



Operating Instructions

Universal Precision Manual Lathes



D2000 E



D2400 E



D3000 E

**Walter Blombach GmbH
Tool and Machine Factory**

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EC – Conformity Declaration

In the name of the manufacturer

Walter Blombach GmbH

**Tool and Machine Factory
based in Remscheid and Neuerburg**

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We hereby declare that the universal milling and drilling machines specified below

**Universal Lathes Typ:
D2000E – D2400 E – D3000 E**

meet the following regulation requirements for standard serie production

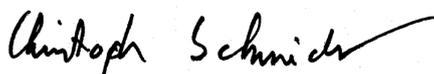
- **EC directive for machines EWG 91/68 and 89/392**
- **EC low voltage directive 73/23/EWG**

In order to meet / implement the requirements of the above mentioned directives, the following applicable and previously published standards have been adhered to:

EN 292-1
EN 292-2
EN292-2 Enclosure I
EN 294
EN 349
EN 418
EN 60204

D-54673 Neuerburg

City



Signature

Outlay

Dear customer!

Congratulations on choosing the **WABECO Universal Lathe**. We have taken great care in its manufacture and we have given it a thorough quality control test. These operating instructions are to help you to work with it safely and properly.

After unpacking the machine please check to see if any kind of damage has occurred during transportation. Any complaints must be made immediately. Complaints made at a later date **cannot** be accepted.

If you have any questions or need any spare parts, please quote the machine number located on the front of the motor.

Wir können Ihnen wahlweise unsere Bedienungsanleitungen und Prospekte in englischer und französischer Sprache kostenlos zusenden.

We are able to send you free of charge our Operating Instructions and leaflets in French and/or English translation.

Nous avons la possibilité de vous donner nos Instructions de Service et prospectus aussi en traduction française et/ou anglaise, sans frais.

1. Technical Data

1.1 Universal Lathe D2000 E

Working range

Centre distance	350 mm
Centre height.....	110 mm

Work spindle

Drive output.....	1,4 kW, 230 V, 50 Hz
Infinetely variable spindle speed	45 – 2300 r.p.m.
Spindle bore	20 mm optional 30 mm
Cone in spindle nose.....	Cone 3 – only for spindle bore 20 mm

Cross table

diameter of chuck work, measured above the cross table.....	126 mm
cross table range of displacement.....	110 mm
turning carriage´s range of displacement	58 mm
swivel-feature of the upper slide rest.....	360°
Height of turning tools max.....	20 mm

Guideways

Longitudinal support.....	ground guiding bars
Cross support.....	adjustable dovetail guide
Stripping rings	protection of the guides
Length of guides.....	575 mm
Width of guides.....	130 mm
diameter of chuck work, measured above the guiding bars	220 mm

Tail stock

Tail spindle´s range of displacement	65 mm
Tail spindle´s hole bore	cone2
lateral displacement of the tailstock to both sides	±10 mm

Advance

Automatic advance.....	0,085mm/r.p.m. optional 0,16
------------------------	-------------------------------------

Screw cutting attachment - **optional**

- metric thread	0,4 - 3,0 mm
- inch thread	10 - 32 thread per inch

Noise values according DIN 45635 - part 1

Emission data:

no-load running	LpA = 63 dB(A)
load running	LpA = 67 dB(A)

- Subject to technical alterations -

1. Technical Data

1.2 Universal Lathe D2400 E

Working range

Centre distance	500 mm
Centre height.....	110 mm

Work spindle

Main drive.....	electronic adjustable motor
Drive output.....	1,4 Kw, 230V, 50 Hz
Infinitely variable spindle speed	45 – 2300 r.p.m.
Spindle bore	20 mm optional 30 mm
Cone in spindle nose.....	CM3 – only for spindle bore 20 mm

Cross table

diameter of chuck work, measured above the cross table.....	126 mm
cross table range of displacement.....	110 mm
turning carriage's range of displacement	58 mm
swivel-feature of the upper slide rest.....	360°
Height of turning tools max.....	20 mm

Guideways

Longitudinal support.....	ground guiding bars
Cross support.....	adjustable dovetail guide
Stripping rings	protection of the guides
Length of guides.....	740 mm
Width of guides.....	130 mm
Ø of guides	30 mm
diameter of chuck work, measured above the guiding bars	220 mm

Tailstock

Tail spindle's range of displacement	65 mm
Tail spindle's hole bore	cone2
lateral displacement of the tailstock to both sides	±10 mm

Advance

Automatic advance.....	0,085 mm/r.p.m. Optional 0,16
------------------------	--------------------------------------

Screw-cutting attachment **Optional**

- metric thread	0,4 - 3,0 mm
- inch thread	10 - 32 thread per inch

Noise values according DIN 45635 - part 1

Emission data:

no-load running	LpA = 63 dB(A)
load running	LpA = 67 dB(A)

- Subject to technical alterations -

1. Technical Data

1.3 Universal Lathe D3000 E

Working range

Centre distance 500 mm
Centre height 110 mm

Work spindle

Main drive electronic adjustable motor
Drive output 1,4 Kw, 230V, 50 Hz
Infinitely variable spindle speed 45 - 2300 r.p.m.
Spindle bore 20 mm **Optional** 30 mm
Cone in spindle nose CM3 – only for spindle bore 20 mm

Advance

Automatic advance 0 - 250

Cross table

diameter of chuck work, measured above the cross table 126 mm
cross table range of displacement 100 mm
turning carriage's range of displacement 58 mm
swivel-feature of the upper slide rest 360°
Height of turning tools max 20 mm

Guideways

Longitudinal support ground guiding bars
Cross support adjustable dovetail guide
Stripping rings protection of the guides
Length of guides 740 mm
Width of guides 130 mm
Ø of guides 30 mm
diameter of chuck work, measured above the guiding bars 220 mm

Tailstock

Tail spindle's range of displacement 65 mm
Tail spindle's hole bore cone2
lateral displacement of the tailstock to both sides ±10 mm

Advance

Automatic advance 0-250 mm/min

Screw cutting attachment

metric thread 0,4 - 3,0 mm
inch thread 10 - 32 thread per inch

Noise values according DIN 45635 - part 1

Emission data:

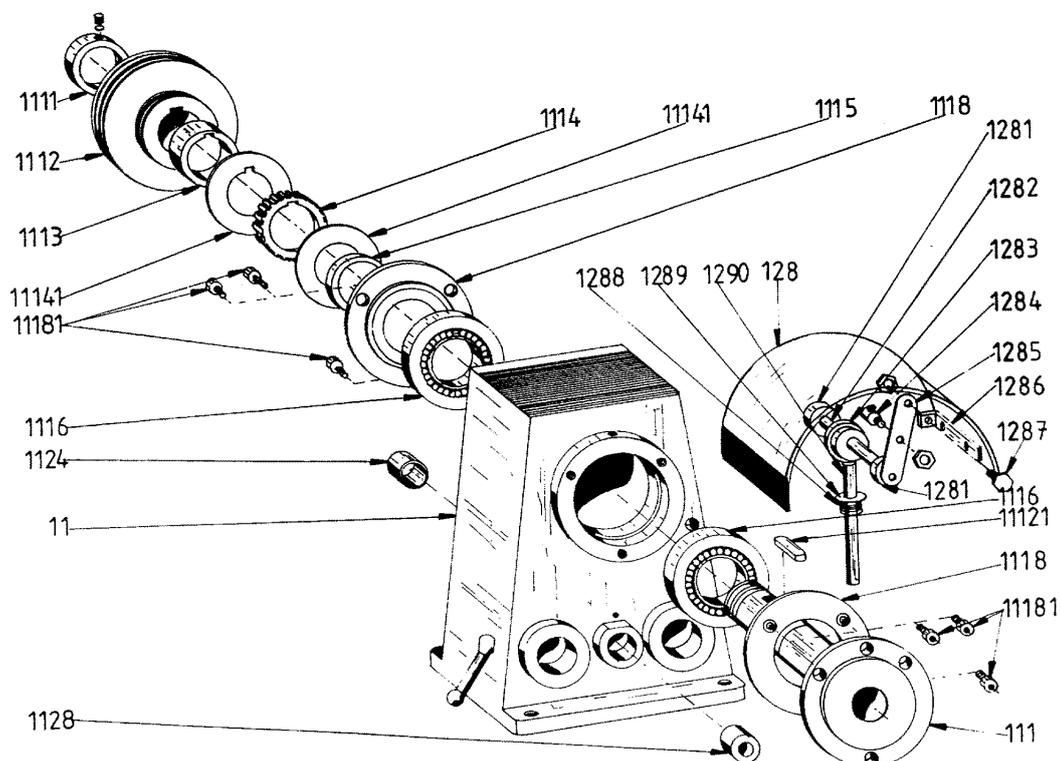
no-load running LpA = 63 dB(A)
load running LpA = 67 dB(A)

- Subject to technical alterations -

2. Drawings and list of parts

2.1 Headstock for D2000 E, D2400 E, D3000 E

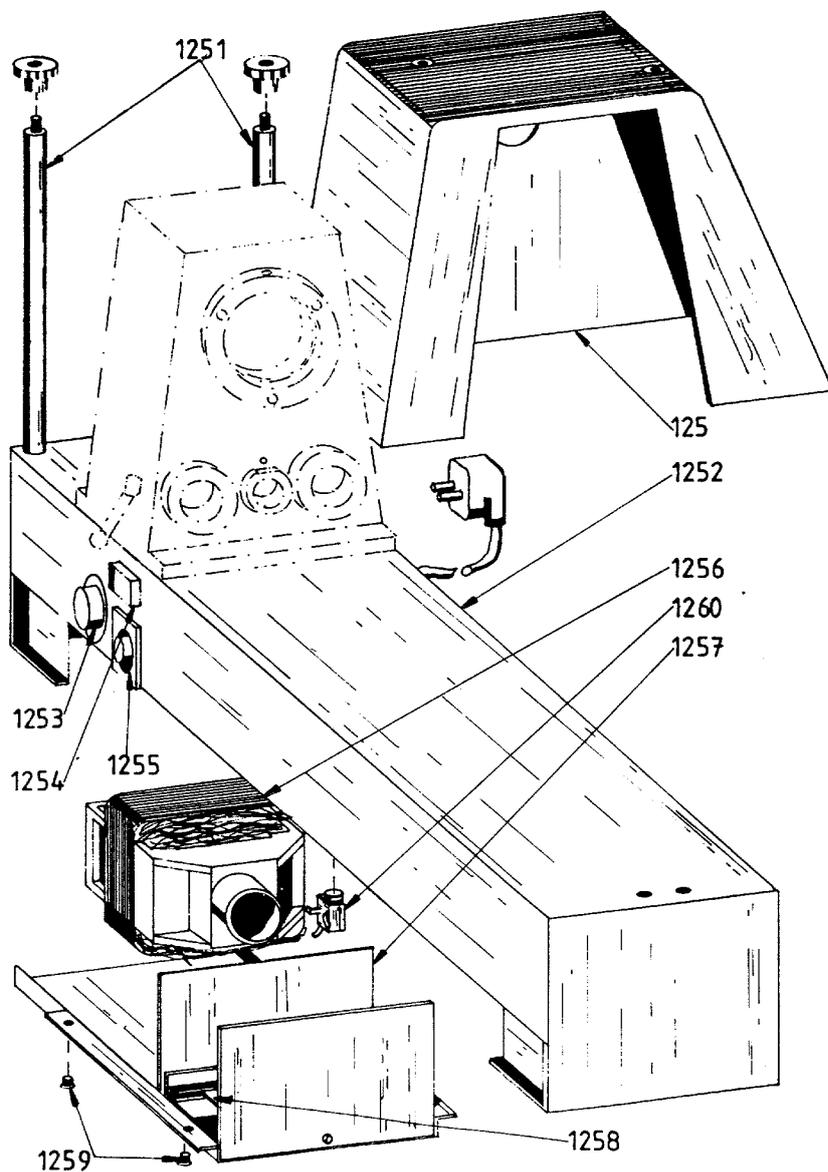
Part-No.	Order-No.	Designation
11	10200011	Headstock
1124	10201124	Bronze bushing
1128	10201128	Bronze bushing
111	10200111	Spindle with flange
1118	10201118	Bearing cap
11181	10211181	Hexagon socket screw
11121	10211121	Feather key
1115	10201115	Spacer sleeve
1116	10201116	Tapered roller bearing
11141	10211141	Starter pulley
1114	10201114	Toothed belt pulley
1113	10201113	Spacer sleeve
1112	10101112	Belt pulley for Universal Lathe D2000
1112	10201112	Belt pulley for Universal Lathe D2400 E
1111	10201111	Regulating nut
128	10200128	Plexiglass cover
1281	10201281	Adjusting ring
1282	10201282	Shaft
1283	10201283	Eccentric
1284	10201284	Stop
1285	10201285	Bracket
1286	10201286	Angle piece
1287	10201287	Hexagon bolt with nut
1288	10201288	Pressure spring
1289	10201289	Lock washer
1290	10201290	Pin



