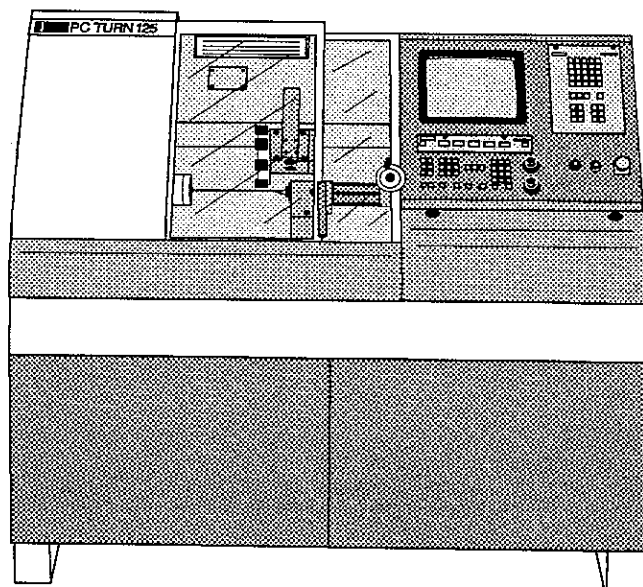


# Machine description

## EMCO PC TURN 125

Inclined-bed turning lathe



Edition 1998

Ref. No. EN 4362

Machine description  
EMCO PC TURN 125  
A98-03      EN 4362





# Introduction

For more than five decades EMCO has been developing metal working machines and has also been successfully on the market since 1980 with computer controlled machine tools (CNC machines), particularly on the training sector.

This high degree of experience is a profit for the turning and milling machines of the PC TURN and PC MILL model series.  
The newly designed compact machines meet entirely today's requirements in construction and set up as well as safety.

The PC machines are operated via a conventional personal computer (PC). This kind of operation permits an efficient training of the most different CNC controls (SIEMENS, FANUC, etc.) with one and the same machine.  
The CNC monitor of the installed CNC control is simulated on the PC screen, input of data is carried out via a control keyboard.

Due to the worldwide industrial use of our machines we dispose of a service network which covers all world areas.  
Immediately available service engineers, telephone service as well as a 100% sparepart supply exceeding the 10-year obligatory provision is something natural for us.

One of our more than 100 general representatives worldwide will inform you on particular new developments (e.g. clamping options for work pieces or tools, new softwares, etc.) and their fitting possibilities.

In the present operating instructions you will find a complete description of safety hints, transport, set-up, operation and maintenance of the machine. Therefore read this instructions completely before machine start-up.

## EC conformity



The CE sign certifies together with the EC declaration of conformity that the machine and the manual correspond to the EC guideline for machines 89/392/EEC and its modifications 91/368/EEC and 93/68/EEC.

**EMCO MAIER Gesellschaft m. b. H.  
Abteilung Technische Dokumentation  
A-5400 Hallein, Austria**

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# Contents

Adequate use .....	7
Warranty conditions for new EMCO machines .....	7
Safety recommendations .....	8
Technical data of the machine .....	9
Accessories .....	10
Data of PC control .....	11
Declaration of conformity .....	13

## A Installation of the machine

Machine number .....	15
Scope of supply .....	15
Transport of machine .....	16
Transport with pallet .....	16
Transport without pallet .....	16
Installation criteria .....	17
Ground .....	17
Ergonomic design .....	17
Installation possibility, alignment .....	17
Dimensions of the machine .....	18
Space required for operation and maintenance .....	18
Electrical connection .....	19
Electrical connection 230/400V with zero conductor .....	19
Electrical connection 230V without zero conductor .....	19
PC connection .....	20
Pneumatic connection (Option) .....	20
Initial start-up .....	21
Switching on machine .....	21

## B Description of the machine

Main elements .....	23
Machine base .....	24
Machine bed .....	24
Slides .....	24
Slide drives .....	24
Central lubrication .....	24
Main spindle .....	25
Pneumatic maintenance unit (option) .....	25
Pneumatic scheme of the maintenance unit .....	26
Hand tailstock .....	27
Pneumatic tailstock (option) .....	27
Setting the clamping pressure .....	27
Adjusting the clamping position .....	28
Connection air pressure-clamping force .....	29
Automatic door mechanism (option) .....	29
Robotics interface (option) .....	29
DNC-interface (option) .....	29
Safety devices .....	30
EMERGENCY-OFF key .....	30
Door limit switch/Door lock .....	30
Key switch .....	31
Consent key .....	32
Working area of the machine .....	33
Tool turret .....	34
Clamping the tool in the tool turret .....	34
External machining tools .....	34
Internal machining tools .....	35

Collet facility ESX 16 (Accessory) .....	36
Mounting the collets .....	36
Dismantling the collet .....	36
Care .....	36
Clamping range .....	36
Three-jaw chuck ø82 mm .....	37
Mounting the chuck .....	37
Clamping ranges .....	37
Pneumatic clamping device (option) .....	38
Clamping cylinder without bore .....	38
Adjusting the final pos. proximity detectors .....	38
Setting the clamping device pressure .....	39
Standard values for the clamping pressure .....	39
Blow-out device .....	39
Power operated three-jaw chuck KFD 85 .....	40
Mounting the chuck .....	40
Mounting the top jaws .....	40
Dimensions of the chuck, Clamping ranges .....	41
Working with synthetic materials .....	41
Technological data .....	42
Speed-torque characteristic line of the main drive .....	42
Maximum machining values .....	43
Finding the speed .....	44
Points at the machine - coordinate system .....	45
Tools .....	46
Coolant device (accessory) .....	48
Mounting the coolant device .....	48
Electrical connection .....	49
Switching on/switching off coolant device .....	49
Exchange of the control keyboard .....	50

## C Maintenance of the machine

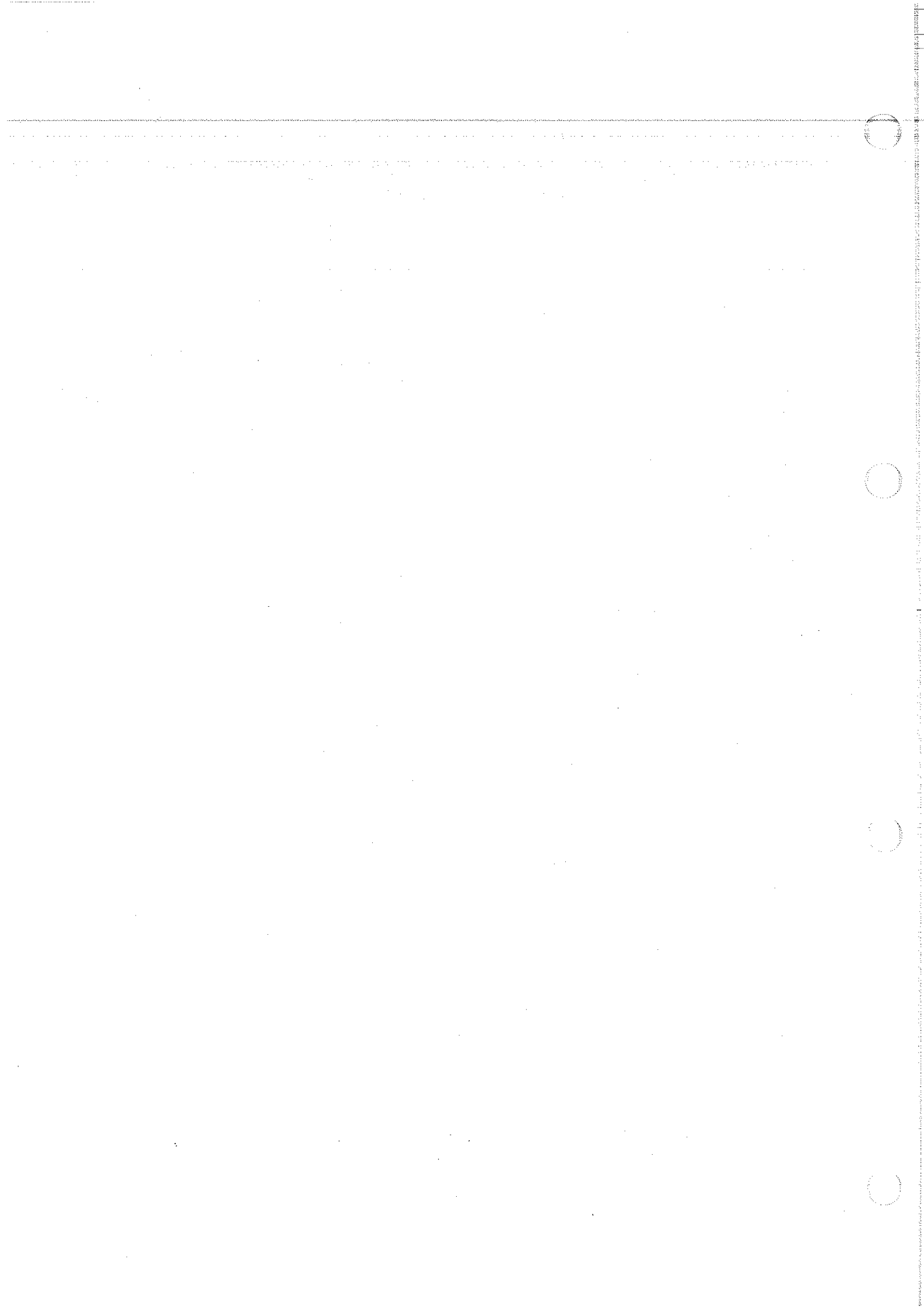
Lubricating and oiling the machine .....	51
Survey .....	51
Lubricant recommendations .....	51
Central lubrication .....	52
Deaerating the lubricant lines .....	52
Longitudinal and cross spindle .....	53
Hand tailstock .....	53
Pneumatic tailstock .....	54
Pneumatic clamping device .....	54
KFD power chuck .....	54
Clamping cylinder without bore .....	55
Pneumatic unit .....	55
Water separator .....	55

## D Readjustment work

Special tool .....	57
Testing tools .....	58
Headstock .....	59
Tailstock .....	63
Tool turret .....	67
Slides .....	69
Main driving belt .....	73

## Supplements

Service part list .....	
Service addresses .....	



## Adequate use

The machine is designed for turning of machinable metals and machinable synthetic materials.

Machining of other materials is not admitted and may be carried out in particular cases only after consultation with the machine manufacturer.

Adequate use also includes compliance with the operating and maintenance instructions indicated by the manufacturer.

The machine may exclusively be operated by persons familiar with operation, maintenance and repair and who know about the hazards.

All regulations for the prevention of accidents and safety instructions for work with machine tools have to be complied with at any time.

In case of inadequate use of the machine the manufacturer renounces any liability and the responsibility is transferred exclusively to the user.

## Warranty conditions for new EMCO machines

1. The warranty period for new EMCO machines is, without limitation of operating hours, 12 months after initial shipment of the machine from EMCO or its authorized representative. Should the installation be completed by EMCO or its authorized representative, the warranty period begins with the completed installation of the machine.  
If a delay of installation occurs which is not caused by EMCO or its representative, the warranty period becomes invalid 12 months after scheduled installation date.
2. The warranty extends to the elimination of all defects in material or workmanship which affect the regular function of the machine.
3. Occuring defects must be immediately reported to the EMCO representative or the next EMCO service department with detailed description of the defect in written or oral form, followed by a written verification.
4. Defects which are correctly reported and under warranty will be corrected by either repair or replacement delivery to the original buyer free-of-charge; defective parts are to be returned to EMCO or the EMCO authorized representative, freight prepaid, if requested.
5. Warranty for spare parts: Emco guarantees to the original buyer that, only those parts sold directly by Emco or through an authorized representative will be free from defects, which render part commercially unacceptable in material and workmanship, for a period according to applicable national law, at least three (3) months, but not to exceed six (6) months from the date of initial shipment or installation by Emco or its representative.  
In the case of repeated claims for the same part: Warranty replacement does not extend the period of the original warranty.
6. There is no claim of warranty for defects which occurred by:  
Negligence of operating instruction manuals, safety and handling regulations or other instructions regarding delivery, installation, set-up or usage of the machine, incorrect set-up resp. installation, as well as, unauthorized, not expressed regulated or allowed alternations or modifications of the machine by the original buyer or third parties, natural wear, improper or negligent handling, chemical, electro-chemical or electrical influences, inadequate energy supply or force majeure.
7. Any service performed by EMCO or its authorized representative beyond warranty will be charged at EMCO's or its authorized representative's regular rates.

## Safety recommendations

### **Read documentation**

Read this documentation completely before you start up the machine.

### **Electrical connection**

The electrical connection of the machine must only be carried out by electricians experts.

### **Authorized operation**

The machine may only be operated by authorized persons.

Protect the machine against unauthorized start-up (main switch which can be locked).

### **Start-up**

Make sure that prior to each start-up the machine is in perfect maintenance state and that no safety features have been removed.

### **No modifications on machine**

Modifications on your own on safety features, bridgings of control features as well as any interference with the electric/electronic part of the machine is prohibited.

### **In case of hazards EMERGENCY-OFF**

In case of hazards immediately actuate EMERGENCY-OFF key to stop machine.

### **Safe tool-clamping**

Prior to start of operation check if workpiece and tool are clamped safely.

### **Remove chuck key**

Prior to start of operation check if chuck key has been removed.

### **Observe speed limits**

Clamping devices are subject to speed limits. Thus observe the maximum speed of the clamping devices used by you.

### **Clamp only short workpieces in cantilevered mode**

Support longer workpieces (> clamping diameter 3x) by means of collar plate or revolving center punch.

### **Do not clamp too short**

Avoid small clamping diameters with large turning diameters.

The workpiece should fit tightly.

### **Use chip hook**

Remove chips only with machine switched off and by means of a chip hook.

### **Do not reach into running machine!**

### **Use protection for projecting parts**

During machining of rod material the parts projecting over the headstock should be covered by a fixed protection device along the entire length.

### **Tool change**

Change machining tools only during standstill of machine.

### **Measurement work**

Carry out measurement work only during standstill of the machine and with EMERGENCY-OFF key actuated.

### **Wear body protection**

Mind that your hair does not get caught in the machine - hair protection to be worn.

Protect your eyes with safety-glasses.

Do not wear loose working clothes. Mind that the working clothes are tight around the wrists and hips.

### **Machine supervision**

Never leave running machine unattended.

Before leaving the working place switch off machine.

### **Maintenance and readjustment work**

All maintenance and readjustment work may be carried out only with machine switched off and EMERGENCY-OFF key actuated.

### **Claim**

In the event of a collision or instance of damage, contact the representative or manufacturer.

In case of complaints, damage, confusions and spare parts orders always indicate the machine number.

For parts not supplied by EMCO, EMCO will not assume liability.



## Technical data of the machine

Working area		
Maximum workpiece diameter for chuck parts	[mm]	ø120
Maximum workpiece diameter for chuck parts with tailstock	[mm]	ø75
Maximum turning length	[mm]	121
Turning diameter over bed	[mm]	ø180
Turning diameter via cross slide	[mm]	ø75
Travel of X-slide (useable)	[mm]	55
Travel of Z-slide (useable)	[mm]	172
Turning spindle		
Spindle nose according to manufacturer's standard		
Spindle bore	[mm]	ø20.7
Chuck diameter	[mm]	max. ø85
Spindle speed (infinitely variable)	[rpm]	150-4000
Main drive		
3-phase A.C. motor		
Torque with 100%/60% D.C.	[Nm]	14/18
Power with 100%/60% D.C.	[kW]	2.2/2.8
Feed drives		
Step resolution/output resolution	[mm]	0,000625
Working feed in X/Z (infinitely variable)	[mm/min]	0-4000
Rapid motion in X/Z	[mm/min]	5000
Maximum feed force X/Z	[N]	2000/2000
Tool system		
Automatic revolver-type turret		
Tool holds (alternatively internal or external)		8
Maximum tool cross-section	[mm]	12x12
Support bore for internal machining tools	[mm]	ø16
Tailstock		
Sleeve diameter	[mm]	ø35
Sleeve stroke	[mm]	120
Integrated centre punch		
Electrical connection		
Power supply, reversible	[V]	3/N/PE ~ 230/400 3/PE ~ 230
Connected load	[kVA]	3,5
Maximum voltage fluctuations	[%]	+5/-10%
Frequency	[Hz]	50/60
Preliminary fuse for the machine	[A-slow]	max. 20

*Subject to technical modifications!*

Lubrication system		
Guideways, longitudinal and cross slides		Central lubrication
Working spindle, spherical threaded spindles		Grease lubrication
Dimensions		
Height of turning axis above floor	[mm]	ca. 1095
Total length x total depth x total height	[mm]	1730 x 875 x 1620
Total weight	[kg]	530
Machine acceptance		
Machine acceptance according to DIN		DIN 8605
Sound pressure level		
mean sound pressure level	[dB(A)]	66
With the following conditions:		
<ul style="list-style-type: none"> <li>• Measuring method: enveloping surface according to DIN 45 635</li> <li>• Operating mode: maximum speed during idle running</li> </ul>		
Safety instructions/standards		
Conforming to EC standards according to		EN292 Part 1/2
		EN60204 Part 1
		EC-machine guideline Annex 1

## Accessories

Accessories marked with "\*" are built up on order in the plant

Coolant device		
Tank capacity	[l]	35
maximum conveying capacity	[l/min]	15
maximum conveying pressure	[bar]	5
* Pneumatic unit		
Prerequisite for automatic door mechanism, pneumatic clamping chuck, automatic tailstock		
Supply pressure	[bar]	6
Pneumatic connection	[mm]	ø10
* Pneumatic clamping chuck		
3-jaw chuck with stroke control and blow-out device		
Chuck diameter	[mm]	ø85
Chuck opening	[mm]	ø18
* Automatic tailstock		
pneumatic tailstock with stroke control		
Sleeve stroke	[mm]	120
integrated centre punch		
* Automatic door mechanism		

Subject to technical modifications!

## Data of PC control

Control set-up		
Separate set-up of machine operating board and control-specific keyboard		
Control specific keyboard		exchangeable
Integrated computer (PC)		Pentium 166
Screen standard		14" color
PC configuration		
PC IBM compatible		Pentium
Cycle frequency	[MHz]	166
Main storage RAM	[MB]	16
Hard disk	[GB]	1,6
Graphics card		VGA
Keyboard		MPF-2
Serial interface		2
Parallel interface		1
Disk drive		3½"
Software		
Operating system		Win95

*Subject to technical modifications!*



## Declaration of conformity

**Product:** PC-controlled lathe

<b>Machine data:</b>	<b>Model</b>	<b>Type</b>
	<b>EMCO</b>	<b>PC TURN 125</b>

**Address of manufacturer:** Emco Maier Ges.m.b.H  
Salzachtal Bundesstraße Nord 58  
A-5400 Hallein

**Bases of standards:** EN 292-1; EN 292-2; EN 294; EN 418; EN 60204-1; prEN 954-1;  
prEN 1037; prEN 1050; prEN 1088

**Regulations:** MSV (BGBl. Nr. 306/1994, 27.4.94)

**Test certificates:**

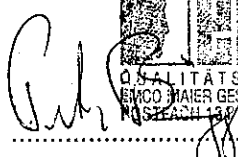
**Particular notes ,  
enclosures:** Electrical documentation as applicable

We herewith declare that the above-mentioned product referring to the subject declaration is in conformity with the currently valid stipulations of the directive of the Council dated June 14<sup>th</sup>, 1989 for the alignment of the legal stipulations of the member states for machines (89/392/EEC) and its modifications dated June 20<sup>th</sup>, 1991 (91/368/EEC), June 14<sup>th</sup>, 1993 (93/44/EEC), July 22<sup>nd</sup>, 1993 (93/68/EEC), with the directive of the Council dated May 3<sup>rd</sup>, 1989 for the alignment of the legal stipulations for electromagnetic compatibility (89/336/EEC) and its modifications dated April 28<sup>th</sup>, 1992 (92/31/EEC) and July 22<sup>nd</sup>, 1993 (93/68/EEC), and with the directive of the Council dated February 19<sup>th</sup>, 1973 concerning low voltage equipment (73/23/EEC) and its modification dated July 22<sup>nd</sup>, 1993 (93/68/EEC).

Furthermore, the conformity of the subject product with the above-mentioned standard bases and regulations is effective.

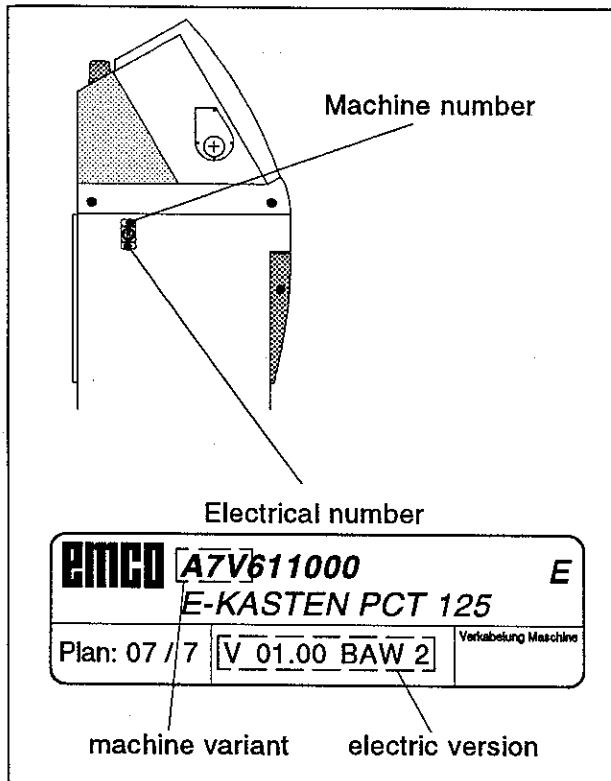
**Place, date:** Hallein, 11.02.98

**Authorized person:** Head of quality department Peter Binggl

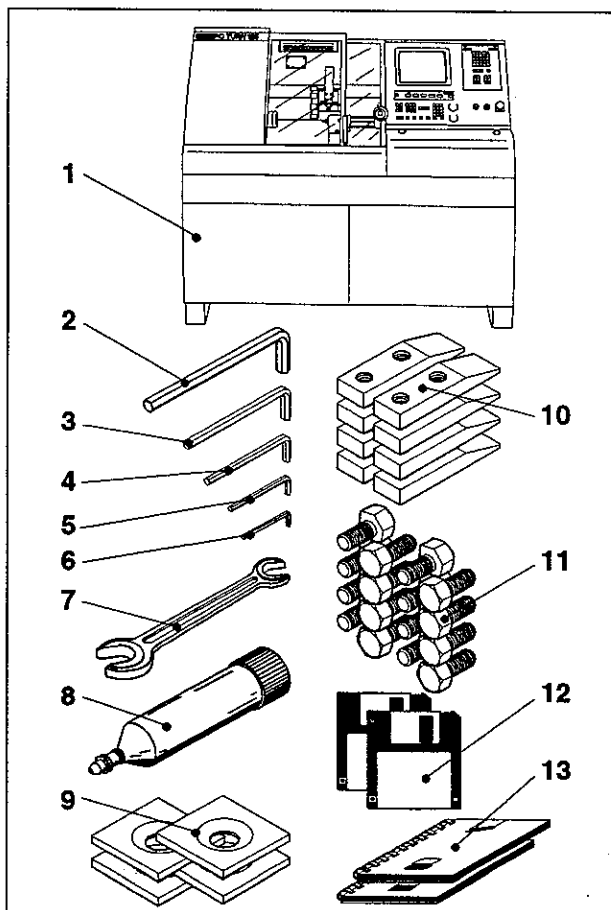
  
QUALITÄTSSICHERUNG  
EMCO MAIER GESELLSCHAFT M.B.H.  
SALZACHTAL 1307/A-5400 HALLEIN



# A Installation of the machine



Side view of the machine



Scope of supply

## Machine acceptance

- Check the machine for any transport damage and completeness of the delivery. If you find any defects, please contact the dealer or the insurance company.
- In case of complaints always specify the exact designation of the machine and the machine number and the electric number. The self-adhesive plate indicating the machine number and the electric number is to be found laterally on the machine below the main switch.

On the plate with the electric number you'll find:

- machine variant (e.g. "A7V")
- Electric version (e.g. "V 01.00 BAW 2")

The available circuit diagrams for this machine you will find in the Electrical Documentation, which is put inside of the electrical cabinet of the machine.

The Electrical Documentation may also be ordered from EMCO:

**Electrical Documentation EMCO PC TURN 125**  
Ref. No. ZVP 675 030

**Version A7V\_V01.00 BAW 2**

(= machine variant and electrical version of your machine)

- The rust protection agent must be removed by the customer.

## Scope of supply

1. Inclined-bed turning lathe EMCO PC TURN 125 with full shell, safety devices, tool turret, tailstock, machine lamp, central lubrication. Control part complete with PC and keyboard, key module for desired control
2. 1 hexagonal key SW5
3. 1 hexagonal key SW4
4. 1 hexagonal key SW3
5. 1 hexagonal key SW2.5
6. 1 hexagonal key SW2
7. 1 double-ended spanner SW8x10
8. 1 grease gun
9. 4 supports
10. 8 clamping elements for tool turret
11. 16 clamping screws for tool turret
12. control software and control keyboard as desired, MSD floppy
13. Machine description and software description, Electrical Documentation

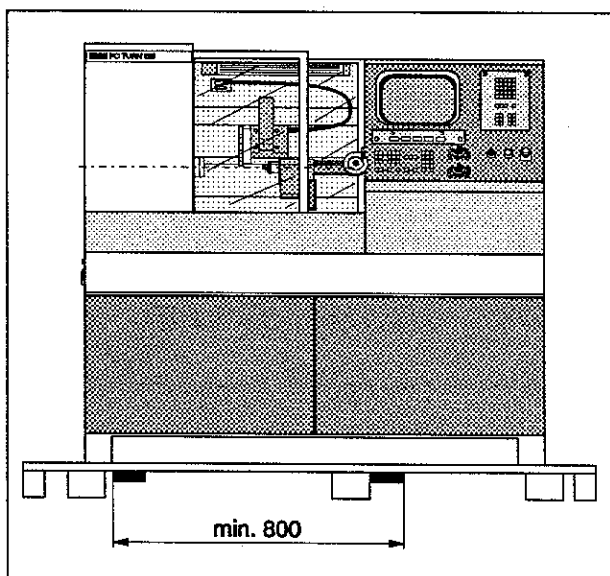
## Transport of machine

The machine is delivered on a wooden pallet. It is fixed on the pallet with 4 square neck bolts.



