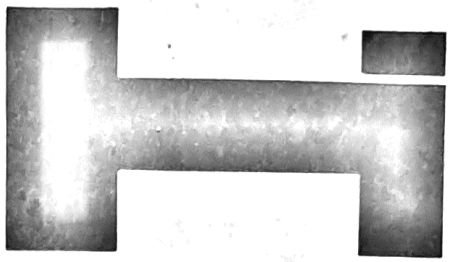


Harrison

Harrison M250

280mm – 11in swing centre lathe

machine manual

machine manual

Contents

Machine Specification

280mm (11in) swing Centre Lathe

500mm MODEL – 500mm (20 in) between centres
750mm MODEL – 750mm (30 in) between centres ✱

This machine is manufactured to British metric standards throughout, and is available in two bed lengths

Metric or English gear boxes and drive screws (together with the appropriate micrometer dials) are optional variations.

summarised specification

Centres Height . . . . . 145mm (5.7 in)
Admits Between . . . . . 500mm (20 in)
or . . . . . 750mm (30 in)

Swing Over Bed . . . . . 280mm (11 in)
Over Cross Slide . . . . . 178mm (7 in)

Spindle Bored to Pass . . . . . 35mm (1.375 in)
Nose D1-3
Morse Taper In Nose Bush. 3

Speeds
50 Hz Machines Number. 9
Range . . . . . 40 - 1500 rpm
Motor . . . . . 0.9 kW (1.2hp)
or Range . . . . . 80 -3000 rpm
Motor . . . . . 1.3 kW (1.8hp)
or Range . . . . . 40 - 1500 rpm
Motor (Single Phase) . . . . . 1.1 kW (1.5hp)
60 Hz Machines Range . . . . . 40 - 1500 rpm
Motor . . . . . 1.5 hp
or Range . . . . . 52 - 2000 rpm
Motor . . . . . 1.5 hp
or Range . . . . . 52 - 2000 rpm
Motor (Single Phase) . . . . . 1.5 hp

Leadscrew Diameter . . . . . 25mm (0.98 in)
Thread . . . . . 6mm pitch or 4 TPI

Metric Gearbox with 6mm pitch Leadscrew
Threads Metric pitches (33). . . . .0.25 - 8mm
English Pitches (33)* . . . 3 - 72 TPI
**(available by changewheels supplied as additional equipment)*
Feeds Longitudinal (21) . . . . .0.012 - 0.4mm
Cross (21) . . . . . .0.006 - 0.2mm

English Gearbox with 4 TPI Leadscrew
Threads English Pitches (56) . . . . 4 - 84 TPI
Metric Pitches (23)* . . . . . 0.4 - 10mm
**(available by changewheels supplied as additional equipment)*
Feeds Longitudinal (24) . . 0.0006 - 0.016 in
Cross (24) . . 0.0003 - 0.008 in

Bed Width Over Ways. . . . . 190mm (7.5 in)
Depth Under Headstock . . . . 230mm (9 in)

Cross Slide Width . . . . . 130mm (5.1 in)
Travel . . . . . 165mm (6.5 in)

Top Slide Width . . . . . 76mm (3 in)
Travel . . . . . 92mm (3.6 in)

Tailstock Quill Diameter . . . . . .38mm (1.5 in)
Travel . . . . . .95mm (3.7 in)

Weight 500mm (20 in) Centres. . . .356 kg (785 lbs)
750mm (30 in) Centres. . .457 kg (1008 lbs)

Shipping Data

Gross Weight	Packing Case Dimensions L W H
500mm (20 in) Centres	
457 kg (1008 lbs) . .	1574 x 838 x 1371mm (62" x 33" x 54")
750mm (30 in) Centres	
559 kg (1232 lbs) . .	1828 x 838 x 1371mm (72" x 33" x 54")

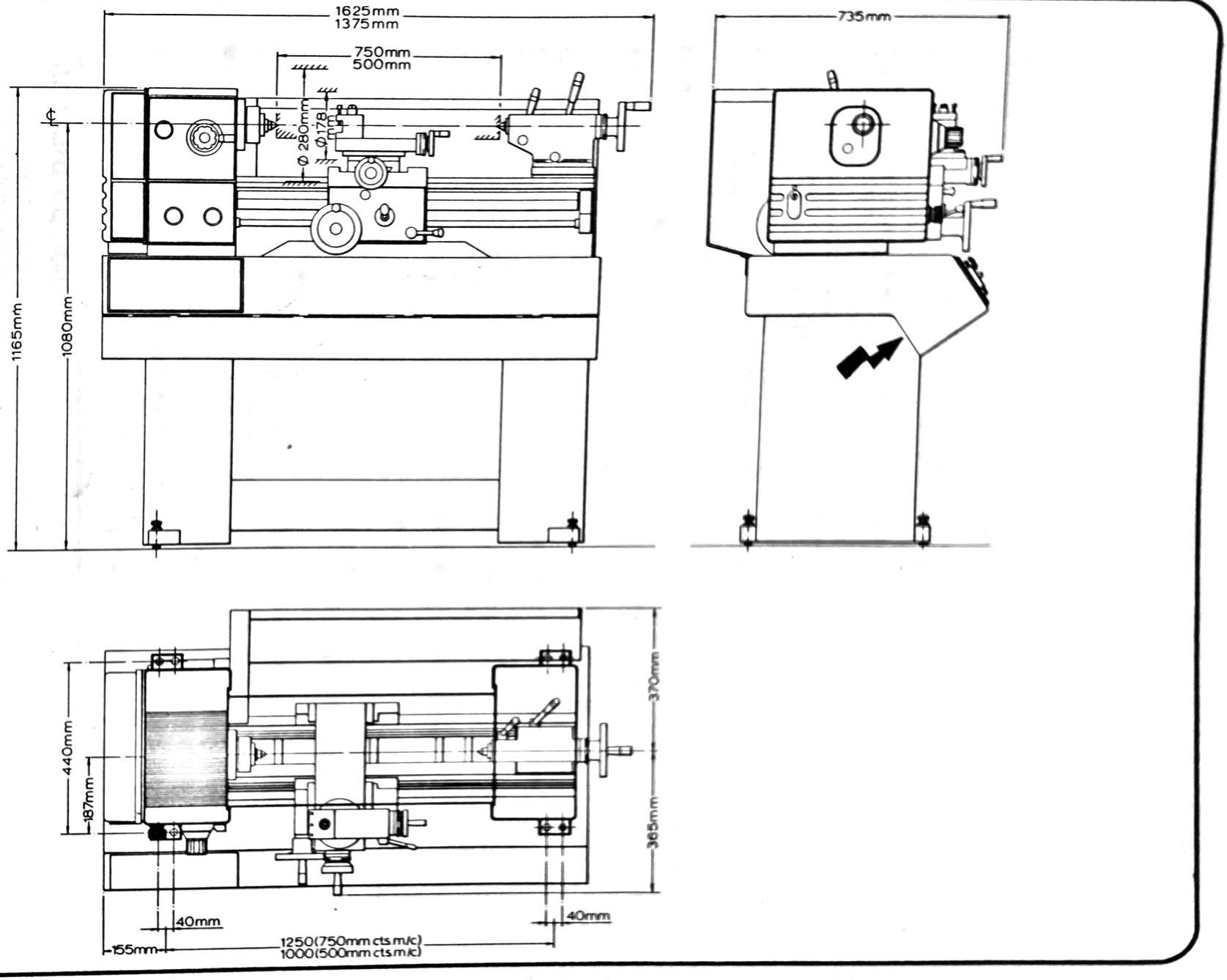
SPACE REQD. 65" x 27"

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


1625mm
1375mm
750mm
500mm
Ø 280mm
Ø 178
1165mm
1080mm
735mm
370mm
365mm
440mm
187mm
40mm
40mm
155mm
1250(750mm cts.m/c)
1000(500mm cts.m/c)

Lifting

The approximate weights of the machine are:-

500mm Model (500 mm/20") between centres - 400 kg (880 lbs)
750mm Model (750 mm/30") between centres - 460 kg (1010 lbs)

The machine should be lifted using a rope sling looped under both ends of the swarf tray.

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

Power should be supplied through an external fused isolator - recommended fuses being 15 amp for 220 volts supply and 10 amp for 380 to 440 volts supply. External wiring should be of a permanent character and be undertaken by a competent electrician. SEE GENERAL ARRANGEMENT AND FOUNDATION DRAWING FOR CABLE ENTRY.

Line connections and a substantial earth continuity conductor should be connected to the terminal block (SEE ELECTRICAL WIRING DIAGRAM).

If main spindle rotation does not coincide with that indicated by forward/reverse switch at control station, interchange two line connections.

continued

Lubrication (Refer to Lubrication diagram)

Ensure that the headstock, gearbox and apron are filled to the level of the relevant oil sight windows - and oil the cross-slide nut, dials and changewheel stud etc. through the appropriate oil nipples using the oil gun provided.

Running-in

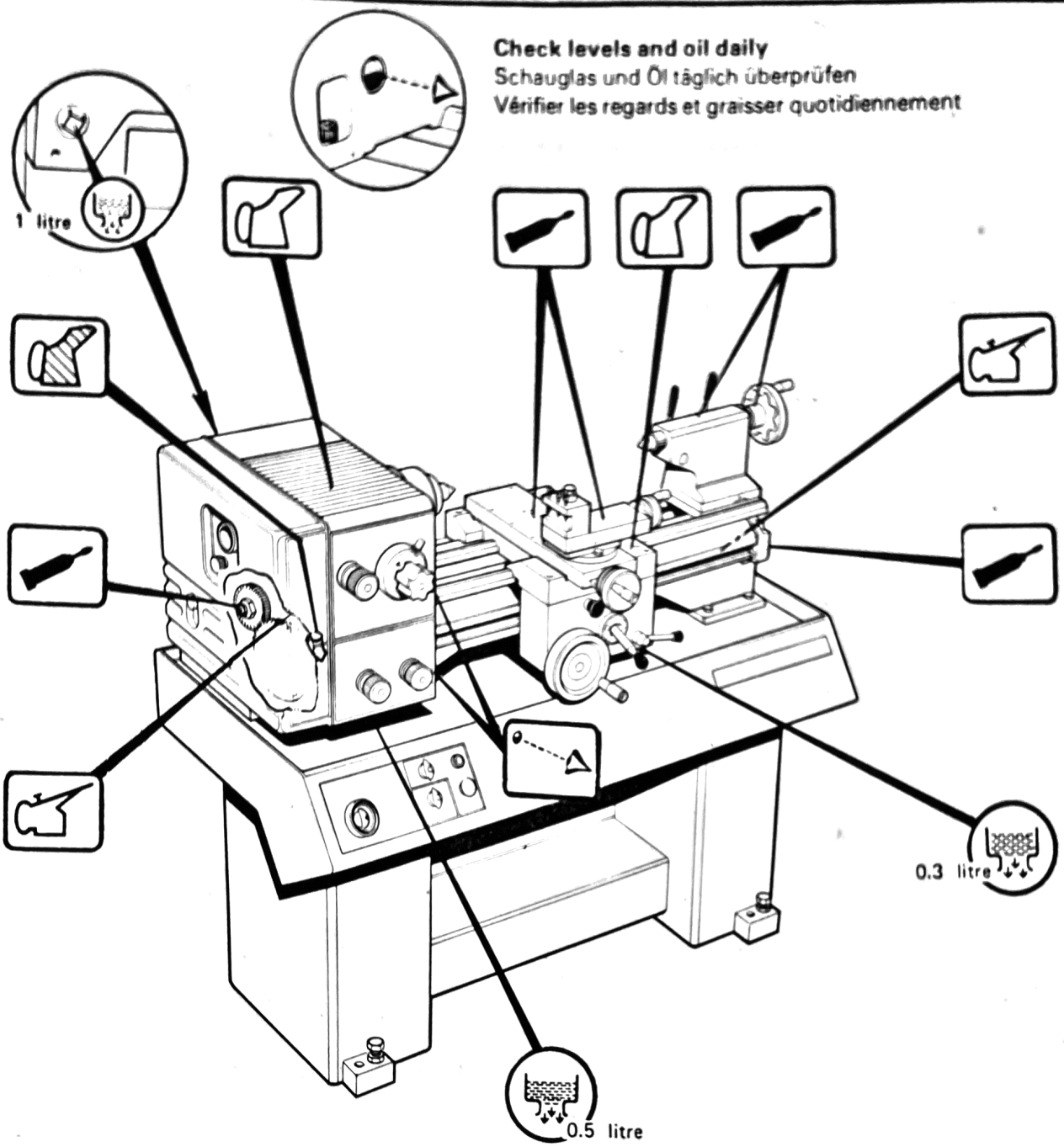
For optimum bearing life and performance it is recommended that high spindle speeds be avoided during the initial life of the machine.

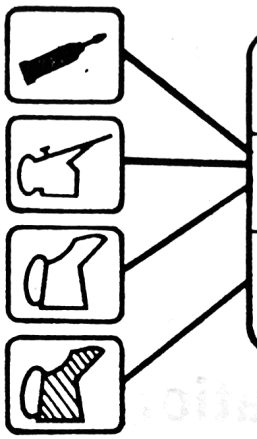
Alternatively a running-in procedure should be adopted as follows:-

Make a low feed rate selection and run the machine light for 3 hours at 260 rpm
then for 1 hour at 550 rpm
then for ½ hour at 750 rpm

Lubrication

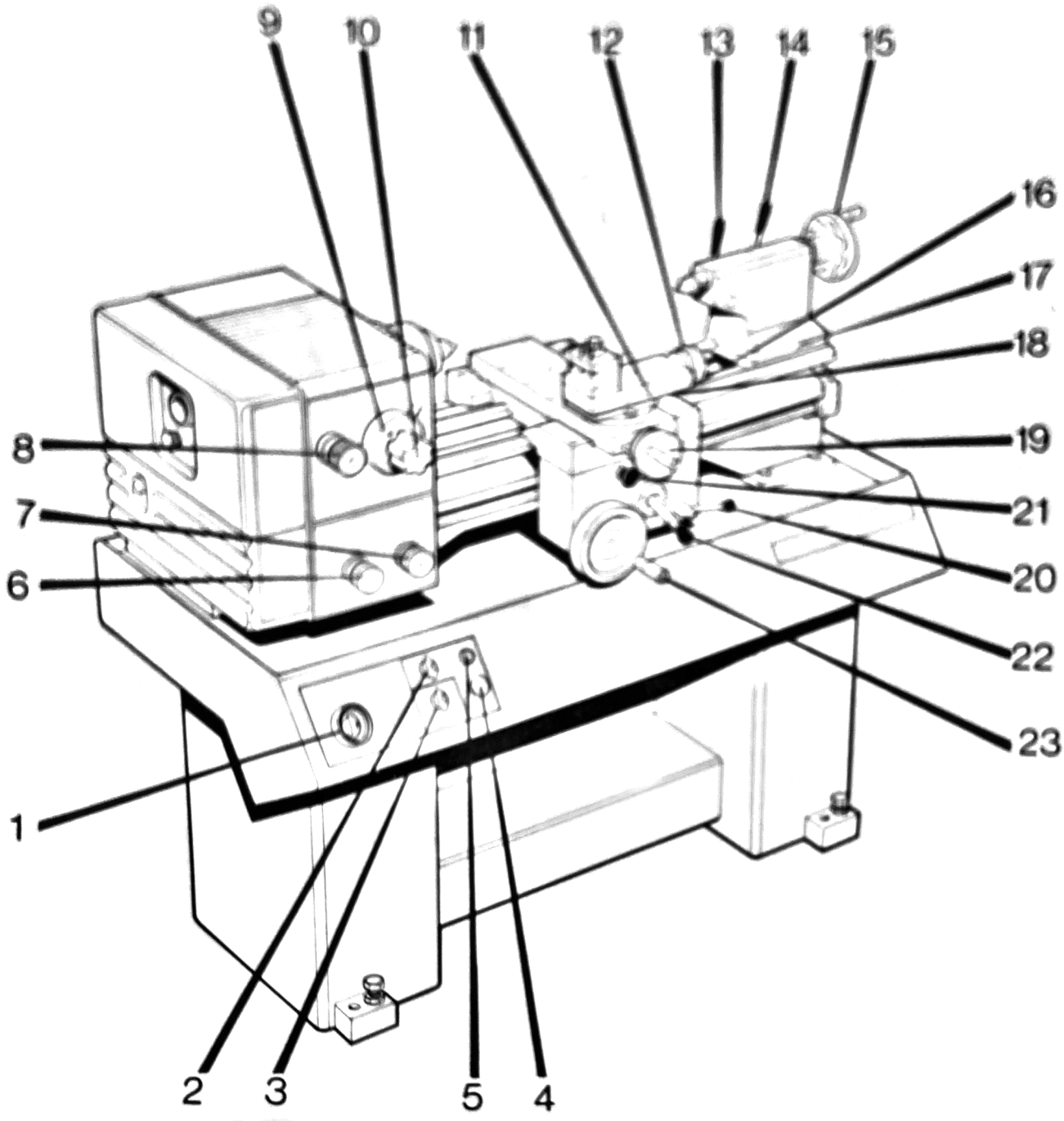
Check levels and oil daily
Schauglas und Öl täglich überprüfen
Vérifier les regards et graisser quotidiennement





Mobil	BP	Castrol	C	Esso	Shell	Texaco
DTE OIL HEAVY MEDIUM	ENERGOL HLP 68 (ISO)	HYSPIN AWS 68	P.W.L.C.	NUTO H68	TELLUS 68 OR R68	RANDO HD 68
DTE EXTRA HEAVY	ENERGOL HP 150 (ISO)	ALPHA ZN 220	WLM	NURAY 220	VITREA 220	REGAL R &O 220

Operation



1. MAINS ISOLATOR
2. FORWARD/REVERSE SWITCH
3. COOLANT ON/OFF SWITCH
4. EMERGENCY STOP PUSHBUTTON
5. START PUSHBUTTON
6. FEED SELECTOR
7. FEED SELECTOR
8. FEED DIRECTION SELECTOR
9. SPEED SELECTOR LEVER
10. SPEED RANGE SELECTOR DIAL
11. TOP SLIDE LOCK
12. TOP SLIDE TRAVERSE HANDLE
13. QUILL LOCK
14. TAILSTOCK CLAMP
15. QUILL TRAVERSE HANDWHEEL
16. CROSS-SLIDE LOCK (in R.H. side of cross slide)
17. TAILSTOCK SET-OVER SCREW
18. CARRIAGE LOCK
19. CROSS TRAVERSE HANDLE
20. TREADCUTTING ENGAGEMENT
21. FEED AXIS SELECTOR
22. FEED ENGAGE
23. LONGITUDINAL TRAVERSE HANDWHEEL

Starting the Machine

1. **Ensure that lubrication has been carried out in accordance with the Lubrication diagram.**

2. **Check** that the feed engage lever (22) and thread-cutting lever (20) 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 (21).
   Select - Direction of feed - by means of the headstock lower selector (8)
   Select - Feed Rate - by referring to the charts on the headstock and selecting (in the sequence listed) the appropriate positions on the gearbox selectors (6) and (7). (Engagement of the feed gears may be assisted by turning the main spindle)
   Select ** Spindle speed by turning the speed range selector dial (10) to present the appropriate range i.e. A B or C, then turn the speed selector lever (9) to point to the required speed from the chart.
   (Engagement of the drive gears may be assisted by manually turning the spindle)

4. **Switch on the electrical supply** at the mains isolator (1) which is the red knob at the L.H. end of control station.

5. **Select** direction of spindle rotation by means of forward/reverse switch (2).

6. **Start** the spindle by means of start push-button (5).

7. **Start and stop the feed motion** as required by means of the feed engage lever (22)

Stopping the Machine

The machine may be stopped by the Emergency Stop pushbutton (4).

Operational Notes

FACEPLATES	NOTE MAXIMUM SPEEDS:- 1500 rpm for 260 mm (12") dia.
COARSE SCREWCUTTING/ FEED RANGE 'J'	SHOULD NOT BE USED WITH SPINDLE SPEEDS ABOVE 750 RPM.

NOTES

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

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 **(23)** may be disengaged by pulling it away from the apron face.

Tailstock set over adjustment - is provided in the form of socket screws (17) 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 14)**
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.

Leadscrew Drive

Drive to the leadscrew is obtained by first removing the torque limiter cover plate. Then slide the driving sleeve towards the gearbox so engaging the shear pin with the leadscrew shaft. When not in use it is recommended that the leadscrew be disengaged.

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).

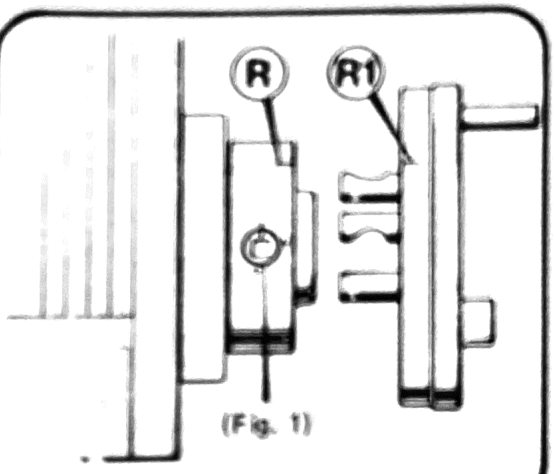
Mount the attachment on to the spindle nose and lock each cam by turning it clockwise using the key provided.

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

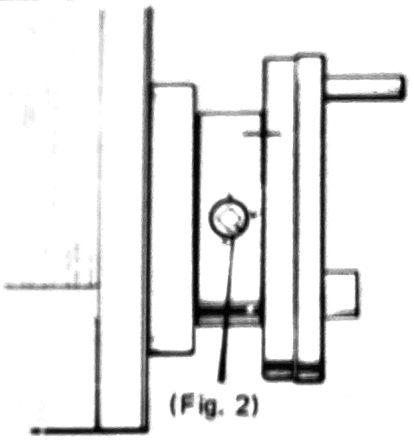
NOTE:-

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.



(Fig. 1)


(Fig. 2)

TO ADJUST 'CAMLOCK STUDS'

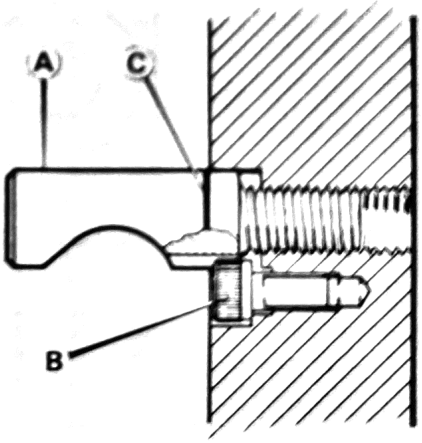
Remove Lockscrew (B).

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

Re-fit and tighten lockscrew (B).

NOTE:-

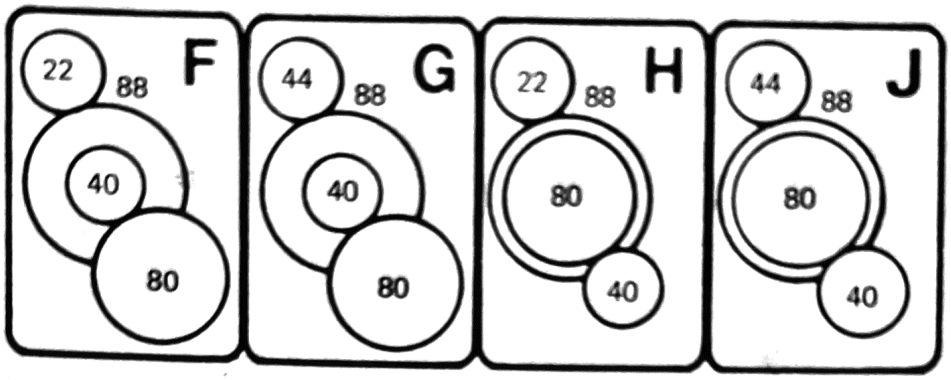
A datum ring (C) is marked on each stud as a guide to the original or initial setting.



Spindle Nose

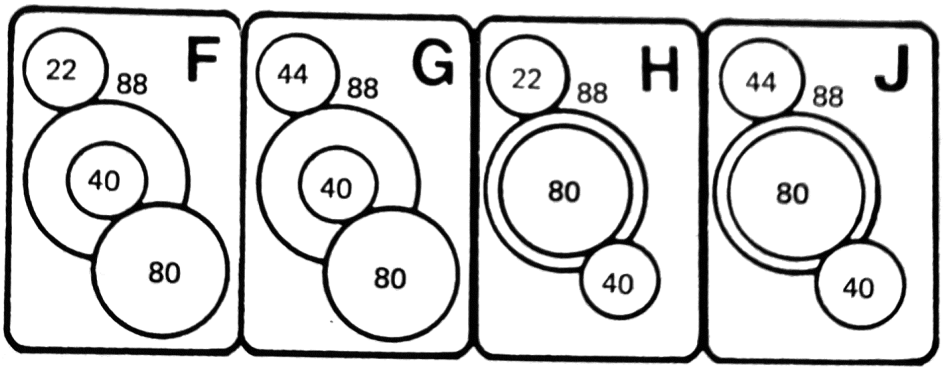
Changewheel Combinations

Fig. 2A for Metric Leadscrew Machines



6 mm. pitch Leadscrew

Fig. 2B for English Leadscrew Machines



4 tpi. Leadscrew

Thread–cutting

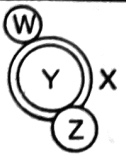
THREADCUTTING – METRIC GEARBOX

STANDARD THREADS AVAILABLE

mm

0.25	N3F	0.7	M1F	1.2	K1G	2	L2G	3.5	M2H
0.3	K3F		M3G		K3H		N1H	4	L2H
0.35	M3F	0.75	K2F	1.25	N2G		N3J		N1J
0.40	L3F	0.8	L1F	1.4	M1G	2.4	K1H	4.8	K1J
0.5	N1F		L3G		M3H		K3J	5	N2J
	N3G	0.875	M2F	1.5	K2G	2.5	N2H	5.6	M1J
0.6	K1F	1	L2F	1.6	L1G	2.8	M1H	6	K2J
	K3G		N1G		L3H		M3J	6.4	L1J
0.625	N2F		N3H	1.75	M2G	3	K2H	7	M2J
						3.2	L1H	8	L2J
							L3J		

THREADS AVAILABLE WITH ADDITIONAL CHANGEWHEELS



ins

		W	X	Y	Z
72	N3	30	81	40	84
64	N3	35	84	40	84
56	N3	40	84	40	84
48	N3	40	84	40	72
40	N3	22	88	80	63
36	N3	30	81	60	63
32	N3	35	84	60	63
28	N3	30	84	80	63
27	N3	30	81	80	63
26	N3	30	78	80	63
25	L3	22	88	80	63
24	N3	35	84	80	63
23	N3	40	92	80	63
22	N3	40	88	80	63
20	K3	35	84	80	63
19	N3	40	76	80	63
18	N3	40	72	80	63
16	N2	22	88	80	63
14	N1	30	84	80	63
13	N1	30	78	80	63
12	N1	35	84	80	63
11.5	N1	40	92	80	63
11	N1	40	88	80	63
10	K1	35	84	80	63
9	N1	40	72	80	63
8	K2	35	84	80	63
7.5	L1	35	84	80	63
7	L2	30	84	80	63
6	L2	35	84	80	63
5	K1	60	72	80	63
4.5	L2	40	72	80	63
4	K2	60	72	80	63
3	L2	60	72	80	63

993

MOD		X	Y	Z
.3	K3	22	88	56
.4	L3	22	88	56
.5	N1	22	88	56
.6	K1	22	88	56
.7	M1	22	88	56
.8	L3	44	88	56
1	N1	44	88	56
1.25	N2	44	88	56
1.5	K2	44	88	56
1.75	M2	44	88	56
2	L2	44	88	56
2.5	N2	44	88	28
3	K2	44	88	28
3.5	M2	44	88	28

DP		W	X	Y	Z
56	N3	44	98	100	63
48	N3	44	84	100	63
40	N3	55	81	72	49
36	N3	44	81	100	49
32	N3	55	56	80	63
28	N3	55	63	80	49
24	N3	55	63	80	42
22	N3	60	63	80	42
20	K3	55	63	80	42
18	N1	44	81	100	49
16	N2	44	63	80	56
14	N1	55	63	80	49
12	N1	55	63	80	42
11	N1	60	63	80	42
10	K1	55	63	80	42
9	L2	44	81	100	49
8	K2	55	63	80	42

1037

THREADCUTTING – ENGLISH GEARBOX

STANDARD THREADS AVAILABLE

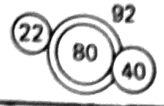
ins

3.1/8	K2J	8	M2H	13.3/4	R1H	25.1/3	K2F	44	M1F
4	M2J	8.71	K1H	14	S2H	26	L2G	48	M3F
4.35	K1J	8.15/16	L1J	15	R3H	27	T3G	49.1/2	T1F
4.1/2	T2J	9	T2H	16	M2G	27.1/2	R1G	52	L2F
4.3/4	K3J	9.1/2	K3H	17.42	K1G	28	S2G	54	T3F
5	R2J	9.5/8	S1J	17.7/8	L1H	30	R3G	55	R1F
5.1/2	M1J	9.3/4	L3J	18	T2G	32	M2F	56	S2F
6	M3J	10	R2H	19	K3G	34.83	K1F	60	R3F
6.3/16	T1J	10.1/2	S3J	19.1/4	S1H	35.3/4	L1G	71.1/2	L1F
6.1/3	K2H	11	M1H	19.1/2	L3H	36	T2F	77	S1F
6.1/2	L2J	12	M3H	20	R2G	38	K3F	78	L3G
6.3/4	T3J	12.3/8	T1H	21	S3H	38.1/2	S1G	84	S3F
6.7/8	R1J	12.2/3	K2G	22	M1G	39	L3G		
7	S2J	13	L2H	24	M3G	40	R2F		
7.1/2	R3J	13.1/2	T3H	24.3/4	T1G	42	S3G		

