Please read before start-up!

Operating instructions

Universal Lathes

Version of 09/2009

D4000

CC-D4000

Walter Blombach GmbH
Tool and Machine Factory

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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.
Therefore, please read the respective instructions carefully and pay attention to them.

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 (see nameplate).

Disposal of the lathe

The transport and protective packaging made up of the following materials:

- corrugated cardboard
- polystyrene free of freon
- polyethylene foil
- non-returnable wooded pallet (untreated)
- Euro pallet (deposit)

If you have no further need of these articles or do not wish to use them again, please dispose of them at the public recycling facilities.

The lathe consists of up to 98 % of recyclable materials, i.e. steel, cast iron, aluminium and 2 % of chemical materials, e.g. the coating of electrical leads, printed circuits.
If you have trouble disposing of these parts in a proper manner, we would be pleased to help you. Upon mutual agreement we will take the complete machine back and dispose of it. However, the costs for transporting the machine to our plant must be at your expense.

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EC – Conformity Declaration

Version 07.2010

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 lathes specified below

Universal Lathe type:
D4000
CC-D4000

meet the following regulation requirements for standard series production

- **directive for machines 2006/42 EG**
- **EMV directive 89/336/EWG**

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

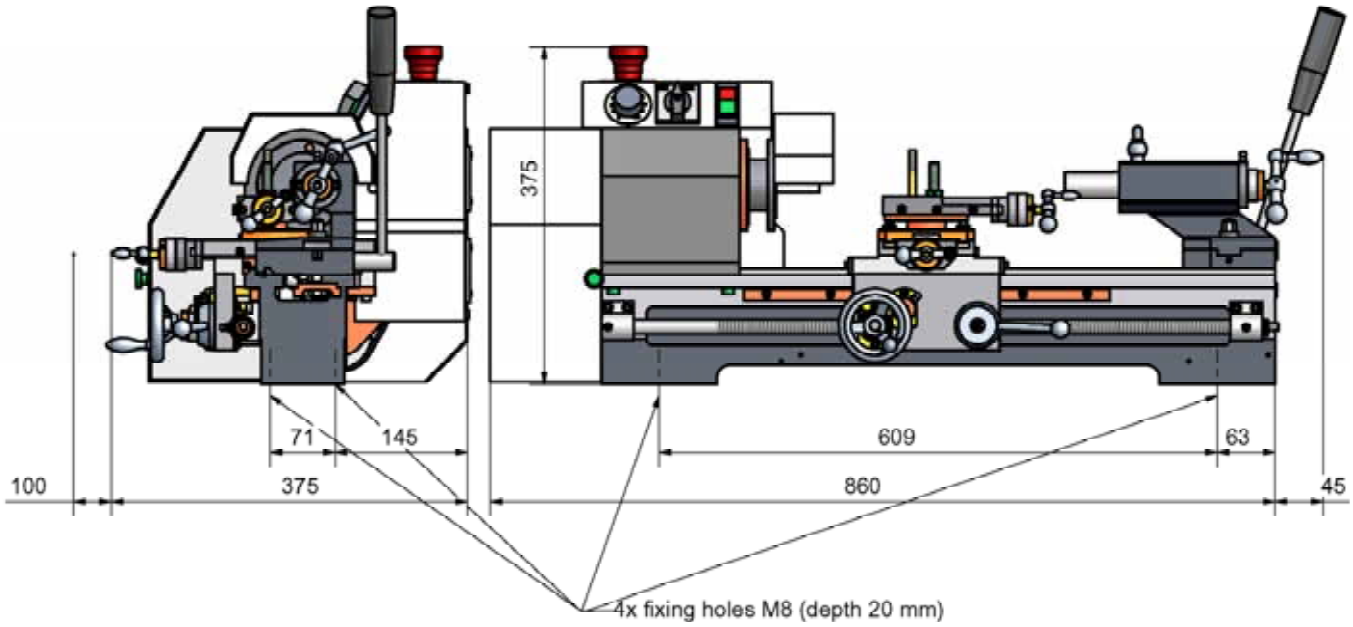
EN ISO 12100-1
EN ISO 12100-2
EN 12840
EN 60204-1

D-54673 Neuerburg

City

Technical Director

1. Machine dimensions



2. 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 drilling and milling machine shows signs of damage in transit or if there is any other reason for complaint. In this case we request your immediate notification. Claims made at a later date cannot be accepted.**

The drilling and milling machine must be installed on an appropriate, level and firm base.

This would be, for example:

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

The drilling and milling machine must be firmly screwed to the base. Use the 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 are observed.

The machine should be installed in a well lighted area and electrical cables with earthed sockets and O-conductors must be installed close to the machine so that the mains cable is not subject to any tension whatsoever. The mains cable should be such that, for example, by means of a multiple socket, a coolant unit can also be connected.

3. Conditions for best results

Fix the machine to 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 close as possible to the work piece.
Clamp the work pieces tightly and without vibrations.
Long pieces are to be supported by the tailstock or a fixed stay.
Apply coolant and lubricant for better surface quality (finish) and dimensional accuracy.
Fix processing tools and work pieces on clean clamping surfaces.
Grease the machine sufficiently.
Use the correct tools for removing material from the work pieces.
Set correct bearing clearances and align guides.

4. Safety instructions

1. The feed line for the motor must be connected to a sealed contact socket or junction box. (Have the socket or junction box checked by an electrician beforehand; protection against children).
2. The socket or junction box must be close enough to the equipment, so that the live cable is subject to no stress whatsoever.
3. When maintenance or cleaning work is done, the machine must be shutdown and the mains plug pulled.
4. Do not slow down work pieces or chucks by hand or any other objects.
5. Wear safety goggles when working with the machine.
6. Do not remove the chips with the hand. Use corresponding aids (hand brush, paint brush).
7. Always keep the protective hood of the drive closed.
8. The turning tools must be tightly clamped at the correct height and as short as possible.
9. The turning tools must never be replaced when the machine is running.
10. **Never leave the clamping chuck key in (even when not in operation).**
11. Always pay attention to the clamping width of the lathe chuck. (lathe chucks ∅ max. 40mm, drill chucks max. 100mm ∅).
12. **Never take measurements on work pieces during the lathing process** (risk of accidents and damage to the measuring gauges)
13. Do not wear loose clothing (ties, shirt sleeves, jewellery etc.).
14. When working between centres, always centre well in order to prevent the work piece from being slung away. In addition, make sure that the locking screw of the tailstock is tightened.
15. When using the automatic feed always take care that the cross support does not get in contact with the chuck or the tailstock.
16. Never leave the machine alone when in operation.
17. **When machining wood, use the lathe centre instead of the lathe chuck to support the work piece.**
18. The machine must be secured so that it cannot be switched on by children. Make sure that other people do not operate the machine.
19. Always keep the machine dry.
20. Frequently check the machine for damage. Any damaged parts must be replaced by original parts and are to be fitted by an expert or by us.

5. Start-up and maintenance

5.1 Maintenance

The longtime serviceability is vitally dependent upon appropriate care. The lathe needs to be cleaned after every turning job.

In case the lathe is to be installed in a moist cellar room, all bare parts need to be oiled after use to avoid corrosion.
An overall and constant lubrication of all moving parts is highly significant.
In case of backlash inside the bearings or inside the guideways of the slides, read-just in time to avoid the bearing or the guideways of the slides being destroyed.

5.2 Start-up

Prior to the initial operation, the machine must once more be cleaned with great care and all lubrication points have to be lubricated with grease. Thoroughly oil the cross support, lead screws, guiding rods and spindle sleeve.

Check all spindles by hand in order to ensure they run smoothly.

Please pay particular attention to the following before putting the machine into operation:

1. Ensure that the machine is free from protective agent (preservative) and all sliding surfaces are clean and oiled. We recommend the use of petroleum or similar to remove protective agent.
2. Lubricate the machine according to the lubricating instructions.
3. Release the longitudinal slide clamp and check the slide travel manually for both axes.
4. Ensure that the protective hoods are closed.
5. Check the condition of the chuck.

5.3 Lubrication of the machine

The lathe should be lubricated every 8 operating hours according to the lubricating schedule (2.1).

Lubricating points 3 (bed guide), 4 (dovetail guide of transversal slide), 5 (dovetail guide of longitudinal slide) and 7 (tailstock sleeve) with the help of an oil can and a standard lubricating oil, moving the slides and the sleeves to and fro while doing so.

All other lubricating points are to be greased at the designated lubricating nipples with a grease gun and standard roller bearing grease.

5. Start-up and maintenance

5.4 Guidelines for the periodical maintenance of the machine

Daily	Grease the lubrication points in compliance with lubricating schedule 2.1
(every 8 operating hours)	Clean the machine and guides.
Every 3 months	Check the tension of the Poly-V and toothed belt and tighten as
(every 500-600	necessary.
operating hours)	Check the play inside the guideways and lead screws and adjust.
	Check the bearing heat of the main spindle and the electric motor.

6. Description of assembly groups

6.1 Design features

- Solid large-dimensioned grey cast iron machine bed.
- Sturdy cross ribbing makes the bed extremely stable and enables you to work without oscillations.
- The wide prismatic guide is ground.
- Transversal and longitudinal support with dovetail guides and adjustable gibs.
- All guides provided with a wiper for chips and dirt.
- Large-dimensioned, pivoting scale rings, reading accuracy 0.05 mm.
- Main spindle is seated in adjustable taper roller bearings.
- Ground main spindle nose.
- Electronically infinitely-adjustable spindle speeds.
- Clear and ergonomically-arranged controls.
- Equipped with Emergency OFF push button.
- Main switch with undervoltage release.
- Motor switchable left-right.
- Tailstock with its own prismatic guides.
- Large torque on main spindle via gear transmission.

6. Description of assembly groups

6.2 Headstock

6.2.1 Main spindle

The headstock is firmly screwed to the machine bed. Inside the headstock, the main spindle is seated on two adjustable precision tapered roller bearings.

If readjustment of the bearings is required, 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 clockwise direction until the bearings run free of play again (the main spindle can easily be turned by hand).
3. Re-tighten the locking screw.

Roller bearings adjusted too tightly become useless after a short period

The spindle bore (capacity) is 20 mm.
For safety reasons the whole drive is completely covered with a protective hood and is fixed on to the headstock.

6.2.2 Electrical equipment

All the electrical equipment is housed in the box situated at the rear side of the headstock.

The AC motor is supplied already installed. The sealed contact plug can be connected directly to the 220 V mains supply via a sealed contact socket.

All 230V machines are fitted with a main switch with undervoltage release, i.e. this switch must be switched on before the machine can be switched on via the reserving switch. The main switch must also be switched on again following a power failure.

If you wish to change the sense of rotation of the motor by means of a reversing switch in the case of Electronic Lathe 10600 the reversing switch must remain in the O position for about one second so that the relay on the controller board has enough time to switch over.

Before connecting the machine to the mains supply the earthing has to be checked.

6. Description of assembly groups

6.2.3 Speed regulation

The rotational speed of the work spindle can be adjusted infinitely variable from 45 and 2300 rpm by means of the potentiometer loated at the front of the machine.
Should you require the lower rotation level with a minimum speed of 30 min^{-1}, the drive belt must be relocated.

Please proceed as follows (see headstock):
After removing the protective cover, release the driving belt. To do this, loosen the nut (of the transmission gear lever) and the axis screw (26). Back the toothed belt wheel (23) so that the drive belt can easily be put on to the other wheel transmission (12 and 23).

Tension the belts by pushing the toothed belt wheel (23) until the belts cannot slip off the pulleys.

Re-tighten the axis screw (26) and nut (of gear transmission lever).