2. Drawings and list of parts

2.2 Support with motor and protective cover for D2400 E, D3000 E

Part-No.	Order-No.	Designation
125	10200125	Cover
1251	10201251	Stud bolt + radial nut
1252	10201252	Support
1253	10201253	Potentiometer
1254	10201254	Master switch with undervoltage release
1255	10201255	Switch right/left
1256	10201256	Motor
1260	10201260	Limit switch, protective cover
1258	10201258	Circuit board
1257	10201257	Motor cover
1259	10201259	Screws
	10201200	Collecting reservoir for chips



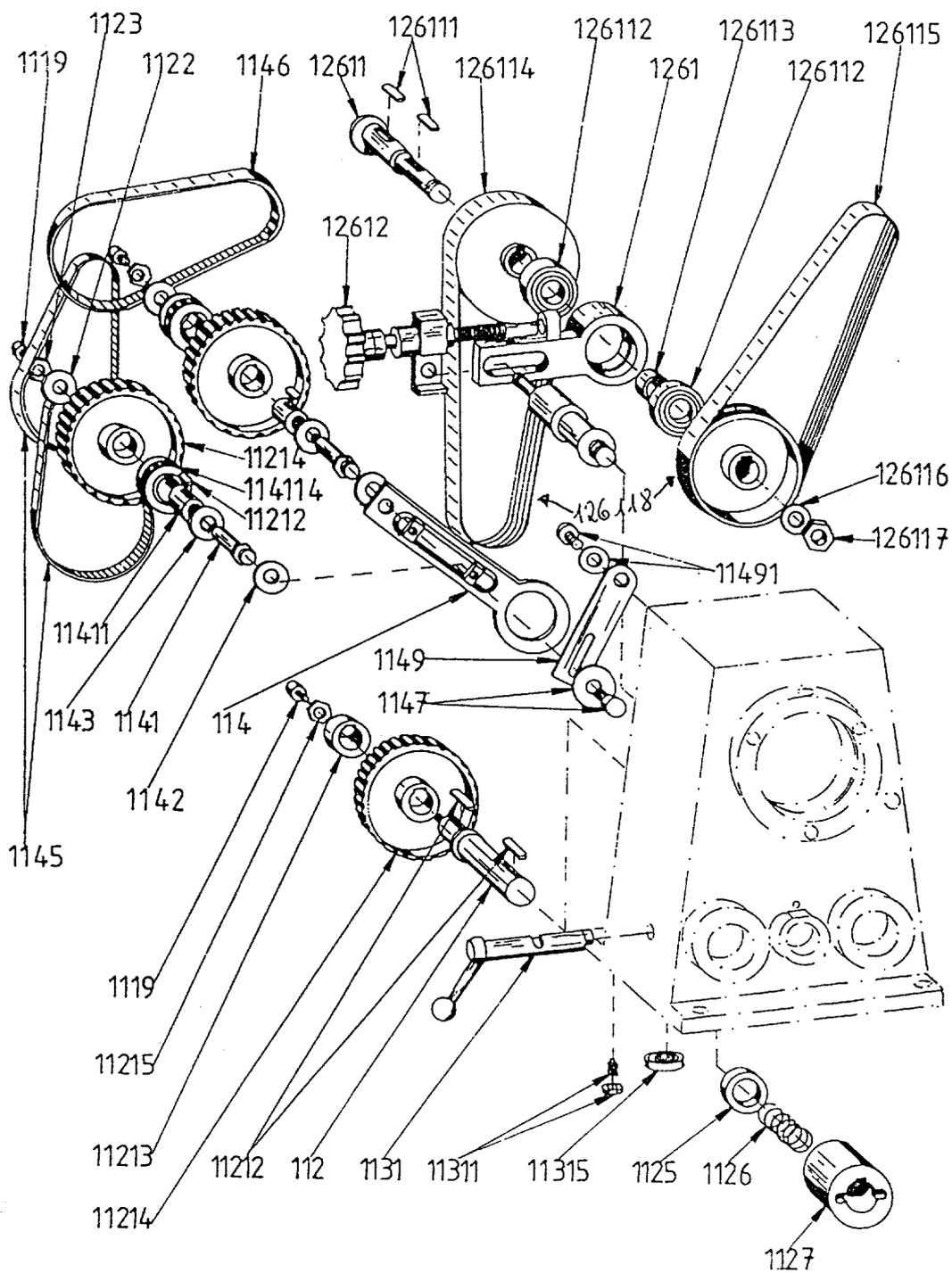
2. Drawings and list of parts

2.3 Leading spindle drive for D2000 E, D2400 E

Part-No.	Order-No.	Designation
1119	10201119	Lubricating nipple
1145	10201145	Toothed belt Z 120 XL037
1146	10201146	Toothed belt Z 140 XL037
1147	10201147	Hexagon socket screw + washer
1149	10201149	Quadrant holder
11491	10211491	Hexagon socket screw + washer
1261	10201261	Clamping piece
126111	102126111	Feather key
12611	10212611	Axis
126112	102126112	Ball bearing
126113	102126113	Spacer sleeve
126114	102126114	Drive belt with belt pulley
126115	102126115	Drive belt with belt pulley
126118	102126118	Drive belt J 8-559 suitable for Universal Lathe D2400 E
126116	102126116	Washer
126117	102126117	Stop nut
12612	10212612	Spindle guide, complete
112	10200112	Feed spindle
11212	10211212	Feather key
11213	10211213	Bushing
11214	10211214	Toothed belt pulley
1122	10201122	Washer
1123	10201123	Nut
1125	10201125	Adjusting ring
1126	10201126	Pressure spring
1127	10201127	Coupling
1131	10201131	Eccentric shaft, complete
11311	10211311	Stud bolt + nut
11315	10211315	Ball bearing
114	10200114	Change gear quadrant
1141	10201141	Hexagon bolt
11411	10211411	Bronze bushing
11215	10211215	Nut
114114	102114114	Toothed belt pulley Z 14
1142	10201142	Washer
1143	10201143	Washer
114816	102114816	Change gear Z16 (without picture) optional
114818	102114818	Change gear Z18 (without picture) optional
114820	102114820	Change gear Z20 (without picture) optional
114822	102114822	Change gear Z22 (without picture) optional
114824	102114824	Change gear Z24 (without picture) optional
114828	102114828	Change gear Z28 (without picture) optional
114832	102114832	Change gear Z32 (without picture) optional
114834	102114834	Change gear Z34 (without picture) optional
114836	102114836	Change gear Z36 (without picture) optional
114840	102114840	Change gear Z40 (without picture) optional
	10201100	Belt set compl. 5 pieces for Lathe D2400 E consists of: Part-No. 1145 (2x) Part-No. 1146 (1x) Part-No. 126118 (2x)
	10201101	Change gears 1 set 10 pieces Z16 - Z40

2. Drawings and list of parts

2.3 Leading spindle drive for D2000 E, D2400 E



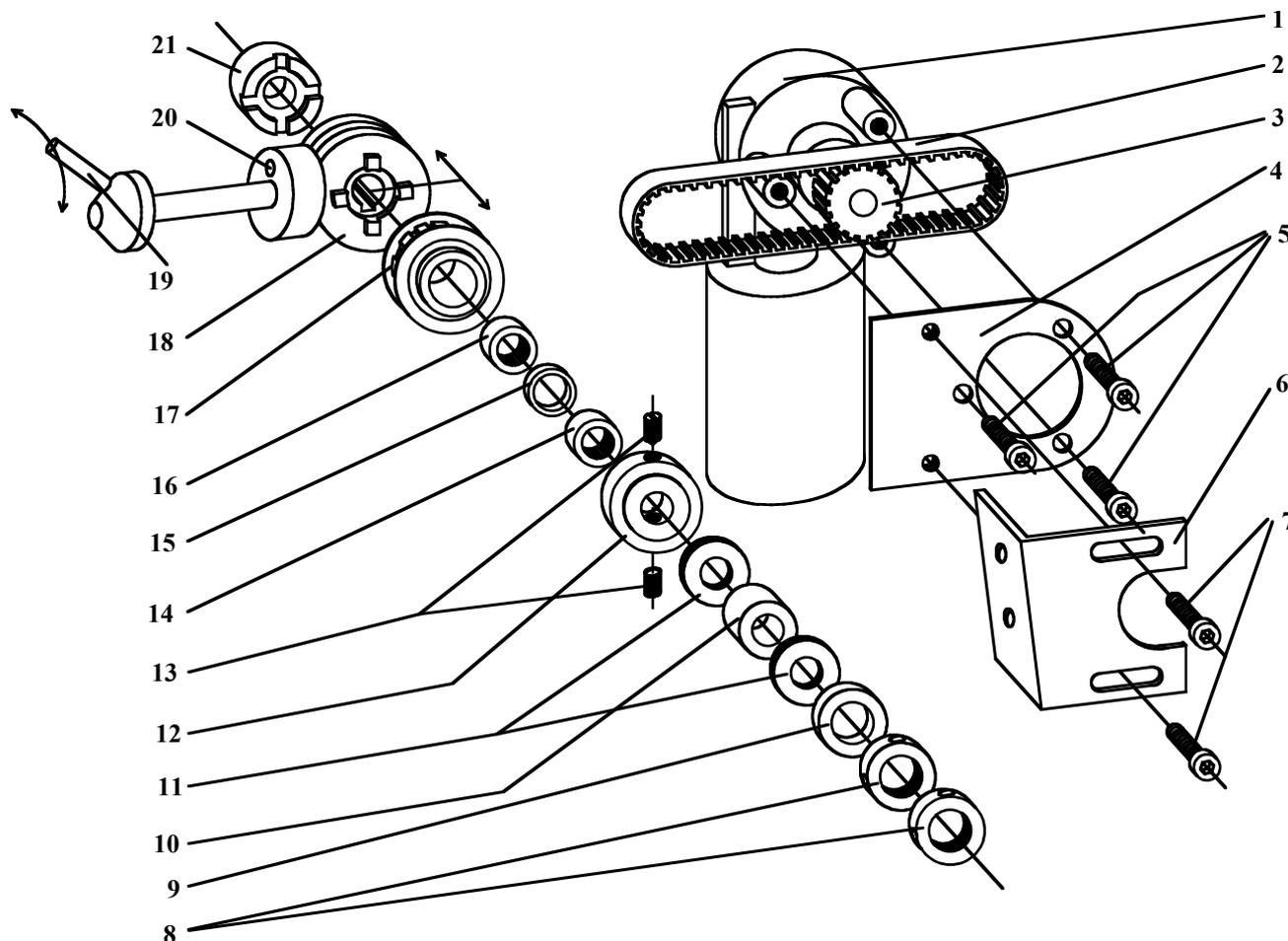
2. Drawings and list of parts

2.4 Leading spindle drive for D3000 E

Part-No.	Order-No.	Designation
1	10300001	D.c. Motor
2	10300002	Toothed belt
3	10300003	Toothed belt pulley
4	10300004	Motor bearing
5	10300005	3 screws
6	10300006	Bracket
7	10300007	2 screws
8	10300008	2 adjusting nuts
9	10300009	Pressure ring
10	10300010	Bushing
11	10300011	2 thrust bearing
12	10300012	Run-on-ring
13	10300013	2 screws
14	10300014	Needle bearing
15	10300015	Distance ring
16	10300016	Needle bearing
17	10300017	Toothed belt pulley
18	10300018	Clutch disk
19	10300019	Handle
20	10300020	Operating pin
21	10300021	Threadcutting coupling

