emco tronic M1

Operating Instruction

emco

Ref. No. ○ DE2 704
● EN2 704
○ FR2 704
○ SP2 704

Foreword

The "EMCOTRONIC M1" user manual is part of the literature which is supplied with a machine. The entire literature comprises:

1. Operating instructions, spare parts list
   (These operating instructions describe machine-specific features)

2. Programming instructions "EMCOTRONIC M1"

3. User manual "EMCOTRONIC M1"

It is very often the operation of the control which causes initial difficulties because there are a very wide variety of possibilities.

The EMCOTRONIC M1 control is very straight-forward and designed for easy operation. You will master the control within a very short time.

These instructions are designed and written so that you can also learn how to operate the control yourself. However, practical instruction is certainly the ideal way.

Note on the General Remarks at the Front

Some general remarks are given at the front. This results in an easy-to-follow structure and means that the subsequent descriptions can be kept short.

Explanations of the Keys

The explanations of the keys include a listing of which mode the individual keys can be activated in.

In the examples that follow the functions in the respective mode are described briefly.

Description of the Modes

- The summaries are intended to provide you with a quick guide.

- The operation sequences for the activity in question are shown in boxes.

- The texts and explanations are intended to give you a deeper understanding of the logical structure of control operation.

EMCO MAIER & CO

Printed in Austria

PART 1

General Remarks

Part 2

Illustrations

Part 3

The Modes

Mode - Reference Point

Mode - EXECUTE

Submode - SPECIAL

Mode - MANUAL

Mode - EDIT

Mode - AUTOMATIC

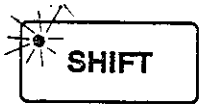
Part 1

General Remarks

The SHIFT Key

SHIFT means here changing over.
When the key is pressed, the LED of the SHIFT key illuminates. When pressed again, the LED goes off.

The address keyboard and part of the function keyboard have a dual function.



- When the SHIFT key is pressed (LED illuminates), the upper address, i.e. O is selected.

- When the SHIFT key is not activated (LED off), the lower address is selected.

The Following Representation Rules Apply to the Explanations of the Keys on the Subsequent Pages

No arrow --> lower address
SHIFT LED does not illuminate

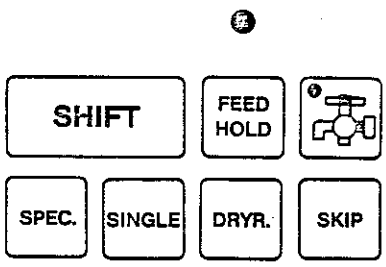
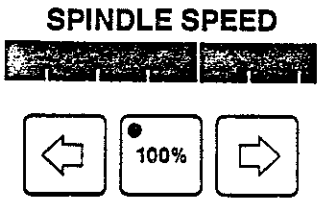
Arrow points to upper address --> upper address
SHIFT has been pressed.
(LED illuminates)

In explanations of the operation modes only the address is described for the sake of clarity.
For further functions of the SHIFT key, refer to key explanation.

The LEDs

LEDs are installed in several keys.
The LEDs indicate which conditions or modes are active.

Examples:

	If ON is pressed, the main spindle is switched on. The LED illuminates.
	When these keys are pressed, the mode is activated (LED illuminates). If pressed again, they are de-activated (LED off).
	When the 100% key is pressed, the main spindle runs at the programmed speed. The LED illuminates.

Decimal Points:

Decimal points have to be entered, otherwise 1/1000 mm or 1/10000 inch.

Leading Zeros:

Following Zeros:

Leading and following zeros can be entered, but need not be.

Exceptions:
Changing the numbers of programs/blocks (see EDIT 9.6).

Plus/Minus Signs:

Plus signs are not entered.

The minus sign can be entered before or after a number.

Alarms:

You will find a list explaining the alarms in the programming instructions.

CYCLE START cannot be activated as long as an alarm is displayed.

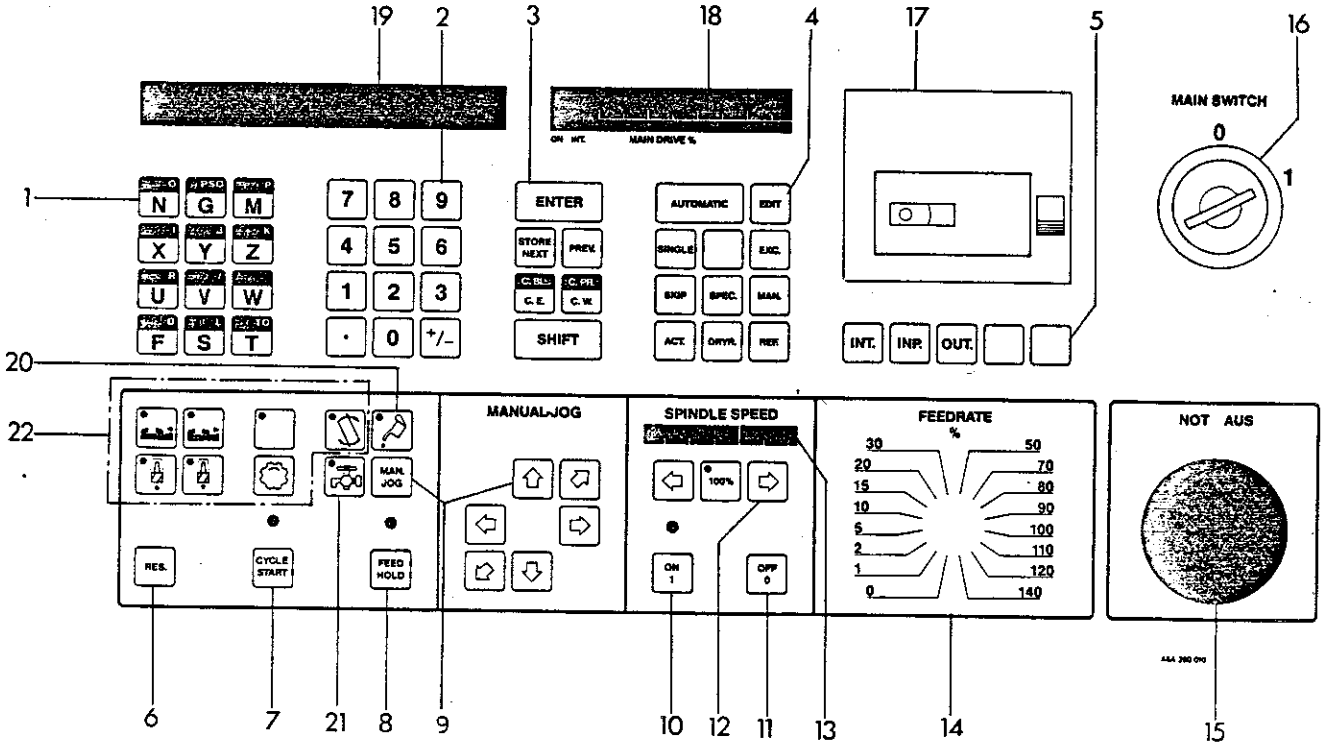
Cancelling an alarm:
Alarms are cancelled with Clear Entry (C.E.) or by switching over to another main mode. Subsequently, the situation which had triggered the alarm must be remedied.
In numerous situations (e.g. when you press CYCLE START with the chip door open) the situation triggering the alarm must be remedied first (close doors); only then can you cancel the alarm.

Representation of the Letter O and the Digit 0 (Zero):

The letter O is written widely spaced. The digit zero is represented in the texts without a slash but in the screen texts with a slash (Ø).

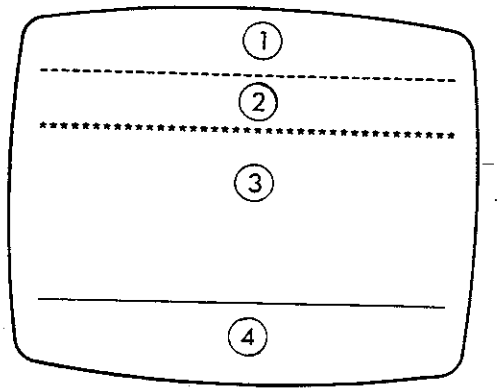
Part 2
Illustrations

Control Panel EMCOTRONIC M1



1. Address keyboard, tool memory (TO), position shift offset register (PSO), skip block designation.
2. Number keyboard
3. Function keyboard
4. Mode keyboard
5. Keyboard for cassette mode, RS 232C
6. RESET key (abort/cancel key)
7. CYCLE START, start key for program run.
8. FEED HOLD
9. Traversing keys for slides in manual mode
10. ON - main spindle on
11. OFF - main spindle off
12. Speed override
13. Display of speed override
14. FEEDRATE, feed override
15. EMERGENCY-OFF key
16. Main switch (key-operated switch)
17. Cassette deck
18. Main drive (percentage display of absorbed power of main motor)
19. Display (for controls without screen)
20. Activate central lubrication again.
21. Coolant ON-OFF
22. Not occupied (at present)

The Screen



The screen is divided into 4 sections.

1) Information on

- main mode
- submodes
- display in mm or inch
- program number
- remarks
  COMPLETE
  NEW
  LOADING
  EXISTS
  SAVING
  DELETED

2) Alarm displays:

Complete list - see alarm messages.

3) Display and input field

Contents are indicated in the modes.

4) - Buffer store in EDIT/EXC.

- Active block in AUTOMATIC mode

Address Keyboard

EDIT
EXC.
AUTOM.

N-address: for block number

EDIT
EXC.
AUTOM.

O-address: - for program number
- free storage capacity (EDIT)

EDIT
EXC.

G-address: G-function

EDIT

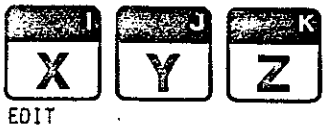
PSO: Position shift offset
Entry into position shift offset register.

EDIT
EXC.

M-address: M-function

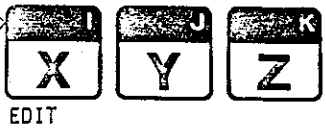
EDIT
EXC.

P-address: Parameter in the case of cycles



EDIT
EXC.
REF.

X,Y,Z addresses:
Addresses for absolute path data.



EDIT
EXC.

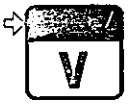
I,J,K addresses:
Circle centre parameters.

EDIT
EXC.

U,V,W addresse:
Addresses for incremental path data.

EDIT

R-address: MON mode (operator monitor) address for parameter R (reference point dimensions).



EDIT

/ - slash: Designation of a skip block.
e.g. N0100/G01.

EDIT
EXECUTE
MAN

F-address: FEED
thread lead

EDIT
EXC.

D-address: 1. Parameter in the case of program cycles.
2. Parameter for MON (operator monitor)

EDIT
EXC.
MAN.

S-address: SPEED - spindle speed

EDIT
EXC.

L-address: 1. Jump address in the case of G25/27 (EDIT,
2. Parameter address in MON mode.
3. Call address for stored programs (EDIT

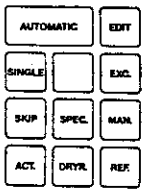
EDIT
EXC.

T-address: TOOL, tool address

EDIT
MAN

TOOL DATA: Entry into tool data register (EDIT).

Direct take-over of the tool data (MAN).