6.2.4 Speed transmission - main spindle to lead screw

The toothed wheel (11) on the main spindle drives the two intermediate wheels (32) on the tumbler gear. On the centre of rotation of the tumbler gear there is a toothed wheel (40) with a toothed belt wheel (41). The toothed wheel is driven by the intermediate gears and the toothed belt wheel assumes the drive of the gear combination on the change gear quadrant.

6.2.5 Tumbler gear adjustment

As shown in the diagram (2.2) the right-hand wheel on the tumbler gear engages with the toothed wheel of the main spindle.
This setting is required for LH threads, i.e. if the spindle is turning in an anti-clockwise direction (looking at the chuck), the tool slide will move away from the chuck.
After loosening the clamping screw (36), then the tumbler gear can be pivoted over to the right so that the left-hand intermediate gear engages with the toothed wheel of the main spindle. This setting serves for cutting right-hand threads, or the slide moves towards the chuck (while the sense of rotation the main spindle stays the same).

6.2.6 Protective cover for chuck

The main spindle of the machine will only run with the chuck protective hood (24) closed.

For safety reasons it is not possible to switch the machine on if the protective hood is open.

6. Description of assembly groups

6.3 Bed with lead screw drive

6.3.1 Overload clutch

In order to avoid damage to the drive system of the lead screw an overload clutch is fitted on the lead screw drive side. The clutch becomes effective when the machine is overloaded and also when the machine hits an end stop in longitudinal direction.

The clutch is adjusted with the hexagon nuts (18) and counter screwed.

6.3.2 Setting the bearing play of the lead screw

On the right-hand side the lead screw is seated radially in a bronze bushing (10) and axially in two axial bearings (9;8). These two axial bearings allow the lead screw to be adjusted free of play (6).

If the bearing play needs to be readjusted, first of all loosen the outer of the two capstan nuts (14). Then the inner nut is turned against the axial bearing so that the lead screw has no more air axially.

Then the outer capstan nut is countered against the inner one.

6.4 Tool slide

6.4.1 Transversal slide

The front part of the transversal slide rests on a V-guide and the rear part on a surface guide. The slide is kept on the bed from below by means of the guide rail (46). The cylindrical screw (39) can be found at the front, on the right. The clamping piece (38) is clamped to the bottom of the V-guide by using this screw. This clamping version is suitable for face turning and parting.

The dovetail guide of the transversal slide is adjustable. If readjustment is necessary, loosen the hexagon nuts (12). Adjust the threaded pins (45) with the Allen key (not too tight) so that the slide can easily be moved back and forth by using the ball-ended crank (57). Re-tighten the hexagon nuts (12) after completion of the adjustment.

If axial play occurs in spindle (38) please proceed as follows. First of all, loosen the threaded pin (29). Now the scale support (27) can be turned to the right until there is no more axial play. Re-tighten the threaded pin (29) after completion of the adjustment.

After making the adjustment the spindle must still be easy turnable.

For calculating the displacement path of the slide on scale support (27) there is a large scale ring (29) divided into millimetres. One notch corresponds to 0.05 mm of adjustment and this corresponds to the same amount of chip removal from the work piece, i. e. the actual slide travel amounts to 0.025mm only, whereas the work piece diameter is reduced by 0.05mm.

6. Description of the assembly groups

6.4.2 Longitudinal slide

The longitudinal slide is clamped to the transversal slide upper part (5) by means of the clamping ring (5). After loosening the retaining screws (operating elements Pos. 6) the upper slide can be pushed or turned along the transversal slide. This is suitable for lathing short tapered pieces. A scale is engraved on the guide ring (2) so that you can read the exact setting. The zero mark is on the upper part of the transversal slide.

The dovetail guides of the longitudinal slide can be adjusted as described for the transversal slide. The parts have a different numbering in the drawing: hexagon nut (11), threaded pins (10), ball-ended crank (24).

Likewise, as described in the case of the transversal slide, the axial play of the spindle can be adjusted. Here, the parts are numbered differently: spindle (21), spindle bearings (19), threaded pin (26), scale support (27).

As described in the case of the transversal slide, the longitudinal slide is also provided with a reading scale for its travel path. Here, one scale mark corresponds to a feed motion of 0.05mm. As the diameter is not taken into consideration with the longitudinal slide, the feed motion of 0.05 mm corresponds to the actual path. One revolution of the crank corresponds to a path of 2mm.

6.5 Tailstock

The tailstock can be displaced along the lathe bed and may be locked in any position by tightening the hexagon nut (13). The tailstock consists of an upper and lower part. The upper part can be displaced up to 10 mm for turning long, slim tapers.

To do so please proceed as follows:
Loosen hexagonal nut (13) and with the help of the two threaded pins (9) push the upper part in the desired direction.

The central position of the tailstock is shown by the notch embossed on the side. Find out by doing some trial turns if the work piece is cylindrical and if necessary correct the tailstock setting.

Solid tailstock sleeve:
The solid tailstock sleeve, which is provided with a millimetre scale (5), is designed in such a way that the lathe centre, drill barrel or chuck are **automatically ejected** when turning back.

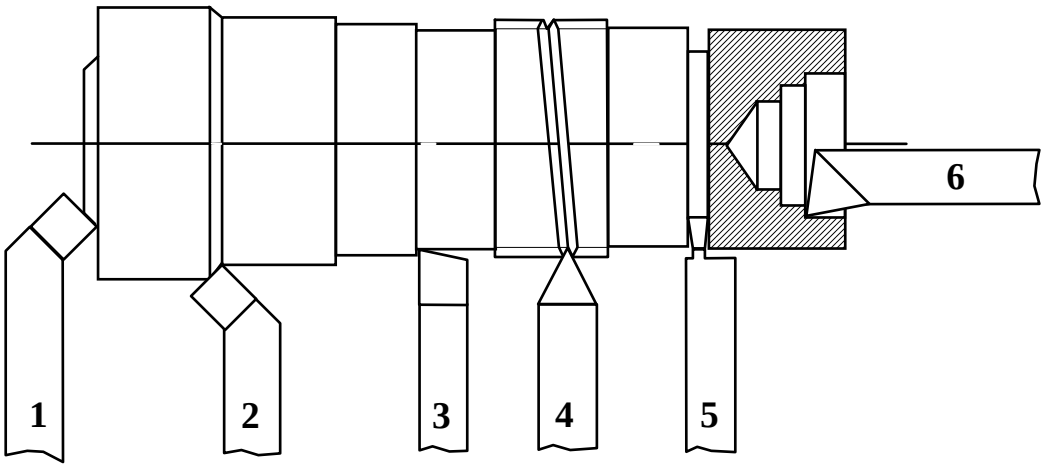
Tool clamping:
An **inner cone CM 2** which is worked into the tailstock sleeve (4) serves to accept the tools. By screwing the upper T-handle (7), the tailstock sleeve can easily be clamped in any position. The tailstock sleeve can be moved axially over a threaded spindle by using the crank (25) located at the rear end.

7. Applications

7.1 Longitudinal and transverse turning

Longitudinal turning:
In the case of longitudinal turning tool moves parallel to the axis of the work piece. For roughing at longitudinal turning the use of either a straight or arcuated turning tool is favourably. For smoothing the use of pointed or broad turning tools is favourable.

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 work piece. 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 work pieces.

When inserting the parting 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 oscillations of the turning tool which might otherwise occur (uneven surface).

7. Applications

7.1 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 to long the turning chisel curves and springs back. The cutting part enters uneven into the work piece 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 work piece 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.

7.2 Thread cutting and automatic feed

7.2.1 Thread cutting

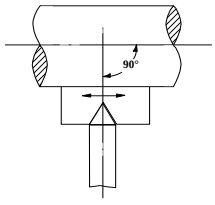
The thread turning chisel is a form turning chisel with the profile of the thread to be cut. It is ground according to jigs (diagram 1) and must be adjusted exactly to the middle of the work piece as, otherwise, the profile of the thread would be distorted.
In order to obtain the correct position of the flanks of the thread to the axis of the work piece, the grinding jig is put against the work piece and the turning tool is adjusted in accordance with it.

The feed of the thread turning chisel is affected via the lead screw, and must correspond to the thread pitch. The gearwheels in the accessories establish the connection between the feed gears and the lead screw. By fitting different combinations of gearwheels it is possible to cut metric and inch RH and LH threads. The different axis distances of the toothed wheels can be adjusted by pivoting the cutting edge and adjusting the cutting screws.

The feed is switched on by hand on the cam box. When cutting thread, please make sure that the feed remains continuously switched on so that the turning chisel always goes back to the same position when carrying cut several cuttings. For this reason, when the cutting is finished, the turning chisel is disengaged from the cross slide because otherwise the flanks and the cuts would be damaged. The chisel is taken back to its home position via the reversing switch by means of a change of direction of the motor. It is advisable to cut a 4-5 mm wide groove on the thread end in order to be able to disengage the threading tool better.

In the case of a long thread diameter, the lathe centre should travel along with the cutting head in order to avoid the work piece from being pushed to one side.

Diagram 1: Setting the thread turning chisel



7. Applications

7.2.2 Application of change gears for D4000

For automatic longitudinal turning there are two feed rates available: 0.085 mm and 0.16 mm/revolution. (The machine is delivered with the gears producing a feed of 0.085 mm/revolution put on). Putting on different combinations of gears enables you to cut metric threads ranging from 0.25 to 7.0 mm in pitch. The same applies to inch threads ranging from 10 threads/" to 40 threads/" in pitch.

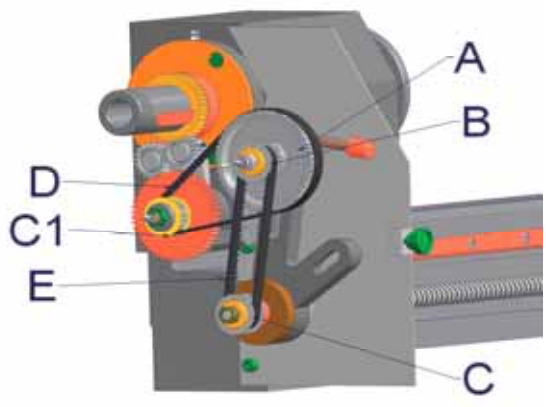


Table on thread cutting * = optional accessories

mm	0.4	0.5	0.7	0.75	0.8	1.0	1.25	1.5	1.75	2.0
A	48	48	48	48	48	48	48	48	48	48
B	16	20	14	18	16	14	20	36	28	40
C	40	40	20	24	20	14	16	24	16	20
C1	16	16	16	16	16	16	16	16	16	16
D	140	140	140	140	140	140	140	140	140	140
E	140	140	140	140	140	140	140	140	140	140

mm	2.5	3.0	3.5	4	5	7
A	48	48	24	24	24	24
B	40	48	28	40	40	28
C	16	16	16	20	16	16
C1	16	16	16	16	16	32
D	140	140	120	120	120	120
E	140	140	140	140	140	120

Z/1“	10	11	12	13	14	16	18	19	20	24	28	32	36	40
A	34	34	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	14	18
C	20	22	24	26*	28	32	14	36	20	32	28	32	28	40
C1	16	16	16	16	16	16	16	16	16	16	16	16	16	16
D	120	120	120	140	140	140	120	140	120	120	120	120	120	120
E	140	140	140	140	140	140	140	140	140	140	140	140	140	140

7. Applications

7.2.2 Application of change gears for D4000

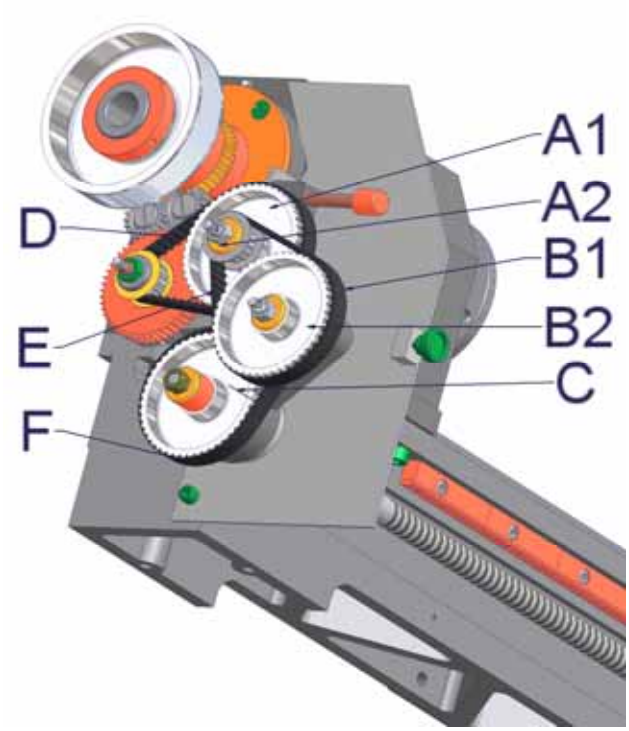


Table for cutting very fine threads with a second change gear bolt

mm	0.25
A1	48
A2	24
B1	18
B2	48
C	36
D	120
E	140
F	110
A2 and B2 front toothed wheel! A1 and B1 rear toothed wheel!	