### **Danger:**

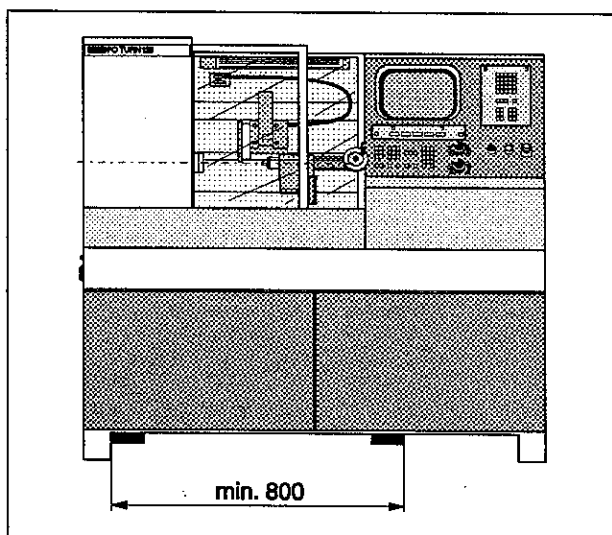
Mind the maximum permissible lifting capacity of the hoist when lifting the machine.



*Transport with pallet*

## Transport with pallet

Fork width ..... min. 1100 mm  
Lifting capacity ..... 620 kg



*Transport without pallet*

## Transport without pallet

Fork width ..... min. 1100 mm  
Lifting capacity ..... 530 kg



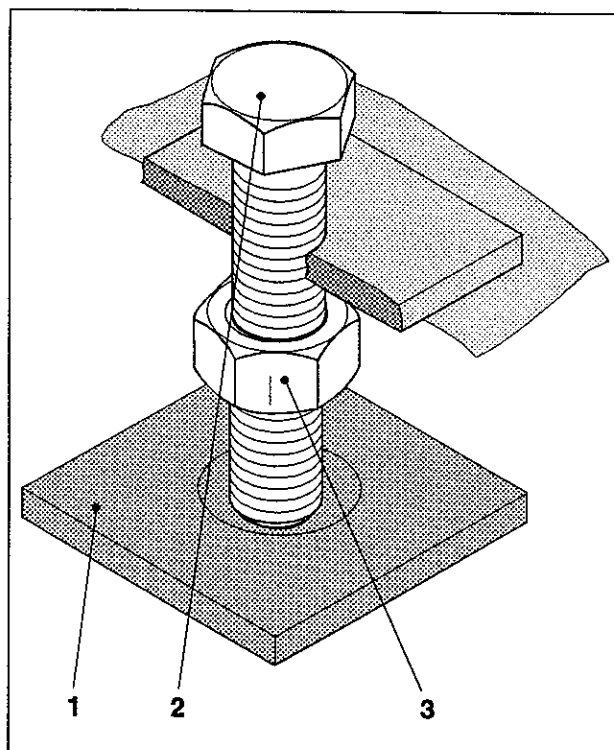
## Installation criteria

### Ground

The machine is to be set up on a ground as horizontal as possible with appropriate load-bearing capacity to assure a steady position and avoid vibrations which could have a negative influence on the finishing accuracy.

### Ergonomic design

Due to its ergonomic design the machine provides optimum operation. However, when choosing the installation site pay attention to sufficient lighting. (A machine lamp is available in the working area of the machine.)



Setting screws for aligning the machine

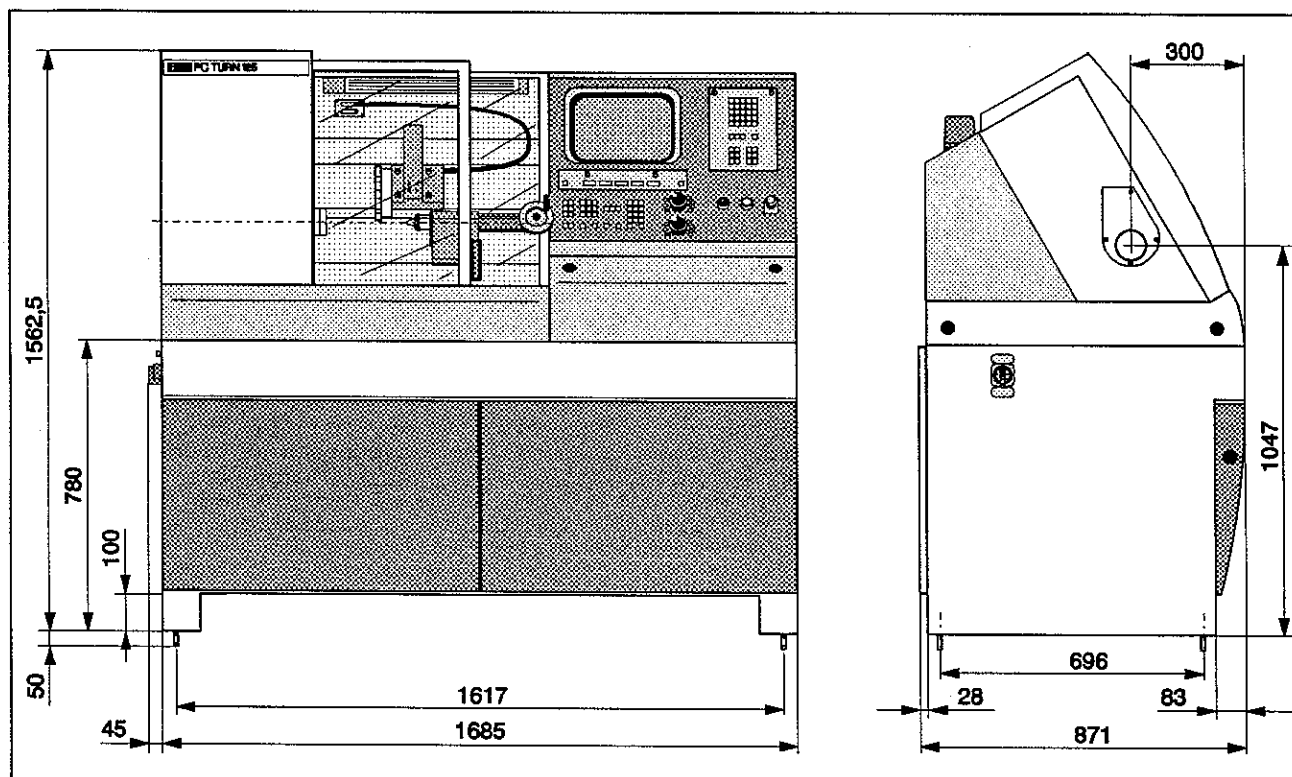
### Installation possibility, alignment

4 supports (1) are supplied with the machine. Instead of the 4 supports also levelling elements can be used.

The levelling elements can be ordered under order no. 780 150 (4 pieces required).

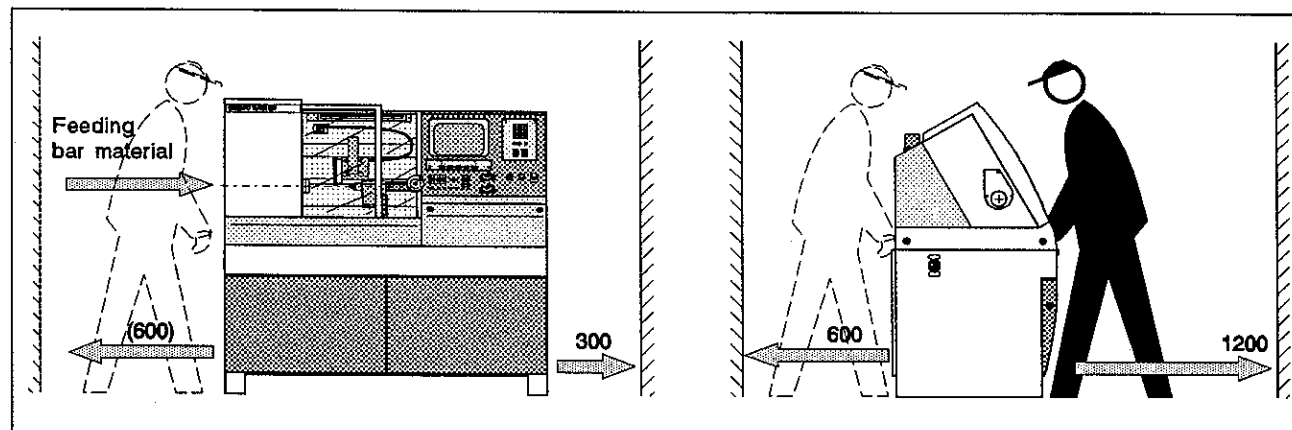
- Lift machine.
- Lay supports (1) under the setting screws already mounted M16x65, SW24 (2).
- Place machine onto the supports and align it with the setting screws (2) as horizontal as possible.
- Secure alignment with the counter nuts (3).

## Dimensions of the machine

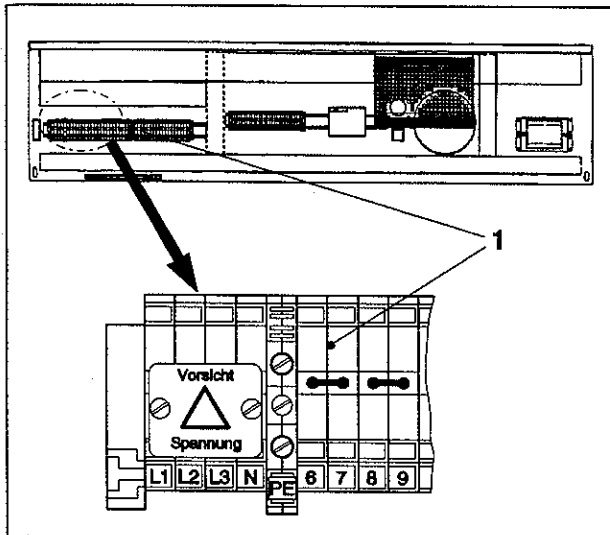


Total dimensions of the machine

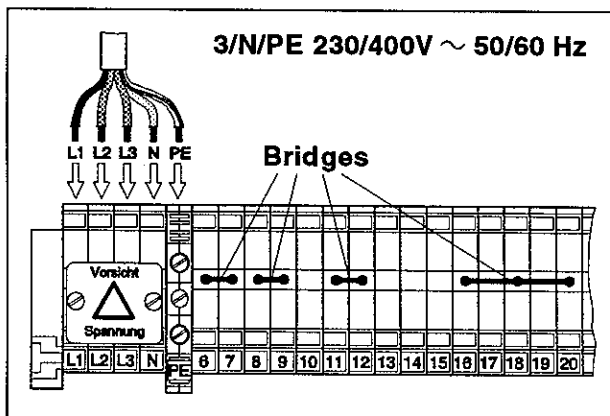
## Space required for operation and maintenance



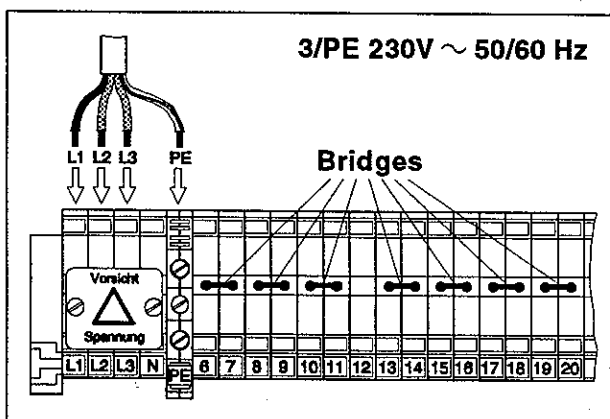
Space required for operation and maintenance



Terminal strip for electr. connection in the electrical cabinet (seen from above)



Electrical connection with zero conductor



Electrical connection without zero conductor

## Electrical connection

### Danger:

The electrical connection may only be established by an electrician expert.

- Thread cable through the cable screwed joint at the electrical cabinet.
- Connect each of the cores at the terminal strip (1).

### Caution:

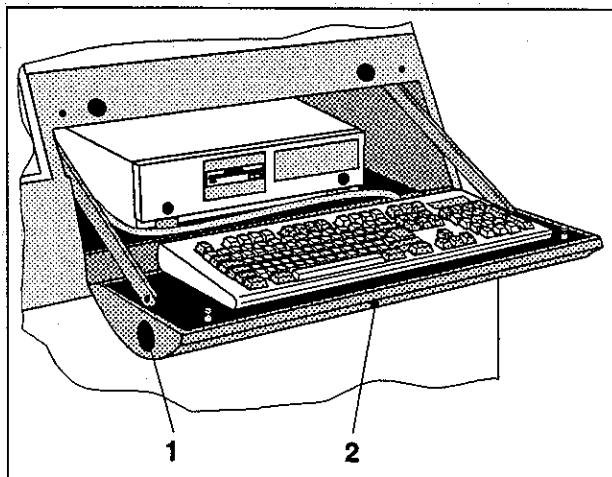
- Mind the positions of the bridges on the clamping elements 6 up to 20 at the terminal strip (1) in order to avoid damage in the electrical equipment.  
For further information please see electric documentation.
- Take care that the phase sequence during the connection of the machine is in clockwise direction to guarantee sufficient cooling of the main motor.  
You can check it at the rotating direction of the fan of the main motor which can be seen after removing the back panel of the machine (fan must run in arrow direction).

## Electrical connection 230/400V with zero conductor

Voltage ..... 3/N/PE 230/400V ~ 50/60 Hz  
 Connection load ..... 3,5kVA  
 Preliminary fuse for machine ..... max. 20 A slow  
 Cross-section of cable ..... min. 5x4 mm<sup>2</sup>  
 Max. voltage fluctuations ..... +5/-10%

## Electrical connection 230V without zero conductor

Voltage ..... 3/PE 230V ~ 50/60 Hz  
 Connection load ..... 3,5 kVA  
 Preliminary fuse for machine ..... max. 20 A slow  
 Cross-section of cable ..... min. 4x4 mm<sup>2</sup>  
 Max. voltage fluctuations ..... +5/-10%



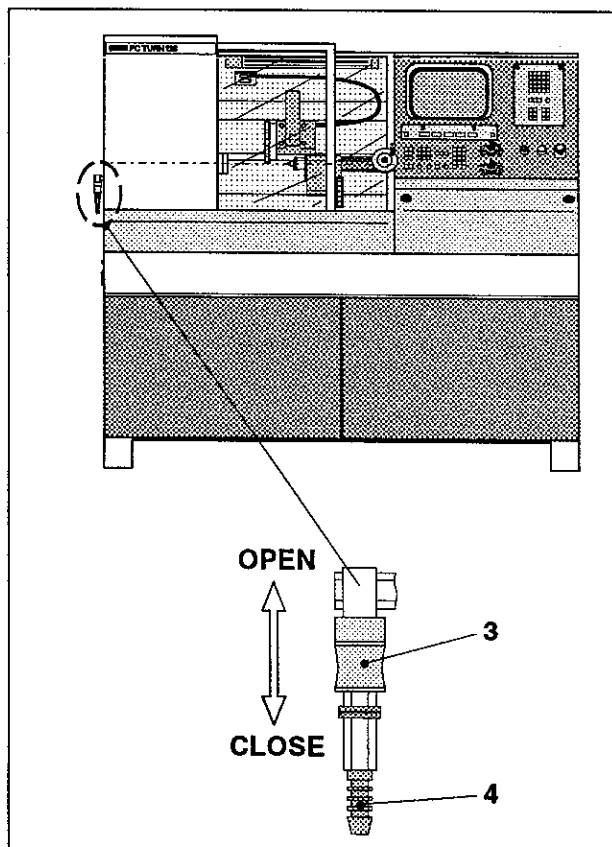
Opening the PC-case

## PC connection

The PC with the keyboard is mounted and cabled fixedly in the machine.

By turning down the cover (2) the case for the PC is accessible.

The cover (2) can be opened by pulling in the bores (1).

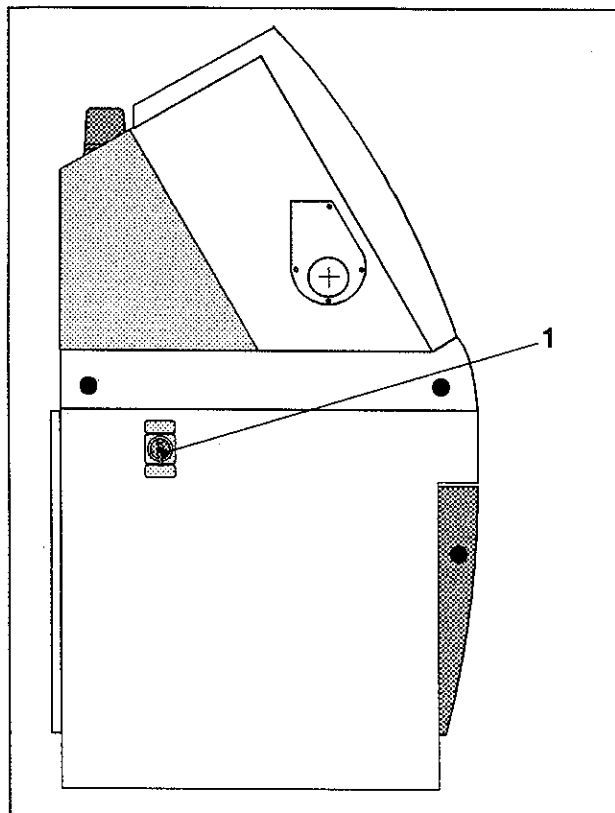


Pneumatic connection of the machine

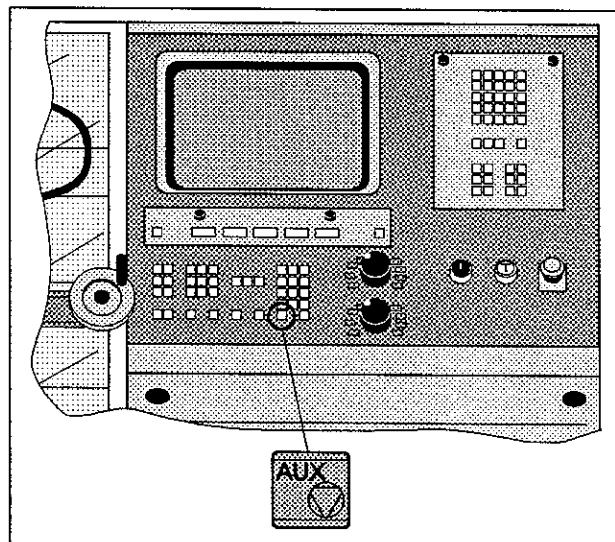
## Pneumatic connection (Option)

Working pressure ..... min.4 – max.6 bar

- Connect air supply at the connection piece (4) of the pneumatic unit laterally at the machine (compressed air hose  $\varnothing 10$  mm).
- By pushing the manual slide (3) upwards the filter and the valves are supplied with compressed air.
- Lock air supply by pushing the manual slide (3) downwards.



*Main switch at the machine*



*Activating the central lubrication with "AUX ON"*

## Initial start- up

- All blank parts are to be cleaned from rust preventive agent with a clean cloth.
- Prior to start-up grease the machine (see maintenance of the machine).
- Check oil level of central lubrication, if necessary refill oil (see maintenance of the machine).
- Tool and workpiece must be clamped tightly and safely.
- For further operation please see switch-on and switch-off procedure of the machine as well as software description.

## Switching on machine

- Turn main switch (1) to position "1" .
- Open air-supply (option).
- After a major standstill of the machine press "AUX ON" key for approx. 1 minute. By pressing the "AUX ON" key all drives are supplied with current. With a steady pressure on the key also the central lubrication is activated approx. every 6 seconds in order to lubricate the slide guides.
- For further operation of the machine please see your **"Software description"** .

### Note:

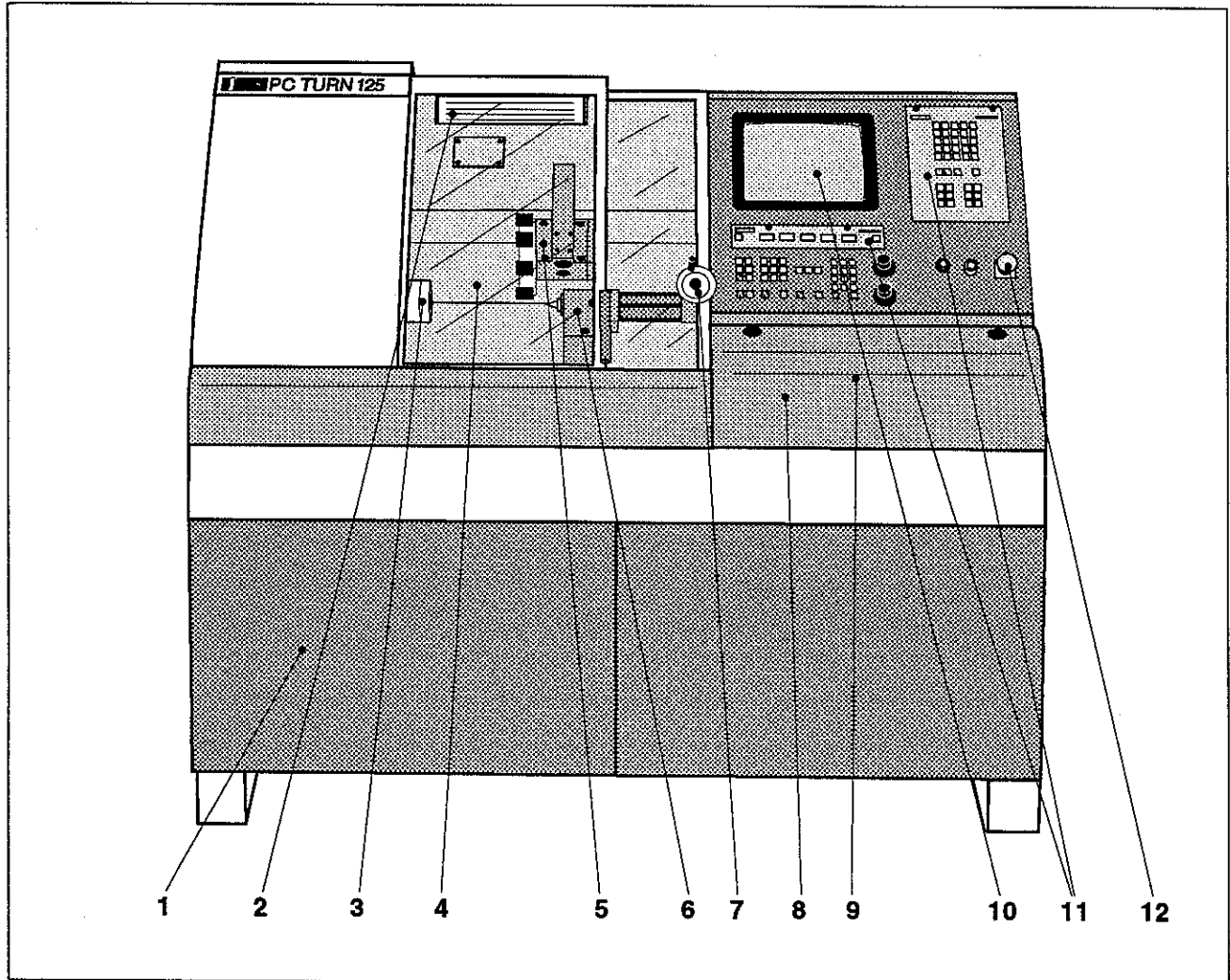
If the machine is not used for a major period:

- Clean machine carefully
- Slightly oil blank parts.
- Protect machine against unauthorized start-up (key switch at the operating panel, lockable main switch).
- Cover machine with dust protection (packing).

After a major standstill of the machine all operations as described under "Initial start-up" are to be carried out.



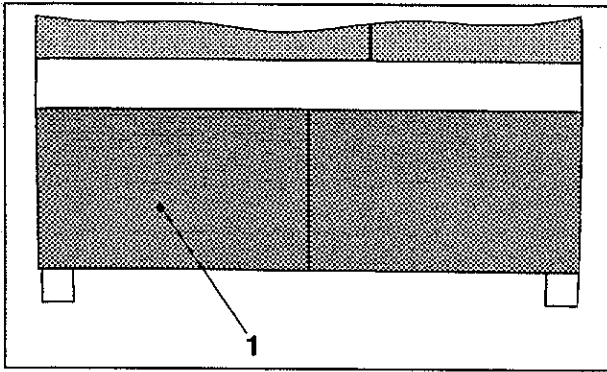
## B Description of the machine



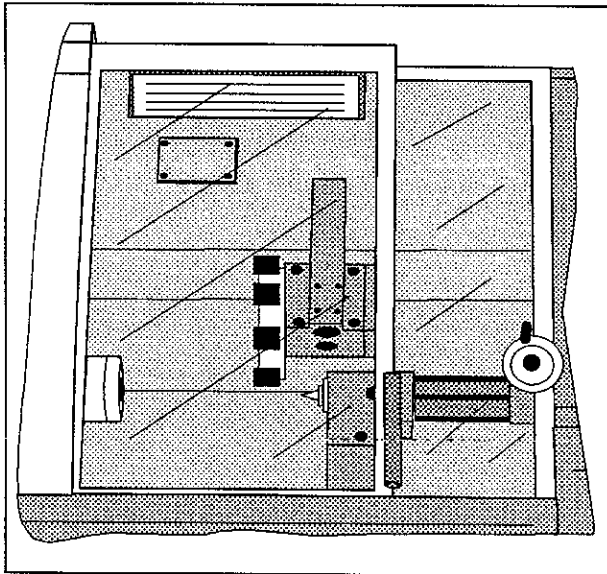
*Main elements at the machine*

### Main elements

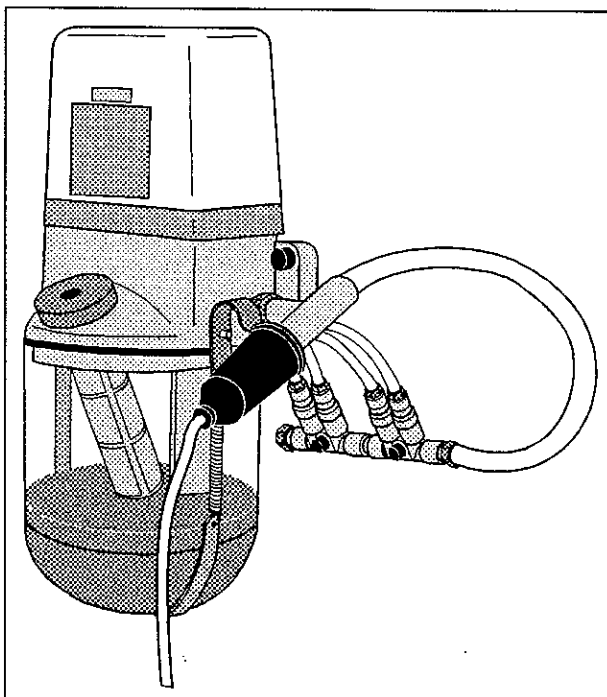
1. Machine base
2. Machine lamp
3. Main spindle
4. Chip guard door
5. Tool turret
6. Toolstock
7. Toolstock handwheel
8. Cover for PC area (swivelling)
9. Control PC
10. Screen
11. Control-specific keyboard (exchangeable)
12. EMERGENCY-OFF key



Machine base



Working area with slide and cased machine bed



Central lubrication

## Machine base

The machine base is of solid welded design, for supporting the machine bed, the control with the PC as well as the whole electrical equipment. Furthermore, there is a space provided for the coolant device (accessory) behind the removable cover (1).

