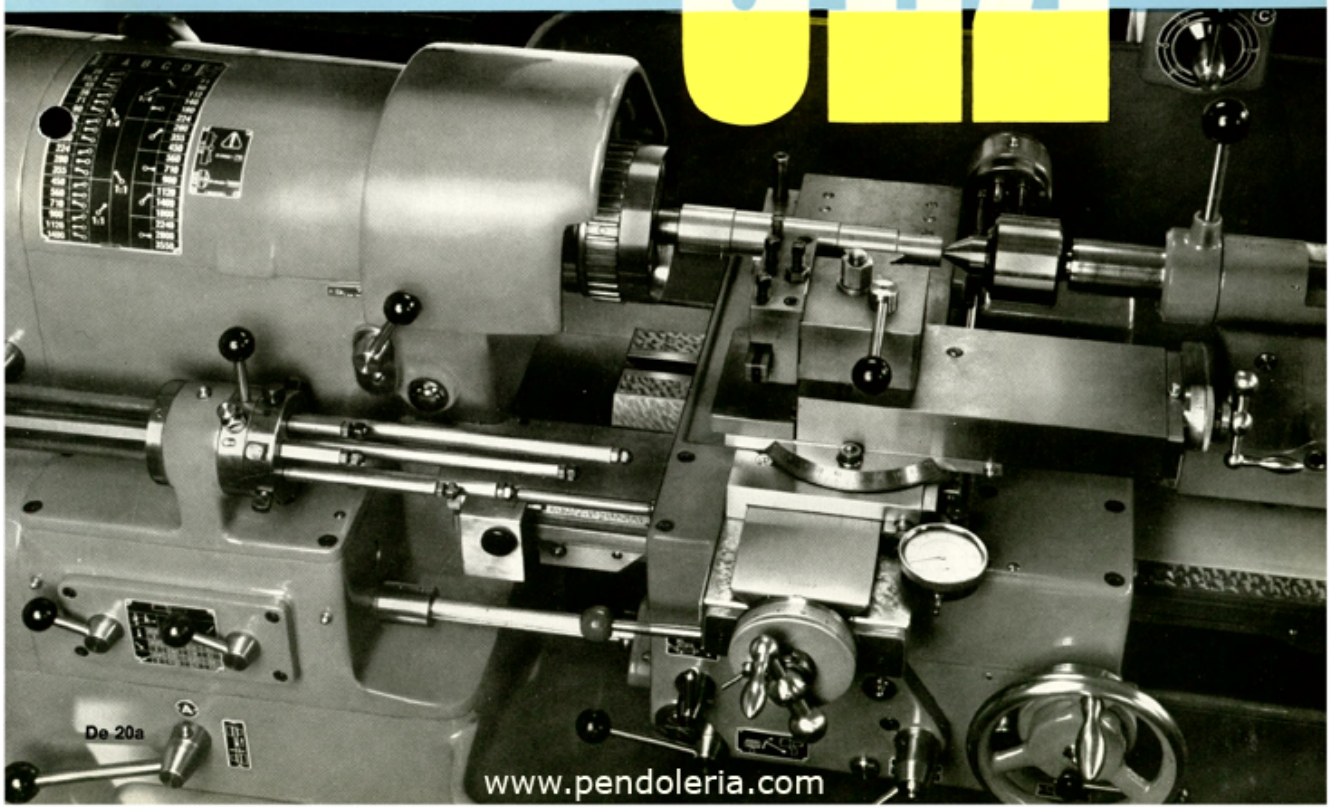
Boley

# In the micron range

# 5LZ



# Sliding, Surfacing and Screw Cutting Lathe 5LZ

## Outstanding Features

**Consistently maintained accuracy** – even with heavy cuts

**A wide spindle speed range:** 22 speeds from 28 to 3550 r.p.m., with uniform close play maintained in bearings

**Stop turning** against a six-station longitudinal stop and a six-station facing stop – high releasing accuracy by a drop worm.

**All operating controls** within easy reach. The machine is exceptionally practical

**Short times** for tool and component change

**High cutting capacity** using the hydraulic profiling attachment

**Handling times** for controlling and indexing considerably reduced

**9 longitudinal feeds** from .063 to .4 mm. (.0025 to .016") per rev., **9 facing feeds** from .032 to .2 mm. (.0013 to .008") per rev.; also fine feeds down to .01 mm. (.0004") per rev.

**Leadscrew and feed spindle,** i. e. pitches and feeds can be set independently of each other. Automatic drop-nut release

**Rapid change-over** from turning to screwcutting and vice versa

**Directions of feed to saddle** – right or left – **and to facing slide** – forwards or backwards – are also adjustable independently of each other

**Large space for change-gears,** so that unusual pitches can also be cut

**Ample space for swarf.** Longitudinal and facing stops out of reach of swarf

**Semi-automatic screwcutting attachment** with quadrupled return speed, resulting in considerable time saving

**High frequency** of reversals for screwcutting

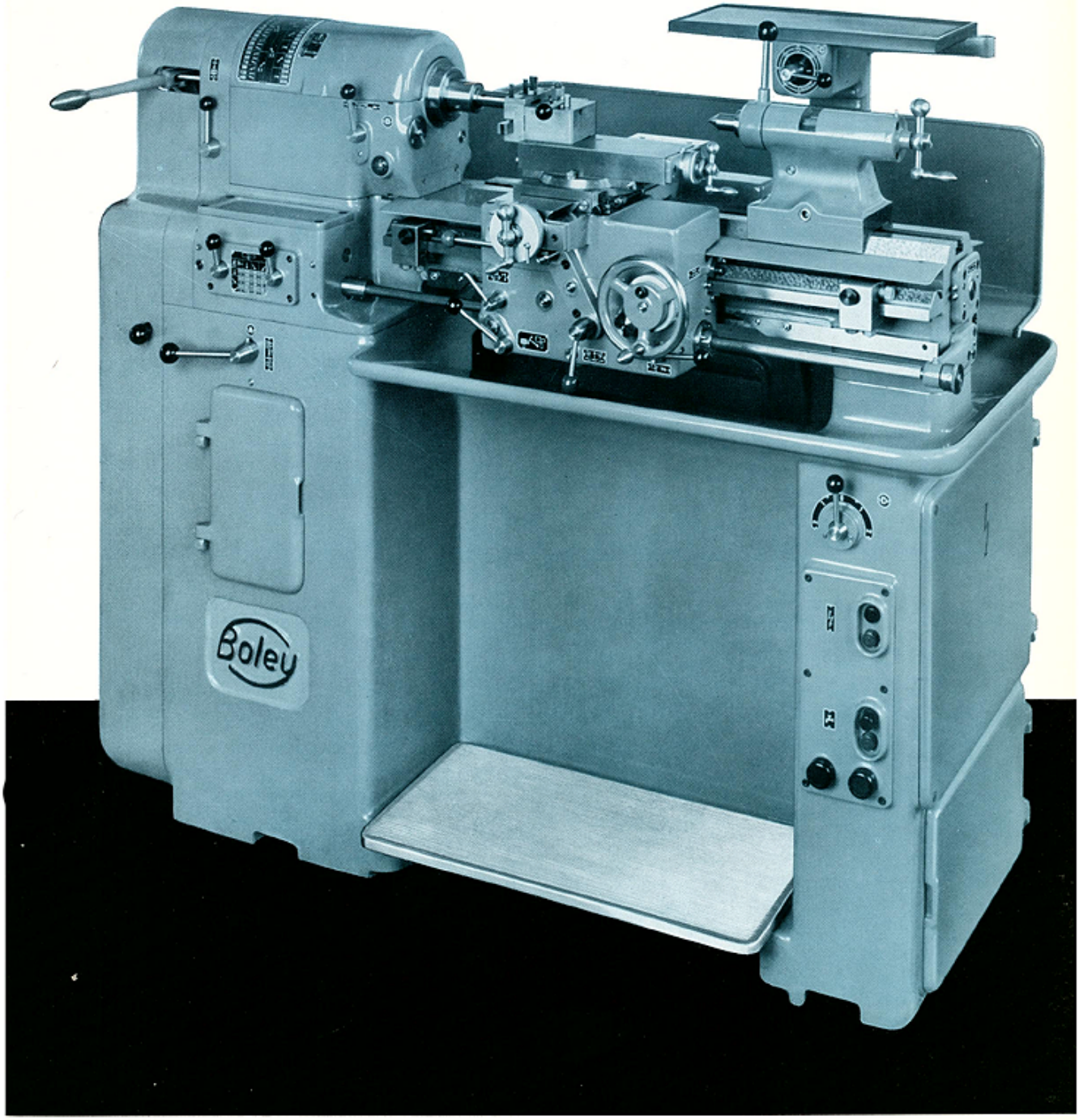
**Sturdily built saddle** suitable for accommodating rear toolholders

**Hardened saddle slideways** – ensuring low rate of wear

**Machine bed of special casting** with long covered carriage slideways. This arrangement makes the slideways resistant to wear

**The leadscrew** arranged in the middle of the bed engages the slide at the focal point of resistance, ensuring smooth traversing

**The machine is pleasing in appearance and is smooth,** so that it is easy to clean and maintain
The 5 LZ is **so rigidly built** that tests undertaken by the Technical College in Aachen failed to make it chatter.




So handy – so conveniently arranged for the operator

# 5LZ

## The lathe for high demands

The BOLEY 5 LZ sliding, facing and screwcutting lathe, developed in accordance with the very latest working physiological knowledge, is an exceptonally useful machine. It attracts attention by its external appearance alone, its elegant lines, its exceptional stability and its impressive design. Whole decades of experience in building lathes have been incorporated in this model.

Especially when used as a production machine, the 5 LZ proves highly efficient, as it can utilise tungsten carbide tools to their full capacity. This is corroborated by the fact that it is used in the production lines of many of the leading German and foreign firms. Its versatility also makes it especially suitable for use in tool-rooms and research workshops.

Hundreds of satisfied customers at home and abroad testify to this. Amongst these, there are some who make very high demands, such as jig boring firms, firms engaged in precision mechanics and in the optical industry. The car industry, electrical engineering, laboratories and scientific experimental establishments, as, indeed, nearly all branches of industry where great turning accuracy and economic production are essential, are amongst the users of this machine.

Arrangement to German DIN Standards.
Acceptance conditions to DIN 8605 and BON 320/3 E.

## Capacity data

| | | mm | ins. |
|---|---|---|---|
| Height of centres | | 130 | 5 1/8 |
| Maximum swing | over carriage | 200 | 8 |
| Maximum turning diameter | over bed | 250 | 10 |
| Maximum turning diameter | over carriage | 200 | 8 |
| Maximum turning diameter | over bottom slide | 140 | 5 1/2 |
| Maximum length turned in one pass | | 500 | 20 |
| Maximum length of thread cut | without autom. device | 430 | 16 |
| Maximum distance between centres | | 500 | 20 |
| Maximum carriage traverse | | 500 | 20 |
| Traverse of longitudinal slide | | 95 | 3 3/4 |
| Traverse of facing slide | | 150 | 6 |

## Spindle

| | | |
|---|---|---|
| Working height above floor | 1150 | 46 |
| Spindle nose suitable for collets a 12, size 4 (see page 6) | | – |
| Spindle nose, on request, with | | |
| external steep taper | | 3 DIN 55 022 |
| internal Morse taper | | 4 |
| Spindle bore diameter | 23 | 7/8 |
| Front bearing: plain | | GL |
| Rear bearing: plain | | GL |
| Step bearing: roller | | WL |