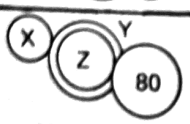
THREADS AVAILABLE WITH ADDITIONAL CHANGEWHEELS

ins

11½ M1



mm



		X	Y	Z
.4	R3	21	100	45
.5	M3	21	100	45
.6	R2	21	100	45
.7	M3	21	100	63
.75	M2	21	100	45
.8	M3	24	100	63
1	M3	24	80	63
1.2	M2	24	100	63
1.25	M2	22	88	63
1.4	R2	28	80	63
1.5	M2	24	80	63
1.6	R2	40	100	63
1.75	M2	28	80	63
1.8	R2	45	100	63
2	R2	40	80	63
2.2	R2	44	80	63
2.25	M2	45	100	63
2.4	R2	48	80	63
2.5	M2	40	80	63
2.75	M2	44	80	63
2.8	R2	42	60	63
3	M2	48	80	63
3.2	R2	48	60	63
3.5	M2	42	60	63
3.75	M2	45	60	63
4	M2	48	60	63
5	R2	60	48	63
6	R2	60	40	63
6.25	M2	60	48	63
7	R2	63	40	70
7.5	M2	60	40	63
8	R2	63	40	80
10	M2	63	40	80

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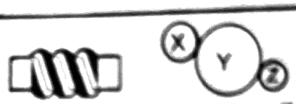
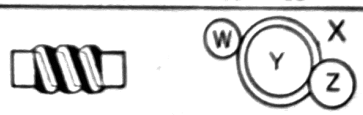


DP		X	Y	Z
56	S2	22	88	56
48	M3	22	88	56
40	R2	22	88	56
36	T2	22	88	56
32	M2	22	88	56
28	S2	44	88	56
24	M3	44	88	56
22	M1	44	88	56
20	R2	44	88	56
18	T2	44	88	56
16	M2	44	88	56
14	S2	44	88	28
13	L2	44	88	28
12	M3	44	88	28
11	M1	44	88	28
10	R2	44	88	28
9	T2	44	88	28
8	M2	44	88	28

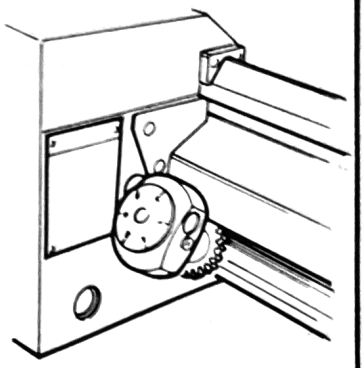


MOD		W	X	Y	Z
.4	R3	45	100	66	80
.5	M3	45	100	66	80
.6	R2	45	100	66	80
.7	M3	63	100	66	80
.8	R3	30	100	99	40
1	M3	30	100	99	40
1.25	M2	30	100	99	48
1.5	M2	30	100	99	40
1.75	M2	42	100	99	48
2	R2	44	88	99	40
2.25	M2	45	100	99	40
2.5	M2	44	88	99	40
2.75	M2	44	80	99	40
3	M2	48	80	99	40
3.5	M2	56	80	99	40

1038

(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 requisite gear of the double pinion should be arranged to mesh with the leadscrew.

in column 3. The dial numbers at which the leadscrew nuts may be engaged.

mm

	✱			✱	
0.25	20	14	1.4	21	135
0.3	20	14	1.5	20	14
0.35	21	135	1.75	21	135
0.4	20	14	2	20	14
0.5	20	14	2.5	20	14
0.6	20	14	3	20	14
0.7	21	135	3.5	21	135
0.75	20	14	4	20	14
0.8	20	14	5	20	14
1	20	14	6	20	14
1.2	20	14	7	21	135
1.25	20	14	8	20	1

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.

ins

4	1-6	11	1-6	28	1-6
4½	135	12	1-6	30	1-6
5	1-6	14	1-6	32	1-6
5½	135	15	1-6	36	1-6
6	1-6	16	1-6	38	1-6
6½	135	18	1-6	40	1-6
7	1-6	19	1-6	44	1-6
7½	135	20	1-6	48	1-6
8	1-6	22	1-6	52	1-6
9	1-6	24	1-6	54	1-6
9½	135	26	1-6	56	1-6
10	1-6	27	1-6	60	1-6

(B) ENGLISH THREADS on METRIC LEADSCREW MACHINES
or
METRIC THREADS on ENGLISH LEADSCREW MACHINES
or
ALL THREADS ON MACHINES NOT FITTED WITH THREAD INDICATOR

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 reverse switch (2) 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).

LATHE OPERATOR SAFETY

Harrison Lathes are fast, powerful machines which can be dangerous if used under improper circumstances. Please read and observe the following Health and Safety Guidance Notes before and during the use of the machine.

HEALTH AND SAFETY AT WORK ETC. ACT 1974

In accordance with the requirements of the Health and Safety at Work etc. Act 1974 this manual contains the necessary information to ensure that the machine tool can be operated properly and with safety. It is assumed that the operator has been properly trained, has the requisite skill and is authorised to operate the machine, or, if undergoing training, is under the close supervision of a skilled and authorised person.

Attention is drawn to the importance of compliance with the various statutory regulations which may be applicable, such as "The Protection of Eyes Regulations". It is further stressed that good housekeeping, common sense and the maintenance of good established work shop practice is essential.

Adequate information is also provided to enable the machine to be properly serviced and maintained by persons with the necessary skills and authority. It is recommended that a "Permit to Work" system, such as that detailed in Code of Practice BS 5304; 1974. Safeguarding of Machinery should be operated.

MACHINE CAPACITY

The dimensions of a component which can be accommodated on the M250 lathe are limited only by the physical restrictions of the machine itself but responsibility for the following points with respect to machining a component must inevitably rest with the user.

(1) Ensuring that the operator has had suitable training and possesses the required degree of skill and experience to undertake the work.

(2) Providing suitable work holding and/or supporting equipment, i.e. chucks, steadies, revolving centres, etc.

(3) Ensuring that suitable tooling is provided and correctly mounted.

(4) Ensuring that suitable feeds and speeds are selected (if in doubt select the lowest).

(5) Providing suitable workpiece guards and ensuring that these are consistently used.

IMPORTANT SAFETY NOTE ON ALL MACHINES

Because of the possibility of bodily contact and whipping, especially when small diameters of material are used, bar stock must NOT, under any circumstances, be allowed to extend beyond the end of the headstock spindle without the use of special guarding and adequate support.

OPERATING SAFETY PRECAUTIONS

1. Keep the machine and work area neat, clean and orderly.
2. Ensure all guards and cover plates are in place and all machine cabinet doors closed before starting machine.
3. Never lay anything on the working surfaces of the machine, or inside the machining chamber, where it may foul with rotating or moving parts.

4. Do not touch or reach over moving or rotating machine parts.
5. ENSURE YOU KNOW HOW TO STOP THE MACHINE BEFORE STARTING IT.
6. Do not operate the machine in excess of its rated capacity.
7. Do not wear rings, watches, ties or loose sleeved clothing.
8. STOP MACHINE IMMEDIATELY ANYTHING UNEXPECTED HAPPENS.
9. DO NOT interchange chucks or other spindle mounting items without checking for correct locking (see Operational Notes).
10. Do not use other workholding devices without checking for compatability with T.S. Harrison and Sons Ltd. and workholding manufacturer.
11. Check load capacity of revolving centres for application in hand.
12. Stop motors and switch off isolator when leaving machine unattended.

OPERATING HAZARDS

When using the machine be FULLY AWARE of the following operating hazards detailed under the following instructions:

a) **Cancer of the Skin Caused by Oil**

Cancer of the skin may be produced by continuous contact with oil, particularly with straight cutting oils, but also with soluble oils. The following precautions should be taken:

1. Avoid unnecessary contact with oil.
2. Wear protective clothing.
3. Use protective shields and guards.
4. Do not wear oil soaked or contaminated clothing.
5. Use barrier creams provided.
6. Do not wash hands in coolant.
7. After work thoroughly wash all parts of the body that have come into contact with oils.

b) **Safe Operation of Lathe Chucks**

Where details of operating speeds and of maximum recommended operating speeds are supplied these are intended only as a guide. Such details must be regarded as for general guidance only for the following reasons:

They apply only to chucks in sound condition.

If a chuck has sustained damage, high speeds may be dangerous. This applies particularly to chucks with grey cast iron bodies wherein fractures may occur.

The gripping power required for any given application is not known in advance.

The actual gripping power being used for any given application is not known by the chuck manufacturer.

There is the possibility of the workpiece becoming insecurely gripped due to the influence of centrifugal force under certain conditions. The factors involved include:–

(a) Too high a speed for a particular application.

(b) Weight and type of gripping jaws if non-standard.

(c) Radius at which gripping jaws are operating.

(d) Condition of chuck – inadequate lubrication.

(e) State of balance.

(f) The gripping force applied to the workpiece in the static condition.

(g) Magnitude of the cutting forces involved.

(h) Whether the workpiece is gripped externally or internally.

Careful attention must be paid to these factors. As they vary with each particular application, a manufacturer cannot provide specific figures for general use, the factors involved being outside his control.

GENERAL PRINCIPLES CONCERNING OPERATOR SAFETY FOR ALL TURNING MACHINES

1. Do not hold a lathe part with grease or oil on it.
2. Hold all lathe parts firmly.
3. Do not attempt to hold lathe parts that are too awkward or too hard to hold.
4. Do not hold or lift lathe parts that weigh too much.
5. Know how to properly hold lathe parts when lifting.
6. Use the correct type of sling when lifting workpieces or equipment by crane.
7. Stand clear when lifting workpieces of equipment by crane.
8. Obtain assistance when mounting heavy or awkwardly shaped workpieces.
9. Be sure to clean oil or grease from hand tools and levers and handles.
10. Be sure there is enough texture on the surface of the hand tool or lever handle for proper safe hand contact.
11. Hold hand tools and lever handles firmly.
12. Always choose the proper hand tool and appropriate hand position on the lever handle.
13. Do not use hand tools or lever handles in an awkward position.
14. Always use the recommended number of hands to grasp hand tools and lever handles.
15. Do not get turning or hand tools caught in the chuck or other holding device.
16. Do not use broken or chipped tools.
17. Be sure work piece cannot move in chuck or other holding device.
18. Beware of irregular shaped work pieces.

19. Beware of burrs on work pieces and remove if possible.
20. Always select the proper tool for the job.
21. Always attend to your lathe operation – do not run the machine unattended.
22. Do not use tools without handles.
23. Do not apply too much pressure with tools.
24. Do not use defective tools.
25. Always secure your work piece.
26. Always completely secure tool in sockets and screw slots.
27. Do not rely on work tool sockets, screw slots, nuts or bolts.
28. Do not rely on fasteners beyond your reach.
29. Beware of obstructions that prevent complete tightening of fasteners.
30. Do not work in a hurry.
31. Do not overtighten equipment.
32. Never substitute the wrong size tools if the correct size tool is not available in the shop.
33. Never substitute the wrong sized tool if you cannot locate the correct tool in the shop.
34. Do not move guards while lathe is under power.
35. Do not place hand or body part in path of moving parts.
36. Beware of touching lathe parts that will move or fall.
37. Be aware of where you are moving your hand or body part.
38. Beware of holding a tool or other parts inserted in or attached to the chuck or work piece.
39. Be aware of hand or other body part that is in position to be hit by a chuck or work piece.
40. Be aware of your resting position.
41. Do not lean on the machine.
42. Beware of accidentally engaging clutch or turning the power on.
43. Know your controls.
44. Read and understand operation notes before attempting to use the machine.
45. Do not touch revolving chuck, spindle or work piece.
46. Never place your hand on chuck, spindle, or work piece to stop rotation of the lathe.
47. Make sure clutch is disengaged.
48. Make sure power has been turned off.
49. Beware of chuck drifting to a stop before operating it.
50. Always check chuck area.
51. Never engage power with chuck wrench in the chuck.
52. Remove the chuck key immediately after use.

53. Do not operate lathe while talking.
54. Keep your mind on the job.
55. Beware of lathe dangers when attending to other aspects of lathe operation.
56. Beware of loose clothing near the rotating parts of the lathe.
57. Button up overalls and roll up sleeves or button the cuffs.
58. Beware of loose hair near the rotating parts of the lathe.
59. Keep hair short or wear a cap and hair net.
60. Beware of performing another operation while in close proximity to rotating parts on the lathe.
61. Be aware when changing body positions.
62. Always attend to filing and deburring operations.
63. Always pay attention to file or deburring tools close to the chuck.
64. Files and deburring tools may catch on chuck.
65. Beware of clutch position when jogging the spindle to different positions for gauging.
66. Beware of hands resting on clutch levers.
67. Be sure lathe is in neutral position when placing gauges on components gripped in the chuck.
68. Be sure motor is not running when using gauges on the machine.
69. Be sure speed is set at 0 RPM when placing gauges on mounted workpieces.
70. Always wear protection before operating the lathe.
71. Always wear the right protection before operating the lathe, i.e. safety glasses, overalls, protective shoes, etc.
72. Never remove protection for even a short time when operating the lathe.
73. Wear protective devices correctly.
74. Know the correct way to wear protective devices.
75. Beware of foreign material flying from the lathes.
76. Keep protective shields at the point of operation.
77. Know how to set or attach protective guards properly.
78. Never use the wrong protective guard.
79. Know how to select the proper guards.
80. Never reach over, under or around a work piece to make an adjustment.
81. Never reach over, under or around a work piece to retrieve a hand tool or lathe part.
82. Beware of where you leave your tools during set up.
83. Never reach over, under or around work piece to move hand tool/lathe to another position.
84. Never reach over, under or around the work piece to tighten a lathe part.
85. Never reach over, under or around work piece to remove cuttings.

86. Beware of time/space relationships.

87. Beware of weight/force relationships.

88. Know the proper procedure for applying force.

89. Never apply force from an awkward position.

90. Never mount a work piece too large for the lathe to handle.

91. Never mount a work piece too large for the worker to handle.

92. Use the equipment necessary for handling work pieces.

93. Never apply more force on the accessory or control lever than you can handle.

94. Secure all work pieces.

95. Secure all jaws, nuts, bolts and locks.

96. Avoid unsafe procedures.

97. Never use undersized parts.

98. Always use the proper equipment.

99. Tighten all fasteners.

100. Never take excessive cuts in machine operation.

101. Never use excessive force in polishing, filing and deburring.

102. Always use the proper hand tool to remove cuttings.

103. Never hurry to remove cuttings.

104. Beware of cuttings wrapped around the chuck or work piece.

105. Never change gears by moving item with your hands.

106. Never remove gear guards.

107. Beware of tools/lathe parts falling on controls.

108. Do not remove swarf with bare hands, use a rake or a brush.

109. Do not interfere with electrical equipment.

110. Do not keep tools in overall pockets.

111. Report any accident, however small, immediately it happens.

112. Use only high speed chucks.

113. Note maximum permissible speeds of faceplates (see operational notes).

114. Check — spindle control lever is in stop position before starting motors

spindle speed selected

feed rate selected

direction of feed, and that feed and thread cutting levers are disengaged before starting the spindle

115. Do not remove work from the machine without retreating the tool to a safe position.

Maintenance

FIG. 1

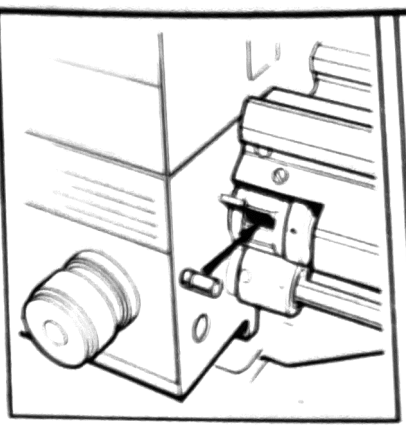


FIG. 2

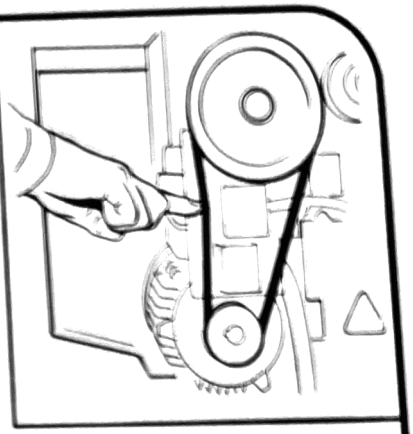


FIG. 3

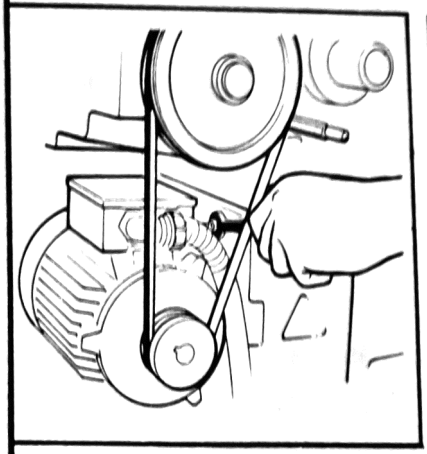


FIG. 4

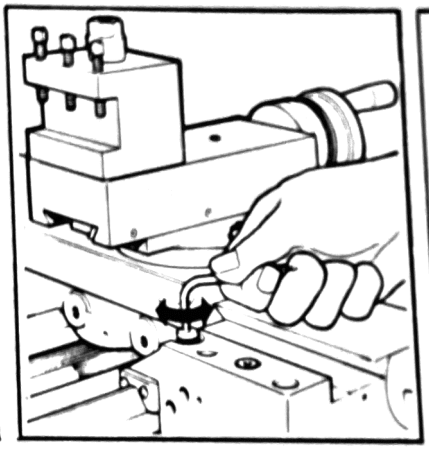


FIG. 5

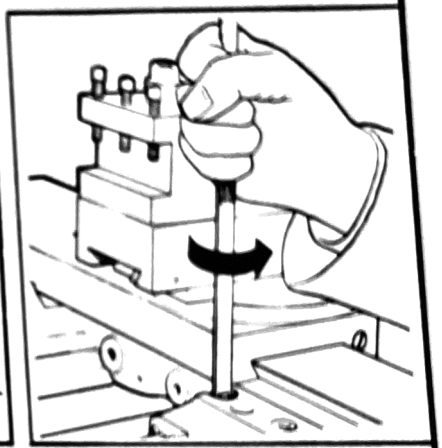


FIG. 6

FIG. 7

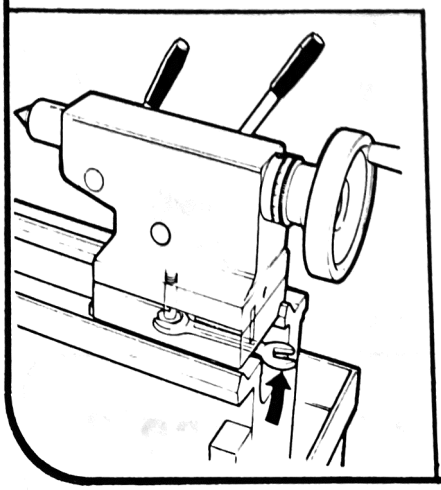


FIG. 8

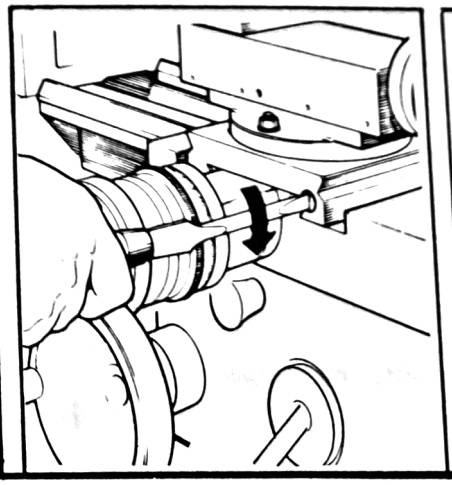
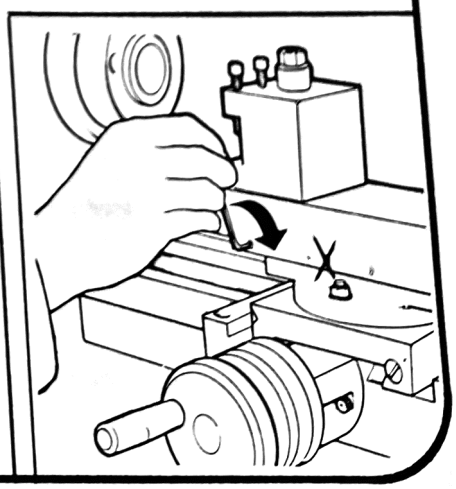


FIG. 9



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.

Leadscrew Shear Pin (Fig.2)

A shear pin device is incorporated on the leadscrew adjacent to the gearbox, as protection against overload. Instructions for replacing the shear pin are as follows:-

Remove the torque limiter cover plate.

Disengage shear pin assembly by sliding away from gearbox face.

Rotate spring steel cover on its locating sleeve until access slot is exposed.

Release M5 dog-point set screw in sleeve and rotate sleeve and cover until shear pin is exposed through slot.

Replace shear pin as shown in illustration (2) and re-assemble ensuring that the dog point of the M5 set screw is correctly located.

Drive Belts (Fig. 3 and 4)

Access to the Drive Belt is gained by removal of the moulded end guard when vee Belt tension may be assessed by applying finger pressure on the belt at a point midway between the two pulleys (fig. 3). For correct tension a deflection of about 10 mm should be possible.

To adjust the vee belt tension – release the lock nut on the adjusting screw (fig. 4) to increase tension, tighten screw against the bed until correct tension is obtained then re-tighten lock nut.

It is important that when making adjustments a straight edge be placed across the face of each pulley to ensure that correct alignment is maintained.

Saddle Strips (Fig. 5 and 6)

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^{o} turn at the sleeve represents approximately 0.1 mm (.004") take up in the strip.

Tailstock Bed Clamp (Fig. 7)

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.

continued

Cross-slide (Fig. 8)

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.

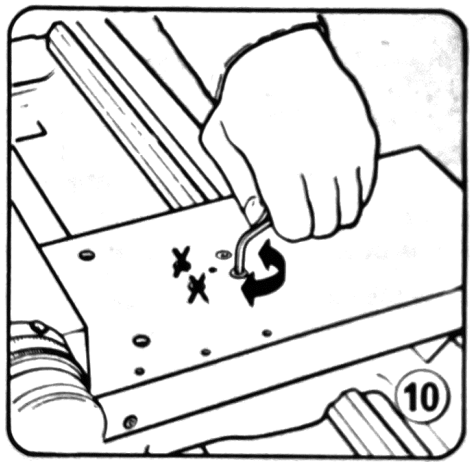
Top Slide (Fig. 9)

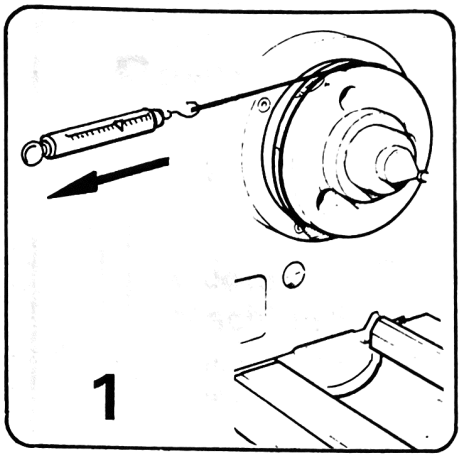
Take up for wear on the top slide strip is by means of the four (self-locking) socket set screws in the front face of the top slide casting.

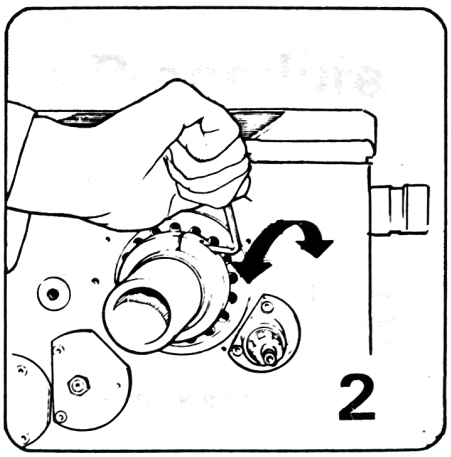
Cross-slide Nut (Fig. 10)

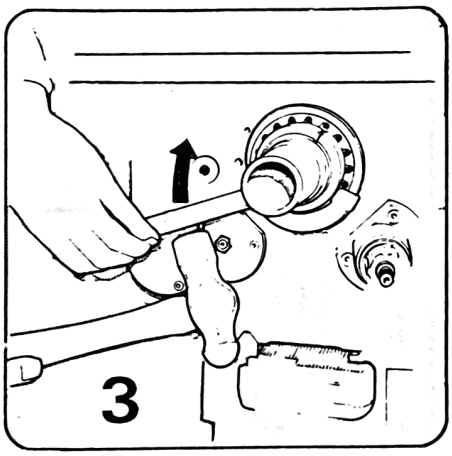
Provision is made for the elimination of backlash in the cross-slide nut, the procedure for adjustment being as follows:-

Release **only** the rear pair of socket cap head screws in the top face of the cross-slide, which allows a spring loaded device to automatically remove backlash. Re-tighten cap head screws.









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

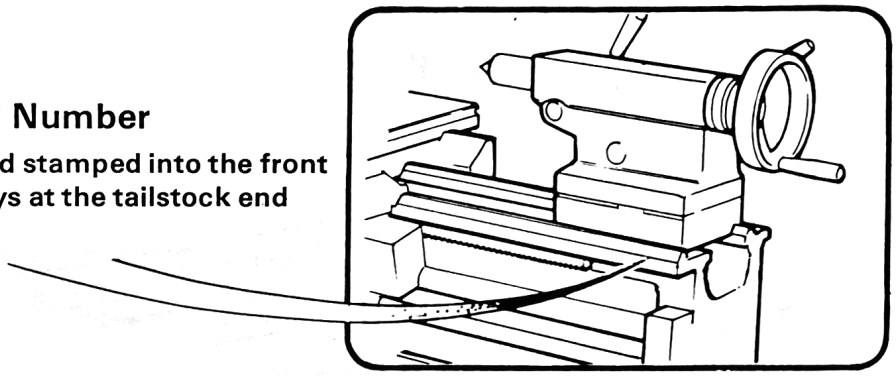
Remove end drive guard, changewheels, swing frame and rear bearing cover.

Release locking screw in the bearing adjusting nut, Fig. 2. With a pin key 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.

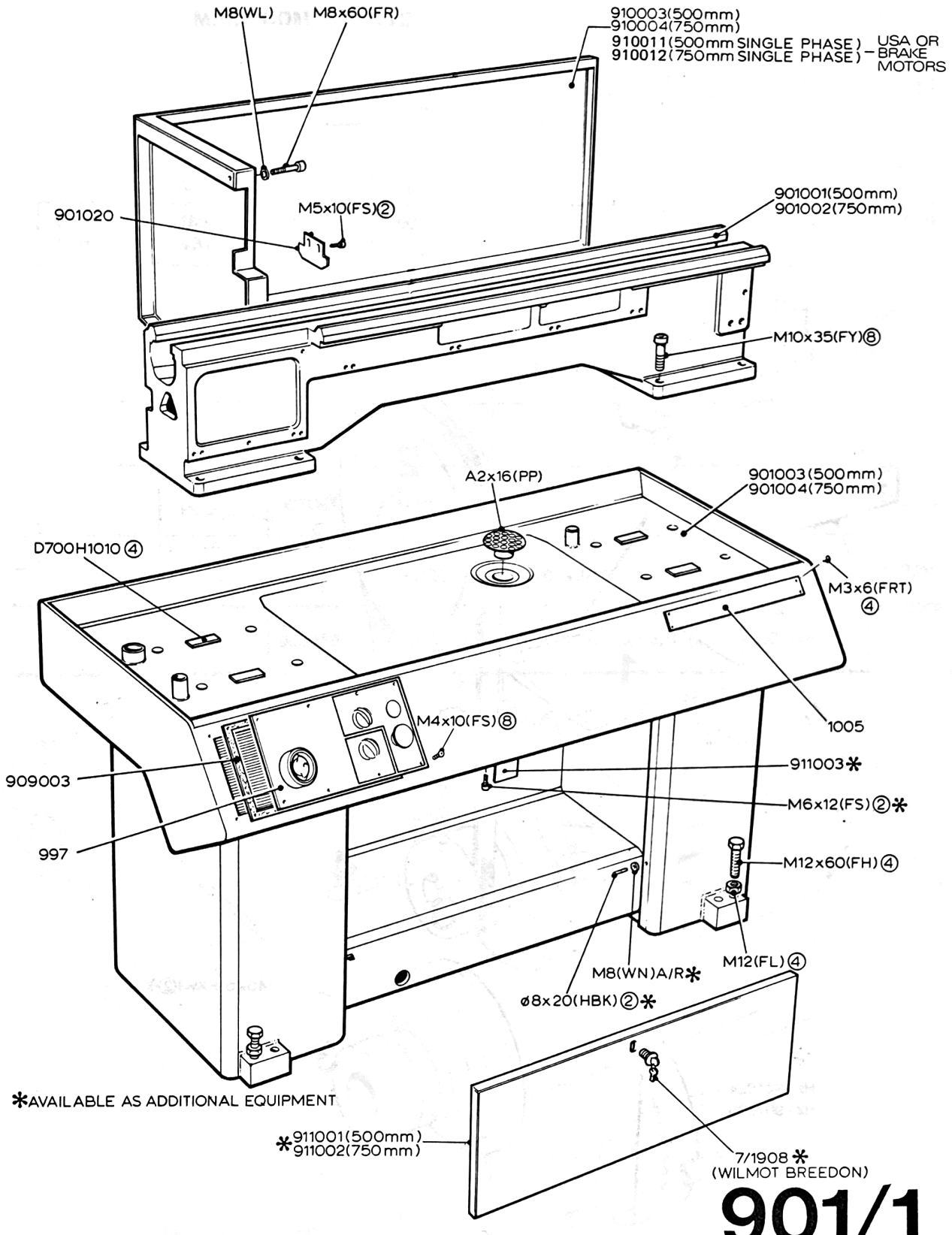
Where part numbers change with machine bed length then the model number is given, vis.