## Machine bed

The machine bed is made of cast iron, extremely resistant to torsions and vibration-damping. The headstock, slide unit and tailstock are mounted on the machine bed. Due to the three-point support of the machine bed a distortion and thus an impairment of the accuracy is avoided.

## Slides

Longitudinal and cross slide run in precisely ground dove-tail guides.

The clearance of the slides can be readjusted via tapered gibs.

The slides are supplied with oil via the central oil lubrication so that all sliding surfaces are always dampened with oil.

## Slide drives

The slides are traversed with step motors via recirculating ball screw spindles.

The amply dimensioned spindles, the rigid spindle nuts and the axial bearings without backlash provide high-positioning and working accuracy.

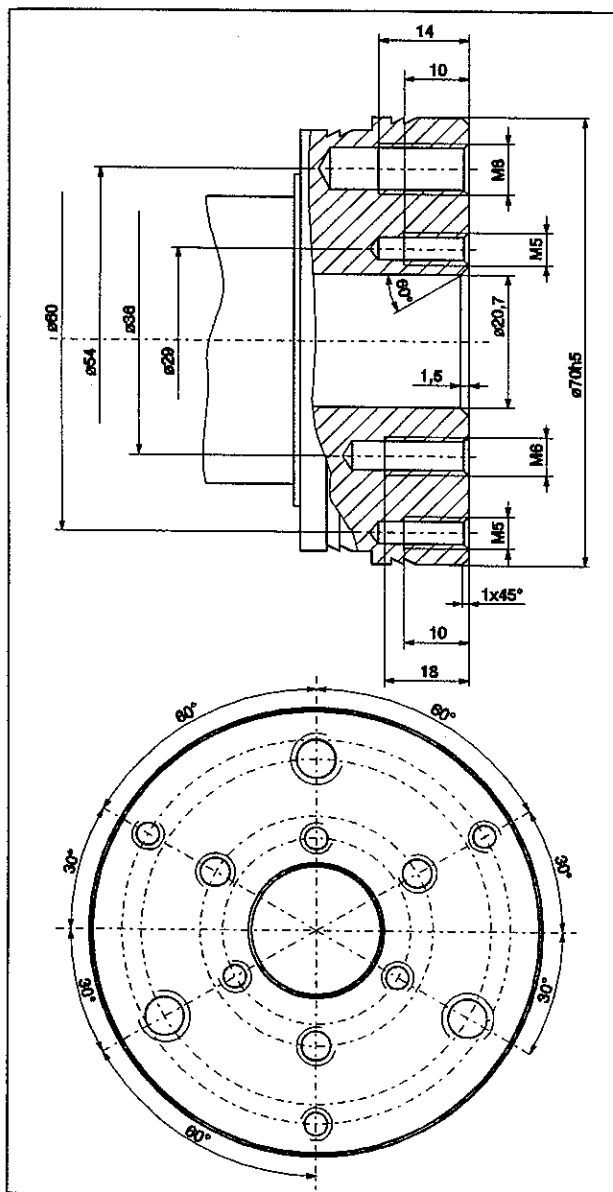
Feed speed .....	0-4000 mm/min
Rapid motion speed .....	5000 mm/min
Travel path longitudinal slide .....	172 mm
Travel path cross slide .....	55 mm
Step resolution.....	0.000625 mm
max. feed force longitudinal slide .....	2000 N
max. feed force cross slide .....	2000 N

## Central lubrication

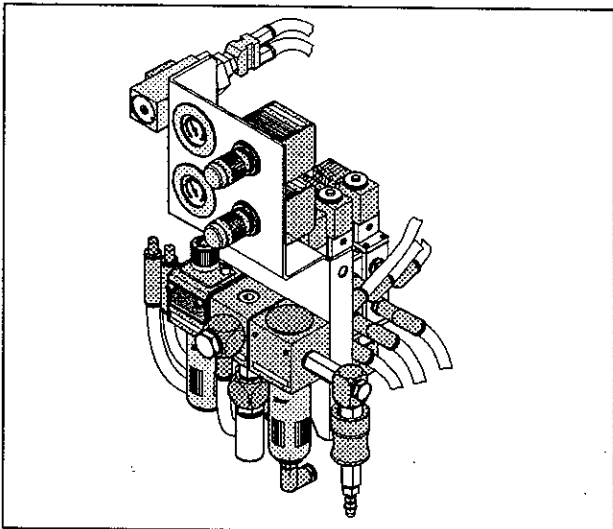
Longitudinal and cross slides are supplied with slideway oil via the central lubrication.

The pump is automatically switched on after a slide travel path of 16 m.





**Fitting dimensions at the spindle nose  
(manufacturer's standard)**



### Pneumatic maintenance unit

## Main spindle

The main spindle is driven by a three-phase A.C. motor via a V-belt.

It is guided in taper roller bearings greased for life and, thus, maintenance-free.

The headstock is formed thermosymmetrically, i. e. in case of heating of the spindle a deviation in alignment is not effected.

The fixation of the clamping devices is carried out in accordance with the kind of clamping device at the thread bores provided for this purpose.

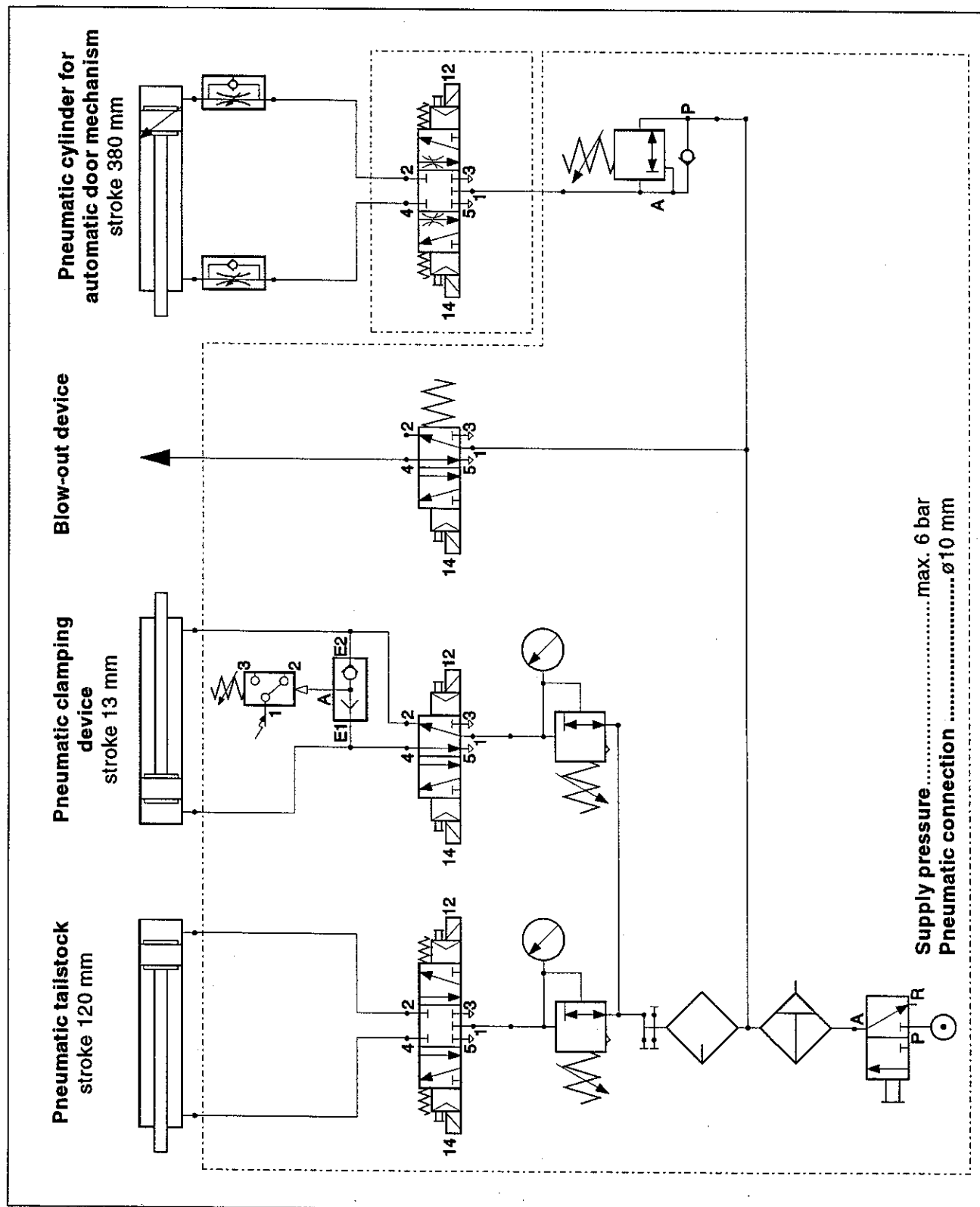
The clamping devices must be provided with an intermediate flange.

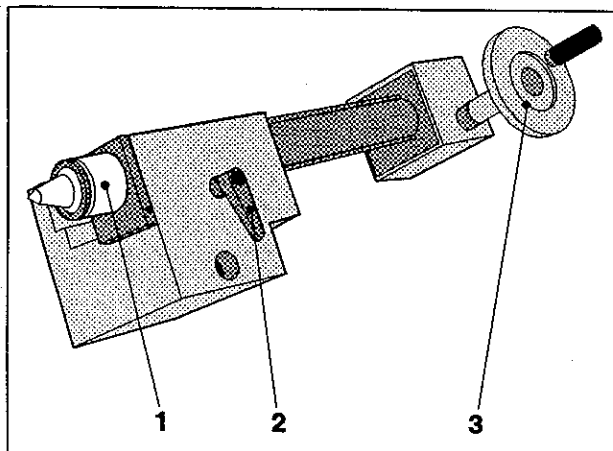
## Pneumatic maintenance unit (option)

In machines with automatization, the pneumatic maintenance unit (pneumatic clamping device, blow-out device, pneumatic tailstock, automatic door mechanism) is mounted on the rear side of the machine behind the machine back panel.

The maintenance unit contains all connections, pressure switches, pressure control units and valves which are necessary for triggering the automatization devices.

# Pneumatic scheme of the maintenance unit





Hand tailstock

## Hand tailstock

Sleeve diameter .....  $\varnothing 35$  mm  
 maximum sleeve stroke ..... 120 mm

The hand tailstock is firmly mounted at the machine bed.

The centre is integrated in the sleeve (1).

The position of the handwheel (3) enables a stroke movement of the sleeve also with closed chip guard door.

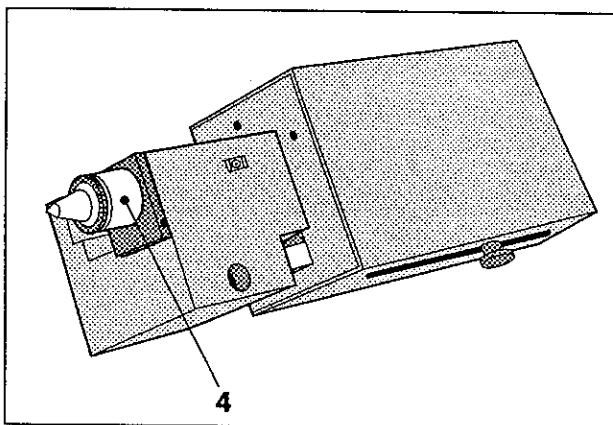
Clamping of the sleeve is carried out with the clamping lever (2).

Exact setting of the centre to turning centre is possible due to a built-in eccentric mechanism.



### Danger:

- The sleeve may be moved only during machine standstill.
- When countersupporting workpieces the sleeve has always to be clamped.



pneumatic tailstock

## Pneumatic tailstock (option)

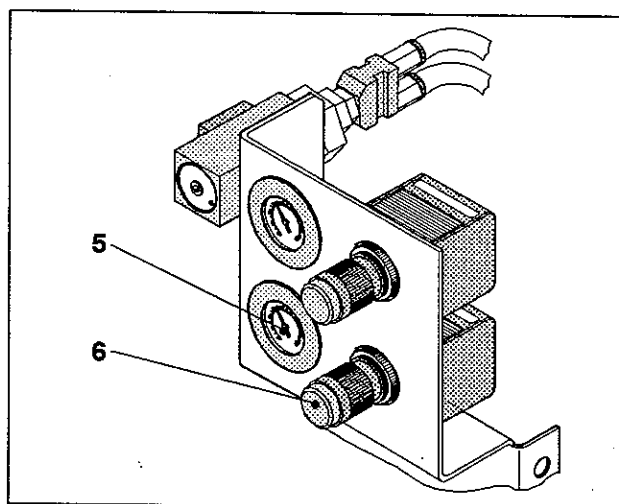
Upon order the pneumatic tailstock can be mounted at the manufacturer.

Sleeve diameter .....  $\varnothing 35$  mm

Sleeve stroke ..... 120 mm

Clamping pressure ..... max. 6 bar

The centre is integrated in the sleeve (4). Exact setting of the centre to turning centre is possible due to a built-in eccentric mechanism.

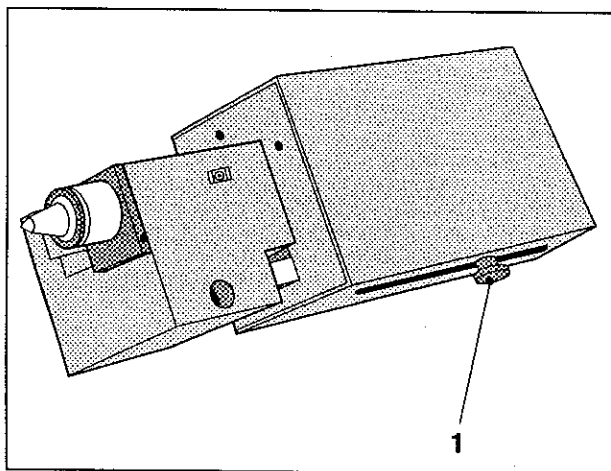


Setting the clamping pressure

## Setting the clamping pressure

The clamping pressure of the tailstock sleeve is set on the rear side of the machine at the pressure control unit (6).

The pressure setting is controlled at the manometer (5).



Adjusting the clamping position

## Adjusting the clamping position

Monitoring of the position of the tailstock sleeve is carried out by 3 final position proximity detectors.

Two adjustable proximity detectors control the clamping position while a firmly installed limit switch recognizes the extreme rear final position of the sleeve.

## Prerequisites for the adjustment

- The machine is switched on.
- The reference point has been approached.
- The workpiece is clamped in the chuck of the machine.

## Adjustment procedure

- Traverse tailstock sleeve into extreme rear final position.  
During traversing the control displays the message "7052 Sleeve in intermediate position!" on the screen.
- Loosen knurled screw (1) and dislocate it extremely to the left in direction workpiece.  
Retighten knurled screw (1).
- Traverse tailstock sleeve with closed door into the centre of the workpiece (establish clamping state).  
The message "7052 Sleeve in intermediate position!" is displayed on the screen.
- Open machine door.  
Loosen knurled screw (1) and move it slowly to the right (away from the workpiece) until the message "7052 Sleeve in intermediate position!" is replaced by the message "7040 Machine door open!".  
Clamp knurled screw (1) in this position.

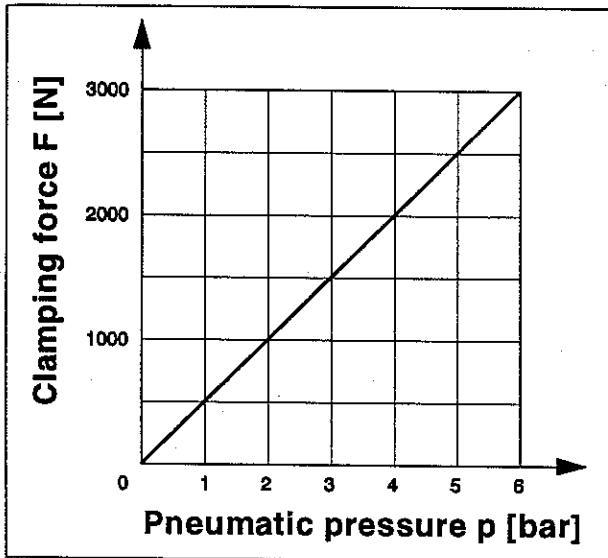
### Note:

If the knurled screw (1) is dislocated too fast it might happen that the message "7053 Sleeve-No part clamped!" is displayed on the screen.

A correct setting of the proximity detectors is not possible any more.

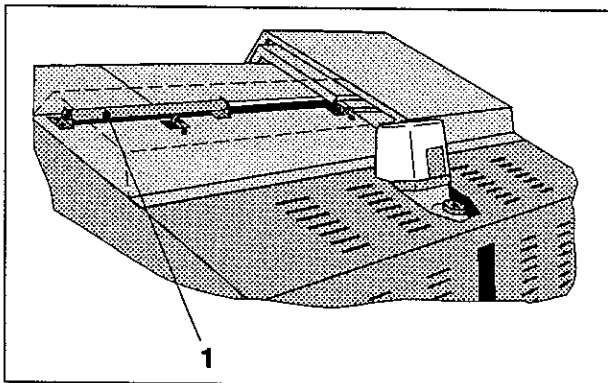
Traverse the sleeve into the extreme rear position and start again with the adjustment procedure.

- Close the machine door, the message on the screen extinguishes.  
At the same time pressure is applied on the pressure valve of the tailstock sleeve, the sleeve is clamped.



*Clamping force diagram of the tailstock sleeve*

### Connection air pressure-clamping force



*Pneumatic cylinder for automatic door mechanism*

### Automatic door mechanism (option)

Upon order the automatic door mechanism can be mounted as option at the manufacturer. The chip guard door can be opened and/or closed by the program or by pressing a key via a pneumatic cylinder (1). Monitoring of the door position is carried out via 3 limit switches.

### Robotics interface (option)

With the robotics interface in addition to the general triggering of the periphery (such as automatic door mechanism) the machine can also be connected with further machines or devices (e.g. loading and unloading robot).

### DNC-interface (option)

Via the DNC-interface the machine can be operated via a host. In contrast to the robotics interface, in addition to standard functions, e.g. programs can be transmitted or started from the host.

The DNC-interface is mainly used for the set-up of an FMS.

## Safety devices

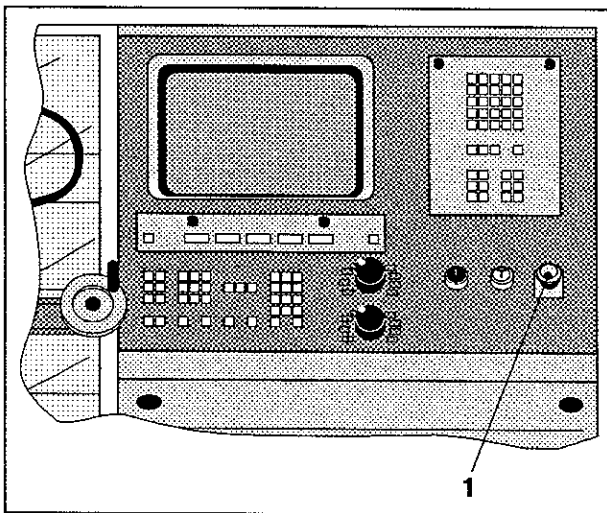
The safety devices are contained in the base machine and facilitate generally risk-free operation of the machine.



### Danger:

The safety devices must never be removed from the machine.

Also mechanic or electric bridgings of the safety devices are prohibited.



EMERGENCY-OFF key at the machine

## EMERGENCY-OFF key

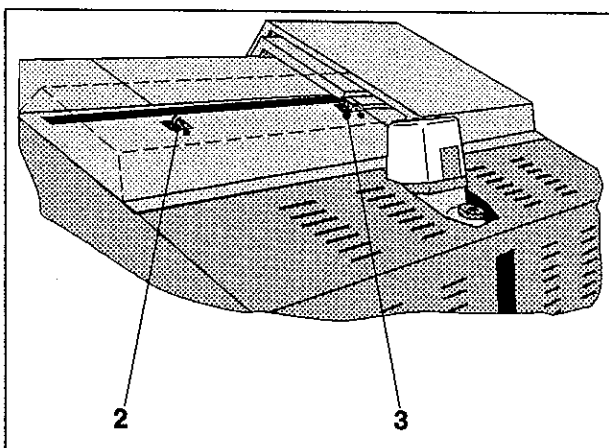
In case of any hazard the EMERGENCY-OFF key (1) is to be pressed immediately.

By pressing the key (1) the power supply to the main drive, the feed motors as well as the tool turret is interrupted immediately.

For unlocking the EMERGENCY-OFF key turn knob in clockwise direction.

### Note:

After pressing the EMERGENCY-OFF KEY the reference point must be reapproached.



Door limit switch

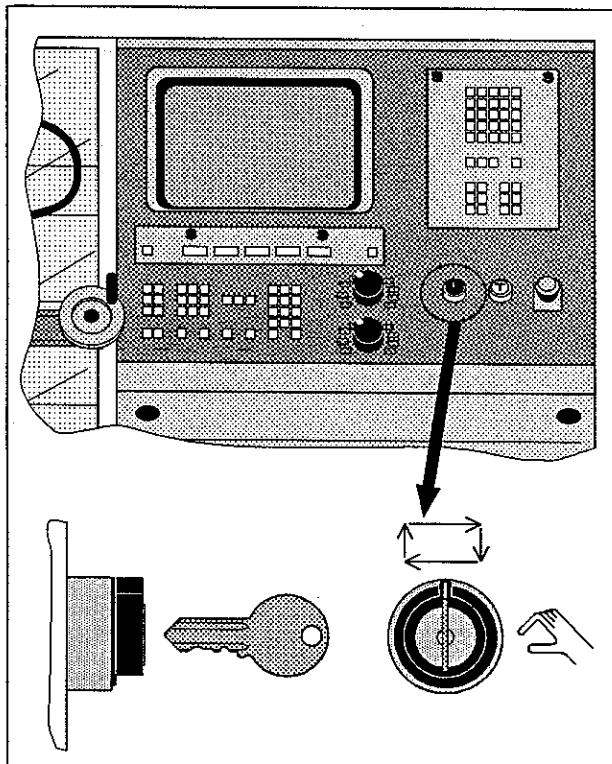
## Door limit switch/Door lock

The position of the chip guard door is controlled by two limit switches (2 and 3).

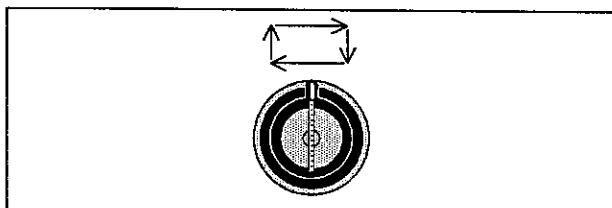
Due to the control a program start is not possible with open door.

Additionally, a door lock is built into the machine which permits opening of the chip guard door only during standstill of the main drive.

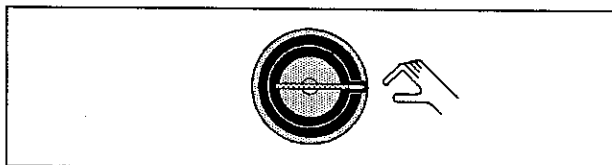
If the chip guard door is opened during traversing the tool turret or swivelling the tool turret disk, the movement is stopped immediately and an alarm message appears on the screen.



*Position of the key switch*



*Key switch in position "automatic operation"*



*Key switch in position "setting operation"*

## Key switch

The key switch can be switched in 2 different positions:

### Position "automatic"

The switch position "automatic" is the working position of the machine in which all safety devices are active.

#### Note:

Manual traversing of the slide is only possible with closed chip guard door as soon as the reference point has been approached, and the key switch is in position "setting operation".

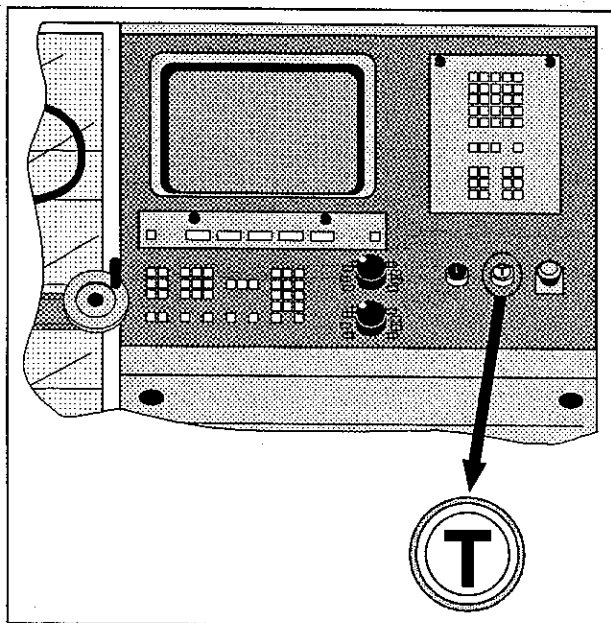
### Position "setting operation"

In this switch position it is possible to carry out various operations at the machine with open chip guard door (see consent key).

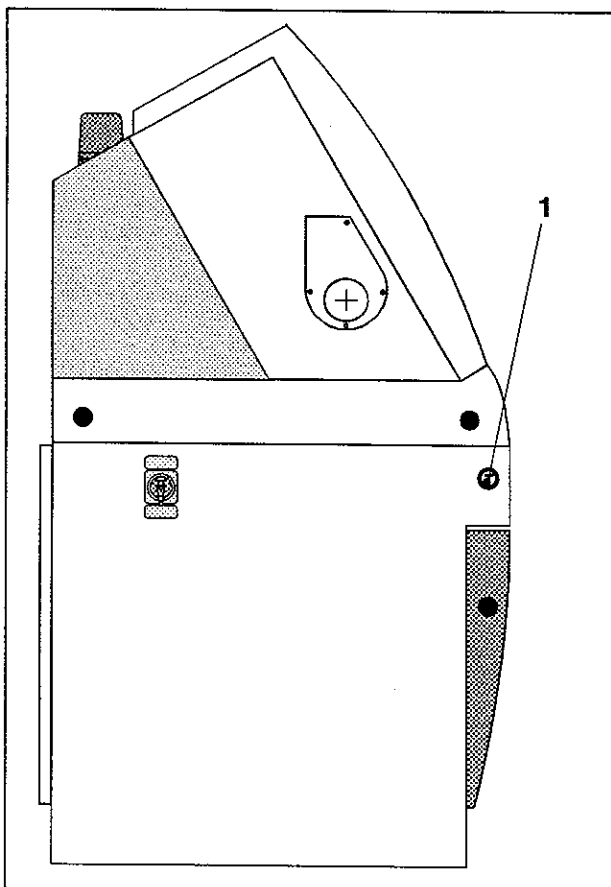
#### Danger:



- With switch position "setting operation" there is an increased danger of hazards.
- During setting operation keep the chip guard door closed as far as the working procedure permits.
- After termination of the setting work immediately switch the key switch to position "automatic" and take off the key.
- The key may be handed only to those persons who know about the hazards and take adequate precaution measures.



