

Operating Instruction EMCOTRONIC TM 02 Milling

Edition 91-4

Ref. No. EN7 765

**Operating Instruction
EMCOTRONIC M2
91-4 EN7 765**

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()

Foreword

1. LITERATURE EMCOTRONIC TM 02 - Milling

The following literature is available for the description of the EMCOTRONIC TM 02 - Milling:

- | | |
|--------------------------------------|----------------|
| * Programming instructions - milling | Ref. No.: 7766 |
| * Operating instructions - milling | Ref. No.: 7765 |

2. LITERATURE FOR MACHINES WITH EMCOTRONIC TM 02 CONTROL:

This comprises the above-mentioned brochures and the machine-specific operating instructions, spare parts lists and wiring diagrams.

3. Structure of the EMCOTRONIC TM 02 LITERATURE:

The operating and programming instructions are designed so that they are also suitable for self-study.

The programming instructions contain numerous examples which supplement the summaries and illustrations and describe the control features clearly and comprehensively.

All input routines are described in an easy-to-follow way in the operating instructions.

Note:

The pages in this brochure marked "in preparation" will be completed in the next edition.

Yours sincerely,
EMCO, Maier & Co., Hallein
TECHNICAL DOCUMENTATION

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CHAPTER 1

General preliminary notes

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The SHIFT Key

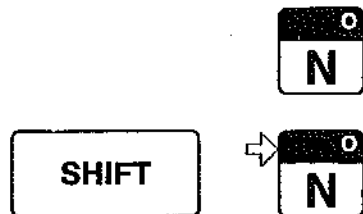
SHIFT means here changing over.

If the SHIFT key has been pressed beforehand, the second function of the key in question is selected.

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

Example:

N-, 0-key



- When the SHIFT key is not activated, the lower address (N) is selected.
- When the SHIFT key is pressed, the upper address, i.e. 0, is selected.

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



No arrow

--> lower address



Arrow points to upper address -->

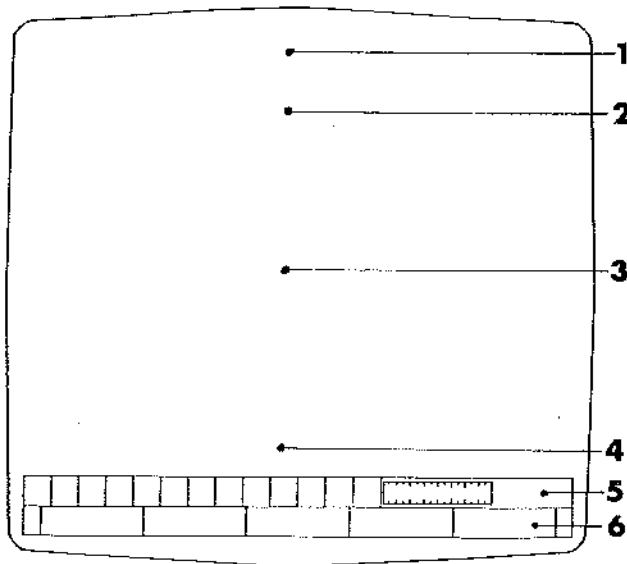
upper address
SHIFT has been pressed.

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 screen

The screen is divided into 6 sections.



1) Information on

- Main mode
- Submodes
- Display in mm or inch
- Program number
- Interface status

2) Alarm displays:

For complete list, see alarm messages.

3) Display and input section

Contents are indicated in the modes.

4) Input field:

- Buffer store in EDIT/EXC.
- Active block in AUTOMATIC mode
- Notes
- COMPLETE
- NEW
- LOADING
- EXISTS
- SAVING
- DELETED

5) Symbol menu

- Display of the active control keys
- SPINDLE OVERRIDE
- Main drive power display

6) Softkeys

Display of the assignment of the unmarked keys below the screen.

The symbol menu

Active key symbols of the machine are shown in the symbol menu on the screen.

Examples:

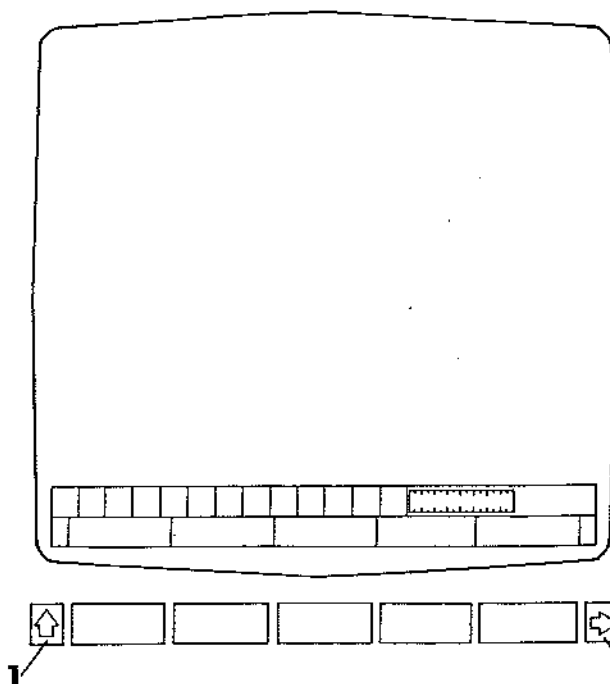


The main spindle is switched on by pressing ON. The symbol for the main spindle in the symbol box on the screen illuminates.



A specific status of the machine is activated by pressing these keys. The relevant symbol in the symbol box illuminates.

The softkeys



5 softkeys are displayed at the bottom edge of the screen.

These softkeys can be selected with the unmarked keys below the screen.

Note:

Key 1: Return to the last softkey level

Key 2: "MORE" function

Display of other softkeys.

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).

Chapter 2

Summaries

- Control panel EMCOTRONIC TM 02	2/1
- Address keyboard	2/2
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Control panel EMCOTRONIC TM 02

(milling)

in preparation

Address Keyboard

 N-address: for block number EDIT EXC. AUTOM.	 R-address: MON mode (operator monitor) address for parameter R (reference point dimensions). EDIT
 0-address: - for program number - free storage capacity (EDIT) EDIT EXC. AUTOM.	 / - slash: Designation of a skip block. e.g. NO100/G01. EDIT
 G-address: G-function EDIT EXC.	 F-address: FEED thread lead EDIT EXECUTE MAN
 PSO: Position shift offset Entry into position shift offset register. EDIT	 D-address: 1. Parameter in the case of program cycles. 2. Parameter for MON (operator monitor) EDIT EXC.
 M-address: M-function EDIT EXC.	 S-address: SPEED - spindle speed EDIT EXC. MAN.
 P-address: Parameter in the case of cycles 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.
 X, Y, Z addresses: Addresses for absolute path data. EDIT EXC. REF.	 T-address: TOOL, tool address EDIT EXC.
 I, J, K addresses: Circle centre parameters. EDIT EXC.	 TOOL DATA: Entry into tool data register (EDIT). EDIT MAN
 U, V, W addresses: Addresses for incremental path data. EDIT EXC.	Direct take-over of the tool data (MAN).

Mode Keyboard**MAN.**MANUAL mode
Manual operation**EDIT**EDIT mode
Program input with relevant routines,
data input for offsets and tools.
Cassette mode, RS 232C mode, user
monitor.**EXC.**EXECUTE mode

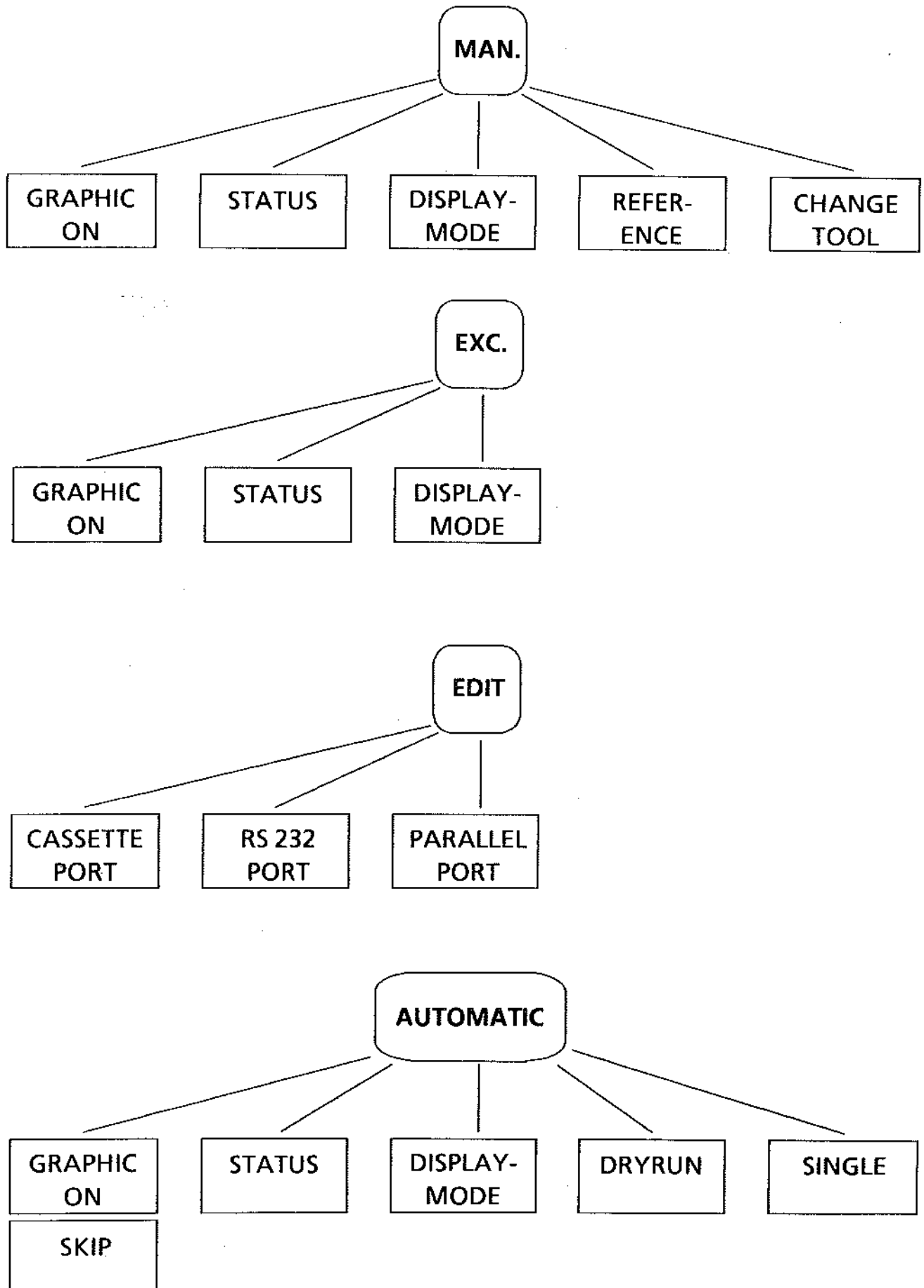
- Processing of block buffer store.
- Call-up of tools and position shift offsets so that the values are displayed in the MAN mode.
- Jog mode with any increments desired.