Mode Keyboard

MAIN MODES	REF.	Approach reference point mode
	MAN.	MANUAL mode Manual operation
	EDIT	EDIT mode Program input with relevant routines, data input for offsets and tools. Cassette mode, RS 232C mode, operator monitor.
	EXC.	EXECUTE mode - Processing block buffer store. - Call of tools and position offsets so that the values are displayed in the MAN mode. - Jogging operations with any increments desired.
	AUTOMATIC	AUTOMATIC mode
SUBMODES	SINGLE AUTOMATIC	Single block mode
	SKIP AUTOMATIC	Skip block mode
	DRYR. AUTOMATIC	DRYRUN
	SPEC. MAN EXC. AUTOMATIC	SPECIAL Machine condition display
	ACT.	ACTIVE Display for machine without screen

Function Keyboard

ENTER EDIT EXC. MAN. AUTOM.	In the CNC field ENTER means: - store in a memory - acknowledge - control function - call of T/PSO register, N,O,INT, tool data direct take-over.
EDIT EXC.	Examples: 1) Words must be acknowledged with ENTER when being input You enter a word, e.g. G01. G01 appears on the screen but it is not stored until ENTER is pressed.
MAN	2) Input of F,S values must be acknowledged with ENTER.
EDIT EXC.	3) Jump forwards in the block wordwise.
EDIT EXC.	4) [SHIFT] [ENTER] Jump back to block start.
EDIT	5) Call of a tool or a position shift offset register.

SHIFT EDIT EXC. MAN. AUTOM.	SHIFT here means switching over When the key is pressed, the SHIFT key LED illuminates. The LED goes off when the key is pressed again.
EDIT EXC. AUTOM.	Functions: 1) An upper address is selected. Example: [SHIFT] [R] [U] R-address is selected.
EDIT EXC.	2) [SHIFT] [ENTER] When the cursor stands on a program word, it jumps back to the block start with SHIFT ENTER.
MAN	3) Manual mode [SHIFT] [ON] Spindle turns counterclockwise

C BL **C. E.**	C.E. = Clear Entry - which means delete entry.
EDIT EXC.	Functions: - Delete the last entry (digit)
EDIT EXC. MAN. AUTOM. REF.	- Cancellation of alarm messages.

C BL **C. E.** EDIT EXC.	C.Bl. = Clear Block - which means delete block
EDIT	Function: Deletion of blocks in the program memory and block buffer store.
EXC.	Deletion of blocks in the block buffer store.

C PR **C. W.** EDIT EXC. MAN.	C.W. = Clear Word - which means delete word. Word must be selected.

C PRG **C. W.** EDIT	C.Pr. = Clear Program - which means delete program. program number must be selected, screen must display "found".

Function Keyboard

STORE NEXT EDIT EXC. AUTOM.	
EDIT	Functions: 1. Storing of a block from the block buffer store into the main memory. The block is concluded with STORE NEXT
	2. At the same time a jump is made to the next block. Please note: STORE NEXT has to be pressed even after corrections in a block as otherwise the corrected value is not taken over into the main memory.
EDIT AUTOM. EXC.	- Turning pages of a called program (blockwise).

PREV. EDIT AUTOM. EXC.	- PREV = previous. Function: Working backwards blockwise in the program.

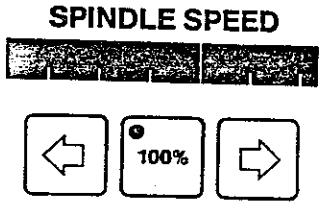
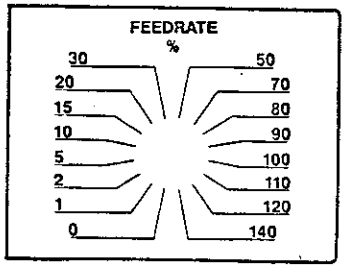
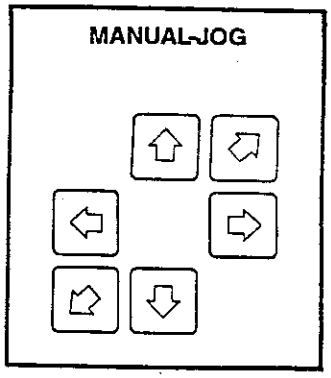
Control Keyboard

RES. MAN EDIT EXC. AUTOM. SPEC.	RESET
AUTOM. EXC.	Functions: 1) Program abort For details, see AUTOMATIC mode.
EDIT	2) - Cancellation of a program - Abort from PSO or TO memory, cassette mode etc.; operator monitor.
MAN. AUTOM. EXC.	3) Active zero offsets, tools, feed rate, speed is cancelled.

CYCLE START AUTOM. EXC. REF.	Cycle Start Start command for program run in AUTOMATIC and EXECUTE modes. Note When CYCLE START is pressed, safety devices must be locked and alarms cancelled.

FEED HOLD AUTOM. EXC. MAN.	Feed Hold: Slides stop. Same effect as with feed override 0 % Coolant off

Control Keyboard

 MAN EXC. AUTOMATIC	Speed override: Increase speed Decrease speed 50% - 120% of the active speed.
 AUTOMATIC EXC. MAN.	Feed override: 0% - 140% of the active F value (exception: thread-cutting!)
MAN. JOG  MAN	Manual traversing key for MAN slides The MAN JOG key must also be pressed with the direction keys. F-value must be entered.
SPEC.	SPEC. Turning page to Special mode.

Control Keyboard

ON 1	Main spindle on.
OFF 0 MAN. EXC. AUTOM.	Main spindle off.

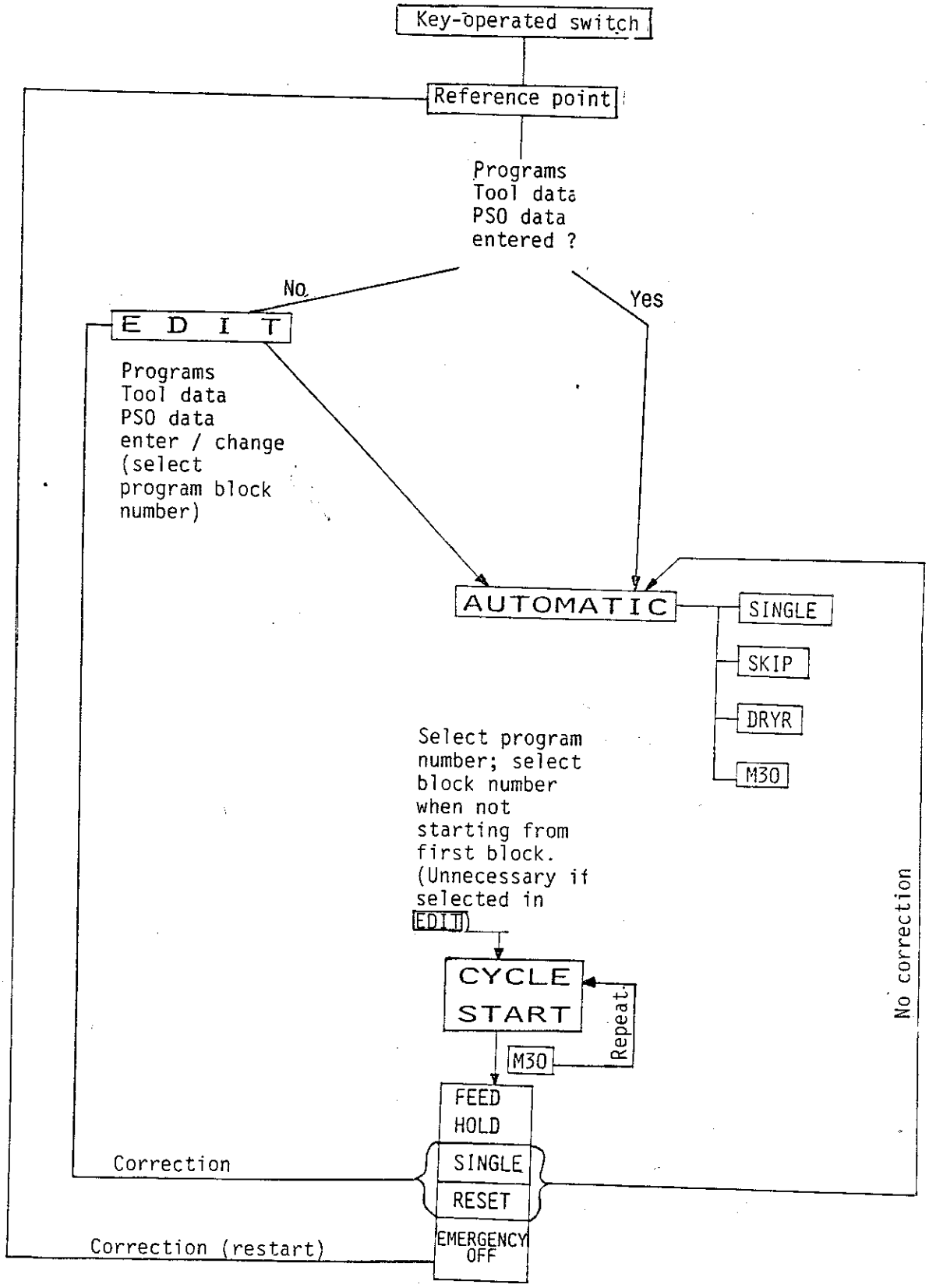
MAN	
ON 1	Main spindle on in clockwise direction
SHIFT ON 1	Main spindle on in counterclockwise direction

AUTOM. EXC.	
FEED HOLD ⇩ OFF 0 ON 1	If, after FEED HOLD, the main spindle is switched off with the OFF key and ON is then pressed, the spindle runs in the original direction of rotation, i.e. before it was switched off.

Keyboard for Cassette and RS 232 Operation

INT.	INT - Interface
INP.	INP - INPUT From external units and cassette into machine control.
OUT. EDIT	OUT - Output From machine control to external units and cassette

Diagramm of Program run



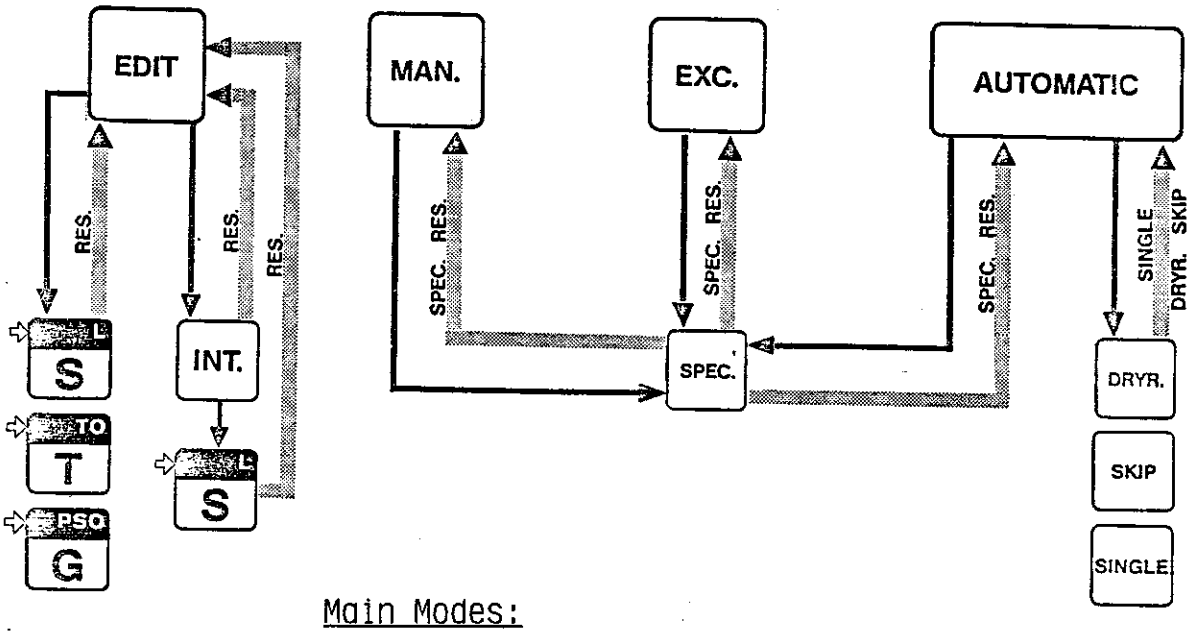
Part 3

The Modes

- Summary
- REFERENCE
- EXECUTE
- SPECIAL
- MANUAL
- EDIT
- AUTOMATIC

Summary of Modes

Selection and Return



Main Modes:

EDIT, MAN, EXC., AUTOMATIC, REF.
You can switch over from one main mode to another (CYCLE START must not, however, be active).

