

Instruction book

Service parts

EMCO

COMPACT 5 CNC

Englisch Order No. EN 2 019

Auflage: 10. 9. 8. 7. 6. 5. 4. 3. 2.

92 91 90 89 88 87 86

Maier+Co.

A-5400 Hallein/Austria

Edition for
Software A6C 114004

Manual feeds

Variable speed range from 5 - 400 mm/min
Rapid traverse 700 mm/min, via push buttons to
give directions and rapid speed button resp.
single step movement 0,0138 mm.
Digital path recording system in 0,01 mm.

Technical data CNC unit:

1. Programm memory for 210 blocks
2. Feeds 2 - 499 mm/min and 0,002 - 0,499 mm/rev.
3. Rapid traverse speed 700 mm/min
4. Thread pitches from 0,02 - 4,99 mm (graded by 0,01 mm)
5. Radii programming
6. Alarms in the event of maloperation
7. Programm modification during operating sequence possible
8. Inkremental or Absolute programming
9. Tool length calculation
10. Magnetic tape memory (transfer and memorisation of the
programm
11. Interface RS 232 (video-, TV-connection)
12. DNC-Interface (accessory)

Addresses

(Extension SW-A6C 114 004)

CPU as per NO: A6C 114 003		CPU as per No: A6C 114 004	
N	Block number	→	<u>NEW:</u> N00 to N209
G	Traverse function		
M	Miscellaneous function		
X	Traverse coordinates	→	
Z			
F	Feed	→	
		I	Center point coordinates
		K	
		X	Dwell
		L	Jump address
T	Tool address	→	
		H	Parameter division of cut
		H	Parameter impulse edit
		K	Thread pitch

G-Codes - Extensions

A6C 114 003		A6C 114 004	
G00	Rapid traverse —————→		
G01	Linear interpolation —————→		
G02	Circular interpolation Clockwise		<u>New:</u> - Programming with center point coordinates DIN 66025 - Each desired circle arc possible; no limitation in angles.
G03	Circular interpolation Counter clockwise		
G04	Dwell		<u>New:</u> Input of dwell period.
G20	Intermediate Stop	M00	(G20 replaced)
G21	Empty Line —————→		
G22	End of program	M30	(G22 replaced)
G24	Radius programming —————→		
		G25	Sub-routine call-up
G26	Tool correction and tool call-up	M06	(G26 replaced)
		G27	Jump instruction
G33	Threading with constant pitch		<u>New:</u> Input of thread pitch under address K.
G64	Feed motors currentless —————→		
G65	Cassette operation —————→		
G66	RS 232 operation —————→		
		G73	Chip breakage cycle
G78	Threading cycle		<u>New:</u> Automatic division of cut.
		G81	Drilling cycle
		G82	Drilling cycle with dwell
		G83	Drilling cycle, deep hole with withdrawal

A6C 114 003		A6C 114 004	
G84	Longitudinal turning	→	<u>New:</u> Automatic division of cut (parameter H)
		G85	Reaming cycle
		G86	Grooving with division of cut (parameter H)
		G88	Facing with division of cut (parameter H)
		G89	Reaming and drilling cycle with dwell
G90	Absolute value programming	→	
G91	Incremental value programming	→	
G92	Set register (zero point offset)	→	
G94	Feed in mm/min	→	
G95	Feed in mm/rev.	→	

M-Codes

CPU as per No. A6C 114 003		CPU as per No. A6C 114 004	
G20	→	M00	Programmed stop
		M03	Main spindle ON, right hand direction run
		M05	Main Spindle OFF
G26	→	M06	Tool length compensation
		M08	Switch exit X62 PIN 15 HIGH
		M09	Switch exit X62 PIN 15 HIGH
		M17	Return command to the main program
		M22	Switch exit X62 PIN 18 LOW
		M23	Switch exit X22 PIN 18 LOW
		M26	Switch exit X62 PIN 20
G22	→	M30	End of Program
		M98	Automatic compensation of play
		M99	Circle parameter

Summary of Max. Values

Input size

(SW-A6C 114 004)

Address	Metric		Inch	
	Value	Dimension	Value	Dimension
N Block number	00-209	1	00-209	1
G Traverse function (G-Codes)	00-95	1	00-95	1
M Miscellaneous function (M-Codes)	00-99	1	00-99	1
X Coordinate CNC-input	0- \pm 5999	$\frac{1}{100}$ mm	0- \pm 1999	$\frac{1}{1000}$ "
Z Coordinate CNC-input	0- \pm 32760		0- \pm 12900	
X Coordinate hand input	0- \pm 89999		0- \pm 29999	
Z Coordinate hand input	0- \pm 89999		0- \pm 29999	
F Feed	2-499		2-199	
	With G94	mm/min		$\frac{1}{10}$ "/min
	With G95	$\frac{1}{1000}$ mm/U		$\frac{1}{10000}$ "/U
I Circle point coordinate in X	0-5999	$\frac{1}{100}$ mm	0-1999	$\frac{1}{1000}$ "
K Circle point coordinate in Z	0-1999			
X Dwell (time)	0- \pm 5999	$\frac{1}{100}$ sec	0- \pm 1999	$\frac{1}{100}$ sec
L Jump address	0-221	1	0-221	1
T Tool address	0-499		0-199	
H Parameter division of cut	0-999	$\frac{1}{100}$ mm	0-999	$\frac{1}{1000}$ "
H Parameter width of turning tool (G86)	10-999		10-999	
H Parameter impulse edit	0-999		0-999	
K Thread pitch	2-499		2-199	

Max. Main Spindle R.P.M.
when Threading
(SW-A6C 114 004)

Thread pitch		max. r.p.m.
metric [mm]	inch ["]	
0,02 - 0,5	0,002 - 0,02	950
0,5 - 1	0,02 - 0,04	500
1 - 1,5	0,04 - 0,06	320
1,5 - 2	0,06 - 0,08	250
2 - 3	0,08 - 0,12	170
3 - 4	0,12 - 0,16	120
4 - 4,99	0,16 - 0,199	100

Alarm Signs

(SW-A6C 114 004)

If you want to put in and register data the computer does not know, the alarm sign will be indicated. The read-out shows AL and the respective alarm number.

On the monitor screen the alarm number is shown together with an explanatory text.

Alarm Signs - Survey

A00 Wrong G- or M-Code:

Example of an incorrect input: G61

A01 Wrong Circle Interpolation:

With input of wrong circle points (Arc, circle target points resp. center point coordinates) alarm 01 is given.

The computer checks whether an arc with the given values is possible before it works off the arc.

A02 X-Value too Large

For max. values compare chart max.values!

A03 Wrong F-Value

Compare chart max. values!

A04 Z-Value too large

For max. values compare chart max.values!

A05 No M30 Programmed

If you forget to put in M30 at the end of the program and you press the start key resp. want to carry out a test run, alarm 05 will be shown.

A06 Main Spindle R.P.M. too High when Threading

This alarm shows only during program execution and not at program input (G33 or G78).

Measures:

- reduce r.p.m.
- press keys INP + REV;
the alarm disappears, program execution is automatically continued if the respective r.p.m. is given. Max. r.p.m. for threading compare chart.

A07 Not occupied

ALARM SIGNS IN CASSETTE OPERATION

A08 Tape end with SAVE

A09 Program not found

A10 Writing protection active

A11 Running Fault

For detailed explanations of alarms

A08 - A12 compare cassette operation.

A13 Switching from mm to Inch with Full Register

If you read in a metric program, however the selector switch is set at Inch, this alarm will be given.

A15 Wrong H-Value

Possible value compare chart max.values!

A16 Not used

A17 Wrong sub-routine:

If a sub-routine is more than five-fold.

Note:

- Alarm 13 can only be cancelled by turning the selector switch metric/ inch.
- Alarm A06 can only be cancelled if the main spindle r.p.m. is reduced.
- For Alarm Signs in Cassette-Operation Mode look for the chapter Cassette Operation.

Format A6C 114 004

G-Codes

N	G (M)	X (I)	Z (K)	F (T)(L)(K)	H	Remarks
...	00	± .....	± .....	.....	.....
...	01	± .....	± .....	....	.....
...	02	± .....	± .....	....	.....
...	03	± .....	± .....	....	.....
...	04	.....	.....	.....	.....
...	21	.....	.....	.....	.....
...	24	.....	.....	.....	.....
...	25	.....	.....	L...	.....
...	27	.....	.....	L...	.....
...	33	.....	± .....	K...	.....
...	64	.....	.....	.....	.....
...	65	.....	.....	.....	.....
...	66	.....	.....	.....	.....
...	73	.....	± .....	....	.....
...	78	±	±	K...	....
...	81	.....	± .....	....	.....
...	82	.....	± .....	....	.....
...	83	.....	± .....	....	.....
...	84	± .....	± .....	....	....
...	85	.....	± .....	....	.....
...	86	± .....	± .....	....	....
...	88	± .....	± .....	....	....
...	89	.....	± .....	....	.....
...	90	.....	.....	.....	.....
...	91	.....	.....	.....	.....
...	92	± .....	± .....	.....	.....
...	94	.....	.....	.....	.....
...	95	.....	.....	.....	.....

M-Codes

..	M 00	.....	.....	.....	.....
..	M 03	.....	.....	.....	.....
..	M 05	.....	.....	.....	.....
..	M 06	±	±	T...	.....
..	M 08	.....	.....	.....	.....
..	M 09	.....	.....	.....	.....
..	M 17	.....	.....	.....	.....
..	M 22	.....	.....	.....	.....
..	M 23	.....	.....	.....	.....
..	M 26	.....	.....	.....	....
..	M 30	.....	.....	.....	.....
..	M 98	....	....	.....	.....
..	M 99	I.....	K .....	.....	.....

Program Input - Operation

(Survey)

- H/C** Switch key Hand/CNC-operation
- INP** Register key
- DEL** Delete key
- FWD** Forward within block (forward)
- REV** Reverse within block (backward)
- Minus key
1. Input of Minus values
 2. Main spindle off, if program is in dwell (MOO or INP + FWD)
- M -** M-key: The minus key features M-codes and test run function tool.
1. Cursor resp. read-out is on G:
If the minus key is pressed M will be written.
 2. Test run: Block Noo must be indicated

INP + **FWD** Intermediate Stop

INP + **REV**

1. Program Interruption
2. Delete Alarm

hold **DEL** , then **INP** : Delete program

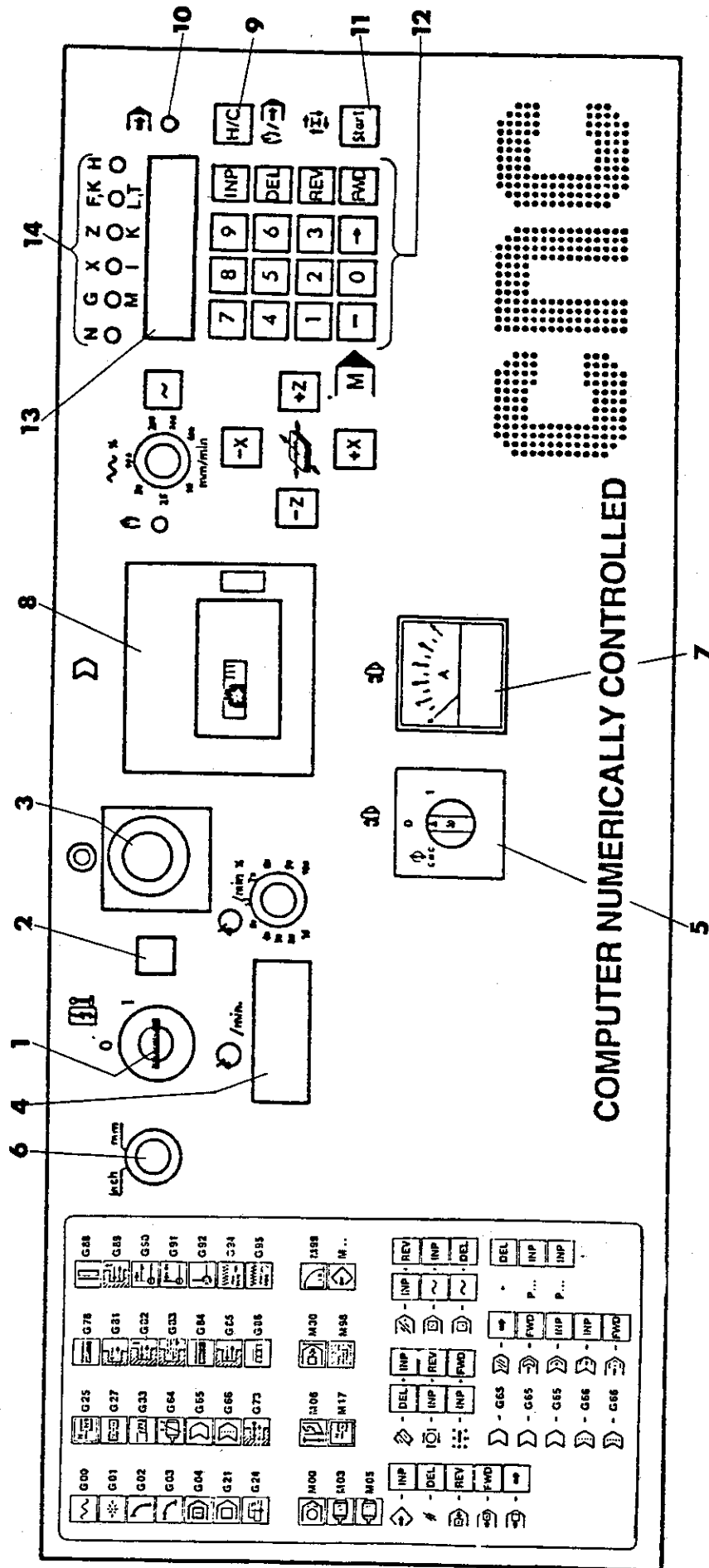
~ + **INP** Insert blocks

~ + **DEL** Delete blocks

1 **2** **3** ... **START** Single block operation

START Program start

Operation- and Control Elements CNC-Operation



1. Main switch

Turn key to the right. Machine and control system are energized.

2. Control lamp - main switch

When main switch is on, control lamp (2) is on.

3. Emergency-stop-button

When pushing the emergency-stop-button you cut the current from the main motor, feed motors and control unit.

Disengaging emergency-stop-button:

Turn button to the left. Switch on main switch.

4. Display of main spindle speed

5. Main spindle switch (CNC-0-1)

6. Switch for option between inch or metric programming

7. Ammeter for drive motor of main spindle

The ammeter indicates the actual current consumption of the drive motor. To protect the motor against overload, the current consumption must not exceed 2 Ampere at continuous operation. The load can be diminished by reducing depth of cut, feed rate or belt position. (safe range)

8. Cassette deck

9. Switch key: hand-operation to CNC-operation

If you press the key H/C, the light jumps from control lamp hand-operation to control lamp CNC-operation. If you press again, the light jumps back.

10. Control lamp - CNC-operation

11. Start key [START]

When operating the start key, the recorded program will start.

12. Key board for input of program, correction of program, etc. (compare also detailed explanation)

12.1. Keys [0] to [9]

These keys serve for input of number combinations for addresses G/X/Z/F/H

12.2. Minus key [-]

When you press the key [-] after input of X or Z numbers, these will be recorded in thy memory as minus value.

With the [-] key you are also able to check a ready program in Test-mode. Pushing the [-] key in intermediate stop causes a main spindle stop.

M) [-] key:

Input of M-Codes

12.3. Input key [INP]

When pressing the input key [INP], you record the value in the memory.

12.4. Delete key [DEL]

12.5. Reverse key [REV]

The display signal will jump back block by block, when operating [REV]

12.6. Forward key [FWD]

The display signal will jump forward block by block (NOO - NO1- NO2 etc.).

12.7. The [→] key

When operating the [→] key, the display signal will jump forward word by word. The recorded values will be shown.

N → G → X → Z → F → H

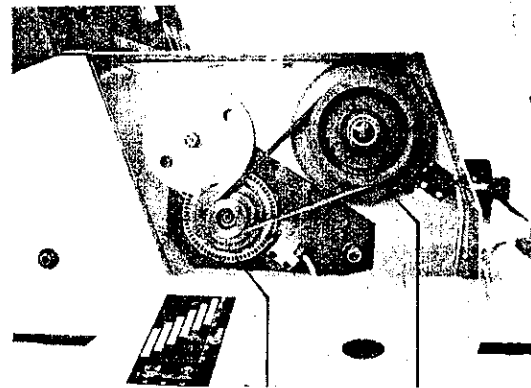
13. The display

Indicating the number values of the relative words and the various alarm codes

14. Indication lamp for addresses

N/G/M/X,I/Z,K/F,K,L,T/H

Belt pulley drive



17. Perforated disc with impulse generator

To synchronize main spindle drive and feed drives; besides that for display of spindle speeds.

18. Perforated disc with impulse generator

To control load of drive motor of main spindle.

See also page 1.1, chapter: Load control of motor

DNC - Interface

PIN - Coverage

X62/PIN	1	A	Status hand
	2	E	Turret - hand operation
	3	E	Instruction G66 + INP
	4	-	-
	5	-	-
	6	E	Instruction G66 + FWD
	7	A	Status program running
	8	A	Status intermediate stop
	9	E	Instruction switch hand /CNC
	10	-	-
	11	-	-
	12	-	-
	13	-	-
	14	-	-
	15	A	Output set with M8, M9
	16	-	-
	17	E	Instruction start
	18	A	Output set with M22, M23
	19	A	Status main motor ON/OFF
	20	A	Output impulse set with M26
	21	E	Instruction blockage-turret
	22	V	+10V not controlled
	23	V	} GND
	24	V	
	25	V	
	26	V	+5V controlled

E = Input
 A = Output
 V = Power

Data formats COMPACT 5 CNC Software A6C 114 004

123456789012345678901234567890 31 32

```
% CR LF
....N'.G'...X:'.....Z.'...F'..H. CR LF
....00.24..... CR LF
....01.00.-5999..32760..... CR LF
....02.01.....01.....12.499.... CR LF
....03.02.-1000.-.1000..09.... CR LF
....04.03...200....200.199.... CR LF
....05M99.I..00.K..200..... CR LF
....06.04.....10..... CR LF
....07.21..... CR LF
....08M06..1222.-10000T.01.... CR LF
....09.78...100.-.2000K120..20 CR LF
....10.73.....-.100.100.... CR LF
....11.81......02.400.... CR LF
....12.82.....-10200.100.... CR LF
....13.83......30..09.... CR LF
....14.85......2000.120.... CR LF
....15.89......2300.200.... CR LF
....16.86.-.100...3000..50.100 CR LF
....17.88...200...300.200..05 CR LF
....18.84.-1000.-.2000.499..25 CR LF
....19.90..... CR LF
....20.91..... CR LF
....21.92...100...200..... CR LF
....22.94..... CR LF
....23.95..... CR LF
....24.33.....-.5000K100.... CR LF
....25M00..... CR LF
....26.27......L.02.... CR LF
....27.25......L.98.... CR LF
....28M03..... CR LF
....29M05..... CR LF
....30M08..... CR LF
....31M09..... CR LF
....32M17..... CR LF
....33M22..... CR LF
....34M23..... CR LF
....35M98....02....03..... CR LF
....35M30..... CR LF
...M
```

.	Space	ASCII 32
:		ASCII 56
CR	Carriage return	ASCII 13
LF	Line feed	ASCII 10

When programs are received, the data format must be fully retained, otherwise the programs will not be correctly stored.

You can also obtain the data format by printout of a punched tape.

Hints

- The book "Basis" and "Instructor" are serving for programming instruction
- Note the hints about accident prevention and the highest allowable gripping diameter of clamping tools.
- The drawn pictures differ in some parts from the delivered machinery.

Notice

- All service and repair works have to be done by trained service people only.
- The cover of the E-control has to be removed by trained service people only.
- All electrical service and repair works (replacing fuses, boards etc.) have to be done by trained service people only.

Accident Prevention

The same accident prevention rules are valid as for conventional lathes.

Note: the feed power of the slides is 1000 Newton (100 kp).

If program is not correct, the workpiece could be pressed out of the clamping device when it is not clamped and supported correctly.

Therefore use tailstock center for supporting the workpiece.

- + FOLLOW ALL ACCIDENT PREVENTION RULES
Read instruction manual before working with the machine.
- + ELECTRICAL CONNECTION: The electrical connections must be carried out professionally. A grounding receptacle must be available. Mounting of the plug (if not already mounted) must also be carried out professionally.
- + DO NOT ALTER GUARDS! Close belt guard before starting the machine. Never open belt guard while machine is running.
- + KEEP CHILDREN AND VISITORS AWAY! The machine should be stored so that children and visitors not acquainted with the use of the machine cannot start it.
- + ALWAYS WEAR SAFETY GOGGLES! Be also aware that some materials (for examp. brass) spray while being worked on. Therefore, it is important that all persons near the machine are protected.
- + WEAR PROPER APPAREL! Loose sleeves could get caught in chuck or workpiece.
- + KEEP WORK AREA CLEAN! Cluttered areas and benches invite accidents.
- + REMOVE ADJUSTING KEYS AND WRENCHES!
Even when machine is not being used. The chuck keys should never be attached to the machine with chains or similar.
- + USE CHIP HOOK for removing chips!
- + NEVER TOUCH RUNNING MACHINE PARTS!
Never try to stop workpiece or chuck with the hand.
- + DO NOT SURPASS THE CLAMPING CAPACITY OF THE LATHE CHUCK AND INDEPENDENT CHUCK! See maximum capacities.
- + BE CAREFUL OF EXTENDING CHUCKS! Never reach over running (rotating) chucks.
- + SWITCH MACHINE OFF BEFORE SERVICING!
Remove plug from socket.
- + TURN OFF MOTOR BEFORE ATTEMPTING adjustments, maintenance or measuring work.
- + USE ORIGINAL SPARE PARTS!

Technical Data

Center height	65 mm
Distance between centers	310 mm
Swing over bed	100 mm
Swing over cross slide	60 mm
Travel of cross slide	50 mm
Approx. net weight	55 kg

Tailstock:

Center sleeve diameter	22 mm
Tailstock taper	MT 1
Stroke of center sleeve	35 mm
Tool holder:	
max. steel section	12 x 12 mm

Headstock:

Hole through work spindle	16 mm
Spindle hole taper	MT 2

Feed motors:

Step motor	5°, 50 Ncm
Rapid feed	700 mm/min

Main spindle drive:

D.C. permanent magnetic motor; variable speed range 1 : 7, in 6 transmissions (speed ranges see inside cover)

speed range 50 - 3200 rpm.

Motor:

Data see motor plate. Overload protection of motor by current limits automatic power balance, thus practically constant speed, ammeter shows the actual motor load. Digital read out of main spindle speeds.

Manual feeds

Variable speed range from 10 - 400 mm/min
Rapid traverse 700 mm/min, via push buttons to
give directions and rapid speed button resp.
single step movement 0,0138 mm.
Digital path recording system in 0,01 mm.

Technical data CNC unit

1. Programm memory for 160 blocks
2. Feeds 2 - 499 mm/min and 0,002 - 0,499 mm/rev..
3. Rapid traverse speed 700 mm/min
4. Thread pitches from 0,02 - 4,99 mm (graded by 0,01 mm)
5. Radii from 0,5 - 59 mm
6. Alarms in the event of maloperation
7. Programm modification during operating sequence possible.
8. Inkremental programming
9. Magnetic tape memory (transfer and memorisation of the programm)

Programm system (N,G,X,Z,F)

N = Block numbers 00 - 159

G = Preparatory functions

00 = Rapid traverse

01 = Linear interpolation

02 ≠ 03 = Circular interpolation

20 = Intermediate stop

21 = Empty line

22 = End of programm

23 = DNC interface

26 = Tool calculation/compensation

33 = Thread cutting

64 = Feed motor without current supply

65 = Magnetic tape memory

66 = Interface RS 232

78 = Thread cutting cycles

84 = Turning cycles

90 = Absolute value programming

92 = Zero shift (preload registers)

94 = Feed rate in mm/min

95 = Feed rate in mm/rev.

X+Z = Input in 0,01 mm

F = Feed rate input in mm/min

F = Feed rate input in 0,001 mm/rev.

F = Thread pitch in 0,01 mm/rev.

F = Turret tool command 0 - 6:
indexing of the turret tool.