2. Drawings and list of parts

2.4 Leading spindle drive for D3000 E



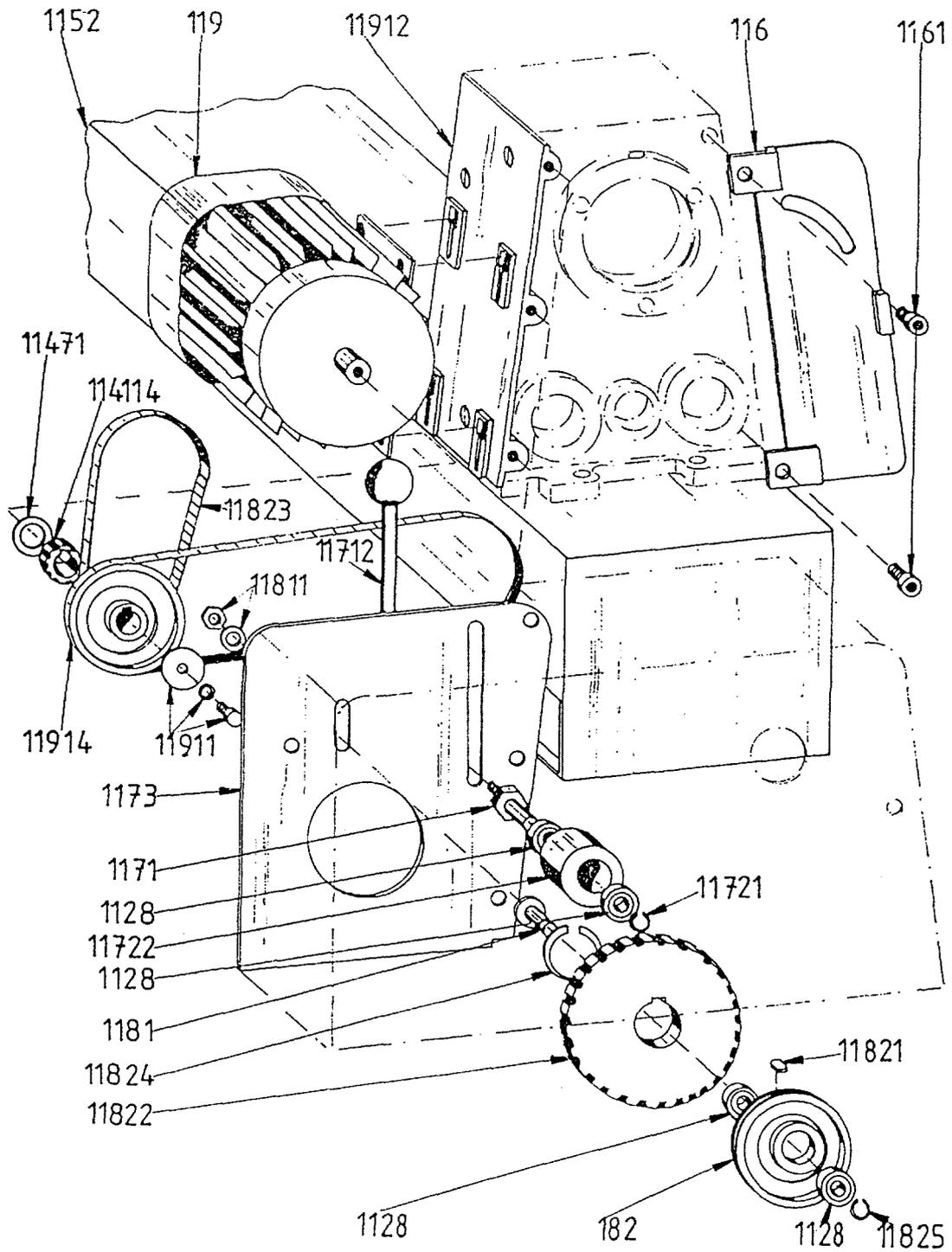
2. Drawings and list of parts

2.5 Leading spindle drive with gear motor for D2000 E

Part-No.	Order-No.	Designation
1152	10101152	Support
119	10100119	with A.C. motor
119	10101120	with rotary current motor
11912	10111912	Bearing plate
116	10100116	Mounting support of quadrant
1161	10101161	Hexagon socket screw
11471	10111471	Washer
114114	102114114	Toothed belt pulley Z 14
11823	10111823	Toothed belt
11914	10111914	Drive belt J 610
11911	10111911	Screw with washer
1173	10101173	Bearing plate
11811	10111811	Nut and washer
11712	10111712	Adjusting rod
1171	10101171	Axle
1128	10101128	Ball bearing
11722	10111722	Roller
11721	10111721	Retaining ring
1181	10101181	Axle
11824	10111824	Retaining ring
11822	10111822	Toothed belt pulley
182	10100182	Belt pulley
11821	10111821	Feather key
11825	10111825	Retaining ring

2. Drawings and list of parts

2.5 Leading spindle drive with gear motor for D2000 E



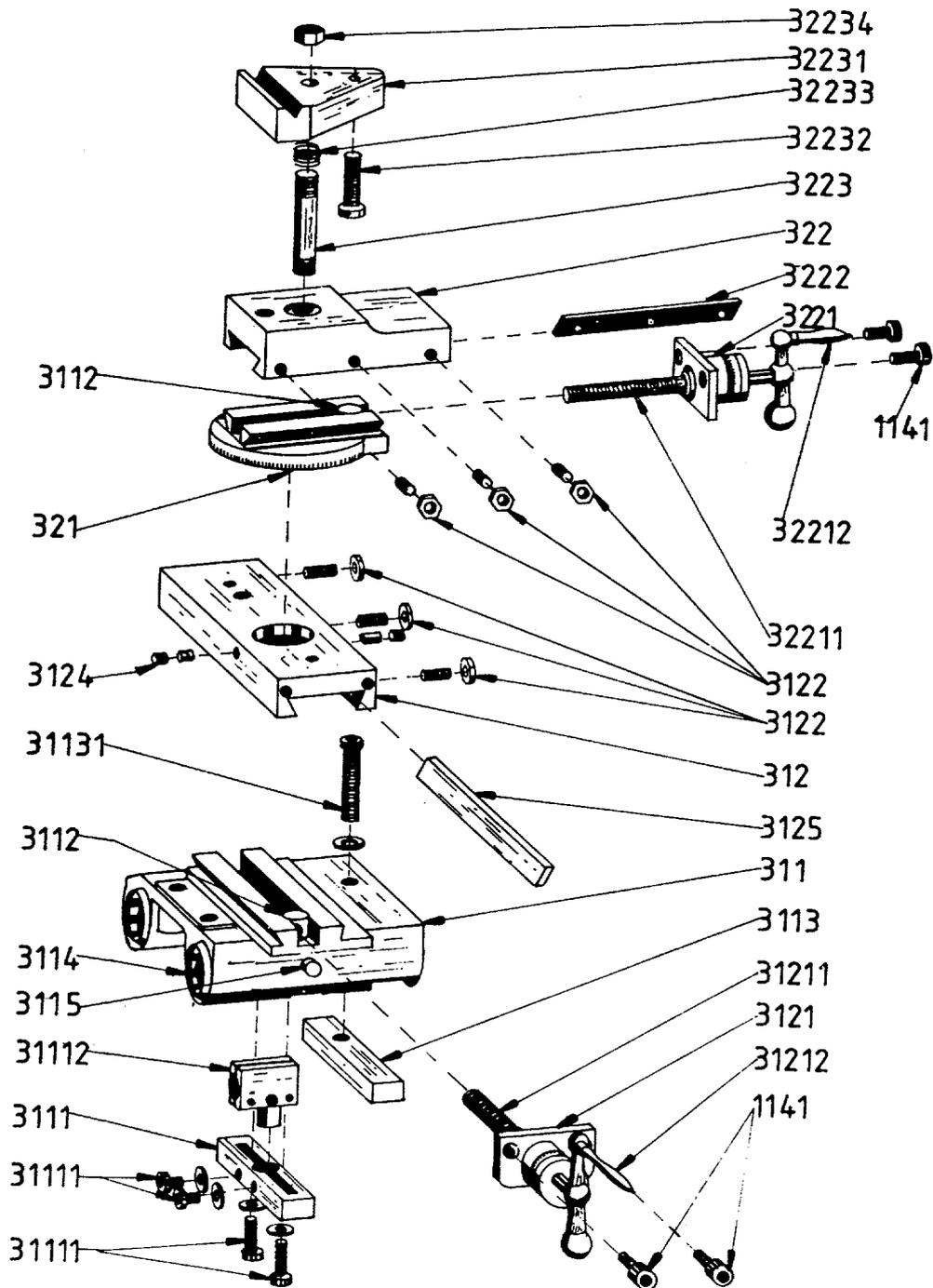
2. Drawings and list of parts

2.6 Cross table

Part-No.	Order No.	Designation
311	10200311	Lower part of cross slide
3111	10203111	Nut holder
31111	10231111	Bolts + washers
31112	10231112	Bronze nut
3112	10203112	Bronze nut
3113	10203113	Shim
31131	10231131	Clamping bolt
3114	10203114	Wiper ring
3115	10203115	Lubricating nipple
312	10200312	Upper part of cross-slide
3121	10203121	Spindle bearing compl. with graduated ring
31211	10231211	Spindle
31212	10231212	Ball-ended crank
1141	102W1141	Hexagon socket
3122	10203122	Threaded pin + plain nut
3124	10203124	Threaded pin with thrust piece
3125	10203125	Readjusting gib
321	10200321	Lower part of turning carriage
322	10200322	Upper part of turning carriage
3221	10203221	Spindle bearing compl. with graduated ring
32211	10232211	Spindle for turning carriage
32212	10232212	Ball-ended crank
3222	10203222	Readjusting gib
3223	10203223	Stud bolt
32231	10232231	Clamping plate
32232	10232232	Hexagon bolt
32233	10232233	Pressure spring
32234	10232234	Thick nut
	10200300	Longitudinal support compl. Parts-No. 321 - 3112 - 3122 - 32211 - 32212 - 1141 - 3221 - 3222 - 322 - 3223 - 32232 - 32233 - 32231 - 32234
	10200301	Transversal support compl. Parts-No. 3124 - 31131 - 3112 - 3114 - 3115 - 31112 - 3111 - 31111 - 3122 - 312 - 3125 - 311 - 3113 - 31211 - 3121 - 31212 - 1141
	10200302	Cross table compl
	10200303	Spindle compl. with transversal support Parts-No. 3121 - 31212 – 31211
	10200304	Spindle compl. with longitudinal support Parts-No. 3221 - 32211 – 32212