Table for automatic longitudinal feed

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

7. Applications

7.2.3 Altering the feeds or thread pitches

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. (First loosen the knurled screw at the front of the headstock and open the protective cover.)

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. Turn bolt B out of the quadrant with the two tooth pulleys and take them out. Remove toothed belt of drive disc to A.

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.

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. Put toothed belt of of drive disc on bolt A and from bolt A on bolt B.

f. Pull bolt A upwards until the toothed belt is under tension, then tighten bolt A. Move quadrant to the front until toothed belt of drive disc is tensed to bolt A. Then tighten fixing screw D, mount washers and nuts on A and B and tighten.

g. Close the cover of the headstock and tighten again the screw with hexagonal recessed hole.

2. Changing the feed from 0.085 mm to metrical thread pitch 1.0 mm

a.-c. Proceed exactly as already described under pos. 1 a-c. The procedure differs merely – as described under 1b - in additionally taking away the hexagonal socket screw off bolt C.

d. Changing bolt and the tooth belt pulley Z 48 running on bolt C. First push bolt on bolt C, then the tooth belt pulley Z 14.

Bolt B with toothed belt will be needed for cutting very fine threads.

e. As the toothed belt Z14 is already on bolt A you do not have to make any changes. Move the toothed belt from the drive disc to bolt A and from A to C..

f. - g. Proceed as described under pos. 1, f-g!

3. Changing the feed from 0.085 mm to pitch 12Z/1”

Start the procedure exactly as already described. Only toothed belt pulley Z 48 on bolt A has additionally to be substituted by toothed belt pulley Z 34.

The feed is switched over via the lever grip on the front side of the cam box. When cutting thread please make sure that the feed remains permanently switched on so that the turning chisel gets into the same position every time in the case of several cuttings.

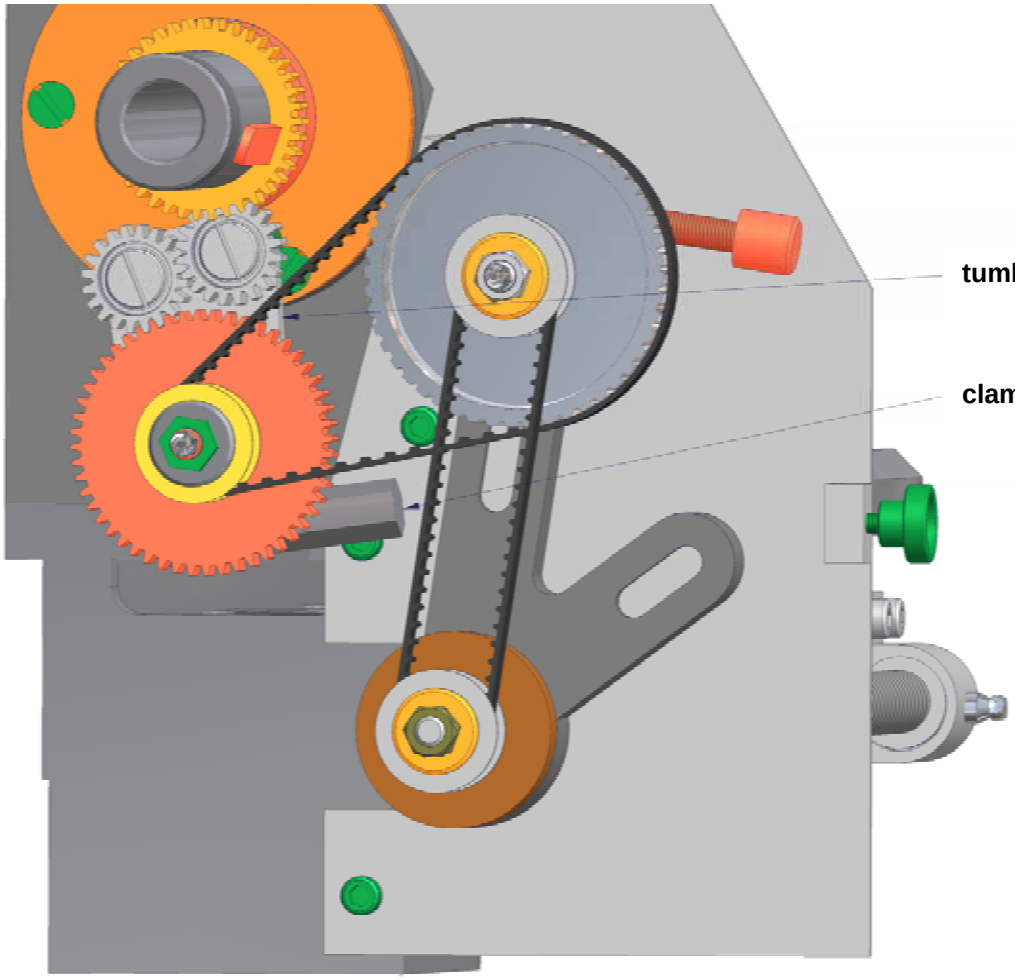
For this reason, when you have finished cutting, the chisel is turned out with the cross slide and is brought back by means of a change of direction of the motor via the reversing switch into the original position.

7. Applications

7.2.4 LH thread

To cut an LH thread all you have to do is bring the RH change wheel on the tumbler gear and link it into the drive wheel on the main spindle.

In figure 2.4 you can see the position when cutting an LH thread. In order to pivot the tumbler gear all you have to do is loosen the clamping screw.



8. Three-jaw chuck and four-jaw chuck

The three-jaw chuck
serves to clamp circular, triangular and hexagonal work pieces centrically to the spindle axis.

The four-jaw chuck
serves to clamp square work pieces 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 resp. 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).

9. Collet chuck

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

Mounting of the tool holder:
When working with the collet chuck, the concentric chuck must be removed from the work spindle. 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 lifted from the concentric flange of the work spindle and the closer can be inserted into the work spindle by gently pushing it.

Subsequently, insert the required collet chuck into the closer and by means of the hand draw-in tube (which is fed in through the hollow work spindle from the gear side) draw the collet chuck into the closer.

10. Lubrication coolant unit

The lubrication coolant unit consists of:

1. Tray with lubrication coolant tank which supplies the feed pump with lubrication coolant. General content of 19 litres.
2. Feed pump with the following electrical data
   - nominal voltage 230 V
   - frequency 50 Hz
   - nominal current input 0.4A
   - nominal output 0.07 kW
   - ON-OFF switch and mains supply with a length of 2 m with earthed plug.
3. Adjustable, flexible pressure hose with stop valve and nozzle for transporting the cooling lubricant to the machining area.

When using lubrication coolant, especially water based emulsions, a number of health and safety measures must be observed, which we would like to recommend:

1. Use concentrated products free of nitrites.
2. Use concentrates without secondary amins.
3. Use products with the lowest possible allergy potential.

When mixing a refill of cooling lubricant, please observe the following:

- clean / rinse the circulation system (tray / filter)
- determine the concentration necessary to meet the technical demands
- (concentrate: water 1:5 – 1:30)
- check the water has a low level of nitrites (< 50 mg NO 3-, test strip)

A cleaning plan should determine at what intervals the system should be cleaned of swarf and other waste.

A service plan should determine the following:

- when to check the concentration in use (daily / weekly)
- when to check the pH values (weekly)
- when to check / assess the bacteria count (monthly)
- when to check the nitrate content (weekly)

(The information in brackets can be varied according to the production circumstances.

In order to reduce splashing, we recommend the attachment of a splash guard and / or reducing the amount sprayed from the nozzle.

Since steps to protect the skin must be taken, it is advisable to wear gloves and aprons. The skin should be cleaned with acidic syndets without abrasive ingredients and rich cream should be applied to regenerate the skin.

Please also take note of the enclosed information on the general operating instructions.

11. Declaration of noise levels in accordance with DIN EN 24871 (German Industrial Standard)

Noise levels while running idle

Acoustic capacity level	**67 dB (A)**
Sound pressure level on operator's ear	**63 dB (A)**

The stated values reflect emission levels and not necessarily working levels. Although there is a correlation between the level of emission and the level of stress, this cannot be used reliably in order to determine whether additional safety measures are necessary or not.
Other factors which influence the actual stress level or employees are the characteristics of the working area, other sources of noise, i.e. the number of machines and other processes going on nearby and so on. Apart from that, the permitted stress levels may vary from country to country. This information is to allow the user of the machine to assess the dangers and risks more accurately.

Noise levels in accordance with DIN 45635 - part 1
noise level in work area

idle phase	LpA = 63 dB(A)
load phase	LpA = 67 dB(A)