Submodes:

INT., SPEC., DRYR., SKIP, SINGLE;
(ACT. not listed)

Selection: Press appropriate key (LED illuminates).

Return: Press RESET or same key again. If Spec. is active, another main mode can be selected directly.

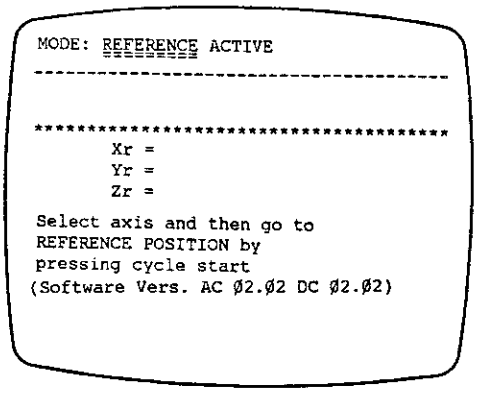
Memories O, L, TO, PSO, MON

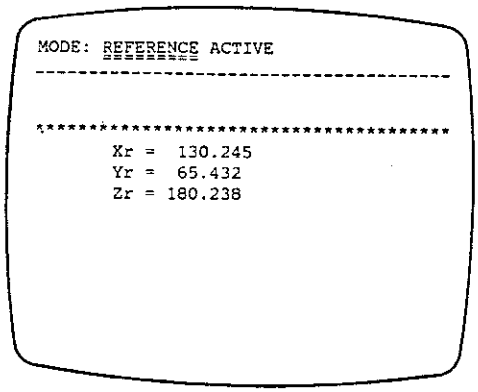
Selection: Acknowledge directly with ENTER.

Cancellation: RESET

Mode - Reference Point

Approach Reference Point





1) When:

- After the machine has been switched on.
- After Emergency-Off (depending on software version).
- After alarm 15
  (Loss of synchronisation)
  the reference point must be approached. By approaching the reference point the measuring system is synchronised internally.

After the machine has been switched on, the screen also displays the software version.

2) Procedure:

MAN	Activate key-operated switch. Control reports in MAN. mode.
	Traverse slides with MAN JOG keys into the reference zone (see operating instructions)
REF	Select REF mode.
X CYCLE START Y CYCLE START Z CYCLE START	Reference point is approached in in the respective axis. Screen displays the distances XMN, YMN, ZMN.
	Switch over to other modes.

3) Notes:

3.1 For software versions AC 02.00, DC 02.00 you only need to press CYCLE START after the slides have been traversed into the reference zone. All three slides move to the reference point.

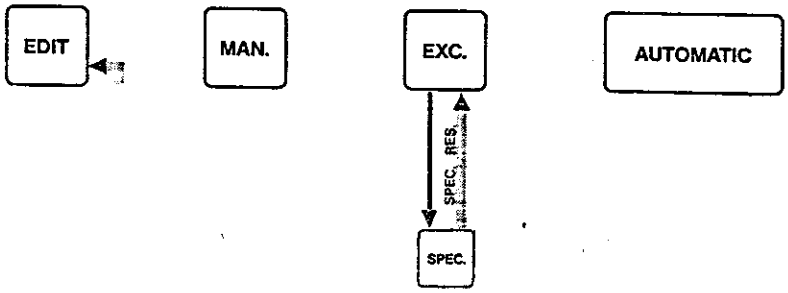
3.2 If the machine has not been switched on for over three months, it may happen that the MSD data (machine setting data) are no longer available in the buffer store. In this case the screen displays alarm 13 after the machine has been switched on. The values in the position shift offset register and the data for the tool lengths indicate nonsensical values, the program memory is empty.

Action:
Read in machine data again from cassette or punched tape.

Mode - EXECUTE

EXC. - EXECUTE

1. Selection and Cancellation



2. Applications:

2.1 Activation of the tool length compensation in the path display see also MAN.

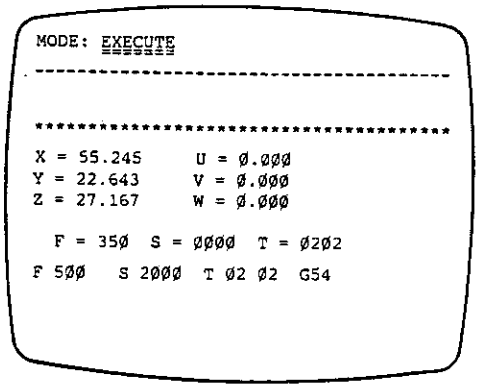
2.2 Activation of the zero offset in the path display see also MAN.

2.3 Processing of single blocks

- Traversing of any increments desired, e.g. for setting-up (jogging mode).
- Entry and processing of single blocks.
- Calling and processing of single blocks from the program memory.

2.4 Selection of other machine conditions e.g. G70/G71/M38,M39

3. Screen Display



Path displays

F

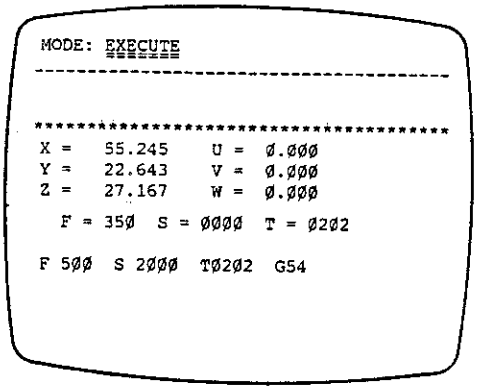
S

Active tool (e.g. T 02 02)

NC block in buffer store.

Ad) 2.1 Activation of displays M-N, W-N M,W --> Cutting Tip

The path displays are changed accordingly by calling tools and position shift offset registers.
This is often practical in the setting-up mode.
For details, see also MAN. mode.



Example:

Path display is to indicate distance from cutting tip of tool T 02 02 to workpiece zero point (G54).

EXECUTE	
T 02 02 ENTER	
CYCLE START	Activation, display
G54 ENTER	
CYCLE START	Activation, display

You can also enter T 02 02 and G54 consecutively and then activate the display.

EXECUTE	
T 02 02 ENTER G54 ENTER	
CYCLE START	Activation, display

If the values M-N, W-N, M,W to cutting tip P are to be displayed in the MAN mode, the displays must first be activated in EXC. Then switch-over to MAN.

Ad) 2.3 Entry of NC-Blocks

If you make an entry in the EXECUTE mode, the blocks without a block number are entered. It is not possible to transfer these blocks to the main memory.

Example: Jogging mode
The X-slide is to traverse 0.5 mm at every CYCLE START.

EXECUTE	
G00 ENTER U 0.5 ENTER	
CYCLE START	As a result of CYCLE START the slide travels 0.5 mm.

Example:
Testing of NC blocks, such as cycles.

Please note:
If during testing you also want to remove material, do not forget

- spindle ON
- coolant ON
- activation of the tool and the zero offset etc.

Ad) 2.3 Calling of NC-Blocks from the Main Memory

Example:
Block N 110 is to be called from the program O 25.

O25 ENTER	Program call
N 110 ENTER	Block call
CYCLE START	Block is processed

Note:

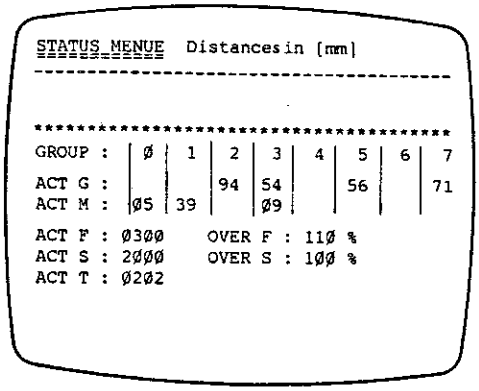
Only the contents of this block are processed. The contents of the previous blocks are disregarded.

Compare Start from any block in AUTOMATIC mode.

Submode - SPECIAL

SPEC.

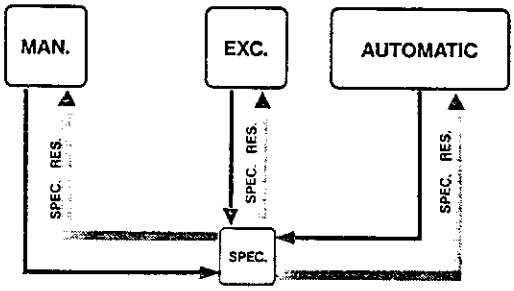
SPECIAL -> Status Menu Display



1. Description

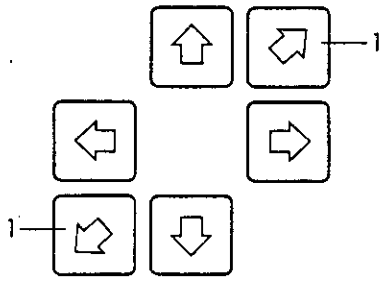
In the Special submode the following pages are displayed:

- actual G, M functions
- actual tools, position offsets;
- effective feed, spindle speed, overrides (feed rate, speed rate).



2. Selection/Cancellation

By pressing Special the status menu is displayed (LED of Special illuminates). If Spec. or RES. is pressed again, the machine is reset to the initial mode.



3. Page Turning

The pages can be turned backwards or forwards with the keys (1).

Mode - MANUAL

Mode - MANUAL

1. Summary - Possibilities:

* Traversing slide by hand
* Spindle on, off, clockwise and counterclockwise
* Coolant on, off.