2. Drawings and list of parts

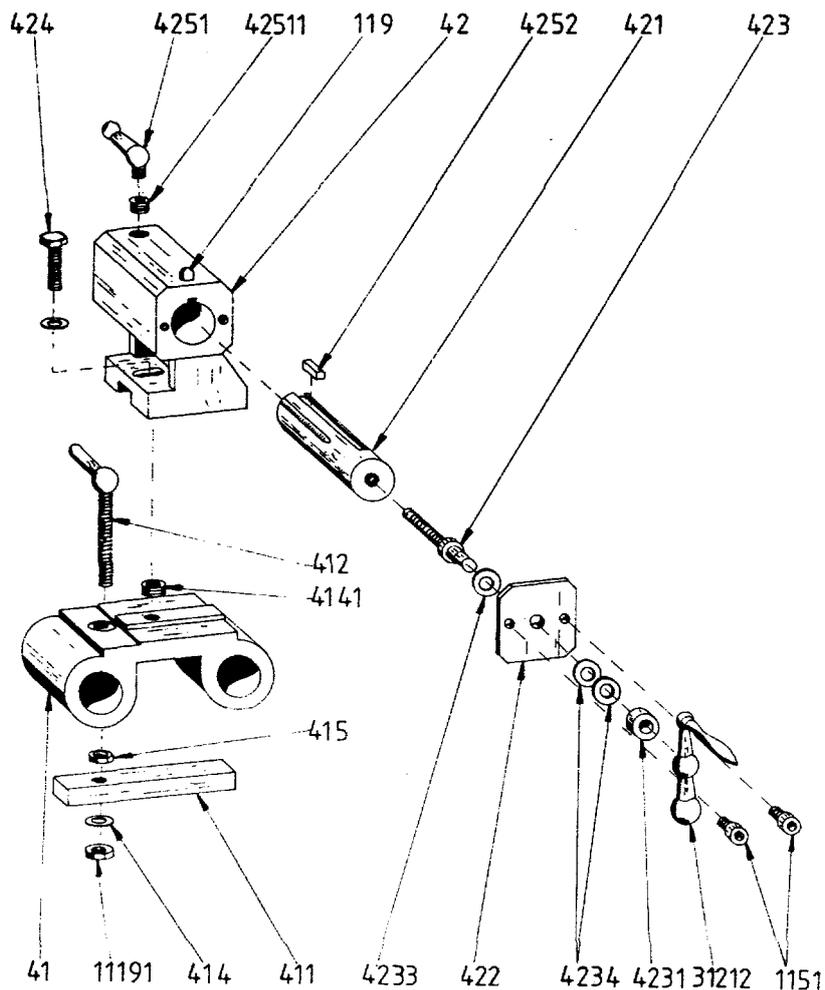
2.6 Cross table



2. Drawings and list of parts

2.7 Tailstock

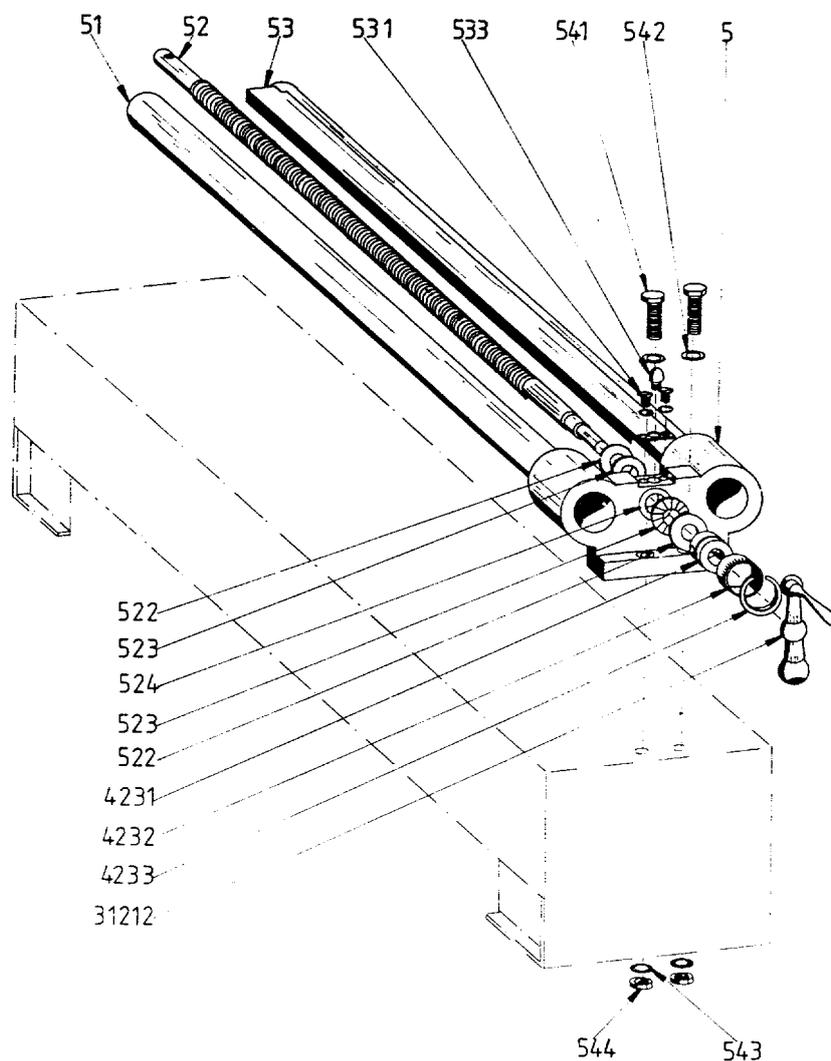
Part-No.	Order-No.	Designation
41	10200041	Lower part of tailstock
411	10200411	Shim
412	10200412	Capstan with stud bolt
414	10200414	Washer
415	10200415	Hexagon nut
42	10200042	Upper part of tailstock
421	10200421	Quill
422	10200422	Flange
1151	10201151	Hexagon socket screw
423	10200423	Spindle
4231	10204231	Adjusting ring
4234	10204234	Spring washer
4233	10204233	Washer
31212	10231212	Ball-ended crank
424	10200424	Hexagon bolt with washer
4251	10204251	Capstan with clamping bolt
42511	10242511	Insert
4141	10204141	Insert
4252	10204252	Feather key
119	10200119	Lubricating nipple
	10200400	Tailstock compl. without lathe center



2 Drawings and list of parts

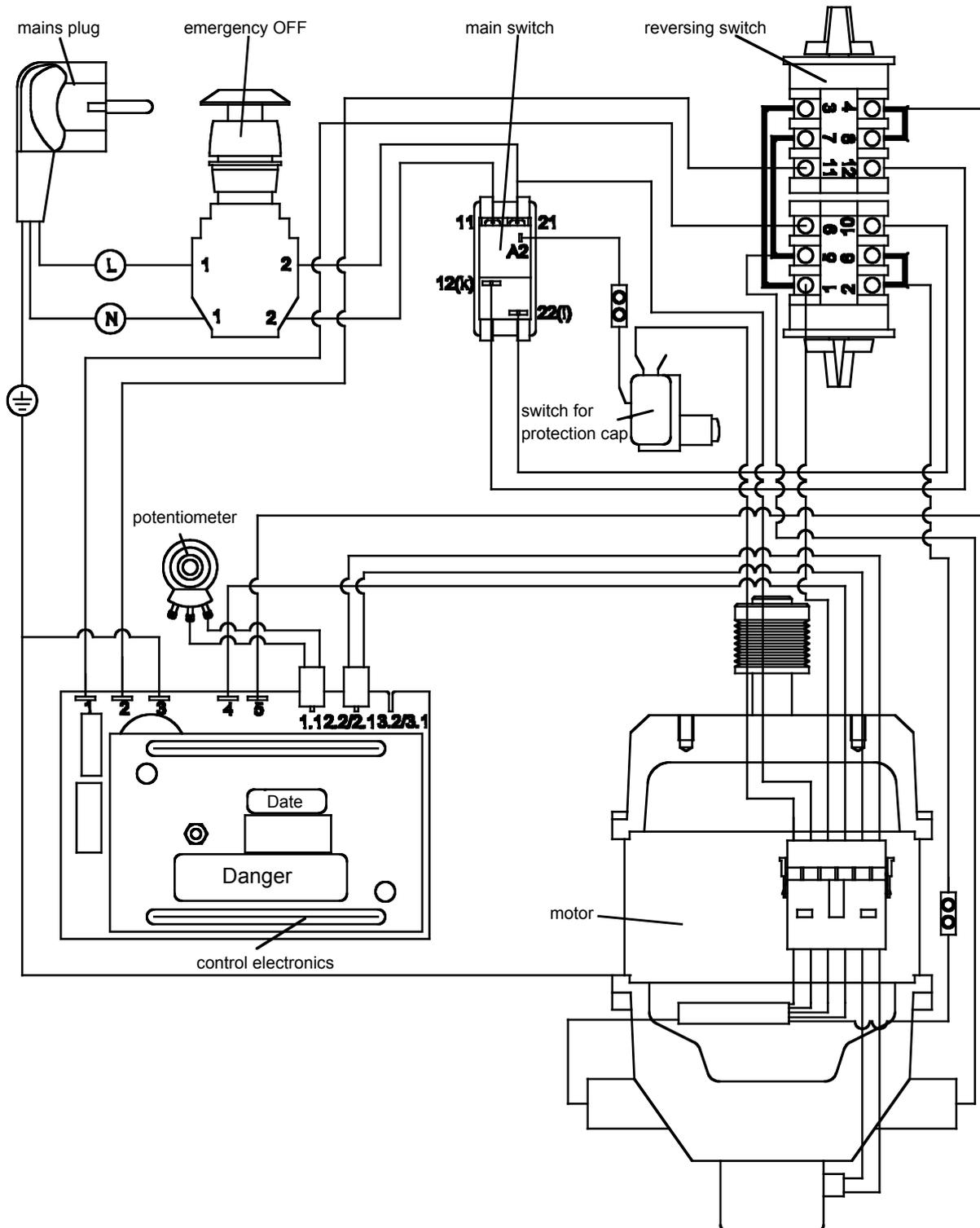
2.8 Rear support with guide rods

Part-No.	Order-No.	Designation
5	10200005	Rear support (only the cast iron part)
51	10200051	Guide rods
52	10200052	Feed spindle
522	10200522	Washer
523	10200523	Axial needle bearing
31212	10231212	Ball-ended crank
4231	102H4231	Spacer sleeve
524	10200524	Bronze bushing
53	10200053	Protective channel
531	10200531	Screw + washer
4232	10204232	Graduated ring
4233	10204233	Retaining ring
533	10200533	Lubricating ring
541	10200541	Hexagon bolt
542	10200542	Washer
543	10200543	Serrated lock washer
544	10200544	Hexagon nut
	10200500	Rear bearing compl.



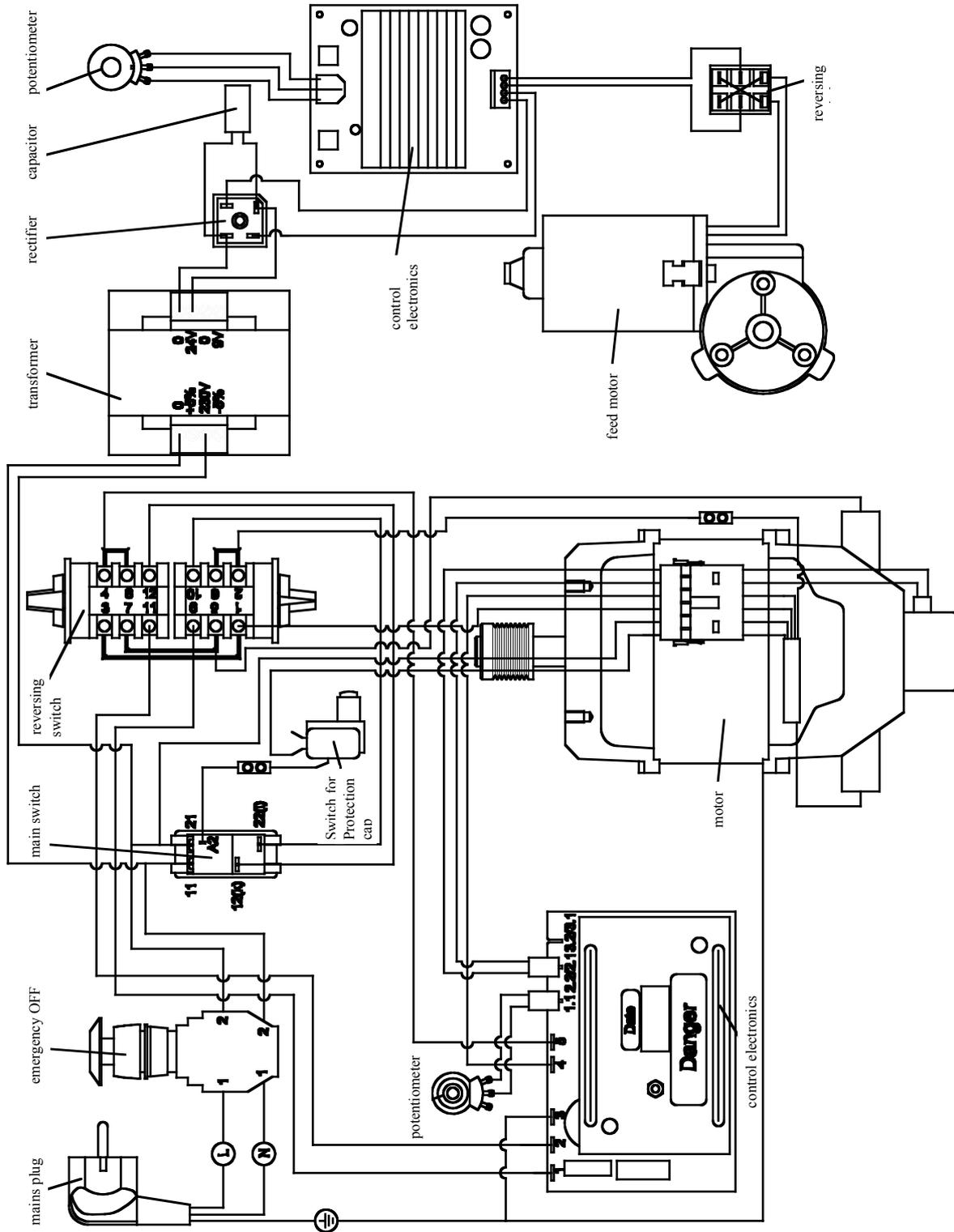
3. Block circuit diagram

3.1 for D2000 E, D2400 E



3. Block circuit diagram

3.2 for D3000 E



4. Delivery and installation

The lathes are carefully packed in our factory.

Please check the following on delivery:

- 1. whether the packaging has been damaged and/or:**
- 2. whether the lathe shows signs of transport damage or if there are grounds for complaint. In this case we request your immediate notification. Claims made at a later date cannot be acknowledged.**

The lathe must be installed on an appropriate, level and firm base.