AUTOMATICAUTOMATIC mode

- Stored programs can be started from any block.
- Stored programs run in single block mode, skip block mode, dry run mode or test run without any axis movement.

Softkeys

Diagram



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.	<u>Examples:</u> 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)   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
EDIT EXC. AUTOM.	<u>Functions.</u> 1) An upper address is selected. <u>Example:</u>   R-address is selected.
EDIT EXC.	2)   When the cursor stands on a program word, it jumps back to the block start with SHIFT ENTER.
MAN	3) Manual mode   Spindle turns counterclockwise

C.BL. C.E.	C.E. = Clear Entry - which means delete entry.
EDIT EXC.	<u>Functions:</u> - 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	<u>Function:</u> 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.PR. C.W. EDIT	C.Pr. = Clear Program - which means delete program. program number must be selected, screen must display "found".
-----------------------------------	--

Funktion Keyboard

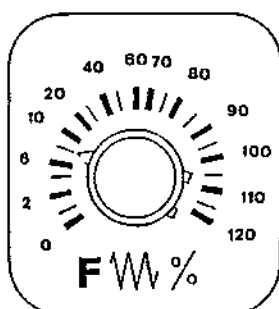
STORE NEXT EDIT EXC. AUTOM.	
EDIT	<u>Functions:</u> 1. Storing of a block from the block buffer store into the main memory. The block is concluded with STORE NEXT 2. At the same time a jump is made to the next block. <u>Please note:</u> STORE NEXT has to be pressed even after corrections in a block as 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. <u>Function:</u> Working backwards blockwise in the program.

Control Keyboard

MAN
EXC.
AUTOMATIC

Speed override:

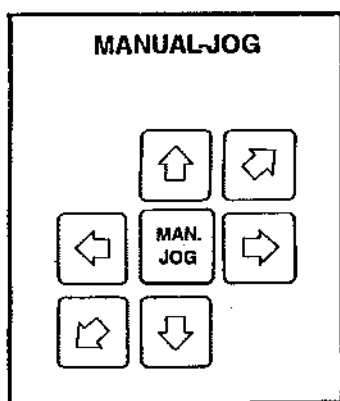
Increase speed
Decrease speed



AUTOMATIC
EXC.
MAN.

Feed override:

0% - 120% of the active F-value
(exception: thread-cutting!)



MAN

Manual traversing keys for slides MAN

The MAN.JOG key must also be pressed with the direction keys. The F-value must be entered.

STATUS submode
Scrolling

Control keyboard

Main spindle ON.



Main spindle OFF.

MAN.
EXC.
AUTOM.MANUAL mode

Main spindle ON in clockwise direction.

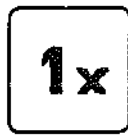


Main spindle ON in counterclockwise direction.

AUTOMATIC, EXECUTE modes

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.

Control Keyboard



Single piece key

Single workpiece mode can be set with this key.

"1x" in the symbol menu illuminates:
Single piece mode active

"1x" in the symbol menu goes off:
The program is run several times according to the preselected number of workpieces



Central lubrication key

The lubrication pump is switched on and off by pressing this key.

The flashing of the relevant symbol in the symbol menu indicates that the machine has to be lubricated manually. The flashing is cancelled by pressing the key.



AUXILIARY ON key

The auxiliary drives of the machine are switched on with this key.



AUXILIARY OFF key

The auxiliary drives of the machine are switched off with this key.

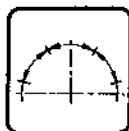


Chip conveyor key

This key function is activated in a subsequent software version.

Control KeyboardChip guard door key

This key function is activated in a subsequent software version.

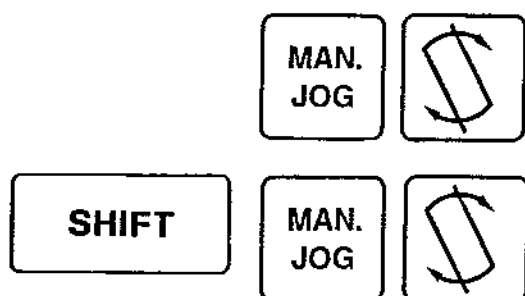
Dividing attachment key

This key function is activated in a subsequent software version.

Tool magazine key

The tool magazine can be indexed by pressing the MAN.JOG and tool magazine keys at the same time.

Tool magazine rotates in counter-clockwise direction:



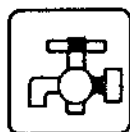
Tool magazine rotates in clockwise direction:

Coolant key

The coolant can be switched on and off with this key.

"Coolant" in the symbol menu illuminates:
Coolant on.

"Coolant" in the symbol menu goes off:
Coolant off.

Clamping fixture keys

These key functions are activated in a subsequent software version.

CHAPTER 3

Modes

- MANUAL
- EXECUTE
- EDIT
- AUTOMATIC

MANUAL mode

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6.3 Path display from machine zero point to the cutting tip (M - P)	MAN 11
6.4 Path display from the workpiece zero point to the cutting tip (W - P)	MAN 11

Mode - MANUAL

1. Summary - Possibilities

- o Traversing slides by hand
- o Spindle on, off, clockwise, counterclockwise
- o Coolant on, off
- o Index tool magazine

Overrides:

FEED OVERRIDE
SPINDLE OVERRIDE

Other applications:

Collecting tool data

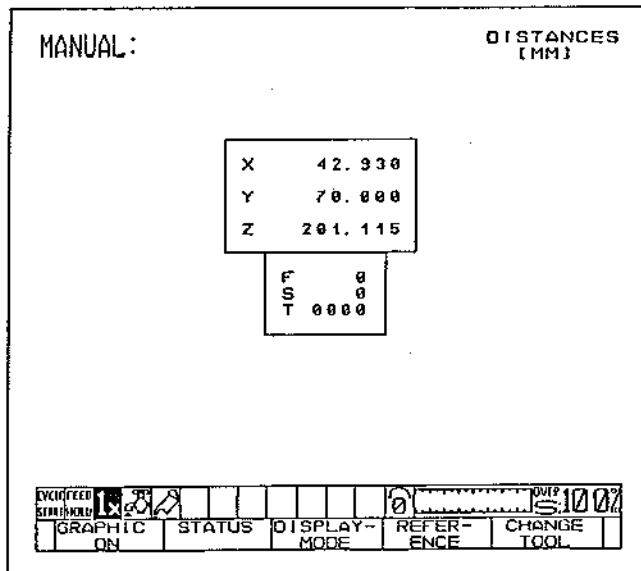
Submodes:

STATUS: Display of the active functions

REFERENCE: Approaching the reference point

CHANGE TOOL: Manual changing of the tools

2. Displays on the screen



- Path display X, Y, Z values
- Feed rate F
- Current speed S
- Tool number and correction number (T...)
- PS0 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. The softkeys and their meaning in the MANUAL mode

GRAPHIC
ON

GRAPHIC ON softkey:

The softkey function GRAPHIC ON is activated in a subsequent software version.

STATUS

STATUS softkey:

This softkey function switches the machine into the STATUS submode (display of the active functions). You will find a detailed description of this softkey and its function under "The submodes of the MANUAL mode".

DISPLAY-
MODE

DISPLAY MODE softkey:

2 letter sizes of the path display (X,Y,Z) can be selected with the DISPLAY MODE softkey function.

REFER-
ENCE

REFERENCE softkey:

The activation of this softkey switches the machine into the REFERENCE submode (approach reference point). You will find a detailed description of this softkey and its function under "The submodes of the MANUAL mode".

CHANGE
TOOL

CHANGE TOOL softkey:

This softkey function switches the machine into the CHANGE TOOL mode. You will find a detailed description of this softkey and its function under "The submodes of the MANUAL mode".

4. Operation

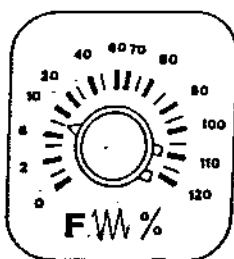
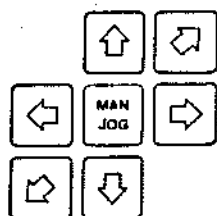
4.1 Traversing the Slides

4.1.1 Entry of the feed rate:

e.g. $F = 500 \text{ mm/min}$



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



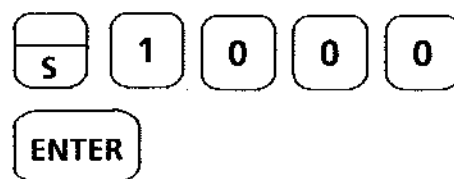
4.1.2 Traversing:

The key MAN JOG must be pressed at the same time as the direction key.
Control with FEED OVERRIDE of 0 - 120%.

4.2 Switching the main spindle on and off

4.2.1 Entry of the main spindle speed:

e.g.: $S = 1000 \text{ rpm}$



4.2.2 Entry of the direction of spindle rotation:

Spindle runs clockwise



Spindle runs counterclockwise



Spindle off

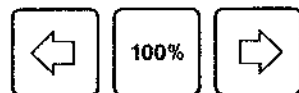


Further possibilities of switching off the main spindle:

- RESET
- EMERGENCY OFF

Note:

Please also observe the direction of rotation symbol in the symbol menu on the screen.



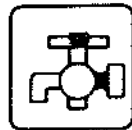
4.2.3 Overriding the main spindle speed

You can override the programmed spindle speed (50%-120%) using these keys.

Note:

Please observe the percentage display of the main spindle speed in the symbol menu on the screen.

4.3 Coolant on, off



"Coolant" in the symbol menu illuminates:

- Coolant on

"Coolant" in the symbol menu off:

- Coolant off

Switch over by pressing the key again.

4.4 Central lubrication

The lubrication pump is switched on and off by pressing the key.



The flashing of the relevant symbol in the symbol menu indicates that the machine has to be lubricated manually. The flashing is cancelled by pressing the key.



4.5 Indexing the tool magazine

4.5.1 Indexing the tool magazine in counterclockwise direction

By pressing the MAN.JOG keys and the tool magazine key at the same time, the magazine can be indexed in counter-clockwise direction.

4.5.2 Indexing the tool magazine in clockwise direction



When the SHIFT key is active (corresponding symbol in the symbol menu illuminates) and the MAN.JOG and tool magazine keys are pressed at the same time, the tool magazine is indexed in clockwise direction.

Reduced safety function:

If G₀₈ bit 0 is set in the user monitor, the tool magazine can only be indexed with the tool magazine key.



