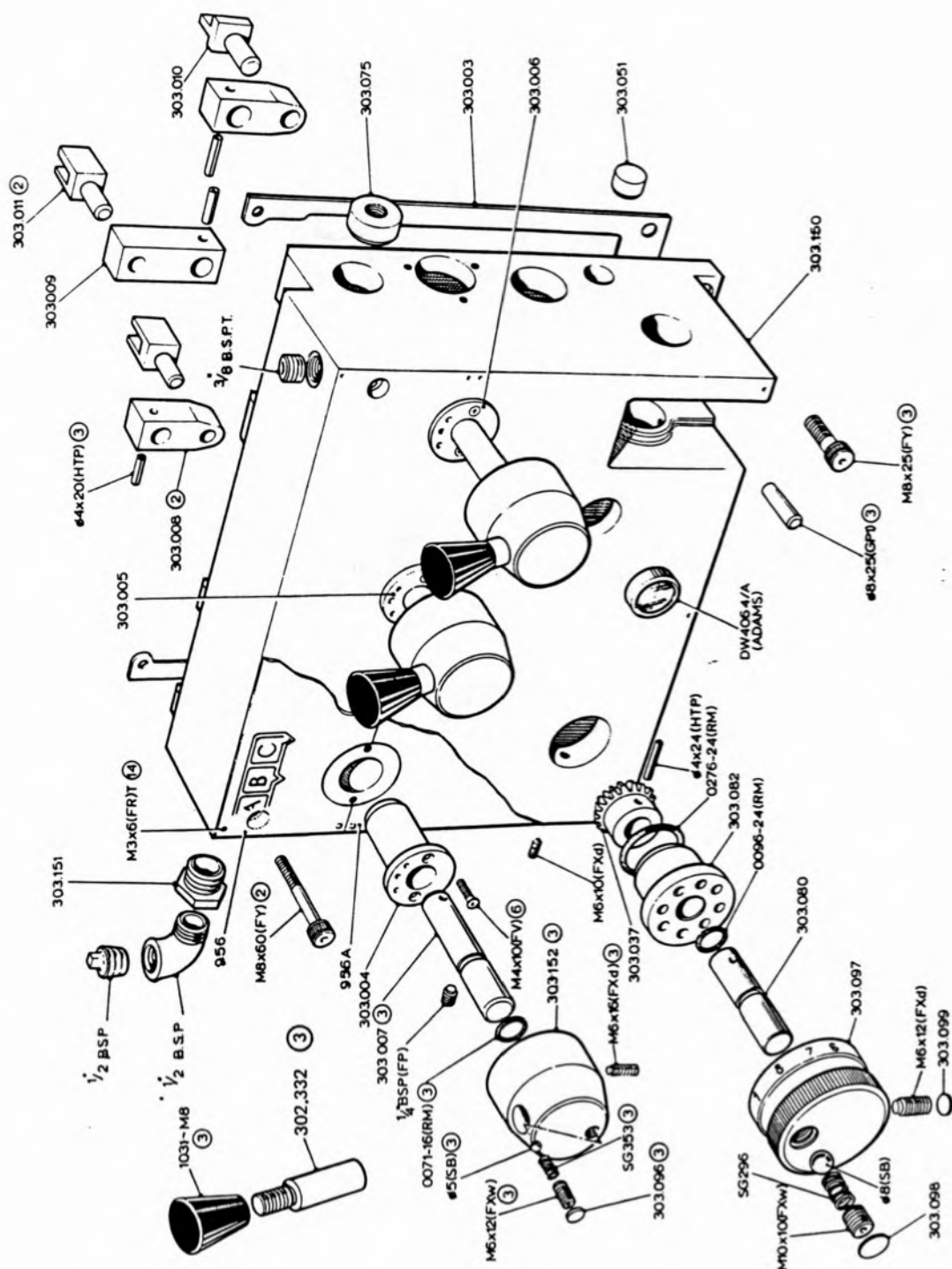


**302/1**





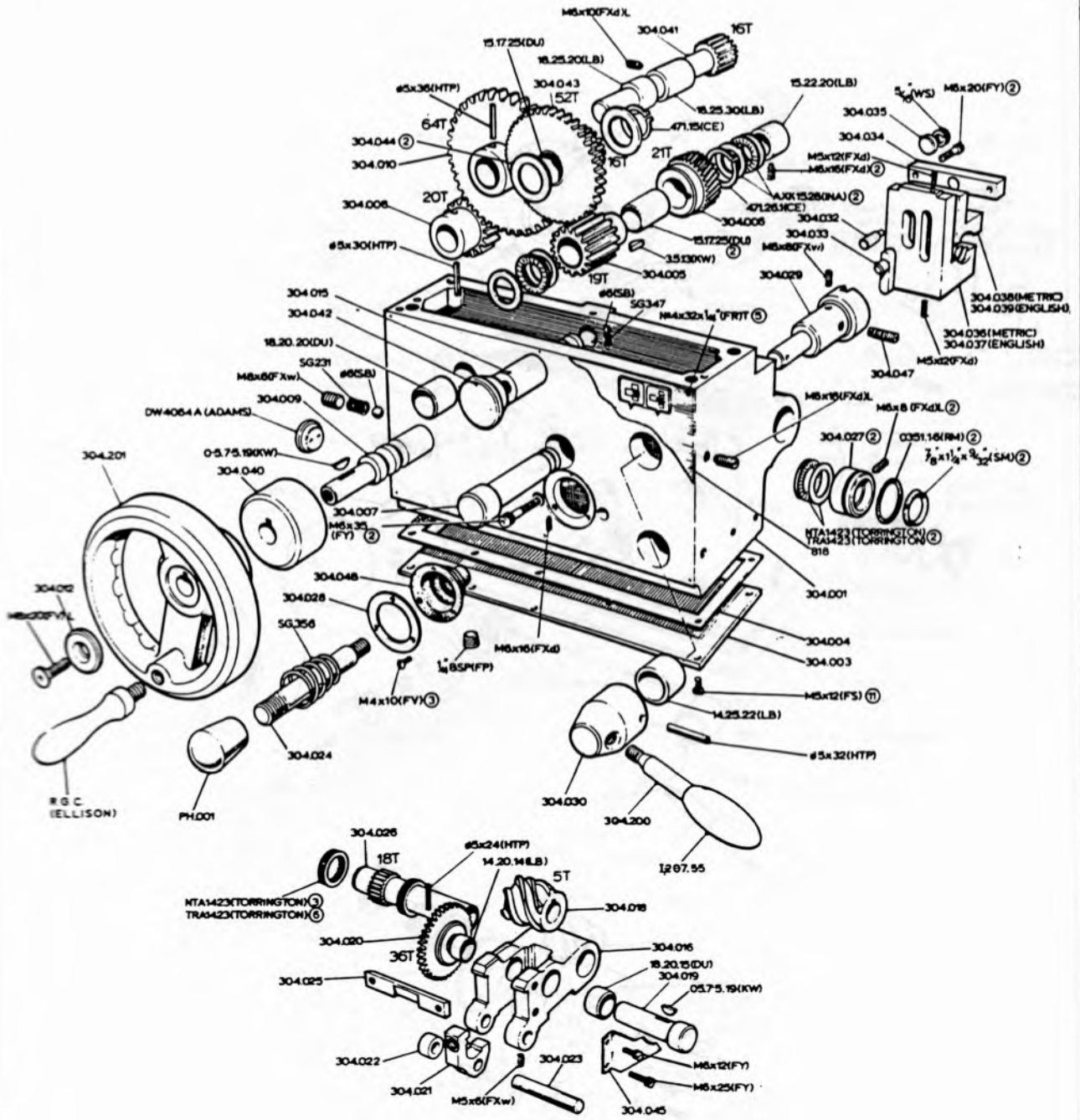
**302/3**



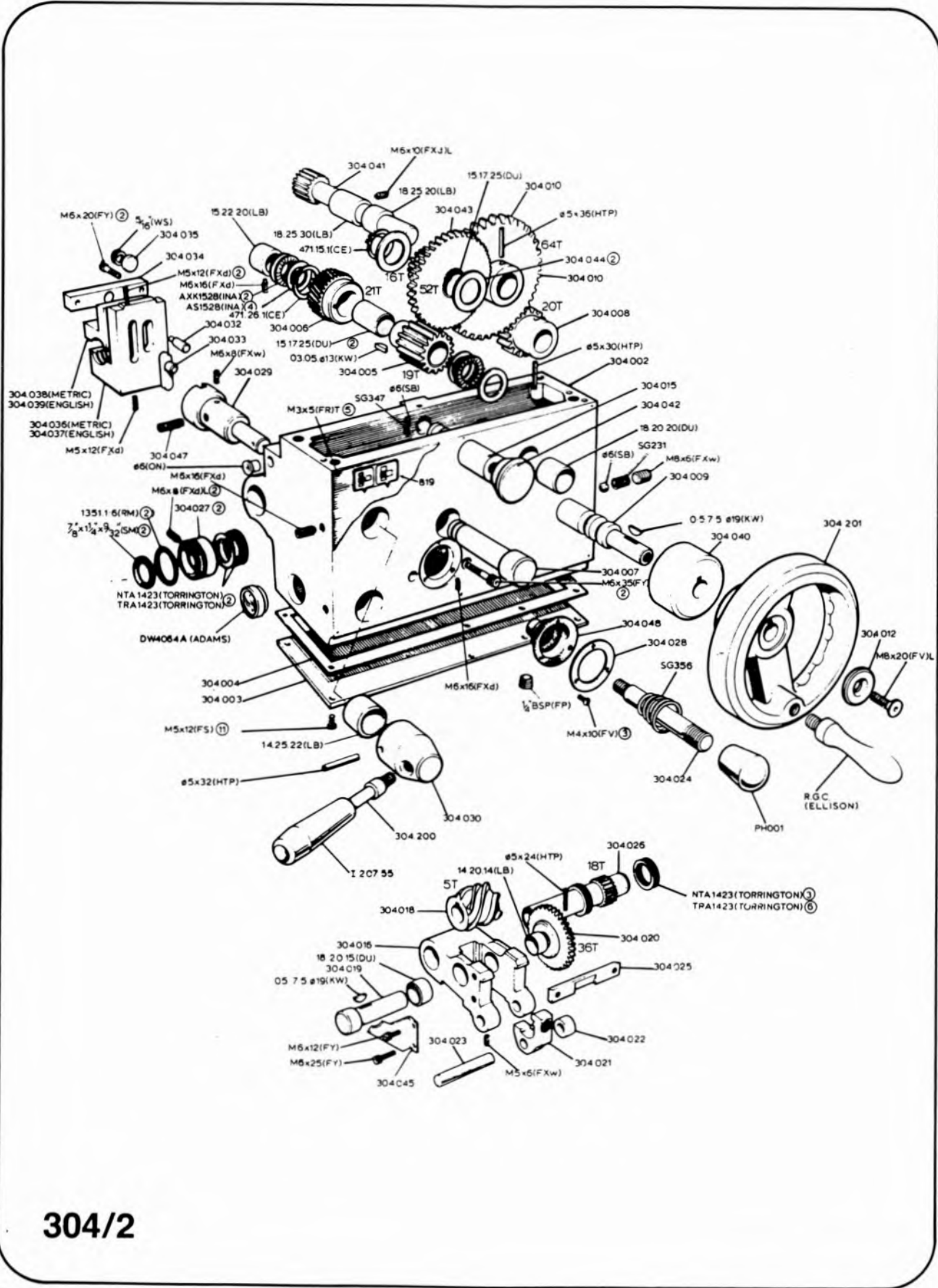
303/1





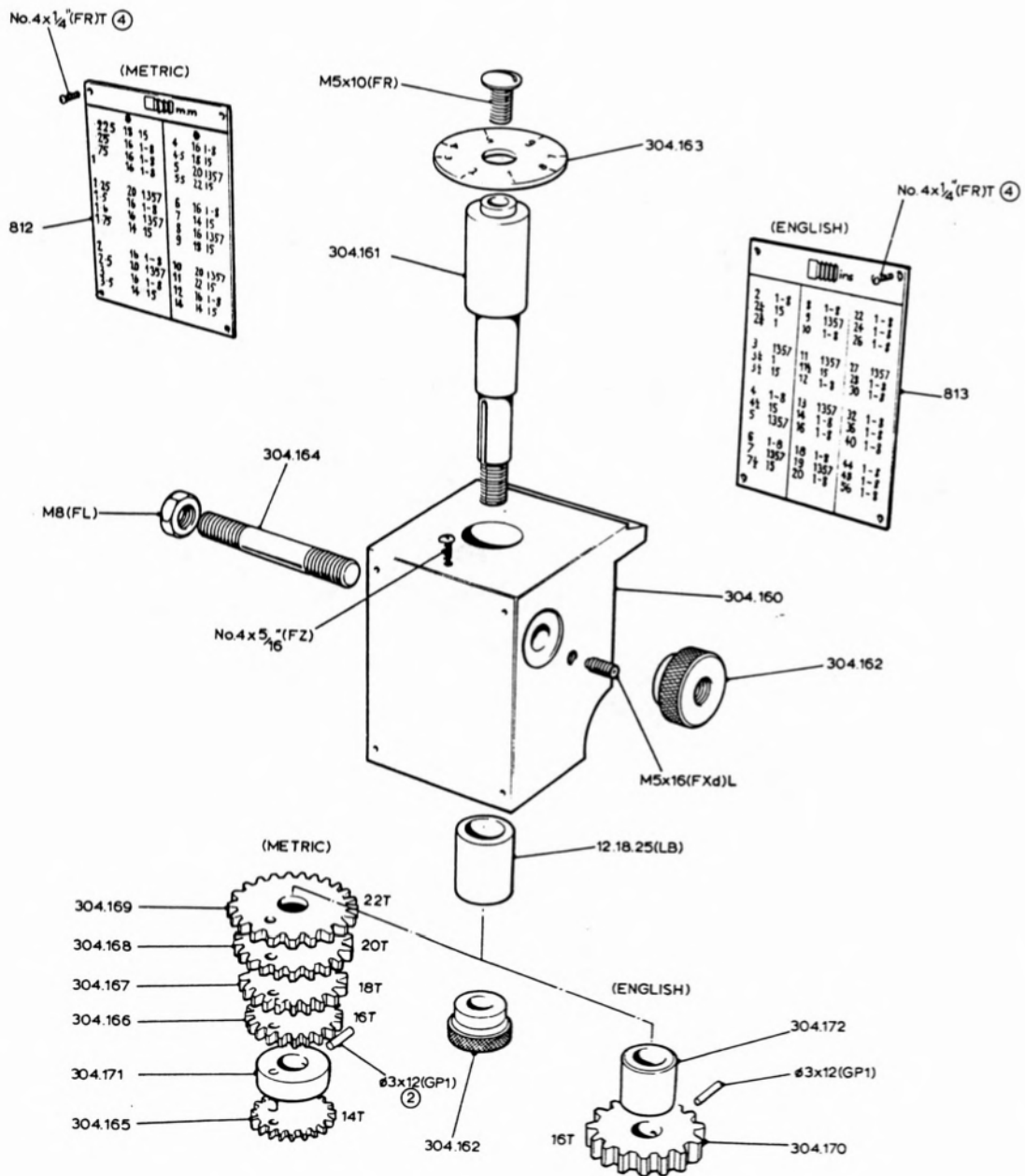