500	or	750

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

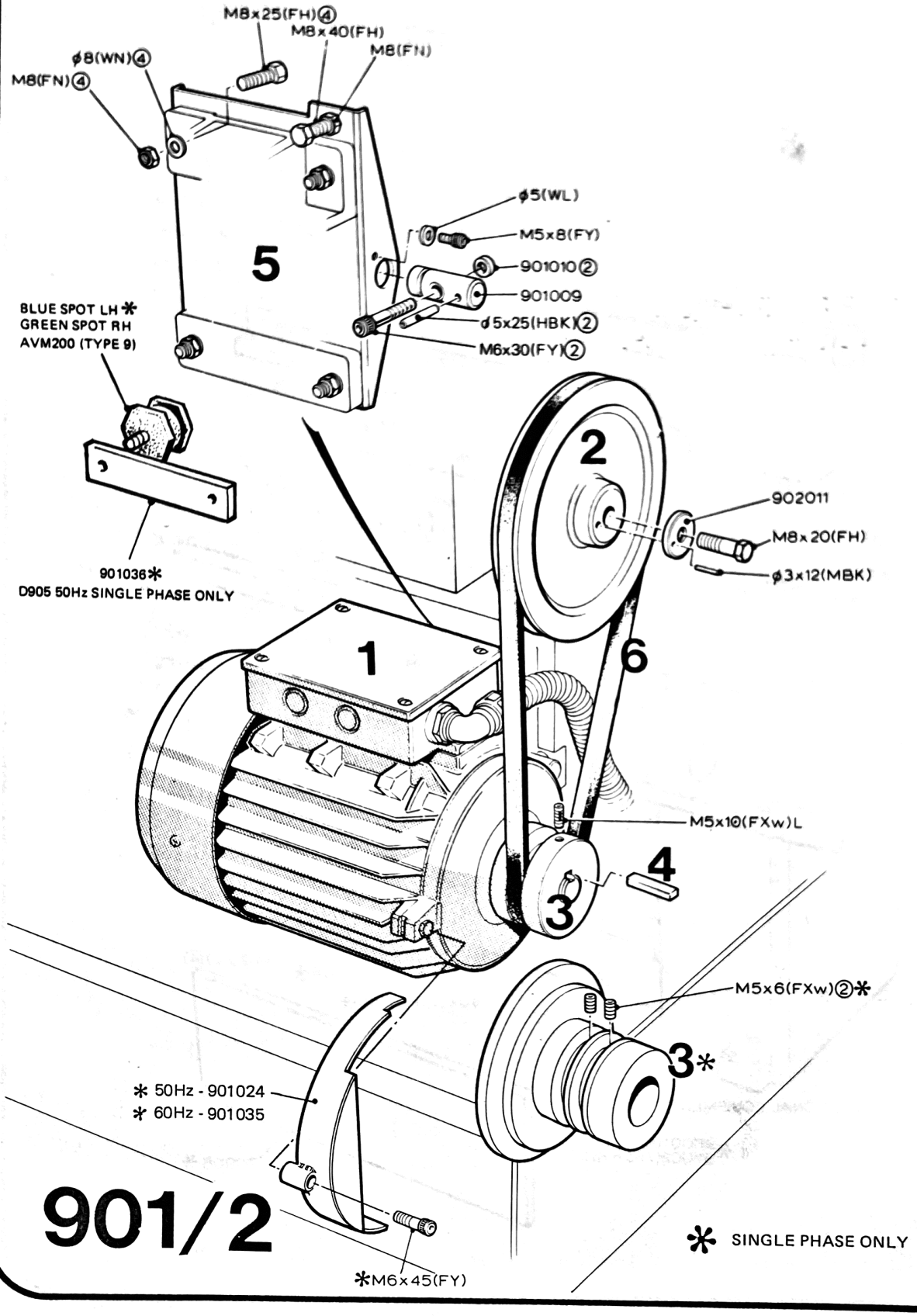
Contents List



*AVAILABLE AS ADDITIONAL EQUIPMENT

901/1

0924 403751

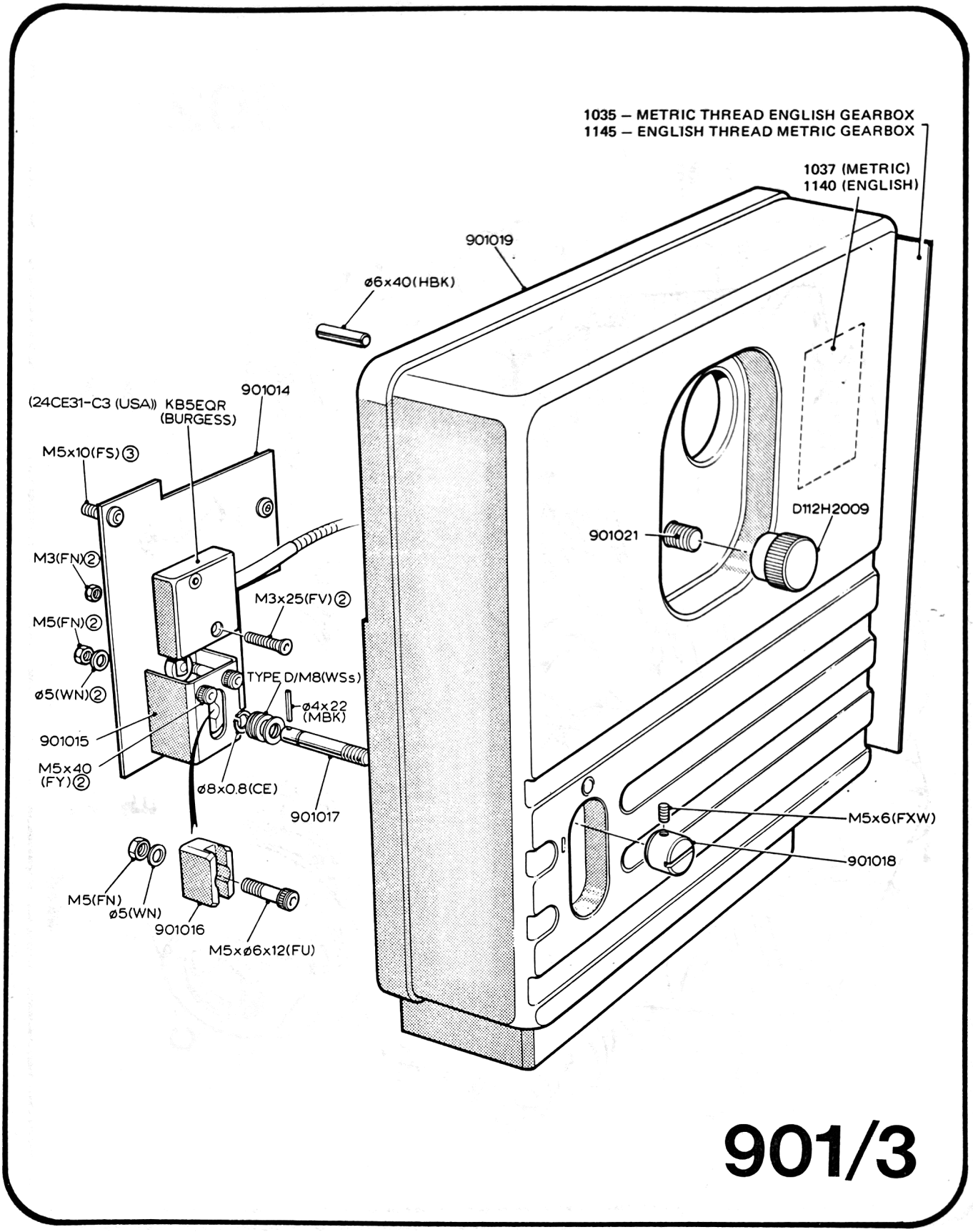


901/2

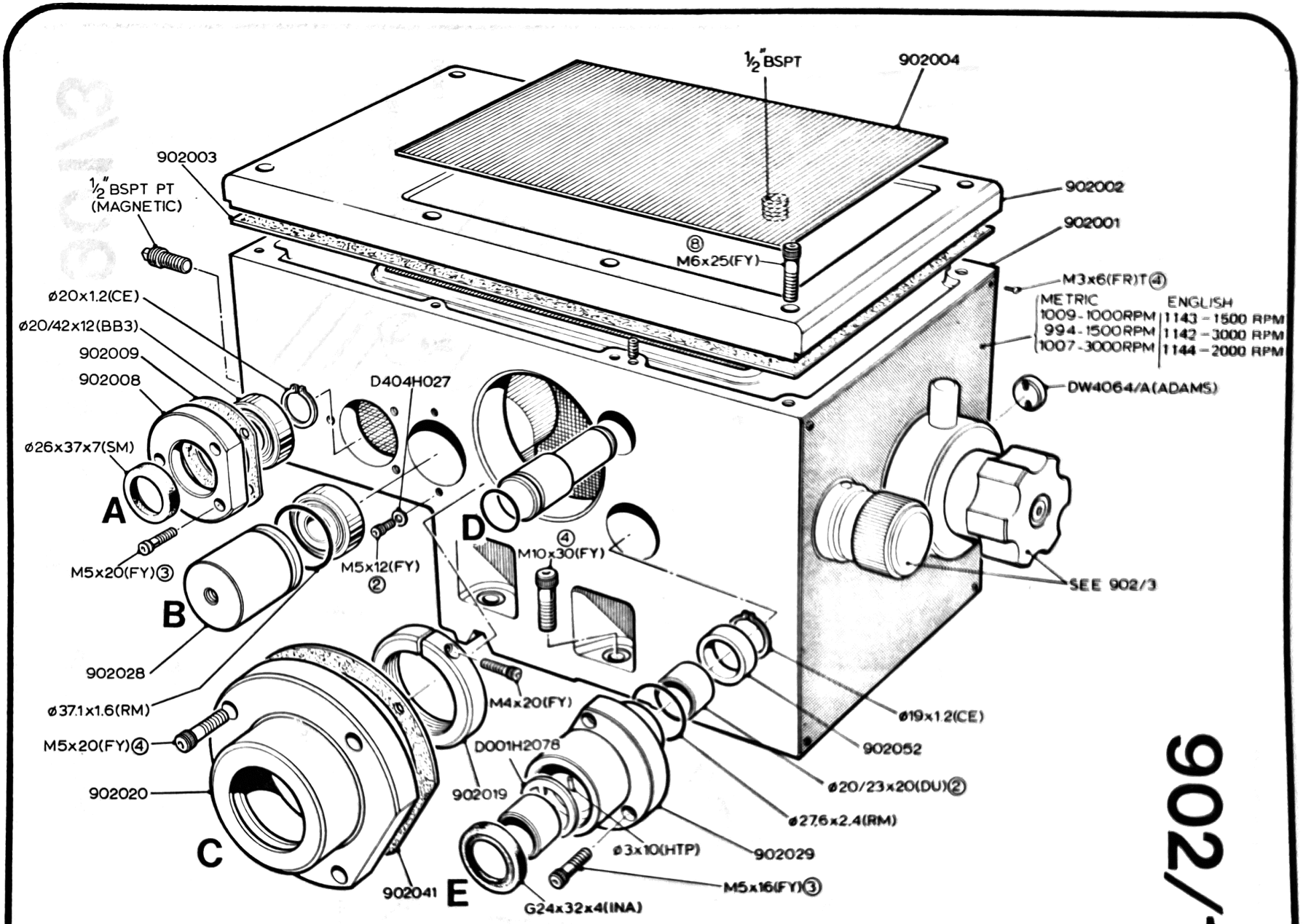
✻ SINGLE PHASE ONLY

KEY TO DRIVE ASSEMBLY COMPONENTS (901/2)

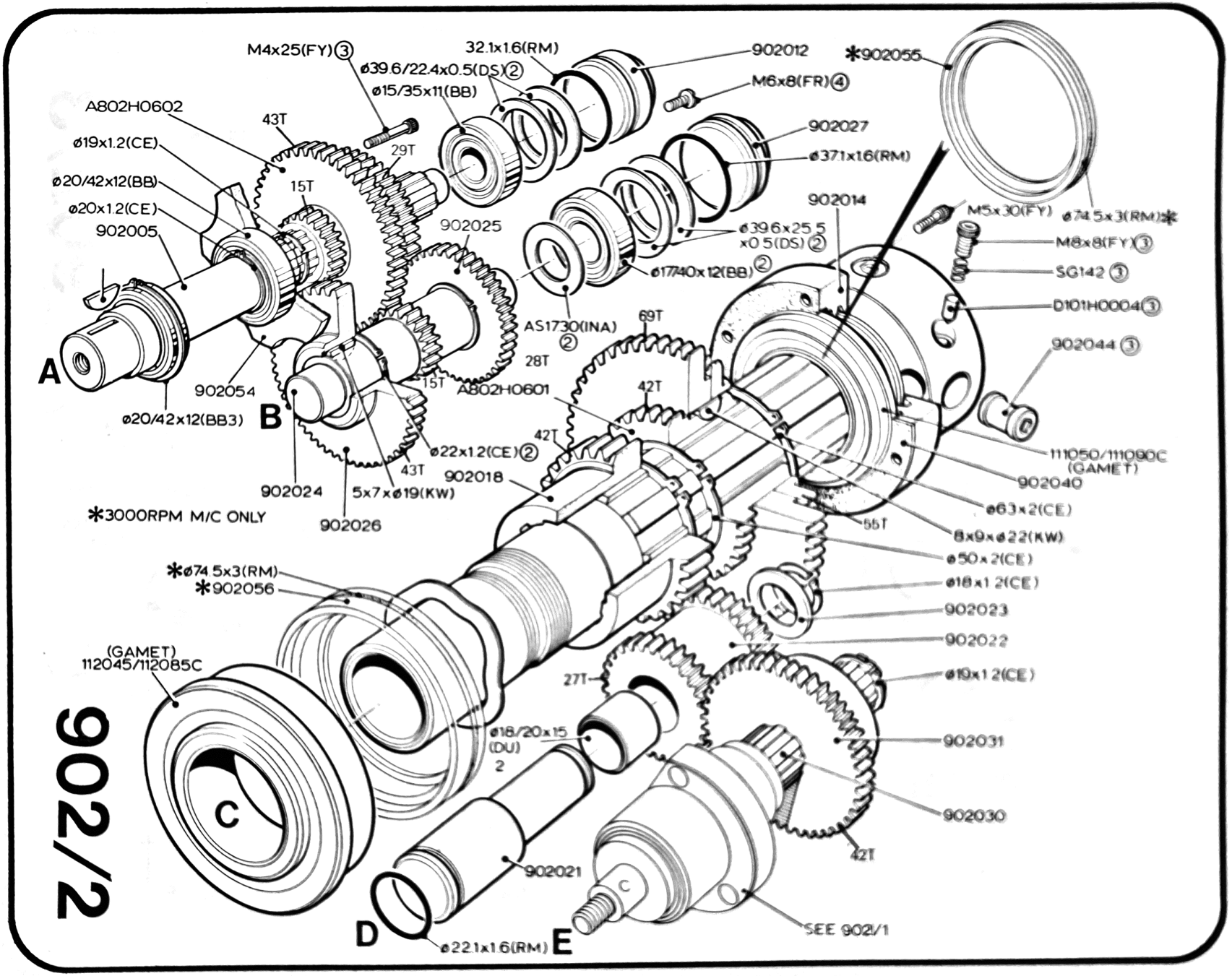
1		2	3	4	5	6
MOTOR		TOP SPEED SPINDLE	TOP PULLEY	MOTOR PULLEY	KEY	MOUNTING BRACKET	BELTS
D80	3 PH 50Hz	1500 3000	902010	901012	6x5x40 (KR)	901007	SPZ 800
D90S	Single PH 50Hz	1500	902053	901023	8x7x32 (KR)	901037	NU-T-Z/10(40°) Brammer ②
D80	3 PH 60Hz	1500 3000	902010	901028	6x5x40 (KR)	901007	SPZ 800
LS145T	3 PH 60Hz	1500	902010	901013	3/16"x3/16"x1.3/8"(KS)	901008	SPZ 800
LS145T	3 PH 60Hz	2000	902057	901026	3/16"x3/16"x1.3/8"(KS)	901008	SPZ/3V 787
EL145T	Single PH 60Hz	2000	902061	901033	3/16"x3/16"x1.3/8"(KS)	901008	SPZ/3V 787
EL145T	Single PH 60Hz	1500	902089	901051	3/16"x3/16"x1.3/8"(KS)	901008	SPZ 800

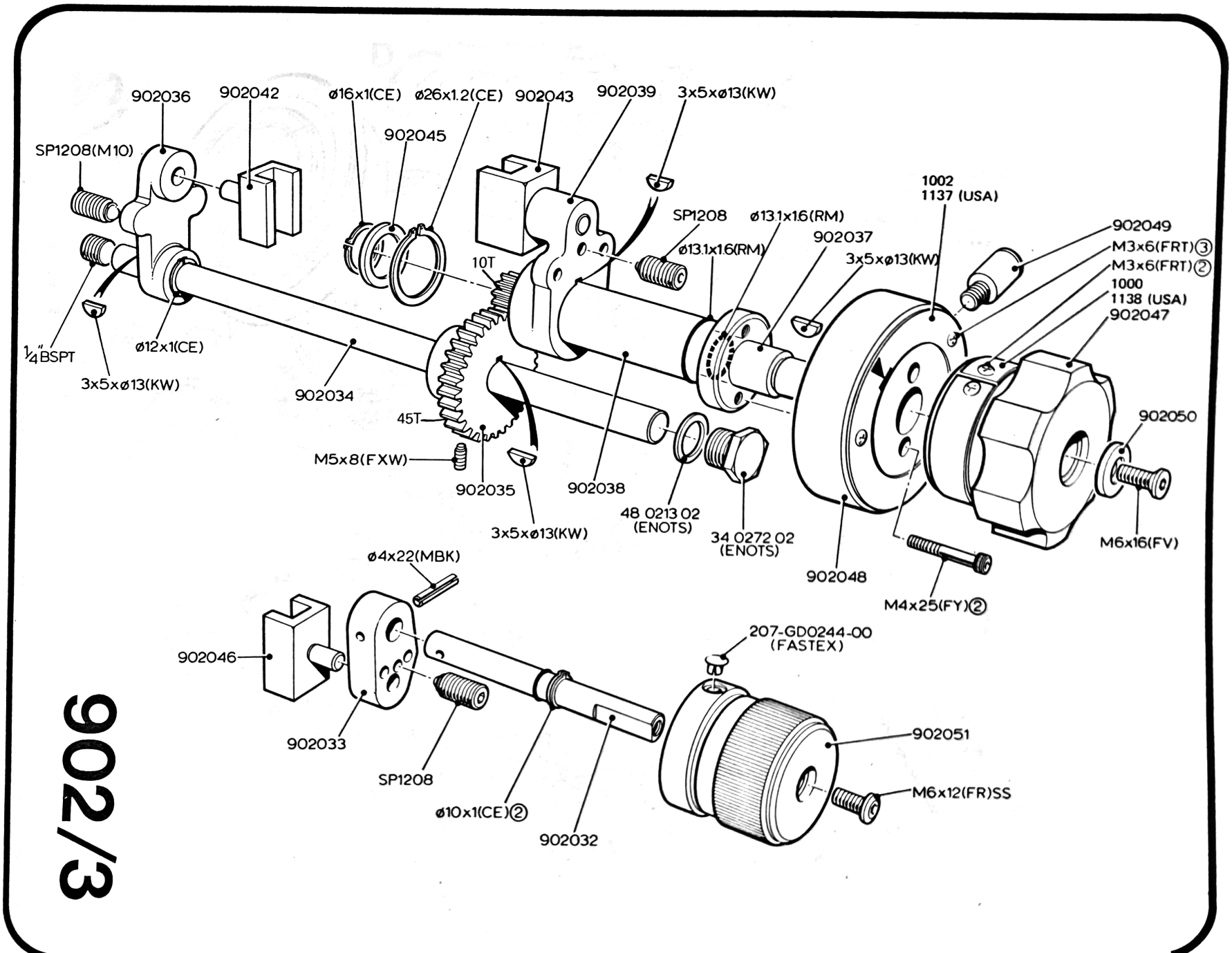

1035 – METRIC THREAD ENGLISH GEARBOX
1145 – ENGLISH THREAD METRIC GEARBOX
1037 (METRIC)
1140 (ENGLISH)
901019
ø6x40(HBK)
901014
(24CE31-C3 (USA)) KB5EQR (BURGESS)
M5x10(FS) ③
M3(FN)②
M5(FN)②
ø5(WN)②
M3x25(FV)②
TYPE D/M8(WSs)
ø4x22 (MBK)
901015
M5x40 (FY)②
ø8x0.8(CE)
901017
M5(FN)
ø5(WN)
901016
M5xø6x12(FU)
901021
D112H2009
M5x6(FXW)
901018

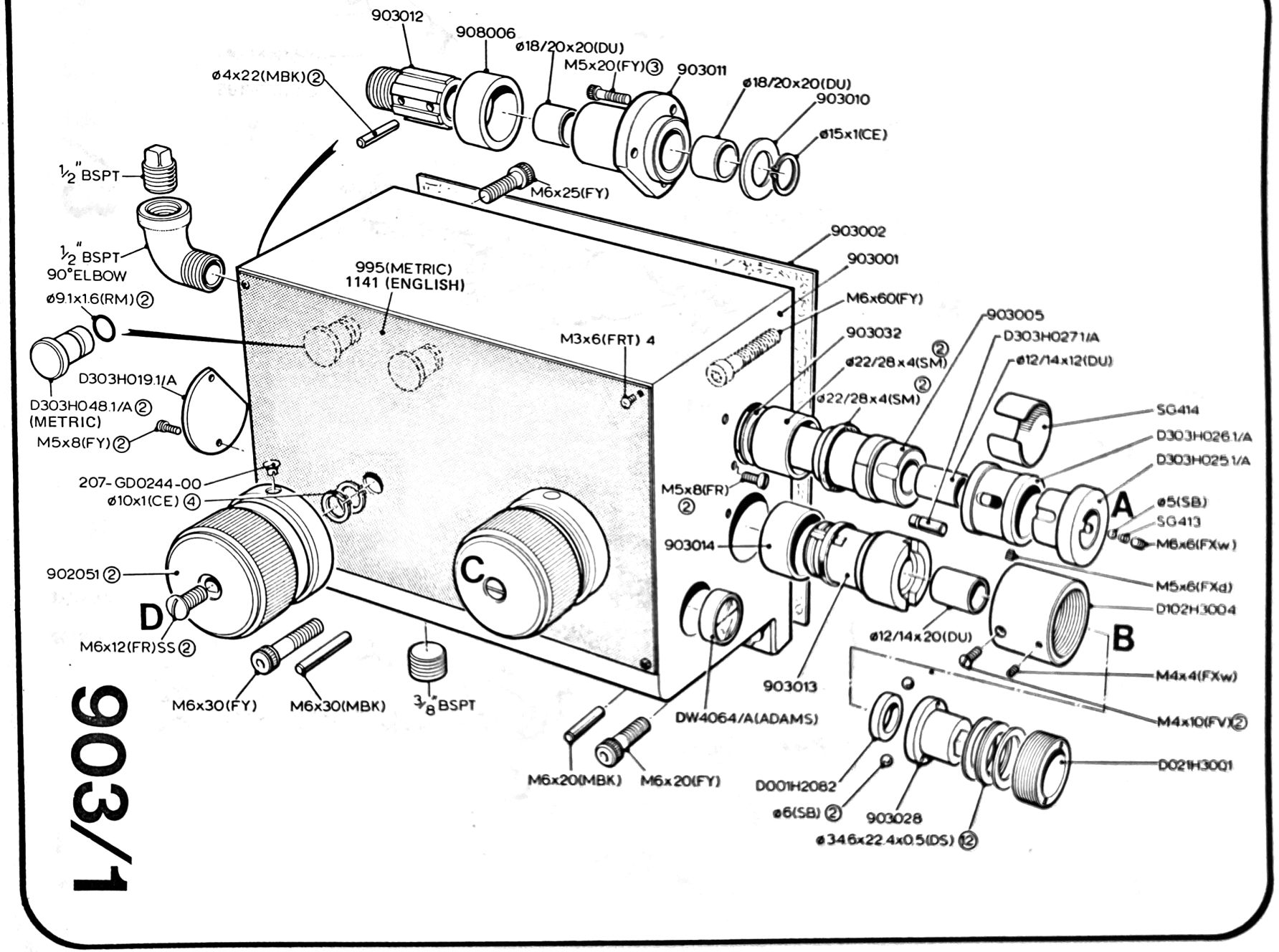
901/3


½"BSPT
902004
902003
½"BSPT PT
(MAGNETIC)
902002
902001
⑧
M6x25(FY)
M3x6(FR)T④
METRIC
ENGLISH
1009 - 1000RPM
1143 - 1500 RPM
994 - 1500RPM
1142 - 3000 RPM
1007 - 3000RPM
1144 - 2000 RPM
DW4064/A(ADAMS)
ø20x1.2(CE)
ø20/42x12(BB3)
902009
902008
D404H027
ø26x37x7(SM)
A
M5x20(FY)③
M5x12(FY)
②
D
④
M10x30(FY)
SEE 902/3
B
902028
ø37.1x1.6(RM)
M4x20(FY)
ø19x1.2(CE)
M5x20(FY)④
902052
D001H2078
902020
902019
ø20/23x20(DU)②
ø27.6x2.4(RM)
C
ø3x10(HTP)
902029
902041
E
M5x16(FY)③
G24x32x4(INA)

902/1


902/2
M4x25(FY) ③
ø39.6/22.4x0.5(DS) ②
32.1x1.6(RM)
902012
*902055
ø15/35x11(BB)
M6x8(FR) ④
A802H0602
43T
29T
902027
ø19x1.2(CE)
ø37.1x1.6(RM)
ø20/42x12(BB)
15T
902014
ø20x1.2(CE)
902025
M5x30(FY)
ø74.5x3(RM)*
902005
ø39.6x25.5 x0.5(DS) ②
M8x8(FY) ③
ø17.40x12(BB) ②
SG142 ③
AS1730(INA) ②
69T
D101H0004 ③
28T
902044 ③
A
902054
15T
A802H0601
42T
ø20/42x12(BB3)
B
42T
111050/111090C (GAMET)
ø22x1.2(CE) ②
902040
43T
902018
902024
5x7x ø19(KW)
ø63x2(CE)
*3000RPM M/C ONLY
902026
55T
8x9x ø22(KW)
ø50x2(CE)
*ø74.5x3(RM)
ø18x1.2(CE)
*902056
902023
902022
(GAMET) 112045/112085C
27T
ø19x1.2(CE)
ø18/20x15 (DU)
902031
C
902030
42T
902021
C
SEE 902/1
D
ø22.1x1.6(RM)
E