4.6 Switching on the auxiliary drives

The auxiliary drives are switched on by pressing the AUXILIARY ON key.



4.7 Switching off the auxiliary drives

Through pressing the AUXILIARY OFF key, all auxiliary drives will be stopping and switched off.

5. The submodes of the MANUAL mode

MANUAL:			STATUS			DISTANCES (MM)		
GROUP	G	M	GROUP	G	M	GROUP	G	M
00	:	105	:	08	140	:	:	:
01	:	139	:	09	117	:	:	:
02	194	:	:	10	:	190	:	:
03	153	109	:	11	198	:	:	:
04	:	:	:	12	:	:	:	:
05	156	:	:	13	:	:	:	:
06	:	:	:	14	:	:	:	:
07	171	:	:	15	:	:	:	:
ACTUAL F 5000			OVER F 0%					
ACTUAL S 0			OVER S 100%					
ACTUAL T 0000								
GRAPHIC ON	STATUS	DISPLAY-MODE	REFER-ENCE	CHANGE	TOOL			

5.1 STATUS submode

By switching over to the STATUS submode, you can see which functions are active.

Display in the STATUS submode:

- * G-functions
- * M-functions
- * Programmed F-value
- * Programmed S-value
- * Actual T-value
- * Percentage of the FEED OVERRIDE
- * Percentage of the SPINDLE OVERRIDE

MANUAL:		REFERENCE	DISTANCES (MM)
X	42.930		
Y	70.000		
Z	201.115		
F	0		
S	0		
T	0000		

VERSION: AC04.01/DC04.00/GC04.06/IC01.00

GRAPHIC ON	STATUS	DISPLAY- MODE	REFER- ENCE	CHANGE TOOL
---------------	--------	------------------	----------------	----------------

REFER-
ENCE

CYCLE
START

5.2 REFERENCE submode

The internal measuring system of the machine is synchronised by approaching the reference point.

5.2.1. Approaching the reference point

- After the machine has been switched on
- After ALARM 150 (loss of synchronisation)

5.2.2. Procedure

- o Switch on control with key-operated switch. The control reports in the MANUAL mode.
- o Switch on the auxiliary drives with the AUX ON key.
- o Press REFERENCE softkey. The REFERENCE submode is selected.
- o All three slides traverse automatically to the reference point when the CYCLE START key is pressed.

Notes:

If the machine has not been switched on for over 3 months, it can happen that the MSD data (machine status data) are no longer in the buffer store. In this case the screen displays ALARM 150 after being switched on. The values in the position shift offset and the data in the tool data memory show nonsensical values, the program memory is empty.

Measures:

Reload machine data from cassette or punched tape.

5.3 CHANGE TOOL submode

This submode serves to change tools by hand on the tool magazine.

Procedure:

- o Select the CHANGE TOOL submode.
- o Press tool magazine key and MAN.JOG key.
- o The Z-slide traverse upwards into a defined position. This tool can now be changed.

You will find a detailed description of this submode in the operating instructions of the machine in question.

6. 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.

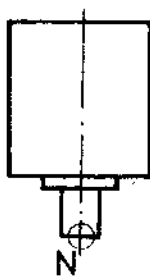
The same path displays are given in the AUTOMATIC and EXECUTE modes as well, depending on whether position shift offsets (PS0) and tool length data (T0) are called or not.

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

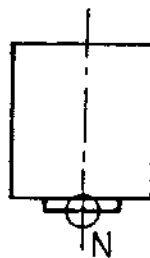
Tools and PS0 data are called in the EXECUTE mode; using CYCLE START the display jumps over, followed by switch-over to MAN.

Preliminary explanations

The position of the tool holding reference point N is different on the machines VMC-100 and VMC-200 (see diagrams).



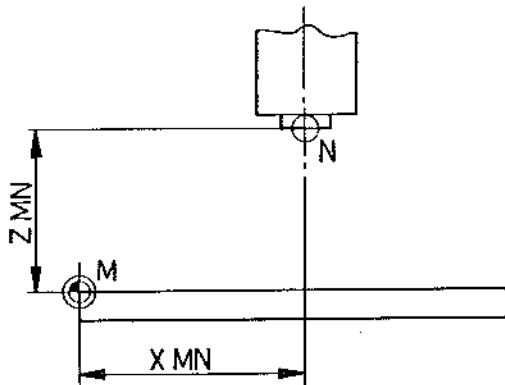
VMC-100



VMC-200

On the following pages the tool holding reference point N of the VMC-200 is used for the explanatory diagrams.

6.1 Path display from the machine zero point to the tool holding reference point (M-N)



- No tool active (T00 00) or one tool without correction value (e.g.: T03 00).
- POSITION SHIFT OFFSET INACTIVE (no G54, G55, G57, G58, G59 active)

The distances

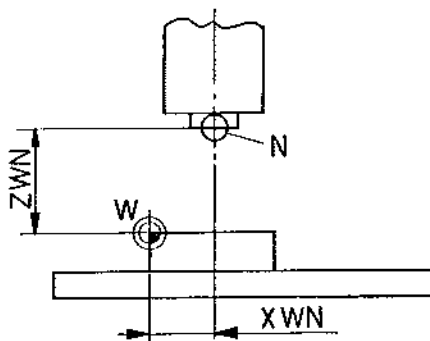
X_{MN}
 Y_{MN}
 Z_{MN}

are displayed.

When:

- When the machine is switched on and the reference point approached.
- With EMERGENCY OFF.
- When the machine is switched over from other modes and neither a tool nor PS0 are active.

6.2 Path display from the workpiece zero point to the tool holding reference point (W-N)



- No tool active (T00 00) or one tool without correction value (e.g.: T03 00).
- POSITION SHIFT OFFSET ACTIVE (G54, G55, G57, G58, G59 active)

The distances

X_{WN}
 Y_{WN}
 Z_{WN}

are displayed.

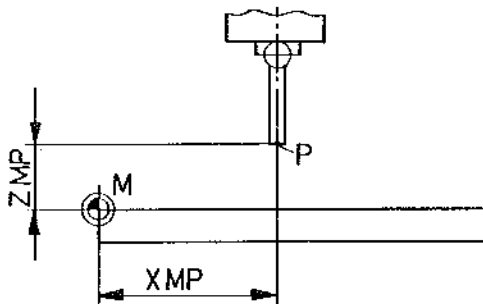
Activation of a PS0: e.g. G 54

EXECUTE mode



Switch-over to MANUAL mode:
W-N values are displayed.

6.3. Path display from the machine zero point to the cutting tip (M-P)



- One tool with correction value active.
- POSITION SHIFT OFFSET INACTIVE
(no G54, G55, G57, G58, G59 active)

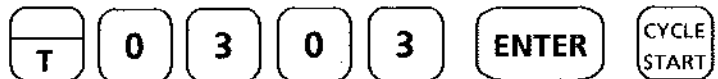
The distances

X_{MP}
 Y_{MP}
 Z_{MP}

are displayed.

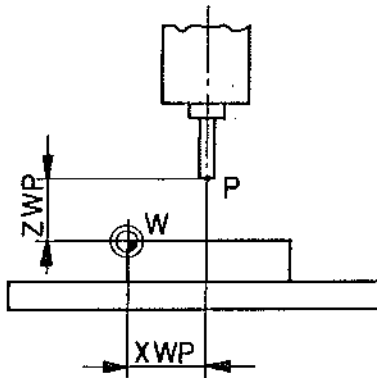
Activation of a tool: e.g. T 0303

EXECUTE mode



Switch-over to MANUAL mode:
M-P values are displayed.

6.4. Path display from the workpiece zero point to the cutting tip (W-P)



- One tool with correction value active.
- POSITION SHIFT OFFSET ACTIVE
(G54, G55, G57, G58, G59 active)

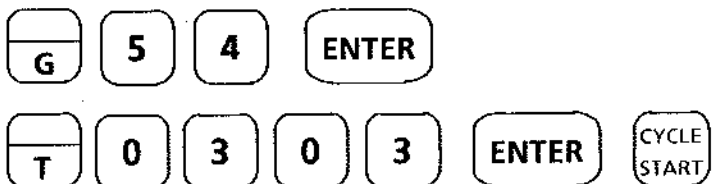
The distances

X_{WP}
 Y_{WP}
 Z_{WP}

are displayed.

Activation: e.g. G 54 T 0303

EXECUTE mode



Switch-over to MANUAL mode:
W-P values are displayed.

EXECUTE mode

1. Summary, possibilities	EXE 1
2. Displays on the screen	EXE 1
3. The softkeys and their meaning in the EXECUTE mode	EXE 2
4. Possibilities in the EXECUTE mode	EXE 3 - EXE 4
4.1 Activation of the displays M-N, W-N, M-P, W-P	EXE 3
4.2 Entry of NC blocks	EXE 4
4.3 Call-up of NC blocks from the main memory	EXE 4
5. The submode of the EXECUTE mode	EXE 5
5.1 STATUS submode	EXE 5

EXECUTE mode

1. Summary, possibilities

- o Traversing of any increments
- o Entry and processing of single blocks
- o Call and processing of single blocks from the program memory
- o Selection of machine statuses (e.g.: G70/G71, M38/M39)

Overrides:

FEED OVERRIDE

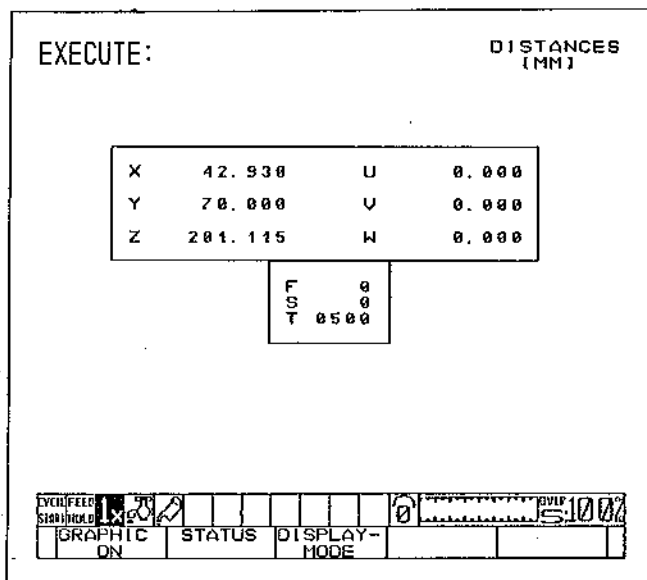
SPINDLE OVERRIDE

Other applications:

- * Activation of the tool length compensation in the path display
→ see MANUAL
- * Activation of the zero point offset in the path display
→ see MANUAL.

Submode:

STATUS: Display of the active functions.