Overrides:

FEED OVERRIDE

SPINDLE OVERRIDE

Other applications:

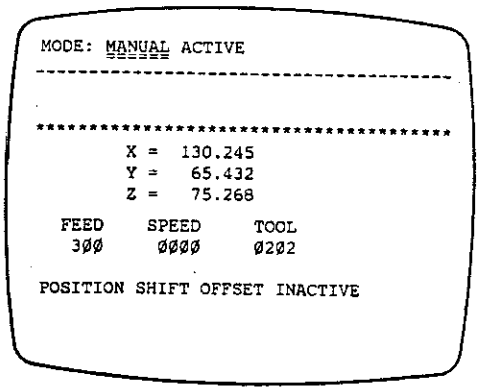
Collecting tool data

- scratching a workpiece of known height
- direct take-over of the tool lengths

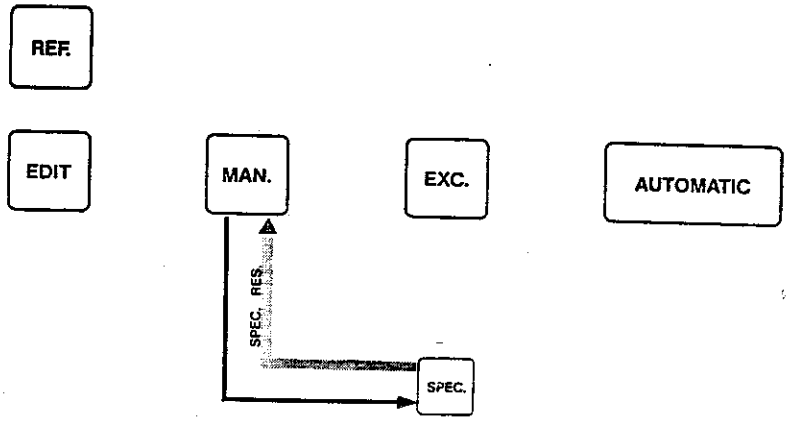
2. Displays on Screen:

- feed rate
- speed
- tool number and offset number (T...)
- PSO active or inactive
- XYZ-values:

* values M to N (machine zero point - tool holding fixture reference point)
* value M to cutting tip of tool
* values W to N (workpiece zero point - tool holding fixture reference point)
* values W to cutting tip of the actual tool.

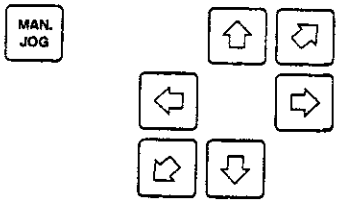


3. Selection Options Submodes



4. Operation

4.1 Traversing the Slides



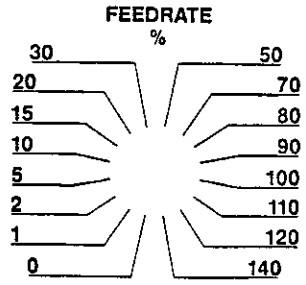
4.1.1 Entry of the feed rate:

e.g. F = 500 mm/min

F 5 0 0

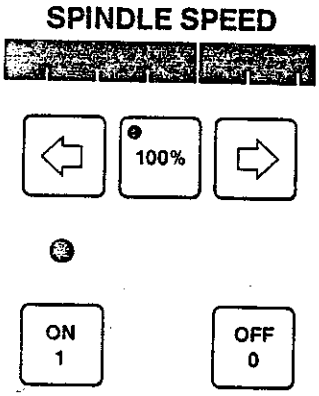
E N T E R

The maximum feed rate is limited. Alarm is given in the event of excessive values.



4.1.2 Traversing:

The key MAN JOG must be pressed at the same time as the direction key. Control with FEED OVERRIDE of 0 - 140%.



4.2 Switching the Main Spindle on and off

S 1000 ENTER	Enter speed
ON	Spindle runs clockwise
SHIFT ON	Spindle runs counterclockwise
OFF	Spindle off

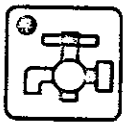
Further possibilities of switching off:

RESET

EMERGENCY OFF

Override:

Spindle speed 50 - 120 %.



4.3 Coolant On-Off

LED illuminates: coolant on

LED off: coolant off

Switch over by pressing the key again.

4.4 Central Lubrication

If the machine is equipped with automatic central lubrication, a lubrication pulse is triggered by pressing the key.
Otherwise, the flashing LED indicates that lubrication must be performed manually. The LED stops flashing when the key is pressed.

5. The Path Displays in Manual Mode

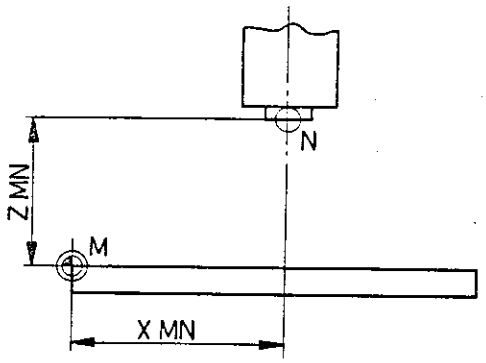
Knowledge of the various types of display in the manual mode is important for the setting-up mode and the various types of tool measurement.
The same path displays are given in the AUTOMATIC and EXECUTE modes as well, depending on whether position shift offsets (PSO) and tool length data (TO) are called or not.

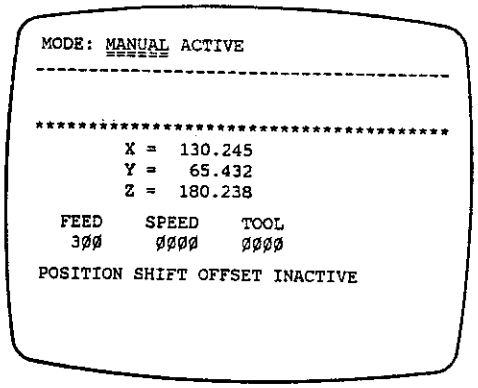
Please note that positive position offsets (tool offsets) are not cancelled by a change in the mode!

Tools and PSO data are called in the EXECUTE mode; using CYCLE START the display jumps over, followed by switch-over to MAN.

The Path Displays

5.1 Displays M - N





- Tool T 00 00 (or tool without offset value, e.g. T 03 03); This means no tool length offset.
- POSITION SHIFT OFFSET INACTIVE (No G54, G55, G57, G58, G59 active)

The following distances are displayed:

X M N

Y M N

Z M N

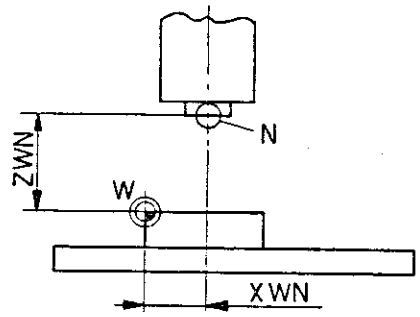
When:

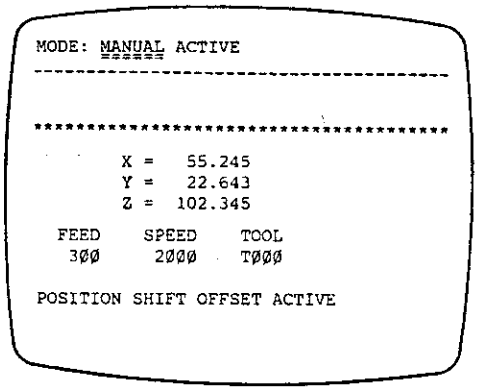
* When the machine is switched on
* After EMERGENCY-OFF
* When switching over from other modes and no tool or PSO is active.
* After RESET has been pressed

5.2 Display W - N

- A position shift offset is active (G54, G55, G57, G58, G59)

- Tool T 00 00 active





Activation of the position shift offset:
e.g. G54

Possibility 1:

EXECUTE	
G54 ENTER	Entry of G54
CYCLE START	Display jumps over
MAN	W - N values are displayed.

The drawn distances are displayed.

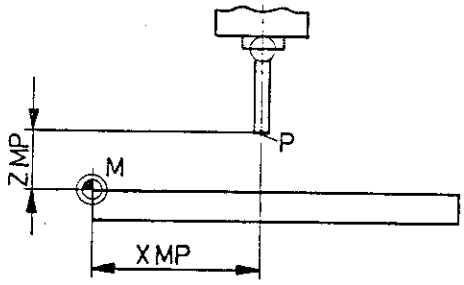
Possibility 2:

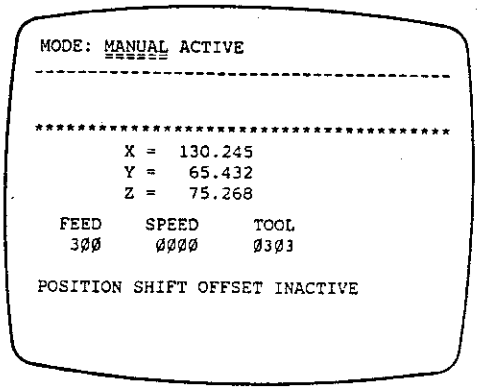
If a position shift offset has not been cancelled in the EXECUTE or AUTOMATIC modes, it also remains active in the MAN mode.

5.3 Display M to Cutting Tip P

- No position shift offset active

- Tool with offset value active





Activation: e.g. T 0303

Possibility 1:

EXECUTE	
T 0303 ENTER	Entry of G54
CYCLE START	Display jumps over
MAN	M --> is displayed.

Possibility 2:

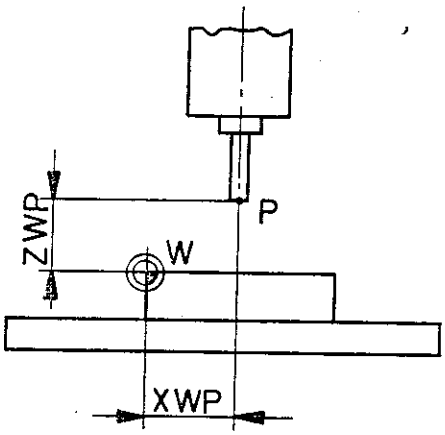
Tool was not cancelled in the AUTOMATIC or EXECUTE modes and also remains active in the MAN mode.

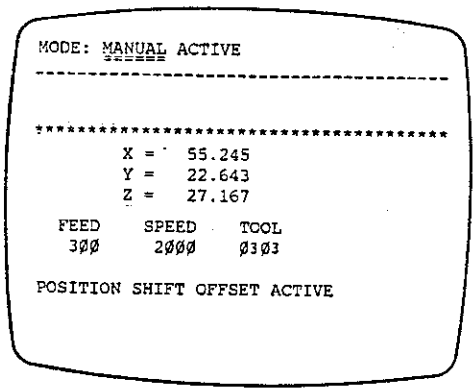
5.4 Display W to Cutting Tip P

- Position shift offset active
- Tool with offset active

Activation: e.g. G54 T 0303

Possibility 1:





EXECUTE	
G54 ENTER	Entry of G54
CYCLE START	Display jumps over.
T 0303 ENTER	Entry of T 03 03
CYCLE START MAN	Display jumps over. W - P is displayed.

You can also activate G54 and T0303 both at once.

Possibility 2:

Switch-over from other modes if PSO and tool are active.

EXECUTE	
G54 ENTER T 0303 ENTER	
CYCLE START -> MAN	Display jumps over.