*Position of the consent key at the operating panel*



*Second consent key at the machine*

## Consent key

The function of the consent key depends on the position of the key switch.

In addition to the consent key at the operating panel there is also a second consent key (1) laterally at the machine.

The second consent key (1) has the same functions as the consent key at the operating panel, it only serves for easier accessibility in setting operation (tool measuring).

### Note:

If the consent key is pressed for more than 40 s the function of this key is interrupted, the consent key must be released and pressed again.

## Functions of the consent key

### Key switch in "automatic" position

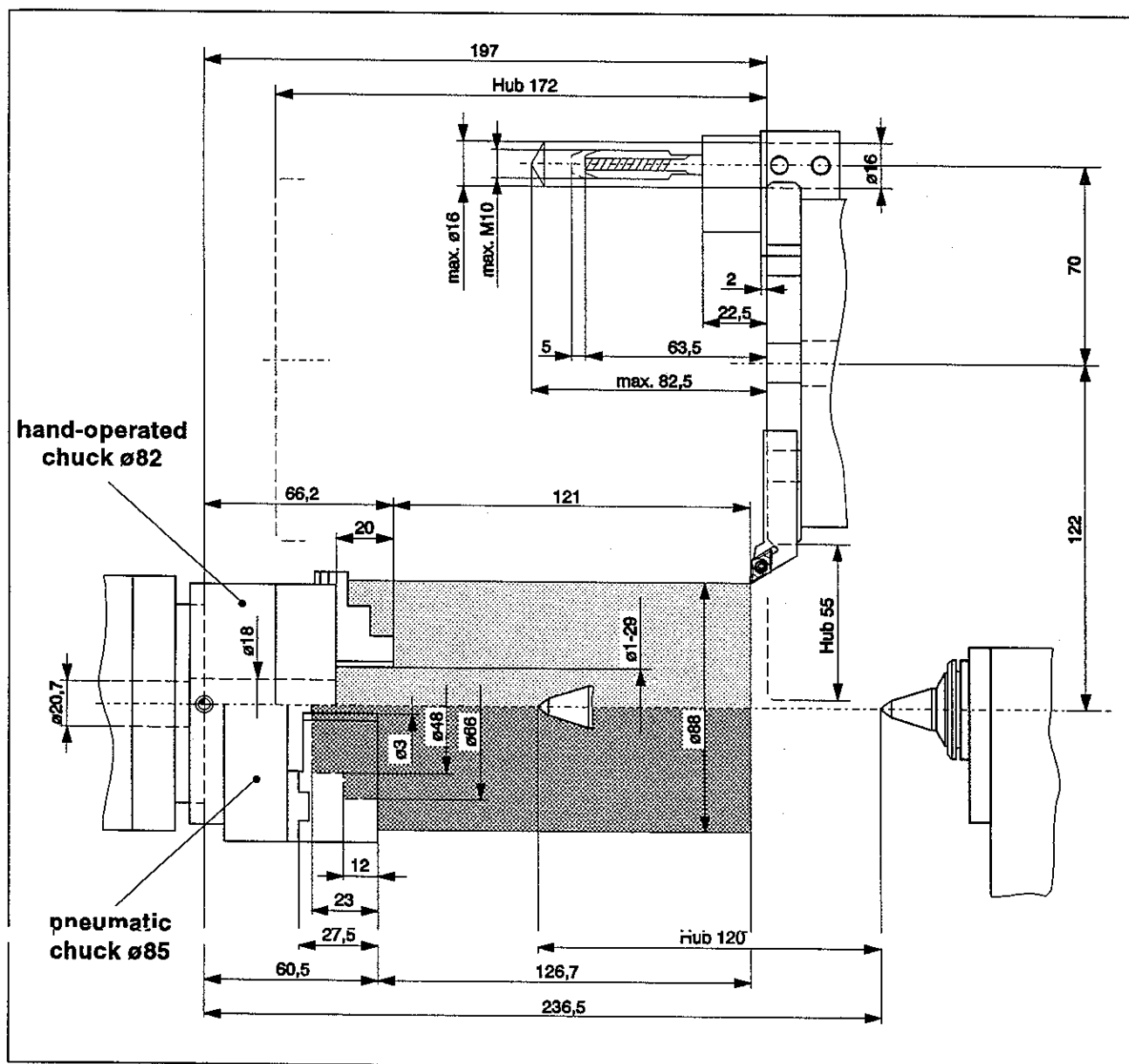
- Releasing the interlocking bolt of the chip guard door with main spindle out of operation. The machine door is to be opened.
- Traversing of slides in the JOG-manual, with non activated reference point and opened machine door.

### Key switch in "setting" position

- Releasing the interlocking bolt of the chip guard door with main spindle out of operation. The machine door is to be opened.
- Manual traversing of the slide with open chip guard door.
- Swivelling the tool turret with open chip guard door (swivelling by one position respectively)
- Traversing the pneumatic tailstock quill with open machine door.



## Working area of the machine



Working area of the machine



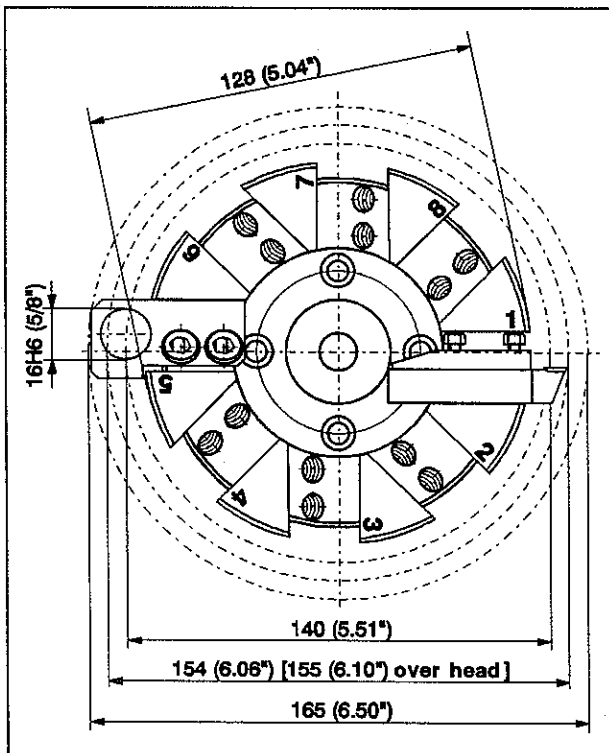
The light-screened space indicates the working area for the machine with mounted three-jaw chuck  $\varnothing 82$ .

The chuck is obtainable as an accessory.



The dark-screened space indicates the working area of the machine with mounted automatization (pneumatic chuck).

The automatization is an option and is mounted in the plant.



Dimensions of the tool turret disk  
(dimensions in brackets = inch system)

## Tool turret

The tool turret is used for the support of all external and internal machining tools. It has a direction logic, i.e. the tool turret disk always turns into the same direction during swivelling.

Number of tool supports ..... 8  
(external or internal machining tools)

Shaft height of external tools ..... 12 mm

Shaft width of external tools ..... 12 mm

Cutting circle for external tools ..... 154 mm

Tools clamped over head ..... 155 mm

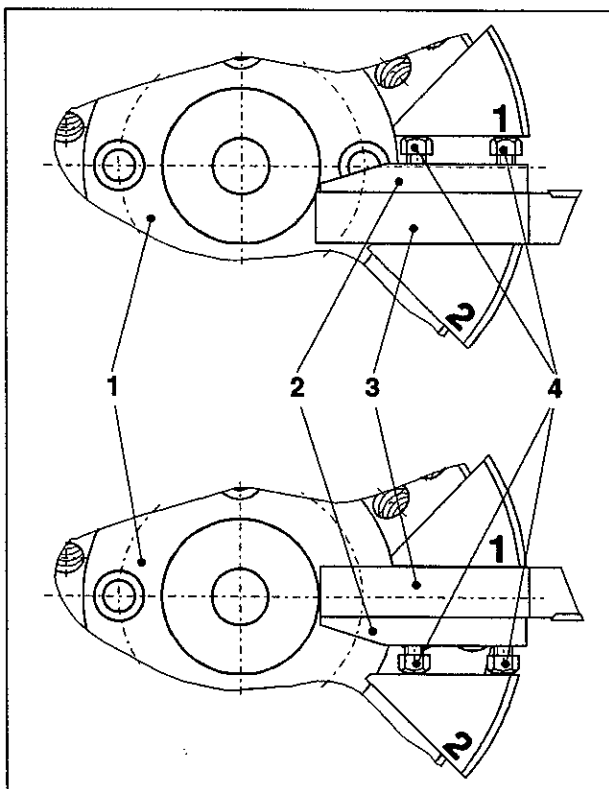
Bore for internal tools .....  $\varnothing 16H6$

## Clamping the tool in the tool turret



### Danger:

- The tools may be clamped only during machine standstill.
- The tools must be clamped tightly and safely.



Clamping external machining tools

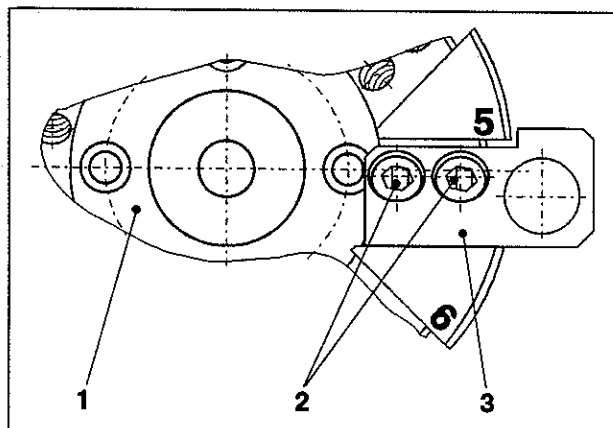
## External machining tools

- Insert tool (3) with clamping element (2) until stop into the support groove of the tool turret disk (1).
- Adjust tool to centre height by enclosing shim platelets.
- Clamp tool with both clamping screws (4).

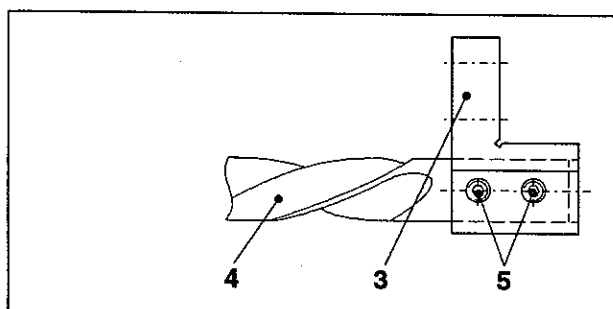
### Note:

- Mind the modified cutting circle diameter with tools which are clamped over head.

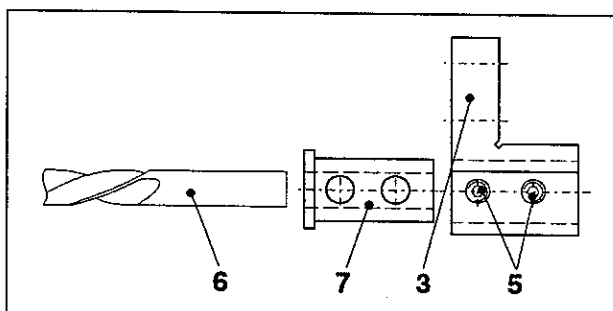




Clamping the toolholder



Direct clamping in the toolholder



Clamping with reducing bushes

### Internal machining tools

The internal machining tools are clamped into the toolholders provided for this end.

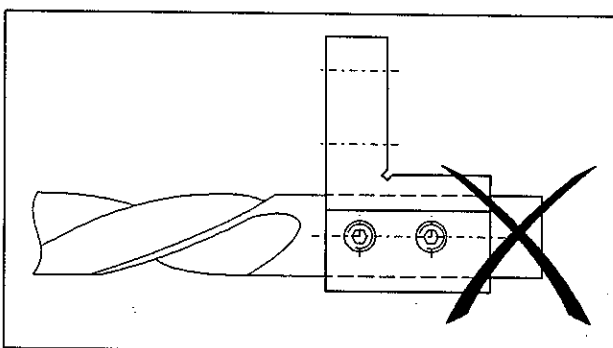
- Insert toolholder (3) until stop into support groove of the tool turret disk (1).
- Fix toolholder (3) with both hexagon socket screws SW5 (2).

- Insert tools with a shaft diameter of 16 mm (4) directly into the support bore at the toolholder (3) and clamp with both set screws M6, SW3 (5).

- Tools with smaller shaft diameter (6) are clamped with adequate reducing bushes (7). Take care that the set screws (5) pass through the bores in the reducing bush (7) so that the tool (6) is clamped directly.

#### Note:

A set of reducing bushes can be ordered under order no. 270 270.

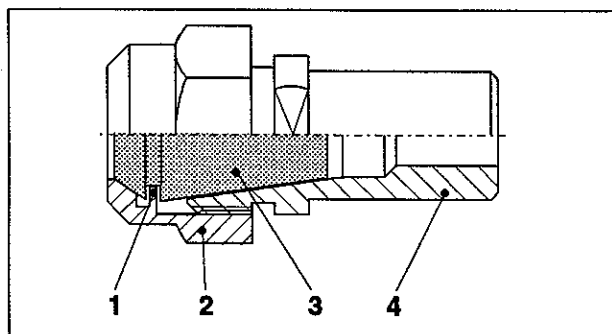


Wrong clamping of internal tools

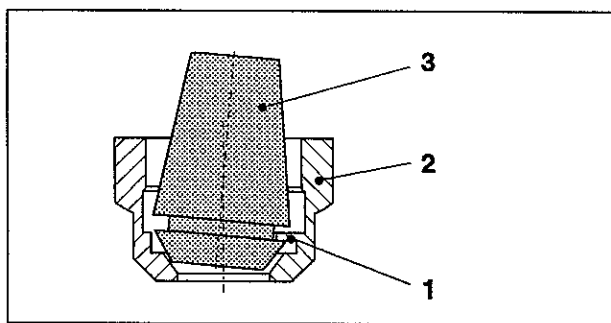
#### Caution:

At the rear side the tools must not project over the bore, otherwise they would stop the swivel movement of the tool turret.





Collet facility ESX 16 with collet



Mounting the collets

## Collet facility ESX 16 (Accessory)

Order-No. .... 270 760

Set of collets (1–10)/Order-No. .... 152 700

The collet device permits workpieces with cylindrical shafts to be clamped.

### Mounting the collets

- Undo clamping nut (2) size 24.
- Insert collet (3) at an angle into the clamping nut so that the eccentric ring (1) engages the groove of the collet.
- Screw clamping nut (2) with collet (3) onto collet holder (4) - do not tighten.
- Insert tool.
- Tighten clamping nut (2).

### Dismantling the collet

- Undo clamping nut (2).  
While the nut is being unscrewed, the collet is pushed off by the eccentric ring (1) in the nut.

### Clamping range

Nominal diameter of the collet	Clamping range		Order-No.
	[mm]	[inch]	
1,0	0,5-1,0	1/64-1/32	152 710
1,5	1,0-1,5	3/64	152 715
2,0	1,5-2,0	1/16-5/64	152 720
2,5	2,0-2,5	3/32	152 725
3,0	2,5-3,0	7/64	152 730
4,0	3,0-4,0	1/8-9/64-5/32	152 740
5,0	4,0-5,0	11/64-3/16	152 750
6,0	5,0-6,0	13/64-7/32-15/64	152 760
7,0	6,0-7,0	1/4-17/64	152 770
8,0	7,0-8,0	9/32-19/64-5/16	152 780
9,0	8,0-9,0	21/64-11/32	152 790
10,0	9,0-10,0	23/64-3/8-25/64	152 800
Set of collets (ø1,0 - ø10)			152 700

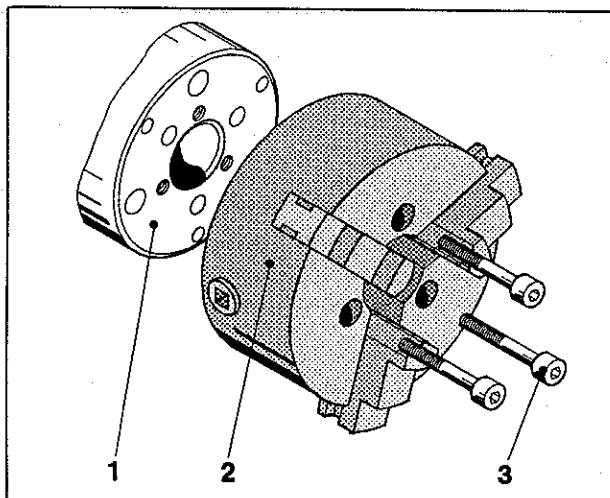
### Care



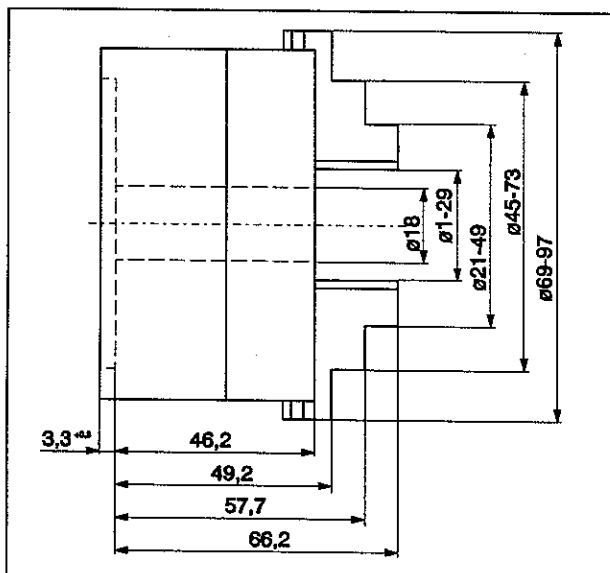
#### Caution:

Chips and dirt can damage the clamping taper and cone and can make unuseable collets and/or collet holder.

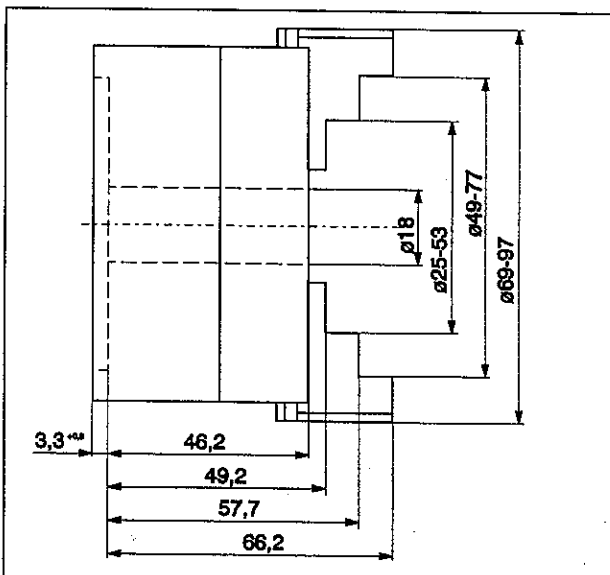
Before and after use clean and oil collets and collet holders.



Mounting the chuck



Clamping range - externally graduated jaws



Clamping range - internally graduated jaws

## Three-jaw chuck $\varnothing 82$ mm

Order-no. .... V4W 186R

### Note:

Also mind the instructions enclosed with the chuck.

## Mounting the chuck



### Danger:

- The chuck may be mounted only during machine standstill.
- For chuck mounting only screws M5x40 according to DIN 912 may be used. With longer screws the chuck might not fit tightly on the spindle nose, in case of too short screws these might tear out.

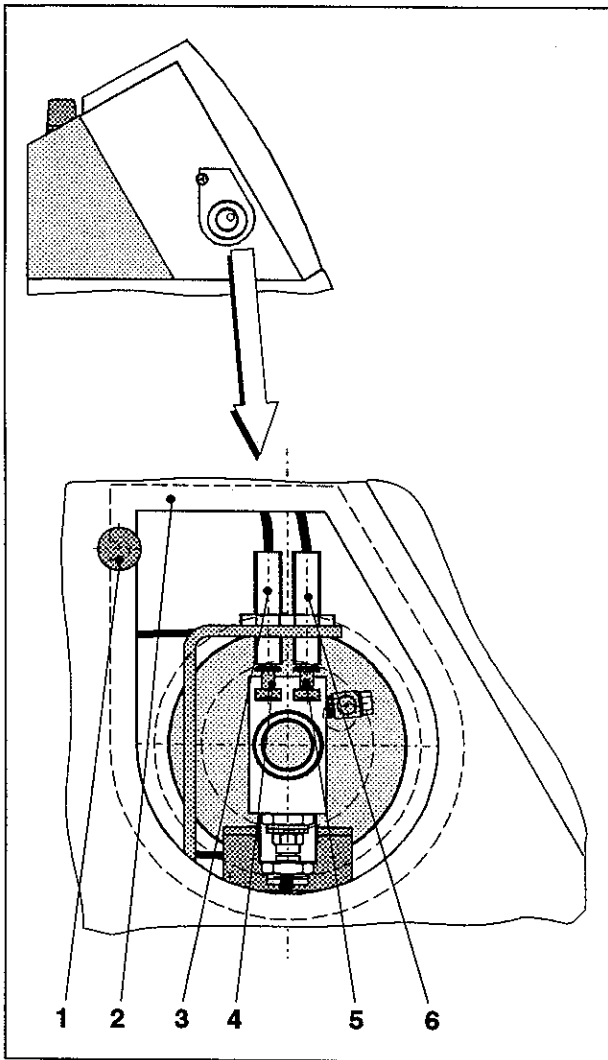
- Spindle nose (1) and centering flange (2) have to be free from dirt.
- Screw the chuck (2) with the three cheese head screws M5x40, SW4 (3) onto the spindle nose and tighten the screws.

## Clamping ranges



### Danger:

- The maximum admissible clamping ranges must never be exceeded. Exceeding them may lead to jaw fracture.
- Jaw projection must never be more than 12 mm since otherwise there is risk of jaw fracture.
- After clamping the workpieces take off the chuck key.



*Adjusting the final position proximity detectors*

#### Adjustment procedure for collet

- Clamp workpiece in the clamping device.
- Loosen knurled nut (1) and swivel cover (2) downward.
- Loosen indexing bolt (5) by opening the set screw with an Allan key SW2.5 and move it until the LED at the proximity detector (6) lights up. The message "7051 Collet - No part clamped!" is displayed on the screen of the control.
- Push indexing bolt (5) approx. 1 mm in the direction of the cover (2) and clamp it in this position, the message on the screen is cancelled.
- Open collet.
- Adjust indexing bolt (4) in such a way that the LED at the proximity detector (3) lights up. The message "7050 Collet open!" is displayed on the screen.
- Swivel cover (2) upward again and clamp it with the knurled nut (1).

## Pneumatic clamping device (option)

Upon order the pneumatic chuck is mounted at the manufacturer. It consists of a clamping cylinder without bore, a KFD power chuck and a blow-out device.

### Clamping cylinder without bore



#### Caution:

Adjustment work at the clamping cylinder without bore except for adjusting the final position detector may only be carried out by trained service personnel.

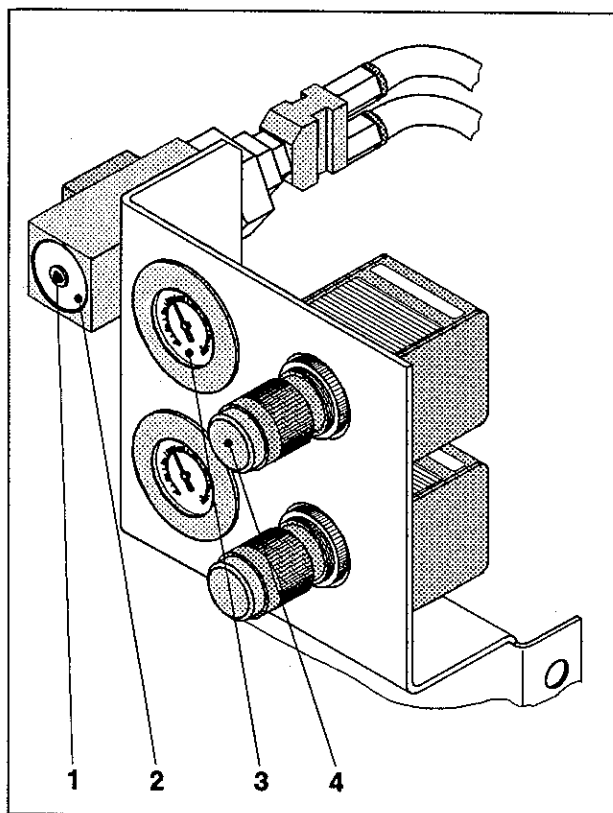
### Adjusting the final pos. proximity detectors

To enable the control to monitor the clamping device condition it is necessary to adjust correctly the final pos. proximity detectors in accordance with the clamping device and the workpiece. It depends on the position of the tensioning bar (chuck/collet) which proximity detector is adjusted for which clamping device condition.

Clamping device	Clamping device condition	Position of tensioning bar	respective proximity detector
Chuck	open	front	6
	closed	rear	3
Collet	open	rear	3
	closed	front	6

### Adjustment procedure for chuck

- Clamp workpiece in the clamping device.
- Loosen knurled nut (1) and swivel cover (2) downward.
- Loosen indexing bolt (4) by opening the set screw with an Allan key SW2.5 and move it until the LED at the proximity detector (3) lights up. The message "7049 Chuck-no part clamped!" is displayed on the screen of the control.
- Push indexing bolt (4) approx. 1 mm in the direction of the chuck and clamp it in this position, the message on the screen is cancelled.
- Open chuck.
- Adjust indexing bolt (5) in such a way that the LED at the proximity detector (6) lights up. The message "7048 chuck open!" is displayed on the screen.
- Swivel cover (2) upward again and clamp with the knurled nut (1).



Setting the clamping device pressure

### Setting the clamping device pressure

The clamping force of the chuck can be regulated by changing the air pressure.

Additionally a press switch is mounted which controls the pressure set at the manometer.

If the set pressure is not achieved an alarm message is displayed on the screen.

- Clamp sample workpiece.
- Set clamping device pressure –0.5 bar.  
Set a pressure which lies about 0.5 bar below the desired clamping device pressure by means of the turning knob (4).  
The set pressure can be read at the manometer (3).
- Loosen fixation screw (2) at the press switch.
- Turn setting screw (1) at the press switch until the message "6048 Chuck not ready" or "6049 Collet not ready" is displayed on the screen.

Increase pressure...turn in clockwise direction  
Reduce pressure ...turn in counter-clockw. dir.

- Tighten fixation screw (2) moderately.
- Set desired clamping device pressure at the turning knob (4) of the pressure control unit.
- If the workpiece is clamped again no alarm message must be displayed on the screen.