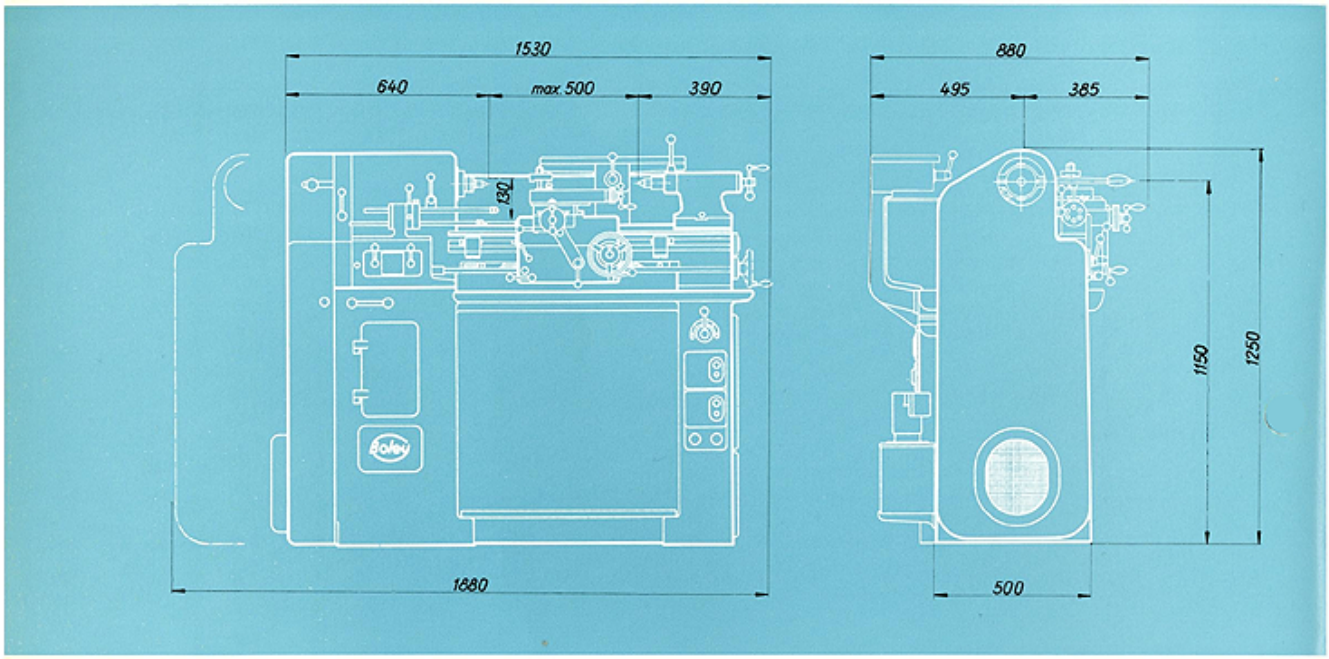
## Chucking Parts

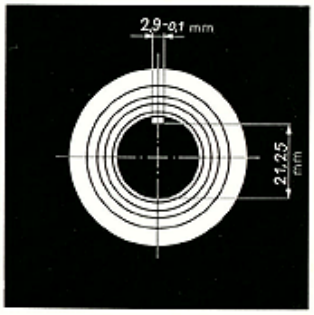
| | | | |
|---|---|---|---|
| Faceplate diameter | | 240 | 9 1/2 |
| Clamping capacity (clamped externally) | | from 34 to 200 | 1 3/8 to 8 |
| Chuck diameter, standard/maximum | | 110/137 | 4 3/8 to 5 3/8 |
| Clamping capacity (clamped externally) | | 3 to 50 | 1/8 to 2 |
| Collet a 12, size 4 | | | |
| Maximum diameter clamped | with through bores | 16 | 5/8 |
| | with blind bores | 20 | 3/4 |
| Steady | | | |
| Maximum capacity | fixed | 60 | 2 3/8 |
| | travelling | 60 | 2 3/8 |
| Toolholder | | | |
| Maximum tool cross section | | 16 × 16 | 5/8 × 5/8 |
| Tailstock | | | |
| Inside taper of sleeve | | Morse 3 | |
| Longitudinal movement of sleeve | | 80 | 3 1/8 |
| Lateral adjustment | left-hand and right-hand | 10 | 3/8 |

## Spindle speeds as per DIN 804

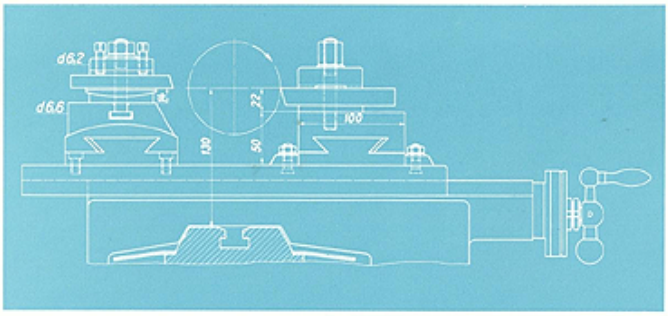
| | | |
|---|---|---|
| Step $\varphi = 1.25$ | 22 steps | from 28 to 3550 r.p.m. |
| Countershaft in headstock, ratio | | 1:4 |
| Gear box, ratio | | 1:4 |

# 6 Floor Plan

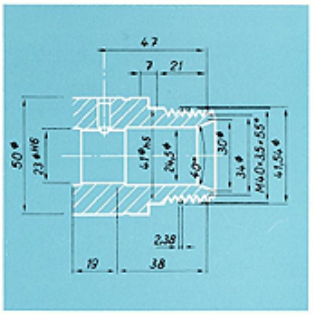



Top view of spindle nose
On request,
external steep taper 3 DIN 55022,
internal Morse taper No. 4




Working area over the saddle
(measurements in mm.)




Longitudinal section through the spindle
nose (measurements in mm.)

## Feeds as per DIN 803

| | | | mm | ins. |
|---|---|---|---|---|
| Longitudinal | Step $\varphi = 1.25$ | No. of steps 9 | per rev. / .063 to .4 | (.0025 – .016)* |
| Facing | Step $\varphi = 1.25$ | No. of steps 9 | per rev. / .032 to .2 | (.0013 – .008)* |
| | Micro feeds for superfine turning | | per rev. / .01 to .05 | (.0004 – .002) |
| Finer feeds can be provided if required: | | | | |
| Longitudinal | Step $\varphi = 1.25$ | No. of steps 9 | per rev./.04/.25 or .022/.14 | (.0016/.0098 or .00086/.055) |
| Facing | Step $\varphi = 1.25$ | No. of steps 9 | per rev. / .02/.125 or .011/.07 | (.0008/.0049 or .00044/.0028) |

* (Spindles of machine, normally with metric threads, are also available with inch threads)

## Thread pitches

| | | |
|---|---|---|
| With change gears | | |
| Metric threads | No. of threads 35 | from .2 to, 24 mm |
| Inch threads | No. of threads 34 | from 80 to 4 T.P.I. |
| Module threads | No. of threads 36 | from .3 to 8 module |
| Leadscrew pitch to DIN 113 | | 36×6 mm. Trapezoid |

## Drive

| | | |
|---|---|---|
| Drive capacity | | 1.3/2.2 kw. |
| Diving motor | Build to DIN 42950 | Form B 5 |
| | Casing to DIN 40050 | P 33 |
| | Speeds | 750/1500 r.p.m. |
| | Arranged for | A.C., 3 phase |
| | Voltage (special voltages on request) | 220 or 380 volts |
| | Frequency | 50 cycles |

## Floor and space requirements

| | | | |
|---|---|---|---|
| Basis space | length×width | 1500×900 mm. | 5×3 ft. |
| Height of machine | | 1250 mm. | 4 ft. |
| Case dimensions | | 1.7×1.1×1.6 metres | 5½×3½×5½ ft. |
| Shipping dimensions | | approx. 3.0 cbm. | 107 cu.ft. |

## Weights

| | | | |
|---|---|---|---|
| Nett, | including electrical equipment | approx. | 1000 KG = 1 ton |
| | without electrical equipment | approx. | 950 KG = 19 cwt. |
| Gross, | packed for rail transport | approx. | 1150 KG = 1 t. 3 cwt. |
| | packed for shipment | approx. | 1200 KG = 1 t. 4 cwt. |

## Standard Equipment

included in the machine price

25 Pick-off gears with 25, 26, 27, 30, 30, 35, 40, 45, 50, 55, 60, 65 70, 75, 80, 85, 87, 90, 95, 100, 105, 110, 120, 125 and 127 teeth (for standard and odd pitches)
1 Driver plate a 48 m A
1 Centre adaptor a 24 with centre a 25
1 Protecting nut for spindle thread
1 Tungsten carbide tipped centre b 29,4 for tailstock
1 Glass tube with 10 shear pins a Zt 1/54a
Tool kit, 2 Tins = 2 litres lubrication oil "Mobil Velocite Oil No. 4"
1 Grease gun BON 417/1 for headstock
1 Measuring device on lower slide
1 Belt changing device
1 Screw-operated tailstock b 5, with lateral adjustment
2 Operating instructions

Boley | Inspection procedure for BOLEY 5 LZ Sliding, Surfacing and Screwcutting Lathes. Acceptance directives for the working accuracy of the machine. | **BON** 320/3e Sheet 3

The following measurements are required for use within our own works. Only extracts from these figures are entered in the Test Sheet BON 320/3e, Sheet 1, under Items 14-16, for the customer's use.

Customer: .....
Machine No. 60 635 NS 58 764 Date 30/11/61 Tester Dr.

| No. | Operation and measurements | Illustration | Permissible error mm | Actual error mm |
|---|---|---|---|---|
| 1. | Turn bronze or brass pin without centres with diamond tool. Check roundness and centricity. | roundness a/b; 25; 300; M 58<br>n=2800 r.p.m.<br>s=.02 mm/rev.<br>a=.05 mm depth of cut<br>v=265 m/min. | Roundness:<br>at a: .005<br>at b: .005<br>Centricity:<br>.005 in 75 mm | .002<br>.002<br>.002 in 75 mm |
| 2. | Turn mild steel cylinder with diamond, radius 1 mm, held between centres. Check finish (roughness). Turn without using intermediate gears. | ±300; M 58; 120<br>n=1400 r.p.m.<br>n=2800 r.p.m.<br>s=.02 mm/rev.<br>a=.05 mm<br>v=265 m/min. | at 1400 r.p.m.:<br>R= .60 µm<br>at 2800 r.p.m.:<br>R= .70 µm | R= .28 µm<br>R= .45 µm |
| 3. | Face driving plate, if included in Works Order, if not, face slave driving plate. Check flatness of face (only hollow). | Ø 60; 25<br>n=355 r.p.m.<br>s=.1 mm/rev.<br>a=.2 mm depth of cut<br>v=140 m/min. | .015 in 120 mm | .01 in 120 mm |
| 3a. | Bed straight longitudinally (convex only). | | 0 - .02 in 1000 mm | .01 in 1000 mm |
| 3b. | Bed flat back to front. No distortion (±) permissible. | | + .02 or - .02 mm in 1000 mm | + .01 in 1000 mm |
| 4. | Release pressure max. 330 lbs. | | Release pressure set to 330 lbs. | |

J. Boley, Eßlingen a. N. | Ersatz für / Ersatz durch | Ges. Nr. 1. 1957 | AV bearb. | gez.

Inspection card for turning test components at our works.
All dimensions are in millimetres.
Corresponding dimensions in inches:
Roundness .00008"
Centricity .00008"
Surface finish: 2–4 micro-inches (at 1400 r.p.m.)
3–7 micro-inches (at 2800 r.p.m.)

Before any 5 LZ leaves our works, we must have a record of its working accuracy. The figures given by measurements made with the machine stationary and recorded in the inspection sheet are not sufficient for us. The actual running accuracy figures are obtained by the methods shown alongside and the records are kept by the Works Management, so that the condition of the machine on delivery can be determined at any time.

When turning up to the six-station longitudinal stop d 31, the cut-out accuracy is .02 mm (about .0008").

Each machine is accompanied by an inspection card. Quite apart from the various inspections that take place in the course of making the machine, each machine is subjected to a general inspection after it is completed. Having carried out the inspection as outlined in the test bock for machine tools (lathes with toolmakers' accuracy), the machine is used for turning test pieces, which reveal the working accuracy and the surface finish that can be achieved in turning and facing operations. The readings thus obtained are nearly always well within the permissible tolerances.

A well-known technical college carried out vibration tests on the machine on our behalf. Vibration forms and resonance curves were registered during dynamic tests with alternating stresses. Moreover, vibration measurements were taken during turning experiments, which included rough as well as fine turning. The report has confirmed that there are no visible chatter marks even during the heaviest load on the driving motor. The machine was stated to be **dynamically stable**.

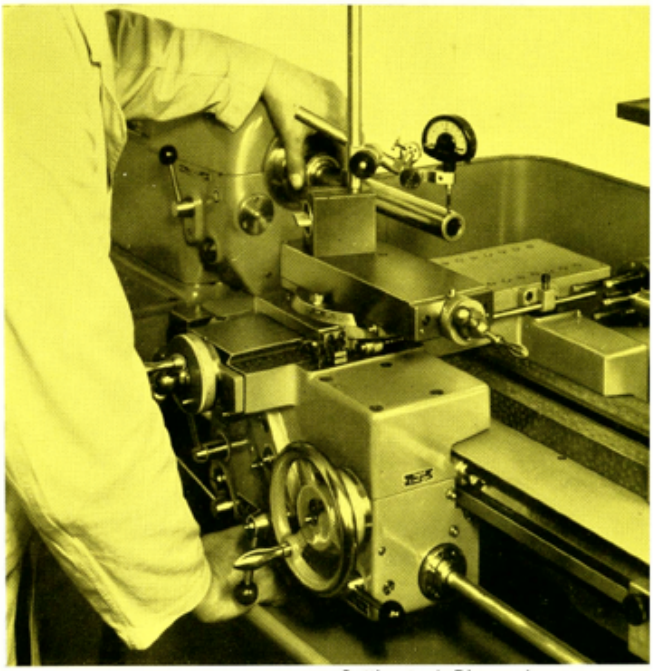

The sharp outlines of the mirror image give clear optical proof of the high finish of this test piece turned with a diamond tool.