Unpacking, Cleaning the Machine

Check the machine for possible transport damages and for completeness of the delivered parts.

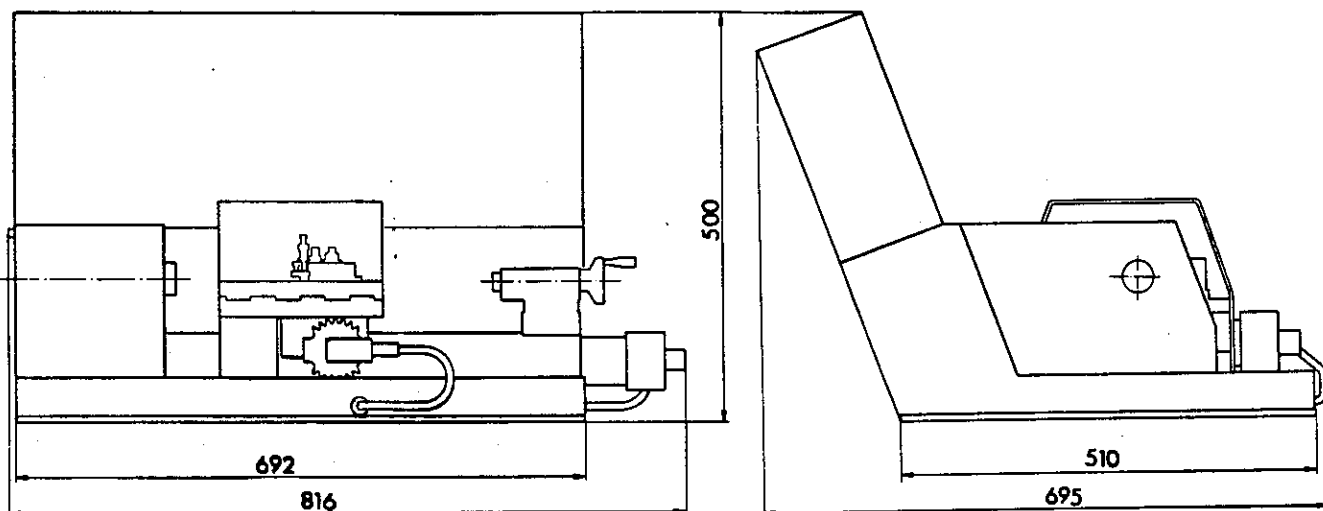
Setting-up

Place the machine to a stable table.
Recommended height approx. 650 mm (25").

Service, Repair of Machine

Service and repair work have to be done by trained service people only.

Overall Dimensions



Electrical Power Supply

Electrical connections must be done professionally. A grounding receptacle must be available. The voltage must be within V.

Care of Machine

The COMPACT 5 CNC is a precision machine tool. Exact care of the machine is a pre-requisite for the long-lasting precision and efficiency.

Have a look to the professionals operating their machines and how they care about it - and you will do it all right.

- Clean and oil all machine surfaces regularly!! (light machine oil) For cleaning use a brush of a cloth. Chips and dirt on the leadscrew cause quick wear of the leadscrew nut.
- Clean the spindle nose and threads before mounting the chuck or independent chuck.
- Never use force!

Main Elements of the COMPACT 5 CNC

Main motor – Spindle drive – Ammeter

D.C. permanent magnetic motor

Variable speed range 1:7

Speed range 600 - 4000 r.p.m.

Input power (P1) 500 W

Output power (P2) 300 W

Output power (P2) 440 W

How do you change the motor speed with a D.C. motor?

By changing the power of the current.

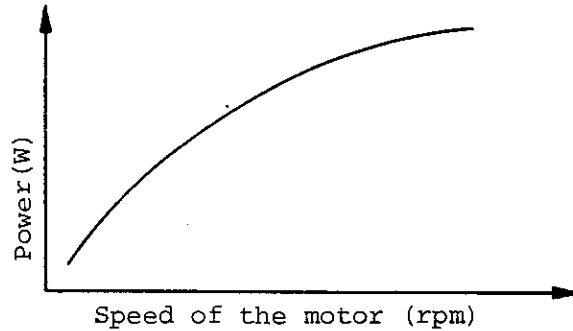
Current limitations:

The motor is protected against overload through a current limitation. An overload could cause a burning out of the motor. Current limitation therefore at 4 ampere.

Ammeter:

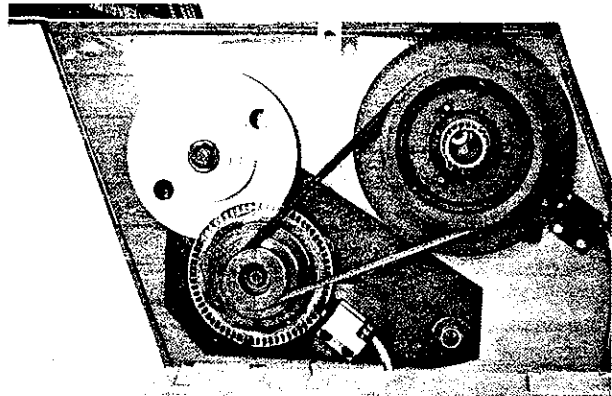
Indicates the actual current consumption of the drive motor.

R.P.M. Performance Diagram



Up to machine number 80 09 50 the light barrier and the perforated disc on the motor pulley controlled the motor speed (see illustration).

Starting from machine number 80 09 51 the motor speed is controlled electronically (I x R compensation). Therefore light barrier and perforated disc are not mounted.

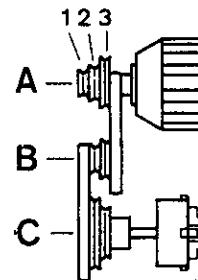


The belt pulley drive

The 6-pulley drive allows for a setting of the various ranges of revolutions of the main spindle.

Drive for range of revolutions BC1, BC2, BC3 (from Idler pulley to main spindle):

1. Belt pulley A (motor) belt pulley B (Idler pulley). The belt from A to B remains and is not changed.
2. Belt pulley B to belt pulley C (main spindle). The belt can be put on in 3 positions: BC1, BC2, BC3



Drive for range of revolutions AC1, AC2, AC3

From motor pulley A to main spindle pulley C.

The Idler pulley runs idle.

Change the belt position:

- Loosen hexagon nut (1).
- Lift motor up
- Put belt onto desired pulley
- Push down motor and tighten hexagonal screw.



The main spindle – R.P.M.-display

Range of revolutions: 50 - 3200 r.p.m.

Spindle nose: EMCO standard

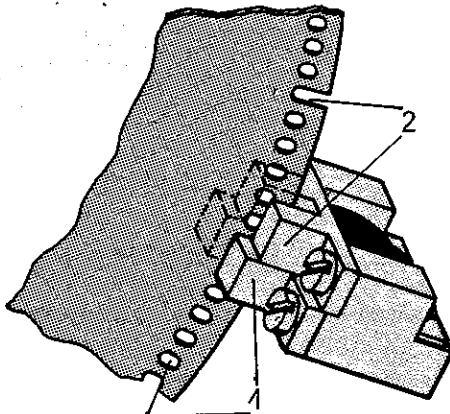
Hole through spindle: 16 mm

Inside spindle taper: MT 2

Clamping devices on main spindle:

- 3 - jaw chuck ϕ 80 mm
 - 4 - jaw chuck ϕ 80 mm
 - Independent chuck ϕ 90 mm
 - Mounting plate ϕ 90 mm
 - Collet holder for collets ESX 25
- Mounting instructions, chucking capacity, reversing of jaws, safety instructions - please refer to instruction book Compact 5.

PERFORATED DISC AND LIGHT BARRIER ON MAIN SPINDLE



1. Function for all turning operations except when screw-cutting

Via perforation ring 1 and light barrier 1 the main spindle speed is indicated on the digital read-out of the CNC-panel.

2. Function when screw-cutting

- Perforation ring 1, light barrier 1:

The speed of the main spindle is measured and reported to the Computer.

- Slot hole 2, light barrier 2:

The special start position of the main spindle is reported to the computer.

Drive of slides

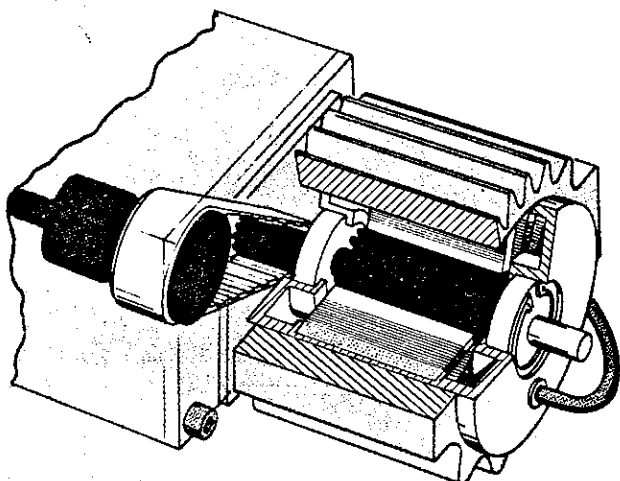
Step motors - Re-circulating ball screws

THE STEP MOTORS

Technical Data:

Single step 5°
Torque 0,50 Nm

As the name says, a revolution of the motor is divided into steps.



A revolution of the Compact 5 CNC step motors is divided into 72 steps, i.e. one step = angle of 5° ($360^{\circ} / 72 = 5^{\circ}$).

The limitation of the traverse paths (the Tack-Tack sound)

If you move the slides to the limit positions or against a stop, you will hear a tack-tack sound. The step motor receives impulses for further movement, but cannot move any further. That means overload on spindles, nuts and guide-ways of the slides.

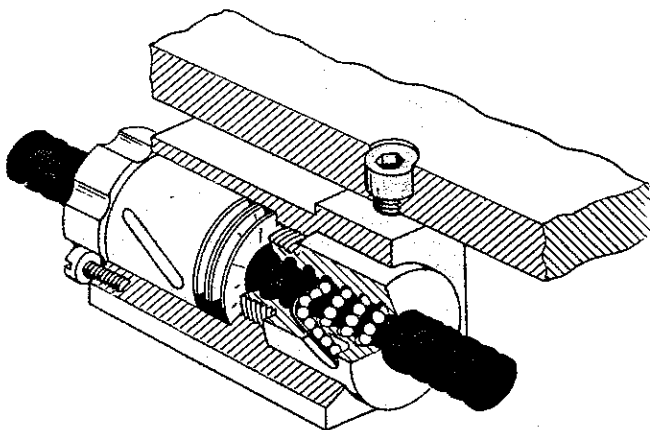
Thus you have to stop the feed when you work on "hand" operation.

You have to interrupt the program when you run on "CNC" operation.

Longitudinal- and cross slides

Technical Data:

- Traverse speed for longitudinal and cross slides:
Rapid traverse speed 700 mm/min
Variable feed rates (hand-operation)
10 - 400 mm/min
Programmable feed rates (CNC-operation)
2 - 499 mm/min resp. 0,002-0,499 mm/rev
- Smallest possible traverse path:
0,0138 mm
- Traverse path longitudinal slide
300 mm
- Traverse path cross slide 50 mm
- Indication on digital read-out in
0,01 mm
- Feed power on slides approx. 1000 N



Ball screws - Preloaded nuts

Longitudinal and cross slides are driven via ball screws. The screws run play-free in the nuts (no backlash).

Reduction step motor - feed screws

Smallest slide movement (for longitudinal and cross slides)

When the step motor turns by 5° (with the smallest step the slide will move 0,0138 mm).

Traverse path indication on digital read-out - slide movement

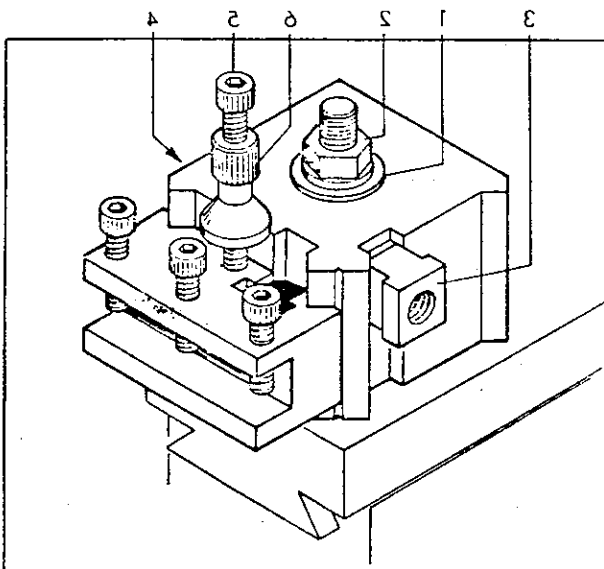
The traverse path will be indicated on the digital read-out in 0,01 mm

Steps (angle of step motors)	Traverse path (mm)	Read-out 1/100 mm
1. Step (5°)	0,0138	1
2. Step (10°)	0,0277	3
3. Step (15°)	0,0416	4
4. Step (20°)	0,0555	6
5. Step (25°)	0,0694	7
6. Step (30°)	0,0833	8
7. Step (35°)	0,0972	10
8. Step (40°)	0,111	11
9. Step (45°)	0,125	12

The toolholder

The tool holder can be fixed in a front or back position on the cross slide.
Ranges of diameter, please refer to page 1.6 .

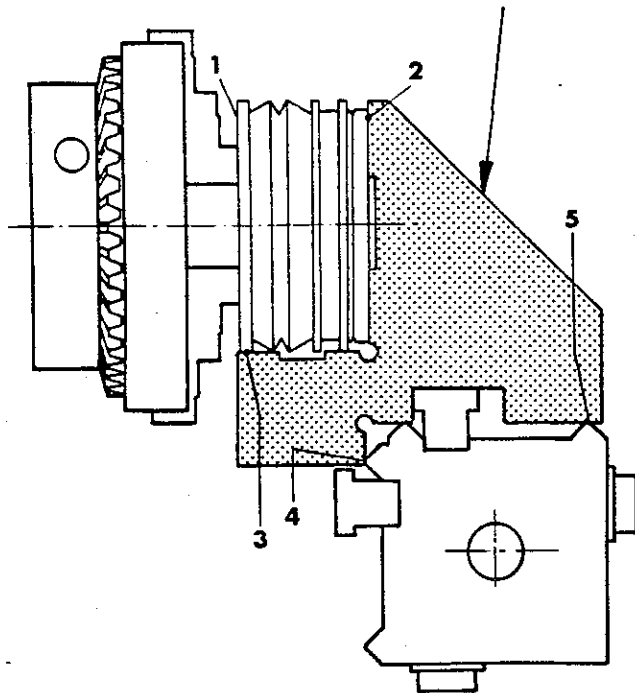
Max. tool section: 12x12 mm



Mounting

1. The basic element is placed onto the centering bolt of the top slide and tightened with the collar bush (1) and the hexagon nut (2).
2. Loosen the T-nut (3) with the hexagon head screw (4) and insert the toolholder from the top.
3. Loosen the socket head screw (5) and turn the knurled nut (6) until the main cutting edge of the tool is at exact center height. By retightening the socket head screw (5), the knurled nut is countered.
4. Clamp the toolholder with the hexagon head screw (4) (turning clockwise).

Template for new toolholder



Positioning of the quick change tool post
in required angle:

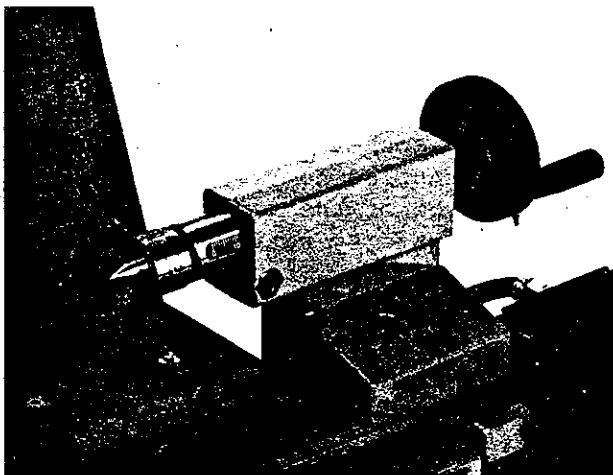
with template:

without template:

Position of quick change tool post parallel
to cross slide

The tailstock

The tailstock serves to support the
workpiece by using a center - as well
as for drilling/centering.



Drilling operation:

Drills up to \varnothing 8mm (0.314") to be moun-
ted in drill chuck. Drills of more than
8 mm need a MT1 so that they can be mounted
directly into the tailstock barrel.
Feed via handwheel and tailstock sleeve.

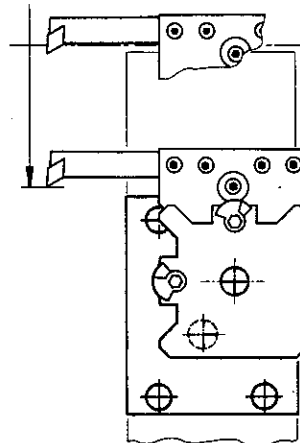
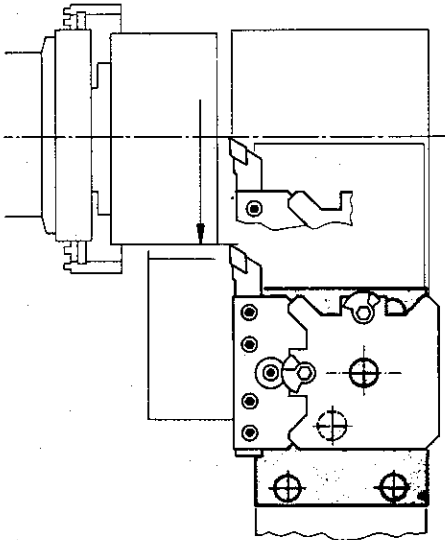
Positions of Toolholder

The toolholder can be clamped in front position and in back position.

Front position

Outside diameter
 $\varnothing 0$ to $\varnothing 80$ mm

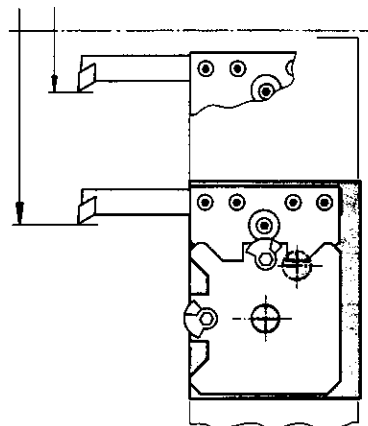
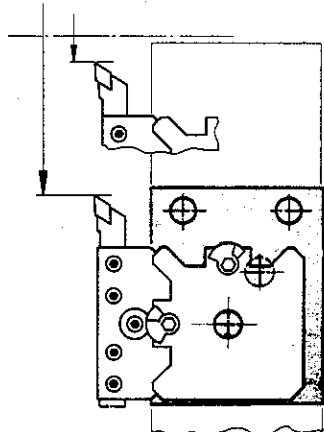
Interior diameter
 $\varnothing 14$ to $\varnothing 100$ mm



Back position

Outside diameter
 $\varnothing 20$ to $\varnothing 120$ mm

Interior diameter
 $\varnothing 50$ to $\varnothing 130$ mm

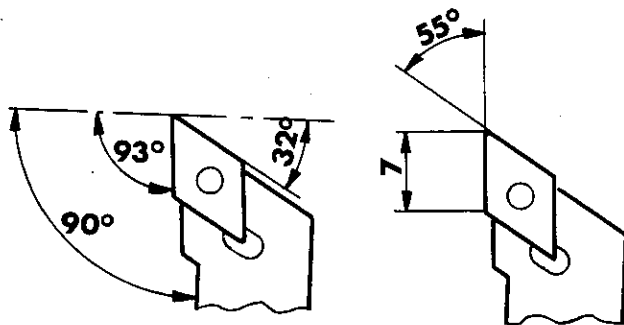


Please clamp the toolholder in the front position for our programming exercises.

The Right Hand Side Tool (T01)

Dimensions – Applications

The exercises make it possible to use the right hand side tool for all programming work, part 1. Further tools are explained in part 2 of the programming exercises.



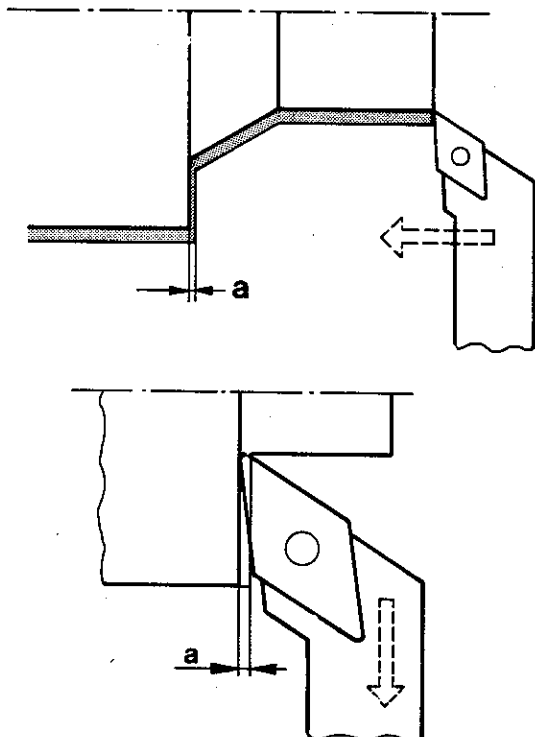
Examples of application:

Clearance angle $\alpha = 93^\circ$

1. Longitudinal turning, facing and angle turning:

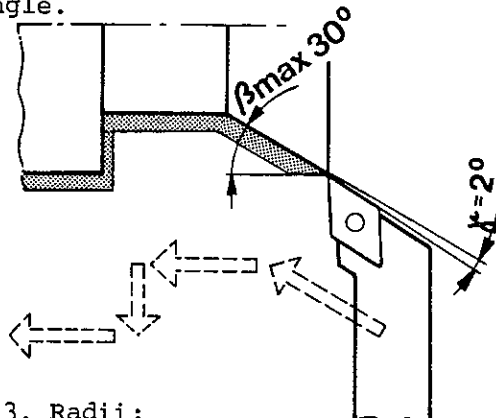
up to $\alpha = \max. 90^\circ$

The depth of cut "a" with facing must not be bigger than 0,3 mm, otherwise the chip flow is bad.

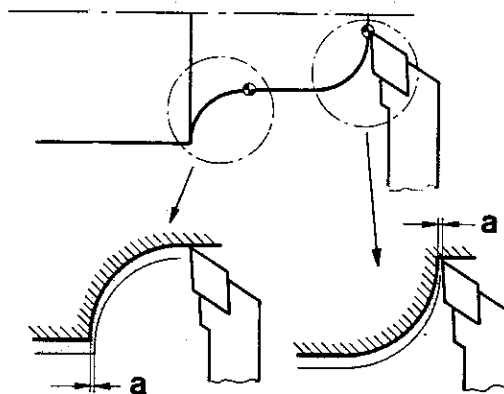


2. Shape turning:

β must not be bigger than 30° , otherwise there will be insufficient clearance angle.



3. Radii:

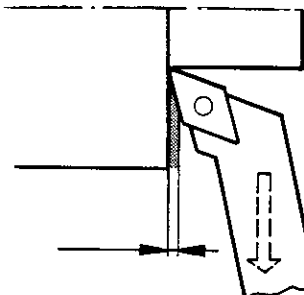


Depth of cut at the end of the 4th part of circumference
max. 0,3 mm

Depth of cut at the start of the 4th part of circumference
max. 0,3 mm.

OPERATING HINT 1

If you set the toolholder in another angle position, $\alpha = 100^\circ$, you can take bigger cuts when facing.



OPERATING HINT 2

Move with the transparent scale drawing of the tool bit along the shape of the drawing. You will immediately see if the depth of cut is too big.

Working Data

1. Cutting speed (Vs)

$$V_s \text{ (m/min)} = \frac{d \text{ (mm)} \times \pi \times S \text{ (U/min)}}{1000}$$

V_s = Cutting speed

d = Dia. of workpiece

S = Speed of main spindle

The max. acceptable cutting speed depends on: -

- Material of workpiece:

The higher the strength of the material, the lower the cutting speed.

- Material of tool:

Carbide tools allow for a higher cutting speed than HSS tools.

- Feed:

The larger the feed the lower the cutting speed.

- Depth of cut:

The larger the depth of cut the smaller the cutting speed.