304/1

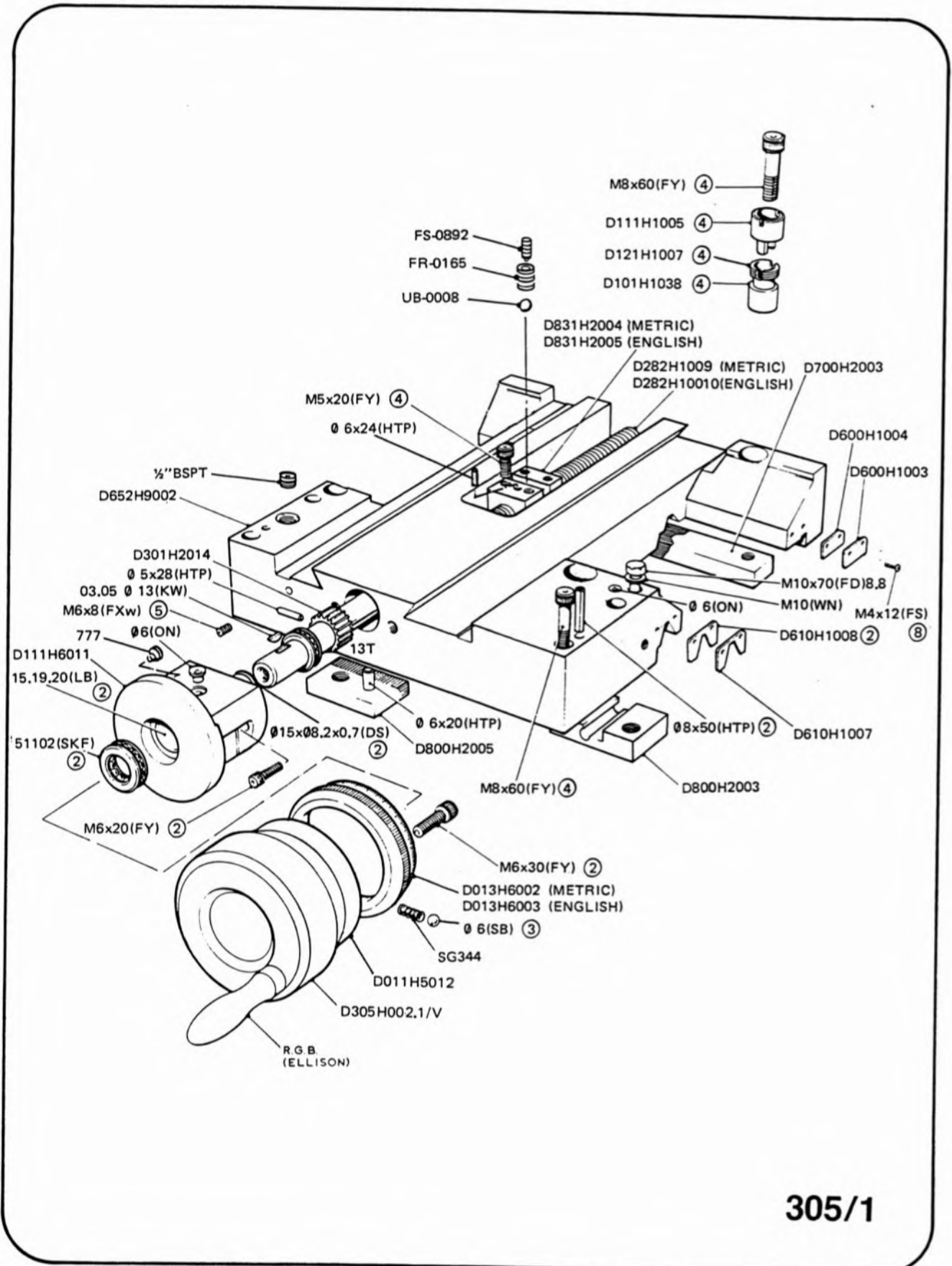


304/2

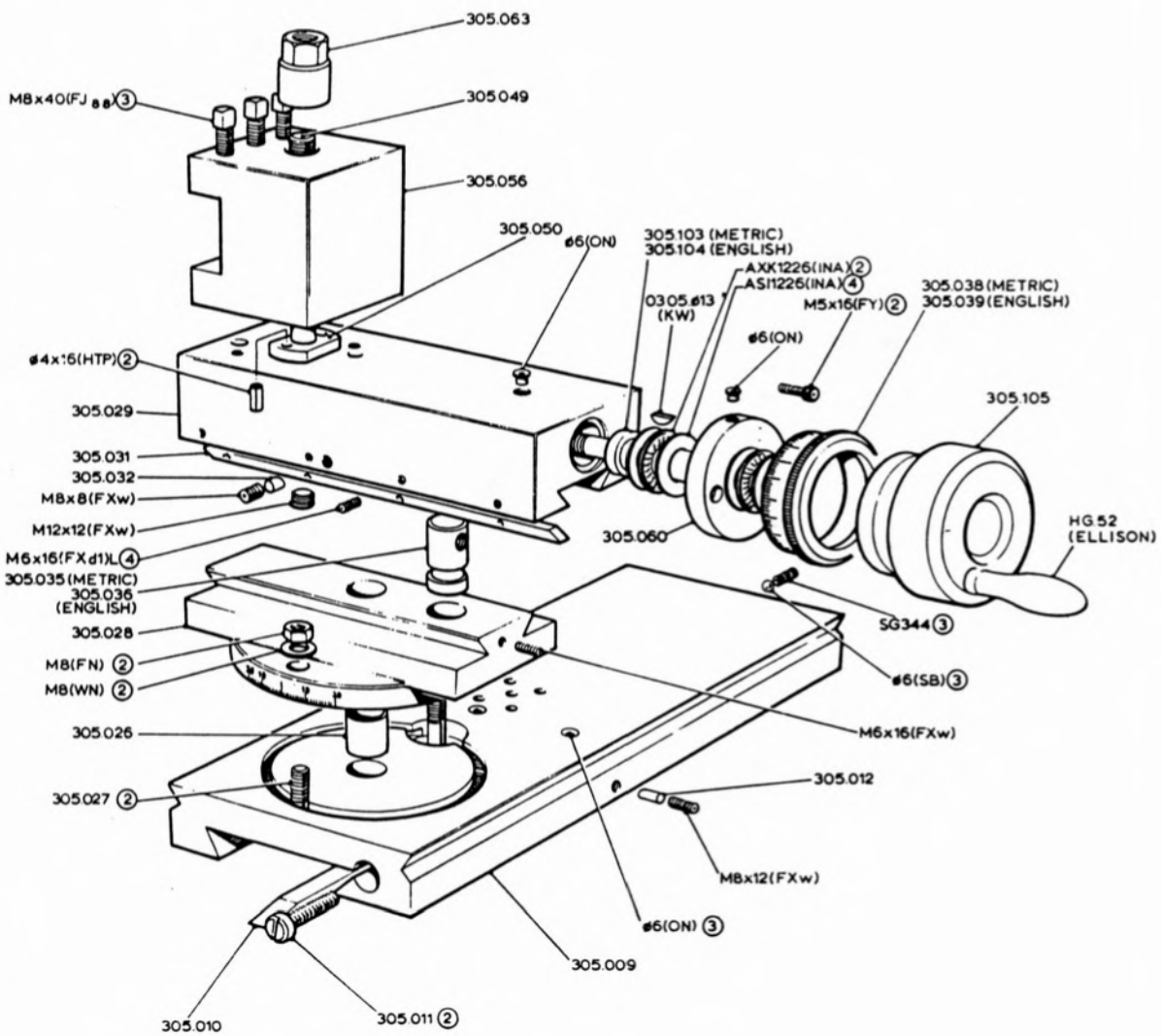




304/4



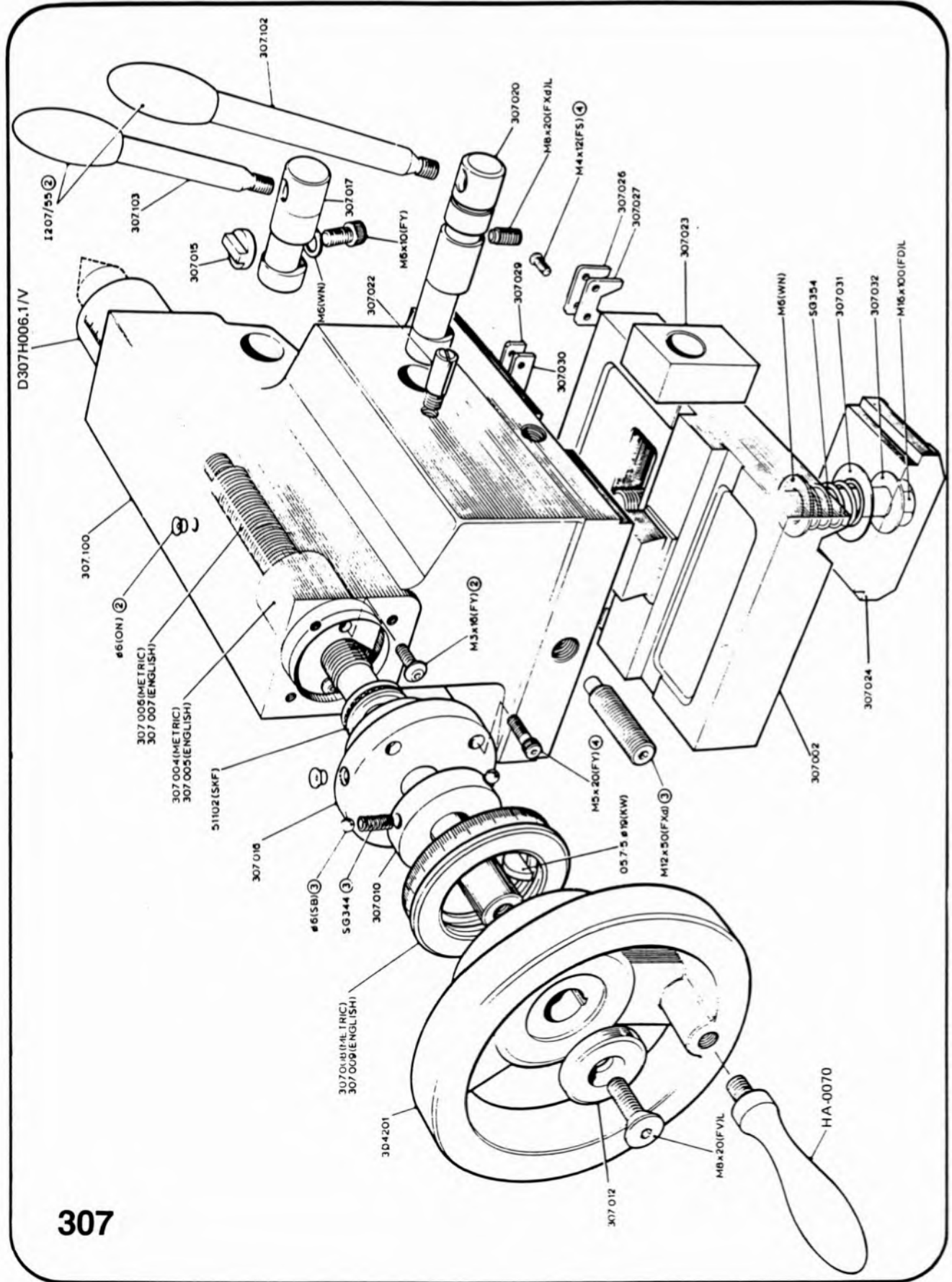
305/1

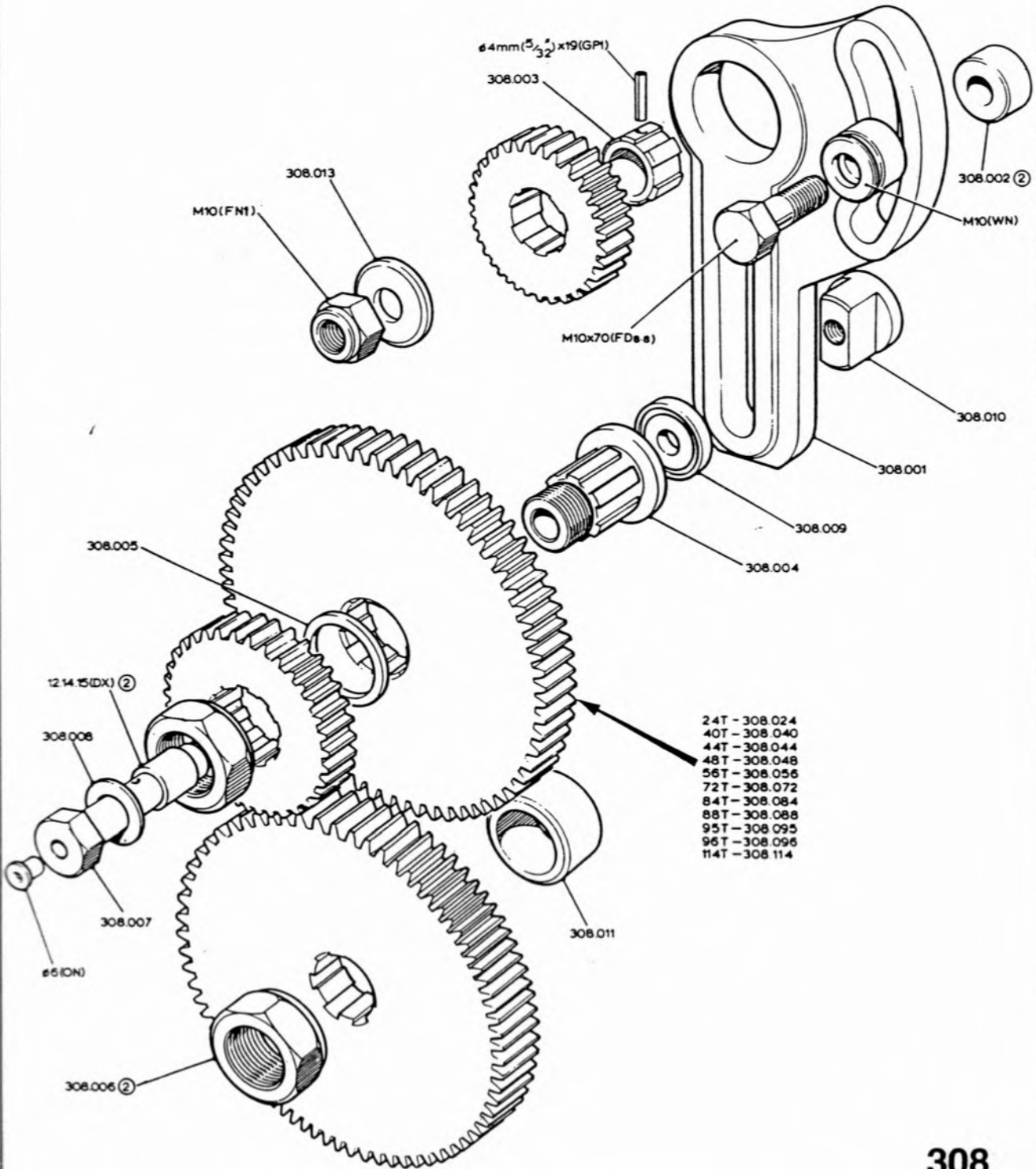


