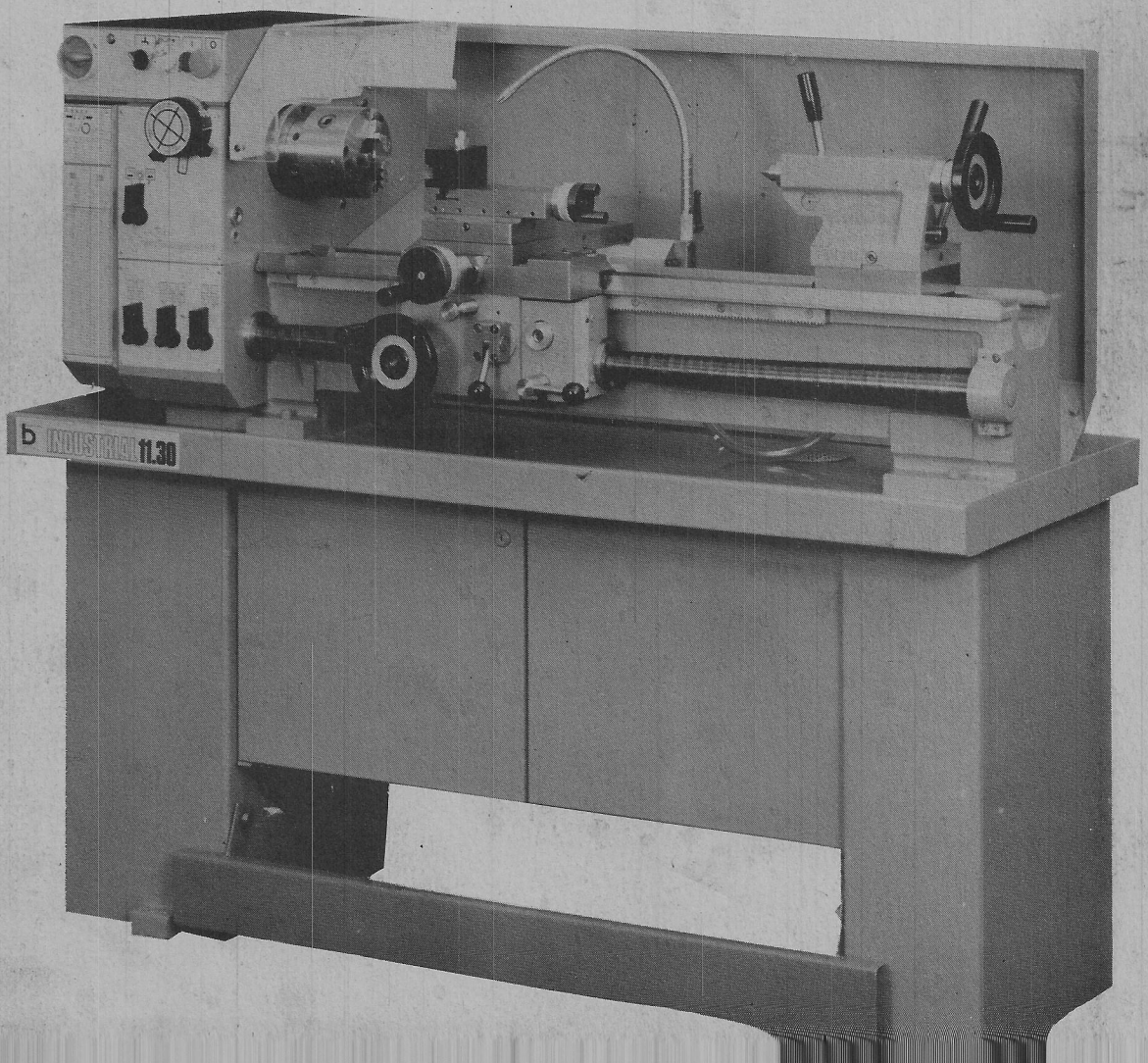
Boxford

Halifax England

BOXFORD

Industrial and Training Lathes Machine Notes and Parts Illustrations



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Foreword

Our objectives are to guide the user of a new Boxford Lathe towards its safe operation, optimum performance and maximum useful life.

We emphasize our belief however, that safety on the lathe relies to a very great extent upon the adoption of safe working practices, and that the useful life of the lathe, its performance and its accuracy depend largely on the care taken in its installation, operation and routine maintenance.

We suggest therefore that the advice and information offered should be thoroughly digested and adhered to as closely as possible.

Our commercial and technical departments will be pleased to supply further advice or information should this be required.

QUOTE LATHE MODEL
AND MACHINE SERIAL NUMBER
(WHICH IS STAMPED ON THE TAILSTOCK END OF THE BED)
IN ALL COMMUNICATIONS

Safety

General safety information is available in the form of a wall-chart No. **SEP/S233-5** for school workshops.
From: The Royal Society for the Prevention of Accidents (ROSPA, Cannon House, The Priory, Queensway, Birmingham B4 6BS).
Other related documents are:-

BS 4163.1975— Recommendations for Health and Safety in Workshops of Schools and Colleges.
BS 5304.1975— Code of Practice for Safeguarding of Machinery.
(From British Standards Institution, 101 Pentonville Road, London N1 9ND).
Code of Practice— Safeguarding of Turning Machines— 1978.
(From Machine Tool Trades Association, 62 Bayswater Road, London W2 3P4).

For further guidance on safe working practices see the Engineering Industry Training Boards Instruction Manuals.
"Safety Practice for Engineering Trainees".
And for lathe work in particular.
Module H2 Turning I and H23 Turning II for Engineering Craftsmen.
From the:
Publications Department
Engineering Industry Training Board, PO Box 176,
54 Clarendon Road, Watford WD1 1LB.

Safety Guidance Notes: Boxford Lathes

Whilst every effort is made in the design and manufacture of Boxford Lathes to provide a fundamentally safe machine, attention should be given to the following notes in the interests of safe lathe usage.

PERSONAL SAFETY PRECAUTIONS TO BE OBSERVED WHEN OPERATING A LATHE.

Always wear suitable clothing— overalls or a strong apron tied at the back and safety shoes are best.
Never wear loose floppy garments.
Never wear rings, watches, ties, gloves, bandages or anything which could become caught in the moving parts of the machine.
Always wear your clothing buttoned up and roll up long sleeves or button the cuffs.
Never allow long hair to hang loosely.
ALWAYS WEAR SAFETY GLASSES OR A PROTECTIVE VISOR.
Always use a barrier cream on the hands.
Never wash hands in machine coolant or wipe your hands with rags used to clean the machine.
Never keep tools or other sharp objects in your pockets.
ALWAYS REPORT ANY ACCIDENT HOWEVER SMALL IMMEDIATELY IT HAPPENS.
ALWAYS ASK A QUALIFIED SUPERVISOR IF IN DOUBT.
AND, ALWAYS REMEMBER THAT THE MOST EFFICIENT SAFETY PRECAUTION IS TO ADOPT SAFE WORKING PRACTICES.

OPERATING A LATHE SAFELY

Know your lathe— read and understand the operating instructions provided before attempting to use the machine.
Ensure you know how to STOP the machine before starting it. And be prepared to STOP THE MACHINE IMMEDIATELY ANYTHING UNINTENDED HAPPENS.
ALWAYS REMOVE CHUCK KEY FROM CHUCK IMMEDIATELY AFTER USE OR, USE A SPRING LOADED SAFETY CHUCK KEY.
NEVER TOUCH REVOLVING PARTS OF THE MACHINE OR WORK PIECE.
Never remove swarf from the machine with the bare hands and never whilst the machine is running.

Always switch off at the mains before cleaning the lathe.
Always use correct size spanners.
Never use cracked or chipped turning tools.
Always ensure work-piece and/or chip guards are in position (where these are provided) before starting the machine.
Always retreat the tool to a safe position before removing the work piece from the machine.
Always obtain qualified assistance when handling heavy or awkwardly shaped work-piece, chuck and/or faceplate, and check that large work-pieces clear bed and saddle etc. by rotating them by hand before starting the spindle.
Be careful of, and remove if possible all work-piece burrs and sharp edges.
Never lean on the lathe and

NEVER INTERFERE WITH THE ELECTRICAL EQUIPMENT.

Keep lathe clean and keep area surrounding the lathe tidy, and the floor free from grease or oil.
Always stop machine and switch off at the mains when leaving the machine unattended.

MACHINE CAPACITY AND USER RESPONSIBILITY

The dimensions of a work-piece which can be accommodated on a Boxford Lathe are limited only by the physical restrictions of the machine itself and responsibility for the following points with respect to machining a work-piece must inevitably lie with the user.–
The operator must possess the required degree of skill and experience to undertake the work planned or adequate qualified supervision must be provided.
Suitable work holding and/or supporting equipment must be provided for each work piece to be machined, i.e. chucks, steadies, revolving centres, etc.
Suitable lathe tools, drills, drill chucks etc. must be provided and correctly mounted in the lathe.
Suitable cutting speeds and feeds should be selected and safe working practices adopted.
Suitable work-piece or chip guards should be provided and consistently used.

Installation

WARNING — Do not turn Handwheels or move Tailstock until packing and all bright surface protection has been removed from the Slideways.

Cleaning Bright Surfaces

Any protective compound or grease which has been applied during manufacture may be removed with Paraffin (Kerosene) or White Spirit. Then a light coating of general purpose machine oil should be applied to prevent rusting.

Lifting

Approximate lathe weights including an allowance for accessories and equipment are as follows:-
20" CTS Models 365kg 800lb
30" CTS Models 385kg 850lb
And any equipment or structures used in the lifting or transportation of Boxford Lathes must be of a suitable character and have certified S.W.L. values in excess of the above figures.

Lifting Using an Eye Bolt

An M16 Tapped Hole (ISO ϕ 16 × 2mm Pitch Thread) is provided in the Bed Cross Bracing nearest to the Spindle Nose and this may be used to lift the machine with a suitable Dynamo-Type Eye Bolt.
WARNING—Check any Eye Bolt used for correct thread and ensure that it is firmly screwed down to its shoulder before lifting.
It is essential that the machine weight is evenly balanced about the Eye Bolt by suitable positioning, of the carriage and Tailstock Assys. along the Bed.
Normally machines will be packed for delivery with these units correctly positioned for lifting.
NOTE: On 30" CTS Machines the Carriage Assy. should be to the left of the Eye Bolt and requires to be moved to this position before the Eye Bolt can be inserted.

Lifting Using an Endless Sling

WARNING—Rear splash guard must be removed when lifting by this method,chains must not be used.

A suitable Endless Rope or Nylon Sling may be crossed, looped under both ends of the Swarf Tray and centred on the Hoist Hook to give a balanced lift condition. But care must be taken to ensure that the sling is of sufficient length to allow a balanced condition without coming into contact with vulnerable parts of the machine.
Minimum Recommended Sling Length is 6m (20ft).
And Suitable S.W.L. 1000kg (1 ton).

Siting the Machine

The lathe should be located on a firm preferably concrete floor which is capable of supporting the combined weights of:— Machine, Accessories, Equipment, Potential Work in progress and an Operator — without noticeable deflection.
Sufficient space should be provided for unimpeded operation of the machine and unrestricted access allowed for cleaning and maintenance purposes.

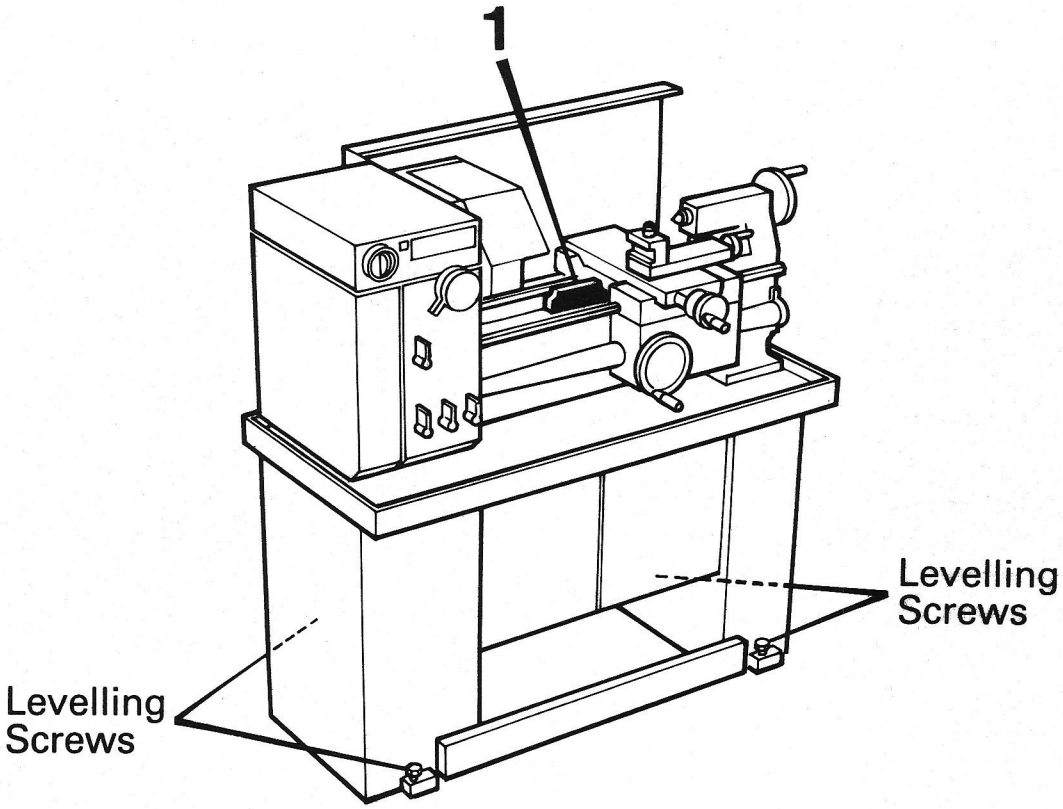
Machine Fixing

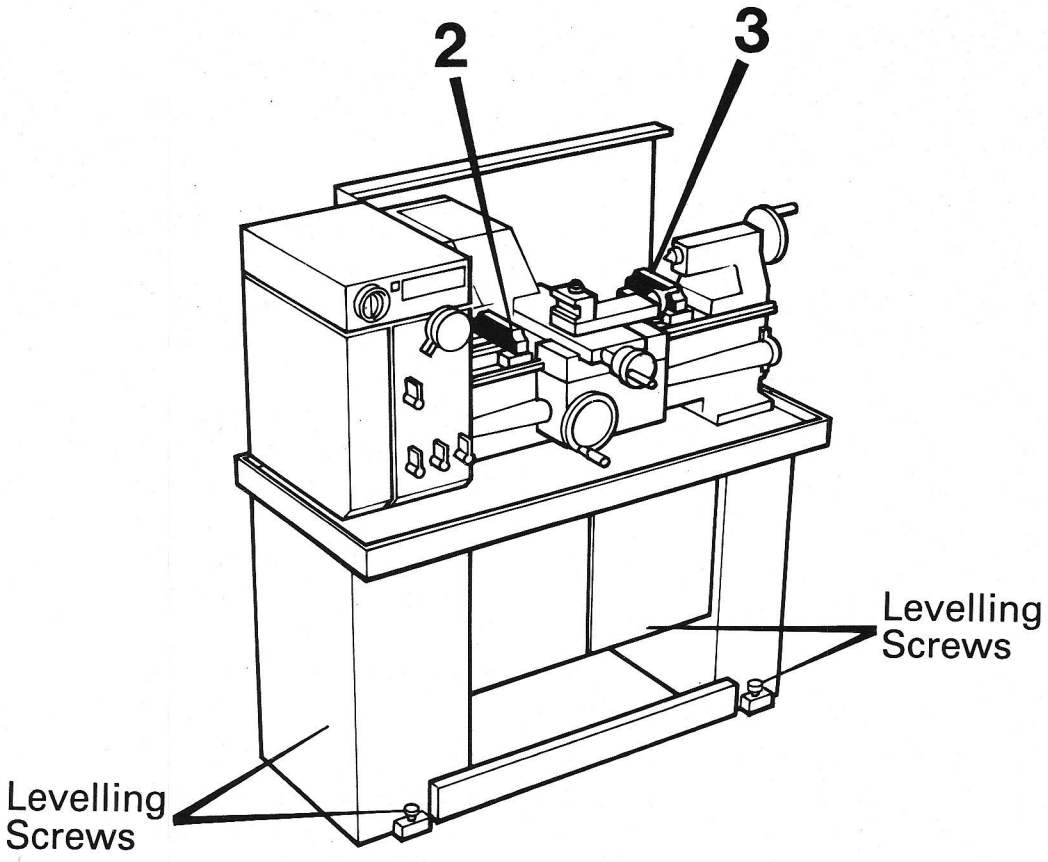
Under normal operating conditions it is not essential for the machine to be bolted down, but for optimum accuracy and cutting performance foundation or clamp bolts are recommended and bolt holes are provided adjacent to each of the four levelling screws for this purpose.
In cases where the machine is to be free standing some form of location should be provided to prevent the machine from being moved bodily once levelling and straightness checks have been completed.

Levelling

Perfect i.e. 'zero' level conditions are not necessary for operation of the machine but a precision engineers level must be used to check for bed straightness and steel plates, as

Level Positions





Boxford part numbered X10/14/011, or at least 60 × 50 × 6mm ($2\frac{1}{2} \times 2 \times \frac{1}{4}$") should be provided under each levelling screw to spread the point load and prevent the screw from digging into the floor.

Levelling Equipment

One off — precision engineers level at least 150mm (6") long and capable of showing a distinct bubble movement when a .05mm (.002") shim is placed under one end.
One pair — engineers precision gauge blocks or 'parallels' of indentical height — say 20mm (¾") minimum.

Levelling Procedure

1. Position tailstock and carriage at extreme L. Hand end of bed. Place level lengthways on front flat — Bedway approximately halfway along the bed. Then adjust the four levelling screws to obtain an approximate level condition whilst maintaining an equal share of the machine weight on front and rear levelling screws.
2. Wind carriage to a central position along bed. Using the gauge blocks on front and rear flat bedways, check level across the bed at a point approx 250mm (10") from the headstock face. Then adjust the levelling screws evenly at both ends of the machine to obtain an approximately level condition.
3. Observe the precise bubble reading at this point and then move the level with the gauge blocks to a similar set-up approximately 250mm (10") from the tailstock end of the bed.

CAUTION—Do not turn level end for end and use a square to align the level across the bed at both points. Then adjust the tail-end levelling screws only to give the same bubble reading.
Re-check at first position and repeat procedure until absolutely identical bubble readings are obtained at both positions.

If machine is to be bolted down carefully tighten each clamping bolt by an equal amount.

NOTE—Only a light clamping is required. Then re-check levels across bed to ensure that conditions have not been disturbed by clamping.

Re-check levels across bed after 7 days and adjust for identical bubble readings if necessary.

WARNING—Inaccurate workpieces and poor cutting performance can result from an improperly levelled lathe or a less than substantial machine foundation.

Operational Check

A check for correct levelling may be made by the following cutting test:—
Insert a length of machining quality steel bar into the chuck, approximately 50mm (2") diameter so as to stand out approximately 180mm (7") from the chuck jaws and without support at the free end. Clean up the bar to within 10mm (⅜") of the chuck jaws and then take a very light but consistent finishing cut over the cleaned up length. Using a suitable micrometer, measure the precise diameter at each end of the cut when readings should be identical or slightly plus (.01mm (.0004") max) at the headstock end.