Data for cutting speed and feed can be found in the various tool brochures of the manufacturers. These data are the technological basis for programming.

Cutting speed for programming exercises on the Compact 5 CNC

Workpiece material: automatic aluminium

Tool: carbide tips

Cutting speed for turning: 150-200 m/min

Cutting speed for parting off:
60-80 m/min

Feed size for turning: 0,02-0,1 mm/rev.

Feed size for parting off: 0,01-0,02 mm/r.

2. Calculation of spindle speed (S)

The cutting speed and the workpiece dia. enable you to calculate the speed of the main spindle.

$$S \text{ (rev/min)} = \frac{V_s \text{ (mm/min)} \times 1000}{d \text{ (mm)} \times \pi}$$

3. Calculation of feed (F)

On the Compact 5 CNC you program the feed in mm/min

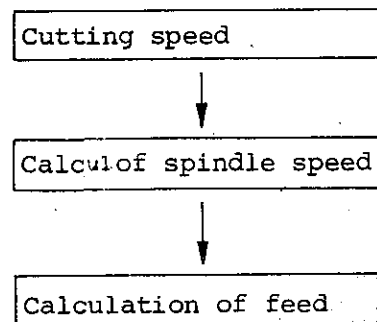
Conversion:

$$F \text{ (mm/min)} = S \text{ (rev/min)} \times F \text{ (mm/rev)}$$

F (mm/min) = Feed in mm per minute

S = Speed of main spindle

F (mm/rev) = Feed in mm per revolution



The charts on the following page save the calculation work.

Selection of Transmission Steps on COMPACT 5 CNC

The performance curve of a direct current motor depends on the number of revolutions. Choose the transmission step of the pulley drive such that the revolutions of the motor are within an optimum efficiency range (blue field).

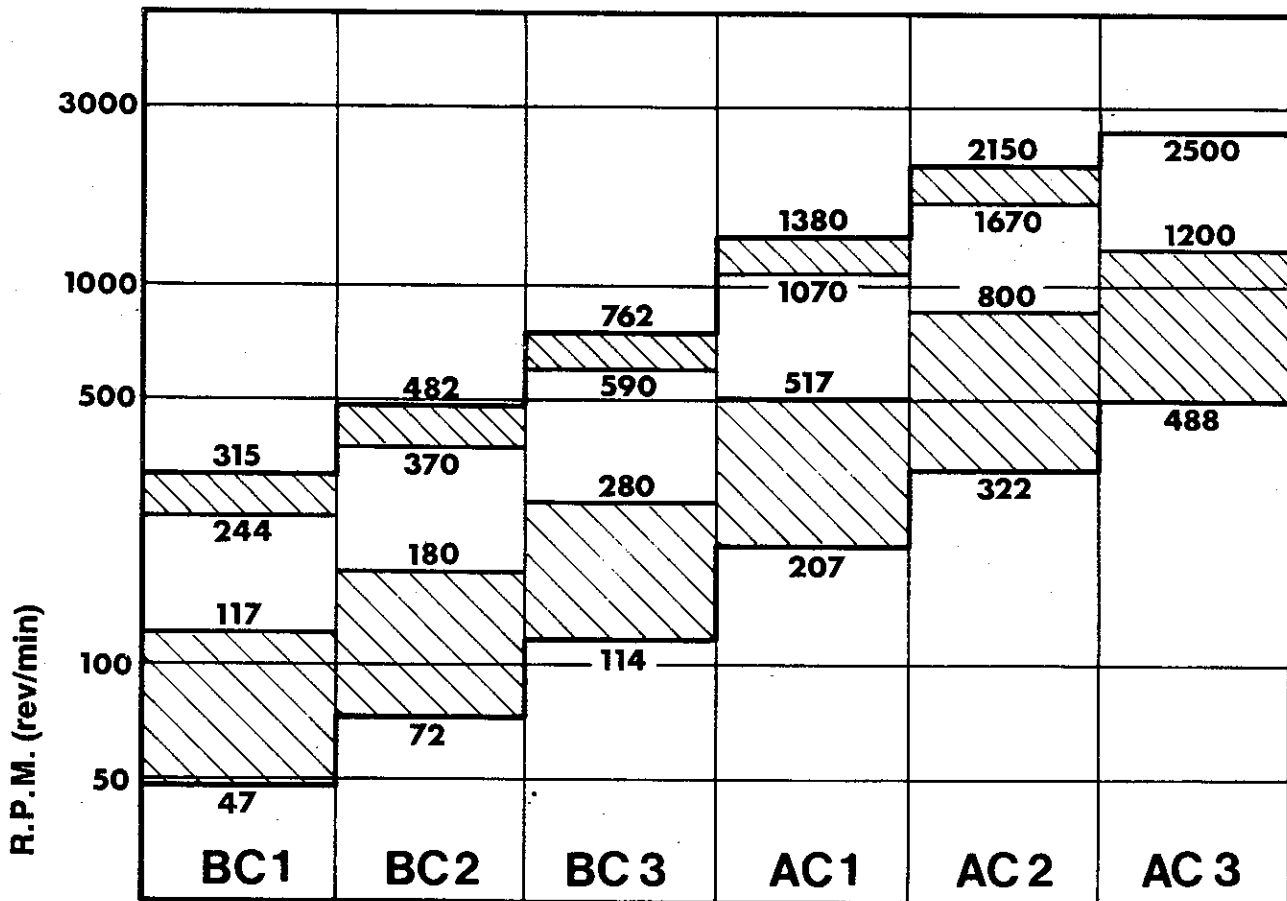
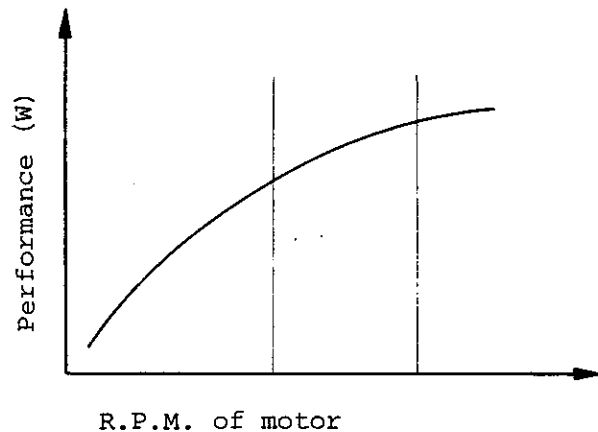
Example:

Number of revolutions for rough cuts:
600 rpm.

Number of revolutions for fine cuts:
800 rpm.

Optimum transmission step: AC1

With pulley position AC2 you would come into an unfavourable performance range.



Belt position

Finding the Cutting Values

(Metric Dimensions)

1. Finding the R.P.M.

You know

- Diameter of workpiece
- Suggested cutting speed

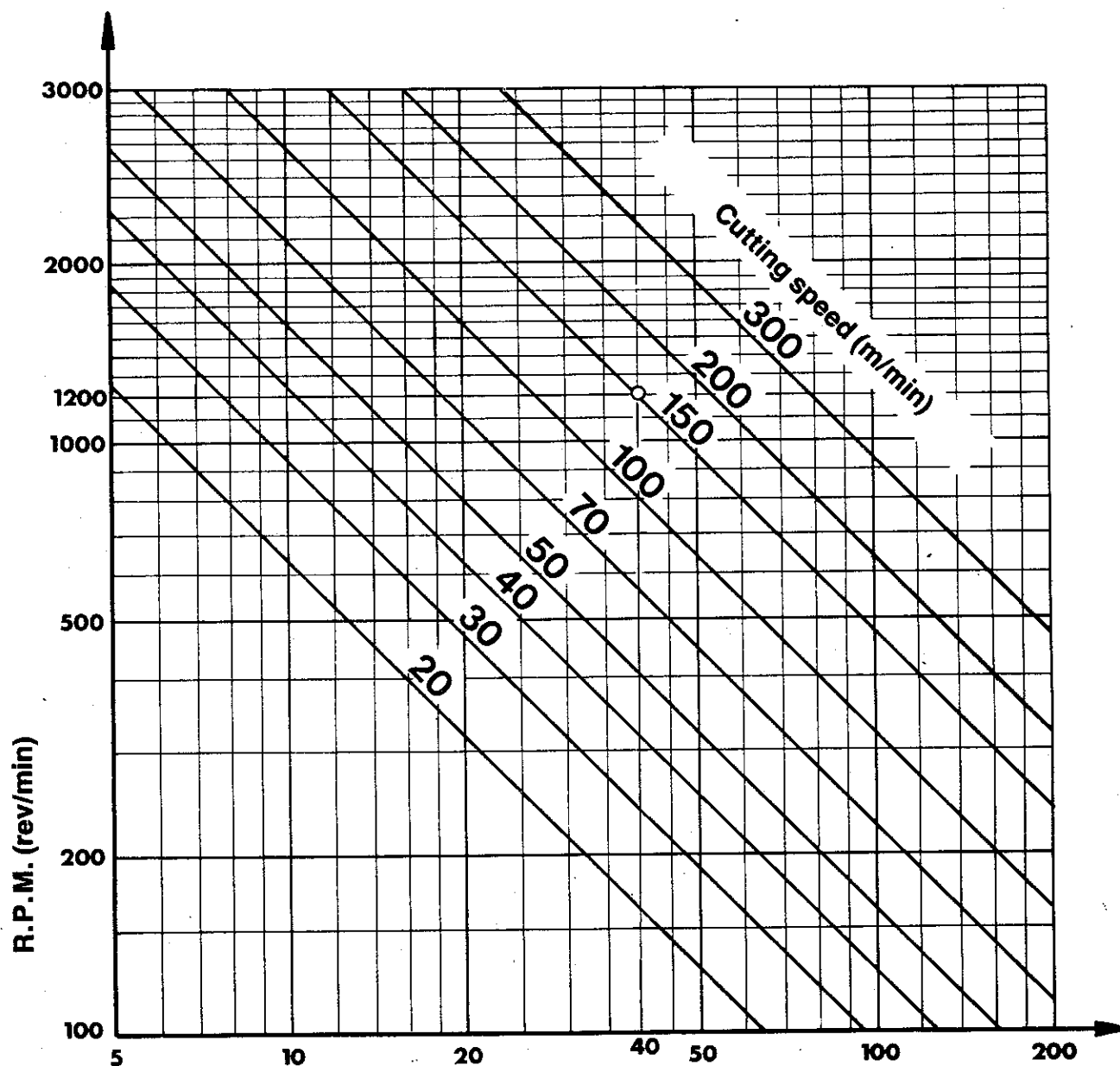
From the chart you can select the r.p.m.

Example:

Diameter of workpiece: 40 mm

Cutting speed: 150 m/min

Therefore: 1200 rpm.



2. Finding the feed speed in mm/min (Metric Dimensions)

You know

- Diameter of workpiece
- Feed size in rpm.

From the chart you select the feed in mm/min.

Example:

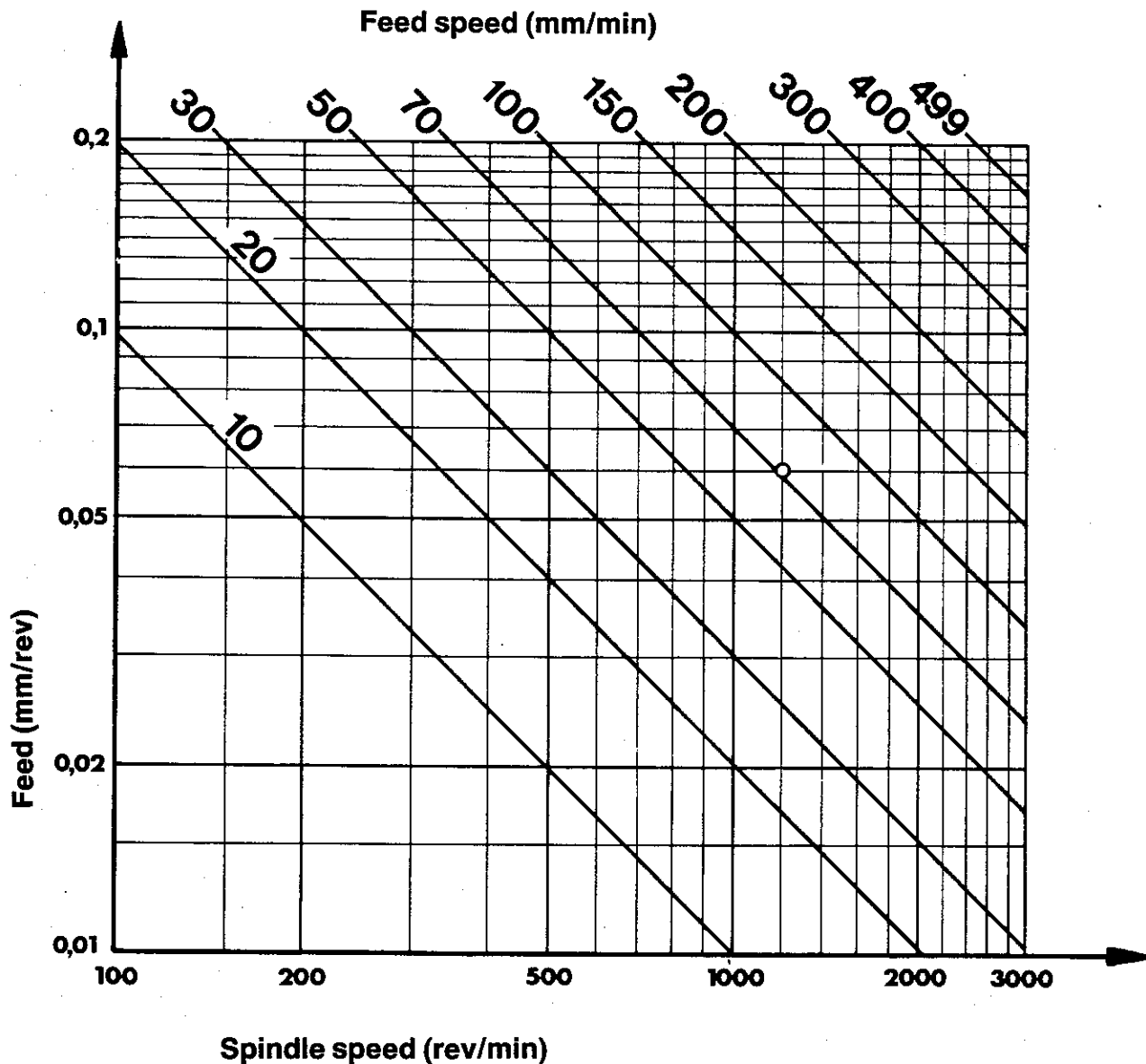
Spindle speed: 1200 rpm.

Feed: 0,06 mm/rev.

Results in feed speed: 70 mm/min

Feed chart

Conversion of feed (mm/rev into mm/min and vice-versa)



Survey

Path functions- block formats

G00 Positioning with rapid traverse
N../G00/X[±]...../Z[±].....

G01 Linear interpolation
N../G01/X[±]...../Z[±]...../F.....

G02 Circular interpolation (clockwise)
N../G02/X[±]..... /F.....

G03 Circular interpolation (counter-clockwise)

N../G03/X[±]..... /F.....

G20 Hold
N../G20

G21 Empty line
N../G21

G22 Programm end
N../G22

G23 DNC Interface
N../G23

G24 Radius programming (absolut)
N../G24

G26 Tool calculation/compensation
N../G26/X[±]...../Z[±]...../F....

G33 Thread cutting
N../G33 /Z[±]...../F.....

G78 Thread cutting cycles
N../G78/X[±]...../Z[±]...../F

G84 Turning cycles
N../G84/X[±]...../Z[±]...../F.....

G65 Magnetic tape operation
G65 (does not go into memory,
but is a simple switch function)

G64 Step motor without power
G64 (does not go into memory,
but is a simple switch function)

G66 Interface RS 232
N../G66

G90 Absolute value programming (dia)
N../G90

G91 Incremental value programming
N../G91

G92 Zero shift (preload registers)
N../G92/X[±]...../Z[±].....

G94 Feed rate in mm/min
N../G94

G 95 Feed rate in mm/rev.
N../G 95

Alarm signs

1. CNC operation

A00 Wrong G instruction

A01 Wrong radius input
Possible radii: 50/100/200/300
....5900

A02 Wrong X-value
X = 0 to X = ±5999 possible

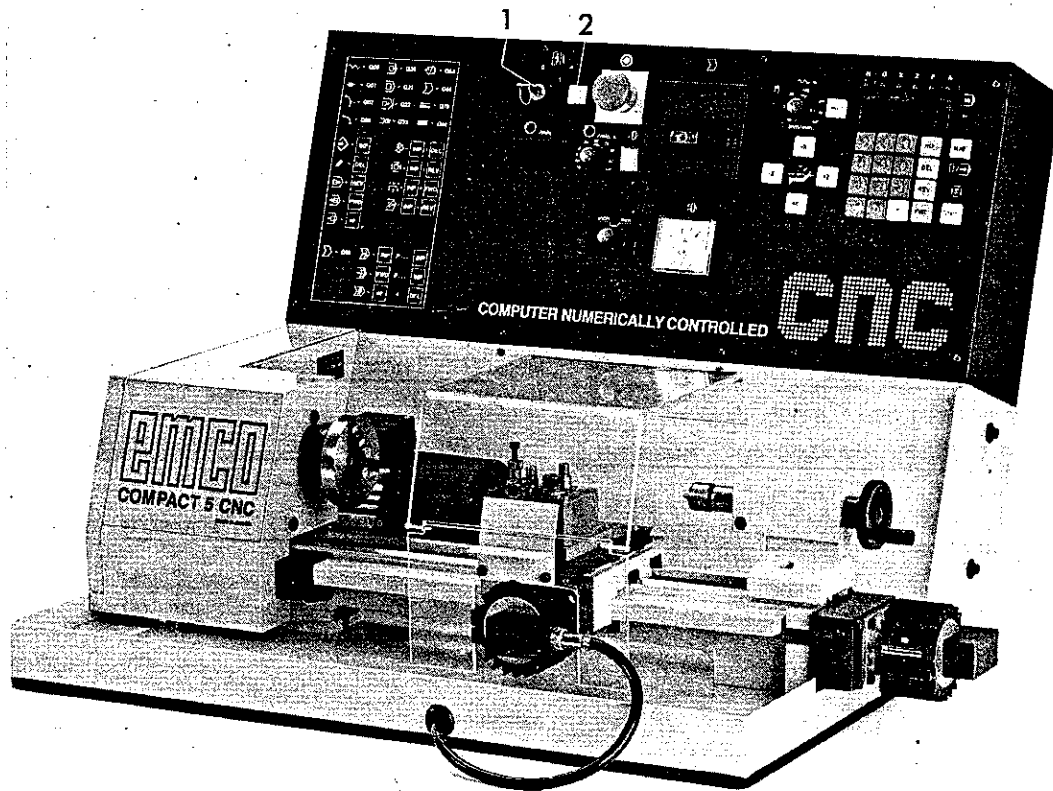
A03 Wrong F-value
F = 1 to F499 possible

A04 Wrong Z-value
Z = 0 to 39999 possible

A05 No G22 instruction programmed

A06 Main spindle speed too high for
threading

OPERATION ELEMENTS - HAND-OPERATED



1. Main switch

Turn key to the right. Machine and control system are energized.

2. Control lamp - main switch

When main switch is on, control lamp (2) is on.

3. Switch for drive of main spindle

4. Knob for control of main spindle speed

5. Display of main spindle speed

6. Knob for setting feed rate

In Z-direction (saddle) and X-direction (cross slide). Infinitely variable from 10 - 400 mm/min.

7. Control lamp - Hand-operation

The slides can only be moved by hand when lamp (7) is on.

8. Key board for feeds

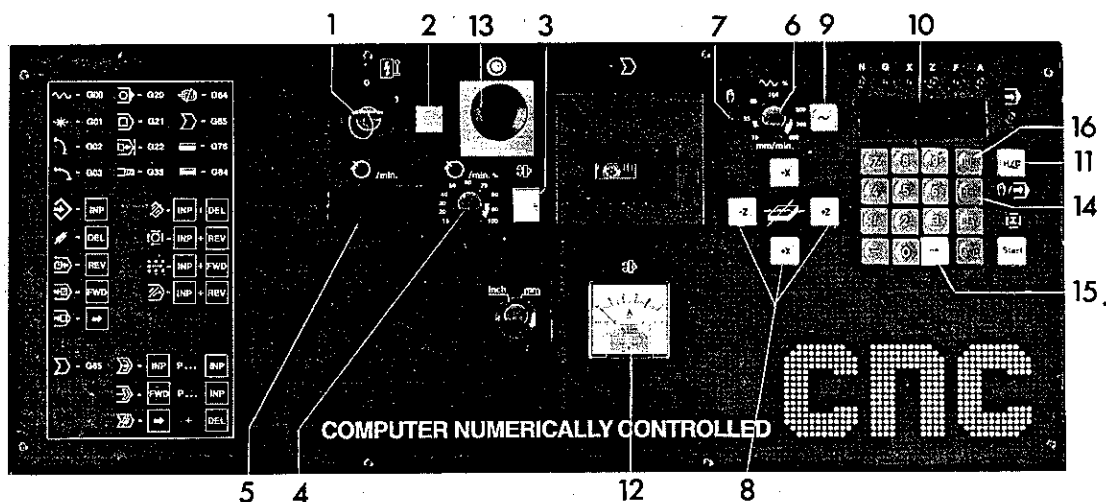
in \pm X and \pm Z direction

The symbol for slide shows the direction of movement and the relative key. The slides move at pre-set feed rate.

Tip operation: if you just tip the key slightly, the relative slide will move by 0,01 mm.

9. Rapid traverse key

If you press the feed key and the rapid traverse key at the same time, you achieve rapid movement of saddle or cross slide.



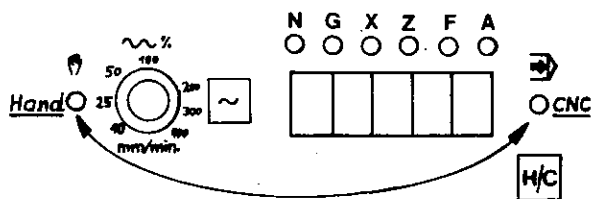
10. Display shows the paths

In \pm X and \pm Z-direction in hundredth of mm. The minus sign comes as point on the display.

● 1 5 2 = - 1,52 mm

11. Switch key: hand-operation to CNC-operation

If you press the key HAND/CNC, the light jumps from control lamp hand-operation to control lamp CNC-operation. If you press again, the light jumps back.



12. Ammeter for drive motor of main spindle

The ammeter indicates the actual current consumption of the drive motor. To protect the motor against overload, the current consumption must not exceed 2 Ampere at continuous operation. The load can be diminished by reducing depth of cut, feed rate or belt position.

For overload protection of the motor, the maximum power consumption is cut with 4 Amperes.

13. Emergency-stop-button

When pushing the emergency-stop-button, the current is cut from the main motor, feed motors and control unit.


Disengaging emergency-stop-button:

Turn button to the left. Switch on main switch.

14. DEL key

When pressing the DEL key, you clear X- and Z-display numbers (compare exercise).

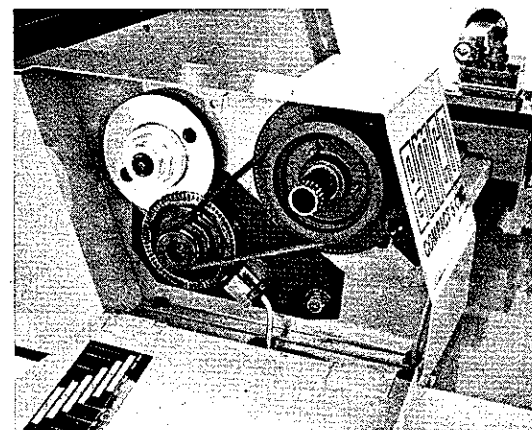
15. The X/Z switch over key

When operating the forward key , the display is showing path X, jumps to path Z and vice versa. So you can read both paths (X + Z).