12. Drawing and list of parts

12.1 Diagram for reading the speed

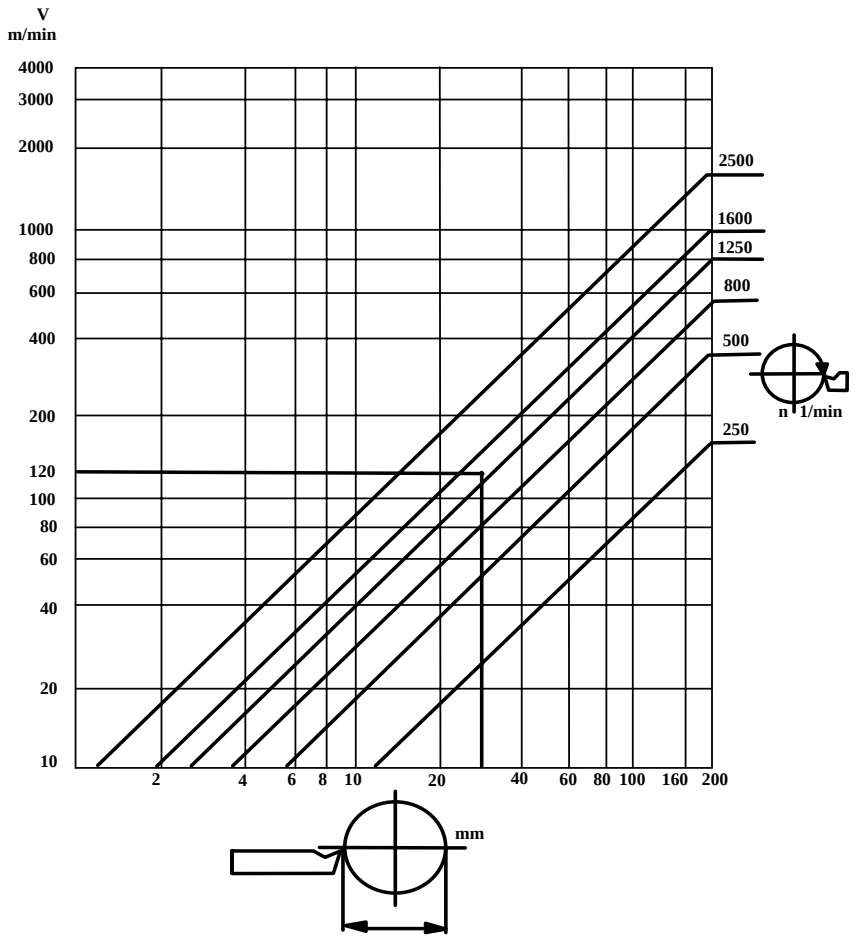
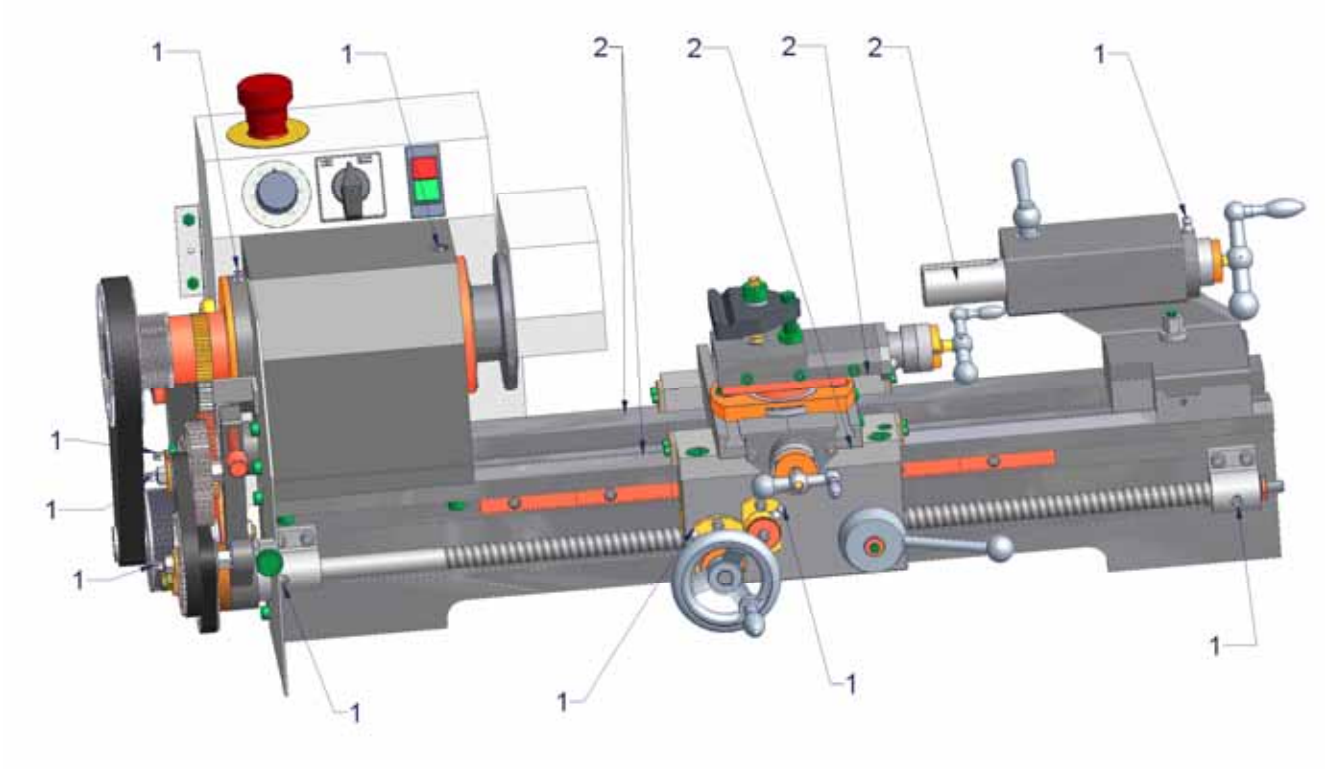
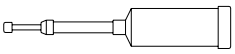
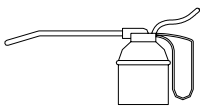


table		
	I	II
0%	30	150
10%	35	155
20%	50	220
30%	90	450
40%	150	850
50%	200	1050
60%	290	1500
70%	350	1900
80%	400	2050
90%	460	2200
100%	490	2300