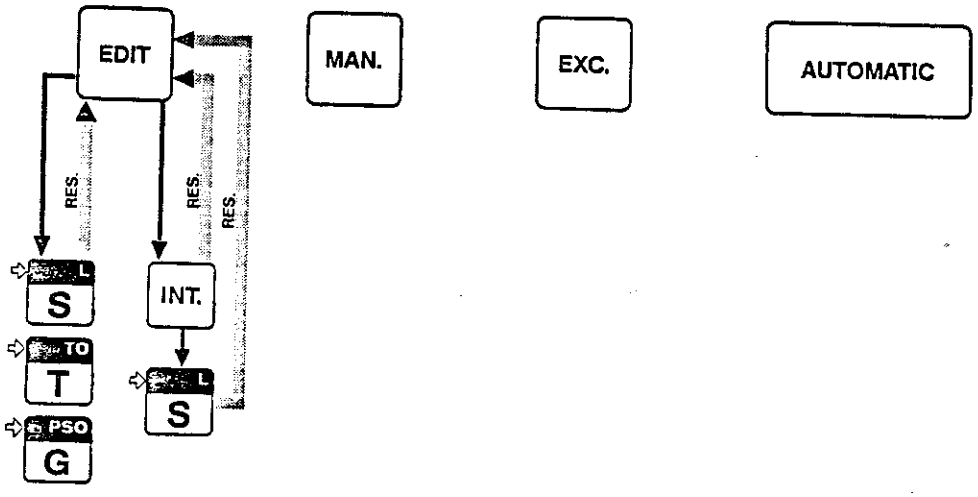
Mode - EDIT

EDIT

1) Possibilities (Summary)

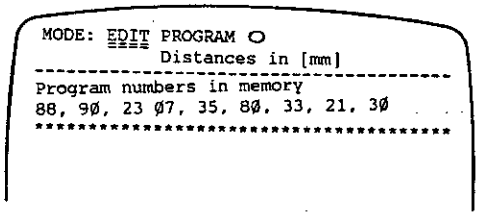
EDIT	Program entry by hand with relevant routines such as clearing, corrections etc.
O	Selection of existing programs in machine memory, indication of the free storage space
TO	Tool data memory (entry, call)
PSO	Position shift offset registers (zero offsets, entry, call)
L	Listing of stored programs
INT + 0	Cassette mode Loading and storing of programs and machine data on the cassette.
INT + 1	RS 232 mode Loading and storing of programs and machine data via external data carriers.
MON	Operator monitor Establishing and changing the machine and control condition

2) Selection/Cancellation (Summary)



3) Listing of Stored Programs

Precondition:
No workpiece program may be active.



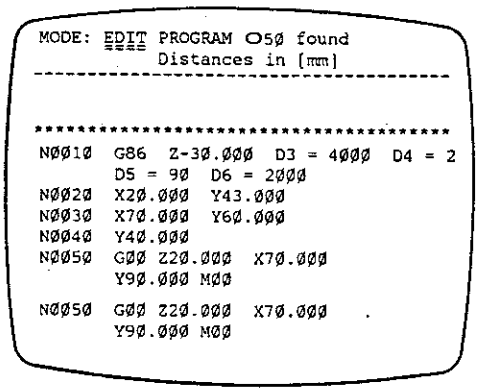
L ENTER	The program numbers of the stored programs are listed.
RESET	Abort --> EDIT

4) Call of a Stored Program

It is possible to call a program in the EDIT, AUTOMATIC and EXECUTE modes.

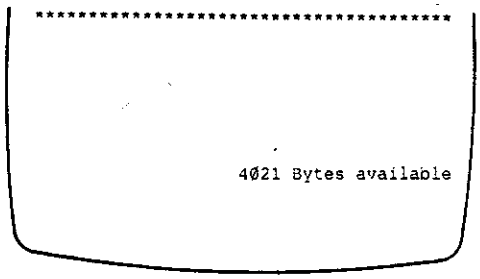
Example:

Program O50 is to be called.



O 5 0 ENTER	Screen displays "O50 found" and the initial blocks. If this program does not exist, screen displays "O50 new".
RESET c. Pr.	Program cancellation

Indication of the Available Storage Space



O ENTER	The storage capacity still available is indicated in the bottom section of the screen.
	Abort: possible at all times

5. Entry of NC-Program via Keyboard:

Key-operated Keys:

ENTER

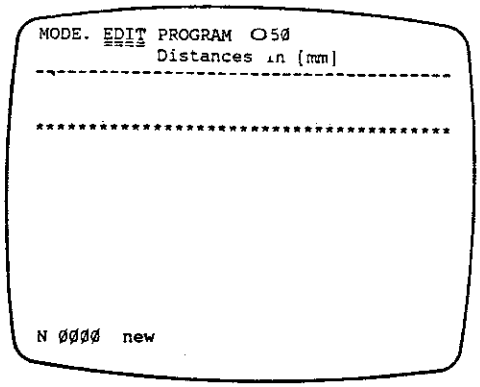
- Storing of a word
- Confirmation of "new" with O and N numbers.

STORE NEXT

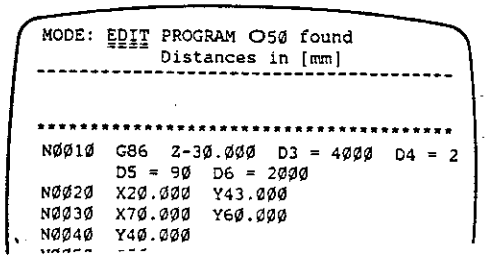
1. Storage of a block in the main memory (STORE)
2. Simultaneous call of the next block. The block numbers are always proposed in increments of ten (NEXT).

5.1 Program Number Entry: e.g. O50

Each program must have a program number. The program number is entered via the O address.
Program numbers possible from Ø to 99.
One can also enter a program number in the operator monitor determining from which number subroutines are possible.
See Programming instructions G25/M17.



EDIT	
O 5 0 ENTER	Screen displays "O50 new"
ENTER	O50 is in buffer store. The "new" is deleted.
STORE NEXT	O50 is opened in the program memory. The block number "N 0000 new" is proposed. The contents entry can commence after the "new" has been acknowledged with ENTER.



Note:

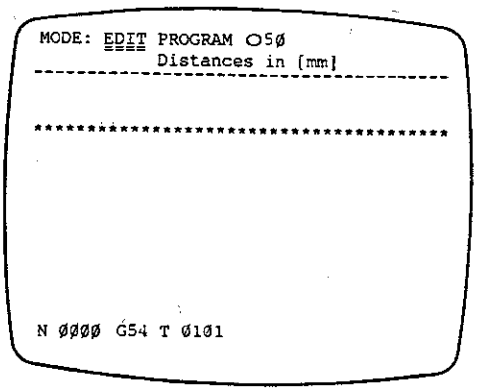
If O50 is already in the memory, the screen displays O50 found.
The program contents are listed.

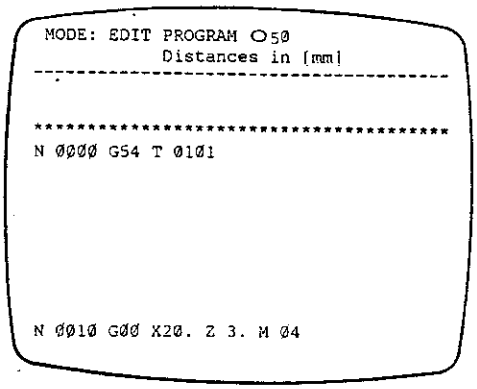
Possibilities:
- Delete program O 50
- Select different program number
- Renumber old program O50.

5.2 Program Contents Entry

Example:

N 0000/G54/T0101
N 0010/G00/X20./Z3./M04





Block N 0000		Screen displays N 0000 new.
	ENTER	Command: N 0000 opened in the buffer store; screen displays N 0000.
	G54 ENTER	Entry of words
	T0101 ENTER	In buffer store
	STORE NEXT	- Command: take over block into main memory. - Proposal of next block number N 0010 new.
BLOCK N 0010	ENTER	Command: Open N 0010 in the buffer store. Screen displays N 0010.
	G00 ENTER	
	X 20. ENTER	
	Z 3. ENTER	
	M04 ENTER	
	STORE NEXT	

Summary:

The computer proposes the block numbers in increments of ten.

However, you can also number the blocks arbitrarily. See "Arbitrary block numeration".

The block numbers are confirmed with ENTER. With STORE NEXT the block is concluded and taken over into the main memory. At the same time the next block number is proposed.

5.3 Arbitrary Block Numeration

With STORE NEXT the next block number is proposed in increments of ten. You can confirm this block number (ENTER) or enter a different one.

Possibilities:

1. Confirmation of the proposed block number

e.g. N 0020 new

	Bildschirm zeigt N 0020 new.
ENTER	N 0020 ist bestätigt; Bildschirm zeigt N 0020.

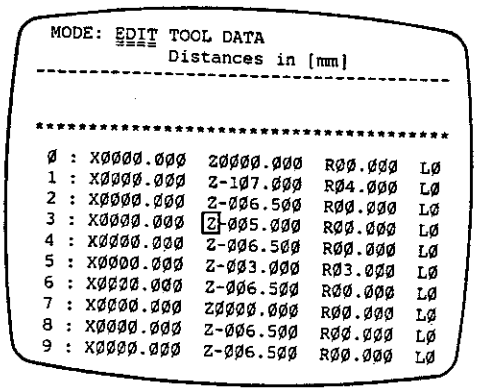
2. Selection of a different number

Example: N 0011 is to be entered.

	Bildschirm zeigt N 0020 new.
N 11 ENTER	Bildschirm zeigt N 0011 new.
ENTER	Bestätigung von N 0011. Bildschirm zeigt N 0011.

6. Entry of the Tool Data

Example: The values Z - 50./R5 are to be entered in register 3.



TO	Screen displays listing.
3 ENTER	Tool data memory 03 is selected; cursor stands on Z.
C.W. oder C.E.	Delete old value of Z (also 0).
-50. ENTER	Z-value is stored Cursor jumps to R.
C.W. oder C.E.	
5. ENTER	R 5 is stored
RESET oder EDIT	Leave tool data memory.

Note:

With ENTER you key to the respective address.
The X and L-addresses are not activated with EMCOTRONIC M1.
Direct take-over of the tool length data: See operating instructions.

7. Entry - Changing the PSO Data
Data for Zero Offsets

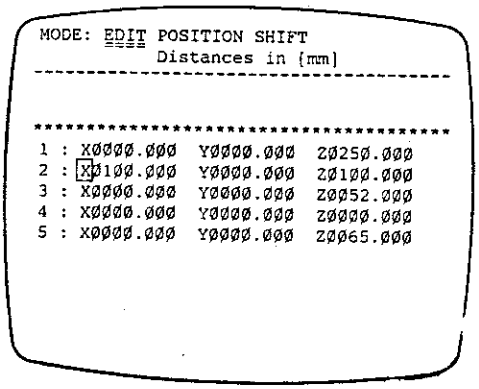
- You can enter the offset values into the 5 registers.
- Each register is called by a G-command.

Example:

The following offset values are to be entered into the PSO register 2:

X = 30.2

Y = 20.5



PSO	Screen displays listing
2 ENTER	Register 2 is selected, cursor stands on X.
C.W. oder C.E.	Delete old value (also value 0).
30.2 ENTER	Value stored, cursor on Y.
C.W. oder C.E.	Delete old value.
20.5 ENTER	Value stored, cursor on Z.
RESET od. EDIT	Leave PSO memory.