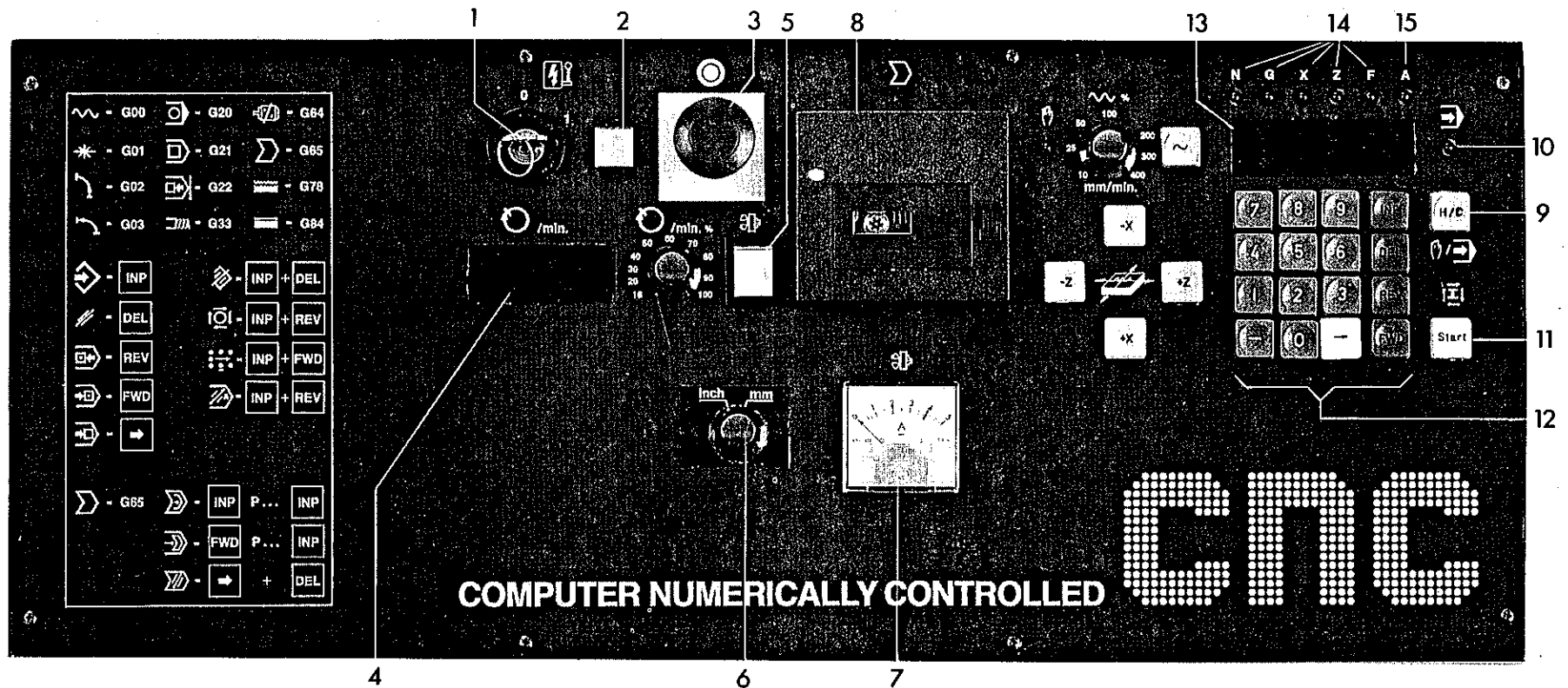
16. Input key INP

(Compare exercise)

17. Belt pulley drive



Operation- and Control Elements CNC-Operation



1. Main switch

Turn key to the right. Machine and control system are energized.

2. Control lamp - main switch

When main switch is on, control lamp (2) is on.

3. Emergency-stop-button

When pushing the emergency-stop-button you cut the current from the main motor, feed motors and control unit.

Disengaging emergency-stop-button:

Turn button to the left. Switch on main switch.

4. Display of main spindle speed

5. Main spindle button (on/off)

6. Switch for option between inch or metric programming (only US-machine version).

7. Ammeter for drive motor of main spindle

The ammeter indicates the actual current consumption of the drive motor. To protect the motor against overload, the current consumption must not exceed 2 Ampere at continuous operation. The load can be diminished by reducing depth of cut, feed rate or belt position. (safe range)

8. Cassette deck (accessory)

9. Switch key: hand-operation to CNC-operation

If you press the key H/C, the light jumps from control lamp hand-operation to control lamp CNC-operation. If you press again, the light jumps back.

10. Control lamp - CNC-operation

11. Start key [START]

When operating the start key, the recorded program will start.

12. Key board for input of program, correction of program, etc. (compare also detailed explanation)

12.1. Keys [0] to [9]

These keys serve for input of number combinations for addresses G/X/Z/F

12.2. Minus key [-]

When you press the key [-] after input of X or Z numbers, these will be recorded in thy memory as minus value.

12.3. Input key [INP]

When pressing the input key [INP], you record the value in the memory.

12.4. Delete key [DEL]

12.5. Reverse key [REV]

The display signal will jump back block by block, when operating [REV].

12.6. Forward key [FWD]

The display signal will jump forward block by block (NOO - NO1- NO2 etc.).

12.7. The [→] key

When operating the [→] key, the display signal will jump forward word by word. The recorded values will be shown.

N → G → X → Z → F

13. The display

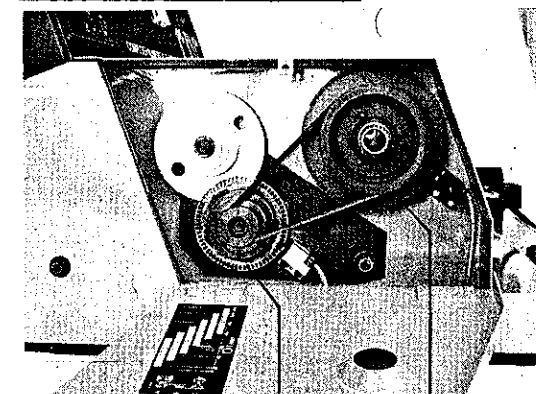
Indicating the number values of the relative words and the various alarm codes

14. Indication lamp for addresses

N / G / X / Z / F

15. Alarm lamp

16. Belt pulley drive



17. Perforated disc with impulse generator

To synchronize main spindle drive and feed drives; besides that for display of spindle speeds.

18. Perforated disc with impulse generator

To control load of drive motor of main spindle.

See also page 1.1, chapter: Load control of motor.

Summary

2. TAPE OPERATION

A08 Tape end with SAVE

A09 Program not found; no G22 programmed on tape

A10 Writing protection active

A11 Loading mistake

A12 Checking mistake

3. ONLY WITH METRIC/INCH TYPE MACHINE

A13 Inch/Millimeter change over with full program memory

A14 Wrong path dimension for loaded program

Inputs

Plus-Minus inputs of X,Z-values

Plus inputs: Figures to be put in without sign

Minus inputs: after input of figures press key .

Input of figures

X,Z values in hundredth of mm

F-values in mm/min

Thread pitches in hundredth of mm.

Operation

Program hold

Press key +

Program interruption

Press key +

Delete program

First press then
Block number must be indicated.

Delete alarm

Press key +

Correction of input

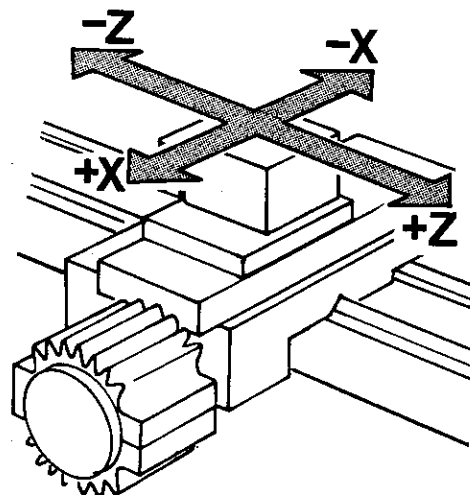
Press key , put in correct value, press key .

Cassette tape operation

See extra sheet!

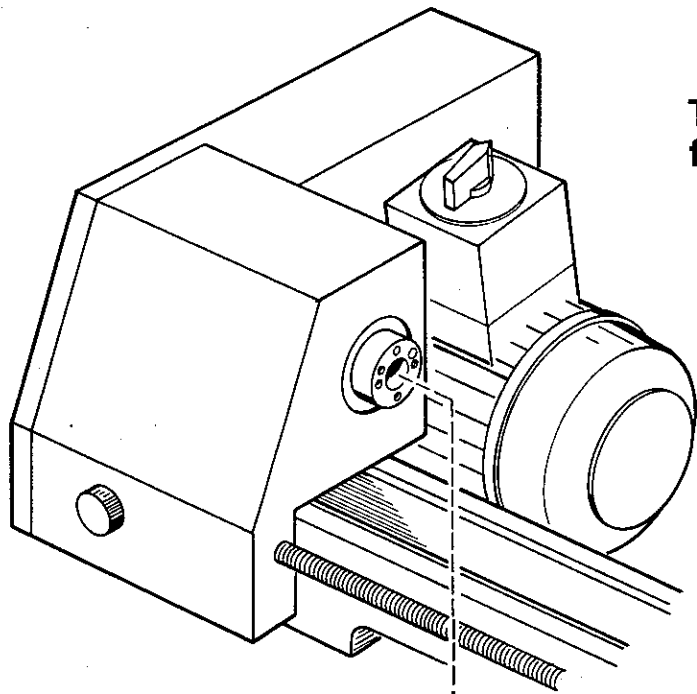
See chapter 7

The system of axes

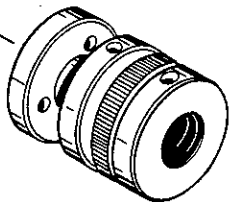


Adresses / Possible Inputs / Input Dimensions

1. Address N: Block numbers
160 blocks from N00 to N159
2. Address G: Preparatory functions (G functions)
3. Address X: Traverse path (coordinate) in⁺ X-direction
Input dimensions:
Metric input: in 1/100 mm without decimal point
Inch input: 1/1000 inch without decimal point
Possible X-values:
Metric-values: 0 - 5999 (0-59,99 mm)
Inch - values: 0 - 1999 (0 - 1,999 inch)
4. Address Z: Traverse path in⁺ Z direction
Input dimension:
Metric input: 1/100 mm without decimal point
Inch input: 1/1000 inch without decimal point
Possible Z-values:
Metric-values: 0 - 39999 (0 - 399,99 mm)
Inch-values: 0 - 1,9999 (0 - 19,999 inch)
5. Address F: a) Programming feed speeds
b) Programming thread pitches
c) Programming of turret tool command
- to a) Feed speed G94 (mm/min)
Metric input: mm per minute
Inch input: 1/10 inch per minute without decimal point
Possible inputs:
Metric input: 2 - 499 (2 - 499 mm/min)
Inch input 2 - 199 (2 - 19,9 inch/min)
Feed speed G95 (mm/rev.)
Input dimension:
Metric input: 1/1000 mm/rev.
Inch input: 1/10000 inch /rev.
Possible inputs:
Metric input: 2 - 499 (0,002 - 0,499 mm/rev.)
Inch input: 2 - 199 (0,0002 - 0,0199 inch /rev.)
- to b) Thread pitches (with G33, G78)
Input dimension:
Metric input: 1/100 mm/rev.
Inch input: 1/1000 mm/rev.
Possible inputs:
Metric input: 1 - 499 (0,01 - 4,99 mm/rev.)
Inch input: 1 - 199 (0,001 - 0,199 inch/rev.)
1000 - 5,025 TPI
- to c) Programming of turret tool command
Input dimension:
Metric input: (1) = One turn on turret tool
Inch input: (1) = One turn on turret tool



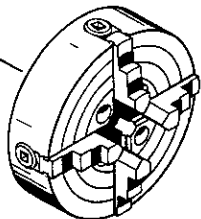
Turning: Clamping Devices for Workpieces (Summary)



Collet chuck attachment

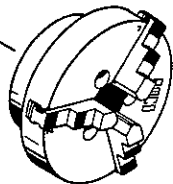
Clamping capacity 1,5 - 14 mm in connection with collets type ESX 25.

Round workpieces can be clamped with highest round-run accuracy using the collets. Collets leave no clamping marks on the workpiece.



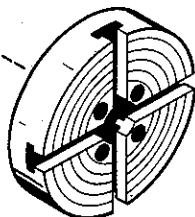
4-jaw independent chuck 90 mm diameter

With the 4-jaw independent chuck, workpieces can be clamped centrally and excentrically. Each jaw can be individually adjusted and reversed.



3-jaw chuck, 80 mm diameter

The 3-jaw chuck serves for centrally clamping round, hexagon or twelve-sided workpieces.



Clamping plate, 90 mm diameter

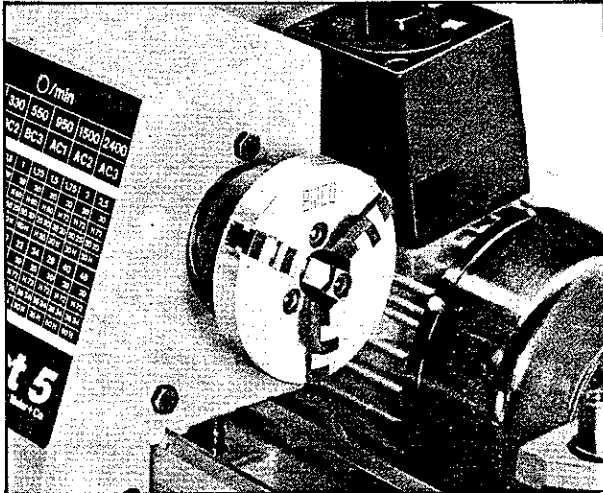
For clamping large-dimensioned workpieces that cannot be clamped with the 3-jaw or 4-jaw independent chuck. The workpiece is clamped by using the clamping shoes.

Clamping Devices – Working Examples

The illustrations show clamping tools mounted on Compact 5. Description and mounting are also valid for Compact 5 CNC.

3-Jaw chuck, $\varnothing 80 \text{ mm}$ ($\varnothing 3,15''$)

For centrally clamping of round, hexagon and 12-sided workpieces. Square workpieces cannot be clamped centrally with the 3-jaw chuck.



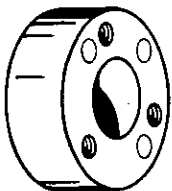
	$d_5 \text{ min.}$	$d_6 \text{ max.}$	$d_7 \text{ min.}$	$d_8 \text{ max.}$	$d_9 \text{ max.}$	$d_{10} \text{ min.}$	$d_{11} \text{ min.}$	$d_{12} \text{ max.}$	$d_{13} \text{ max.}$
mm	1	36	21	80	104	5	29	84	104
inch	0.04"	1.4"	0.8"	3.15"	4.1"	0.2"	1.15"	3.3"	4.1"

Mounting

Spindle nose and chuck bore must be dust-free. Mount the 3-jaw chuck onto the spindle nose with the 3 allen screws (M5 x 30, DIN 912).

Do not use longer screws - this would prevent the correct contact with the spindle nose.

Do not use shorter screws - the screws could break or tear out.



Threaded holes for
3-jaw chuck and
lathe dog guard

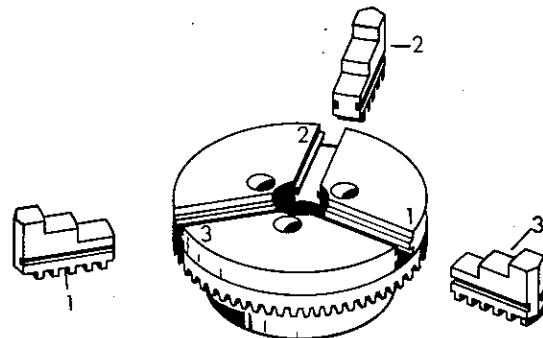
Reversing the Jaws

The jaws can be reversed: jaws mounted stepped outside or jaws mounted stepped inside. Note the correct mounting order for the jaws. Clean the jaws before re-inserting.

A) Jaws stepped inside (external):

Turn the toothed tension ring until the beginning of the spiral thread comes to groove 1.

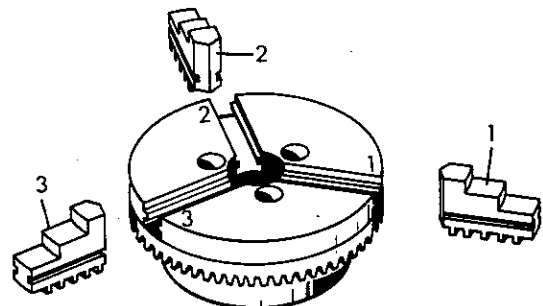
1. Insert jaw no. 3 into groove 1 and turn the tension ring until spiral comes to groove 2.
2. Insert jaw no. 2 into groove 2, turn tension ring.
3. Insert jaw no. 1 into groove 3.



B) Mounting the jaws, stepped outside:

Inserting order:

1. Jaw no. 1 in groove 1
2. Jaw no. 2 in groove 2
3. Jaw no. 3 in groove 3



Remark:

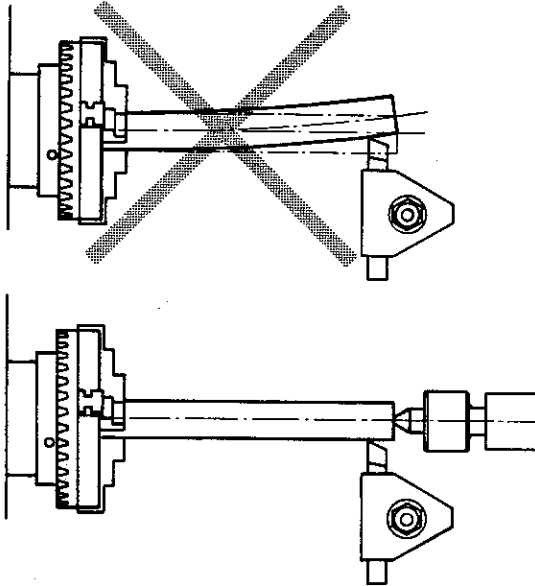
With lathe chuck Ref. Nr. V3U 176 and lathe chuck Ref. Nr. V3U 178 one set inside stepped jaws and one set outside stepped jaws are delivered. The number of jaws has to correspond with the number of groove.

SAFETY TIP

Never exceed the maximum clamping capacity of the chuck. This could cause the chuck teeth to break - the jaws and the workpiece would be thrown out and could cause severe injuries.

SUPPORTING LONG WORKPIECES

Long workpieces bend through the pressure of the tool and must be supported by the tailstock center.

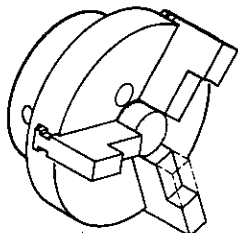


WORKING TIPS - PARTING-OFF

- Clamp workpiece with as minimum overhang as possible, so that it is not bent by the pressure of the tool.
- The parting-off tool must be clamped at exact center height and at a right angle to the turning axis.
- Use low spindle speed
- Oiling enables easier parting-off

Soft jaws for the chuck

The steps of the soft jaws must be turned by the user.
When turning these steps, clamp a round workpiece to fix the jaws.



Procedure:

Clamp a round workpiece and turn the step.

Safety tip:

The overhang of the jaws may never be more than 12 mm (1/2"), otherwise the teeth might break. If the teeth break, the jaw could be thrown out and cause severe injuries.

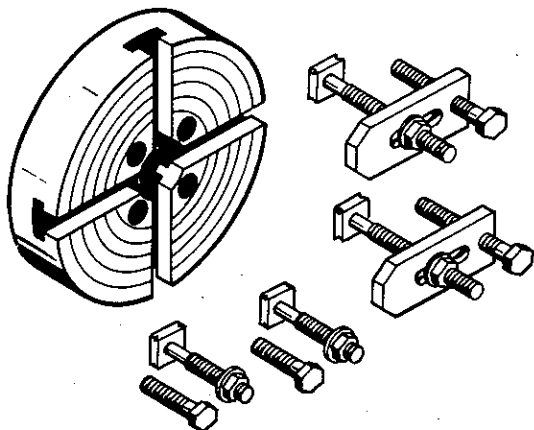
SAFETY TIP:

The steps must be turned so deep that the workpiece is clamped securely.

The Clamping Plate 90 mm diameter (\varnothing 3,54")

Clamping capacity using the small T-nut screws: up to 13 mm (1/2").

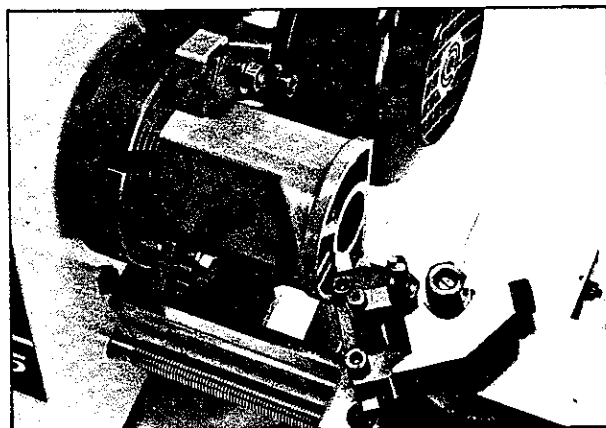
Clamping capacity using the big T-nut screws: up to 33 mm (1.3").



Often uneven or irregular shaped workpieces cannot be clamped with the 3-jaw chuck or the 4-jaw independent chuck. Using the T-nut screws and the clamping shoes, uneven or large-dimensioned workpieces can be clamped. The rings turned into the clamping plate serve as an aid for central clamping.

Mounting

Mount the clamping plate onto the spindle nose with the 4 socket head screws M5 x 20.

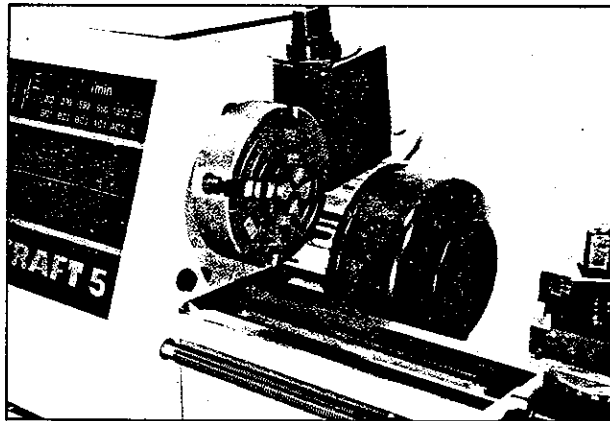


Safety Tip:

Uneven workpieces often cause unbalanced round-run. Therefore always work with low spindle speeds. Be careful of extending parts.

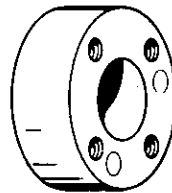
The Independent Chuck, $\varnothing 90 \text{ mm}$ ($\varnothing 3,54''$)

For clamping round, square, rectangular and uneven shaped workpieces. Each jaw can be adjusted individually. Workpieces can be clamped centrally and excentrically.



Mounting

Mount the independent chuck to the spindle nose with the 4 allen screws (M5 x 25, DIN 912).



Threaded bores for independent chuck.

Clamping Capacities

	$d_5 \text{ min.}$	$d_6 \text{ max.}$	$d_7 \text{ min.}$	$d_8 \text{ max.}$	$d_9 \text{ max.}$	$d_{10} \text{ min.}$	$d_{11} \text{ min.}$	$d_{12} \text{ max.}$	$d_{13} \text{ max.}$
mm	1	42	21	86	110	9	29	90	110
inch	0,04"	1,6"	0,8"	3,4"	4,3"	0,35"	1,15"	3,54"	4,3"

The Collet Chuck Attachment for the Lathe

Clamping capacity 1,5-14 mm (1/16"-35/64") using the collets type ESX 25.

Round workpieces can be clamped with highest round-run accuracy using the collets. Collets leave no clamping marks on the workpiece.

Mounting

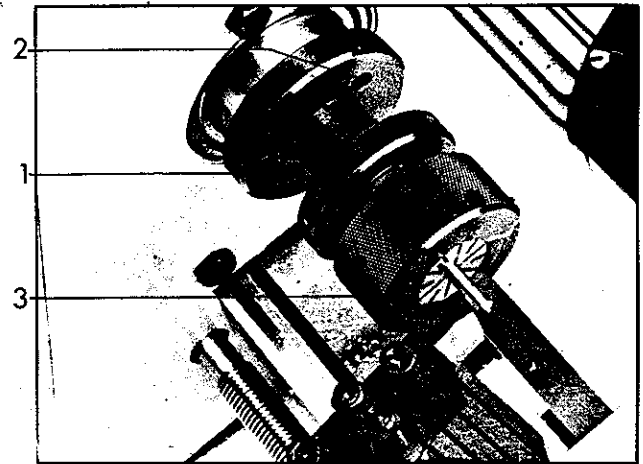
Mount collet holder (1) onto the spindle nose with the 3 hexagon screws (2).