2. Displays on the screen

- Path display X, Y, Z values
- Feed rate F
- Actual speed S
- Tool number and correction number (T...)
- NC block in buffer store.

3. The softkeys and their meaning in the EXECUTE mode

GRAPHIC
ON

GRAPHIC ON softkey:

The softkey function GRAPHIC ON is activated in a subsequent software version.

STATUS

STATUS softkey:

This softkey function switches the machine into the STATUS submode (display of the active functions). You will find a detailed description of this softkey and its function under "The submode of the EXECUTE mode".

DISPLAY-
MODE

DISPLAY MODE softkey:

2 letter sizes of the path display (X,Y,Z,U,V,W) can be selected with the softkey function DISPLAY MODE.

4. Possibilities in the EXECUTE mode

4.1 Activation of the displays

M-N, W-N, M-P, W-P

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 mode



Activation, display



Activation, display

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

EXECUTE mode



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

4.2 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 Mode

G **0** **0** **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.

4.3 Calling of NC-Blocks from the Main Memory

Example:

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

Program call

O **2** **5** **ENTER**

Block call

N **1** **1** **0** **ENTER**

CYCLE START As a result of CYCLE START the block processes.

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.

5. The submode of the EXECUTE mode

EXECUTE: STATUS				DISTANCES (MM)			
GROUP	G	M		GROUP	G	M	
00	:	06	:	08	140	:	:
01	:	39	:	09	117	:	:
02	194	:	:	10	:	190	:
03	153	09	:	11	198	:	:
04	:	:	:	12	:	:	:
05	156	:	:	13	:	:	:
06	:	:	:	14	:	:	:
07	171	:	:	15	:	:	:
ACTUAL F 0				OVER F 0%			
ACTUAL S 0				OVER S 100%			
ACTUAL T 0000							
GRAPHIC ON				STATUS DISPLAY-MODE			

5.1 STATUS submode

By switching over to the STATUS submode, you can see which functions are active.

Display of the STATUS submode:

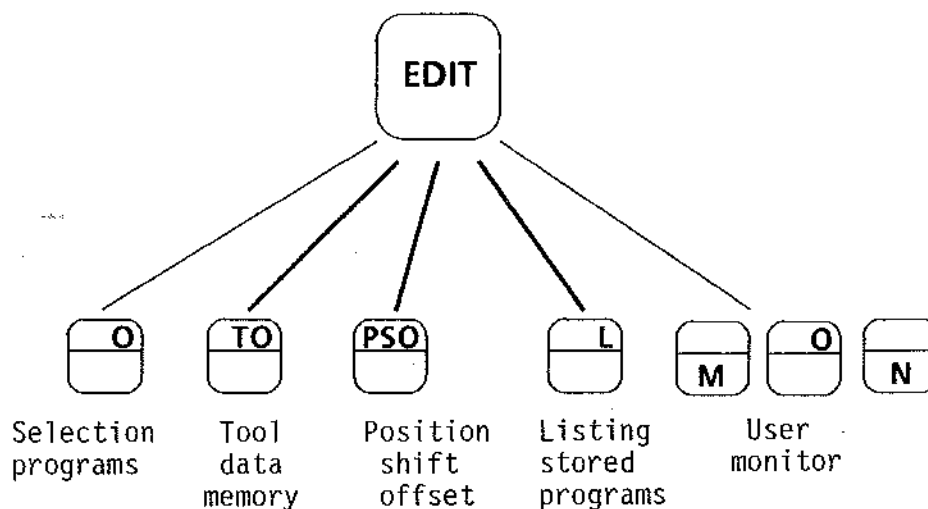
- * G-functions
- * M-functions
- * Programmed F-value
- * Programmed S-value
- * Actual T-value
- * Percentage of the FEED OVERRIDE
- * Percentage of the SPINDLE OVERRIDE

EDIT mode

1. Summary, possibilities	EDIT 1
2. The softkeys and their meaning in the EDIT mode	EDIT 2 - EDIT 3
3. Listing of stored programs	EDIT 4
4. Call-up of a stored program	EDIT 4
Indication of the available storage space	EDIT 4
5. Entry of an NC program via keyboard	EDIT 5 - EDIT 7
5.1 Program number entry	EDIT 5
5.2 Program contents entry	EDIT 6
5.3 Arbitrary block numeration	EDIT 7
6. Entry of the tool data	
7. Entry, changes to the PSO data, data for zero offsets	EDIT 9
7.1 Incremental changing of the PSO and T0 data	EDIT 10
8. Selection routines/Operation routines	EDIT 11
8.1 Key forwards blockwise	EDIT 11
8.2 Key backwards blockwise	EDIT 11
8.3 Jump forwards in block	EDIT 11
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8.5 Select block number	EDIT 11
8.6 Select word	EDIT 11
9. Program changes, corrections etc.	EDIT 12 - EDIT 17
9.1 The most important key functions	EDIT 12
9.2 Deletion/correction of block contents	EDIT 13
9.3 Addition of a word	EDIT 14
9.4 Addition of a G or M-function of the same group in one block	EDIT 15
9.5 Insertion of a block	EDIT 16
9.6 Renumbering of blocks	EDIT 16
9.7 Deletion of a block	EDIT 16
9.8 Renumbering of programs	EDIT 17
10. Program deletion	EDIT 17

11. EDIT-INTERFACE submode	
11.1 Summary, possibilities	EDIT 19
11.2 Cassette mode - CASSETTE PORT	EDIT 20 - EDIT 30
11.2.1 Selection, possibilities	EDIT 20 - EDIT 21
11.2.2 Loading program from machine memory onto cassette	EDIT 22
11.2.3 Loading program from cassette into machine memory	EDIT 23
11.2.4 Programs on the cassette	EDIT 24
11.2.5 Overwriting a program in the RAM	EDIT 24
11.2.6 Deletion of total contents of the cassette	EDIT 25
11.2.7 Reading out all stored programs from the machine memory onto cassette	EDIT 26
11.2.8 Loading of all programs stored on cassette into the machine memory	EDIT 27
11.2.9 The PS0 and T0 data	EDIT 28 - EDIT 30
11.2.9.1 Loading offset arrays from machine memory onto cassette	EDIT 29
11.2.9.2 Loading of offset arrays from cassette into the machine memory	EDIT 29
11.2.9.3 Display of the stored offset arrays on cassette	EDIT 30
11.3 RS 232 mode - RS 232 PORT	EDIT 31 - EDIT 38
11.3.1 Selection, possibilities	EDIT 32
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11.3.3 Loading procedures - direct entry via keyboard	EDIT 34
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11.3.3.2 Direct entry of a program or offset arrays via external keyboard	EDIT 36
11.3.3.2.1 Program entry	EDIT 36
11.3.3.2.2 Entry of the offset arrays	EDIT 37 - EDIT 38
11.4 Parallel interface mode - PARALLEL PORT	EDIT 39
12. Loading the machine data (MSD)	EDIT 40
13. Entry into user monitor/data changes	EDIT 41

EDIT mode



EDIT:		DISTANCES (MM)	
?			
CASSETTE PORT	RS232 PORT	PARALLEL PORT	

1. Summary, possibilities

- o Selection, entry of programs
- o Entry, changing of data in the tool data memory
- o Entry, changing of data in the position shift offset
- o Entry into the user monitor.

Submodes:

CASSETTE PORT: Loading, reading out of data onto cassette (interface 0)

RS 232 PORT: Loading, reading out of data via the RS 232 interface (interface 1)

PARALLEL PORT: Loading, reading out of data via the parallel interface.

2. The softkeys and their meaning in the EDIT mode

CASSETTE
PORT

CASSETTE PORT softkey:

The submode cassette mode is activated with this softkey.
You will find a detailed description of this softkey and its function under "EDIT - INTERFACE".

RS 232
PORT

RS 232 PORT softkey:

The submode RS 232 interface is activated with this softkey.
You will find a detailed description of this softkey and its function under "EDIT - INTERFACE".

PARALLEL
PORT

PARALLEL PORT softkey:

This softkey is activated in a subsequent software version.

INPUT

INPUT softkey:

By activating this softkey function data can be loaded in the submodes CASSETTE PORT and RS 232 PORT.
You will find a detailed description of this softkey and its function under "EDIT - INTERFACE".

OUTPUT

OUTPUT softkey:

By activating this softkey function data can be read out in the submodes CASSETTE PORT and RS 232 PORT.
You will find a detailed description of this softkey and its function under "EDIT - INTERFACE".

INPUT
ALL

INPUT ALL softkey:

By activating this softkey function all data stored on cassette are loaded in the submode CASSETTE PORT.

You will find a detailed description of this softkey and its function under "EDIT - INTERFACE".

OUTPUT
ALL

OUTPUT ALL softkey:

By activating this softkey function all data in the control memory are read out onto cassette in the submode CASSETTE PORT.

You will find a detailed description of this softkey and its function under "EDIT - INTERFACE".

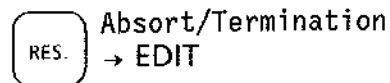
3. Listing of Stored Programs

Precondition:

No workpiece program may be active.



The program numbers of the stored programs are listed.



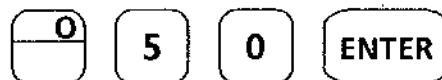
4. Call of a Stored Program

EDIT:		DISTANCES (MM)	
PROGRAM 0050			
N0000 G54 T0101			
0 0050		FOUND	
CASSETTE PORT	RS232 PORT	PARALLEL PORT	

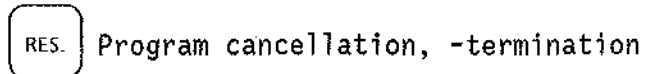
It is possible to call a program in the EDIT, AUTOMATIC and EXECUTE modes.

Example:

Program 050 is to be called.



Screen displays "050 found" and the initial blocks. If this program does not exist, screen displays "050 new".



Indication of the Available Storage Space

0 19904		BYTES FREE	
CASSETTE PORT	RS232 PORT	PARALLEL PORT	



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

EDIT:		DISTANCES (MM)	
PROGRAM 0050			
N 0000 NEW			
CASSETTE PORT	RS232 PORT	PARALLEL PORT	

Each program must have a program number. The program number is entered via the O address.

Program numbers possible from 0 to 6999. One can also enter a program number in the operator monitor determining from which number subroutines are possible. See Programming instructions G25/M17.

EDIT mode

O

5

0

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 O50
- 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.

G **5** **4** **ENTER** Entry of words

T **0** **1** **0** **1** **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

G **0** **0** **ENTER**

X **2** **0** **.** **ENTER**

Z **3** **.** **ENTER**

M **0** **4** **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.