12. Drawing and list of parts

12.2 Lubricating plan

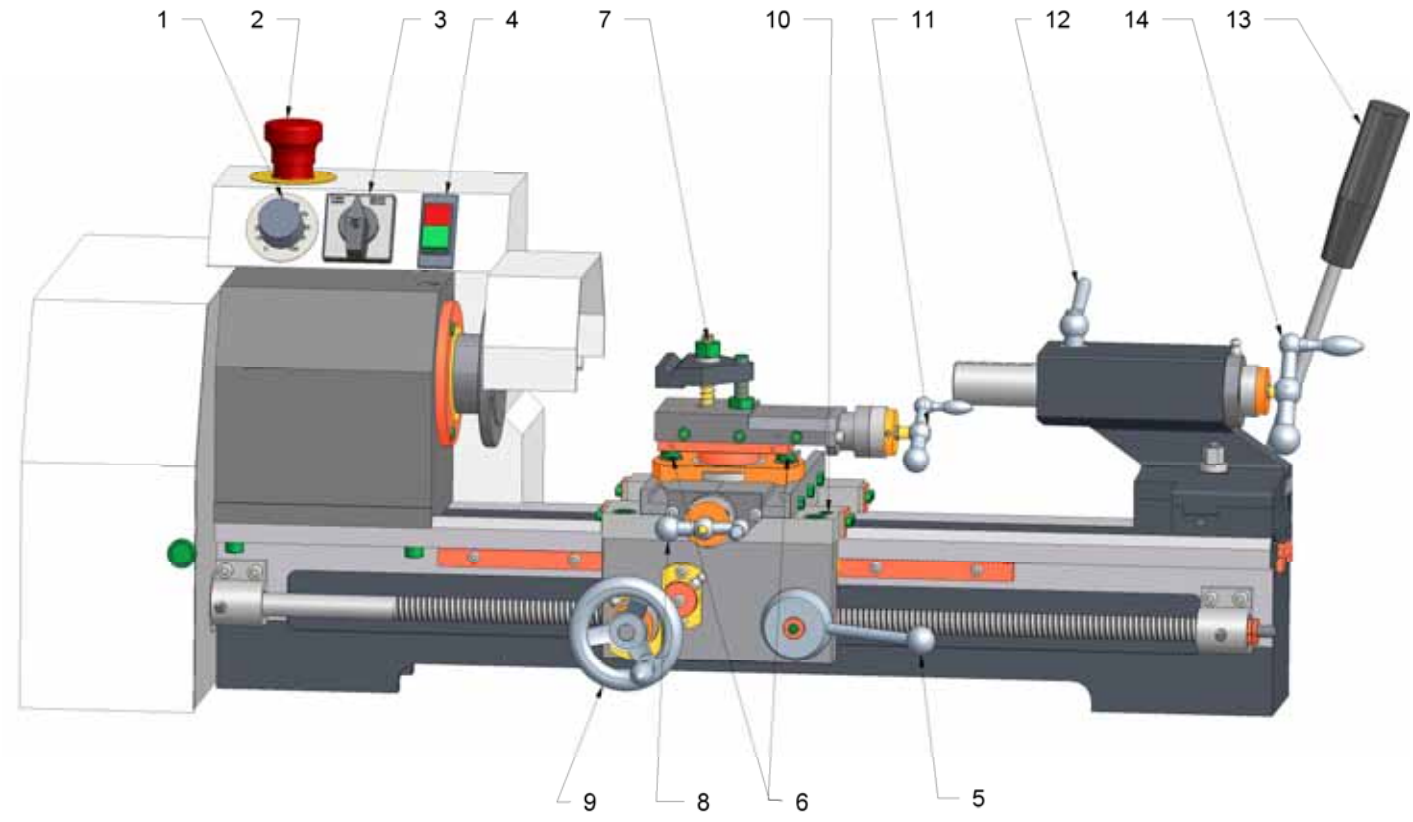


1		every 8 working hours
2		every 8 working hours

12. Drawing and list of parts

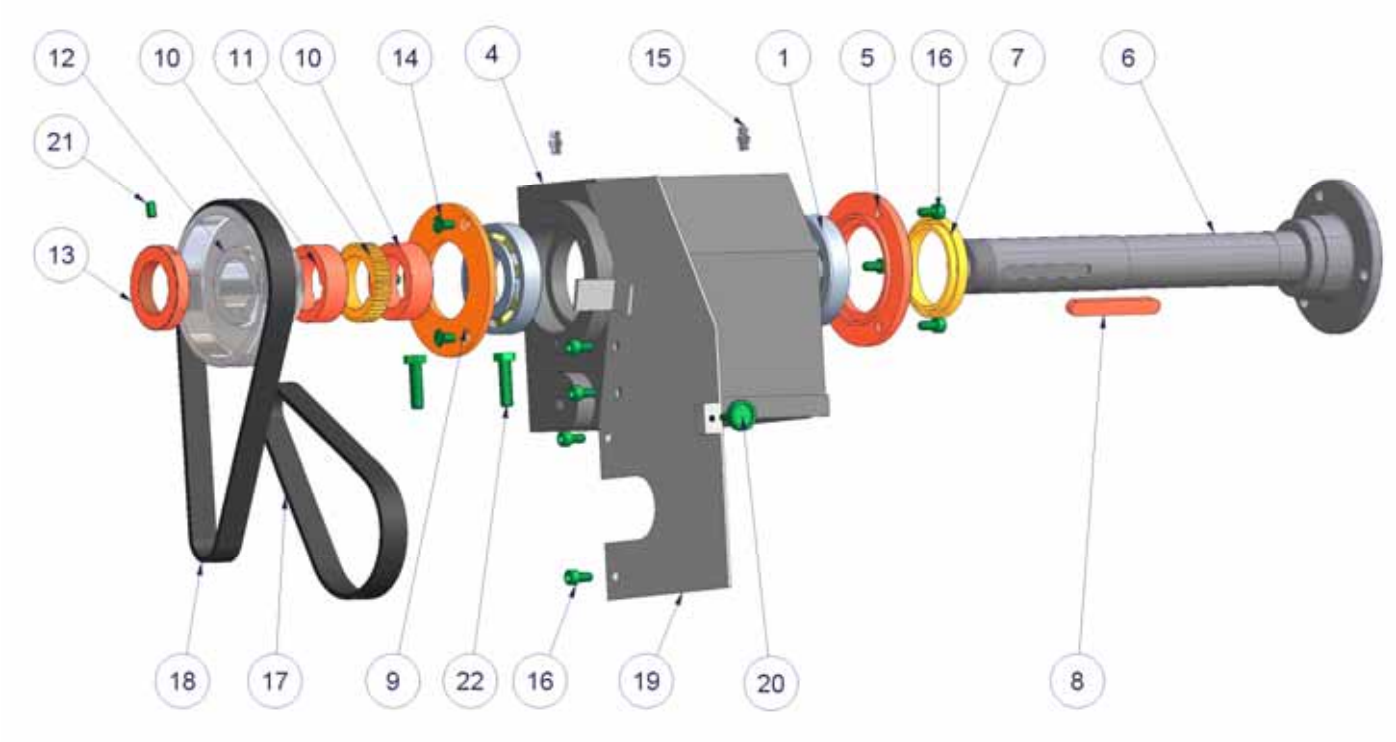
12.3 Operating elements

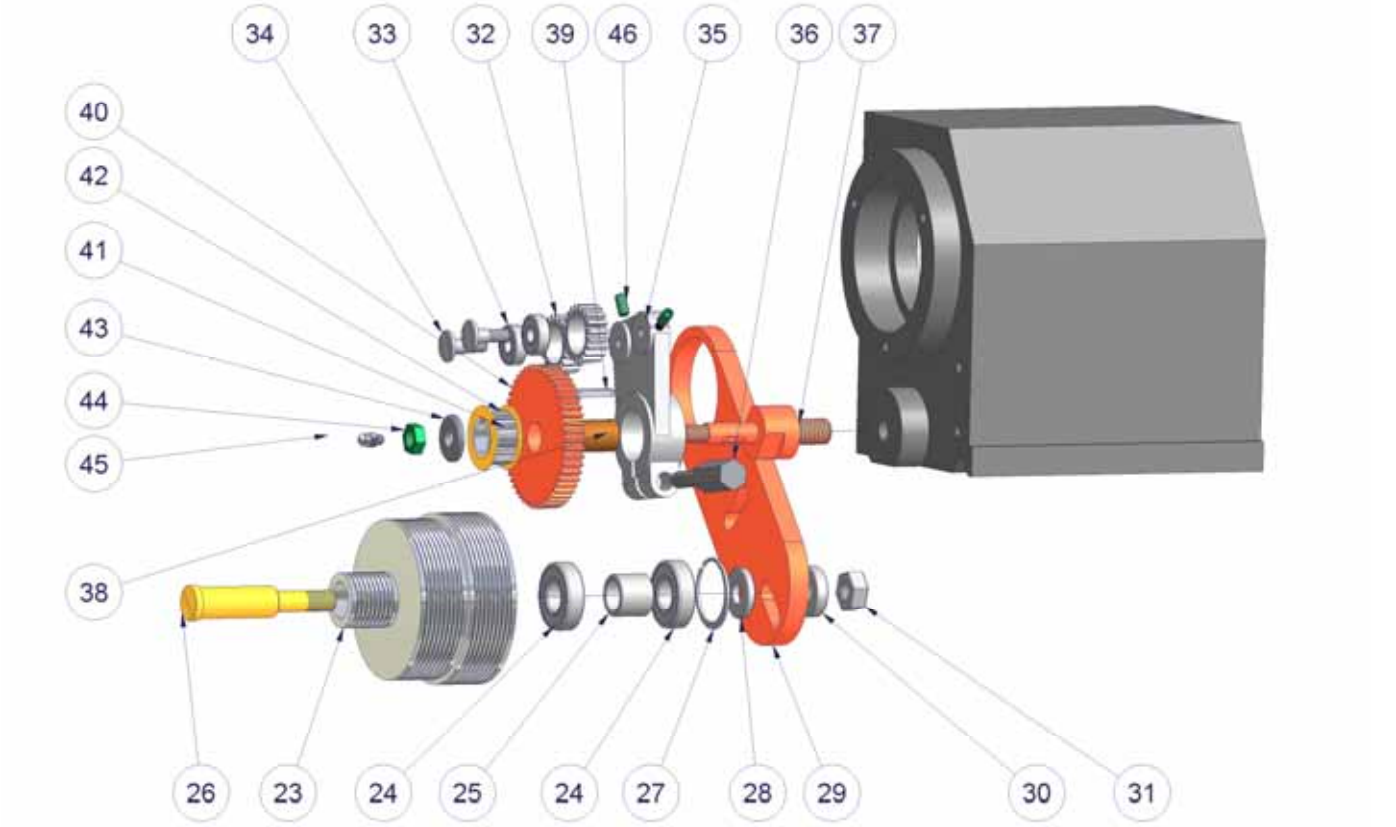
1. Potentiometer rotary knob for the speed regulation of the electric drive motor
2. Emergency OFF switch
3. Reversing switch for changing the turning direction – main spindle
4. Main switch with undervoltage release
5. Opening and closing of clasp nut
6. Retention screws for longitudinal slide
7. Adjusting nut for tool clamping plate
8. Ball ended crank for transversal slide adjustment
9. Hand wheel for quick adjustment of the tool slide
10. Clamping screw for clamping the tool slide
11. Ball ended crank for longitudinal slide adjustment
12. Clamping lever for locking the tailstock sleeve
13. Adjusting nut for locking the tailstock on the guides
14. Ball ended crank for adjusting the tailstock sleeve



12. Drawing and list of parts

12.4 Headstock with gear transmission and tumbler gear





12. Drawing and list of parts

12.4 Headstock with gear transmission and tumbler gear

12.4.1 Main spindle

Part-No.	Pcs.	Order-No.	Designation
1	2	10400101	Tapered roller bearing
4	1	10400104	Headstock
5	1	10400105	Flange, front
6	1	10400106	Main spindle
7	1	10400107	Oil wiper ring
8	1	10400108	Feather key
9	1	10400109	Flange, rear
10	2	10400110	Distance ring
11	1	10400111	Toothed wheel
12	1	10400112	Belt pulley
13	1	10400113	Adjusting nut
14	3	10400114	Countersunk screw
15	2	11810005	Lubricating nipple
16	7	10400116	Hexagon socket screw
17	1	10400117	Short belt to gear
18	1	10400118	Belt
19	1	10400119	Cover plate
20	1	10400120	Knurled screw
21	1	10400121	Threaded pin
22	2	10400122	Hexagon socket screw

12.4.2 Gear transmission

Part-No.	Pcs.	Order-No.	Designation
23	1	10400123	Belt pulley
24	2	10400124	Ball bearing
25	1	10400125	Bushing
26	1	10400126	Axis
27	1	10400127	Circlip
28	1	10400128	Disc
29	1	10400129	Lever
30	1	10400130	Disc
31	1	10400131	Nut

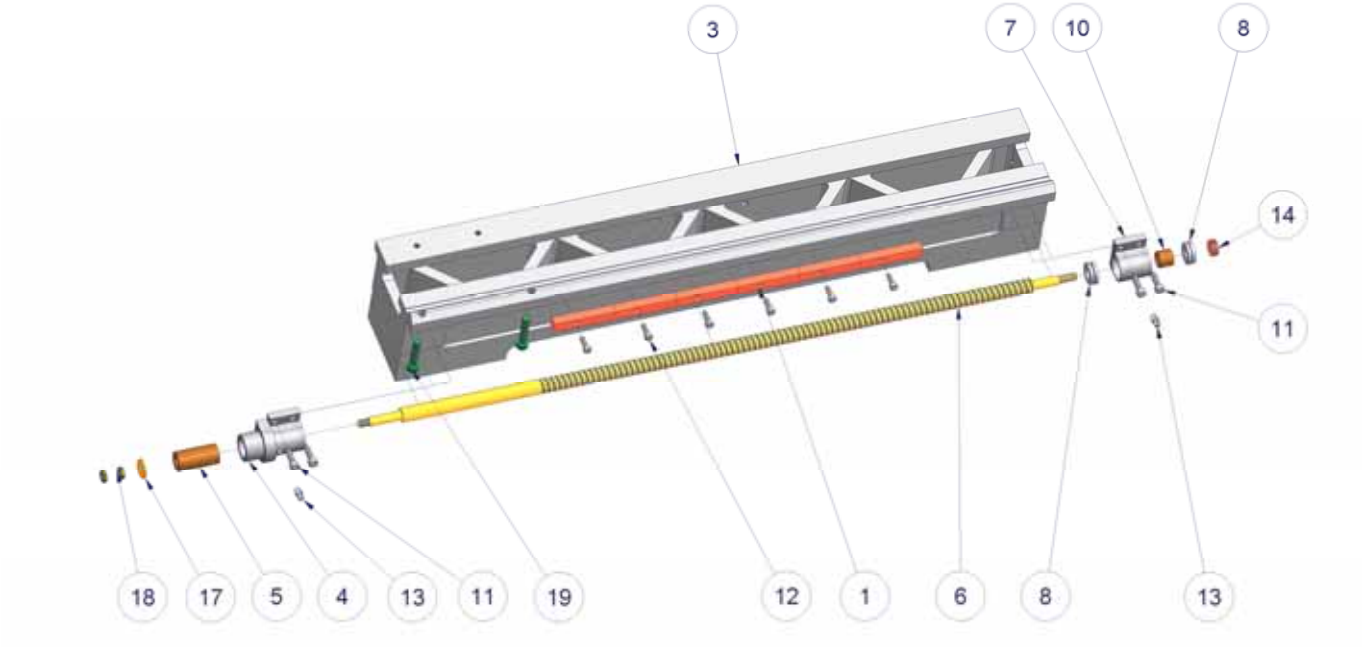
12.4.3 Tumbler gear

Part-No.	Pcs.	Order-No.	Designation
32	2	10400132	Toothed wheel
33	2	10400133	Ball bearing
34	2	10400134	Bolt
35	1	10400135	Lever
36	1	10400136	Clamping screw
37	1	10400137	Retaining bolt
38	1	10400138	Bushing
39	1	10400139	Feather key
40	1	10400140	Toothed wheel Z52
41	1	10400141	Toothed wheel Z16
42	2	10400142	Flanged wheel
43	1	10400143	Washer
44	1	11700053	Nut
45	1	11810009	Lubricating nipple
46	2	11700077	Threaded pin