Clamping the workpiece

Insert collet, loosen clamping nut (3), insert workpiece and re-tighten clamping nut with the socket head key. Tightening is done clockwise!

Changing the collets

When the clamping nut is removed, the collet is automatically ejected from the cone of the collet holder.

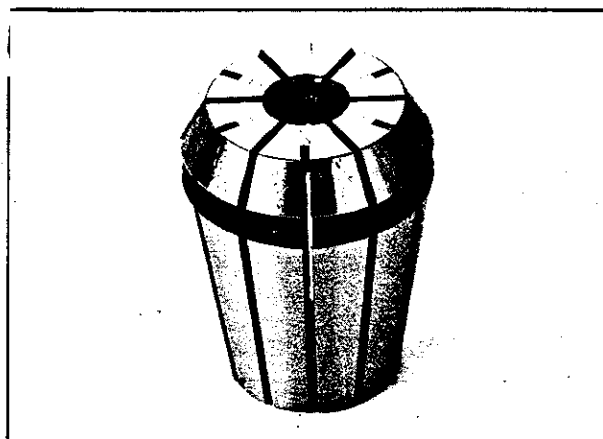


Care/Service

Clean and oil collet holder before and after use - chips and dirt could damage the clamping taper and cone and influence the precision.

The ESX 25 Collets

The metric and inch clamping capacity is engraved in the collets. Larger or smaller diameters cannot be clamped.



The Steady Rest

Capacities:

Smallest workpiece \varnothing : 2 mm (0.078")

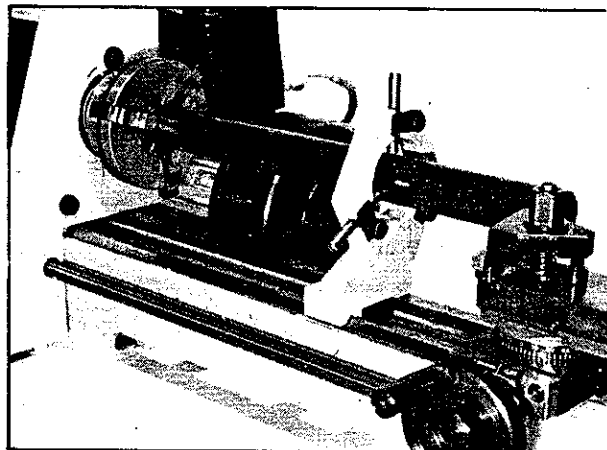
Largest workpiece \varnothing : 40 mm (1.57")

With some work, such as boring, drilling, turning pipes, taper turning, etc., the steady rest is necessary for supporting the workpiece, since the center cannot be used.

Also when turning very narrow (thin) workpieces, which are supported with the center, the steady rest prevents the workpiece from bending.

Mounting:

Mount the steady rest on the lathe bed with the clamping plate. Clamp the slide pins so that the workpiece is centrally supported, but not clamped.



A smooth pipe is turned internally and on the face side, supporting with the center is not possible.

Working tip:

Oil contact points to decrease friction and heating up.

Follow all Accident Prevention Rules!

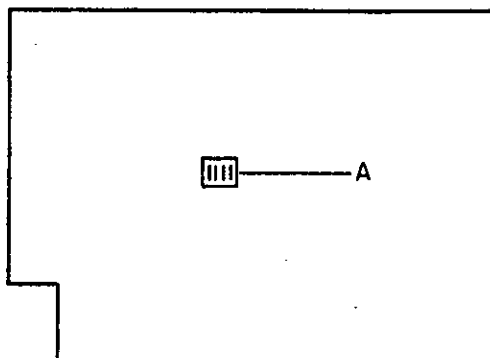
**Always wear Safety Goggles.
Foresight is better
than no Sight!**

**Never surpass the Clamping
Capacity of the Lathe Chuck
and the Independent Chuck!**

**Always check the Workpiece before
Working – is it securely clamped?**

Video Connection TV-Connection Interface RS 232

Setting language and frequency on the video board



Language and frequency are set with the code switch (A).

1. Frequency setting:

50 Hz: switch 2 "ON"

60 Hz: switch 2 "OFF"

Illustration shows position for 50 Hz

2. Languages are set with switch 3 and 4.

Combinations

Language	Switch 3	Switch 4
German	OFF	OFF
English	OFF	ON
French	ON	OFF
Spanish	ON	ON

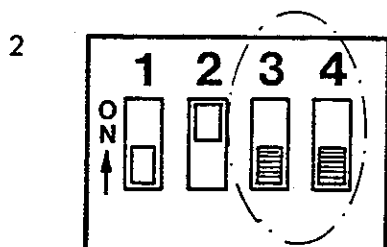
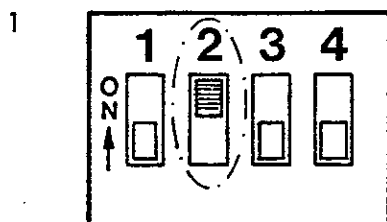


Illustration shows switch positions for German.

Note:

The first switch is without function.

The change of language appears when the machine is switched off and on.

TV-Characteristic

UHF receiving unit : frequency between

500 and 700 Megahertz

Transmitter frequency must be adjusted.

Plug for TV-connection is delivered with the machine.

Monitor Characteristic

Equipped for receiving BAS resp. COMPO-SIT signals.

Connection with Cinch cable.

Cinch cable is delivered with the monitor.

Interface RS 232

For connection of paper tape punchers, paper tape readers, printers, computer systems, etc.

For the connection of the several devices you must know the PINNING!

Pinning of COMPACT 5 CNC and F1-CNC

V24 Interface

Pin B	Transmit
A	Receive
C	GND
D	Request to send

20 mA Interface

Pin F	- 20 mA
G	+ Transmit
H	- Receive
J	+ 20 mA

Pin E	Baud-Rate	left open	300bd.
		conn. to GND	110bd.

Examples RS 232

a) 20 mA Interface:

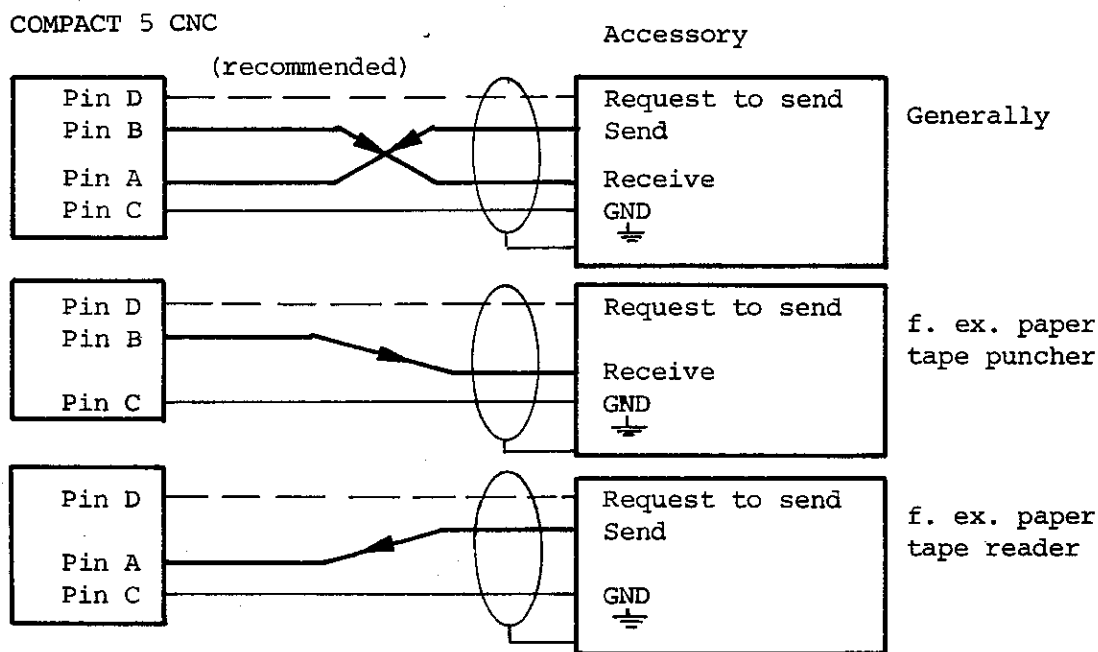
Connection to Teletype ASR 33
(Duplex operation, 110bd.)

COMPACT 5 CNC		TTY	
Pin J	Receive +	TB 7	
H	Receive -	TB 6	
G	Transmit +	TB 4	
F	Transmit -	TB 3	
<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> E } C </div> jumpered </div>		GND	GND Shield connected to ground

b) V24 Interface:

Connection to printer, paper tape recorder/paper tape puncher etc.

Note: If pins H and J are not used they must be jumpered.



RS 232 Connection / Some Tips

Connection with tape readers, punchers, computers, etc.

Pinning and cable type of COMPACT 5 CNC and F1-CNC see the page before.

The plug for the RS 232 Interface of the COMPACT 5 CNC and F1-CNC is delivered with the machine.

Connection:

Either the producer of the tape reader, puncher, computer, etc. makes the connection or he tells you the pinning of the device so that you yourself can make the connection.

Examples:

Possibility 1:

You send to the producer X the RS 232 plug of the COMPACT 5 CNC resp. F1-CNC and the pinning description (the page before). The producer X makes the cable to plug the COMPACT 5 CNC resp. F1-CNC with the tape reader, puncher, computer, etc.

Possibility 2:

You ask the producer of the paper tape reader, puncher, computer, etc. for the pinning of his device and mount the plugs yourself.

Activating RS 232:

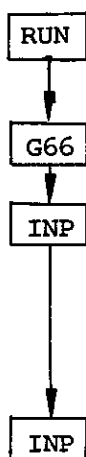
RS 232 is activated via G66. G66 does not enter the memory, it is a switching function.

Examples:

- o Transmission from paper tape to memory of COMPACT 5 CNC resp. F1-CNC

(With "Request to send" signal)

- Switch to CNC-mode (memory must be empty)
- Insert paper tape
- Start paper tape reader



1. Program G66

2. Press **INP**

On the display appears

A						

(A is the abbreviation for ASCII = American Standard Code for Information Interchange)

3. Press **INP**

The display shows

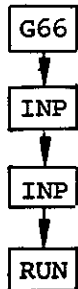
A		L	O			

(LO = LOAD)
The program is transferred. At the end of the transfer the display shows

N						

o Transmission from paper tape to COMPACT 5 CNC
resp. F1-CNC (without "Request to send" signal)

- Insert paper tape
- Switch to CNC-mode



1. Program G66

2. Press **INP** The display shows

A						
---	--	--	--	--	--	--

3. Press **INP** The display shows

A						
	L	O				

4. Start paper tape reader (transmission begins)

o Transmission from COMPACT 5 CNC resp. F1-CNC to
paper tape (with or without "Request to send"
signal)

- Switch to CNC-mode
- Insert paper tape
- Start paper tape puncher



1. Program G66

2. Press **INP** Display shows

A						
---	--	--	--	--	--	--

3. Press **FWD** Display shows

A						
	S	A				

(SA = SAVE)

The paper tape is punched.

RS 232 C Connection Cable for COMPACT 5 CNC and F1-CNC

Order No. 260 170

The V24 Interface is used with this cable. The machine (COMPACT 5 CNC/F1-CNC) is thus set at 300 baud.

Pin occupancy of the cable (standard) for V24 Interface

Pin B	Transmit	Pin 3
A	Receive	2
D	Request to send	5
C	GND	7
H		
J	Bow contact	

COMPACT 5 CNC
F1-CNC

25-pin RS 232 plug for peripheral device

The only "handshake line" of the COMPACT 5 CNC and F1-CNC is intended for the "request to send" (RTS) signal. The RTS core is connected to pin 5 of the 25-pin plug. The Interface of the COMPACT 5 CNC/F1-CNC does, however, function without the request to send signal. (A handshake line is a control line for the data flow. It releases or stops a transmission)

Notes in the event of problems with Interface RS 232 C

Since the COMPACT 5 CNC and the F1-CNC do not depend on a handshake line, you can presume that the transmission and reception mode will be carried out (simple design of the Interface on COMPACT 5 CNC and F1-CNC).

Trouble-shooting in the event of problems

1. Check whether the peripheral device actually has a RS 232 Interface. That is a BIT serial Interface and not a BYTE serial, such as Centronics or IEEE 488.
2. Check whether the V24 or 20 mA Interface on the peripheral device is active.

Pin occupancy COMPACT 5 CNC/F1-CNC

Pin occupancy RS 232 Interface:

V24 Interface

Plug Pin B	Transmit
A	Receive
C	GND
D	Request to send

20 mA Interface

Plug Pin F	- 20 mA
G	+ Transmit
H	- Receive
J	+ 20 mA

Plug Pin E	Baud rate	open	300 bd.
		to GND	110 bd.

If you use the 20 mA connection, open bow contact H/J and note the baud setting.

3. 110 or 300 baud rate: Check setting on peripheral device and COMPACT 5 CNC or F1-CNC.

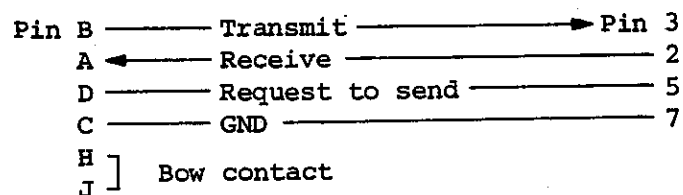
With the EMCO cable, the COMPACT 5 CNC/F1-CNC is set at 300 baud (Pin E not with Pin C - GND - with bow contact).

4. The Interface of data receiver (e.g. printer, PC ...) must be equipped with a buffer memory (due to the lack of handshake signals of the COMPACT 5 CNC/F1-CNC).
5. Check the pin occupancy TRANSMIT and RECEIVE.

Transmit: From COMPACT 5 CNC/F1-CNC to peripheral device (the peripheral device is the receiver).

Receive: From the peripheral device to COMPACT 5 CNC/F1-CNC (the peripheral device is the transmitter).

Pin occupancy of the cable:



COMPACT 5 CNC
F1-CNC

Peripheral device

6. Check whether your peripheral device is operating without the cabling of the handshake line, or if the handshake lines must be functionally disconnected (bow contact, DIL-switch, etc.)

Data formats COMPACT 5 CNC/F1-CNC

You can also obtain the data format by printout of a punched tape.

Data format COMPACT 5 CNC for RS 232 Interface

```

123456789012345678901234567890 31 32
% CR LF
↑↑↑N00↑G00↑X-↑↑↑2↑Z-↑↑↑12↑F↑↑↑ CR LF
↑↑↑N01↑G01↑X↑5999↑Z↑39999↑F499 CR LF
↑↑↑N02↑G02↑X-↑500↑Z↑↑↑↑↑↑F↑↑2 CR LF
↑↑↑N03↑G03↑X↑2000↑Z↑↑↑↑↑↑F120 CR LF
↑↑↑N04↑G90↑X↑↑↑↑↑↑Z↑↑↑↑↑↑F↑↑↑ CR LF
↑↑↑N05↑G92↑X-↑100↑Z↑↑↑200↑F↑↑↑ CR LF
↑↑↑N06↑G01↑X↑9998↑Z↑39999↑F↑80 CR LF
↑↑↑N07↑G33↑X↑↑↑↑↑↑Z-↑1000↑F150 CR LF
↑↑↑N08↑G78↑X↑↑↑20↑Z↑↑4000↑F200 CR LF
↑↑↑N09↑G84↑X-↑↑↑2↑Z↑↑↑↑↑4↑F↑↑4 CR LF
↑↑↑N10↑G91↑X↑↑↑↑↑↑Z↑↑↑↑↑↑F↑↑↑ CR LF
↑↑↑N11↑G20↑X↑↑↑↑↑↑Z↑↑↑↑↑↑F↑↑↑ CR LF
↑↑↑N12↑G22↑X↑↑↑↑↑↑Z↑↑↑↑↑↑F↑↑↑ CR LF
↑↑↑M

```

CR ... Carriage return	ASCII=13
LF ... Line feed	ASCII=10
↑ ... Space	ASCII=32
M ... Metric program	ASCII=77
" ... Inch program	ASCII=34
- ... Minus sign	

When programs are received, the data format must be fully retained, otherwise the programs will not be correctly stored.

7. Transmission from COMPACT 5 CNC/F1-CNC to the peripheral device: the COMPACT 5 CNC/F1-CNC transmits 7 bit ASCII code. The eighth bit is intended as parity bit, which is not, however, transmitted.

In the event of reception, a parity bit can be transmitted, although it is not required and is disregarded by the COMPACT 5 CNC/F1-CNC.

At 110 baud, one start bit and two stop bits are transmitted.

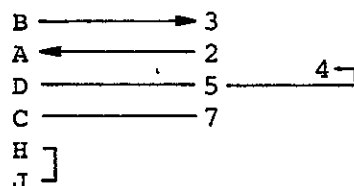
At 300 baud, one start bit and one stop bit are transmitted.

Peripheral device remarks, control lines

The control line connections differ according to the device. Please note the instructions.

- Where the peripheral device requires control lines for operation, the clear to send (Pin 4) can be connected with the request to send (Pin D) of the COMPACT 5 CNC/F1-CNC.

The second possibility would be, to bow connect Pin 4 and Pin 5.



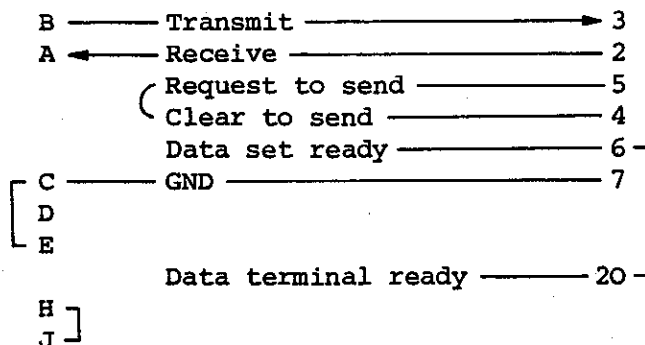
- There are also devices which require the additional signal "Data Terminal Ready". This signal can be generated by bow connection of Pin 6 and 20.

Example of a connection:

4/5 bow connected

6/20 bow connected

C/E bow connected (setting at 110 baud).



Data formats F1-CNC for RS 232 Interface

```

123456789012345678901234567890 31 32
% CR LF
↑↑↑↑N-↑G-↑↑K↑↑-↑↑Y↑-↑↑↑Z↑-↑F↑↑ CR LF
↑↑↑↑00↑21↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑ CR LF
↑↑↑↑01↑S1↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑ CR LF
↑↑↑↑02↑00-18839-8883↑↑↑↑↑↑↑↑↑↑ CR LF
↑↑↑↑03↑00↑↑↑↑00-1234-18836↑↑↑↑ CR LF
↑↑↑↑04↑00-↑↑↑0↑↑↑↑00-↑↑↑0↑↑↑↑ CR LF
↑↑↑↑05↑01-↑↑↑12↑↑↑12↑↑↑↑↑↑499 CR LF
↑↑↑↑06↑01-12345↑↑↑00-12345↑↑02 CR LF
↑↑↑↑07↑02↑↑8889↑8889↑↑↑↑↑↑100 CR LF
↑↑↑↑08M99J↑↑↑01K↑↑89↑↑↑↑↑↑↑↑ CR LF
↑↑↑↑09↑03↑↑↑↑00-↑100↑↑↑100↑100 CR LF
↑↑↑↑10↑04↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑ CR LF
↑↑↑↑11↑21↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑ CR LF
↑↑↑↑12↑25↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑L221 CR LF
↑↑↑↑13↑27↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑L↑06 CR LF
↑↑↑↑14↑40↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑ CR LF
↑↑↑↑15↑45↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑ CR LF
↑↑↑↑16↑46↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑ CR LF
↑↑↑↑17↑47↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑ CR LF
↑↑↑↑18↑48↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑ CR LF
↑↑↑↑19↑72-↑1234↑↑↑12↑↑↑456↑↑45 CR LF
↑↑↑↑20↑81↑↑↑↑↑↑↑↑↑↑↑-12345↑120 CR LF
↑↑↑↑21↑62↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑01↑↑09 CR LF
↑↑↑↑22↑83↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑125↑↑09 CR LF
↑↑↑↑23↑69↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑1234↑232 CR LF
↑↑↑↑24M00↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑ CR LF
↑↑↑↑25M05↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑ CR LF
↑↑↑↑26M06D↑88898889-19999↑499 CR LF
↑↑↑↑27M17↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑ CR LF
↑↑↑↑28M30↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑ CR LF
↑↑↑↑29↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑ CR LF
↑↑↑↑30↑92↑↑1000↑↑100-↑↑100↑↑↑ CR LF
↑↑↑MI

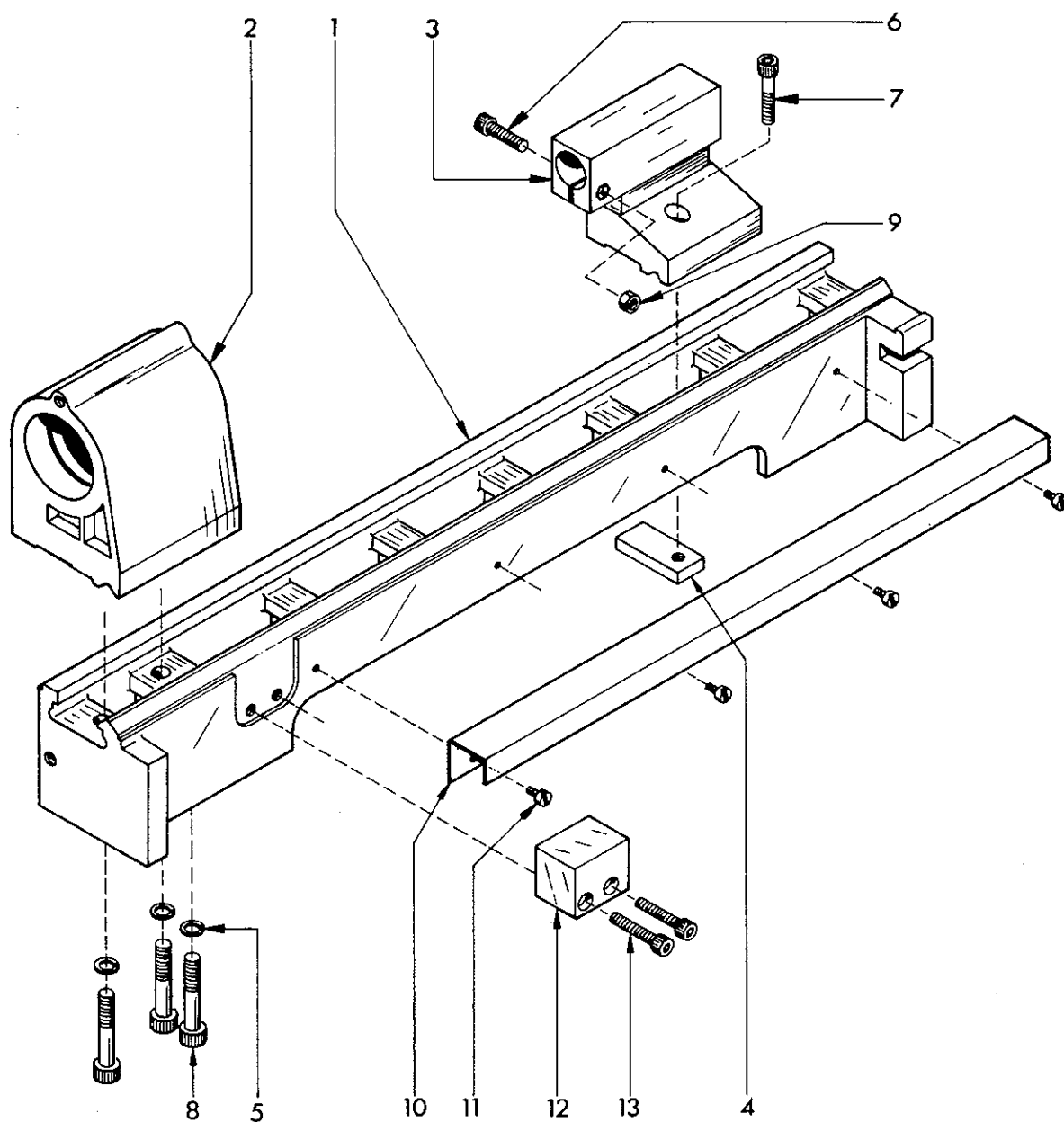
```