This is a characteristic of BOLEY design, maintained throughout the years, combined with first-class workmanship.

The faces are turned to high accuracy and finished with minimum deviation from the geometric form. The excellent finish is achieved by a careful arrangement of bearings.

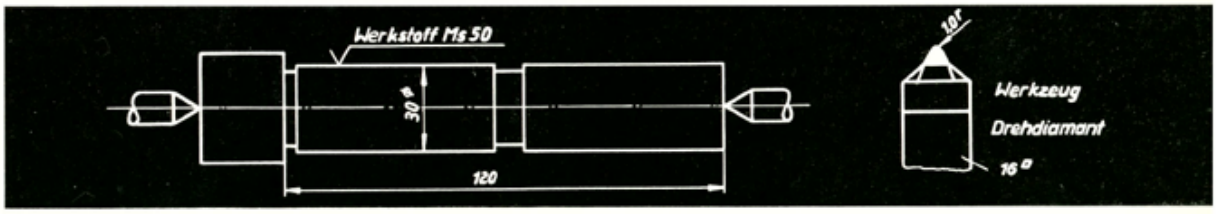
The diagram given below shows a surface finish curve of a test component, turned on a 5 LZ machine, selected at random (measurements taken on a Perth-O-Meter in our laboratory).

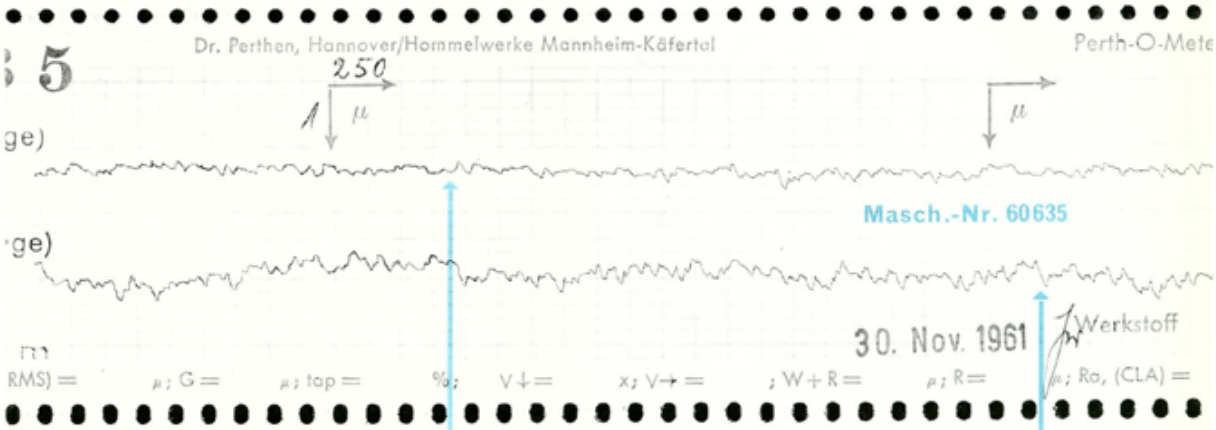
The measuring data are indicated in the diagram.



Material: Brass

Cutting tool: Diamond




Surface-finish diagram of the test piece illustrated above

Details of Machining tolerances:

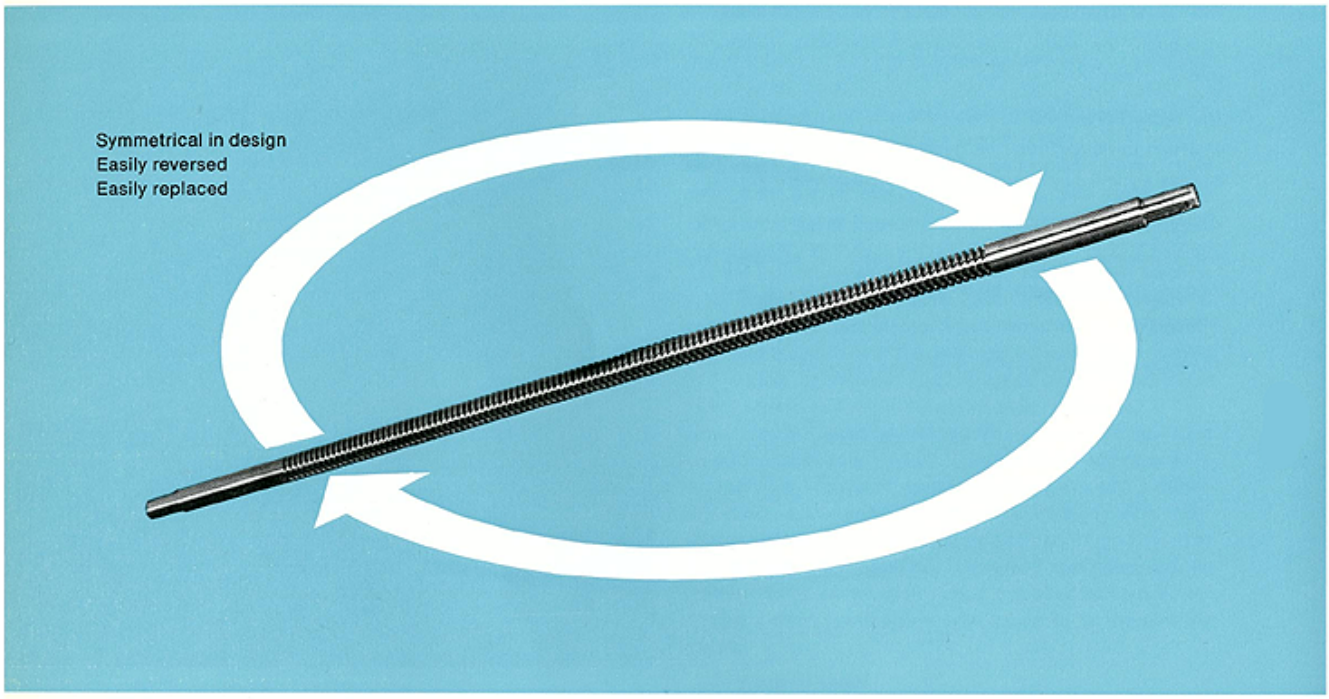
n = 1400 r.p.m. (without countershaft)

**R = 0,28 µ m or RMS = 2-4 micro-inches**

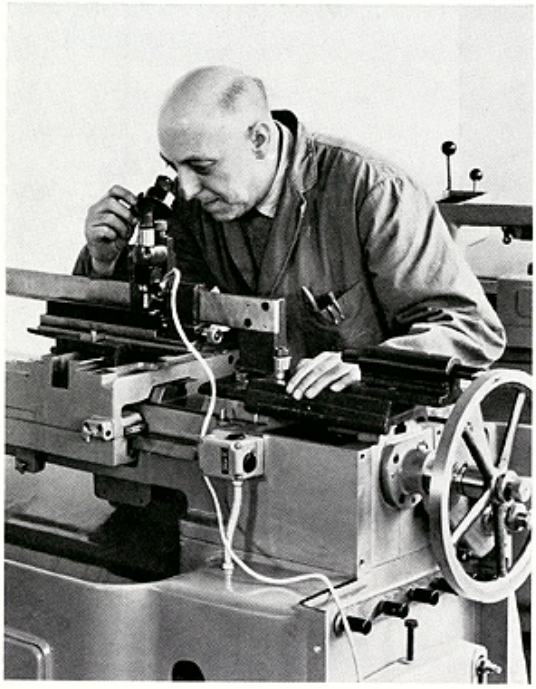
n = 2800 r.p.m. (without countershaft)
Feed = .02 mm. p. rev. (through leadscrew) cutting depth = .05 mm.

**R = 0,45 µ m or RMS = 3-7 micro-inches**

# 10 | Leadscrew




**Guaranteed pitch accuracy of leadscrew when fitted in the machine: .02 mm. (about .0008″) in 300 mm. (about 12″).**



The leadscrew engages in the centre point of resistance in the saddle and obviates canting. It is driven through a reversing lobe and change-gears. When one flank of the leadscrew thread is worn and accurate threads can no longer be cut with it, the spindle can easily be reversed. The pitch accuracy, with the leadscrew fitted in the machine, is checked with super-precision optical instruments.

The machine is suitable for various methods of chucking:

**Draw-in collet a 12, size 4,** located direct in the spindle, the clamping being effected by means of a hand lever. Through bores up to 16 mm., blind bores up to 20 mm. If it is necessary to clamp components to exact identical lengths, an adjustable internal stop a 16 can be inserted in the collet.

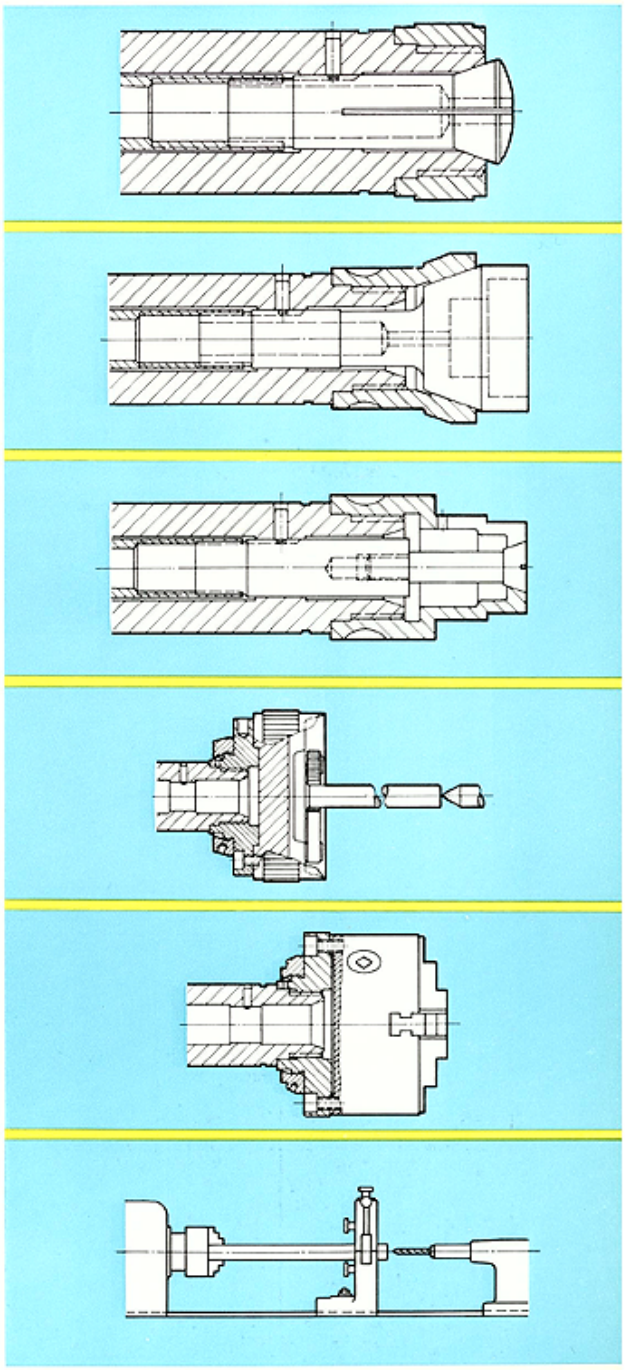
**Oversize collet a 18,4 and a 18,6, size 4,** for short components with large diameters exceeding the clamping capacity of standard collets. The enlarged collets are supplied rough-machined and are finished by the users. They can be hardened after slotting. Special collets with spring ejector can be supplied, if required.