12. Drawing and list of parts

12. Drawing and list of parts

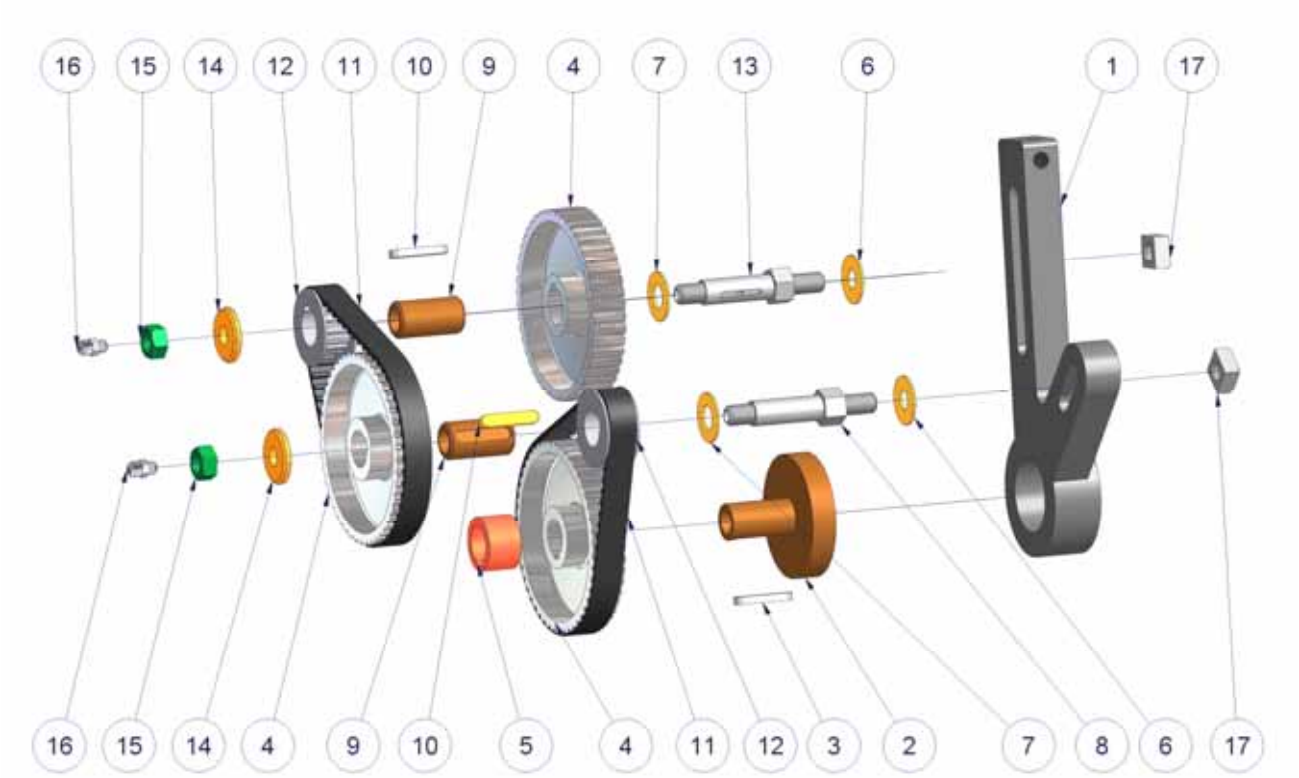
12.5. Bed with lead screw drive



Part-No.	Pcs.	Order-No.	Designation
1	1	10400201	Toothed rack
3	1	10400203	Machine bed
4	1	10400204	Supporting bearing, front
5	1	10400205	Bushing
6	1	10400206	Lead screw
7	1	10400207	Supporting bearing, rear
8	2	10400208	Grooved ball bearing, axial
10	1	10400210	Bushing
11	4	10400211	Hexagon socket screw
12	6	10400212	Hexagon socket screw
13	2	11810005	Lubricating nipple
14	2	10400214	Nut
17	1	10400217	Disc
18	2	10400218	Nut
19	2	10400219	Hexagon socket screw

12. Drawing and list of parts

12.6 Change gear quadrant

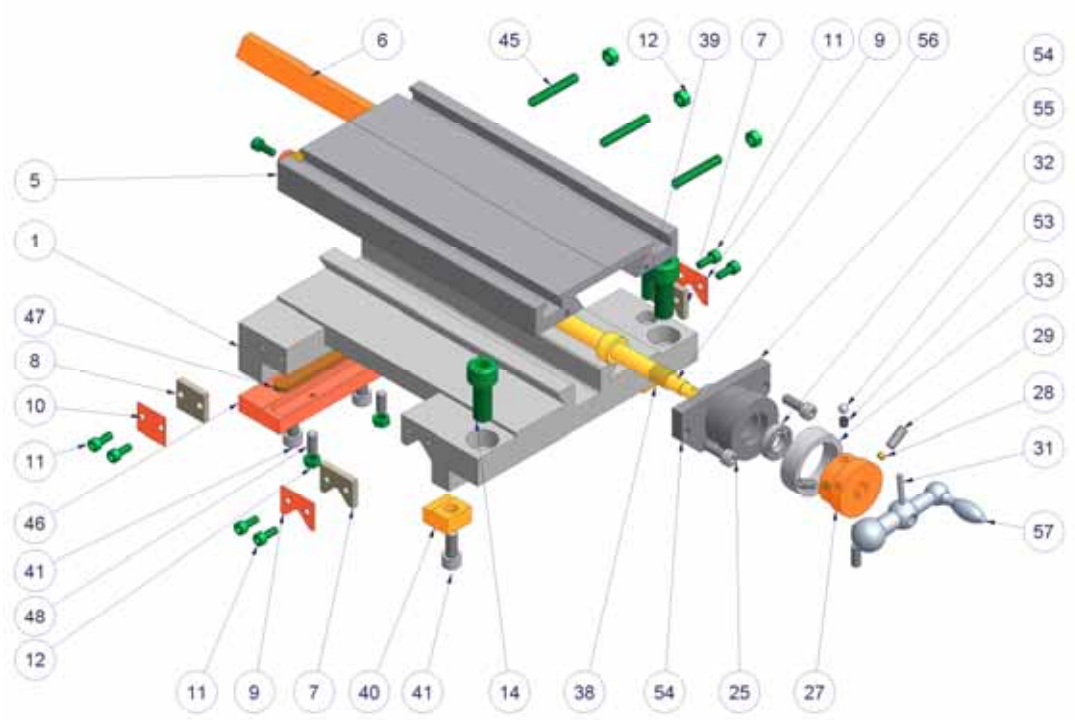


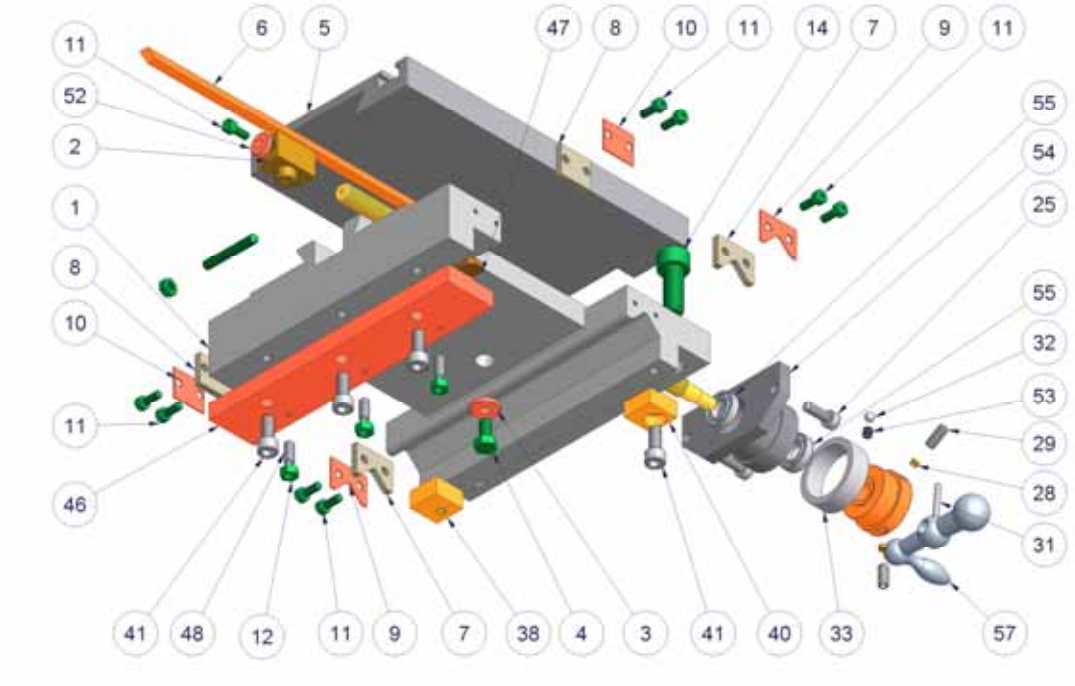
Part-No.	Pcs.	Order-No.	Designation
1	1	10400301	Change gear quadrant
2	1	10400302	Shearing bushing
3	1	10400303	Feather key of shearing bushing
4	3	10400304	Toothed belt wheel Z48
5	1	10400305	Bushing
6	2	10400306	Disc
7	2	10400307	Disc
8	1	10400308	Change gear bolt
9	2	10400309	Bushing
10	2	10400310	Feather key for bushing
11	2	10400311	Toothed belt
12	2	10400312	Toothed belt wheel Z14
13	1	10400313	Change gear bolt
14	2	10400314	Disc
15	2	11700053	Nut
16	2	11810009	Lubricating nipple
17	2	11700054	Square nut

12. Drawing and list of parts

12.7 Tool slide

12.7.1 Transversal slide





12. Drawing and list of parts

12.7 Tool slide

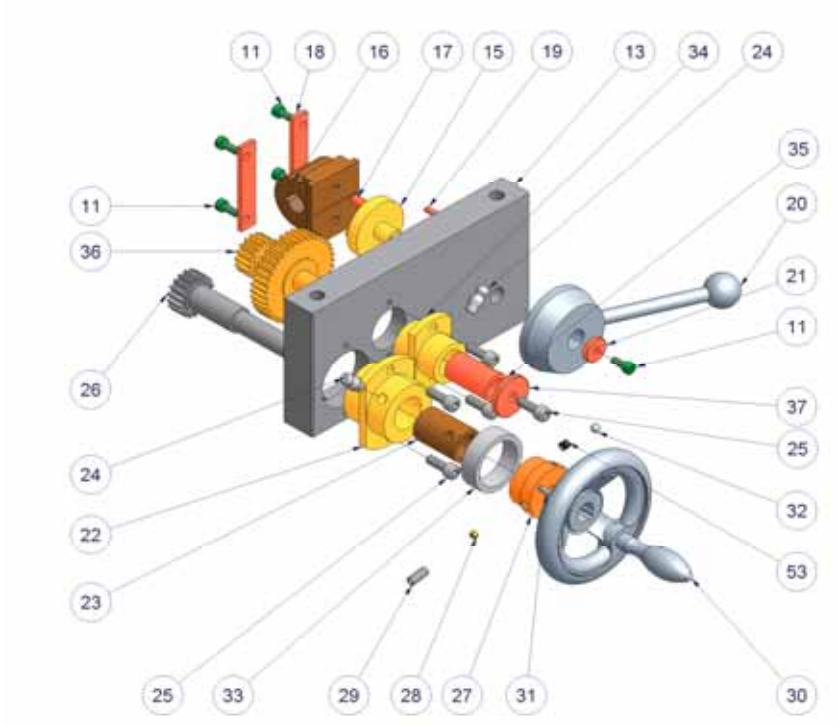
12.7.1 Transversal slide

Part-No.	Pcs.	Order-No.	Designation
1	1	10400401	Lower part of transversal slide
2	1	10400402	Nut
3	1	10400403	Disc
4	1	10400404	Hexagon bolt
5	1	10400405	Upper part of transversal slide
6	1	10400406	Adjustable gib
7	2	10400407	Felt
8	2	10400408	Felt
9	2	10400409	Felt clamp
10	2	10400410	Felt clamp
11	14	10400411	Hexagon socket screw
12	6	10400412	Hexagon screw
14	2	10400414	Hexagon socket bolt
15	1	10400415	Clasp holder
16	2	10400416	Clasp nut
17	2	10400417	Pin
18	2	10400417	Guide rail
19	1	10400419	Feather key clasp holder
20	1	10400420	Switch lever
21	1	10400421	Disc
22	1	10400422	Flange
23	1	10400423	Bushing
24	2	11810005	Lubricating nipple
25	9	10400425	Hexagon socket screw
26	1	10400426	Pinion
27	2	10400427	Scale support
28	4	10400428	Thrust piece scale support
29	4	10400429	Threaded pin
30	1	10400430	Hand wheel
31	2	10400431	Pin
32	2	11810004	Ball
33	2	10400433	Scale ring
38	1	10400438	Clamping piece
39	1	10400439	Hexagon socket bolt
40	1	10400440	Guide piece
41	4	10400441	Hexagon socket screw
45	3	11700055	Threaded pin
46	1	10400446	Guide rail
47	1	10400447	Guide rail
48	3	10400448	Threaded pin
52	1	10400452	Washer
53	2	11850002	Feather
54	1	10400454	Spindle bearing
55	2	10400455	Grooved ball bearing
56	1	10400456	Spindle
57	1	10400457	Ball-ended crank