Electrical Supply

WARNING—Connection of the lathe to the mains electrical supply must only be undertaken by a qualified electrician. Power to the lathe must be supplied through an external fused Isolator Unit using fuses and wiring materials rated in accordance with the information provided on the machine electrical Data Plate, and so as to comply with prevailing electrical standard and statutory requirements.
External Wiring Conduits should be of a permanent character and conductors used must be of a flexible or stranded type.

It should be noted that the line conductors will be lightly flexed inside the controls box when it is opened for maintenance or inspection purposes.

The electrical entry point is

situated underneath the rear of the electrical controls box and access to the inside of the box requires the release of a single recessed fixing screw, located inside the Changewheel Guard and underneath the front edge of the box. When this screw is released and the Isolator Switch is in the off position, then the hinged top unit may be lifted up from the front.
Line connections should be made directly onto the Isolator Switch terminals and a substantial earth continuity conductor must be provided.

Alternatively
Line connections must be made in accordance with the wiring diagram supplied and a substantial earth continuity conductor must be provided.
IN ALL CASES — Direction of spindle rotation must agree with the selector switch legend and appropriate line or motor connections must be interchanged if wrong directions are obtained when the spindle is started.

Lubrication

Machined Surfaces and Leadscrew Covers—Should regularly be lightly coated with a general purpose machine oil to prevent rusting.

Oiling Points—Should be charged daily with general purpose machine oil using a fine nozzled pressure oil-can or gun.

Oiling points are located in the following places:-

Location	Number
Changewheel Centre Stud	1
Tool Slide	4
Cross Slide & Dial	4
Saddle	2
Apron Dial	1
Tailstock	2
Thread Cutting Unit (On RH Side)	1

Apron Grease Point

(Worm & Leadscrew Lubrication)

This grease nipple should be charged with approx 3cm^3 (0.2 cu. in.) of general purpose grease at monthly intervals.

Changewheel Gear-Teeth—Should be lightly coated with a general purpose grease or open gear lubricant at monthly intervals or when the changewheel set-up is disturbed.

Headstock—Check the oil-level daily when the spindle is stationary by means of the sight-glass located on the spindle nose end of the headstock casting and replenish if the level is below the marker line.

DO NOT OVERFILL—Fill to top of sight-glass only—Through the filler plug-hole situated above the sight-glass.

Use only recommended lubricants as follows:-

Shell	**Tellus 68**
Mobil	**DTE Heavy Medium 26**
Esso	**Nuto H54**
Castrol	**Hyspin Aws 68**
BP	**HLP 100**
Texaco	**Rando HD 68**
Century	**P.W.L.C.**

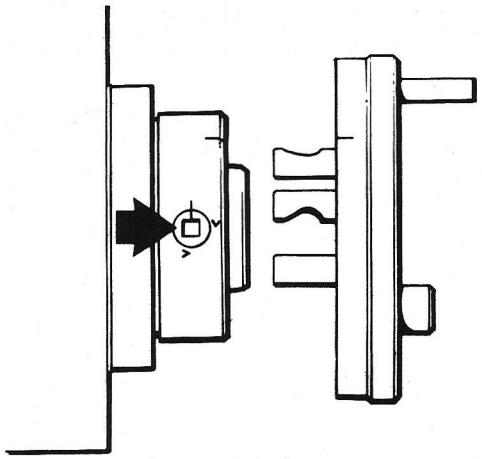
or Equivalent

General Note— The feed gearbox and apron main gear compartment are packed at manufacture with Shell Alvainia R1 grease or its equivalent and under normal working conditions should not require any further lubrication.

The leadscrew tail-end bearing is a sealed for life unit.

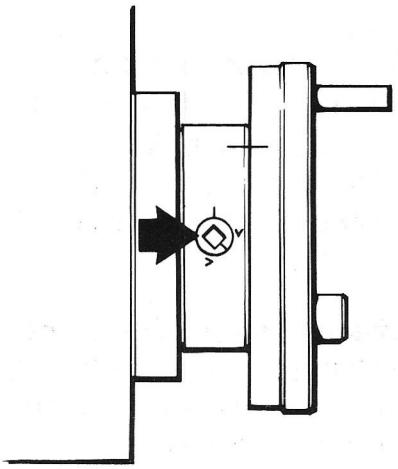
Chucks and Faceplates

Cam fully released



Cam correctly locked

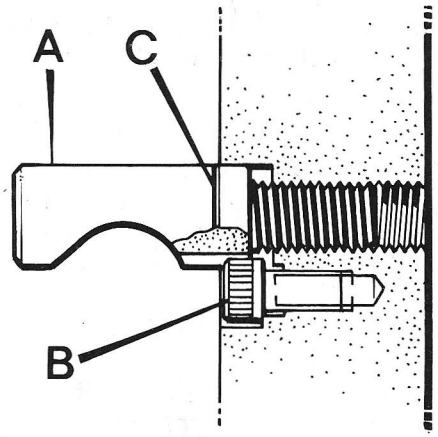
(Note – Reference line on nose & faceplate)



A. Camlock Stud

B. Cap-head Lock Screw

C. Initial Setting Line



Chucks and Faceplates

Mounting Chucks Etc.

Thoroughly clean the location faces of both chuck and spindle nose. Then check that all 3 cams (in the nose) are in the fully released position.
i.e. with the cam marker lined up with the adjacent index line on the spindle nose.
Offer chuck up to spindle nose (see note on reference marks) and tighten the three cams in turn. Each cam should move clockwise between 90 and 180° so that the cam marker is postioned between the two adjacent vee marks on the spindle nose when fully tight. If this condition cannot be obtained then it may be necessary to adjust the appropriate camlock stud setting on the chuck as follows:-
Remove the cap-head lock screw fitted against the stud.
Turn stud one full turn in or out as required.
Re-fit cap-head lock screw and test for correct fit on the spindle.
NOTE: An annular datum line is marked on each camlock stud as a guide to its initial setting.

Reference Marks

In order to ensure consistently firm locking and repeated accuracy, a chuck or other spindle mounted item should always be mounted in the same angular position with respect to the spindle nose. To this end a reference line is provided on the spindle nose so that a correctly fitted chuck may be correspondingly marked and repeatedly mounted in the same relative position on the spindle.

WARNING

Do not interchange chucks or other spindle mounted items between lathes without checking each cam stud for correct locking.

SAFETY

Check maximum safe rpm of any chuck or spindle mounted item used.

NOTE: Chucks and work driver-plate supplied with the machine are safe at the top spindle speed of the machine. But the maximum safe speed for the 280mm (11") diameter faceplate is 820 rpm and in all cases out of balance conditions must be avoided or minimum spindle speed adopted.

Running In

Industrial Models (9 Speed Headstock)
in the interest of long term accuracy and cutting performance, top spindle speeds should be avoided during the first few days of use. In any event, avoid running the spindle at top speeds for prolonged periods during the first few weeks of operation and always try to avoid starting the spindle from cold on top speed.
For best long term results from bearings and machine in general, the following simple running in procedure should be followed:-
Select the 1:1 feed ratios i.e. with 48/48 changewheels and feed-lever positions. B.D.G.
Then run the machine in a forward direction without chuck or workpiece as follows:-
For 1 hour at 110 rpm
For 1 hour at 300 rpm
For 1 hour at 820 rpm
And for ½ hour at 1340 rpm
Making short stops at 15 minute intervals and periodically engaging the feeds in each axis and both directions.

Running In

Training Models (6 Speed Headstock)
in the interests of long term accuracy and cutting performance it is advisable to avoid running the spindle for long periods at top speed during the first few days of operation.
For best long term results from bearings and machine in general, the following simple running in procedure should be adopted:-
Select 1:1 feed, i.e. with 48/48 changewheels and lever positions at 1:1
Then run the machine in a forward direction without chuck or workpiece as follows:-
For ½ hour at 43 rpm
For ½ hour at 76 rpm
For 1 hour at 150 rpm
For 1 hour at 292 rpm
And for 1 hour at 512 rpm
Making short stops at 15 minute intervals and periodically engaging the feeds in each axis and both directions.

Operating the lathe

Safety

Read the safety guidance notes provided at the front of this manual and be sure you know how to STOP the lathe before starting it.

To Stop the Lathe

The lathe may be stopped by operating any of the controls which are coloured RED

i.e. Press the Emergency Stop Button
or — Switch off the Main Isolator
or — If a Kick Stop Bar is fitted touch this with your foot.

On most models additional electrical safety interlocks are provided which will stop the machine as follows:-
When the Chuck Guard is lifted.
When the Changewheel Door is opened
or — If the Forward Reverse Selector Switch is moved whilst the spindle is running.

Controls

Before starting the lathe a check must be made to ensure that all work holding or driving devices and cutting tools are correctly mounted and firmly fixed in place and that the desired control positions have been selected in accordance with the detailed instructions and operational notes provided i.e. check:-

Spindle direction
Spindle speed
Feed direction (left/in or right/out)
Feed rate (or thread pitch)
Feed axis (longitudinal or cross)
and that both the feed engagement and threadcutting levers are in the downward (disengaged) position

To Start the Lathe

Ensure that the Changewheel Guard is closed and the Chuck Guard is down. Switch on Mains Isolators and press the GREEN start button.

Spindle Speed Selection (9 Speed Headstock)

WARNING—Stop machine before changing speed.
Spindle speeds are indicated directly on the speed selector dials by the position of the outer-dial pointer against the inner-dial speed scale.
3 speed ranges, each consisting of 3 individual steps are selected by moving the inner-dial handle to the numbered positions on the Headstock legend plate.
WARNING—Under no circumstances must any intermediate position be adopted.
A spring plunger in the dial provides feel for correct positions
Speeds within the individual range of three may then be selected by moving the outer-dial to point out the speed required. A second spring plunger in this dial provides feel for correct position.
Speed selection may be eased by manually turning the spindle nose whilst moving the individual dials.

Spindle Speed Selection (6 Speed Headstock)

WARNING—Stop machine before changing speed
Spindle speed selection is indicated directly by the positions of the two selector handles on the speed legend plate.
NOTE: The selector handles must be pushed in towards the Headstock face before they can be turned. Upon release, spring pressure will relocate them for correct position.
Speed selection may be eased by manually turning the spindle whilst moving the individual handles.

Feed Axis & Direction

Feed Axis— Longitudinal or Cross Feed is selected by the push-pull knob situated below the cross slide dial on the Apron front face.
i.e. Push the knob in for Longitudinal Feed Selection or pull the knob out for Cross Feed Selection.
Cross Feed values are always half

Longitudinal values.
Selection may be eased if the Apron Handwheel is turned slightly whilst moving the knob.
NOTE: A safety interlock is incorporated in the Apron which requires the push-pull knob to be in its central (neutral) position before the Halfnut Lever can be engaged for Threadcutting.
Feed Direction is selected by the upper small lever on the machine face where Longitudinal Feed direction is indicated by the position of the handle against the legend. — Corresponding Cross Feed directions are:-
In for Right to Left Longitudinal Feed and **Out** for Left to Right Longitudinal Feed
A central feed-disengaged position is provided.
Selection may be eased by manually turning the spindle nose whilst moving the handle.

Feed & Thread Selections (12 Speed Gearbox)

Feeds
Feed values for a one-to-one end drive i.e. 48 to 48 tooth changewheels are tabulated at the top of the changewheel guard chart and are obtained by moving the three lower levers on the machine face to the appropriate lettered positions in accordance with the chart.
Selection may be eased by manually turning the spindle nose while moving any one of the levers.
Feed ratio changes for each lever movement are indicated above the lettered positions and allow feed changes to be made without recourse to the tabulated value.
e.g. Movement of the central lever to the right or left of its vertical position will consequently double or half the initial feed values.
Feed ratio changes may be made whilst the machine is running but only on the lower spindle speeds, and undue crashing of the internal gearing must be avoided. Cross feed values are always ½ the longitudinal values selected.

Threads
9 small changewheels are supplied in addition to the standard set-up normally used for feeds, and in total provide for the cutting of all standard metric or English pitches between the minimum and maximum values shown on the charts.
The threadcutting charts tabulate the appropriate changewheel set-up and gearbox lettered lever positions for each pitch to be cut, and indicate in bold type the 9 metric and 10 English pitches which can be obtained with the standard 48 to 48 top and bottom wheels.
When arranging changewheel set-ups approximately 0.13mm (.005") backlash (i.e. running clearance between the gear teeth) must be provided and the teeth should be lightly lubricated with a general purpose grease or open gear lubricant.
NOTE: A safety interlock is incorporated in the Apron which requires the push-pull knob to be in its central (neutral) position before the Halfnut Lever can be engaged.

Feed & Thread Selections
(2 Speed Gearbox)

Feeds (TS & TF Models)
Feed values for the three basic changewheel set-ups are tabulated on the lower right of the machine face and are obtained by arranging the changewheels as shown on the chart and making the appropriate 'A' or 'B' lever selection in accordance with the chart.
Selection of the lever positions may be eased by manually turning the spindle nose whilst moving the lever.
When re-arranging changewheels.
Approximately 0.13mm (.005") backlash (i.e. running clearance between the gear teeth) must be provided and the teeth should be lightly coated with a general purpose grease or open gear lubricant.
The feed ratio change for movement of the lever is also indicated above the lettered lever positions.
i.e. movements of the lever from

position 'A' to 'B' will reduce the feed by 2/5 or from 'B' to 'A' will increase it by 5/2.
This lever may be moved whilst the machine is running, but only on the lower spindle speeds and undue crashing of the internal gearing must be avoided.
Cross feed values are always ½ the longitudinal values selected.

Threads–(TS Model only.)
On machines fitted with a thread cutting unit, 9 changewheels in addition to the basic feed wheels are supplied and provide for the cutting of 21 metric and 24 English standard pitches, these are shown along with the appropriate changewheel set-up and 'A', 'B' lever positions in bold type on the threadcutting plate.
The remaining pitches shown can be covered by the aquisition of further wheels as indicated.
It will be noted from the threadcutting chart that only the top and bottom changewheels need to be altered for change of thread pitch and that for both feed and threadcutting set-ups the 120 and 127 tooth wheels may be left permanently mounted on the intermediate changewheel stud.
When rearranging changewheels approximately 0.13mm (.005") backlash (i.e. running clearance between the gear teeth) must be provided and the teeth should be lightly coated with a general purpose grease or open gear lubricant.
NOTE—A safety interlock is incorporated in the Apron which requires the push-pull knob to be in its central (neutral) position before the Halfnut Lever can be engaged.

Feed to Thread Relationship
It may be useful to note that longitudinal feed values obtained through the apron gearing are always 1/10th of the corresponding pitch value obtained through the leadscrew halfnut — thus for any particular pitch set-up we have a known feed value.
EXAMPLE
With changewheels and lever positions set up for 2mm pitch via the halfnut then the longitudinal feed via the feed engage lever is.0·2mm/rev. or for 12 TPI (i.e. .083" pitch). Longitudinal feed value is .008"/rev.

Threadcutting Engagement Dial
The threadcutting unit (at the R.H. end of the apron) is provided with a threadcutting engagement dial positioned above the halfnut engagement lever. This allows the halfnut to be disengaged for the tool return stroke in a threadcutting cycle and is used to correctly time suitable halfnut re-engagement points for subsequent passes of the tool.
NOTE—The threadcutting dial may only be used to cut threads as follows:-
Standard metric thread pitches on a metric leadscrew machine or —
Standard English thread pitches (TPI) on an English leadscrew machine.
For all other pitches or multi-start threads — the halfnut must not be disengaged at any time during the cutting of any one thread.
For these threads the whole machine must be repeatedly reversed using the spindle controls at both ends of each threadcutting pass.

English Leadscrew Machines—Standard English Pitches (TPI)
Referrring to the chart located on the side of the unit, the halfnut must only be engaged at the points indicated. i.e.
for even numbered TPI—
Engage at any number or any line.
For odd numbered TPI—
Engage at any numbered line.
For half pitch values e.g. 11.5 TPI—
Engage at numbers 1 or 3 only.
And for quarter pitch values
e.g. 3.75 TPI—
Engage at line number 1 only.

Metric Leadscrew Machines—Standard Metric Pitches
Referring to the chart located on the side of the unit, the halfnut must only be engaged at the lettered position indicated.
NOTE—The dial may be pushed in or pulled out to show two separate sets of markings and the correct position for

the dial must be selected in accordance with the chart.
i.e. Push dial in for 'A' or 'B' markings.
or Pull dial out for 'C' or 'D' markings.
At one point on each set of markings the two letters coincide and these lines are marked 'AB' and 'CD' respectively
EXAMPLE When cutting a 1mm pitch thread — push dial in and engage halfnut only at lines 'A' or 'AB'.
or When cutting a 0.7mm pitch thread — pull dial out and engage halfnut only at lines 'C' or 'CD'.

Multi-Start Threads
Multi-Start threads may be cut by any one of several well-established and documented methods.

1. Using the tool slide to advance the tool axially by an amount equal to precisely one thread pitch after each consecutive start has been cut.
   NOTE: Toolslide must be set at 0° setting on circular scale and cuts to depth can only be applied using the cross slide dial.
   EXAMPLE
   To cut a 2mm pitch/2 start thread. Set changewheels etc to cut 4mm lead.
   Cut first starts to depth advance toolslide precisely 2mm and cut second start to depth to complete the thread.
2. Using an accurately divided work driving device and advancing workpiece by a precise angular division after each consecutive start has been cut.
   EXAMPLE
   To cut a 30TPI/5 start thread set changewheels etc to cut 6 TPI lead.
   Cut first start to depth. Advance workpiece angularly by precisely 72° —
   i.e. $\frac{360°}{5 \text{ Starts}} = 72°/\text{Start}$
   cut second start to depth and repeat procedure until 5 starts have been cut.
3. By advancing the driving changewheel a predetermined number of teeth calculated to advance the spindle (and workpiece) by the appropriate angle after each start has been cut.
   It should be noted, however, that when using this method on a Boxford Lathe that the changewheel driving shaft rotates at only ⅓ of the spindle speed. and the number of starts which can be cut is limited to the figures which can be divided wholely into ⅓ the number of teeth on the top changewheel.
   EXAMPLE
   To cut a two start thread when top changewheel has 48T.
   Teeth to be indexed $= \frac{48T}{2 \text{ Starts}} \times ⅓$
   Where ⅓ is machine constant = 8 teeth/start.
   Then cut first start to depth mark meshing tooth on 48T wheel and meshing space on intermediate wheel. Move intermediate wheel out of mesh with top wheel and advance top wheel 8 teeth by turning spindle and re-engage in marked meshing space on intermediate wheel. Cut second start to depth to complete thread.
4. A dividing scale is available for the spindle tail-end cover (inside the changewheel guard) which can be used to aid dividing for multi-start threads and 2, 3, 4, 6, 8, 12 or 24 start threads can be accurately divided using this scale in conjunction with the feed direction selector lever (i.e. the upper small lever on the machine face). As follows:-
   Cut first start to depth. Open changewheel guard and turn whole machine manually until index line on spindle is opposite the zero mark on the scale. Move feed direction lever into its vertical disengaged position (i.e. marked 'O' on legend plate). Index spindle to required number on dividing scale (i.e. No. 2 for 2 start No. 3 for 3 start etc).
   Re-engage feed direction lever by moving it to its original position. Cut second start to depth and repeat procedure until thread is complete.

WARNING
Do not move saddle or change - wheels whilst feed Direction lever is disengaged.

NOTE
Threadcutting engagement dial can **Not** be used for multi-start threads.

Feed Slipping Clutch

A load sensitive slipping unit is provided in the apron feed gearing to act as a protective safety device in the event of an overload condition occurring under power feed. i.e. if the carriage or cross slide is driven into a solid restriction under feed then this device will slip, and the feed engagement lever must immediately be pushed down into its disengaged position.
This device may also be used in conjunction with fixed longitudinal or cross stops set up to provide precise feed stop points in either axis, but the feed must be manually disengaged (as above) immediately a slipping condition occurs.

