

SINUMERIK 3 G

**Operating
Instructions**

SINUMERIK

Edition 02.88

SINUMERIK 3G

Operating Instructions

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Functions extending beyond the scope of this Description may be capable of operating on the controller. However, we accept no responsibility for such functions for new equipment or equipment which has been serviced.
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SINUMERIK®-Documentation

Key to editions

The following editions were published prior to this edition.

Listed in the "Revisions" column are the sections which have been amended in relation to the previous edition.

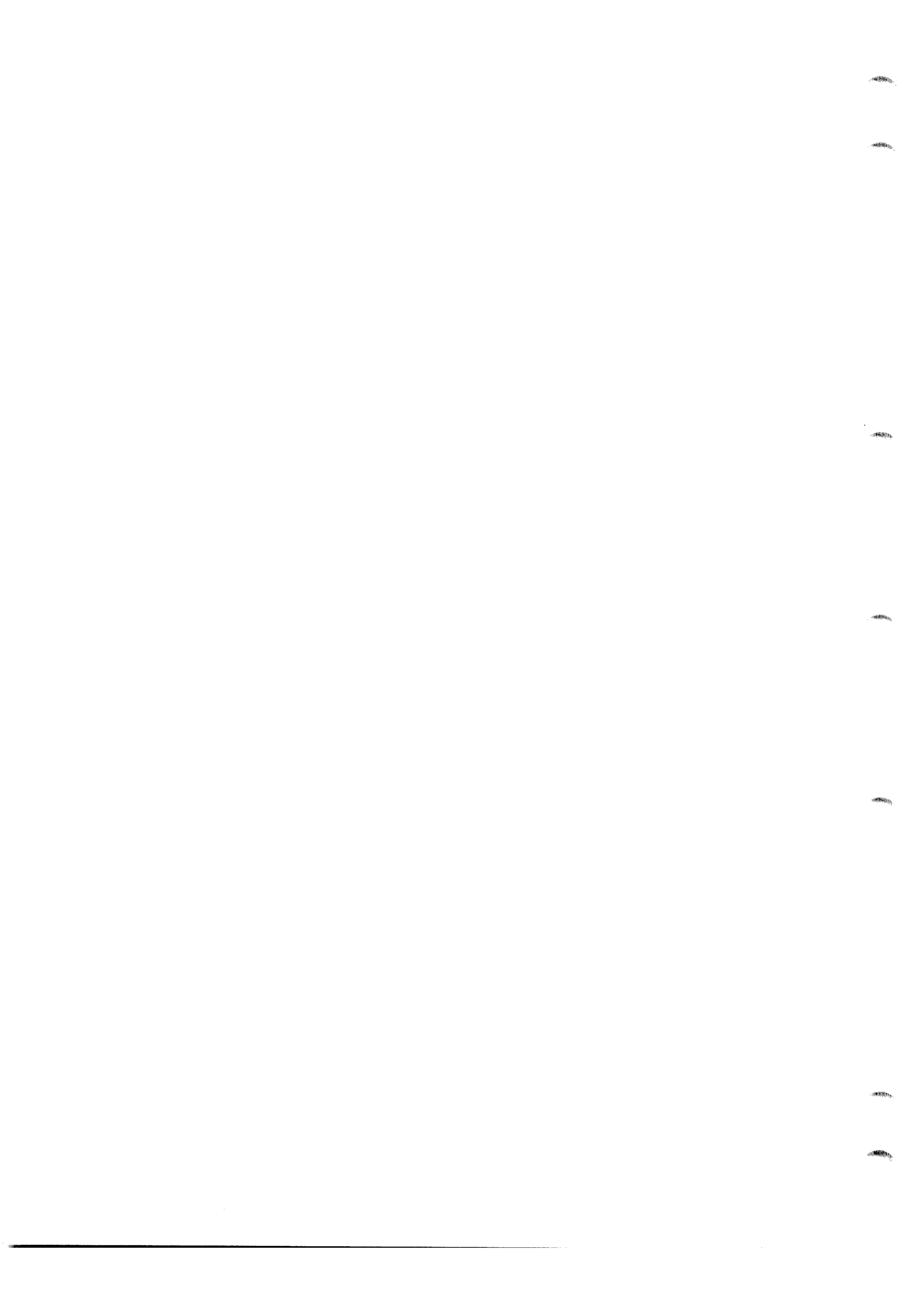
Edition	Order No.	Revisions
03.84	E80210-T36-X-A0-7600	New edition
05.86	E80850-D35-X-A1-7600	Revised edition
02.88	E80850-D35-X-A2-7600	Revised edition

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1. Introduction

=====

1.1 General

These Operating Instructions apply to the SINUMERIK 3G.

The operating concept of the SINUMERIK 3G system is characterized by its systematically unitary operating logic.

Operator prompting of the SINUMERIK 3G facilitates and simplifies input of the grinding cycles.

The operating sequences are presented in the order in which they occur, extensive use being made of the symbols on the operator panel and machine control panel.

The Operating Instructions are structured in accordance with the settings of the mode selector. A fold-out drawing of the operator panel and machine control panel can be found in the Appendix. This diagram is best left open when working through this manual.

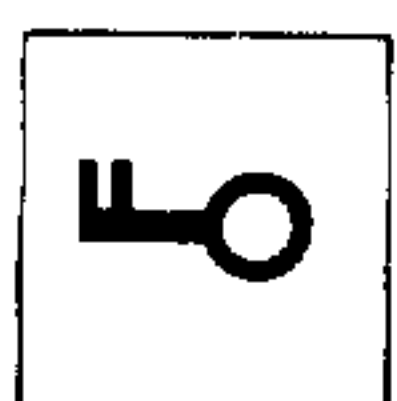
The operator panel is divided into modules, which are also presented in the Appendix.

The individual controls are described the first time they appear in the text. Reference is also made to the key number in the diagram (Appendix, Section 11).

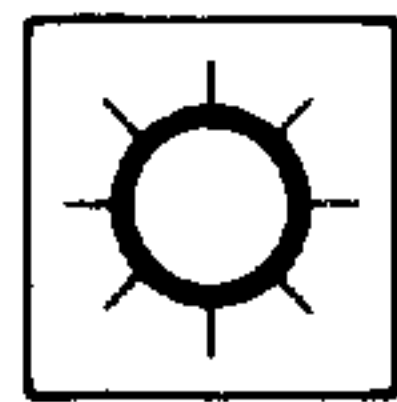
The diagrams listed in the instructions are based on an input/output resolution of 1 μm .

1.2 Symbol Description

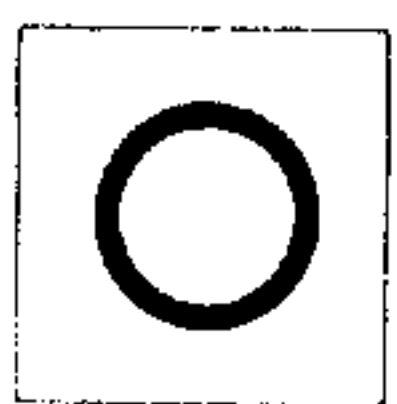
The following symbols will be used in the Operating Instructions:



Key-operated switch enabled



Lamp ON



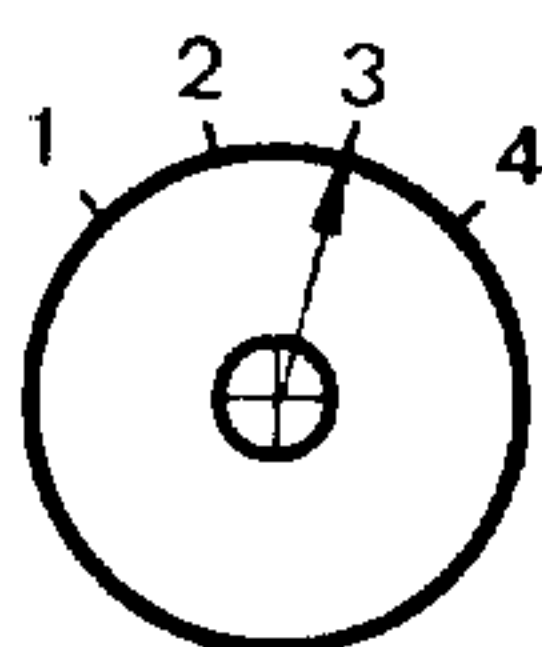
Lamp OFF



Toggle switch OFF



Toggle switch ON



Rotary switch, e.g. axis selector set to axis 3
The axis name (address) is specified by machine data



Hand
Operation is subject to the condition indicated
alongside

X12345.678 Address with specified number of decades
(shown here: 8 decades, 3 decimal points)

4 4th axis

1.3 Terminology

Program Indicator

The control distinguishes between 9999 part programs.
A maximum of 200 programs can be stored simultaneously.
The program number indicator is used to select and display the current part program.

- Program number indicator e.g. % 1234

Program Status Indicator

The program status indicator displays the current operating status, and consists of the following:

- Block number in part program	N 1234
- 1st subroutine number with number of passes	L 123 P 1
- Block number in subroutine 1	N 1234
- 2nd subroutine number with number of passes	L 134 P 2
- Block number in subroutine 2	N 1234
- 3rd subroutine number with number of passes	L 145 P 50
- Block number in subroutine 3	N 1234
- 4th subroutine number with number of passes	L 156 P 325
- Block number in subroutine 4	N 1234


```
AUTOMATIC
% 103 N 30 L109 P 1 N1020
          L110 P 2 N2020
          L111 P 3 N3020
          L112 P 4 N1010

ACTUAL POSITION DIFFERENCE VALUE
X + .000 X + .000
Y + .000 Y + .000
Z + .000 Z + .000


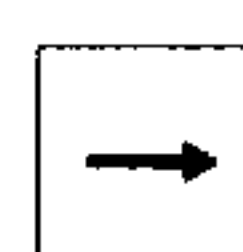
SINUMERIK 3G
```

Selection



Key selection of displays (e.g. part program)

 Switch display key (No. 17)

Cursor

 Cursor left (No. 24)  Cursor right (No. 25)

Page

Page of display  Page backwards (No. 22)  Page forwards (No. 23)

1.4 Operating Modes

An NC system for a grinding machine controls the motions of the grinding wheel and workpiece in accordance with a specified program, the part program. Before the actual machining process can begin, a set-up procedure has to be completed for an NC-controlled grinding machine in addition to loading the machine with the grinding wheel(s) and workpiece.










This procedure includes the following operations:

- Moving the grinding wheel or workpiece to the correct starting position specified in the setting-up drawing;
- Loading the part program into the control memory;
- Checking or entering the zero offsets and compensation values;
- Checking or entering the grinding wheel data;
- Dressing the grinding wheel and recording the dressing position.









For the above procedure the control must be set to specific modes so that it can accommodate these operations.

These modes are selected by operating the mode selector on the machine control panel.


The distinction is made between the following operating modes:

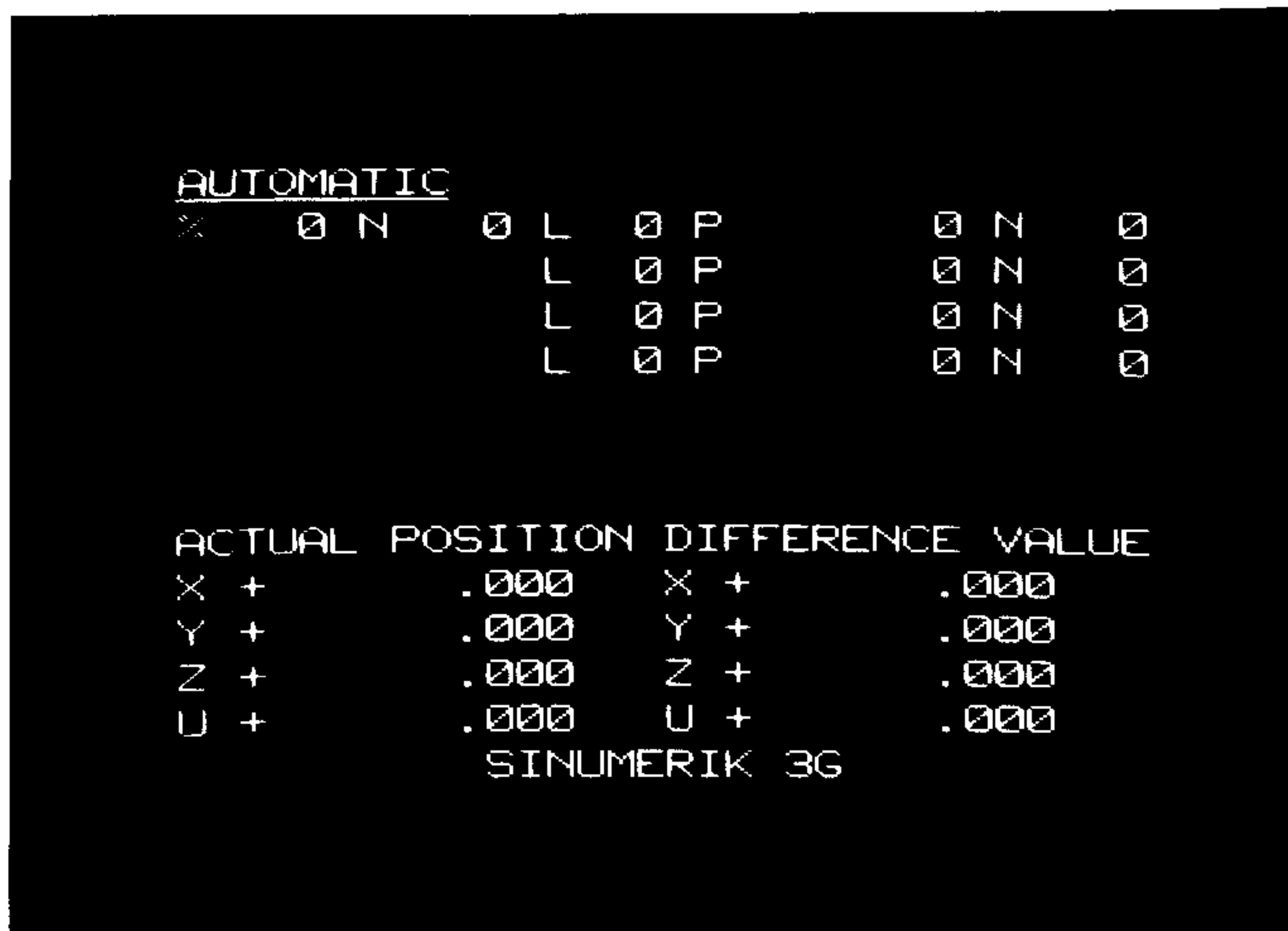
Symbol	Description	Screen Text	Abbreviation
	Data output interface	DATA OUTPUT	DO
	Data input interface	DATA INPUT	DI
	Set actual values (PRESET) Record actual values, dressing positions	PRESET	PRESET
	Jog, handwheel	JOG	JOG
	Incremental feed	INC FEED	INC
	Manual data input, part program	MDI PART PROGRAM	MDI-PP
	Manual data input Grinding wheel data Machine data Setting data Test data	MDI SE-TE	MDI-SE-TE
	Automatic	AUTOMATIC	AUT
	Reference point approach	REFERENCE POINT	REF

1.5 Input and Display List

									
DO	Data output via data interface of part programs %, subroutines L, parameter values RP, machine data TE			2.	* Alarms 8.3.1 * Interface status 8.3.2	Data output via data interface	2.	* Position indicator 1.8	
DI	Data input via data interface of part programs %, subroutines L, parameter values RP, machine data TE			3.	* Machine data 8.3.3	Data input via data interface	3.		
PRESET	Set actual values 4.1	Record dressing positions 4.2	Input: User data 8.1 R parameters 8.2	* Alarms 8.3.1 * Interface status 8.3.2 * Machine data 8.3.3	Set actual values 4.1	* Position indicator 1.8			
JOG	Axis traverse via direction keys or handwheel								
	Basic display Transfer M, S functions and G05/G06 Subroutine call	5.0	Input: User data 8.1 R parameters 8.2	* Alarms 8.3.1 * Interface status 8.3.2 * Machine data 8.3.3	Basic displays Transfer M, S functions and G05/G06 Subroutine call	* Position indicator 1.8			
INC	Incremental feed via direction keys								
	Basic display Transfer M, S functions and G05/G06 Subroutine call	6.0	Input: User data 8.1 R parameters 8.2	* Alarms 8.3.1 * Interface status 8.3.2 * Machine data 8.3.3	Basic displays Transfer M, S functions Subroutine call	* Position indicator 1.8			
MDI-PP	Delete part programs % subroutines L	7.1	Input: User data 8.1 R parameters 8.2	* Alarms 8.3.1 * Interface status 8.3.2 * Machine data 8.3.3	Basic display Input, edit part programs % subroutines L	7.3 7.4	* Position indicator 1.8		
MDI-SE-TE	Basic displays		Input: User data 8.1 R parameters 8.2	* Alarms 8.3.1 * Interface status 8.3.2 * Input machine data 8.3.3 Drift compensation 8.3.5	Input grinding wheel data if grinding wheel rad comp set	8.1	* Position indicator 1.8		
AUT	Processing of a part program								
	Basic displays Transfer M, S functions 9.0 Block search 9.5	Display DRF offset 9.7	Input: User data 8.1 R parameters 8.2	* Alarms 8.3.1 * Interface status 8.3.2 * Machine data 8.3.3	* Program indicator 9.3 * Compensation block 9.3	* Position indicator 1.8			
REF	Reference point approach via direction keys								
	* Display reference point approach	10		* Alarms 8.3.1 * Interface status 8.3.2 * Machine data 8.3.3	* Display reference point approach	10	* Position indicator 1.8		

Note: * indicates display only, input not allowed
The numbers alongside the functions indicate the sections in the Operating Instructions

 These displays appear after a change of operating mode as basic displays



The structure of the displays (shown here automatic display = basic display) is generally identical for all operating modes. The monitor has 16 lines with 32 characters each. The 1st line indicates the operating mode selected.

The 14th line indicates the first NC alarm number as a function of the machine datum together with its alarm text.

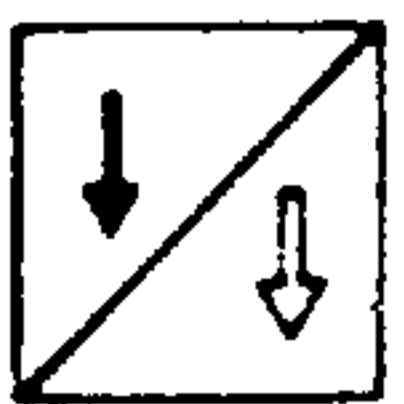
The 15th line is the interactive dialog line for operator prompts and PLC texts.

The last line is reserved as the input line.

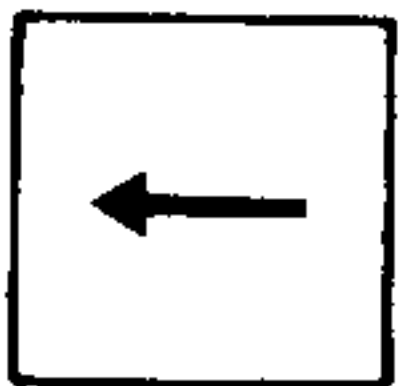
Since the CRT displays a large amount of data, the PAGE and CURSOR keys are used to search for specific information:



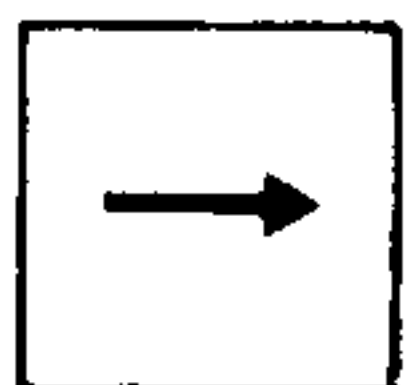
PAGE keys
(page backward, key #22 and
page forward, key #23)



(block-by-block forward paging when part
programs displayed)
(search for R parameter in R parameter display)



CURSOR keys
(cursor left, key #24 and
cursor right, key #25)



1.7 Power-Up

Before the control is powered up for the first time, it should be ensured that it has been properly commissioned by qualified personnel. Before starting, set the toggle and rotary switches to the following positions:



I
0

Single block (switch #40)



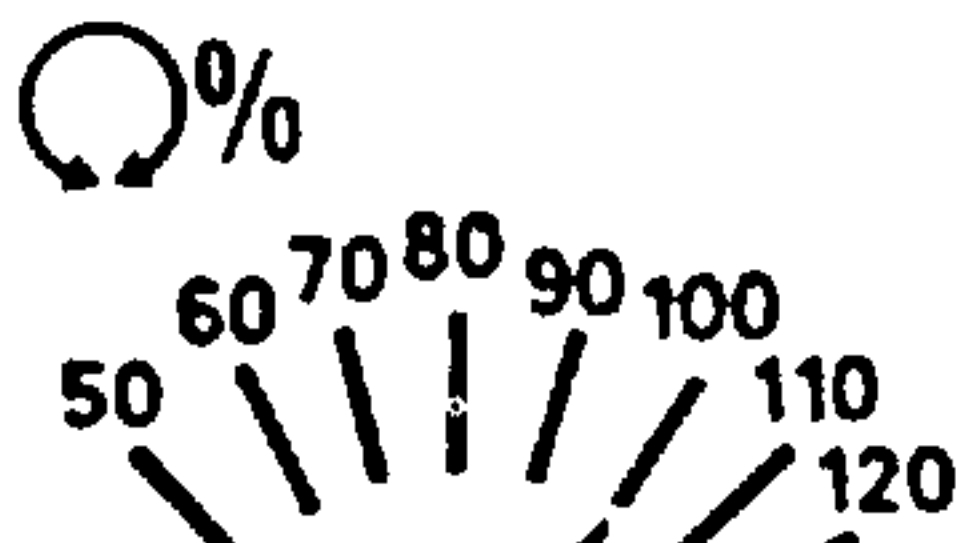
I
0

Feedrate (switch #41)



I
0

Dry run (switch #42)



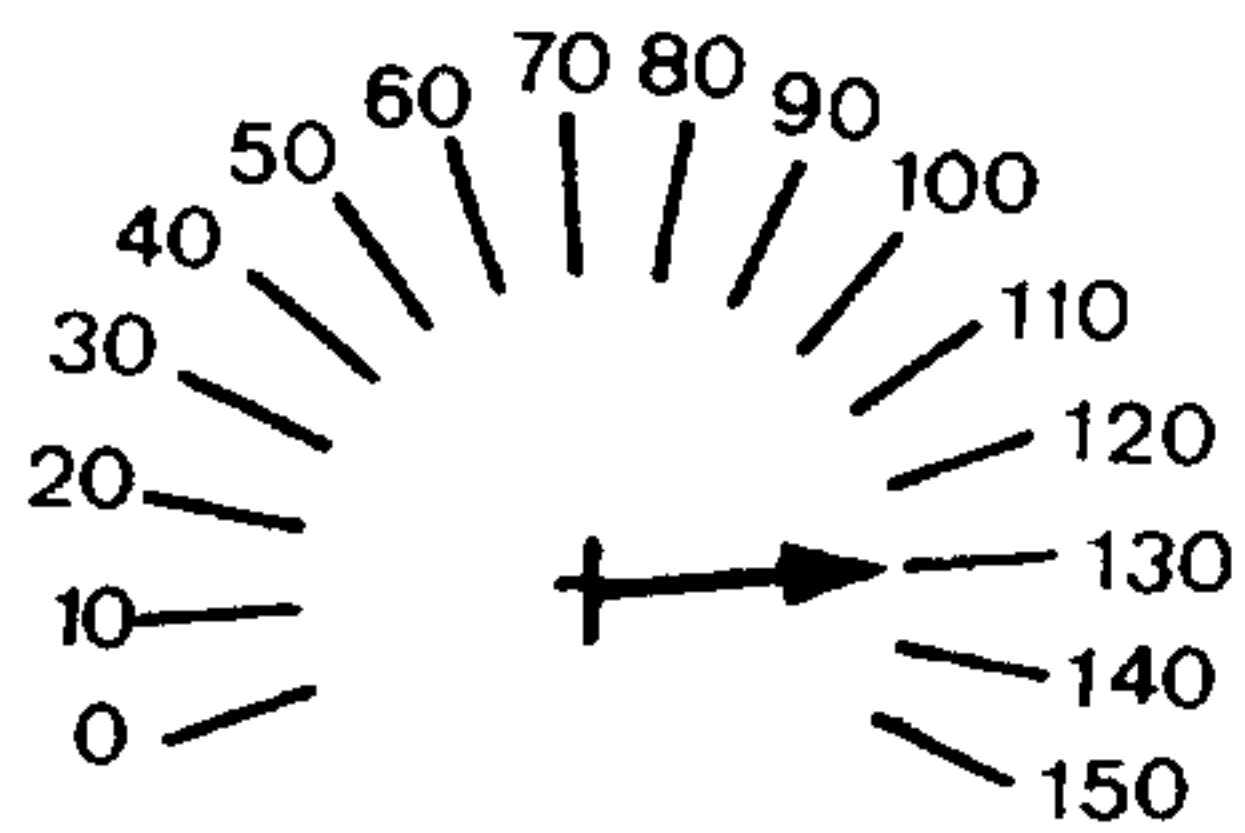
Spindle speed override switch (#32) 100%

F

W%

+

Feedrate override switch (#33) 130%



Rapid traverse override active (#43)

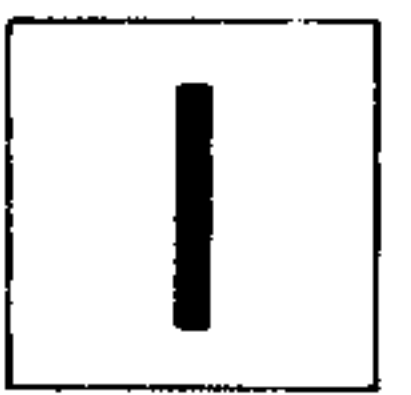


I
0

It will be assumed below that the metric system of units is used for input and programming.

The feedrate is indicated in mm/min in the displays.

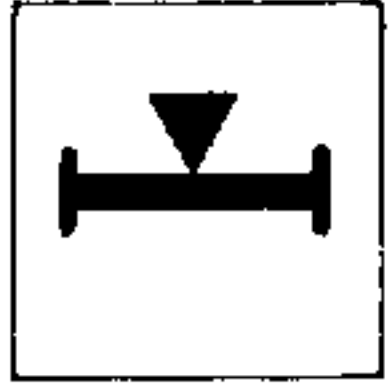
Power ON



After the control has been powered up, the basic display for the current operating mode is shown (see input and display list, Section 1.5).

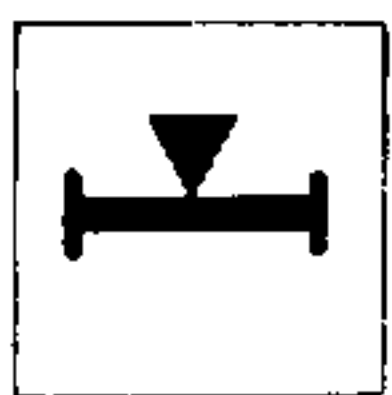
1.8 Actual Value Display

Position display in double-height characters can be selected in any operating mode.



Select position display (key #18)

```
AUTOMATIC
ACTUAL POSITION
X +      .000
Y +      .000
Z +      .000
U +      .000
```



Deselect (key #18)

After position display in double-height characters has been deselected, the basic display of the current operating mode appears. A change of mode will also cause the double-height position display to be deselected.

2. Data Output

=====



Select data output mode

After the operating mode has been selected, the following display appears:

```
DATA OUTPUT

AVAILABLE MEMORY 12960 CHARACTER

SINUMERIK 3G
MAINPROGRAM (%) ?
```

Line 6: Available part program memory area
(tape characters = ASCII characters)

Line 15: Operator prompting for selection of output data

The following types of data can be output:

Main programs	%
Subroutines	L
R parameters	RP
Machine data	TE

Operational Sequence



Data output mode (mode selector #31)

NO

The data type can be selected by switching forward using the key (#27) and is displayed in line 15 in the sequence %, L, RP, TE

YES

The data type in line 15 is selected for output by depressing the key (#26)

Example:

Output of single part program

	1	2	3	4
%				



only with % and L



Input of part program number and termination using "Input" key (#16)

END !?



Depressing the NO key (#20) causes the part program number to be automatically supplemented for the end of output

```
DATA OUTPUT
% DATA ARE BEING GIVEN OUT !
BEGIN : %1234
END   : %1500
AVAILABLE MEMORY 12960 CHARACTER

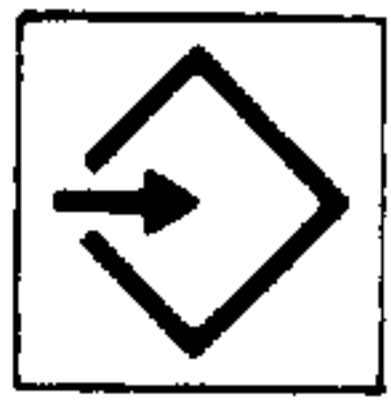
SINUMERIK 3G
START !
```



Start data output (key #28)
CONTROLLER BUSY is displayed in line 15
during data output

Example: Output of several part programs

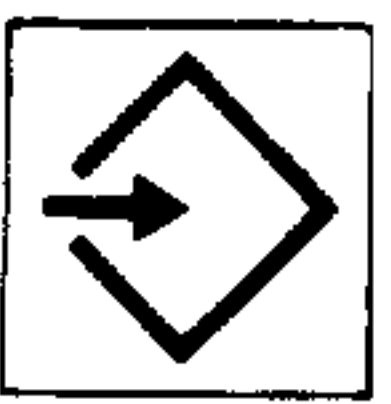
%	1	2	3	4
---	---	---	---	---



only with % and L
Input of first part program number and termination
using input key (#16)

```
END !?
```

%	1	5	0	0
---	---	---	---	---

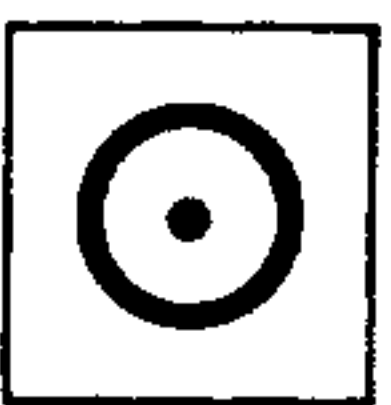


Input of last part program number and termination
using "Input" key (# 16)

```
DATA OUTPUT
% DATA ARE BEING GIVEN OUT !
BEGIN : %1234
END   : %1234

AVAILABLE MEMORY 12960 CHARACTER

SINUMERIK 3G
START !
```



Start data output (key #28)
CONTROLLER BUSY is displayed in line 15
during data output

Example: Output of all part programs

NO

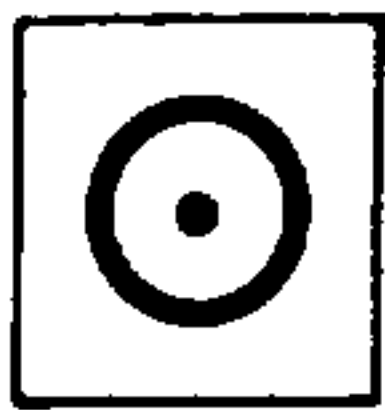


only with % and L

Part programs %0 through %9999 are selected automatically by activating the NO key (#20)

```
DATA OUTPUT
% DATA ARE BEING GIVEN OUT !
BEGIN : % 0
END   : %9999
AVAILABLE MEMORY 12960 CHARACTER

SINUMERIK 3G
START !
```



Start data output (key #28)
CONTROLLER BUSY is displayed in line 15
during data output

One data type is output per operation.

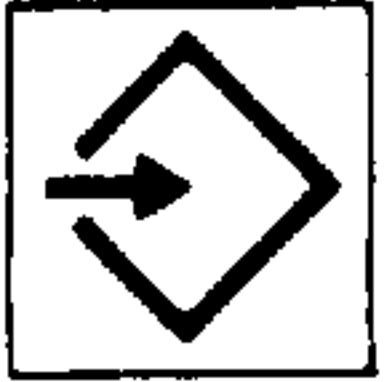
In the case of main programs and subroutines and R parameters it is also possible to output certain parts, e.g. %1 to %10, L120 to L200, or R105 to R109.

The output code (ISO or EIA) is specified via the user datum (Section 8.1).

At the start and end of the program approximately 0.3 meters of punched tape with sprocket holes is automatically output. A longer leader should be adjusted at the punch if required.

3. Data Input

=====



Select data input mode

The following display appears:

```
DATA INPUT

AVAILABLE MEMORY 12960 CHARACTER

SINUMERIK 3G
START !
```

Line 6: Available part program memory area
(tape characters = ASCII characters)

Line 15: Operator prompting for initiating data input

The following types of data can be input:

Main program	%
Subroutines	L
R parameters	RP
Machine data *)	TE

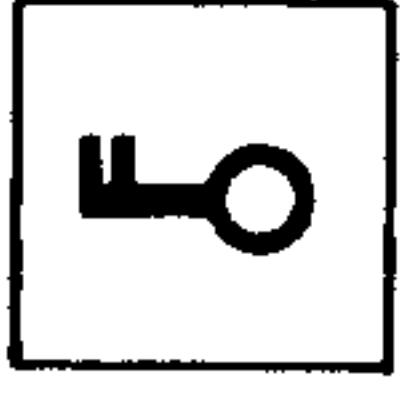
The data type is recognized automatically during read-in.

*) Locked via switch on the PLC link module.

Operational Sequence



Data input mode (mode selector #31)

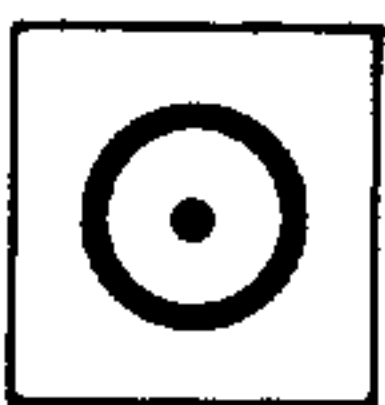


Key-operated switch (#38) enabled
(depending on machine datum)



Start data input (key #28)

During data input line 15 displays CONTROLLER BUSY,
which disappears on completion of data transfer.



If no data are transmitted from the reader within
20 seconds, alarm 238 is displayed (in event of
uncontrolled data transmission).

When data are being entered, the end criterion for input is
always M02 or M30.

3.1 Verifying Input Data

The input data are checked for simple errors.

- Character parity

All characters must have an even number of bits (logical "1") in ISO code or an odd number of bits in EIA code (corresponding to number of holes per character for punched tape).

- Block parity

The number of characters in a block (including LF) must be an even number. Block parity checks can be activated or deactivated via the user datum.

- Double input

If the same program (identical program number) is read in twice, the newly read program is compared with the stored program.

If an error is recognized, input stops and alarm 277 is displayed.

3.2 Interface, Interface Devices

An interface to the following specification is available for data transfer:

Full duplex* { 20 mA current loop
RS 232C; V.24 in accordance with DIN 66020

Interface data can be set separately for input and output and are specified via the machine datum.

Input and output is only possible to and from an internal memory.

The following devices can be connected:

Reader, punch, combined reader-punch unit,
e.g. Siemens PT 80 keyboard printer terminal,
as well as other devices that comply with the interface specifications.

* See also "SINUMERIK System 3 and 8 Universal Interface for Data Input/Output" Description

3.3 Program Deletion

This function enables main programs and subroutines to be deleted in any sequence via the universal input/output interface.

DELETE PROGRAM	- Leader
% CL LF	- Identifier (CLEAR)
% 1234 LF	- Delete part program % 1234
% 1 % 1200 LF	- Delete part programs % 1 through % 1200
L10 LF	- Delete subroutine L10
L11 L79 LF	- Delete subroutines L11 through L79
L81 LF	- Delete subroutine L81
M30 or M02 LF	- End-of-file identifier M30 or M02

Example:

% CL LF	% 1LF	L55 LF	% 1% 1200 LF	L11 L79 LF
---------	-------	--------	--------------	------------

Delete programs	Delete programs % 1	Delete subroutine L55	Delete programs % 1 through % 1200	Delete sub-routines L11 through L79
-----------------	---------------------	-----------------------	------------------------------------	-------------------------------------

L81 LF	M30 or M02 LF
--------	---------------

Delete sub-routine L81 End of deletion block

Note:

Subroutines L80 through L99 and L900 through L999 must be deleted one by one.

These subroutines cannot be deleted if cycle inhibit is active.

1

2

3

4

5

6

7

4. Setting Actual Values

=====

This operating mode allows two possibilities:

- Setting of actual values for each existing axis
- Recording of dressing position for selected axis

4.1 Manual Setting of Actual Values

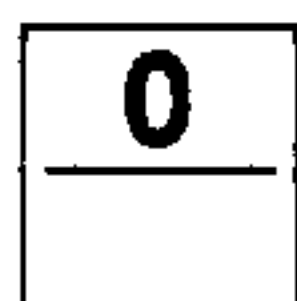
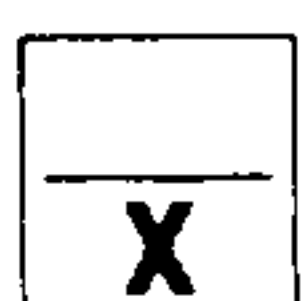
The desired actual values may be directly set by hand. The appropriate display will be shown for the selected grinding wheel.



Setting actual value mode (selector #31)

```
PRESET
GRINDING WHEEL 1
MANUALLY
PRESET VALUE    ACTUAL POSITION
X +             .000    X +             .000
Y +             .000    Y +             .000
Z +             .000    Z +             .000
U +             .000    U +             .000

SINUMERIK 3G
```



Input X 50

Word-by-word input of an actual value in accordance with the standard input conventions.



The actual value entered is displayed in the left actual value column and remains displayed until overwritten by a new actual value in this mode. When the control is switched on the value zero is displayed as actual value entered. The right-hand actual value column always contains the actual value which is also displayed in the automatic basic display, for example.

Setting actual values changes the axis-specific and grinding-wheel-specific parameters:

- R254...R265 Zero offset
- R296...R299 Contents of actual value display

4.2 Recording of Dressing Position



Setting actual value mode



The following display appears after actuating the display switch (#17):



```
PRESET
GRINDING WHEEL 1
DRESS. POSITION  DRESSINGSUMS
X +             0 X +             0
Y +             0 Y +             0
Z +             0 Z +             0
U +             0 U +             0

SINUMERIK 3G
```

The corresponding display appears for grinding wheel 1, 2 or 3, depending on compensation code A and B (specifying grinding wheel number 1, 2, 3; see Interface for description).

The machine is moved to the dressing position in the individual axes.

The axis selector (#47) is set to the axis in which the dressing position is to be recorded.

When the cycle start key (No. 44) is pressed, the actual value referred to machine zero is stored as dressing position, the dressing sum is automatically deleted in this axis and calculated into the actual value display.

The dressing positions and dressing sums are accessible as parameters R 242 ... R 253 and R 279 ... R 290. Recording of the dressing position may be disabled via machine data.

Caution:

The sequence X before Z must be observed for machines with an inclined axis (grinding wheel).

If the absolute dressing position is approached later, the zero offsets and compensations must be deselected (G51 and G53 active).

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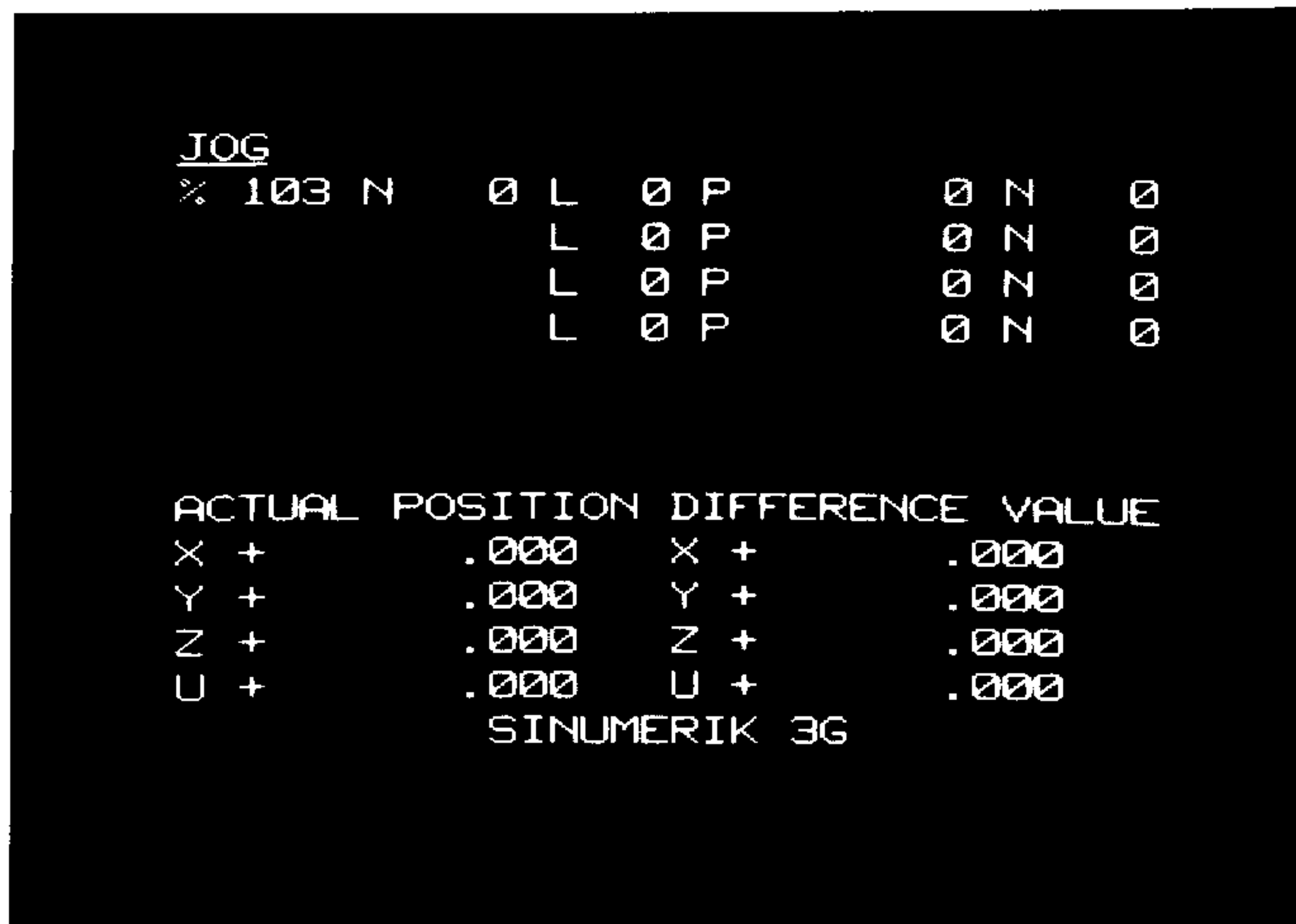
5. Manual Jog, Handwheel

=====



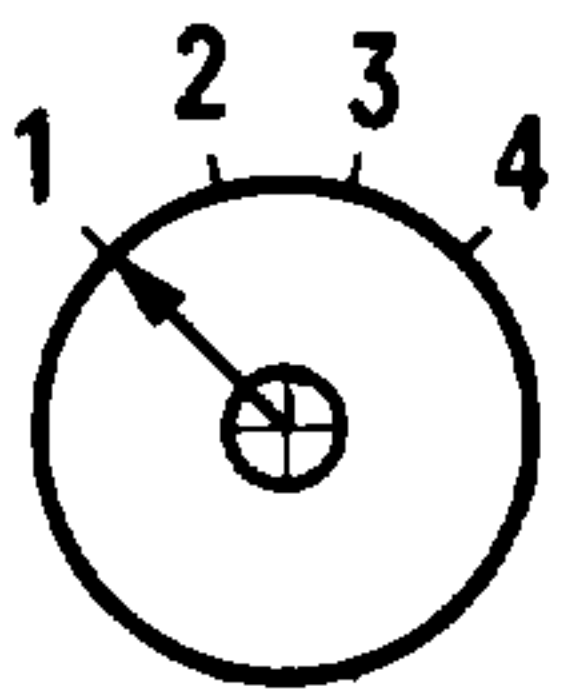
JOG mode (selector #31)

The following display appears:

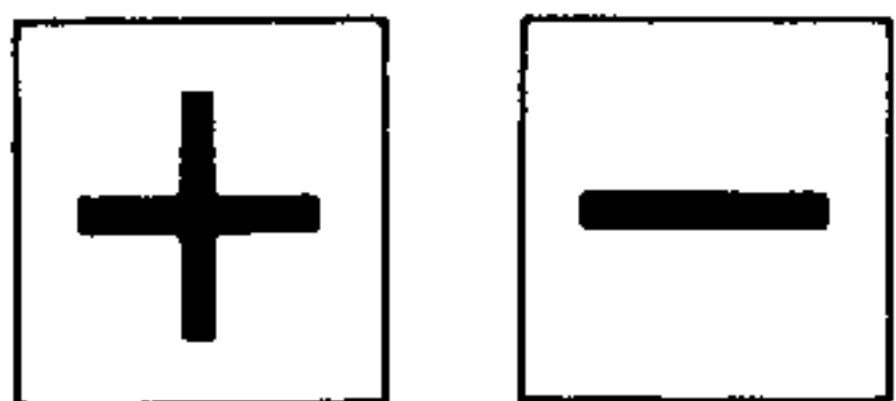


In this mode S and M functions as well as G05/G06 can be transferred (see Section 5.5). Subroutines may also be called.

