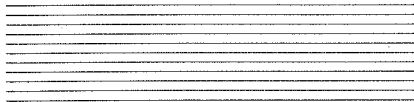


**THE BENCH CENTRE LATHE
FOR FINE MECHANICS**

MN 80 A

Serial Number on Machine:



With the development of manufacturing processes new machines are developed whose design is being adapted continuously to the new requirements of efficient machining. It follows that the Operating Instructions may not always conform in detail to the machine. In ordering spare parts, customers are, therefore, requested to always state the type of the machine and the order number of the part, thus enabling the order to be carried out in conformity with the supplied machine.

PREFACE

We have pleasure in submitting this Manual to you and wish to request you to pay special attention to same and become thoroughly acquainted with its contents. This Manual will inform you on the correct erection, servicing, and starting of the machine. It would fail, however, in its purpose if the foremen and operators were not thoroughly acquainted with its contents. It is of great importance to become familiar with all parts of the machine previous to putting same into operation; special care must be paid above all, to servicing. If you follow the instructions contained in this Manual you will save time and avoid losses. Before setting the machine into operation you must be thoroughly acquainted with all controls of the machine. The working accuracy of each machine is ascertained by highprecision instruments. The system and special care with which this test is carried out ensure absolute accuracy of the machine within the scope of the acceptance standards involved. To maintain this accuracy, the machine must therefore be transported and installed with special care. If you follow the instructions contained in this Manual you will be satisfied with the accuracy and performance of the machine. We wish you success and the best possible results on our machines.

PRINCIPAL DATA OF THE MACHINE

Kind of machine: Bench Centre Lathe for Fine Mechanics

Type: Mn-80A

Manufactured by: TOS Čelákovice, National Corporation

Year of manufacture:

Serial number: 04

Overall length of machine: mm 1150

Width: mm 570

Height: mm 1200

Total weight without attachments kg 135

Operating tension of electric motors:

All-up power input of the
machine kW 0,37

The machine is most suitable for fine mechanics and optical industry, research laboratories, pattern shops as well as for wireless sets industry etc.

Inventory No.:

Supplier:

Order number:

Date of delivery:

Time of guarantee:

Place and date of installation:

Notes regarding changes of machine site:

TECHNICAL DATA OF THE MACHINE:**1. Working range:**

Swing over bed	mm	160
Swing over saddle	mm	90
Height of centres over bed	mm	80
Turning length	mm	300

2. Working spindle:

diameter and length of the front bearing	mm	38 x 50
Centering diameter of the front spindle nose	mm	40 j 5
Thread of the front spindle nose	M	39 x 4
Bore of the working spindle	mm	18

3. Spindle speeds:			
Number of steps			9
Ranges of speeds	r.p.m.		150, 250, 400, 600, 750, 1000, 1250, 1600, 2000
4. Feeds of saddles:			
Range of longitudinal feeds	mm		0,01 to 0,15
19 metric threads with a pitch from	mm		0,2 to 3
15 Whitworth threads – number of threads per inch from			36 to 7
17 module threads – pitch of module			0,2 to 1.5
18 Diametral pitch: number of threads per inch dia.	from		20 to 80
(is supplied against a special order of the customer only).			
5. Lead screw:			
Diameter x pitch	Tr		16 x 3
6. Saddles:			
Working stroke of cross slide	mm		100
Working stroke of tool slide	mm		100
Lead of the moving screw threads	mm		1,5
1 division of the tool slide in – dexting ring	mm		0,05
1 division of the cross slide in – dexting ring (related to the worked diameter)	mm		0,1
Standard tool section	mm		10 x 10
7. Tailstock:			
Diameter of centre sleeve	mm		20
Working stroke of centre sleeve	mm		80
Internal taper of centre sleeve	Morse		1
1 division of indexing ring equals to	mm		0,05
8. Collet chucking attachment:			
Maximum diameter of round iron	mm		10
Maximum diameter of square iron	mm		7 x 7
Maximum diameter of hexagonal iron – width of spanner jaws	mm		8
Step collets for external chucking from	mm		10 – 40
Step collets for internal chucking from	mm		10 – 50

TECHNICAL DESCRIPTION OF THE MACHINE:

The lathes of the Mn-80A type are intended for the fine mechanics and optical industry, the wireless sets industry, the research labs, as well as for pattern shops etc. Current turning operations, the lathe being suitable to perform, can be completed by finishing operations with the use of additional attachments. The machine is suitable for all boring, milling, indexing operations as well as for cutting of different threads and layout operations of parts on bed surfaces etc., making the lathe a real multi-purpose machine tool.