Slipping Load—is suitably set at manufacture but can be adjusted by means of the four cap-head screws in the feed engagement lever block. i.e. by turning each of the four screws in or out an equal amount as follows:-

Slacken screws to reduce slipping load, tighten screws to increase slipping load.

NOTE—Do not overtighten. Use only setting required to drive machine under cut. Adjust by turning each screw only one full turn at a time.

NOTE—Slipping clutch does not operate when threadcutting since carriage is driven directly through the halfnut.

Shear Pin

The complete feed and threadcutting transmission is protected against accidental overload by a shear pin located in the splined changewheel sleeve on the top changewheel shaft. Shear pin dimensions are:- 4mm (5/32") diameter × 19mm (¾") long. Shear pin material must be:- Bright drawn brass rod.

WARNING—Under no circumstances must pins of any other material be used.

Cross Slide Dial

For convenience of operation the cross-slide dial is direct reading on workpiece diameter i.e. Actual cross slide movement is half the indicated value at the dial graduations.

NOTE—All micrometer dials on the lathe i.e. cross-slide, toolslide, apron and tailstock are of the friction drive type and can be rotated independently of the handwheel for setting purposes.

Carriage Lock

The carriage locking bolt is situated at the right hand end of the front saddle wing and may be used to prevent the carriage moving under tool pressure when using the cross axis for accurate facing or parting-off operations.

CAUTION—Be sure to release lock before attempting to move carriage or engage longitudinal feed or engage halfnut lever.

Cross Slide Lock

Locking of the cross-slide is achieved by tightening one of the two central socket screws in the right hand side of the slide. On no account should the four similar gib-adjustment screws situated at the ends of the slide be used for this purpose.

CAUTION—Be sure to release lock before attempting to move cross-slide.

Tool Slide Lock

Locking of the toolslide is achieved by tightening the central socket screw in the front face of the slide. On no acccount should the other similar gib-adjusting screws be used for this purpose.

CAUTION—Be sure to release lock before attempting to move top slide.

Cross Slide Nut

Backlash in the cross slide nut can be taken up by tightening the cap head

screw provided in the bronze nut body which is located in the centre of the cross slide top face.

CAUTION—Do not over-tighten and check for smooth operation over the whole length of the cross-slide movement.

WARNING—Failure to release locks after use or over-tightening of backlash adjustment can result in poor performance, rapid wear and machine malfunction.

Tailstock Centre and other Morse-Taper equipment

Thoroughly clean both male and female tapers before inserting any item into the tailstock quill. Standard length No. 3 morse taper equipment will be ejected by retracting the quill to its 'fully in' position.

Clamping Tailstock

The tailstock is clamped to the bed by lifting the long clamp lever towards the front of the machine and adjustment for clamp point is made by turning the large cap head bolt which passes up from the underside of the bed clamp plate into the tailstock body. Access to the clamp bolt being either up through the bed openings or by removing the tailstock from the machine.

NOTE—The tailstock clamp bolt has a self-holding thread and is tight to turn. Also a safety stop screw is fitted through the tail-end of the front bedway to prevent the tailstock from being accidentally pulled off the end of the bed.

Set-over (Tailstock)

Set-over is used to align the tailstock with the machine axis for standard turning or to off-set the tailstock from the machine axis when turning shallow tapers.

The tailstock is accurately aligned with the main spindle axis at manufacture and a zero mark for correct alignment is provided in relation to the set-over scale situated on the handwheel end of the unit. Socket-head set-over adjusting screws are provided in the front and rear faces of the tailstock body and a similar socket lock screw is situated in the handwheel end of the unit.

Set over adjustments are made as follows:—

Unclamp tailstock.

Slacken socket clamp screw in end face. Then consecutively slacken one and tighten the other set-over screw until the required sideways movement is obtained.

Re-tighten socket clamp screw in end face. Re-clamp tailstock to bed.

CAUTION—Make sure both set-over screws are tight against each other at final setting to prevent tailstock from shifting under load.

NOTE—An accurate test mandrel and dial-indicator should be used to reset tailstock for zero alignment with main spindle.

Maintenance

Servicing

General cleanliness, and regular, conscientious lubrication will extend the life of a lathe enormously. Frequent checks for bed straightness and machine alignments will guarantee the accuracy of work produced and intelligent use of the lathe in accordance with the operating instructions will prevent damage to machine or danger to its operator.

The following notes and parts section provide for long term maintenance requirements and our service department will be pleased to supply advice and further information should this be required.

Spindle Bearings models fitted with **GAMET** micron precision taper roller bearings, these machines carry a **GAMET** identification sticker.
Spindle bearings are partially run-in and carefully adjusted for correct running conditions at manufacture. The user is advised not to disturb the settings during normal use of the machine but to contact our service department in the unlikely event of a bearing problem.
For reference purposes, our experience is that for the best compromise between acceptable temperature rise at high speeds and general overall cutting performance an end-float condition in the region of ·005mm (·0002") is desirable when the headstock is at ambient temperature.
End-float conditions may be checked using a precision grade dial indicator set up to register on a specially prepared flat-nosed centre placed in the spindle. Indicator variations are then noted whilst rotating the spindle and at the same time lightly pushing and pulling it along its axis.
CAUTION— Considerable expertise is required to ascertain true end-float conditions, care must be exercised to ensure that only true axial forces are applied and that excessive pressure is not used. All tests must be undertaken when the headstock is at room temperature.

If adjustments are to be made for end-float condition then the following procedure should be adopted: —
Lower swing frame to bottom position, remove top changewheel, aluminium rear bearing cover and gasket. Release radial locking screw in screwed adjusting ring and locate a suitable C spanner in the adjusting ring holes then: —

1. **To Reduce End-Float**
   Tighten the adjusting ring by lightly tapping the 'C' spanner in a clockwise direction. Only a very small increment is required.
   Re-check for correct end-float and, repeat procedure if necessary.

Or,

2. **To Increase End-Float**
   Slacken the adjusting ring by lightly tapping the 'C' spanner in an anti-clockwise direction. Only a very small increment is required.
   Strike Tail-End of spindle hard and square along its axis several times with a soft-faced mallet or hammer and fibre block.
   Rotate spindle to ensure full roller seating and — re-check for correct end-float. Repeat procedure or revert to procedure 1 as necessary.
   Re-fit Gasket, Aluminium Bearing Cover, Swing Frame & Change Wheels.

WARNING— Incorrectly adjusted bearings can cause poor cutting performance and loss of accuracy or lead to total bearing failure.

Spindle Bearings models fitted with **'TIMKEN'** precision taper roller bearings
Spindle bearings are partially run-in and carefully adjusted for correct running conditions at manufacture, the user is advised not to disturb the settings during normal use of the machine, but to contact our service department in the unlikely event of a bearing problem.
For reference purposes our experience is that for the best compromise between acceptable temperature rise at high speed and general overall cutting performance, a slight pre-load condition is desirable when the headstock is at ambient temperature.
Pre-load condition may be checked using the cord and spring balance method, when a steady pull in the region of ·68kg (1½lbs) for new bearings or ·34kg (¾lb) for used bearings should be obtained, with the cord wrapped round the spindle nose and all gearing disengaged from the spindle.
CAUTION— Considerable expertise is required to ascertain true pre-load conditions by this method. All tests must be undertaken when the headstock is at room temperature.

If adjustments are to be made for pre-load condition then the following procedure should be adopted.

Remove drive-belt and headstock pulley, lower swing frame to bottom position, remove top changewheel, aluminium rear bearing cover and gasket. Release radial locking screw in screwed adjusting ring and locate a suitable 'C' spanner in the adjusting ring holes.

Then—

1. **To Increase Pre-load**
   Tighten the adjusting ring by lightly tapping the 'C' spanner in a clockwise direction. Only a very small increment is required. Re-check for correct pre-load and, repeat procedure if necessary.

   Or,

2. **To Reduce Pre-load**
   Slacken the adjusting ring by lightly tapping the 'C' spanner in an anti-clockwise direction. Only a very small increment is required. Strike tail-end of spindle hard and square along its axis with a soft-faced mallet or hammer and fibre block. Rotate spindle to ensure full roller seating and re-check for correct pre-load. Repeat procedure or revert to procedure 1 as necessary.

   Re-fit — Gasket, Aluminium Bearing Cover, Swing Frame, Changewheels, Headstock Pulley and Drive Belt.

WARNING—Incorrectly adjusted bearings can cause poor cutting performance and loss of accuracy or lead to total bearing failure.

Drive Belt Tension
A check for correct belt tension may be made by applying medium finger pressure to the outside of the drive belt at the centre of its span. A deflection of approximately 12mm (½") should be possible.

Drive Belt Adjustment
The standard drive motor has a slotted foot and is bolted directly to the lathe bed by four M8 Hexagon head set-screws. For access to these set-screws remove the rear splash guard and open the end drive guard.

To change belt tension use a long, thin, open-ended spanner to slacken the four set-screws just enough to allow the motor to be moved vertically.
Then using a suitable timber spar approx 75 × 50 × 400mm (3" × 2" × 16") as a lever lift or lower the motor as required.
re-tighten the four set-screws and re-check for correct belt tension.

CAUTION—Horizontal alignment of the motor must be maintained. Check this by careful sighting from the rear of the machine and use a straight-edge across the pulley faces to confirm both horizontal and vertical settings.

Toolslide Gib
Adjustment of the toolslide gib-strip is made by tightening the socket screws on the front face of the slide. Then checking for correct feel as the slide is traversed over its full length.
NOTE—The four end socket screws are of a self-holding type and are tight to turn. The centre screw is provided as a slide-locking screw and should be backed off slightly during adjustment.

Cross-slide Gib
Adjustment of the cross-slide gib-strip is made by tightening the socket set-screws on the right hand face of the slide, then checking for correct feel over the whole length of the slide traverse.
NOTE—The four end socket screws are of a self-holding type and are tight to turn. The two centre screws are provided as slide-locking screws and should be backed off slightly during adjustment.

Cross-slide Nut
Backlash in the cross-slide nut can be taken up by tightening the cap head screw provided in the bronze nut body which is located in the centre of the cross-slide top face.
CAUTION—Do not over tighten and check for smooth operation over the whole length of the cross-slide movement.

Saddle, Rear Keep Plate

Adjustment for sliding clearance at the saddle rear keep plate is achieved by means of the three pairs of jacking and clamping screws provided in the plate itself.

Adjust one pair of screws at a time by first releasing the cap-head clamp screw slightly, then moving the adjacent jacking screw as required.

Re-tighten clamp screw then check for correct feel and smooth movement over the whole bed length. Repeat procedure for the other two pairs of screws.

Saddle Front Keep Plate (R. Hand)

This keep plate is formed as part of the saddle lock assembly and the threading unit (if fitted) must be removed to provide access for adjustment.

Two jacking screws pass through the keep plate itself whilst the one cap-head clamp screw is accessible from the saddle top face.

Adjustment for sliding clearance is achieved by first releasing the clamp screw slightly then turning the two jacking screws by equal amounts in the required direction.

Re-tighten the clamp screw then check for correct feel and a smooth movement over the whole bed length.

NOTE—The saddle clamp bolt should be released whilst adjustments are being made.

Saddle Front Keep Slug (L. Hand)

A brass keep slug is accommodated in the left hand end of the apron casting and is adjustable by means of a self-holding socket set-screw passing up through the top of the leadscrew telescopic cover housing. On some models this screw is accessible by pulling out the telescopic leadscrew cover and using a specially shortened 4mm allen key, but the leadscrew may have to be removed for access in other cases.

To remove leadscrew

First compress the telescopic leadscrew covers and tie them in a closed condition with a short length of wire whilst still on the leadscrew.

Punch out the coupling pin at the left hand end of the leadscrew.

Wind carriage to left hand end of machine.

Remove tail-end bracket screws then bracket itself by pulling it away from the bed slightly and sliding it off to the right.

Pull leadscrew out carefully in the same direction.

To Adjust Keep Slug

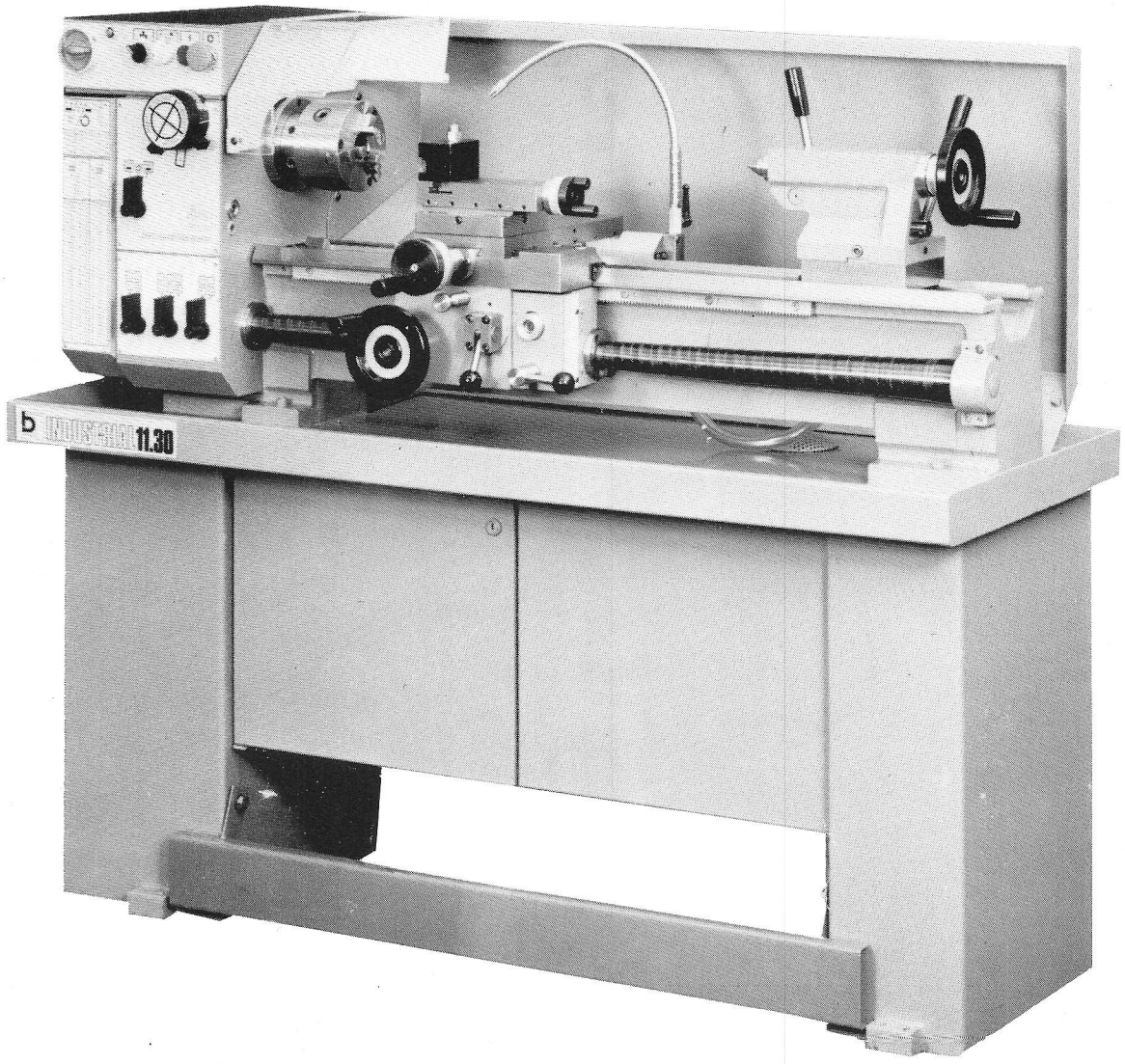
Insert a standard 4mm allen key up through the top of the large hole in the left hand end of the apron casting. Then, turn the socket set-screw to raise or lower the brass slug as required.

NOTE—This screw is a self-holding type and is tight to turn-check for correct feel and smooth movement over the whole bed length, re-fit leadscrew, telescopic covers and tail end bracket.

Boxford Ltd.,
Wheatley, Halifax,
West Yorkshire, England.
HX3 5AF

Telephone 0422 58311
Telex 517410
Cables Boxford Halifax.

Parts Illustrations



Parts Ordering Instructions

When ordering parts for your lathe the following information should be furnished to ensure that we supply the required items.

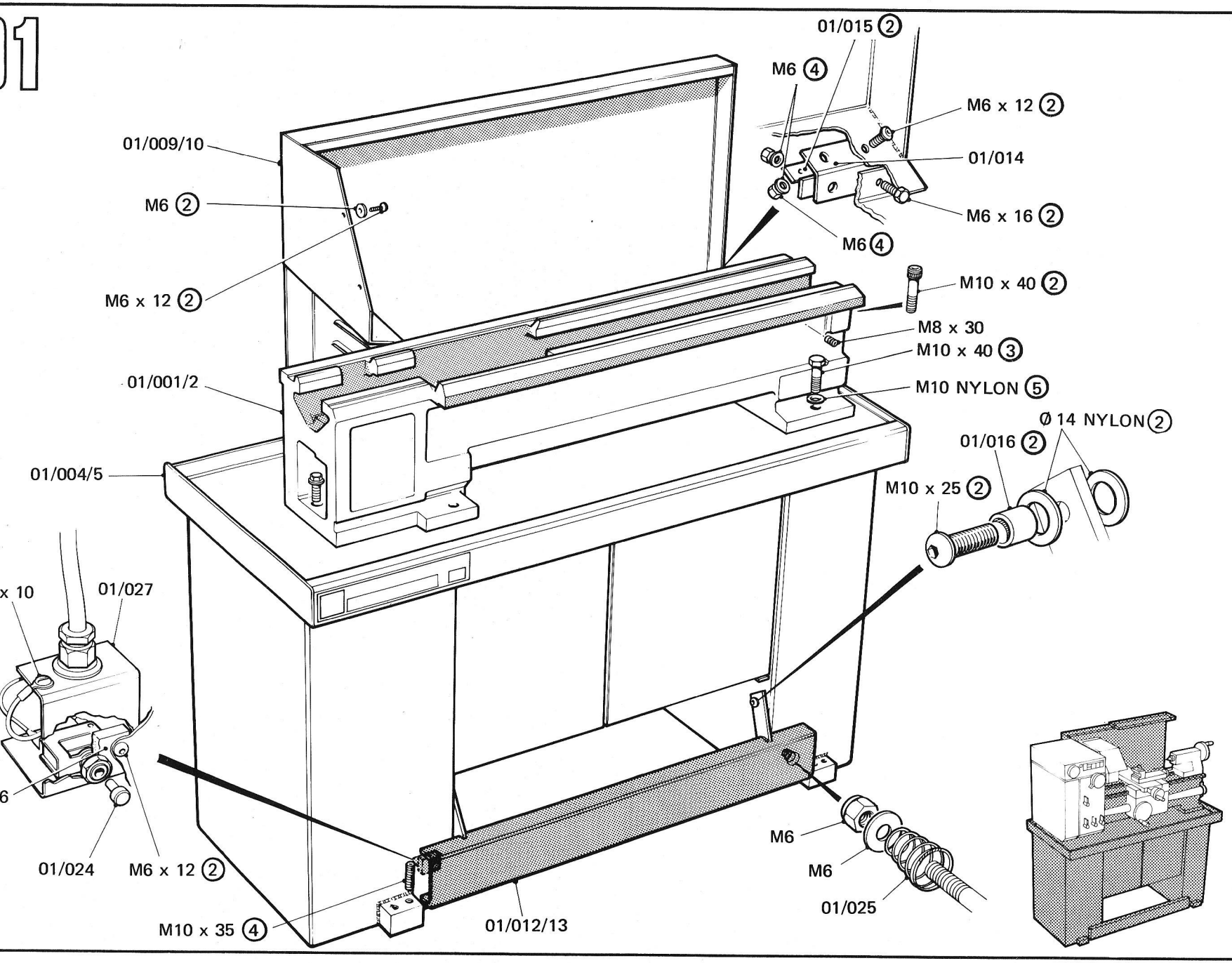
1. Lathe Model Number — shown on the machine nameplate.
2. Lathe Serial Number — which is stamped on the front face of the bedways at the tailstock end of the machine.
3. Part(s) Number(s) — for the items required (taken directly from the appropriate illustration.)