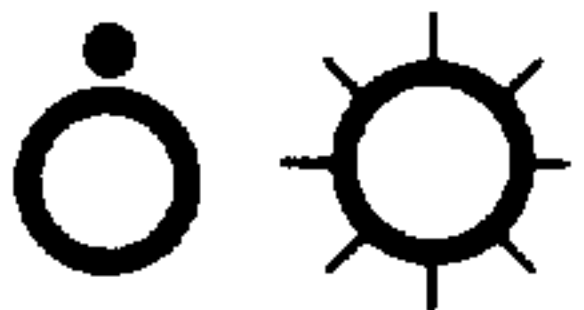
5.1 Feed and Rapid Traverse in JOG Mode



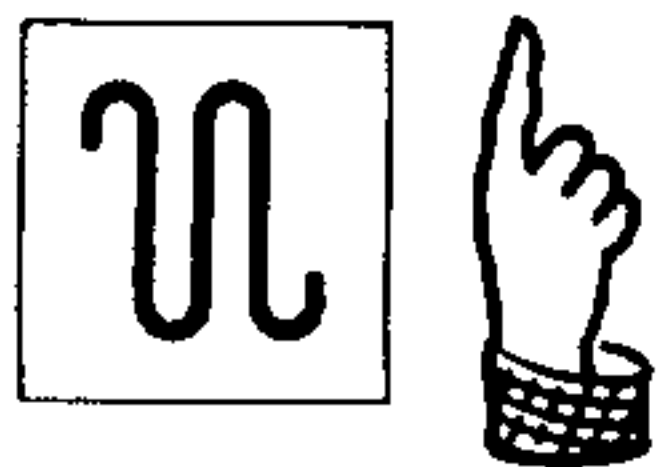
Axis selector switch (#47)




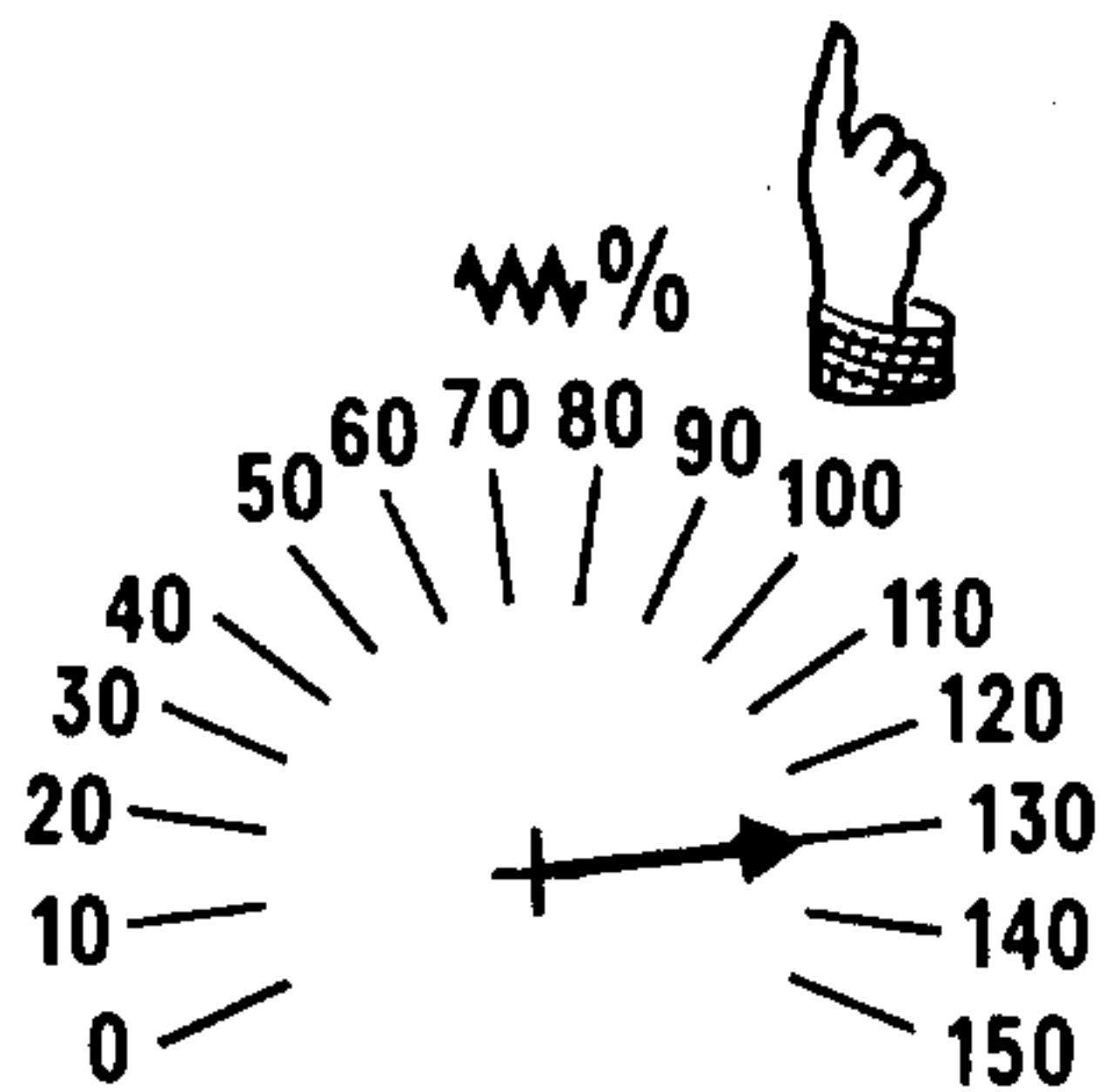
Direction keys (#34)





Feed Hold (#2) must not be active



 For rapid traverse, the rapid traverse override key (#35) may be depressed.

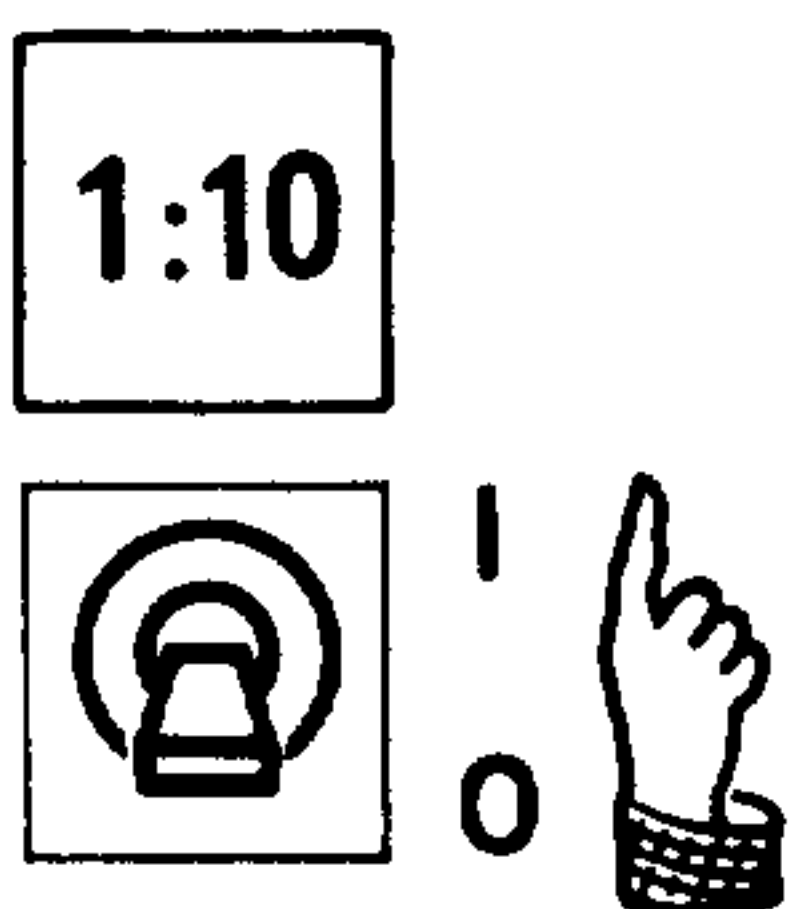



 The feedrate can be altered using the feedrate override switch (#33).

 If operating in rapid traverse with the toggle switch (#43) in the "rapid traverse override" position, the rapid traverse override switch (#33) is active over a range from 0 to 100 %.



Regardless of the position of this switch, the 0 % position of the feedrate override switch results in stoppage during feed or rapid traverse.



 The feedrate can be scaled down 1:10 with the toggle switch (#41). The switch is active during feed and rapid traverse override.

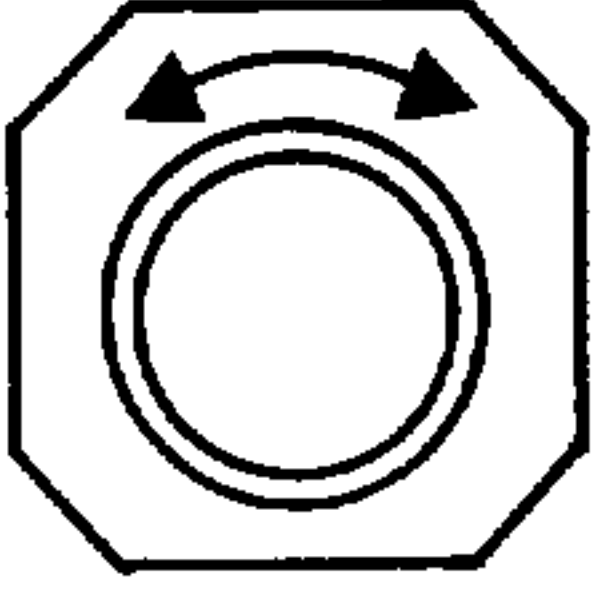
0:	Feedrate	1:10
1:	Feedrate	1:1

5.2 Handwheel Operation

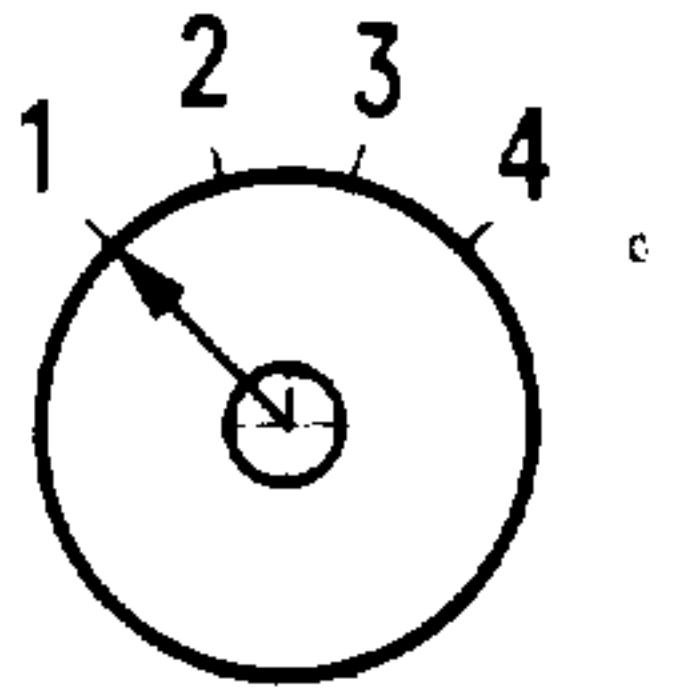
The handwheel moves the axes in the same manner as JOG.



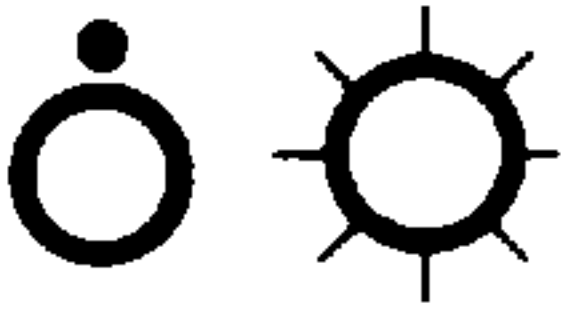
Handwheel movement is selected in the same way as "feed and rapid JOG" in JOG mode (selector #31)



One handwheel may be connected



The handwheel is assigned to an axis using the axis selector switch (#47)



Feed Hold (#2) must not be active

If a handwheel is provided, both the handwheel and the direction keys are to be used for JOG mode. When operated simultaneously, the direction keys take priority over the handwheel.

Incremental resolution per division can be set for the handwheel to 0 (handwheel inactive), 1 x input resolution, 10 x input resolution and 100 x input resolution.

Incremental resolution is set via "bit-oriented user data" (see Appendix).

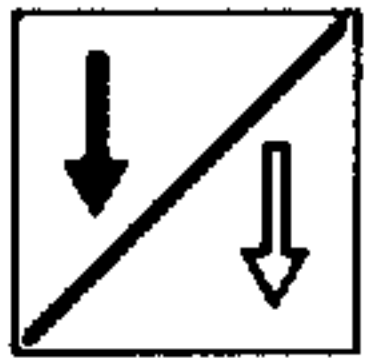
Combined operation (1 axis via handwheel, 1 axis via direction key) is not possible.

5.3 Operation with G05/G06

On machines with an inclined axis or inclined grinding wheel the axes can be traversed by operating the X direction keys parallel to the X or inclined axis.

G Function	Inclined Axis	Inclined Grinding Wheel
G05	Parallel to inclined axis	Parallel to X axis
G06	Parallel to X axis	Parallel to inclined grinding wheel

A G06 command activates motion in two axes simultaneously. G06 must therefore be input by the operator.



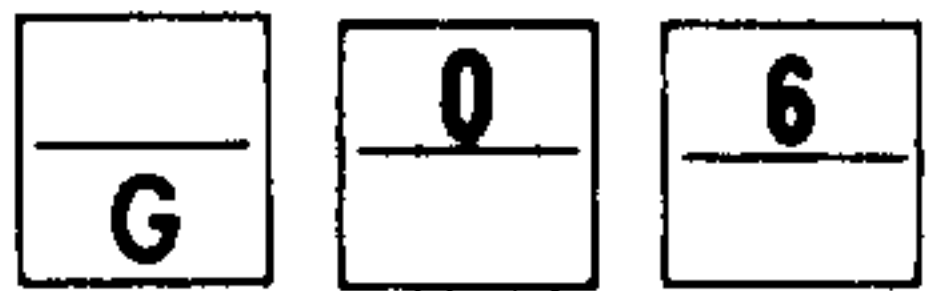
Forward paging produces the following display (basic display previously shown).

```

JOG

AUX.-FCT.:M      M      M
G-FCT.   :G06
SET-VALUE      ACT.-VALUE
F1=          .00      M
F2=          .00      M
F3=          .00      M
F4=          .00      M
S1          S1=+    0
S2

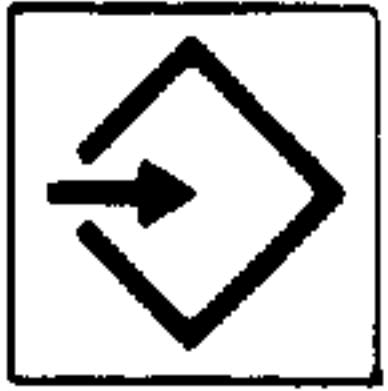
SINUMERIK 3G
    
```



With input G06 is displayed or stored in memory



G05 input or reset reactivates G05



or

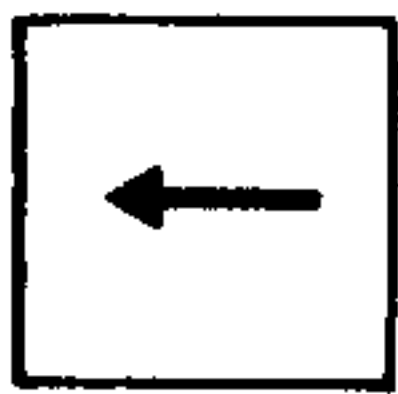
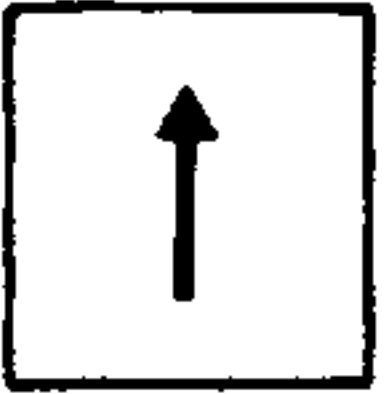


This function is active for feed, rapid traverse and handwheel.

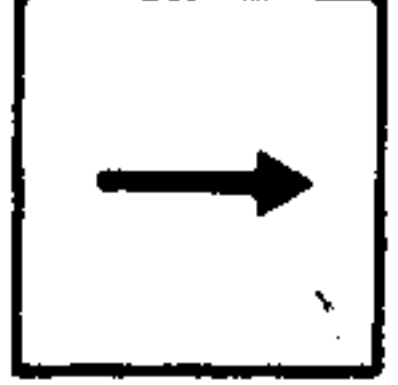
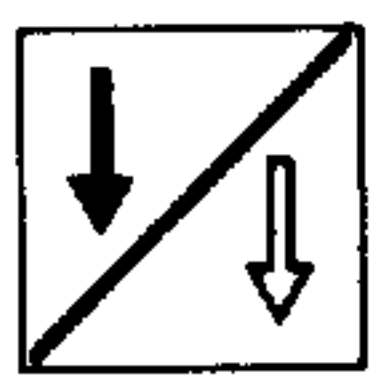
5.4 Calling Subroutines



Before calling subroutines, the control must be in the "RESET" state.



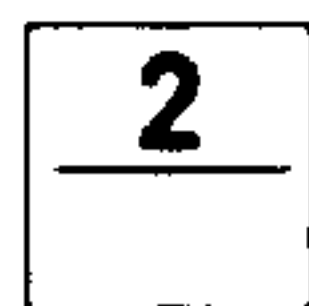
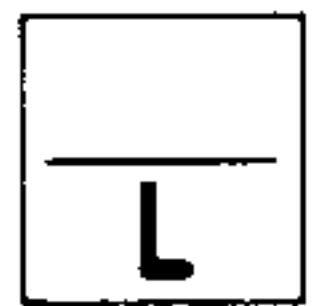
Preselection of basic display



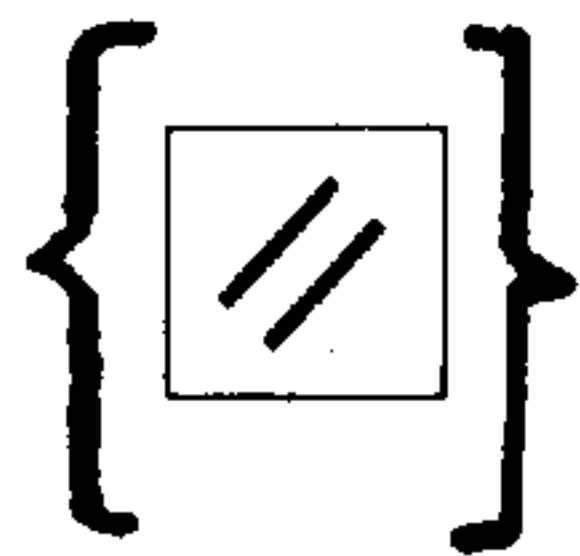
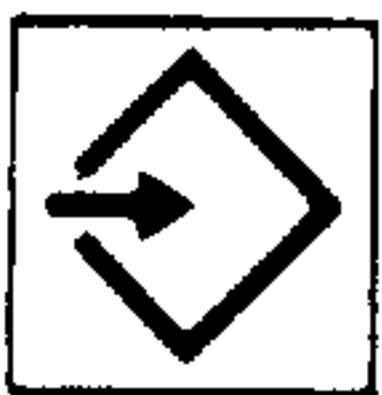
```

JOG
% 103 N   0 L  0 P      0 N  0
           L  0 P      0 N  0
           L  0 P      0 N  0
           L  0 P      0 N  0

ACTUAL POSITION DIFFERENCE VALUE
X +      .000  X +      .000
Y +      .000  Y +      .000
Z +      .000  Z +      .000
U +      .000  U +      .000
          SINUMERIK 3G
    
```



The input key is used to enter the subroutine number. The control automatically asks whether the number entered is correct. It can be deleted using the reset key.



```

JOG
          L123 P      0 N  0
          L  0 P      0 N  0
          L  0 P      0 N  0
          L  0 P      0 N  0

ACTUAL POSITION DIFFERENCE VALUE
X +      .000  X +      .000
Y +      .000  Y +      .000
Z +      .000  Z +      .000
U +      .000  U +      .000
          SINUMERIK 3G
START OK IF CORRECT CYCLE !
    
```



After depressing the CYCLE-START key the subroutine is started. The monitor indicates that a subroutine is being processed.


```

JOG
      L123 P      J H  0
      L 0 P      0 H  0
      L 0 P      0 H  0
      L 0 P      0 H  0

ACTUAL POSITION DIFFERENCE VALUE
00 +      .000  00 +      .000
01 +      .000  01 +      .000
02 +      .000  02 +      .000
03 +      .000  03 +      .000
      STOPPED

***** AUTOMATIC CYCLE RUN *****

```

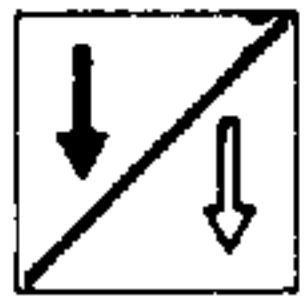
During execution of the subroutine the control may be operated in the same manner as in automatic mode.

If the same subroutine is to be processed several times consecutively, it must be called several times as described.

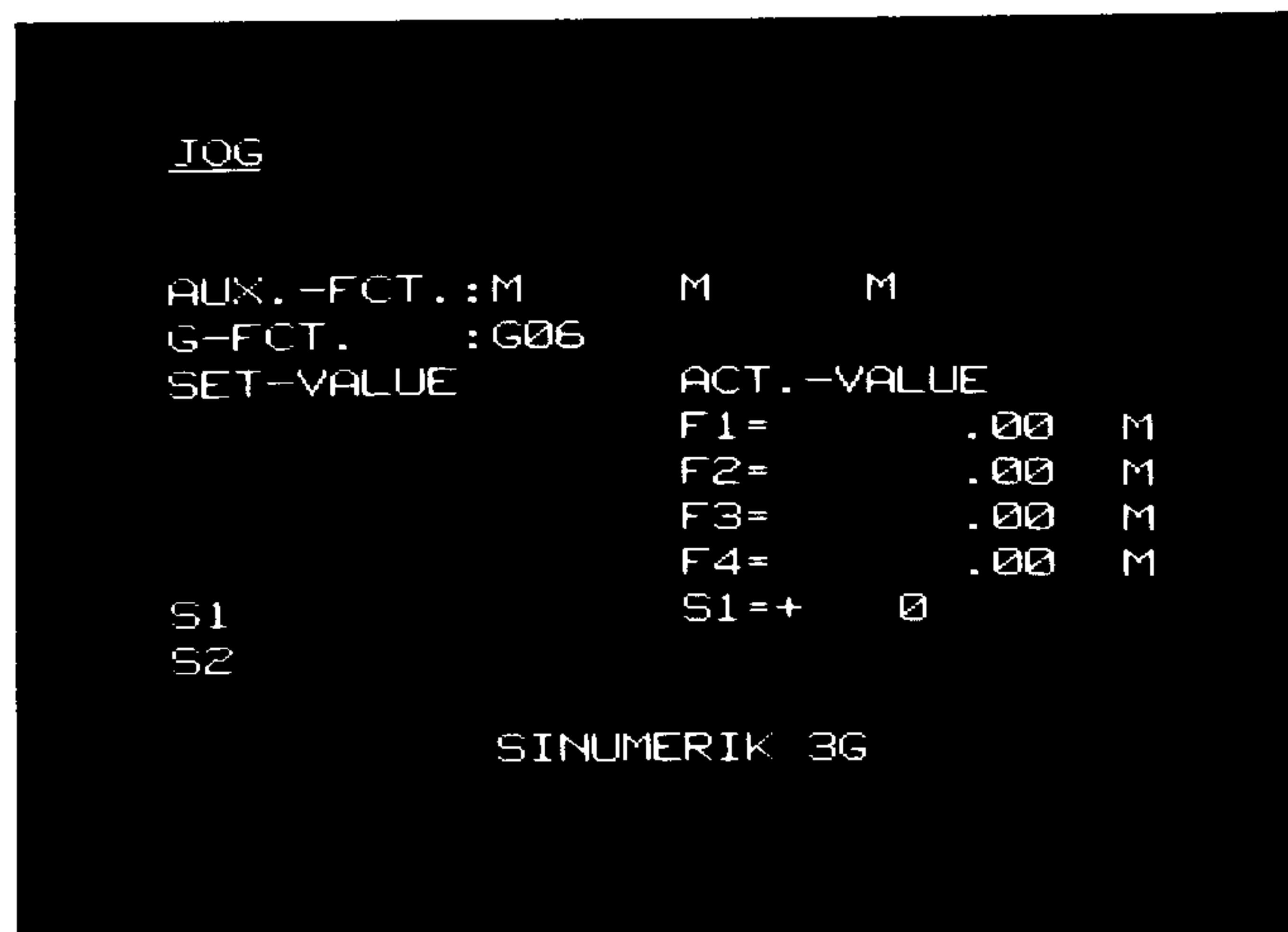
5.5 Transfer (Overstore)



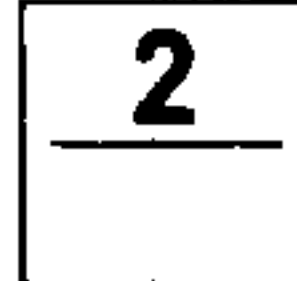
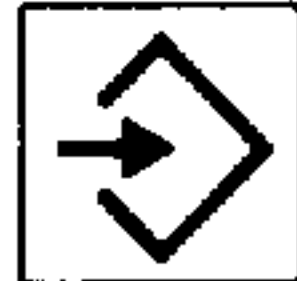
M and S functions may be transferred. This is possible in the following modes:


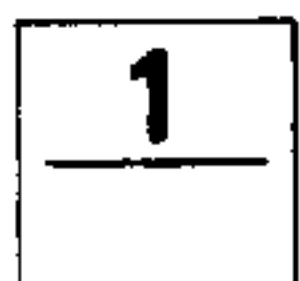
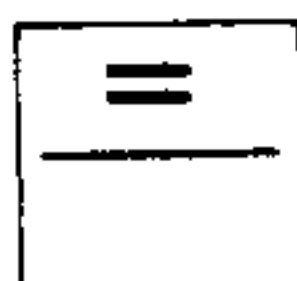

- JOG
- Incremental feed (INC)
- Automatic (AUT)


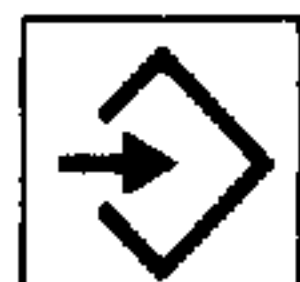


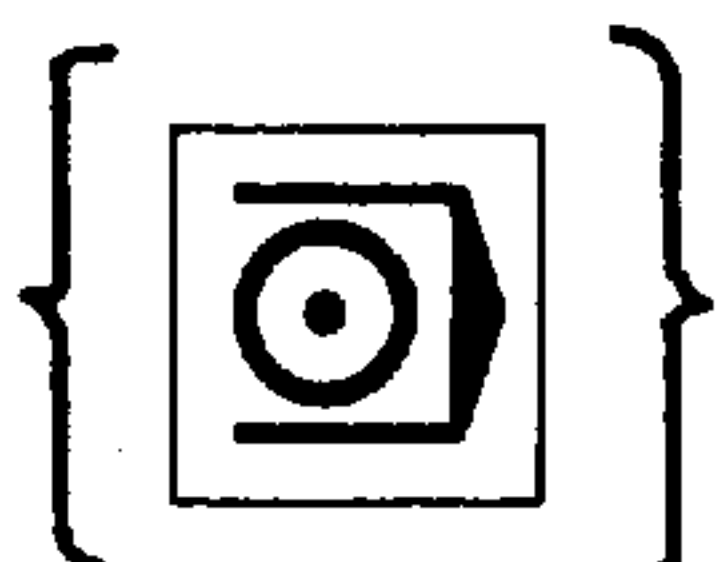
The 3rd group display must first be selected.



    With this sequence M12 for instance is transferred and output to the PLC.

    With this sequence S1=10 for instance is transferred. It is only output to the PLC when M103, M104 are transferred immediately beforehand or afterwards.



If a preselected S value for an operational spindle is to be transferred and output to the PLC, the cycle start key must be operated in addition (can be selected via machine data).

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6. Incremental Feed

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Incremental feed can be used, for instance, to withdraw from the contour or for precise positioning as an alternative to using the handwheel.

It permits defined paraxial positioning by hand.

Feedrate F is determined by a machine datum and is dependent on the rapid traverse override switch (#33).

→ Incremental feed mode (selector #31)

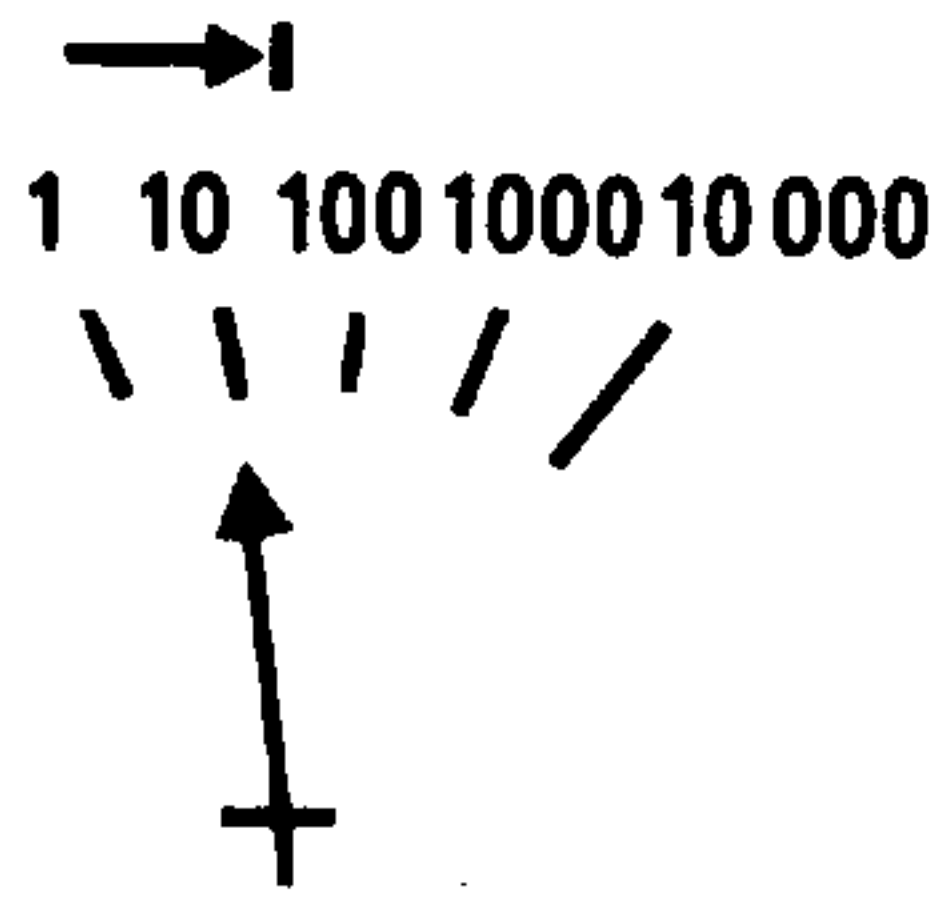
```
INC FEED 10000
100 N 0 L 0 P 0 H 0
      L 0 P 0 H 0
      L 0 P 0 H 0
      L 0 P 0 H 0

ACTUAL POSITION DIFFERENCE VALUE
X + .000 X + .000
Y + .000 Y + .000
Z + .000 Z + .000
A + .000 A + .000
      SINUMERIK 35
```

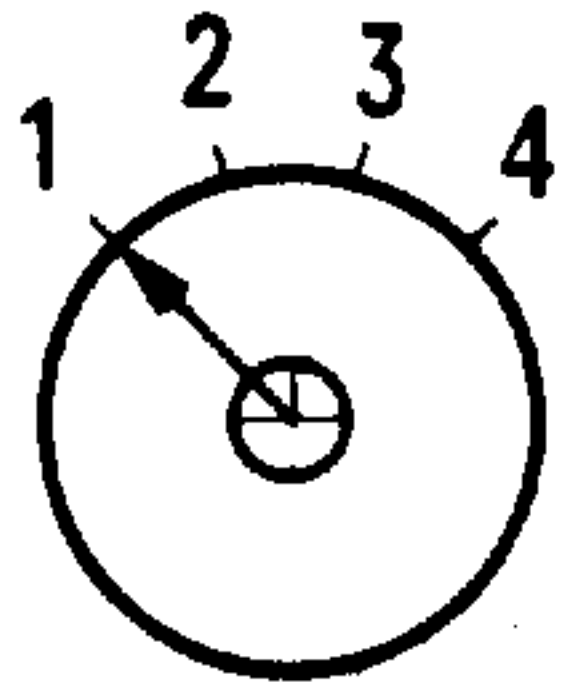
S and M functions may be transferred in this mode (see Section 5.5).

G05/G06 may be transferred and subroutines called in this mode (see Section 5.3).

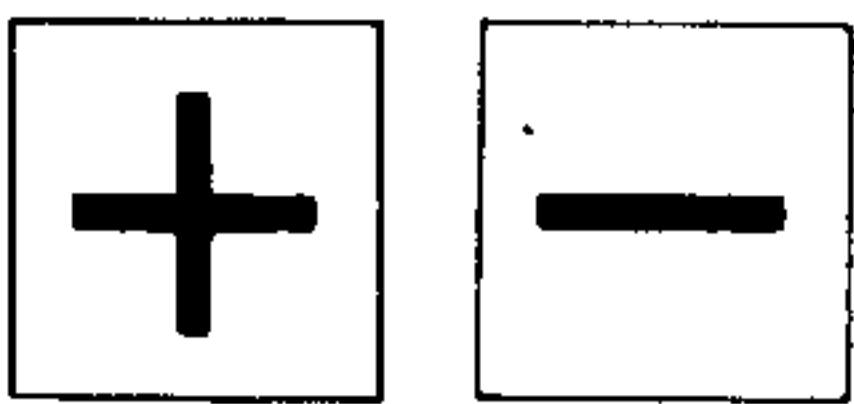
Operational Sequence



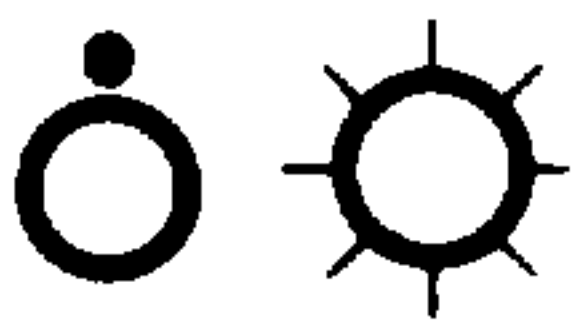
Preselection of increment using mode selector (#31).



Axis selector (#47)



Direction key (#34)



Feed Hold (#2) must not be active

The incremental step movements are executed modally. The value of an increment is identical with the input resolution.

7. Manual Data Input, Part Program

=====

Part programs must be input in and processed from the part program memory.

The NC automatically assigns the memory areas for part programs and subroutines (operator involvement is not required). Up to 200 part programs and subroutines can be simultaneously stored in the memory. Part programs may be numbered and are identified as follows:

% 1234 LF
└──────────┘ 1- to 4-digit program number

Subroutines are identified by means of a 1- to 3-digit number:

L 123 LF
└──────────┘ 3-digit subroutine number

A part program without program number is assigned a "0" in the control. This number is neither displayed nor punched out. Only one part program without program number can be stored in the program memory.

Operational Sequence



Mode selector set to MDI PART PROGRAM (#31)

The following display appears:

```
MDI PARTPROGRAM
PROGRAM : % 11
%11 *
N1 G90 G0 M0103 S1=50 *
N2 R10=22 R11=25 R12=50 R13=78
R15=46 R22=80.4 R16=2 R17=30
R18=2 *
N25 R20= R14- R16 R21= R20- R16
R23= TAN R17 R22= R15- R21 R22=
R22/2 R22= R22* R23 R22= R22+
R13 *
N30 X R15 Z R22 R24= R16/2 R24=
R24* R23 R24= R24+ R13 *
SINUMERIK 3G
```

The display shows the last program to have been input or preselected (here %11) (end-of-block character LF=*).

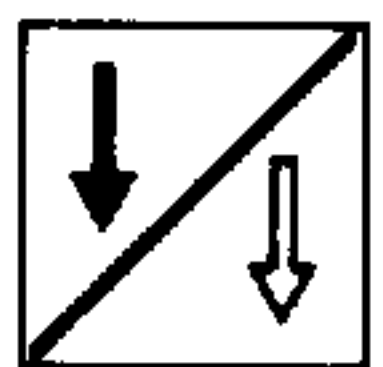


If the mode is switched to the basic display using the display switch key (#17), a list of stored programs is displayed.

```
MDI PARTPROGRAM
PROGRAM LISTING
% 0 98CH % 1 91CH
% 2 167CH % 3 54CH
% 4 99CH % 5 70CH
% 6 85CH % 7 42CH
% 8 133CH % 9 62CH
% 10 108CH % 11 318CH
% 12 70CH % 13 221CH
% 14 43CH % 15 350CH
% 16 136CH % 17 68CH
% 20 54CH % 21 51CH
AVAILABLE MEMORY 12926 CHARACTER
SINUMERIK 3G
```



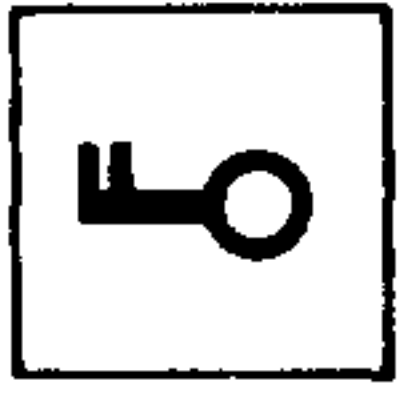
Using the keys (#22, 23) 10 pages containing the following information can be selected:



- Available memory area
- Available part programs (with program length)
- Available subroutines (with program length)

Data input is not possible in this display mode, only programs may be deleted.

7.1 Deleting Programs



Key-operated switch enabled (#38)
depending on machine datum.
Switch mode to basic display.



Input the program number and depress the "Cancel"
key (#14) to delete a program. Subroutines are
deleted in the same way (e.g. L5, Cancel).



By entering % and depressing the "Cancel" key
(#14), all main programs are deleted.

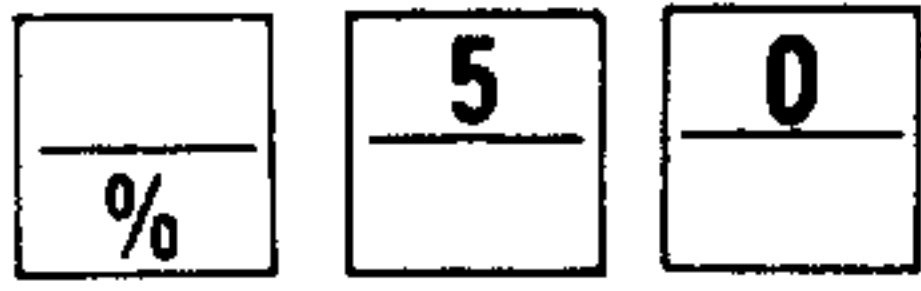


By entering L and depressing the "Cancel" key
(#14), all subroutines except L80 through L99 and
L900 through L999 are cleared if the "cycle
inhibit" (interface signal) is present.

7.2 Program Preselect/Program Initialization

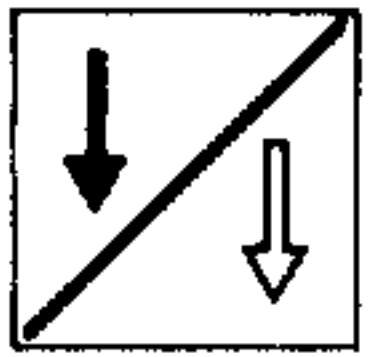


Switch mode to part program input (#9)



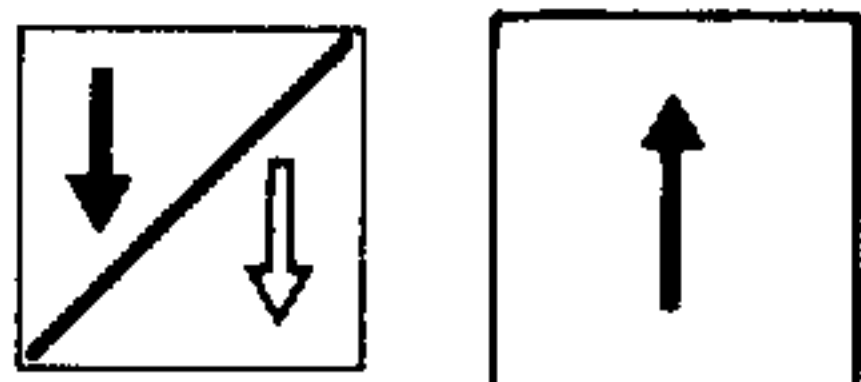
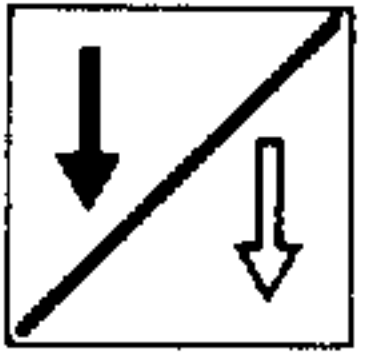
Preselect program % 50, for instance

If % 50 is not yet in the program, the program is initialized by actuating this key.



Preselect block number N15, for instance

Before the desired block number is preselected, the program number must be preselected.

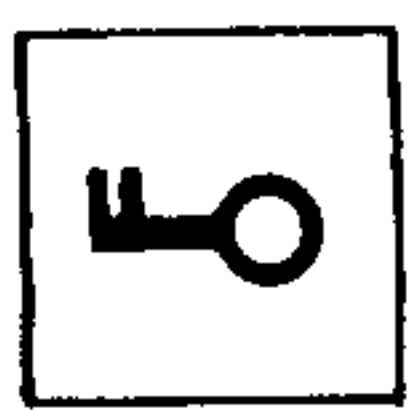


The display can be paged forwards or backwards one block at a time by depressing the "Page" keys (page forward #22, page backward #23).

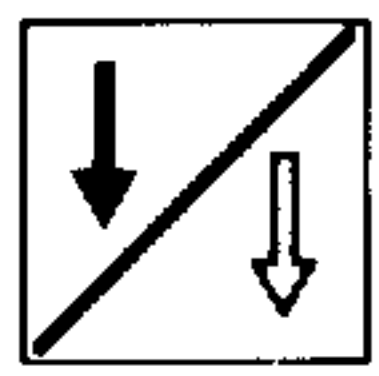
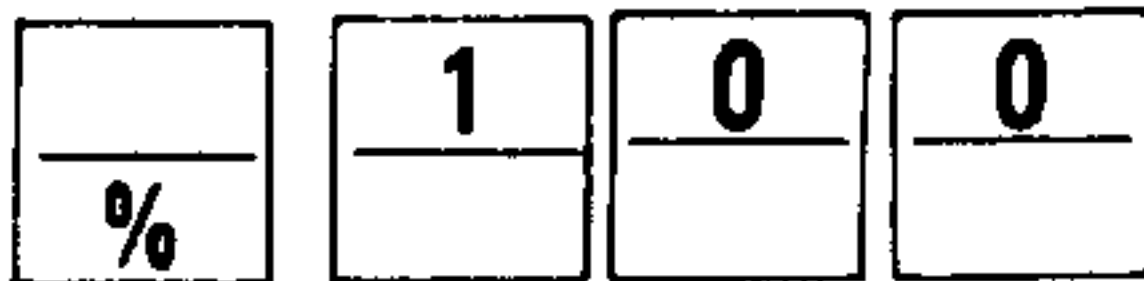


The "Cursor" keys (#24, 25) move the cursor by one program word.