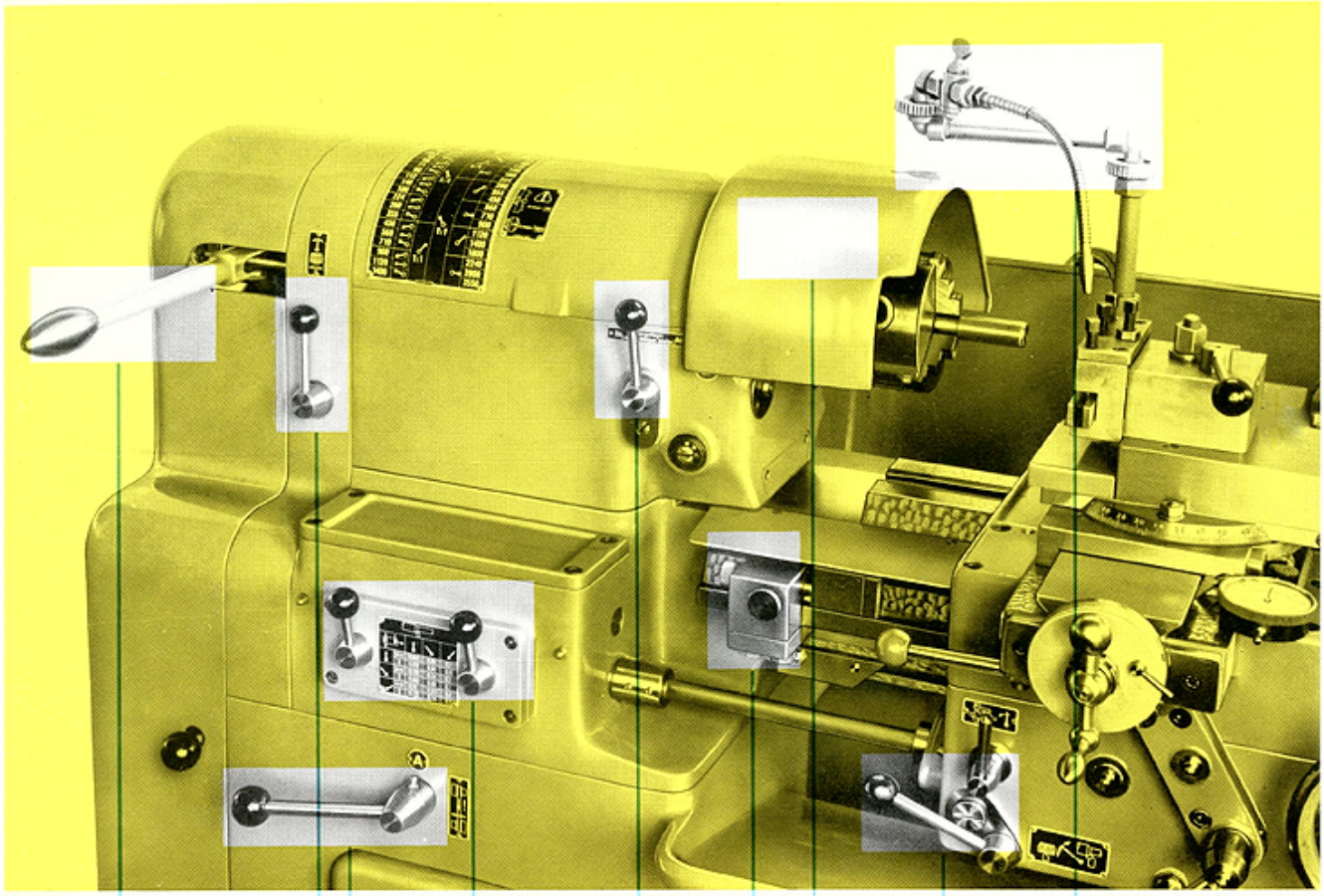
**Expanding mandrels.** Where the components are to be held in the bore, the expanding mandrels a 20 or expanding adaptors a 20,2, size 4, can be used, provided the eccentricity between bore and outside diameter of the component permits. Where concentricity must be very accurately maintained, the use of special chucks and expanding mandrels is recommended, e. g. "Stieber" roller clutch, or a similar clamping device.

**For turning between centres,** the driver a 33 with automatic clamping is used instead of dogs, which are not altogether safe and in any case, rather cumbersome. (No key is required for the driver.) The reliable and safe drive of the components is effected by means of three eccentric holding jaws, moved quickly by a tooth rim. A safety device is provided to prevent slipping when the gear-box brake is actuated.

**Chucks of all types are available,** but three-jaw or four-jaw chucks with a retaining device, are predominantly used.

**Steadies.** The travelling steady c 17,1 which is fixed on the carriage and has a maximum capacity of 58 mm., or the fixed steady c 19,1, whose jaws open to facilitate component unloading, with plain or roller jaws, can be employed.





Reversing lever
for L.H. and R.H. threads

Adjustable
splashguard g 89

Hand-lever clamping

Sliding gear box
for 9 longitudinal
and 9 facing feeds

Adjustable
coolant pipe

Countershaft 1:4

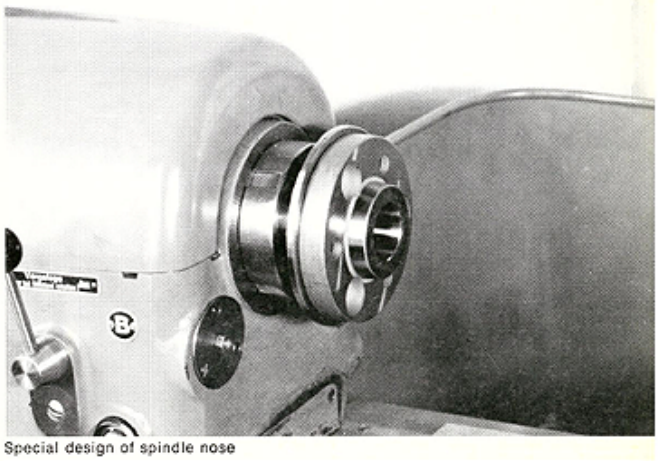
Control lever for lead and feed screws
Automatic drop-nut release

Belt-change
for altering speeds

L.H. longitudinal stop
for feed screw

## Headstock

The work spindle – not subject to the belt pull – runs in adjustable plain bearings of hardened bronze. The countershaft is controlled by a lever. Quick hand lever clamping is available when using collets.
When the motor is switched off, the spindle is immediately braked. On request, the spindle can be provided with an external steep taper to 3 DIN 55022 and an internal Morse taper No. 4 (together with spindle adaptor a 23, for use of collets a 12).



Special design of spindle nose

## Drive and Spindle Speeds

The spindle speed wanted is quickly selected by switch. No drop of spindle speeds. Efficient drive.
The motor is arranged on an adjustable rocker, and the drive is transmitted to a gear-box 1:4 through a two-step vee-pulley. From here, the drive to the headstock is by means of a three-step flat belt pulley with a belt-changing device. The machine has 22 different spindle speeds in all, 18 spindle speeds in a lower, and 18 in a higher speed range.

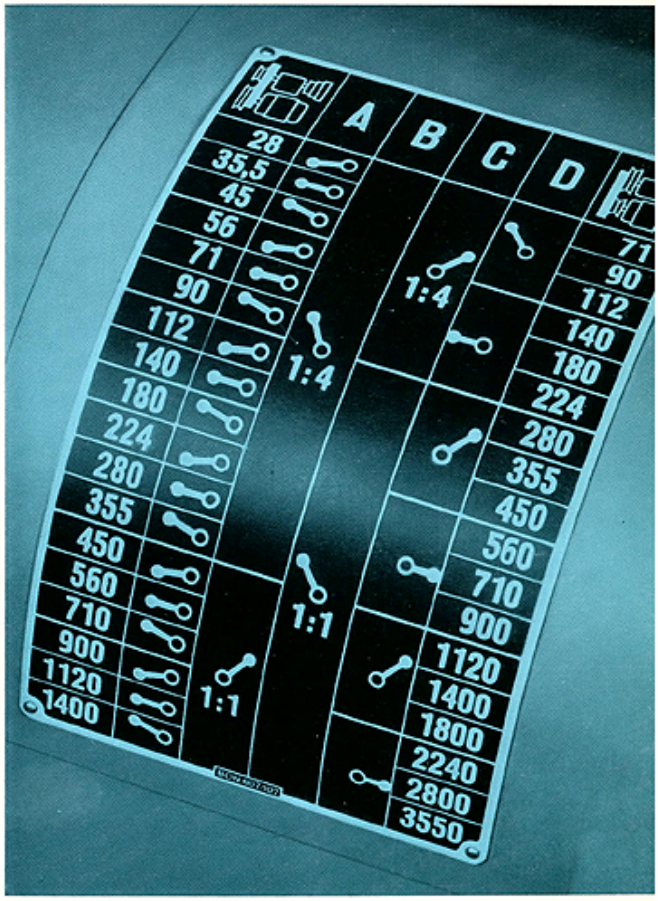
Spindle speed range with lower speeds:

28 – 35 – 45 – 56 – 71 – 90 – 112 – 140 – 180 – 224 – 280 – 355 – 450 – 560 – 710 – 900 – 1120 – 1400 r.p.m.

Spindle speed range with higher speeds:

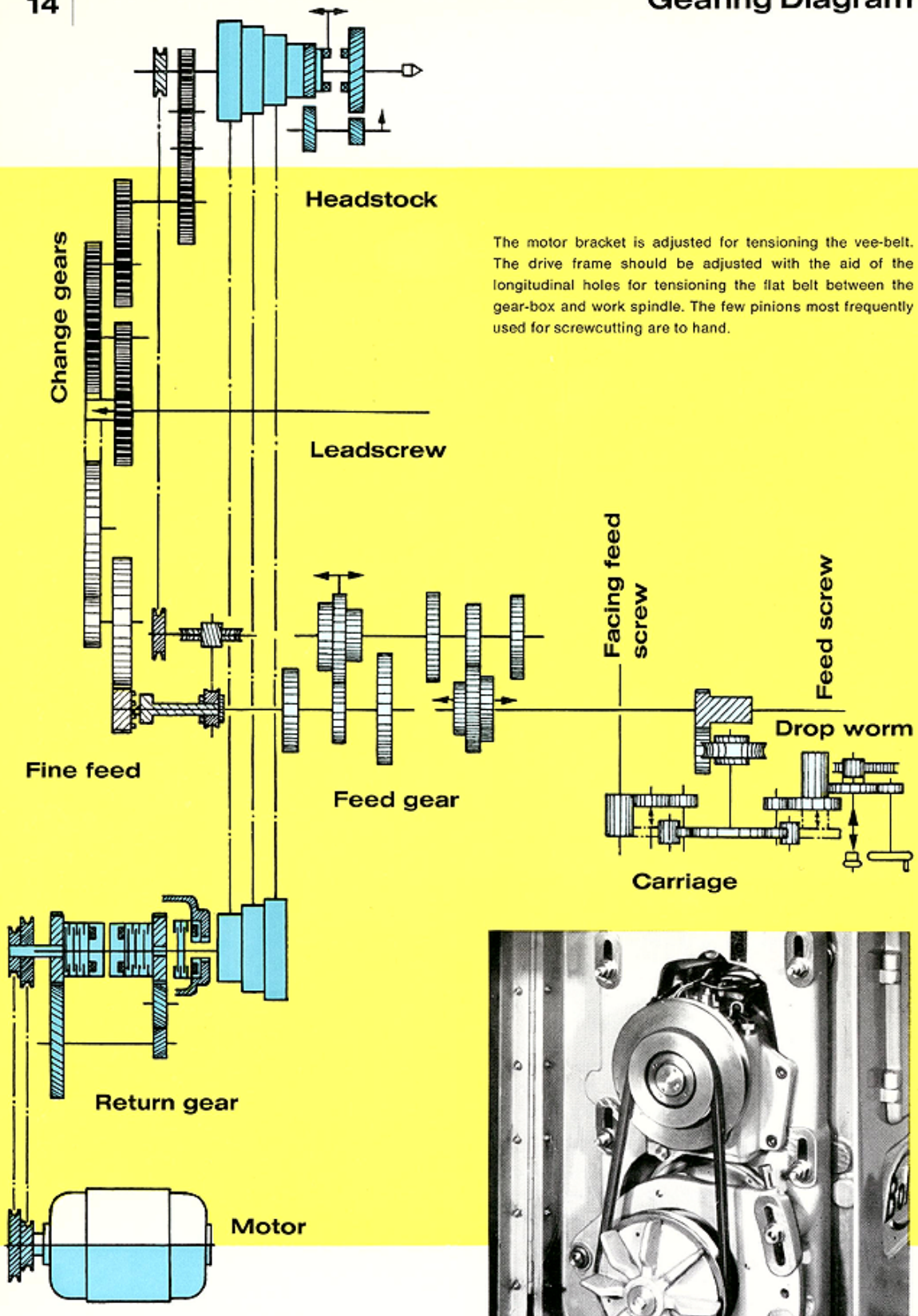
71 – 90 – 112 – 140 – 180 – 224 – 280 – 355 – 450 – 560 – 710 – 900 – 1120 – 1400 – 1800 – 2240 – 2800 – 3550 r.p.m.
The speed step for both ranges is 1.25.