The working spindle derives its 9 ranges of revolutions from 150 to 2000 r.p.m. The drive of the machine is effected by means of V-belts which are stretched by means of a swivelling countershaft. The electric motor, the countershaft as well as the electric installation are situated in the left part of the bench, on which the lathe is assembled.

The Headstock with its sliding seating of the working spindle is equipped with a collet chucking attachment, making the use of round, square and hexagon iron turning operations and the chucking of rings on outer and inner diameters possible.

The drive to the lead screw is done by means of change gears, into which a planet gearing is assembled, reducing by 20x the set pitch. By only shifting of the clutch an advantageous use of displacing the longitudinal feed for threading is made of, without making a change of the change gears necessary.

The saddles are lead in narrow prismatic guide-ways. The auxiliary attachments as travelling steady, milling attachment, vertical slide with chucking angle make the saddles suitable for universal operations.

The tailstock, sliding on the bed, can be easily removed, having on its centre sleeve a scale in mm rise for reading of depth while performing the boring, reaming and threading operations. It can be replaced by a lever drilling tailstock, which forms an additional equipment of the machine.

TRANSPORT OF THE MACHINE AND ERECTION

The machine, prior to despatch from the factory, is protected with a paint coating avoiding the corrosion and is attached to wooden skids. Against damaging the lathe is protected by a crating made of laths. It is recommended to remove the crating not sooner until the machine is forwarded to its site of installation, avoiding the damage to paint as well as to the protruding parts.

The lathe should be carefully levelled by means of a spirit level. A correct levelling of the machine is of vital importance which ensures a perfect accuracy of same during operation. It is recommended to check from time to time the accurate level of it, ensuring the correct position of bed against a distortion.

ELECTRICAL INSTALLATION OF THE MACHINE, ELECTRICAL EQUIPMENT AND CONNECTION TO THE MAINS

Fig. 1, 2, 3

In the manufacturer's workshop the machine is fitted with electrical equipment, corresponding to the voltage and frequency prescribed by the customer and complying with the regulations which are in force in Czechoslovakia. The entire electric equipment is completely installed, interconnected and tested. The customer has only to connect the mains to the terminal board D1.

The electric equipment, including electric motor and lead-in terminal board, is located in the left portion of the bench. Protecting, interconnecting and control instruments are situated on a common plate fixed to the door which covers the said portion of the bench. Control devices are accessible from the outer side of the door, i. e. from the operator's position.

Specification of the used instruments

Designation	Function	Type
V 1	Switch	N 453 5574-03/35
S 1	Contacteur	VM4, VM10, 220 V
T 1*	Single phase transformer 32 VA	JV 32
D 1	Lead-in terminal board	6035-00
D 2	Interconnecting terminal board	6035-00

* for 400-500 voltage only

Specification of the built-in three-phase electric motor

Design	Output kW	Voltage V	Frequency cycles	Current A	RPM	Shape	Type
M1	0,37	220	50	1,9	1380	M 101	2AP 71-4
		380	50	1,1	1380		
		415	50	1,07	1380		
		500	50	0,81	1380		
		220	60	1,8	1670		
		415	60	1,05	1670		

Specification of the built-in single-phase electric motor

Design.	Output kW	Voltage V	Frequency cycles	Current A	RPM	Shape	Type
M1	0,25	220	50	3,5	1390	M 101	2APJC71-4

Specification of fuses and protecting relays, 3-phase supply

Design.	Function	Voltage V	Frequency cycles	Current A	Type
P1	Short circuit protection of motor	220	50	4	E27,2410T-4
P2		380	50-60	4	E27,2410T-4
P3		415	50-60	4	E27,2410T-4
		220	60	6	E27,2410T-6
P4	Protection of control circuit	220-500	50-60	4	E27,2410T-4
P5					
P6					
		220	50-60	2,3	R100,-2,3
F1	Overload protection	380	50-60	1	R100-1
		415	50-60	1	R100-1
		500	50-60	1	R100-1