EDIT:		DISTANCES (MM)	
PROGRAM 0050			
N0000 G54 T0101			
N 0010 NEW			
CASSETTE PORT	RS232 PORT	PARALLEL PORT	

EDIT:		DISTANCES (MM)	
PROGRAM 0050			
N0000 G54 T0101			
N0010 G00 X20.000 Z3.000 M04			
N 0020 NEW			
CASSETTE PORT	RS232 PORT	PARALLEL PORT	

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

Screen displays "N 0020 new".

ENTER

N 0020 is confirmed.

2. Selection of a different number

Example: N 0011 is to be entered.

The screen displays "N 0020 new".

N **1** **1** **ENTER**

The screen displays "N 0011 new".

ENTER

Confirmation of N 0011

The screen displays "N 0011".

6. Entry of the Tool Data

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

EDIT:	TOOL DATA		DISTANCES (MM)	
	X	Z	R	L
00:	0.000	0.000	0.000	10
01:	0.000	-17.000	4.000	10
02:	0.000	-6.500	0.000	10
03:	0.000	-5.000	0.000	10
04:	0.000	-6.500	0.000	10
05:	0.000	-3.000	3.000	10
06:	0.000	-4.500	2.000	10
07:	0.000	0.000	0.000	10
08:	0.000	-9.000	0.000	10
09:	0.000	-26.000	0.000	10

Z3=-5.000			
CASSETTE PORT	RS232 PORT	PARALLEL PORT	

TO Screen displays listing.

3 **ENTER**

Tool data memory 03 is selected;
cursor stand on Z.

C.W. or **C.E.**

Delete old value of Z (also 0).

- **5** **0** **.** **ENTER**

Z-value is stored.
Cursor jumps to R.

C.W. or **C.E.**

5 **.** **ENTER** R 5 is stored

RES. or **EDIT**

Leave tool data memory.

Note:

You key to the respective address with
ENTER.
The X and L-addresses are not activated
with the ECMOTRONIC TM 02.
Direct transfer of the tool length
data: see operating instructions of the
respective machine.

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

PSO = Position Shift Offset

- 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

EDIT:		POSITION SHIFT		DISTANCES (MM)
	X	Y	Z	
1:	0.000	0.000	250.000	
2:	100.000	0.000	100.000	
3:	0.000	0.000	52.000	
4:	0.000	0.000	0.000	
5:	0.000	0.000	65.000	

X2=100.000			
CASSETTE PORT	RS232 PORT	PARALLEL PORT	

PSO

Screen displays listing

2

ENTER

Register 2 is selected,
cursor stands on X.

C.W.

or

C.E.

Delete old value (also
value 0).

3

0

.

2

ENTER

Value stored, cursor on Y.

C.W.

or

C.E.

Delete old value.

2

0

.

5

ENTER

Value stored, cursor on Z.

RES

or

EDIT

Leave PSO memory.

Note:

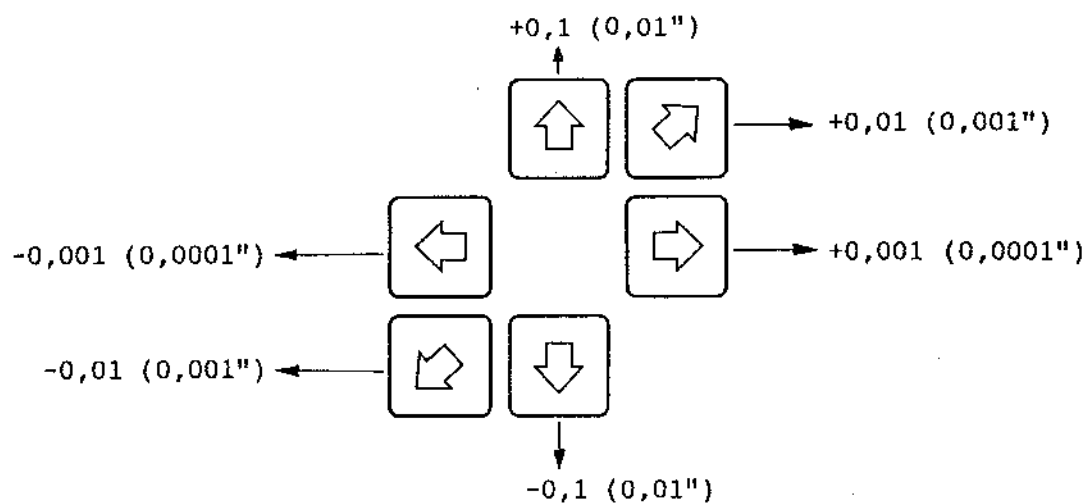
You can jump addresses with ENTER.

7.1 Incremental changing of the PS0 and T0 data

If you have selected the respective offset (PS0 or T0) and the offset or tool number, you can change the X, Y and Z values with the JOG keys.

The illustration shows with which keys the values can be changed.

MANUAL-JOG



8. Operation Routines/Selection Routines

8.1 Key forwards in blocks


 N 100
 N 110
 N 120
 N 130

STORE
NEXT

8.2 Key backwards in blocks


 N 100
 N 110
 N 120
 N 130

PREV.

8.3 Jump forwards in block

N 100/G00/X20,Y30.

ENTER

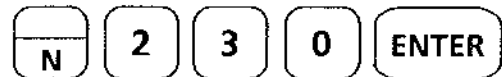
8.4 Jump back to block start

N 110/G00/X20,Y30.

SHIFT

ENTER

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


 N 2 3 0 ENTER

The selected block is displayed.

8.6 Select word e.g. X. word

Requirements: 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: (Delete program)



Store changed contents
in buffer store.



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

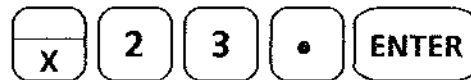
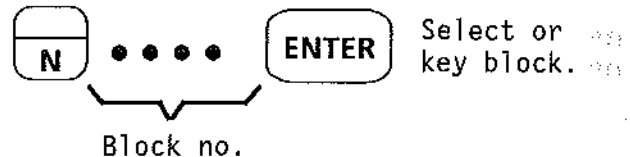
General:

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

Possibilities

Overwriting contents:

Example:
X 23. instead of X 32.



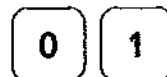
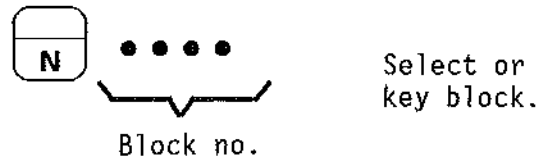
Word in buffer store



X23. is in main
(program) memory.

Deletion and entry of new contents:

Example:
G01 is to be programmed instead of G00.



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.



Word in
buffer store.



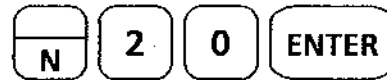
Word in
main memory.

9.3 Addition of a Word

You can add new words to a block.

Example:

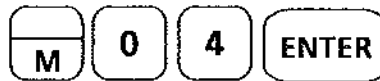
You have forgotten the switching-on of the spindle M 03.



N0020/G00/X 20./Z 2.

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

N 20 is selected.



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.

Select block, cursor stands on N.

Program G01.

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



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.

Note that the feed value (F)
programmed last also applies to
this G01 block!

9.5 Insertion of a Block

Example:

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

N **1** **0** **1** **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 be changed to N 99.

N **1** **0** **0** **ENTER**

Select or key in block:

C.E. **C.E.** **C.E.** **C.E.**

Keep pressing C.E. until all the digits of N are deleted.

N **0** **0** **9** **9** **ENTER**

Enter block number with leading zeros.

9.7 Deletion of a Block

Example:

Block N 110 is to be deleted.

N **1** **1** **0** **ENTER** Select block.

C.BL Delete block.

9.8 Renumbering of Programs

Example:

Program 0 20 is to be renumbered to
program 0 08.

Select program.

Keep pressing C.E. until all
the digits are deleted.

Enter new program number
Leading zeros must be entered.

10. Deletion of a Program

Example:

Program 0 25 is to be deleted.

Program selection.

Program is deleted.

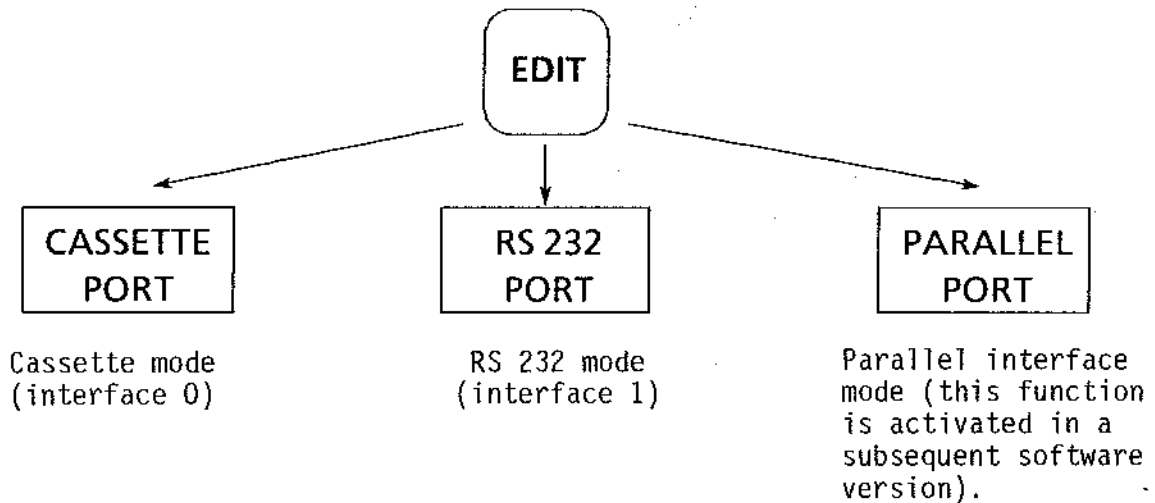
11. EDIT-INTERFACE submenu

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11. Submodes

EDIT - INTERFACE

11.1 Summary, possibilities



General

Interface mode

Part of the control memory has been established as a main memory (RAM) for the interface mode. As a result programs can be loaded or read out more quickly in the cassette mode.

Loading of all programs stored on cassette:

If a cassette is inserted, all the programs stored on it are transferred into this main memory (RAM) ("MOUNTING"). If one of these programs is called up, it can be loaded more quickly into the memory of the control.

Reading out of stored programs onto cassette:

If programs are read out, these programs are first transferred into the main memory (RAM). These programs are not stored on cassette until the INTERFACE submode has been abandoned.

Note on loading - reading out:

During the loading and read-out of the programs already loaded in the main memory (RAM) onto cassette the machine can be switched over to another mode or another operation sequence performed.

11.2 Cassette mode CASSETTE PORT

Data can be stored onto cassette
or read out from cassette.

11.2.1 Selection, possibilities

By activating the CASSETTE PORT softkey the machine is switched into cassette mode (interface 0).