Both speed ranges are available on the machine by shifting the vee-belt between the motor and the gear-box, and for this type of machine the number of speeds is unusually great. Most of the speeds can be engaged while the machine is running. Only while the spindle countershaft is engaged (the motor continues running) is the spindle temporarily stopped by means of an automatic brake. One lever only, conveniently arranged, is used for controlling the multi-disc clutches and brake. This hand lever is also used for controlling the forward and return traverse of the carriage when threading individual components and for setting the semi-automatic or fully automatic carriage cycle for threading in batch production.




A Belt shift.
B Layshaft.
C Cotrol switch.
D Pole-change reversing switch.

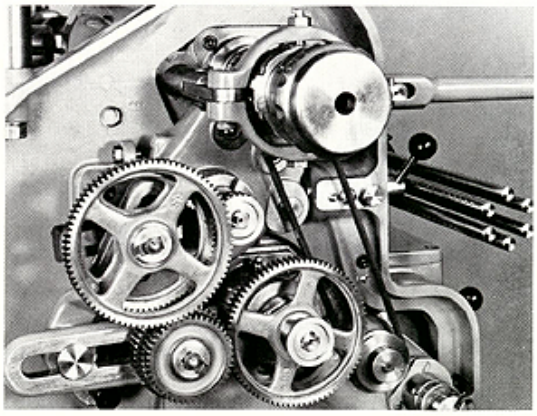
# Gearing Diagram



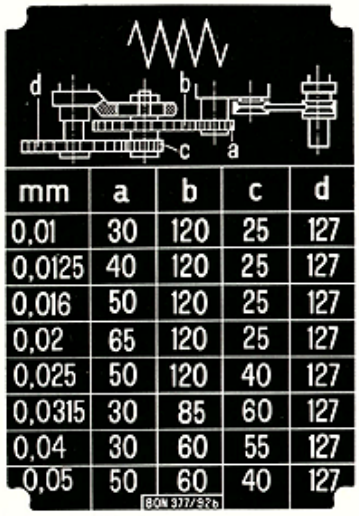

The motor bracket is adjusted for tensioning the vee-belt. The drive frame should be adjusted with the aid of the longitudinal holes for tensioning the flat belt between the gear-box and work spindle. The few pinions most frequently used for screwcutting are to hand.



Driving motor and gear box



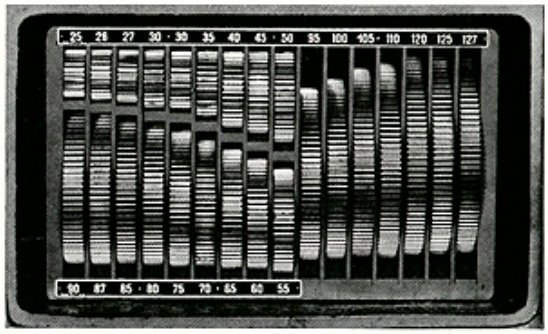
Auxiliary shears for unusual threads




| mm | a | b | c | d |
|---|---|---|---|---|
| 0,01 | 30 | 120 | 25 | 127 |
| 0,0125 | 40 | 120 | 25 | 127 |
| 0,016 | 50 | 120 | 25 | 127 |
| 0,02 | 65 | 120 | 25 | 127 |
| 0,025 | 50 | 120 | 40 | 127 |
| 0,0315 | 30 | 85 | 60 | 127 |
| 0,04 | 30 | 60 | 55 | 127 |
| 0,05 | 50 | 60 | 40 | 127 |

BDN 377/92b

Superfine feeds for fine turning




This is how the change-gears are stored in the righthand side of the front of the machine.

The fewer change-gears are in mesh, the more accurate are the threads. Only 3 change-gears are required for pitches from 1 to 7 mm. Practically every pitch can be set with sufficient accuracy.

**Example:**

To change over from 1.25 to 3 mm. pitch, **only one** pinion has to be changed, a 25-tooth pinion being replaced by one with 60 teeth, as can be seen from the change-gear table below.

The space provided for the change-gears is so ample that additional auxiliary shears and change-gears can be utilised to produce the most unusual pitches with a high degree of accuracy.

Change-gear Table

G. BOLEY Werkzeug- u. Maschinenfabrik Eßlingen / Neckar

$\frac{a \cdot c \cdot e}{b \cdot d \cdot f} = \frac{mm}{4}$

6mm

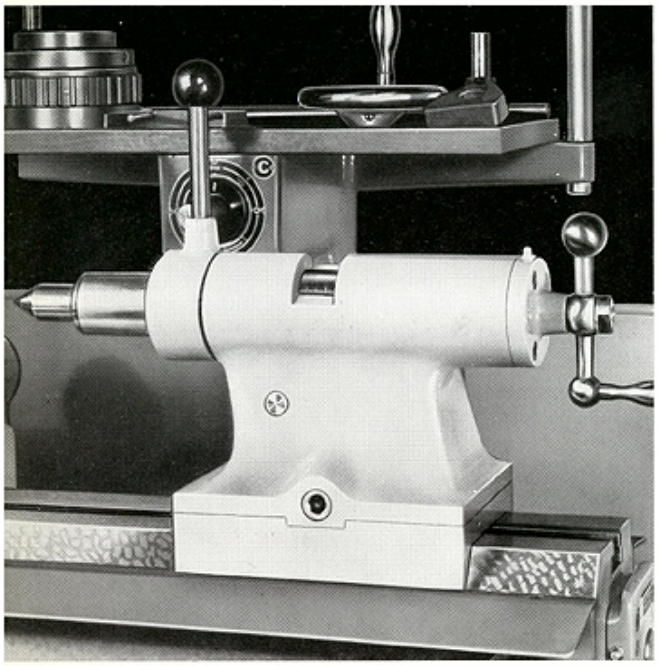
| mm | a | b | c | d |
|---|---|---|---|---|
| 0,2 | 30 | 120 | 25 | 125 |
| 0,25 | 30 | 100 | 25 | 120 |
| 0,3 | 25 | 120 | 45 | 125 |
| 0,35 | 25 | 80 | 35 | 125 |
| 0,4 | 25 | 60 | 30 | 125 |
| 0,45 | 30 | 80 | 30 | 100 |
| 0,5 | 25 | 60 | 30 | 100 |
| 0,6 | 30 | 60 | 30 | 100 |
| 0,7 | 35 | 60 | 30 | 100 |
| 0,75 | 25 | 40 | 30 | 100 |
| 0,8 | 40 | 60 | 30 | 100 |
| 1 | 25 | 120 | | 100 |
| 1,25 | 25 | 120 | | 80 |
| 1,5 | 30 | 120 | | 80 |
| 1,75 | 35 | 120 | | 80 |
| 2 | 40 | 120 | | 80 |
| 2,5 | 50 | 120 | | 80 |
| 3 | 60 | 120 | | 80 |
| 3,5 | 35 | 120 | | 40 |
| 4 | 30 | 120 | | 30 |
| 4,5 | 45 | 120 | | 40 |
| 5 | 50 | 120 | | 40 |
| 5,5 | 55 | 120 | | 40 |
| 6 | 60 | 120 | | 40 |
| 7 | 70 | 120 | | 40 |
| 8 | 40 | 30 | 90 | 60 |
| 9 | 45 | 30 | 90 | 60 |
| 10 | 50 | 30 | 90 | 60 |
| 12 | 60 | 30 | 75 | 50 |
| 14 | 70 | 30 | 75 | 50 |
| 16 | 40 | 30 | 90 | 30 |
| 18 | 45 | 30 | 90 | 30 |
| 20 | 50 | 30 | 90 | 30 |
| 22 | 55 | 30 | 90 | 30 |
| 24 | 60 | 30 | 90 | 30 |

| Zoll - INCH - Pouce | a | b | c | d |
|---|---|---|---|---|
| 80 | 30 | 90 | 25 | 105 |
| 72 | 30 | 85 | 30 | 120 |
| 64 | 25 | 85 | 27 | 80 |
| 60 | 25 | 85 | 45 | 125 |
| 56 | 25 | 70 | 27 | 85 |
| 48 | 25 | 85 | 45 | 100 |
| 44 | 25 | 65 | 45 | 120 |
| 42 | 45 | 85 | 30 | 105 |
| 40 | 40 | 70 | 25 | 90 |
| 36 | 25 | 85 | 60 | 100 |
| 32 | 50 | 85 | 27 | 80 |
| 30 | 50 | 85 | 45 | 125 |
| 28 | 30 | 85 | 45 | 70 |
| 26 | 30 | 65 | 45 | 85 |
| 24 | 35 | 70 | 45 | 85 |
| 22 | 30 | 55 | 45 | 85 |
| 20 | 30 | 120 | 127 | 100 |
| 18 | 30 | 120 | 127 | 95 |
| 18 | 30 | 120 | 127 | 90 |
| 17 | 30 | 120 | 127 | 85 |
| 16 | 25 | 100 | 127 | 80 |
| 15 | 25 | 125 | 127 | 60 |
| 14 | 30 | 120 | 127 | 70 |
| 13 | 30 | 120 | 127 | 65 |
| 12 | 25 | 80 | 127 | 75 |
| 11 | 25 | 110 | 127 | 50 |
| 10 | 45 | 120 | 127 | 75 |
| 9 | 35 | 70 | 127 | 90 |
| 8 | 35 | 80 | 127 | 70 |
| 7 | 40 | 80 | 127 | 70 |
| 6 | 35 | 70 | 127 | 80 |
| 5 | 35 | 70 | 127 | 50 |
| 4½ | 35 | 70 | 127 | 45 |
| 4 | 30 | 80 | 127 | 30 |

| Modul | a | b | c | d | e | f |
|---|---|---|---|---|---|---|
| 0,3 | 26 | 120 | 87 | 80 | | |
| 0,4 | 26 | 120 | 87 | 60 | | |
| 0,5 | 50 | 80 | 87 | 40 | 26 | 90 |
| 0,6 | 65 | 120 | 87 | 100 | | |
| 0,7 | 26 | 60 | 87 | 30 | 35 | 80 |
| 0,8 | 26 | 90 | 87 | 40 | | |
| 0,9 | 26 | 80 | 87 | 40 | | |
| 1 | 26 | 60 | 87 | 30 | 50 | 80 |
| 1,2 | 26 | 40 | 60 | 80 | 87 | 45 |
| 1,25 | 25 | 40 | 65 | 80 | 87 | 45 |
| 1,4 | 35 | 40 | 87 | 50 | 65 | 90 |
| 1,5 | 26 | 40 | 87 | 80 | 100 | 60 |
| 1,6 | 26 | 45 | 87 | 30 | 60 | 80 |
| 1,75 | 35 | 30 | 87 | 60 | 65 | 80 |
| 1,8 | 26 | 40 | 87 | 80 | 120 | 60 |
| 2 | 26 | 40 | 75 | 60 | 87 | 45 |
| 2,1 | 26 | 30 | 87 | 80 | 105 | 60 |
| 2,25 | 45 | 30 | 65 | 60 | 87 | 80 |
| 2,4 | 26 | 30 | 87 | 45 | 90 | 80 |
| 2,5 | 50 | 30 | 65 | 60 | 87 | 80 |
| 2,7 | 26 | 30 | 90 | 40 | 87 | 80 |
| 2,75 | 55 | 30 | 65 | 60 | 87 | 80 |
| 3 | 30 | 30 | 65 | 60 | 87 | 40 |
| 3,25 | 27 | 45 | 90 | 25 | 65 | 55 |
| 3,5 | 35 | 30 | 65 | 60 | 87 | 40 |
| 3,75 | 50 | 30 | 65 | 80 | 87 | 40 |
| 4 | 50 | 30 | 65 | 75 | 87 | 40 |
| 4,5 | 45 | 30 | 65 | 60 | 87 | 40 |
| 5 | 50 | 30 | 65 | 60 | 87 | 40 |
| 5,25 | 65 | 30 | 70 | 80 | 87 | 40 |
| 5,5 | 65 | 30 | 55 | 80 | 87 | 30 |
| 6 | 65 | 40 | 90 | 60 | 87 | 45 |
| 6,75 | 65 | 40 | 87 | 80 | 90 | 30 |
| 7 | 70 | 40 | 87 | 30 | 65 | 60 |
| 7,5 | 65 | 30 | 75 | 60 | 87 | 40 |
| 8 | 65 | 30 | 80 | 60 | 87 | 40 |