### Standard values for the clamping pressure

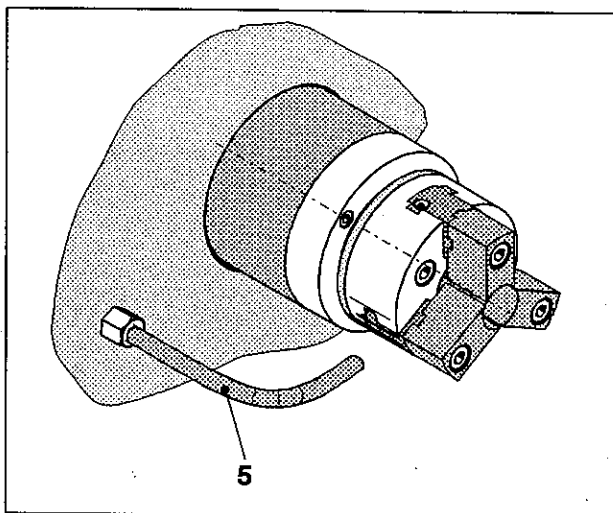
Minimum pressure ..... 2 bar  
Maximum pressure ..... 6 bar

Iron, steel ..... approx. 5.5 bar  
Nonferrous metals (Al, Mg) ..... approx. 3-4 bar  
Soft synthetic materials, bushes ... approx. 2 bar

### Blow-out device

The blow-out device serves for blowing out the clamping device during tool change.

To enable an efficient blow-out the copper tube (5) can be adequately adjusted by bending it with caution.



Blow-out device with pneumatic chuck

## Power operated three-jaw chuck KFD 85

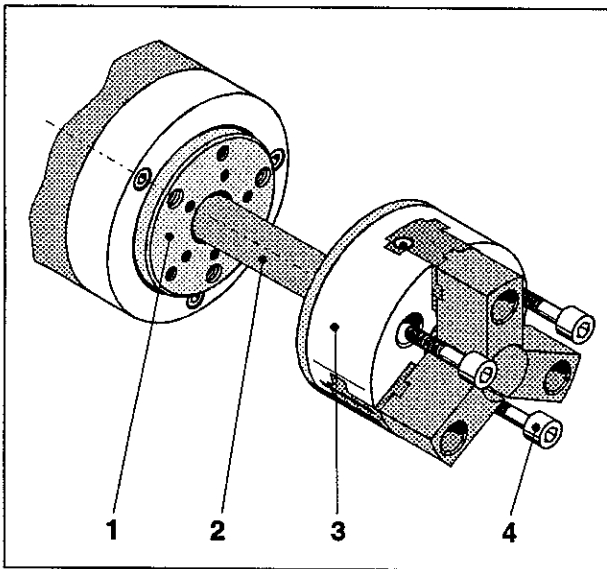
### Note:

Also mind the instructions enclosed with the chuck.

## Mounting the chuck

### Danger:

For mounting the chuck only screws M8x30 according to DIN 912, 8.8 may be used. With longer screws the chuck might not fit tightly on the spindle nose, in case of too short screws these might tear out.



Mounting the chuck on the main spindle

- Adjust clamping cylinder without bore to opened clamping device condition for chuck.
- Insert tensing tube (2) into the bore of the main spindle (1) and fasten it with screws in the clamping cylinder without bore.
- Turn chuck (3) until stop into the tensing tube (2).

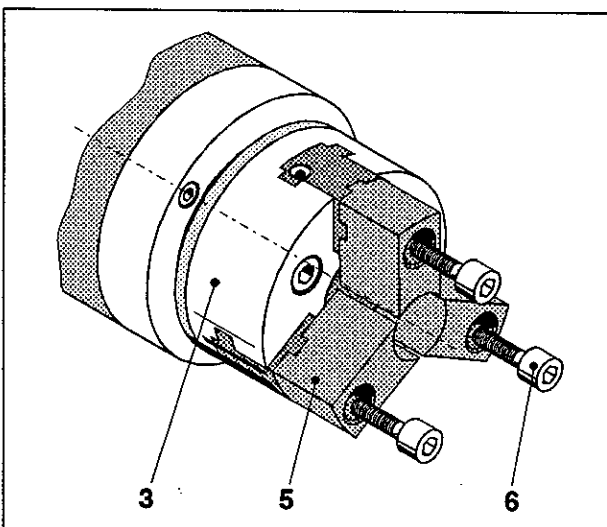
The chuck lies tightly on the centering flange of the main spindle (1).

- Turn out chuck again until it can be fastened at the main spindle (1) by means of the cheese head screws M8 x 30, DIN 912 8.8 (4).
- Tighten cheese head screws by means of an Allan key SW6.

## Mounting the top jaws

A set of turned out jaws ( $\varnothing 30$  mm) and a set of pointed jaws for hardware is supplied with each chuck.

- The 3 top jaws (5) are mounted at the chuck (3) with one cheese head screw M8 x 20 DIN 912, 8.8 (6) each.



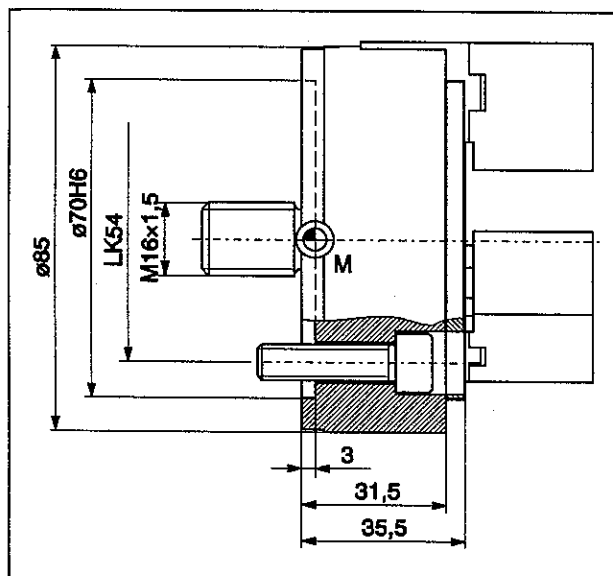
Mounting the top jaws on the chuck

### Danger:

- The top jaws may only be mounted during machine standstill.
- Prior to a machining process make sure that the top jaws are mounted tightly and safely.
- The top jaws may only be mounted with the screws M8 x 20 DIN 912, 8.8.



## Dimensions of the chuck Clamping ranges



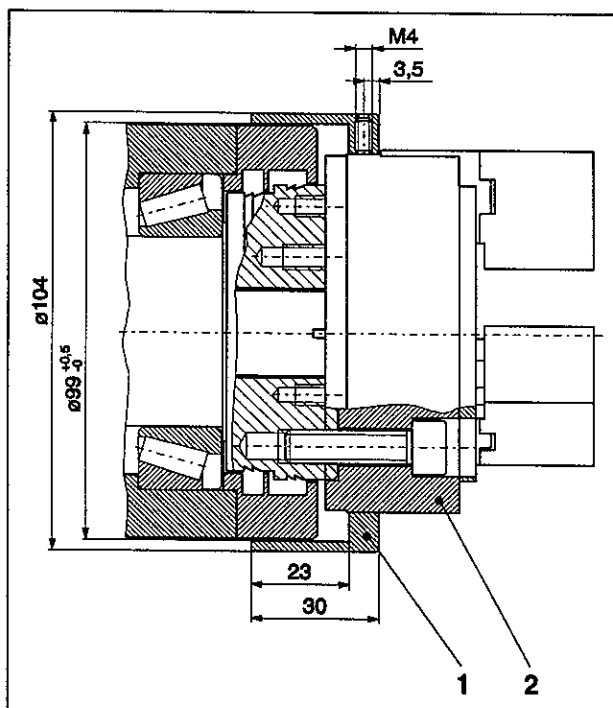
Dimensions of the chuck

According to the workpiece diameter the top jaws must be adequately turned-out on the machine.

A deviation from the turned-out diameter of +3mm is admissible.

### Note:

Number the top jaws so that the same concentricity is received when remounting them.



Union sleeve for work with synthetic materials

## Working with synthetic materials

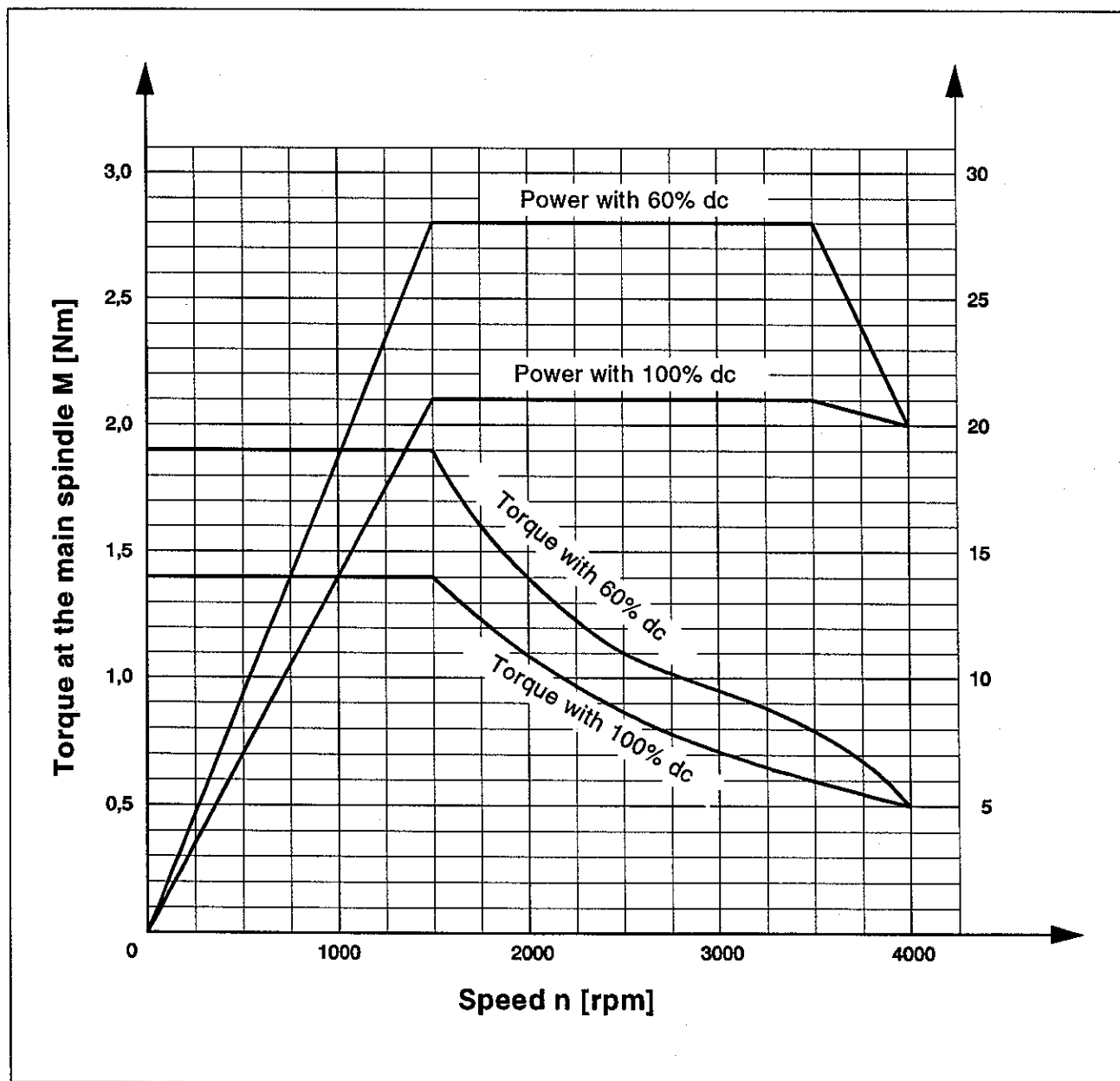
Some kinds of synthetic materials such as nylon form ropy thready chips.

These chips can penetrate between chuck and main spindle into the labyrinths of the main spindle bearing and destroy them.

Thus, when machining such synthetic materials you should mount a self-made union sleeve (1) at the chuck (2).

## Technological data

### Speed-torque characteristic line of the main drive

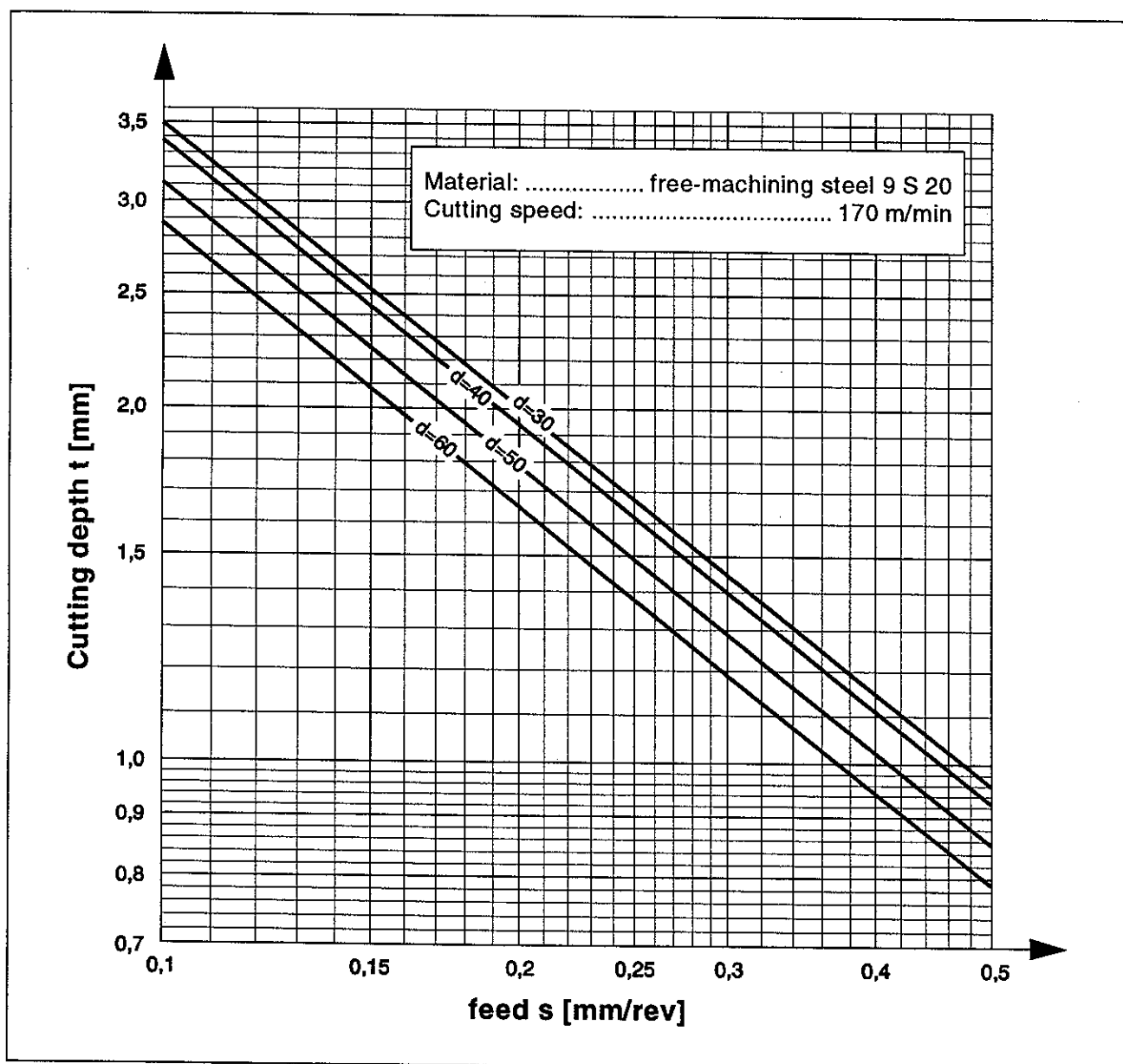


Torque at the main spindle as a function of speed

## Maximum machining values

**Note:**

The values indicated in the diagram are maximum values and should not be achieved during machining.

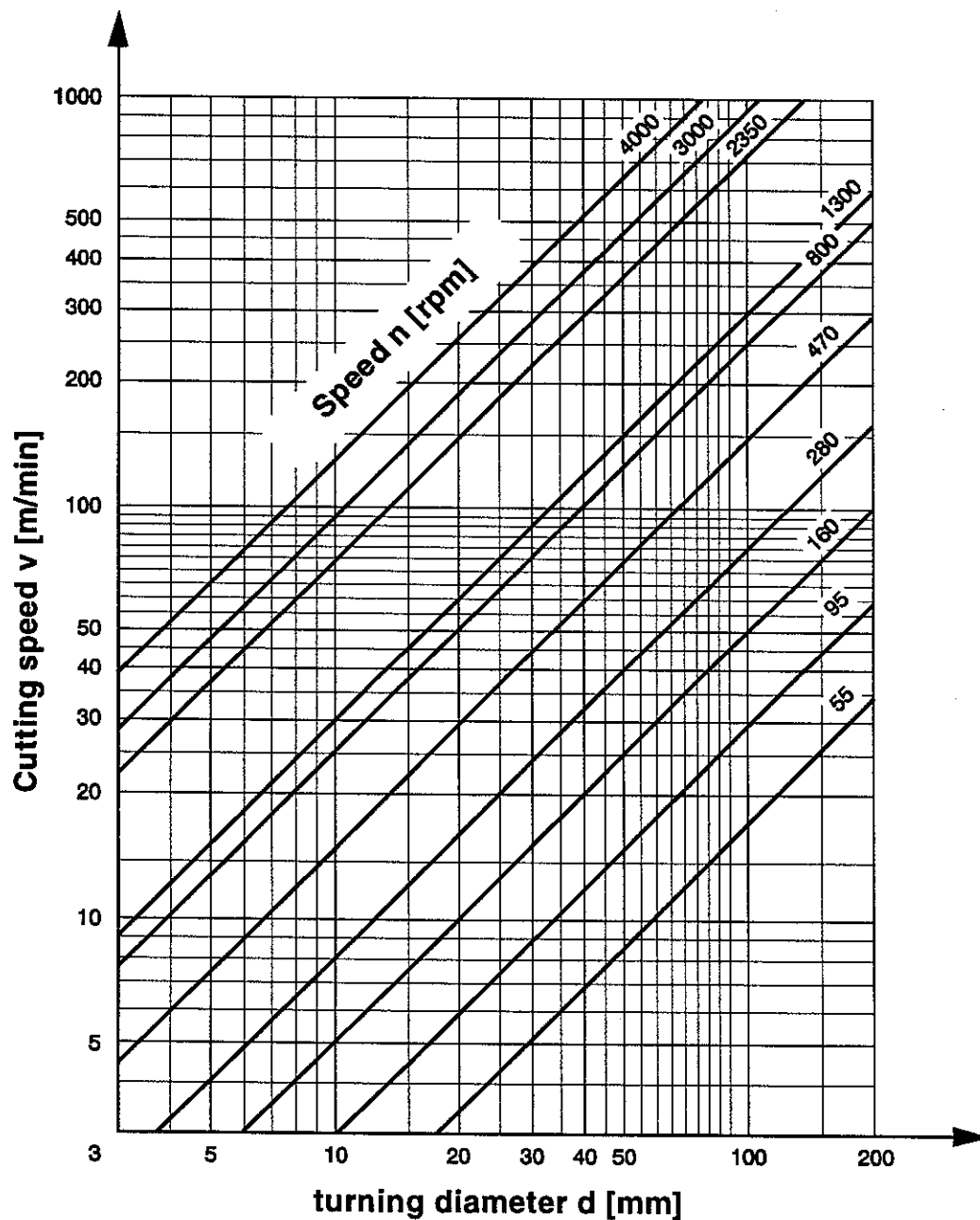


Maximum machining values

## Finding the speed

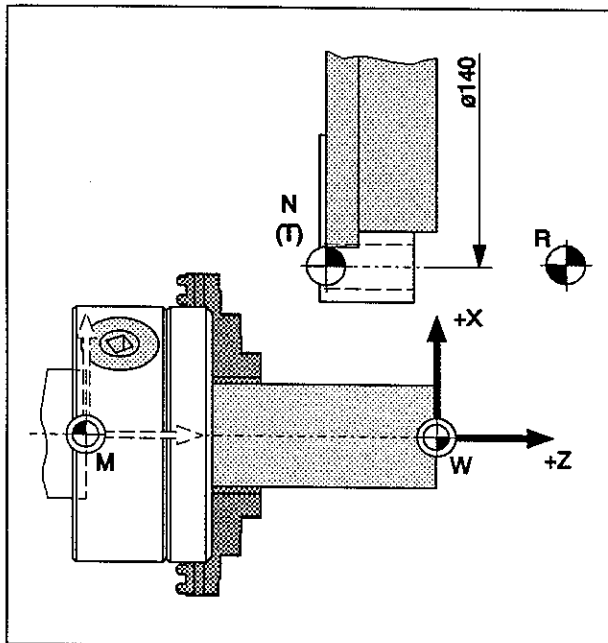
$$n = \frac{1000 \cdot v}{d \cdot \pi}$$

n [rpm] ..... speed  
 v [m/min] ..... cutting speed  
 d [mm] ..... turning diameter



Finding the speed  $n$  with selected cutting speed  $v$  and turning diameter  $d$

## Points at the machine - coordinate system



Points at the machine

### Machine zero point M ⊕

The machine zero point M lies in the rotary axis at the front of the spindle nose.

The machine zero point is the origin of the coordinate system.

### Reference point R ⊕

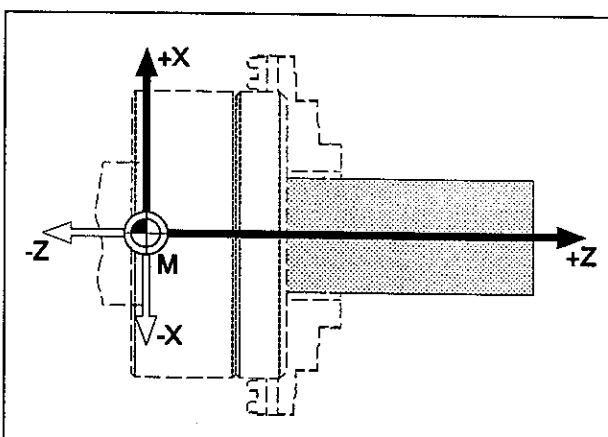
The reference point R is a fixed point on the machine. It serves for the calibration of the measuring system.

The reference point must be approached after each switch-on and after each unlocking the EMERGENCY-OFF key to communicate the exact distance between the points M and N (T) to the control.

### Workpiece zero point W ⊕

The workpiece zero point W can be freely programmed by the user.

By programming a workpiece zero point the origin of the coordinate system is displaced from the machine zero point M into the workpiece zero point W.



Coordinate system

### Toolholding-fixture reference point N (T) ⊕

The toolholding-fixture reference point N or T is a fixed point. It serves as reference point for measuring the tools.

The toolholding-fixture reference point lies on the tool turret disk.

#### X-direction ("diameter direction"):

With mounted toolholder for internal machining tools exactly in the axis of the support bore ( $\varnothing 140$  mm).

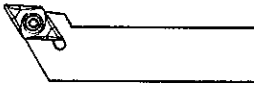


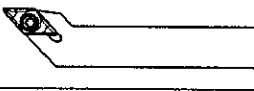


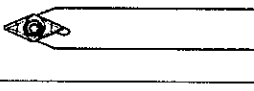


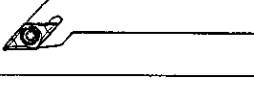


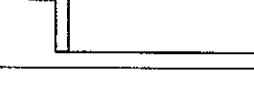

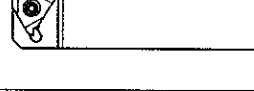


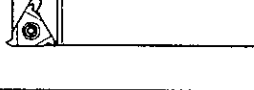


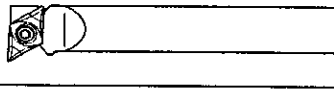


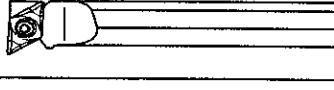


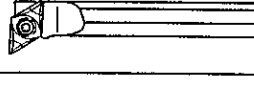


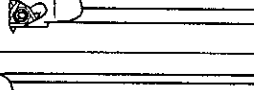

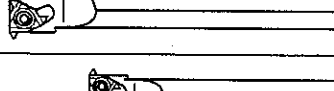

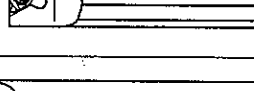



#### Z-direction ("longitudinal direction of rotation"):

At the front side of the tool turret disk.




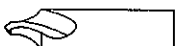


## Tools

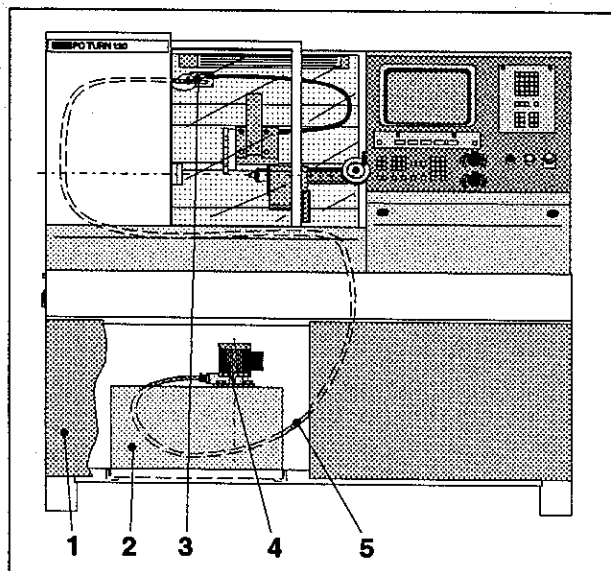
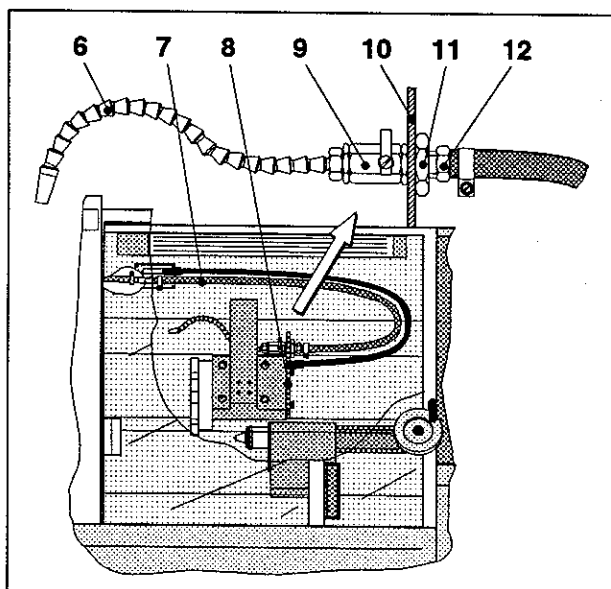
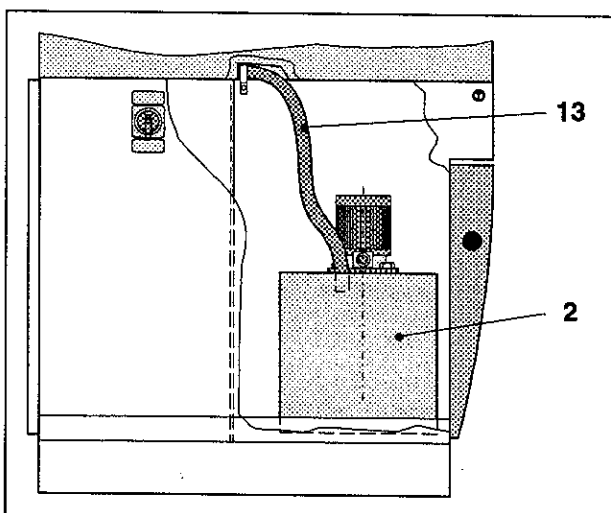
All listed tools are to be ordered as accessory by EMCO with the specified order-no.