Please Note—Readily available engineering hardware can be identified for type from the illustrations and a basic dimensional description is given to assist with local procurement.
When ordering these items on Boxford please include a description.
Other standard engineering components such as ball-bearings and circlips are given I.S.O. codes and may be obtained from any reputable manufacturer.
Unique proprietary items include the manufacturers name in brackets following the description given.
In all cases the number-off, when other than one is given in a circle following the part designation.

Address all communications to:—
Boxford Ltd.
Wheatley, Halifax,
West Yorkshire, England HX3 5AF

Telephone 0422 58311
Telex 517410

01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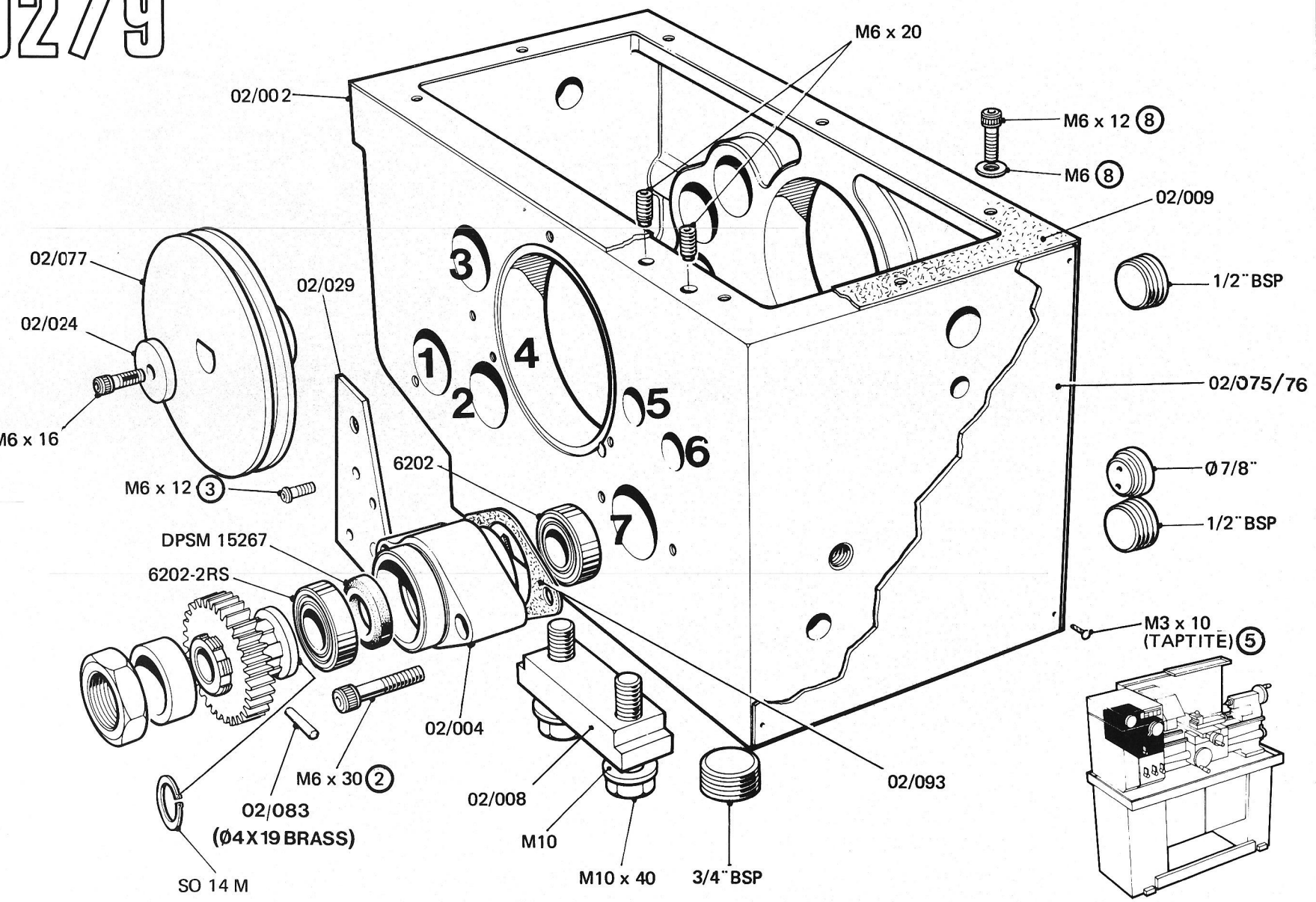
M6 (4)
M6 x 12 (2)
01/009/10
01/014
M6 (2)
M6 x 16 (2)
M6 (4)
M6 x 12 (2)
M10 x 40 (2)
M8 x 30
M10 x 40 (3)
01/001/2
M10 NYLON (5)
Ø 14 NYLON (2)
01/016 (2)
01/004/5
M10 x 25 (2)
x 10
01/027
6
01/024
M6 x 12 (2)
M6
M6
01/025
M10 x 35 (4)
01/012/13

02/9


M6 x 20
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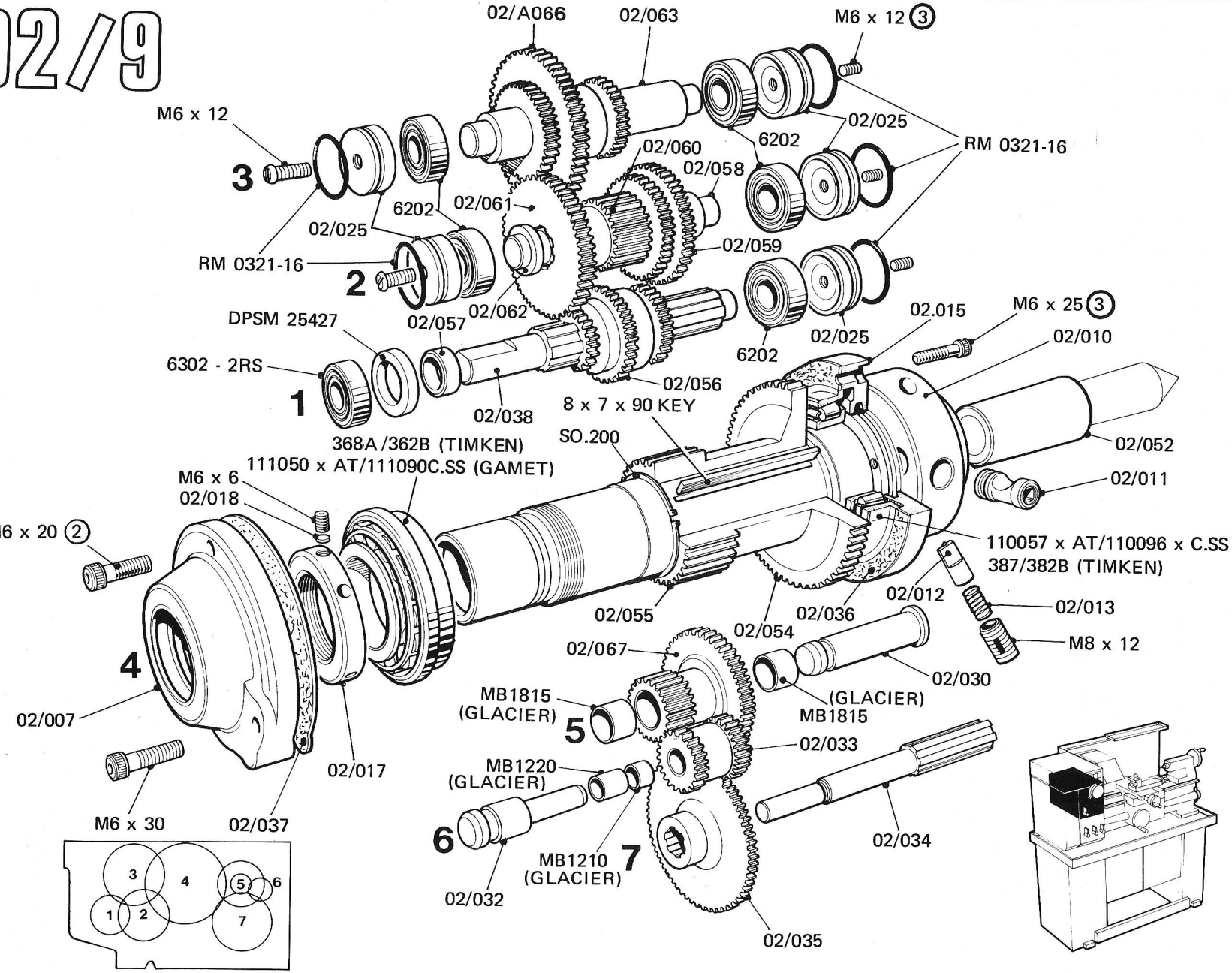
M6 x 12 (8)
M6 (8)
02/009
02/077
02/029
1/2" BSP
02/024
02/075/76
M6 x 16
6202
Ø7/8"
M6 x 12 (3)
1/2" BSP
DPSM 15267
6202-2RS
M3 x 10
(TAPTITE) (5)
02/004
M6 x 30 (2)
02/093
02/008
02/083
(Ø4X19 BRASS)
M10
M10 x 40
3/4" BSP
SO 14 M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02/063
M6 x 12 (3)
M6 x 12
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RM 0321-16
02/060
02/058
02/061
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02/025
RM 0321-16
02/059
2
RM 0321-16
02/062
02/057
DPSM 25427
6302 - 2RS
1
02/038
02/056
6202
02/025
02.015
M6 x 25 (3)
02/010
8 x 7 x 90 KEY
SO.200
368A /362B (TIMKEN)
111050 x AT/111090C.SS (GAMET)
M6 x 6
02/018
02/052
02/011
110057 x AT/110096 x C.SS (GAMET)
387/382B (TIMKEN)
02/012
02/013
M8 x 12
02/055
02/054
02/036
02/030
(GLACIER)
MB1815
02/067
MB1815
(GLACIER)
5
02/033
MB1220
(GLACIER)
6
MB1210
(GLACIER)
7
02/034
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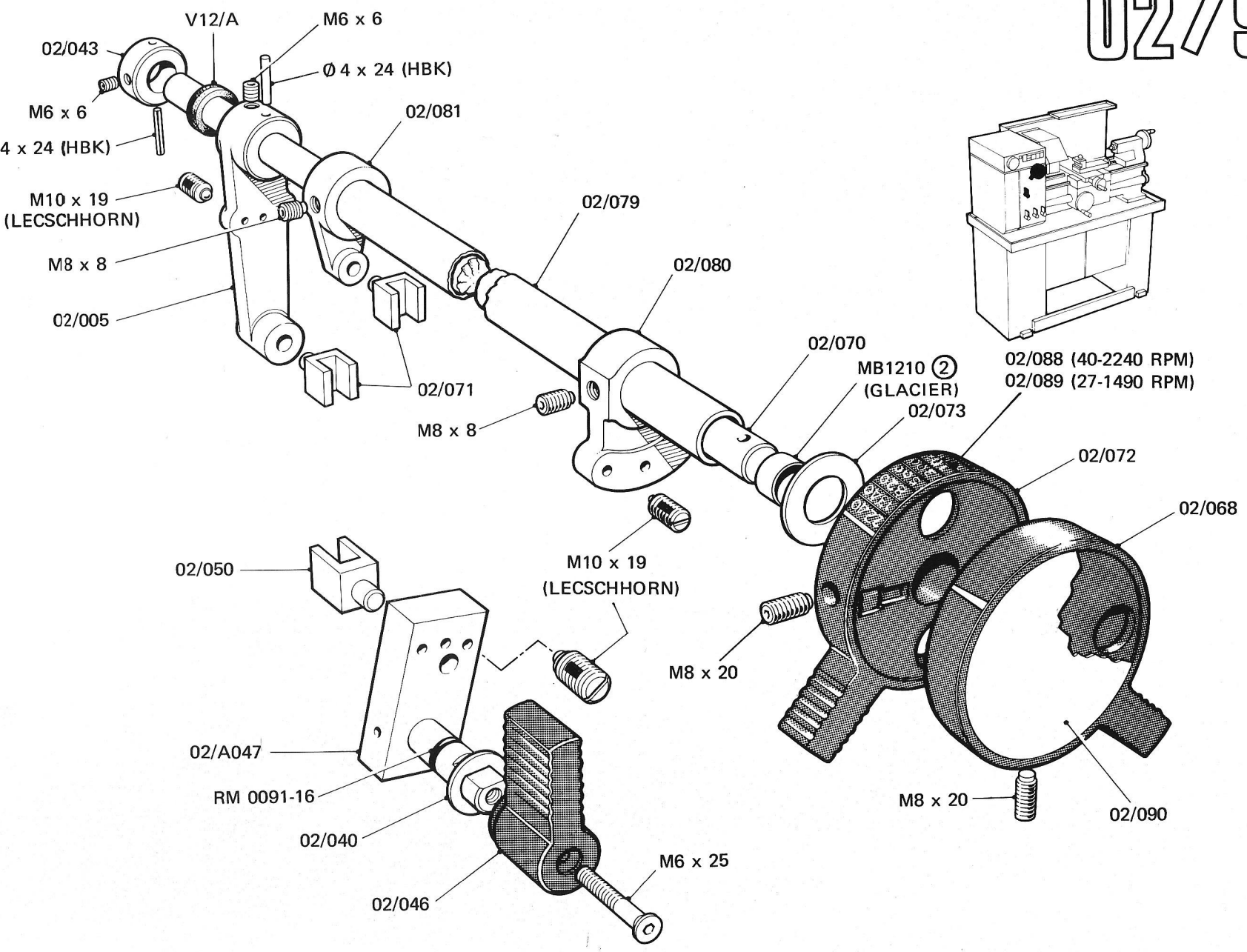
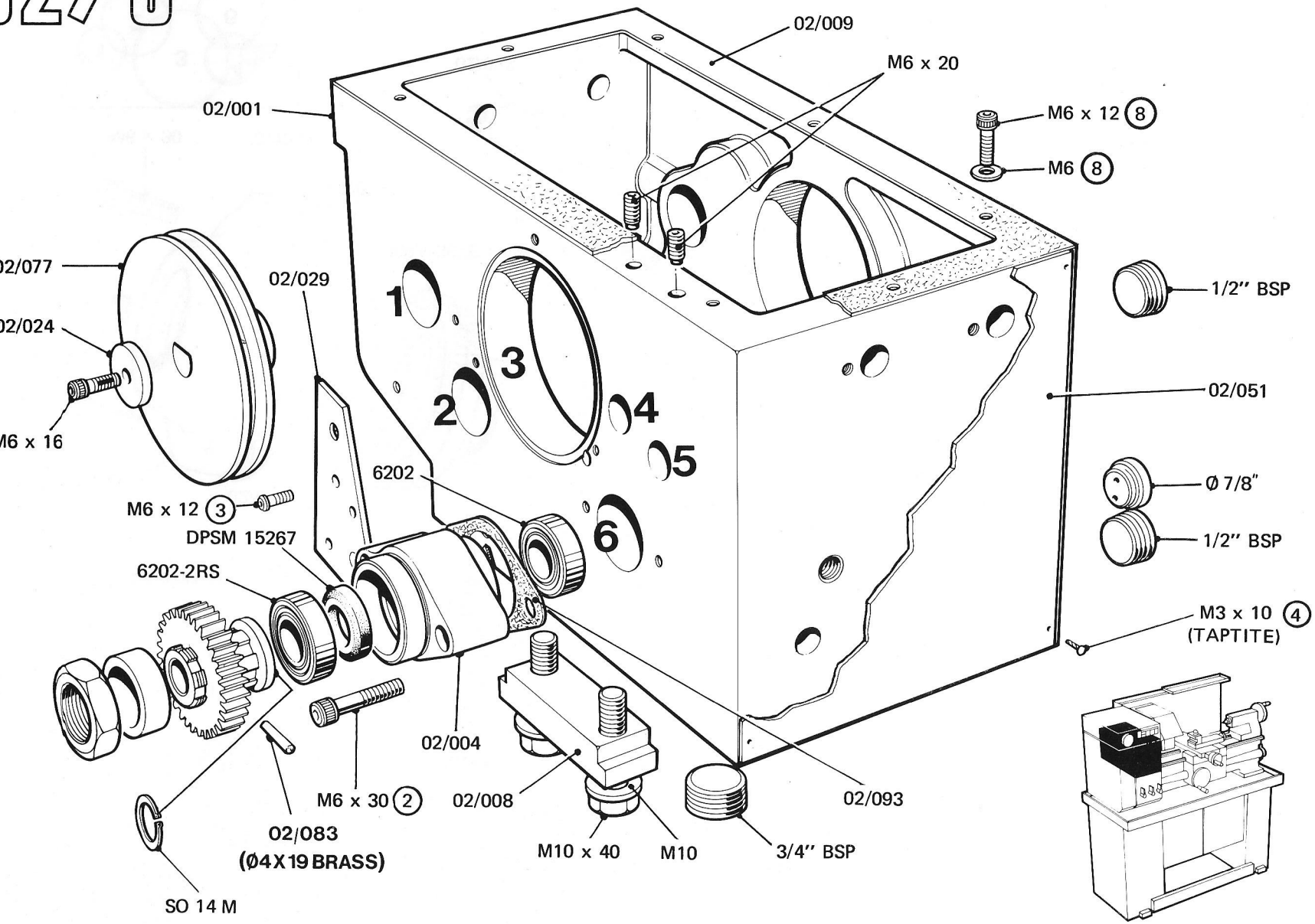
4
5
6
1
2
7

02/9


V12/A
M6 x 6
02/043
Ø 4 x 24 (HBK)
M6 x 6
4 x 24 (HBK)
02/081
M10 x 19
(LECSCHHORN)
02/079
M8 x 8
02/080
02/005
02/070
MB1210 (2)
(GLACIER)
02/088 (40-2240 RPM)
02/089 (27-1490 RPM)
02/071
M8 x 8
02/073
02/072
02/068
02/050
M10 x 19
(LECSCHHORN)
M8 x 20
02/A047
RM 0091-16
02/040
M8 x 20
02/090
M6 x 25
02/046