25–26–27–30–30–35–40–45–50–55–60–65–70–75–80–85
87–90–95–100–105–110–120–125–127

BDN 377/92c



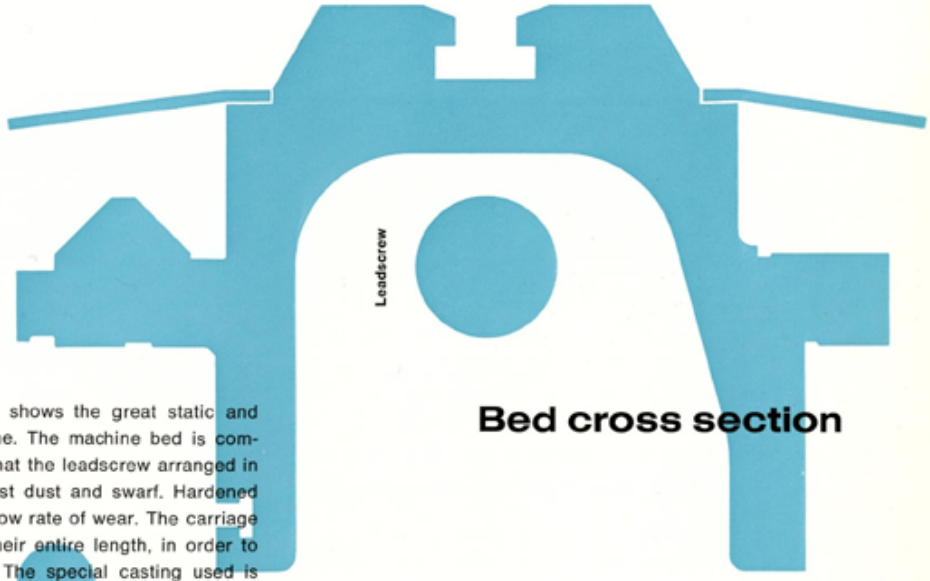
## Tailstock

Sleeve with 40 mm. diameter, hardened, Morse Taper 3. Sleeve movement 80 mm. This can be read off a scale on the tailstock body. The sleeve can be fixed concentrically (no centre line displacement). The tailstock can be adjusted for taper turning 10 mm. to either side.

Special tailstock with a dividing ring can be supplied, if required.

## Machine base

Made from one casting. The weight of the machine, in conjunction with vibration-eliminating properties of cast iron, ensure quiet running of this high-speed machine. To facilitate cleaning, the machine is smooth.
It is suitable for operating from a sitting or a standing position, so that it is best suited for batch production and can be operated by personnel with leg disabilities.

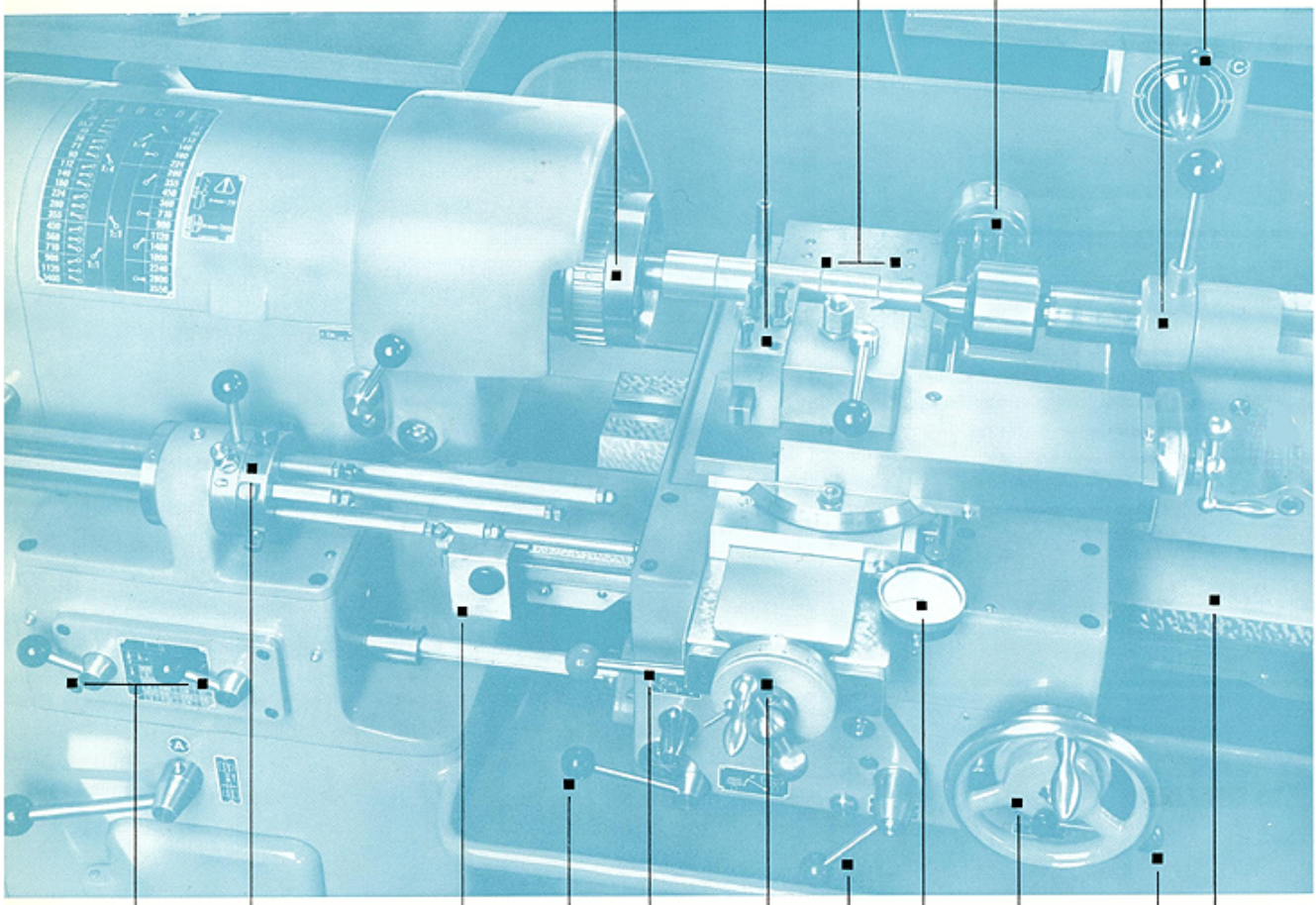



## Bed cross section

The section through the bed shows the great static and dynamic rigidity of the machine. The machine bed is completely closed at the top, so that the leadscrew arranged in the middle is protected against dust and swarf. Hardened saddle slideways – ensuring low rate of wear. The carriage slideways are covered over their entire length, in order to keep out swarf and coolant. The special casting used is highly resistant to wear. The original accuracy is maintained for many years if the machine is properly serviced.

The leadscrew engages in the centre of resistance of carriage

Assembling the bed and carriage


1
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17

1 Automatic driver a 33

2 Quick-change toolholder d 30

3 Mounting bores for rear toolholders

4 6-Station facing stop b 34

5 Concentric sleeve clamping device

6 Control switch for spindle and carriage movement when screw-cutting (for electro-magnetic clutches in the gear box)

7 Sliding gear for 9 longitudinal and 9 cross feeds

8 6-Station longitudinal stop d 31

9 L. H. longitudinal stop for feed screw

10 Control lever for lead and feed screws

11 Selector lever for facing "forwards" or "return"

12 Large chromium-plated scale ring

13 Selector lever for longitudinal turning "left" or "right"

14 Clock gauge for accurate cross positioning

15 Handwheel with scale ring for quick carriage adjustment

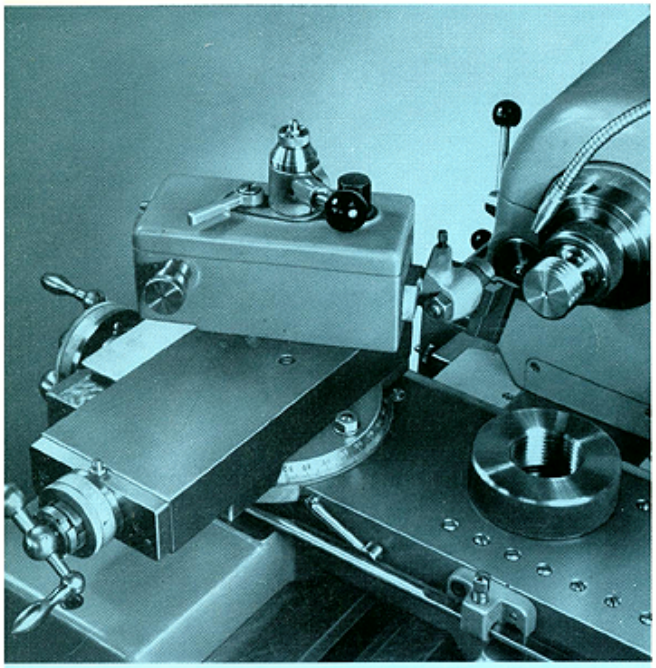
16 Disengaging lever for feed screw

17 Slideways, covered over the entire length

Longitudinal turning and facing by means of feed screw can be done in both directions, employing adjustable stops. The longitudinal stop is provided with a fine adjustment screw and can take a slip gauge. If required, a six-station turret stop can be supplied for carriage and facing slide. Moreover, a clock gauge can be arranged on the facing slide. The drive of the feed screw from the headstock is by means of vee-belts, and not gears, so as to eliminate vibration. Nine different feeds can be set while the machine is running, with the aid of two levers on the sliding gear box. When the feed screw is used for turning against the hardened stop, a drop worm is released. The releasing pressure can be easily adjusted. The carriage can be clamped for facing. When precision turning with a very small feed (less than .05 mm. or .0019") the feed screw can drive the leadscrew by means of pick-off gears. The minimum feed is .01 mm. per rev. (= .0004"). The handwheel on the righthand end of the feed-shaft and the overrun clutch make rapid adjustment possible with the spindle nut closed. The leadscrew is arranged in the centre line of the bed and engages the carriage at the focal point of resistance. It is completely protected against coolant and swarf. The arrangement prevents canting. The handwheel on the apron, conveniently arranged, serves for easy adjustment of carriage, with the aid of its scale (one division mark = .1 mm. or .004"). This is of great advantage for drilling and boring work. The depth adjustment is by means of a graduated ring. The handwheel can be fixed for screw-cutting. The feed and leadscrew are controlled by one and the same lever and are therefore interlocked.

The large scale ring, 80 mm. diameter (= 3 1/8"), is used for exact readings on the carriage (one division = .05 mm. diameter or .025 mm. slide traverse. If required, the screw can be provided with a 2 mm. pitch [= .079 "] and a scale ring graduation of .02 mm. [= .0008"] in relation to the diameter). The sturdy screw, with 4 mm. (= .157") pitch in the longitudinal and cross slide, affords the advantage of quick adjustment. All slideways are provided with taper gibs. The top slide can be swivelled to either side through angles up to 90°. The graduation is clearly visible from the operator's position. Rear toolholders can be supplied for parting-off and recessing tools, edge-breaking tools, etc. The adjustable toolpost d 6,6, or the rear facing slide d 6,71 described in catalogue De 25, are used for this purpose.

Screwcutting with automatic II and attachment d 32
(Description of d 32 on Page 22)



## Screwcutting

With the set of change-gears supplied (25 gears in all, accommodated in the machine base) it is possible to cut all the usual millimetre and inch threads with pitches from .2 to 20 mm. and from 80 to 4 T.P.I. L.H. and R.H. Module threads from .3 to module 8 can be cut. The return traverse has quadruple acceleration by electric reversal of the gear-box whilst the motor is running. When producing single components, the forward and return traverse of the carriage is controlled with the aid of a manually-operated lever (see No. 6 as illustrated on page 18). Even with small batches of components, it is economical to use the automatics I or II (German patent applied for).

### Automatic I

The control lever (No. 6, page 18) is set for automatic reversal. The carriage moves to the left towards the limit switch at screwcutting speed. On reaching the limit switch, the return traverse speed is quadrupled. The carriage then moves to the right towards a second limit switch, which cuts out the work spindle and carriage movement, thus bringing them to a stop.

### Automatic II

Here, the forward and return traverse of the carriage is carried out automatically. Normally, the fully automatic control mechanism can be used for right-hand threads only, but it can be arranged for cutting left-hand threads, if required.