305/2

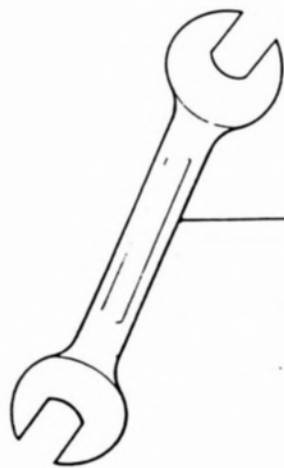




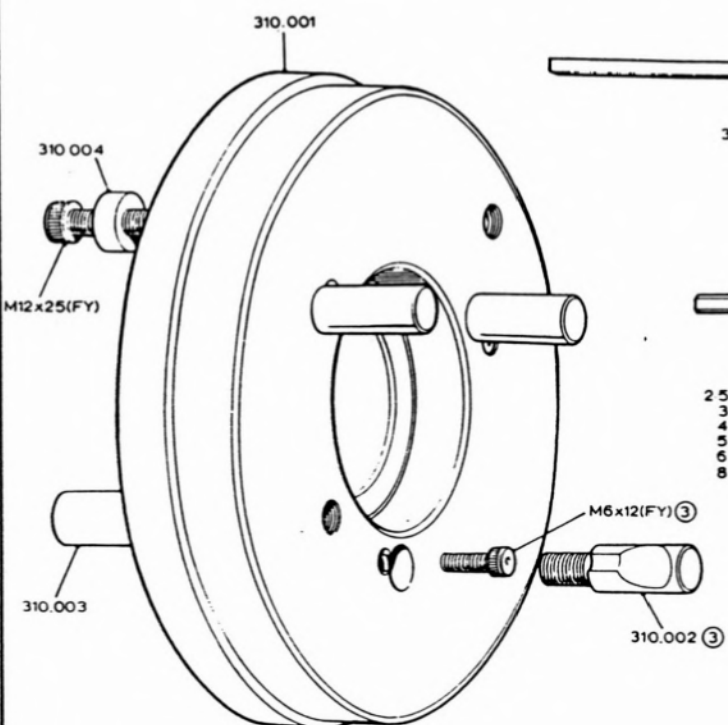
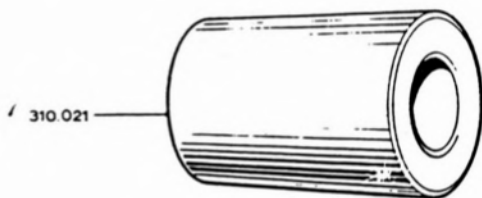
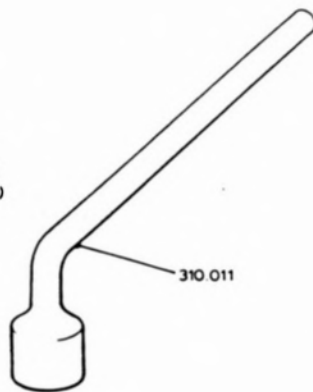