7.3 Data Input into Memory via Keyboard



Key-operated switch enabled (#38)
depending on machine datum



In order to input programs, a program number not yet present in the control memory (in this case % 100) is preselected. A program % 100 already stored is displayed. The cursor is located behind the first program number.

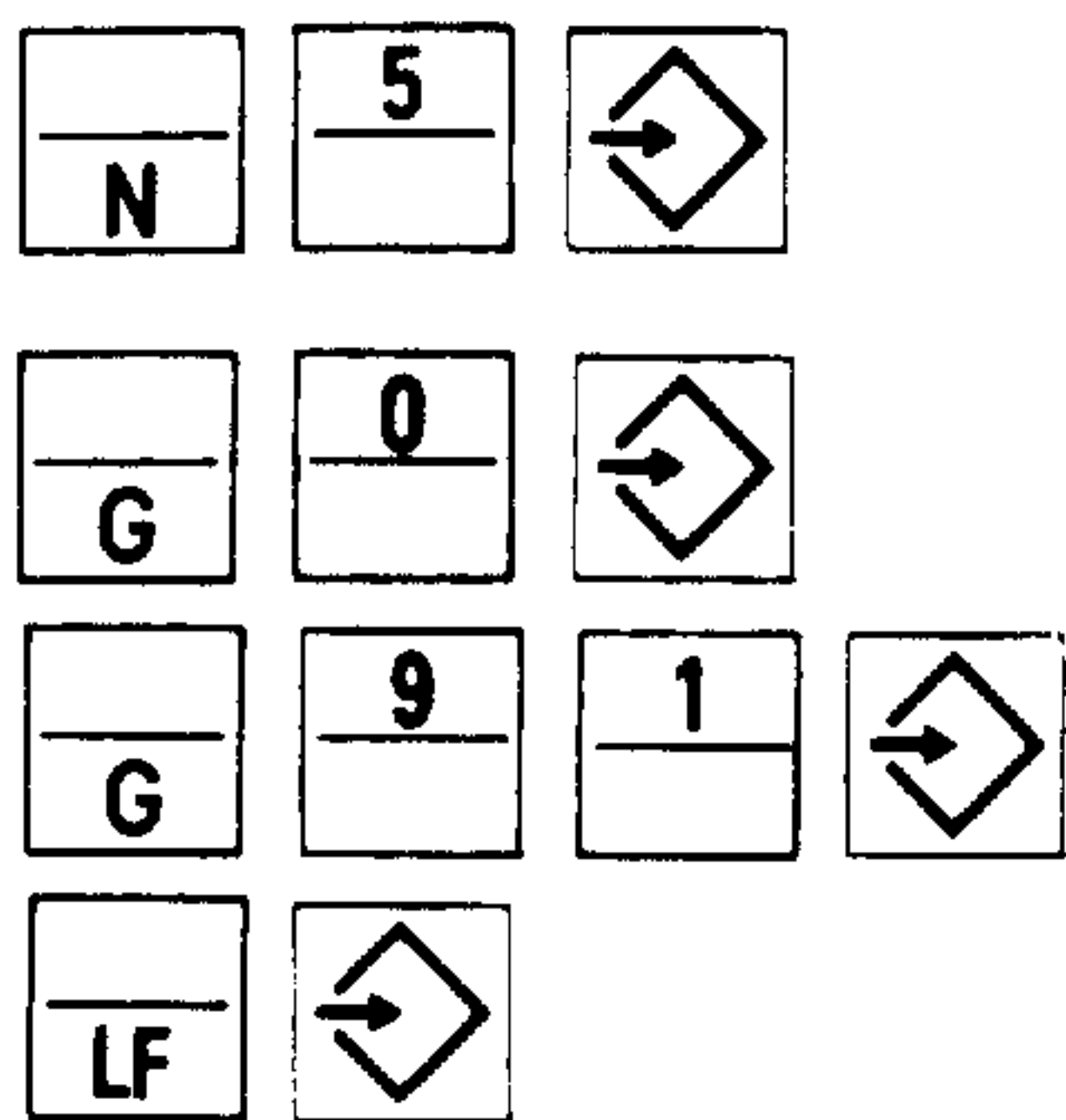
If the program is not stored, the first block "% 100 LF" is stored automatically in the memory and is displayed on the CRT monitor.

The cursor is set behind LF.

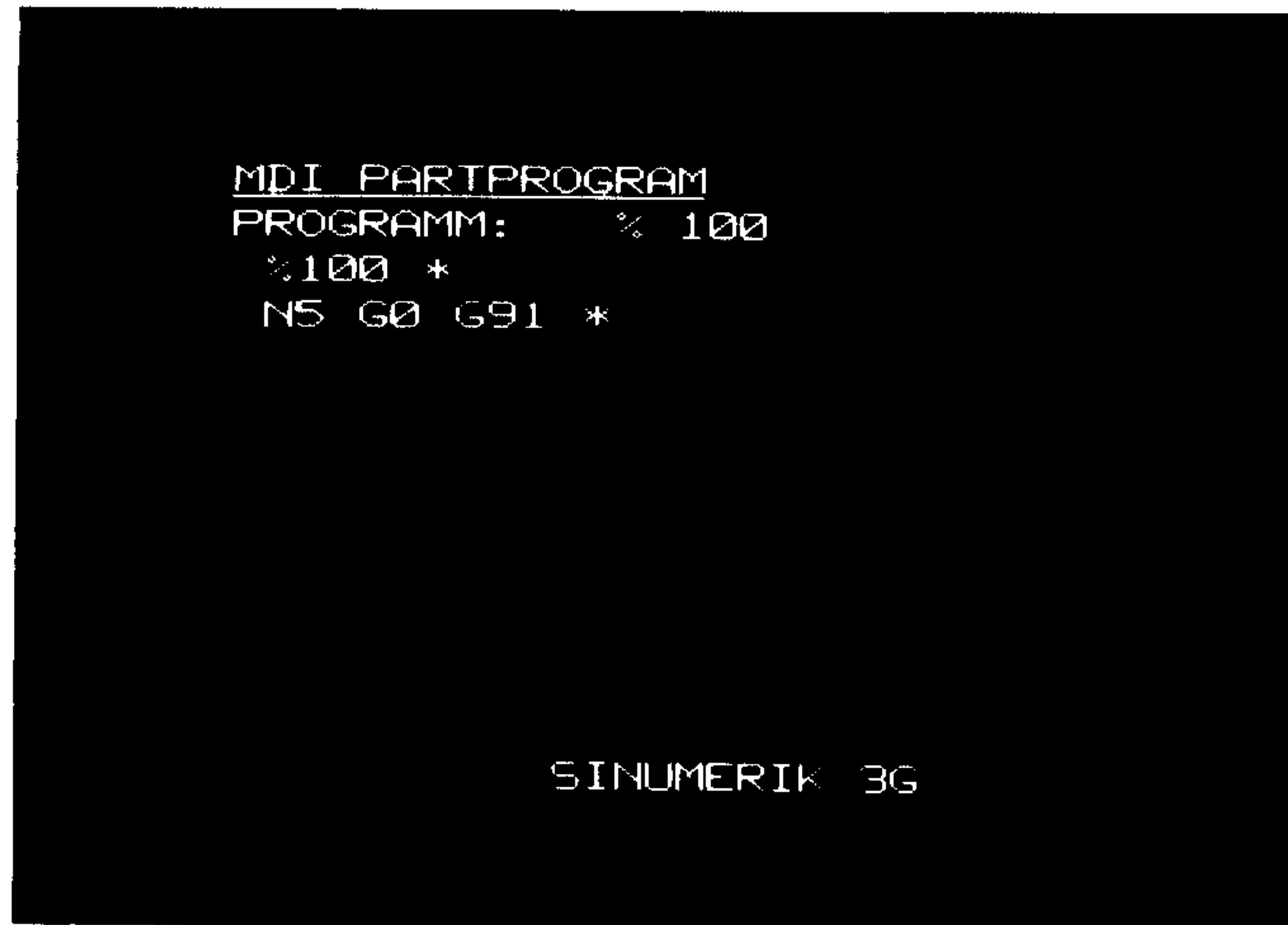
The program blocks can now be entered from the operator panel keyboard.



Example:



Enter the data word by word and terminate with the "Input" key (#16)



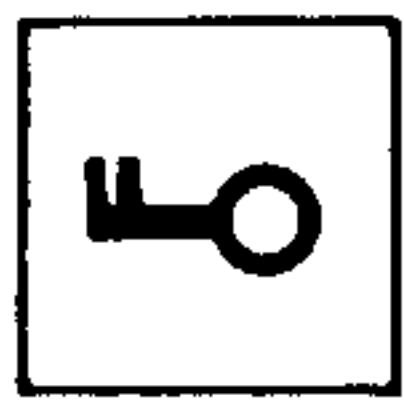
When entering and editing programs, the block length (maximum 120 characters) and the available memory area are checked. If necessary an alarm is displayed.

In the event of errors, the input line is not accepted and is signalled as an inverted flashing display.



Input errors in the input line can be cleared using the CLEAR key (#29).

7.4 Program Editing



Key-operated switch enabled (#38)

depending on machine datum



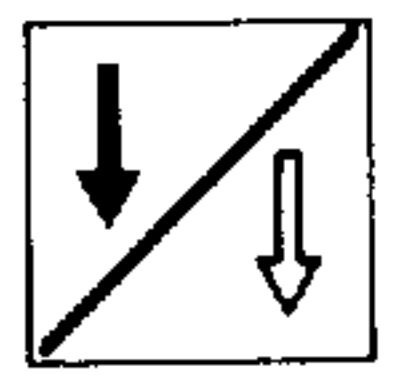
7.4.1 Insert Block

The block

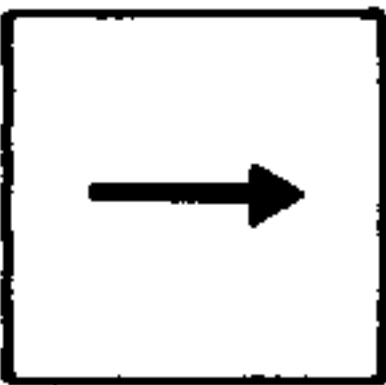
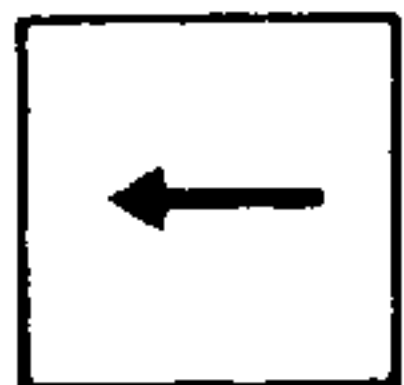
```
N16 X20 Z10 LF
```

is to be inserted in program % 100 entered above.

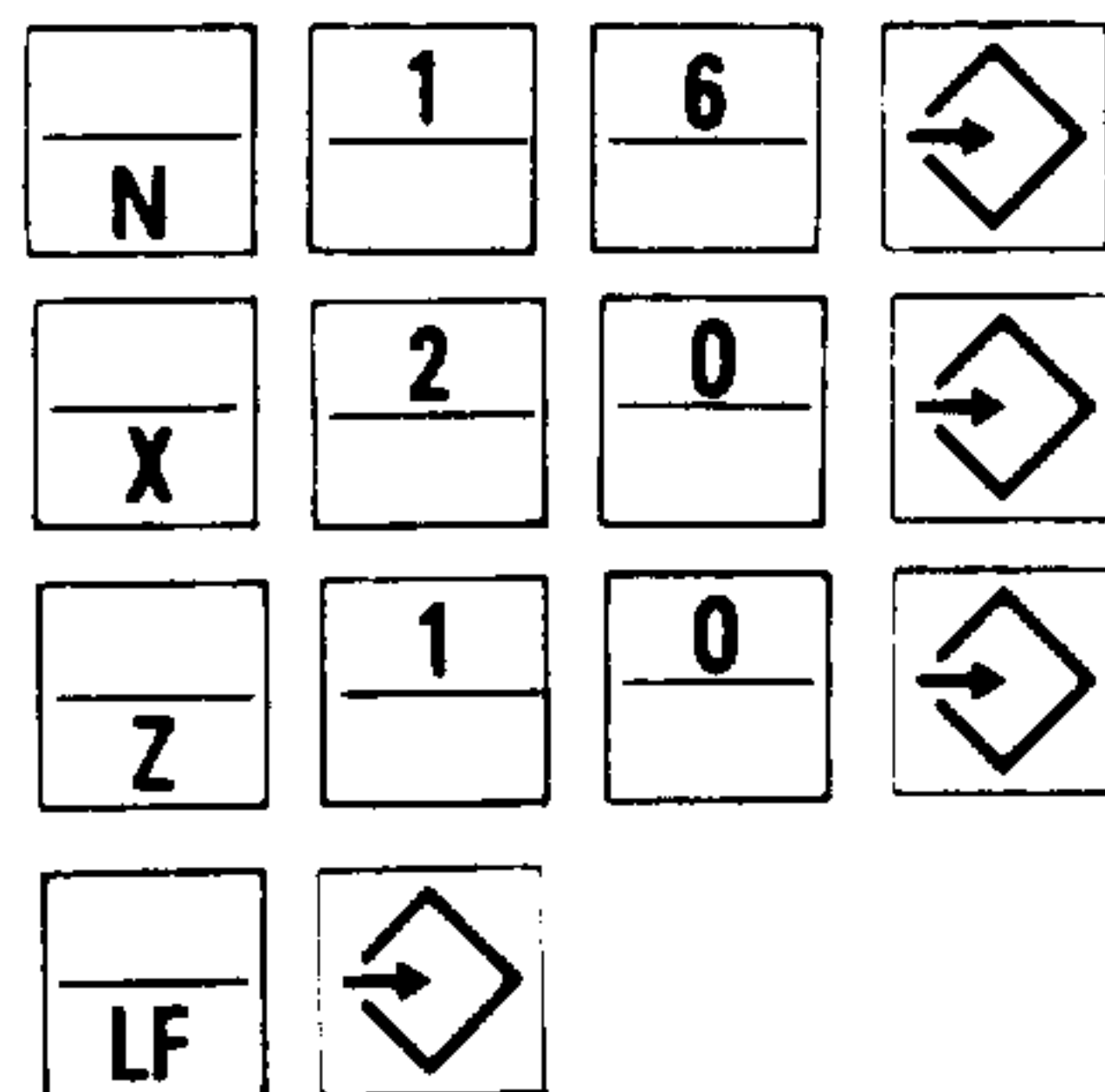
Preselect the program as described in Section 7.2.



The "Page" and "Cursor" keys are used to move the cursor ahead of block N20.



Block N16 is entered (see Section 7.3).



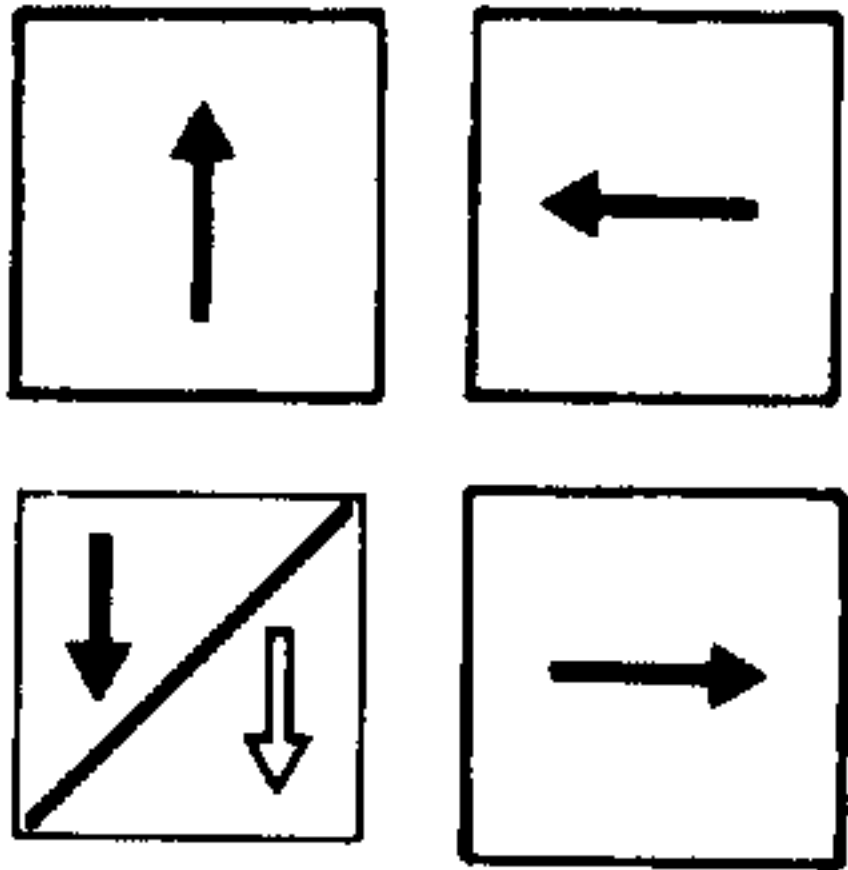
```
MDI PARTPROGRAM
PROGRAM : % 100
%100 *
N5 G0 G91 *
N10 X100 Z0 *
N15 X90 Z5 *
N16 X20 Z10 *
N20 M0103 S1=1000 *
N30 M96 *
N35 G8 X80 Z100 F=600 *
N40 M97 M0105 *
N45 M30 *

SINUMERIK 3G
```

7.4.2 Editing Individual Words

The value Z10 is to be changed to Z20 in block N16.

Preselect the program as described in Section 7.2.



Using the "Page" and "Cursor" keys (#22, 23, 24, 25), move the cursor ahead of the word to be edited, in this example Z10.



Example of input error:
X20 entered instead of Z20



and terminated with the "Edit" key (#15).

```
MDI PARTPROGRAM
PROGRAM I:  % 100
%100 *
N5 G0 G91 *
N10 X100 Z0 *
N15 X90 Z5 *
N16 X20 Z10 *
N20 M0103 S1=1000 *
N30 M96 *
N35 G8 X80 Z100 F=600 *
N40 M97 M0105 *
N45 M30 *

SINUMERIK 3G
```

The input error (the address entered does not coincide with the address to be edited) is signalled by an inverted flashing display. These data are not transferred into memory.



The "Clear" key (#29) clears the input error.



Input of correct value Z20.

```
MDI PARTPROGRAM
PROGRAM:  % 100
%100 *
N5 G0 G91 *
N10 X100 Z0 *
N15 X90 Z5 *
N16 X20 Z10 *
N20 M0103 S1=1000 *
N30 M96 *
N35 G8 X80 Z100 F=600 *
N40 M97 M0105 *
N45 M30 *

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Z20
```



Input terminated with the "Edit" key (#15).

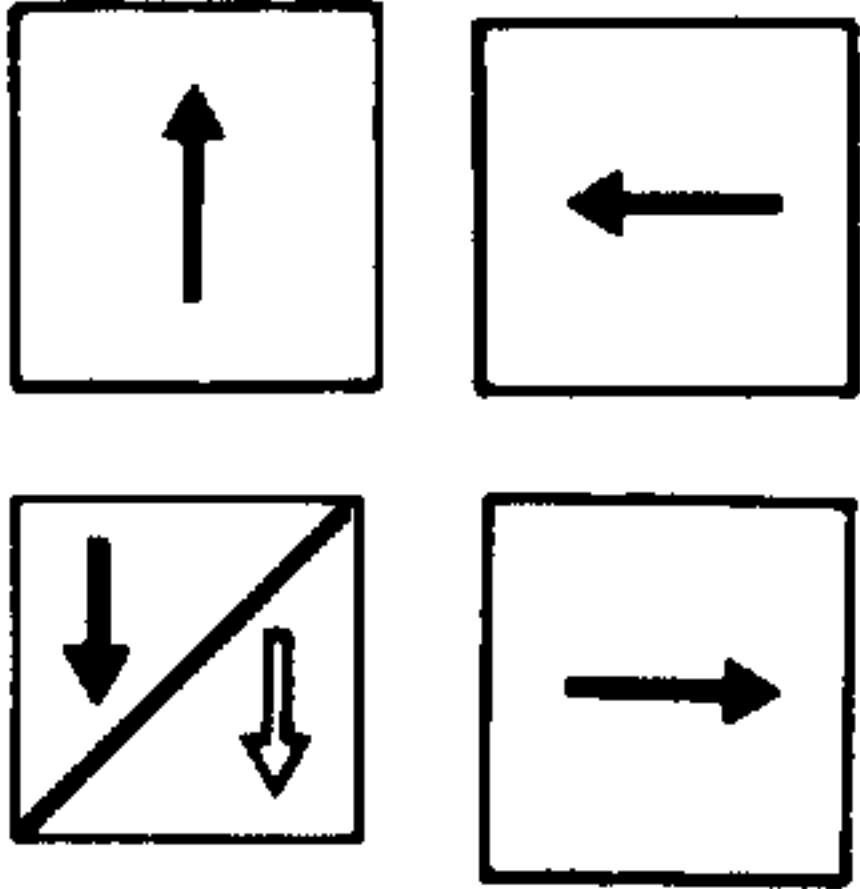
The new word to be edited is entered in the input line. Only the numerical value of an address may be changed.

If an address change is also required, the old word must first be deleted before the new word can be inserted.

7.4.3 Deleting Individual Words

X20 is to be deleted from block N16.

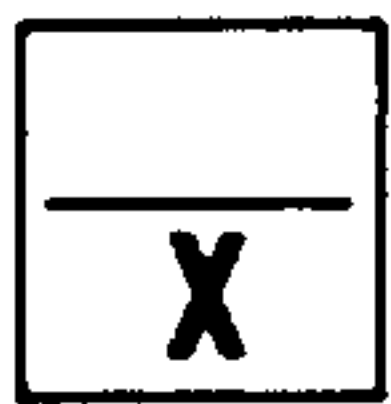
Preselect the program as described in Section 7.2.



Using the "Page" and "Cursor" keys (#22, 23, 24, 25) the cursor is moved ahead of word X20.

```
MDI PARTPROGRAM
PROGRAM :   % 100
%100 *
N5 G0 G91 *
N10 X100 Z0 *
N15 X90 Z5 *
N16 X20 Z10 *
N20 M0103 S1=1000 *
N30 M96 *
N35 G8 X80 Z100 F=600 *
N40 M97 M0105 *
N45 M30 *

SINUMERIK 3G
```



Enter address X and terminate by activating the "Cancel" key (#14). The programmed X value is deleted.



LF cannot be deleted.

(It can only be deleted by erasing entire blocks, see Section 7.4.4)

7.4.4 Deleting Entire Blocks

Block N16 is to be deleted.

Preselect the program as described in Section 7.2 to block N16.

```
MDI PARTPROGRAM
PROGRAM :  % 100
%100 *
N5 G0 G91 *
N10 X100 Z0 *
N15 X90 Z5 *
N16 X20 Z10 *
N20 M0103 S1=1000 *
N30 M96 *
N35 G8 X80 Z100 F=600 *
N40 M97 M0105 *
N45 M30 *

SINUMERIK 3G
```



Enter the block number and depress the "Cancel" key (#14). Block N16 is deleted.



Blocks without a block number can be deleted by entering block number NO and depressing the "Cancel" key (#14).

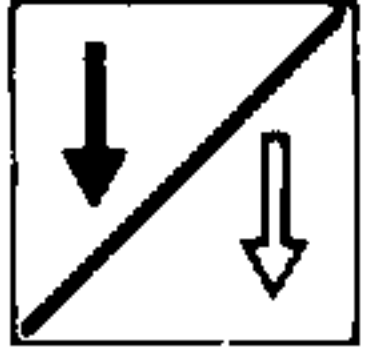


In MDI-PP mode, the appropriate displays are selected when TE or RP mode is selected, but inputs are not possible with TE data (see display list, Section 1.5).

7.4.5 Editing Program and Subroutine Numbers



Preselect the program or subroutine number to be changed (e.g. % 50).



Enter the new program or subroutine number (e.g. % 60) and depress the "Edit" key. The old program (% 50) is renamed % 60.



If the new number (e.g. % 60) is already stored in the program memory, the new program number will flash in the input line.

A main program number cannot be changed to a subroutine number (or vice versa).

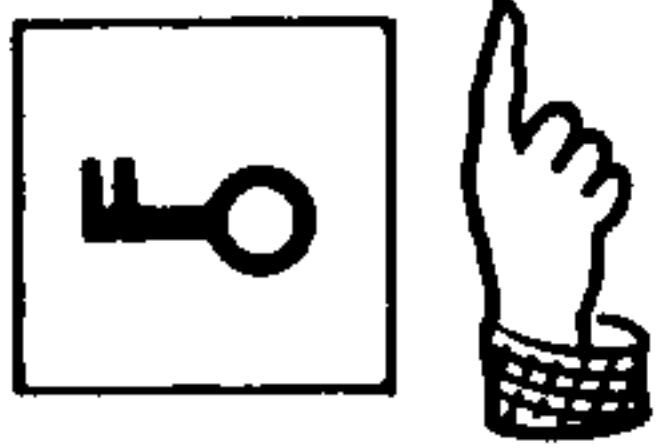
7.5 Memory Input via Keyboard with Operator Prompting (Guiding)

During input of subroutines, the control display in MDI PP mode prompts the operator by displaying in plain text the name of the subroutine and the number and significance of the R parameters specified for defining the subroutine.

The programmer can specify the plain text he wishes to display and the format of the R parameters to be entered. The plain text can be programmed in foreign languages if the required characters are displayable.

Operator prompting can be selected or deselected via bit-oriented user datum SE 25, bit 7. Datum SE 25, bit 6 determines whether or not the displayed text is to be stored in the program memory.

Irrespective of this, the relevant R parameter value can be displayed via the input line for subsequent program changes (user datum SE 25, bit 2). The text is displayed of the R parameter before which the cursor is positioned.

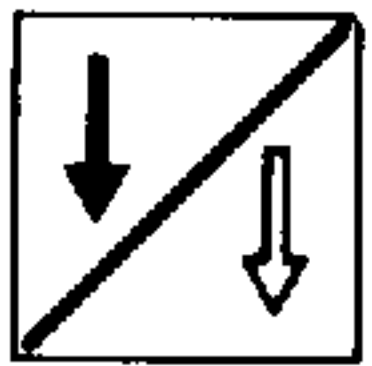


Key-operated switch (#38) enabled
depending on machine datum.


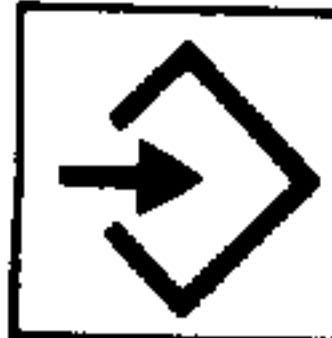


	1	0	0
%			




 Initialize part program (e.g. % 100)





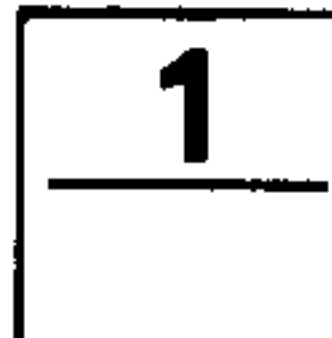

Input part program

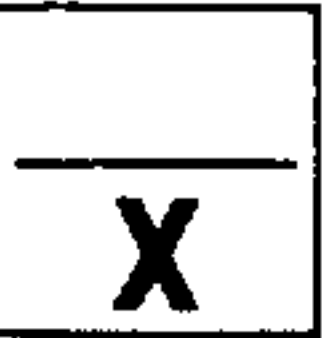


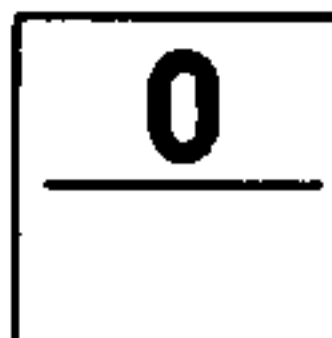

N5




G0



G91


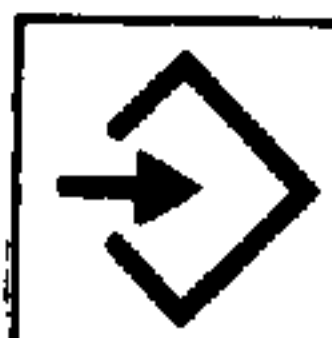
X100


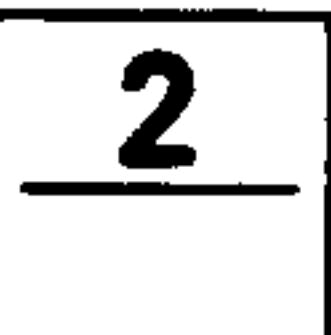
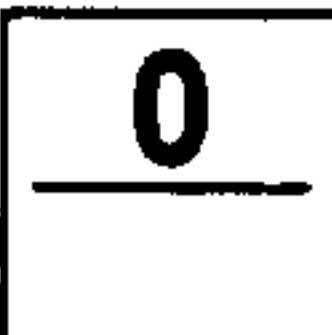

Z0




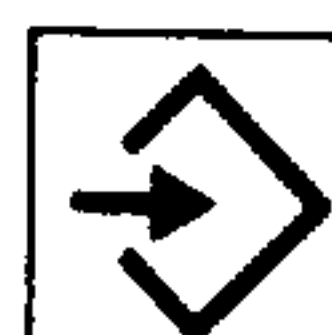
LF

N10



Y20


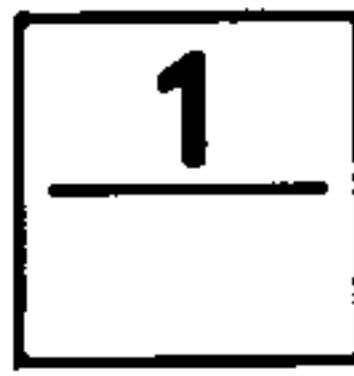
U80

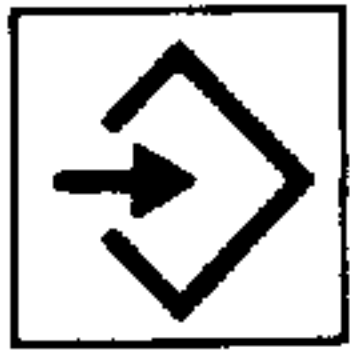
      

R98 = 10

LF



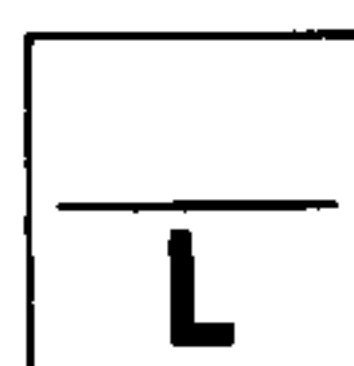
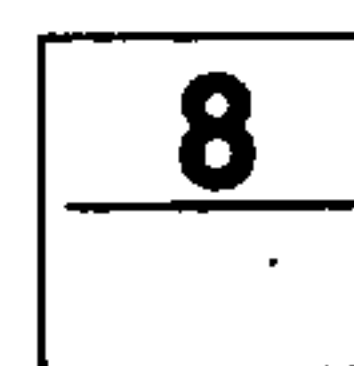
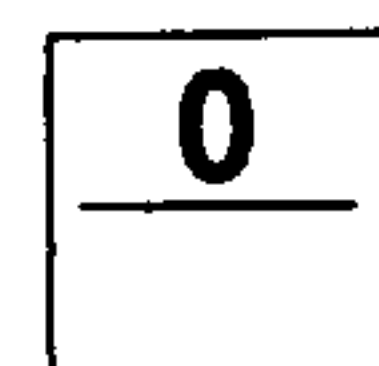
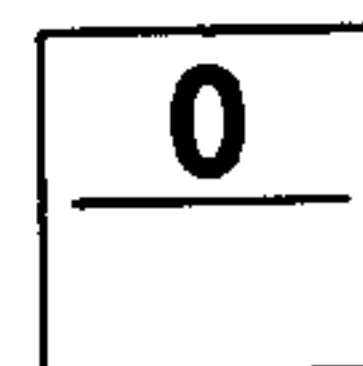
Manual data input as described in Section 7.3.

Input N15 in memory.

```
MDI PARTPROGRAM
PROGRAMM:  % 100
%100 *
N5 G0 G91 X100 Z0 *
N10 Y20 U80 R98=10 *

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N15
```



Input required subroutine number.

A subroutine can be called in different ways (see Programming Instructions).

The number of passes and initial parameter are not programmed until the last parameter has been input. The subroutine can be entered in a block with block number.

```
MDI PARTPROGRAM
PROGRAMM:  % 100
%100 *
N5 G00 G91 X100 Z0 *
N10 Y120 U80 *
N15 L800 *
N1 R010=0 (TEILE PRO ABRI) *
N1 R011=1 (ABRI-HUEBE) *
N1 R012=20 (ABRI-BETR MY) *
N1 R013=2 (VX-ABRI MM/U) *
N1 R014=3 (VZ-ABRI MM/U) *
N1 R015=2 (RADIUS MM) *
N1 R016=0 (FASE X MM) *

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```

The text after L800 is automatically entered. Section 1.8.4 of the Programming Instructions describes how the text is stored in the memory.

The subroutine call can be deleted using the "Clear" key. L800 is transferred to the part program with the text, irrespective of user datum SE 25, bit 6, and the first parameter for input displayed in plain text.



```

ND1 PARTPROGRAM
PROGRAM:      100
1001 +
R1=0.001 R51 +
R10=0.000 20 +
R15=1.800
GENERAL WORKPIECE SPEEDS

```

. TIME R11 = 00

SENSITRON
R11



The next R parameter is displayed when the "Clear" key (#29) is actuated.



Input numerical value for Sensitron

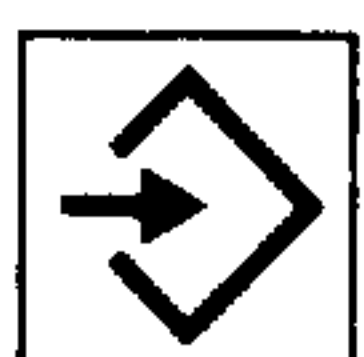
```

ND1 PARTPROGRAM
PROGRAM:      100
1001 +
R1=0.001 R51 +
R10=0.000 20 +
R15=1.800
GENERAL WORKPIECE SPEEDS

```

. TIME R11 = 00

SENSITRON
R11

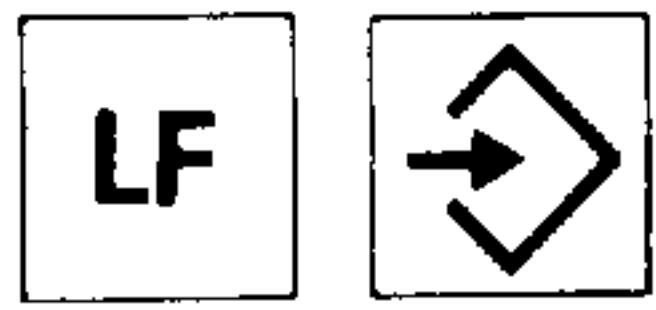


By depressing the "Input" key, the R parameter is displayed on the screen ahead of subroutine call. The next parameter to be defined is displayed in plain text in the input line. If the input value differs from the defined format, this value flashes in the display.



This value may be cancelled by depressing the "Clear" key.

The operation described is used to enter the remaining R parameters in the memory. Once all parameters have been input, operator prompting is terminated.

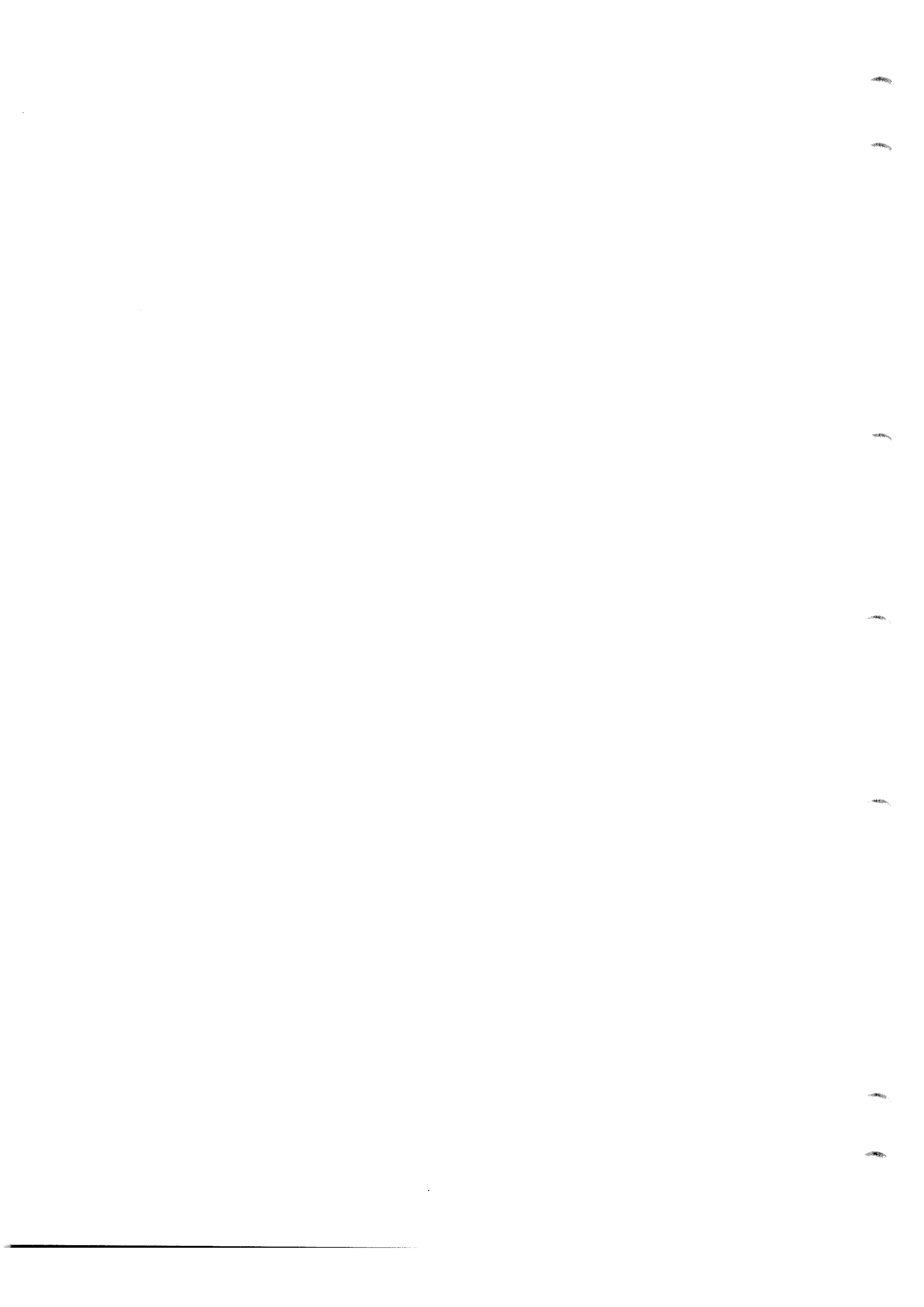


Another LF must be entered after all R parameters have been input in the subroutine.