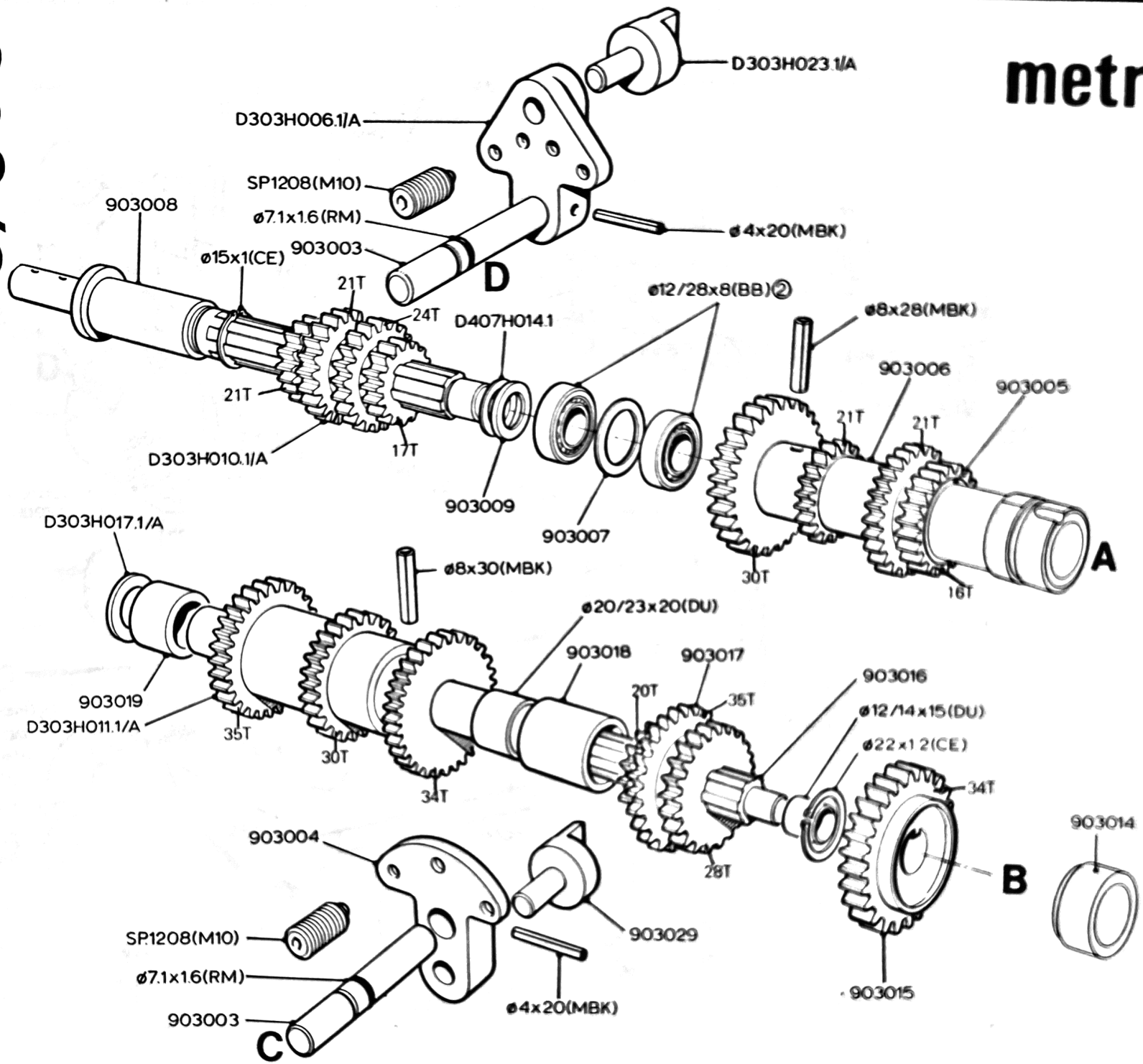

902036
902042
ø16x1(CE)
ø26x1.2(CE)
902043
902039
3x5xø13(KW)
902045
SP1208(M10)
SP1208
ø13.1x1.6(RM)
1002
1137 (USA)
902049
M3x6(FRT)③
M3x6(FRT)②
1000
1138 (USA)
902047
902037
3x5xø13(KW)
10T
ø13.1x1.6(RM)
1/4"BSPT
ø12x1(CE)
3x5xø13(KW)
902034
45T
M5x8(FXW)
902035
902038
3x5xø13(KW)
48 0213 02
(ENOTS)
34 0272 02
(ENOTS)
902050
M6x16(FV)
902048
M4x25(FY)②
ø4x22(MBK)
207-GD0244-00
(FASTEX)
902046
902033
SP1208
ø10x1(CE)②
902032
902051
M6x12(FR)SS
902/3


903012
908006
ø18/20x20(DU)
M5x20(FY)③
903011
ø18/20x20(DU)
903010
ø15x1(CE)
ø4x22(MBK)②
½" BSPT
½" BSPT
90°ELBOW
M6x25(FY)
903002
903001
995(METRIC)
1141 (ENGLISH)
M6x60(FY)
ø9.1x1.6(RM)②
M3x6(FRT) 4
903032
903005
D303H0271/A
ø22/28x4(SM)②
ø12/14x12(DU)
ø22/28x4(SM)②
SG414
D303H0261/A
D303H0251/A
D303H0191/A
D303H0481/A②
(METRIC)
M5x8(FY)②
207-GD0244-00
ø10x1(CE)④
M5x8(FR)②
A
ø5(SB)
SG413
M6x6(FXw)
903014
M5x6(FXd)
D102H3004
902051②
D
M6x12(FR)SS②
ø12/14x20(DU)
B
M4x4(FXw)
903013
M4x10(FV)②
M6x30(FY)
M6x30(MBK)
⅜" BSPT
DW4064/A(ADAMS)
D021H3001
M6x20(MBK)
M6x20(FY)
D001H2082
ø6(SB)②
903028
ø34.6x22.4x0.5(DS)⑫

903/1

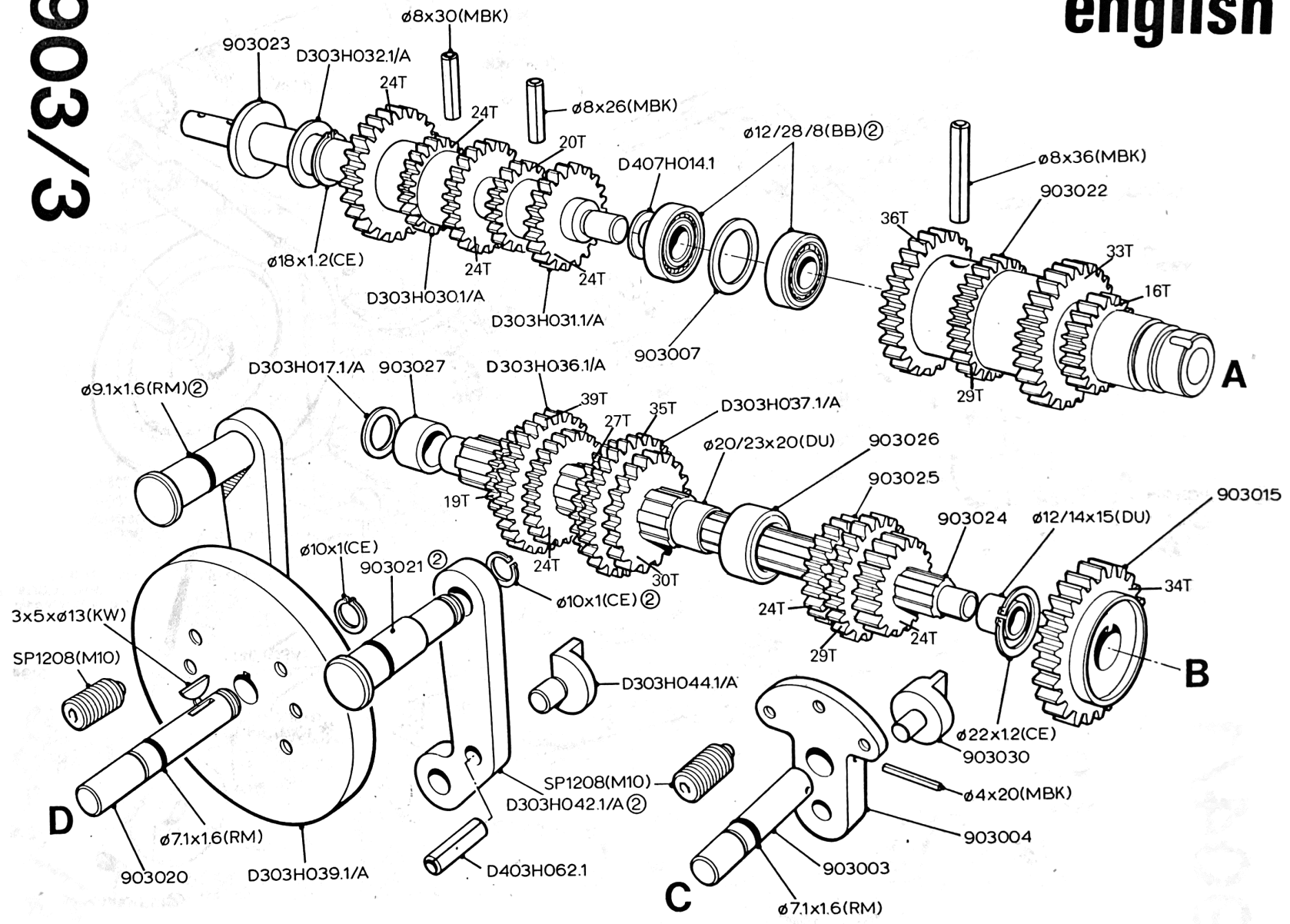
903/2

metric

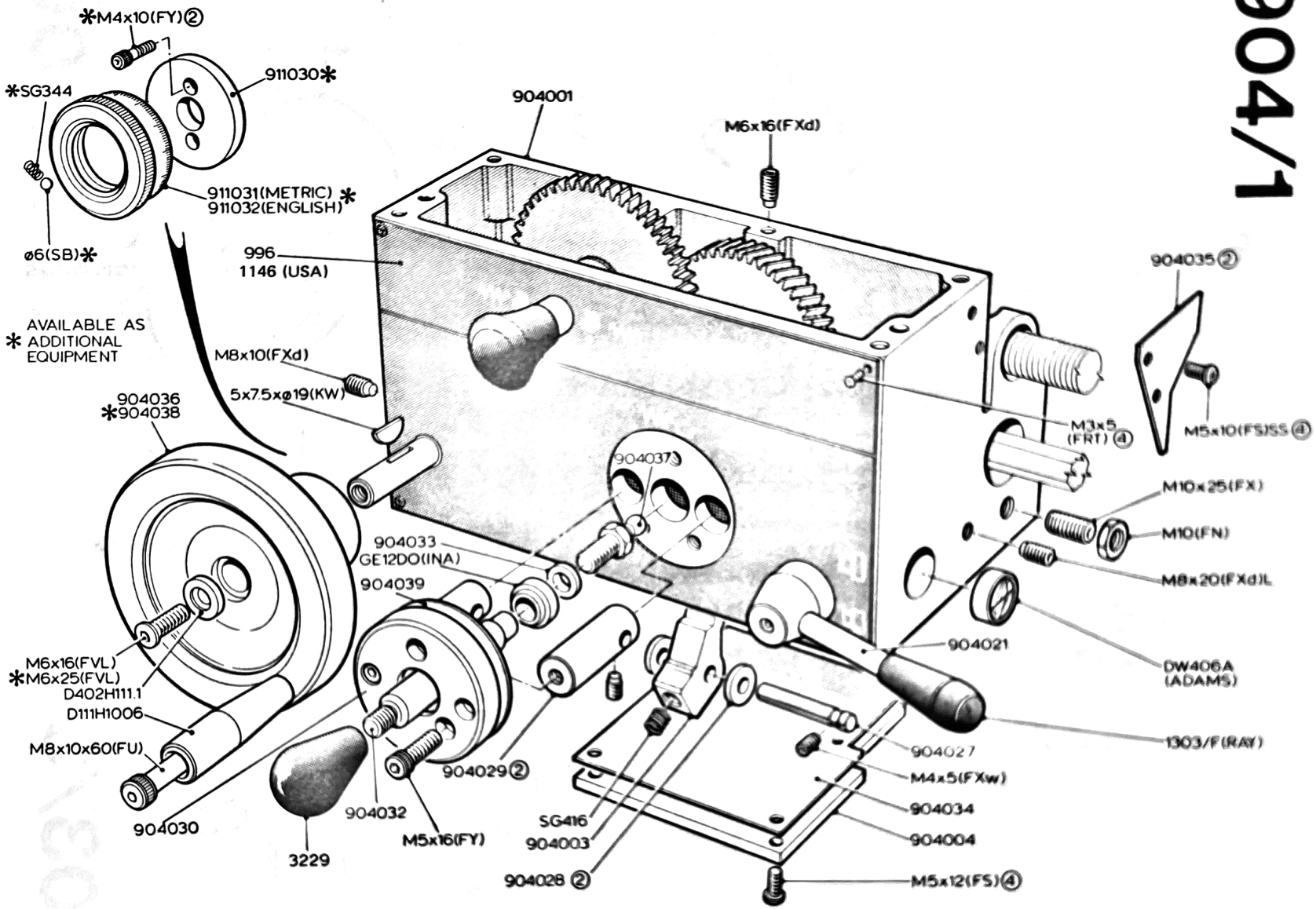

D303H023.1/A
D303H006.1/A
SP1208(M10)
ø7.1x1.6(RM)
903003
D
ø4x20(MBK)
903008
ø15x1(CE)
21T
24T
D407H014.1
ø12/28x8(BB)②
ø8x28(MBK)
903006
903005
21T
21T
21T
17T
D303H010.1/A
903009
903007
30T
16T
A
D303H017.1/A
ø8x30(MBK)
ø20/23x20(DU)
903018
903017
903016
903019
D303H011.1/A
35T
30T
20T
35T
ø12/14x15(DU)
ø22x12(CE)
34T
34T
28T
B
903014
903004
SP1208(M10)
ø7.1x1.6(RM)
903003
C
903029
ø4x20(MBK)
903015

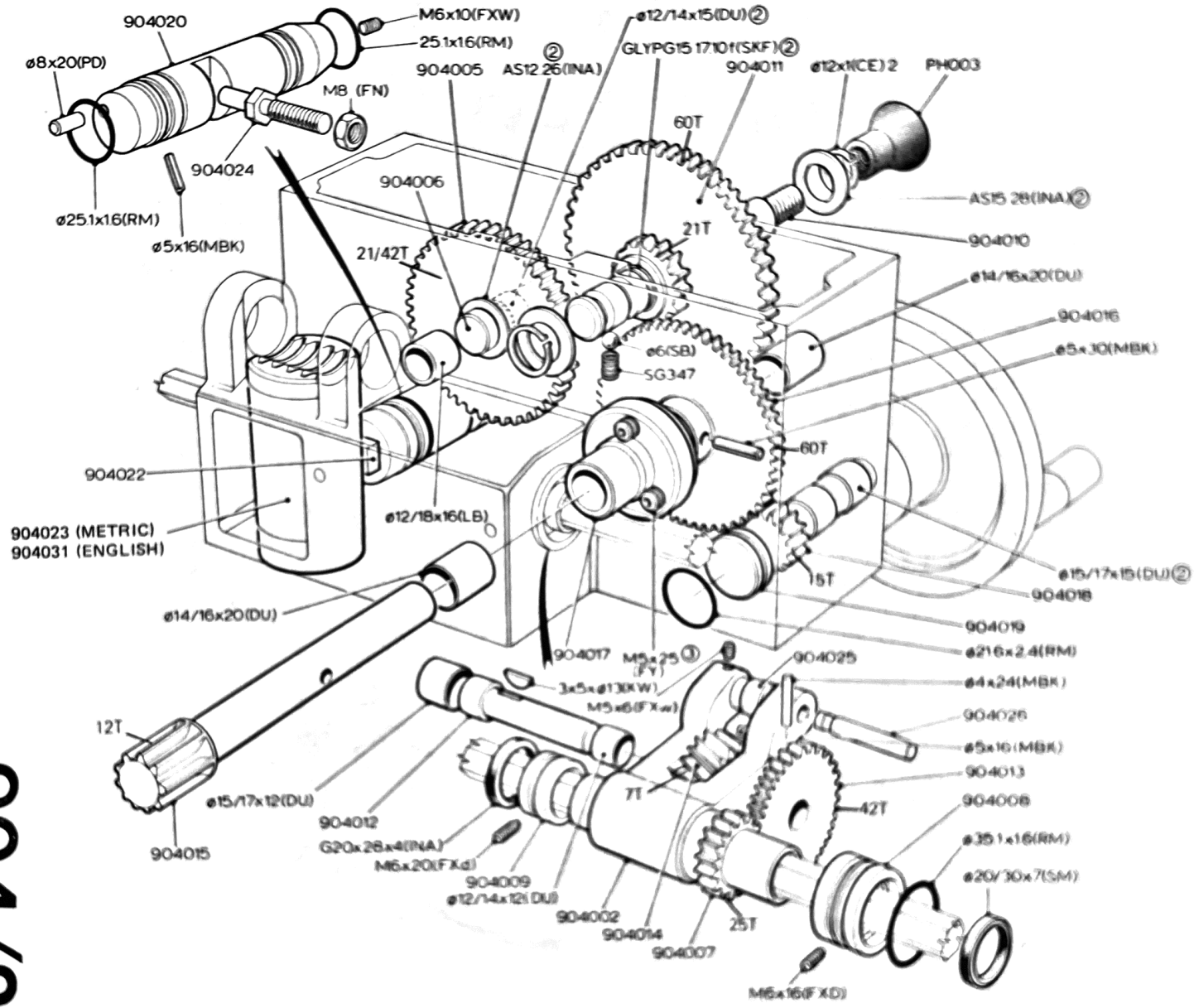
903/3

english

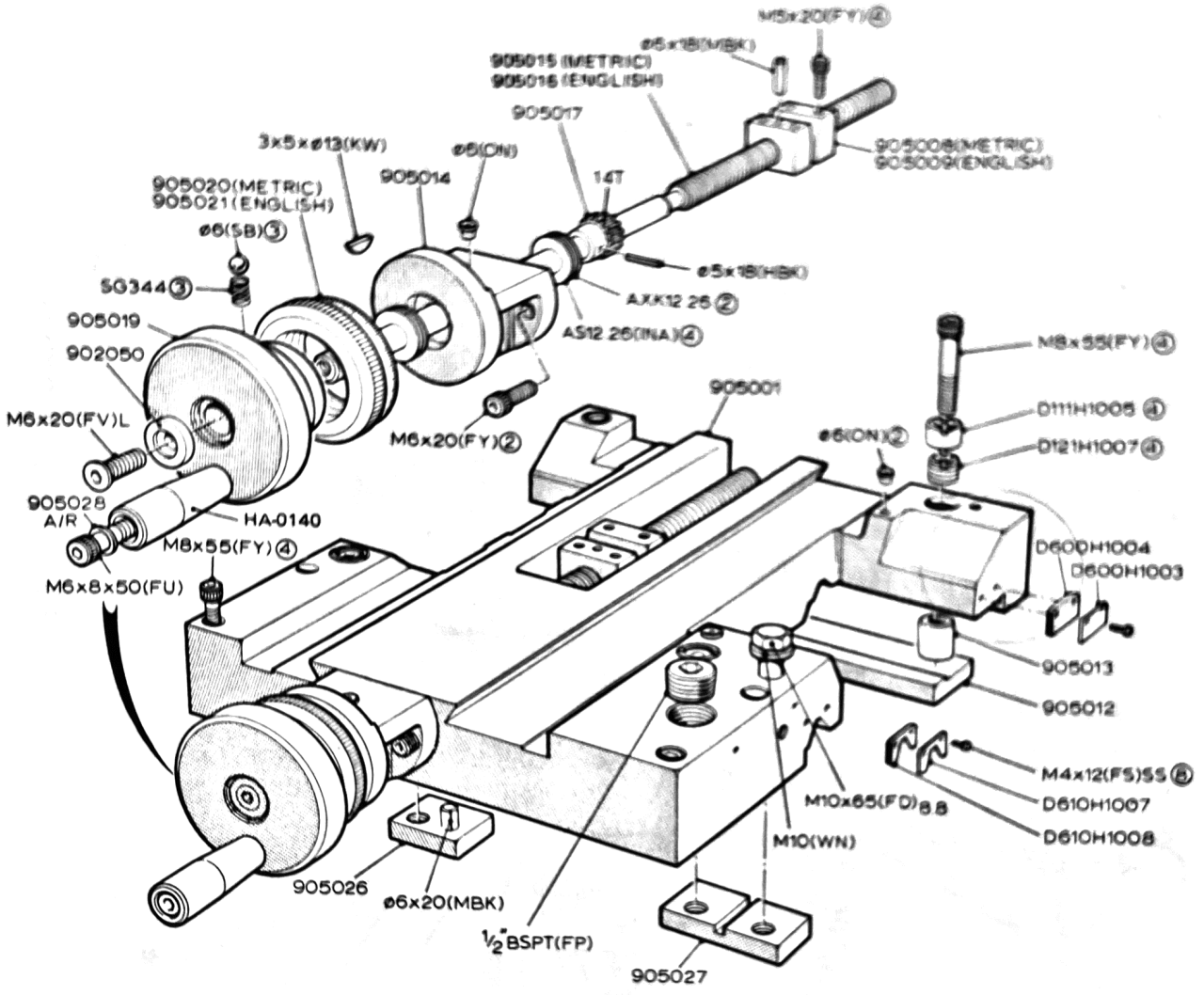


904/1

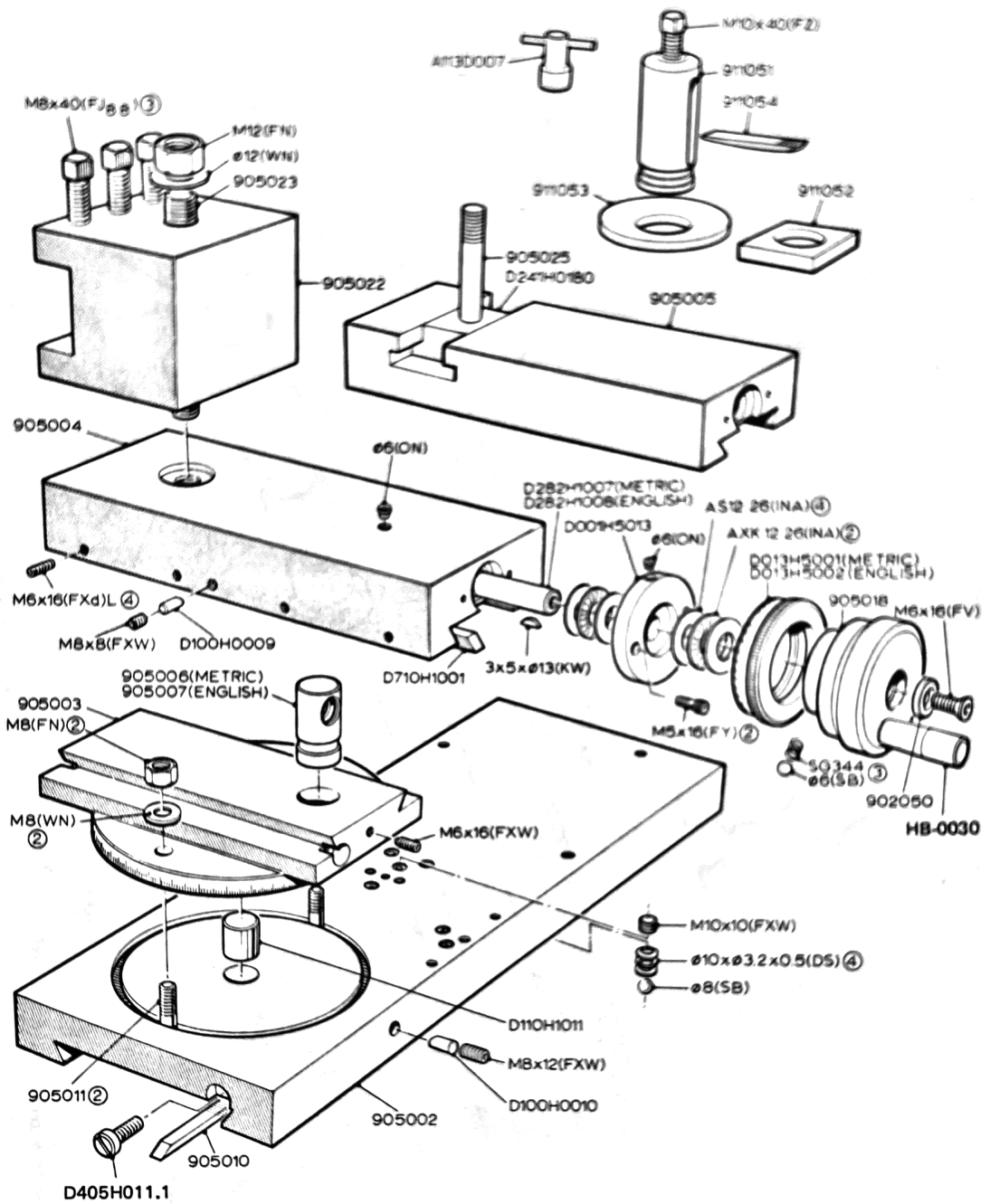

*M4x10(FY)②
911030*
*SG344
911031(METRIC) *
911032(ENGLISH)
ø6(SB)*
904001
M6x16(FXd)
996
1146 (USA)
904035②
* AVAILABLE AS ADDITIONAL EQUIPMENT
M8x10(FXd)
5x7.5xø19(KW)
904036
*904038
M3x5 (FRT)④
M5x10(FS)SS④
904037
M10x25(FX)
M10(FN)
904033
GE12DO(INA)
M8x20(FXd)L
904039
904021
DW406A (ADAMS)
M6x16(FVL)
*M6x25(FVL)
D402H111.1
D111H1006
1303/F(RAY)
M8x10x60(FU)
904027
M4x5(FXw)
904029②
904034
904032
SG416
904004
904030
M5x16(FY)
904003
3229
904028②
M5x12(FS)④


904020
M6x10(FXW)
ø12/14x15(DU)②
25.1x16(RM)
ø8x20(PD)
904005
AS12 26(INA)②
GLYPG15 1710f(SKF)②
904011
ø12x1(CE)2
PH003
M8 (FN)
60T
904024
904006
AS15 28(INA)②
ø25.1x16(RM)
ø5x16(MBK)
21T
904010
21/42T
ø14/16x20(DU)
904016
ø6(SB)
ø5x30(MBK)
SG347
60T
904022
ø12/18x16(LB)
904023 (METRIC)
904031 (ENGLISH)
15T
ø15/17x15(DU)②
904018
ø14/16x20(DU)
904019
ø216x2.4(RM)
904017
M5x25③
(7T)
904025
3x5x ø13(KW)
ø4x24(MBK)
M5x6(FXw)
12T
904026
ø5x16(MBK)
904013
7T
42T
904008
ø15/17x12(DU)
904012
ø35.1x16(RM)
G20x26x4(INA)
ø20/30x7(SM)
M6x20(FXd)
904009
ø12/14x12(DU)
904002
25T
904014
904007
904015
M6x16(FXD)

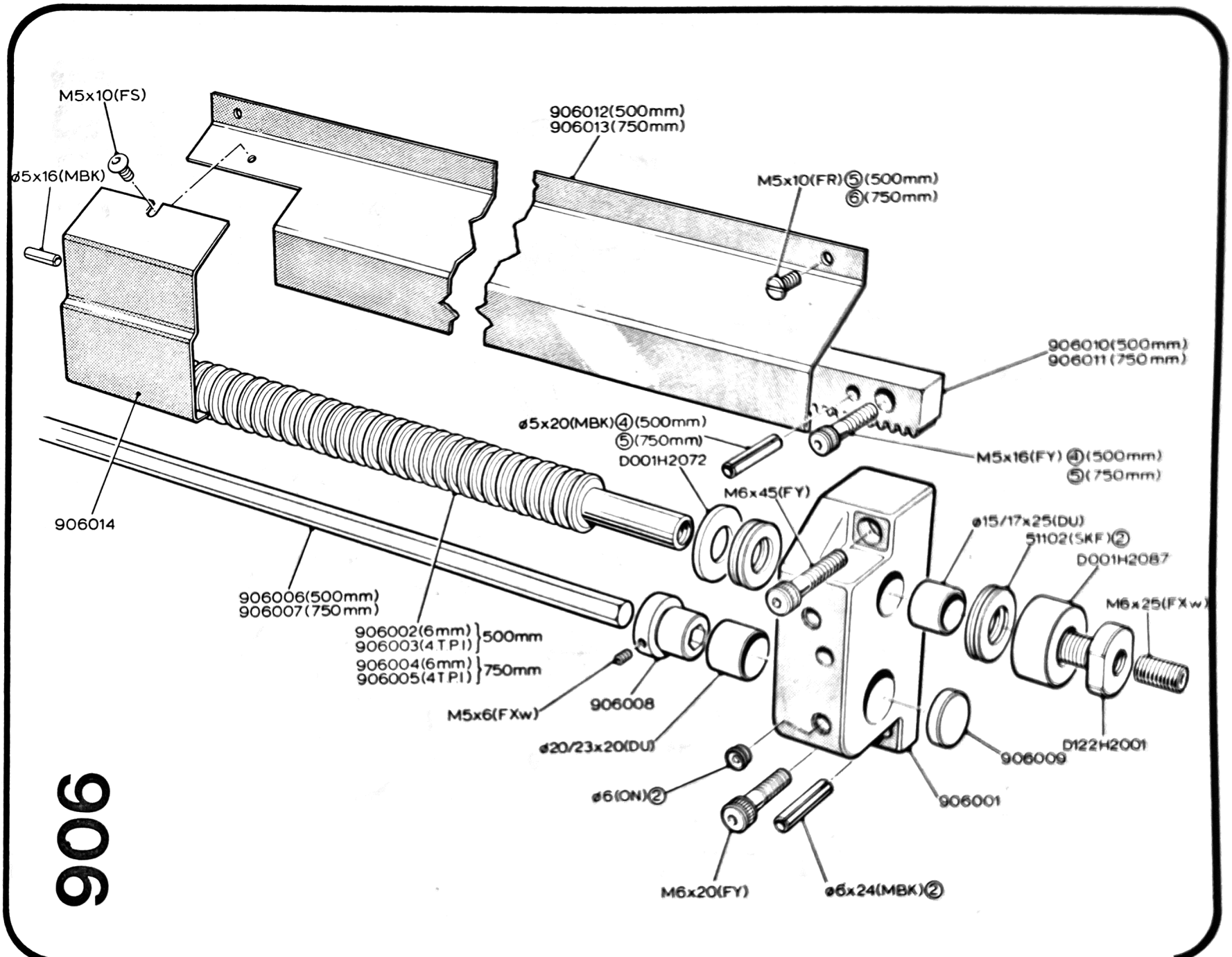
904/2


M5x20(FY)④
ø6x18(MBK)
905015 (METRIC)
905016 (ENGLISH)
905017
905008(METRIC)
905009(ENGLISH)
3x5xø13(KW)
ø6(ON)
905014
14T
905020(METRIC)
905021(ENGLISH)
ø6(SB)③
ø5x18(HBK)
SG344③
AXK12 26②
905019
AS12 26(INA)④
902050
M8x55(FY)④
905001
M6x20(FV)L
M6x20(FY)②
ø6(ON)②
D111H1005④
D121H1007④
905028
A/R
HA-0140
M8x55(FY)④
D600H1004
D600H1003
M6x8x50(FU)
905013
905012
M4x12(FS)SS⑧
M10x65(FD)8.8
D610H1007
D610H1008
M10(WN)
905026
ø6x20(MBK)
½"BSPT(FP)
905027