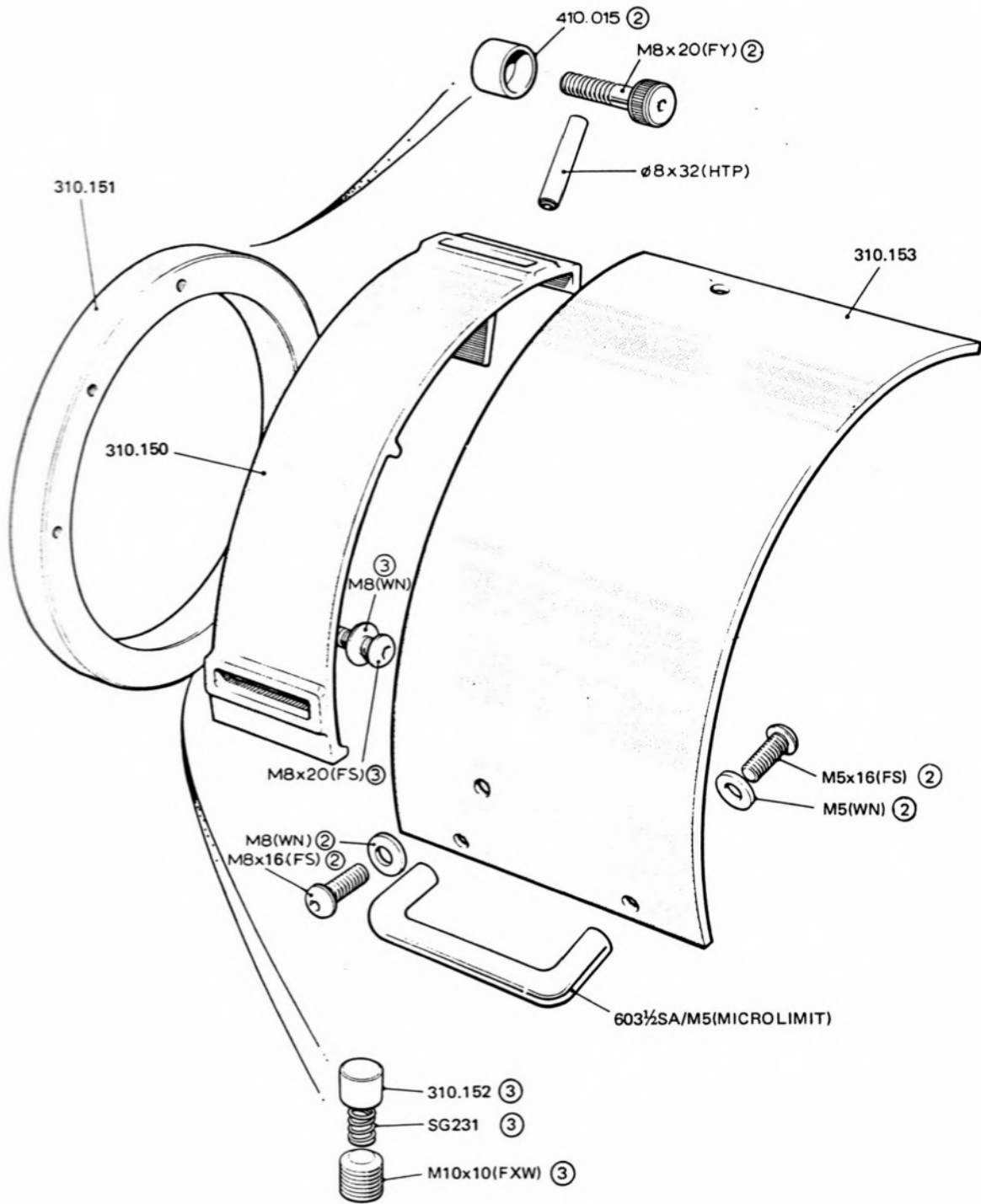
**308**



MB/13mm x 15mm (WRS)  
M10/17mm x M12/19mm (WRS)  
M14/22mm x M16/24mm (WRS)  
M18/27mm x M22/32mm (WRS)