```
MDI PARTPROGRAM
PROGRAM:  % 100
R022=70 (MAX. DIAMETER) *
R023=20 (M/MIN WORKPIECE) *
R024=15 (NUMBER OF SEATS)*
R025=1 (DRESSING FOR WORKPIECE) *
R026=5 (DRESSING FOR SEAT NUMBER) *
N15 L800
(GENERAL WORKPIECE DATA) *

SINUMERIK 3G
```

If these programs are to be edited at a later date, the NC always displays the appropriate texts independently of user datum N25, bit 6.



8. Input of User Data, R Parameters and Test Data

=====

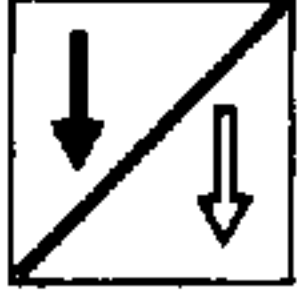


Set MDI-SE-TE mode (display is also possible in other modes).

8.1 Bit-Oriented User Data



Preselect display using "Page" keys (#22, 23)



```

MDI PART PROGRAM
SETTING DATA NO. 25
N
0 PROMPTING CYCLES          1=ON
0 TEXT TRANSFER    0=OFF    1=ON
0 PUNCHING CODE    0=ISO    1=EIA
0
0 PROGRAM START WITH LF    1=ON
0 TAPE BLOCK PARITY  0=OFF  1=ON
0 R PARAMETER TEXT DISPLAY 1=ON
0 COMMENT TEXT DISPLAY  1=ON

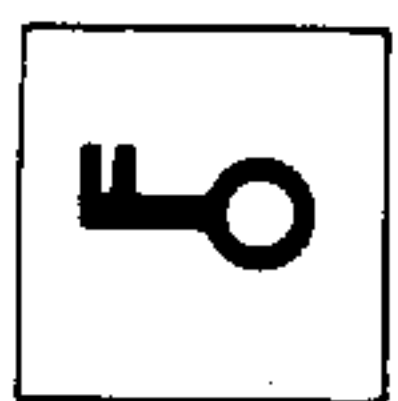
SINUMERIK 3G
    
```

```

MDI PARTPROGRAM
SETTING DATA NUMBER 25
N
0
0
0
0
0
0
0 HANDWHEEL CALIBRATION 100
0 HANDWHEEL CALIBRATION 10
0 HANDWHEEL CALIBRATION 1

SINUMERIK 3G
    
```

The user data are described in plain text.

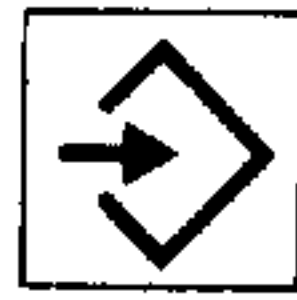


Interlocking via key-operated switch (#38)
(depending on machine datum)

```

N 1 1 1 0 1 0 0 0
    
```

Entering a user datum (e.g. user datum 25):



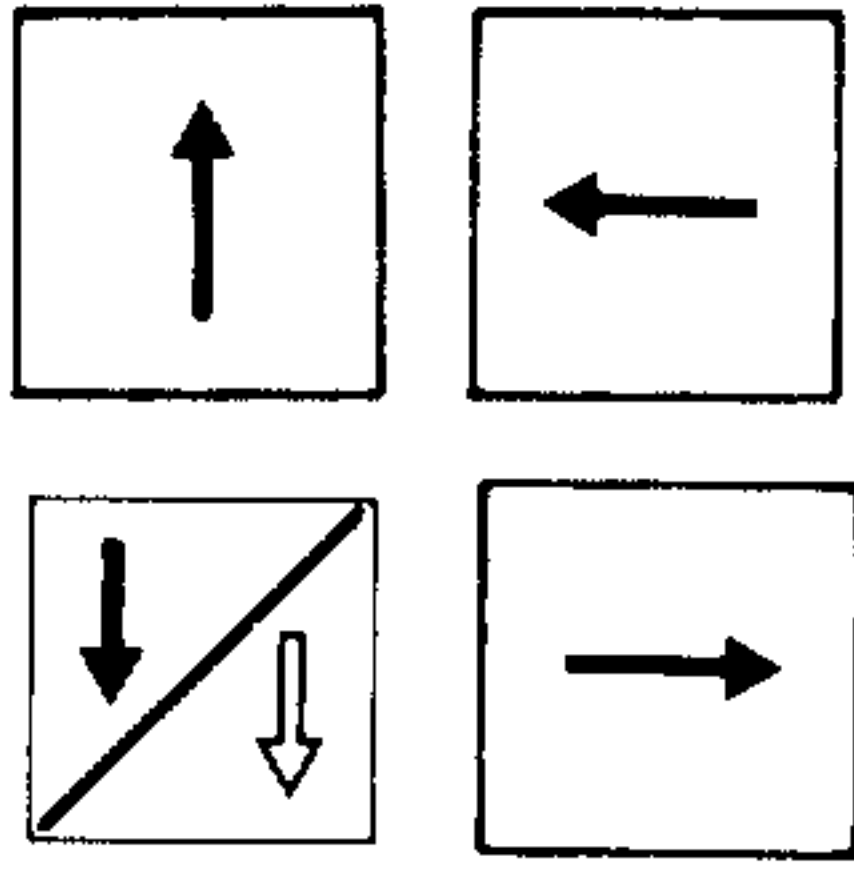
- Cycles operator prompting ON
- CP takes text
- Punch out EIA code
- Program start with LF

The Appendix contains a list of bit-oriented user data. When entering the data, leading zeroes may be omitted.

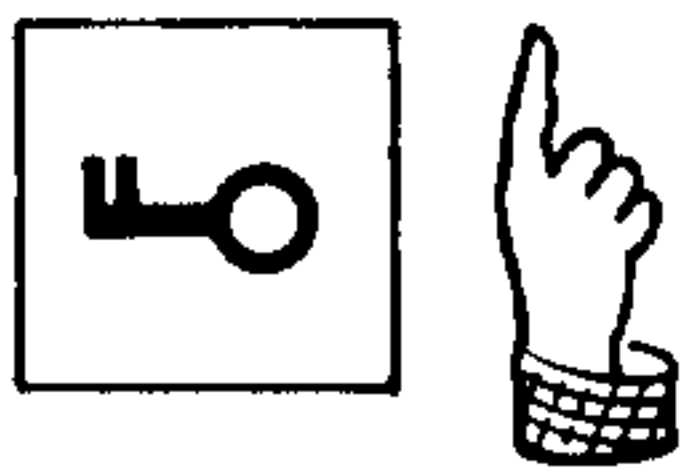
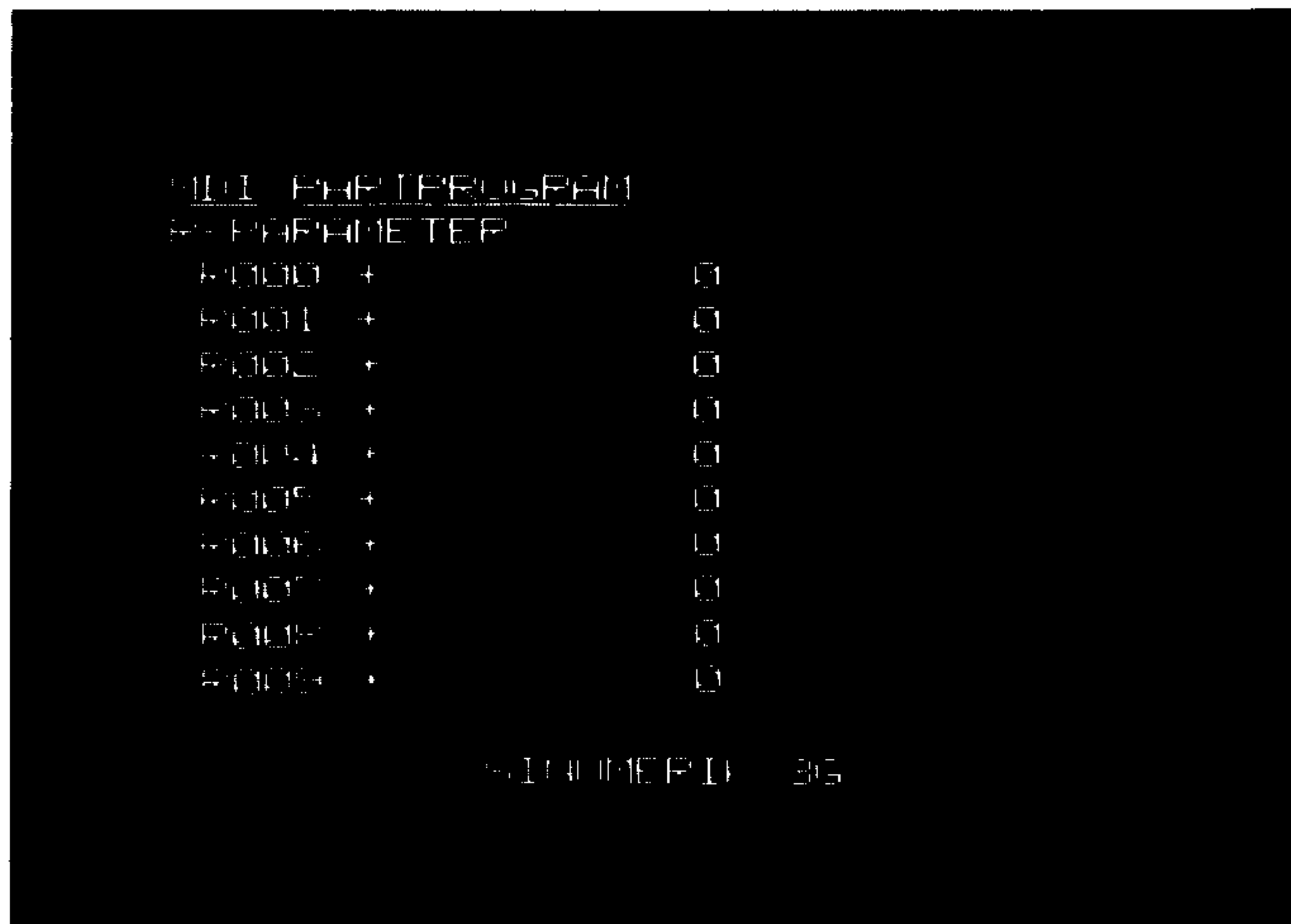
On-screen display from top to bottom corresponds to input in the input line from left to right.

8.2 R Parameters

The R parameters (see Programming Instructions, Section 5) can be displayed (R0 to R499) and edited, with the exception of actual values in R parameters in R292 to R299.



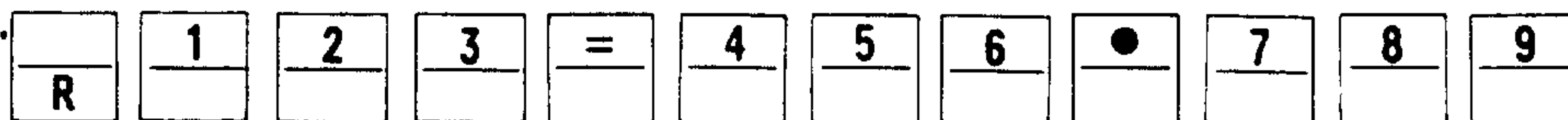
Select parameters R0 to R499 using the "Page" keys (No. 22, 23) and cursor keys (No. 24, 25).



Key-operated switch (#38) interlock
(depending on machine datum)

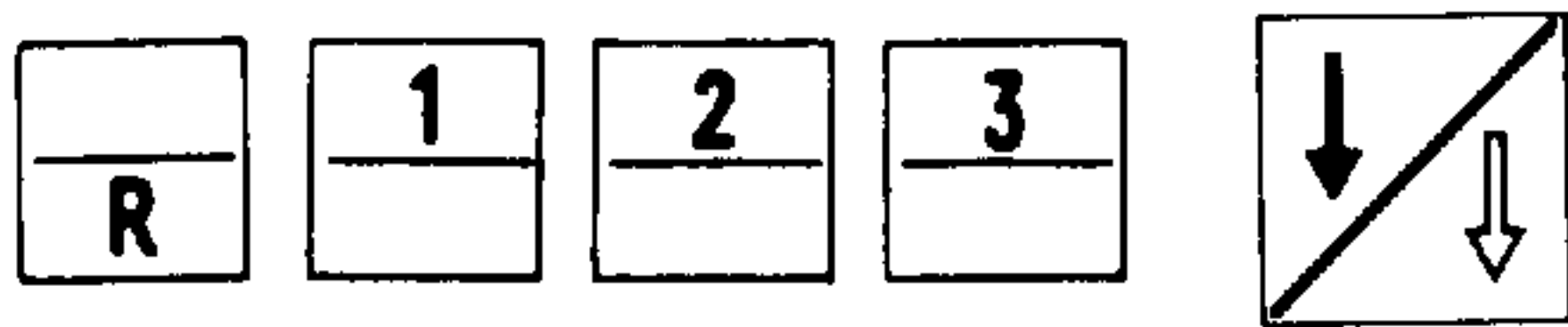


A protected memory area may be defined by setting an additional machine datum.

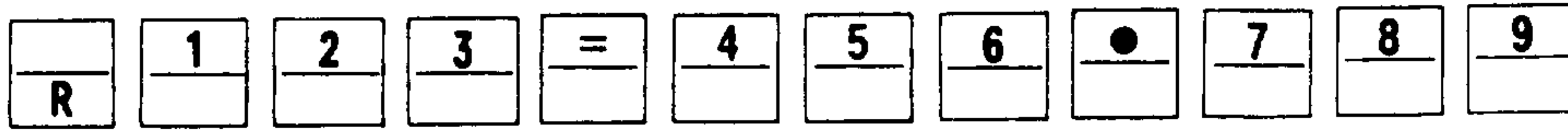


R parameter input
e.g. R123 = 456.789

Preselecting Parameters: (e.g. R123)



Preselection of parameters followed by input of required value:



Cursor pointing to R123



Previously entered value is stored in memory when "Input" key is actuated

The 'equals' sign may also be omitted during input.

List of R Parameters

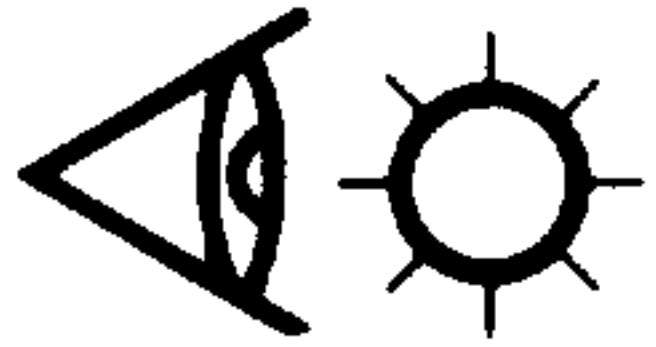
Parameter	Significance
R000 bis R199	Freely available in main program and subroutine
R200 R201 R202 R203	1st subroutine level Pass counter 2nd subroutine level 3rd subroutine level 4th subroutine level
R204 R205 R206	1st wheel Minimum grinding wheel diameter 2nd wheel 3rd wheel
R207 R208 R209	1st wheel Diameter of new grinding wheel 2nd wheel 3rd wheel
R210	Reversal time, counter-clockwise reciprocation
R211 R212 R213 R214 R215 R216 R217 R218 R219	1st auxiliary axis Setpoint for PLC auxiliary axes 2nd auxiliary axis 3rd auxiliary axis 4th auxiliary axis 5th auxiliary axis 6th auxiliary axis 7th auxiliary axis 8th auxiliary axis 9th auxiliary axis
R220	Reversal time, clockwise reciprocation
R221 R222 R223 R224 R225 R226 R227 R228 R229	1st auxiliary axis Feedrate for PLC auxiliary axes 2nd auxiliary axis 3rd auxiliary axis 4th auxiliary axis 5th auxiliary axis 6th auxiliary axis 7th auxiliary axis 8th auxiliary axis 9th auxiliary axis
R230 R231 R232 R233	1st axis Compensation for grinding wheel 1 2nd axis 3rd axis 4th axis
R234 R235 R236 R237	1st axis Compensation for grinding wheel 2 2nd axis 3rd axis 4th axis
R238 R239 R240 R241	1st axis Compensation for grinding wheel 3 2nd axis 3rd axis 4th axis
R242 R243 R244 R245	1st axis Dressing sum for grinding wheel 1 2nd axis 3rd axis 4th axis
R246 R247 R248 R249	1st axis Dressing sum for grinding wheel 2 2nd axis 3rd axis 4th axis
R250 R251 R252 R253	1st axis Dressing sum for grinding wheel 3 2nd axis 3rd axis 4th axis
R254 R255 R256 R257	1st axis Zero offset for grinding wheel 1 2nd axis 3rd axis 4th axis
R258 R259 R260 R261	1st axis Zero offset for grinding wheel 2 2nd axis 3rd axis 4th axis
R262 R263 R264 R265	1st axis Zero offset for grinding wheel 3 2nd axis 3rd axis 4th axis

Parameter	Significance
R266 R267 R268	1st wheel Dressing axis, minimum diameter 2nd wheel 3rd wheel
R269 R270 R271	Radius R1 Grinding wheel 1 Radius R2 Position of radii
R272 R273 R274	Radius R1 Grinding wheel 2 Radius R2 Position of radii
R275 R276 R277	Radius R1 Grinding wheel 3 Radius R2 Position of radii
R278	Deselect reciprocation at reversal point
R279 R280 R281 R282	1st axis Absolute dressing position relative to machine zero for grinding wheel 1 2nd axis 3rd axis 4th axis
R283 R284 R285 R286	1st axis Absolute dressing position relative to machine zero for grinding wheel 2 2nd axis 3rd axis 4th axis
R287 R288 R289 R290	1st axis Absolute dressing position relative to machine zero for grinding wheel 3 2nd axis 3rd axis 4th axis
R291	Measured value, rapid traverse
R292 R293 R294 R295	1st axis Absolute actual value relative to machine zero 2nd axis 3rd axis 4th axis
R296 R297 R298 R299	1st axis Contents of actual value display 2nd axis 3rd axis 4th axis
R300 R301 R302	1st wheel Minimum grinding wheel width 2nd wheel 3rd wheel
R303 R304 R305	1st wheel Width of new wheel 2nd wheel 3rd wheel
R306 R307 R308	1st wheel Dressing axis, minimal width 2nd wheel 3rd wheel
R309 R310 R311 R312	1st axis DRF values 2nd axis 3rd axis 4th axis
R313 to R349	Temporarily free in main program
R350 to R499	Free in main program and subroutine

8.3 Data and Selection Displays



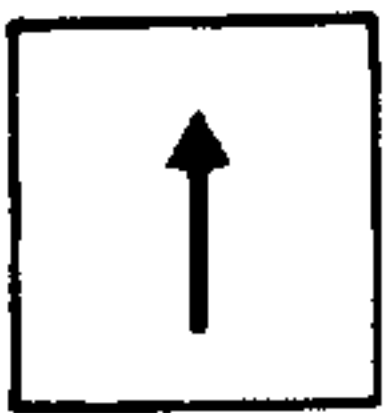
Select "Test" (#8) using appropriate key



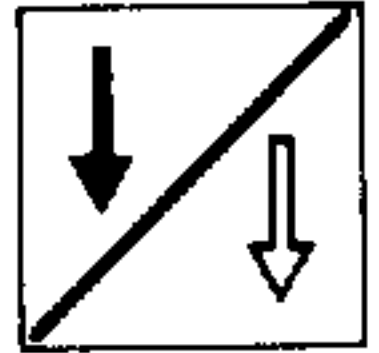
Switch display (#17)

The following data are displayed on the TEST display:

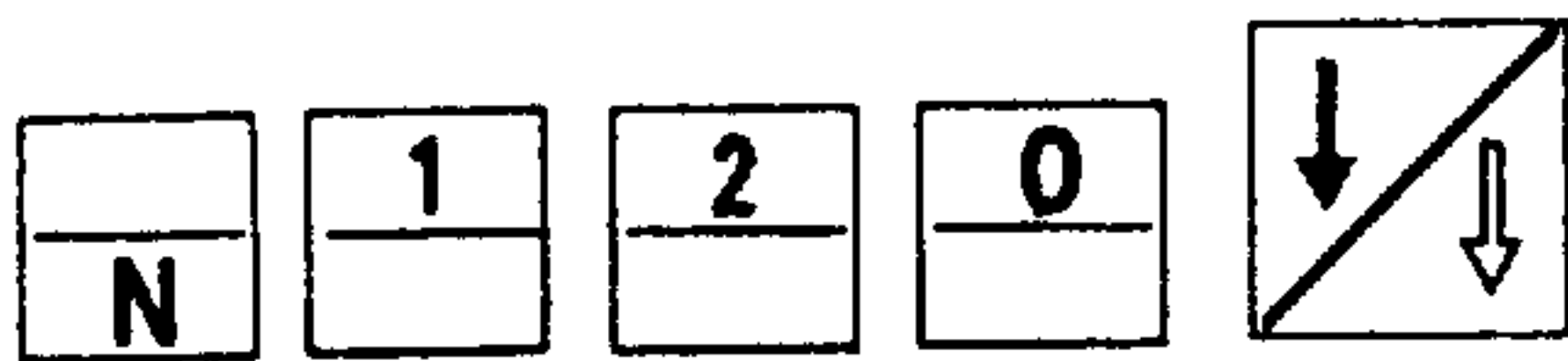
Ident Number	Data Type
1	NC alarms
7 - 9	NC input signals
10 - 11	NC output signals
100 - 479	Machine data
800 - 861	Service values



Paging through display numbers using the "Page" keys (No. 22, 23).

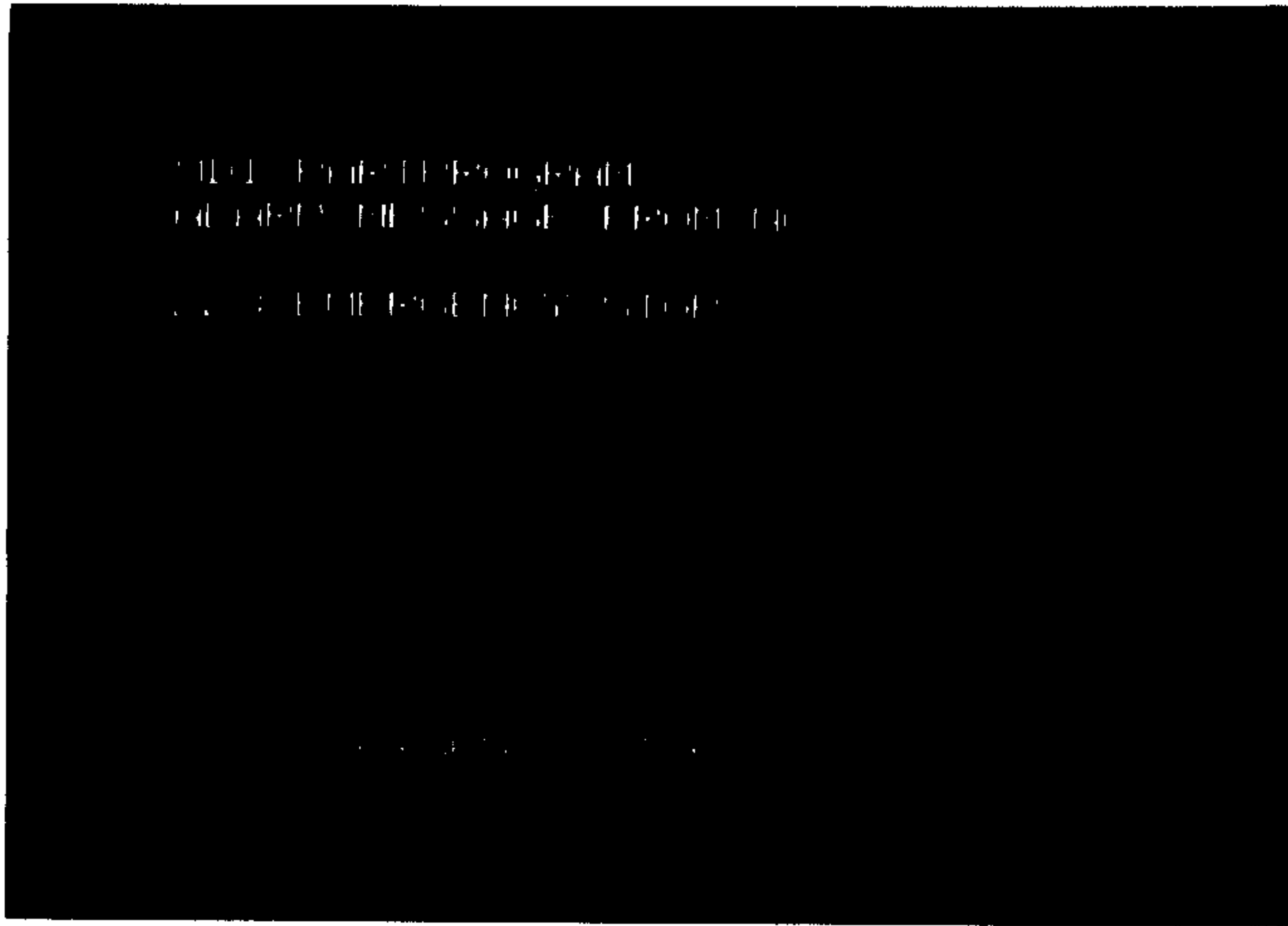


The values from N100 to N861 can also be keyed in, e.g. N120 and "Page" key (No. 23).



Values may only be edited in MDI-SE-TE mode (selector #31) and with the machine data safety switch in the OFF position (see Commissioning Instructions).

8.3.1 Alarm Display



The first NC alarm number of all active alarms is generally displayed in line 14. In addition, up to 10 simultaneous alarms are displayed in plain text (brief description of origin of error).

8.3.2 Interface Status

8.3.2.1 Input/Output Signals (NC-PLC)

The I/O signals of the interface between the NC and PLC can be displayed at any time thanks to the integrated interface diagnostics.

No inputs are possible. See the tables below for the individual interface signals and their selection.



MDI-SE-TE mode

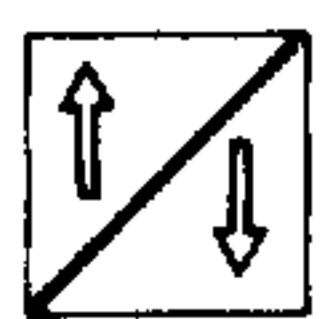


```
MDI PARTPROGRAM
INPUT SIGNALS

  7  0  01011111  1 10100000
  2  0  00000011  3  00000001
  8  4  00001101  5 11000000
  6  6  00010000  7  00010001
  9  8  00010000  9  00000010

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```

10 bytes of NC input signals are displayed.



```
MDI PARTPROGRAM
OUTPUT SIGNALS

 10  0  00110000  1  00110000
  2  0  00000000
 11  3  00000000  4  00000000
  5  0  00000000

SINUMERIK 3G
```

6 bytes of NC output signals are displayed.

SINUMERIK SYSTEM 3G4											
INPUT INTERFACE 3G					NC-PLC					PLC	
NC	DATA BIT										
TESTING	7	6	5	4	3	2	1	0			
NO.	BYTE	FEED/RAPID TRAV. OVERRIDE SWITCH DW:									
		MODE SELECTOR				SPINDLE OVERRIDE SWITCH					
7	0	D	C	B	A	D	C	B	A	34 H	
7	1	KEY-OP SWITCH	DRY RUN	* FEEDRATE 1:10	SINGLE BLOCK	BLOCK SEARCH	C	B	A	34 L	
7	2	RAP TRAV OVERRIDE ACTIVE	RAP TRAV OVERRIDE	DIRECTION KEYS +	DIRECTION KEYS -	AXIS SELECTOR CODE B	A	* DECELERATION 1	SERVO ENABLE 1	35 H	
7	3			DATA TART	RESET	DRF HANDWHEEL	NC-START	* DECELERATION 2	SERVO ENABLE 2	35 L	
8	4		COMPENSATION CODE B	COMPENSATION CODE A	SPINDLE SET DIRECTION CW	SPINDLE ENABLE	FEED ENABLE	* DECELERATION 3	SERVO ENABLE 3	36 H	
8	5	* EMERGENCY STOP	READ ENABLE			COMMON AXIS INHIBIT	OPERATOR PANEL INHIBIT	* DECELERATION 4	SERVO ENABLE 4	36 L	
8	6	SWITCH OFF SPINDLE MONITOR	KEY INHIBIT		FEED ENABLE 1		EXTERNAL INPUT 1	AXIS INHIBIT 1	FOLLOW-UP OPER 1	37 H	
8	7	V.24 INHIBIT		CYCLE INHIBIT	FEED ENABLE 2		EXTERNAL INPUT 2	AXIS INHIBIT 2	FOLLOW-UP OPER 2	37 L	
9	8	SYNCHRONIZATION			FEED ENABLE 3		EXTERNAL INPUT 3	AXIS INHIBIT 3	FOLLOW-UP OPER 3	38 H	
9	9	HANDWHEEL INHIBIT		RESYNCHRONIZATION SPINDLE	FEED ENABLE 4		EXTERNAL INPUT 4	AXIS INHIBIT 4	FOLLOW-UP OPER 4	38 L	
OUTPUT INTERFACE											
		SPINDLE				TRAVEL COMMAND					
		ACTUAL SPINDLE DIRECTION CW	SPEED LIMIT	NC ALARM	NC READY 2	IN SET RANGE	STOPPED	4TH AXIS	3RD AXIS	2ND AXIS	1ST AXIS
10	0							RAPID TRAVERSE	Gxx33	PROBE DEFLECTED	PROGRAMMED STOP MOD
10	1	PROGRAM RUNNING	NC ALARM	NC READY 2	NC READY 1			REF POINT REACHED 4	REF POINT REACHED 3	REF POINT REACHED 2	REF POINT REACHED 1
10	2	SPINDLE POSITION REACHED	Gxx96	V.24 RUNNING	GEAR 2			SPINDLE SPEED AT LIMIT			
10	3										40L
11	4	M	S		H			REVERSE +	REVERSE -	M02/M30 RESET	PROGR. SPINDLE SPEED REACHED
11	5	D (10**1)	C (10**1)	B (10**1)	A (10**1)	BCD OUTPUT		D (10**0)	C (10**0)	B (10**0)	A (10**0)
11	6	D (10**3)	C (10**3)	B (10**3)	A (10**3)	BCD OUTPUT		D (10**2)	C (10**2)	B (10**2)	A (10**2)
11	7	D (10**5)	C (10**5)	B (10**5)	A (10**5)	BCD OUTPUT		D (10**4)	C (10**4)	B (10**4)	A (10**4)

8.3.2.2 PLC Status Display

The control has testing facilities for field service which enable it to display the states of all input and output signals between the PLC and the machine, as well as the PLC-internal flags, timers, counters and data on its CRT monitor.

The input and output signals, flags and data may be entered via the NC operator panel.

Selecting PLC Status Display

PC

Select menu by switching to customer display

0

Status display is selected by entering number 0



The key assignments of the address keys modified for status display appear in the bottom right-hand corner after the PLC status display has been selected.

I = Input signals ① T = Timers ④ DB = Data block ⑦
O = Output signals ② C = Counters ⑤ H/M = Hex/bit pattern
F = Flags ③ W = Word ⑥ switching ⑧

Meaning ①...⑧

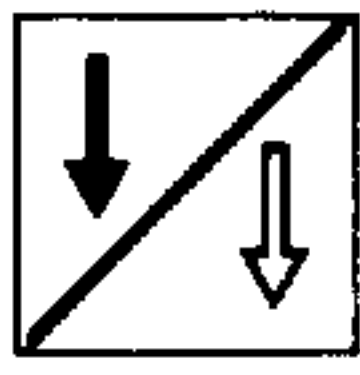
① SIN/F key ④ */4 key ⑦ +/LF key
② COS/S key ⑤ -/Q key ⑧ -/G key
③ SQR/T key ⑥ =/M key

General

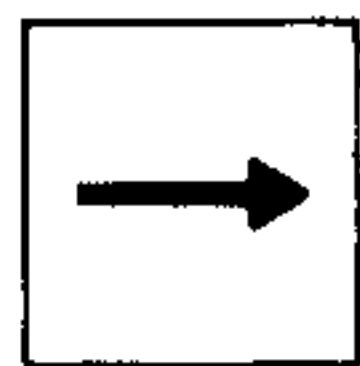
Keys 22 through 25 are used as follows in operating the PLC status display:



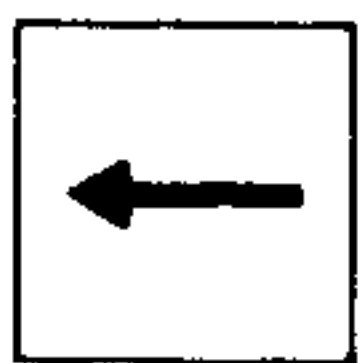
Decrement byte or word address by 10



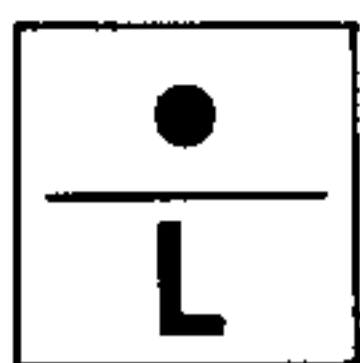
Increment - " - 10



Increment - " - 1



Increment - " - 1



Increment bit address by 1 modulo 8

Decrementing/incrementing is executed automatically with a 1 Hz clock pulse as long as the keys are depressed.

Inadmissible entries are underlined.
No transfer occurs.

N.B.

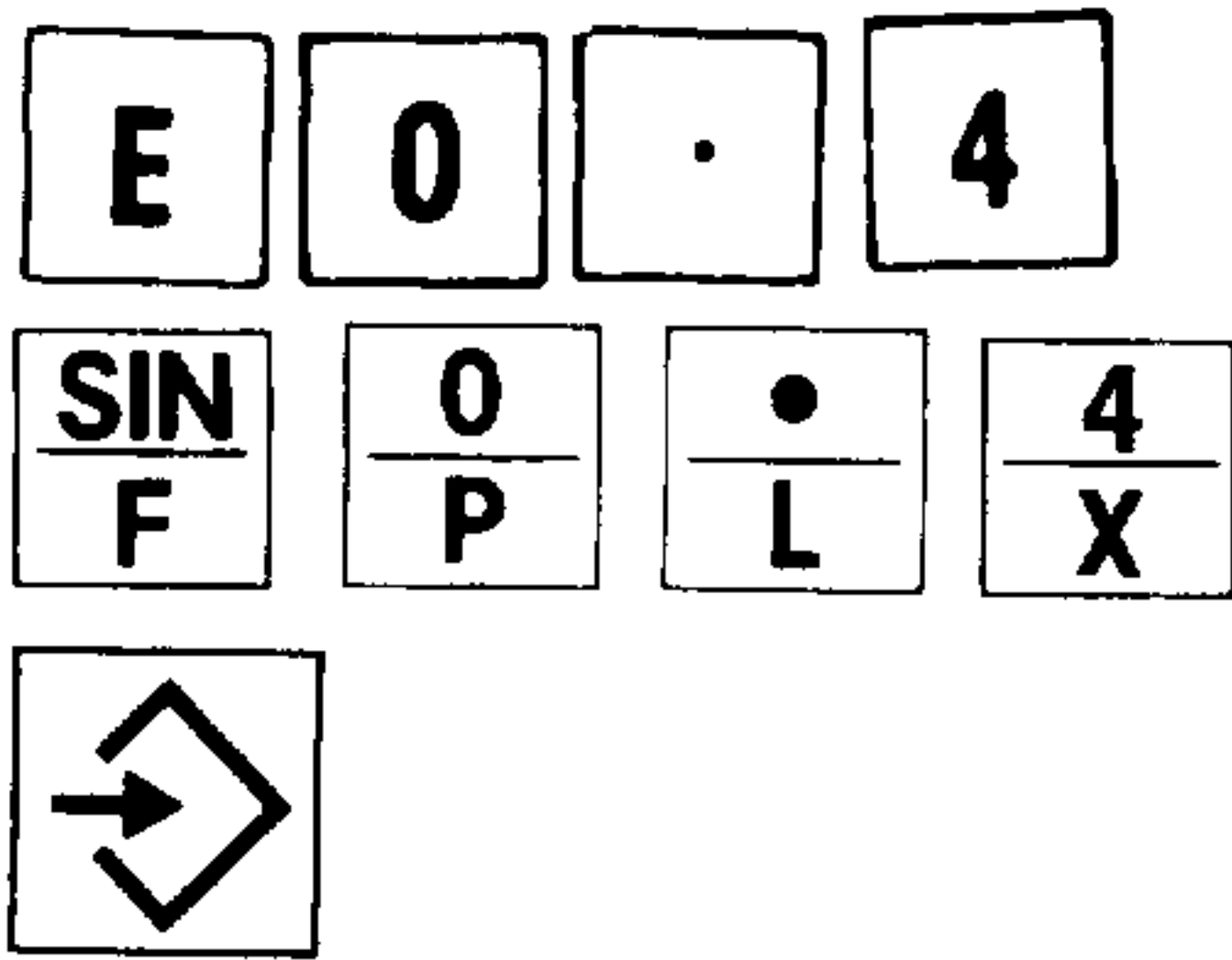
The input sequences are indicated twice:

Line 1: Desired input (e.g. I0.4)

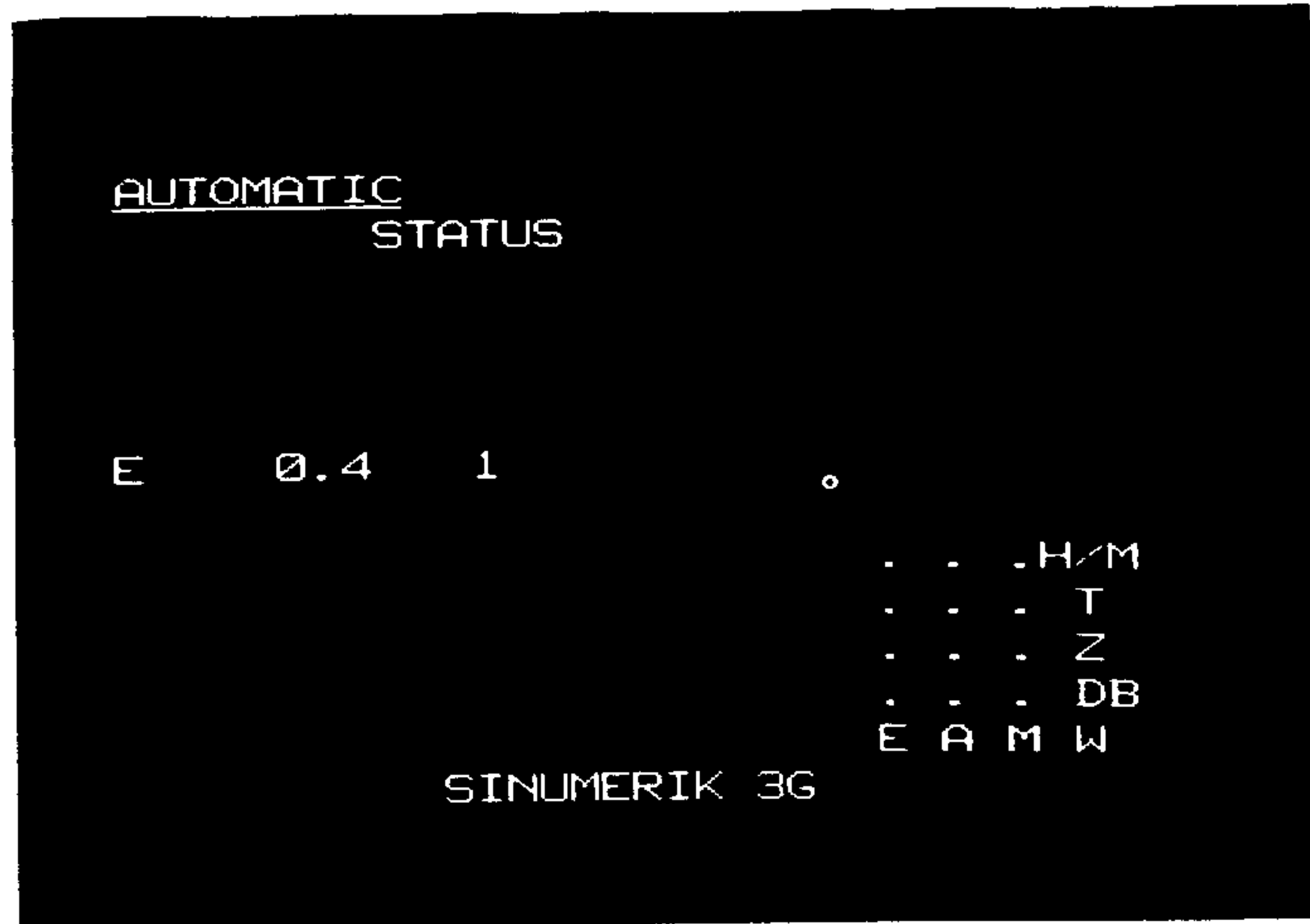
Line 2: Keys to be actuated at NC (e.g. for I0.4)



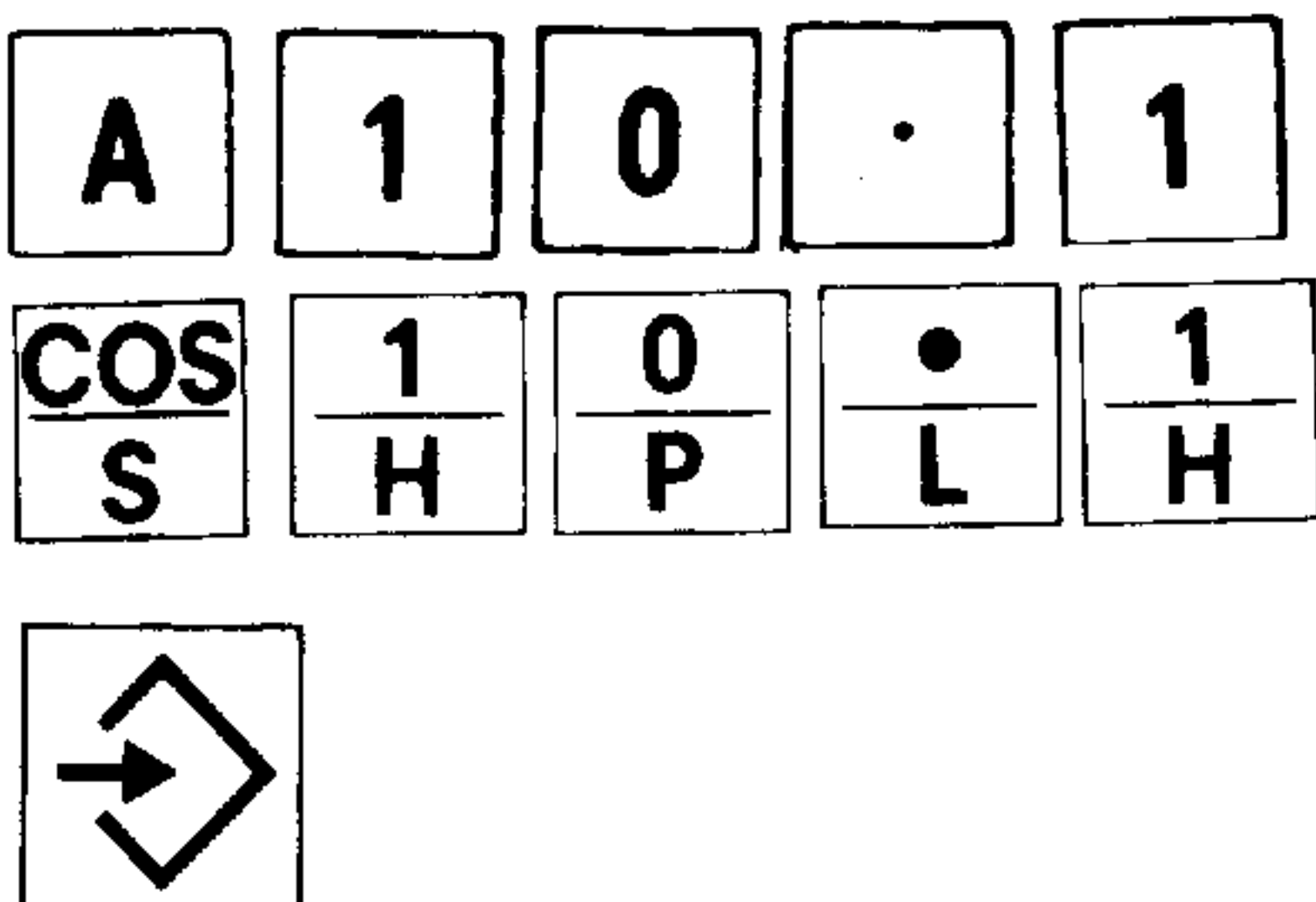
Reading Individual Input/Output Signals and Flags



Input I0.4 is selected.
Selection range 0.0 through 127.7

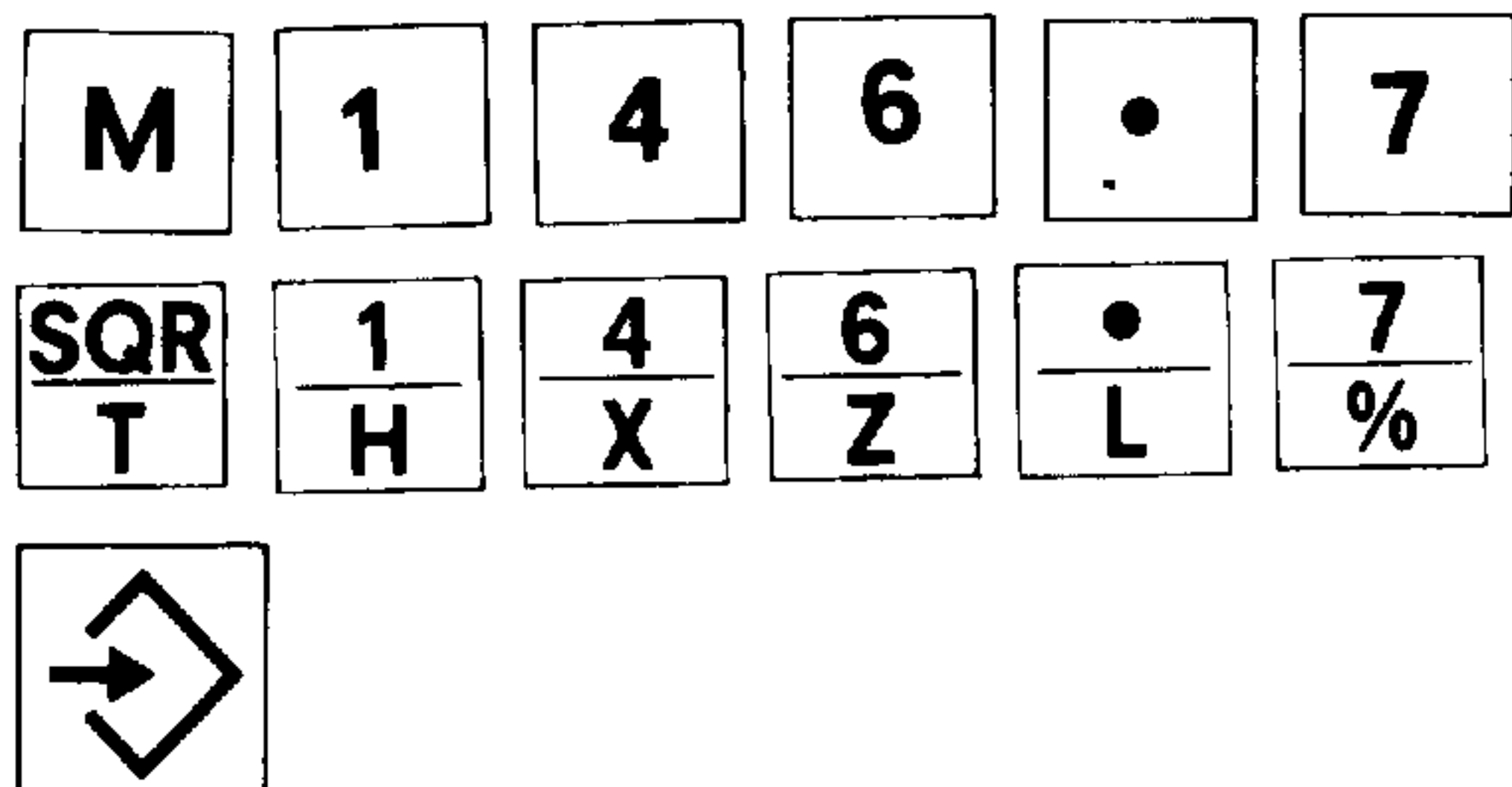


or

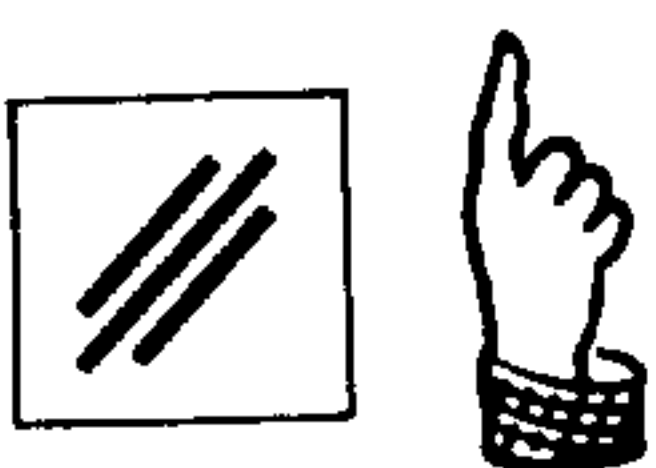


Output Q10.1 is selected.
Selection range 0.0 through 127.7

or

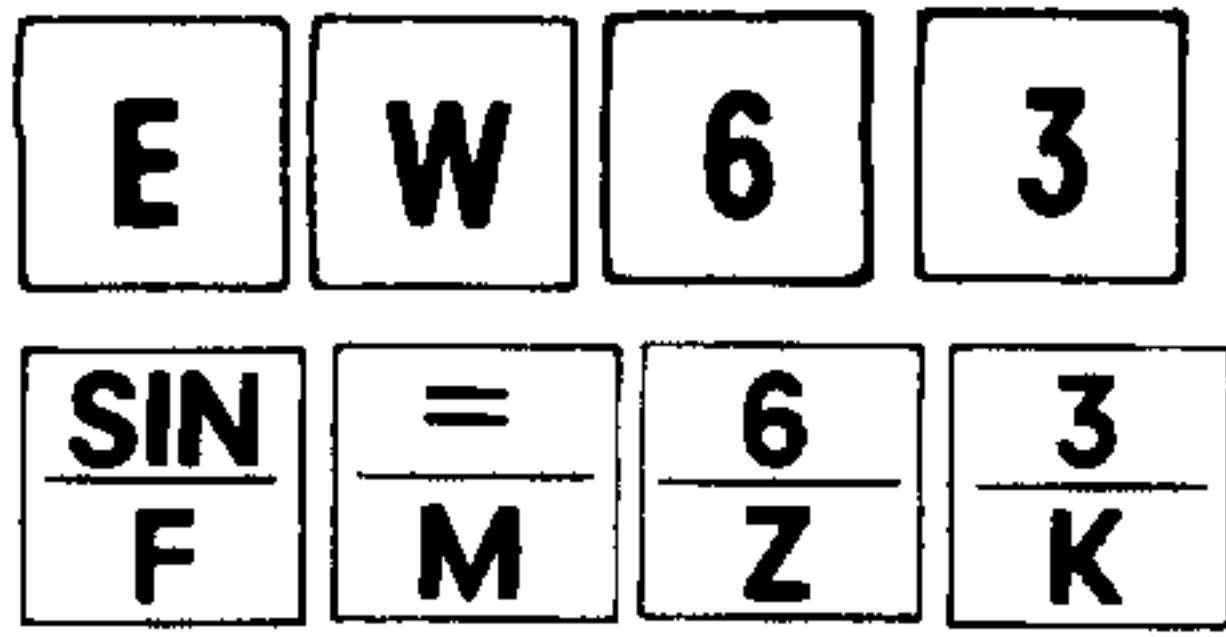


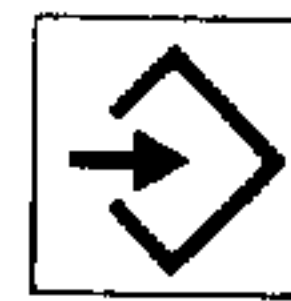
Flag F146.7 is selected.
Selection range 0.0 through 255.7

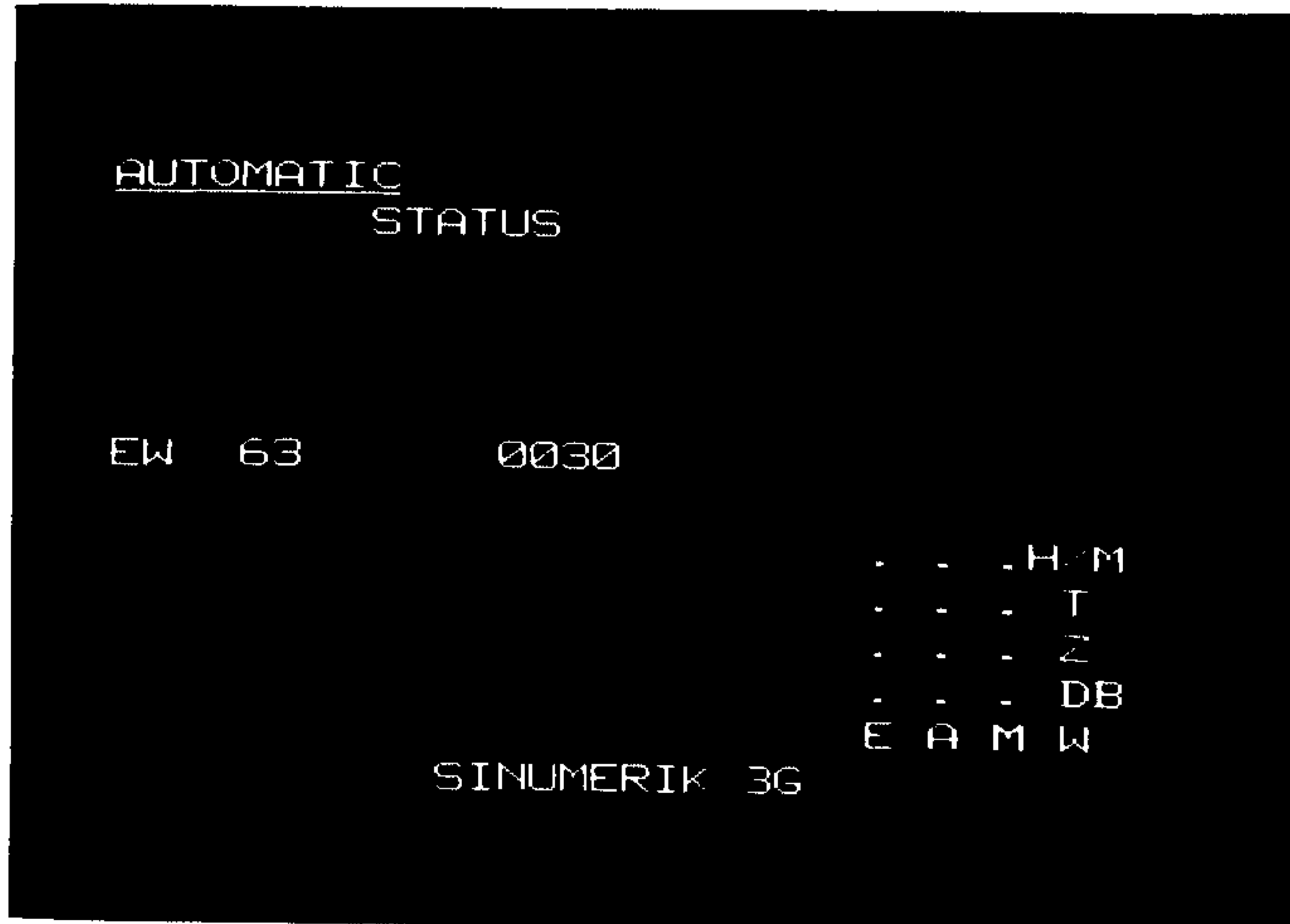


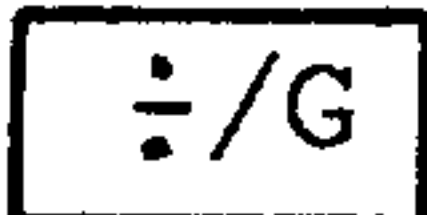
Input is cleared with "Clear input" key (#29).