02/6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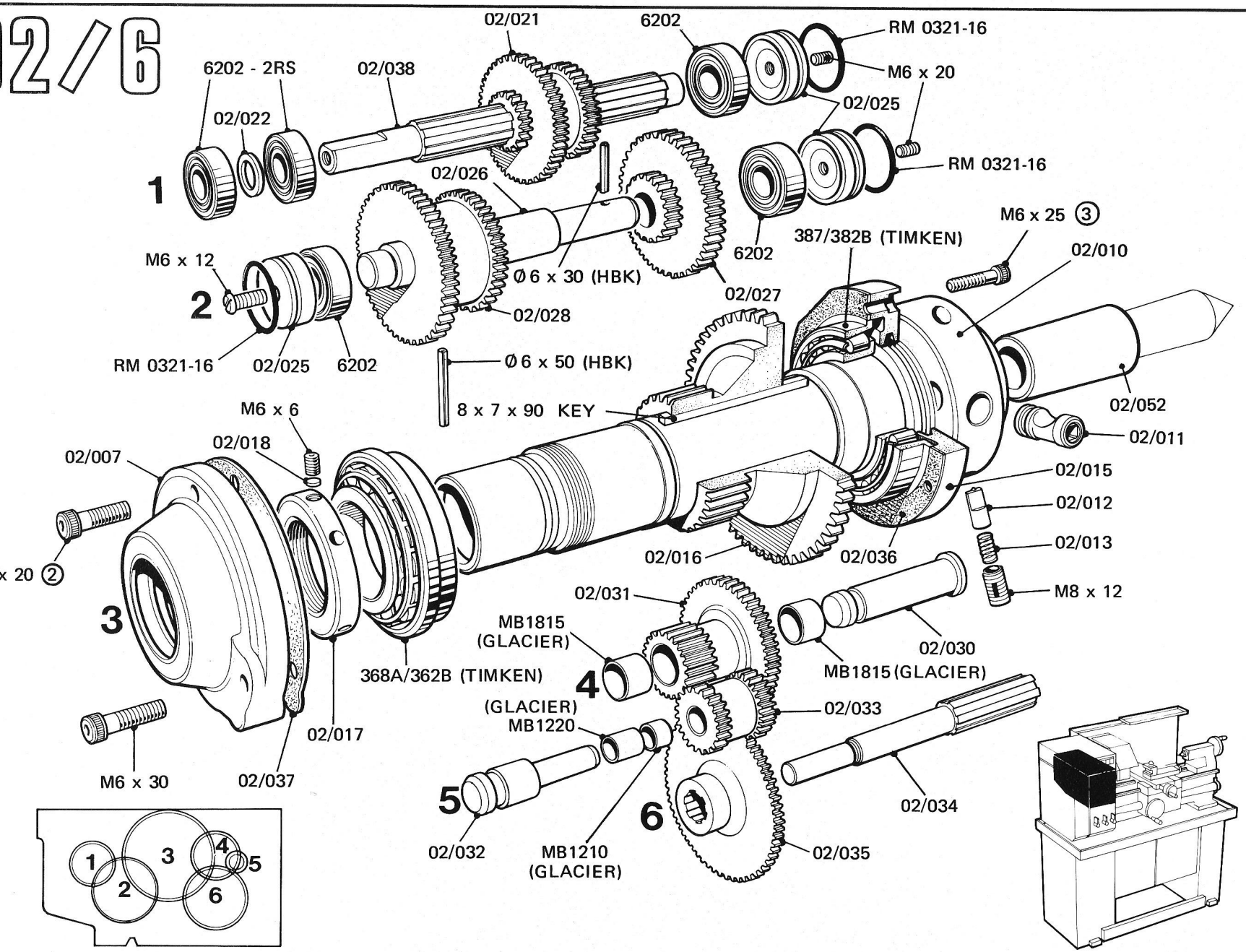
M6 (8)
02/077
02/029
02/024
1/2" BSP
02/051
M6 x 16
6202
Ø 7/8"
M6 x 12 (3)
DPSM 15267
1/2" BSP
6202-2RS
M3 x 10 (4)
(TAPTITE)
02/004
M6 x 30 (2)
02/008
02/093
02/083
(Ø4X19 BRASS)
M10 x 40
M10
3/4" BSP
SO 14 M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RM 0321-16
6202 - 2RS
02/038
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02/022
02/025
RM 0321-16
1
02/026
6202
387/382B (TIMKEN)
M6 x 25 ③
M6 x 12
Ø 6 x 30 (HBK)
02/010
02/027
2
02/028
RM 0321-16
02/025
6202
Ø 6 x 50 (HBK)
8 x 7 x 90 KEY
02/052
02/011
M6 x 6
02/018
02/007
02/015
02/012
02/013
x 20 ②
02/016
02/036
M8 x 12
02/031
MB1815
(GLACIER)
02/030
3
368A/362B (TIMKEN)
MB1815 (GLACIER)
4
(GLACIER)
02/033
MB1220
02/017
M6 x 30
02/037
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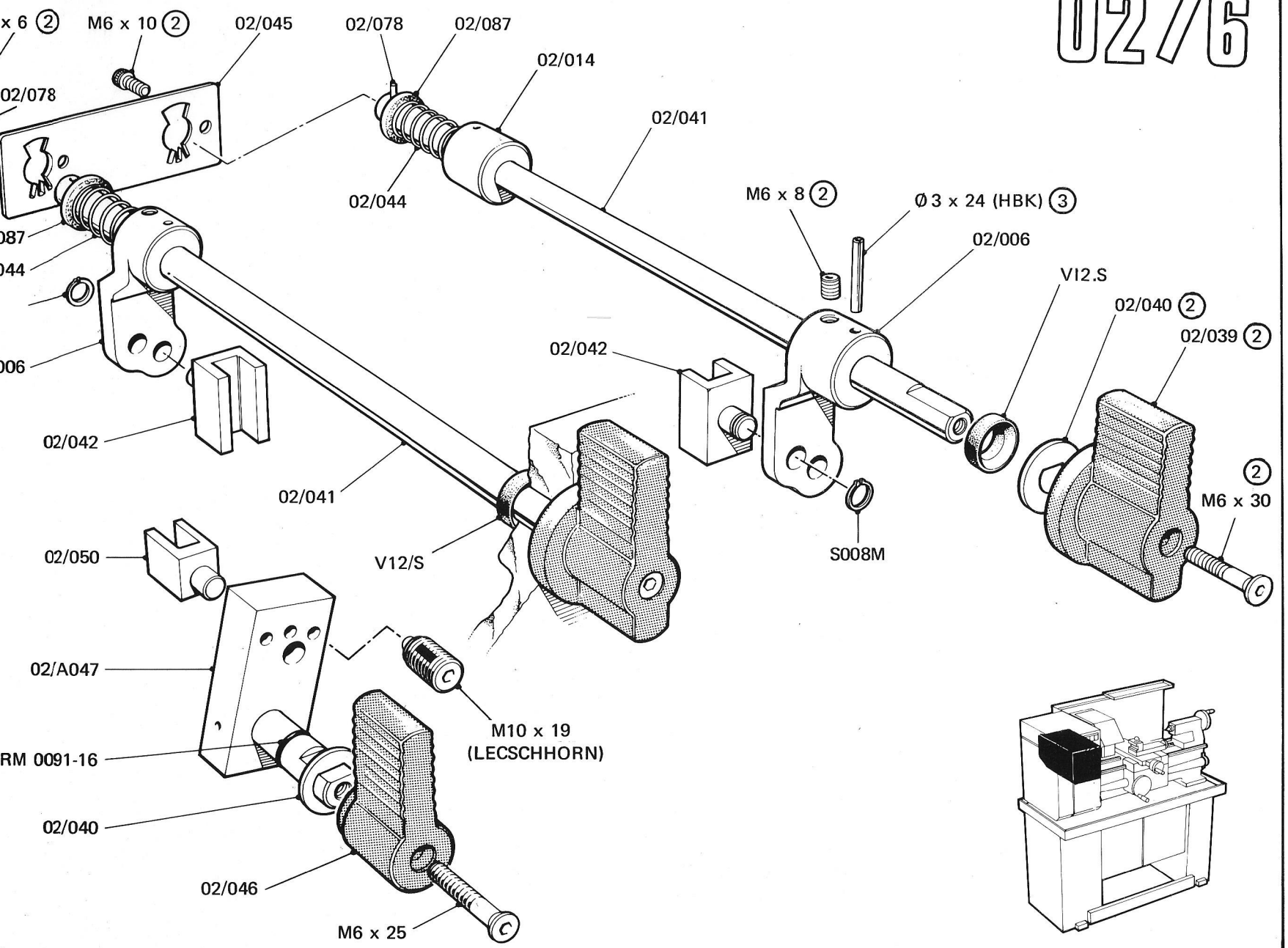
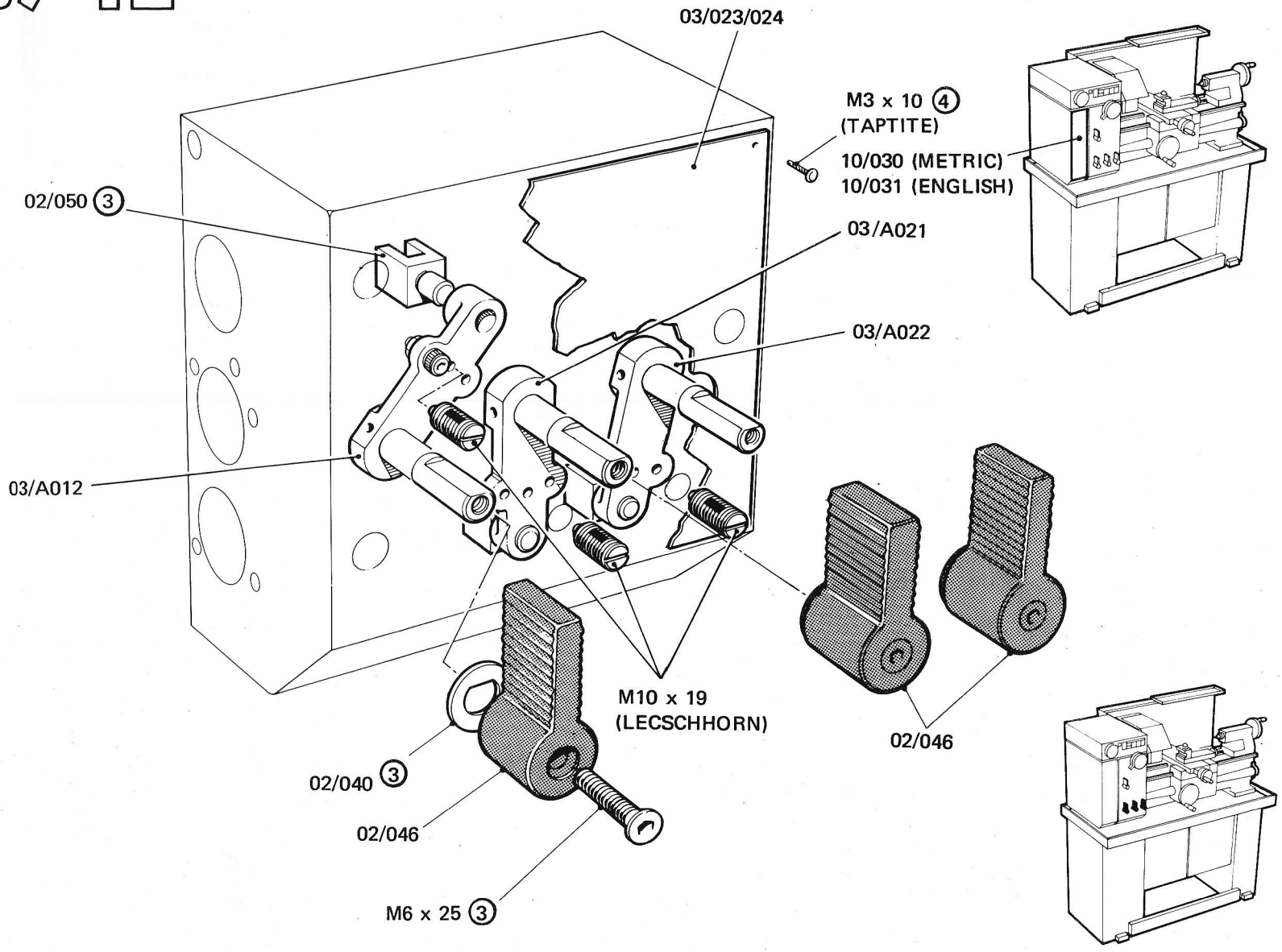
02/035
1
2
3
4
5
6

02/6


x 6 (2)
M6 x 10 (2)
02/045
02/078
02/087
02/014
02/078
02/041
02/044
M6 x 8 (2)
Ø 3 x 24 (HBK) (3)
087
044
02/006
VI2.S
02/040 (2)
02/039 (2)
006
02/042
02/042
02/041
(2)
M6 x 30
S008M
02/050
V12/S
02/A047
M10 x 19
(LECSCHHORN)
RM 0091-16
02/040
02/046
M6 x 25

03/12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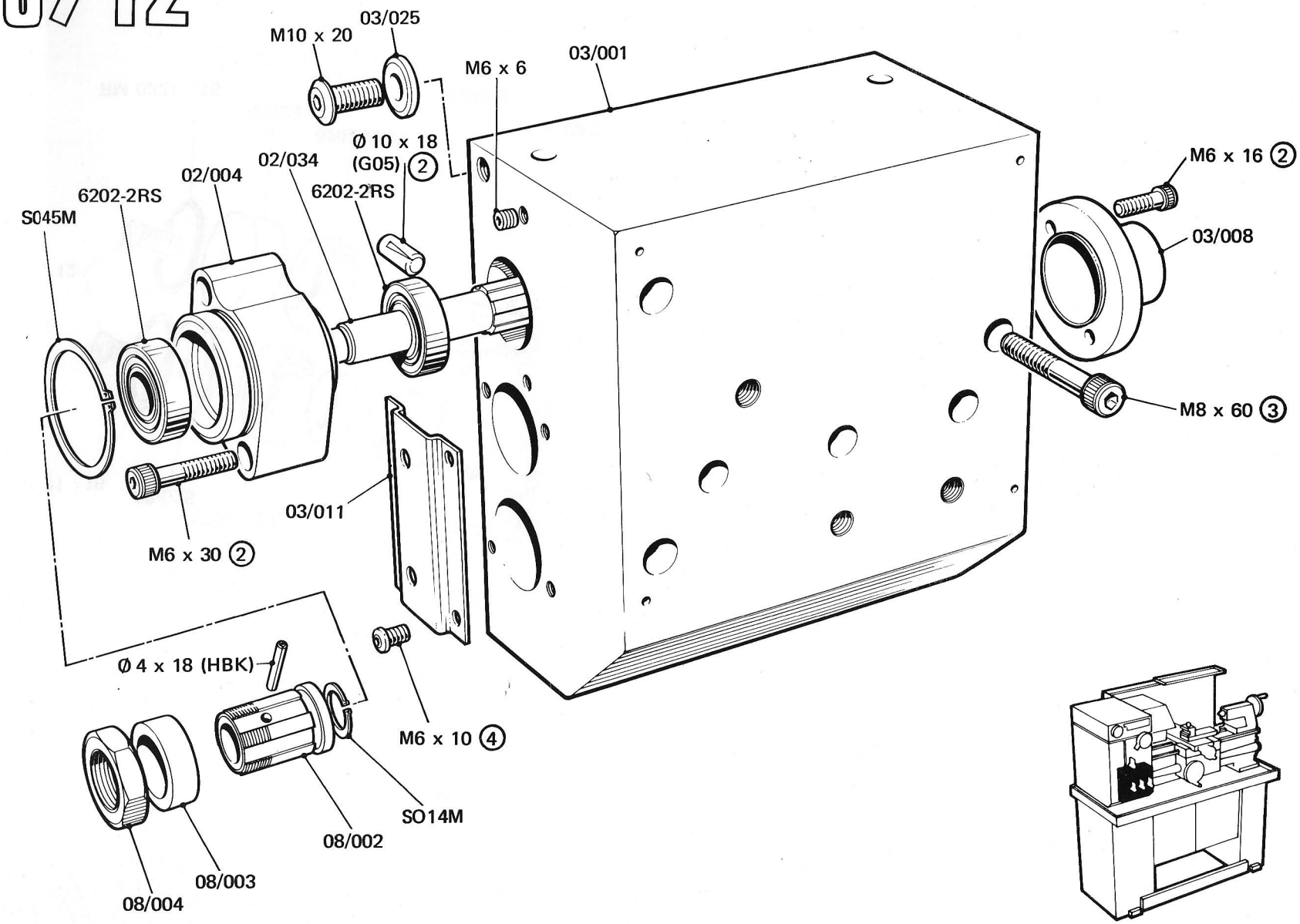
(TAPTITE)
10/030 (METRIC)
10/031 (ENGLISH)
02/050 (3)
03/A021
03/A022
03/A012
M10 x 19
(LECSCHHORN)
02/046
02/040 (3)
02/046
M6 x 25 (3)

03/12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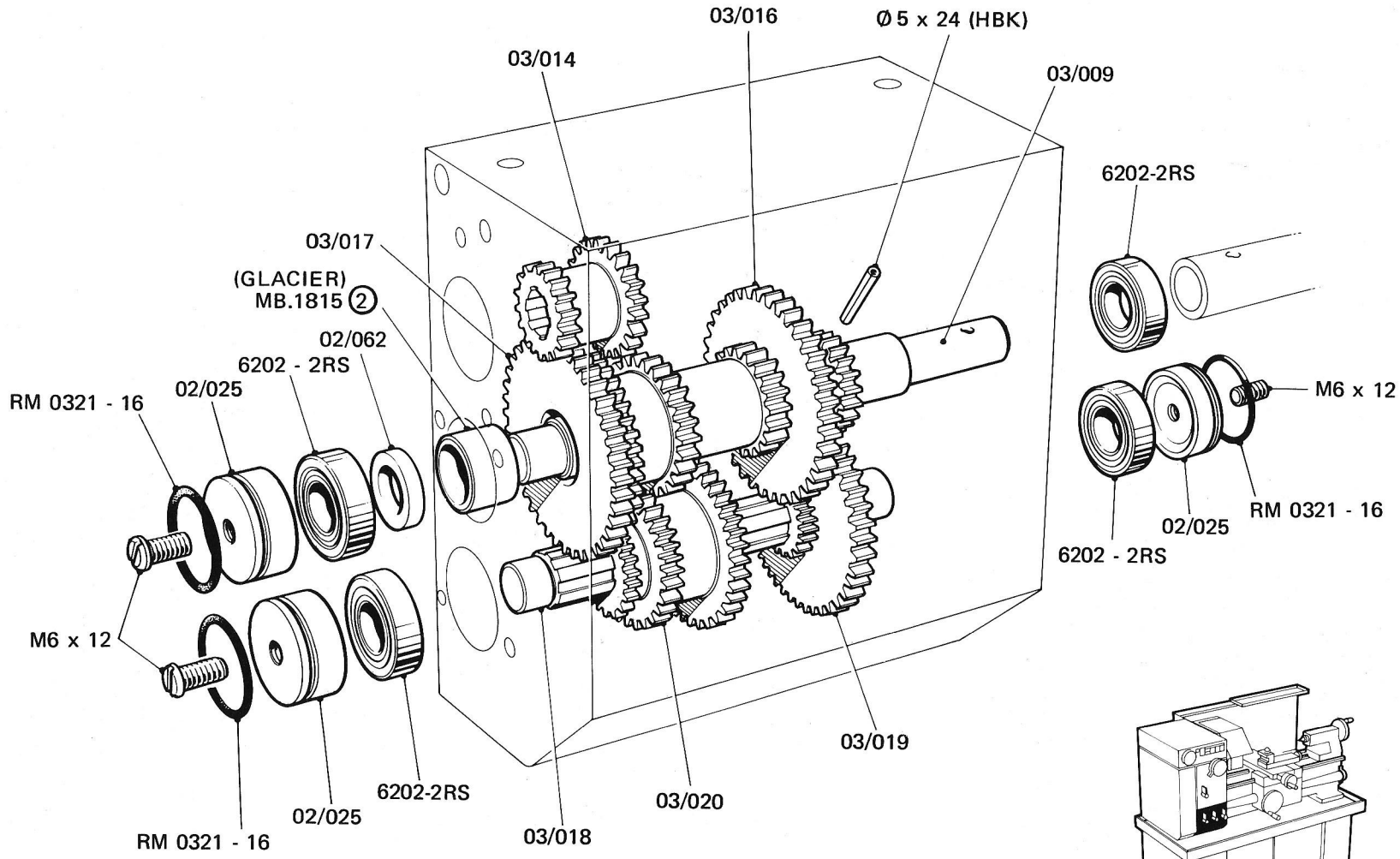
03/025
M6 x 6
03/001
Ø 10 x 18
(G05) ②
02/034
02/004
6202-2RS
S045M
6202-2RS
M6 x 16 ②
03/008
M8 x 60 ③
03/011
M6 x 30 ②
Ø 4 x 18 (HBK)
M6 x 10 ④
SO14M
08/002
08/003
08/004