# 310/1



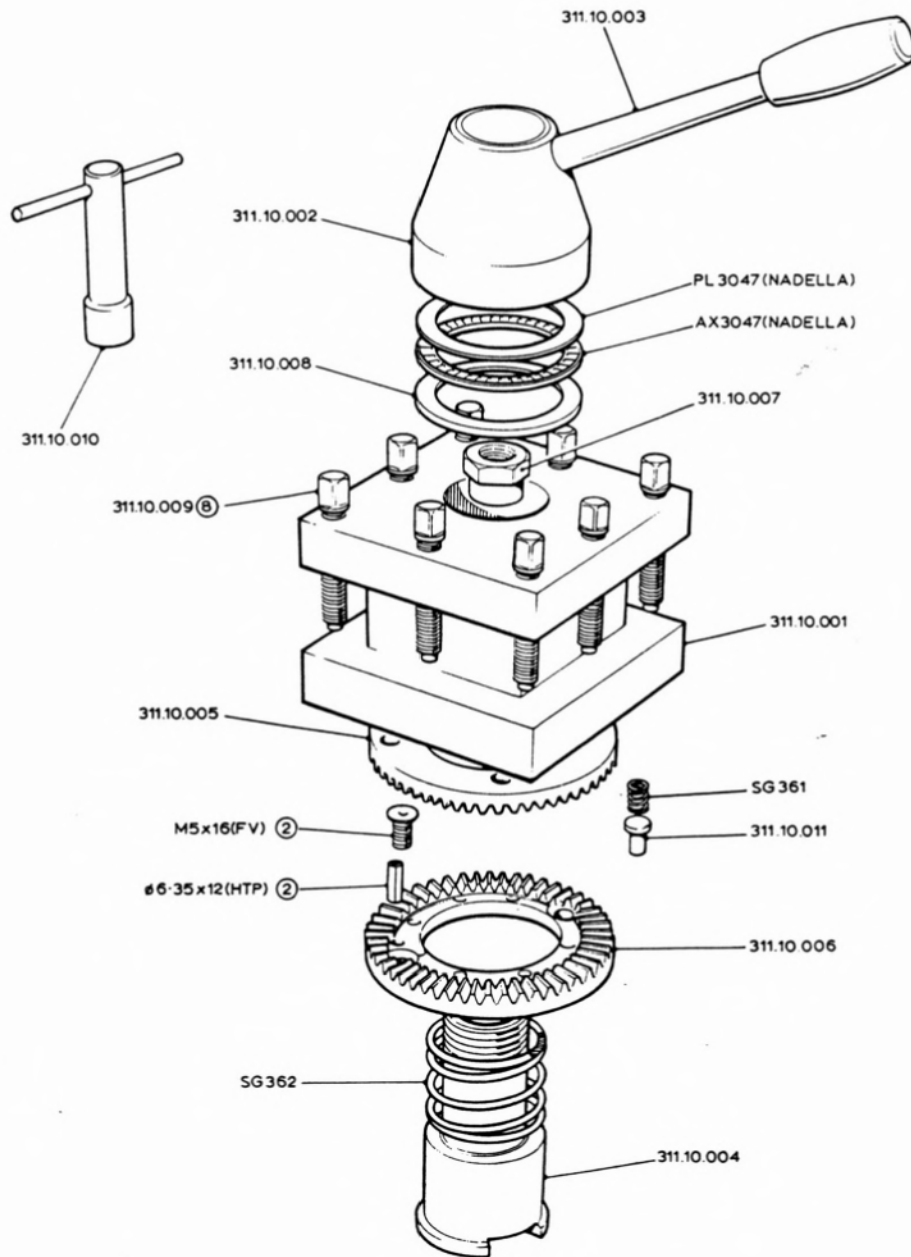
**310/2**

## **Additional Equipment**

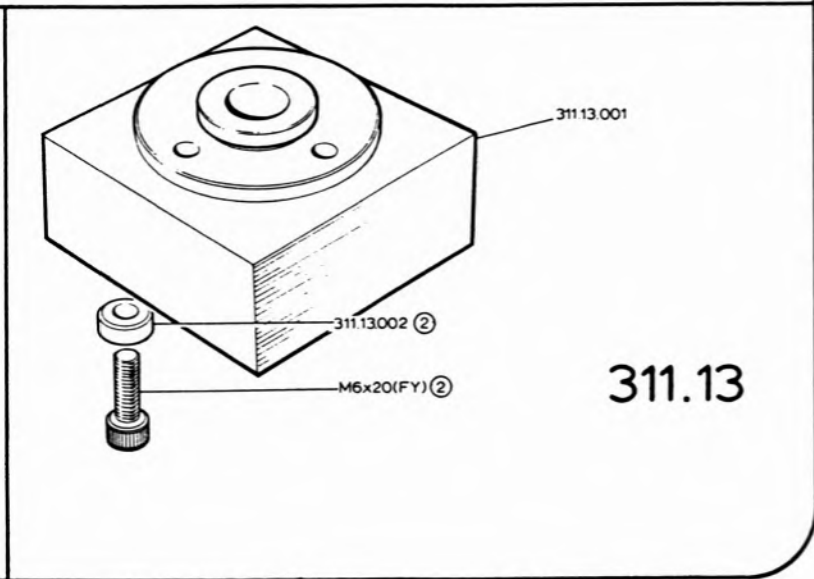
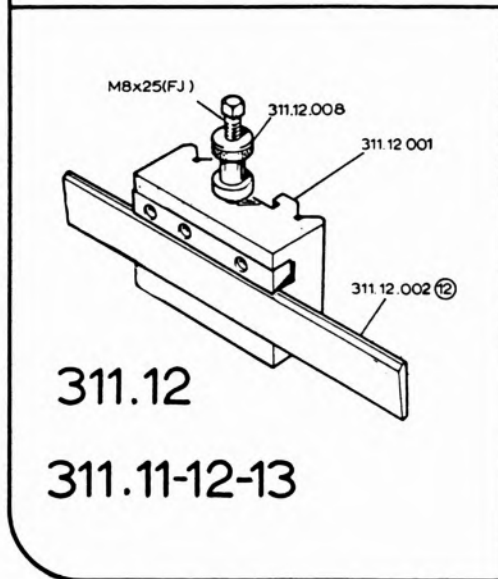
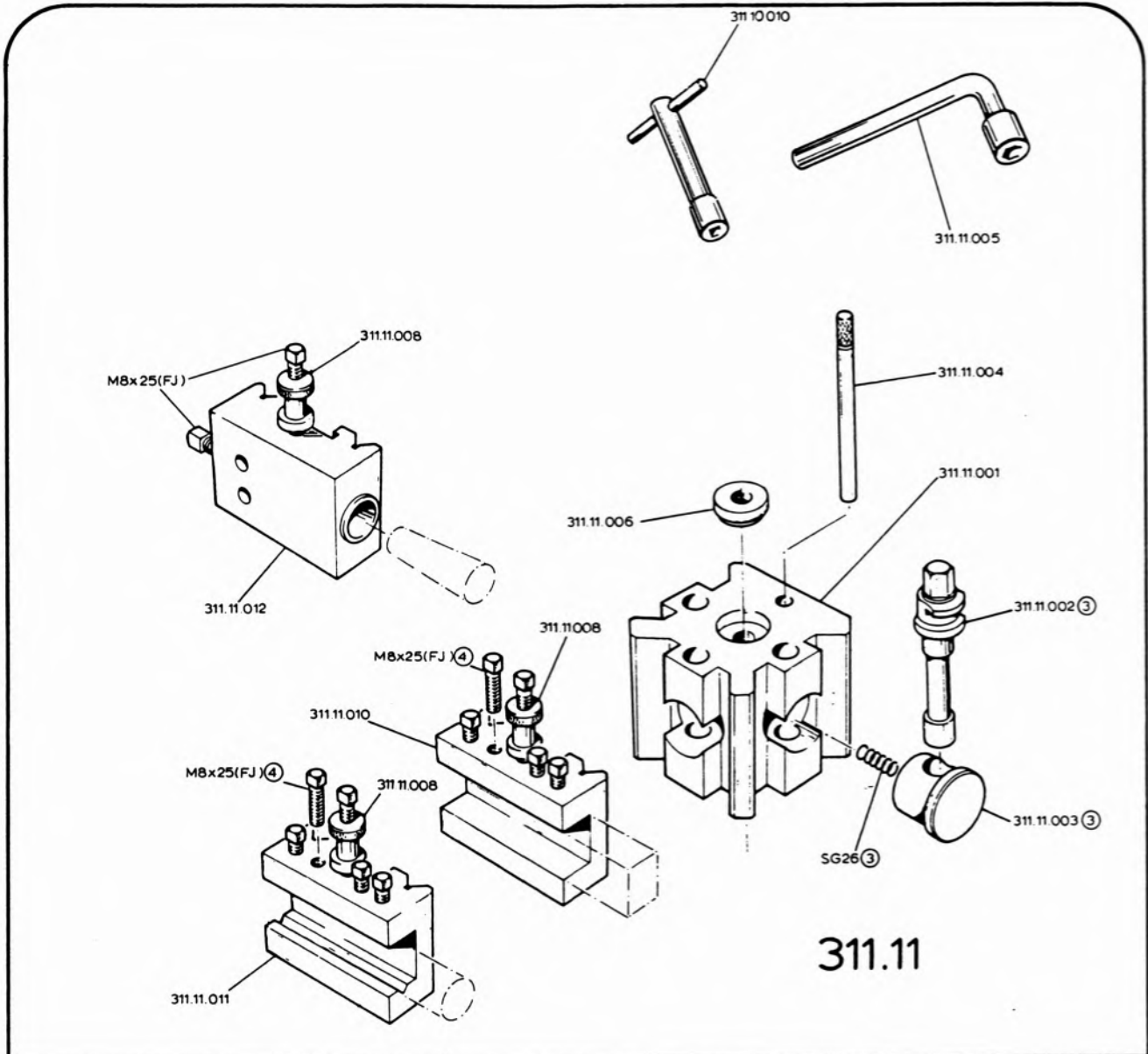
311.10	4-way hand-indexing toolpost
311.11	Quick-change toolpost
311.12	Quick-change parting-off toolholder
311.13	Riser block (for use with 311.11 mounted on 311.14)
311.14	Auxiliary rear slide
311.15	Single toolpost (for auxiliary rear slide)
311.31	Perspex chip guard - saddle mounting
311.32	Perspex chip guard - magnetic base
311.60	Magnetic-based dial indicator - metric graduations
311.61	Magnetic-based dial indicator - English graduations
311.35	Coolant pump, tank and fittings
311.38	Low-voltage machine lighting
311.41	Travelling steady
311.42	Stationary steady
311.45	5-position stop - cross-slide traverse
311.46	Single stop - saddle traverse
311.47	Micrometer stop - saddle traverse
311.48	5-position stop - saddle traverse
311.50	Apron handwheel dial - metric graduations
311.51	Apron handwheel dial - English graduations
311.72	Wattmeter

Equipment available as additional equipment  
(Not Illustrated)

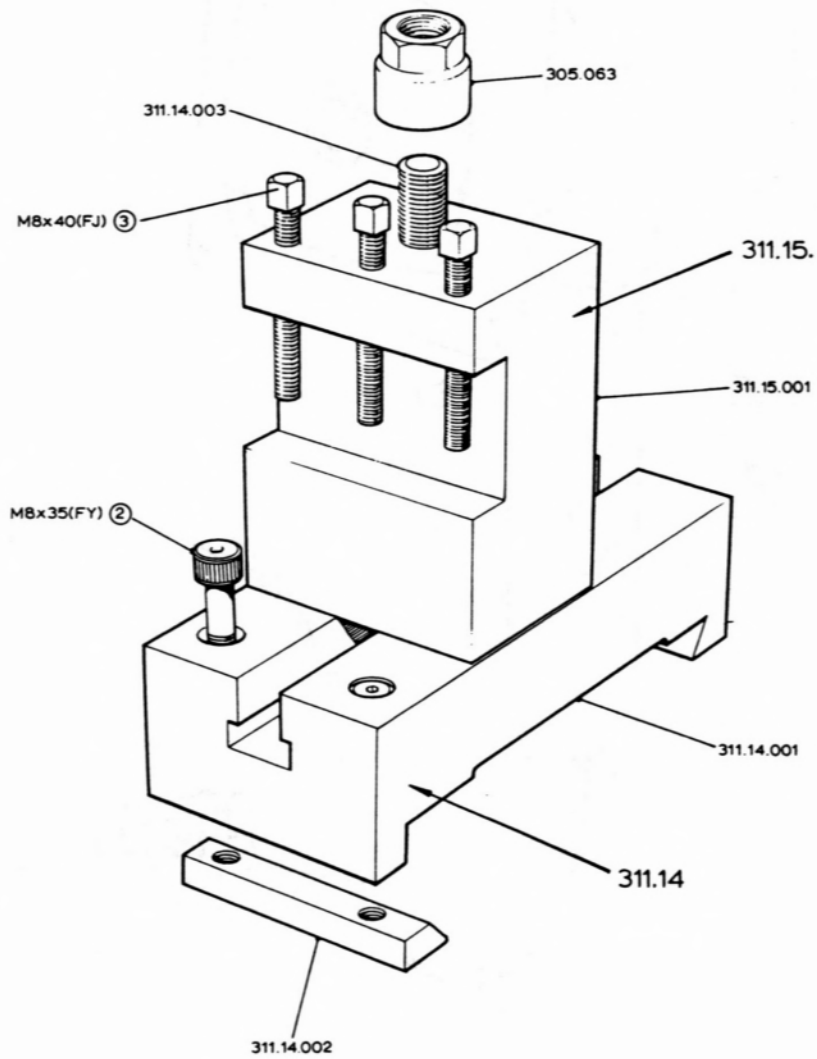
311.65	Metric/English dual-reading dial - cross-slide (English cross-slide screw and nut required)
311.66	Metric/English dual-reading dial - top slide (English top slide screw and nut required)