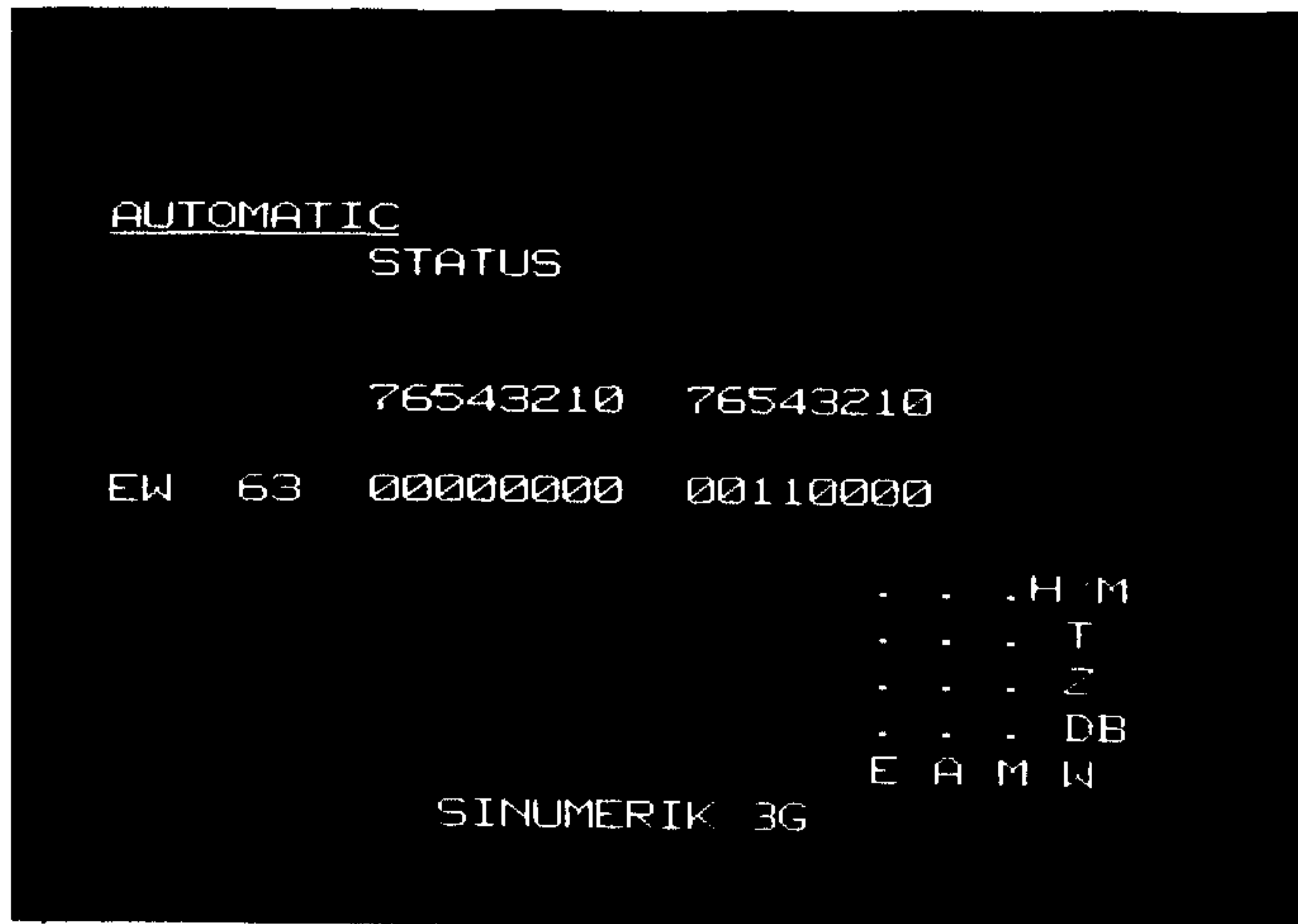
Reading Input/Output Signals and Flag Words



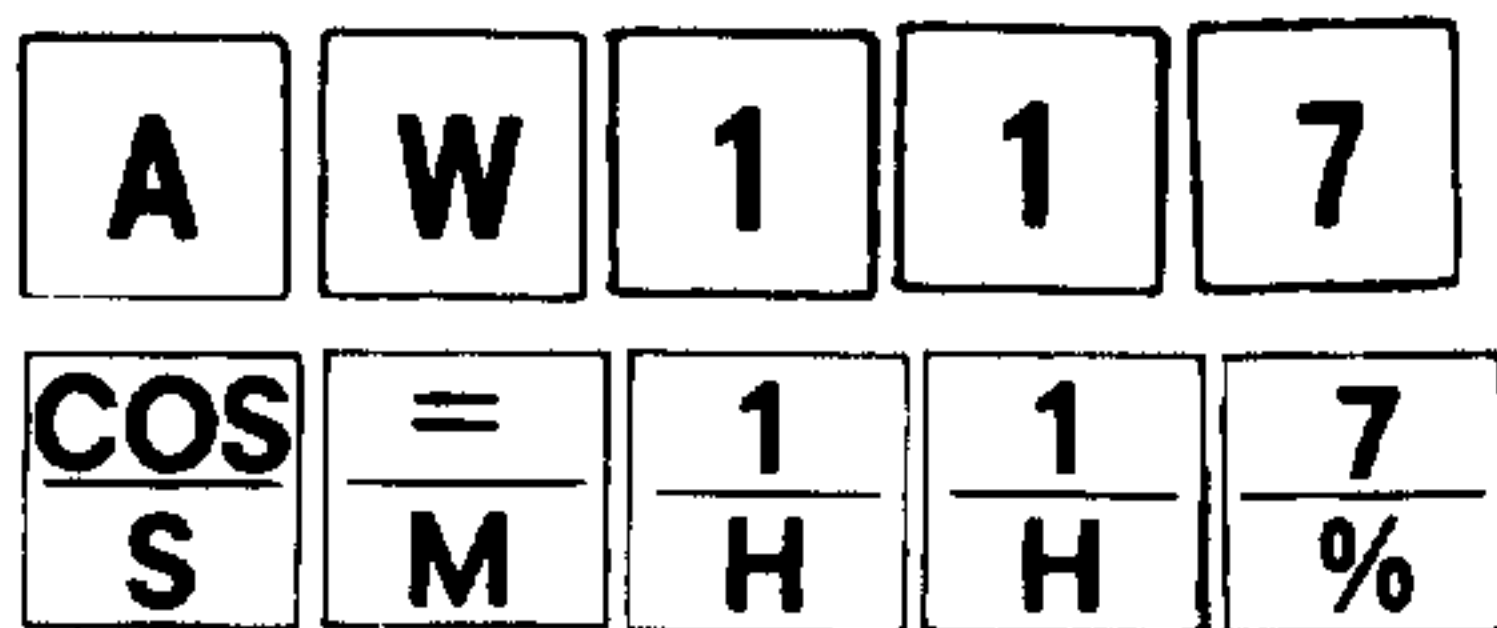
 Input word IW63 is selected.
Selection range 0 through 126

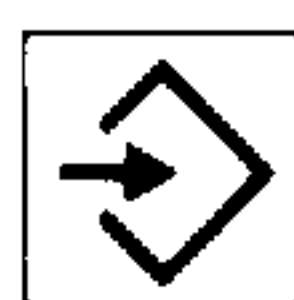


The word content is displayed in hexadecimal after the  key has been depressed.

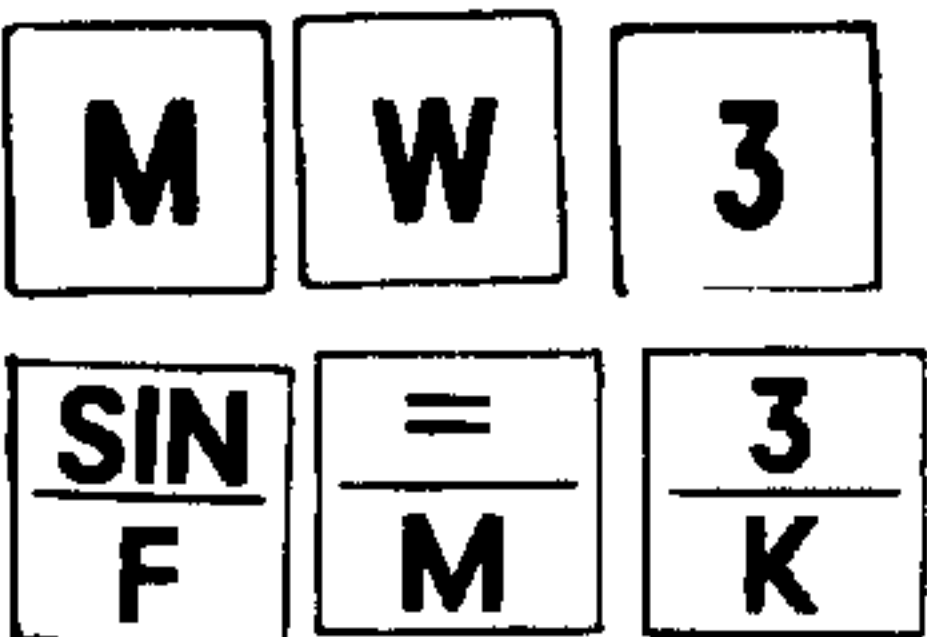


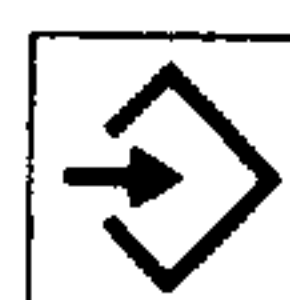
or

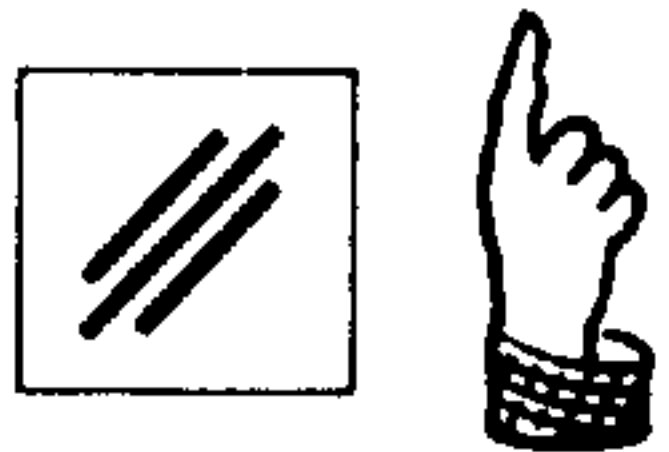


 Output word QW117 is selected.
Selection range 0 through 126

or

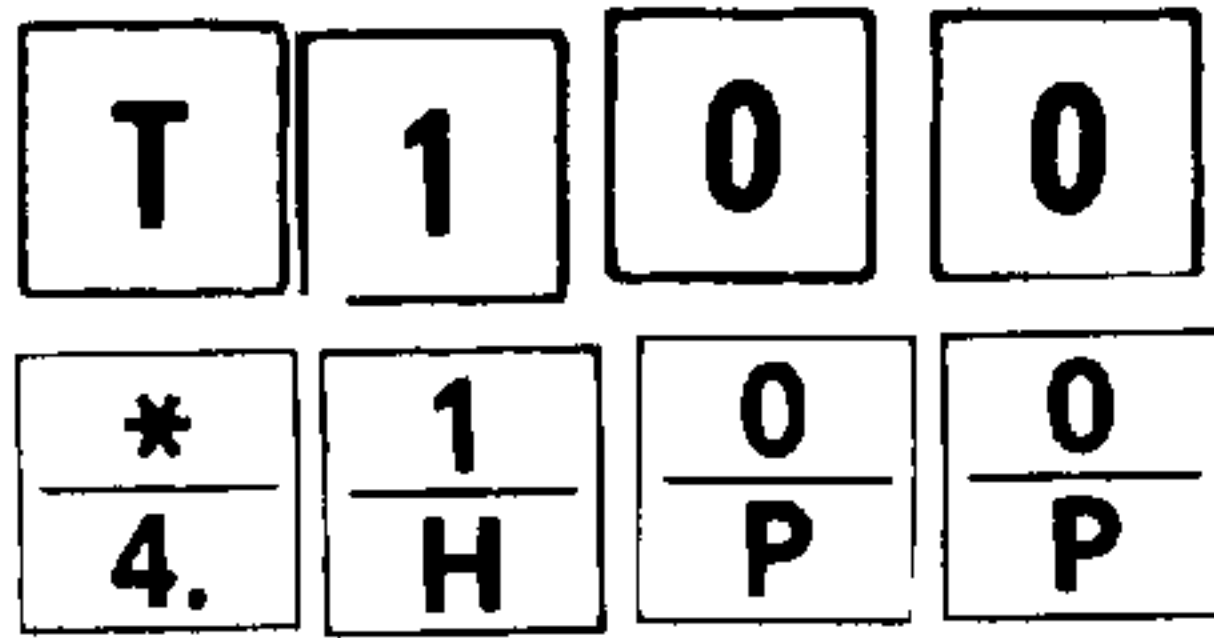


 Flag word FW3 is selected.
Selection range 0 through 254

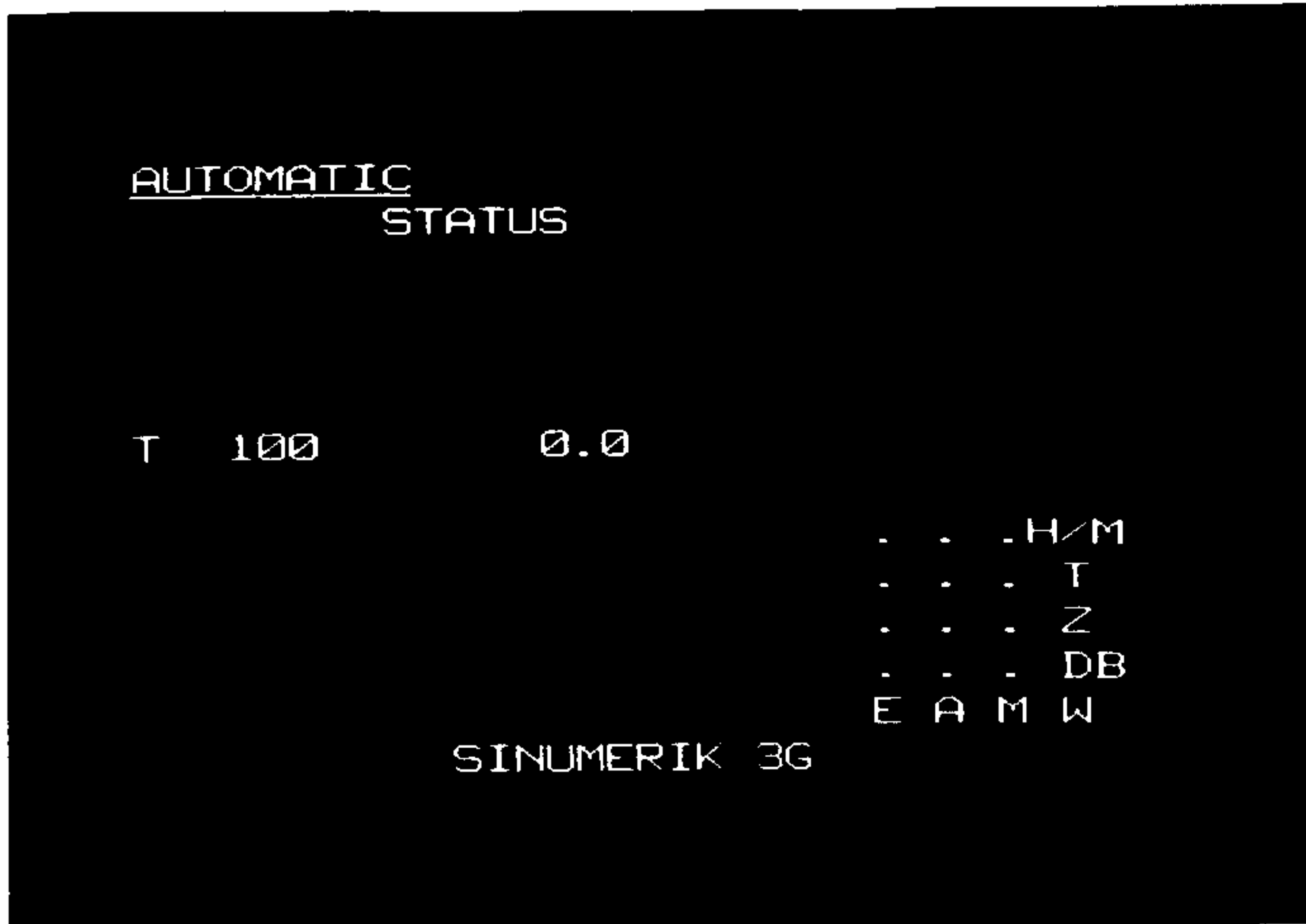


Input is cleared with "Clear input" key (#29).

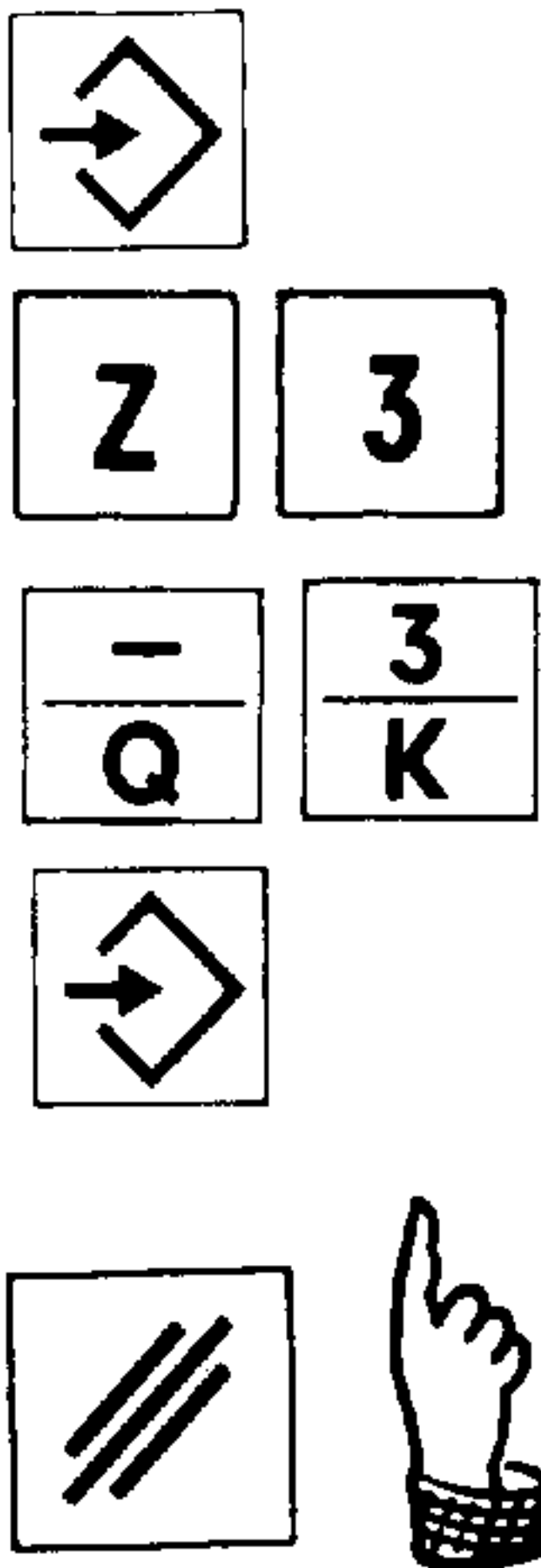
Reading Timers and Counters



Timer T100 is selected.
Selection range 0 through 127



The time is displayed in STEP 5 notation.
The count is displayed in BCD code.



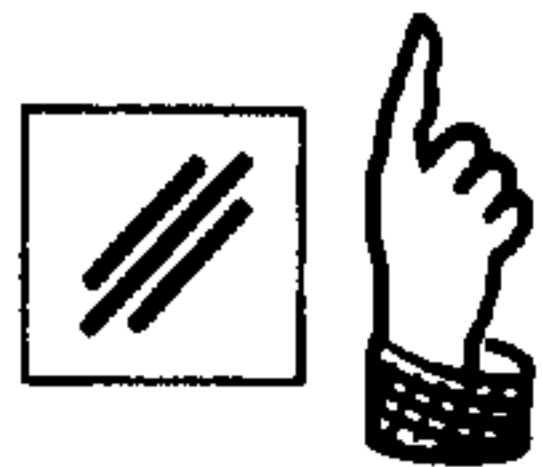
Counter C3 is selected.
Selection range 0 through 127

Input is cleared with "Clear input" key (#29).

Reading Data Words

DB	1	4	DW	0
----	---	---	----	---

+	1	4	=	0
LF	H	X	M	P




Data word DW 0 of data block DB 14 is selected.

Selection range DB 1 through 255 DW 0 through 255

Input is cleared with "Clear input" key (#29).

```

AUTOMATIC
STATUS
DB 14
DW 0      1416
          . . . H/W
          . . . T
          . . . Z
          . . . DB
          E A M W
SINUMERIK 3G
    
```

The contents of the word are displayed as a bit pattern after the  key has been depressed.



```

AUTOMATIC
STATUS
DB 14  76543210  76543210
DW  0  00010100  00010110
          . . . H/M
          . . . T
          . . . Z
          . . . DB
          E A M W
SINUMERIK 3G
    
```

When selecting data words, the control checks whether the word has been defined.

If a data word has not been defined, the display will indicate:

In hexadecimal: XX XX

In bit pattern: XXXXXXXX XXXXXXXX

Writing Individual Input/Output Signals and Flags

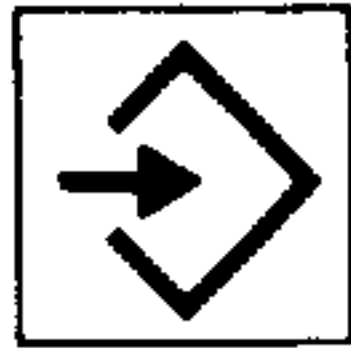
E 4 . 0

Input I4.0 is selected.

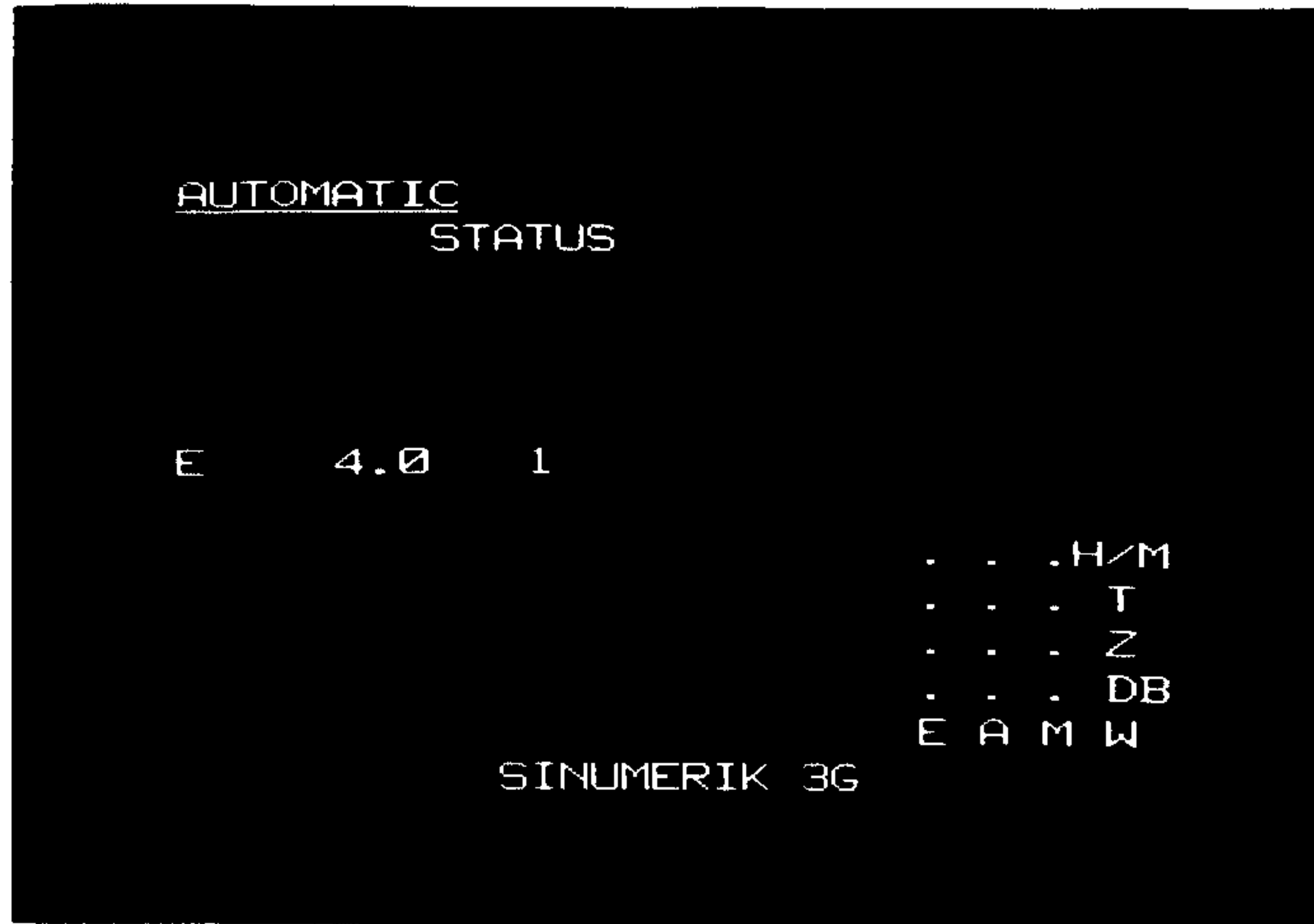
SIN 4 . 0
F X L P

Selection range 0.0 through 127.7

0 → or 1
P H



Input set to 0 or 1



A 1 0 0 . 0

Output Q100.0 is selected.

COS 1 0 0 . 0
S H P P L P

0 → or 1
P H

Output set to 0 or 1

M 1 4 6 . 7

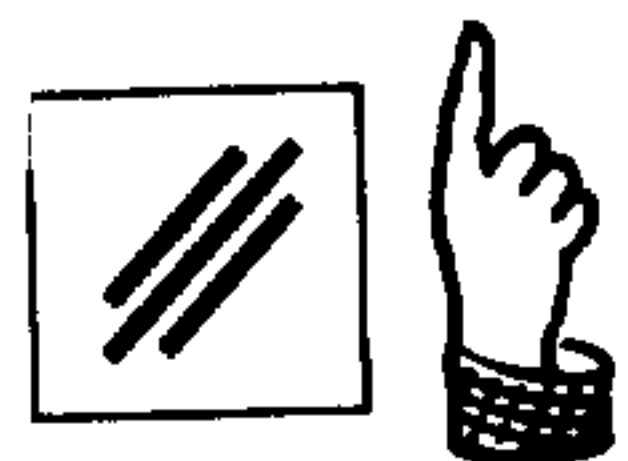
Flag F146.7 is selected.

SQR 1 4 6 . 7
T H X Z L %

Input range 0.0 through 229.7

0 → or 1
P H

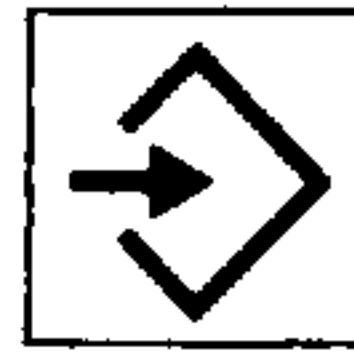
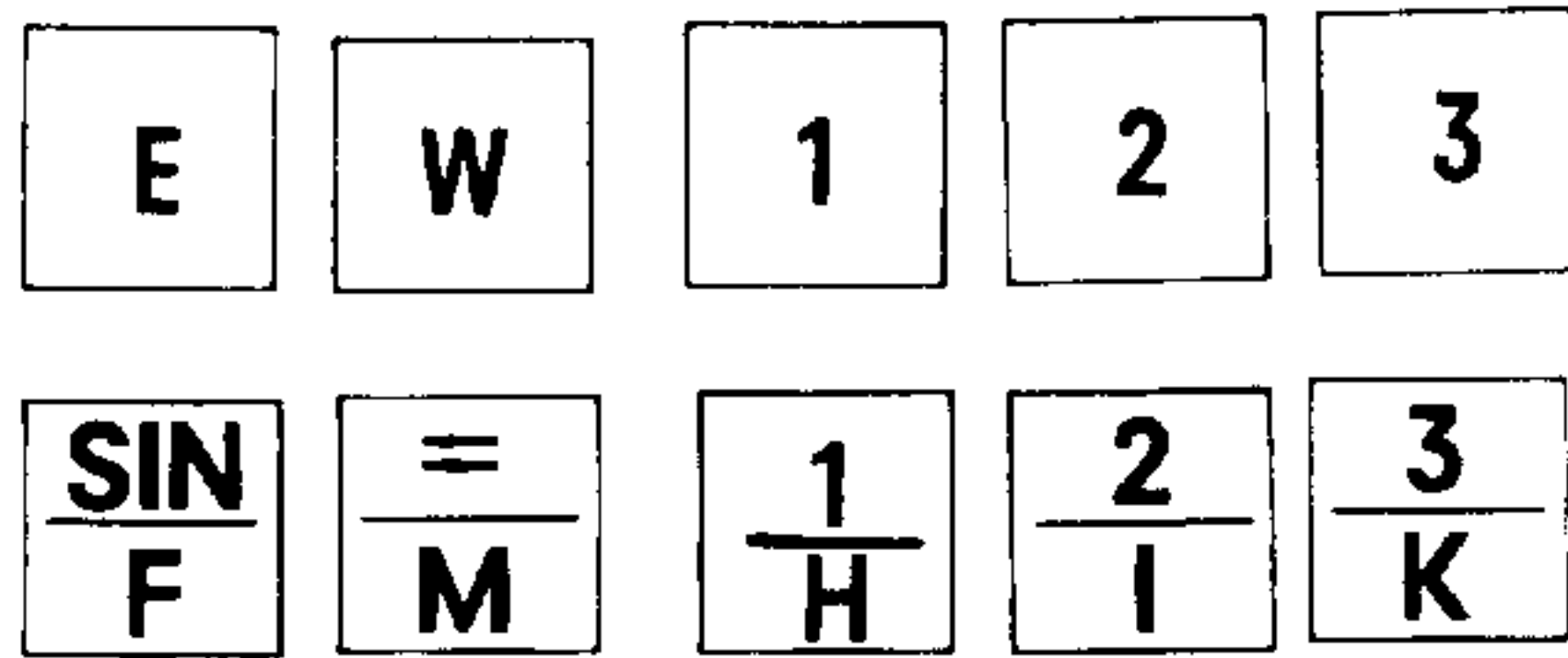
Flag set to 0 or 1



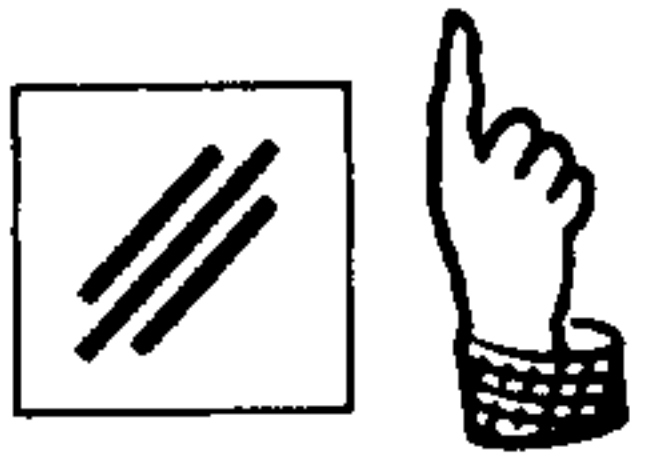
Input errors can be cleared with
"Clear input" key (#29).

During writing, the input and output signals and flags for a cycle time are set to 0 or 1. In the following cycle the input/output signal or flag can be changed again by means of the user program.

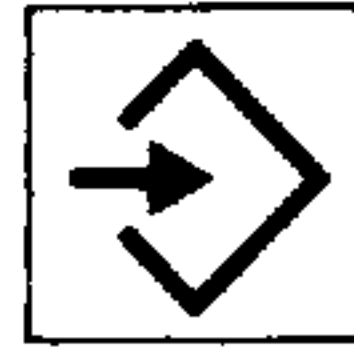
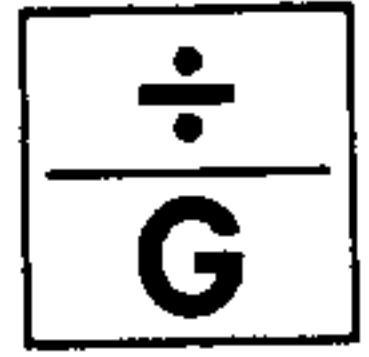
Writing Input/Output Signals and Flag Words



Input word IW123 is selected.



After the display has been switched over (H/M) the values can also be input in hexadecimal.

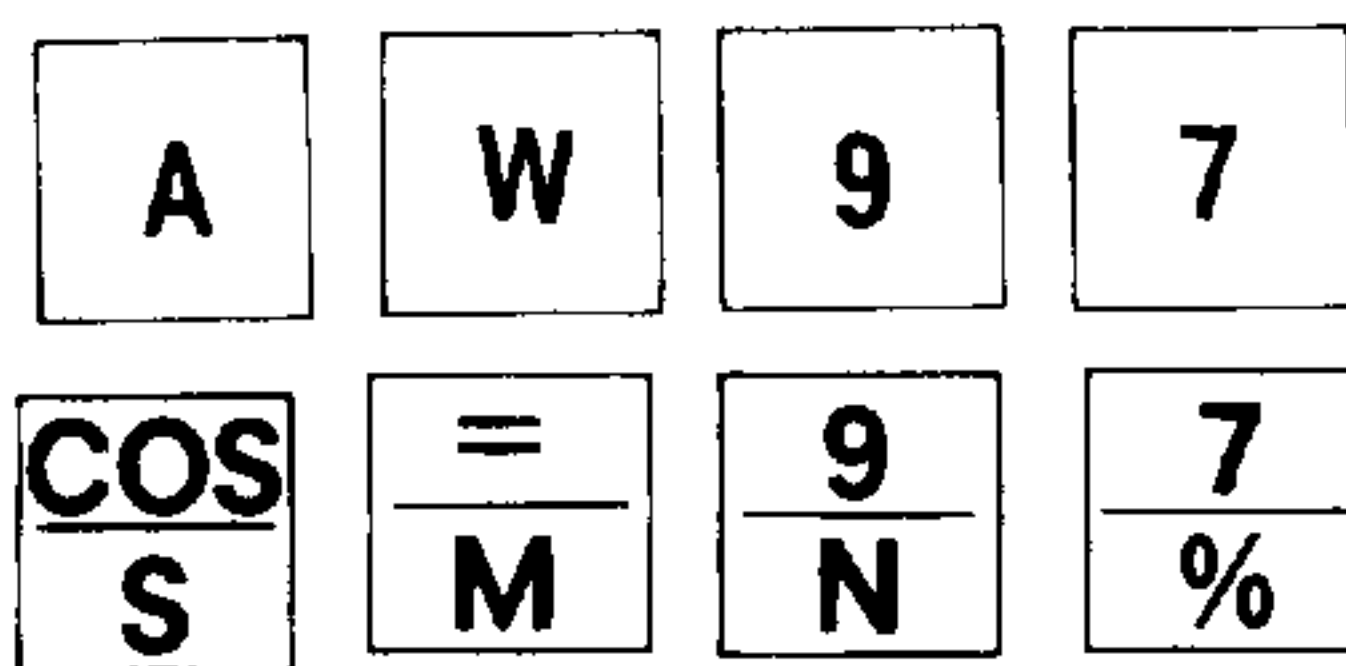
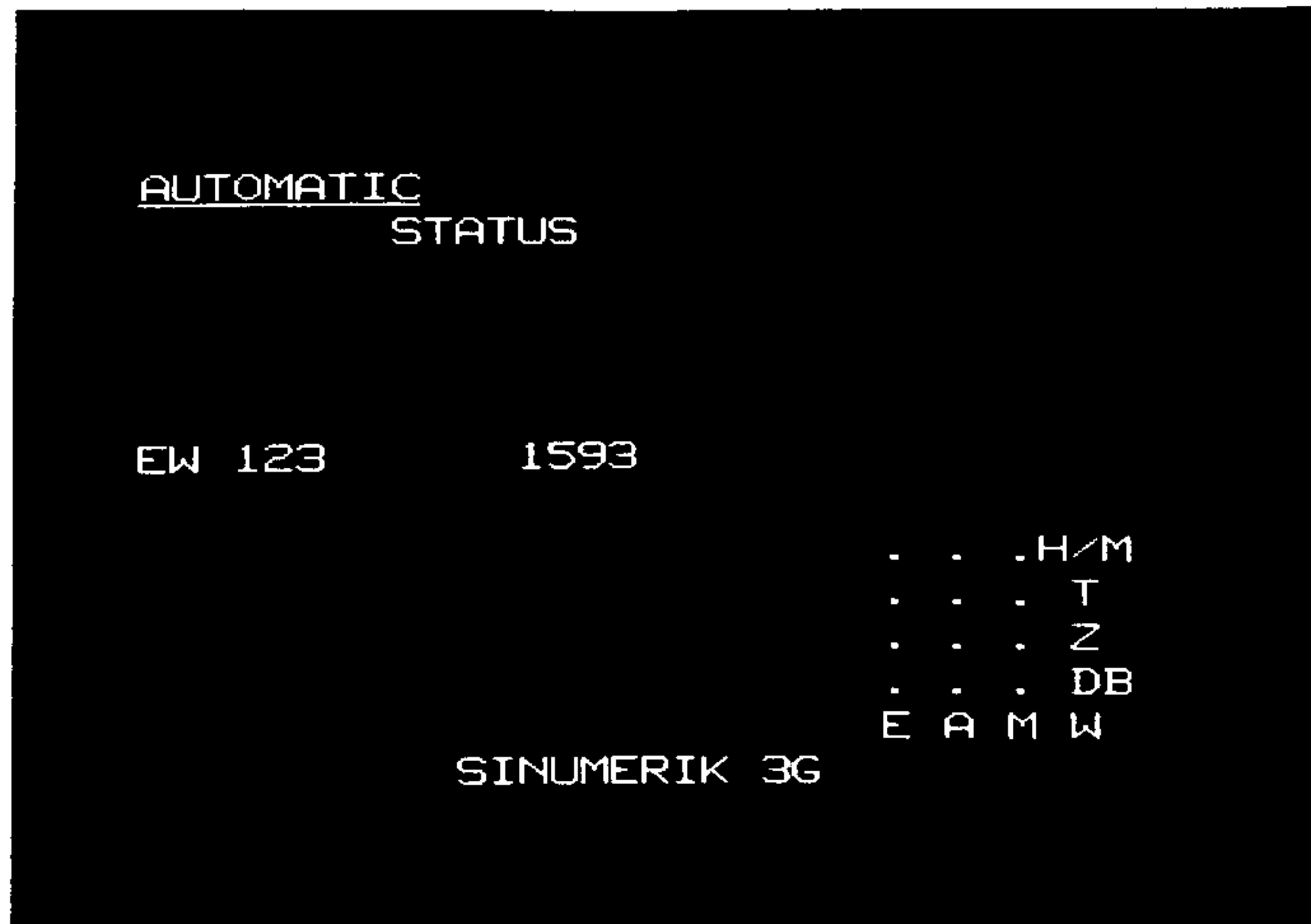


Input errors can be cleared with "Clear input" key (#29).