03/12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Ø 5 x 24 (HBK)
03/014
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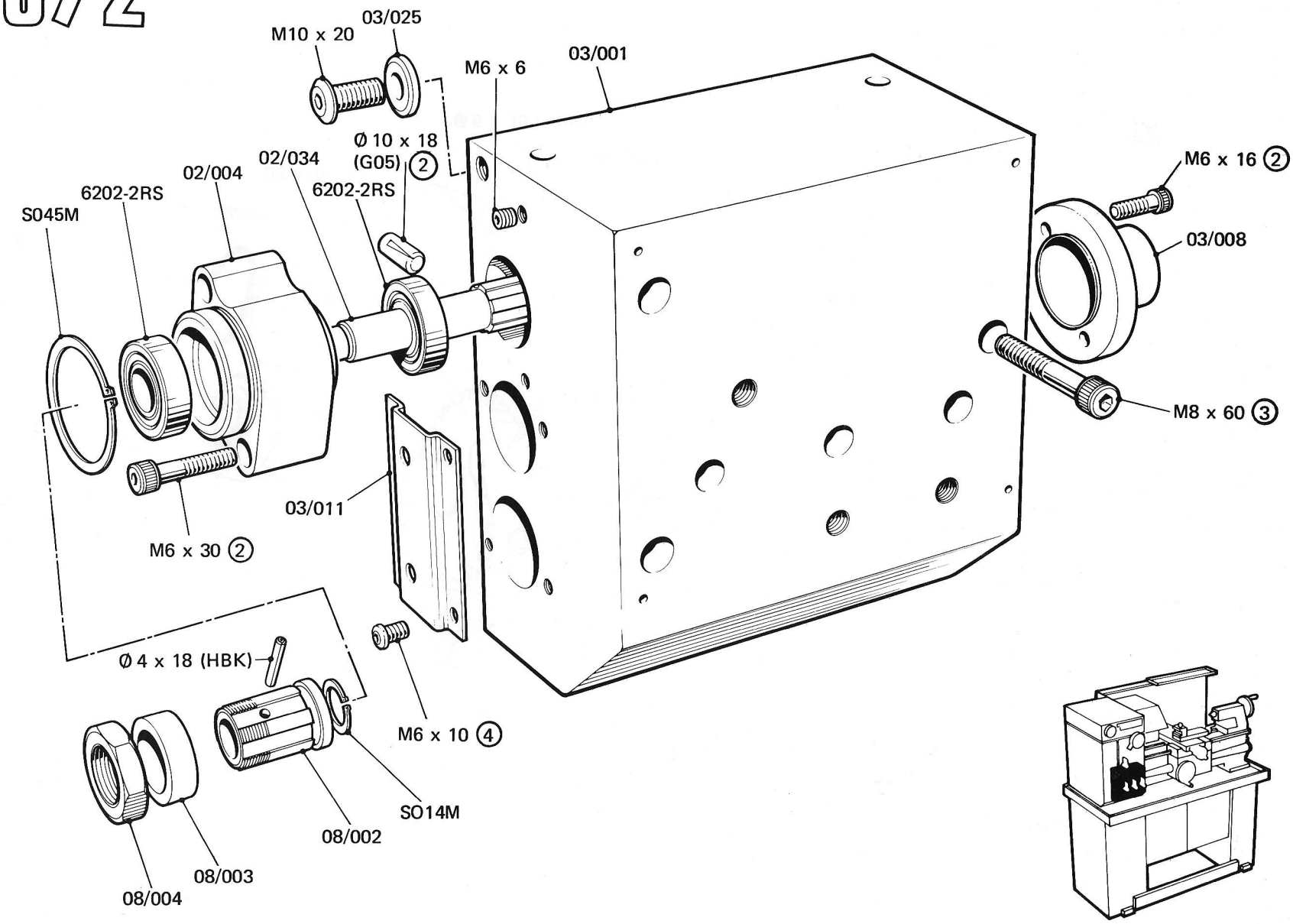
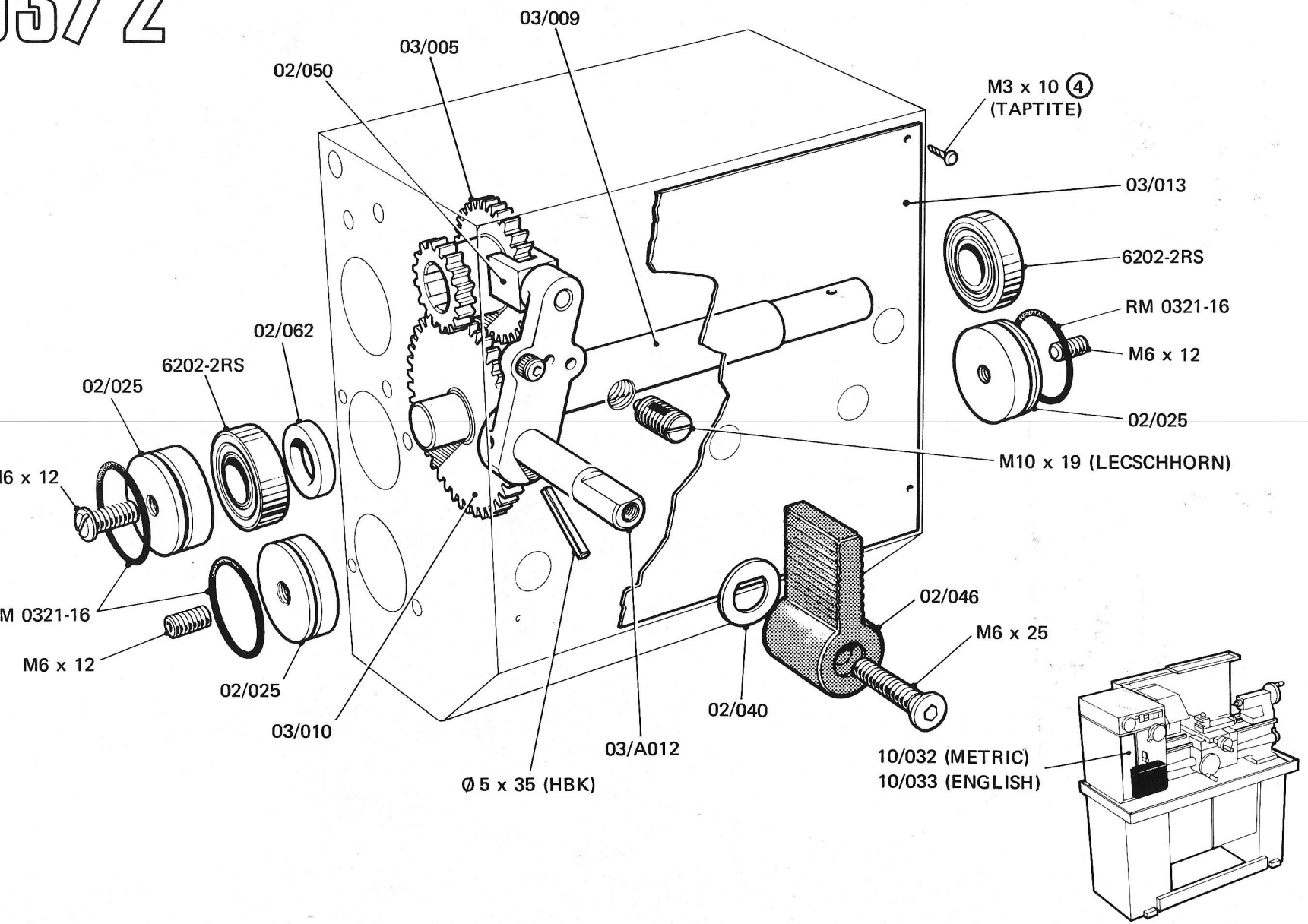
6202-2RS
03/017
(GLACIER)
MB.1815 ②
02/062
6202 - 2RS
02/025
RM 0321 - 16
M6 x 12
02/025
RM 0321 - 16
6202 - 2RS
M6 x 12
6202-2RS
02/025
RM 0321 - 16
03/018
03/020
03/019

3/2


M10 x 20
03/025
M6 x 6
03/001
Ø 10 x 18
(G05) ②
02/034
02/004
6202-2RS
S045M
6202-2RS
M6 x 16 ②
03/008
M8 x 60 ③
03/011
M6 x 30 ②
Ø 4 x 18 (HBK)
M6 x 10 ④
SO14M
08/002
08/003
08/004

03/2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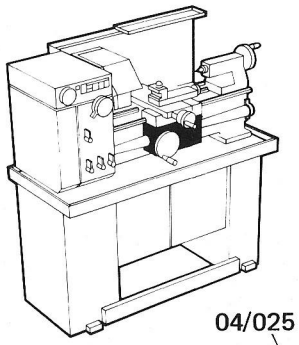
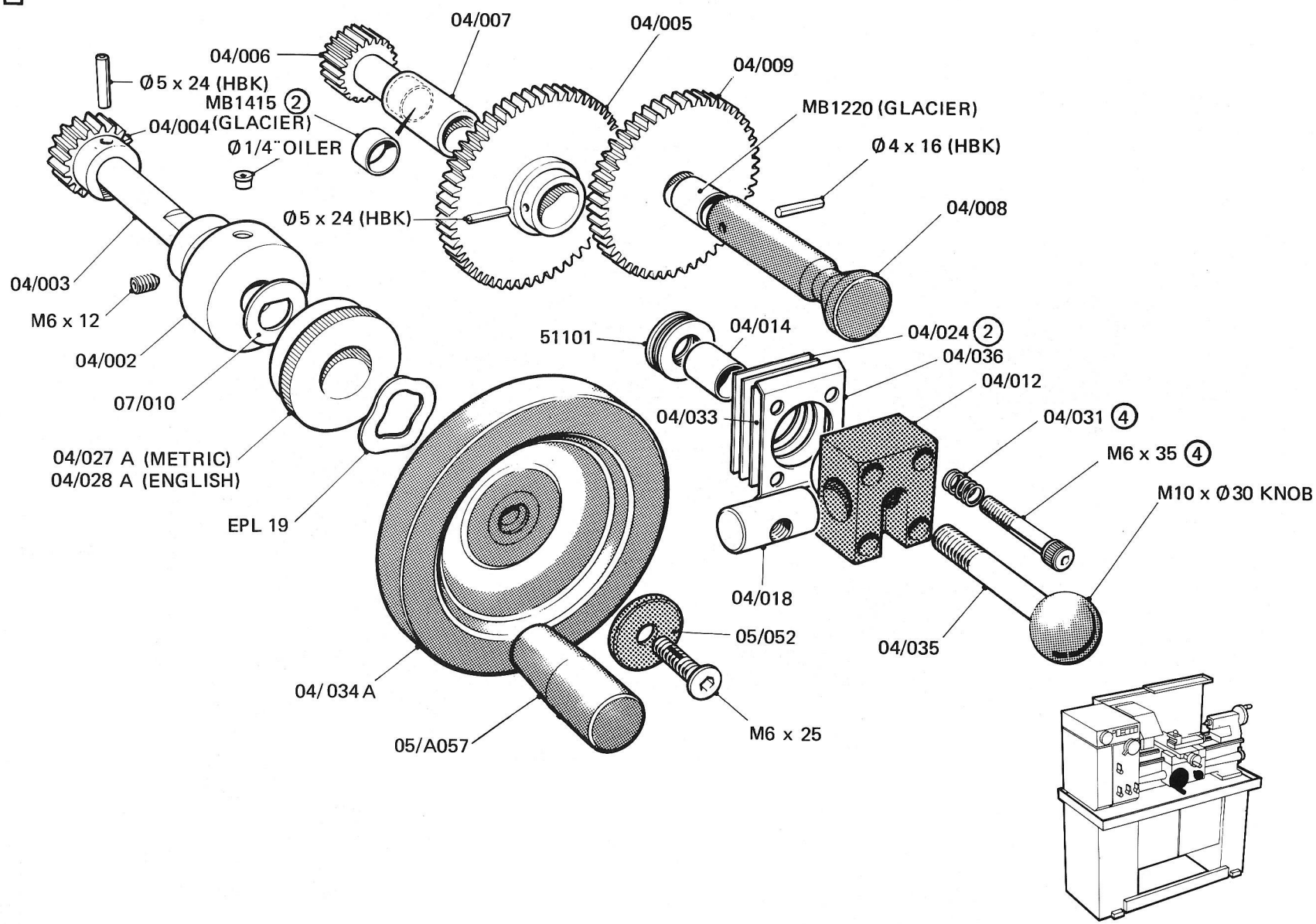
03/005
02/050
M3 x 10 (4)
(TAPTITE)
03/013
6202-2RS
RM 0321-16
M6 x 12
02/025
M10 x 19 (LECSCHHORN)
02/062
6202-2RS
02/025
M6 x 12
M 0321-16
M6 x 12
02/025
03/010
Ø 5 x 35 (HBK)
03/A012
02/040
02/046
M6 x 25
10/032 (METRIC)
10/033 (ENGLISH)

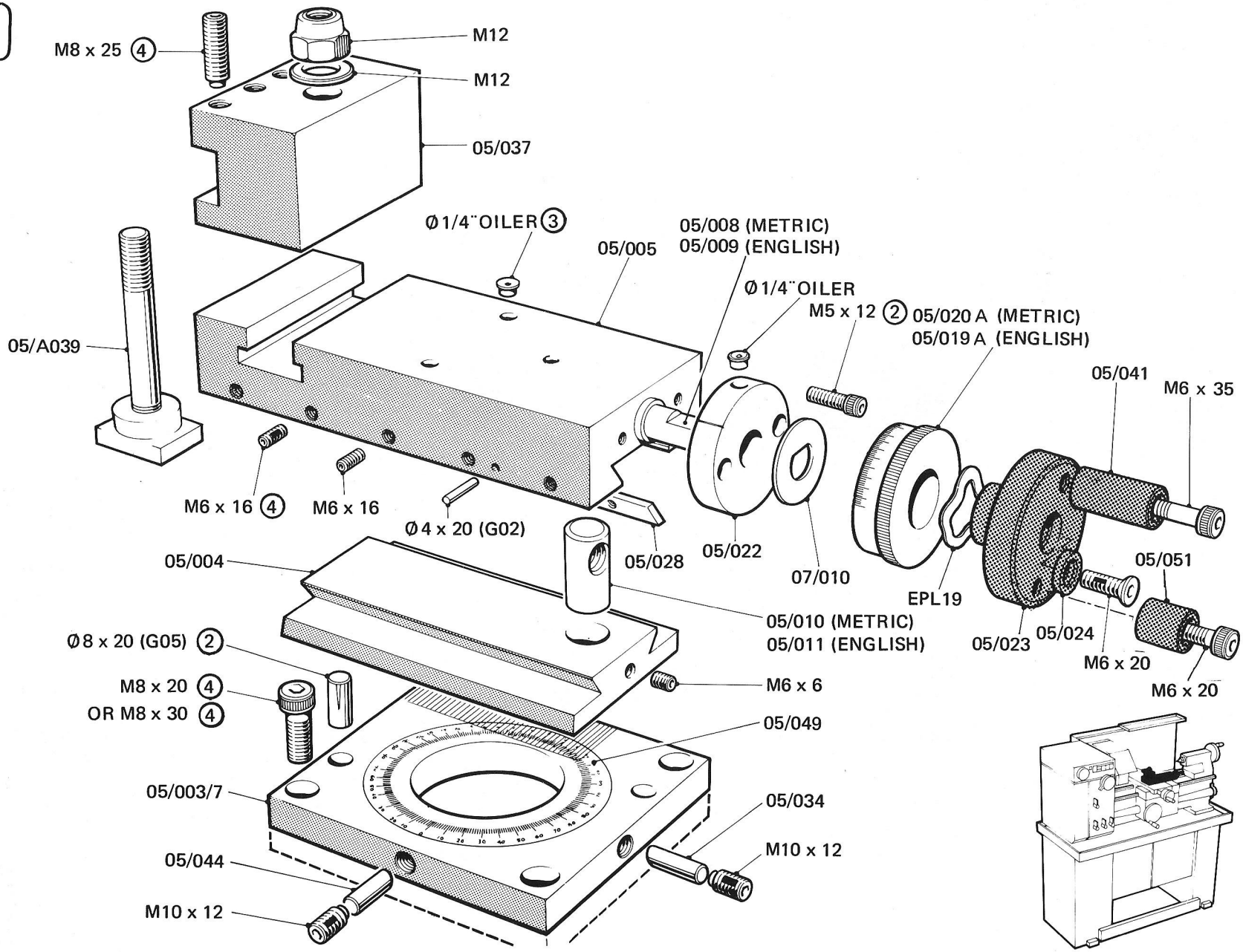
04



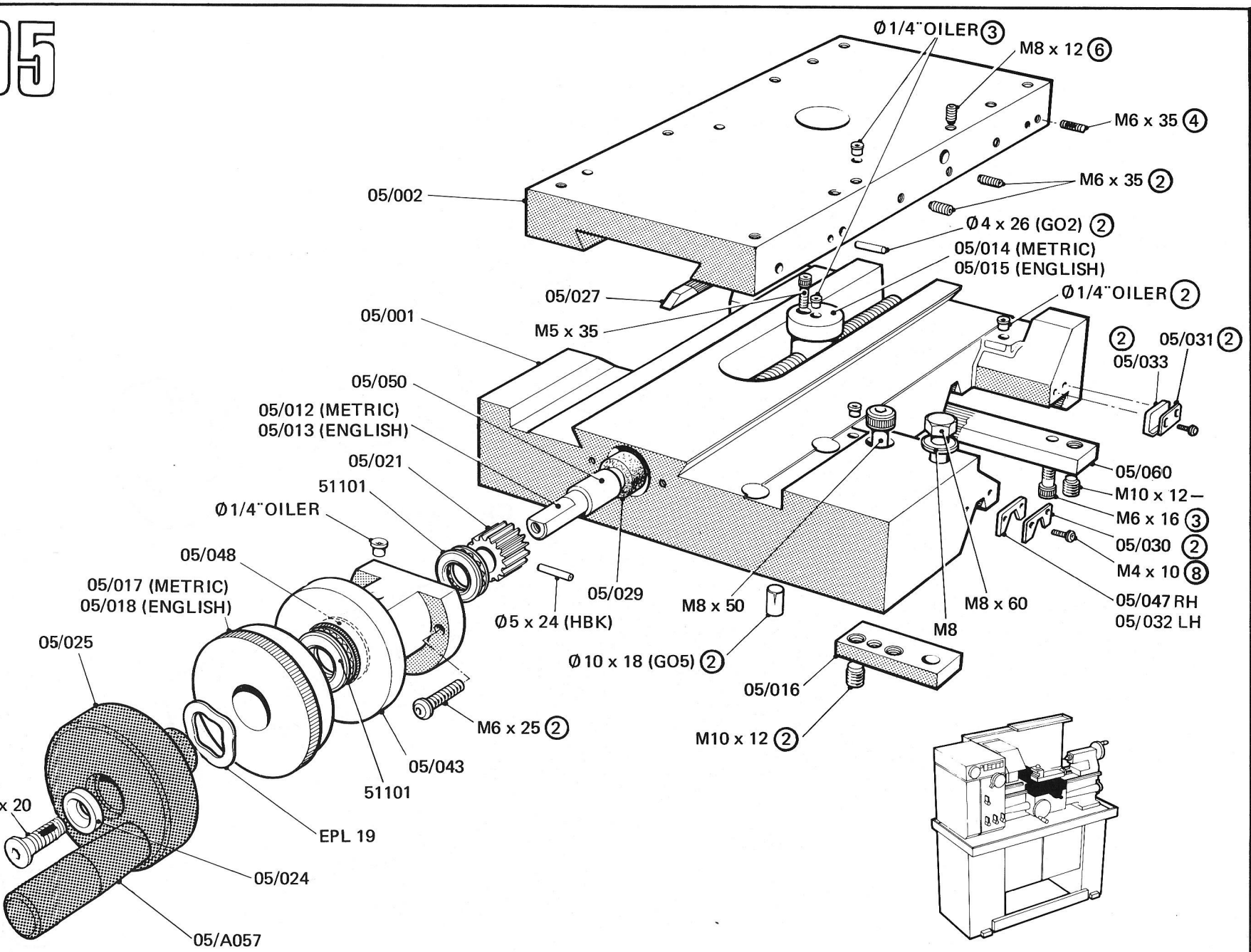
M8 x 55 (2)
M8 x45 (2)
040MS
M8 x 25
04/013
M5
04/037
04/022
M8 x 25
04/011
M6 x 10 (4)
04/025
M6 NIPPLE
04/010
04/023
M6
M4 x 10
04/015
04/016
04/040
090MS
51101
04/041
04/026
61806
04/020
61806
M6 x 12
51101
M6 x 12
M6
Ø22 NYLON PLUG
04/017
M6 x 16 (2)
M6 x 12
M6 x 10 (2)
04/038