### Turning tools

Tool		suitable HM-indexable inserts	
Order-no.	Description	Order-no.	Description
 271 040	Roughing tool-left	 271 045	for steel
		 271 046	for aluminium
 271 050	Side tool-left	 271 055	for steel
		 271 056	for aluminium
 271 060	Turning-tool-neutral	 271 055	for steel
		 271 056	for aluminium
 271 070	Side tool-right	 271 055	for steel
		 271 056	for aluminium
 271 080	Cutting-off tool	 271 085	
 271 100	External thread tool-left	 271 105	or pitches 0,5-1,5mm, 60°
		 271 106	or pitches 1,75-3,0mm, 60°
 271 110	External thread tool-right	 271 115	or pitches 0,5-1,5mm, 60°
		 271 116	or pitches 1,75-3,0mm, 60°
 271 120	Roughing boring-bar ø16×100mm	 271 045	for steel
		 271 046	for aluminium
 271 130	Boring-bar ø16×100mm	 271 055	for steel
		 271 056	for aluminium
 271 140	Boring-bar ø10×60mm	 271 055	for steel
		 271 056	for aluminium
 260 627	Internal thread tool-right ø10×60mm	 260 626	for pitches 0,5-1,5mm, 60°
 271 180	Internal thread tool-left ø16×100mm	 271 185	for pitches 1,75-3,0mm, 60°
 271 170	Internal thread tool-right ø10×60mm	 271 175	for pitches 0,5-1,5mm, 60°
 271 190	Internal thread tool-left ø16×100mm	 271 195	for pitches 1,75-3,0mm, 60°

## Boring tools

Description		Order no.
	Set of twist drills HSS ø1-13mm, 0,5mm increasing	781 280
	Set of twist drills HSS for root diameters ø2,5/3,3/4,2/5,0/6,8/8,5	271 230
	Jobber twist drills HSS acc. to DIN 1897 ø12, graduated	271 200
	ø16, graduated	271 210
	Center drill A8, DIN 333	271 220
	Set of taps HSS M3/4/5/6/8/10	781 300
	Taps HSS M3	781 301
	M4	781 302
	M5	781 303
	M6	781 304
	M8	781 305
	M10	781 306

Placing the 1<sup>st</sup> coolant hosePlacing the 2<sup>nd</sup> coolant hose

Placing the return flow hose

## Coolant device (accessory)

Order no. .... 270 600

Coolant capacity ..... ca. 35 l

Conv. capac. at nozzle ..... approx. 3.5 l/min

All bores, connections and chip sieves are already contained in the basic machine.

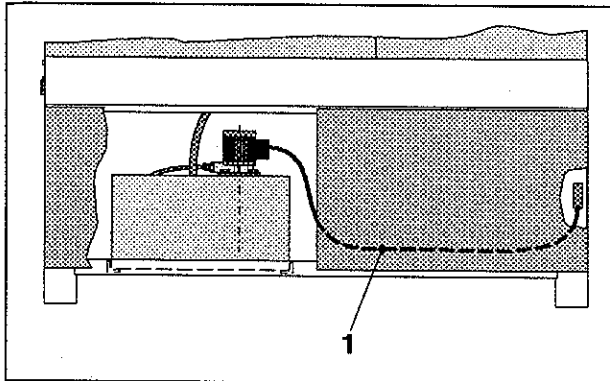
## Mounting the coolant device

### Danger:

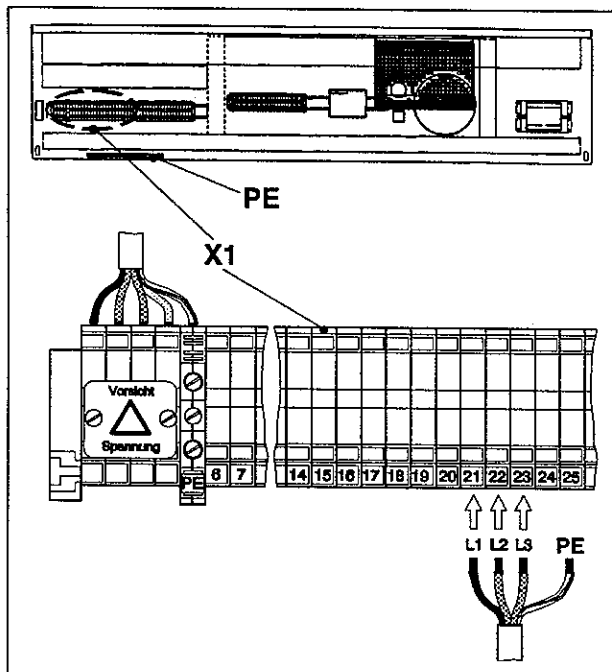
Mounting the coolant device may only be carried out during standstill of the machine.  
(Switch off machine main switch!).

- Unscrew rear panel of machine.
- Take off left front blind (1) by lifting it slightly.
- Mount coolant pump (4) by means of the 4 supplied hexagon head screws M6 x 20, the 4 serrated lock washers and hexagon nuts M6 (SW10) on the cover of the coolant tank (2).
- Mount holder (10) on the back side of the tool turret with supplied socket head screws M6x12 and serrated lock washers.
- Fix premounted unit consisting of plug valve (9), screwed socket (12), adapter and flexible hose (6) an holder (10) by means of the hexagon nut R1½" (11).
- Mount coolant hose  $\varnothing 10 \times 3700$  mm (5) at the pressure exit of the coolant pump (2) by means of a hose clip.
- Thread second end of the coolant hose (5) through the introduction hole, lay it along the laid cables and mount it with a hose clip on the leading sheet (3).
- The second coolant hose  $\varnothing 10 \times 720$  mm (7) has to be mounted with hose clips on the leading sheet (3) and the screwed socket (12).
- Mount return flow hose  $\varnothing 16 \times 1100$  mm (13) with hose clip on the outlet connection piece of the machine.
- Place coolant tank (2) on the rails in the machine base.
- Remount rear panel of machine.





Laying the cables into the electrical cabinet



Terminal strip for electrical connection in the electrical cabinet (view from above)

## Electrical connection



### Danger:

The electrical connection of the coolant device may only be carried out by an electrician expert. Prior to the connection the machine has to be separated from the mains supply.

- Lead cable (1) of the coolant pump along the cables already placed in the machine into the electrical cabinet.

- Connect cable cores at terminal strip X1 according to the picture on the opposite and the following list.

**Earthing on terminal strip PE.**

(For the connection see also electrical documentation)

### E-connection of the coolant pump

Core ends (pump)	1	2	3	yellow/green
Terminal strip (E-cabinet)	X1			PE
Supply terminal	21	22	23	PE

- Close electrical cabinet again, mount front blind.

## Switching on/switching off coolant device

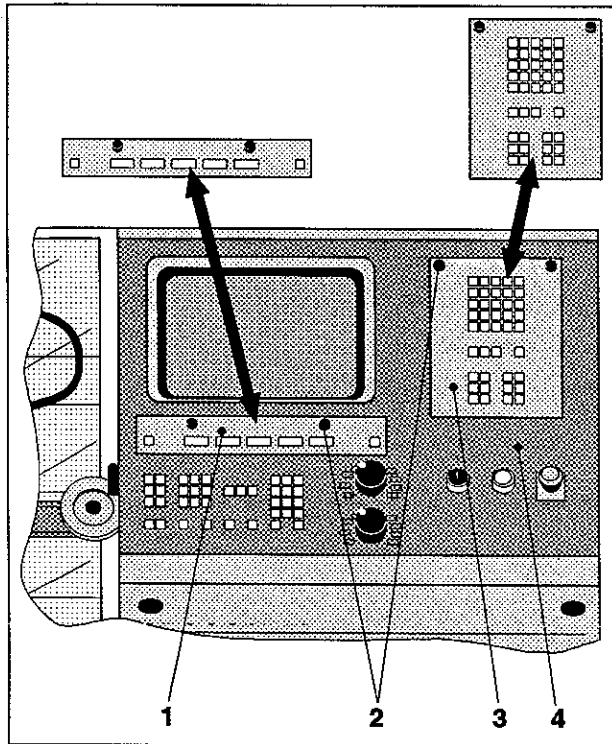
The coolant pump is switched on and off by pressing the coolant key at the operating panel of the machine (see also software description).

Additionally, there is a plug valve on the flexible coolant hose for regulating the flow quantity.



## Exchange of the control keyboard

By exchanging the control keyboard it is possible to operate the machine fast and without larger resetting effort with another control.



*Change of the key modules*

- Untwist knurled screws (2) at the key modules (1 and 3).
- Take off key modules (1 and 3).
- Insert new key modules from above into the recesses at the operating panel (4) and then swivel them to the operating panel.
- Fasten the newly inserted key modules with the 4 knurled screws (2) at the operating panel (4).
- Now install the corresponding software for your new control at your PC (see software description).

### Note:

Wrap up well the key modules not needed and keep them in a protected and clean place to avoid damage.

# C Maintenance of the machine

## Lubricating and oiling the machine



### Danger:

All lubrication and maintenance work may only be carried out during machine standstill.

### Survey

No.	Lubricating point	Lubricant	Interval [h]
1	Guideway longitudinal slide	Central oil lubrication	preset by manufacturer
2	Guideway cross slide	Central oil lubrication	
3	Longitudinal spindle (bearing)	Grease (lubrication nipple)	40
4	Cross spindle (bearing)	Grease (lubrication nipple)	40
5	Longitudinal spindle nut	Grease (lubrication nipple)	40
6	Cross spindle nut	Grease (lubrication nipple)	40
7	Hand tailstock	Slideway oil	8
8	Pneumatic maintenance unit (option)	Pneumatic oil	when needed
9	Pneumatic tailstock (option)	Slideway oil (lubric. nipple)	8
10	Clamping cylinder without bore (option)	Grease (lubrication nipple)	8
11	Power chuck for clamp. cylinder without bore (option)	Grease (lubrication nipple)	8

### Lubricant recommendations

Use	Designation according to DIN	Examples	
Central oil lubrication (Slide guides) Tailstock sleeve	Glideway oil CGLP DIN 51502 ISO VG68	BP CASTROL ESSO KLÜBER MOBIL	Maccurat 68 Magnaglide D68 Febis K68 Lamora Super Pollad 68 Vactra 2
Longitudinal and cross spindle, Spindle nuts, Clamping cylinder, Power operated chuck	Grease DIN 51804/T1 NLGI 2 DIN 51807-1	EMCO BP CASTROL KLÜBER MOBIL RÖHM	Gliding paste L2 Greace MS3 Altemp Q NB 50 Mobilgrease Special F 80
Compressed-air oiler	Pneumatic oil DIN 51524 ISO VG32	CASTROL MOBIL	Magnaglide D32 HLP 32

## Central lubrication

Longitudinal and cross slides are supplied with glideway oil via the central oil lubrication. The distribution elements (5) distribute the glideway oil evenly to the lubricating points. As soon as the slide has passed a travel path of 16 m the pump (2) is switched on automatically.

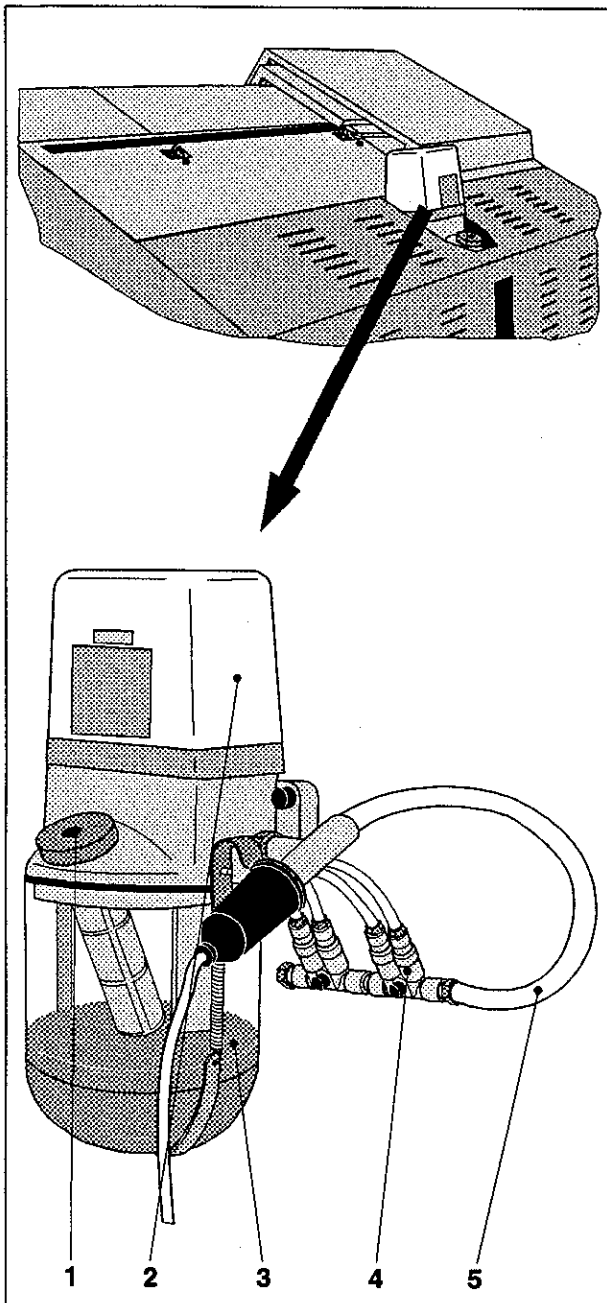
The central lubrication can also be activated manually by means of the "AUX ON" key. If the "AUX ON" is pressed for a major period the pump is switched on every 6 s (also see initial start-up in chapter "A Installation of the machine").

- Check the level of the lubricant tank (3) daily on the rear side of the machine. Take care that the oil level does not drop below the minimum level.
- For refilling unscrew filling screw (1).  
Tank capacity ..... 0.7 l

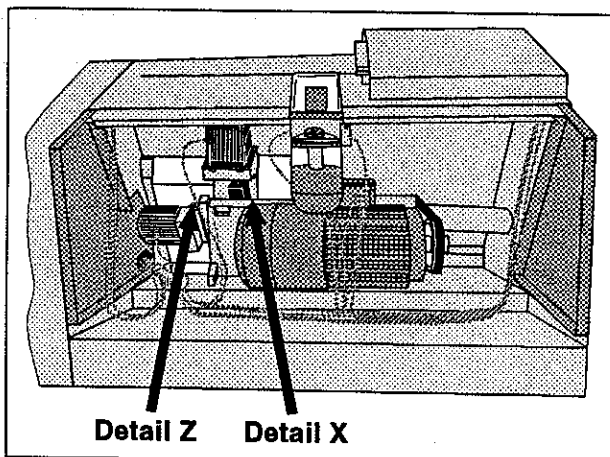
## Deaerating the lubricant lines

If a lubrication is started with too low oil level air enters the lubrication system. Air inclusions are visible in the lubricant lines behind the distribution elements (5).

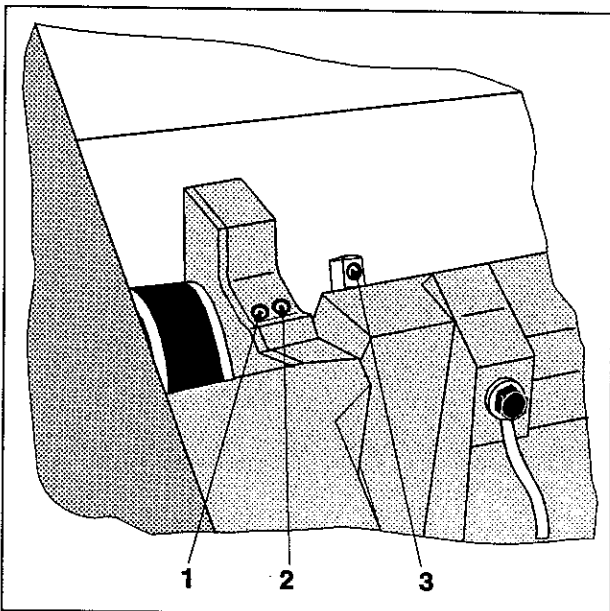
- Unscrew lubricant line (4) in front of the distribution elements.
- Carry out lubrication with "AUX ON" key until only oil is pressed out of the line (4).
- Retighten lubrication line (4).



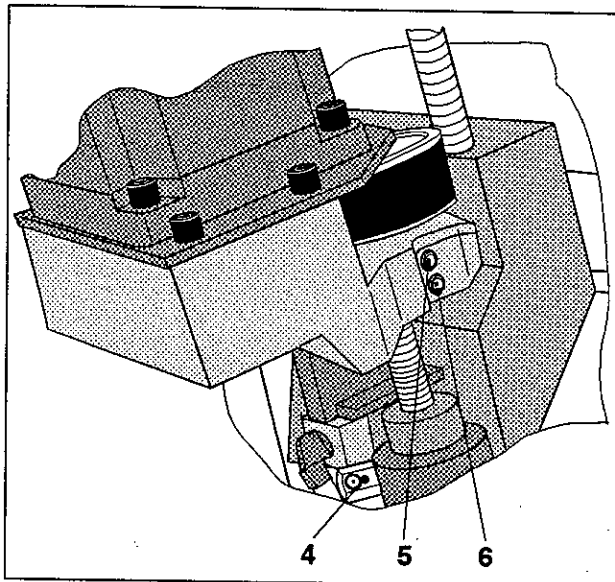
Central oil lubrication



Position of lubrication nipples for longitudinal and cross slide



Detail Z: lubricating points for longitudinal spindle



Detail X: lubricating points for cross spindle

## Longitudinal and cross spindle



### Danger:

The lubrication of the spindles and spindle nuts may only be carried out during machine standstill.

(Main switch in position "0")

Longitudinal and cross spindle are ball threaded spindles of high production quality. Therefore mind that the spindles and spindle nuts are regularly supplied with lubrication grease to avoid damage.

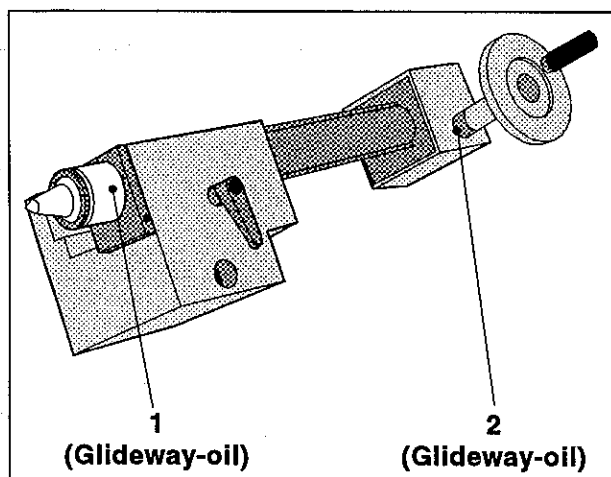
**Lubrication interval** ..... weekly

**Lubrication** ..... via lubrication nipples (1-6)

**Lubrication grease** ..... see lubricant

recommendations

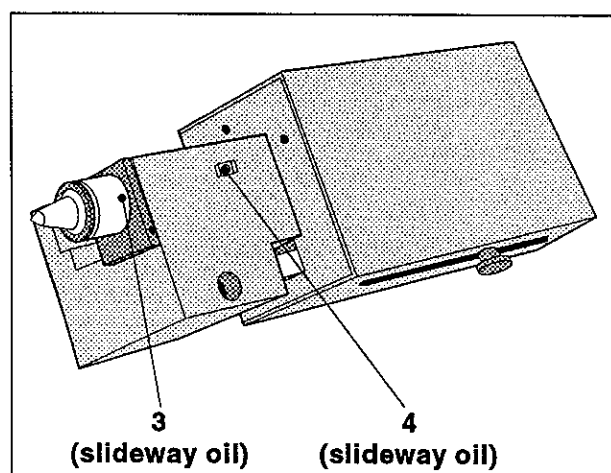
- Dismount rear cover of machine.
- Lubrication of spindles and nuts by means of the supplied grease gun at the lubrication nipples (1-6).
- Remount rear cover.



Maintenance of the tailstock

## Hand tailstock

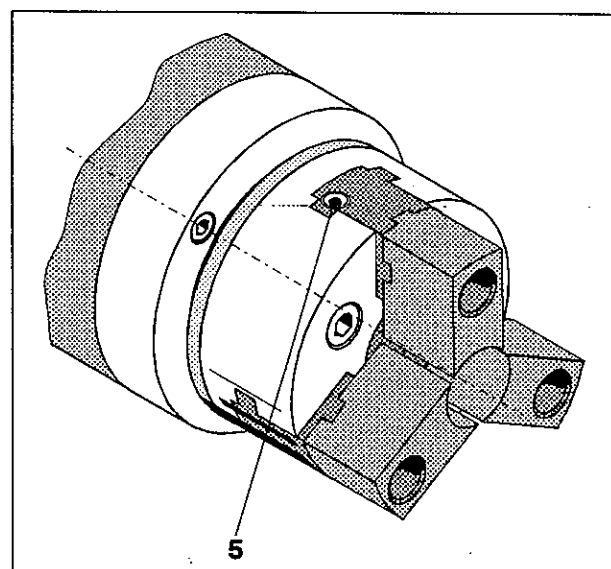
Oil tailstock sleeve (1), as well as bearing (2) of the tailstock handwheel slightly with glideway oil every 8 hours (daily).



Maintenance of the pneumatic tailstock

## Pneumatic tailstock

Oil the tailstock every 8 hours (daily) at the tailstock sleeve (3) and with the supplied oil press at the lubrication nipple (4).



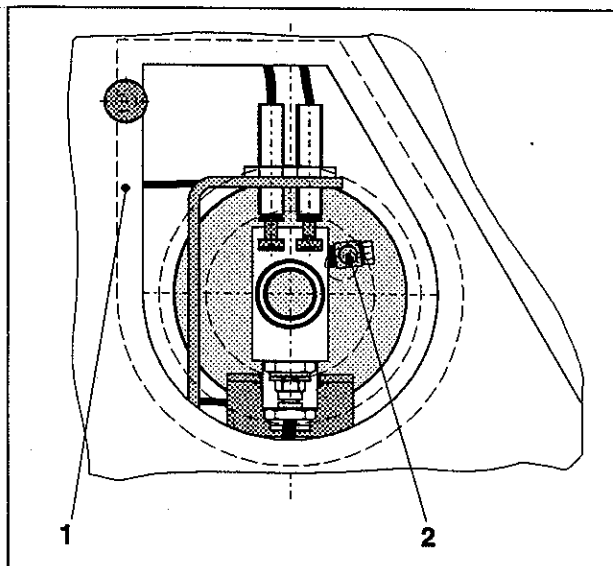
Lubrication nipple at the power chuck

## Pneumatic clamping device

### KFD power chuck

Clean the chuck daily from chips and other kinds of dirt to guarantee smooth running and thus safe clamping.

The guides of the top jaws have to be lubricated daily (every 8 hours) with grease at the 3 lubrication nipples (5).

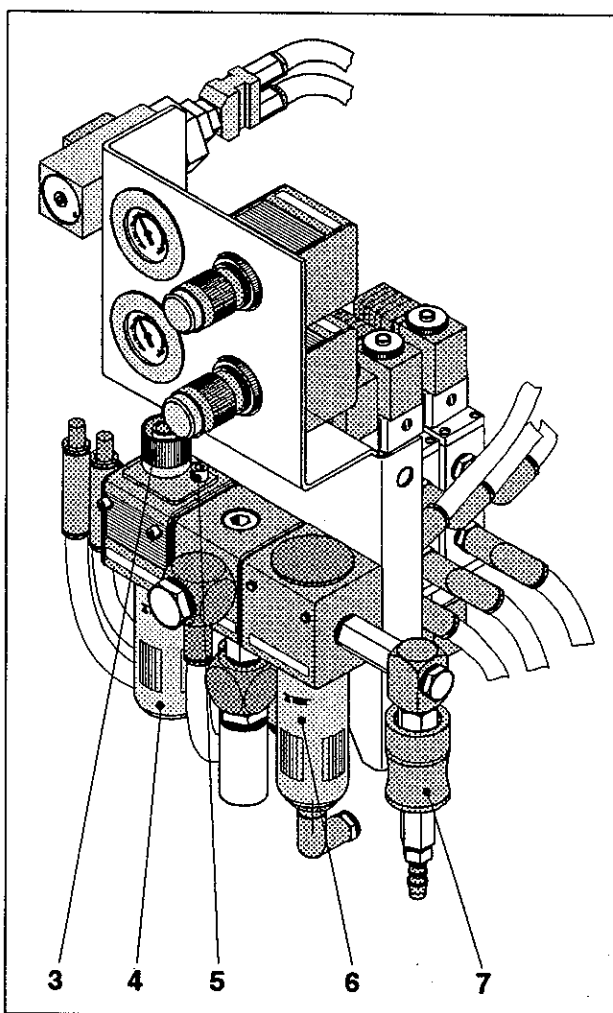


Lubrication nipple at the clamping cylinder without bore

## Clamping cylinder without bore

The bearing at the clamping cylinder without bore has to be lubricated every 8 hours (daily) with grease at the lubrication nipple (2).

The lubrication nipple is accessible by means of the supplied grease gun laterally at the machine through the bore on the cover (1).



Refilling the pneumatic oil

## Pneumatic unit (option)

The oil level of the compressed-air oiler has to be controlled daily at the tank (4) of the maintenance unit.

If necessary an adequate oil has to be refilled (see lubricant recommendations).

- Screw off filling screw (5) and fill in oil up to the "max" mark at the tank (4).
- The control knob (3) serves for setting the mixture ratio air/oil. It is preset by the manufacturer and should not be changed.

## Water separator

To keep the compressed air as free as possible from water a water separator is installed in the maintenance unit.

The separator tank (6) is automatically emptied after each closing and subsequent opening of the air supply at the manual slide (7).





# D Readjustment work



## Danger:

All readjustment work at the machine may only be carried out during machine standstill (take off mains plug).

## Special tool

For adjustment and readjustment work at the headstock and tailstock an **alignment pin pull-out device** is necessary.

This special tool must be made by yourself.