CASSETTE PORT					
EDIT:	INTERFACE 0	DISTANCES	[MM]		
INTERFACE 0 SELECTED					
A	INPUT	OUTPUT	INPUT	OUTPUT	
			ALL	ALL	

Softkey functions:

INPUT

INPUT softkey:

By activating this softkey function
data can be loaded in the CASSETTE PORT
submode.

OUTPUT

OUTPUT softkey:

By activating this softkey function data can be read out in the CASSETTE PORT submode.

INPUT
ALL

INPUT ALL softkey:

By activating this softkey function all the programs stored on cassette can be loaded in the CASSETTE PORT submode.

OUTPUT
ALL

OUTPUT ALL:

By activating this softkey function all the programs in the control memory can be read out onto cassette in the CASSETTE PORT submode.

Notes on the operation of the cassette:

- Only digital cassettes can be used.
- Protect the cassette against contamination.
- If the cassette comes near magnetic fields, stored programs may be destroyed.
- Every new cassette must first be formatted (side A and side B).

Formatting the cassette (deletion)

- Insert cassette

CASSETTE
PORT

Select cassette
mode



The cassette is formatted. The procedure is terminated when the cassette comes to a standstill.

11.2.2 Loading program from the machine memory onto cassette. (SAVING)

Example: Program 0 0025

CASSETTE PORT	Select cassette mode
------------------	-------------------------

0	2	5	ENTER
---	---	---	-------

Program selection.
(This is omitted if the program has
already been selected beforehand.)

OUTPUT	Command to store the program.
--------	----------------------------------

- The message "SAVING INTO RAMDISK" now appears in the input line of the screen. This message is replaced by the message " 0 0025 COMPLETE" after a certain time (depends on the program length).
- The program is now in the main memory (RAM) but not yet on the cassette. In order to attract your attention to this condition, the message "TAPE NOT UPDATED" appears at the top left-hand edge of the screen.
- By changing the mode or pressing the RESET key the programs in the RAM are stored on the cassette. This condition of the control is indicated by the message "TAPE SAVING" at the top left-hand edge of the screen.

Note

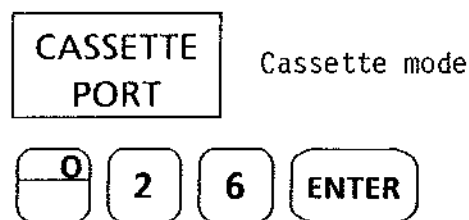
If a program 0 0025 exists in the RAM, "ALREADY EXISTS" appears on the screen.

Remedy:

If the message "ALREADY EXISTS" is deleted with C.Pr., the program 0 0025 in the RAM is overwritten.

11.2.3 Loading program from cassette into machine memory (LOADING)

Example: Program 0 0026



Call up program number on cassette.



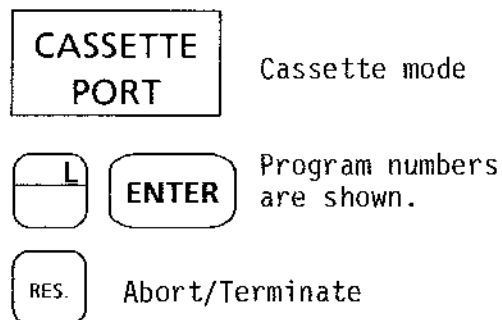
- The message "LOADING FROM RAMDISK" now appears in the input line of the screen. This message is replaced by the message "0 0026 COMPLETE" after a certain time (depends on the program length).
- The program is now in the machine memory (RAM).

Note

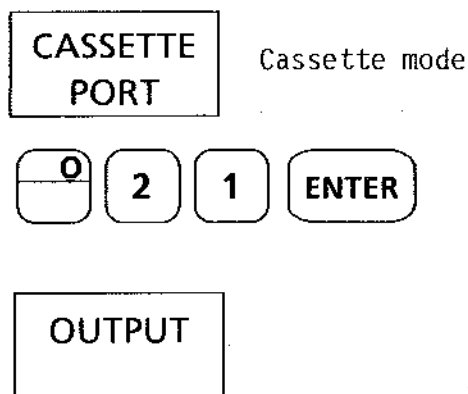
If a program 0 0026 exists in the machine memory, "ALREADY EXISTS" appears on the screen.

Remedy:

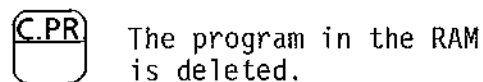
If the message "ALREADY EXISTS" is deleted with C.Pr., the program 0 0026 in the machine memory is overwritten.

11.2.4 Programs on the cassette11.2.5 Overwriting of a program in the RAM

Programs with the same number which are stored on the cassette are automatically overwritten during reading-out. However, if there is a program with the same number in the RAM, it must first be deleted.



If a program 0 0021 exists in the RAM, "ALREADY EXISTS" appears on the screen.



The "new 0 0021 program" can be stored.

11.2.6 Deletion of the total contents of the cassette

CASSETTE
PORT

Cassette mode

C.PR

Command to delete the total contents of the cassette. Reformatting takes place at the same time as deletion.

11.2.7 Reading out of stored programs from the machine memory onto cassette

CASSETTE
PORT

Select cassette mode

OUTPUT
ALL

Command to store all programs

J
Y N

• After activation of OUTPUT ALL the control asks, whether cassette should be formatted or not. Press J(Y) for YES or N for NO. This input is valid for all following cassettes.

• The message SAVING INTO RAMDISK now appears in the input line of the screen. This message is replaced by the message "COMPLETE" after a certain time (depends on program length).

• The programs are now in the main memory (RAM) but not yet on the tape. In order to attract your attention to this condition, the message "TAPE NOT UPDATED" appears at the top left-hand edge of the screen.

RES.

• By changing the mode or pressing the RESET key the programs in the main memory are transferred onto the cassette. This condition of the control is indicated by the message "TAPE SAVING" at the top left-hand edge of the screen.

• If the first cassette is filled up the message (INSERT NEXT TAPE) appears. On the new inserted cassette the control starts saving with that program which exceeded space on the preceding cassette.

After saving all programs the control automatically reports in EDIT mode.

Note

- If possible, format the cassette(s) with OUTPUT ALL (formatted cassettes also) to avoid tape errors.
- Existing programs on cassette will not be deleted (if no formatting selected).
- RESET cancels OUTPUT ALL, all other keys are not active.
- If programs with the same number exist on cassette, "ALREADY EXISTS" appears on the screen.

Possibility 1:

If O₀₃ bit 1 = high is set in the user monitor, the programs on the cassette with the same program numbers are overwritten.

Possibility 2:

O₀₃ bit1 = low

Every "ALREADY EXISTS" message has to be deleted with C.Pr. to overwrite the program.

11.2.8 Loading all programs stored on cassette
into the machine memory

CASSETTE PORT	Cassette mode
INPUT ALL	Command to load.

- The message "LOADING FROM RAMDISK" now appears in the input line of the screen. This message is replaced by the message "COMPLETE" after a certain time (depends on the program lengths).
- The programs are now in the machine memory.

Note

If programs with the same number exist in the machine memory, "ALREADY EXISTS" appears on the screen.

Possibility 1:

If O03 bit 1 = high is set in the user monitor (MONITOR), the programs in the machine memory with the same program number are overwritten.

Possibility 2:

O03 bit 1 = low

Every "ALREADY EXISTS" message has to be deleted with C.Pr.

11.2.9 The PSO and T0 data

From software version DC 2.01 onwards the PSO and T0 data can be loaded and read out via cassette and the interface RS 232. PSO and T0 data are also called offset arrays in the following explanations (offset array = group of offsets, position registers).

Note:

1. Loading and read-out procedures as well as listings of the offset arrays are in principle the same as the loading and read-out procedures for the programs. In the case of programs the address 0 is selected, with offset arrays T0.
2. Numeration of the offset arrays
You can give the offset arrays (T0 + PSO data) numbers from 0 to 99.
It is advisable to give the offset arrays the same numbers as the corresponding programs.
3. PSO data
All 5 PSO data are always loaded and read out together.
4. T0 data
With the parameter O02 you can establish the number of tool data which are to be stored in the operator monitor.
e.g. 20 tools are to be stored.
Entry: O02 = 20
With O02 = 99 all 99 tools are stored. This means in most cases unnecessary assignment of storage space on cassette or an external data carrier in the RS 232 mode.
5. Displays

From machine memory onto cassette:

During the storing procedure "T25 SAVING INTO RAMDISK".

On completion of the storage procedure "T25 complete".

Loading from cassette into machine

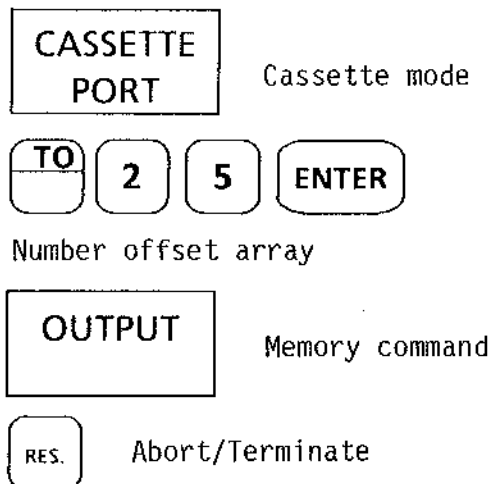
During the loading procedure "T25 LOADING FROM RAMDISK".

On completion of the loading and storing procedure "T25 complete".

After the start of the loading process "T25 exists" first appears. In order to avoid unintentional overwriting of the offset data in the memory, C.Pr. must be pressed as an acknowledgment and only then is the loading process continued.

11.2.9.1 Loading offset arrays from machine memory onto cassette:

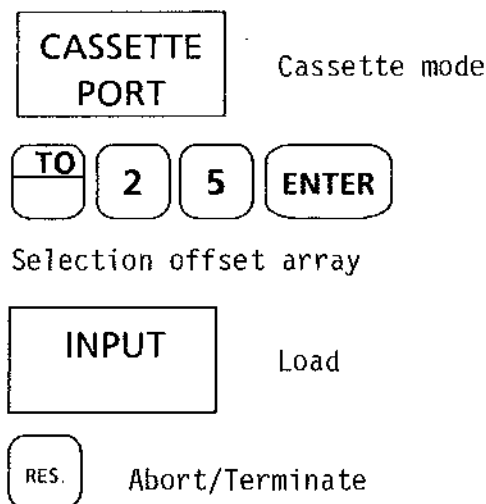
e.g. T0 25



If T0 25 already exists on the cassette (screen indicates this), it can be deleted on the cassette with C.Pr. The offset array T0 25 is transferred from the machine memory onto the cassette after C.Pr.