↑	Space	
—	Apostroph	
CR	Carriage Return	
LF	Line Feed	
-	(Minuszeichen) Waagrechtfräsmaschinenprogrammierung	Minus sign / Horizontal programming
I	Senkrechtfräsmaschinenprogrammierung	Vertical programming
"	Zoll-Programmierung	Inch programming
M	Metrisch-Programmierung	Metric programming

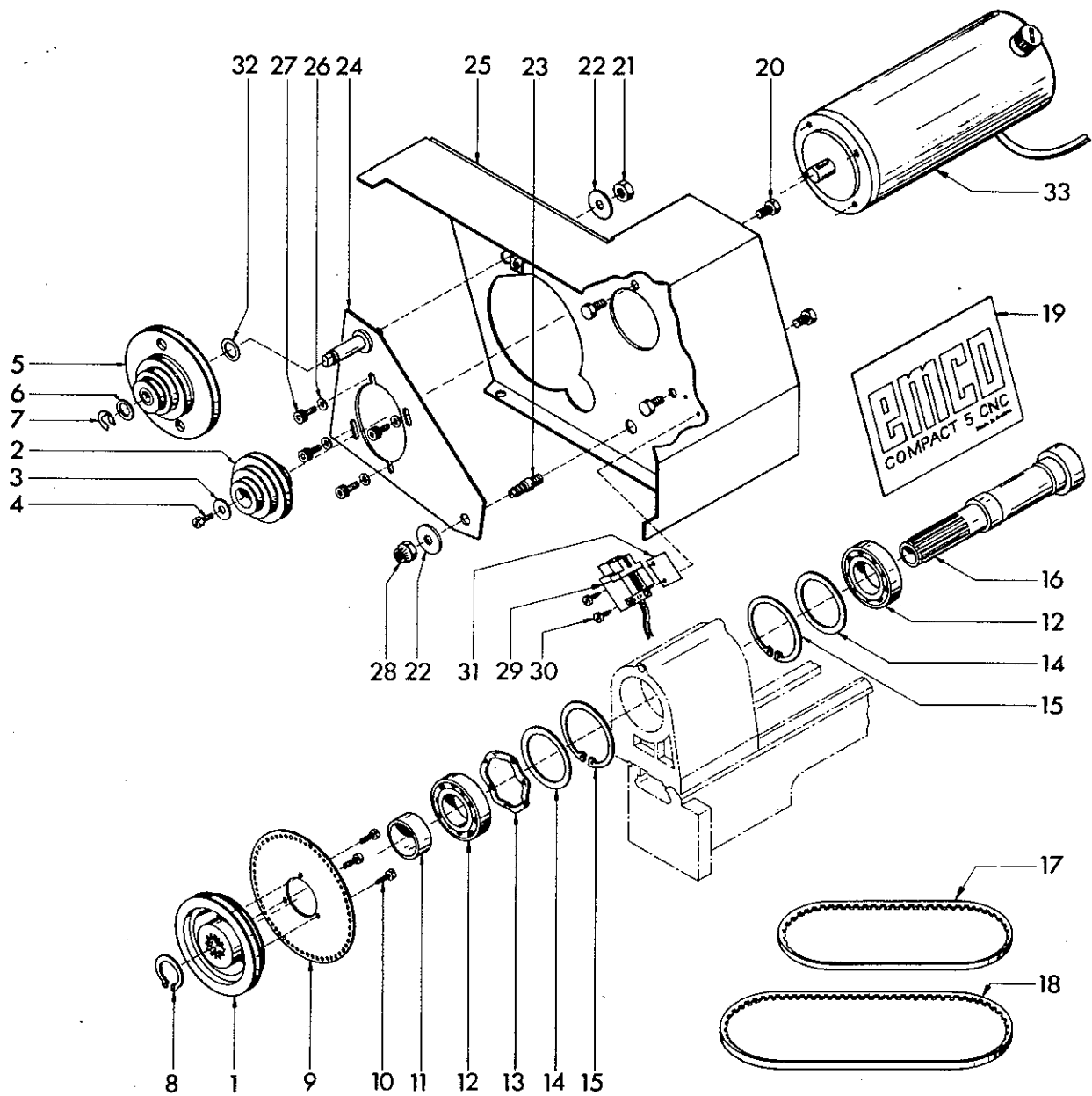
SERVICETEILE

SERVICE PARTS

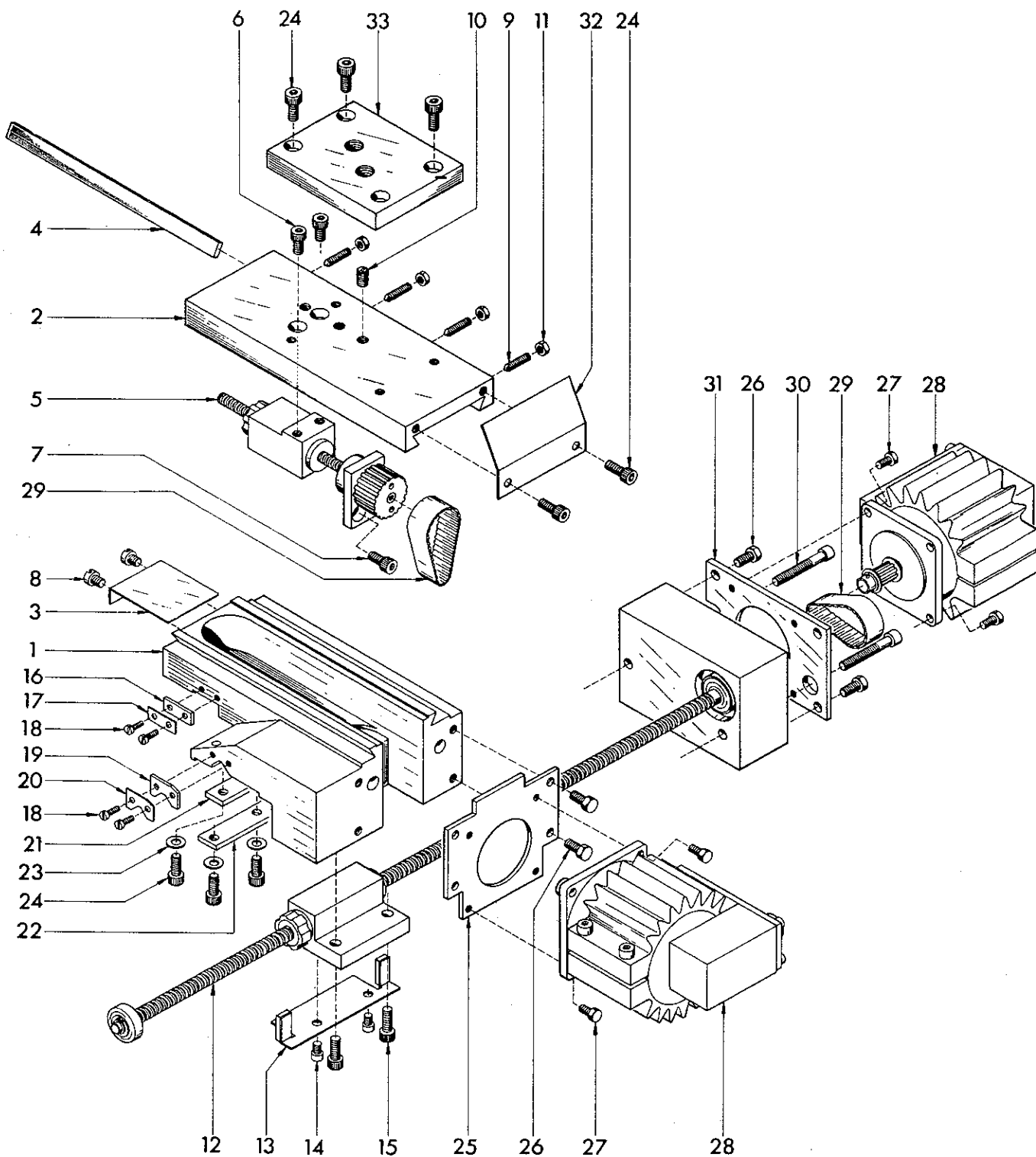
PIECES DE SERVICE



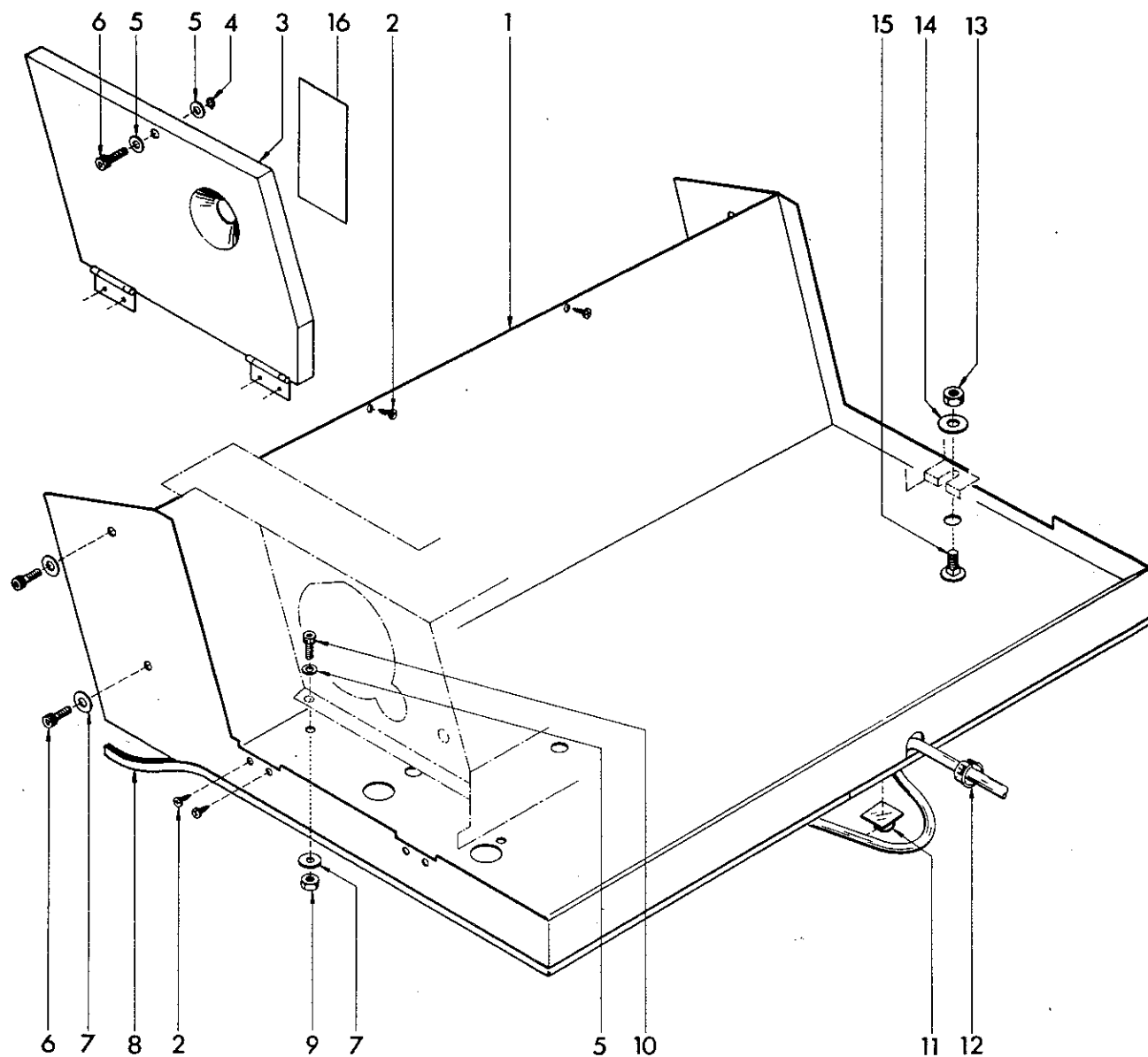
Pos.	Ref. No.	DIN		Benennung	Description	Designation
1	A6A 010 010			Bett	Bed	Banc
2	A5A 010 020			Spindelstock	Headstock	Poupée fixe
3	A5A 010 030			Reitstockgehäuse	Tailstock housing	Corps de la poupée
4	A3A 000 040			Klemmplatte	Clamping plate	Plaque de blocage
5	ZRG 28 0080	B8 DIN127		Federring	Spring washer	Rondelle ressort
6	ZSR 12 0625	M6x25 DIN912-6.9		Zylinderschraube	Socket head screw	Vis 6 pans creux
7	ZSR 12 0630	M6x30 DIN912-6.9		Zylinderschraube	Socket head screw	Vis 6 pans creux
8	ZSR 12 0845	M8x45 DIN912-6.9		Zylinderschraube	Socket head screw	Vis 6 pans creux
9	ZMU 34 0600	M6 DIN934-6		Sechskantmutter	Hexagonal nut	Ecrou 6 pans
10	A6A 000 060			Abdeckung	Cover	Couvercle
11	ZSR 63 0408	M4x8 DIN963-4.8		Senkschraube	Countersunk screw	Vis tête fraise
12	A6A 000 040			Lagerbock 2	Bearing block	Palier de la roulement
13	ZSR 12 0530	M5x30 DIN912-6.9		Zylinderschraube	Socket head screw	Vis 6 pans creux



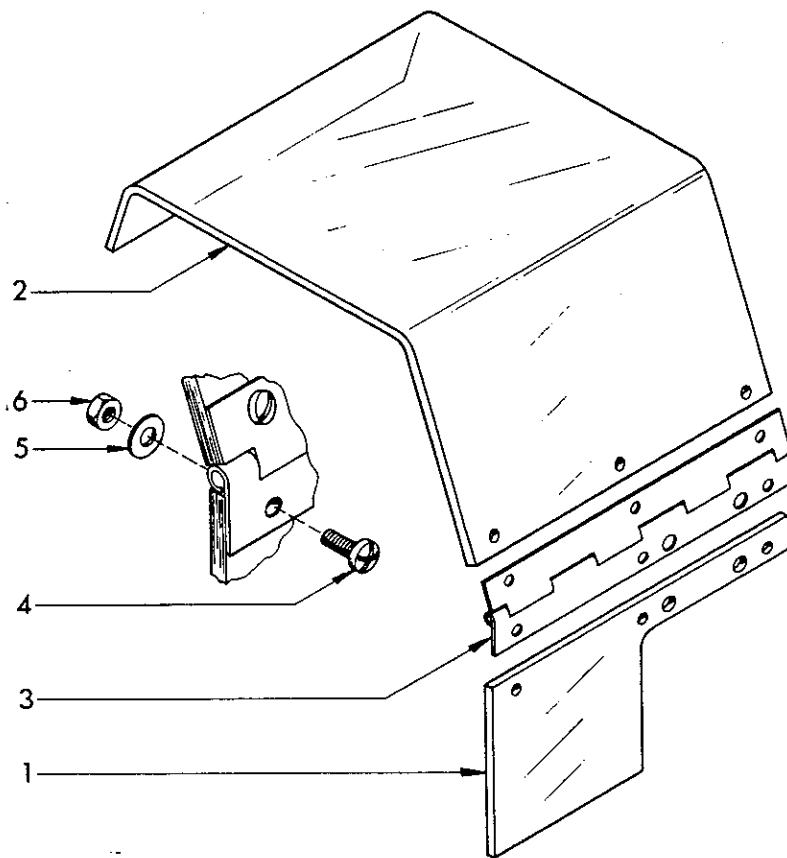
Pos.	Ref. No.	DIN	Benennung	Description	Designation
1	A6A 000 020		Riemenscheibe	Pulley	Poulie
2	A5A 000 030		Motorriemenscheibe	Motor pulley	Poulie de moteur
3	ZSB 22 0530	B5,3 DIN9021	Scheibe	Washer	Rondelle
4	ZSR 84 0512	M5x12 DIN84-4.8	Zylinderschraube	Flat head screw	Vis à tête cylindrique
5	A5A 060 000		Vorgelegeriemenscheibe	Countershaft pulley	Poulie
6	ZSB 10 2181	PS12x18x1,2	Stützscheibe	Supporting ring	Rondelle
7	ZSB 99 0900	9 DIN6799	Sicherungsscheibe	Retaining washer	Poulie de retenue
8	ZRG 71 2412	24x1.2 DIN471	Sicherungsring	Retaining ring	Anneau de retenue
9	A6A 000 110		Teilscheibe 100	Dividing washer 100	Disque diviseur 100
10	ZSR 84 0516	M5x16 DIN84-4.8	Zylinderschraube	Flat head screw	Vis à tête cylindrique
11	A6A 000 240		Hülse	Spacer	Douille d'écartement
12	ZLG 60 0602	6006-2Z	Rillenkugellager	Ball bearing	Roulement à billes
13	ZSB 02 6006	6006/2K	Ausgleichscheibe	Compensating washer	Rondelle de compensation
14	ZSB 10 5553	SS45x55x3	Stützscheibe	Supporting ring	Rondelle
15	ZRG 72 5520	B55x2 DIN472	Sicherungsring	Retaining ring	Anneau de retenue
16	A5A 000 010		Hauptspindel	Main spindle	Broche principale
17	ZRM 40 6335	6x335	Keilriemen	V-belt	Courroie trapézoïdale
18	ZRM 40 6450	6x450	Keilriemen	V-belt	Courroie trapézoïdale
19	A6A 000 170		Frontschild	Front plate	Plaque frontale
20	ZSR 33 0612	M6x12 DIN933-5.6	Sechskantschraube	Hexagon head screw	Vis hexagonale
21	ZMU 34 0800	M8 DIN934-6	Sechskantmutter	Hexagonal nut	Ecrou 6 pans
22	ZSB 21 0840	A8,4 DIN9021	Scheibe	Washer	Rondelle
23	A5A 000 100		Lagerbolzen	Bearing shaft	Axe palier
24	A6A 130 000		Trägerplatte	Carrier plate	Plaque support seule
25	A6A 030 000		Spindelstockabdeckung	Headstock cover	Couvercle de la poupée fixe
26	ZSB 22 0530	B5,3 DIN9021	Scheibe	Washer	Rondelle
27	ZSR 11 0512	M5x12 DIN6912-6.9	Zylinderschraube	Socket head screw	Vis à 6 pans creux
28	ZMU 80 0800	NM8 DIN980-8	Sicherungsmutter	Securing nut	Ecrou de sûreté
29	A6A 108 001		Lichtschränke	Light barrier	Barrière lumineuse
30	ZSR 75 3513	B3.5x13 DIN7981	Blechschräube	Sheet metal screw	Vis en tôle
31	A6A 000 280		Abstimmblech	Compensating sheet	Tôle de compensation
32	ZSB 12 1203	PS 12x18x0,3	Paßscheibe	Shim ring	Rondelle
33	A6A 104 000		Motor 220-240 V (A,B,F,G,N)	Motor 220-240 V (A,B,F,G,N)	Moteur 220-240 V (A,B,F,G,N)
	A6C 104 000		Motor 115 V (C,H)	Motor 115 V (C,H)	Moteur 115 V (C,H)



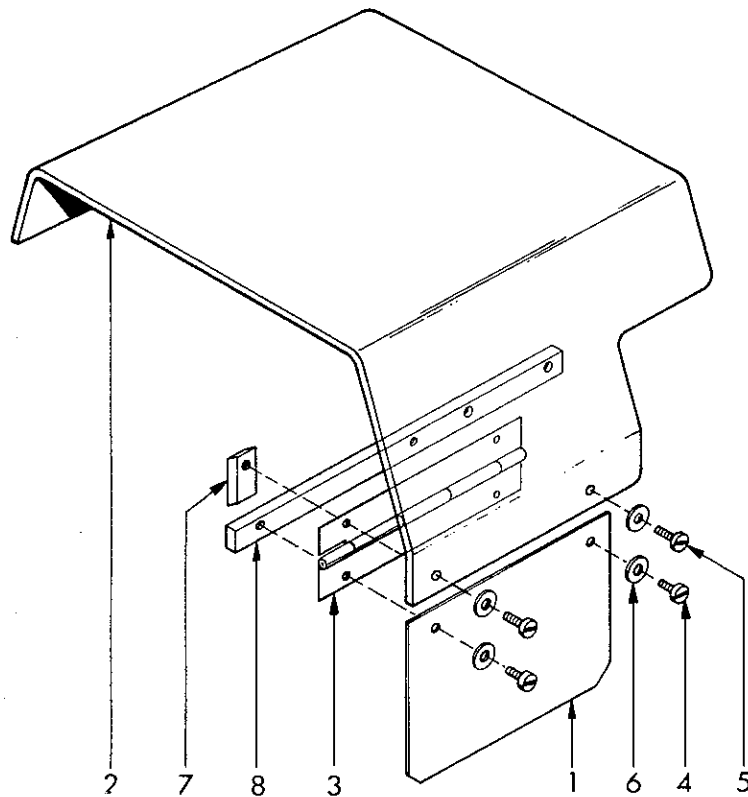
Pos.	Ref. No.	DIN	Benennung	Description	Designation
1	A6A 020 010		Schlitten	Slide	Chariot
2	A6A 020 020		Querschlitten	Cross slide	Chariot transversal
3	A6A 020 060		Abdeckblech	Cover sheet	Couvercle
4	A6A 020 070		Einstelleiste	Gib	Lardon
5	ZME 200 260		Gruppe Querspindel	Cross slide spindle c.	Ens. broche transversale
6	ZSR 12 0508	M5x8 DIN912-6.9	Zylinderschraube	Socket head screw	Vis 6 pans creux
7	ZSR 12 0510	M5x10 DIN 912-6.9	Zylinderschraube	Socket head screw	Vis 6 pans creux
8	ZSR 84 0506	M5x6 DIN 84-4.8	Zylinderschraube	Socket head screw	Vis 6 pans creux
9	A6A 020 080		Gewindestift	Set screw	Vis pointeau
10	ZST 13 0606	M6x6 DIN913-45H	Gewindestift	Set screw	Vis pointeau
11	ZMU 34 0400	M4 DIN934-5	Sechskantmutter	Hexagonal nut	Ecrou 6 pans
12	ZME 200 270		Gruppe Längsspindel	Lead screw complete	Ens. vis-mère
13	A6A 040 000		Abstreifblech	Wiper sheet	Tôle de racleur postérieur
14	ZSR 12 0408	M4x8 DIN912-6.9	Zylinderschraube	Socket head screw	Vis 6 pans creux
15	ZSR 12 0516	M5x16 DIN912-6.9	Zylinderschraube	Socket head screw	Vis 6 pans creux
16	A6A 000 220		Abstreiffilz 1	Felt wiper 1	Racleur en feutre post. 1
17	A6A 000 200		Abstreifblech 1	Wiper plate 1	Plaquette de racleur post.1
18	ZSR 84 0308	M3x8 DIN84-4.8	Zylinderschraube	Flat head screw	Vis à tête cylindrique
19	A6A 000 230		Abstreiffilz 2	Felt wiper 2	Racleur en feutre post. 1
20	A6A 000 210		Abstreifblech 2	Wiper plate 2	Plaquette de racleur post.2
21	A5A 000 130		Bettleiste kurz	Keep plate short	Lardon de chariot court
22	A6A 000 050		Bettleiste lang	Keep plate long	Lardon de chariot long
23	ZSB 25 0530	B5,3 DIN125	Scheibe	Washer	Rondelle
24	ZSR 12 0512	M5x12 DIN912-6.9	Zylinderschraube	Socket head screw	Vis 6 pans creux
25	A6A 000 070		Motorplatte 1	Motor plate 1	Plaque de moteur 1
26	ZSR 33 0510	M5x10 DIN933-5.6	Sechskantschraube	Hexagon head screw	Vis hexagonale
27	ZSR 33 0408	M4x8 DIN933-5.6	Sechskantschraube	Hexagon head screw	Vis hexagonale
28			Schrittmotor	Step motor	Moteur pas à pas
29	ZRM 73 4805		Zahnflachriemen	Timing belt	Courroie crantée
30	ZSR 12 0535	M5x35 DIN912-6.9	Zylinderschraube	Socket head screw	Vis 6 pans creux
31	A6A 000 080		Motorplatte 2	Motor plate 2	Plaque de moteur 2
32	A6A 000 260		Anschlag	Stop	Butée
33	A6A 000 140		Stahlhalterauflage	Toolpost support	Support de tourelle