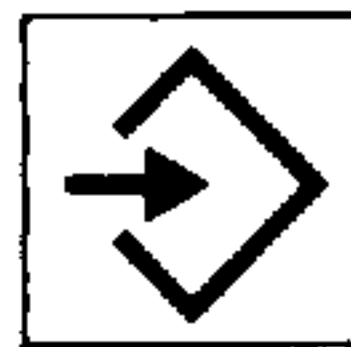
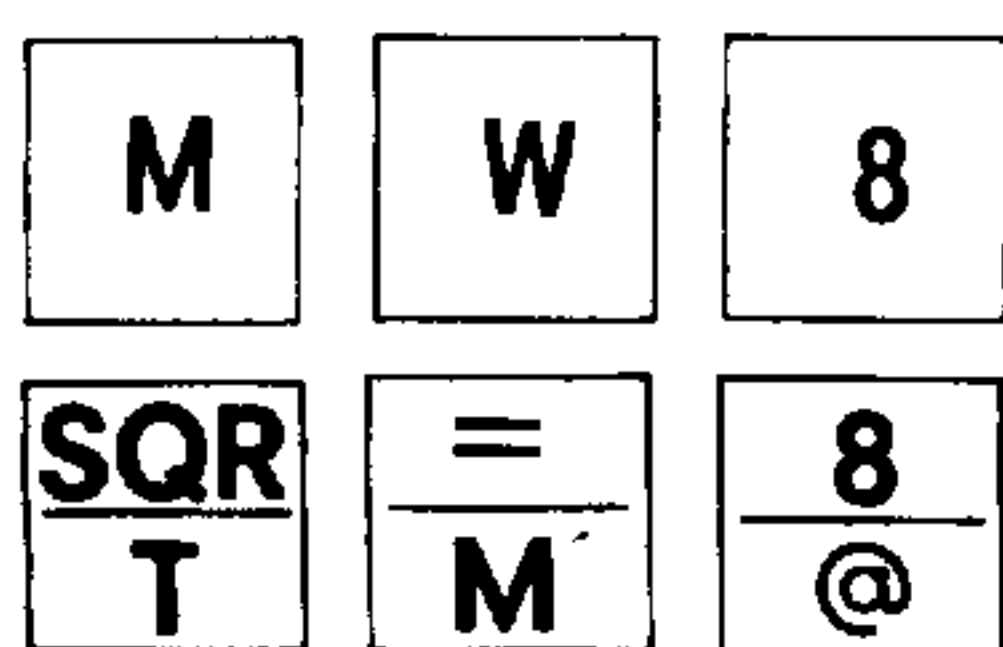


Two keys must always be depressed consecutively for hexadecimal numerals A through F:

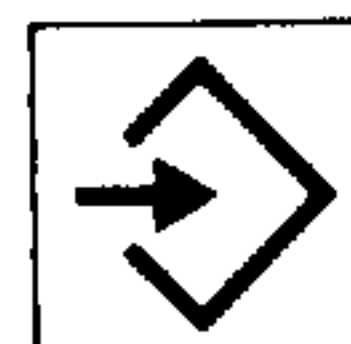
- . and 0 for A
- . and 1 for B
- . and 2 for C
- . and 3 for D
- . and 4 for E
- . and 5 for F



or



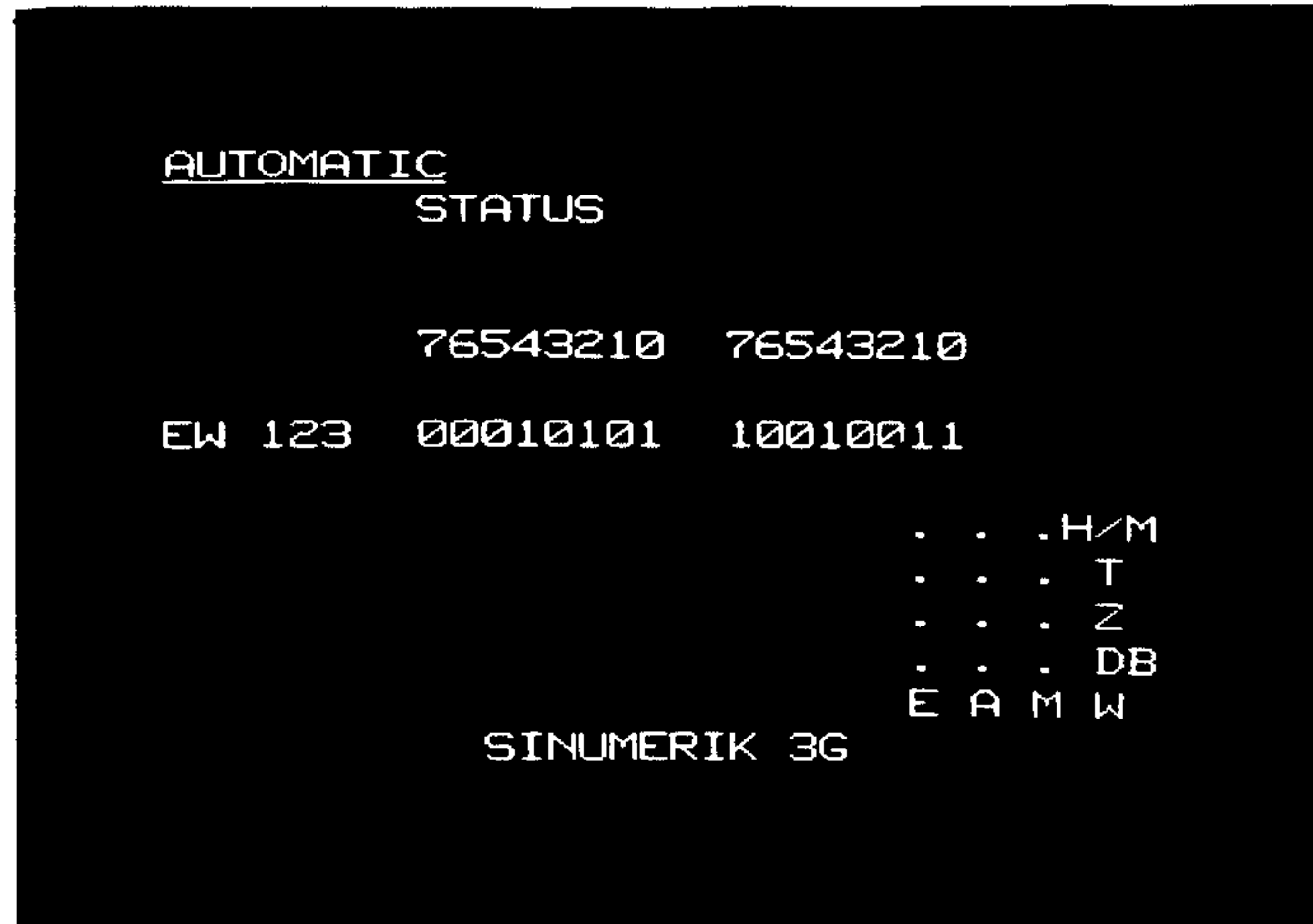
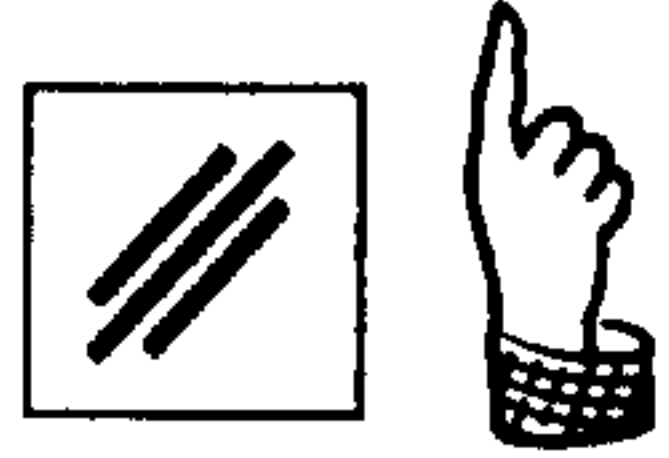
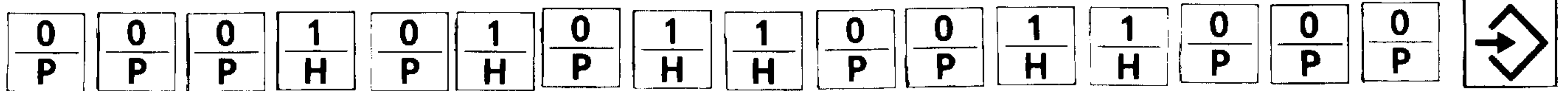
Output word QW97 is selected.



Flag word FW8 is selected.
Input range 0 through 228



Switch to bit pattern display.

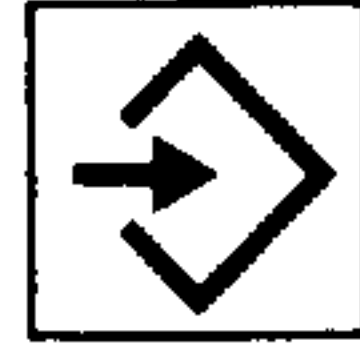


All inputs are entered right-justified.

Input errors can be cleared with "Clear input" key (#29).

Writing Data Words

DB	7	2	DW	1
----	---	---	----	---



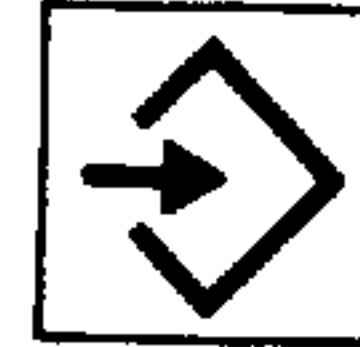
Select DB72 DW 1.

+	7	2	=	1
LF	%	J	M	H

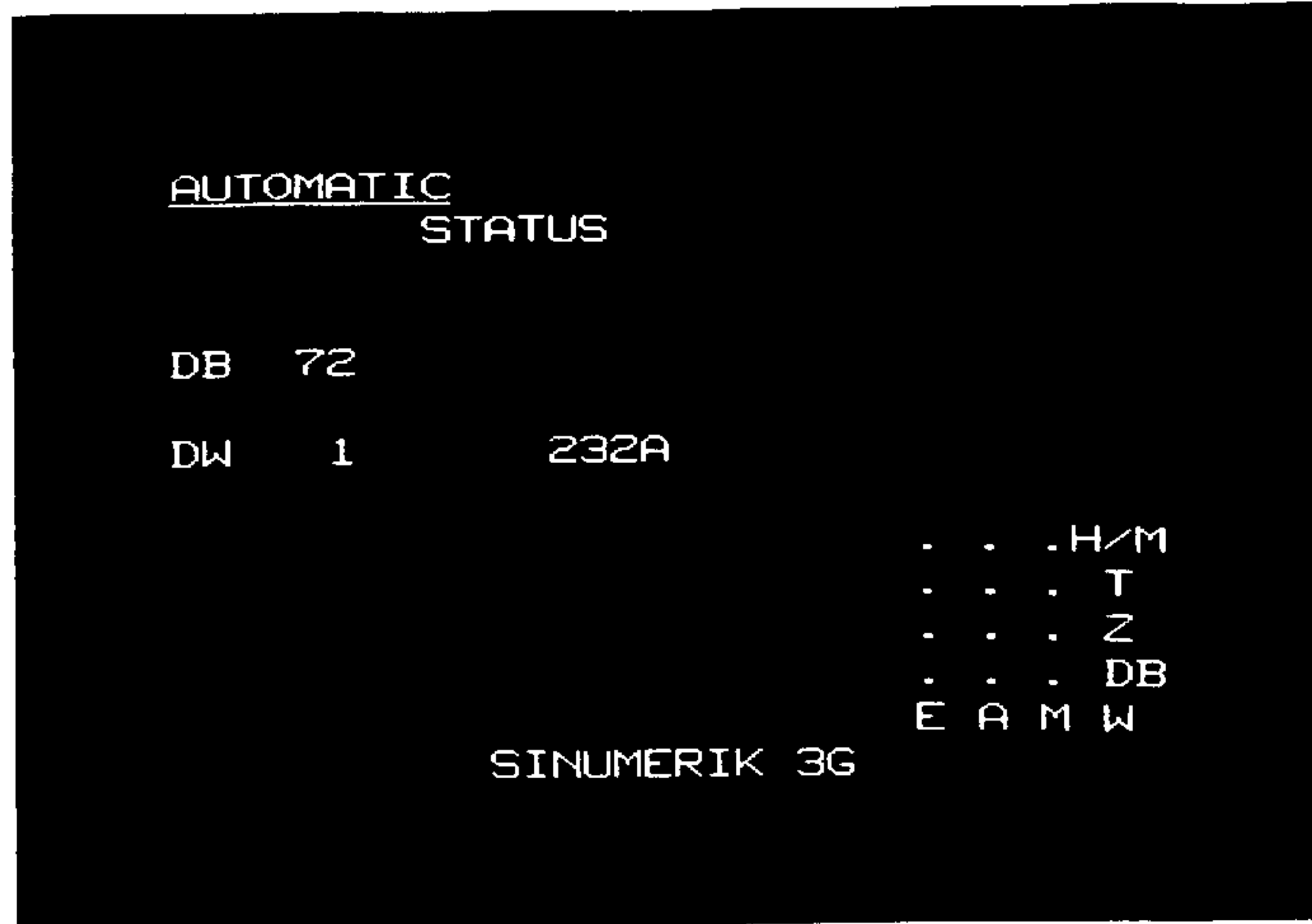
÷
G

Switch to hexadecimal display.

2	3	2	•	0
I	K	I	L	P



Set DW 1 with value 232A



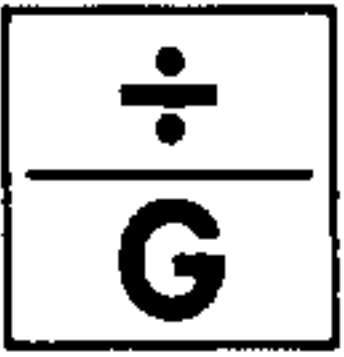
All inputs are entered right-justified.

Two keys must always be depressed consecutively for hexadecimal numerals A through F:

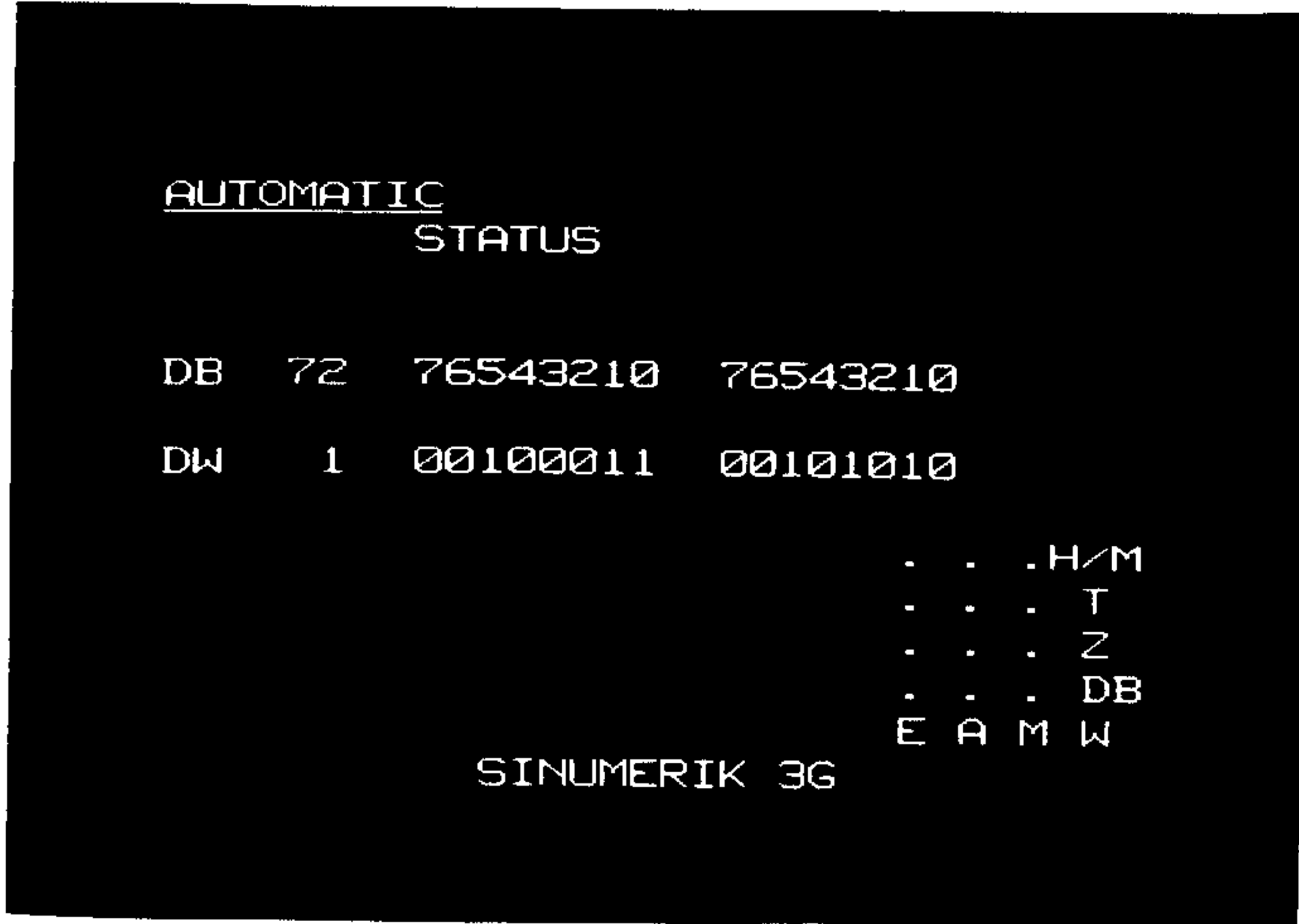
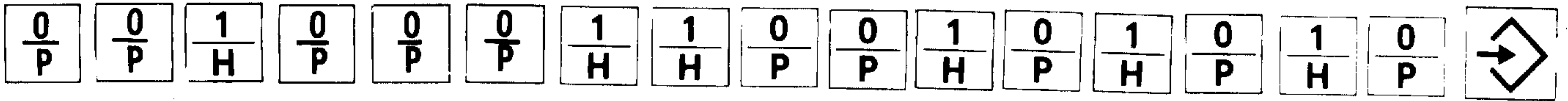
- . and 0 for A
- . and 1 for B
- . and 2 for C
- . and 3 for D
- . and 4 for E
- . and 5 for F



Input errors can be cleared with "Clear input" key (#29).



Switch to bit pattern display.

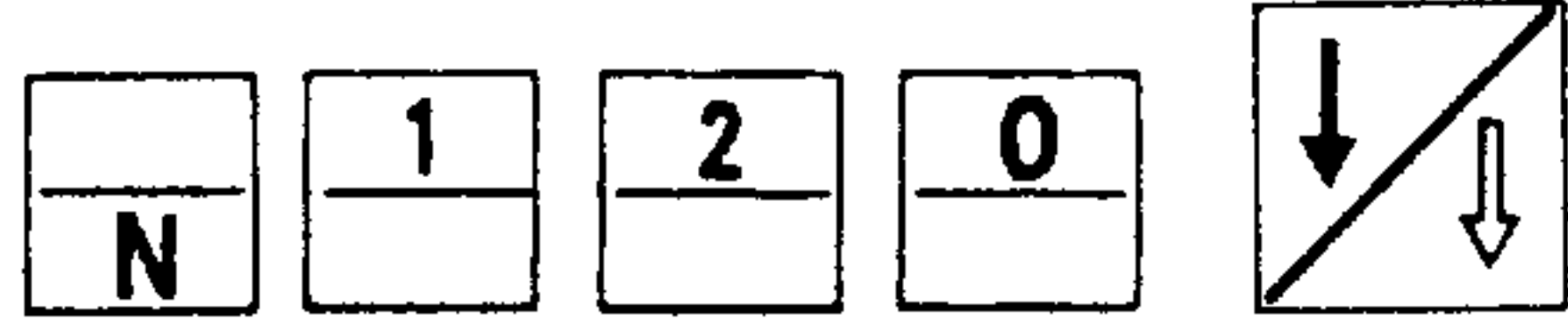
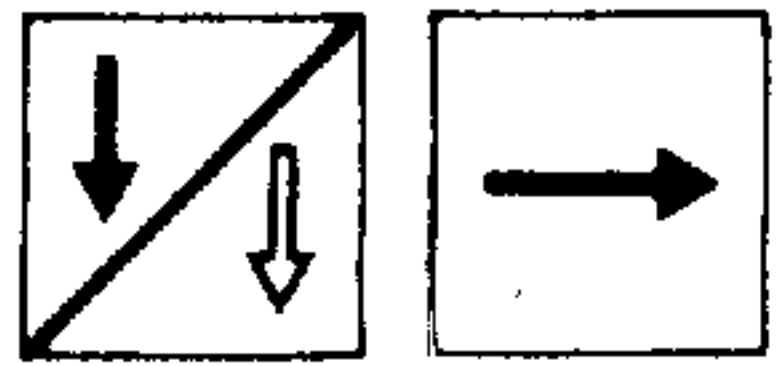
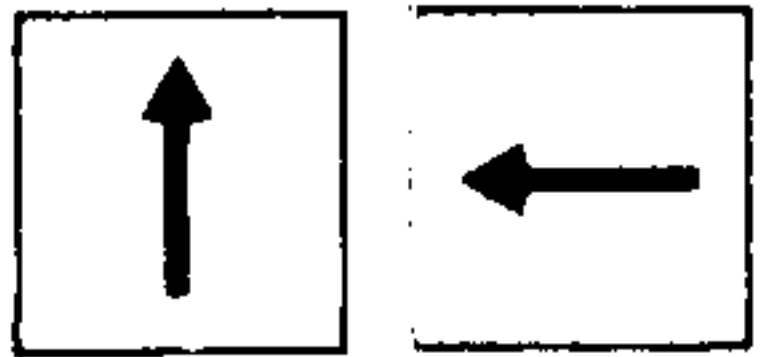


All inputs are entered right-justified.



Input errors can be cleared with "Clear input" key (#29).

8.3.3 NC Machine Data



Preselect display numbers 100 through 479 using the "Page" and "Cursor" keys (# 22, 23, 24, 25)

"Page" and cursor keys (No. 22, 23, 24, 25) or by keying in the number, e.g. N120 and actuating the "Page" key (No. 23).

Machine data are determined and entered once during machine commissioning.

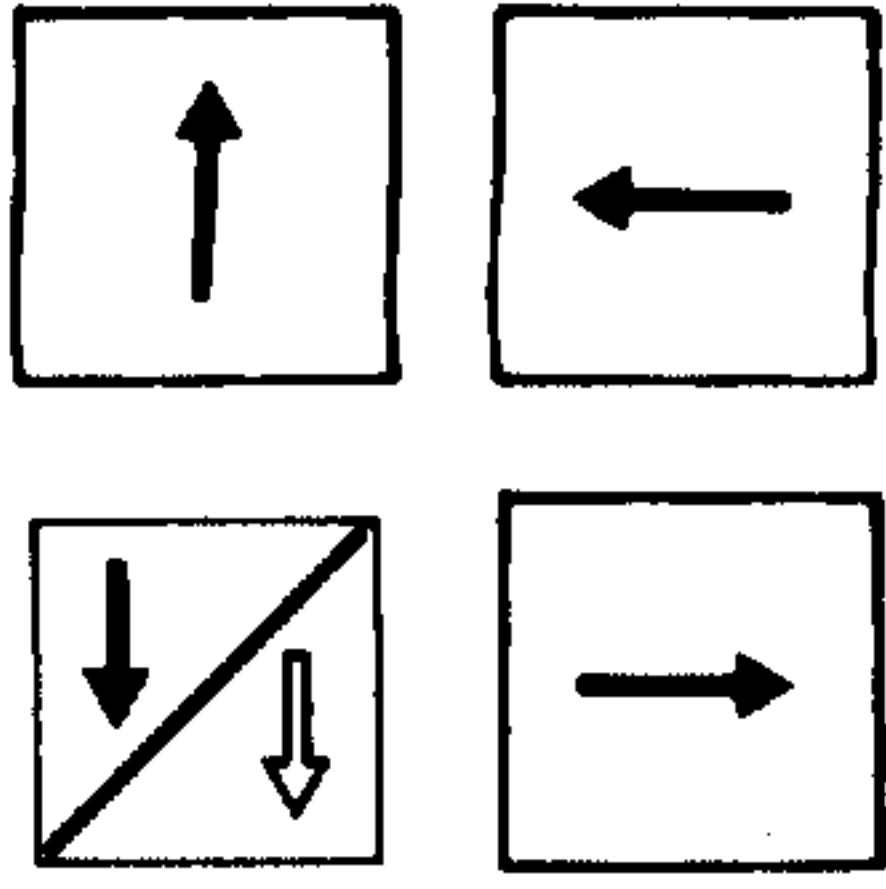
```
MDI PARTPROGRAM
AXIAL COMMISSIONING DATA
>150 S+      1666 151 S+      1666
152 S+      1666 153 S+      1666
160 S+      9999999 161 S+      9999999
162 S+      9999999 163 S+      9999999
170 S-      9999999 171 S-      9999999
172 S-      9999999 173 S-      9999999
180 S+      0 181 S+      0
182 S+      0 183 S+      0
190 S+      0 191 S+      0
192 S+      0 193 S+      0

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```

Axis-specific machine data	(100 to 295)
General machine data	(299 to 399)
PLC machine data	(250 to 279)
Machine data bits	(400 to 499)
PLC machine data bits	(450 to 479)

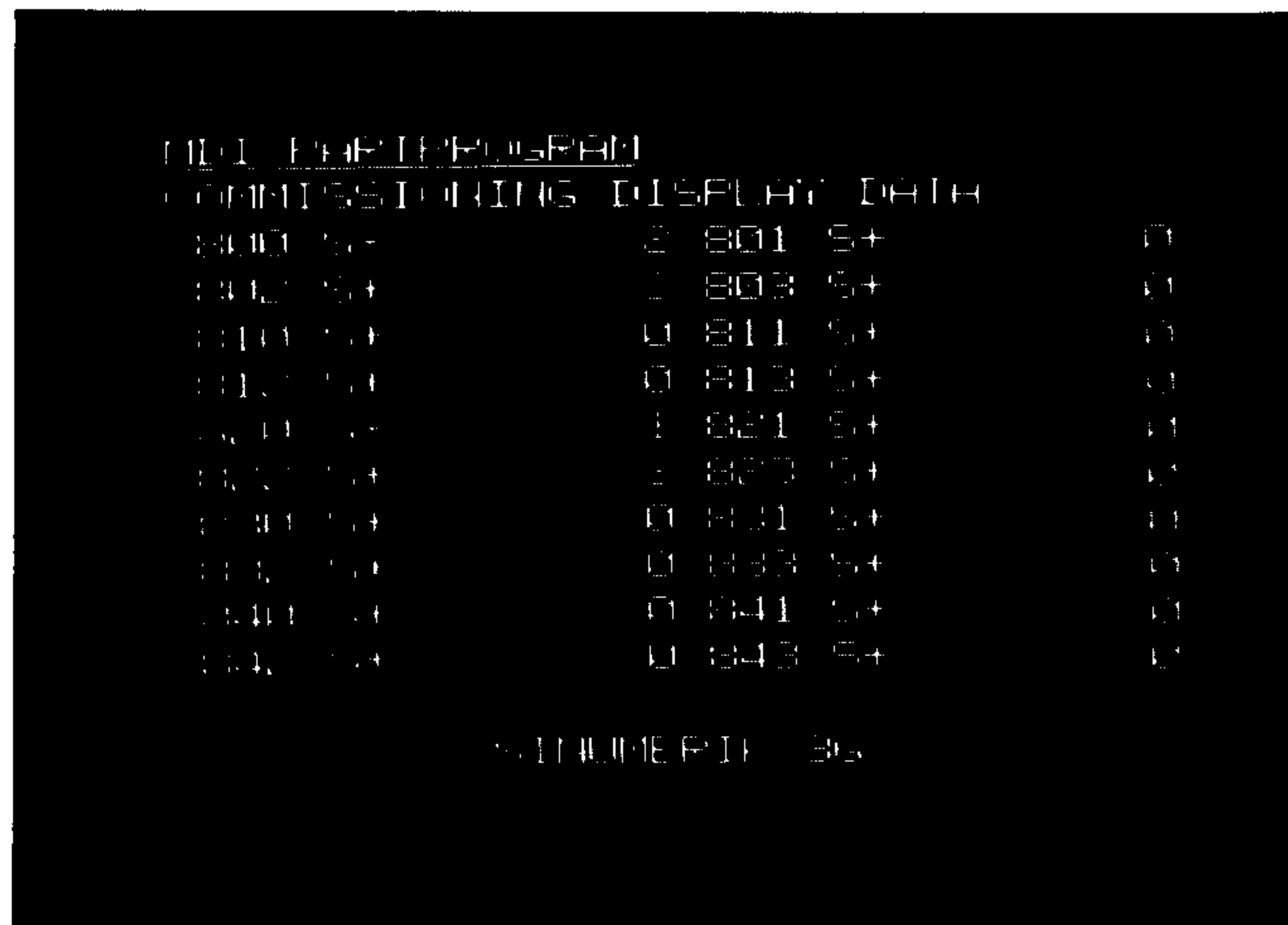
Not all machine data numbers are assigned.

8.3.4 Service Values



Preselect display numbers 800 through 861 using the "Page" and "Cursor" keys (#22, 23, 24, 25)

No input possible.

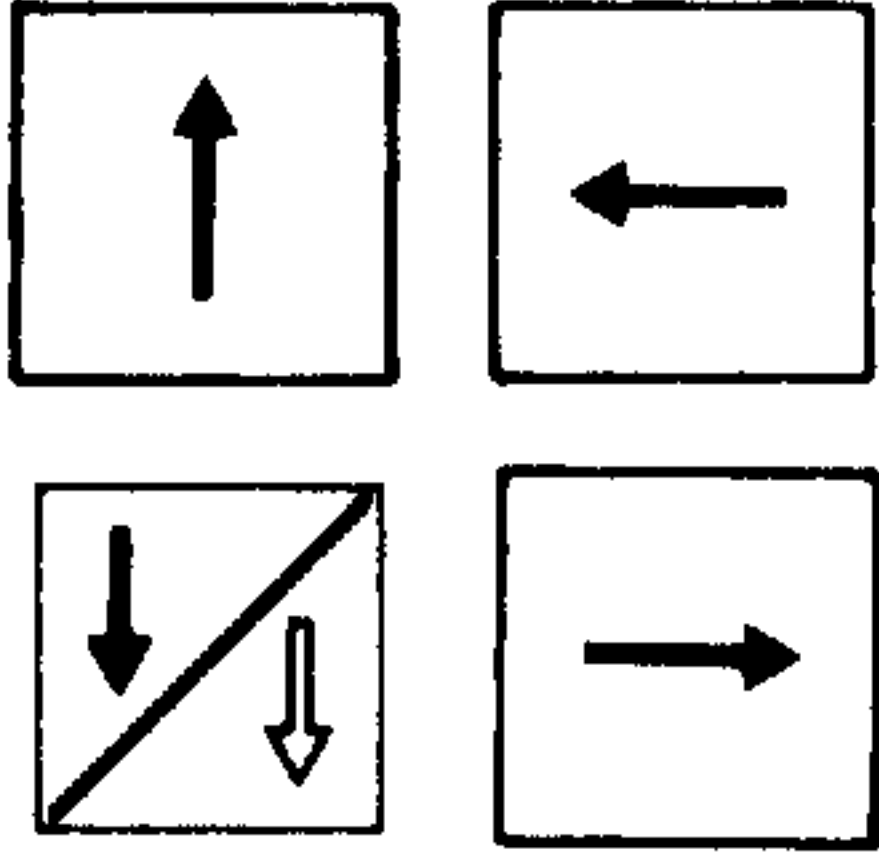


The following values are displayed:

Ident No.	Axis	Display
800 S	1st	Following error
801 S	2nd	Following error
802 S	3rd	Following error
803 S	4th	Following error
810 S	1st	Actual value (measuring system)
811 S	2nd	Actual value (measuring system)
812 S	3rd	Actual value (measuring system)
813 S	4th	Actual value (measuring system)
820 S	1st	Set speed
821 S	2nd	Set speed
822 S	3rd	Set speed
823 S	4th	Set speed
830 S	1st	Actual part value
831 S	2nd	Actual part value
832 S	3rd	Actual part value
833 S	4th	Actual part value
840 S	1st	Contour deviation
841 S	2nd	Contour deviation
842 S	3rd	Contour deviation
843 S	4th	Contour deviation
850 S	1st	Measured KV factor
851 S	2nd	Measured KV factor
852 S	3rd	Measured KV factor
853 S	4th	Measured KV factor
860 S	-	Set speed, spindle 1
861 S	-	Set speed, spindle 2

8.3.5 Setting Drift Compensation

Voltage drift results from temperature changes affecting the analog components of the position control loop. This drift may result in the position control deviating from the setpoint and can be offset by means of drift compensation.



Preselect display numbers 200 through 233 using the "Page" and "Cursor" keys (#22, 23, 24, 25)

```

MDI PARTPROGRAM
AXIAL COMMISSIONING DATA
200 S          201 S
202 S          203 S
210 S+        0 211 S+        0
212 S+        0 213 S+        0
220 S+        2225 221 S+      2225
222 S+        2225 223 S+      2225
230 S-        3 231 S-        8
232 S-        7 233 S+        0
240 S          241 S
242 S          243 S

SINUMERIK 3G
    
```



Edit key (#15)



The drift value is transferred automatically to the display. This setting of drift compensation is not protected by the machine data lock switch. Drift compensation is performed for the axis selected with the cursor.

Display Number Cursor Position	Axis
230	1st
231	2nd
232	3rd
233	4th

9. Automatic Mode

The control calls the program blocks consecutively and executes them. After a block has been executed, the next entered and prepared block is executed.

"Prepare block" signifies the following:

The paths to be traversed in the axes programmed in this block are calculated to include "zero offset", "compensation" and "dressing sum".

The only source of data from this process is the NC-internal program memory.



Automatic mode (selector #31)

Basic display:

```
AUTOMATIC
%  0 N  0 L  0 P      0 N  0
      L  0 P      0 N  0
      L  0 P      0 N  0
      L  0 P      0 N  0

ACTUAL POSITION DIFFERENCE VALUE
X +      .000  X +      .000
Y +      .000  Y +      .000
Z +      .000  Z +      .000
U +      .000  U +      .000
                        SINUMERIK 3G
```

```
AUTOMATIC
%  0 N  0 L  0 P      0 N  0
      L  0 P      0 N  0
      L  0 P      0 N  0
      L  0 P      0 N  0
```

Display of automatic mode and the current program status in all nestings. Display of subroutines with program number indicator and program status indicator (see Section 1.3).

ACTUAL POSITION	DIFFERENCE VALUE
X + .000	X + .000
Y + .000	Y + .000
Z + .000	Z + .000
U + .000	U + .000

SINUMERIK 30

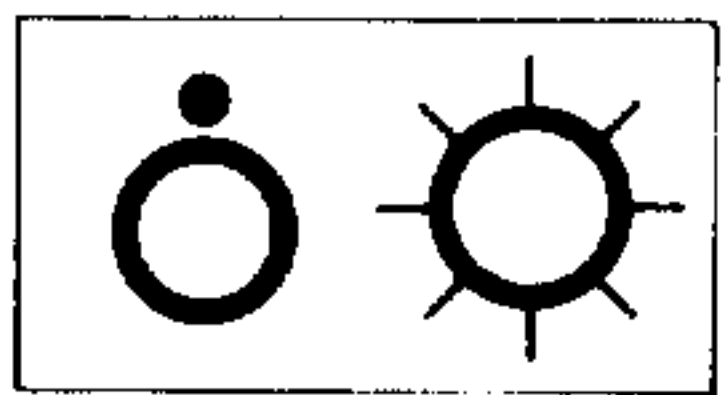
Actual Values (ACTUAL POSITIONS)

The actual values of all axes are displayed (workpiece-related system of coordinates).

Distance to go (DIFF VALUE)

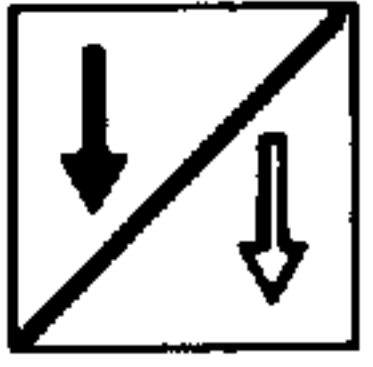
The remaining distance as far as the end point of the block is displayed for all axes.

The programmed feedrate and actual feedrate have the same dimensions.



In Feed Hold (#2), the programmed spindle speed S and programmed auxiliary functions M can be transferred (see Section 5.5).

A program must be selected before it can be processed. Then the program number pointer is set to the desired value.



Select display 2

```

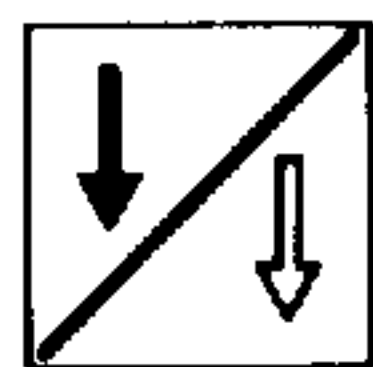
AUTOMATIC
G-FUNCTIONS:
G00      G05      G21

G40
G54
G60
G61

G71
G1180 G1280 G1380 G1480
G90      G94      G97
          SINUMERIK 3G

```

Display of all current G functions



Select display 3