11.2.9.2 Loading offset arrays from cassette into machine memory:

e.g. T0 25

Note:

The screen displays "EXISTS".
 This "EXISTS" is an indication that the existing offset arrays are overwritten.
 If C.Pr. is pressed, the offset arrays in the machine memory are deleted.
 The loading procedure is started with the INPUT softkey.

11.2.9.3 Display of the stored offset arrays on cassette

No program may be selected.

**CASSETTE
PORT** Cassette mode

T **L** **ENTER** Call-up

RES. Abort/Terminate

Screen displays the number of offset arrays on the cassette.

11.3 RS 232 mode - RS 232 PORT

The loading and read-out procedures are the same as in the cassette mode. By activating the softkey RS 232 PORT the RS 232 interface mode (interface 1) is selected. You will find a detailed functional description of the RS 232 interface in the programming instructions M2.

Notes on the RS 232 interface

1. Interface configuration (001)

From software version DC 2.01 onwards the interface can be configured as desired (user monitor).

2. Providing punched tape with a leader and trailer (000 bit 1)

If the parameter 000 bit 1 is set high, a leader and trailer are created by the output of 50 ASCII "NULL characters" in each case.

3. As in cassette mode, the number of tools to be read out can also be established with the parameter 002 in the RS 232 mode.

4. During the loading process the offset numbers of the data being loaded are displayed on the screen.

11.3.1 Selection, possibilities

RS 232
PORT

By activating the softkey RS 232 PORT the machine is switched to the RS 232 interface mode (interface 1).

INTERFACE 1 SELECTED					
Δ	INPUT	OUTPUT			

Softkey functions:

INPUT

INPUT softkey:

By activating this softkey function data can be loaded in the RS 232 PORT submode.

OUTPUT

OUTPUT softkey:

By activating this softkey function data can be read out in the RS 232 PORT submode.

11.3.2. Read-out procedures

= Program transfer from machine memory to matrix printer, punched tape or other data carriers.

The following may have to be established beforehand in the user monitor:

- Baud rate (parameter D00)
- Configure interface, if necessary (parameter O01).
- Establish whether punched tape has a leader or trailer (parameter O01 bit 1).
- Establish the number of tools which are to be read out (parameter O02).

Example:

Program **O** 25 or offset array T025 is to be read out.

RS 232
PORT

RS 232 mode

0

2

5

ENTER

Program selection

or

TO

2

5

ENTER

Select offset array

OUTPUT

Read-out command

RES.

Abortion/Termination

11.3.3 Loading procedures - direct entry via keyboard

With the parameter **O 00** bit 0 (display input data flag) you can determine the type of loading procedure (operator monitor).

1) **O 00** bit 0 low:

During loading no display of the loaded data.

2) **O 00** bit 0 high:

This mode is used for direct editing via an external keyboard, e.g. teletype, PC.

The entries are displayed on the screen.

During input no check is made as to whether a program with this number exists (no message "exists").

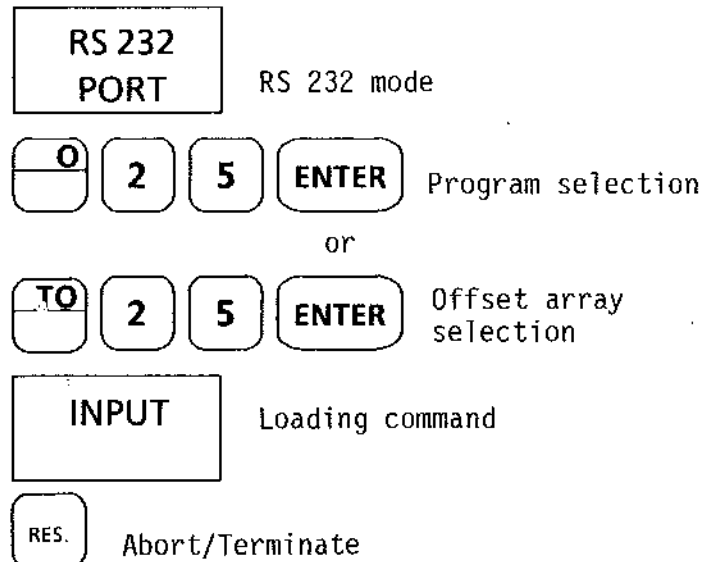
In this way it is also possible to change a program existing in the memory and the current offset.

11.3.3.1 Loading procedures

(**O 00** bit 0 low)

Example:

Program **O 25** or **T025** is to be loaded.



Note:

The program with the number **O 25** or **T025** is expected. If a program other than 25 or **T025** comes first, the process is terminated and alarm 850 given.

This means that the program selected must be at the start of the data carrier.

Regulations:

1. If M30 is last in the last block of the program, the loading procedure is ended.
2. If M30 is not last in the block or does not exist at all, the following programs are also loaded until the condition under point 1 is fulfilled or after an offset array has been loaded.

Practical application: Example

You can store the subroutines first and then the main program and the offset array. All data belonging to the program are loaded.

3. After an offset array has been loaded, an abortion takes place automatically.

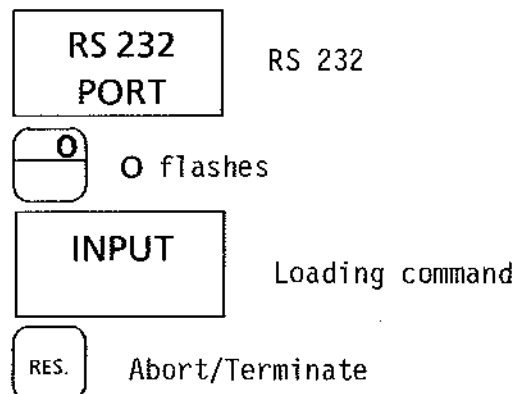
Application:

You store the main program first (M30 not last), then the pertinent offset array.
When the main program is selected, the offset array is also loaded.

4. An alarm results in abortion (with O_{00} bit 0 low).
5. Abort with RESET.

Loading of all syntactically correct programs on the data carrier

No specific program number is selected.



All programs on the data carrier are loaded.
However, the same abortion conditions apply as above.

Application:

The desired program is not first on the data carrier. You therefore also load the preceding programs.

11.3.3.2 Direct entry of a program or offset arrays via external keyboard

Display input data flag is set high.
(**O**₀₀ bit 0 = high)

Note:

- All entries or loading procedures are displayed on the screen.
- No check is made as to whether programs of the same number already exist in the memory.
You therefore have the possibility of changing existing programs in the machine memory with an external keyboard.

Loading:

Same as with display input data flag **O**₀₀ bit 0 = low.

11.3.3.2.1 Program entry

Entry via external keyboard

Entry is always made in the same way as on the control panel of the control.

The editor keys of the control not available are replaced by the following ASCII keys:

Control panel keys	ASCII keys
PREV.	ctrl P
STORE NEXT	StrlN oder lf
ENTER	____, cr, ctrl E
Cl. Bl.	ctrl B
Cl. Pr.	ctrl O
Cl. W.	ctrl W
C.E.	Del
Shift ENTER	Back space
RES	ESC oder ctrl E

Syntax during program entry

```
% (oder O) ZiZi [ ] crlf
N ZiZiZiZi [ ] [ ] GZiZi [ ] ..... crlf
.
.
.
B ZiZiZiZi .....M30 [ ] crlf
```

The interface mode can be abandoned with the key ESC (or ctrl).

11.3.3.2.2 Entry of the offset arraysEntry into the offset array mode:

No message "EXISTS" is given.
% T ZiZi []

Offset array number

a) Entry into T0 register

T ZiZi []

Tool number

The cursor jumps to the number selected.

Entry:

Select X,Y,Z,R.

With this selection the numerical value is deleted.
Enter numerical value, store (, or cr).

You can also key to the corresponding address with ENTER and delete the numerical value with ctrl W.

Select new tool:

T ZiZi

b) Entry into PS0 register

G ZiZi []

Register number

Note:

When the Z-value of the last register (5) has been stored, the interface mode is automatically abandoned.

Abandoning the offset array mode1. ESC or ctrl

You leave the interface mode with these keys.

2. Intentional triggering of an alarm

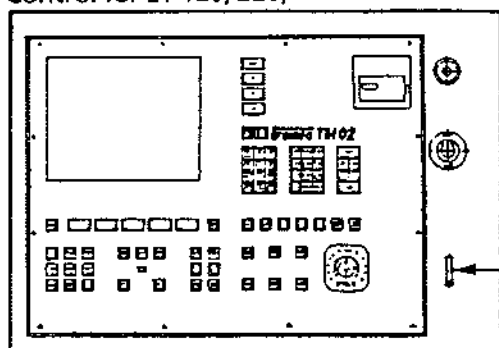
If you enter an incorrect index (e.g. G7 or T 350), you cause an alarm. In this way you leave the offset array mode. However, you remain in the interface mode and can, for example, select a workpiece program.

11.4 Parallel interface (Centronics interface)

Basic conditions

- Software 6.0
- Graphic simulation has to be installed
- Centronics interface has to be installed
This retrofit package with
Ref. no. 276 180 (for ET 120, ET 220, VMC 100) or
Ref. no. 276 120 (for ET 242, VMC 200, MC 90)
consists of a Centronics plug with connection cable to the graphic controller.

Control for ET 120, 220, VMC 100



For the machines ET 242, VMC 200, MC 90,
the Centronics plug is mounted laterally on the
electrical cabinet and is provided with a
"Centronics" sticker.

RS232

Centronics

The installation is possible only ex works or by an EMCO service engineer.

Options with the Centronics interface

In MAN., EXC., AUTOM. modes

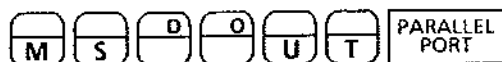
Print the screen content
by pressing softkey „HARDCOPY“ (second line)

In EDIT mode

1. Print NC-program:



2. Print machine data:



3. Print tool data and offset register:



Only the number of tools in the user
monitor in parameter O02 is printed. (Basic
setting: O02 = 09)

After the tool data the offset register is
printed automatically.

4. Print offset register:



In the operator monitor with parameter
O00, Bit 2 you can preselect whether at the
end of the line the command CRLF (= car-
riage return and new line) or CR (= only
carriage return) is activated (depending on
printer).

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 mode
- Insert cassette.

CASSETTE
PORT

Control in cassette mode.

M S D

INPUT

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 mode
- Insert punched tape.

RS 232
PORT

Control in RS 232 mode.

INPUT

Loading procedure is started. This process must be performed three times.

13. Entry into user monitor/ data changing

MON - user monitor

You will find a detailed description of the parameters of the user monitor in the programming instructions TM 02.

Precondition:

No workpiece program may be active.

  Screen displays MONITOR.

Example: Select D₀₀

 Select desired parameter address.

 Key to the desired parameter number with ENTER.

 or  Delete old value.