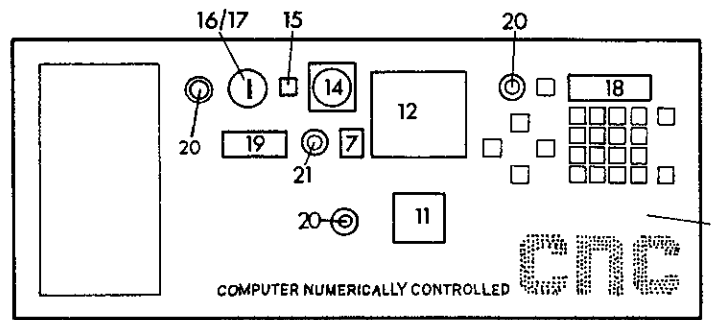
Pos.	Ref. No.	DIN		Benennung	Description	Designation
1	A6A 060 001			Spänetasse	Chip tray	Bac à copeaux
2	ZSR 75 3595	B3,5x9,5 DIN7981		Blechschraube	Sheet metal screw	Vis en tôle
3	A6A 050 000			Deckel	Cover	Couvercle
4	ZRG 71 0607	6x0,7 DIN471		Sicherungsring	Retaining ring	Anneau de retenue
5	ZSB 25 0640	B6,4 DIN125		Scheibe	Washer	Rondelle
6	ZSR 12 0620	M6x20 DIN912		Zylinderschraube	Socket head screw	Vis 6 pans creux
7	ZSB 21 0640	A6,4 DIN9021		Scheibe	Washer	Rondelle
8	ZGU 77 0621	853 mm		Kantenschutzprofil	Protective profile	Perfil protective
9	ZMU 34 0600	M6 DIN934-6		Sechskantmutter	Hexagonal nut	Ecrou 6 pans
10	ZSR 12 0616	M6x16 DIN912-6.9		Zylinderschraube	Socket head screw	Vis 6 pans creux
11	ZEE 25 1010			Kabelklipp	Clip for cable	Pince pour câble
12	ZEL 15 0750			Tülle	Ring	Bague
13	ZMU 34 0800	M8 DIN934-6		Sechskantmutter	Hexagonal nut	Ecrou 6 pans
14	ZSB 21 0840	A8,4 DIN9021		Scheibe	Washer	Rondelle
15	ZSR 03 0820	M8x20 DIN603-4.6		Flachrundschraube	Square neck bolt	Collet carré
16	A6A 000 190			Drehzahlschild	Speed plate	Plaquette de vitesses



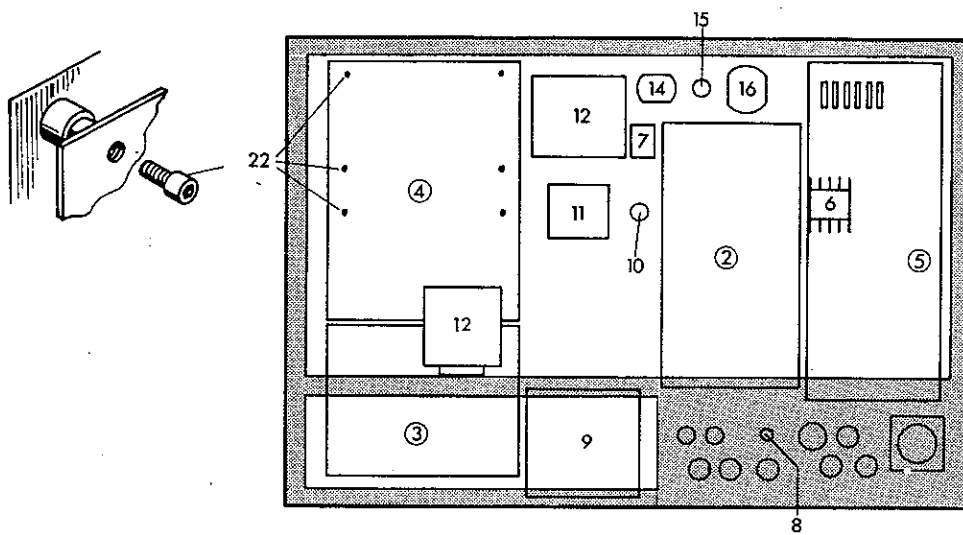
Pos.	Ref. No.	DIN	Benennung	Description	Designation
	<u>A6A 140 000</u>		<u>Gruppe Späneschutz</u>	<u>Chip guard complete</u>	<u>Ens. pare-copeaux</u>
1	A6A 140 010		Frontschutz	Front guard	Pare-copeaux
2	A6A 140 020		Deckel	Cover	Couvercle
3	A6A 140 030		Scharnier	Frame joint	Charnière
4	ZSR 89 0410	M4x10 DIN7985-4.8	Linsenschraube	Filister head screw	Vis à tête lentiforme
5	ZSB 21 0430	A4,3 DIN9021	Scheibe	Washer	Rondelle
6	ZMU 34 0400	M4 DIN934-5	Sechskantmutter	Hexagonal nut	Ecrou 6 pans



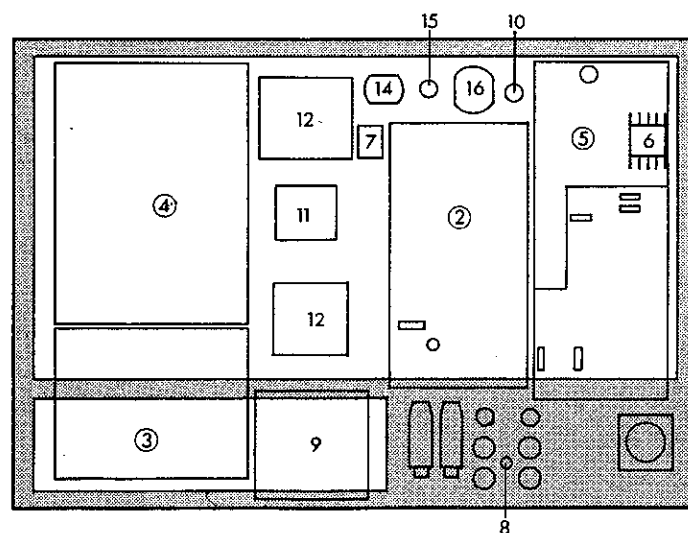
Pos.	Ref. No.	DIN		Benennung	Description	Designation
	<u>A6A 14o o01</u>			<u>Gr. Späneschutz</u>	<u>Chip guard compl.</u>	<u>Ens. pare-copeaux</u>
1	A6A 14o o01			Frontschutz	Front guard	Pare-copeaux
2	A6A 14o o21			Deckel	Cover	Couvercle
3	A6A 14o o31			Scharnier	Frame joint	Charnière
4	ZSR 89 o41o	M4x1o DIN 7985-4.8		Linsenschraube	Filister head screw	Vis à tête lentiforme
5	ZSR 89 o412	M4x12 DIN 7985-4.8		Linsenschraube	Filister head screw	Vis à tête lentiforme
6	ZSB 21 o43o	A4,3 DIN 9o21		Scheibe	Washer	Rondelle
7	A6A 14o o4o			Anschlag	Stop	Butée
8	A6A 14o o5o			Leiste	Gib	Barre



Version ABC



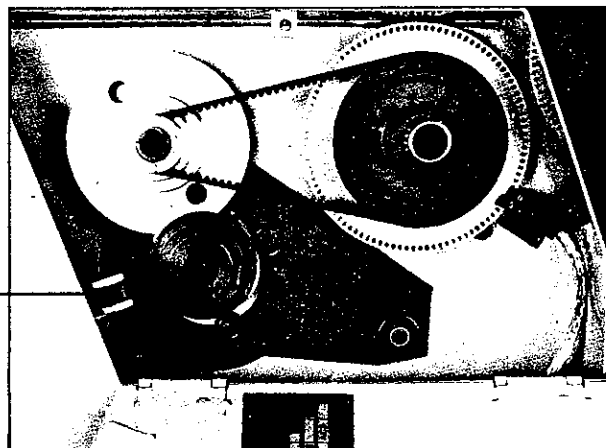
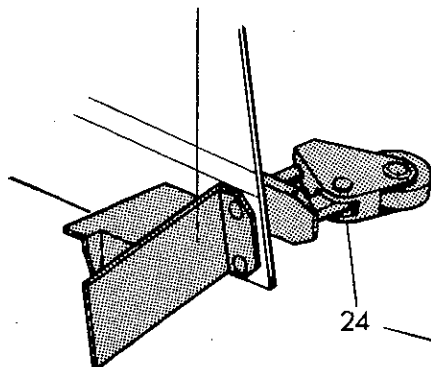
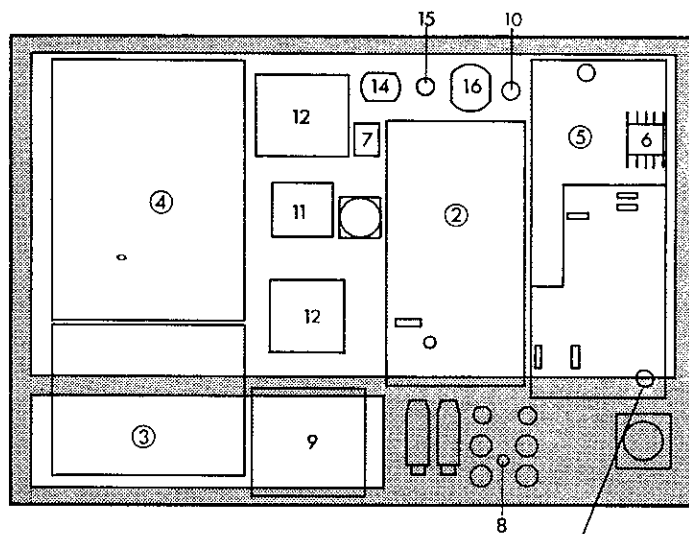
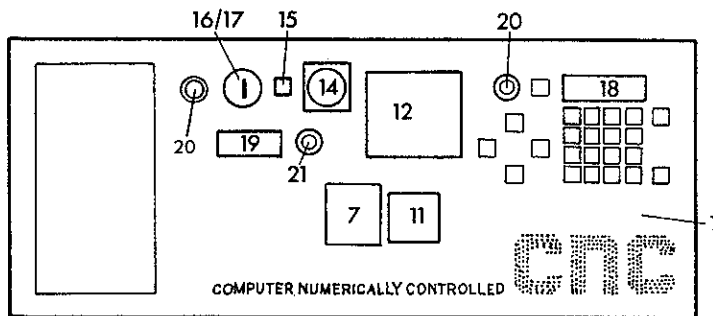
Version FGH



Pos.	Ref. No.	DIN	Benennung	Description	Designation
	A6G 1o5 000		E-Kasten komplett	Ass. E-Housing	Ens. Couvercle Électrique
	A6H 1o5 000		E-Kasten komplett	Ass. E-Housing	Ens. Couvercle Électrique
1	A6A 1oo o11		Frontschild	Front plate	Plaque frontale
2	A6A 112 oo1		Hauptspindelplatine (A,B,F,G)	Main spindle circuit board (A,B,F,G)	Platine alimentation broche (A,B,F,G)
	A6C 112 oo1		Hauptspindelplatine (C,H)	Main spindle circuit board (C,H)	Platine alimentation broche (C,H)
3	A6A 113 oo1		Schrittmotorplatine	Step motor circuit board	Platine alimentation moteur pas à pas
4	A6C 114 oo3		Rechnerplatine	CPU board	Platine entrée informations
5+6	A6A 111 oo1		Netzteilplatine (A,B,F,G)	Power supply circuit board (A,B,F,G)	Platine bloc d'alimentation (A,B,F,G)
	A6C 111 oo1		Netzteilplatine (C,H)	Power supply circuit board (C,H)	Platine bloc d'alimentation (C,H)
6	ZEL 53 1o1o		Schütz (A,B,F,G)	Relay (A,B,F,G)	Relais (A,B,F,G)
	ZEL 53 1o14		Schütz (C,H)	Relay (C,H)	Relais (C,H)
7	ZEL 21 31oo		Motorschalter	Motor switch	Commutateur moteur
8	ZEE 75 1o8o		Hauptsicherung 8 A tr. (A,B,F,G)	Main fuse 8 A slow (A,B,F,G)	Fusible principale 8 A lent (A,B,F,G)
	ZEE 75 11oo		Hauptsicherung 1o A tr. (C,H)	Main fuse 1o A slow (C,H)	Fusible principale 1o A lent (C,H)
9	ZMO 78 922o		Ventilator (A,B,F,G)	Fan (A,B,F,G)	Ventilateur (A,B,F,G)
	ZMO 78 9115		Ventilator (C,H)	Fan (C,H)	Ventilateur (C,H)
1o	ZEL 21 9oo3		Umschalter metrisch/zöllig (B,C,G,H)	Throw-over switch metric/inch (B,C,G,H)	Commutateur métrique/en pouces (B,C,G,H)
11	ZEM oo 1oo5		Amperemeter 5 A (A,B,F,G)	Amperemeter 5 A (A,B,F,G)	Ampèremètre 5 A (A,B,F,G)
	ZEM oo 1o1o		Amperemeter 1o A (C,H)	Amperemeter 1o A (C,H)	Ampèremètre 1o A (C,H)
12	A6F o9o 000		Cassetten Deck mit Interface Platine	Cassette Deck with Interface circuit board	Elément Cassette Deck avec platine Interface
14	ZEL 4o 0oo2		Pilztastenschalter	Mushroom emerg. switch	Arrêt coup de poing
15	ZEE 53 o22o		Leuchte EIN (A,B,F,G)	Power control (A,B,F,G)	Lampe témoin (A,B,F,G)
	ZEE 53 o11o		Leuchte EIN (C,H)	Power control (C,H)	Lampe témoin (C,H)
16	ZEL 21 oo14		Hauptschalter mit 2 Schlüssel	Main switch with 2 keys	Commutateur principal avec 2 clés
17	ZME o62 oo5		Schlüssel zu Hauptschalter	Key for main switch	Clé pour commutateur principal
18	A6A 1o5 o2o		Sichtfenster/Display	Display glass	Ecran visualisation
19	A6A 1o5 o3o		Sichtfenster für Spindelrehzahl	Display glass for number of spindle speed	Ecran visualisation pour vitesse de broche
2o	ZED 25 1oo6		Potentiometergriff 6 mm	Knob 6 mm	Poignée de potentiomètre 6 mm
21	ZED 25 1oo4		Potentiometergriff 4 mm	Knob 4 mm	Poignée de potentiomètre 4 mm
22	ZSR 12 o3o6	M3x6 DIN 912-6.9	Zylinderschraube	Socket head screw	Vis de fixation

E-Ausrüstung für Version
 El. Equipment for Version
 Equipement el. pour version

A,F 220 V, 50/60 Hz, metr.
 B,G ... 220-240 V, 50/60 Hz, metr.-inch
 C,H ... 100-115 V, 50/60 Hz, metr.-inch



E-Ausrüstung für Sonderversion (Frankreich)

El. Equipment for special version (France)

Equipement el. pour version spéciale (France)

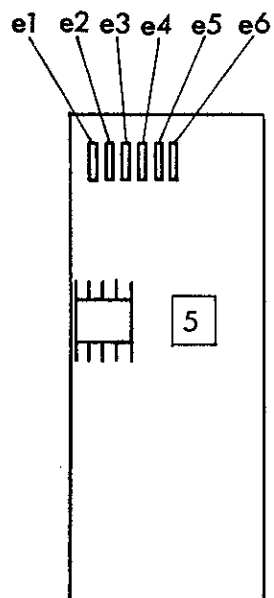
A6N ... 220-240 V, 50/60 Hz, metr.-inch

Pos.	Ref. No.	DIN	Benennung	Description	Designation
	A6N 105 000		E-Kasten komplett	Ass. E-housing	Ens. couvercle électrique
1	A6N 100 010		Frontschild	Front plate	Plaque frontale
2	A6A 112 001		Hauptspindelplatine	Main spindle circuit board	Platine alimentation broche
3	A6A 113 001		Schrittmotorplatine	Step motor circuit board	Platine alimentation moteur pas à pas
4	A6C 114 003		Rechnerplatine	CPU board	Platine entrée informations
5+6	A6A 111 001		Netzteilplatine	Power supply circuit board	Platine bloc d'alimentation
6	ZEL 53 1010		Schütz	Relay	Relais
7	ZEL 22 0002		Motorschalter	Motor switch	Commutateur moteur
8	ZEE 75 1080		Hauptsicherung 8 A tr.	Main fuse 8 A slow	Fusible principale 8 A
9	ZMO 78 9220		Ventilator	Fan	Ventilateur
10	ZEL 21 9003		Umschalter metrisch/zöllig	Throw-over switch metric/inch	Commutateur métrique/en pouces
11	ZEM 00 1005		Amperemeter 5 A	Amperemeter 5 A	Ampèremètre 5 A
12	A6F 090 000		Cassette Deck mit Interface Platine	Cassette Deck with Interface circuit board	Element Cassette Deck avec Platine Interface
14	ZEL 40 0002		Pilztastenschalter	Mushroom emerg. switch	Arrêt coup de poing
15	ZEE 53 0220		Leuchte "EIN"	Power control	Lampe témoin
16	ZEL 21 0014		Hauptschalter mit 2 Schlüsseln	Main switch with two keys	Commutateur principal avec 2 clés
17	ZME 062 005		Schlüssel zu Hauptschalter	Key for main switch	Clé pour commutateur principal
18	A6A 105 020		Sichtfenster/Display	Display glass	Ecran visualisation
19	A6A 105 030		Sichtfenster für Spindelrehzahl	Display glass	Ecran visualisation vitesse broche
20	ZED 25 1006		Potentiometergriff 6 mm	Knob 6 mm	Poignée de potentiomètre 6 mm
21	ZED 25 1004		Potentiometergriff 4 mm	Knob 4 mm	Poignée de potentiomètre 4 mm
22	ZSR 12 0306	M3x6 DIN 912-6.9	Zylinderschraube	Socket head screw	Vis de fixation
23	ZEL 45 0010		Grenztaster	Switch de sécurité sur le couvercle du boîtier	
24	ZEE 47 3104		Winkelrollenhebel	du harnais d'engrenages	

Sicherungen für Netzteilplatine
Fuses for power supply circuit board
Fusible pour platine bloc d'alimentation

A6A 111 000

A6C 111 000



e1 8 A ZEE 75 1o8o
 e2 8 A ZEE 75 1o8o
 e3 4 A ZEE 75 1o4o

e4 $\begin{cases} 220\text{ V} - 240\text{ V} & \dots\dots 4\text{ A} & \dots\dots \text{ZEE 75 1o4o} \\ 110\text{ V} & \dots\dots\dots 8\text{ A} & \dots\dots \text{ZEE 75 1o8o} \end{cases}$

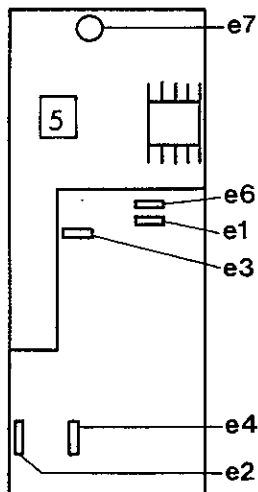
e5 2,5 - 4 A ZEE 75 1o4o

e6 1 A ZEE 75 1o1o

Sicherungen für Netzteilplatine
Fuses for power supply circuit board
Fusible pour platine bloc d'alimentation

A6A 111 001

A6C 111 001

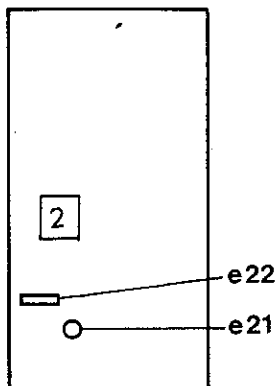


e1 4 A ZEE 75 1o4o
 e2 4 A ZEE 75 1o4o
 e3 6,3 A ... EEE 75 1o63
 e4 4 A ZEE 75 1o4o
 e6 1 A ZEE 75 1o1o
 e7 16 A ZEE 7o 2o16

Sicherungen für Hauptspindelplatine
Fuses for main spindle circuit board
Fusibles pour platine d'alimentation broche

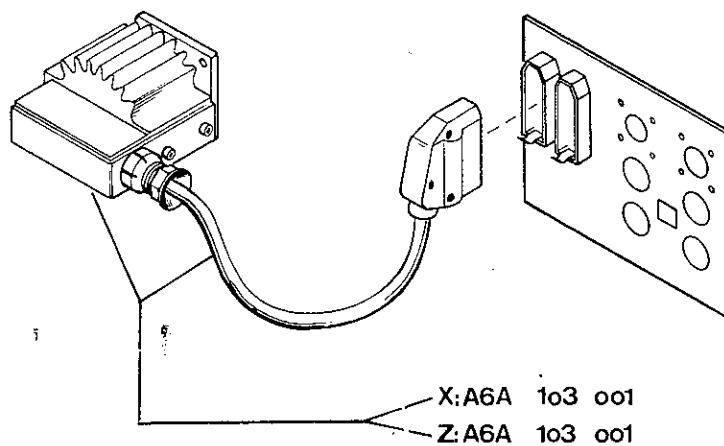
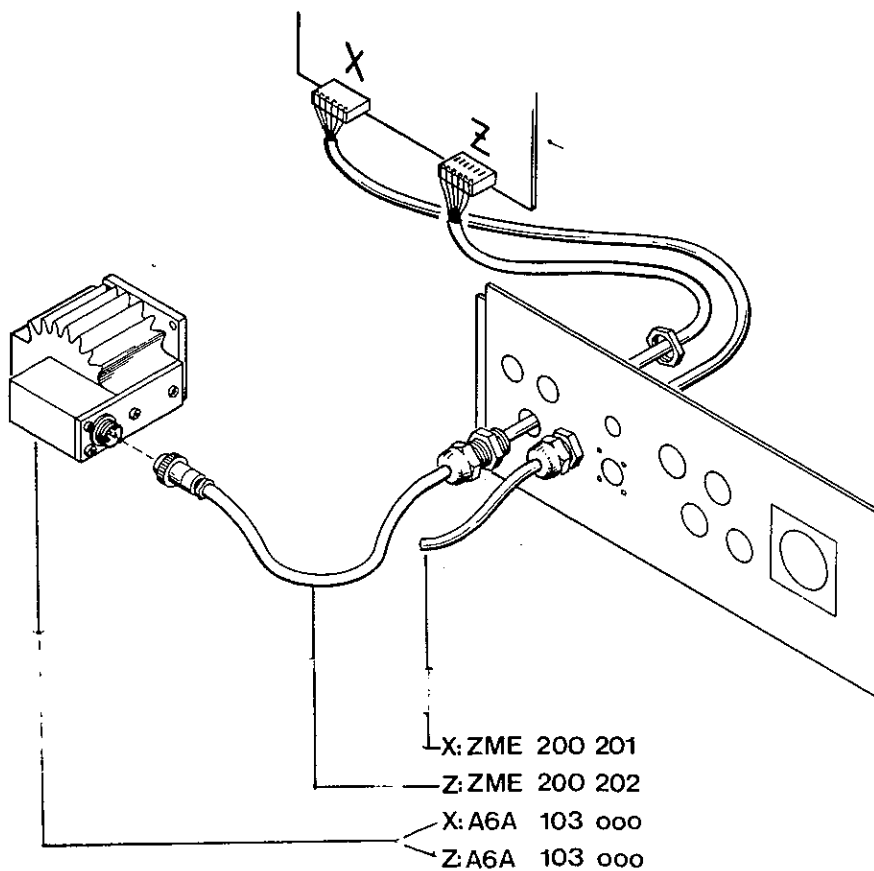
A6A 112 001