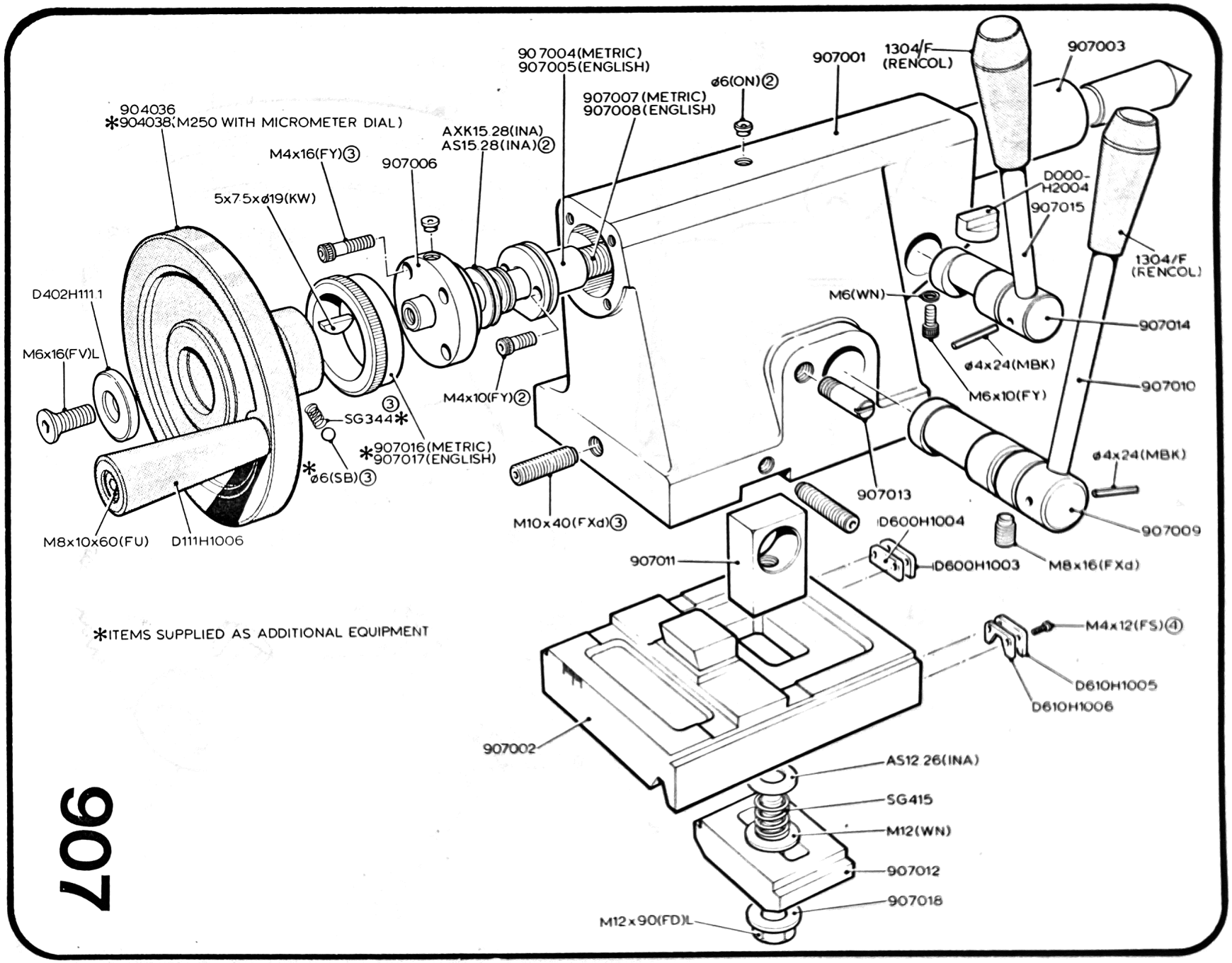
905/1

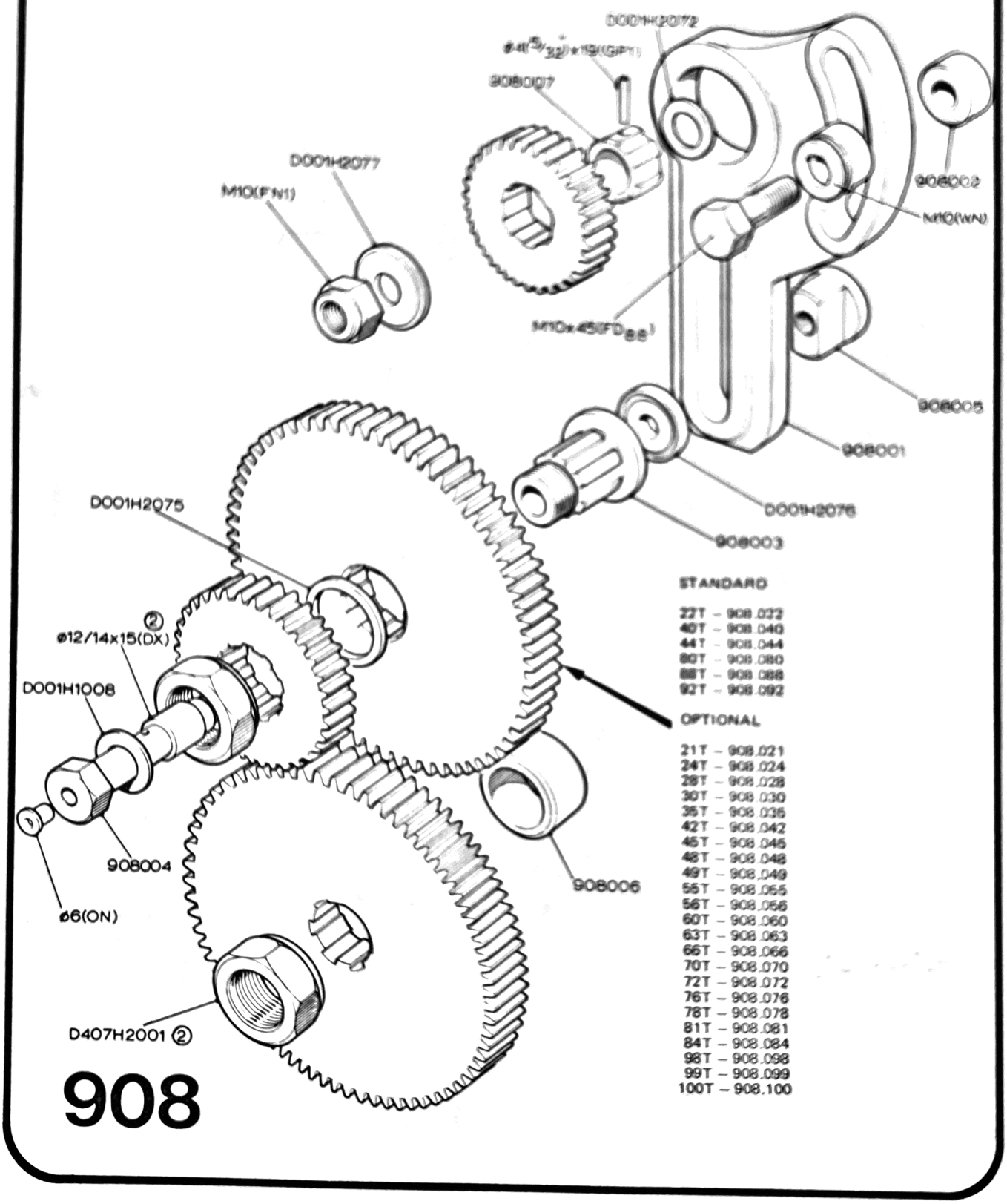

M10x40(FZ)
A1113D007
911051
911054
M8x40(FJ8.8)③
M12(FN)
ø12(WN)
905023
911053
911052
905025
D241H0180
905022
905005
905004
ø6(ON)
D282H1007(METRIC)
D282H1008(ENGLISH)
AS12 26(INA)④
D009H5013
ø6(ON)
AXK 12 26(INA)②
D013H5001(METRIC)
D013H5002(ENGLISH)
905018
M6x16(FV)
M6x16(FXd)L④
M8x8(FXW)
D100H0009
D710H1001
3x5xø13(KW)
905006(METRIC)
905007(ENGLISH)
905003
M8(FN)②
M5x16(FY)②
90344
ø6(SB)③
902050
HB-0030
M8(WN)
②
M6x16(FXW)
M10x10(FXW)
ø10xø3.2x0.5(DS)④
ø8(SB)
D110H1011
M8x12(FXW)
D100H0010
905011②
905002
905010
D405H011.1

905/2


M5x10(FS)
ø5x16(MBK)
906012(500mm)
906013(750mm)
M5x10(FR)⑤(500mm)
⑥(750mm)
906010(500mm)
906011(750mm)
ø5x20(MBK)④(500mm)
⑤(750mm)
D001H2072
M5x16(FY)④(500mm)
⑤(750mm)
M6x45(FY)
906014
ø15/17x25(DU)
51102(SKF)②
D001H2087
M6x25(FXw)
906006(500mm)
906007(750mm)
906002(6mm)
906003(4TPI)
500mm
906004(6mm)
906005(4TPI)
750mm
M5x6(FXw)
906008
ø20/23x20(DU)
906009
D122H2001
ø6(ON)②
906001
M6x20(FY)
ø6x24(MBK)②

906


907
904036
*904038(M250 WITH MICROMETER DIAL)
M4x16(FY)③
5x7.5xø19(KW)
907006
AXK15 28(INA)
AS15 28(INA)②
907004(METRIC)
907005(ENGLISH)
907007(METRIC)
907008(ENGLISH)
ø6(ON)②
907001
1304/F
(RENCOL)
907003
D000-
H2004
907015
1304/F
(RENCOL)
D402H1111
M6x16(FV)L
M6(WN)
907014
ø4x24(MBK)
M6x10(FY)
907010
M4x10(FY)②
③
SG344*
*907016(METRIC)
*907017(ENGLISH)
*ø6(SB)③
907013
ø4x24(MBK)
907009
M10x40(FXd)③
M8x10x60(FU)
D111H1006
D600H1004
D600H1003
M8x16(FXd)
907011
M4x12(FS)④
D610H1005
D610H1006
907002
AS12 26(INA)
SG415
M12(WN)
907012
907018
M12x90(FD)L
*ITEMS SUPPLIED AS ADDITIONAL EQUIPMENT



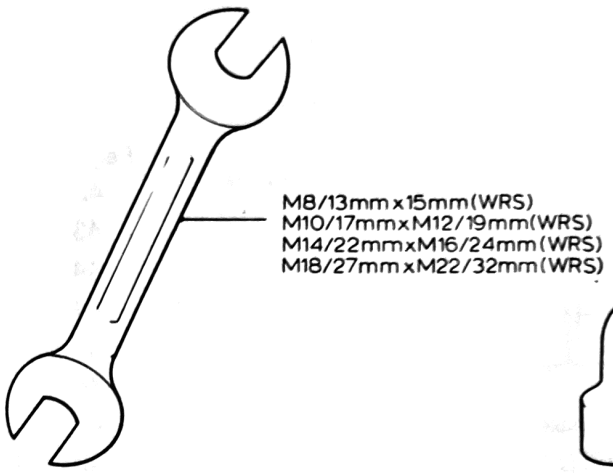
STANDARD

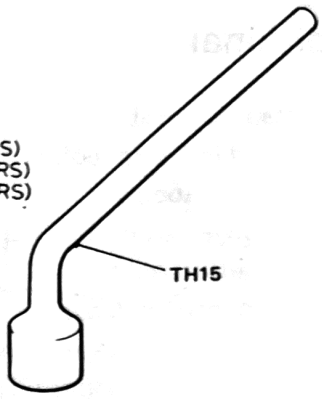
22T – 908.022
40T – 908.040
44T – 908.044
80T – 908.080
88T – 908.088
92T – 908.092

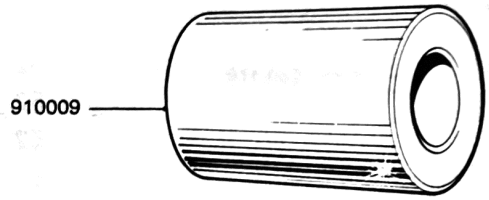
OPTIONAL

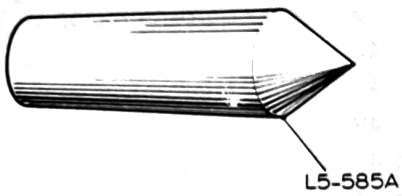
21T – 908.021
24T – 908.024
28T – 908.028
30T – 908.030
35T – 908.035
42T – 908.042
45T – 908.045
48T – 908.048
49T – 908.049
55T – 908.055
56T – 908.056
60T – 908.060
63T – 908.063
66T – 908.066
70T – 908.070
72T – 908.072
76T – 908.076
78T – 908.078
81T – 908.081
84T – 908.084
98T – 908.098
99T – 908.099
100T – 908.100

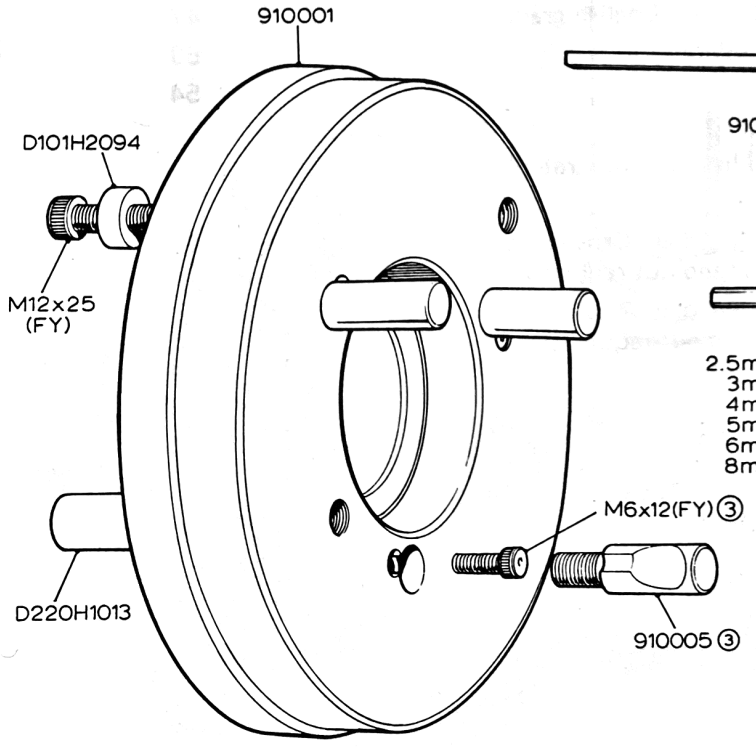
908

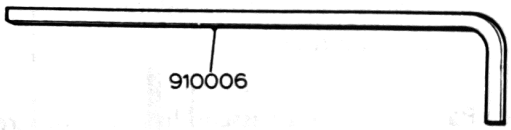

M8/13mm x 15mm (WRS)
M10/17mm x M12/19mm (WRS)
M14/22mm x M16/24mm (WRS)
M18/27mm x M22/32mm (WRS)

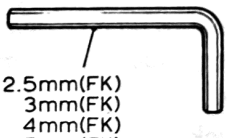

TH15

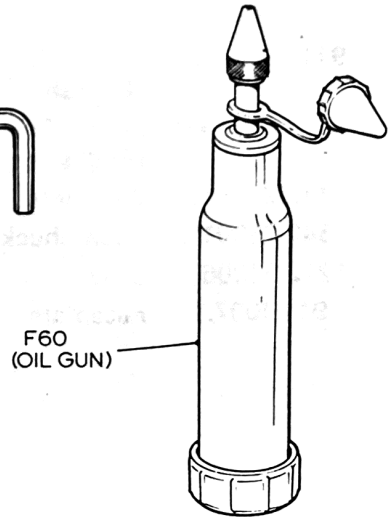

910009


L5-585A


910001
D101H2094
M12x25
(FY)
D220H1013
M6x12(FY) ③
910005 ③


910006


2.5mm(FK)
3mm(FK)
4mm(FK)
5mm(FK)
6mm(FK)
8mm(FK)

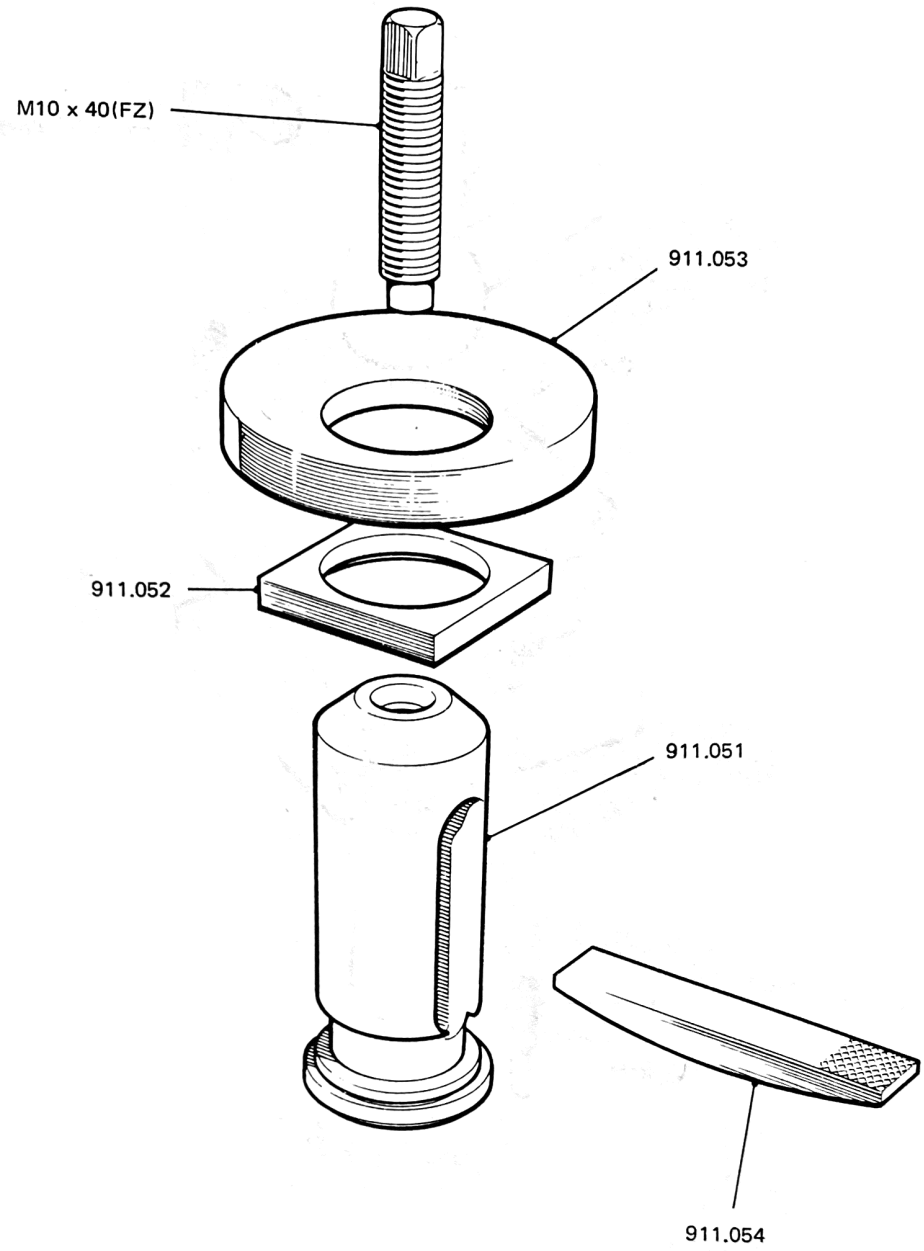

F60
(OIL GUN)

910

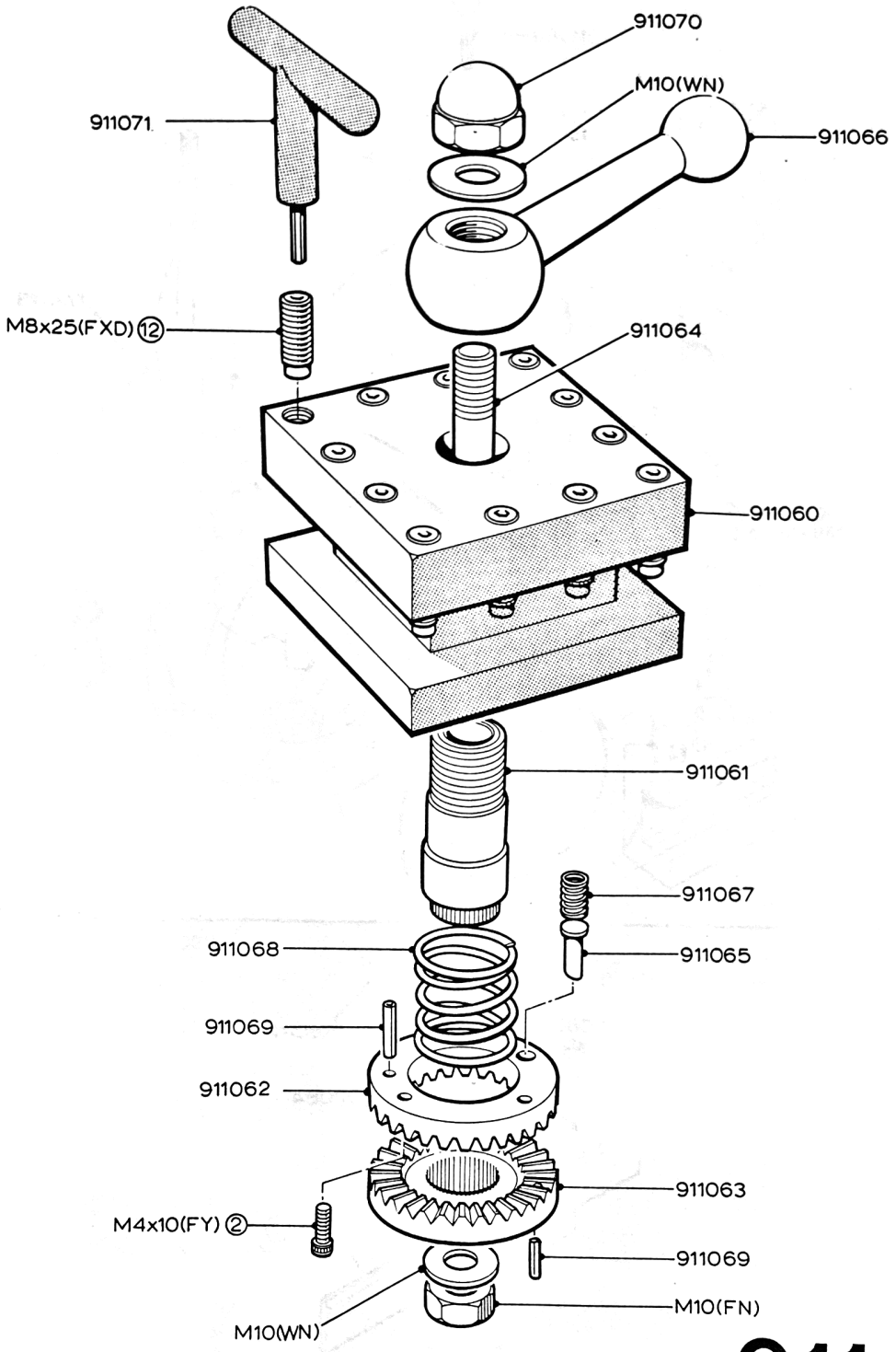
Additional Equipment

Parts available as assemblies (not illustrated):

911.65	Metric/English dual reading dial - Cross-slide (English cross-slide screw and nut required)
911.66	Metric/English dual reading dial - Topslide (English topslide screw and nut required)
911.72	Wattmeter
1542-21601	4-jaw chuck
1212-21305	3-jaw chuck
D911H007.1	Faceplate

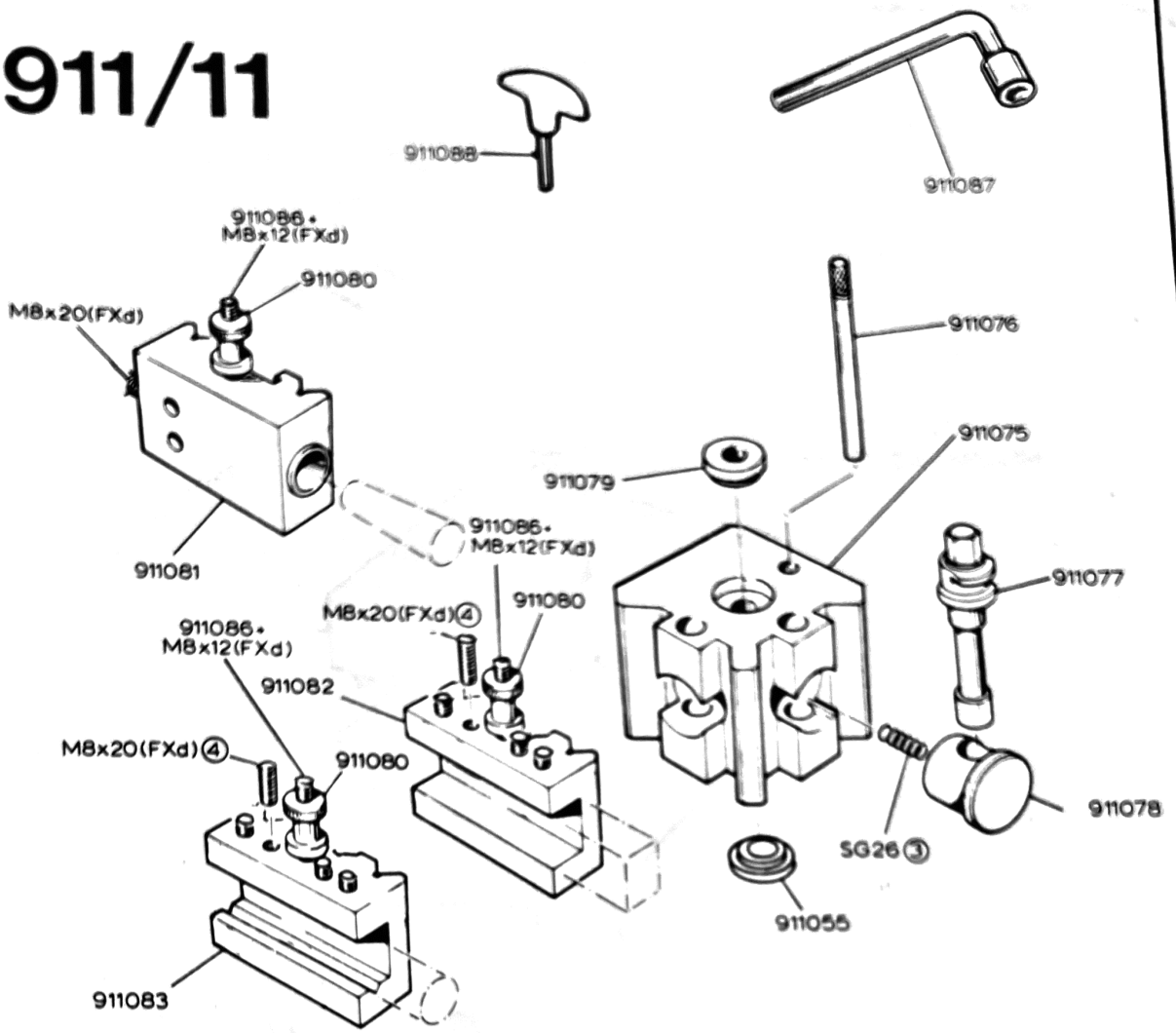


911/09

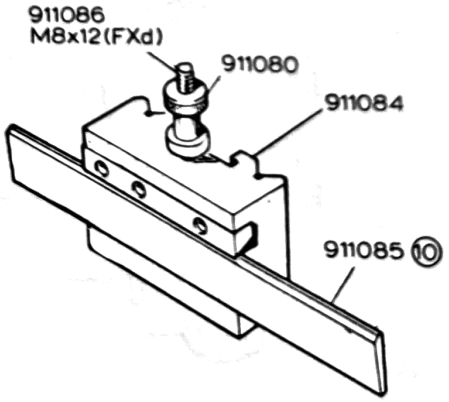

911070
M10(WN)
911071
911066
M8x25(FXD) ⑫
911064
911060
911061
911067
911068
911065
911069
911062
911063
M4x10(FY) ②
911069
M10(FN)
M10(WN)