Note:

You can jump addresses with ENTER.

8. Operation Routines/Selection Routines

8.1 Key forwards in blocks

STORE NEXT

N 100 .....
N 110 .....
N 120 .....
N 130 .....

8.2 Key backwards in blocks

PREV.

N 100 .....
N 110 .....
N 120 .....
N 130 .....

8.3 Jump forwards in block

ENTER

N 110/G00/X20./Y30.

8.4 Jump back to block start

SHIFT ENTER

N 110/G00/X20./Y30.

8.5 Select block number
e.g. block N 230 is selected.

N 230 ENTER	The selected block is displayed.

8.6 Select word
e.g. X. word
Block must be selected

X ENTER	X-word is displayed Contents can be changed. Old word can be deleted

Note:
If there are two identical addresses in one block, the first word is selected. You must repeat the routine to select the second word.
Example: N 120/G01/x.../Y.../G71

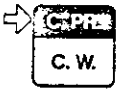
G ENTER G ENTER

9. Program Changes, Corrections etc.

There are several possibilities for correcting and optimising programs.

- Additions, such as the insertion of blocks and words.
- Changes, corrections of words, blocks.
- Deletions of words and blocks.

9.1 The most Important Key Functions

	Clear Entry: 1) Numbers can be deleted but not addresses. Each digit must be deleted. 2) Deletion of alarm messages
	Clear Word: Word contents and address are deleted in the buffer store.
	Clear Block: Deletes block in the main memory (EDIT) or in the buffer store (EXC.).
	Clear Program:
	Store changed contents in buffer strore.
	STORE, NEXT After making corrections in a block, STORE NEXT must always be pressed as otherwise the changed contents will not be taken over into the main memory. STORE means storing in the main memory, NEXT means jumping further.

9.2 Procedures for Deleting and Correcting Block Contents

General:

- Word contents can only be deleted if the corresponding address is displayed.

Possibilities

Overwriting contents:

Example:

X 23. instead of X 32.

N.... ENTER	Select or key block.
X 23. ENTER	Word in buffer store
STORE NEXT	X23. is in main (program) memory.

Deletion and entry of new contents:

Example:

G01 is to be programmed instead of G00.

N....	Select or key block.
G ENTER	Select or key word.
C.W. oder C.E.	Delete word or word contents.
01	Enter word contents; even if the word has been deleted with C.W. in the buffer store, the address remains active. G can, but need not, be entered.
ENTER	Word in buffer store.
STORE NEXT	Word in main memory

9.3 Addition of a Word

You can add new words to a block.

Example:

You have forgotten the switching-on of the spindle M 03.

[N] 0020/G00/X 20./Z 2.

N 0020/M 04/G00/X 20./Z 2.

N 20 ENTER	N 20 is selected.
M 04 ENTER	
STORE NEXT	Block is stored with M 04.

Note:

1. New words are always inserted after the word on which the cursor is standing. In this case M 04 appears after N 20.

2. Apart from G and M words only a word of the same address can be written in a block.

3. If G or M words from the same group are added, the one which last appeared on the screen is valid. See also section 9.4.

9.4 Addition of a G- or M-Function of the Same Group in a Block

Example of incorrect programming:
G01 is to be programmed instead of G00.

N 50/G00/X 20./Z 2.

N 50/G01/G00/X 20./Z 2,

N 50 ENTER	Select block, cursor stands on N.
G01 ENTER	Program G01.
STORE NEXT	Block is stored.

Attention!

G00 stands after G01 and is therefore still active.

Note:

Even if G01 stands after G00 (cursor is on G00 address or a subsequent one during entry of G01), this programming is too confusing.

Therefore: Delete old G-word.

9.5 Insertion of a Block

Example:
The block N 101 is to be inserted between block N 100 and N 110.

N 101 ENTER	N 0101 new appears on the screen.
ENTER	Block is opened in buffer store.
Enter block contents	
STORE NEXT	N 101 is inserted between N 100 in the main memory and N 110.

9.6 Renumbering of Blocks

Example:

N 100 is to changed to N 99.

N 100 ENTER	Select or key in block.
C.E. N....	Keep pressing C.E. until all the digits of N are deleted.
N 0099 ENTER	Enter block number with leading zeros.

9.7 Deletion of a Block

Example:

Block N 110 is to be deleted.

N 110 ENTER	Select block.
C. Bl.	Delete block.

9.8 Renumbering of Programs

Example:

Program O 07 is to be renumbered to program O 08.

O 20 ENTER	Select program.
C.E.	Keep pressing C.E. until all the digits are delected.
08 ENTER	Enter new program number. Leading zeros must be entered.

10. Deletion of a Program

Example:

Program O 25 is to be deleted.

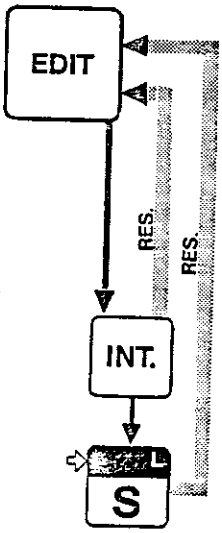
O 25 ENTER	Program selection.
C.Pr.	Program is deleted.

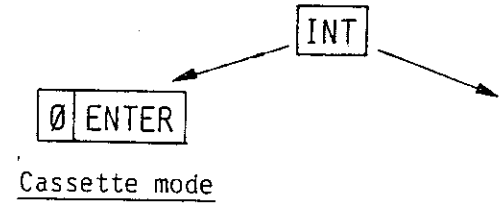
11. Cassette Mode, RS 232 Mode

Important Keys:

INT.	Interface, interface mode for cassette and RS 232
OUT.	OUTPUT: From machine memory to cassette or peripheral.
INP.	INPUT: From cassette or external unit into the machine memory.
RES.	Abortion of the operation in the cassette mode and the RS 232 mode.

11.1 Selection of Cassette Mode, RS 232 Mode





Cassette mode

The control is made ready for cassette mode by entering zero. (Zero can also be omitted).

RS 232 mode

The control is switched over to RS 232 mode by entering the figure 1.

Note: Digital cassette

- Only digital cassettes may be used.
- Protect the cassette against dust and dirt.
- If the cassette comes near a magnetic field, stored programs can be destroyed.

11.2 Cassette Mode

11.2.1 Formatting the Cassette (Deletion)

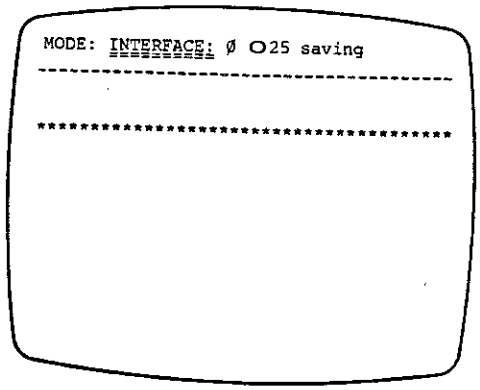
Each new cassette must first of all be formatted. (Side A and side B).

Formatting procedure:

	Insert cassette.
INT (0)ENTER	
C.Pr.	Cassette is formatted. The procedure is terminated when the cassette is stationary again.

11.2.2 Program from Machine Memory to Cassette (Saving)

Example: Program O25



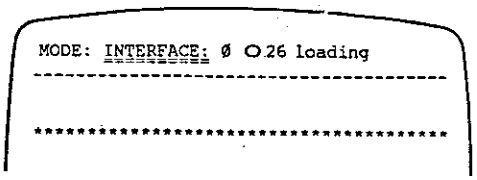
INT(0)ENTER	Cassette mode selected.
O25 ENTER	Program selection. (Program selection omitted if the program has been previously selected).
OUT	Command to store the program. The screen displays "O25 saving". Saving means storing.

Note: Overwriting a program

If a program O25 is already stored on the cassette, the screen displays "exists" (program O25 already present). You can delete the program O25 on the cassette with C.Pr.

Then the program O25 is transferred from the machine memory to the cassette.

11.2.3 Program from Cassette into Machine Memory



Example: Program O26

INT(O)ENTER	Cassette mode.
O26 ENTER	Call up program number on cassette.
INP	Command to load. LOADING appears on the screen.

Note:
If a program O26 already exists in the machine memory, EXISTS appears on the screen.

You can delete the program O26 in the machine memory with C.Pr.

Then the program O26 is loaded from the cassette into the machine memory.

11.2.4 Listing the Programs on the Cassette

INT(O) ENTER	Cassette mode.
L ENTER	Program numbers are displayed.
RES	Leave.

11.2.5 Overwritting of a Program on the Cassette

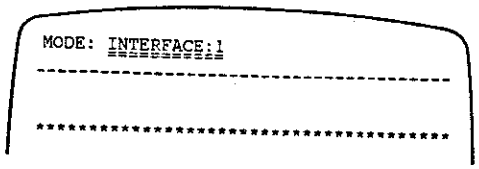
An existing program, e.g. O 21, can be overwritten with another program with the same number. See also 11.2.2.

INT O ENTER	Cassette mode.
O21 ENTER	OUT
Cl.Pr.	Screen displays O 21 deleted and transfers O21 onto the cassette.

11.2.6 Deletion of the Total Contents of the Cassette

INT O ENTER	Cassette mode.
C.Pr.	Command to delete the entire contents of the cassette. Re-formatting takes place at the same time as deletion.

11.3. RS 232 Mode



The reading in and out procedures are the same as in the cassette mode. However, the RS 232 mode must be selected with INT 1 ENTER.

11.3.1 Programs from Machine Memory onto Matrix Printer, Punched Tape or other Data Carries

Example:

Program O28 is to be printed out, punched or stored in another way.

INT 1 ENTER	RS 232 mode.
O28 ENTER	Program call (Can be omitted if program has already been selected).
OUT	Command for transferring.

11.3.2 Loading Programs from External Data Carries

11.3.2.1 Loading total contents of the external data carrier (no particular program)

Example:

Total contents of a punched tape are to be loaded.

INT 1 ENTER	RS 232 mode
O INP	Command for loading the machine memory. Screen displays LOADING.

Note:

If program numbers are already stored, EXISTS appears on the screen.
You can delete the program in the machine memory with C.Pr.

11.3.2.2 Loading a certain program

Example:

O30 is to be loaded.

INT 1 ENTER	RS 232 mode.
O30 ENTER	Program selection.
INP	Loading command; screen displays LOADING.

12. Loading the Machine Data (MSD)

MSD is the abbreviation for "machine status data".

A machine data cassette as well as a punched tape with the MSD data are supplied with the machine.

All system data are loaded into the internal machine data memory in the loading procedure.

12.1 Loading machine data from cassette:

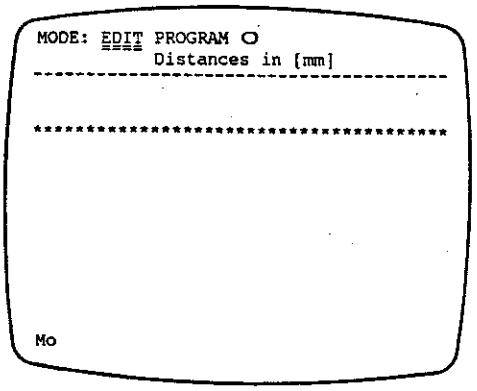
EDIT	Insert cassette.
INT 0 ENTER	Control in cassette mode.
M S D INP	The data are loaded. On completion of the loading procedure the control reports in the MAN mode.