311.10

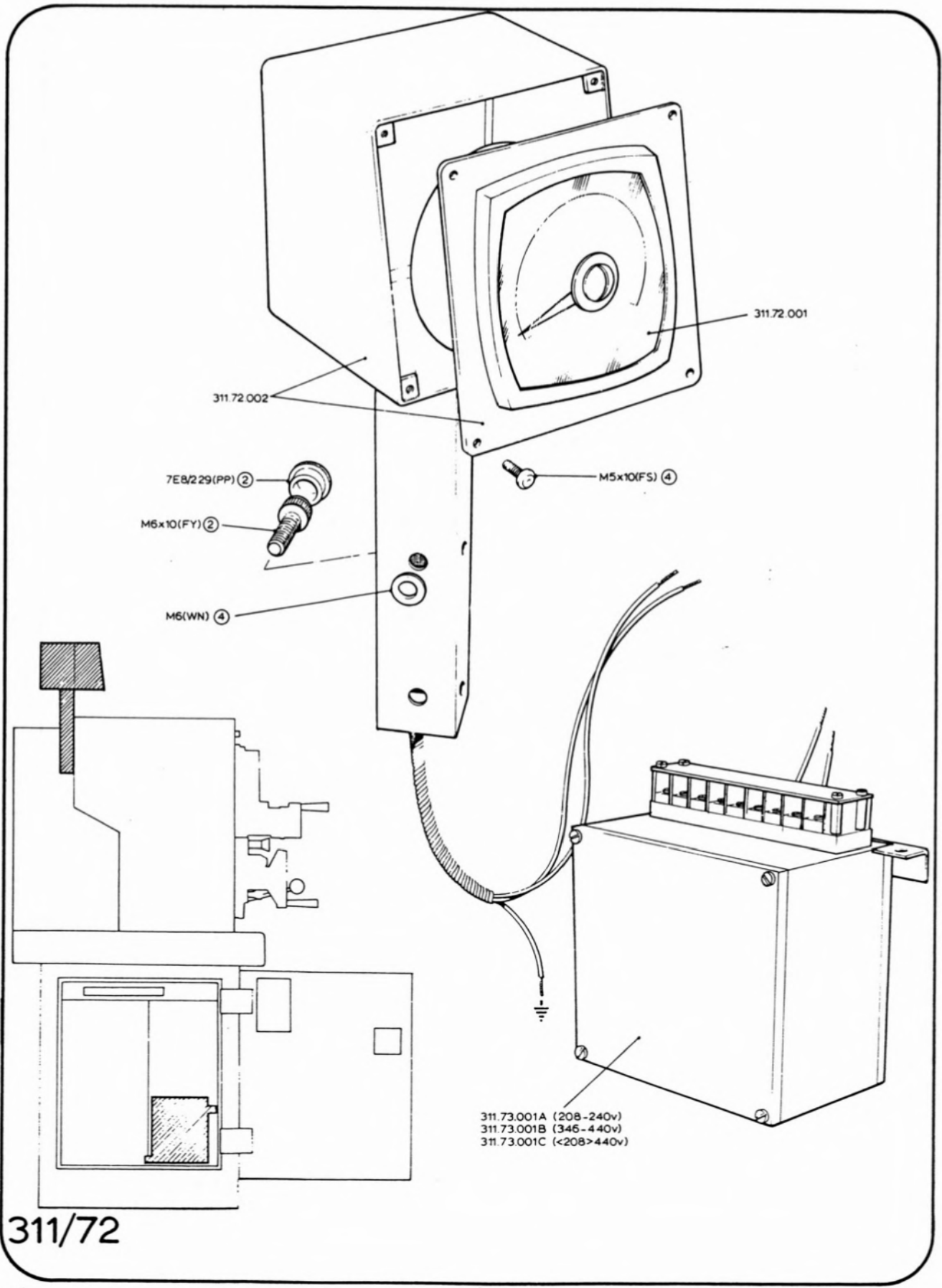


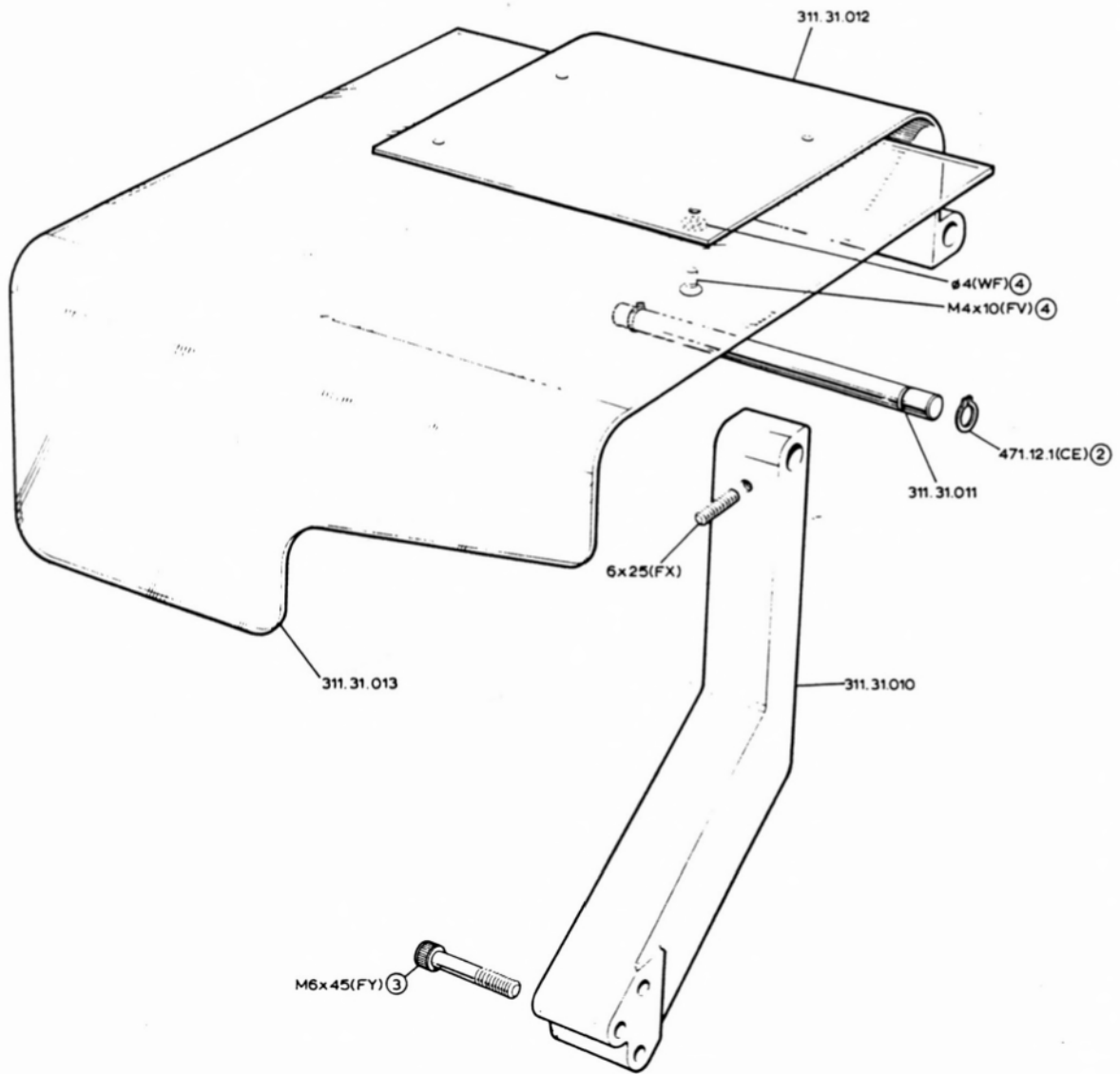
311.11-12-13



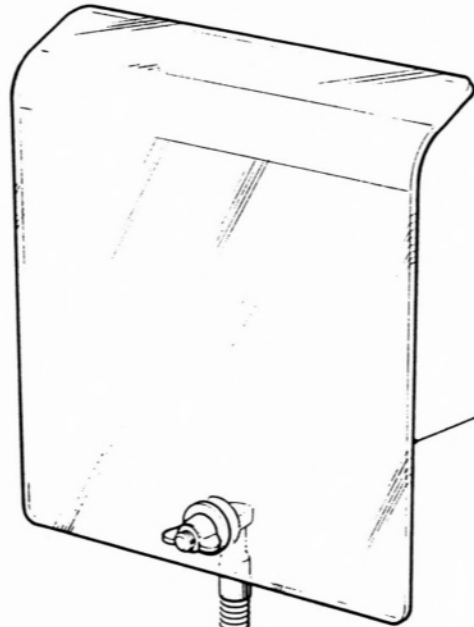
311.14-15







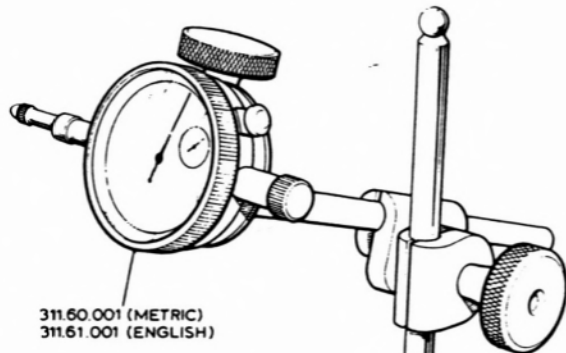
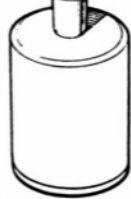
311.31