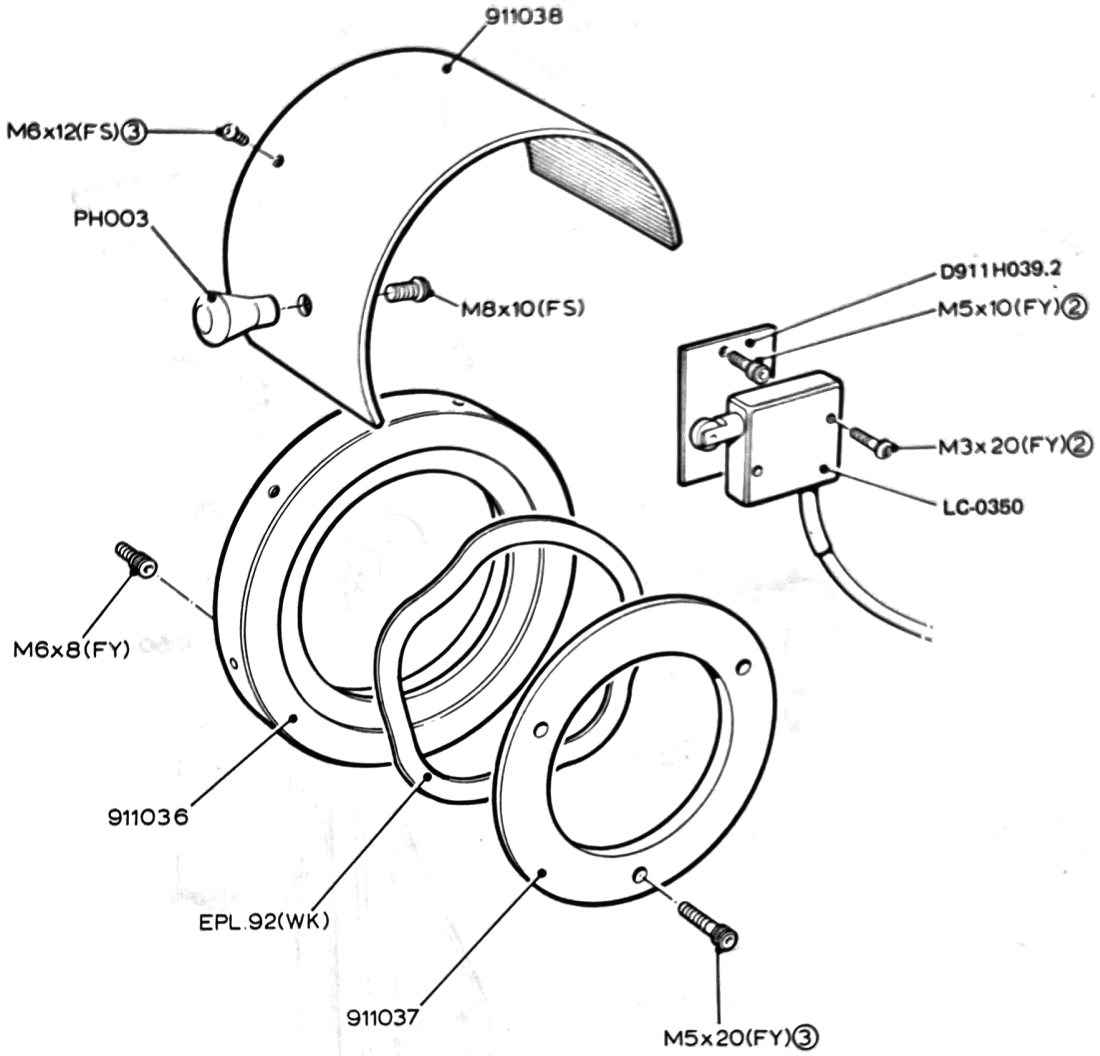
911/10

911/11

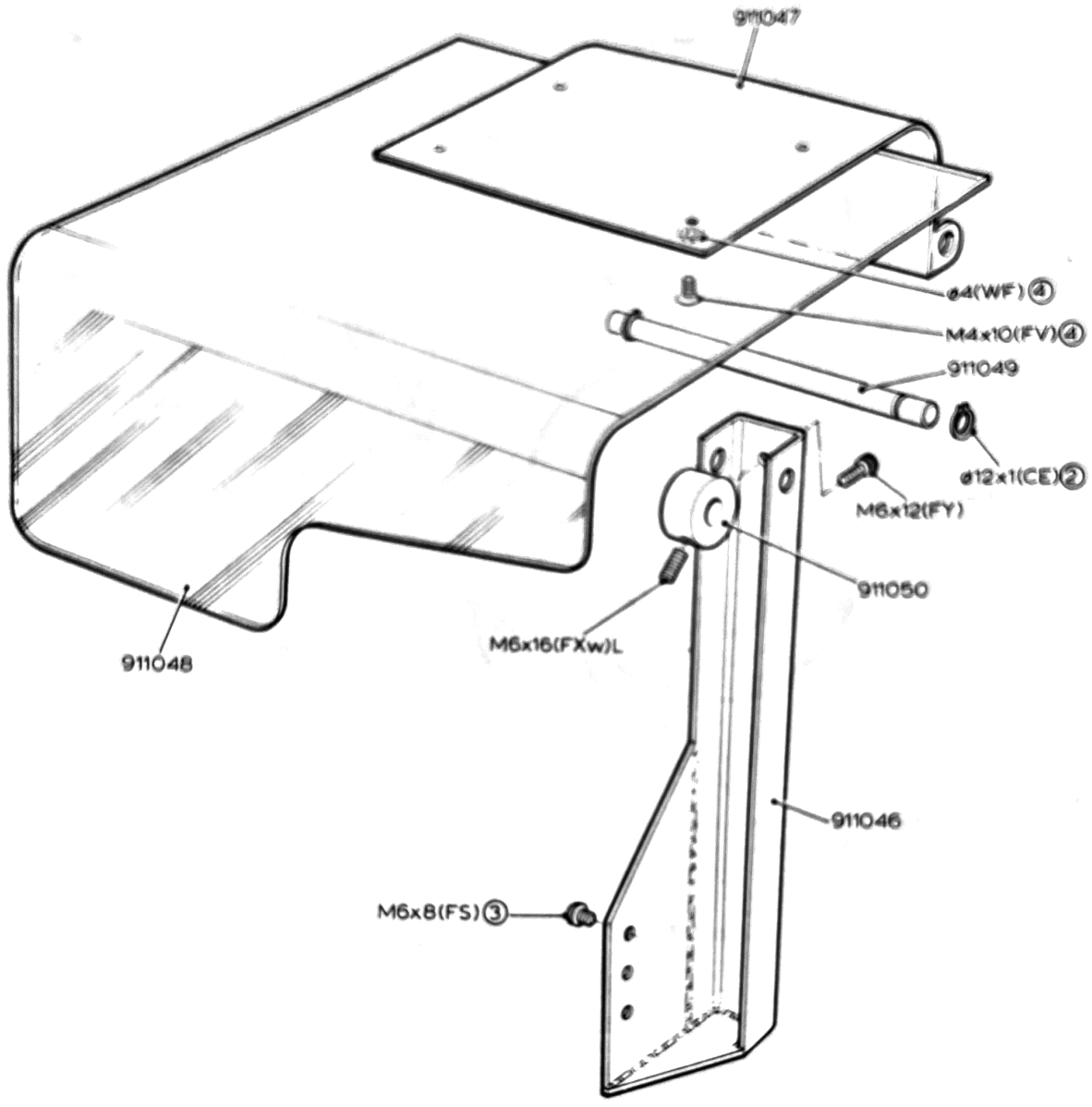

911088
911087
911086 • M8x12(FXd)
911080
M8x20(FXd)
911076
911075
911079
911081
911086 • M8x12(FXd)
911077
M8x20(FXd)④
911080
911086 • M8x12(FXd)
911082
M8x20(FXd)④
911080
911078
SG26③
911055
911083

911/12


911086
M8x12(FXd)
911080
911084
911085⑩

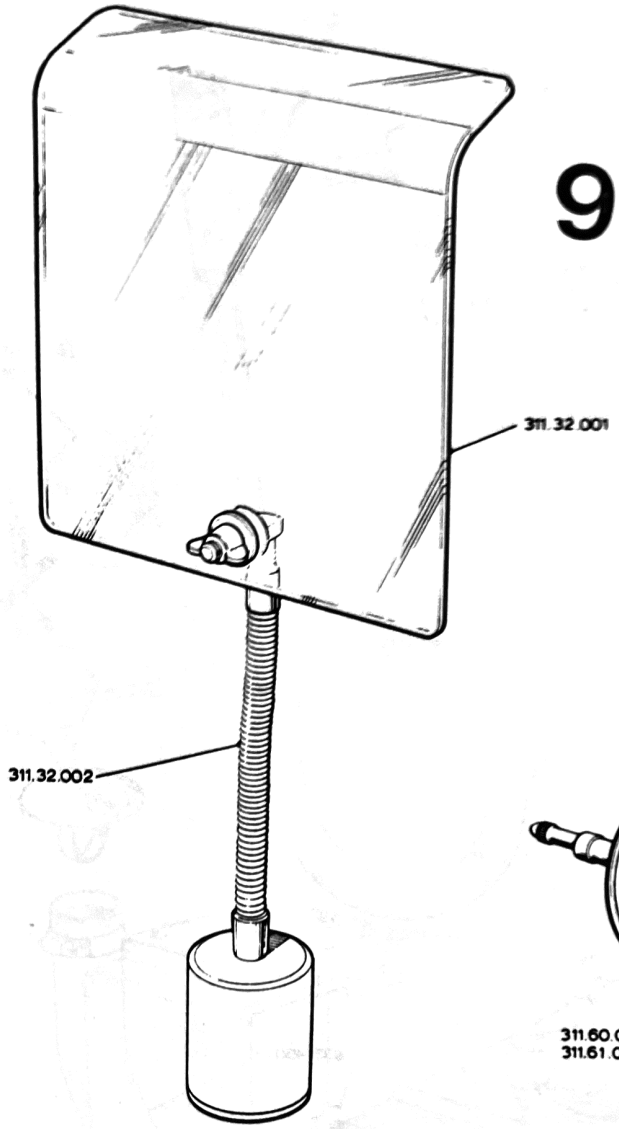

911038
M6x12(FS)③
PH003
M8x10(FS)
D911H039.2
M5x10(FY)②
M3x20(FY)②
LC-0350
M6x8(FY)
911036
EPL 92(WK)
911037
M5x20(FY)③

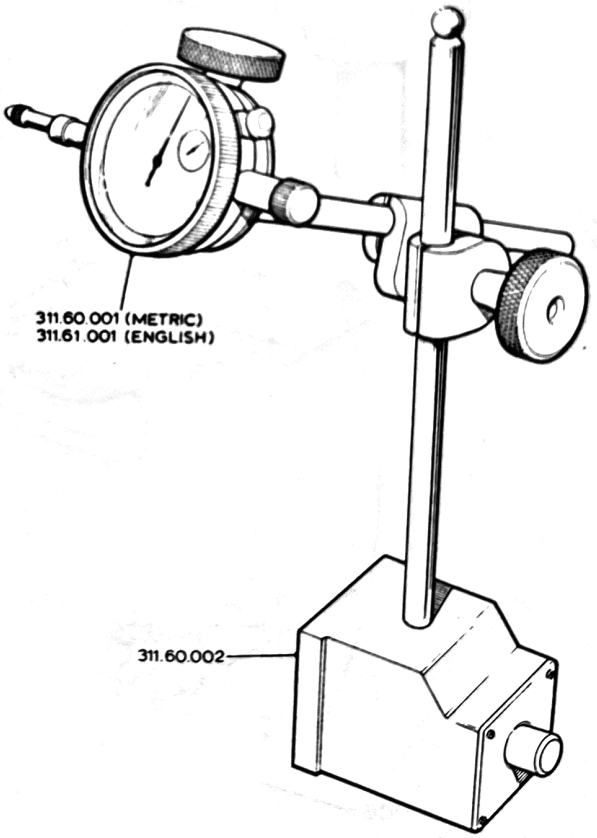
911/14


911047
ø4(WF)④
M4x10(FV)④
911049
ø12x1(CE)②
M6x12(FY)
911050
M6x16(FXw)L
911048
911046
M6x8(FS)③

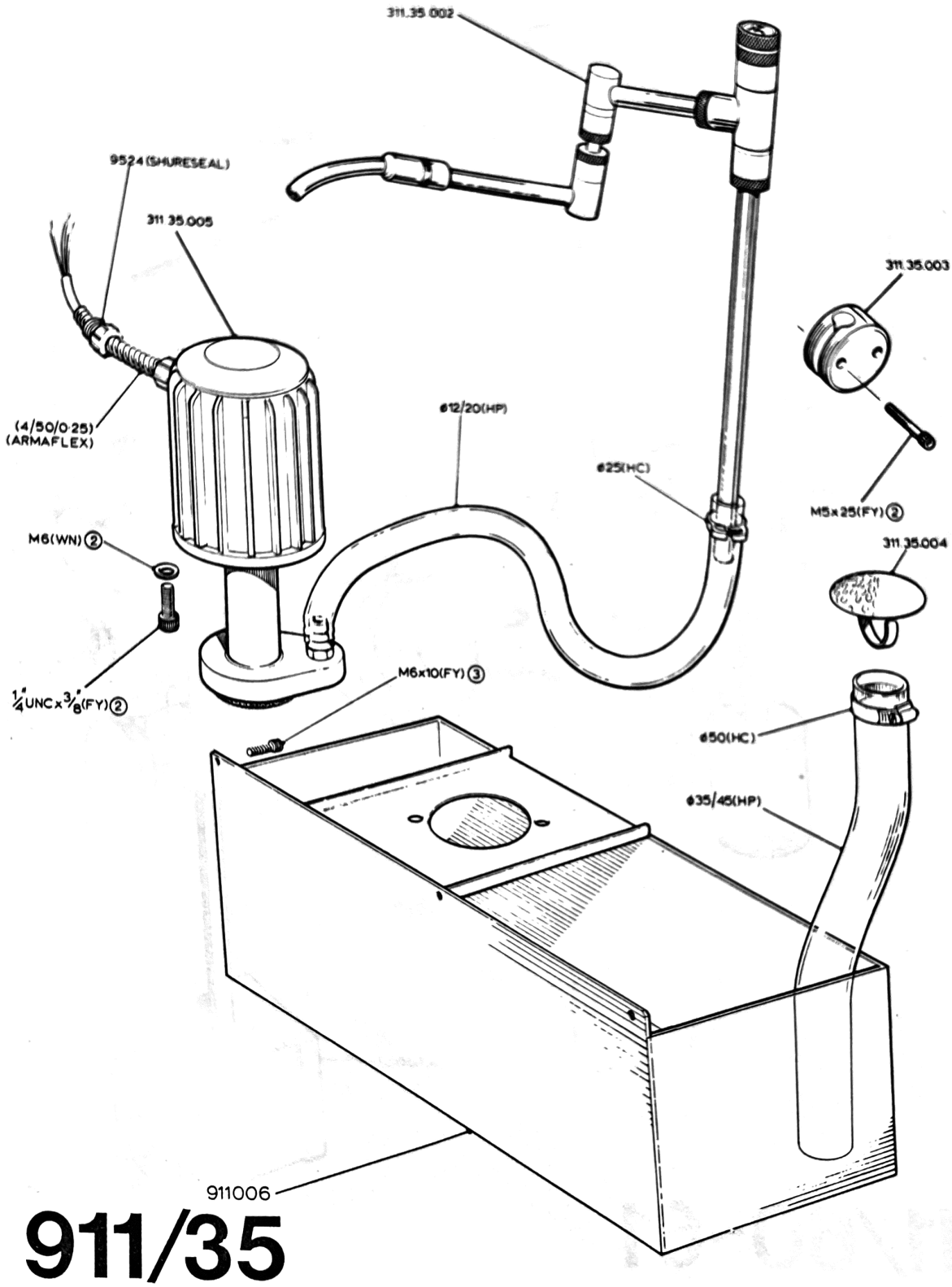
911/31

911/32

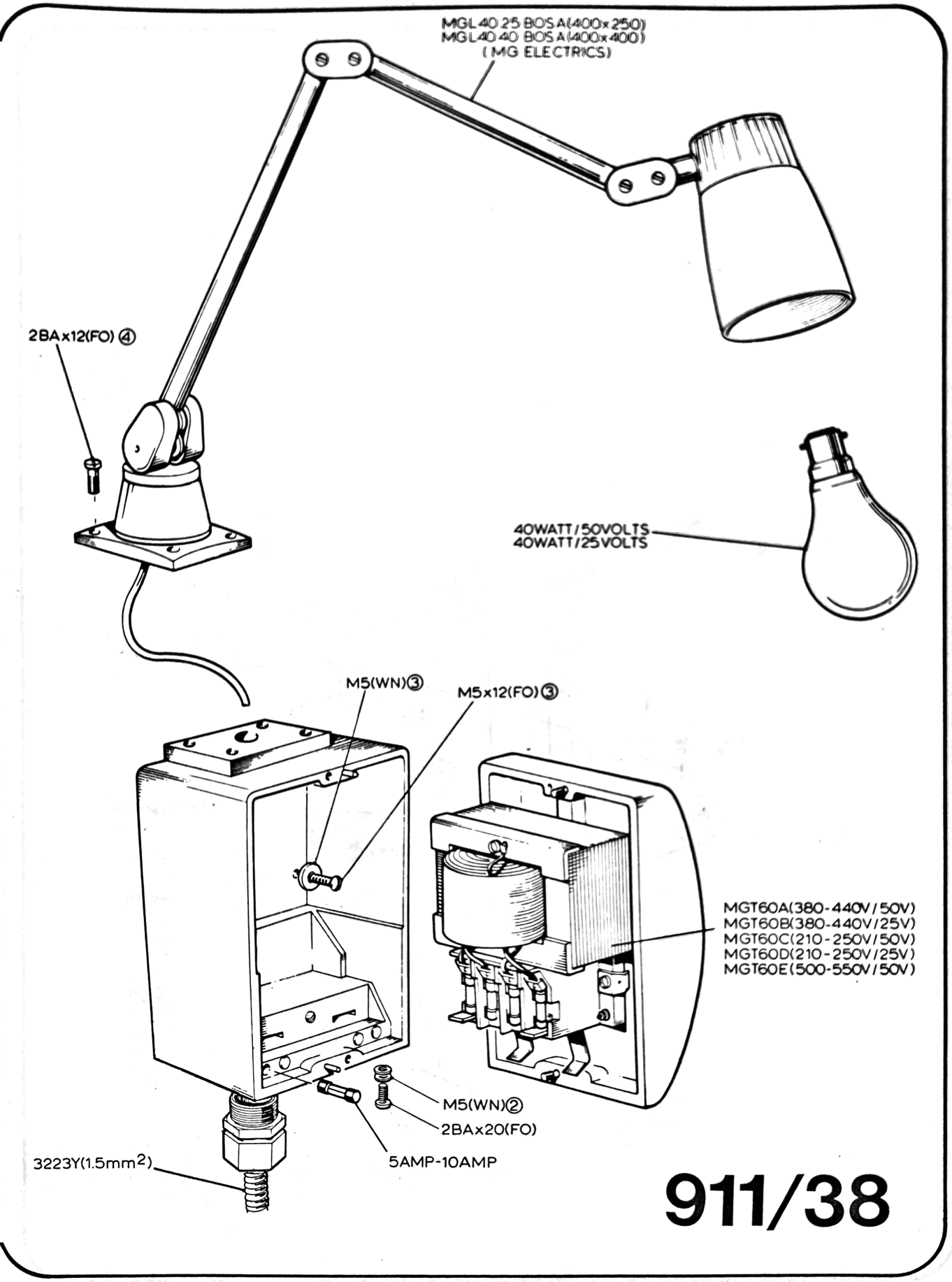




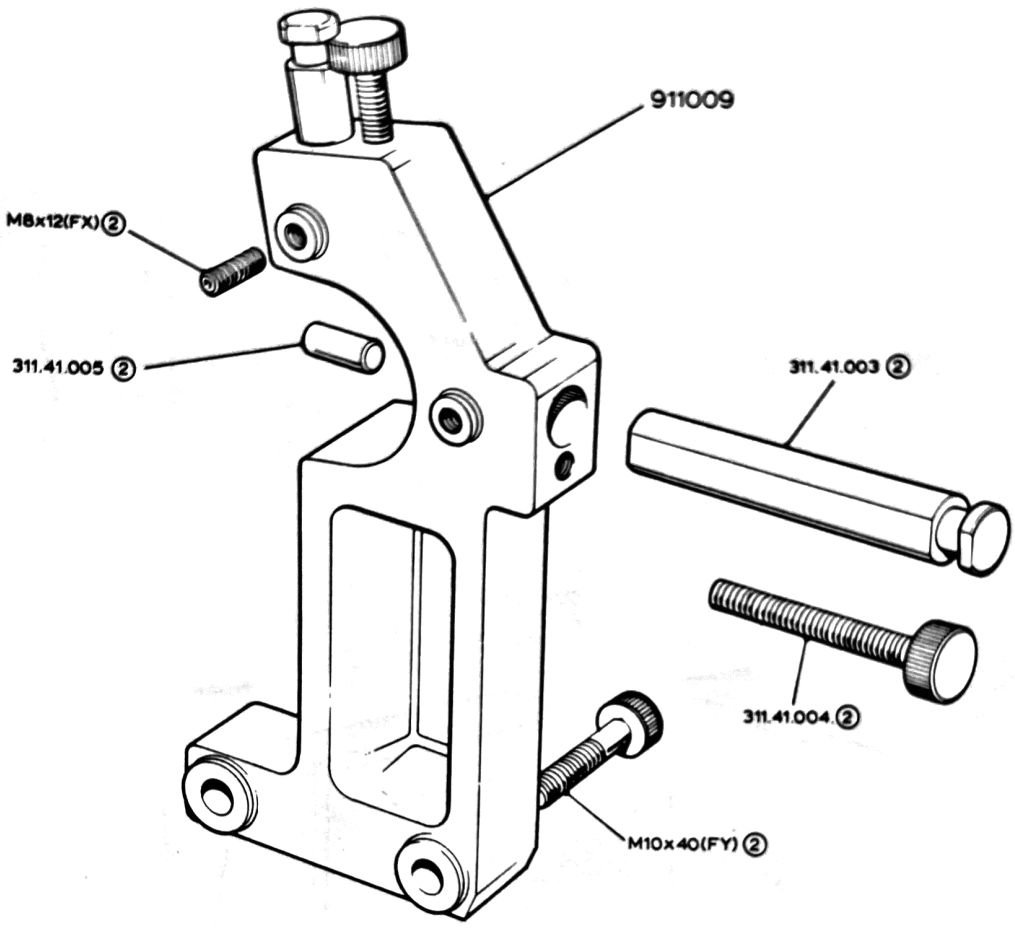
911/60-61


311.35.002
9524 (SHURESEAL)
311.35.005
311.35.003
(4/50/0.25)
(ARMAFLEX)
ø12/20(HP)
ø25(HC)
M5x25(FY) ②
M6(WN) ②
311.35.004
M6x10(FY) ③
1/4 UNC x 3/8 (FY) ②
ø50(HC)
ø35/45(HP)
911006

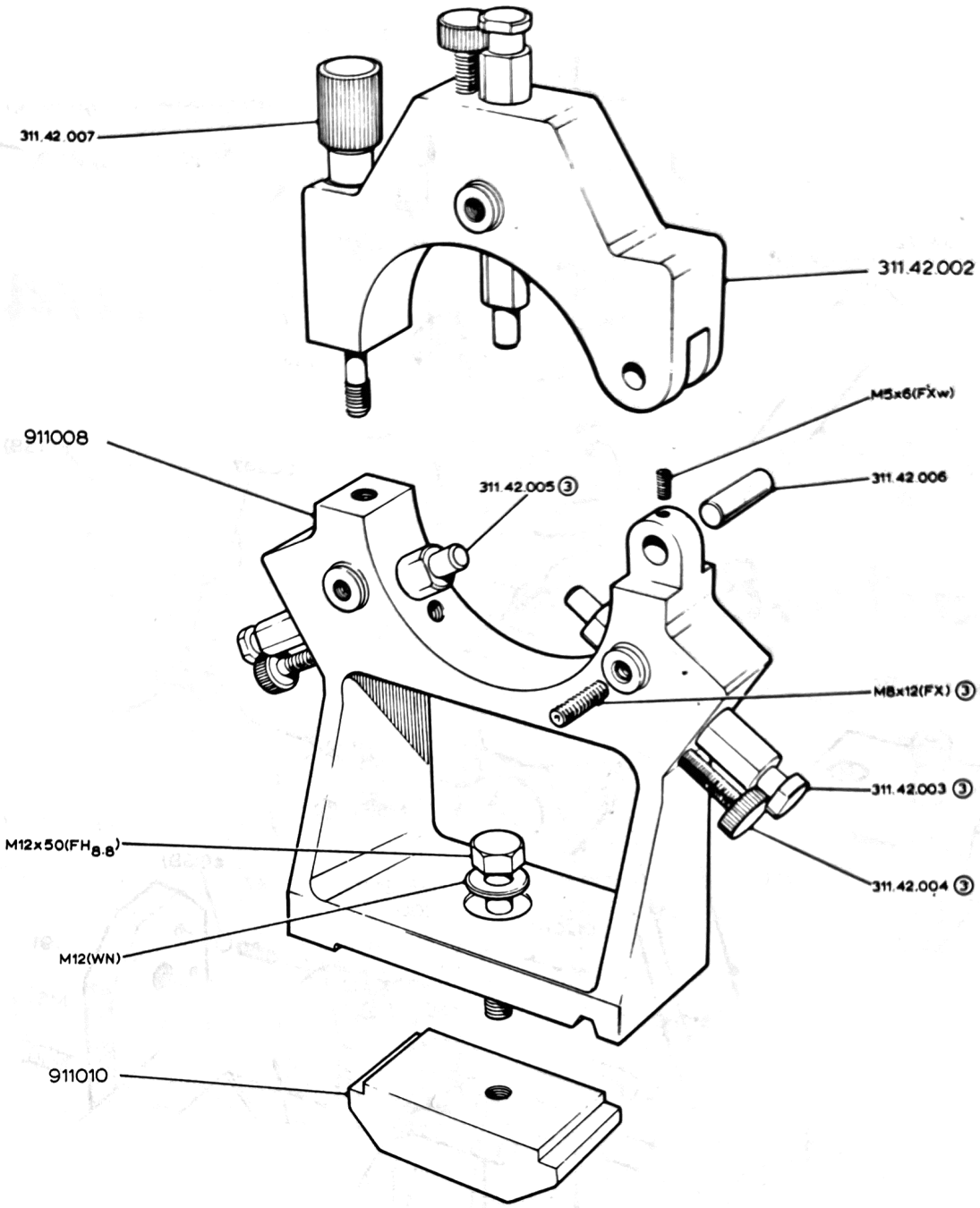
911/35


MGL40 25 BOS A(400x250)
MGL40 40 BOS A(400x400)
(MG ELECTRICS)
2BAx12(FO) ④
40WATT/50VOLTS
40WATT/25VOLTS
M5(WN)③
M5x12(FO)③
MGT60A(380-440V/50V)
MGT60B(380-440V/25V)
MGT60C(210-250V/50V)
MGT60D(210-250V/25V)
MGT60E(500-550V/50V)
M5(WN)②
2BAx20(FO)
5AMP-10AMP
3223Y(1.5mm2)