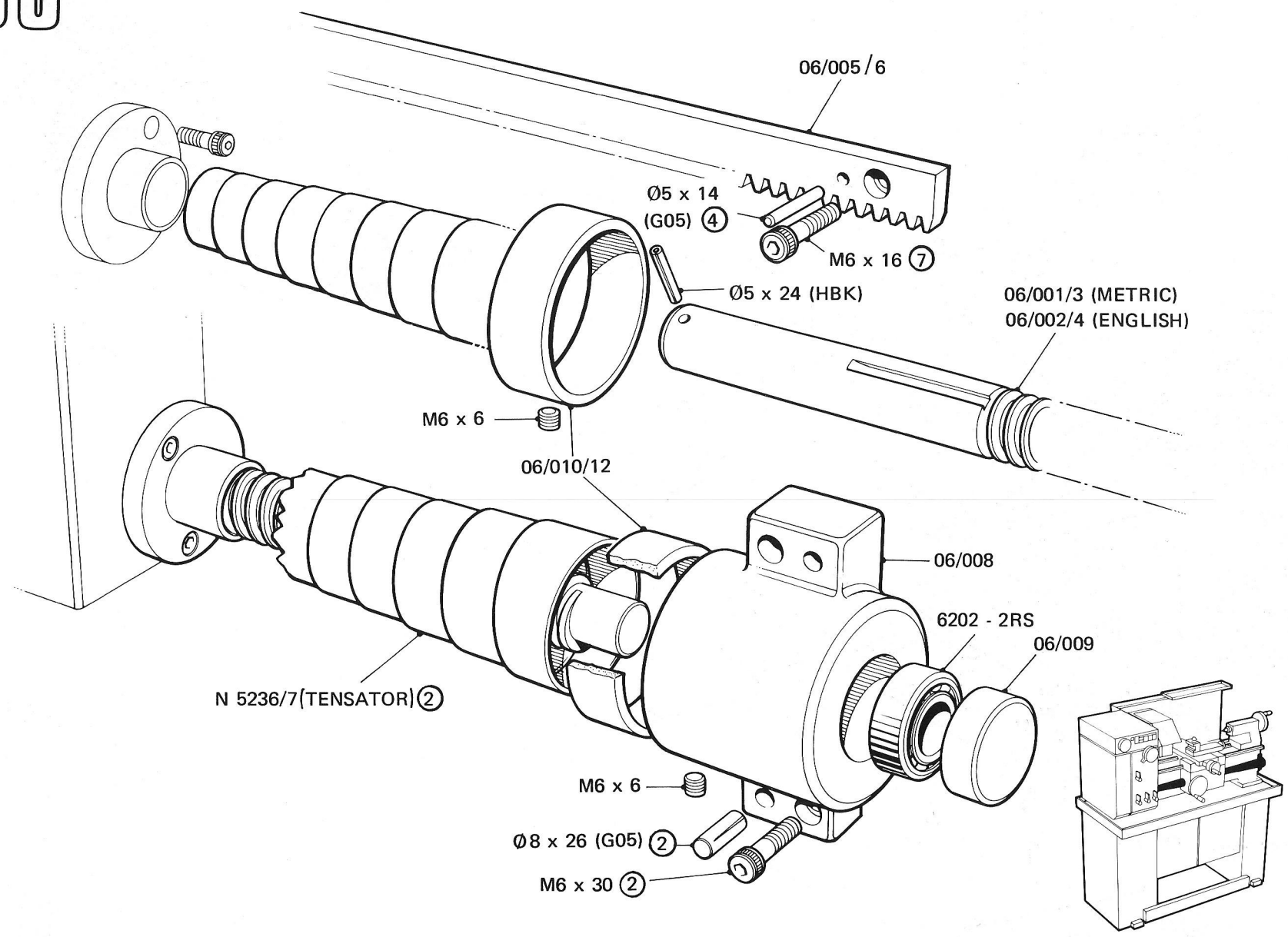
04

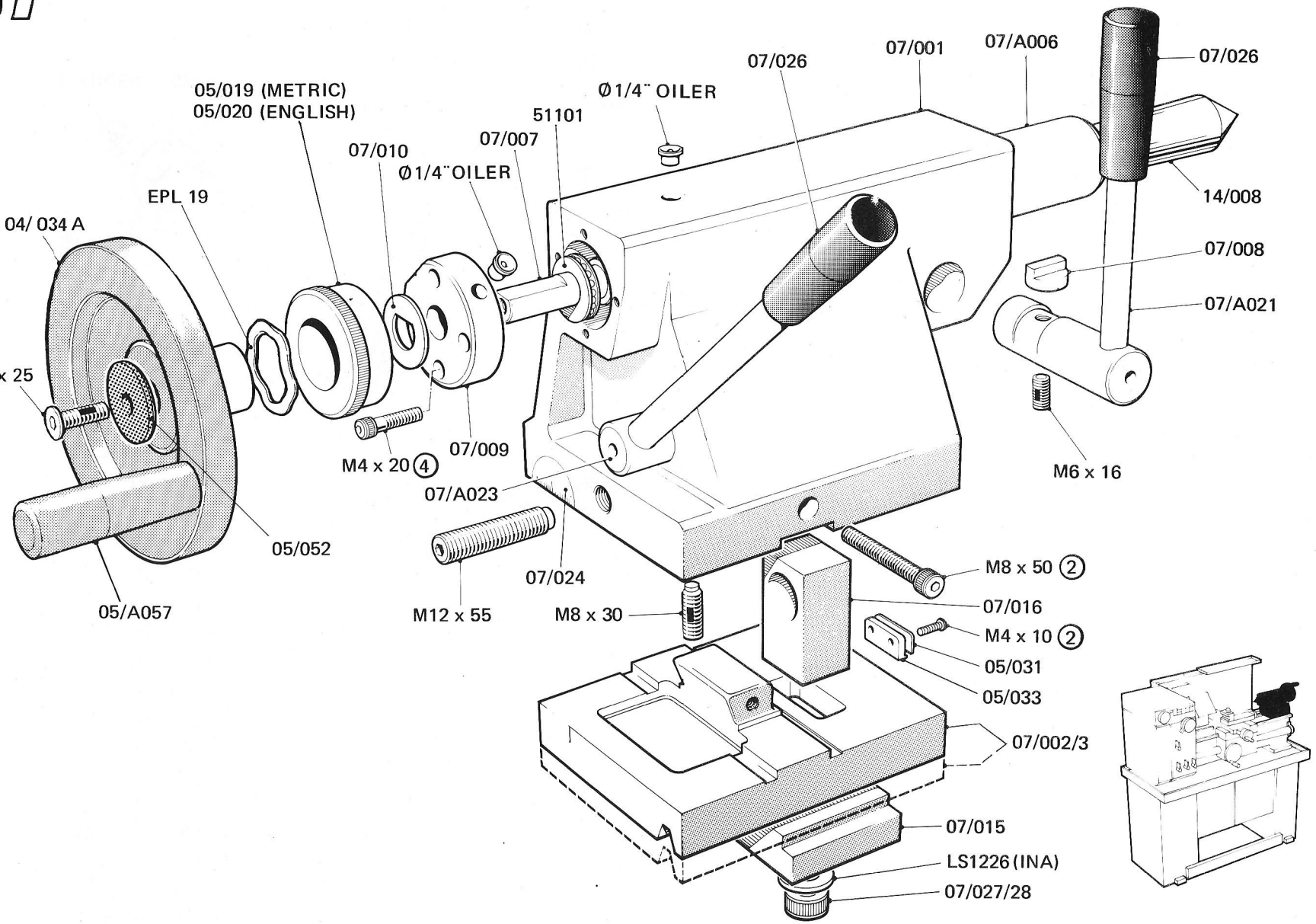

04/007
04/005
04/006
04/009
Ø5 x 24 (HBK)
MB1415 (2)
MB1220 (GLACIER)
04/004
(GLACIER)
Ø4 x 16 (HBK)
Ø1/4" OILER
Ø5 x 24 (HBK)
04/008
04/003
M6 x 12
51101
04/014
04/024 (2)
04/036
04/002
04/012
07/010
04/033
04/031 (4)
M6 x 35 (4)
04/027 A (METRIC)
04/028 A (ENGLISH)
M10 x Ø30 KNOB
EPL 19
04/018
05/052
04/035
04/034 A
M6 x 25
05/A057

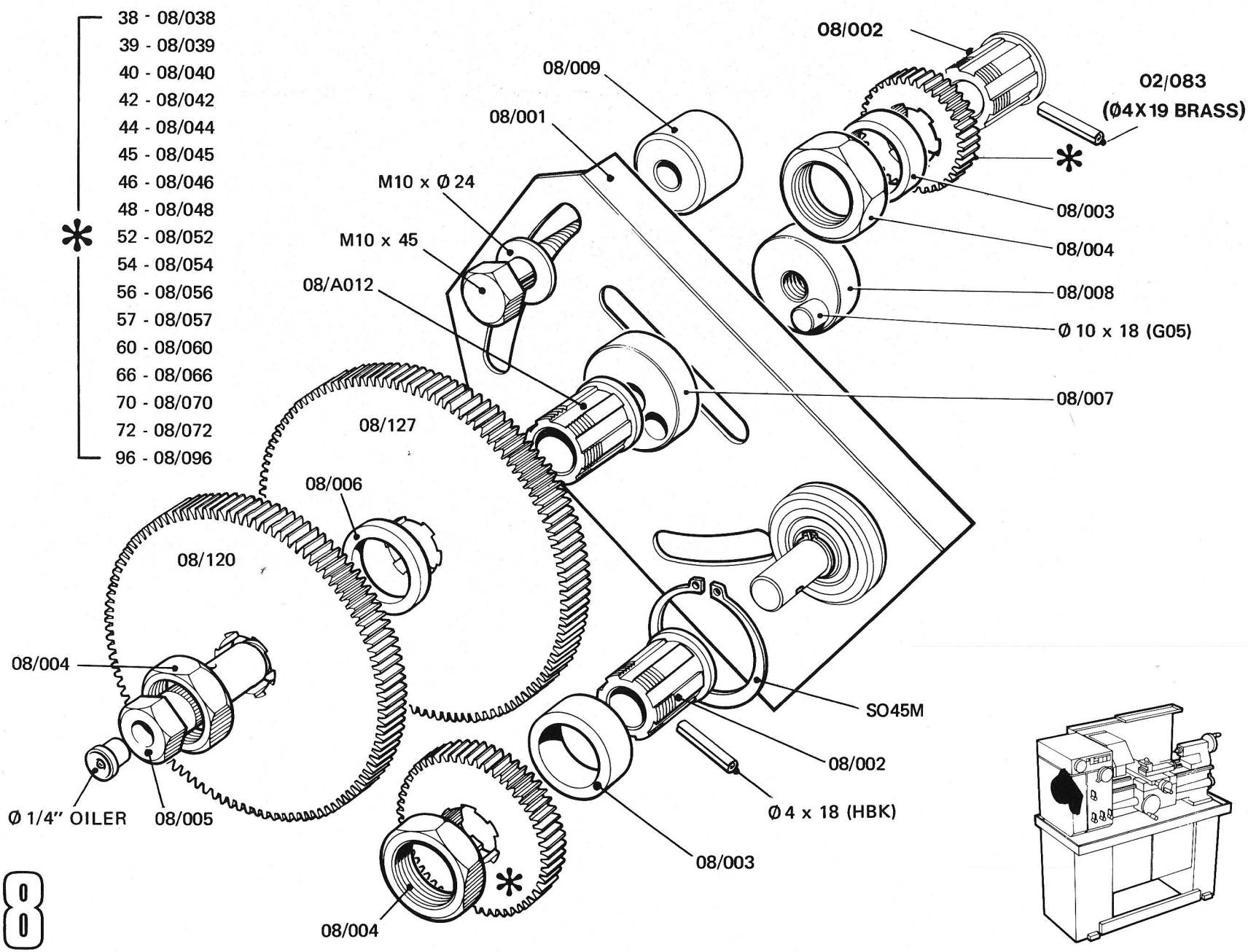

M8 x 25 (4)
M12
M12
05/037
Ø1/4"OILER (3)
05/005
05/008 (METRIC)
05/009 (ENGLISH)
Ø1/4"OILER
M5 x 12 (2)
05/020 A (METRIC)
05/019 A (ENGLISH)
05/041
M6 x 35
05/A039
M6 x 16 (4)
M6 x 16
Ø4 x 20 (G02)
05/028
05/022
07/010
EPL19
05/051
05/004
05/010 (METRIC)
05/011 (ENGLISH)
05/023
05/024
M6 x 20
M6 x 20
Ø8 x 20 (G05) (2)
M8 x 20 (4)
OR M8 x 30 (4)
M6 x 6
05/049
05/003/7
05/034
M10 x 12
05/044
M10 x 12

05

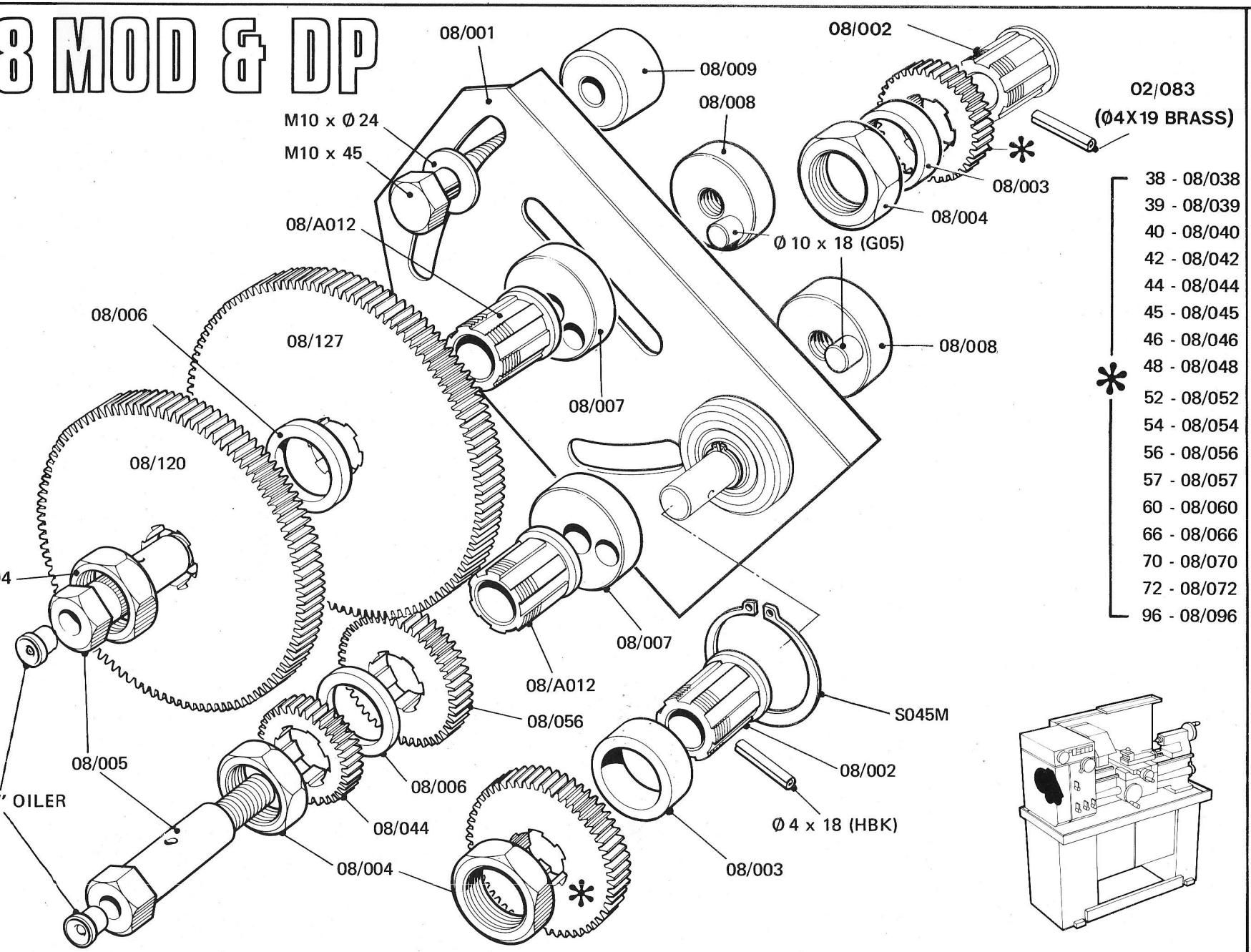

Ø1/4"OILER 3
M8 x 12 6
M6 x 35 4
M6 x 35 2
05/002
Ø4 x 26 (GO2) 2
05/014 (METRIC)
05/015 (ENGLISH)
05/027
Ø1/4"OILER 2
05/001
M5 x 35
2
05/031 2
05/033
05/050
05/012 (METRIC)
05/013 (ENGLISH)
05/021
51101
Ø1/4"OILER
05/060
M10 x 12
M6 x 16 3
05/030 2
M4 x 10 8
05/048
05/017 (METRIC)
05/018 (ENGLISH)
05/029
Ø5 x 24 (HBK)
M8 x 50
M8 x 60
M8
05/047 RH
05/032 LH
05/025
Ø10 x 18 (GO5) 2
05/016
M6 x 25 2
M10 x 12 2
05/043
51101
x 20
EPL 19
05/024
05/A057