- Enter value and store with ENTER.

 Abandon the user monitor.

Note:

The user monitor can also be abandoned by switching over to another mode.

AUTOMATIC mode

1. Summary, possibilities	AUTOM 1
2. Displays on the screen	AUTOM 1
2.1 Display after program call-up	AUTOM 1
2.2 Display during program run	AUTOM 1
3. The softkeys and their meaning in the AUTOMATIC MODE	AUTOM 2 - AUTOM 3
4. Notes	AUTOM 4
4.1 Types of runs (summary)	AUTOM 4
5. Program call-up and program run	AUTOM 5 - AUTOM 7
5.1 Program run from beginning	AUTOM 5
5.2 Start from any block of the program	AUTOM 6 - AUTOM 7
6. Overrides, program interruptions, program abortions	AUTOM 8 - AUTOM 11
6.1 Run control	AUTOM 8
6.2 Program interruption	AUTOM 9 - AUTOM 10
6.3 Program abortions	AUTOM 10 - AUTOM 11
7. AUTOMATIC - various runs	AUTOM 12 - AUTOM 14
7.1 Pure AUTOMATIC mode	AUTOM 12
7.2 The submodes in the AUTOMATIC mode	AUTOM 12 - AUTOM 14
7.2.1 Single block mode	AUTOM 12
7.2.2 Skipping of blocks	AUTOM 13
7.2.3 Program test with axis movement: dry run	AUTOM 13
7.2.4 Combination	AUTOM 13
7.2.5 STATUS submode	AUTOM 14
8. Test run without axis movement	AUTOM 15 - AUTOM 16
9. Reset workpiece time	AUTOM 17

AUTOMATIC mode

AUTOMATIC:				DISTANCES (MM)	
WORK PIECE COUNTER: 1245			PIECE TIME		
WP-COUNTER PRESET : 10000			00:00:00.0		
X	42.930	U	0.000		
Y	70.000	V	0.000		
Z	201.115	W	0.000		
		F	0		
		S	0		
		T	0000		

INCH FEED	0.001	STATUS	DISPLAY-MODE	DRYRUN	SINGLE
GRAPHIC ON					

1. Summary, possibilities

- o Starting a stored program from any block desired.
- o Letting a stored program run in single block mode.
- o Letting a stored program run in dry run mode (test run).
- o Letting a stored program run in test run mode without axis movement.

Overrides:

FEED OVERRIDE
SPINDLE OVERRIDE

Submodes:

SINGLE: single block mode
DRYRUN: test run without axis movement
SKIP: skip block mode

Other applications:

- Test run without axis movement (M30)

2. Displays on the screen

2.1 Display after program call

- Selected program number
- Workpiece counter
- X, Y, Z, U, V, W values
- Feed rate F
- Speed S
- Tool number and correction number (T...)
- Actual block
- Workpiece time
- Symbol menu

2.2 Display during program run

- Current actual coordinate values
- Remaining travel paths
- Feed rate F
- Actual speed S
- Tool number and correction number (T...)
- Actual block
- Workpiece time
- Symbol menu

3. The softkeys and their meaning in the AUTOMATIC mode

GRAPHIC
ON

GRAPHIC ON softkey:

The softkey function GRAPHIC ON is activated in a subsequent software version.

STATUS

STATUS softkey:

This softkey function switches the machine into the STATUS submode (display of the active functions). You will find a detailed description of this softkey and its function under "The submodes of the AUTOMATIC mode".

DISPLAY-
MODE

DISPLAY MODE softkey:

2 letter sizes of the path display (X,Y,Z,U,V,W) can be selected with the DISPLAY MODE softkey.

DRYRUN

DRYRUN softkey:

Activating this softkey function switches the machine into the DRYRUN submode (dry run with axis movement). You will find a detailed description of this softkey and its function under "The submodes of the AUTOMATIC mode".

SINGLE

SINGLE softkey:

With this softkey function the SINGLE submode (single block mode) is selected. You will find a detailed description of this softkey and its function under "The submodes of the AUTOMATIC mode".

SKIP

SKIP softkey:

The SKIP (skip block) submode is selected with this softkey function. You will find a detailed description of this softkey and its function under "The submodes of the AUTOMATIC mode".

4. 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.

4.1 Types of Runs (Summary)

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

Combinations

SINGLE	SKIP	
SINGLE		DRYRUN
	SKIP	DRYRUN
SINGLE	SKIP	DRYRUN

Test Run without Axis Movement

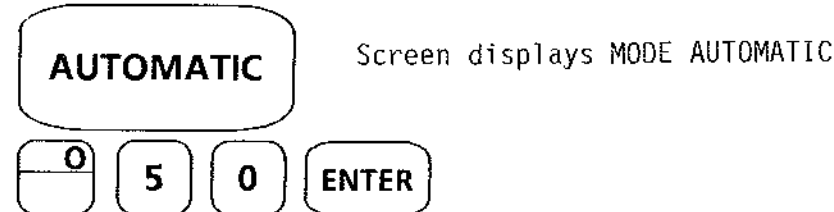
5. Program call and program run

Preconditions:

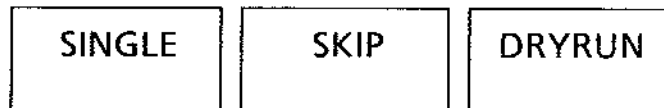
- * Reference point must be approached.
- * A program must be stored.

5.1 Starting a program from the beginning:

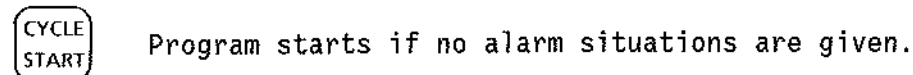
e.g. program O 50



If O 50 is available, screen displays "O50 found"
(Selection can be dispensed with if already selected
in EDIT).



Select submode, if desired.



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, PS0). 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.

5.2 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.

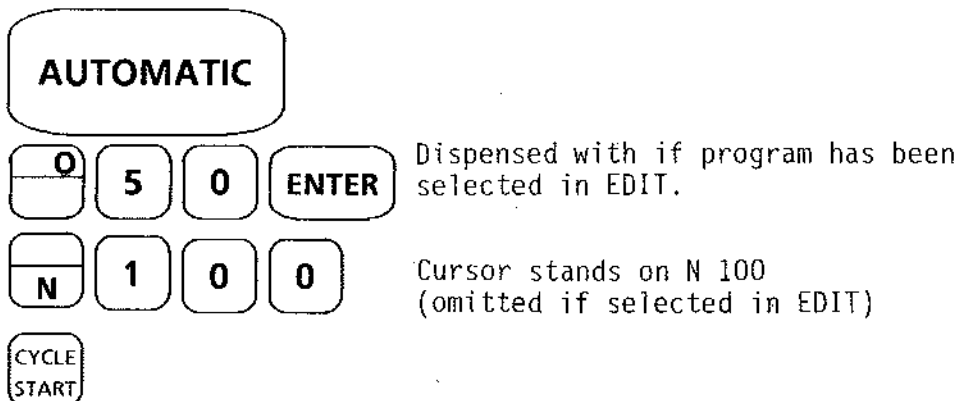
Note:

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



- 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

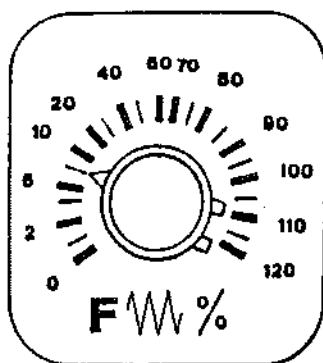
Example:

- 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.

6. Run Control

Program Interruptions

Program Abortions :



6.1 Run Control:

Change in the feed rate from 0 to 120 %.



Change in the spindle speed from 50 to 120 %.

ALARM



SINGLE

6.2 Program Interruption:



NOT - AUS

6.3 Program Abortions:

6.2 Program Interruptions

ALARM

6.2.1 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

6.2.2 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 symbol 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 symbol goes out; program continues.

Caution:

Is the main spindle running?

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

SINGLE

6.2.3 Program Interruption with Softkey

SINGLE

SINGLE key is pressed during the program run.

Consequences:

- The active block is ended, cycles and thread are completed and then the slides stop;
- 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.

6.3 Program Abortions

RES.

6.3.1 RESET - Program AbortionConsequences:

- 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/PS0 - data
- Program number is retained.

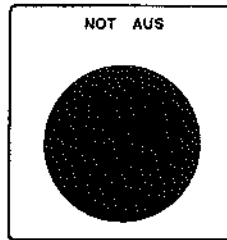
Possibilities:

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 RESET in cases of program interruptions (FEED HOLD, SINGLE).

6.3.2 EMERGENCY-OFFConsequences:

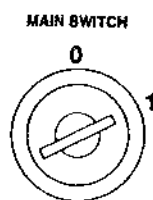
- As RESET

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.

6.3.3 Switch Off Key-Operated SwitchCaution:

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.

7. AUTOMATIC - Various Runs

7.1 Pure AUTOMATIC mode

AUTOMATIC

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:

RES.

NOT - AUS

Note:

DRYRUN

SKIP

cannot be activated during the run.

Only if the program is interrupted (RESET, after SINGLE and naturally before CYCLE START).

7.2 The submodes in the AUTOMATIC mode

AUTOMATIC

SINGLE

7.2.1 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.

7.2.2 Skipping of blocks

AUTOMATIC

SKIP

Skip means jump over

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.

7.2.3 Program test with axis movement

AUTOMATIC

DRYRUN

DRYRUN means dry operation

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.

7.2.4 Combinations

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

Example

AUTOMATIC
SINGLE **SKIP** **DRYR.**

7.2.5 STATUS submode

AUTOMATIC: STATUS				DISTANCES [MM]			
GROUP	G	M		GROUP	G	M	
00	:	05	:	08	40	:	:
01	:	39	:	09	17	:	:
02	194	:	:	10	:	130	:
03	153	09	:	11	98	:	:
04	:	:	:	12	:	:	:
05	166	:	:	13	:	:	:
06	:	:	:	14	:	:	:
07	171	:	:	15	:	:	:
ACTUAL F 0				OVER F 0%			
ACTUAL S 0				OVER S 100%			
ACTUAL T 0000							
GRAPHIC ON	STATUS	DISPLAY-MODE		DRYRUN	SINGLE		

By switching into the STATUS submode you can see which functions are active.

Display in the STATUS submode:

- * G-functions
- * M-functions
- * Programmed F-value
- * Programmed S-value
- * Actual T-value
- * Percentage of the FEED OVERRIDE
- * Percentage of the SPINDLE OVERRIDE

8. 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.

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.

9. Reset workpiece time



The workpiece time is set to zero by pressing the CLEAR PROGRAM key (C.PR.) in the AUTOMATIC mode.