Specification of fuses and protecting relays, 1-phase supply

Design.	Function	Voltage V	Frequency cycles	Current A	Type
P1	Short circuit protection of motor	220	50-60	10	E27,2410T-10
P4		Protection of control circuit	220	50-60	4
F1	Overload protection of motor	220	50-60	3,4	R100-3,4

By positioning the switch V1 to the left or to the right the sense of rotation is selected. Should the voltage drop occur, the switch is to be reset in the middle position and then the required sense of rotation re-engaged.

DESCRIPTION OF THE MAIN ELEMENTS OF THE MACHINE, THEIR OPERATION AND MAINTENANCE

Survey of control elements and principal dimensions of machine (Fig. 1)

1. Clutch for changing-over to thread cutting – feed.
2. Lever for reversing the direction of rotation of the lead screw.
3. Wheel for set-up of clamping pressure of the collet.
4. Control lever of the collet chucking attachment.
5. Handwheel for longitudinal feed of saddle.
6. Handle of saddle slide cross feed.
7. Lever for tightening the square tool holder.
8. Lever for engaging the nut of the lead screw.
9. Feed screw handle of the swivelling saddle.
10. Lever serving for tightening the centre sleeve of tailstock.
11. Lever for tightening the tailstock on bed.
12. Handwheel for feeding the tailstock centre sleeve.
13. Lever for loosening the belt while changing the direction of rotation.

V 1 Switch

D 1 Lead-in terminal board

THE HEADSTOCK (see fig. 4,5).

The working spindle is placed in sliding bronze-bearings, which are – to enable an easy removal of the play of – the bearings – held by means of set nuts in conical bushes. The play in longitudinal direction is removed by means of a friction ring, being easily set by the nut. The lubrication circuit of the sliding surfaces of the working spindle is carried out by means of felt inserts, sucking the oil from tanks. Replace the used oil daily.

SET-UP OF THE SPINDLESTOCK BEARINGS.

The front bearing can be set up by loosening the screw 26, which holds up the bearing brass in the adjusted position. By turning to the left (seen from the operator's site the nut 27 is loosened by a hook spanner. The nut 28 is then tightened so as to remove the improper play of the bearing. A correctly set-up bearing permits to indicate a deviation, ascertained by an indicator (a dial indicator) placed on the seating of the working spindle, ranging from 0,01 to 0,015 mm. A test is carried out in such a way that a bar having a length of approx. 500 mm is set into the spindle bore. By pressing against the contact of the dial indicator the bearing play can be ascertained. In case the machine

is running steadily within the highest range of revolutions, it is necessary to rise the play from 0,02 to 0,03 mm. In other words, when the play is set to minimum, the machine – upon influence of higher temperatures – stops and a rapid wear of the sliding surfaces occurs. Having set up the bearings do not fail to fix the bearing by tightening the screw 26 and nut 27 accordingly.

The rear bearing is set up in the similar way i.e. by loosening the screw 29 and by tightening the nut 30 again. Having set up the bearing, the screw 29 has to be tightened and the set up position of the bearing brass has to be secured again.

The axial thrust of the working spindle is taken up on the front face of the bearing brass of the front bearing by means of a collar on the spindle from one side, in the rear by a friction ring 31. In case the friction surfaces get worn out and an injurious play arises, then the screw 34 has to be loosened and the play has to be set up by a nut 33 in such a way that the spindle can be turned by hand without using an excessive force. While setting up the play, care is to be taken that no impurities cannot penetrate between the friction ring and the friction surface of the bearing as well.

NOTE:

The set up of the bearing play should be carried out by a skilled repair man, so as to ensure an accurate and trouble-free exploitation of the machine.

CROSS SLIDE REST (see fig. 6, 7).

The slide is displaced along the bed on guiding surfaces exactly ground, either by hand or mechanically, while the cross slide rest is displaced on the slides – with the swivelling tool holder – by hand only.