## Alignment pin pull-out device

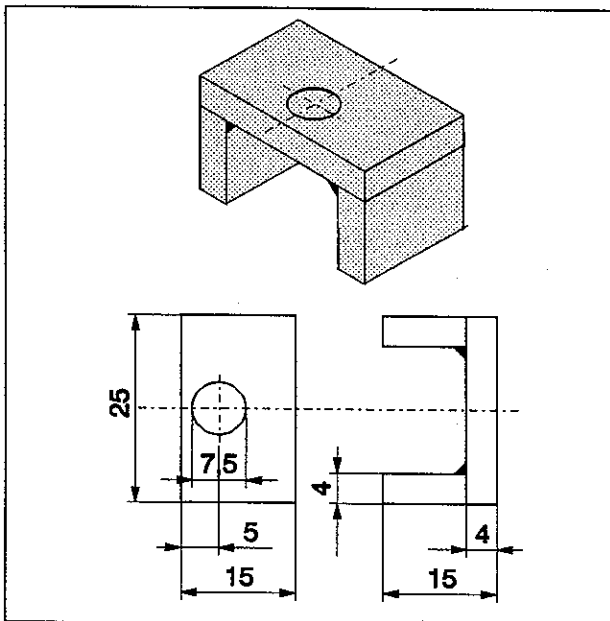
The alignment pin pull-out device is required for pulling out again pins driven in after adjustment (headstock and tailstock).

## Pulling out the pin

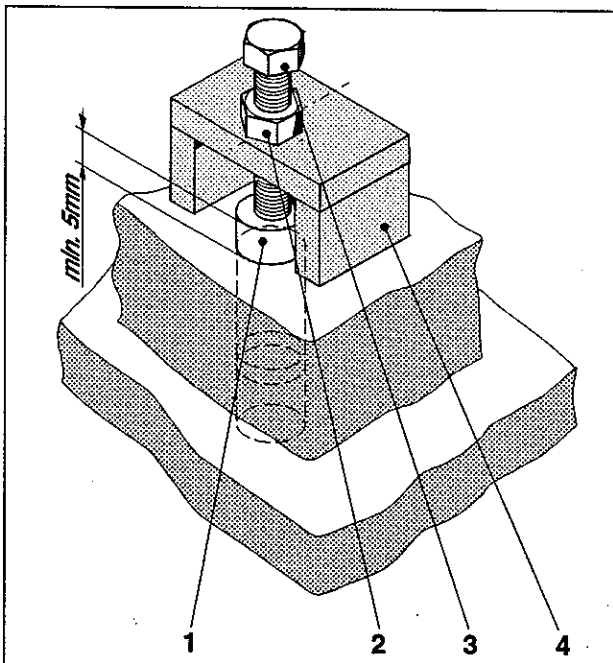
- Put screw M6x35 (3) with hexagon nut M6 (2) through the bore of the alignment pin pull-out device (4).
- Drive screw (3) into the support thread of the alignment pin (1).
- The alignment pin (1) is pulled out by turning the nut (2).

## Note:

Always pull out alignment pin so far that it projects approx. 5 mm over the bore.



Alignment pin pull-out device



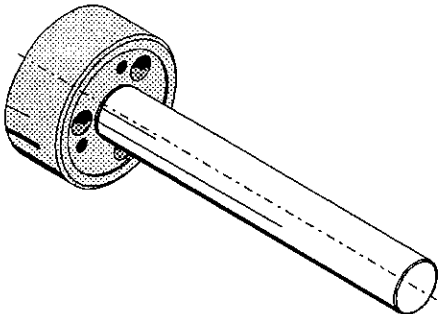
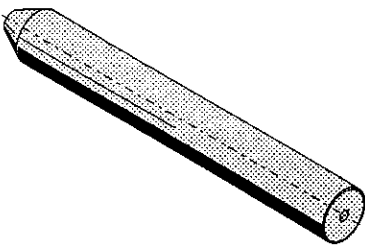
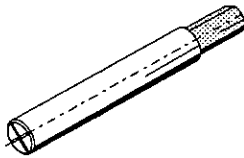
Pulling out an alignment pin

## Testing tools

The **testing tools** for checking the accuracy of individual machine parts (test mandrels) can be purchased from EMCO.

**Note:**

When mounting the test mandrels pay particularly attention to cleanness to avoid damage of the mandrels.

Testing tool		Order no.
	<b>Measuring gauge with support</b> Measuring gauge with setting accuracy of the indicator complete with support vibration protection and magnetic foot with prism. Graduated division ..... 0.01 mm Measuring range ..... 10 mm	<b>565 065</b>
	<b>Test mandrel-headstock</b> Test mandrel complete with test flange and fixation screws for mounting at the main spindle.	<b>270 680</b>
	<b>Test mandrel-tailstock</b> Test mandrel for checking the tailstock adjustment.	<b>270 630</b>
	<b>Test mandrel-tool turret</b> Test mandrel for clamping into the tool turret disc for adjusting the tool turret.	<b>270 650</b>

## Headstock

The headstock is accurately set by the manufacturer. Resetting may be necessary after a collision.

### Indications of a dislocated headstock:

It is not possible to produce cylindrical workpieces, only conical ones can be manufactured.

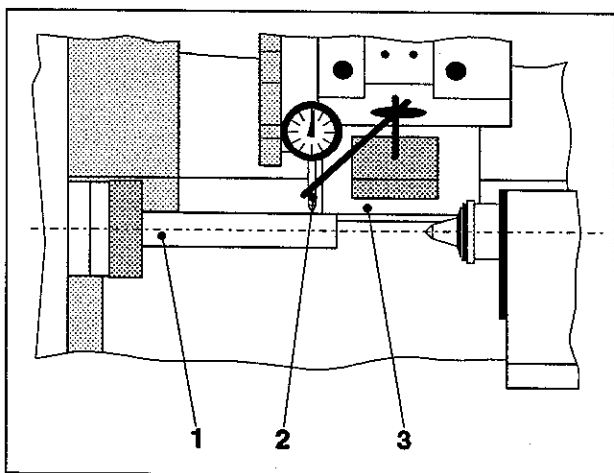
## Checking the headstock adjustment

### Tools

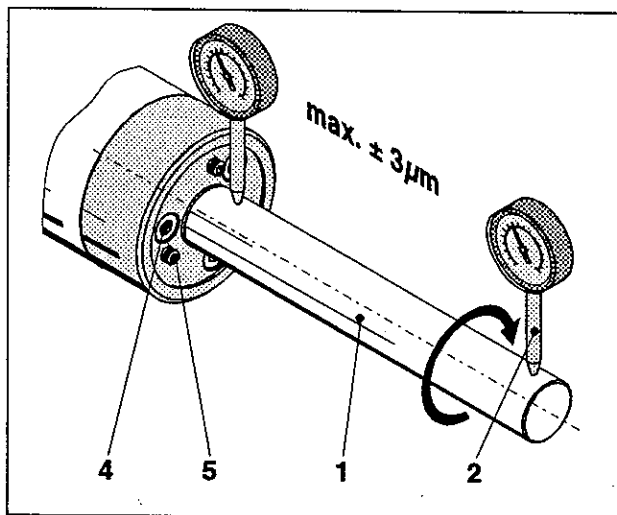
- Test mandrel-headstock
- Measuring gauge with support and magnetic base
- Hexagon key SW4, SW6

### Note:

Check and readjustment of the headstock has to be carried out only in hot operation state. (Let main spindle run at a speed of 4000 rpm for about 30 min.)



Mounting of test mandrel and measuring gauge



Adjust round running

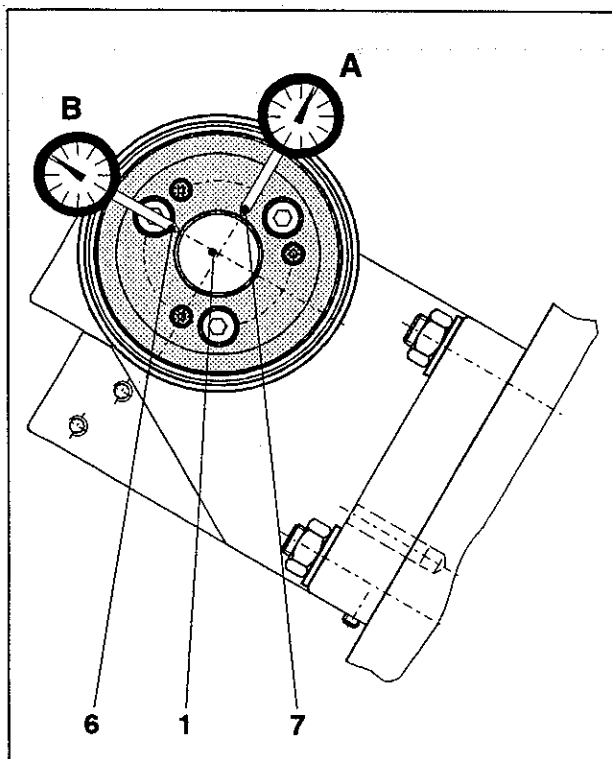
### Mounting test mandrel and measuring gauge

- Mount test mandrel (1) on spindle nose.
- Put measuring gauge (2) with magnetic foot on cross slide (3).

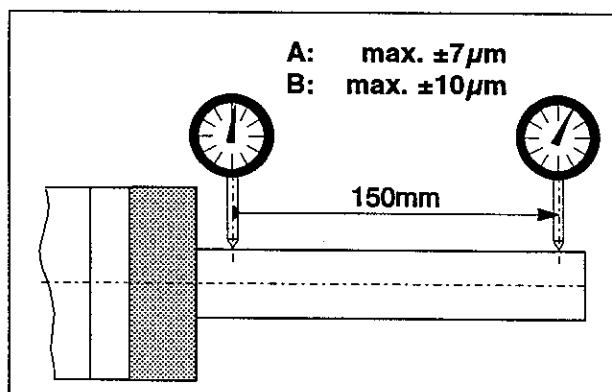
### Adjust round running

Maximum round running deviation .....  $\pm 3\mu\text{m}$

- Place measuring gauge (2) with slight pressure at the left of the test mandrel (1).
- Set measuring gauge to "0".
- Turn main spindle manually and read maximum deflection.
- Release socket head screws (4), SW6, until slight force connection.
- Readjustment of round running by slightly knocking with the hand on the mounting flange of the test mandrel.
- Place measuring gauge at the end of the test mandrel.
- Check round running by turning the main spindle manually and reading the maximum measuring gauge deflection.
- Readjust round running with the 3 set pins (5), SW4.



Measuring arrangements A and B



Maximum admissible deviations

### Check in parallel to the slide level (Measuring arrangement A)

- Place measuring gauge (7) in such a way on the test mandrel (1) that the axis of the measuring gauge is in parallel to the slide level (X direction, see sketch measuring arrangement A).
- Set measuring gauge to "0".
- Traverse cross slide 150 mm into Z direction.
- Read the value deflected on the measuring gauge.

Maximum admissible deviation with a slide traversing path of 150 mm: .....  $\pm 7 \mu\text{m}$

- With a deviation larger than  $\pm 7 \mu\text{m}$  the headstock has to be readjusted.

### Check vertically to slide level (Measuring arrangement B)

- Place measuring gauge with measuring base (6) in such a way on the test mandrel (1) that the axis of the measuring gauge is vertically to the slide level (Y direction, see sketch measuring arrangement B).
- Set measuring gauge to "0".
- Traverse cross slide 150 mm into Z direction.
- Read the value deflected on the measuring gauge.

Maximum admissible deviation with a slide traversing path of 150 mm: .....  $\pm 10 \mu\text{m}$

- With a deviation larger than  $\pm 10 \mu\text{m}$  the headstock has to be readjusted by the EMCO after-sales service.

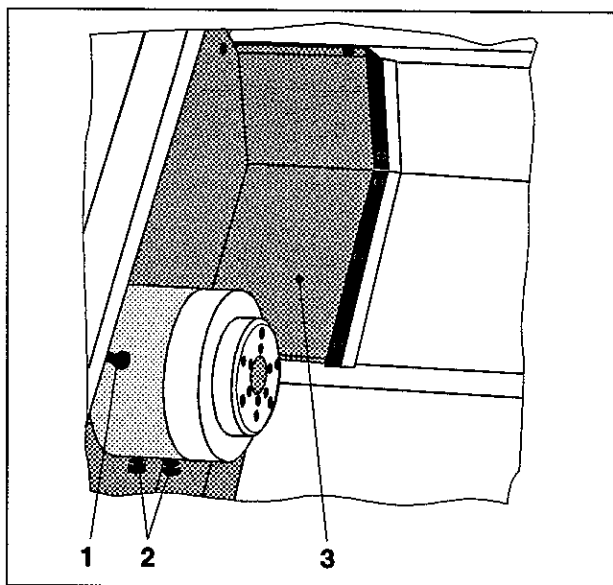
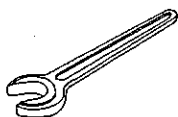
## Readjustment of the headstock

### Note:

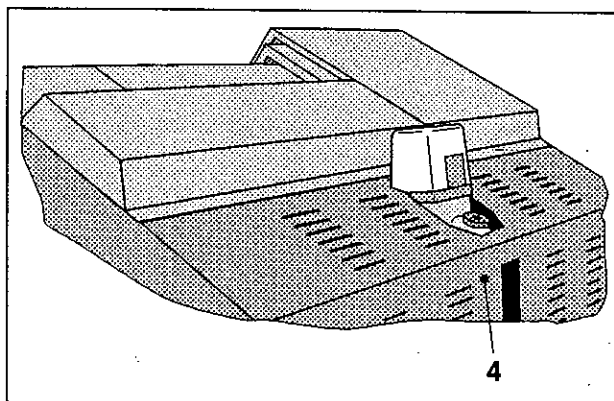
A readjustment of the headstock vertically to the slide level (acc. to measuring arrangement B) is to be carried out only by an EMCO service engineer.

### Tools

- cross screw driver
- fork wrench SW10, SW19
- hexagon key SW3, SW5
- torque spanner SW19
- pin pull-out device
- fitter's hammer
- 2 hexagon nuts M6
- silicon (sealing agent)



Unscrew lateral sheet



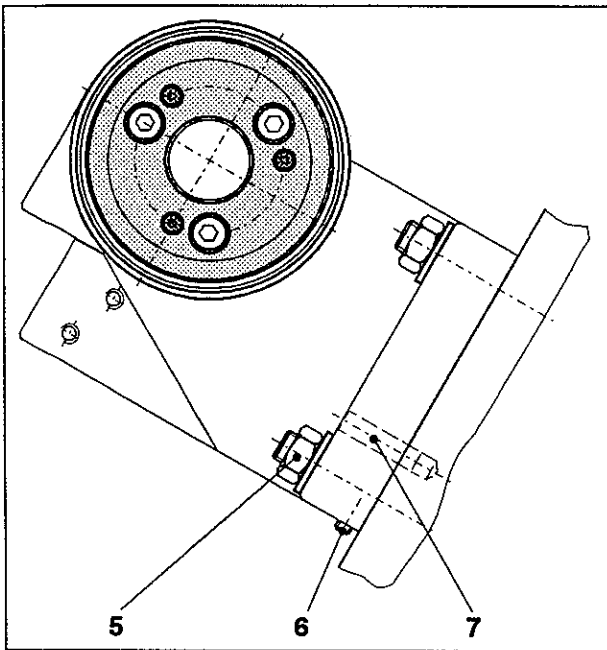
Dismount rear panel

### Procedure

#### Danger:

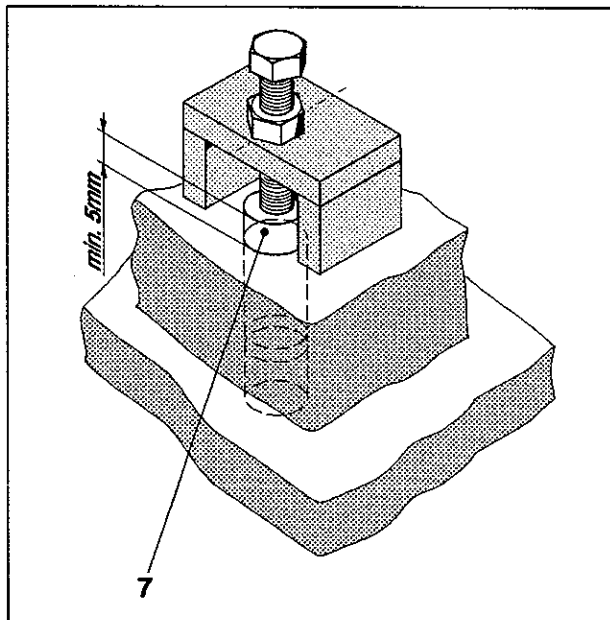
The readjustment of the headstock may only be carried out during standstill of the machine.

- Unscrew screws (1) and (2) at the main spindle. The screw (1) is provided for the optical presetting device and can be unscrewed at the easiest with a hexagon nut M6 and a second counternut M6.
- Dismount lateral sheet (3). In addition to the sheet screws the lateral sheet is also mounted with silicon (coolant tightness).
- Dismount rear panel of the machine (4). Only the uppermost 2 sheet screws have to be unscrewed. The remaining 4 screws must only be loosened so that the rear panel can be unhinged.



Adjustment of the headstock

- Release the 4 fixation nuts at the headstock M12, SW19 (5) until slight force connection. 2 fixation nuts are accessible from the front side the other two nuts are accessible from the rear side of the machine.
- Drive in alignment pin (7) with care until it is flush with the headstock housing. The alignment pin has the function of a pivot and facilitates alignment.
- Adjust headstock with both set screws (6).
- Tighten each of the 4 fixation nuts (5).  
Starting torque ..... 80 Nm
- Check adjustment (see "Check of correct adjustment")
- If necessary, readjust again.



Pull out alignment pin

- When the headstock is aligned exactly check if each of the 4 fixation nuts (5) is tightened fast.
- Pull out alignment pin (7) by means of a pin pull-out device for at least 5 mm.

**Caution:**

The alignment pin must be pulled out in any case. Otherwise it could be damaged in case of another collision.

Thus, a readjustment of the headstock would not be possible any more, the EMCO after-sales service must be contacted .

- Remount lateral sheet (3) with silicon and the fixation screws.
- Remount rear panel (4).
- Screw on again screw (1) and (2).

## Tailstock

A readjustment of the tailstock might be necessary after a collision.

### Indications of a dislocated tailstock:

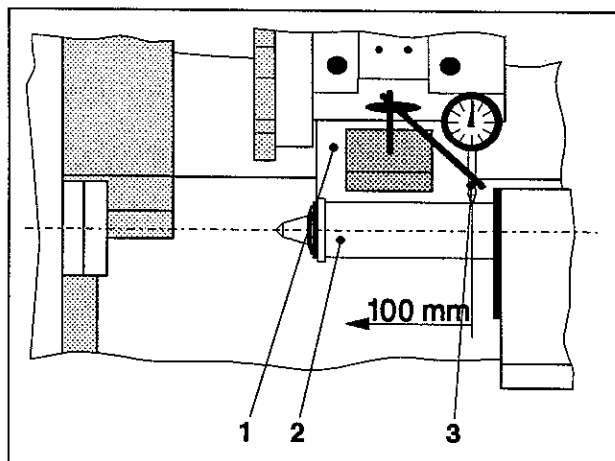
With the headstock exactly adjusted it is not possible to manufacture cylindrical workpieces, only conical ones can still be produced.

It is possible to readjust the parallelism of the tailstock sleeve and the centre.

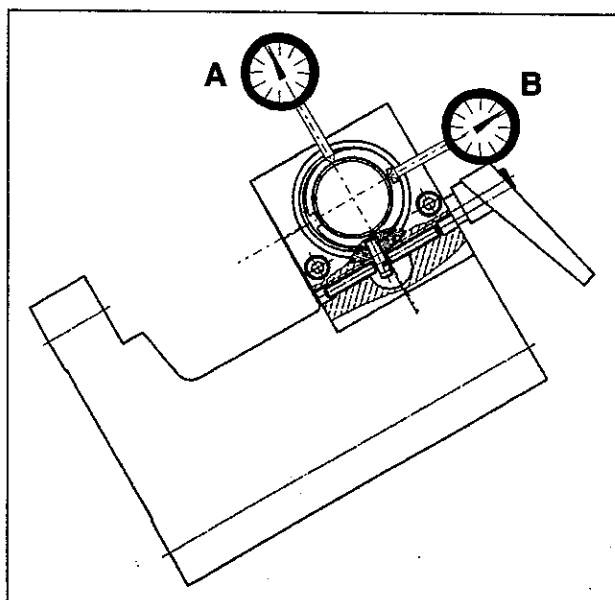
## Check of the tailstock sleeve

### Tools

- Test mandrel-tailstock
- Measuring gauge with support and magnetic base



Mounting the test mandrel and measuring gauge



Measuring arrangements A and B

### Note:

Check and readjustment of the tailstock have to be carried out only in hot operation state. (Let machine run with clamped workpiece and with workpiece counter-supported to the tailstock at a speed of 3000 rpm for about 30 min.)

### Procedure

- Move out tailstock sleeve (2) completely.
- Place measuring gauge (3) with magnetic base on the cross slide (1).
- Place measuring base of the measuring gauge with slight pressure onto the tailstock sleeve so that the axis of the measuring gauge stands parallelly to the slide level (measuring arrangement A).
- Set measuring gauge to "0".
- Traverse cross slide by 100 mm in Z direction and read measuring value from the measuring gauge.
- Place measuring gauge in vertical to the slide level onto the tailstock sleeve and repeat measuring procedure (measuring arrangement B).

### Maximum admissible deviations

Slide travel path..... 100 mm  
 Measuring arrangement A.....  $\pm 7 \mu\text{m}$   
 Measuring arrangement B.....  $\pm 10 \mu\text{m}$

## Readjustment of the tailstock sleeve

### Note:

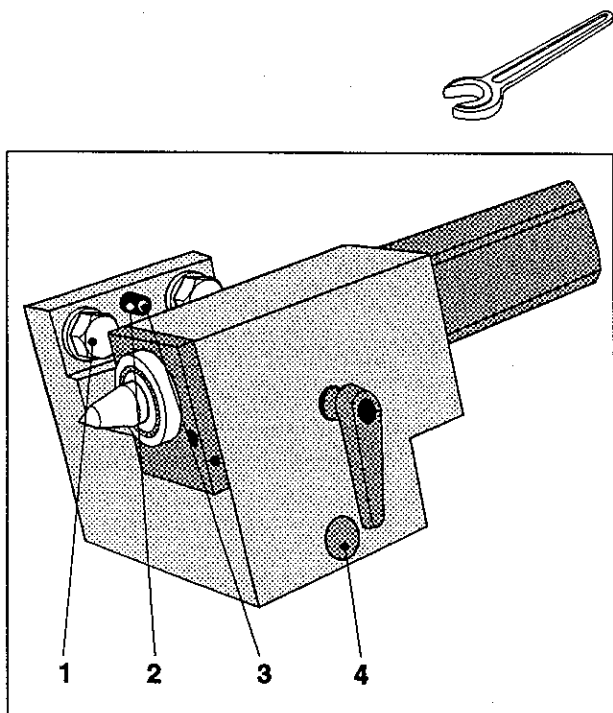
A readjustment of the tailstock vertically to the slide level (measuring arrangement B) has to be carried out only by an EMCO service engineer.

### Tools

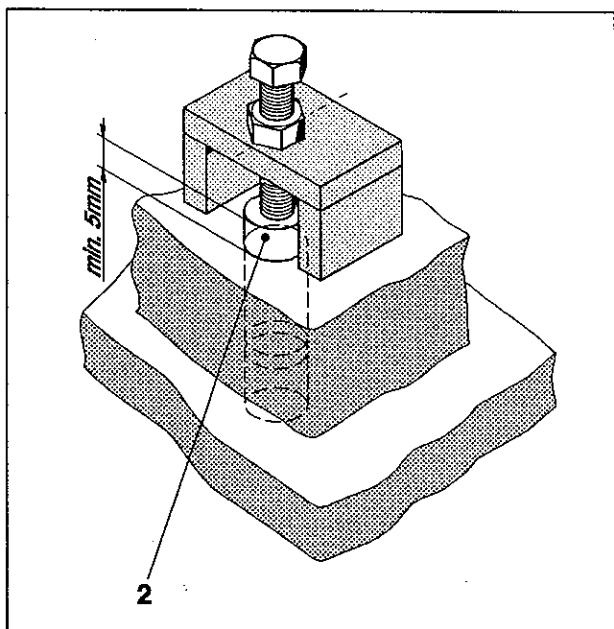
- hexagon keys SW2, SW10
  - fork wrenches SW10, SW19
  - torque spanner SW19
  - countersunk screw driver
  - light fitter's hammer
  - plastic hammer
  - alignment pin pull-out device
- Release both hexagon head screws M12, SW19 (1) and the hexagon socket head screws M12, SW10 (4) until slight force connection.
  - Drive in alignment pin (2) with care until it is flush with the tailstock housing. The alignment pin has the function of a pivot and facilitates alignment.
  - Adjust tailstock by slightly knocking with the plastic hammer onto the tailstock housing, when doing so remeasure again and again the adjustment.
  - Fasten all 3 screws M12 (1) and (4) tighten them.  
Starting torque ..... 80 Nm
  - Check again alignment and if necessary readjust again (possibly only tailstock centre!).
  - Screw off set screw M6 (3) from the alignment pin.  
The function of the alignment pin is to avoid obstructions by chips of the thread bore in the alignment pin.
  - Pull out alignment pin with alignment pin pull-out device for at least 5 mm.
  - Screw alignment pin (3) again into the alignment pin.

### Caution:

The alignment pin must be pulled out in any case. Otherwise it could be damaged in case of another collision. Thus, a readjustment of the headstock would not be possible any more, the EMCO after-sales service must be contacted.