This would be, for example:

- a base cabinet such as in our accessories programme
- own work bench as long as it is strong enough to carry the weight of the machine without warping (see technical data and check with spirit level) and has an even surface.
- a steel plate

The lathe must be firmly screwed down onto the base. To facilitate this, there are 9 mm holes in the machine base. Good results and a minimum of vibration during operation can only be guaranteed if the above mentioned requirements for secure mounting have been kept to.

The installation of the machine should take place where there is sufficient lighting, electrical cables with earthed sockets and O-conductors are installed adequately near to the machine so that the mains connection lead is not subject to any tension whatsoever. The mains lead should be such that, by means of a multiple socket, a coolant or lubrication unit can also be connected.

5. Starting-up and maintenance



- Fix the machine on a sturdy, level support
- Use sharp processing tools
- Adjust speed setting and feed to fit the material and diameter of the tool
- Clamp the tools so that the clamping position is as near possible to the workpiece
- Clamp the workpieces fast and without vibrations.
- Long pcs. support with tailstock or with fixed stay.
- Apply coolant and lubricant for better surface quality (finish) and dimensional accuracy
- Fix processing tools and workpieces on clean clamping surfaces
- Grease the machine sufficiently
- Use the correct tools for removing the material from the workpieces
- Set correct bearing clearances and align guides early enough

6. Overload protection



- Wait approx. 1 second after switching off the machine manually or after an automatic shutdown following an overload before you switch on again. This will ensure that the motor is protected effectively in all work situations. Otherwise it is possible that the machine will not come on because the relay for the electronics has not been able to function.

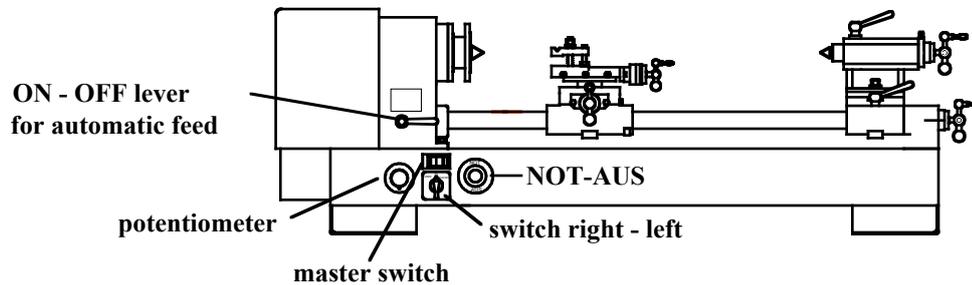
7. Safety Instructions

1. The feed line for the motor may only be connected to a shock-proof socket or junction box. (Have the socket or junction box checked by an electrician beforehand; protection against children being able to put into operation).
The socket or junction box must be close enough to the equipment, that the current-carrying cable is subjected to no tensile strain whatsoever.
2. The three-phase A.C. motor must be connected by an electrician over a protective switch of 1 ampere to the 380 V mains supply.
3. When maintenance or cleaning work is being done, the machine must be shutdown and the mains plug pulled out.
4. Do not brake workpieces or chuck by hand or any other objects.
5. Wear safety goggles when working the machine.
6. Do not remove the chips with the hand. Use corresponding aids (hand brush, hook, paint brush).
7. Always keep the protective hood on the driving mechanism closed.
8. The turning tools must be firmly tightened at the correct height and as short as possible.
9. The turning tools must never be exchanged when the machine is running.
10. **Never leave the clamping chuck key in (even when not in operation).**
11. Observe the bearing distance of the turning chuck. (Turning jaws max. 40mm Ø, Drilling jaws max. 100mm Ø).
12. **Never take measurements on work pieces being turned** (danger of accidents and damage to the measuring gauges)
13. Do not wear loose items of clothing (ties, shirt sleeves, jewellery etc.).
14. When working between centres, always centre well in order to avoid a flying-out of the workpiece. In addition, check the tightening screw of the tailstock to make sure it is tight.
15. When working with automatic advance take care that the cross table does not touch the chuck or the tailstock.
16. Never leave the machine when in operation.
17. **When turning wood, use the lathe centre for the slaving of the work piece instead of the lathe chuck.**
18. The machine must be secured so that it cannot be switched on by children. Make sure that other people do not come in contact with the machine.
19. The machine must be kept dry at all times.
20. Check the machine frequently for damage. Any damage parts must be replaced with original parts and should be fitted by an expert or by us.

8. Startup and Maintenance

8.1 Electrical equipment

The lathes are fitted with a master switch with undervoltage release, i.e. this switch must be switched on before the machine can be switched on via the reserving switch. The master switch must also be switched on again following a power failure.



All lathes can only be switched on with **closed plexiglass bonnet**.

If you want to change the turning direction through the switch right-left the switch must stay for 1 sec. on 0-position for the reason that the relay of the potentiometer has enough time to react.

8.2 Start up

Prior to its putting into operation the machine must once more be cleaned with great care. All lubricating points have to be furnished with grease while the cross slide, the threaded spindles, the guide bars and the quill are thoroughly oiled.

Turn by hand all spindles in order to check for their smooth turning.

Run in the lathe with the lowest possible rotary speed being switched on. A full load to start with must be avoided!

8.3 Maintenance

The longtime serviceability is vitally dependent upon a corresponding serving attendance. The lathe needs to be cleaned after every turning job.

In case the lathe is being erected within a moist cellar, all naked parts need to be oiled after completed usage to avoid corrosion.

An overall and constant lubrication of all moving parts is highly significant.

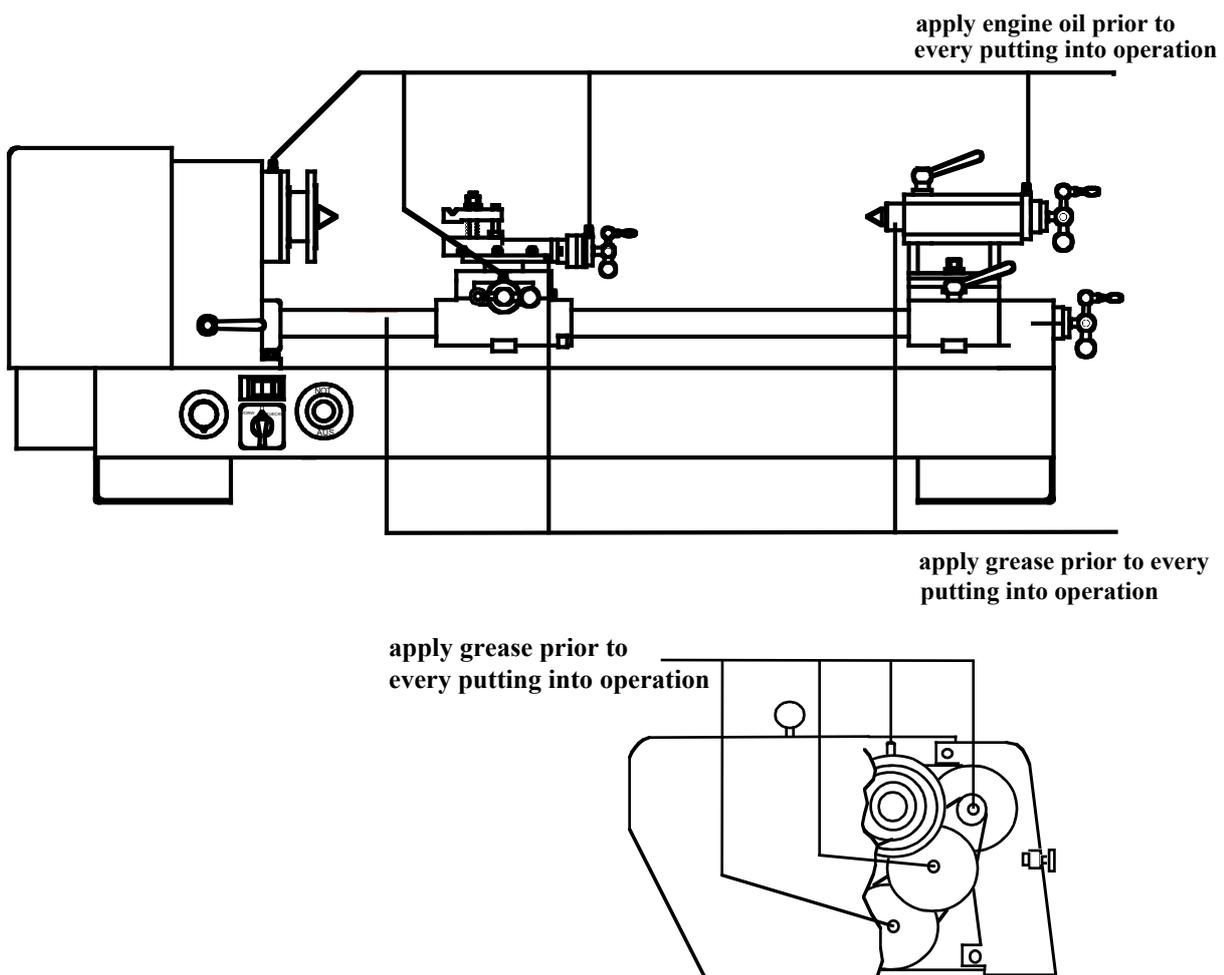
In case backlash within the bearings or within the guideways of the slides should occur, readjust in time to avoid the bearing or the guideways of the slides being destroyed.

8.4 Lubrication

Prior to every putting into operation all lubricating points of the lathe must receive a grease for roller bearings having commercial quality.

Both guiding bars have to be greased, too, preceding every putting into operation. The two dovetail guides of the cross slide, the threaded spindles of the cross slide accessible from below, the feed rod as well as the tailstock quill have to be greased at intervals of 100 service tours each using lubricating oil.

When greasing make sure to put the slide of the cross slide to its hindmost position while extending the tailstock quill to its foremost position. Greasing the tailstock spindle is performed via the hollow borehole within the quill.

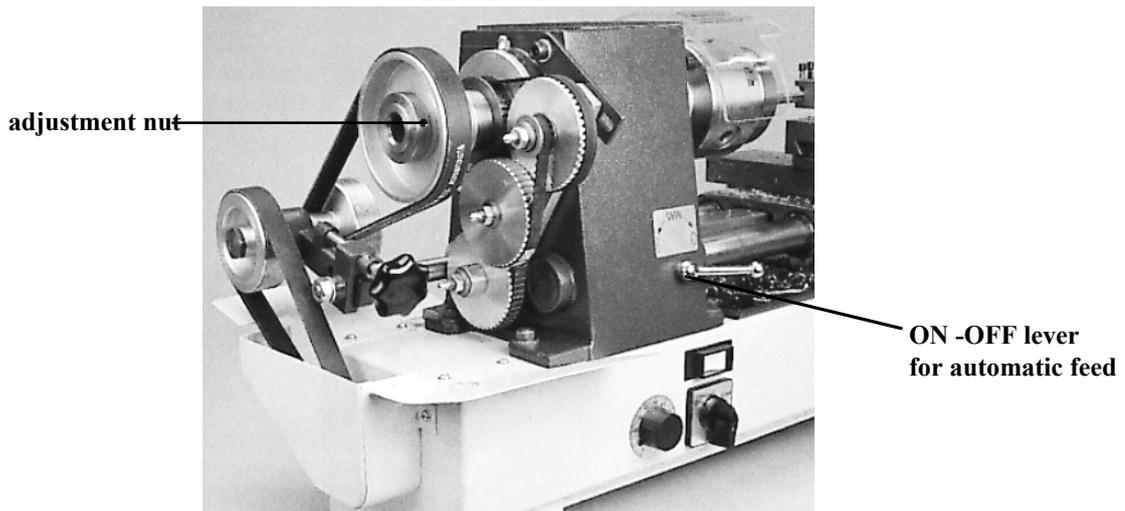


8.5 Initial cleaning of the machine

Prior to putting the machine into operation for the first time all maked parts have to be cleaned applying petroleum or gasoline used for cleaning, because these parts have been treated with slushing oil before leaving the factory.

8.6 Spindle head

The spindle head is firmly attached to the slide bars. In the spindle head, the work spindle is run on two adjustable precision tapered roller bearings.



Should a readjustment of the bearings be necessary, please proceed in the following manner:

1. Loosen the locking screw in the adjustment nut. The adjustment nut is located at the rear end of the work spindle.
2. Turn the adjustment nut in a clockwise direction until the bearings again run free of play (the work spindle being easily able to be turned by hand).
3. Tighten the locking screw again.