## Fully automatic control mechanism

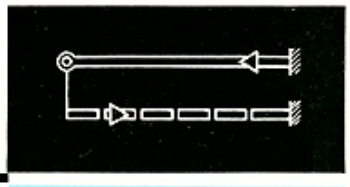
## Automatic Operation

High frequency of reversal for screwcutting. The automatic mechanisms I and II can be fully utilised with the aid of the screwcutting attachment d 32, illustrated and described on page 23. All the operator has to do is to move the lever of the screwcutting attachment against the stop at each pass. This method of operation – the use of automatic mechanisms with the screwcutting attachment – accelerates screwcutting considerably as compared with the usual methods. Screwcutting is made so simple that even unskilled labour can be employed for faultless operation, once the machine hat been set.


Control switch for spindle rotation and carriage movement

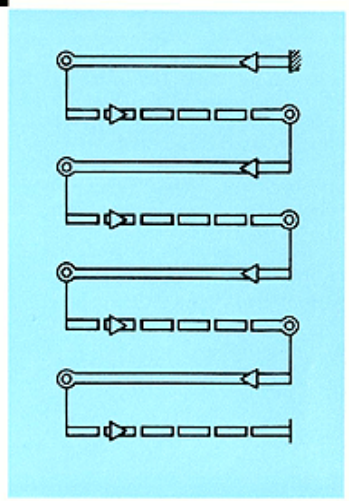
Slow forward traverse for screwcutting, automatic reversal by means of limit switches to four times accelerated rapid return. Standstill

I

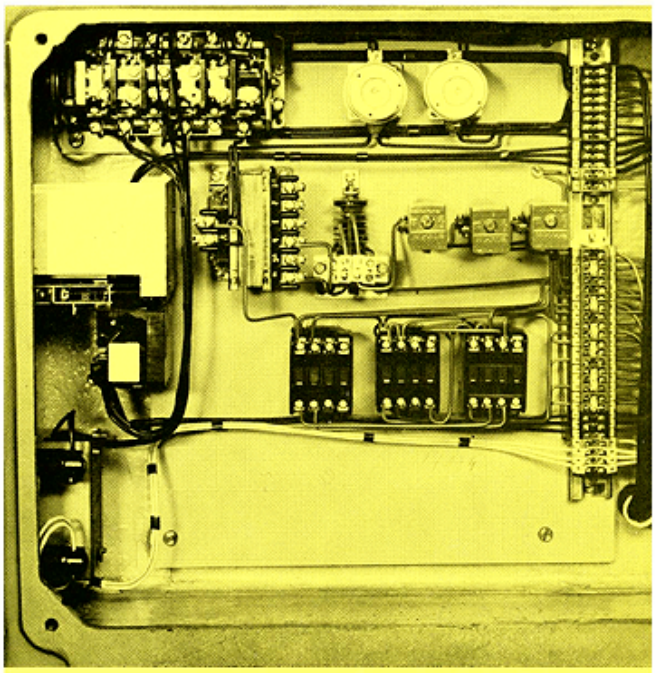


Automatic reversal by means of limit switches

II



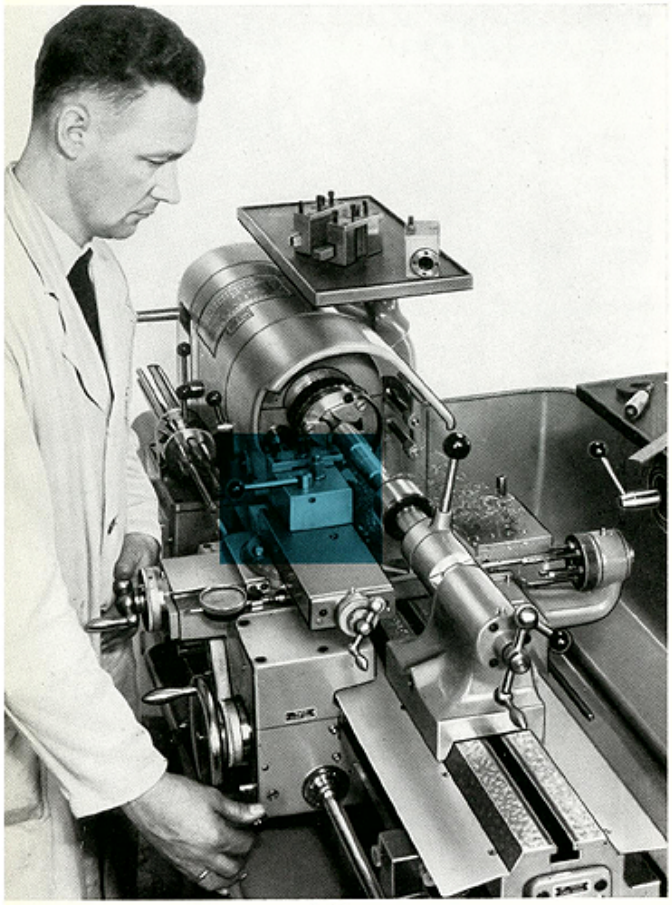
We give below a brief comparison between the change-gears and the Norton gear-box: More gears engage in the Norton gear-box than on the 5 LZ machine. However, the fewer the gears, the higher the accuracy. If, for example, a thread with 7 mm. pitch is to be cut after a thread with 1.25 mm. pitch, only one or, at the most, two gears have to be changed. The gear change is effected quickly and without the aid of any keys, as the gears are secured in position by locking discs. – As already mentioned, the leadscrew is driven through change-gears and the feed screw through the feed gear-box. **The thread pitch and feed are set once, independent of each other,** so that components can be turned rationally in one setting with any desired feed and any pitch of thread. For turning operations, **a single lever is used** for starting the feed screw. The same lever is used to start the leadscrew for screwcutting. It will be seen, therefore, that only **one** lever has to be operated, this being yet another advantage over the Norton gear-box.



## Electric Equipment

Double pole-change flange-type motor, main motor and immersion pump protected by separate motor overloads. Power points for lighting and for connecting various attachments (grinding, milling, etc.), tell-tale lights for main motor and pump. Switchgear clearly arranged and easily accessible at the right- hand end in the machine base.

The illustration shows the accessibility and clear arrangement of the switchgear. The change-gears not required are kept in a compartment under the switchgear.
The switchgear is included in the price of the machine.



Turning with the quick-change toolholder

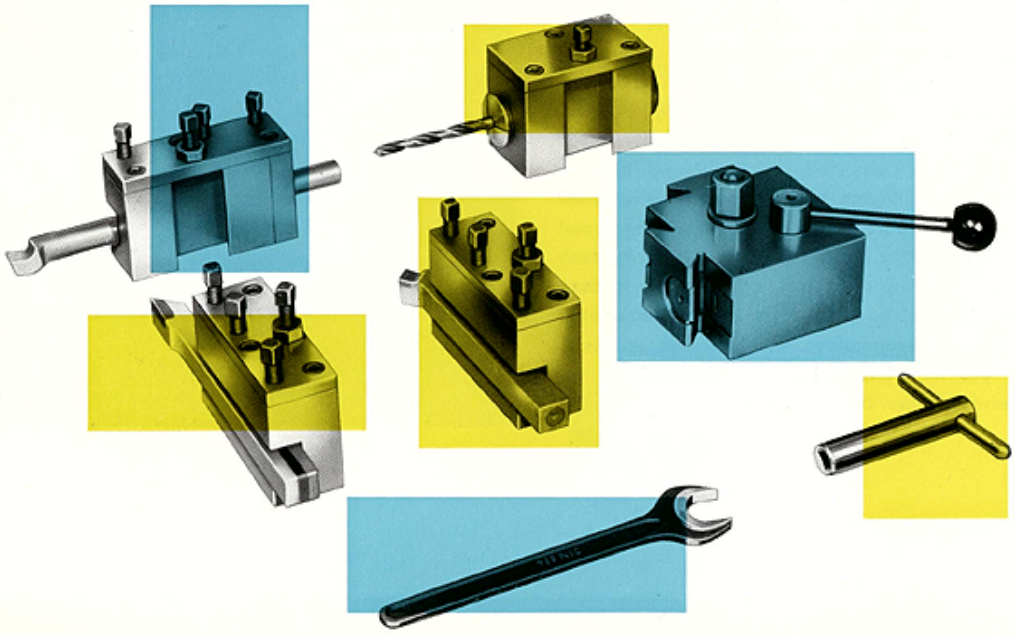
## Quick-change toolholder d 30

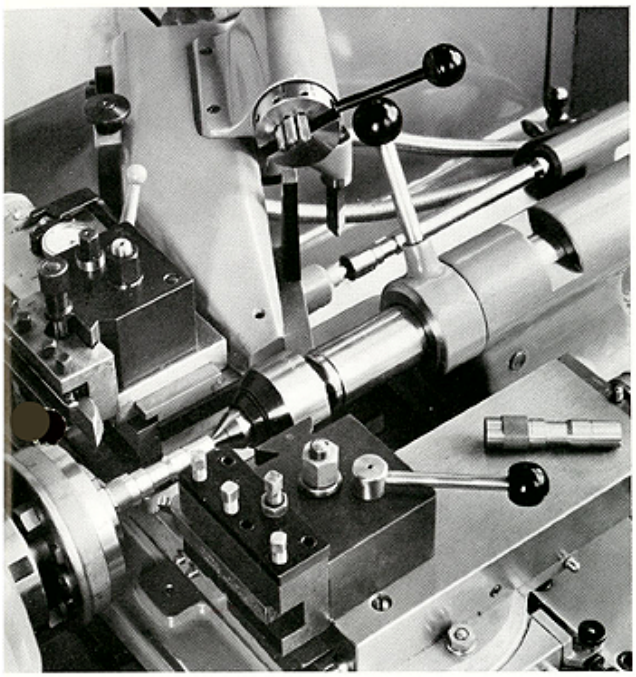
No lathe should be without this equipment. The quick-change toolholder is equally suitable for production of single components or for mass production. Here, any number of tools can be set and used in any sequence. The purpose of the toolholder is to facilitate the change of tools and to speed up the process. It consists of a fixed clamping body with hardened and ground guides and of various holders, easily interchangeable. The holders are arranged and fixed in the guides of the clamping body, in a horizontal or vertical position, according to the type of work be done. A lever is used for clamping the holders in position.
The height of the turning tool con be set with a stop screw. When a tool is changed, no re-adjustment of the height is required and no re-setting of the calibrated ring necessary. For centre and twist drills special toolholders are provided. As the holders can be removed, the tools can be easily reground whilst remaining clamped in the holder. Special holders are used for centring tools and twist drills, so that the automatic feeds to the carriage can be utilised for the drilling operations. A swivelling toolpost is also available where this is preferred.

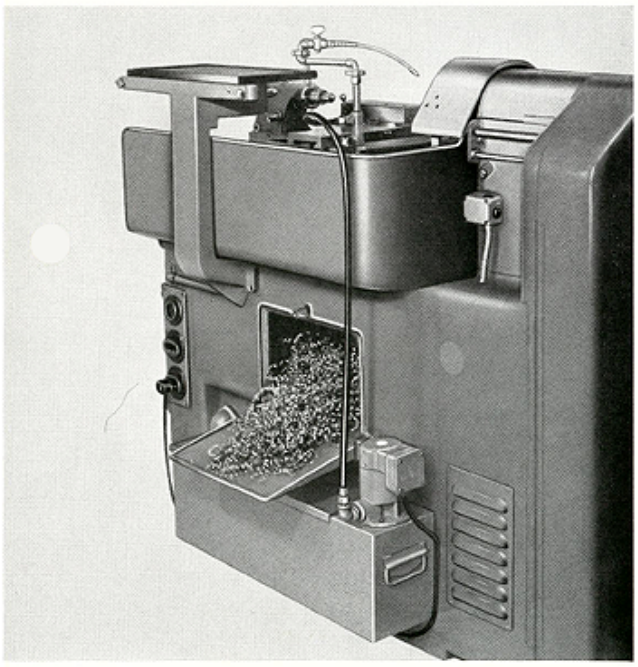
## Screwcutting Attachment d 32

(description on page 20) (German patent applied for).

This incorporates semi-automatic infeed and is used instead of the ordinary toolholder. The screwcutting tool is moved backwards and forwards by means of a lever, and the tool infeed is effected automatically. The overall infeed can be pre-set to scale with the aid of a rotary button (max. 4 mm.). The infeed cam is so arranged that the finishing cuts are carried out with a reduced infeed until this finally reaches zero. Moreover, it is possible to determine beforehand the number of cuts (6 to 24), according to the material machined and depth of thread required. The cutting tool is fed in at an angle of 26°. Thus, the stock is removed mainly at the left thread flank, whereas the right flank is only lightly scraped.