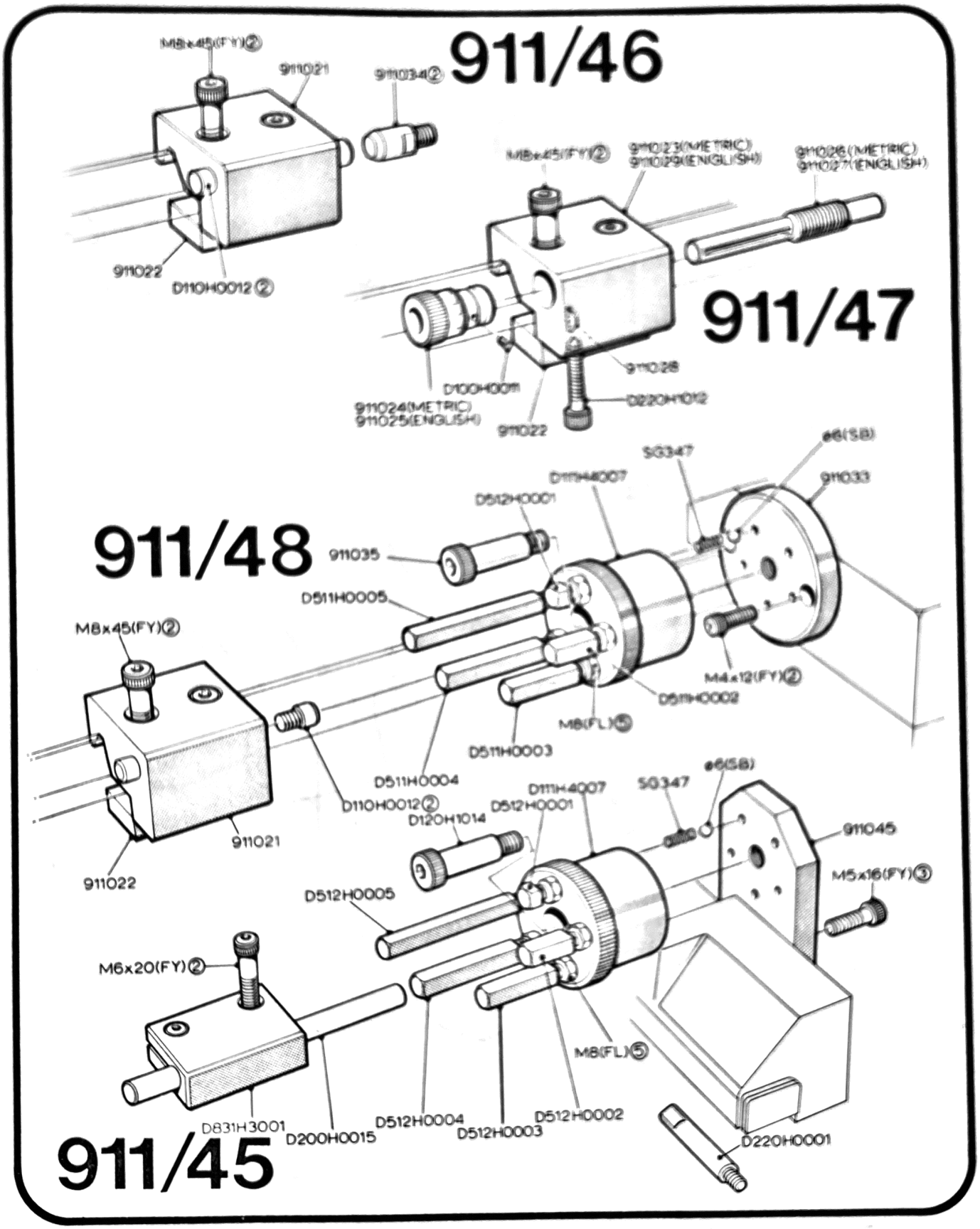
911/38

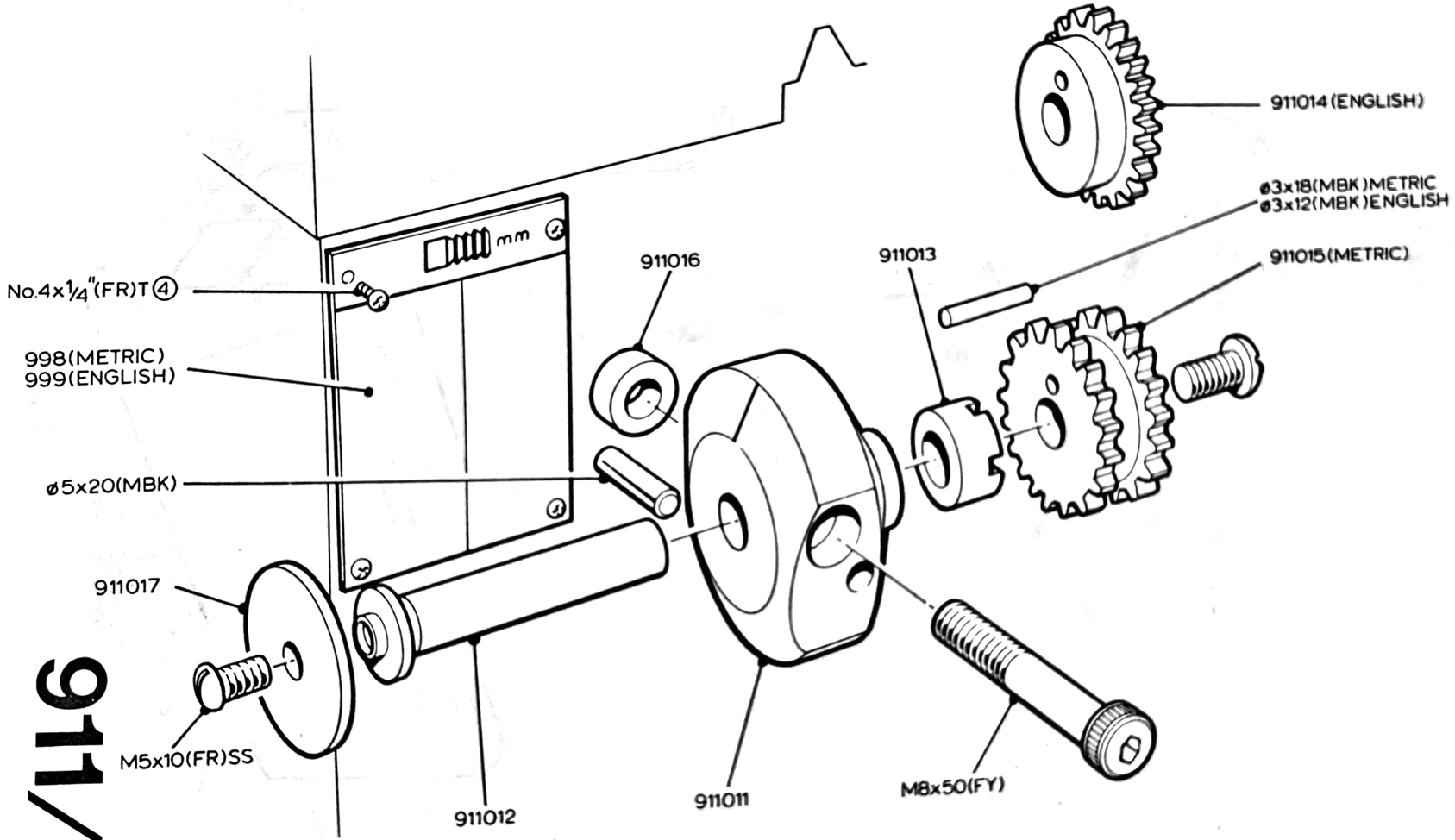

911009
M8x12(FX) ②
311.41.005 ②
311.41.003 ②
311.41.004 ②
M10x40(FY) ②

911/41

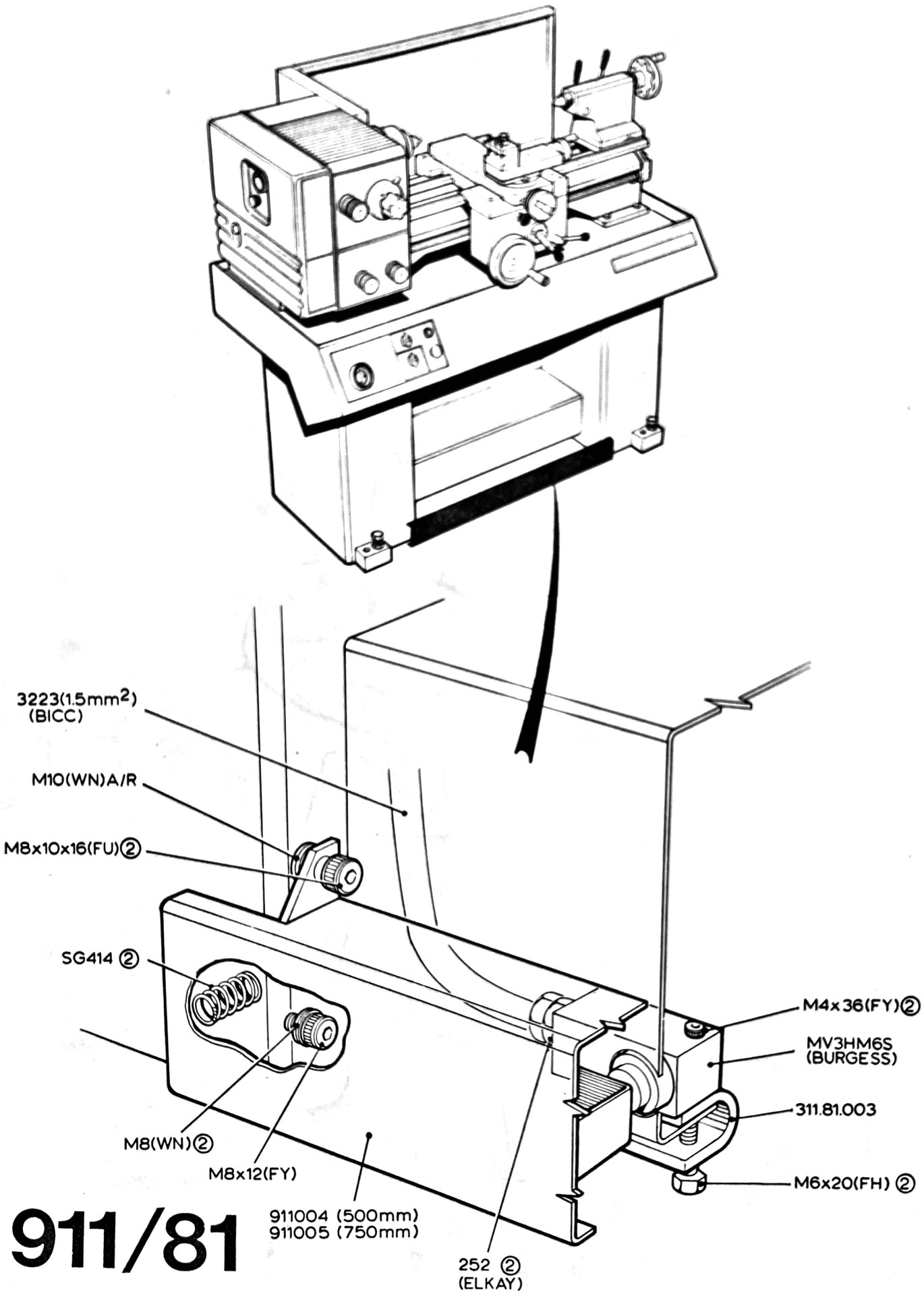

311.42.007
311.42.002
M5x6(FXw)
911008
311.42.005 ③
311.42.006
M8x12(FX) ③
311.42.003 ③
M12x50(FH8.8)
311.42.004 ③
M12(WN)
911010

911/42


911/46
M8x45(FY)②
911021
911034②
911022
D110H0012②
911/47
M8x45(FY)②
911023(METRIC)
911029(ENGLISH)
911026(METRIC)
911027(ENGLISH)
911028
D100H4001
911024(METRIC)
911025(ENGLISH)
911022
D220H1012
911/48
911035
D512H0001
D111H4007
SG347
ø6(SB)
911033
D511H0005
M8x45(FY)②
M4x12(FY)②
D511H0002
M8(FL)⑤
D511H0003
D511H0004
D110H0012②
911021
911022
D120H1014
D111H4007
SG347
ø6(SB)
D512H0001
911045
M5x16(FY)③
D512H0005
M6x20(FY)②
M8(FL)⑤
D831H3001
D200H0015
D512H0004
D512H0003
D512H0002
D220H0001
911/45

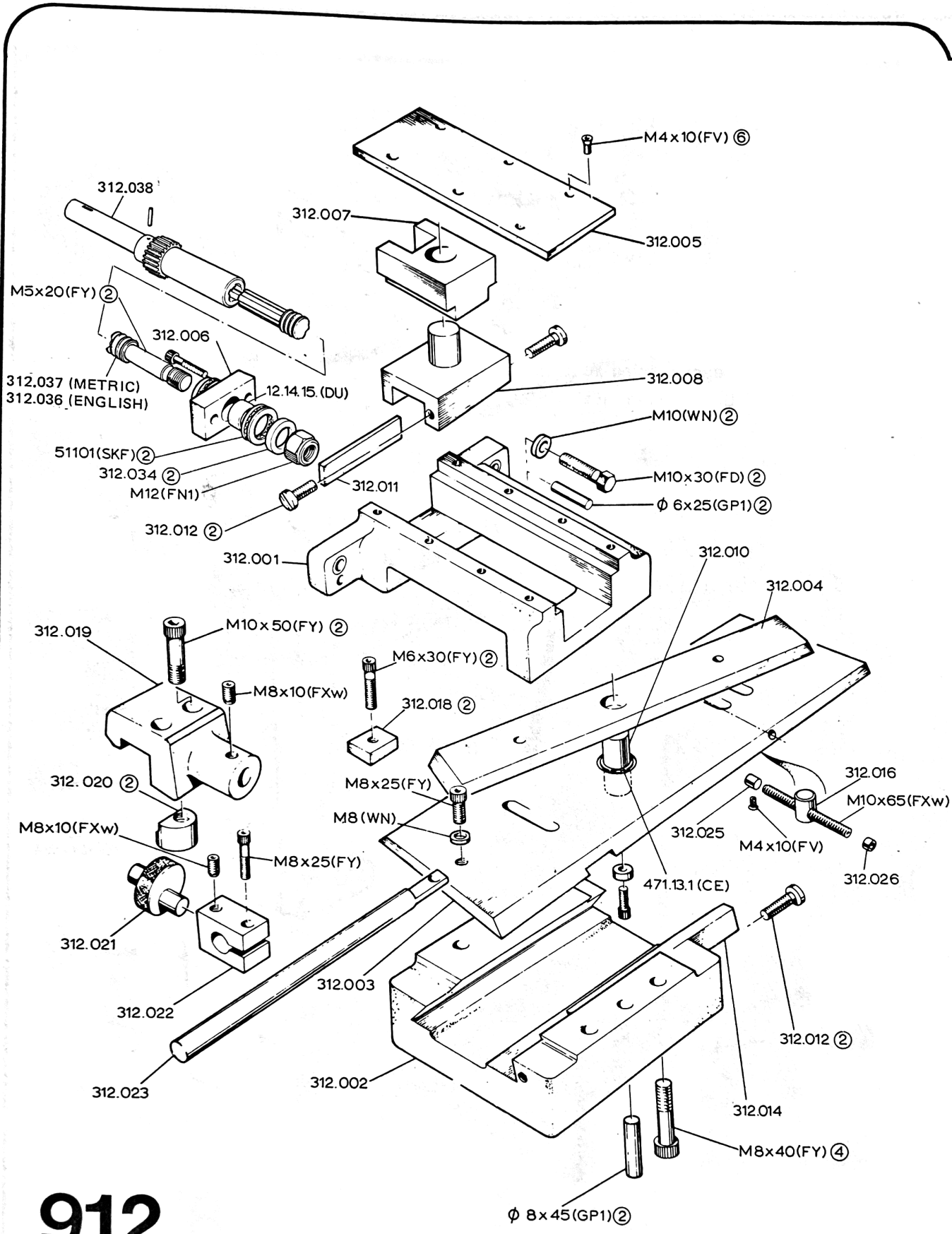

911014 (ENGLISH)
ø3x18(MBK)METRIC
ø3x12(MBK)ENGLISH
911015(METRIC)
911013
911016
No.4x1/4"(FR)T④
998(METRIC)
999(ENGLISH)
ø5x20(MBK)
911017
M5x10(FR)SS
911012
911011
M8x50(FY)

911/67

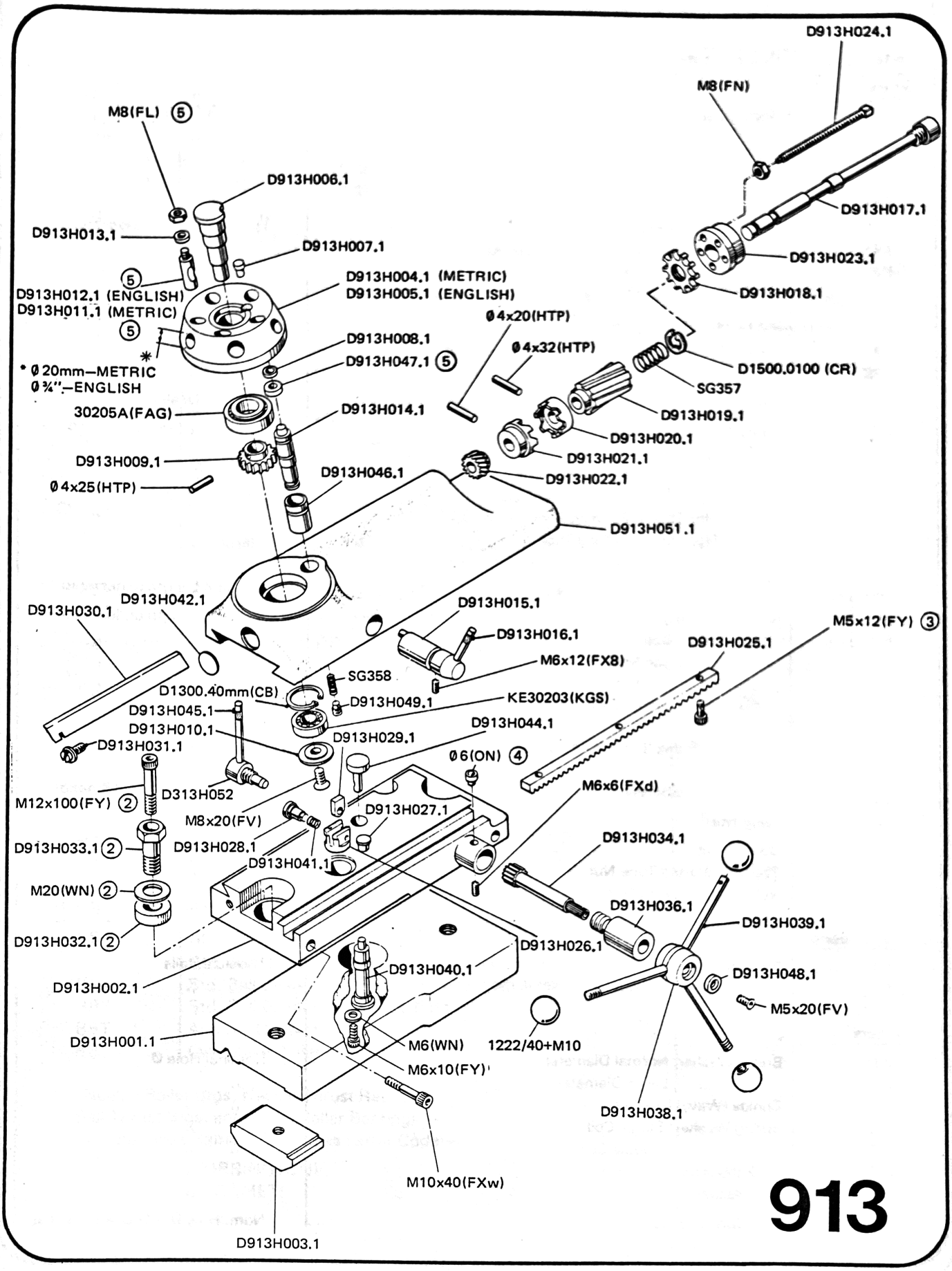

3223(1.5mm²)
(BICC)
M10(WN)A/R
M8x10x16(FU)②
SG414 ②
M4x36(FY)②
MV3HM6S
(BURGESS)
311.81.003
M6x20(FH) ②
M8(WN)②
M8x12(FY)
911004 (500mm)
911005 (750mm)
252 ②
(ELKAY)

911/81

Attachments


M4x10(FV) ⑥
312.038
312.007
312.005
M5x20(FY) ②
312.006
312.037 (METRIC)
312.036 (ENGLISH)
12.14.15.(DU)
312.008
M10(WN) ②
51101(SKF) ②
312.034 ②
M12(FN1)
312.011
M10x30(FD) ②
φ 6x25(GP1) ②
312.012 ②
312.001
312.010
312.004
312.019
M10x50(FY) ②
M6x30(FY) ②
M8x10(FXw)
312.018 ②
312.020 ②
M8x25(FY)
312.016
M10x65(FXw)
M8 (WN)
312.025
M4x10(FV)
M8x10(FXw)
M8x25(FY)
312.026
471.13.1 (CE)
312.021
312.003
312.022
312.012 ②
312.023
312.002
312.014
M8x40(FY) ④
φ 8x45(GP1) ②

912


D913H024.1
M8(FN)
M8(FL) ⑤
D913H006.1
D913H017.1
D913H013.1
D913H007.1
D913H023.1
⑤
D913H004.1 (METRIC)
D913H005.1 (ENGLISH)
D913H012.1 (ENGLISH)
D913H011.1 (METRIC)
D913H018.1
Ø4x20(HTP)
⑤
D913H008.1
Ø4x32(HTP)
* Ø20mm—METRIC
Ø¾"—ENGLISH
D913H047.1 ⑤
D1500.0100 (CR)
SG357
30205A(FAG)
D913H014.1
D913H019.1
D913H020.1
D913H009.1
D913H021.1
D913H046.1
Ø4x25(HTP)
D913H022.1
D913H051.1
D913H030.1
D913H042.1
D913H015.1
M5x12(FY) ③
D913H016.1
D913H025.1
M6x12(FX8)
SG358
D1300.40mm(CB)
D913H049.1
KE30203(KGS)
D913H045.1
D913H044.1
D913H010.1
D913H029.1
D913H031.1
Ø6(ON) ④
M6x6(FXd)
M12x100(FY) ②
D313H052
M8x20(FV)
D913H027.1
D913H033.1 ②
D913H028.1
D913H034.1
D913H041.1
M20(WN) ②
D913H036.1
D913H039.1
D913H032.1 ②
D913H026.1
D913H040.1
D913H048.1
D913H002.1
M5x20(FV)
D913H001.1
M6(WN)
1222/40+M10
M6x10(FY)
D913H038.1
M10x40(FXw)
D913H003.1
913

Standard/Proprietary Parts

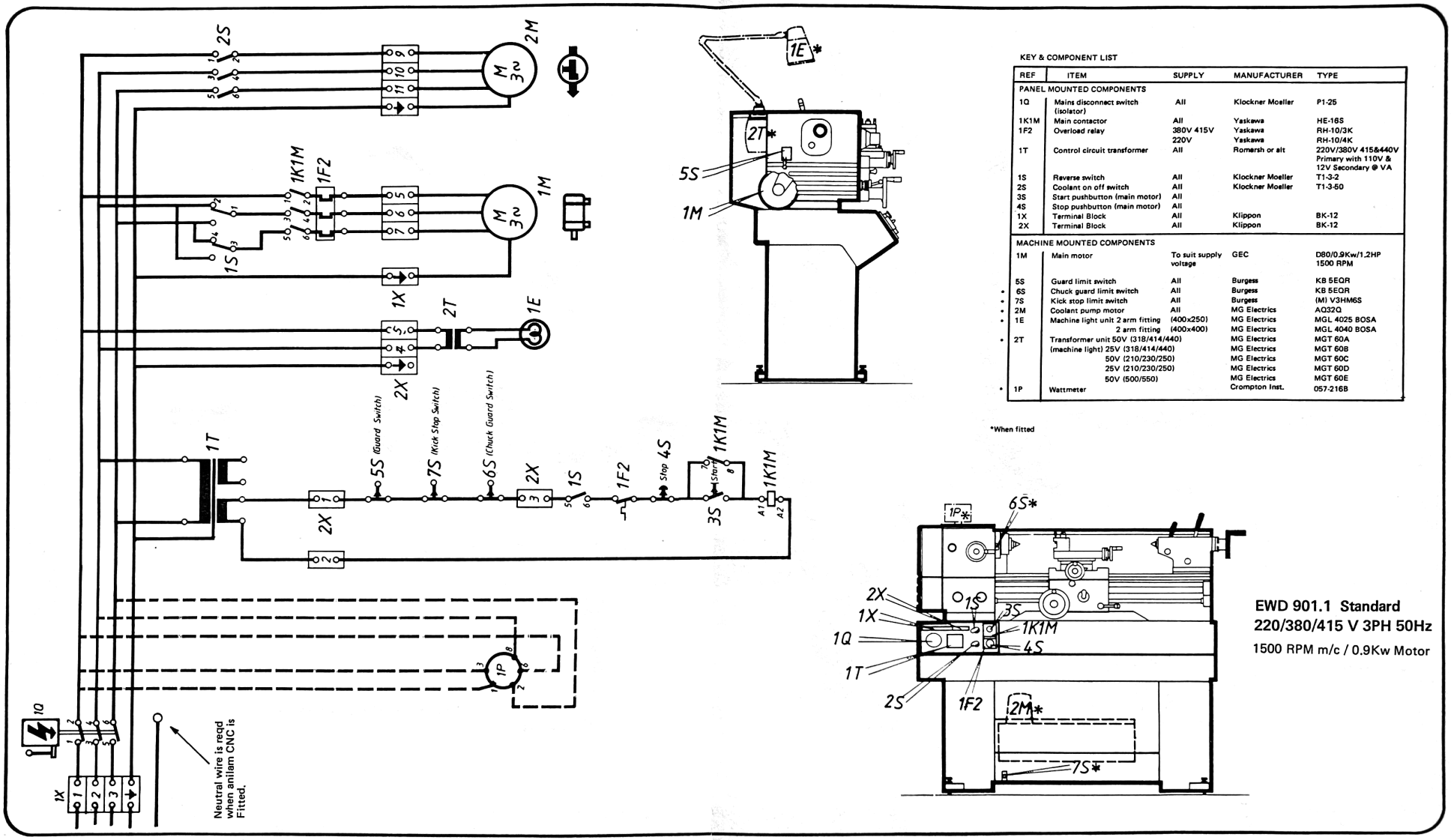
'Bracketed' Letter Code	Component	Letter Codes Conventional Description Given
Screws and Nuts		
FX	Socket Set (Grub) Screw: Flat Point	Thread X O/all Length
FXd	" " " " Dog Point (Normal)	" " " "
FXd1	" " " " Dog Point (Long)	" " " "
FXc	" " " " Cone Point	" " " "
FXw	" " " " Cup, knurled or 'W' Point	" " " "
FY	Socket Head Cap Screw	Thread X Length under head
FY1	Socket Head Cap Screw (Threaded to Head)	" " " "
FV	Socket Countersunk Screw	" " " "
FS	Socket Button Head Screw	" " " "
FU	Socket Shoulder Screw	Thread X Ø Shank X Shank length
FP	Socket Pressure Plug	Thread and Form
FPS	Press Plug (Square Head)	" "
FO	Slotted Set (Grub) Screw	Thread X O/all Length
FT	Slotted or Pozidriv Screw: Countersunk Head	Thread X length under head
FI	" " " " Raised C/sunk Head	" " " "
FR	" " " " Pan Head	" " " "
FE	" " " " Cheese Head	
	Suffix 'B' for Thread Forming Type	
	Suffix 'T' for Thread Cutting Type	
	Suffix 'SS' for Stainless Steel	
FJ	Square Head (Toolpost) Screw	Thread X Length under head
FH	hexagon Head Screw	Thread X Length under head
FD	" " Bolt	" " " "
FN	Standard Hexagon Nut	" " " "
FL	" " " Locknut	" " " "
	Suffix '8.8' for High Tensile Types	
	Suffix 'L' for 'Self-Locking' versions of the above	
FZ	Hammer Drive Screw	Nom Ø X Length under head
FW	Wing Nut	Thread details
DN	Domed Nut	Thread details
CN	Castle of Slotted Type Nut	" "
FN1	Nylon Ring Locking Nut	" "
Thread Inserts		
TI1	Press in Type Thread Insert	Thread details
TI2	Coil Type Thread Insert	" "
Washers		
WN	Bright Washer: Normal Diameter	Nominal Hole Ø
WL	" " Large Diameter	" "
WK	Crinkle (Wavy) Washer	" "
WS	Spring Washer: Single Coil	" "
WSs	" " Double Coil	" "
WC	Folded Copper Sealing Washer	" "
WF	Felt Washer	" "
DS	Disc Spring (Belleville Washer)	Nom. Hole Ø X O.D.X thickness

'Bracketed' Letter Code	Component	Conventional Description Given
Pins and Dowels		
GP1	Grooved Pin: Full length groove — Tight at one end	Nom. Ø X O/all length
GP2	" " Half length groove — Tight on end	" " "
GP3	" " Full length groove — Parallel	" " "
GP4	" " Half length groove — Tight at centre	" " "
GP5	" " Centre groove	" " "
PD	Dowel Pin	Nom Ø X O/all length
PB	Brass Pin or Pad	" " "
PT	Taper Pin	Nom Ø (small end) X O/all leng
PS	Split Pin	Nom Ø X O/all length
LTP	Tension Pin: Light Duty	Nom Ø X O/all length
HTP	" " Heavy Duty	" " "
Keys		
KS	Square Parallel Key	Width X Thickness X Length
KR	Rectangular Parallel Key	" " " "
KW	Woodruff Key	Width X Height X Diameter
Circlips		
CE	External Circlip: DIN 471	DIN. Ref. Nom Shaft Ø and Thickness
CE1	Round Section Circlip	Nom. Shaft Ø, Wire Ø
CE2	Inverted Retainer (Truarc)	" " "
CB	Internal Circlip: DIN 472	DIN. Ref. Nom Bore and Thickness
CR	Radial Fitting Circlip. DIN 6799	DIN Ref. Nom Ø and Thickness
CR1	Radial Retaining Clip (Spring fix)	Nom shaft Ø
CR2	Radial Fitting Circlip BS3673/3	" "
Plain Bearings		
DU	Composite Bearing Bush 'Glacier'	Nom Bore. O.D. and Length
DX	" " " " "	" " " "
LB	Sintered Bronze Bush	Nom Bore O.D. and Length
Ball & Roller Bearings		
BB	Std. Ball Bearing	Nom Bore Outside Ø and Leng
BB1	Std. Ball Bearing with Shield or Seal one side	" " " " "
BB2	Std. Ball Bearing with Shield or Seal both sides	" " " " "
BB3	Std. Ball Bearing with Snap Ring	" " " " "
BBT	Angular Contact Ball Bearing	" " " " "
RB	Cylindrical Roller Bearing	" " " " "

For Needle Roller Brgs, Needle Thrust Races
Ball Thrust Brgs. and Taper Roller Bearings —
Manufactuers Name is Quoted as Letter Code — vis.