311.32

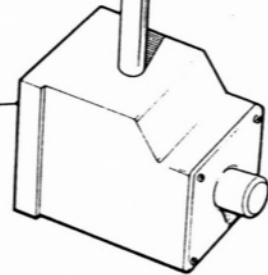
311.32.001

311.32.002

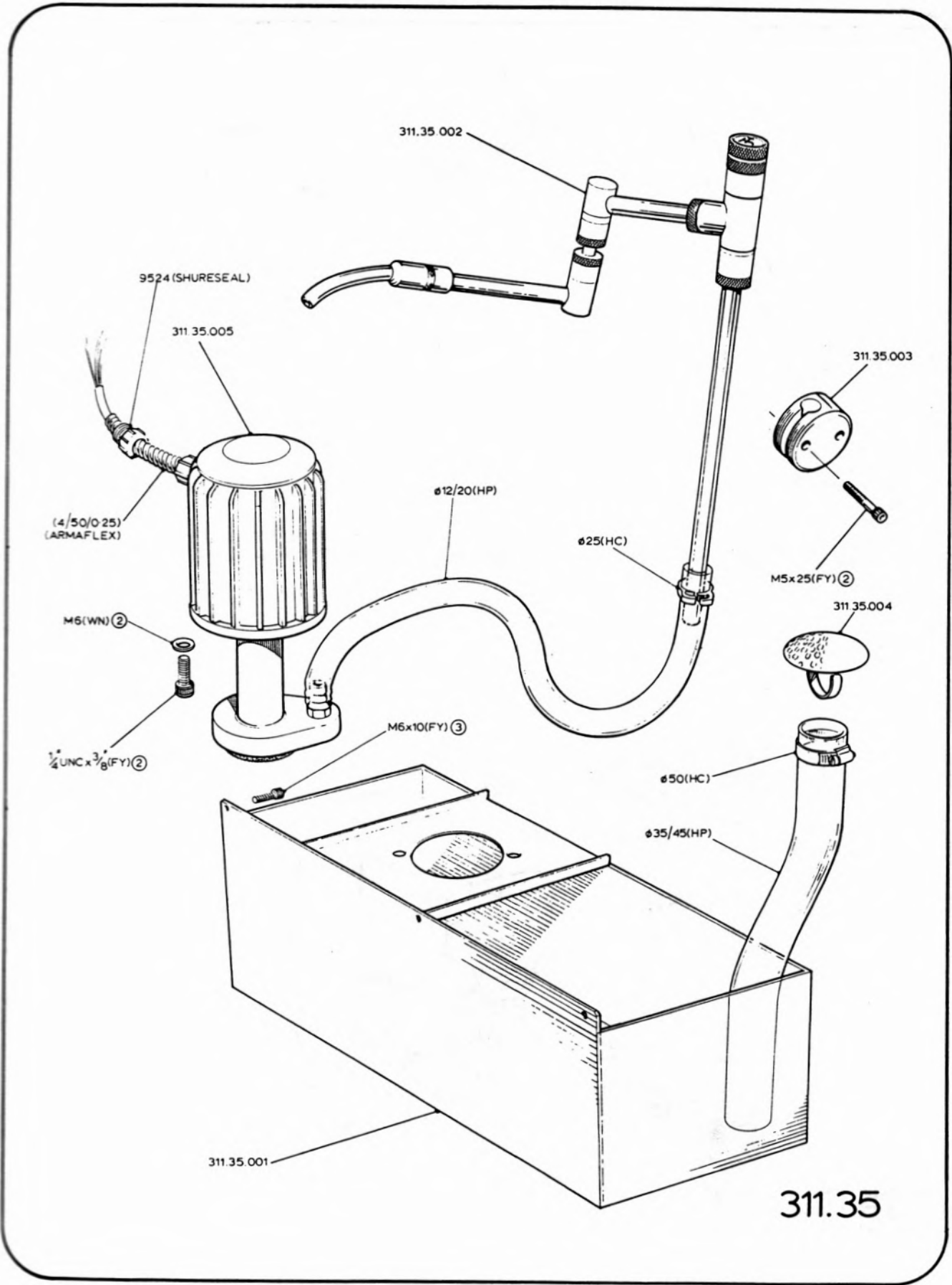


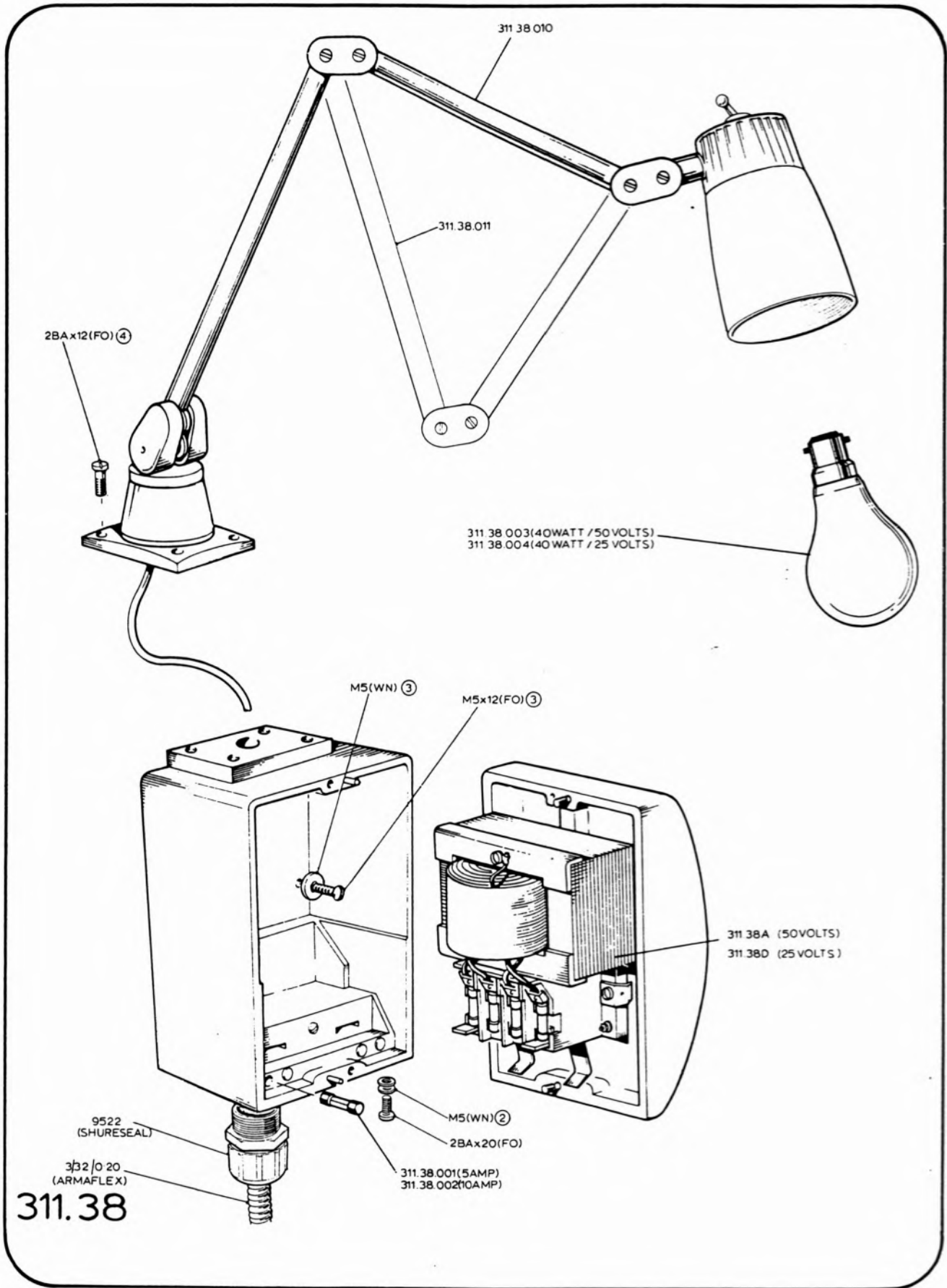
311.60.001 (METRIC)  
311.61.001 (ENGLISH)