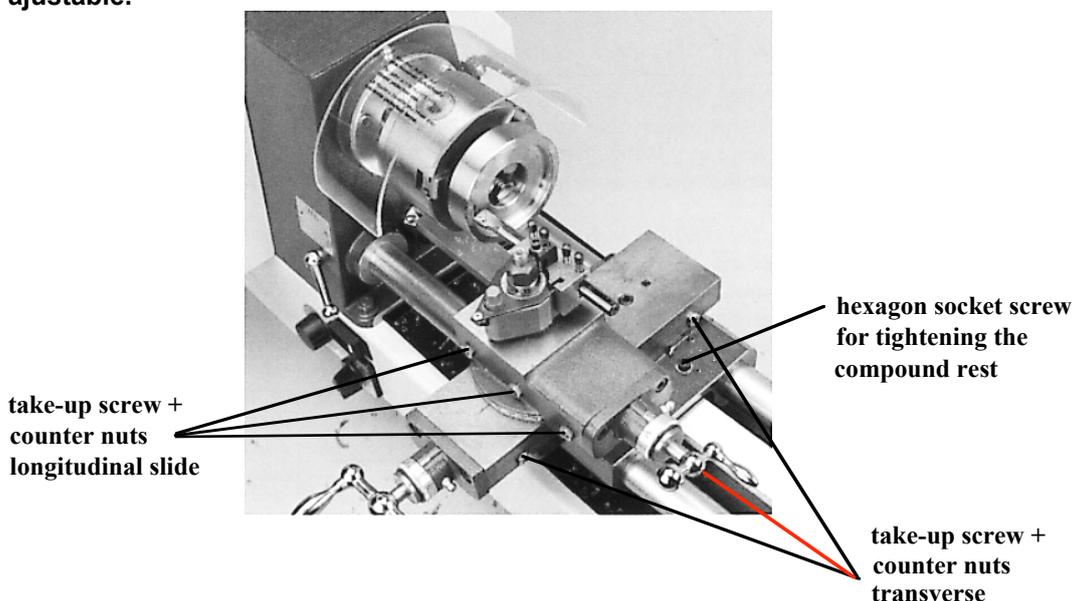
Roller bearing adjusted too tightly become useless after a short period

Automatic feed:

Likewise, there is an on-off lever for the automatic forward feed on the front side of the spindle head. When supplied the wheels for the forward feed 0.085 mm/rev. are attached.

8.7 Compound rest

The compound rest consists of a longitudinal and a transverse slide rest. **Its dovetail guides are adjustable.**



8.7

Compound rest

Should a readjustment be necessary, please proceed in the following manner:

1. Counter nuts must be loosened.
2. By using a socket head wrench, tighten the readjustment screws until the carriage can just be turned to and from by means of the crank.
3. adjustment tighten the counter nuts again.

Longitudinal slide:

The longitudinal slide rest is mounted on the transverse slide rest and can be pivoted through 360° degrees. Thus, it is suitable for the **turning of tapers**. For adjustment, the 4 mm Allen key is used to loosen the two screws located on the outer sides of the transverse slide rest. The arrow on the transverse slide rest. There is a scale of the degrees on the longitudinal slide rest. The distance between two graduation marks represents one degree.

Scale rings:

To set the turning tools, the slide rest spindles have graduation collars with graduation marks. One graduation mark represents a **0.05 mm** feed adjustment which corresponds to a 0.1 mm chip removal on the work piece.

The hexagon socket screw is provided for cases where the compound rest is to be fixed to the slide bars (e.g. in the case of transverse turning.) It screws down the clamped piece at the lower side of the transverse slide rest against the two slide bars.

8.8

Tailstock

The tailstock is attached to the slide bars in such a way that it is slidable. It can be easily tightened in any position by screwing the lower T-handle (4251). It can be separated into barrel and base. By loosening the spanner bolt (424), the tailstock barrel can be pushed to either side by up to 10 mm and is, therefore, suitable for the **turning of slight tapers**. After completing the taper work, the tailstock is to be returned to its original position.

The central position of the tailstock is indicated by the mark on the side. By making a trial turning operation establish whether the working piece is cylindrical and if necessary correct the position of the tailstock.

Solid tailstock sleeve:

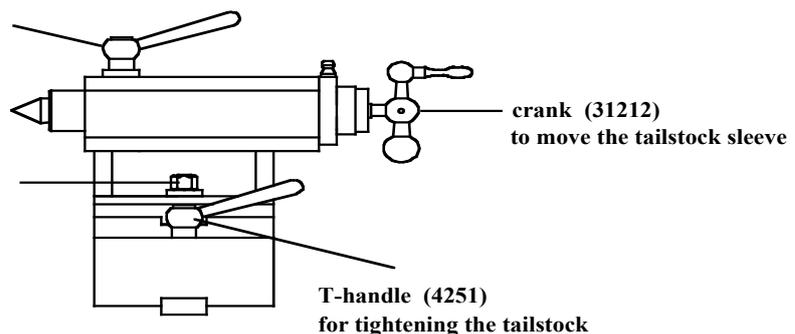
The solid tailstock sleeve, which is provided with a millimetre scale, is designed in such a way that the lathe centre, drill barrel or chuck are **automatically ejected** when turning back.

Tool clamping:

An inner cone MT 2 which is worked into the tailstock sleeve serves to accept the tools. By screwing the upper T-handle (4251), the tailstock sleeve can easily be clamped in any position. The tailstock sleeve can be moved axially over a threaded spindle by using the crank (31212) located at the rear end.

T-handle (4251)
for tightening the
tailstock

spanner bolt (424)



9. Speed regulation

9.1 Speed selection

The spindle speed is to be selected according to the type of material and the diameter of the work piece:

Small diameter ⇒ **relatively high speed**

Large diameter ⇒ **low speed**

The cutting speed is the result of speed and diameter.

With a known and required cutting speed, the necessary spindle speed can be calculated in the following way:

$$\text{speed (n)} = \frac{\text{cutting speed (V)} \times 1000}{\text{diameter of workpiece (d)} \times 3,14}$$

Example: An aluminium workpiece which has a diameter of 20 mm is to be turned with a cutting speed of 100 m/min.

$$\frac{100 \times 1.000}{20 \times 3,14} = \frac{100.000}{62,8} = 1592 \text{ 1/min}$$

Now, from those speeds available, the one is selected which is nearest to the ideal speed of 1592 1/min. (in our case 1600 1/min.).

9.1.1 Speed Setting for Working with Aluminium

workpiece- Ø	approx. r.p.m.	cutting speed m/min
10 mm	2300	75
20 mm	1600	100
40 mm	800	100
60 mm	530	100
80 mm	400	100
100 mm	320	100

9.1.2 Speed setting for working with steel

workpiece- Ø	approx. r.p.m.	cutting speed m/min
10 mm	1600	50
20 mm	800	50
40 mm	400	50
60 mm	270	50
80 mm	200	50
100 mm	160	50

9.1.3 Speed Setting for Working with Brass, Copper

workpiece- Ø	approx. r.p.m..	cutting speed m/min
10 mm	2300	80
20 mm	1270	80
40 mm	640	80
60 mm	425	80
80 mm	320	80
100 mm	250	80

9.2 Changing of speed

Rotational speed 45 - 2300 min⁻¹:

The rotational speed of the work spindle can be infinitely varied between 45 and 400 rpm in the 1. Step or in the 2. Step between 200-2300 rpm. using the potentiometer on the front of the machine.

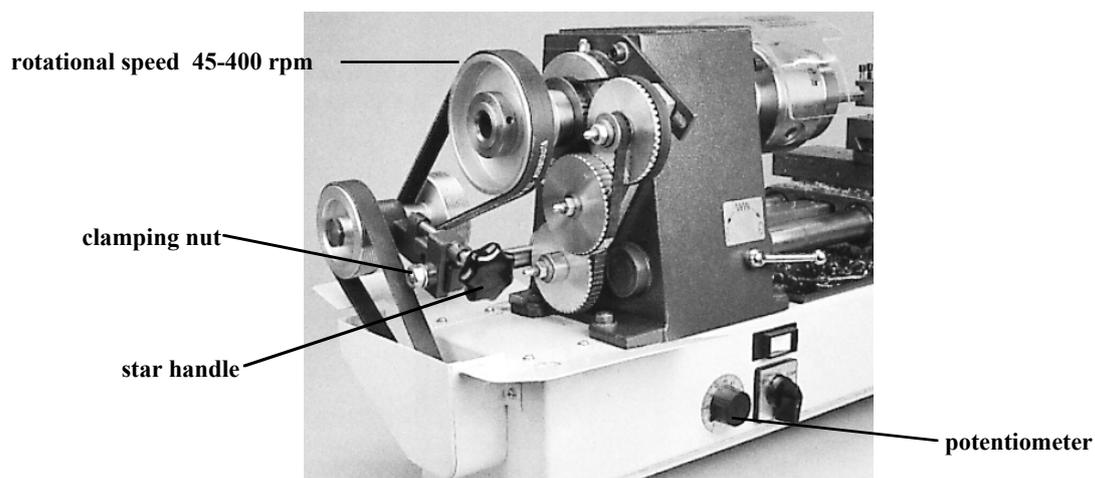
speed setting at the potentiometer	1. step r.p.m.	2. step r.p.m.
10	45	200
20	105	350
30	175	740
40	260	1050
50	325	1440
60	360	1650
70	400	1860
80	460	2120
90	490	2160
100	500	2300

Rotational speed 45 - 400 rpm:

The drive belt must be relocated if the lower speed stage with a minimum speed of 45 rpm is required.

Proceed as follows:

Remove the protective cover and release the drive belt by unscrewing the clamping nut and turning the star handle clockwise until the drive belt can be relocated. Then re-tighten the drive belt in the reverse sequence of steps.



10. Applications

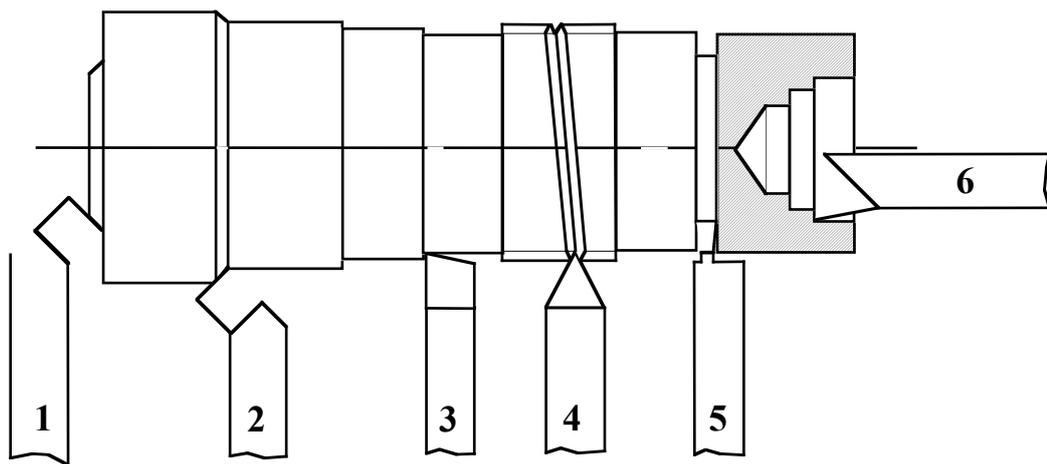
10.1 Longitudinal and transverse turning

Longitudinal turning:

In the case of longitudinal turning tool moves parallel to the axis of the workpiece. For roughing at longitudinal turning the use of either a straight or arcuated turning tool is favourably.

Transverse turning:

The tooling of the face is known as transverse turning. In the case of transverse turning, the turning tool is moved at 90 degrees to the turning axis of the piece being turned. In so doing the compound rest is to be locked. The main cutting edge of the turning tool is to be exactly centred so that no scar remains in the middle of the workpiece. The arcuated tool is used for transverse turning.



to 1+2: Roughing tools arcuated to the left and or right: By using them a maximum on material is to be cut off in as short a time as possible (without paying attention to the finish on the surface of the work piece). They can be used for longitudinal and transverse turning.

to 3: Offset side turning tool: Used for smoothing (clean surface) in the case of longitudinal and transverse turning.

to 4: Outside thread turning tool: Used for cutting of outside threads.

to 5: Narrow square-nose cutting tool: Used for the cutting of grooves and slicing of workpieces.

When inserting the slicing tool No. 5, pay careful attention to the exactness of the centre height of the turning tool. Work with low speed and cool the tool (use soluble oil or emulsion for cooling: serves to lubricate and for the removal of chips.) The slicing tool is to be clamped as short as possible and at 90° degrees to the workpiece.

to 6: Right side tool: Used for the hollowing-out of boreholes. Clamp as short as possible in order to avoid ascillations of the turning tool which might otherwise occur (uneven surface).