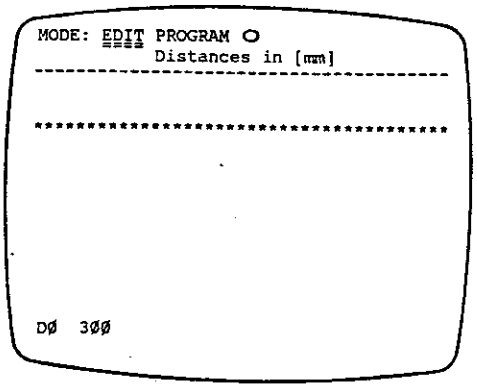
12.2. Loading machine data from punched tape via RS 232

EDIT	Insert punched tape.
INT 1 ENTER	Control in RS 232 mode.
MSD INP	Loading procedure is started. This process must be performed three times.

13. Entry into Operator Monitor/Data Change

Precondition:
No workpiece program may be active.





MON ENTER	Screen displays MO.
D or L or R ENTER	Select desired parameter address. Screen displays D_0 or L_0 or R_0.
ENTER ENTER	With ENTER key to the parameter number.
C.E. or C.W.	Delete old word.
e.g. 1 2 ENTER	Enter word and store with ENTER.
RESET or other modes	Leave MON.

Mode - AUTOMATIC

AUTOMATIC

1. Summaries, Notes

General:

Programs can be started from the first block as well as from any arbitrary block.

Types of runs:

You can select the type of run depending on your requirements.

1.1 Types of Runs (Summary)

AUTOMATIC	Pure Automatic mode
SINGLE	Single block mode
SKIP	Skip block
DRYR.	Dry run (test run) with axis movement

Combinations

SINGLE SKIP

SINGLE DRYR.

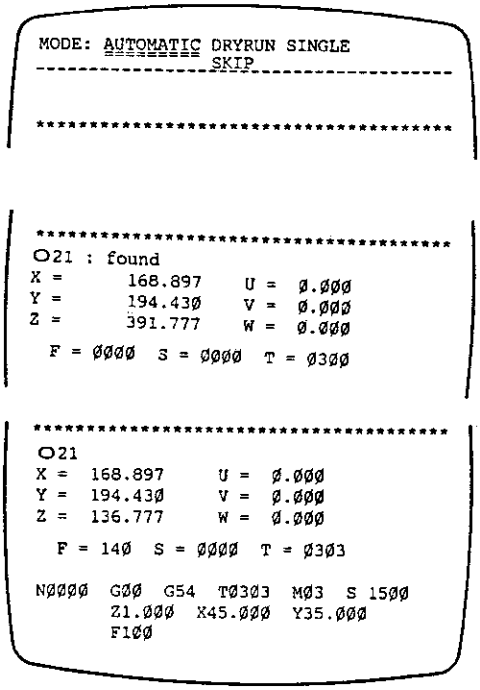
SKIP DRYR.

SINGLE SKIP DRYR.

Test Run without Axis Movement

AUTOMATIC M 30

1.2 The Displays in AUTOMATIC-Mode



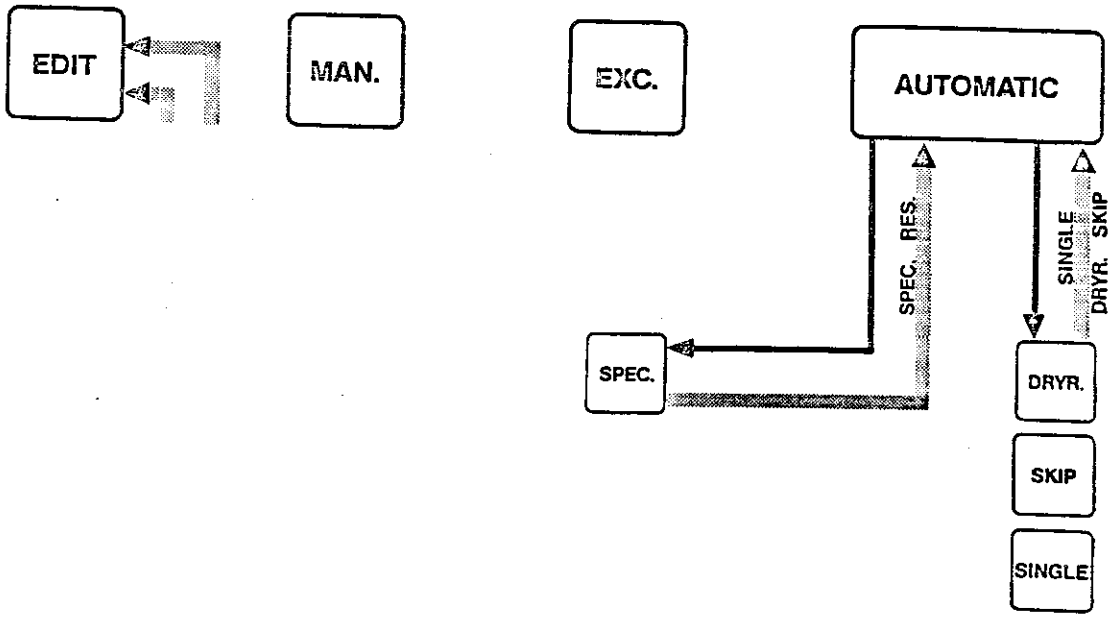
Displays after program call:

- Selected submodes are displayed (SINGLE, SKIP, DRYRUN)
- Program number
- X, Y, Z values
- Feed, speed and active tool.

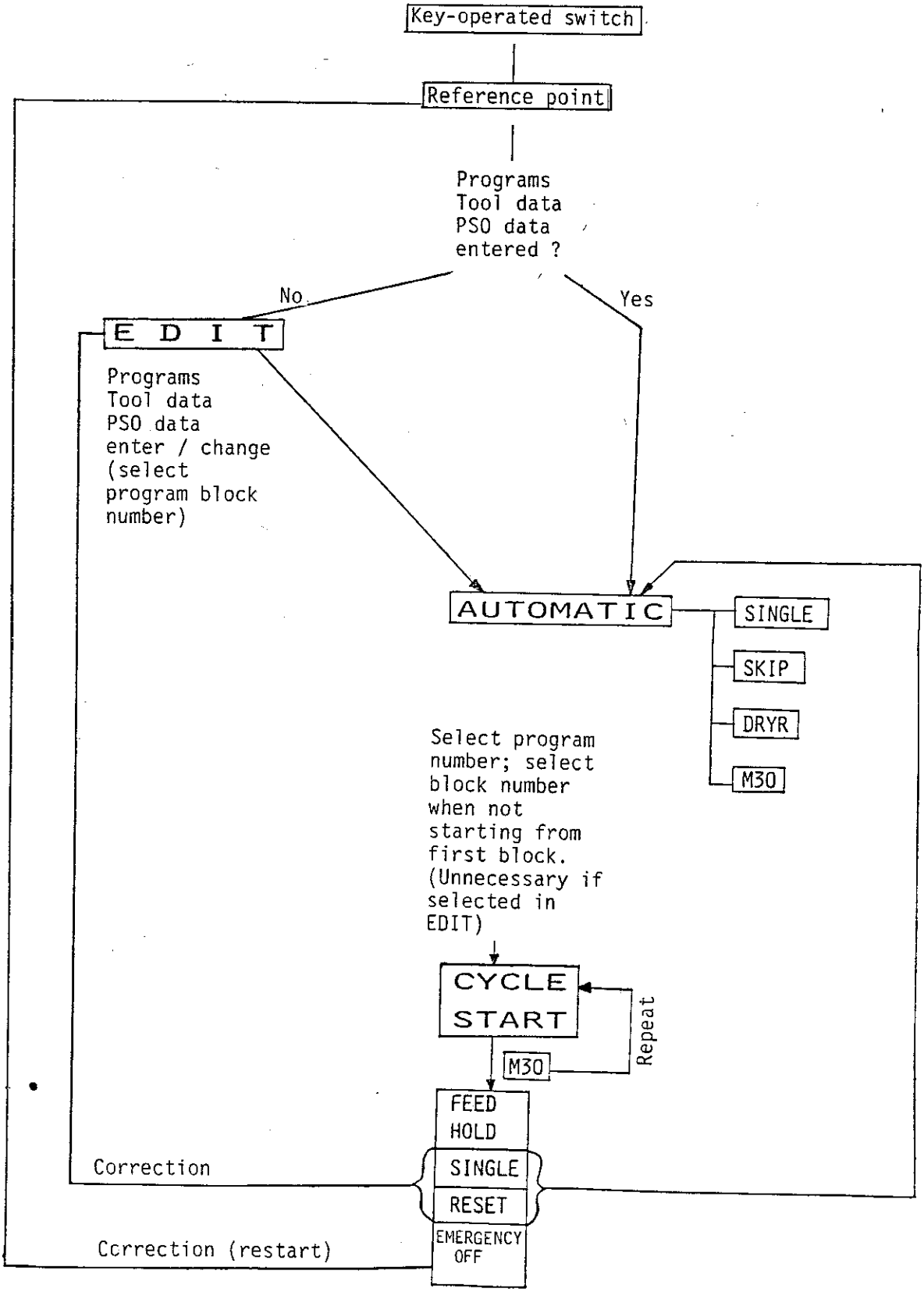
Display during program run

- Current actual coordinate values, remaining travel, technological values (F, S), actual tool (T);
- Actual block

1.3 Selection and Cancellation



1.4 Diagram of Program Run



2. Program Call and Program Run

Preconditions: * Reference point must be approached.

* A program must be stored.

2.1 Starting a Program from the Beginning:

e.g. Programm O50

AUTOMATIC	Screen displays MODE AUTOMATIC
O 50 ENTER	If O50 is available, screen displays "O50 found". (Selection can be dispensed with if already selected in EDIT).
SINGLE SKIP DRYR.	Select submode, if desired.
CYCLE START	Program starts if no alarm situations are given.
FEED HOLD, SINGLE, RESET, NOT-AUS	Program interruptions, program abortions.

Note:

A program selected in the AUTOMATIC mode and a selected block remain selected during switch-over into the EDIT mode and switching back to the AUTOMATIC mode. When switching into a mode other than EDIT the program/block is lost and must be called again after reselecting the AUTOMATIC or EDIT mode.

Before a new program is called for processing, the RES key should always be pressed. The offsets are cancelled with RESET (TO, PSO). Changes which may still be effective owing to the last machining program are cancelled.

A program that has been selected in EDIT is taken over if AUTOMATIC is selected.

If a program and a particular block number are called in EDIT, both the program and block numbers are also selected when switching to AUTOMATIC.

2.2 Start from any Block of the Program

You can start a program from any block you want.

If a block is selected in the middle of the program and you press CYCLE START, the control reads all previous blocks and creates the same condition as if the program had been processed up to the entry block.

This means that

- the zero offset(s) is/are carried out
- the tool is called
- the coolant is switched on
- the main spindle is switched on etc.

if these points are programmed in the preceding blocks.

When is a start out of the program advisable?