The set up of the play in the thread of the cross slide rest screw is carried out by loosening the screws 60 and 61, while by screw 62 the screw nut being split, is tightened as far as to eliminate the injurious play of the screw. After having set up the nut by screw 62 do not fail to re-tighten the screws 60 and 61 again. The axial thrusts of the screw are taken up by a collar placed in the bearing. The play is set up by removing the handle 63 with the indexing ring 64 and after having loosened the screws 65, the play caused by the wear of the contact surfaces, can be adjusted by tightening the screws 66 again. When setting up the play in the thread of the swivelling slide the screws 67 are firstly to be loosened and by means of set screws 68 the nut is to be tightened in such a way so as to set up the play. By tightening the screws 67 again the nut in its set up position is secured.

The axial play of the collar of the swivelling slide screw is removed in a similar way as it is the case with the cross slide screw prior to removing the handle as well as the indexing ring.

The slide carriages are lead by front slide bar of prismatic shape and its play is removed by loosening the screw 76, shifting the wedge by screw 77. A similar way is to be followed out, when setting up the play of the cross slide, i.e. the screw 78 is to be loosened and the screw 79 is to be tightened again. The tool slide screw 80 is to be loosened and the play by tightening the 81 is set up. Care is to be taken that after having adjusted the wedges the both screws are properly tightened, otherwise there is a danger of getting a wedge loosened which would damage the guideways by rubbing them by chips.

The guideways are to be cleaned regularly and lubricated by a proper machine oil so as to avoid their scratching and damaging by chips.

THE TAILSTOCK (fig. 8 and 9)

Can be easily shifted along the whole length of the bed, being loosened and fixed in its set position by lever 11. This lever is set so as not to obstruct the slide nor the bed itself. When removing the tailstock of the bed, screw 71 is turned. Using the tailstock for further operations care is to be taken that the set up position of the lever is maintained again by turning the screw 71 into its proper position. The centre sleeve can be set up in its position by lever 10. To remove the centre from the sleeve the handwheel 12 is shifted in, so as to touch the centre by the feed screw 72 releasing it from its taper. The taper of the centre sleeve equals to Morse 1. The centre sleeve is provided with a scale in mm rise from 0 to 80 mm enabling to read the depth when boring, threading or another operations are carried out. To enable an accurate reading an indexing ring with 30 divisions on its circumference is provided.

One division equals to 0.05 mm. For turning of long tapers the tailstock can be set from its centre position by loosening the screws 75, shifting it by screw 74 and securing it in the set position by tightening the screws 75 again. Should the tailstock be re-set exactly, a centering pin is clamped between the centres and with the aid of a dial indicator the tailstock can be set.

THE COLLET CLAMPING ATTACHMENT WITH THE MACHINE RUNNING

(fig. 4 and 10).

The machine is equipped with an attachment for chucking of bars by collet Mn-809. For chucking of rings on external surface serves the collet Mn-810, while for chucking of rings at internal diameters

the ring collet Mn-811 is used. The collet for bar irons serves for chucking up to 10 mm, while the square material can be chucked up to 7 mm and the hexagon up to 8 mm as well. By stepped collets Mn-810 rings, having a diameter from 10 to 40 mm, graded by 1 mm can be chucked. A set of these collets consists of 5 pieces. The collet Mn-811 for chucking on internal diameters can be used within a range from 6 to 50 mm with a graduation to 1 mm, a set consisting of 5 pieces.

The change of a collet is effected by turning the knurled nut 41 to the left and the collet is released from the thread of the chucking tube 40, to which the nut is coupled. After inserting a thoroughly cleaned collet, one has to see that the collet is tightened as far as to achieve the necessary chucking force for the material to be clamped. By pressing down the lever 4, check the collet for proper chucking force. In case the chucking power is found to be extensive and the lever 4 cannot be pressed any more, the stress is released by the nut 41. If it is found out that the chucking force of the collet is incorrect (unsufficient), the blocking index has to be turned by some teeth.