(INA.)	(TORRINGTON)	Manufacturers Part No.
(SKF)	or (GAMET)	Quoted

'Bracketed' Letter Code	Component	Conventional Description Given
Seals		
SM	Standard Oil Seal	Nom Shaft Ø O.D. and Width
SF	'V' Ring Seal (FORSHEDA)	Manufacturers Part No.
RM	Standard 'O' Ring Seal	Internal Ø of Ring, and Section Ø
RM1	'Nu-Lip Ring' (Pioneer)	Manufacturers Part No.
Lubrication Equipment		
ON	Concave Oil Nipple: Drive in Type	Nom Hole Ø
ONI	" " " Threaded Type	Thread details
OS	Oil Sight Glass	Nom Outside Ø
OS1	Oil Level Glass	" "
OW	Oil Wick	Nom Ø X Length
For Compression and other Pipe Fitting — Manufacturers Name is quoted as Letter Code vis. (ENOTS.) or (TECALEMIT)		Manufacturers Part Number Quoted
Miscellaneous Items		
BJ	Ball Joint	Thread Details
SB	Steel Ball	Nom Ø
FK	Hexagon Wrench Key	Nom width across flats
HP	P.V.C. Hose	Nom Bore and O.D.
HC	Hose Clip	Max. Hose Ø
PP	Plastic Plug	Manufacturers Part Number
WRS	Standard Spanner	Std. Bolt size and width across flats
EB	Eye Bolt	Thread details
OW	Oil wick	Nom Ø X Length
CT	Copper tube	Nom outside Ø
NT1	Nylon Tube Natural	Nom Bore
NT2	Nylon Tube Blue	" "
NT3	Nylon Tube Green	" "
NT4	Nylon Tube Red	" "



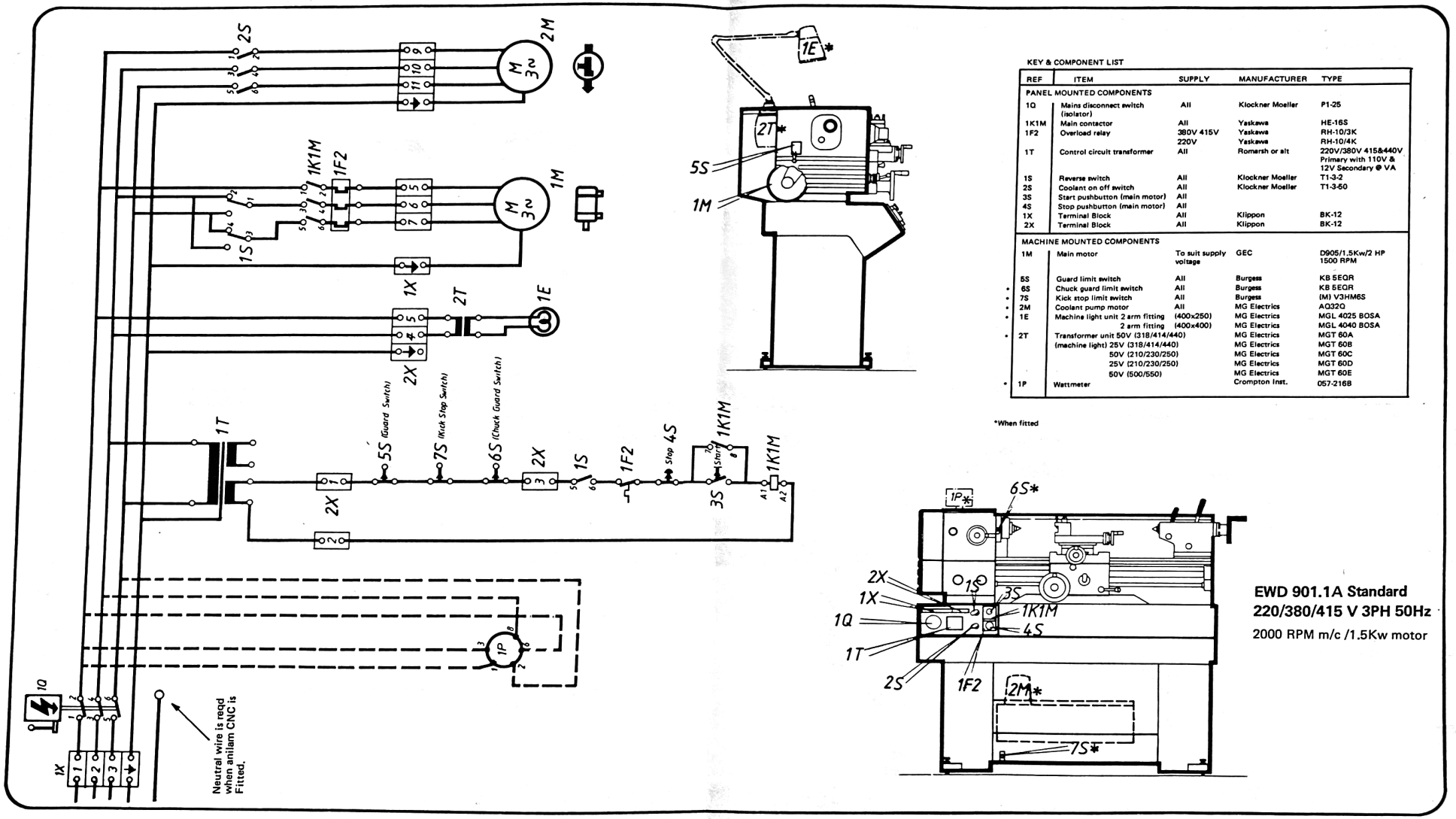
KEY & COMPONENT LIST

	REF	ITEM	SUPPLY	MANUFACTURER	TYPE
	PANEL MOUNTED COMPONENTS				
	1Q	Mains disconnect switch (isolator)	All	Klockner Moeller	P1-25
	1K1M	Main contactor	All	Yaskawa	HE-16S
	1F2	Overload relay	380V 415V	Yaskawa	RH-10/3K
			220V	Yaskawa	RH-10/4K
	1T	Control circuit transformer	All	Romarsh or alt	220V/380V 415&440V Primary with 110V & 12V Secondary @ VA
	1S	Reverse switch	All	Klockner Moeller	T1-3-2
	2S	Coolant on off switch	All	Klockner Moeller	T1-3-50
	3S	Start pushbutton (main motor)	All		
	4S	Stop pushbutton (main motor)	All		
	1X	Terminal Block	All	Klippon	BK-12
	2X	Terminal Block	All	Klippon	BK-12
	MACHINE MOUNTED COMPONENTS				
	1M	Main motor	To suit supply voltage	GEC	D80/0.9Kw/1.2HP 1500 RPM
	5S	Guard limit switch	All	Burgess	KB 5EQR
•	6S	Chuck guard limit switch	All	Burgess	KB 5EQR
•	7S	Kick stop limit switch	All	Burgess	(M) V3HM6S
•	2M	Coolant pump motor	All	MG Electrics	AQ32Q
•	1E	Machine light unit 2 arm fitting	(400x250)	MG Electrics	MGL 4025 BOSA
		2 arm fitting	(400x400)	MG Electrics	MGL 4040 BOSA
•	2T	Transformer unit 50V (318/414/440)		MG Electrics	MGT 60A
		(machine light) 25V (318/414/440)		MG Electrics	MGT 60B
		50V (210/230/250)		MG Electrics	MGT 60C
		25V (210/230/250)		MG Electrics	MGT 60D
		50V (500/550)		MG Electrics	MGT 60E
•	1P	Wattmeter		Crompton Inst.	057-216B

*When fitted

EWD 901.1 Standard
220/380/415 V 3PH 50Hz
1500 RPM m/c / 0.9Kw Motor

Wiring Diagram



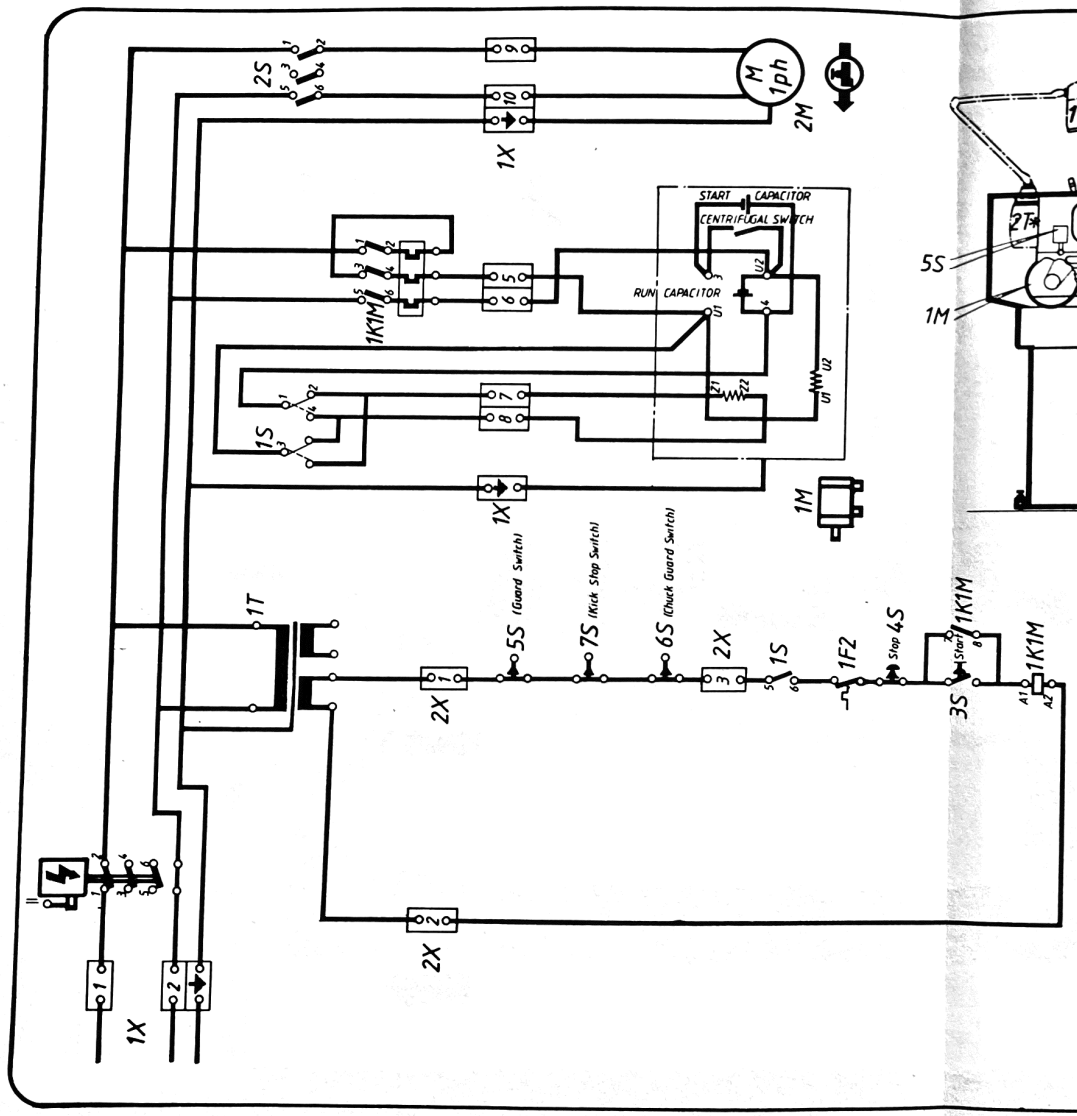
KEY & COMPONENT LIST

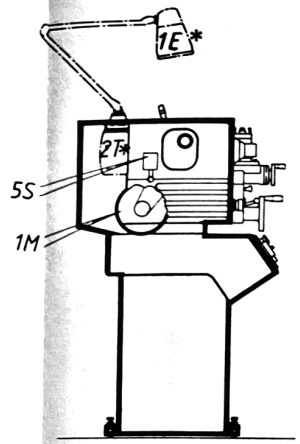
REF	ITEM	SUPPLY	MANUFACTURER	TYPE
PANEL MOUNTED COMPONENTS				
1Q	Mains disconnect switch (isolator)	All	Klockner Moeller	P1-25
1K1M	Main contactor	All	Yaskawa	HE-16S
1F2	Overload relay	380V 415V	Yaskawa	RH-10/3K
		220V	Yaskawa	RH-10/4K
1T	Control circuit transformer	All	Romersh or alt	220V/380V 415&440V Primary with 110V & 12V Secondary @ VA
1S	Reverse switch	All	Klockner Moeller	T1-3-2
2S	Coolant on off switch	All	Klockner Moeller	T1-3-50
3S	Start pushbutton (main motor)	All		
4S	Stop pushbutton (main motor)	All		
1X	Terminal Block	All	Klippon	BK-12
2X	Terminal Block	All	Klippon	BK-12
MACHINE MOUNTED COMPONENTS				
1M	Main motor	To suit supply voltage	GEC	D905/1.5Kw/2 HP 1500 RPM
5S	Guard limit switch	All	Burgess	KB 5EQR
* 6S	Chuck guard limit switch	All	Burgess	KB 5EQR
* 7S	Kick stop limit switch	All	Burgess	(M) V3HM6S
* 2M	Coolant pump motor	All	MG Electrics	AQ32Q
* 1E	Machine light unit 2 arm fitting	(400x250)	MG Electrics	MGL 4025 BOSA
	2 arm fitting	(400x400)	MG Electrics	MGL 4040 BOSA
* 2T	Transformer unit 50V (318/414/440)		MG Electrics	MGT 60A
	(machine light) 25V (318/414/440)		MG Electrics	MGT 60B
	50V (210/230/250)		MG Electrics	MGT 60C
	25V (210/230/250)		MG Electrics	MGT 60D
	50V (500/550)		MG Electrics	MGT 60E
* 1P	Wattmeter		Crompton Inst.	057-216B

*When fitted

EWD 901.1A Standard
220/380/415 V 3PH 50Hz
2000 RPM m/c /1.5Kw motor

Wiring Diagram



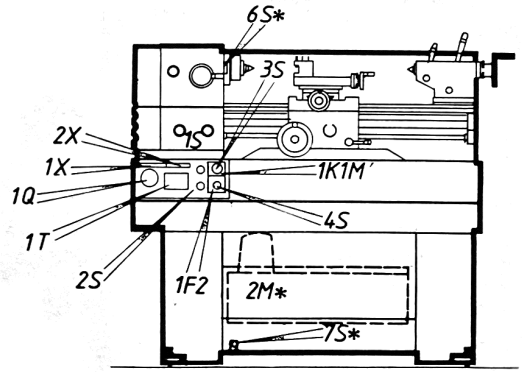


KEY AND COMPONENT LIST

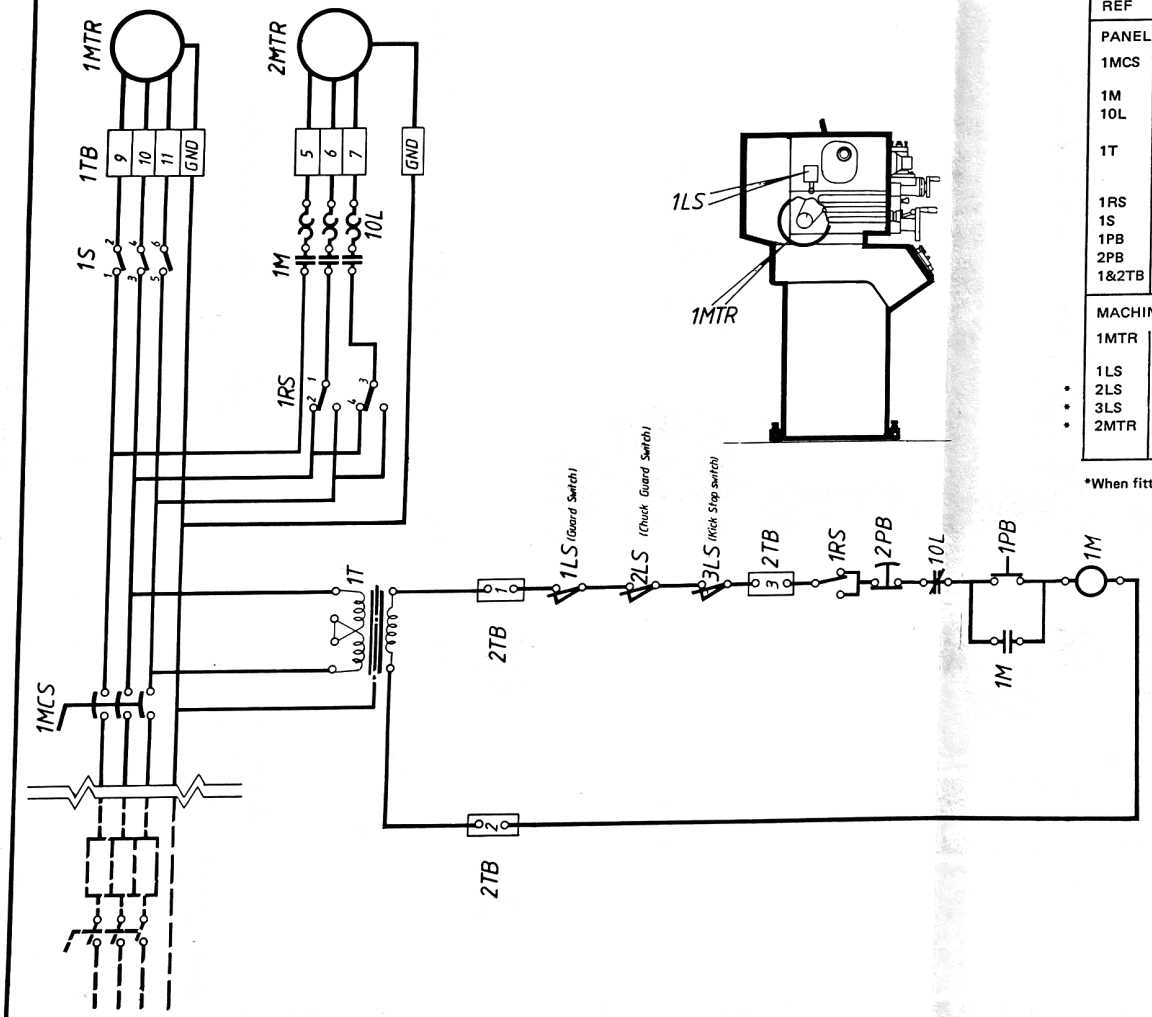
REF	ITEM	SUPPLY	MANUFACTURER	TYPE
PANEL MOUNTED COMPONENTS				
1Q	Mains disconnect switch (Isolator)	All	Klockner Moeller	P1-25
1K1M	Main contactor	All	Yaskawa	HE-16S
1F2	Overload relay	All	Yaskawa	RH-10/7K
1T	Control circuit transformer	All	Romarsh or alt	240V P Primary with 110V & 12V Secondary at VA
1S	Reverse switch	All	Klockner Moeller	T1-3-2
2S	Coolant on off switch	All	Klockner Moeller	T1-3-50
3S	Start pushbutton (main motor)	All		
4S	Stop pushbutton (main motor)	All		
1X	Terminal block	All	Klippon	BK-12
2X	Terminal block	All	Klippon	BK-12
MACHINE MOUNTED COMPONENTS				
1M	Main motor	To suit supply voltage	GEC	D 905/1.1/1.5
5S	Guard limit switch	All	Burgess	KBS EQR
6S	Chuck guard limit switch	All	Burgess	KBS EQR
7S	Kick stop limit switch	All	Burgess	(M) V3HM6S
2M	Coolant pump motor	All	MG Electrics	AQ 3/1/E
1E	Machine light unit 2 arm fitting (400x250)		MG Electrics	MGL 4025 BOSA
	2 arm fitting (400x400)		MG Electrics	MGL 4040 BOSA
2T	Transformer unit 10V		MG Electrics	
	(machine light) 25V		MG Electrics	

*When fitted

EWD 903.1 Single phase
240V 1PH 50Hz



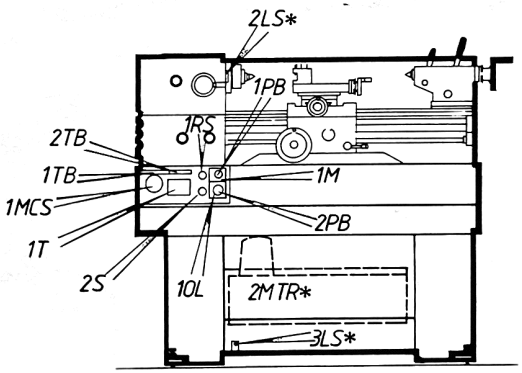
Wiring Diagram



KEY AND COMPONENT LIST

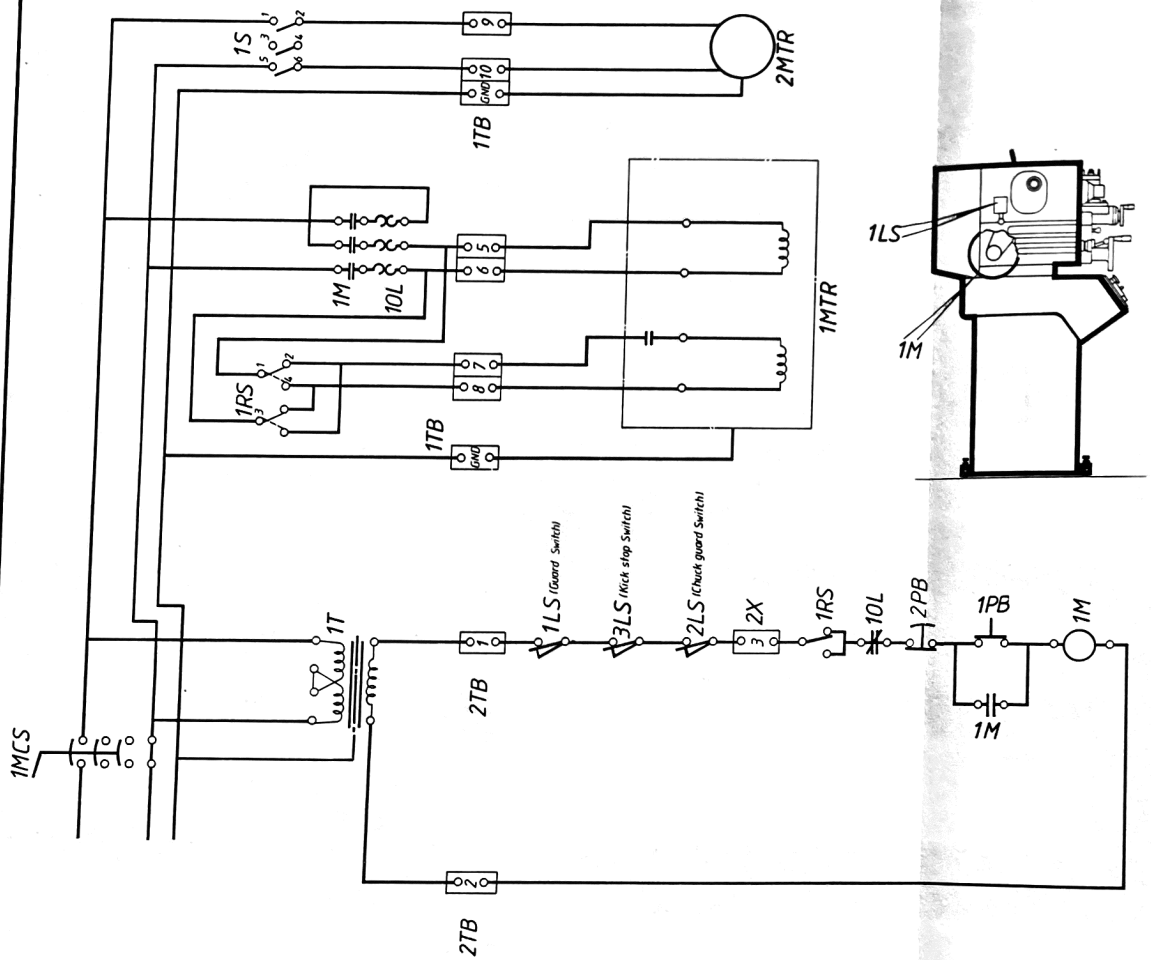
REF	ITEM	SUPPLY	MANUFACTURER	TYPE
PANEL MOUNTED COMPONENTS				
1MCS	Mains disconnect switch (Isolator)	All	Klockner Moeller	T1-2-NA
1M	Main contactor	All	Yaskawa	HE-16S
10L	Overload relay	230V	Yaskawa	RH-10/5K
		460V	Yaskawa	RH-10/3K
1T	Control circuit transformer	All	Romarsh or alt	ULF/UF25/3 208 230 460 575 Volt primary 115 Volt secondary at 25VA
1RS	Reverse switch	All	Klockner Moeller	T1-3-2
1S	Coolant on off switch	All	Klockner Moeller	T1-3-50
1PB	Start pushbutton (main motor)	All	Yaskawa	
2PB	Emergency stop pushbutton	All	Yaskawa	
1&2TB	Terminal block	All	Klippon	BK 12
MACHINE MOUNTED COMPONENTS				
1MTR	Main motor	To suit supply voltage	Brook	K145T, 1½ HP, 1800RPM
1LS	Guard limit switch	All	Burgess	KB5 EQR CSA/UL
* 2LS	Chuck guard limit switch	All	Burgess	KB5 EQR CSA/UL
* 3LS	Kickstop limit switch	All	Burgess	(M)V3HM6S CSA/UL
* 2MTR	Coolant pump motor	To suit supply voltage	MG Electrics	AQ3/2

*When fitted



EWD 905.1 U.S.A.
230-460V 3PH 60Hz

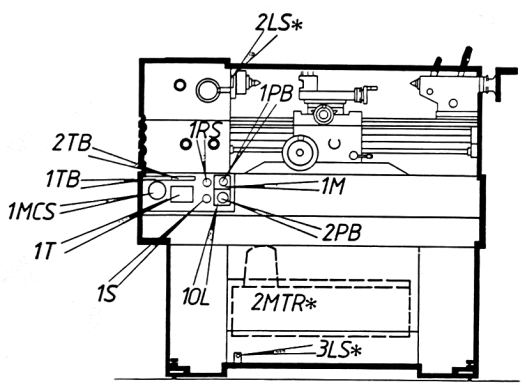
Wiring Diagram



KEY AND COMPONENT LIST

REF	ITEM	SUPPLY	MANUFACTURER	TYPE
PANEL MOUNTED COMPONENTS				
1MCS	Mains disconnect switch (Isolator)	All	Klockner Moeller	T1-25 NA
1M	Main contactor	All	Yaskawa	HE-16S
10L	Overload relay	All	Yaskawa	RH-10/10K
1T	Control circuit transformer	All	Romarsh or alt	220V primary with 115V secondary
1RS	Reverse switch	All	Klockner Moeller	T1-3-2/NA
1S	Coolant on/off switch	All	Klockner Moeller	T1-3-50/NA
1PB	Start button	All	Yaskawa	
2PB	Stop button (mushroom headed)	All	Yaskawa	
1&2TB	Terminal block	All	Klippon	BK-12
MACHINE MOUNTED COMPONENTS				
1MTR	Main motor	All	Brook	K145T, 1½HP 1800RPM Nema
1LS	Guard limit switch	All	Burgess	KB5 EQR CSA/UL
2LS	Chuck guard limit switch	All	Burgess	KB5 EQR CSA/UL
3LS	Kickstop limit switch	All	Burgess	(M) V3HM6S CSA/UL
2MTR	Coolant pump motor	All	M G Electrics	AQ3/2 CSA/UL

*When fitted



EWD 907.1 Single Phase U.S.A.
220/1/60Hz

Wiring Diagram

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