- In cases of program abortion by alarms, overloads etc.
- When you have interrupted the program yourself in order to make corrections, change chips, take measurements etc.

Note:

Test run without axis movement

You can carry out a test run without axis movement owing to the fact that you can enter in any block.
For details, see Test run without axis movement.

Entry Routine for Program Start in Program

e.g. Program O50 is to be started in block N 100

AUTOMATIC	
O50 ENTER	Dispensed with if program has been selected in EDIT.
N 100 ENTER	Cursor stands on N 100 (omitted if selected in EDIT)
CYCLE START	- The start conditions are created. (Previous G, M, S, T instructions are activated) - Tool moves with G00 to starting point of the selected block (= end point of the previous block)

Note:

* You can of course key to the appropriate block number with the keys PREV. or STORE NEXT.
* When starting in the middle of the program you can also determine the type of run with SINGLE, SKIP, DRYRUN.

However, Observe the Following Points when Starting from any Block

1. Is the abort block active?

Example:

- Alarm was triggered in block N 100 and the program interrupted.
- You correct the block N 100 and have to store the block contents with STORE NEXT.
- With STORE NEXT the next block is automatically called.
- If you pressed START, you would enter the next block.

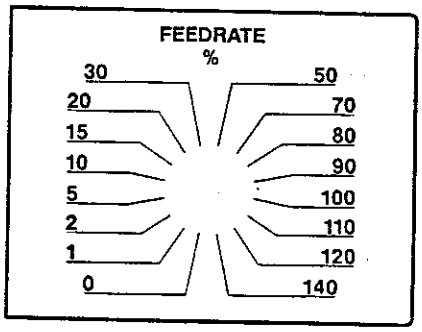
2. Collision check

Example:

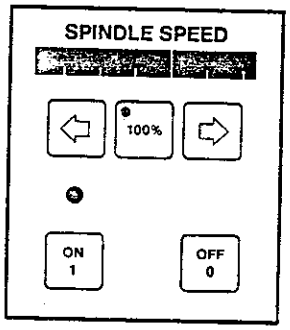
- The program was aborted in block N 100.
- You traverse the tool by hand.
- After the correction you again select N 100 and start the program.
  Check the risk of possible collisions.

3. Run Control
Program Interruptions
Program Abortions

3.1 Run Control:

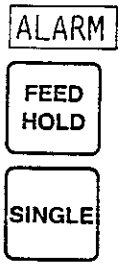


Change in the feed rate from 0 to 140%

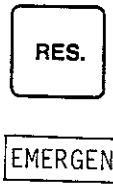


Change in the spindle speed from 50 to 120%.

3.2 Program Interruption:



3.3 Program Abortions:



Effects of Program Interruptions, Abortions, M30

(Summary)

		ALARM	FEED HOLD	SINGLE	RESET	EMERG. OFF
	Program interuption	X①	X	X		
	Program abortion	X②			X	X
	Return to N 0000				X	X③
Circuit	Spindle OFF	X①	O	O	X	X
Circuit	Coolant OFF	X①		O	X	X
Circuit	Slides stop:					
Circuit	at the end of the active block			X		
Circuit	at once, apart from thread at end of block		X			
Circuit	at once, even with thread	X①			X	X
Control condition	Cancellation G41/G42/PSO/TO	X			X	X
Control condition	Cancellation PSO/TO				X	X
Control condition	Reference point lost	X②				X③

Legend:

X Activation

① Not with service alarm A 03

② With alarm 15

③ For software version AC 2.00 DC 2.00
return to N 0000 and no reference point loss.

O Possibilities

3.2 Program Interruptions

ALARM 3.2.1 Automatic Interruptions by Alarms

Syntax mistakes, programming errors, opening of safety devices and overloading trigger alarms and the program run interrupted.

Consequences:

- Program stops and screen displays type of alarm.
- Spindle stops.
- Coolant off.

Measures:

Remedy situation causing alarm.

Start:

Start program from beginning or from abort block.

FEED HOLD 3.2.2 Program Interruptions by FEED HOLD

Possibilities with FEED HOLD

- Switch off main spindle
- If corrections are carried out, RESET must be pressed.
  Only then is it possible to switch over into EDIT.

The LED illuminates after the FEED HOLD key has been pressed.

Consequences:

- Program is stationary.
- Slides stop at once (apart from with thread).
- In the case of thread-cutting the pass in progress is cut to the end and then the feed drives stop.
- Coolant is switched off.

Start:

FEED HOLD Press!

The LED goes out; program continues.

Caution:

Is the main spindle running?

Coolant is automatically switched on if M 08 is programmed beforehand.

SINGLE

3.2.3 Program Interruption with Key

SINGLE key is pressed during the program run.

Consequences:

- The active block is ended, cycles and thread are completed and then the slides stop; during the processing of cycles the SINGLE LED flashes.
- The main spindle and coolant are not switched off, all active functions are retained.
- Control is at next block.

Possibilities:

- Switch off main spindle
- Switch off coolant
- Switch over to EDIT mode (other mode) --> corrections.

Start

As usual from start or abortion block.

RES.

3.3 Program Abortions

3.3.1 RESET - Program Abortion

Consequences:

- Slides stop (also with G33)
- Main spindle off
- Coolant off
- Program jump to N 00
- Cancellation of G41/G42
- Cancellation of the active tool data/PSO - data.
- Program number is retained.

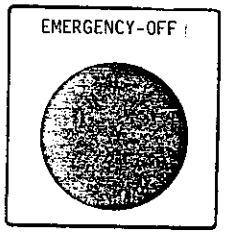
Possibilities:

Switch over to any mode.

Start: as usual.

Notes:

- If during a thread-cutting operation RESET is pressed, the thread turn is not cut to the end.
  This means that the thread is destroyed because the slides stop immediately.
- The program can also be aborted with with RESET in cases of program interruptions (FEED HOLD, SINGLE).



3.3.2 Emergency-Off

Consequences:

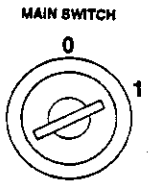
- As RESET

In addition:

- Program is no longer called or displayed.
- Reference point may, under certain circumstances, be lost.

Possibilities:

- Release EMERGENCY-OFF key (turn to right). Machine and control are switched on again.
- If tool turret is in an asynchronous position (alarm), index turret by hand.
- If necessary, approach reference point (alarm 15/46).
- Remedy EMERGENCY-OFF situation (set program correctly, replace broken tool etc.).
- Start:
  As usual.



3.3.3 Switch Off Key-Operated Switch

Caution:

When the machine is running, in particular the main drive, damage can be caused by switching off the key-operated switch (fuses defective etc.).

Therefore, only switch the key-operated switch off when the machine is at a standstill.

Consequences:

Machine must be restarted.
Approach reference point etc.

4. AUTOMATIC
Various Runs

4.1 Pure AUTOMATIC Mode

The program runs to the programmed halt or M30.

Slide movements and speed as programmed.

Override possibilities:

FEED OVERRIDE, SPEED OVERRIDE

Interruptions:

SINGLE FEED HOLD

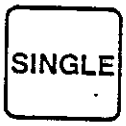
Abortion:

RESET EMERGENCY-OFF

Note:

DRYR. and SKIP cannot be activated during the run.
Only if the program is interrupted (RESET, after SINGLE and naturally before CYCLE START).

4.2 Single Block Mode



Sequence:

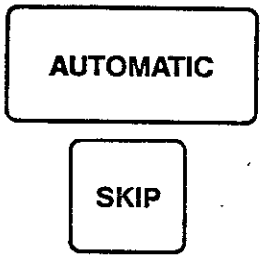
- After every block the program is interrupted. The next block is processed with CYCLE START.
- Slide movement and speed as programmed.

Application:

Test run with workpiece.

Error detection:

All errors are detected.



4.3 Skipping of Blocks

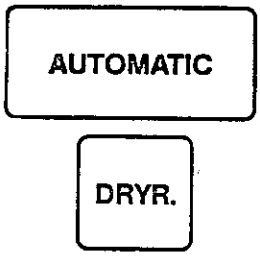
Skip means jump over ("Skippy the kangaroo").

Sequence:
When the SKIP key is pressed, the blocks marked with a slash are jumped.

N 100 / M 00

Designation of a skip block.

Otherwise as AUTOMATIC mode.



4.4 Program Test with Axis Movement: Dry Run

Sequence:

- Slides traverse at a constant speed which is established in the operating data.
- Main spindle is stationary (but can be switched on by hand).
- No coolant
- Otherwise as Automatic mode.

Purpose:

- Detection of syntax and programming errors.
- Detection of possible collisions with chuck.

The following are not detected:

- Feed rates which are wrong or not programmed
- Spindle speeds which are wrong or not programmed, in conjunction with rotation feed rates

Note:
No workpiece machining as the feed rates do not correspond to the technological requirements. This means that no workpiece should be clamped. Moreover, the spindle is stationary if it is not switched off by hand.

4.5 Combinations

You can combine SINGLE, SKIP and DRYR. in the Automatic mode.

Example

AUTOMATIC | SINGLE | SKIP | DRYR.

4.6 Test Run without Axis Movement

AUTOMATIC --> N .../ M30 / CYCLE START

As already mentioned at the start, you can start from any block of the program with the EMCOTRONIC M1.

The control simulates internally the program run up to the selected block.

A detailed explanation for a better understanding:

- for start from any block and

- for test run without axis movement.

When the internal simulation is ended, that means the selected block is reached, the control creates the same condition as if the program had been run.

Example: Program is started in block N 160.

N 000 ..... T 01 01, F 40

.

.

.

N 10 / M 03 / S 2000 / M 08

N

N 120 / ... T 03 03

.

.

.

N 130 / ... M 04 / S 2400 F 40

N 150 / G01 / X 60. / Z -2.

N 160 / G00 / X 40. / Z 10

The following happens in block N 150:

1. Tool T 03 03 is activated and moves at rapid traversing speed to X 60./ Z-2. (Initial position for block N 160 = end position of block N 150).

2. Spindle is switched on counter-clockwise (block N 130) with S 2400.

3. F 40 is activated (block N 130).

4. Coolant is switched on (block N10).

Then block N 160 and the following blocks are processed.

As a Result of This Control Behaviour You Can Perform a Test Run without Axis Movement

Procedure:

- Select last program block (with M 30).
- Set Feed Override to zero. (If you do not set Feed Override to zero, the slides traverse to the target position of the last block before M 30, = starting position for block M 30).
- CYCLE START

Sequence: Error Detection

The program is simulated inside the computer. In the event of errors alarm messages are given. Correction as usual in the EDIT mode.

The following are not detected:

- Feed rates which are wrong or not programmed.
- In conjunction with rotation feed rates spindle speeds which are wrong or not programmed.
- Parameter errors in cycles / circles
- Missing dwell times (technological errors)

Notes:

1. In the M 30 block no traversing motion should be programmed as otherwise it is performed and there is a danger of collision. If Feed Override is set to zero and a traversing command is programmed in block M 30, the program will not be completely simulated.
2. A T 00 00 tool is always to be selected as the last tool. G53/56 is to be active.
3. Feed Override not set to zero
   If the starting point of the slides and slide positions at the program end are not identical, a slide motion occurs because the control creates the final condition of the program. Watch out for possible collision risks.

Alphabetical Register