10.1 Longitudinal and transverse turning



For the reason of the power at the turning chisel take care that the tool is short and fast fixed. If the lever arm is too long the turning chisel curves and springs back. The cutting part enters uneven into the workpiece and is producing a waved surface.

Take care that the turning chisel is placed on the middle of the turning piece.

The control of the height position of the middle of the workpiece is done with the live lathe center in the tailstock.

For the regulation of the height position of the turning chisel use with straight sheet steel pieces.

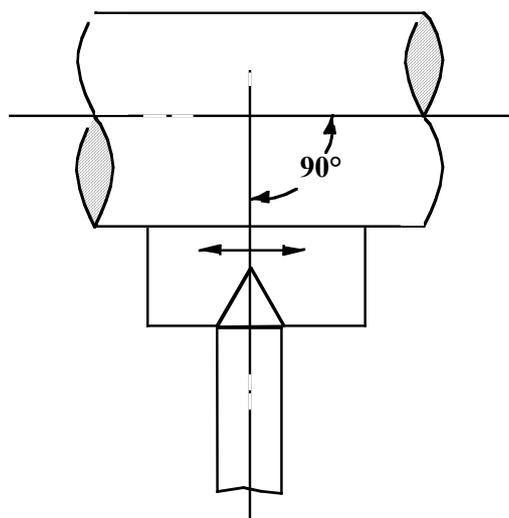
10.2 Thread cutting and automatic feed

10.2.1 General note

The thread turning chisel is a form turning chisel with the profile of the thread to be cut. It is ground according to jigs (diagram 1) and must be adjusted exactly to the middle of the workpiece as, otherwise, the profile of the thread would be distorted.

In order to obtain the correct position of the flanks of the thread to the axis of the workpiece, the grinding jig is put against the work piece and the turning tool is adjusted in accordance with it (diagram 1). For this purpose the jig is pushed successively on to both flanks of the turning tool. The feed of the thread turning tool is effected over the lead screw and must correspond to the thread pitch.

Setting the thread turning chisel



Change gears:

The connection between the feed gear mechanism and the lead screw is made by the translating gear wheels (extras at D2000, D2000E and D2400) included in the attachments. By setting various combinations of gears it is possible to cut a metric right-hand thread with a pitch of 0,4 mm - 3 mm and an inch-system right-hand thread with a pitch of 10Z/1" - 32 Z/1" (see table). (For left hand threads see the section "Gear pair, left-hand thread"). The various distances of the axes between the gears can be adjusted by swiveling the quadrant and readjusting the quadrant bolts.

10.2.1 General note

Feed:

The feed is switched on by means of the T-handle on the front side of the spindle head.



When cutting threads it must be remembered that the feed remains on throughout to ensure that the turning chisel always returns to the same position when cutting more than one thread. For this reason, after completing the cut the turning chisel with the transverse carriage is cammed out as, otherwise, the flanks and cutting edges could be damaged and is returned to its original position by altering the turning direction of the motor over the reversing switch. It is advisable to make a 4-5 mm wide groove at the end of the thread in order to enable a better camming out of the threading tool.

Long thread:

In the case of long thread diameters, the revolving lathe centre should always be used in order to prevent the work piece from being pushed away.

Overload clutch:

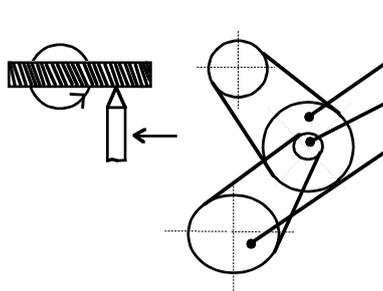
To avoid damage at the advance system the main spindle and the leading spindle drive are connected with an overload clutch.

10.2.2 Application of change gears - optional for D2000 and D2400 E

For the purpose of automatic longitudinal turning there are two feed rates, being at your disposal: 0,085 mm and 0,16 mm/revolution. (Upon delivery, the gears producing a feed of 0,085 mm/revolution have been put on).

Putting on different combinations of gears enables you to cut metric thread ranging from 0,4 to 3,0 mm in pitch. The same applies to inch thread ranging from 10 threads/" to 32 threads/" in pitch.

Table on thread cutting

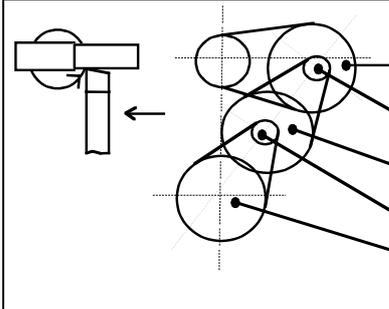


mm	0,4	0,5	0,7	0,75	0,8	1,0	1,25	1,5	1,75	2,0	2,5	3,0
A	48	48	48	48	48	48	48	48	48	48	48	48
B	16	20	14	18	16	14	20	36	28	40	40	48
C	40	40	20	24	20	14	16	24	16	20	16	16
Z/1"	10	11	12	13	14	16	18	19	20	24	28	32
A	34	34	34	34	34	34	34	34	34	34	34	34
B	36	36	36	36	36	36	14	34*	18	24	18	18
C	20	22	24	26*	28	32	14	36	20	32	28	32

* = Extras

10.2.2 Application of change gears - optional for D2000 and D2400 E

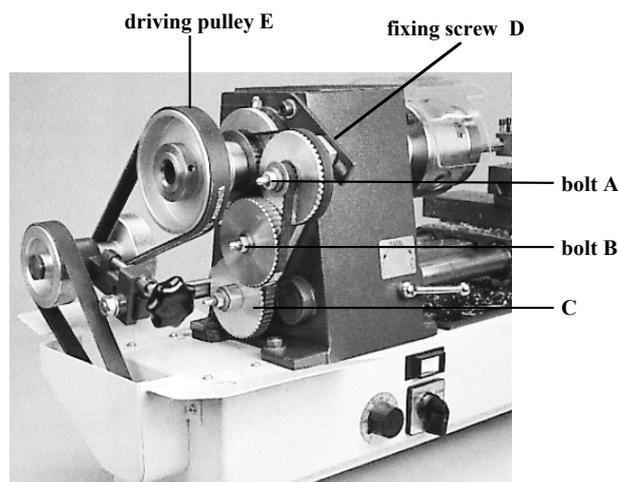
Table automatic longitudinal feed for D2000 - D2400 E

	mm/□	0,085	0,16
A1	48	48	
A2	14	18	
B1	48	48	
B2	14	20	
C	48	48	

10.2.3 Altering the feeds or thread pitches for D2000 E, D2400 E

When altering the feeds or thread pitches, proceed as follows:

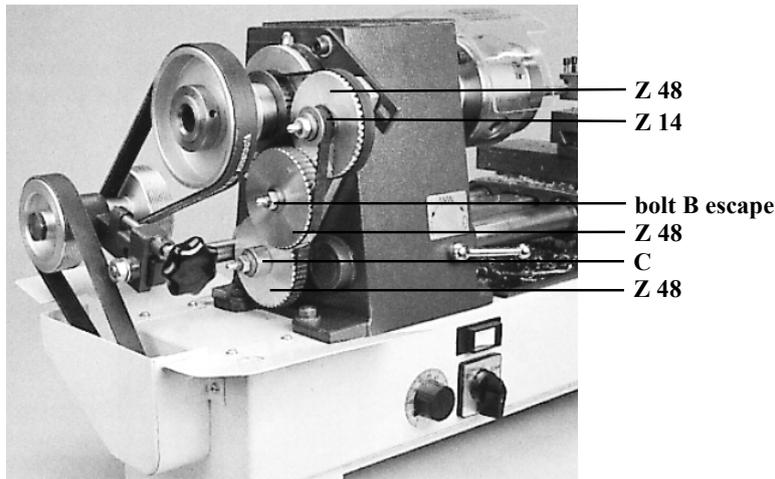
1. **Changing the feed from 0,085 mm to 0,16 mm**
 - a. Loosen the fixing screw D of the change gear quadrant.
 - b. Loosen and remove the hexagonal nuts and washers from the bolts A and B.
 - c. Loosen the hexagonal bolts A and B. Remove the toothed belt connecting A and B. Unscrew the bolt B together with the 2 tooth belt pulleys from the quadrant and remove it by slightly tilting upwards the bolt. This at the same time leaves free the toothed belt connecting the main spindle with A by placing the toothed belt onto the great driving pulley E.
 - d. Remove both tooth belt pulleys Z 14 from their bolts A and B and change them for tooth belt pulley Z 18 or tooth belt pulley Z 20, respectively. Then, tighten bolt A. Mount and tighten the washers and nuts of A and B.
 - e. Mount bolt B, together with both tooth belt pulleys into the change gear quadrant again by slightly tilting the bolt and screwing it into the square nut located behind the quadrant. Put on the toothed belt connecting B and C, pull bolt B upwards imparting tension to the toothed belt. Then, tighten bolt B.
 - f. Put on toothed belt from main spindle to bolt A and from bolt A to bolt B. Then tense the belt between main spindle and bolt A by means of the change gear quadrant and tighten the change gear quadrant with fixing screw D.
 - g. Close the cover of the headstock and tighten again the screw with hexagonal recessed hole.



**10.2.3 Altering the feeds or thread pitches
for D2000 E, D2400 E**

2. Changing the feed from 0,085 mm to a metric pitch of 1,5 mm

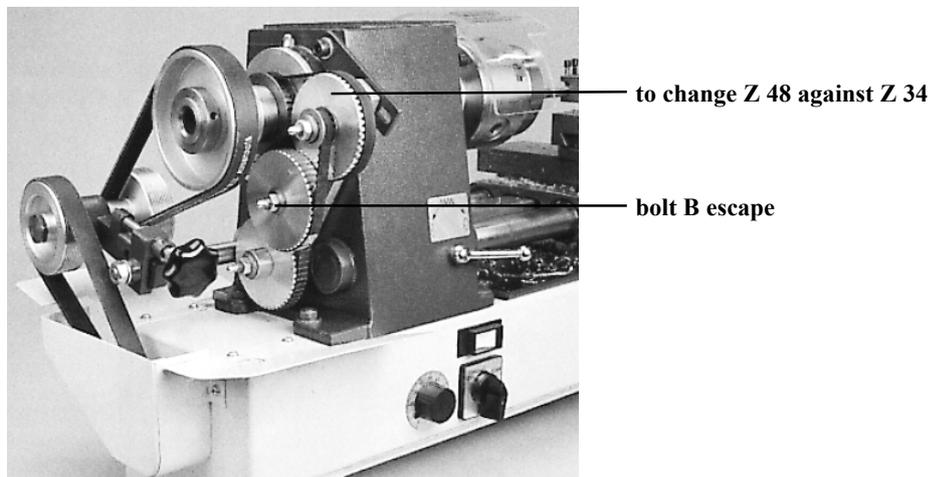
- a. - c. Start the procedure exactly as already described under pos. 1, a-c, expect for the hexagonal nut being removed as well from the shearing bushing C, as described under pos. 1 b.
- d. Pull off the bushing and the tooth belt Z 48 from the shearing bushing C. Put the bushing and the tooth belt pulley Z 24 onto the shearing bushing but, make sure that the bushing **precedes** the tooth belt pulley. **Bolt B with toothed belt will not be needed with thread cutting!**
- e. Pull off tooth belt pulley Z 14 from bolt A and put on tooth belt pulley Z 36. Put on toothed belt connecting the main spindle with bolt A and from A to C.
- f. - g. Proceed as described under pos. 1, f-g!



Only the two short toothed belts (1145) are required for cutting metric threads. The slightly longer toothed belt (1146), which connects the main spindle with wheel A The toothed belt (1145) connects wheel B with wheel C.

3. Changing the feed from 0,085 mm to thread pitch 12 threads/"

Proceed exactly as already described under pos. 2. The procedure differs merely in additionally changing the tooth belt pulley Z 48 running on bolt A for the tooth belt pulley Z 34.



As when cutting metric threads, only the two shorter toothed belts (1145) are normally required. Exeption: For a lead of 13. 14. 16 or 19 threads/inch. In this case, the longer toothed belt (1146) is required to connect wheels A and C.