While changing a collet as well as in the case the collet chucking attachment is not in use during turning operations, care is to be taken that prior to removing the chucking tube with the nut the chucking rollers do not fall out, their designation being 42. These rollers are to be inserted in such a way that they are greased and then put into the grooves of the spindle nose. Then the chucking tube with the nut 41 is to be shifted on. If operation in centres is carried out the collet sleeve is to be replaced by a centre sleeve Mn-807, putting on the driving plate Mn-812, as per fig. 11.

THREAD CUTTING AND FEEDS (fig. 4, 10, 11).

Thread cutting is enabled by means of the lead screw having a pitch of 3 mm as well as by the change gears A, B, C, D. The drive, being derived from the working spindle, is controlled by the lever 2 over the reversing gear, the lever having its 3 positions blocked. The both extreme blocking devices ensure the engagement of the reversing gear for the sense of rotation of the lead screw in the forward or backward motion. The central position disengages the whole drive and the lead screw as well. The thread, fastened to the machine, indicates the standard pitches of metric thread from 0,2 up to 3 mm with the necessary change gears as well. If there is a pitch to be cut which is not incorporated in the chart, the ratio of the change gears is calculated by the following formula:

$$\frac{A}{B} \cdot \frac{C}{D} = \frac{s}{3}$$

in which A, B, C, D are change gears,
 s – is the pitch required and
 „3” is the pitch of the lead screw.

The change gear „D” is always in the chart indicated as a gear having 100 teeth. This is made for the reason that in this gear the planet gear with a ratio of 1/20 is incorporated, which reduces the set pitch ratio for fine feed to the ratio within the range desired. A set of change gears indicated in the chart is always supplied with the machine. Besides the metric threads the inch, module and the DP threads in accordance with the chart 1 c can be cut. For these kind of threads supplementary change gears, which are not included in the standard set, have to be ordered. These are the gears having 38, 44, 56, 57, 64, 65, 72, 70, 80, 90 and 2 x 55 teeth (as well as a gear with 50 teeth) from standard set).

The Inch thread chart is formed from the formula:

$$\frac{A}{B} \cdot \frac{C}{D} = \frac{10 \cdot 11}{B/1 \cdot 13}$$

where B/1 is the Nr. of threads per inch.

The module thread for modules on the chart 1 c is derived from the formule:

$$\frac{A}{B} \cdot \frac{C}{D} = \frac{M \cdot 22}{3 \cdot 7}$$

where the letter „M” is substituted by the module desired.

The Diametral Pitch threads on the chart 1c are calculated from the formula:

$$\frac{A}{B} \cdot \frac{C}{D} = \frac{7 \cdot 19}{5 \cdot DP}$$

The change gears are changed after loosening the screws, removing the washer with the change gears. When inserting another gear, care is to be taken that only thoroughly cleaned gears are brought into mesh, oiling them with the other transmission gears before starting the machine for regular operations.

As mentioned afore, the change gear is supplied with the standard machine as a planet gear, which is engaged by depressing the ring 4, delivering a feed movement, which corresponds to 1/20 of the set pitch. When cutting threads, the knob 1 has to be shifted out from its outer position. By engaging the middle position the leadscrew is disengaged.

If there is a thread to be cut, where the gear „D” doesn't possess 100 teeth, the blocking screw 50 has to be loosened and the planet gear has to be shifted

out. Into the groove of the shaft a carrying pin (supplied as standard equipment), is inserted and in the place of the planet gear the respective change gear is put on, securing it by a distance ring and with a screw 14 as well. The gear-quadrant of the change gears 56 is then secured by the screw 55. For the arrangement of the change gears as well as of the other accessoires we refer you to fig. 11.

THREAD CHASING DIAL (Fig. 1, 6, 7)

Long metric threads can be efficiently cut with the aid of the thread chasing dial 82. Much time can be saved thereby as the reverse run of the machine is not necessary to bring the carriage to its initial position. Having disengaged the lead screw nut by means of the lever 8 (when a cut has been taken) we return the carriage to the initial position, indicated by the thread chasing dial 82.

THE LUBRICATION (fig. 1a)

The lubrication of the machine is carried out by a hand lubricator, for which a bearing oil of proper quality (J2), having a viscosity of 2,5° E at 50° C is to be used. Do not miss to refill all the lubricating spots with oil prior to starting the machine into working. In this manner all the moving surfaces are protected against a rapid wear or rubbing.