A6C 112 001

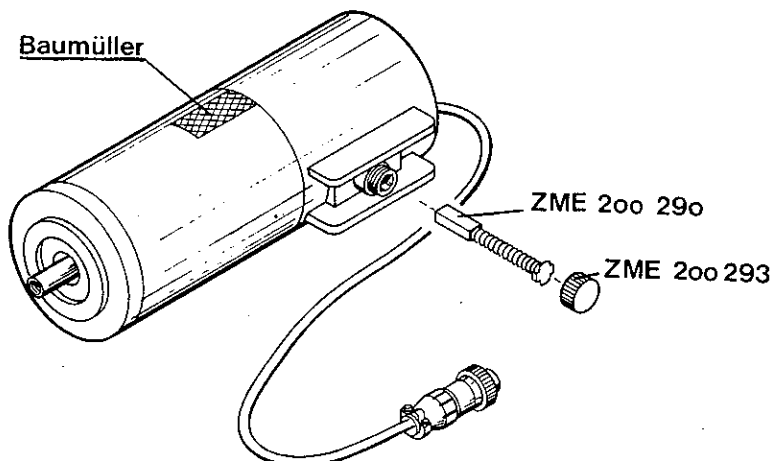
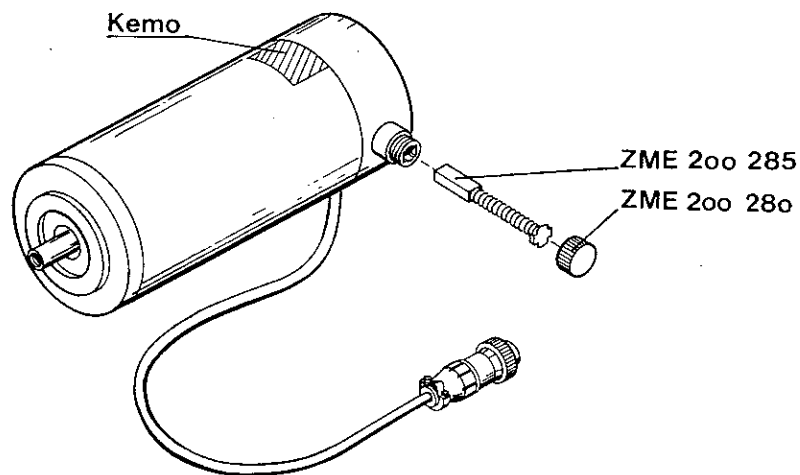
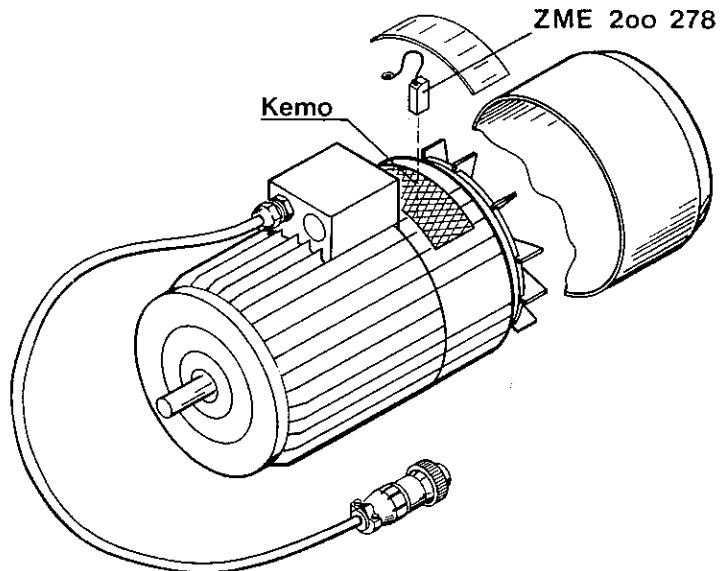


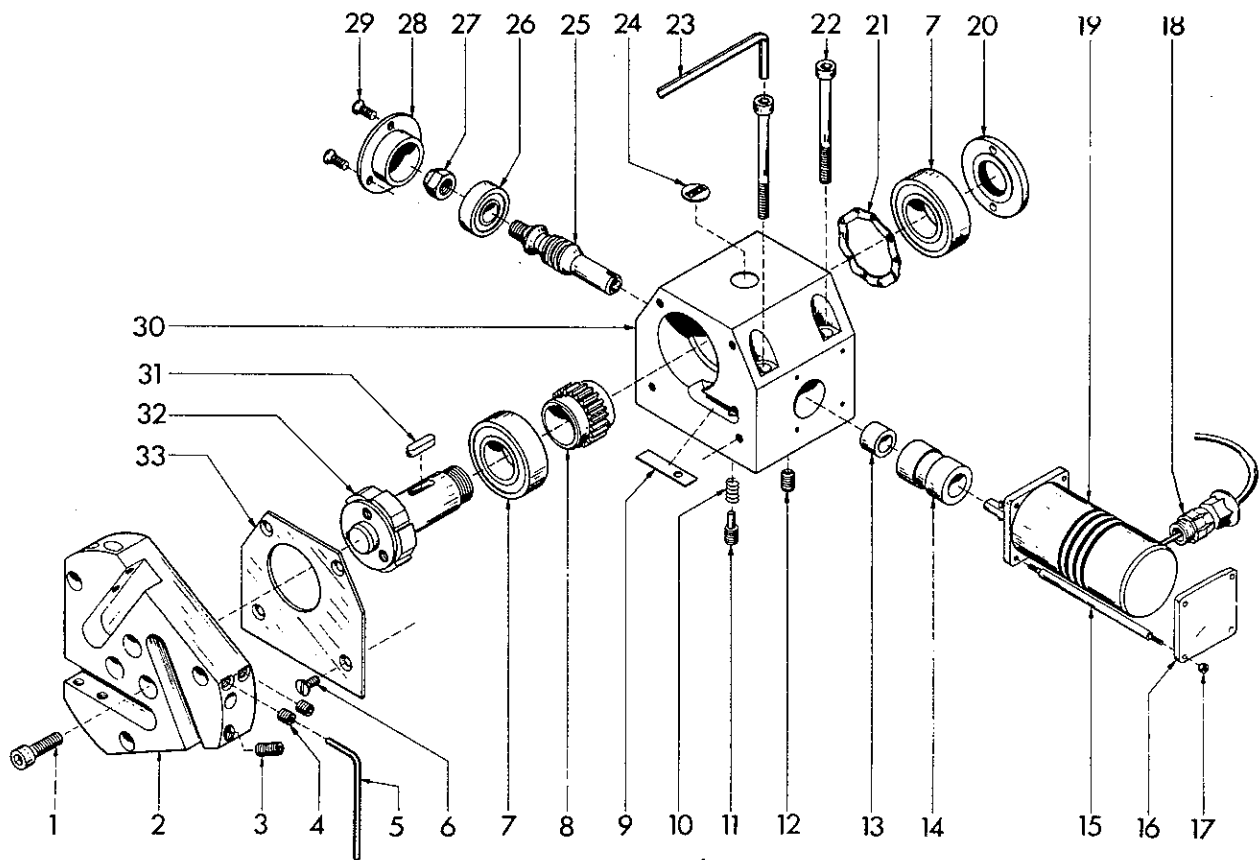
e21 1o A (ff, super fast, rapide) ZEE 75 11o1
 e22 1oo mA ZEE 75 1oo1

Ref. Nr. für Schrittmotor und Kabel
 Ref. No. for step motor and cable
 Réf. pour moteur pas à pas et câble

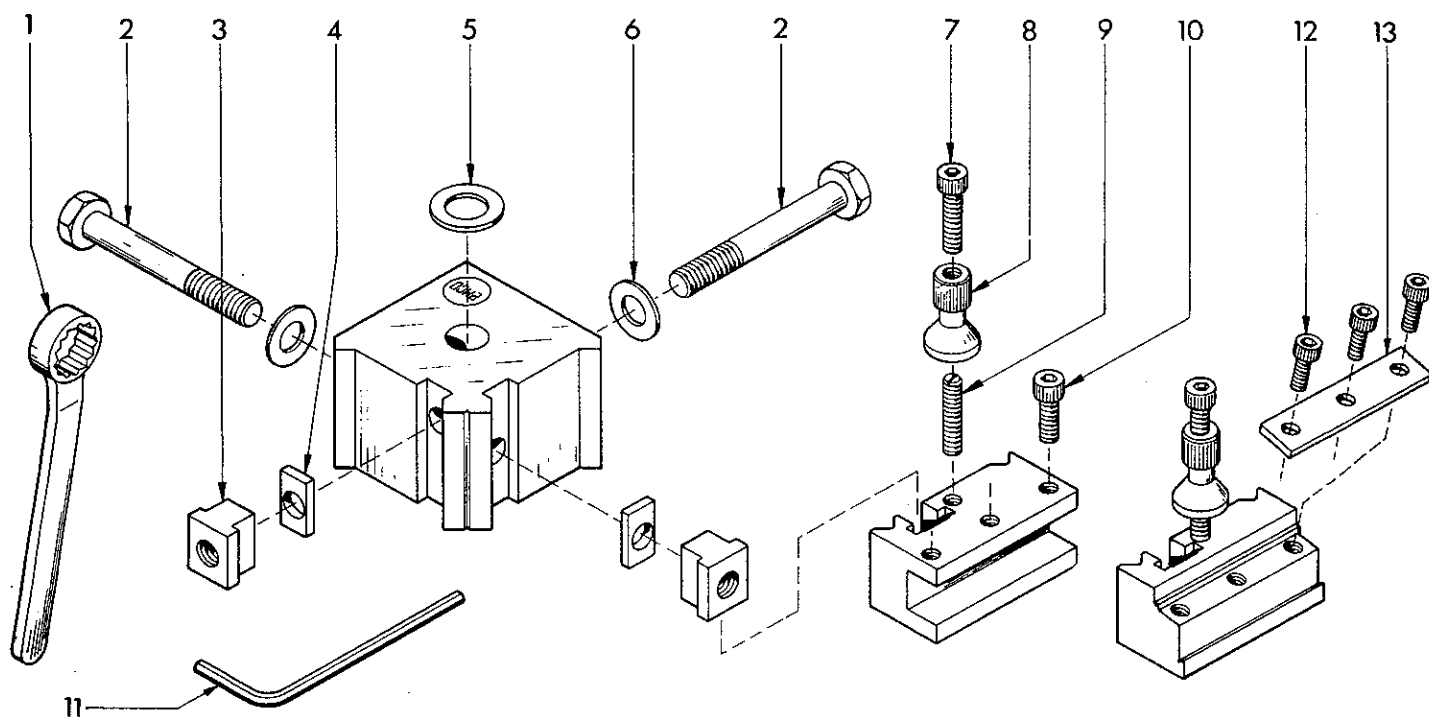


Ref. Nr. für Kohlebürsten
Ref. No. for carbon brushes
Réf. pour balai de charbon

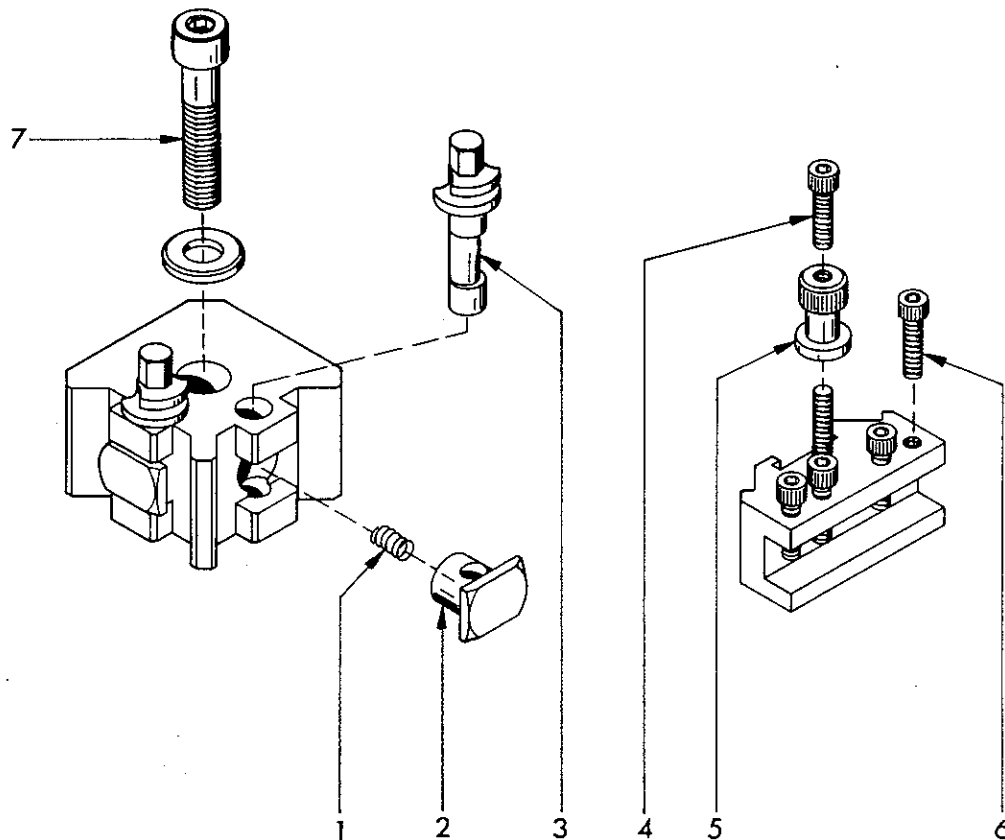




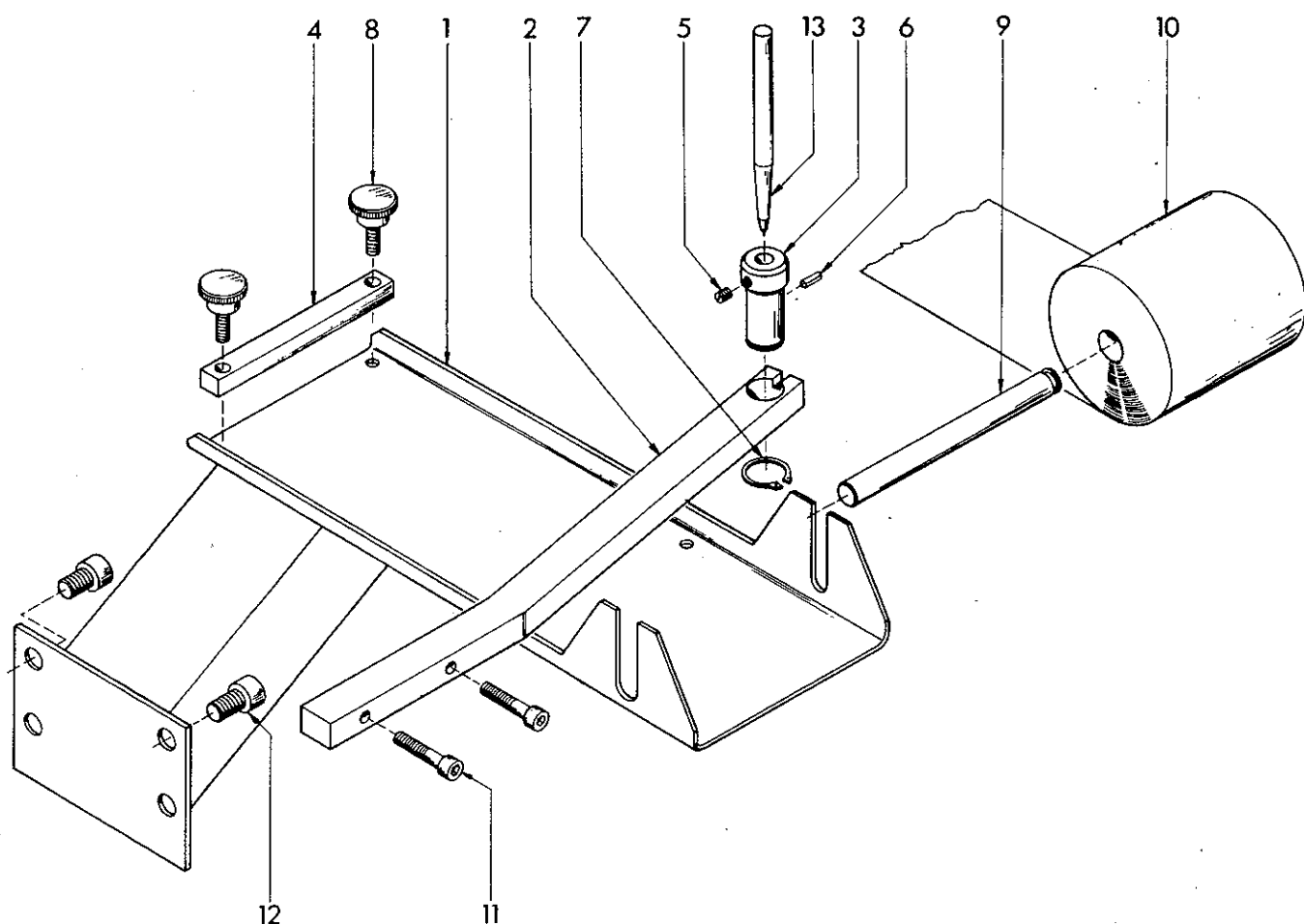
Pos.	Ref. No.	DIN	Benennung	Description	Designation
	<u>26o o4o</u>		<u>Werkzeugrevolver</u>	<u>Turret toolpost</u>	<u>Tourelle-revolver autom.</u>
1	ZSR 12 o62o	M6x2o DIN 912-6.9	Zylinderschraube	Socket head screw	Vis 6 pans creux
2	A6Z o4o o2o		Revolverscheibe	Toolpost disc	Disque de la tourelle
3	ZST 13 o616	M6x16 DIN 913-45H	Gewindestift	Set screw	Vis pointeau
4	ZST 13 o6o6	M6x6 DIN 913-45H	Gewindestift	Set screw	Vis pointeau
5	ZWZ 11 o3oo	SW3 DIN 911	Schraubendreher	Hex.socket screw key	Clê môle coudée
6	ZSR 63 o4o6	M4x6 DIN 963-4.8	Senkschraube	Countersunk screw	Vis tête fraisée
7	ZLG 6o o4o2	6oo4-2Z	Rillenkugellager	Ball bearing	Roulement à billes
8	A6Z o4o o6o		Schraubenrad	Worm wheel	Roue à vis sans fin
9	A6Z o4o 12o		Federplatte	Leaf spring	Ressort en feuillard plat
10	ZED 21 3o74		Druckfeder	Compression spring	Ressort de compression
11	A6Z o4o 19o		Gewindestift	Set screw	Vis pointeau
12	ZST 16 o6o8	M6x8 DIN 916-45H	Gewindestift	Set screw	Vis pointeau
13	ZBU 5o oo15	J1ox14x1o DIN185o	Sinterlager	Bearing bush	Bague
14	A6Z o4o 11o		Büchse	Bush	Bague
15	A6Z o4o 16o		Spannbolzen	Bolt	Bouïon
16	A6Z o4o 17o		Deckel	Cover	Couvercle
17	ZMU 34 o25o	M2,5 DIN 934-5	Mutter	Nut	Ecrou
18	ZPG 1o oo12	MZB7	Kabelverschraubung	Screw-type cond.fittg.	Raccordement à vis
19	A6Z o46 ooo		Motor komplett	Motor compl.	Ens. moteur
20	A6Z o4o 1oo		Mutter	Nut	Ecrou
21	ZSB o2 6oo4	6oo4/K2	Ausgleichscheibe	Compensating washer	Rondelle de compensation
22	ZSR 12 o56o	M5x6o DIN912-6.9	Zylinderschraube	Socket head screw	Vis 6 pans creux
23	ZWZ 11 o4oo	SW4 DIN 911	Schraubendreher	Hex.socket screw key	Clê môle coudée
24	PoB ooo 16o		Firmenschild	Name plate	Plaque
25	A6Z o4o o5o		Schneckenwelle	Worm	Vis sans fin
26	ZLG 6o ooo2	6ooo-2Z	Rillenkugellager	Ball bearing	Roulement à billes
27	ZMU 8o o8oo	NM8 DIN 98o-8	Sicherungsmutter	Securing nut	Ecrou de sûreté
28	A6Z o4o o7o		Deckel	Cover	Couvercle
29	ZSR 63 o4o8	M4x8 DIN 963-4.8	Senkschraube	Countersunk screw	Vis tête fraisée
30	A6Z o4o o4o		Gehäuse	Housing	Corps
31	ZFD 85 4416	A4x4x16 DIN 6885	Paßfeder	Square key	Clavette parallèle
32	A6Z o4o o3o		Schaltwelle	Shaft	Arbre
33	A6Z o4o o8o		Dichtplatte	Seal plate	Joint d'étanchéité



Pos.	Ref. No.	DIN	Benennung	Description	Designation
	584 180		<u>Schnellwechselstahl-</u> <u>halter</u>	<u>Quick-change tool-</u> <u>post</u>	<u>Tourelle porte-outil à</u> <u>changement rapide</u>
1	C6Z 180 o40		Ringschlüssel 13	Ring spanner 13	Clé à oeil 13
2	ZSR 31 o860	M8x60 DIN931-5.6	Sechskantschraube	Hexagon head screw	Vis hexagonale
3	C6Z 180 o20		T-Nutenstein	T-nut	Boulon en T
4	C6Z 180 o30		Zwischenstück	Intermediate piece	Pièce d'écartement
5	ZSB 25 1o50	B10,5 DIN125	Scheibe	Washer	Rondelle
6	ZSB 25 o840	B8,4 DIN125	Scheibe	Washer	Rondelle
7	ZSR 12 o520	M5x20 DIN912-6.9	Zylinderschraube	Socket head screw	Vis six pans creux
8	C6Z 181 o20		Stellknopf	Adjusting nut	Ecrou de reglage
9	ZST 13 o525	M5x25 DIN913-45H	Gewindestift	Set screw	Vis pointeau
10	ZSR 13 o516	M5x16 DIN912-10.9	Zylinderschraube	Socket head screw	Vis six pans creux
11	ZWZ 11 o400	SW4 DIN911	Schraubendreher	Hexagonal key	Clé à six pans
12	ZSR 12 o512	M5x12 DIN 912	Zylinderschraube	Socket head screw	Vis six pans creux
13	C6Z 280 o20		Spannplatte	Clamping plate	Plaquette de serrage



Pos.	Ref. No.	DIN		Benennung	Description	Designation
<u>1-6</u>	<u>544 000</u>			<u>Schnellwechselstahl-</u> <u>halter</u>	<u>Quick-change toolpost</u>	<u>Tourelle porte-outil à</u> <u>changement rapide</u>
1	ZME 11 0002			Feder	Clamp pad spring	Ressort
2	ZME 11 0001			Klemmplatte	Clamp pad	Plaque de serrage
3	ZME 11 0000			Exzenterbolzen	Clamp bolt	Boulon excentré
4	ZSR 12 0520	M4x20 DIN912		Zylinderschraube	Socket head screw	Vis 6 pans creux
5	ZME 11 0005			Mutter	Nut	Ecrou
6	ZSR 12 0516	M4x16 DIN912		Zylinderschraube	Socket head screw	Vis 6 pans creux
7	ZSR 12 1050	M10x50 DIN912-6.9		Zylinderschraube	Socket head screw	Vis 6 pans creux



Pos.	Ref. No.	DIN	Benennung	Description	Designation
	<u>260 310</u>		<u>Gruppe Plotter</u>	<u>Plotter complete</u>	<u>Ens. Plotter</u>
1	A6Z 011 000		Auflage	Table	Tableau
2	A6Z 010 031		Halter	Bar	Support
3	A6Z 010 050		Führung	Holder	Guidage
4	A6Z 010 060		Leiste	Gib	Lardon
5	ZST 51 0404	M4x4 DIN 551-5.8	Gewindestift	Set screw	Vis pointeau
6	ZHL 81 0308	3x8 DIN 1481	Spannhülse	Lock pin	Goupille de serrage
7	ZRG 71 1410	W14x1 DIN 471	Sicherungsring	Retaining ring	Anneau de retenue
8	ZSR 64 0515	M5x15	Rändelschraube	Knurled screw	Vis moletée
9	A6Z 010 040		Achse	Axis	Axe
10	ZRO 06 7070	70 x 70	Papierrolle	Paper roll	Rouleau à papier
11	ZSR 12 0525		Zylinderschraube	Socket head screw	Vis 6 pans creux
12	ZSR 12 0812	M8x12 DIN 912-6.9	Zylinderschraube	Socket head screw	Vis 6 pans creux
13	ZST 99 1000		Plotterstift	Plotter pen	Crayon Plotter