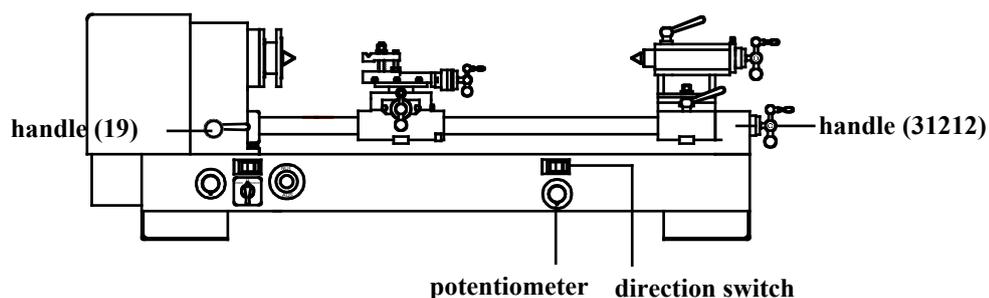
10.2.4 Changing of feeds or thread pitch for D3000 E

1. Working with the automatic longitudinal feed

- a. Turn the handle (19) on the symbol longitudinal turning. For the connection of the clutch disk turn with with the handle (31212) a little.
- b. Switch-on the direction switch on the right of the substructure.
middle position = off
left injected = advance to the spindle
right injected = advance to the tailstock
With the potentiometer adjust the feed speed.
- c. After the automatic longitudinal turning but the direction switch on the middle position.

2. Working with the thread cutting unit

- a. At first for the desired thread pitch the changing wheels must be mounted. You receive the machine from our factory with yet mounted wheels Z 36 and Z 24 for a thread pitch of 1,5 mm. During putting of metric threads the toothed wheel Z 48 is placed on the change gear quadrant as shown on the picture 6.22. During cutting of inch thread this wheel has to be replaced through the tooth wheel Z 34.
For the different thread pitches only the tooth wheels B (beside Z 48) and C (on the main spindle) according to picture 6.22 have to been changed.
- b. Select slowest spindle feed.
- c. Turn the handle (19) on the symbol thread turning. The handle must be in function till the thread is ready produced. For the cutting of several cuts to produce the thread the machine must be stopped with the reversing switch at the end of the thread and at the same time the threadcutting tool separated. Now turn the reversing switch on left turning and the carriage runs in the direction of the tailstock. If the threadcutting tool is placed approx. 5 mm in front of the beginning of the thread, stop again the machine, turn the cross-slide ahead like the before made cut plus the desired removal of material. Then turn the reversing switch on right turning and execute the cutting of the thread. Only when the thread is finished the handle (19) can be put out again.

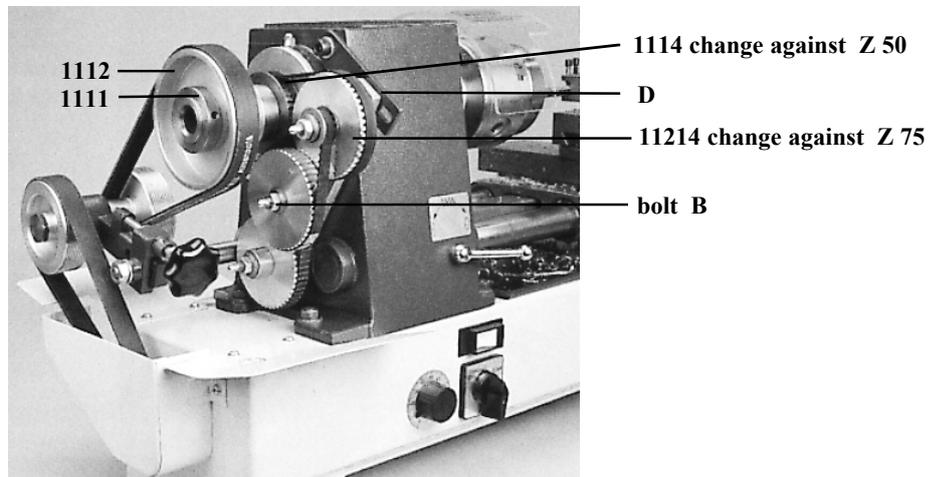


11. Pair of toothed wheels for left-hand thread

To cut left-hand threads, the toothed belt gear No. 11214 on bolt A is to be exchanged for the toothed gear Z 75 and the toothed belt gear No. 1114 on the work spindle exchanged for the toothed gear Z 50.

To do this, proceed in the following manner:

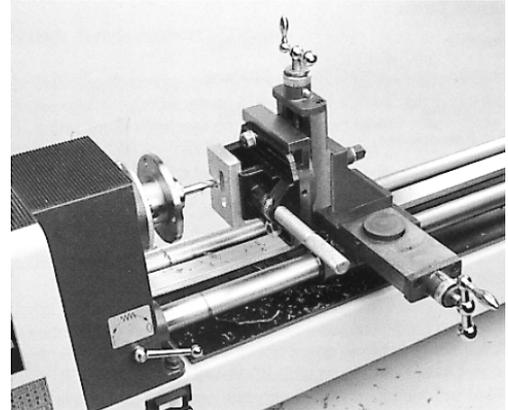
- a. Pull out the mains plug, loosen the hexagon socket screw at the front side of the headstock and open the cover. Remove the belt from the workspindle.
- b. Loosen the screw D of the quadrant. Loosen bolt A and B on the quadrant and remove toothed belt.
- c. Remove bolt A on the quadrant upwards and bolt B on the quadrant downwards.
- d. Loosen nut and washer from bolt A and remove. Loosen toothed belt gear No. 114114 and No. 11214 from bolt A and remove.
- e. Loosen the headless pin on the adjustment nut No. 1111 on the workspindle. Loosen the adjustment nut and remove from the workspindle.
- f. Remove the V-belt pulley No. 1112, the separator bush No. 1113 and the toothed belt gear No. 1114 from the workspindle. Mount the toothed belt from the workspindle and tighten firmly with the adjustment nut.
- g. Mount toothed gear Z 75 and the toothed belt pulley No. 114114 on to the bolt A and tighten with the washer and the hexagon nut.
- h. Mount toothed gear Z 50, separator bush No. 1113 and V-belt pulley No. 1112 on to the workspindle and tighten with the adjustment nut.
- i. Pay attention to the correct adjustment of the tapered roller bearings see section "headstock"
- j. Lay the toothed belt from A to B, cam in the toothed gear Z 75 with Z 50 by swivelling the quadrant, tighten the screw D. Tense the toothed belt from A to B through removing B.
- k. Lay the drive belt on the workspindle and tense . Close the cover and tighten with the hexagon socket screw at the headstock.



12. Angle plate with milling table

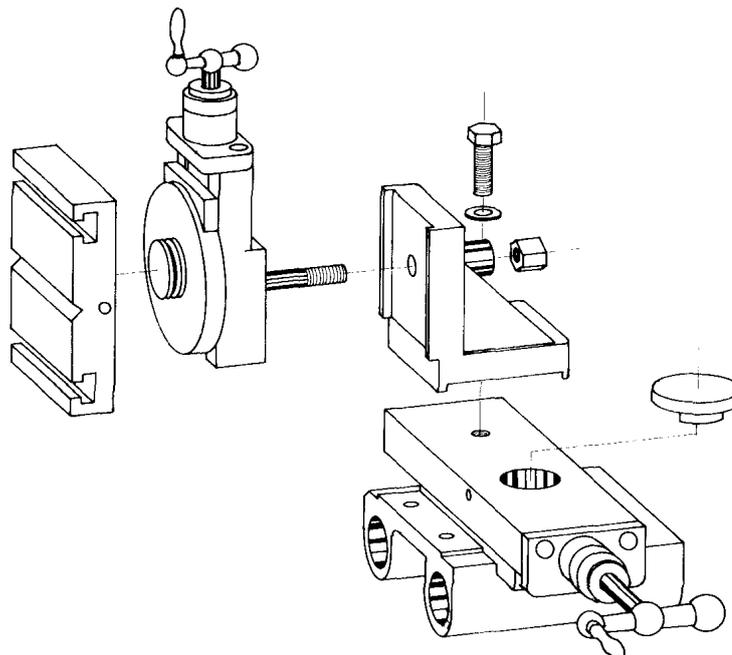
for drilling and milling

The milling is used to produce flat surfaces and grooves. When milling the advance and feed motion are effected with the angle plate from the workpiece. If the angle plate is correctly mounted on the compound rest (see assembly instructions), the workpiece can be rigidly and firmly attached to the clamping plate. This should be cleaned of dirt and chips beforehand in order to guarantee a good rest. The clamping screws used are inserted into the T-groove of the clamping plate. In addition, a machine vice can be attached to the clamping plate. The tool is to be clamped as short as possible in the collet chuck (danger of breaking). If the tool is firmly clamped, the depth adjustment can be made over the feed shaft.



Assembly of the angle plate with the milling table

At first you remove the longitudinal slide rest from the transversal slide rest of the lathe. Then the angle is screwed on to the carriage of the transversal slide rest with the delivered hexagon screw. After removing the clamping plate and the spring from the longitudinal slide rest you fix the longitudinal slide rest as indicated against the clamping angle.



13. Three jaw-chuck and four jaw-chuck

The three-jaw chuck

serves to clamp circular, triangular and hexagonal workpieces centrically to the spindle axis.

The four-jaw chuck

serves to clamp square workpieces centrically to the spindle axis.



Danger of accident

Do not try to clamp larger workpieces. The chucking power is then too low and the jaws can detach themselves.

Mounting of turning jaws:

The jaws and guides are numbered from 1-3. Open the chuck by means of the chuck key until the jaws loosen. (order: 3, 2, 1 bzw. 4, 3, 2, 1).

Now, take the inner jaws beginning with the number 1 and put this in the guide number 1. Push the jaw number 1 in the direction of the centre point of the chuck and at the same time turn the chuck key (direction "tighten"). When the transverse spiral has taken hold of number 1, number 2 must be put in the guide provided. The same now happens to number 2 as to number 1. Proceed with number 3 and number 4 in the same way. Subsequently, examine the position of the jaws.

Mounting of drilling jaws:

If, afterwards, you again want to work with outer jaws, the process repeats itself in the same order (first jaw 1, then 2, then 3, then 4).

14. Collet chuck



Mounting of the tool holder:

When working with the collet chuck, the concentric chuck must be removed from the workspindle. In order to do this, loosen the three tightening screws by means of the Allan key SW6 included in the accessories. Now, the chuck can be removed from the concentric flange of the workspindle and the collet chuck can be fixed in the same way as the lathe chuck.

Collets:

Then press the collet into the union nut and screw it on the collet chuck.



Only those workpieces may be used which accord to the nominal diameter of the collet chuck.

15. Steady and follow rest

Steady and follow rest compensate for the deflection of long shafts caused by resultant cutting forces. The roller jaws of the rests prevent the pieces to be turned from deflection.

They are to be adjusted in such a manner that the turning axis of the workpiece is in true alignment with the height of the centres of the machine. At the point of support, the pieces to be turned must be completely round.

Steady rest:

The steady rest can be firmly clamped to any position on the slide bars. It is put on the slide bars with its half shells and fixed to the slide bars by means of the clamping plate.



Follow rest:

The follow rest is used particularly for turning thin, long shafts and for turning threaded spindles. It is screwed firmly on to the threaded drilled holes of the compound rest provided for this purpose, so that it holds the workpiece as near as possible to the turning tool.



16. Square turret head

The square turret head is used instead of the clamping plate in order to clamp the tools.

Four turning tools can be changed simultaneously. By swivelling the turret head by 90 degrees each time, the required turning tool can quickly be brought into its working position

There are four centering holes on the bottom for securing the square turret head in its four positions. For this purpose, the screw supplied with the springmounted steel ball must first be screwed into the threaded hole in the upper part of the turning carriage.



17. Hand tool rest for turning wood

Die Handstahlaufgabe wird auf die Führungsstangen der Drehmaschine montiert.

There are two alternative adjustments:

1. By loosening the lower part by means of the knurled screw, the hand tool rest can be adjusted to any position or be swivelled to the workpiece.
2. By loosening the upper part by means of the knurled screw, it can be centred or by corresponding turning adapted to match the shape of the workpiece.



To avoid accidents during operating with chisels on the hand steel rest and the fixing of the workpiece into the chuck please use for wood turning the fix lathe centre.

To avoid accidents, the hand tool rest is to be pushed as near as possible to the workpiece and readjusted in the course of machining.

18. Wood turning lathe centre

The wood turning centre serves to accept workpieces out of wood between the centres and enables a machining of the piece throughout its entire length without any reclamping being necessary.

It is contained in the inner taper of the workspindle. Pay careful attention to cleanliness when inserting the wood turning lathe centre since dirt or metal chips could damage the taper. By feeding forward the tailstock sleeve to the workpiece and the cutting edges of the turning lathe centre are pushed into the front side of the workpiece. The correct degree of pressure depends upon the firmness of the workpiece, the diameter and the cutting section (chisel advance).