12. Drawing and list of parts

12.7 Tool slide

12.7.2 Lathe apron

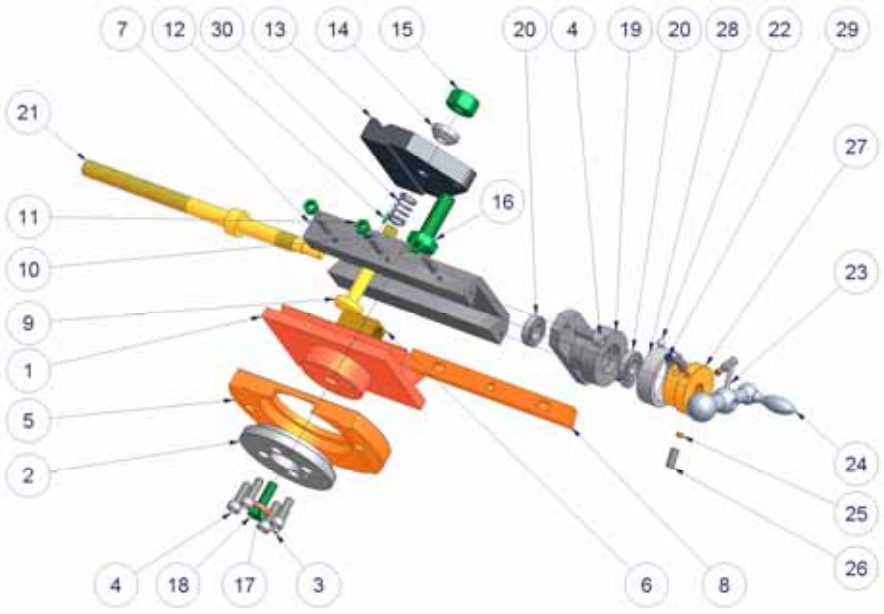


Part-No.	Pcs.	Order-No.	Designation
11	14	11700026	Hexagon socket screw
13	1	10400413	Lathe apron
15	1	10400415	Clasp holder
16	2	10400416	Clasp nut
17	2	11700075	Pin
18	2	10400417	Guide rail
19	1	11700076	Feather key clasp holder
20	1	11840012	Switch lever
21	1	10400421	Disc
22	1	10400422	Flange
23	1	10400423	Bushing
24	2	11810005	Lubricating nipple
25	7	11700070	Hexagon socket screw
26	1	10400426	Pinion
27	1	10400427	Scale support
28	1	10400428	Thrust piece scale support
29	1	11700077	Pin
30	1	11840008	Handwheel
31	1	11700049	Pin
32	1	11810004	Ball
33	1	10400433	Scale ring
34	1	10400434	Flange
35	1	10400435	Bushing
36	1	10400436	Intermediate gear
37	1	10400437	Washer
53	1	11850002	Feather

12. Drawing and list of parts

12.7 Tool slide

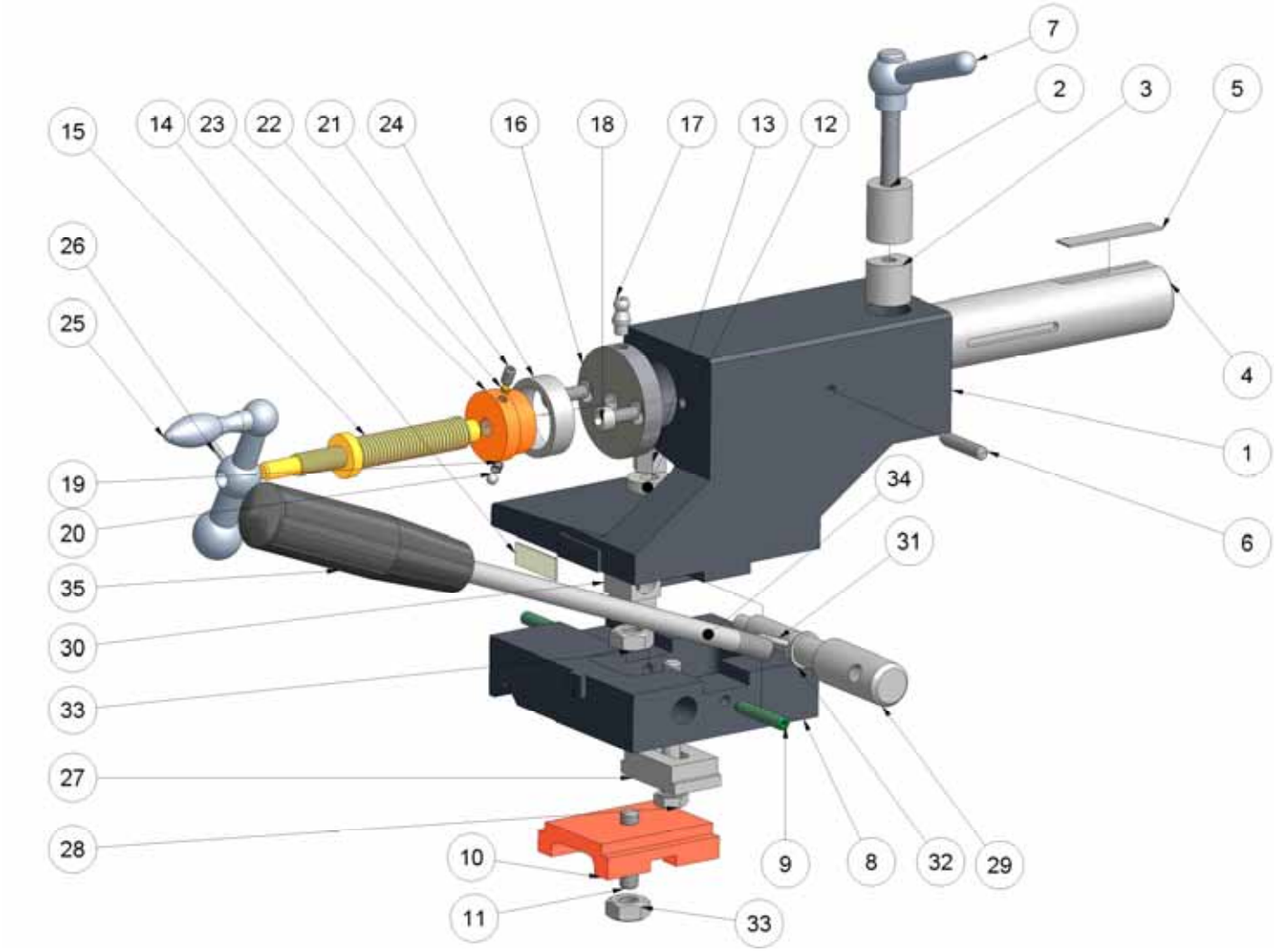
12.7.3 Longitudinal slide



Part-No.	Pcs.	Order-No.	Designation
1	1	10400501	Longitudinal slide lower part
2	1	10400502	Guide ring
3	1	10400503	Pin
4	6	10400504	Hexagon socket screw
5	1	10400505	Clamping ring
6	1	10400506	Nut
7	1	10400507	Longitudinal slide upper part
8	1	10400508	Adjustable gib
9	1	10400509	Threaded bolt
10	3	11700056	Threaded pin
11	3	10400511	Nut
12	1	10400512	Pin
13	1	10400513	Clamping claw
14	1	10400514	Thrust disc clamping claw
15	1	10400515	High nut
16	1	10400516	Hexagon socket screw
17	1	10400517	Washer
18	1	10400518	Hexagon nut
19	1	10400519	Spindle bearing
20	2	10400520	Grooved ball bearing
21	1	10400521	Spindle
22	1	11810004	Ball
23	1	10400523	Pin
24	1	10400524	Ball-ended crank
25	3	10400525	Thrust piece scale support
26	3	10400526	Threaded pin
27	1	10400527	Scale support
28	1	10400528	Scale ring
29	1	11850002	Feather
30	1	10400530	Feather

12. Drawing and list of parts

12.8 Tailstock



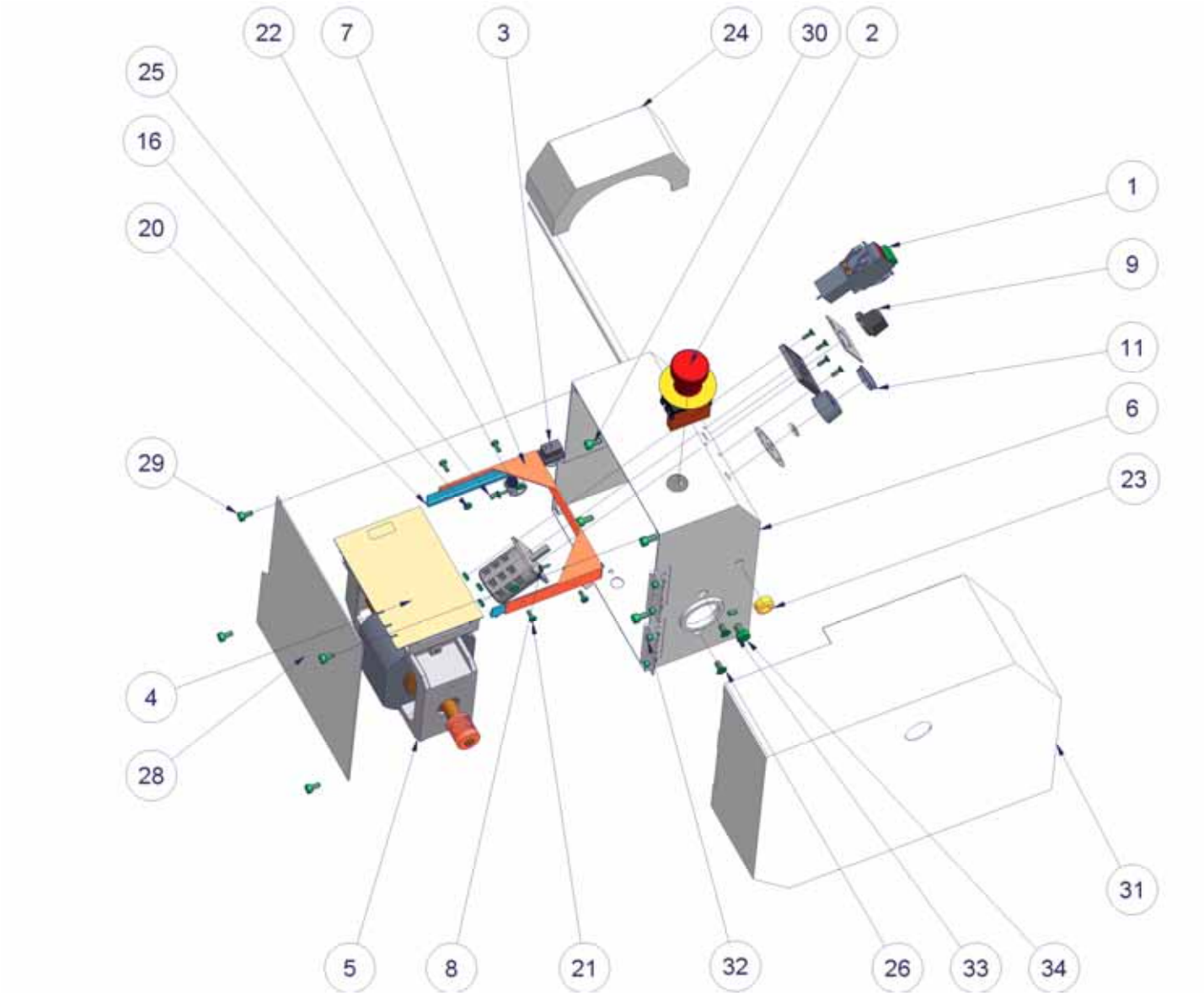
12. Drawing and list of parts

12.8 Tailstock

Part-No.	Pcs.	Order-No.	Designation
1	1	10400601	Tailstock
2	1	10400602	Upper part of sleeve shim
3	1	10400603	Lower part of sleeve shim
4	1	10400604	Tailstock sleeve
5	1	10400605	Scale
6	1	10400606	Threaded pin
7	1	10400607	Ball handle
8	1	10400608	Lower part of tailstock
9	2	10400609	Threaded pin
10	1	10400610	Shim
11	1	10400611	Hexagon bolt
12	1	10400612	Washer
13	1	10400613	Hexagon nut
14	1	10400614	Scale, short
15	1	10400615	Spindle
16	1	10400616	Flange
17	1	11810005	Lubricating nipple
18	2	10400618	Hexagon socket screw
19	1	11850002	Feather
20	1	11810004	Ball
21	1	10400621	Threaded pin
22	1	10400622	Thrust piece
23	1	10400623	Scale support
24	1	10400624	Scale ring
25	1	10400625	Ball-ended crank
26	1	10400626	Pin
27	1	10400632	Clamping piece
28	1	11700129	Sechskantschraube
29	1	10400631	Eccentric shaft
30	1	10400636	Eccentric bushing
31	1	11700130	Fixing pin
32	1	10400635	Washer
33	2	11700030	Nut
34	1	10400634	lever
35	1	11840018	handle