If the machine is run at the maximum speed the headstock bearings are to be oiled twice a shift.

LIST OF PARTS SUBJECT TO WEAR:

Ball bearings of the reduction gear (countershaft) consisting of	2 pcs 6204, 20/47/14
V-belts of the reduction gear	1 pc 10 x 800
V-belt of the spindlestock	1 pc 10 x 1180

Fig. 12

Shift block of the collet chucking attachment	2 pcs
Lead screw	
Front bearing of the working spindle	
Rear bearing of the working spindle	

Fig. 13

Upper portion of the lead screw nut
Lower portion of the lead screw nut

Fig. 14

Tool slide nut
Blocking pawl of the tool head
Tailstock nut
Steady guide insert

THE ACCESSOIRES (fig. 15, 16)

For a full exploitation of the machine not only for turning operations but also for finishing of parts the machine is equipped with extras, which make the machine suitable for performing a greater range of production possibilities. In case, some accessoires were not ordered with the machine, there is always possible to supply them additionally.

Standard equipment

Electric equipment incl. motor
Wooden bench
Chip pan
Collet clamping attachment incl. 1 collet, operating while the machine runs
Back plate for selfcentering chuck
Set of change gears
Set of spanners and wrenches for machine service
Mn 801 Standard lathe centre
Mn 807 Sleeve for lathe centres
Mn 812 Driving plate used with lathe centres

Special equipment

Mn- 802 half centre for performing turning operations of small diameters
Mn- 803 hollow centre for performing turning operations of bolts without punch
Mn- 804 hollow half centre for turning operations of pins of small diameters
Mn- 805 three pronged fork centre for woodworking
Mn- 806 drilling plate for tailstock used for the working of cylindrical parts
Mn- 808 three jaw chuck for chucking of tools with cylindrical shanks (up to dia 6 mm)

- Mn- 809 chucking collet to chuck round irons
- Mn- 810 step collets to chuck rings on outer diameters
- Mn- 811 ring collet to chuck rings on inner diameters
- Mn- 813 lapping plate for polishing by paste or emery paper to mark workpieces, to which the pieces are to be fastened by means of putty
- Mn- 814 flat drilling plate for tailstock
- Mn- 815 face plate with 4 reversible jaws
- Mn- 816 universal three-jaws chuck \varnothing 80 mm
- Mn- 817 universal four-jaws chuck \varnothing 80 mm
- Mn- 818 lever-operated drilling tailstock
- Mn- 819 swivel hand support for turning operations by hand
- Mn- 820 working spindle indexing device
- Mn- 821 vertical slide with chucking angle to be assembled to the tool slide in place of the tool head
- Mn- 822 fixed steady clamped on bed
- Mn- 823 travelling steady clamped on slide
- Mn- 824 vertical slide with indexing device to be assembled on tool slide, with collet chucking attachment.

Special machine construction

Version for 220 volts,
single-phase electric motor 0,25 kW/1390 RPM

Spindle speeds:	number of speeds	6
	speed range	150-1600 RPM

CONCLUSION

The experience summed up in this Manual is a result of many years of practice and diligent work in machine building and provides the best possible prerequisites for the economic use of the machine. All machine component parts are made of the most suitable materials with the use of the latest manufacturing processes and control facilities. If all the operating instructions are complied with, the highest possible accuracy and output of the machine can be obtained at minimum wear of the respective parts. Should, despite this fact, some faults in the operation of the machine occur the machine must be immediately put out of operation no matter if the defect has been caused by infringing the rules, by faulty operation or by an accident. Minor defects can be removed direct in your shop without impairing the accuracy of the machine. In case of serious damage you are advised, however, to inform us thoroughly on its extent, thus enabling us to advise you on the repairs and let you have the documents necessary for carrying out same with maximum speed and efficiency. Kindly address all your telephone or cable orders for spare parts only to our works and, for good order's sake, confirm them in writing simultaneously. Always state the correct designation and abbreviation of the part, possibly, its function in the machine with the number stamped on the damaged part and, if necessary, let us have a sketch of same to permit us to carry out the order with maximum accuracy.

Yours faithfully