```

AUTOMATIC

ACT.-FCT.:M      M      M
              H
SET-VALUE      ACT.-VALUE
F              F
F1             F1
F2             F2
F3             F3
F4             F4
S1             S1
S2
          SINUMERIK 3G

```

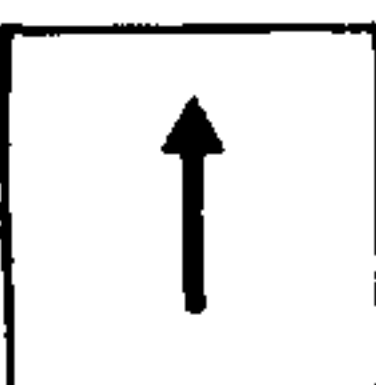
M Programmed miscellaneous functions (3 max.)
H Programmed auxiliary functions
S1, S2 Programmed spindle speed

Actual value
and setpoint

F, F1..F4 Programmed feedrate
 (Dimension: "R" = per revolution)
 (Dimension: "M" = per minute)

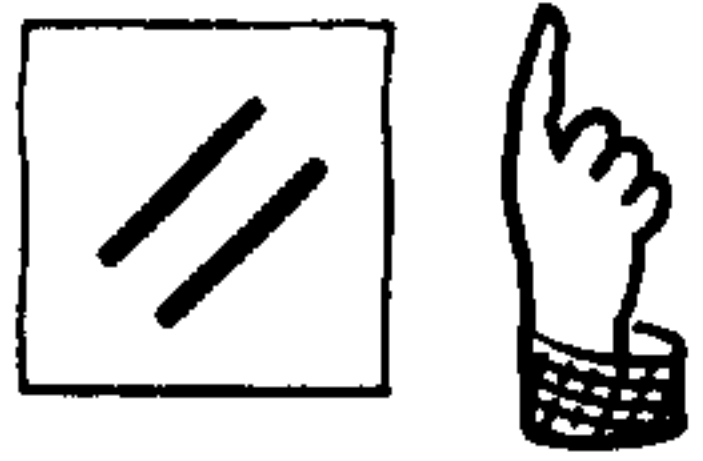


Show display 2



Show basic display

Operational Sequence



If not in reset state



Automatic mode (selector #31)



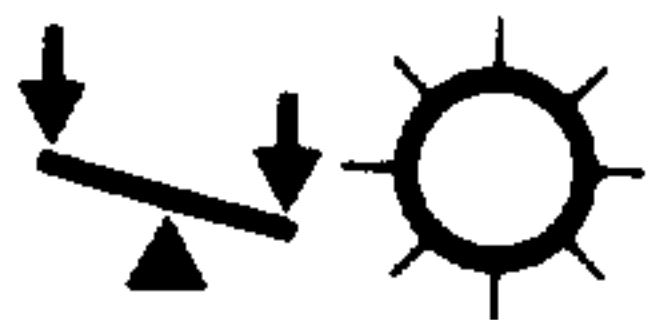
Input program number



Program starts when "Cycle Start" key (#44) is actuated



"Program running" lamp lights up (#1)



During processing the lamp indicating "Position not yet reached" (#3) remains bright as long as the machine axes are in motion.

9.1 Automatic Sub-Modes

Displays

The sub-modes are displayed in line 16.

HOLD:AUTO INTEFF

Automatic mode interrupted

HOLD:SINGLEBLOCK

Single block processed

HOLD:INTERF M00

Programmed program interruption M00



The next block is input, prepared and started by depressing the "Cycle Start" key (#44)

HOLD:NO DATAFRM

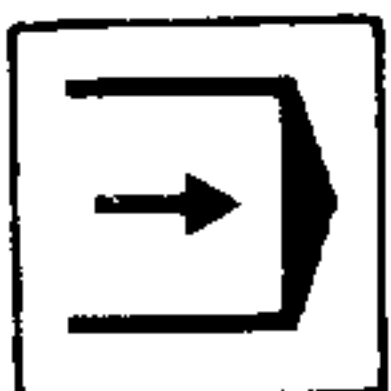
Input not enabled

HOLD:DWELL TIME

Dwell time active

Operation Sub-Modes

Single (#40)



Each time the "Cycle" key is depressed, a single block is called, prepared and processed.



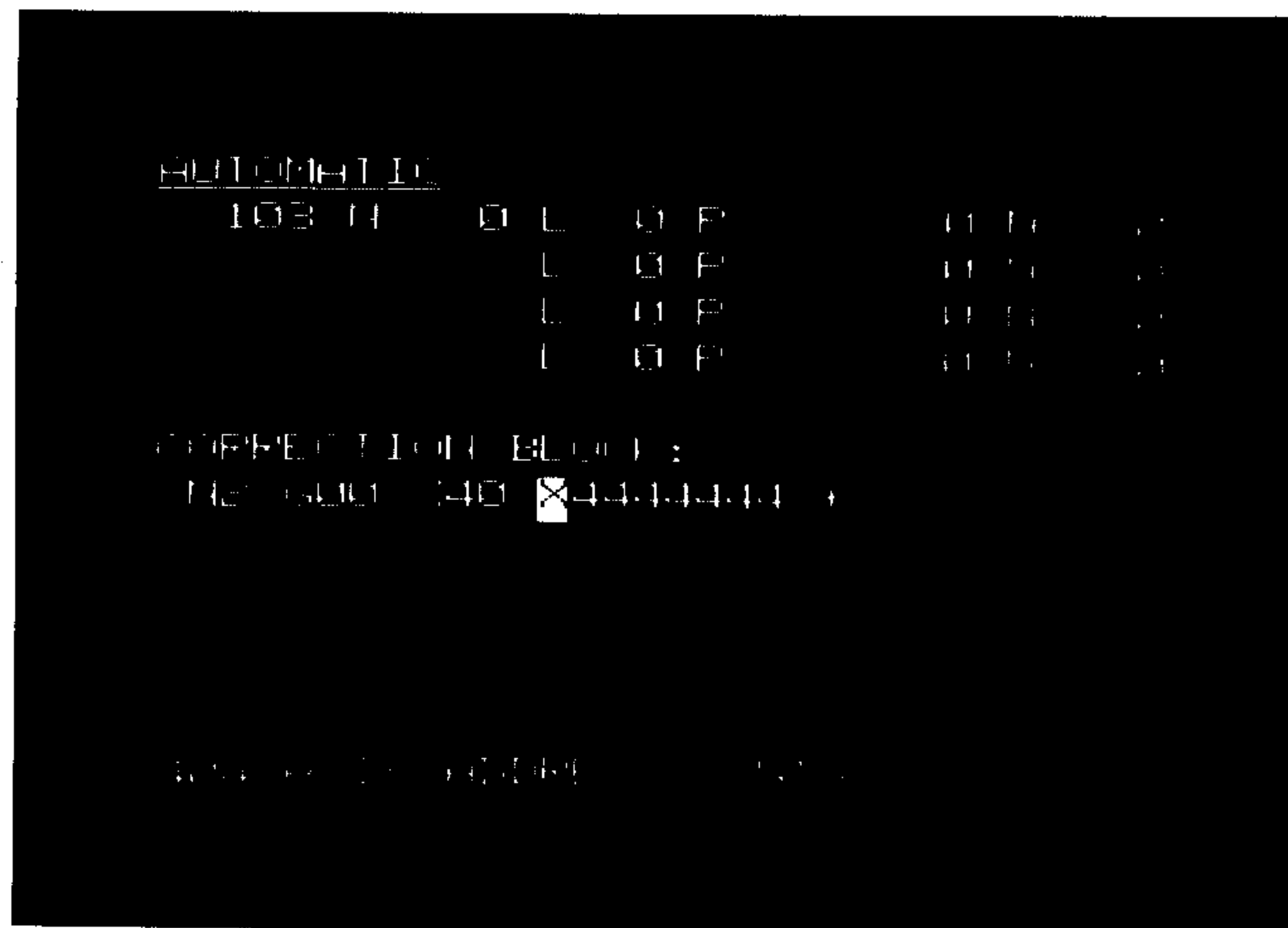
1
0

9.2 Display of Correction Block

Display of last program block to have been decoded.



Select part program (#9)



Display of current program status in all nestings. Display of subroutines with program number indicator and program status indicator. No input possible.

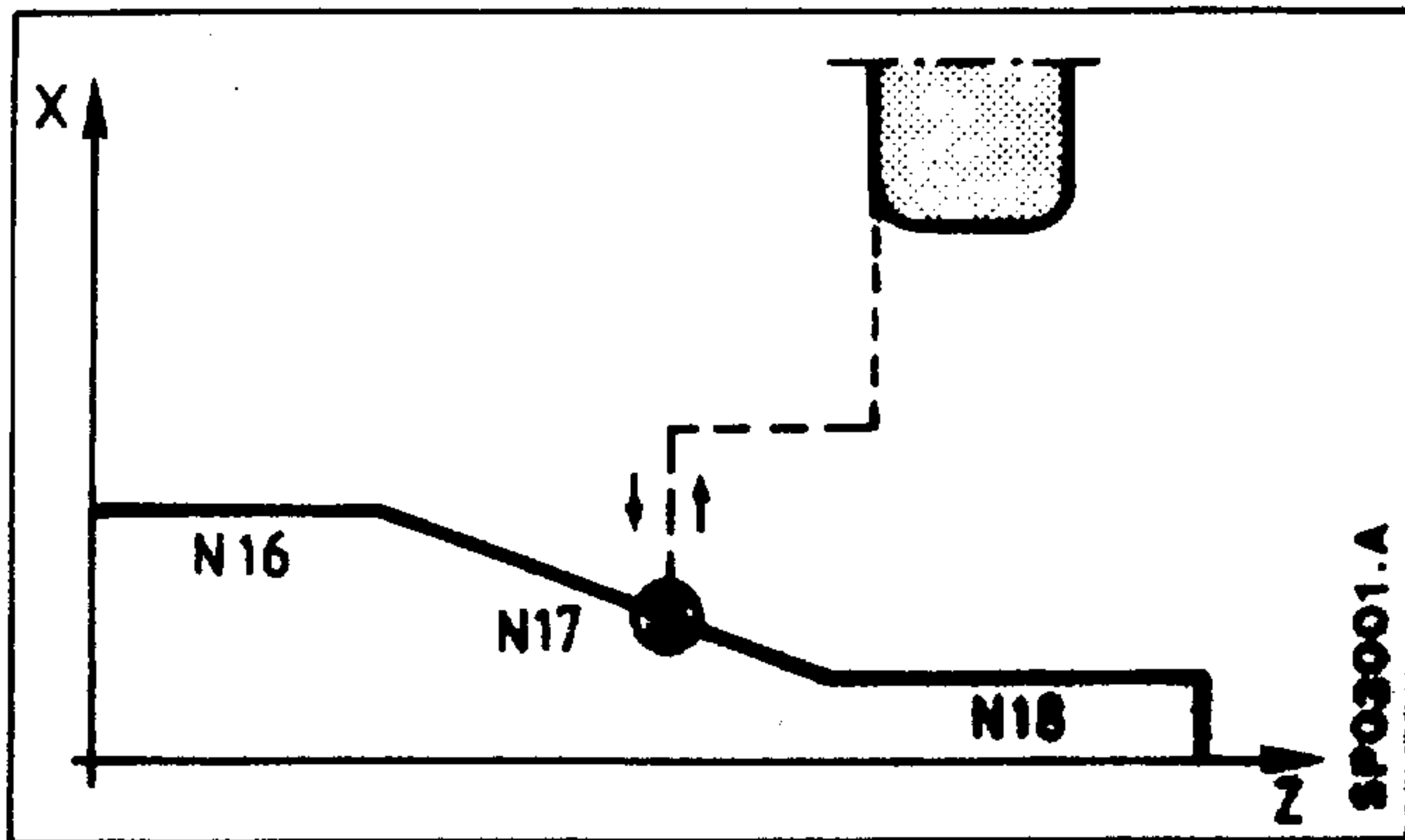
Correction Block

The block found to be incorrect as a result of decoding is shown in inverse video. It can be corrected in MDI Part Program mode (see Section 7). Program reset is required before the program can be started again.

9.3 Continuation of Automatic Mode After Program Interruption

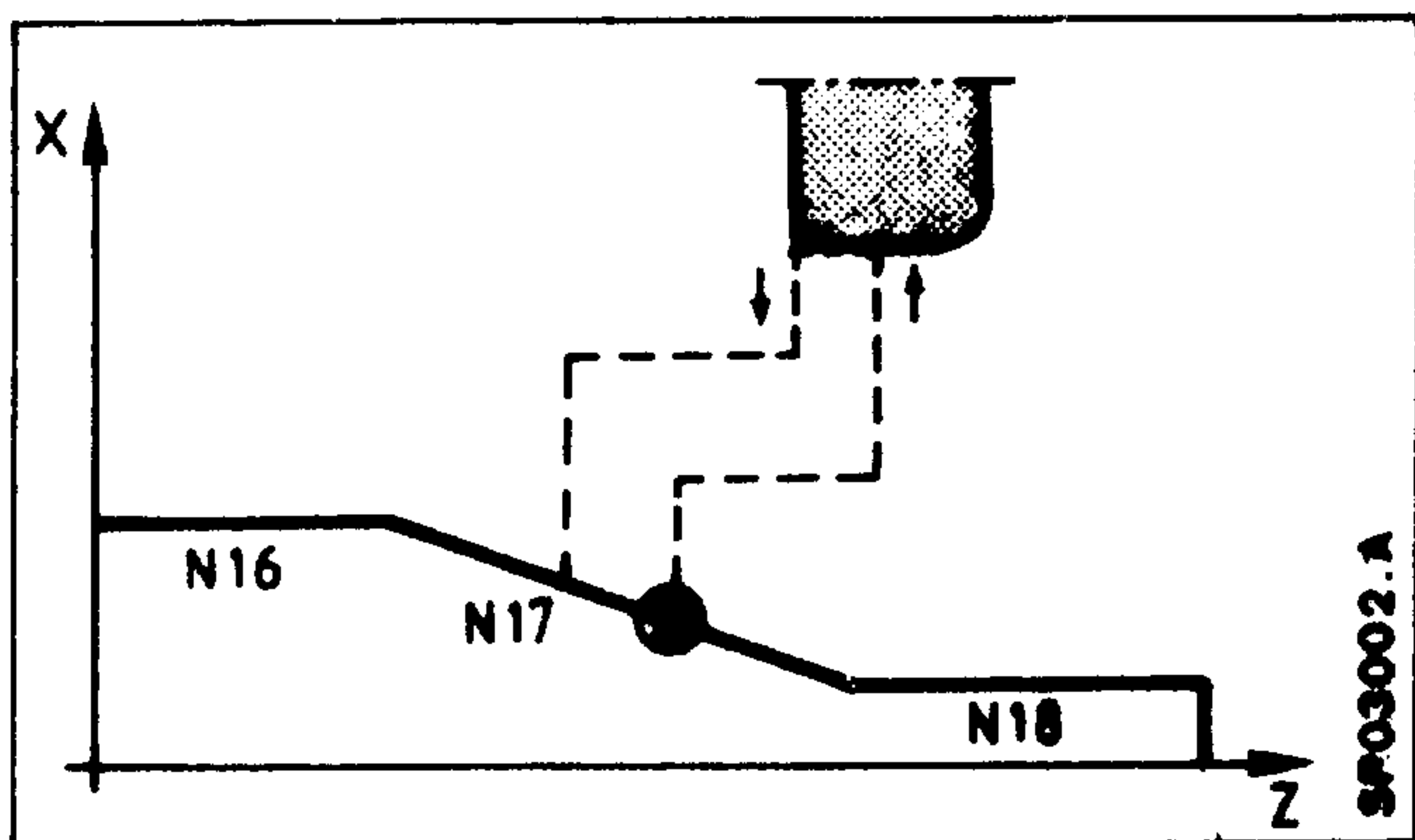
There are five possibilities for returning to automatic mode after a program has been interrupted.

a) Retracting for Grinding Wheel Inspection



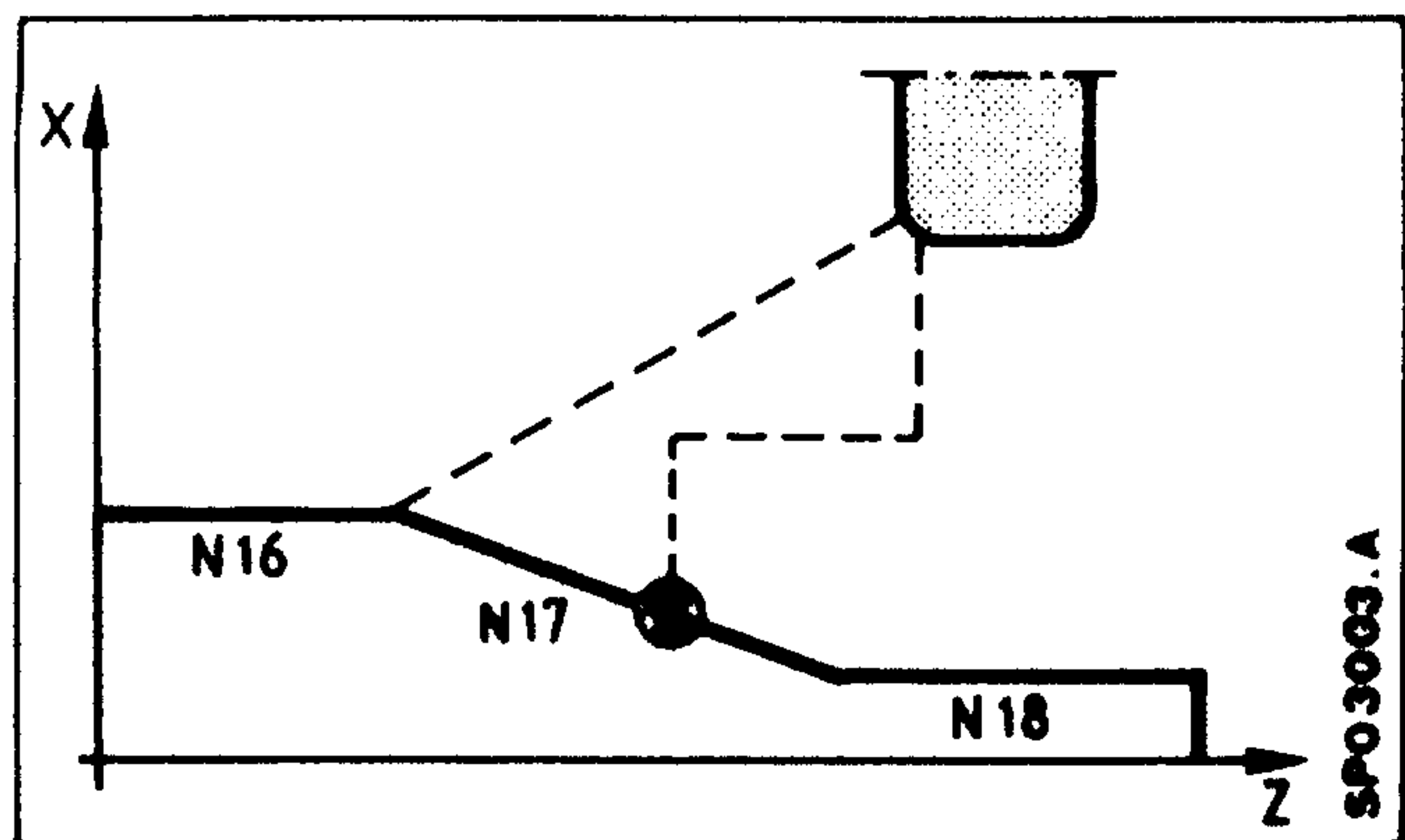
Incremental feed is used to return the grinding wheel to the point of interruption. Any compensation remains unchanged.

b) Scratch Method



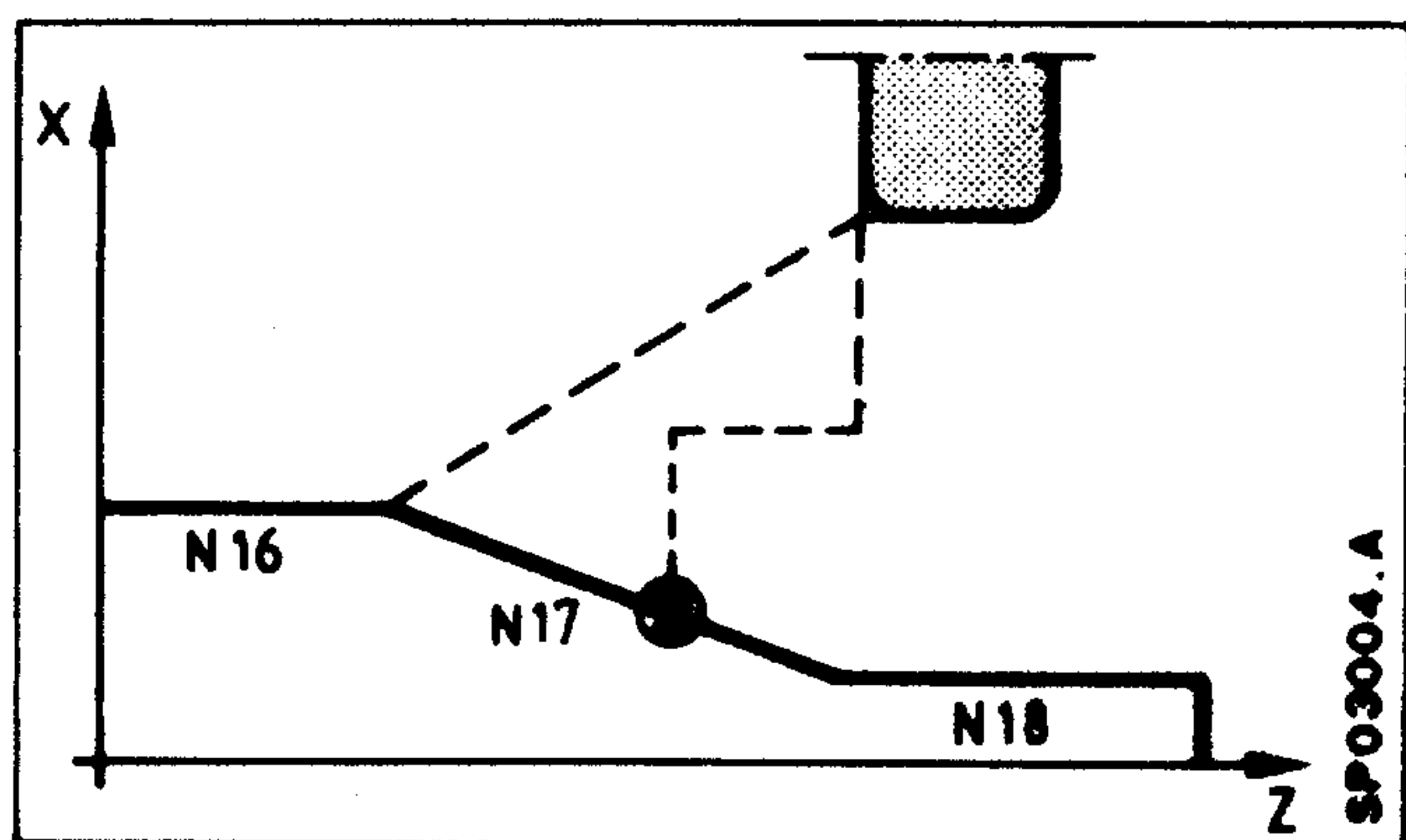
Manual scratching within the interrupted block. Grinding wheel radius compensation remains unchanged. Other compensation values may vary.

c) Search for Interrupted Block in Main Program



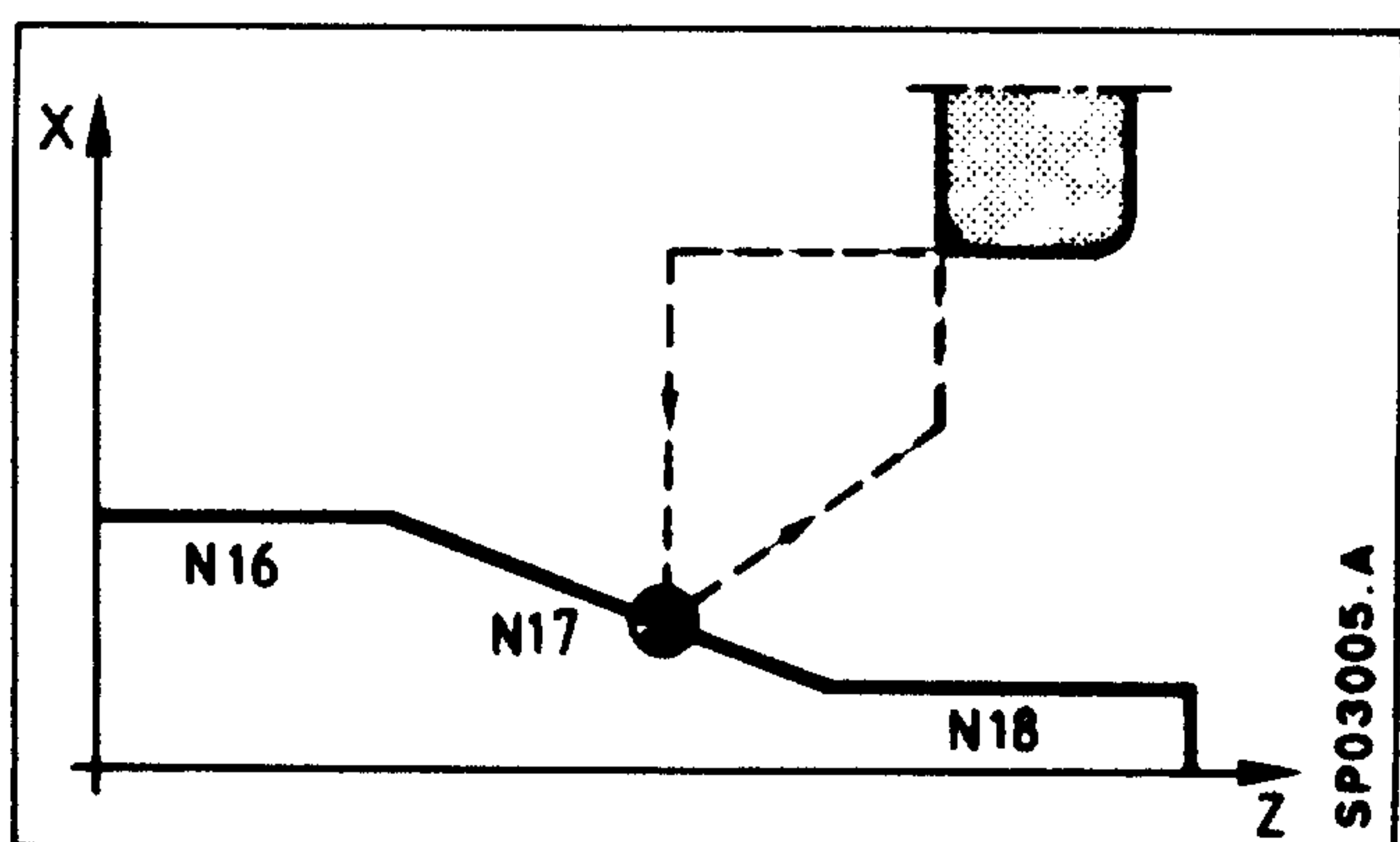
The control automatically moves the grinding wheel with linear interpolation to the starting point of the interrupted block in the main program. Compensation values may vary.

d) Search for Random Block in Main Program



The control automatically moves the grinding wheel with linear interpolation to the end point of a preselected block. (In this example block N16.) Compensation values may vary.

e) Program Interruption Initiated by External Subroutine Call



The position at which program interruption occurs is recorded in the subroutine. This position is programmed last in the subroutine.

9.4 Program Interruption Initiated by Setting Up Operation

9.4.1 Retracting for Grinding Wheel Inspection

Automatic (AUT) mode may be interrupted as a result of setting up (JOG, INC).

Display in line 16 of CRT monitor:

HOLD: AUTO INTERR

Interruption of
automatic mode

The program number indicator and program status indicator are not changed.

The grinding wheel is withdrawn from the contour in increments to inspect the grinding wheel or to measure the workpiece and is then moved back to the interrupt position.

If the axes are to be moved in JOG mode, the operator must note the interrupt positions.

After returning to automatic mode, machining is continued with "Cycle Start".

Other interruptions result in alarm 511.

If the axes are moved with JOG or INC and are not returned to the interrupt position, the absolute block end point is approached in the programmed axes after "Cycle Start" has been activated.

Non-programmed axes may only be corrected once they have been programmed.

This also applies to the end of a single block.

Grinding wheel radius compensation must not be changed.

9.4.2 Scratch Method

Automatic (AUT) mode may be interrupted as a result of setting up (JOG, INC).

HOLD: AUTO INTERR

Interruption of
automatic mode

The grinding wheel is withdrawn from the contour (e.g. to modify the compensation values) incrementally or in JOG mode. After entering the new compensation values (grinding wheel radius compensation unchanged), the grinding wheel is returned to any point on the contour within the interrupted block.

After returning to automatic mode, machining is continued with "Cycle Start".

Other interruptions result in alarm 511.

If the axes are not returned to the interrupt position, the absolute block end point is approached in the programmed axes after "Cycle Start" has been activated. Non-programmed axes may only be corrected once they have been programmed.

This also applies to the end of a single block.

9.5 Block Search in Automatic Mode

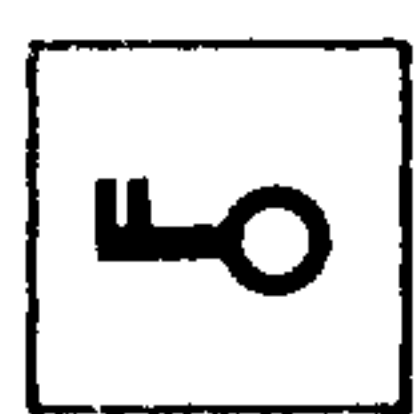
Block search is possible in the main program.

9.5.1 Search for Interrupted Block

After automatic mode has been interrupted, the grinding wheel can be positioned automatically to the start of the interrupted block by means of the "search for interrupted block" function. This function is particularly helpful in cases where the contour of the interrupted block is not perfectly visible to the operator. In such cases, the SINUMERIK 3G automatically moves the grinding wheel with linear interpolation to the starting point of the interrupted block.

In block search the control only considers blocks in the main program. Subroutine calls are ignored since the dressing sums would be changed, for instance, without the grinding wheel being dressed. Consequently block search is only possible in the main program.

Operational Sequence with Operator Prompting



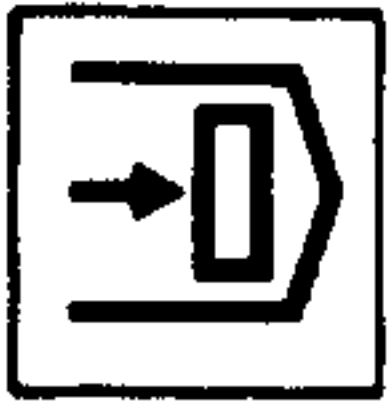
Key-operated switch (#38) enabled if input interlocked with key-operated switch (machine datum)



"Reset" key (#12) if control not in reset state



Select automatic mode (selector #31)



Search key (#39)

```
AUTOMATIC  
SEQUENCE NUMBER SEARCH !  
  
103 N 0  
  
SEQUENCE NUMBER CORRECT
```

The latest program status is displayed here; the program status indicator (block number) shows the last completely processed block.

Line 15 displays the text for operator prompting.



Block search for displayed program status.
The program is continued from the start of the interrupted block.

```
103 N 0
```

Displayed during block search.
The control calculates the contour as far as the displayed program block without axis movement.

```
103 N 0
```

Displayed after block search.
It indicates that the "Cycle Start" key (#44) should be activated.



"Cycle Start" initiates automatic motion to the start of the interrupted block in the main program (displayed program status); the program is then continued.

The "automatic" basic display appears again.

Depending on the machine datum, switching and auxiliary functions (M,S,H) are disabled, output, or collectively output with "Cycle Start" (#44) during block search (last M, S, H word).

Missing switching and auxiliary functions may be transferred after "Cycle Start" with Feed Hold (M and S).

9.5.2 Search for Random Block

This function allows a program to start at an arbitrary point in a main program.

During the search all calculations are executed (grinding wheel dimensions, zero offsets, parameter computations, grinding wheel radius compensations, dressing sums, offsets).

The control automatically moves the grinding wheel to the end point of the preselected block.

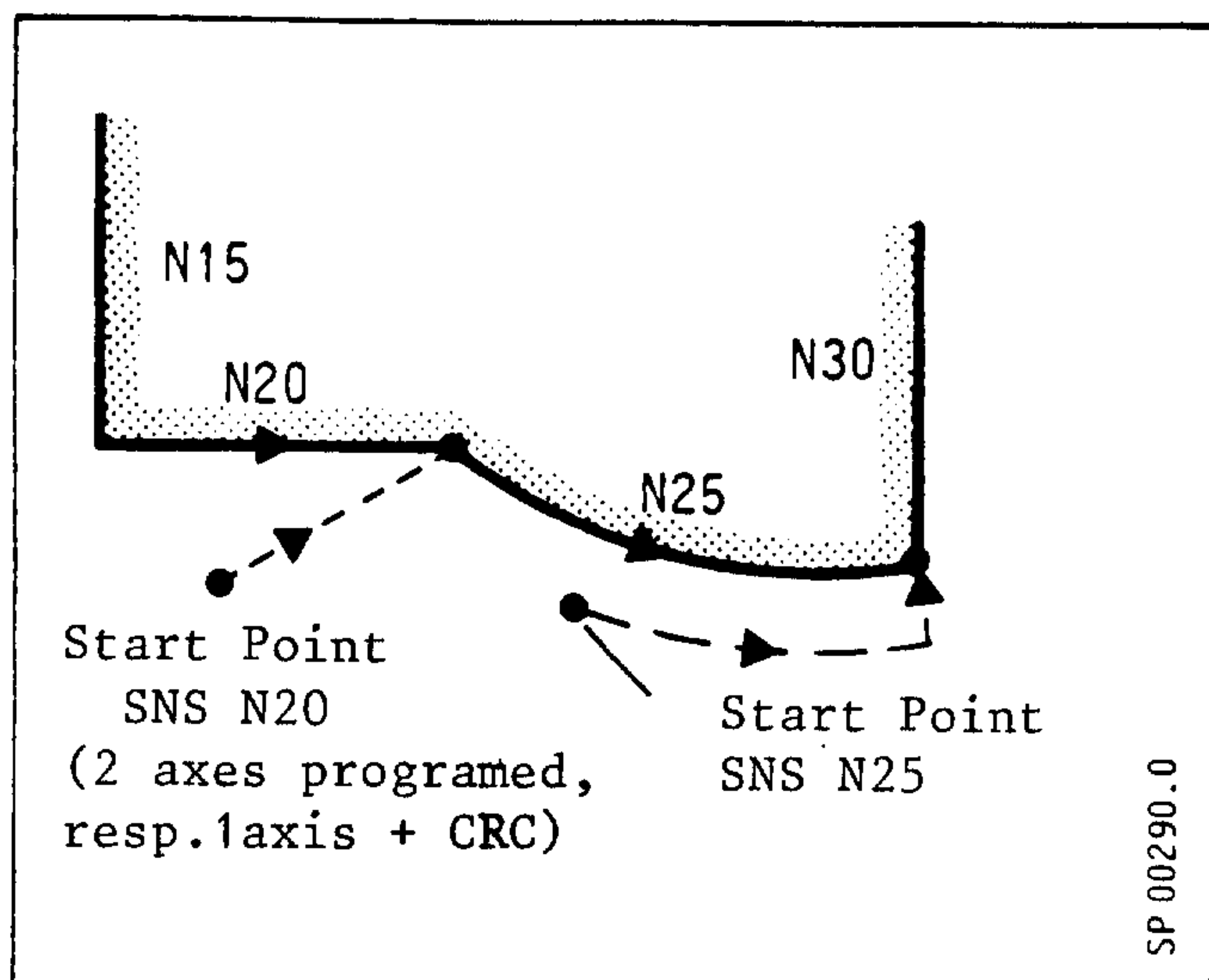
Depending on the type of part program generation, two operational sequences are possible for block search:

1. Initial positional data for all axes programmed with G90 (control thus knows position of workpiece zero point)

If the preselected block contains:

- 1) positional data and if grinding wheel radius compensation is active, or
- 2) positional data,

the grinding wheel should be moved near the contour in setting up mode in the direction of machining ahead of the end of the preselected block.



If the preselected block contains:

- 1) positional data,

the grinding wheel should be positioned in setting up mode on the contour in the direction of machining ahead of the end of the preselected block

If the preselected block contains:

- no, or

- 1) positional data with no grinding wheel radius compensation,

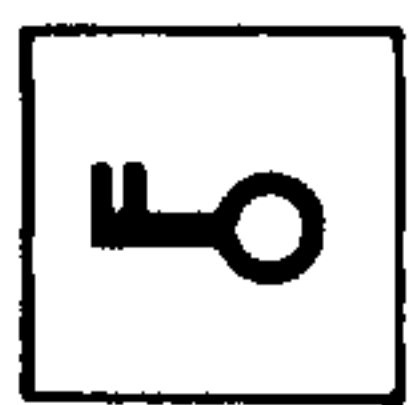
the axes are positioned as soon as they have been programmed in subsequent blocks.

2. Positional data for all axes are programmed with G91 (control does not therefore know position of workpiece zero point)

Before block search, all programmed axes must be in the position corresponding to the start point of the program.

After block search, continue as described in 1.

Operational Sequence with Operator Prompting



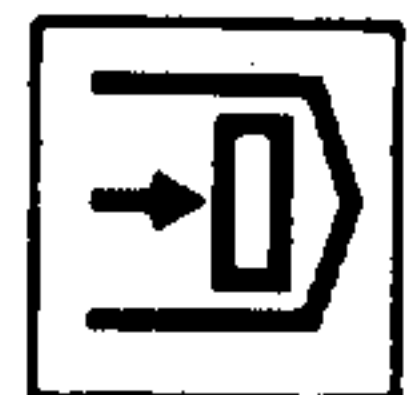
Key-operated switch (#38) enabled if input interlocked with key-operated switch (machine datum).



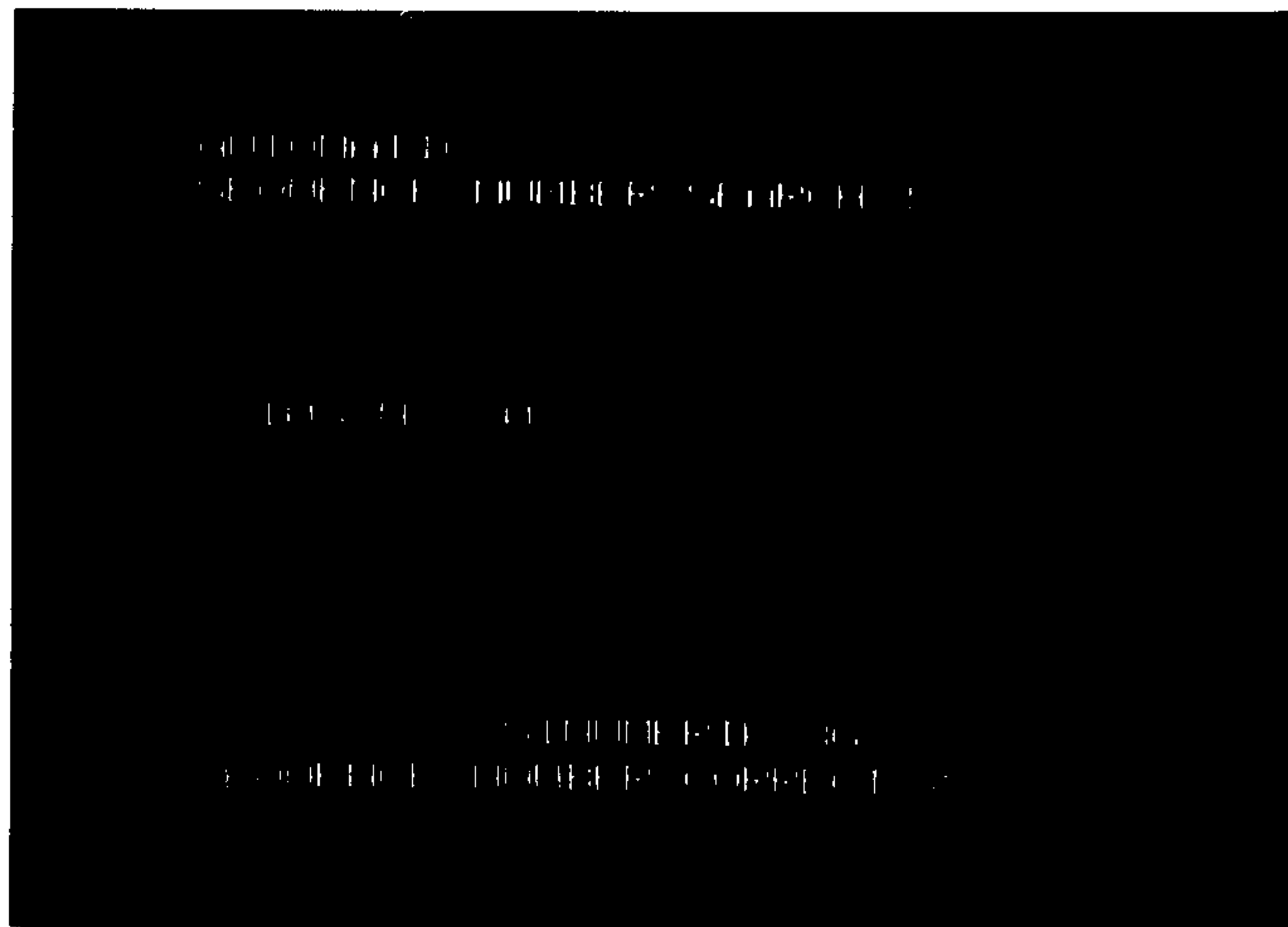
"Reset" key (#12) if control not in reset state



Select automatic mode (selector #31)



"Search" key (#39)



The latest program status is displayed here; the program status indicator (block number) shows the last completely processed block.

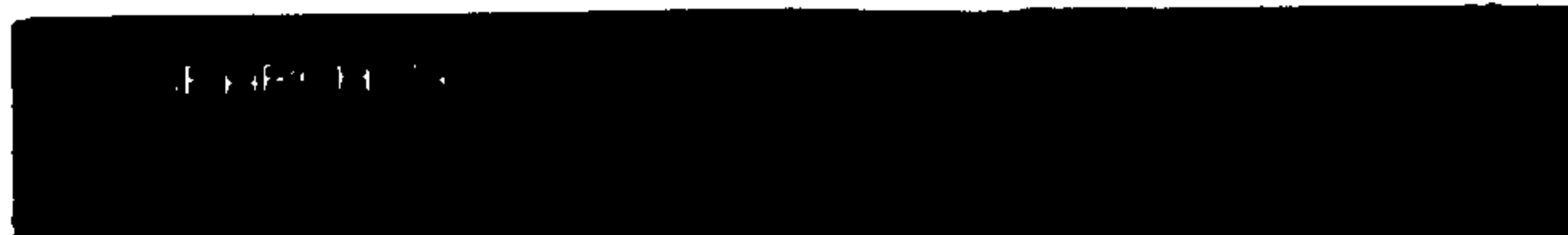
Line 15 displays the text for operator prompting.



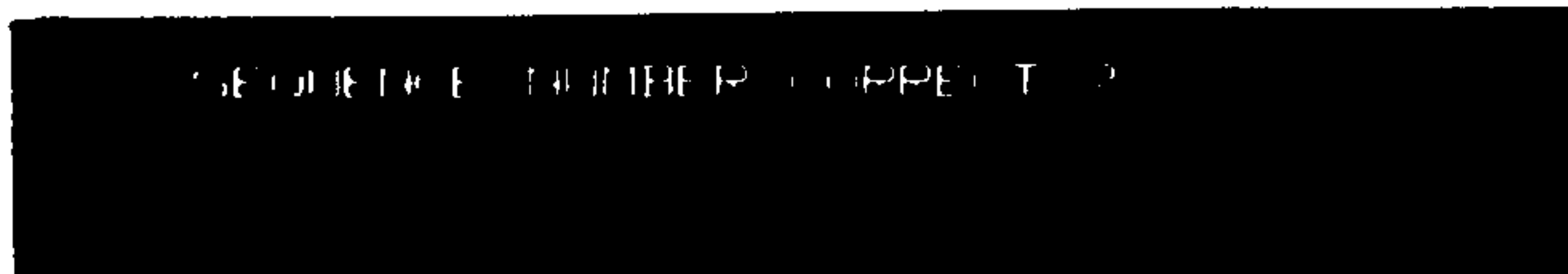
Search for block other than block displayed.

Line 15:

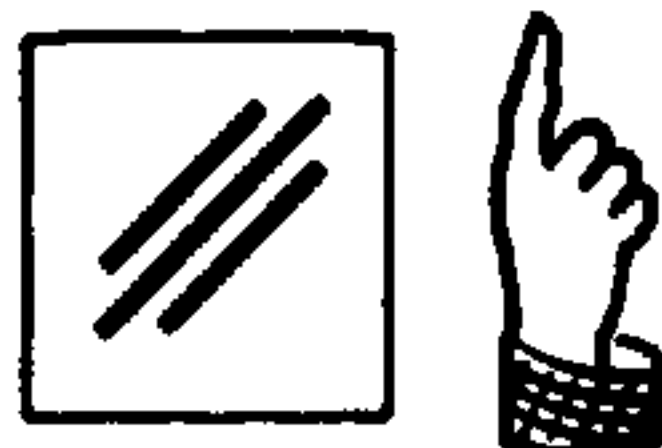
Operator prompting for input of block search destination (e.g. N5, L1101, N10, selected main program 100).



Input of block number



Block search for displayed program status.
For continuation of operation, see
"Search for interrupted block" (Section 9.5.1)



Terminating input of search destination
(no block search in subroutine)



9.6 Program Interruption Initiated by External Subroutine Call

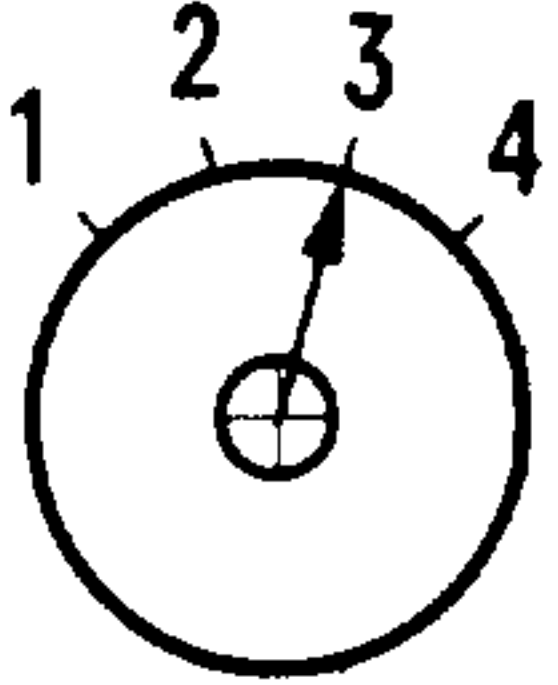
The automatic program may be interrupted by a subroutine via the NC-PLC interface.

The interrupt positions for the individual axes must first be saved in this subroutine (read actual values in R parameters). The interrupt positions must be reprogrammed before M17. This ensures that the interrupted automatic program is continued at the correct point. Work in the interrupted program is resumed automatically without having to reactivate "Cycle Start".

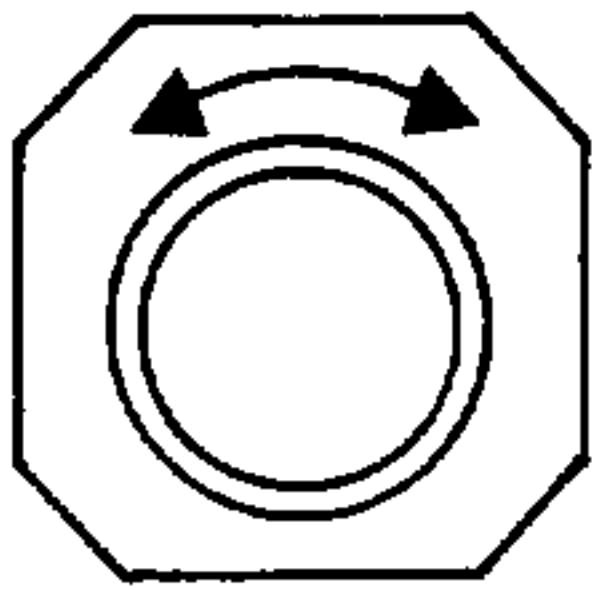
9.7 Zero Offset via Manual Pulse Encoder (Handwheel)

This function may be used for machining operations requiring incremental offset during normal automatic operation which cannot be achieved via the dressing sum, compensation value or zero offset or which must be varied by the operator at the same time as normal operation (Differential Resolver Function, DRF).

DRF does not restrict the reference point approach function. The hand wheel is used for the DRF function.



After the handwheel input has been set (interface), the handwheel and axis selector only become DRF controls in automatic mode.



During setting up operation the handwheel acts as a setting up component and is independent of the handwheel input.

The travel entered via the handwheel is stored in a separate offset memory in this function.

In this case the incremental resolution of the handwheel is identical with the smallest input resolution.

The offset can only be returned by the operator. It is cancelled in the case of "Power ON", "Approach to reference point" or "Emergency Stop".

Displaying Offset



Select display of DRF offset

DRF offset cannot be modified as a result of data input.

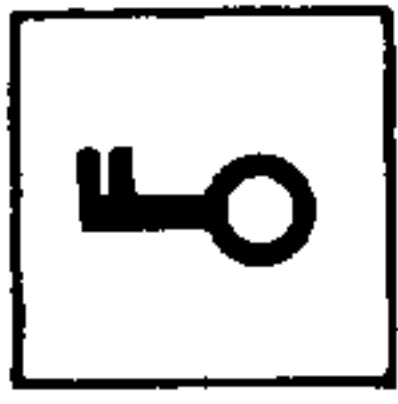
```
AUTOMATIC
103 N  O L  O P      O N  O
        L  O P      O N  O
        L  O P      O N  O
        L  O P      O N  O