311.60.002

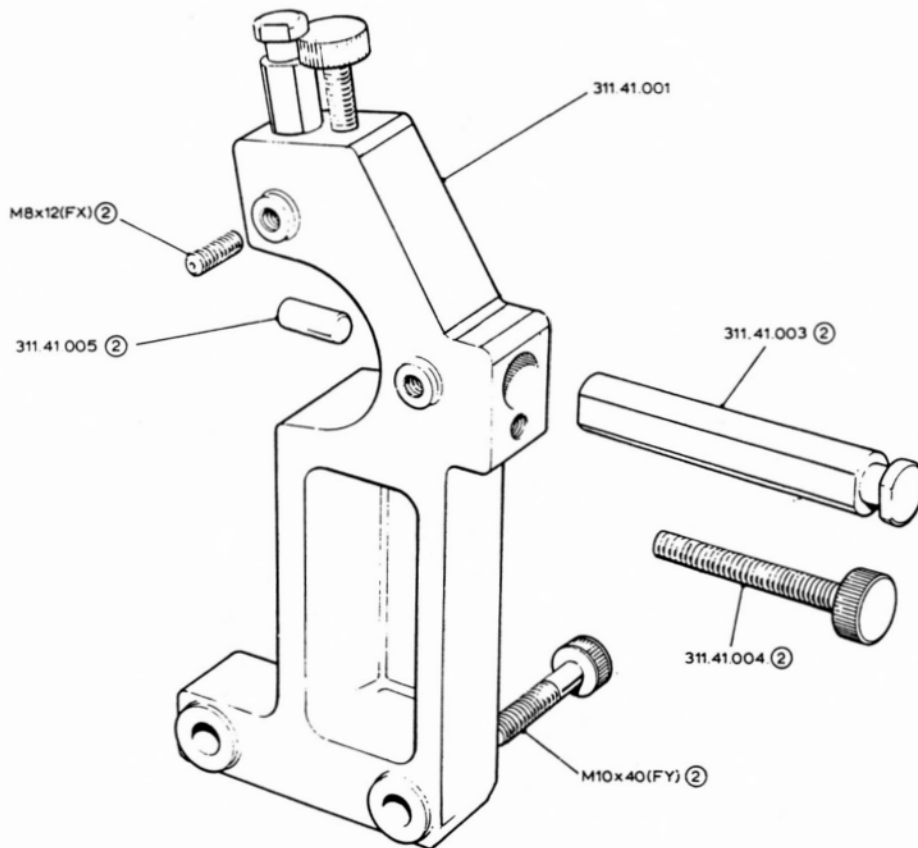


311.60-61

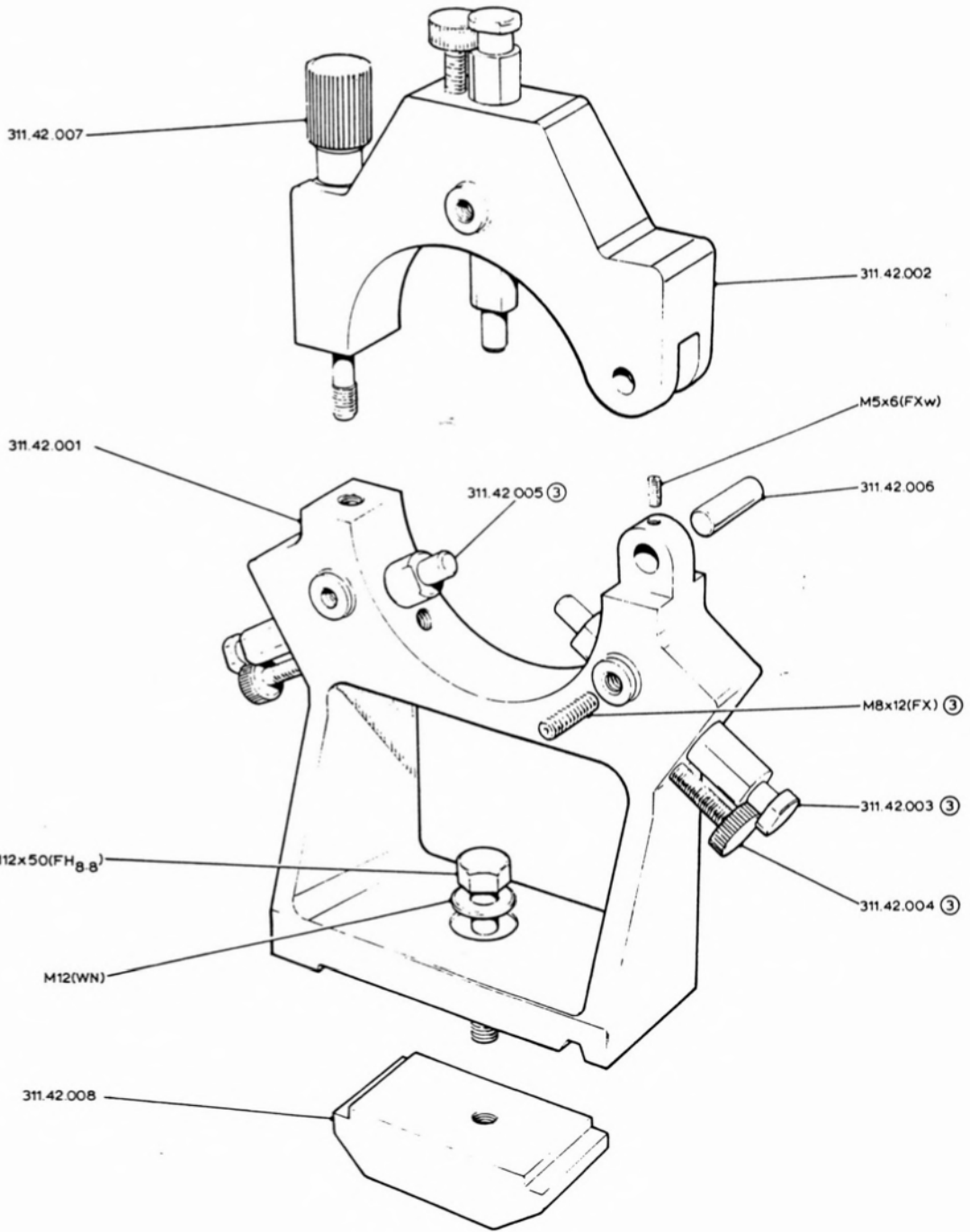




**311.38**



311.41

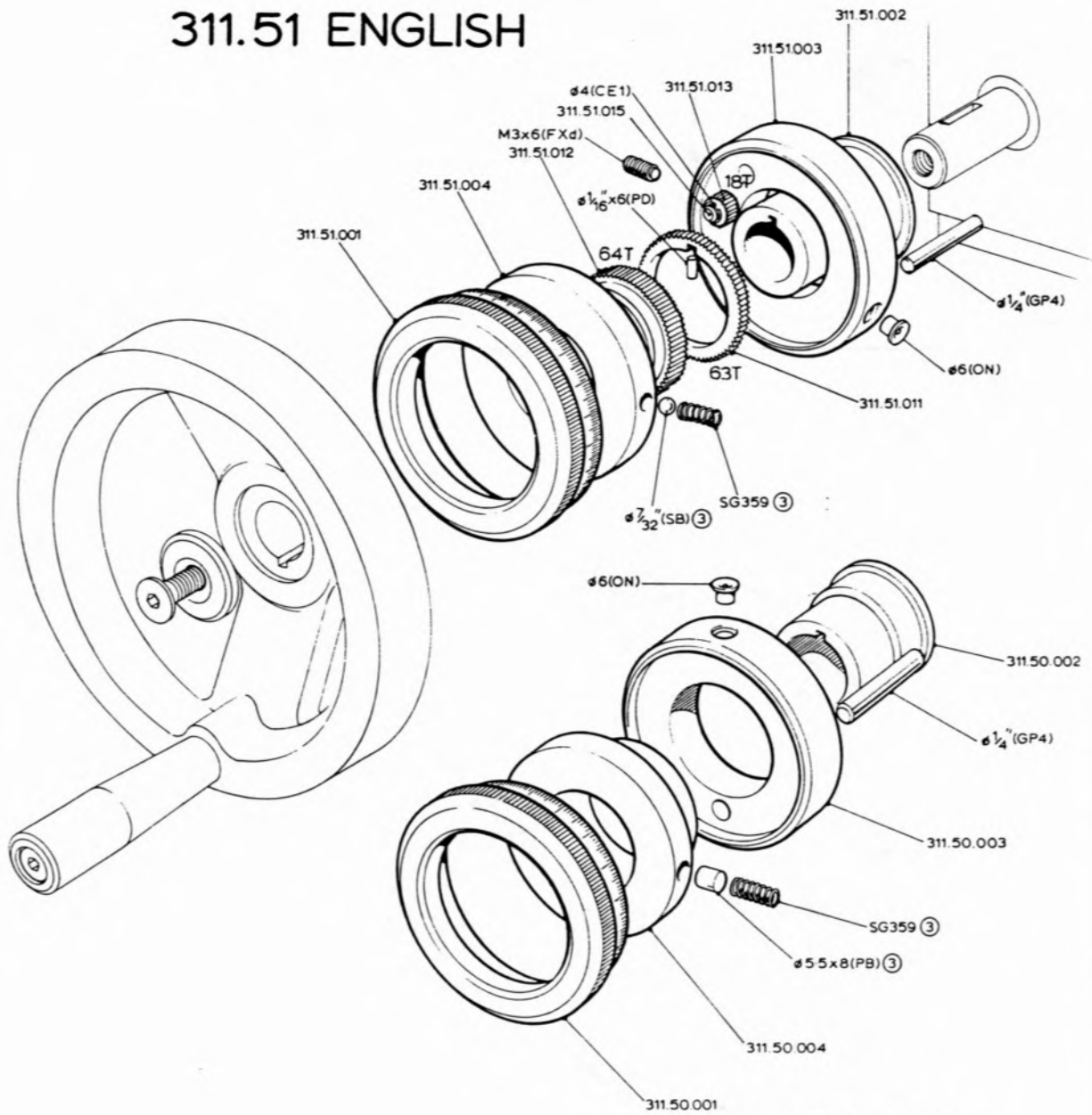


311.42





# 311.51 ENGLISH



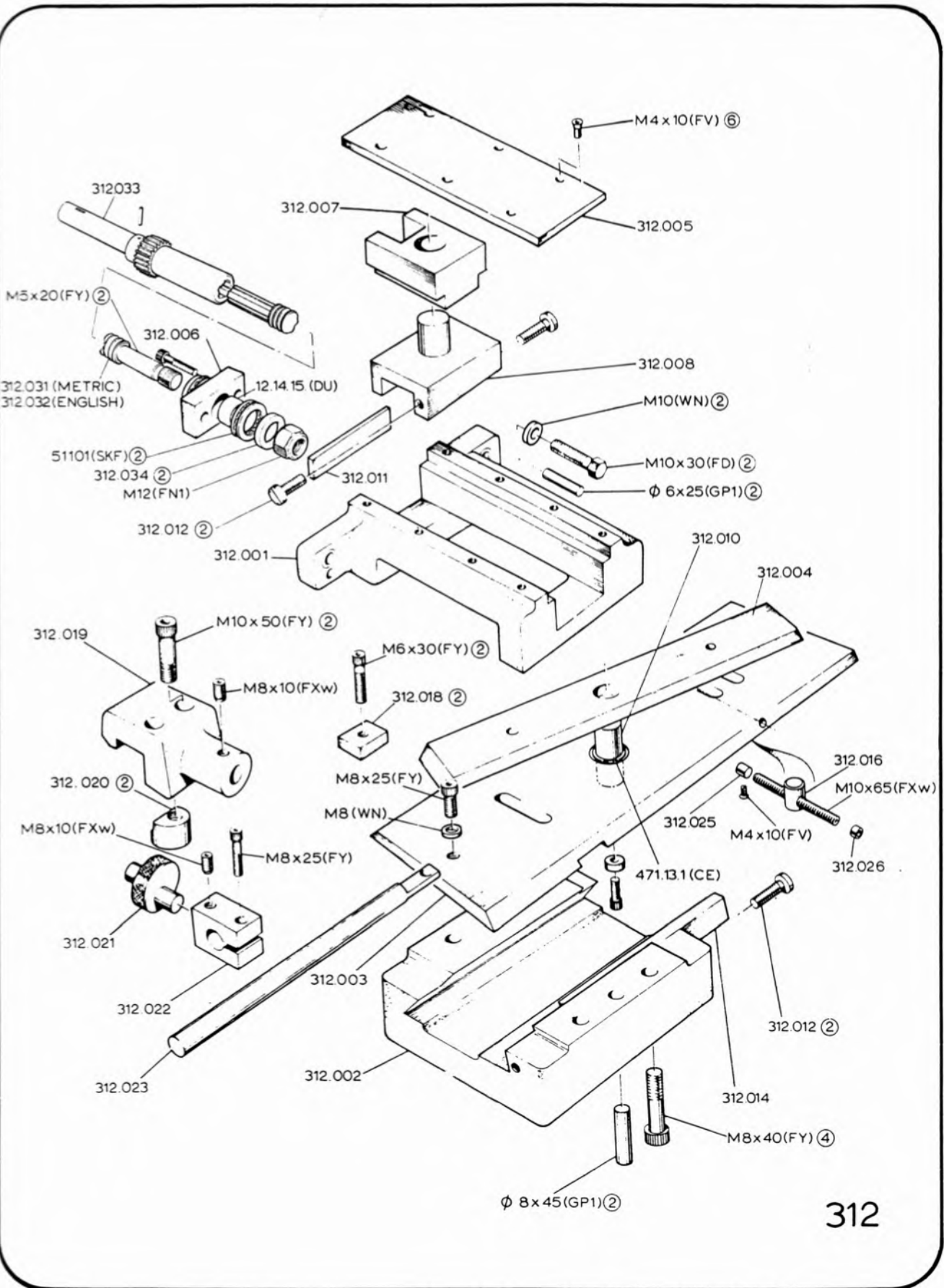
# 311.50 METRIC

311.50-51

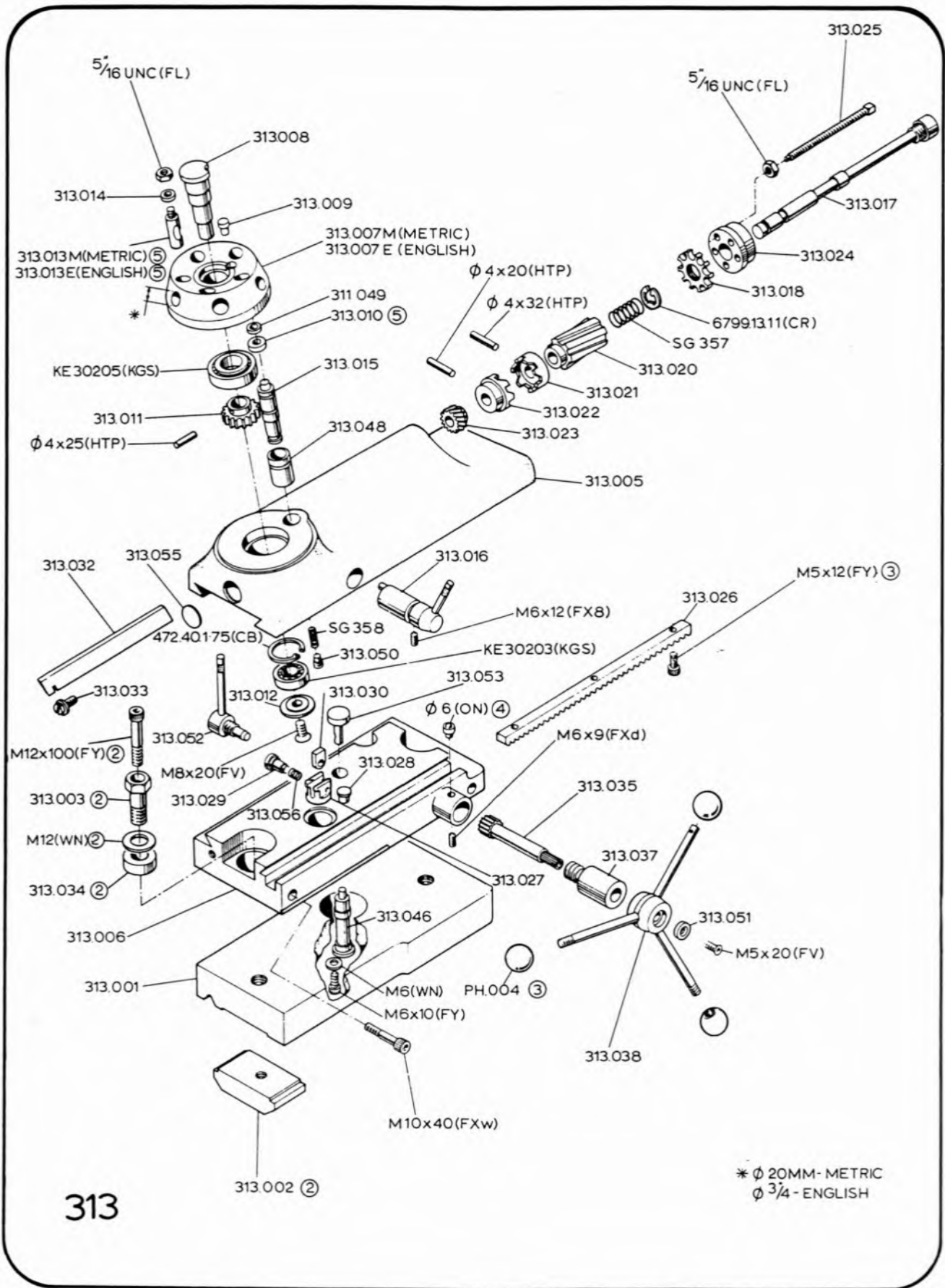
## **Attachments**

- 312 Taper turning attachment
- 313 **Bed capstan unit**
- 314 High speed threading attachments
  
- 316 Hydraulic copying attachment  
(See separate Manual)

## Notes



312



313

\* Ø 20MM - METRIC  
 Ø 3/4 - ENGLISH