12. Drawing and list of parts

12.9 Motor box



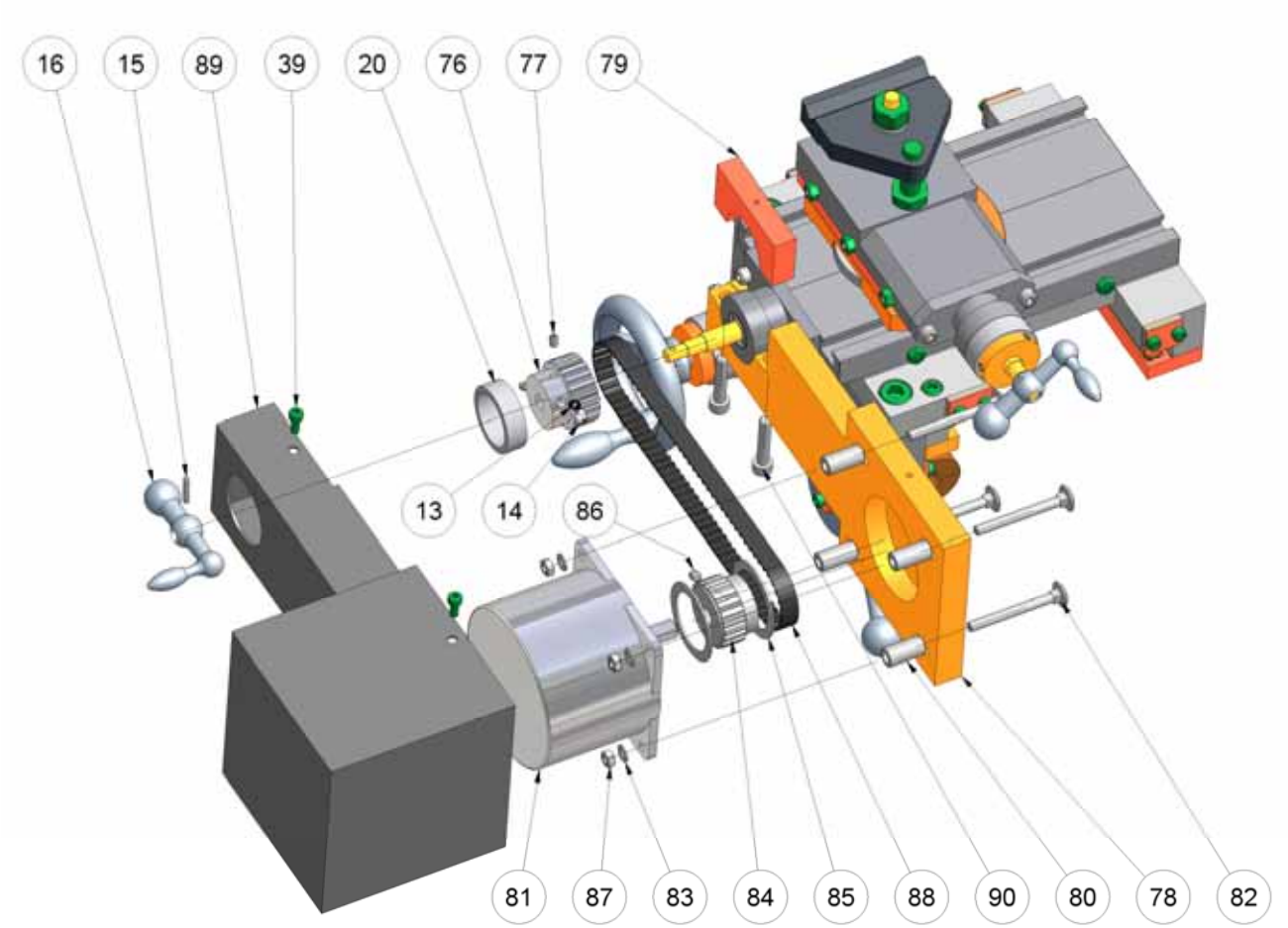
12. Drawing and list of parts

12.9 Motor box

Part-No.	Pcs.	Order-No.	Designation
1	1	11800001	Main switch
2	1	11800008	Emergency OFF switch
3	1	11800014	Limit switch
4	1	11800005	Circuit board
5	1	10400705	Motor
6	1	10400706	Motor box
7	1	10400707	Circuit board holder
8	2	11700057	Cylindric screw
9	1	10400709	Reversing switch
11	1	11800004	Potentiometer complete
16	12	11700002	Nut
20	2	10400720	Guide rail
21	4	11700057	Cylindric screw
22	1	10400722	Eccentric ring
23	1	10400723	Set ring
24	1	10400724	Protective cover, chuck
25	1	11700013	Hexagon socket screw
26	2	11700051	Countersunk screw
28	1	10400728	Motor box cover
29	4	11700026	Hexagon socket screw
30	4	11700059	Hexagon socket screw
31	1	10400731	Protective cover
32	4	11700026	Hexagon socket screw
33	1	11700060	Washer
34	1	11700061	Hexagon socket screw

12. Drawing and list of parts

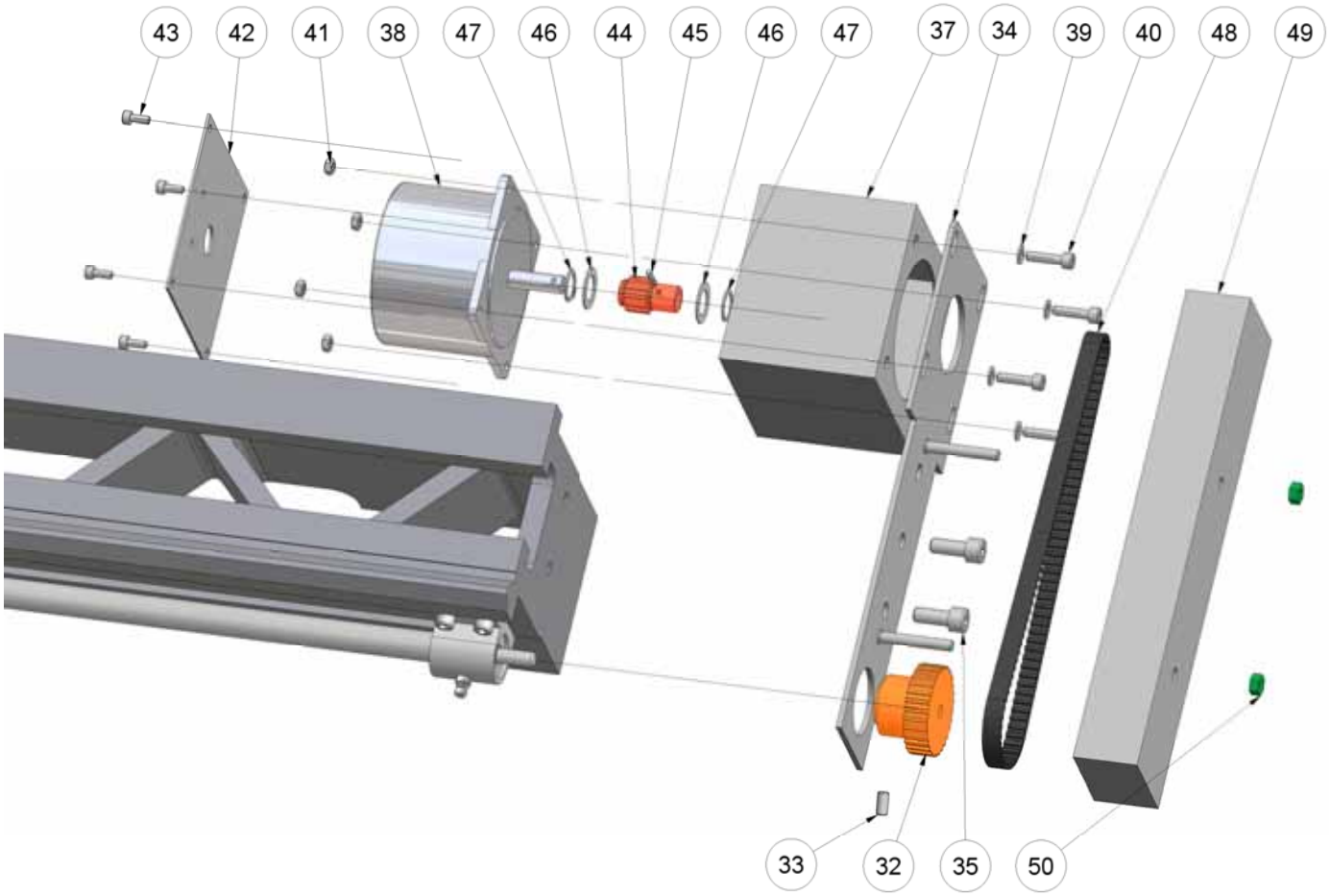
12.10 CNC drive X-axis



Part-No.	Pcs.	Order-No.	Designation
13	1	11850002	Feather
14	1	11810004	Ball
15	1	11700049	Cylindrical pin
16	1	11840009	Ball-ended crank
20	1	10400901	Scale ring
39	4	11700026	Cylindrical screw
76	1	10400902	Belt pulley
77	3	11700089	Threaded pin
78	1	10400903	Motor holding plate
79	1	10400904	Clamping plate
80	4	10400905	Motor supports
81	1	11800003	Stepping motor
82	4	11700047	Saucer-head screw
83	4	11700088	Washer
84	1	10400906	Belt pulley
85	2	10400907	Flanged wheel
86	1	11700024	Spiral clamping pin
87	4	11700050	Hexagon nut
88	1	11820007	Toothed belt
89	1	10400908	Protection cover
90	2	11700052	Cylindrical screw

12. Drawing and list of parts

12.11 CNC drive Z-axis



Part-No.	Pcs.	Order-No.	Designation
32	1	10400801	Belt pulley Z30
33	1	11700087	Threaded pin
34	1	10400802	Motor plate
35	2	11700021	Cylindrical screw
37	1	10400803	Motor housing
38	1	11800003	Stepping motor
39	4	11700088	Washer
40	4	11700039	Cylindrical screw
41	4	11700050	Hexagon nut
42	1	10400804	Motor housing cover
43	4	11700026	Cylindrical screw
44	1	1121021213	Belt pulley Z12
45	1	11700049	Cylindrical pin
46	2	1121021212	Pulley for toothed wheel Z12
47	2	11700048	Circlip
48	1	11820006	Toothed belt
49	1	10400805	Protective cover
50	2	11700019	Nut

13. Circuit diagram