## Hydraulic Copying Attachment d 35

comprising the copying unit, the anchorage for the master shafts and the hydraulic drive.

| | | |
|---|---|---|
| Maximum cross-section of cut | 1 sq. mm. | .00155 sq. inch. |
| Diameter of plunger | 50 mm. | 2″ |
| Stroke of plunger | 60 mm. | 2 3/4″ |
| Maximum difference in diameters | 100 mm. | 4″ |
| Copying length | 500 mm. | 20″ |

The copying attachment is designed for longitudinal copying and works to master shafts. It is mounted at the back of the facing slide at an angle of 60° to the centreline. This still enables facing to be done entirely satisfactorily and also profiles to be turned, which drop off at angles up to 30° towards the back. Components with an angle of drop larger than 30°, for instance 90°, must be finish copy-turned in a second operation, after turning the component round, as is customary with standard turning. These portions of the component, which are not to be copy-turned, can be machined with the standard front toolholder. In many cases, outside diameters can be roughed out with the front tool or an inside diameter bored out, while the component is being copy-turned from the back.

For heavier cuts, multi-cut attachment with turret for three roughing cuts and one finishing cut.

The control accuracy is 5 to 7 microns. This is also affected by other factors such as, for example, tool wear, build-up on the cutting edge, heating and deflection of the component.

The master shaft is held between the centres of two tailstocks, the guide for which is mounted on two bearers. Both bearers are fitted at the back of the lathe bed and firmly bolted to the boxtype base.

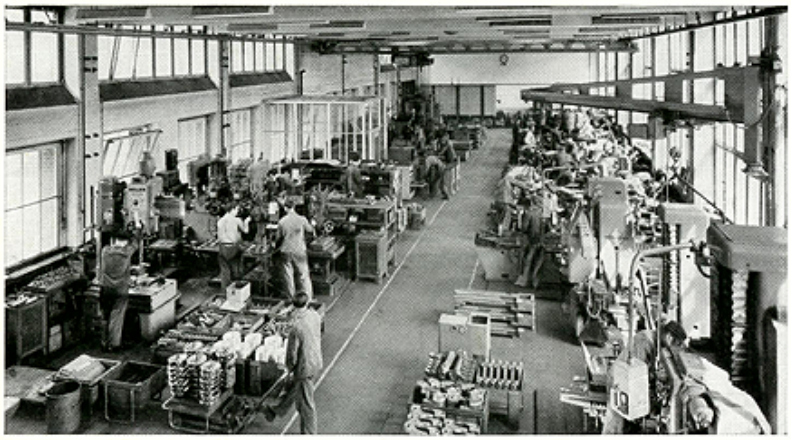
For longitudinal adjustment, one of the tailstock centres is easily adjustable by means of a spindle and calibrated knob, while the other tailstock has built-in plate type thrust springs. Cross adjustment to ensure parallelism of the component can also be effected by setting the guide for the tailstocks by means of a spindle and calibrated knob. As follower, a double-edged stylus is built into the copying slide. The hydraulic unit, working at a pressure between 210 and 485 lbs. per sq. inch, is arranged alongside the machine. It is connected up to the copying attachment by two hoses.

A quick-change toolholder is used to ensure rapid interchange of copying tools and is included in price.

## Coolant attachment g 65,2

This consist of: electric pump with motor overload and tell-tale lights on the right leg of the machine base, coolant tank, metal hose, including travelling coolant jet. The coolant tank, which holds about 6 3/4 gallons and also accommodates the pump, is arranged at the rear of the machine and is easily accessible. For cleaning purposes, the tank can be easily lifted out, with the aid of two handles. The flexible metal coolant hose is adjustable, so that the coolant can be conveyed to the bore for internal turning or drilling.

# 5LZ



Machining individual components on modern high-duty machines

Assembly line
Bed and carriage assembly
Testing the reversing gear

Assembly and inspection of finished machines

Most of the numerous items of special equipment that can be used on the slidding, surfacing and screwcutting lathe, model 5 LZ, are described and illustrated in detail in the catalogue De 25. However, to complete the information contained in this catalogue, we briefly mention the items available.
The chucks, collets, spindle inserts etc. suitable for steep-taper spindles have the suffix "Ku" added to the catalogue number, for instance a 18,2 Ku, and are grouped together in a separate price-list.

| | |
|---|---|
| a 11,2 | Work tray |
| a 12 (size 4) | Collets with continuous bores from .5 to 16 mm., with blind bores from 16.5 to 20 mm., in increments of .5 mm. (inch bores also available) |
| a 14 | A set of collets, consisting of 15 collets a 12, with bores from 2 to 16 mm., in increments of 1 mm., contained in a polished wooden box. |
| a 16 | Adjustable internal stop for a 12 |
| a 18 | Step chucks, the set comprising 4, 31—70 mm. dia., with cone-shaped adaptor a 18,2 |
| a 18,2 | Cone-shaped adaptor for step chuck a 18 and a 18,6 |
| a 18,4 | Oversize collets, rough machined, maximum clamping capacity, about 45 mm. |
| a 18,6 | Oversize collets, pre-machined, maximum clamping capacity, about 70 mm. |
| a 18,8 | Cone-shaped adaptor for a 18,4 |
| a 19 | Ring chucks, the set comprising 4, step diameters from 23 to 70 mm., including cone-shaped backplate a 19,2 |
| a 20 | Expanding mandrel, rough machined, 30 mm. dia. × 35 mm. long, or 30 mm. dia. × 55 mm. long |
| a 20,2 | Expanding adaptor, rough machined, 60 mm. dia. × 50 mm. long |
| a 22 | Adaptor, rough machined, 34 mm. dia × 72 mm. long |
| a 22,2 | Adaptor, rough machined, 50 mm dia. × 40 mm. long |
| a 24 | Centre adaptor with taper bore |
| a 25 | Centre |
| a 26 | Female centre |
| a 33 | Driver with automatic clamping |
| a 33,1 | Automatic driving centre |
| a 40 m A | Faceplate, 240 mm. dia., with retaining device |
| a 44 m A | Three-jaw chuck, 110 mm. dia., with threaded flange and retaining device, with two sets of hardened and ground jaws |
| a 44 m A | Same three-jaw chuck, but with 137 mm. dia. (for light turning work only) |
| a 44,2 m A | Rough-machined threaded flange with retaining device, 113, 125 or 142 mm. outside dia. |
| a 44,4 m A | "Forkardt" chuck with cast steel body, 100 or 125 mm. outside dia., with threaded flange and retaining device |
| a 44,5 m A | Four-jaw chuck, 110 or 137 mm. outside dia., with threaded flange and retaining device |
| a 44,8 m A | Rough turned threaded flange with retaining device for a 44,4 m A, with 100 or 125 mm. outs. dia. |
| a 48 m A | Driving plate, 125 mm. outside dia., with retaining device (standard equipment) |
| a 48,2 | Driving dog holder for a 48 m A |

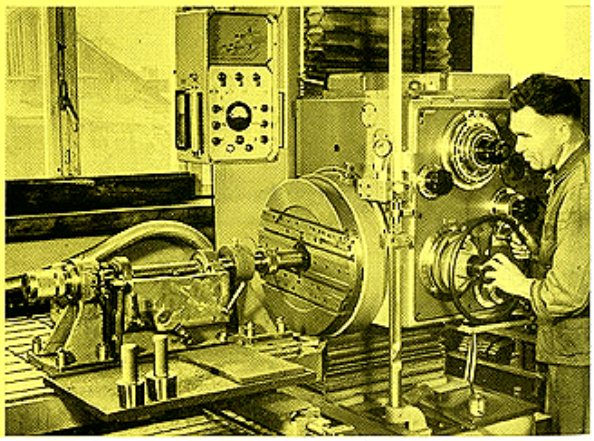
| | |
|---|---|
| b 4 | Lever-operated tailstock |
| b 4,2 | Stop ring for b 4 |
| b 4,4 | Stop ring with precision adjusting screw for b 4 |
| b 4,5 | Toggle for tailstock b 4 |
| b 7,3 | Turret tailstock |
| b 14,2 | Collets (U) for b 14,4 |
| b 14,4 | Two-station turret for b 4 |
| b 20 | Shank for b 21 for use with b 4 |
| b 21 | Tapholder for b 20, self releasing |
| b 21,2 | Collets (U) for b 21 |

| | |
|---|---|
| b 22 | Self-releasing dieholder for b 20, for dies 16 mm. dia. × 5 mm. |
| b 22,1 | 20 mm. dia. × 5 mm. |
| b 22,2 | 20 mm. dia. × 7 mm. |
| b 22,4 | 25 mm. dia. × 9 mm. |
| b 22,6 | 30 mm. dia. × 11 mm. |
| b 22,7 | 38 mm. dia. × 10 mm. |
| b 22,8 | 38 mm. dia. × 14 mm. |
| b 25,1 | Live centre |
| b 27,5 | Drill chuck, 0–10 mm. dia., for screw-operated tailstock |
| b 29 | Centre (= a 25) with a 24 for headstock and lever-operated tailstock b 4 |
| b 29,2 | Half centre, MT 3 |
| b 29,4 | Tungsten carbide centre MT 3 |
| b 29,5 | Centre MT 3 |
| b 30 | Female centre MT 3 |

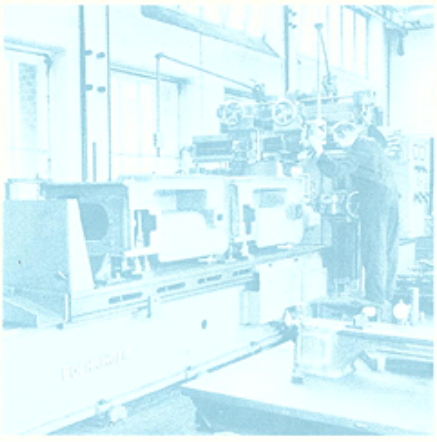
| | |
|---|---|
| c 14,2 | Handrest, collapsible |
| c 17,1 | Travelling steady |
| c 19,3 | Fixed steady, collapsible |
| c 19,4 | Roller jaws for c 19,3 |

| | |
|---|---|
| d 6,3 | Double toolholder |
| d 6,6 | Adjustable toolpost |
| d 6,71 | Rear facing slide |
| d 6,8k | Swivelling lever-operated slide |
| d 8,1 | Four-sided swivelling toolholder, for operation by one hand (special mounting holes) |
| d 8,5 | Four-station turret |
| d 12 | Vertical slide |
| d 30 | Quick-change toolholder (see illustration on page 22), consisting of:<br>d 30,1 – clamping body<br>d 30,2 – three holders for turning tools<br>d 30,3 – Holder for collet a 12, size 4 (without collet), to take drills, reamers, etc.<br>d 30,4 – Vee-shaped insert for d 30,2 |
| d 31 | 6-station longitudinal stop (see illustration on page 18) |
| d 32 | Screwcutting attachment with semi-automatic infeed (illustration and description on page 23) |
| d 32a | Toolholder for internal thread cutting with d 32 |
| d 34 | 6-station facing stop (see illustr. on page 18) |
| d 35 | Hydraulic copying attachment with multi-cut attachment (see page 23) |

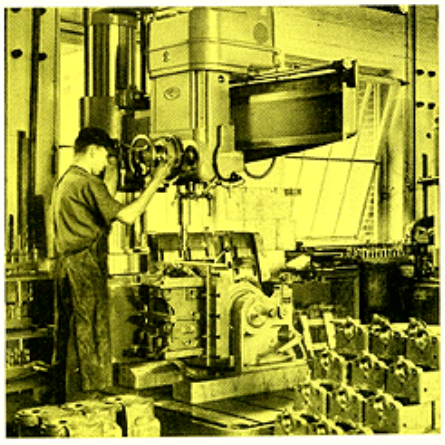
| | |
|---|---|
| g 65,2 | Coolant attachment |
| g 77a | Drawing holder |
| g 80 | Workpiece tray |
| g 83,1 | Operator's stool with backrest, sitting height 70 cm. |
| g 88 | Lighting |
| g 89 | Adjustable splash guard |



Machining headstock bodies on a broring mill.



Planing the massive machine bases



Drilling headstock bodies


**Small Precision Lathes**

**Mechanics' Lathes**

**Finish-turning Lathes**

**Semi-Automatic Finish-turning Machines with cam-controlled saddle**

Boley

# G. BOLEY · 73 ESSLINGEN

**Finest Turning Lathes**

**Turret Lathes**

**Automatic Capstans**

**Small Fine-drilling Machines**

**Multi-spindle Drilling and Tapping Machines**

**Watchmakers' Tools and Parallel Vices**

7. 3. Printed in Western Germany