Readjustment of the tailstock



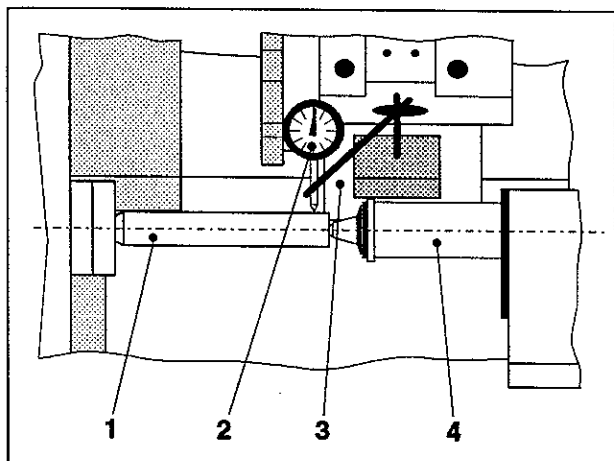
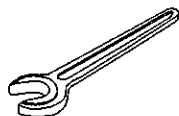
Pull out alignment pin



## Checking the tailstock centre

### Tools

- Test mandrel-tailstock
- Measuring gauge with support and magnetic base



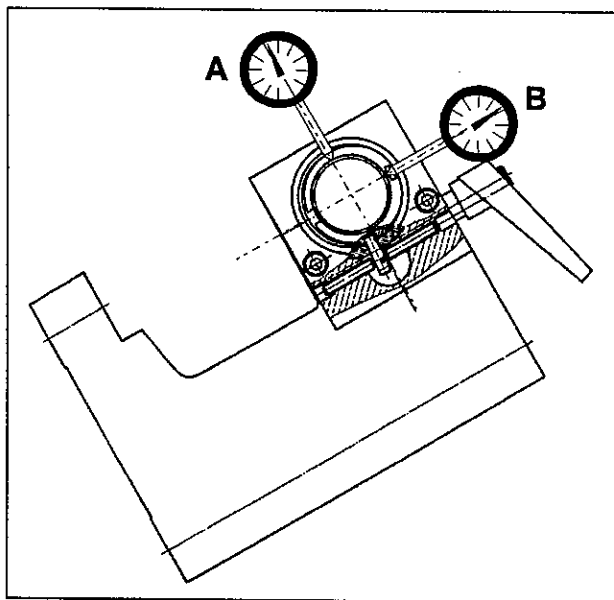
Mounting the test mandrel and measuring gauge

### Note:

Check and readjustment of the tailstock have to be carried out only in hot operation state. (Let machine run with clamped workpiece and with workpiece counter-supported to the tailstock at a speed of 3000 rpm for approx. 30 min.)

### Procedure

- Dismount chuck from main spindle and clean main spindle carefully.
- Insert test mandrel (1) with the tapered end into the main spindle bore.
- Clamp test mandrel with tailstock sleeve (4) moderately tight and clamp sleeve.
- Place measuring gauge (2) with magnetic base onto cross slide (3).
- Place measuring base of the measuring gauge with slight pressure onto the test mandrel so that the axis of the measuring gauge stands parallel to the slide level (measuring arrangement A).
- Set measuring gauge to "0".
- Traverse cross slide by 150 mm in Z direction and read measuring value from the measuring gauge.
- Place measuring gauge in vertical to the slide level onto test mandrel and repeat measuring procedure (measuring arrangement B).



Measuring arrangements A and B

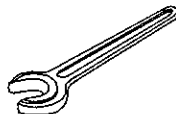
### Maximum admissible deviations

Slide travel path.....	150 mm
Measuring arrangement A.....	$\pm 7 \mu\text{m}$
Measuring arrangement B.....	$\pm 15 \mu\text{m}$

## Readjustment of the tailstock centre

### Note:

A readjustment of the tailstock vertically to the slide level (measuring arrangement B) has to be carried out only by an EMCO service engineer.

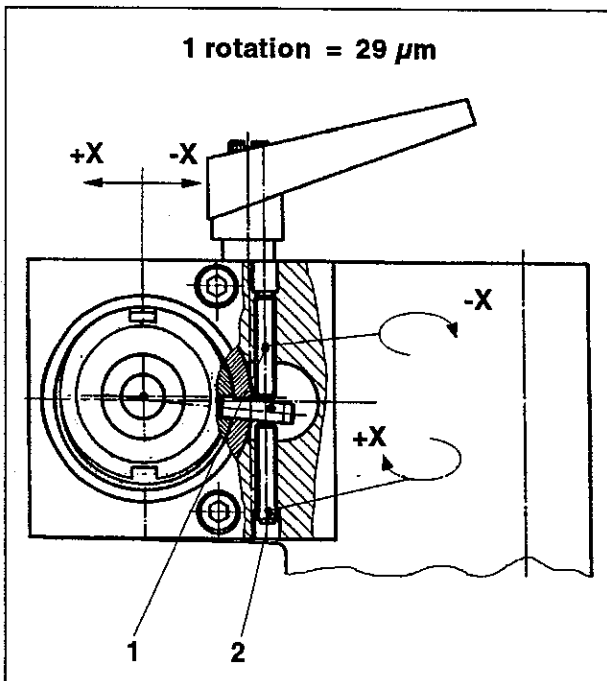


### Tools

- Hexagon key SW2

### Danger:

The readjustment of the headstock may only be carried out during machine standstill.



Shifting the tailstock centre

The tailstock centre is mounted eccentrically in the sleeve. By twisting the sleeve the centre is dislocated in X direction.

- According to wrong position of the tailstock centre turn the set screws M4, SW2 (1) or (2) in clockwise direction. First loosen the second set screw.

### Setting distance in X direction:

1 rotation = 29  $\mu$ m in X direction

- When the tailstock centre is exactly adjusted tighten the second loosened set screw.
- If a tailstock adjustment is not possible any more via the centre the entire tailstock has to be readjusted.

## Tool turret

The tool turret is accurately set by the manufacturer. Resetting may become necessary after a collision.

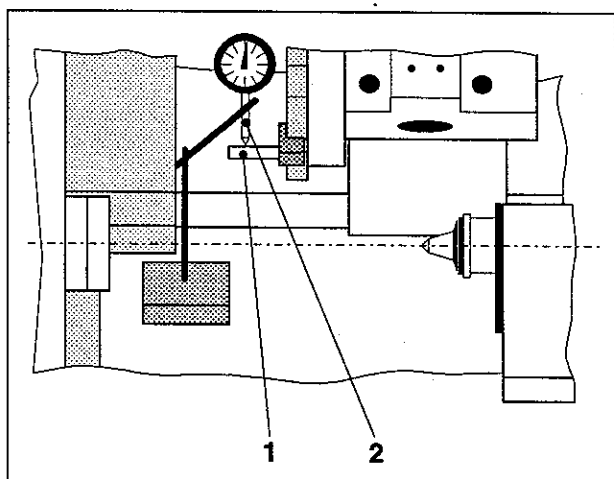
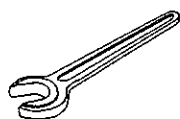
### Indications of a dislocated tool turret:

- With accurately adjusted headstock the workpieces cannot be exactly centered.
- The stored tool data of all tools are not correct any more.

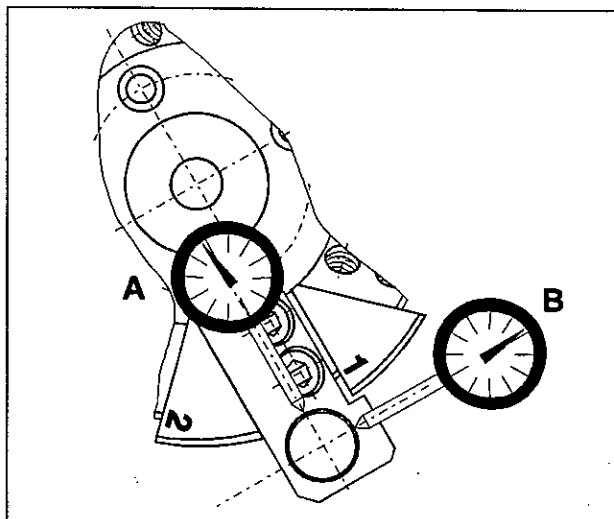
## Checking the adjustment

### Tools

- Test mandrel-tool turret
- Measuring gauge with support and magnetic base
- Hexagon key SW3, SW5



Mounting the test mandrel and measuring gauge



Measuring arrangements A and B

### Procedure

- Swivel in tool position 1.
- Clamp test mandrel (1) with toolholder into the tool turret disc, position 1.
- Place measuring gauge (2) with magnetic base onto machine bed, do not place it on the cross slide.
- Place measuring base of the measuring gauge with slight pressure onto the test mandrel in such a way that the measuring gauge is parallel to the slide level (measuring arrangement A).
- Set measuring gauge to "0".
- Traverse cross slide by 60 mm in Z direction and read measuring value from the measuring gauge.
- Place measuring gauge in vertical to the slide level onto the test mandrel and repeat measuring procedure (measuring arrangement B).

### Maximum admissible deviations

Slide travel path..... 60 mm  
Measuring arrangements A,B .....  $\pm 50 \mu\text{m}$

## Readjustment of the tool turret

### Note:

A readjustment of the tool turret vertically to the slide level has to be carried out only by an EMCO service engineer.

### Tools

- hexagon key SW6
- hexagon key SW8
- torque spanner SW8
- plastic hammer
- square iron □8x15

### Danger:

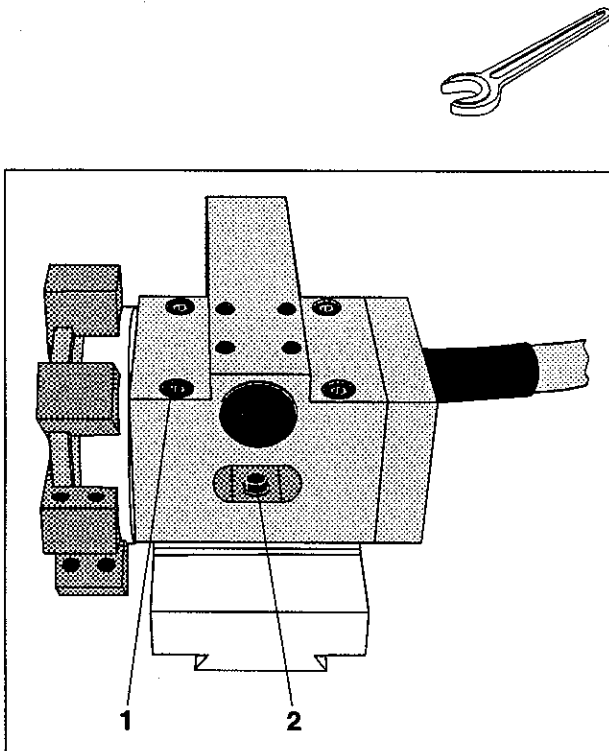
The readjustment of the tool turret may be carried out only during machine standstill.

### Procedure

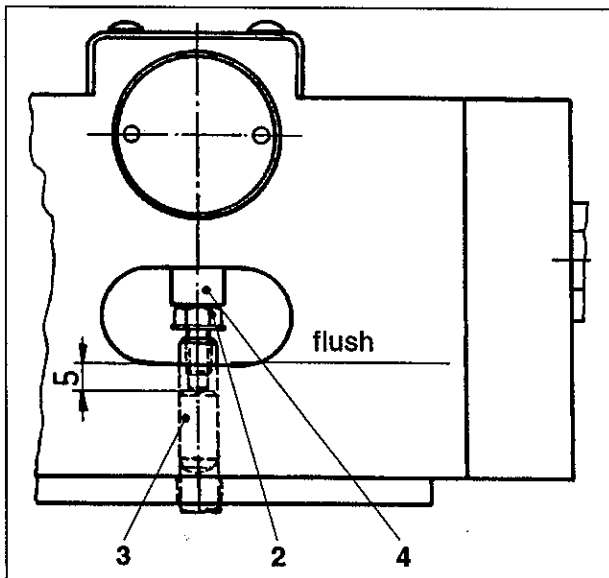
- Loosen the 4 hexagon socket head screws M8, SW5 (1) until slight force connection.
- Press alignment pin (3) downward by turning the screw (2) in counter-clockwise direction until the alignment pin is driven approx. 5 mm into the bore of the tool turret.  
During this procedure support the hexagon head screw towards the top by means of the square iron □8x15 (4).
- The alignment pin has the function of a pivot and facilitates alignment.
- Align tool turret by slightly knocking with the plastic hammer onto the housing of the tool turret.  
In doing so, always remeasure the setting.
- Tighten every 4 screws (1).  
Starting torque ..... 25 Nm
- Pull out alignment pin (3) by turning the screw (2) in clockwise direction until it is flush with the tool turret housing.

### Caution:

The alignment pin must be pulled out in any case. Otherwise, it could be damaged in case of another collision.  
Thus, readjustment of the tool turret would not be possible any more, the EMCO after-sales service must be contacted.



Readjusting the tool turret



Driving in and/or pulling out the alignment pin

## Slides

With the slides (X and Z slides) the **slide clearance** and the **reverse clearance** are to be considered. They are decisive for the working accuracy of the machine.

Since the slide guides of the slides "rub in" in the course of time also in case of careful lubrication, slide clearance and reverse clearance are to be checked after a major operation period (at least once a year).

### Reverse clearance

The reverse clearance is the way by which the step motor spindle is shifted without any traversing movement of the slide.

This occurs in case of a change of direction (e.g. feed direction change from -Z to +Z). Here the control indicates a travelled traversing path although the slide has not been traversed thereby.

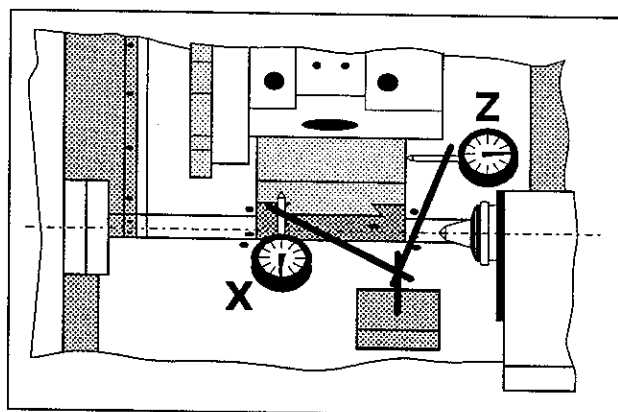
The reverse clearance cannot be readjusted directly but only in relation with the slide clearance.

### Relation slide clearance-reverse clearance

The smaller the slide clearance has been set the larger the reverse clearance becomes.

### Measuring the reverse clearance

- Fix measuring gauge with magnetic base at the machine according to the opposite picture.
- Place measuring base of the measuring gauge with slight pressure onto the slide to be measured.
- Set measuring gauge to "0".
- Set position display of the slide on the screen to "0".
- Traverse respective slide approx. 1-2 mm in direction measuring gauge (+X, +Z direction). Measuring gauge and position display of the control indicate the same value.
- Traverse slide again to position "0" according to the position display.
- Read measuring value from the measuring gauge (=reverse clearance).



*Set up of the measuring gauge, measuring procedure*

### Maximum admissible reverse clearance

Z slide .....	20 $\mu\text{m}$
X slide .....	15 $\mu\text{m}$

- If the measured slide clearance exceeds the admissible one, the slide clearance must be readjusted.  
Subsequently the measuring procedure of the reverse clearance is to be repeated.
- If the measured reverse clearance lies in the admissible tolerance range the measured values have to be entered in the control software ("reverse clearance compensation").

## Slide clearance

In addition to the reverse clearance the slide clearance is the standard for the working accuracy of the machine.

A too large slide clearance can cause "chattering", too small slide clearance enlarges the reverse clearance and stresses unnecessarily step motors and slide guides.

## Check of the slide clearance

### Tools

- screw driver
- cross-type screw driver
- hexagon key SW2,5, SW3
- measuring gauge with support and magnetic base

### Procedure

- Unscrew sheets (1) and (2) from Z slide and pull aside so that Z spindle and guideways are freely visible.  
Both sheets are fastened in addition to the fillister head screws (each 3 pcs. SW3 and 1 pc. SW2,5) also from the rear side on a connection sheet each with 2 slotted screws. (Take off machine rear panel!)

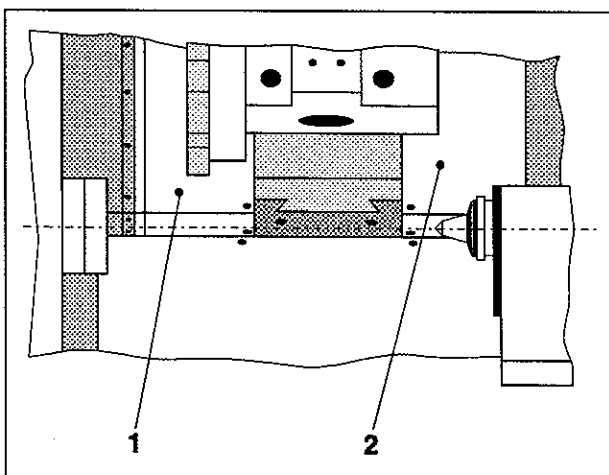
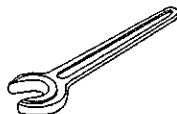


### Caution:

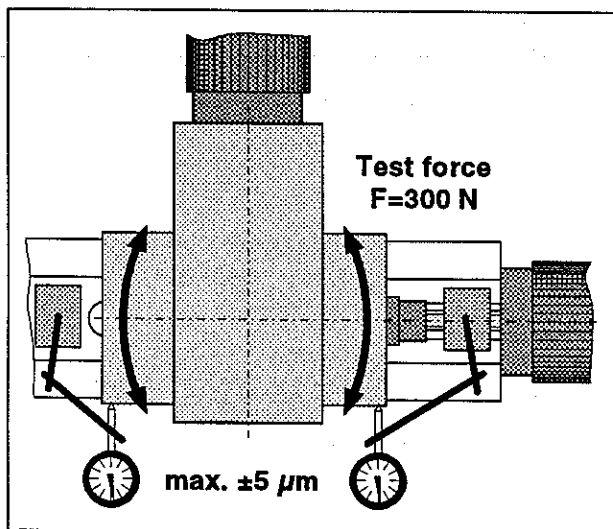
For easier accessibility of the screws the slide has to be traversed partly.

- Prior to a travel movement always make sure that no loosened parts, screws or tools placed in the working area block the slide movement.
- Carry out slide movements only with the chip guard door closed.

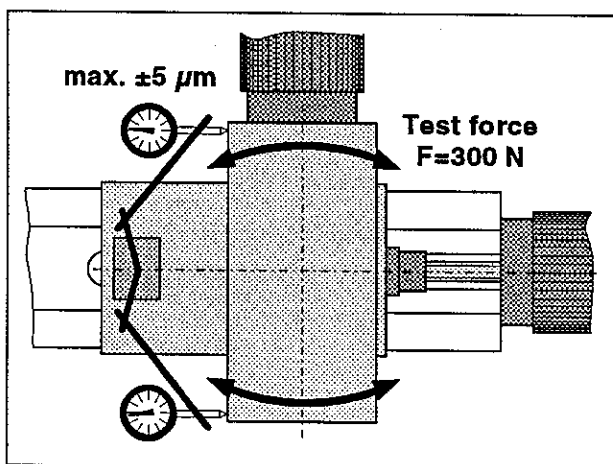
- Place measuring gauge with magnetic base on machine bed.



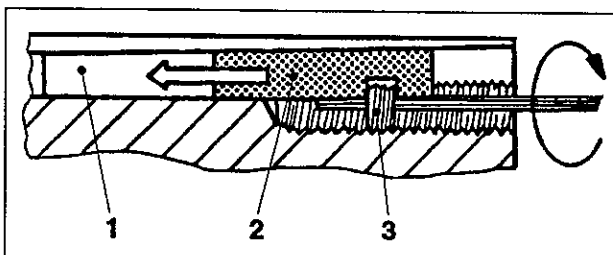
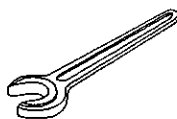
*Dismounting the cover sheets*



Measuring the Z slide clearance



Measuring the X slide clearance



Principle of V-ledge adjustment

- Place measuring gauge with slight pressure onto the Z slide according to the opposite picture.
- Set measuring gauge to "0".
- Find out slide clearance by pressing the slide to and fro at right angles to the Z axis. The test force should amount to approx.  $F=300\text{ N}$ . ( $300\text{ N} \approx 30\text{ kg}$ )
- Repeat measurement on the 2<sup>nd</sup> side of Z slide.
- Place measuring gauge with magnetic base onto Z slide.
- Measurement of the X slide clearance on both sides of the slide (same procedure as with Z slide clearance, however, test force at right angles to the X axis).

#### Maximum slide clearance

X , Z slides .....  $\pm 5\text{ }\mu\text{m}$

#### Note:

During the measurement of the X slide clearance place the measuring gauge in any case onto the Z slide.  
If the measuring gauge is attached to the machine bed, the Z slide clearance is included in the measurement.

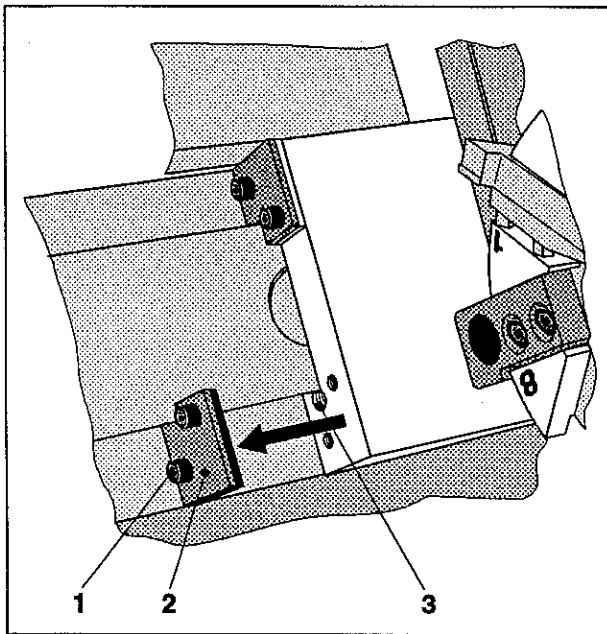
#### Readjustment of the slide clearance

##### Tool

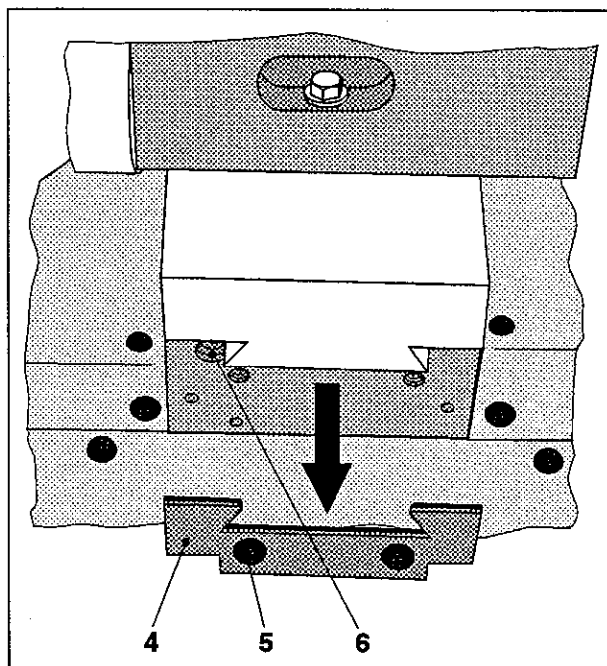
- screw driver
- cross-type screw driver
- hexagon screw SW2,5, SW3, SW4
- measuring gauge with support and magnetic base

#### Principle of slide readjustment

The slides(1) glide in dove-tail guides. Conical V-ledges (2) are applied likewise in conical guideways. By turning the set screws (3) in clockwise direction the V-ledge is pressed deeper, thus the clearance of the slide is reduced.



Readjustment of the Z slide guide



Readjustment of the X slide guide

### Procedure

- To be able to reach the set screws for the V-ledge adjustment the stripping sheets and stripping felts have to be unscrewed.

#### Z slides:

Dismount stripping sheet (1) with stripping felt by unscrewing both hexagon socket screws SW4 (2) (on both sides of the Z slide).

#### X slide:

Take off stripping sheet (4) with felt by un-tightening both fillister head screws SW3 (5). The second V-ledge of the X slide becomes accessible from the rear side of the machine by unscrewing the right stripping sheet.

- Turn set screws SW2,5 with care according to the wrong setting of the slide (2 set screws for X and Z slides each). The set screws are accessible through the thread bores (3) and (6). By turning the set screws in clockwise direction the slide clearance is reduced, turning in counter-clockwise direction enlarges the slide clearance.
- Check slide clearance again after each re adjustment.
- If the measured reverse clearance lies in the tolerance range, check the **reverse clearance** again. Slide clearance and reverse clearance have to be in the tolerance range.
- Assemble machine again completely.



### Danger:

The machine may be started up again only if all parts have been mounted carefully. (Do not forget rear panel of the machine!)



## Main driving belt

The main driving belt should be checked for state and tension at least every half year.  
In case of signs of wear the belt should be exchanged immediately.

Belt ..... Poly V-belt 1092 J8  
Order no. .... ZRM 80 1092

## Exchange of the main driving belt

### Tool

- cross-type screw driver
- hexagon key SW17

### Procedure



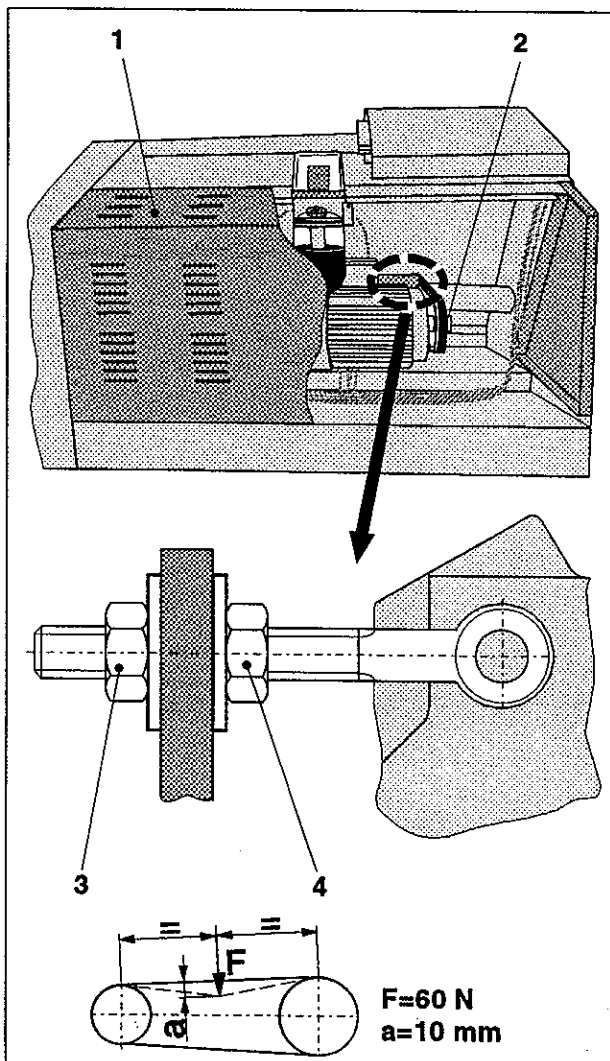
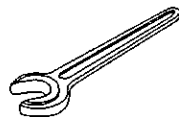
#### Danger:

The main driving belt may only be exchanged during machine standstill.  
(Take off mains plug!)

- Unscrew rear panel of machine (1).
- Loosen counter nut SW17 (3).
- Loosen setting nut SW17 (4) until the driving belt can be taken off.
- Replace driving belt (2) by new belt.
- Tension driving belt by means of the setting nut (4).  
The tension is to be adjusted in such a manner that the belt can be pressed through between both belt discs for about 10 mm with a test force of 60 N ( $\approx 6$  kg).
- Secure belt position by tightening the counter-nut (3).
- Mount rear panel of machine (1).

#### Note:

Check the belt tension with a new driving belt after the first 10 hours of operation (running-in period).



Exchanging and tensioning the driving belt