06/005/6
Ø5 x 14
(G05) 4
M6 x 16 7
Ø5 x 24 (HBK)
06/001/3 (METRIC)
06/002/4 (ENGLISH)
M6 x 6
06/010/12
06/008
6202 - 2RS
06/009
N 5236/7(TENSATOR) 2
M6 x 6
Ø8 x 26 (G05) 2
M6 x 30 2


05/019 (METRIC)
05/020 (ENGLISH)
07/010
Ø1/4" OILER
51101
07/007
Ø1/4" OILER
07/026
07/001
07/A006
07/026
EPL 19
04/ 034 A
14/008
07/008
07/A021
x 25
M4 x 20 (4)
07/009
M6 x 16
07/A023
05/052
07/024
M8 x 50 (2)
05/A057
M12 x 55
M8 x 30
07/016
M4 x 10 (2)
05/031
05/033
07/002/3
07/015
LS1226 (INA)
07/027/28

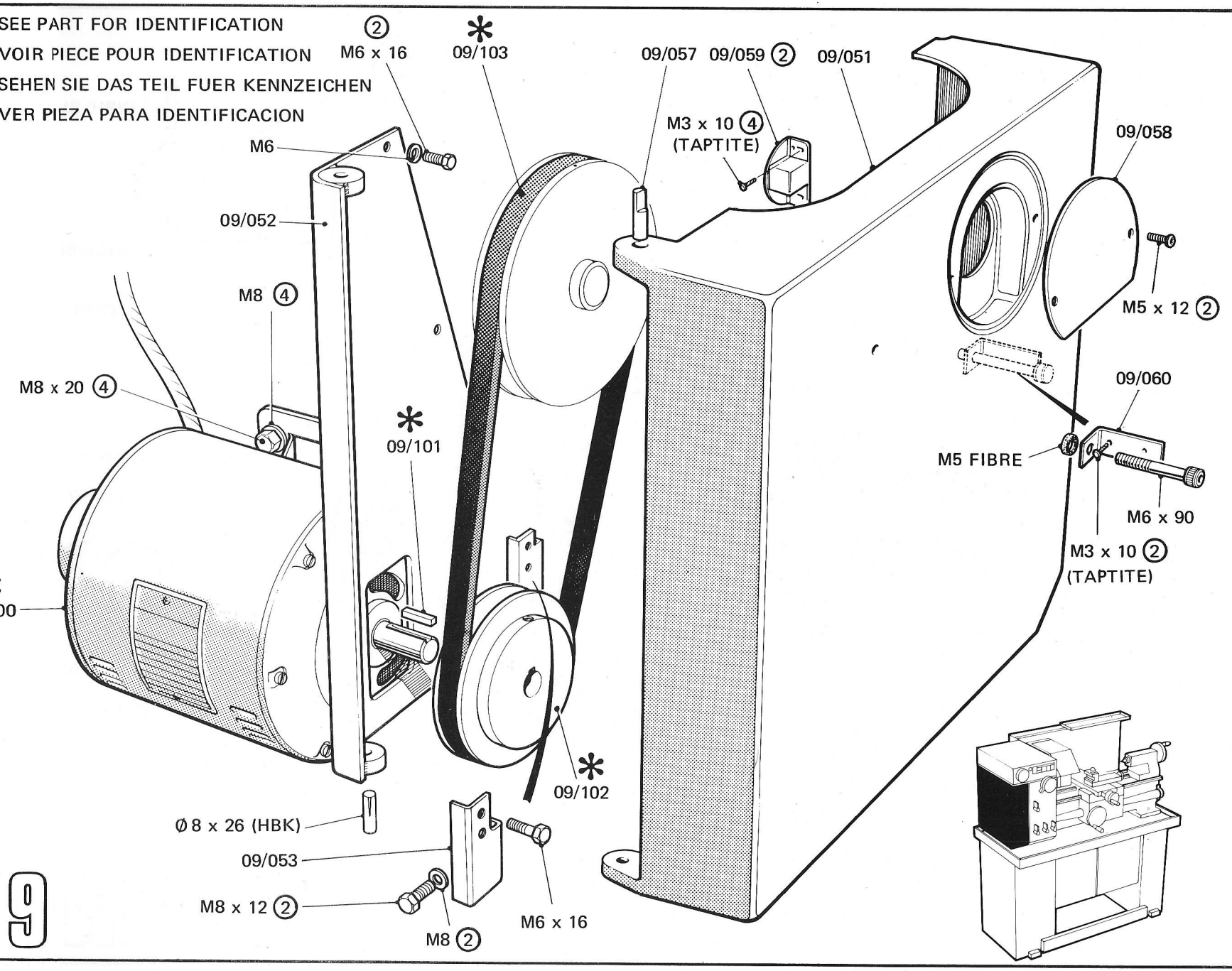

38 - 08/038
39 - 08/039
40 - 08/040
42 - 08/042
44 - 08/044
45 - 08/045
46 - 08/046
48 - 08/048
52 - 08/052
54 - 08/054
56 - 08/056
57 - 08/057
60 - 08/060
66 - 08/066
70 - 08/070
72 - 08/072
96 - 08/096
*
08/002
08/009
08/001
02/083
(Ø4X19 BRASS)
M10 x Ø 24
M10 x 45
08/A012
08/003
08/004
08/008
Ø 10 x 18 (G05)
08/007
08/127
08/006
08/120
08/004
Ø 1/4" OILER
08/005
SO45M
08/002
Ø 4 x 18 (HBK)
08/003
08/004

8 MOD & DP

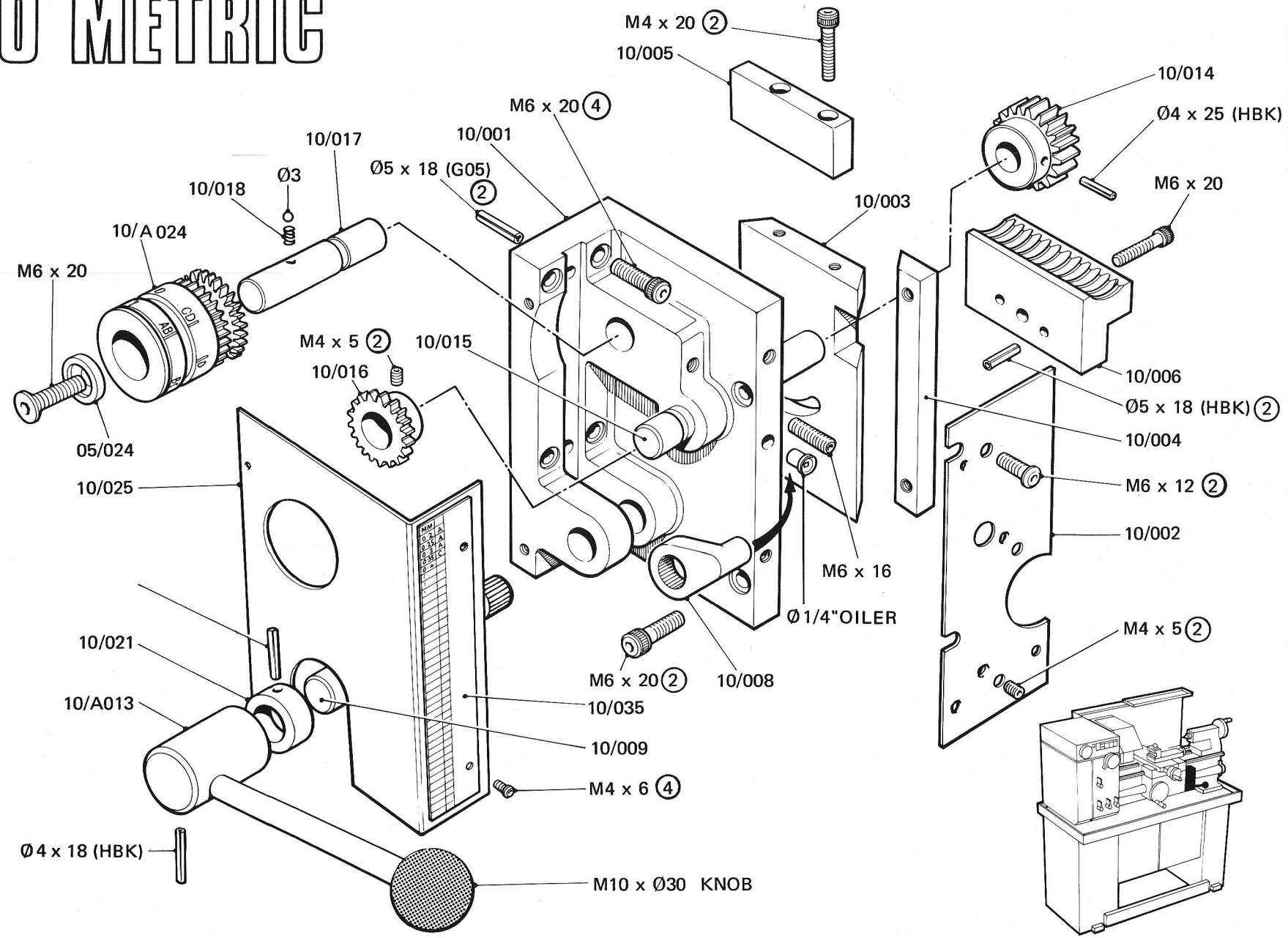


* 38 - 08/038
39 - 08/039
40 - 08/040
42 - 08/042
44 - 08/044
45 - 08/045
46 - 08/046
48 - 08/048
52 - 08/052
54 - 08/054
56 - 08/056
57 - 08/057
60 - 08/060
66 - 08/066
70 - 08/070
72 - 08/072
96 - 08/096

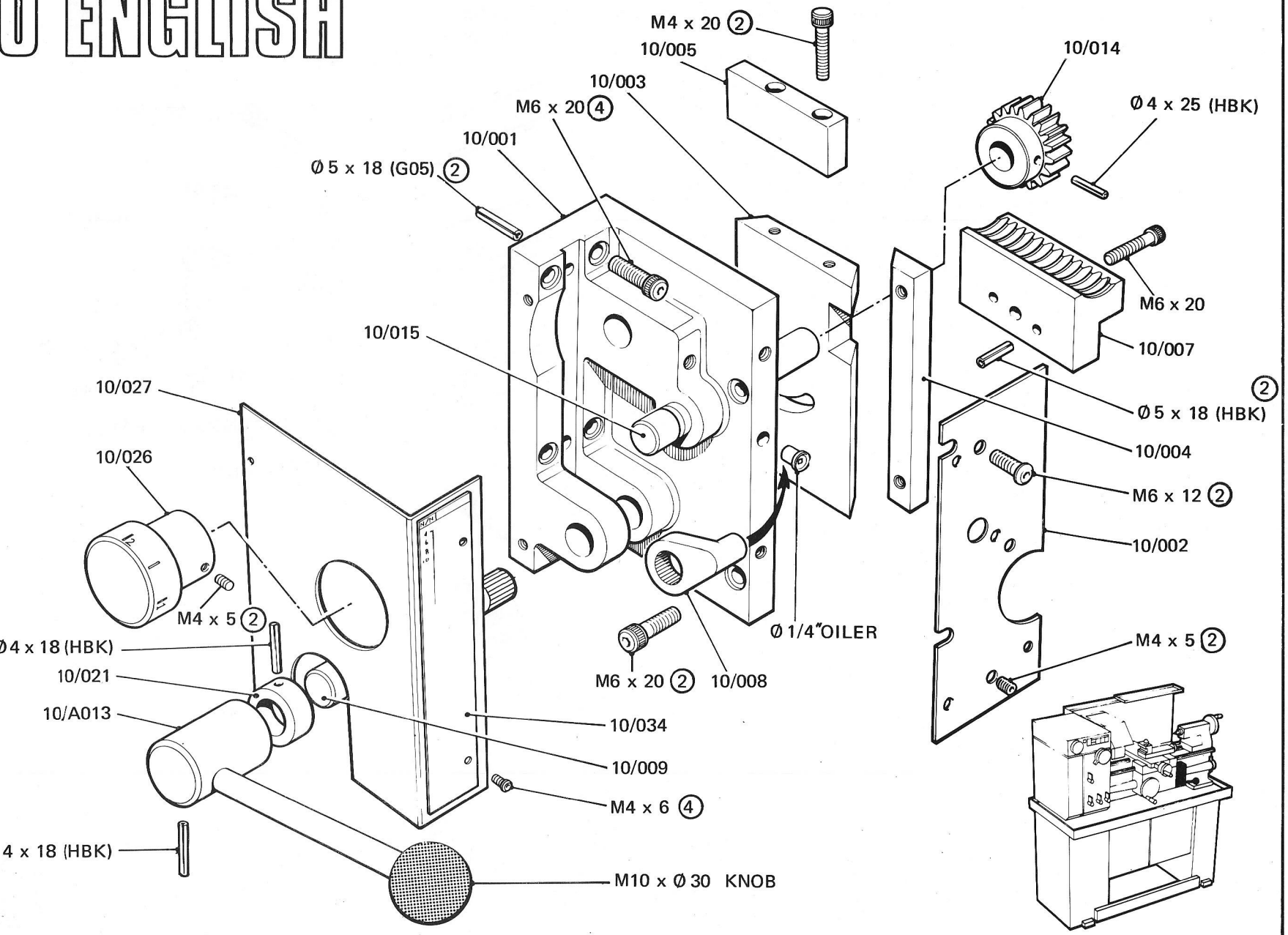
SEE PART FOR IDENTIFICATION
VOIR PIECE POUR IDENTIFICATION
SEHEN SIE DAS TEIL FUER KENNZEICHEN
VER PIEZA PARA IDENTIFICACION

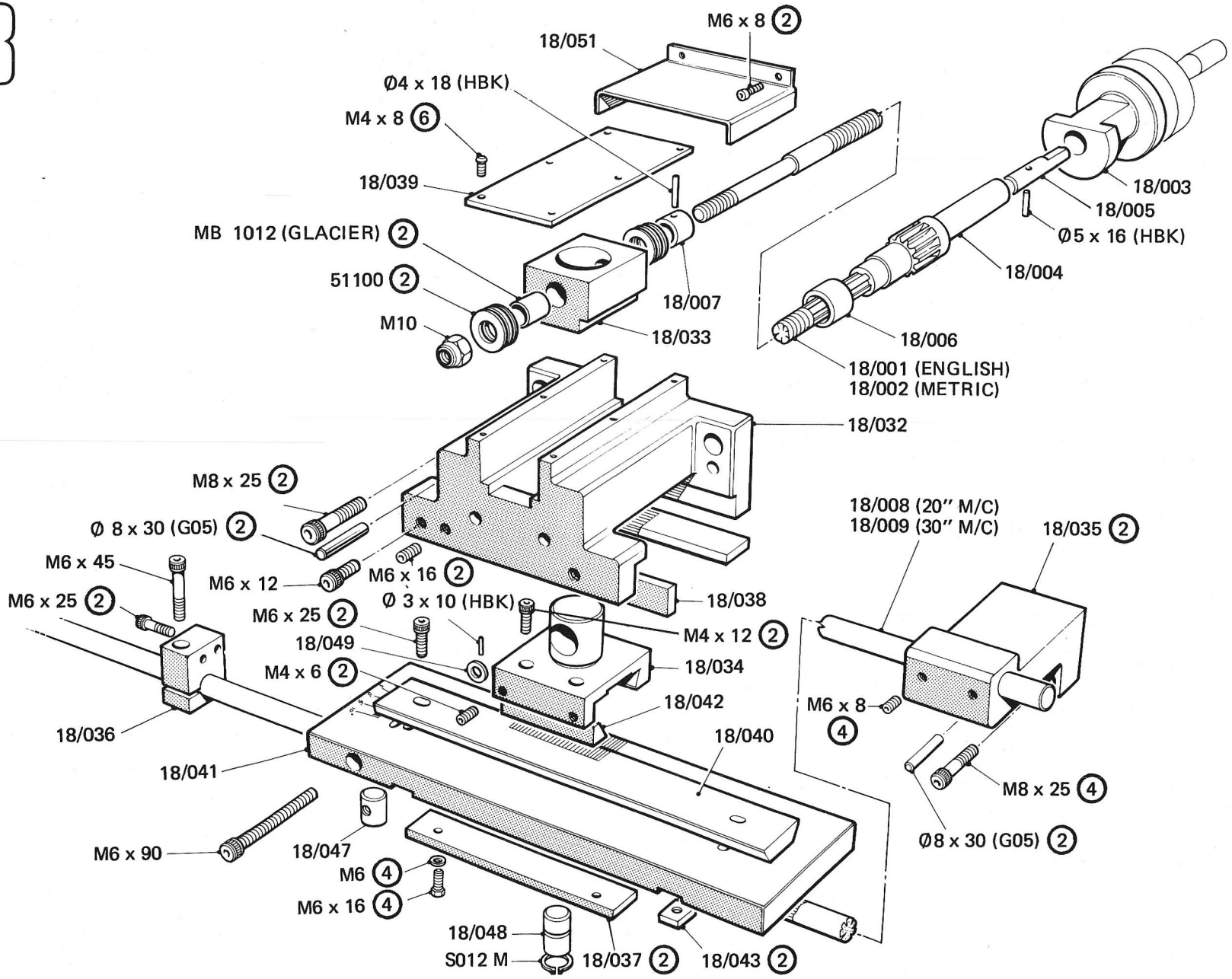


O METRIC


M4 x 20 (2)
10/005
10/014
Ø4 x 25 (HBK)
M6 x 20 (4)
10/001
10/017
Ø5 x 18 (G05) (2)
Ø3
10/018
10/003
M6 x 20
10/A 024
M6 x 20
M4 x 5 (2)
10/015
10/016
10/006
Ø5 x 18 (HBK) (2)
10/004
05/024
10/025
M6 x 12 (2)
10/002
M6 x 16
Ø1/4"OILER
10/021
M4 x 5 (2)
M6 x 20 (2)
10/008
10/A013
10/035
10/009
M4 x 6 (4)
Ø4 x 18 (HBK)
M10 x Ø30 KNOB

O ENGLISH


M4 x 20 (2)
10/005
10/003
M6 x 20 (4)
10/001
Ø 5 x 18 (G05) (2)
10/014
Ø 4 x 25 (HBK)
M6 x 20
10/007
10/015
10/027
10/026
Ø 5 x 18 (HBK) (2)
10/004
M6 x 12 (2)
10/002
M4 x 5 (2)
Ø 4 x 18 (HBK)
10/021
10/A013
Ø 1/4" OILER
M6 x 20 (2)
10/008
M4 x 5 (2)
10/034
10/009
M4 x 6 (4)
4 x 18 (HBK)
M10 x Ø 30 KNOB


M6 x 8 (2)
18/051
Ø4 x 18 (HBK)
M4 x 8 (6)
18/039
MB 1012 (GLACIER) (2)
51100 (2)
M10
18/007
18/033
18/003
18/005
Ø5 x 16 (HBK)
18/004
18/006
18/001 (ENGLISH)
18/002 (METRIC)
18/032
M8 x 25 (2)
Ø 8 x 30 (G05) (2)
M6 x 45
M6 x 12
M6 x 16 (2)
M6 x 25 (2)
M6 x 25 (2)
Ø 3 x 10 (HBK)
18/038
M4 x 12 (2)
18/049
M4 x 6 (2)
18/034
18/042
18/040
18/036
18/041
M6 x 90
18/047
M6 (4)
M6 x 16 (4)
18/048
S012 M
18/037 (2)
18/043 (2)
18/008 (20" M/C)
18/009 (30" M/C)
18/035 (2)
M6 x 8 (4)
M8 x 25 (4)
Ø8 x 30 (G05) (2)