DRF-VALUE
+      .000
+      .000
[ +    .000
] +    .000
      SINUMERIK 35
```

The DRF compensation values are also stored in R parameters R309 to R312. These parameters can be written and read in the NC program. This means that the DRF compensation need no longer be cancelled.

9.8 Program Test

9.8.1 Dry Run



Enable key-operated switch (#35) if necessary, depending on machine datum

Dry (#42)



Dry run feedrate results in the following in automatic mode:



- Programmed feedrates are suppressed by control. Dry run feedrate in mm/min (TE 375) is active.
- Rapid traverse remains unchanged and active. Feed and rapid traverse override switches are active.
- For thread and feedrate per revolution, control also switches over to stored dry run feedrate.

9.8.2 Syntax Test

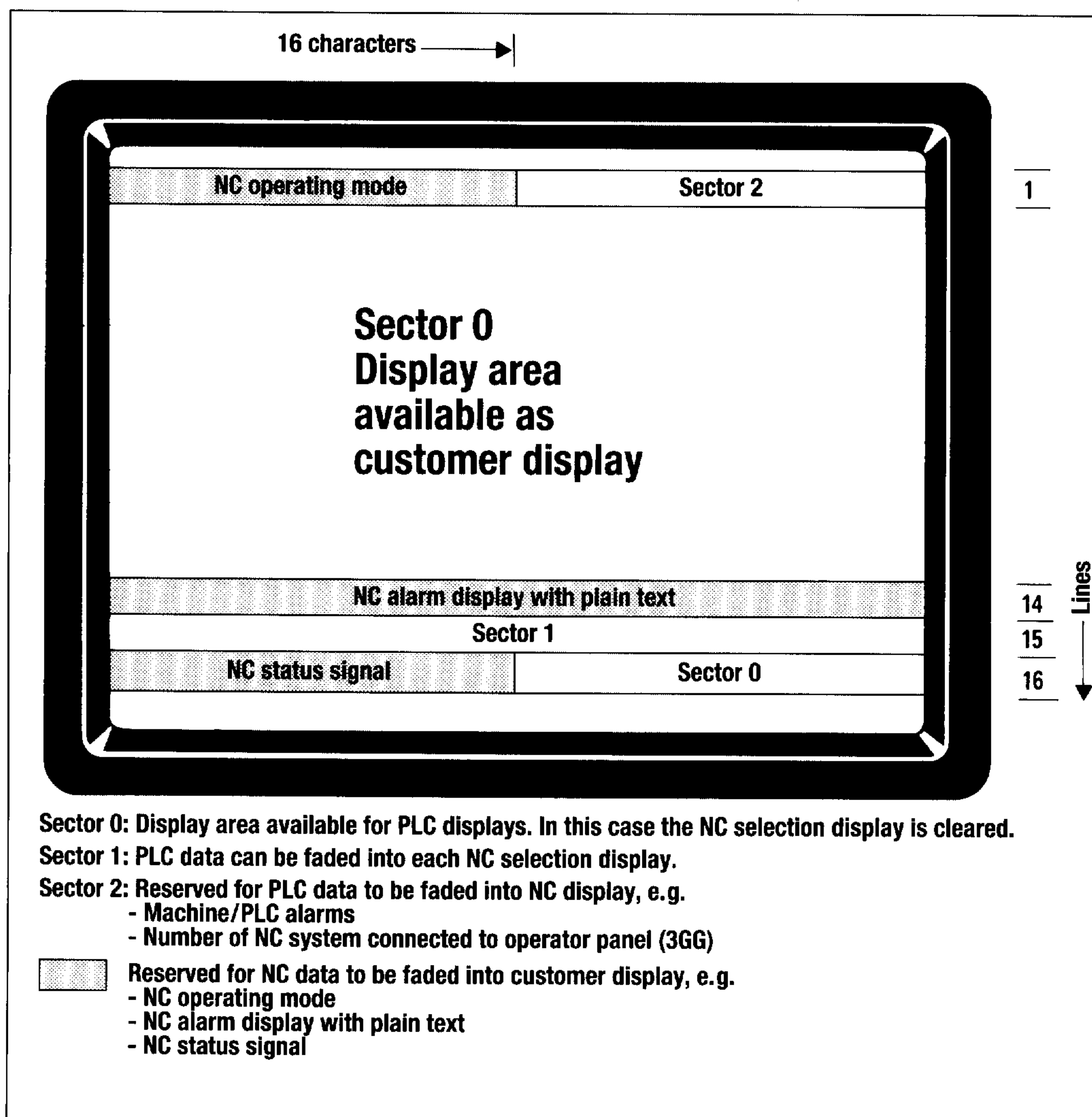
In automatic mode, the block search function can be used to check whether a main program complies with the program format. The search indicator is set to the end of the part program. If an alarm occurs, the number of the last correct block is displayed.

9.9 Influencing Automatic Mode Data via Interface Control

NC-internal program processing may be modified by signals from the interface control, e.g. cancelling distance to go through sensor signals (see Interface Description).

9.10 Special PLC Displays

The CRT of the SINUMERIK 3G can be used to show customized displays (customer display) in all operating modes. The structure and contents of the displays are specified by the machine manufacturer.



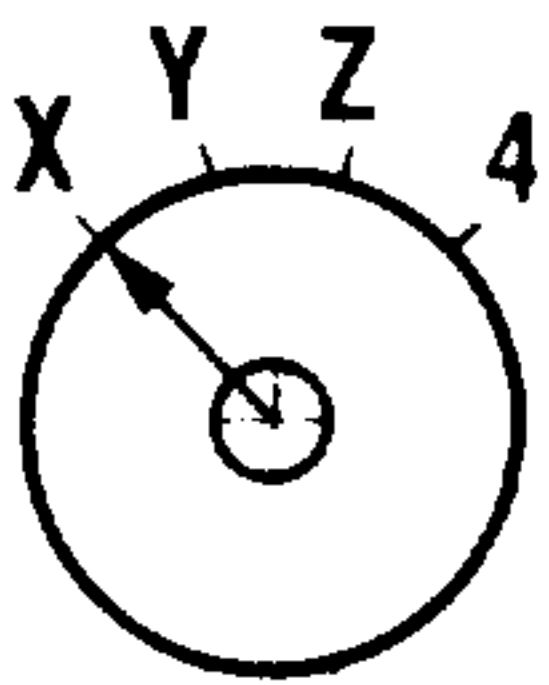
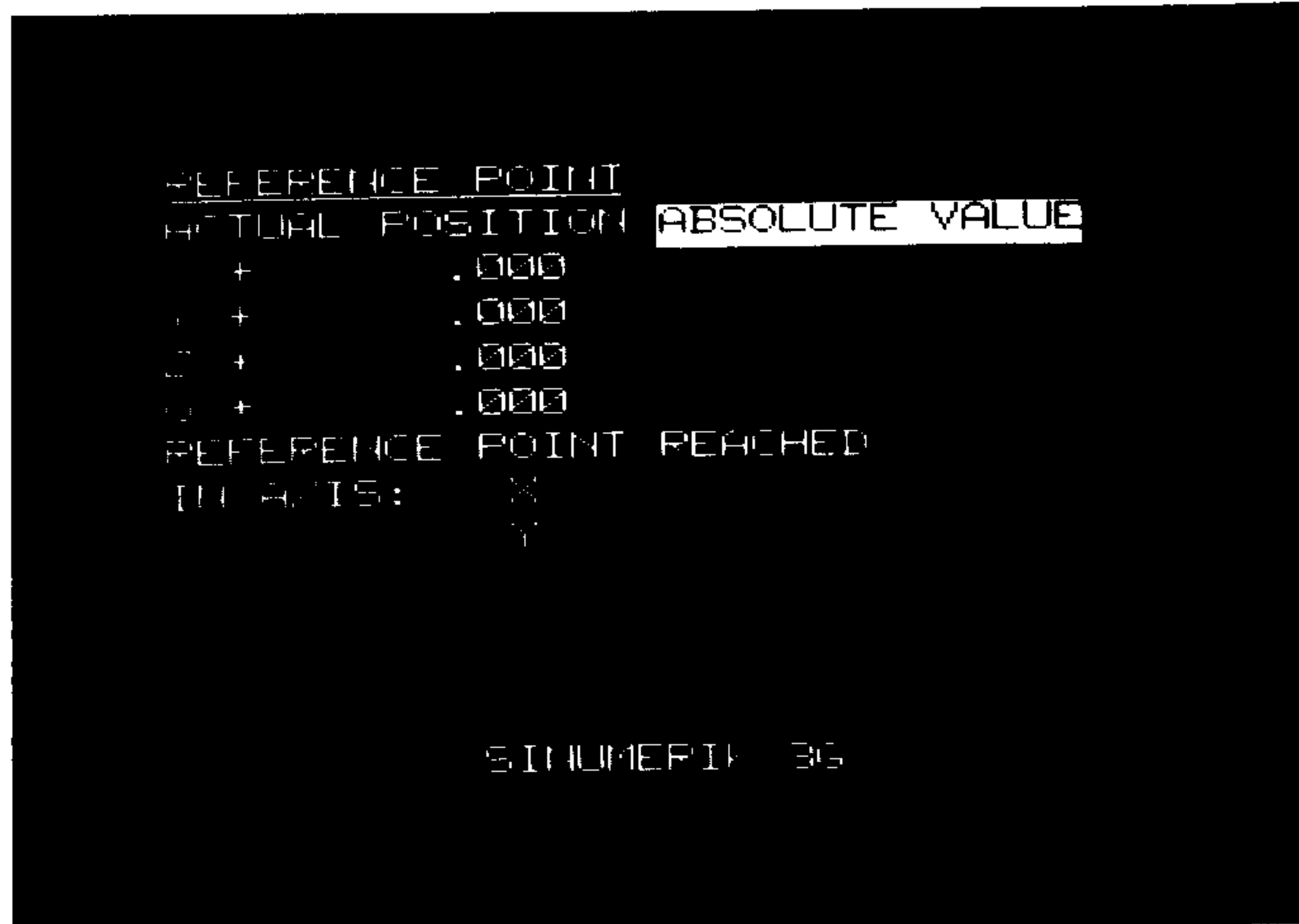
10. Reference Point Approach

A reference point is specified for each machine axis and serves as the fixed starting point for the programs.

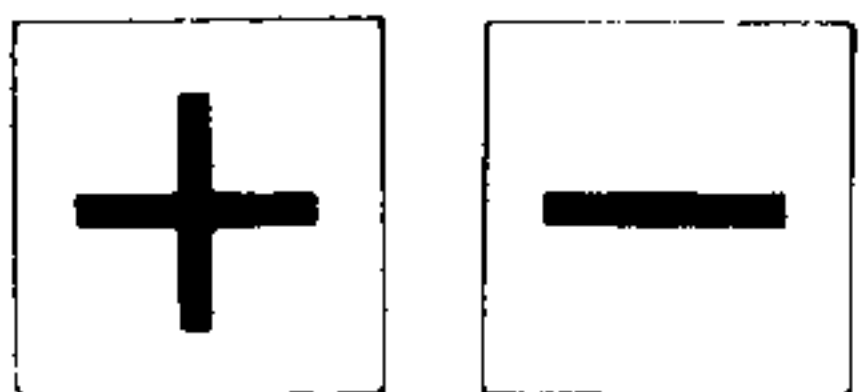
This establishes a reference between the measuring system and the machine which makes it possible for the control, and hence the measuring system and machine to be resynchronized at any time, even after the power has been turned off.



Reference point approach mode (selector #31)



Preselection of axis with axis selector (#47)



The reference point is approached after the appropriate direction key (#34) has been depressed (latching direction).

The names of the axes that have approached the reference point are displayed.

The approach direction selected is checked by the control (wrong direction means that the operation is not accepted, i.e. there is no motion).

The reference point must be approached sequentially in all axes.

When the reference point is reached the actual value memory is set for the axis concerned to the value entered in the machine data as reference point coordinate.

Feed Hold is active, as too is the feedrate/rapid override switch when the "rapid traverse override active" switch (#43) is activated.

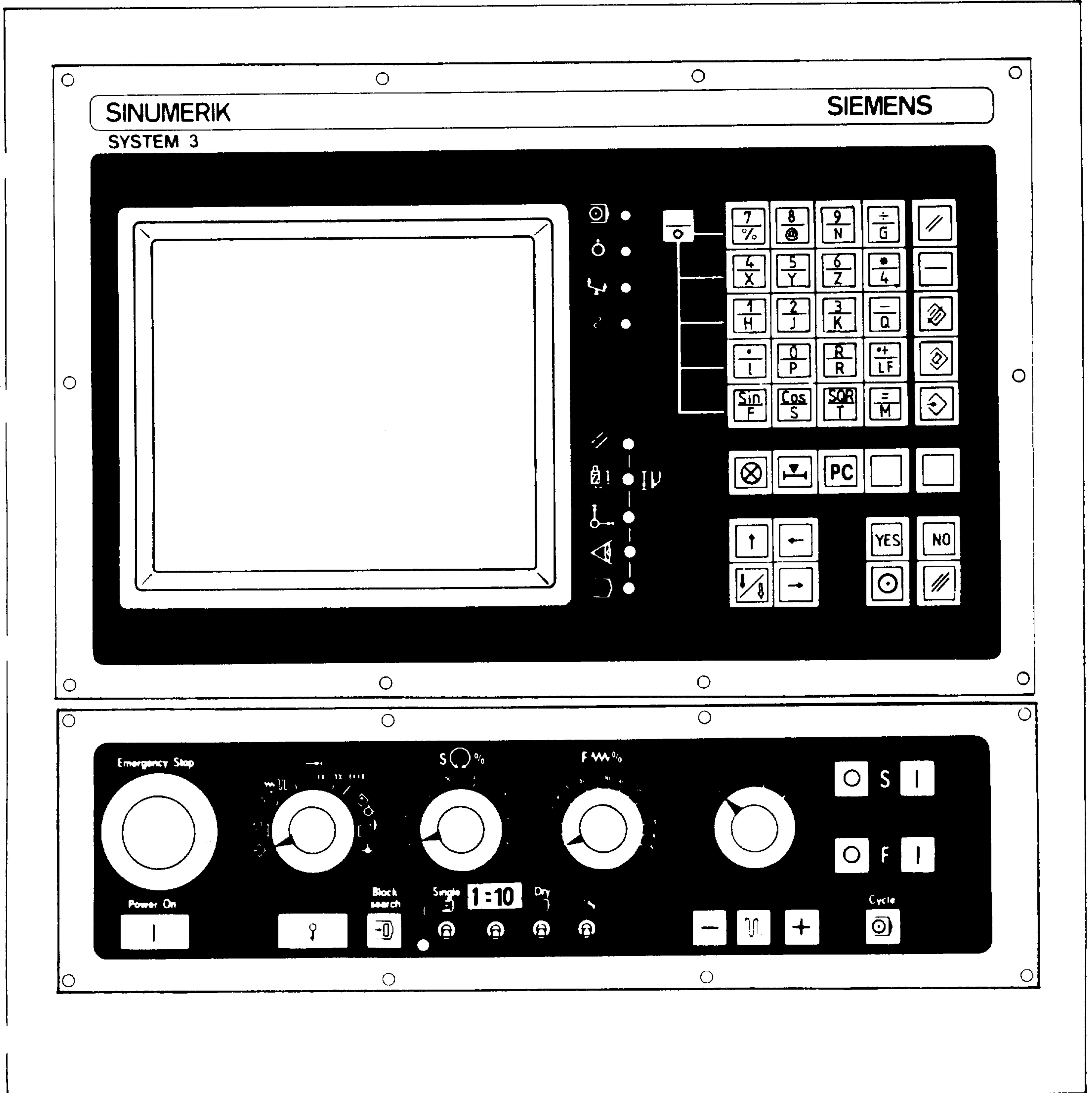
The reference point approach speed is specified via machine data during commissioning.

11. Appendix

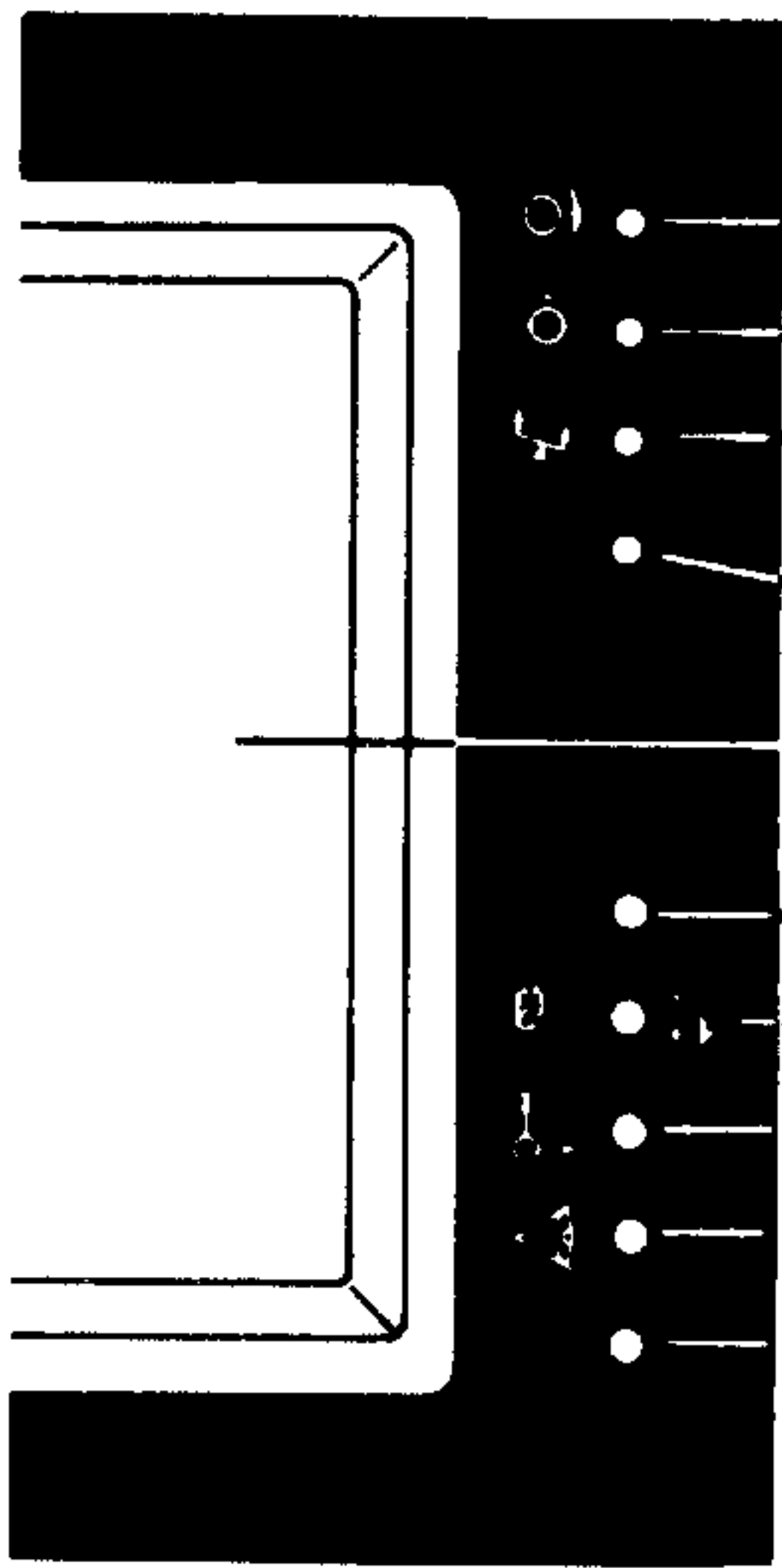
=====

11.1 Operator Panel and Machine Control Panel

3G Operator Panel

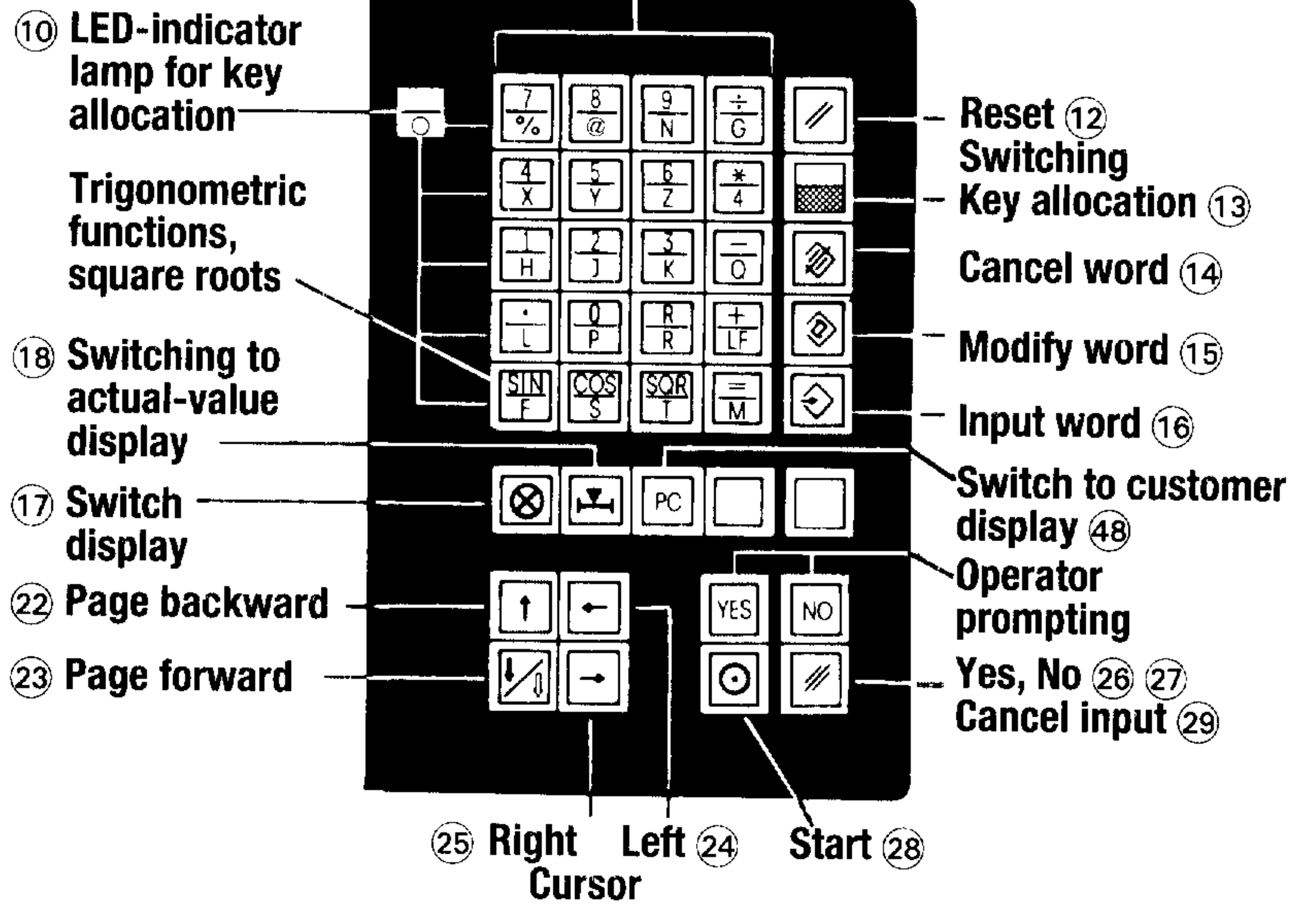


Operator Panel



- ① Program running
- ② Feed hold
- ③ Position not yet reached (machine running)
- ④ Alarm
- CRT monitor
- ⑤ Basic display
- ⑥ DRF Dressing position
- ⑦ R parameter
- ⑧ Dry run
- ⑨ Part program

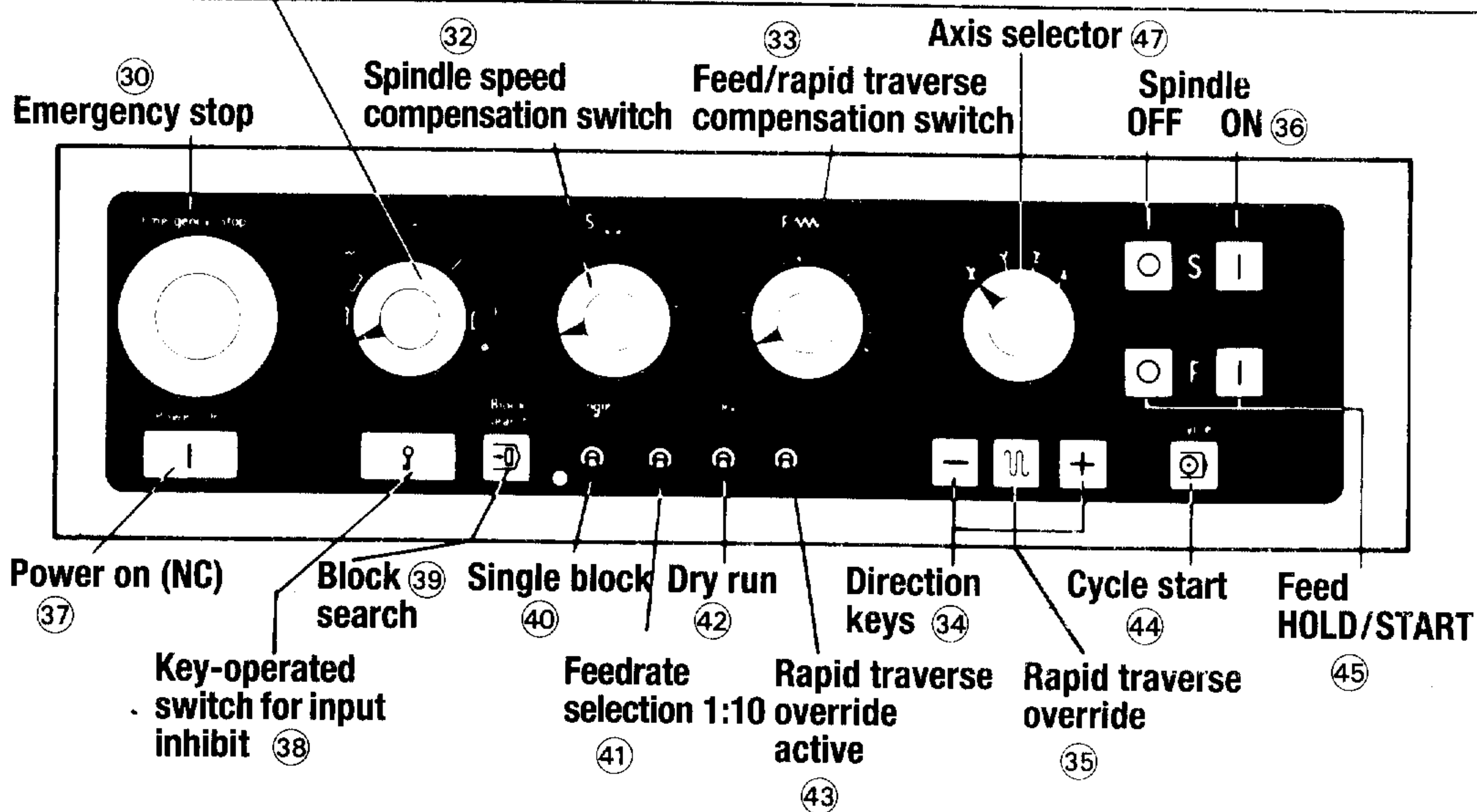
Address keys/numeric keypad*



Machine control panel

Mode selector ⑳

- ◇ Data output
- ◇ Data input
- ⊕ Set actual value
- ⌘ Feed
- ⌘ Rapid traverse
- ⌘ Handwheel
- Incremental feed
- ◇ Manual input Part program
- Manual input Z0, T0, test
- ⇒ Automatic
- ↓ Approach reference point



11.2 Abbreviations, Operator Panel and Machine Control Panel Texts

AUT	Automatic
BLOCK SEARCH	
Clear	Cancel input
Cursor	Correction pointer
Cycle Start	NC start
DI	Data input
DO	Data output
DRF	Differential resolver function
DRY	Dry run
Emergency Stop	
INC FEED (INC)	Incremental feed
JOG	Feedrate/rapid jog, handwheel operation
L	Subroutine
M	Feedrate in mm/min
MDI	Manual data input
MDI-PP	Manual data input, part program
MDI-SE-TE	Manual data input, setting data, machine data
Page	Paging forward/backward
PP	Part program
PLC	Programmable logic control
PLC FAULT	Error from interface control
Power on	
PRESET	Setting actual values (positions)
R	Feedrate in mm/rev
REFERENCE POINT (REF)	Reference point approach
RP	R parameter
Single	Single block
TE	Machine data
%	Main program

11.3 User Data

User Datum #25

N	Bit = 0	Bit = 1
0	Cycles operator prompting OFF	Cycles operator prompting ON
0	Text not stored in memory	Text stored in memory
0	Punch out in ISO code	Punch out in EIA code
0		
0	Program start with %	Program start with LF
0	Tape block parity OFF	Tape block parity ON
0	Display R parameter texts OFF	Display R parameter texts ON
0	Output comments for single block OFF	Output comments for single block ON

User Datum #26

N	Bit = 0	Bit = 1
0		
0		
0		
0		
0		
0	Handwheel pulse value	Handwheel pulse value
	Increment per division 0	Increment per division 100
0	Handwheel pulse value	Handwheel pulse value
	Increment per division 0	Increment per division 10
0	Handwheel pulse value	Handwheel pulse value
	Increment per division 0	Increment per division 1

11.4 Alarm List

Clear	No.: 3rd decade 1st + 2nd decades	8 Bit 7	7 Bit 6	6 Bit 5	5 Bit 4	4 Bit 3	3 Bit 2	2 Bit 1	1 Bit 0
	00				Axis 1			Axis 1	Axis 1
	01				Axis 2			Axis 2	Axis 2
	02				Axis 3			Axis 3	Axis 3
	03				Axis 4			Axis 4	Axis 4
//	10	Axis 1			Axis 1	Axis 1	Axis 1	Axis 1	Axis 1
	11	Axis 2			Axis 2	Axis 2	Axis 2	Axis 2	Axis 2
	12	Axis 3			Axis 3	Axis 3	Axis 3	Axis 3	Axis 3
	13	Axis 4			Axis 4	Axis 4	Axis 4	Axis 4	Axis 4
	22	Spindle encoder contamination error			Max. spindle speed too high	Spindle measuring circuit monitor*)	EMERGENCY STOP	Control not ready	
	23	V. 24 interface time monitor	Overflow 2 reader hardware error	Inhibit step error	Overflow	Parity	Overwrite control word	Overflow 1	Inhibit step parity error
	24							Over-temperature	
	25		Block w/o LF or block 120 char.			V.24 interface operating error	Parity error in memory	Program not in memory	Block not in memory
	26								Coincidence not found in search
	27	Memory overflow	Stored program ≠ tape program	Tape format error	Tape input inhibited	Block with 120 characters	Block parity error	Irrelevant EIA character	Character parity error
	28	Sub-routine error		Gxx80 prog. several times	3G: decoding error				General decoding error

*) May be cleared only with PORESET

Alarm List (continued)

Clear **	No.: 1st + 2nd decades	3rd decade	8 Bit 7	7 Bit 6	6 Bit 5	5 Bit 4	4 Bit 3	3 Bit 2	2 Bit 1	1 Bit 0
//	30		Circle end position error	No half or full degree pos for rotary axes			Zero or tool offset value not allowed		Option not available	Circle not in selected plane
	31			Too many axes to traverse	No F word progr. or too large		Thread lead wrongly programmed			
	32								Program block not allowed for GWRC selected	
	33									Modulo no. = 0 for rotary axis
	34									
	35									NC-Start without reference point
	36									
	37								Block no. incorrect Operator prompting	Incorrect format Operator prompting
///	50		Axis prog 2 x or 2 axes prog rep prog		GWRC contour error		Incorrect block structure		Over 6 geometry params	General
	← Reparable programming error →									
	51			Subrout. start in JOG + INC due to G06	Block cannot be fully displayed	Presel. block no. unavailable	Block with more than 120 characters	Memory overflow	Input inhibited	Input only in reset state
	52		KV factors not recorded Contour mon. error	KV factors for axes not equal		DRF activated for prog Gxx12		Stop at thread	Impermissible PLC signal	Error in strobe input
	54		Parameter value too high for NC- PLC	Parameter value cannot be shown for PLC				Min. grinding wheel width reached	Min. grinding wheel diameter reached	Reciprocation terminated
55		Option not available							Operator prompting, cycle and L = L	
Restart	70		Absolute value incorrect	Memory displacement - CANCEL 4					Incorrect address code in machine datum	
	71									Battery alarm

*CAUSE: Software change without CANCEL 4

** Input line (bottom line) must be completely cleared

Error 70X cannot be cancelled with either RESET or CLEAR

Error 71X can be cancelled with CLEAR

Decoder errors:

No. 3rd dec 1st & 2nd decades	9	8	7	6	5	4	3	2	1	0
38	SRK-Option not available	Dwell time too long	G function not allowed	G function format	Address not allowed		Comment format			Format for block number
39	No axis feed	Incorrect division number	Axis for dividing unit missing	No division programmed	Modulo division for linear axis	Rotary axis must not oscillate	Axis or or I/K missing	Rotary axis: modulo no. missing	For G93: rotary axis or diameter program	1st or 3rd axis is rotary axis
40	Too many parameter calculations	Too many interpol. parameters	Format interpol. parameters	Program: interpol. incorrect	G function in wrong sequence	Format or G function incorrect	Axis not not available	Format parameter assignment	Negative feedrate	Prog. feedrate incorrect
41	Format M function	Axis programmed twice	No inclined axis/wheel	Speed parameters	Incorrect operand sign	Format parameter calculation	R parameter character not recognized	Incorrect DP for parameter	No equal-to sign	Incorrect result parameter
42	Recip. axis programmed several times	Recip. axis already programmed	Reversal time too long	Reciprocation I/K parameters missing	Reciprocation axes incorrect	Reciprocation stroke not programmed	Format I/K parameters	Too many spark-out strokes	Gxx33: too many axes	Not possible with S1
43	3rd axis programmed simult. with G06		Gxx85 configuration	Format jump condition	Spindle speed too high	Format spindle speed	Rotary axis programmed repeatedly	Gxx33: axis for I missing	Gxx96: incorrect axis	Format H function
44	Axis feed-rate missing or 0		G93 without infeed axis	Gxx93: G91 not allowed	Gxx93: axis code incorrect	G93 without measured value parameters	G93 programmed several times	Measuring axis not available	3rd axis must not be measuring axis	More than one measuring axis
45	Circle radius error				Axis programmed several times			Combination G29/Gxx33		Path feed-rate missing or 0
46	More than 1 jump/subroutine call programmed per block				Syntax/format spindle position					Circle end position error
47	No subsequent block available		Combination R298/3rd axis		GWRC: incorrect cutter position	Subrout.: M17 in wrong sequence	Subrout.: pass counter is R0	Nesting depth exceeded	Start block no. 9999	Format subroutine call
48	Format auxiliary axes	More than one auxiliary axis		External subroutine call	SNS: block not available	Subroutine not available	Block not in subroutine	Main program not available	Jump destination not in program memory	Block not main program
49					Division by zero		G21/G22: dressing axis missing	Minimum wheel width	Minimum wheel diameter	Overflow in parameter calculation

11.5 Alarm Description

Alarm Number	Description and Remedy
1, 2, 11, 12, 21, 22, 31, 32	<p><u>Limit Switch</u></p> <p>The alarms are also triggered when a software limit switch (value entered in TE #160-173) has been approached (input dependent on reference point).</p> <p>The axis is stopped, but the position control loop remains active and the following error is eliminated.</p> <p>The axis must be moved in the opposite direction in manual mode and the alarm cleared with the red "Reset" key.</p>
5, 15, 25, 35	<p><u>NO SERVO ENABLE</u></p> <p>This alarm is triggered when a "servo enable" input signal has not been received.</p> <p>It results in rapid deceleration of all axes and disables the control loop (EMERGENCY STOP)</p> <p>It must be checked why servo enable has been cancelled by the interface unit (for interface test see Commissioning Instructions).</p> <p>The alarm is cleared with the red "Reset" key. Program restart is then required.</p>

Alarm Number	Description and Remedy
101, 111, 121, 131	<p><u>Zero-Speed Control</u></p> <p>A clamping error occurs when the specified limit "clamping tolerance measuring-circuit monitoring at zero speed" is exceeded or whenever the axis fails to reach its position within a prescribed time.</p>
	<p>Possible causes:</p> <ul style="list-style-type: none"> - An axis which should be at zero speed is forced out of position because of severe mechanical forces or a fault in the servo unit, tachogenerator, motor, mechanical system or measuring circuit hardware. - An axis fails to reach its position, e.g. due to excessive drift. - A mechanically clamped axis is forced out of position. - See Commissioning Instructions.
	<p><u>Remedy</u></p> <ul style="list-style-type: none"> - Clamping tolerance TE #110-113 must be higher than the exact stop tolerance range TE # 100-103. - The "position monitoring delay" TE #353 must be such that the following error can be eliminated within the prescribed time. - An axis is forced out of position by another moving axis by more than TE #110-113 (clamping).

Alarm Number	Description and Remedy
102, 112 122, 132	<p data-bbox="520 320 974 365"><u>Set Speed Too High</u></p> <p data-bbox="520 388 1713 552">This alarm is displayed when the set speed specified in the control exceeds the "set speed limit" defined in TE #354.</p> <p data-bbox="520 581 1713 744">It may occur if, for instance, the motor cannot follow the set speed (the maximum possible following error is exceeded).</p> <p data-bbox="520 839 1734 943">Check whether the TE #354 value is approximately 20% higher than the "set limit" in TE #140-143.</p>
103, 113, 123 133	<p data-bbox="520 1092 894 1136"><u>Contour Monitor</u></p> <p data-bbox="520 1160 1787 1522">If this monitor is triggered, alarms 103...133 are displayed and the drives are braked at the current limit by specifying a setpoint of zero. In addition, the servo enable signals are inhibited and the control switches to follow-up operation. The alarms are cleared with "Reset".</p> <p data-bbox="520 1611 1829 1849">If alarms 103...133 are displayed, the speed control loop is poorly optimized or the K_v (gain) factor is too high for this particular machine, even if the values for TE #351 and TE #352 are zero.</p> <p data-bbox="520 1932 1776 2294">Alarms 103...133 are indicated when the specified tolerance band for TE #352 is exceeded or when, during acceleration or deceleration of the drives, the axis does not reach the new speed within the time limit specified by the K_v factor. Program G60 (exact positioning) if necessary.</p>

Alarm Number	Description and Remedy
104, 114, 124, 134	<p data-bbox="533 308 1121 356"><u>MEASURING CIRCUIT ERROR</u></p> <p data-bbox="533 373 1764 611">The monitor is triggered in the event of a cable break in the measuring circuit, short-circuit to frame, and in the absence of measuring-circuit signals.</p> <p data-bbox="533 694 1814 872">A hardware monitor on the measuring-circuit boards causes all axes to be shut down immediately (see Commissioning Instructions).</p> <p data-bbox="533 890 1402 934">Check the measuring-circuit cable.</p>
105, 115, 125, 135	<p data-bbox="533 1086 919 1133"><u>Excessive Drift</u></p> <p data-bbox="533 1151 1738 1323">The control is able to compensate for any drift (effect of temperature on components) in the position control loop (see Section 8.3.5).</p> <p data-bbox="533 1406 1663 1513">This alarm is displayed if the drift exceeds approx. 500mV.</p> <p data-bbox="533 1596 1843 1952">The "position not yet reached" LED does not go out if, for instance, the position control loop or drive is not operative, or if the drive unit is inhibited, or if there are hardware malfunctions in the position control loop or drive unit, or if the drift was not properly set at the drive unit.</p> <p data-bbox="533 1976 1822 2083">Readjust the drift compensation (see Commissioning Instructions).</p> <p data-bbox="533 2107 1276 2154">(Check drift in TE #230-233.)</p>

Alarm Number	Description and Remedy
108, 118, 128, 138	<p><u>Contamination Error</u></p> <p>If use is made of a linear scale, the EXE (pulse shaping electronics) issues a hardware signal to the NC. (See Interface Description, Section 7.)</p>
222	<p><u>Control Loop Not Ready (Measuring-Circuit Input Signal)</u></p> <p>This indicates a malfunction in the servo unit. It is displayed when the corresponding input signal "speed controller ready" (group signal for all axes) is connected and a servo unit is defective (e.g. blown fuse, overheating etc.).</p> <p>The alarm causes the feed drives to be braked rapidly and the "control loop ready" signal to disappear.</p> <p>Insert P - N jumper "servo ready simulation" if not used in interface unit (see Commissioning Instructions).</p>
223	<p><u>EMERGENCY STOP</u></p> <p>This alarm is displayed when the interface unit generates the EMERGENCY STOP interface unit input signal.</p> <p>Check whether the EMERGENCY STOP key has been activated or whether the machine has moved to the EMERGENCY STOP cam.</p> <p>(Interface test #8, byte 5, bit 7 = "0" *EMERGENCY STOP is present).</p> <p>The alarm causes the axes to stop and triggers servo inhibit.</p>

Alarm Number	Description and Remedy
224	<p><u>SPINDLE MONITORING</u></p> <p>Spindle hardware monitor. Active only if N407, bit 2 = 1 (pulse encoder available).</p> <p>This signal is triggered if input signals A, A*, B, B*, Z and Z* are faulty or missing. The alarm stops the spindle.</p> <p>The corresponding signals must always have opposite polarity (e.g. A = A*).</p>
225	<p><u>Spindle Speed Too High</u></p> <p>The maximum spindle speed (smallest value of selected gear or TE #370) including tolerance band (TE #367) has been exceeded.</p>
228	<p><u>SPINDLE DIRTY</u></p> <p>(Not currently available)</p> <p>ROD encoders do not have contamination alarms.</p> <p><u>Only</u> for encoders with EXE 600/601 (linear system) Alarms 108...138.</p>

Alarm Number	Description and Remedy
	V.24 (RS 232C) Alarms =====
231	<u>Inhibit Step Error, Parity Error</u> The alarm is only displayed when Siemens tape readers are used. - Machine datum - Reader
232	<u>Overflow 1</u> The alarm is only displayed when Siemens tape readers are used. - MS 600 module on reader
233	<u>Control Word Overwritten</u> The alarm is only displayed when Siemens tape reader is used. - MS 600 module on reader
234	<u>Parity Error</u> This alarm may only be triggered if TE #411 or 412 bit 4 is set. It is set if the data word from the reader (8 bits of data + 1 parity bit) have incorrect parity. This type of error is unrelated to parity errors of ISO or EIA characters from tape (see alarm 271). Check TE number setting and external unit.

Alarm Number	Description and Remedy
235	<p><u>Overflow Error</u></p> <p>This alarm is triggered when a new character is sent before the control has read (stored) the previous one.</p> <ul style="list-style-type: none"> - Check TE number setting and external unit - Error at USART interface - Cables
236	<p><u>Inhibit Step Error</u></p> <p>This alarm is displayed if the number of set stop bits is incorrect.</p> <p>Check TE number setting and external unit.</p>
237	<p><u>Overflow 2</u></p> <p>The alarm is only displayed when Siemens tape readers are used.</p> <ul style="list-style-type: none"> - Reader - MS 600 module on reader
238	<p><u>V.24 (RS 232C) Interface Time Monitor</u></p> <p>This alarm is displayed if the NC cannot output characters or does not receive any characters within 20 seconds.</p> <p>Cause:</p> <ul style="list-style-type: none"> - External unit not switched on - Incorrect cable - External unit blocking CTS signal for more than 20 seconds - When using control signals (DC1-DC4) NC does not receive DC1 (11H) within 20 seconds during data output

Alarm Number	Description and Remedy
242	<p data-bbox="506 320 894 359"><u>Overtemperature</u></p> <p data-bbox="506 388 1759 753">This alarm is displayed if the temperature of the components reaches the limit temperature range (59.7°C). When this happens, the "NC Ready 1" signal is cancelled. The interface unit then inhibits Read Enable, i.e. only the currently active block is processed.</p> <p data-bbox="506 774 1094 813">Check fan and air flow.</p> <p data-bbox="506 834 1808 1012">If the temperature inside the control is lower than 59.7°C, check temperature switch S1 on the 03 840 module.</p>
251	<p data-bbox="506 1151 1247 1190"><u>Block Not Available in Memory</u></p> <p data-bbox="506 1219 1419 1270">e.g. when jumping to a block number.</p>
252	<p data-bbox="506 1406 1297 1445"><u>Program Not Available in Memory</u></p> <p data-bbox="506 1475 1755 1584">The preselected part program is not stored in the memory.</p>
253	<p data-bbox="506 1665 1066 1703"><u>Parity Error in Memory</u></p>
254	<p data-bbox="506 1783 1524 1822"><u>V.24 (RS 232C) Interface Operating Error</u></p> <ul data-bbox="506 1852 1801 2163" style="list-style-type: none"> - NC data output mode with data start from PLC - V.24 (RS 232C) inhibit is present with data start from PLC <li style="padding-left: 2em;">or operator panel - Code for Siemens reader entered in TE #412

Alarm Number	Description and Remedy
257	<p><u>Block without LF or Block with more than 120 Characters</u> or M02, M30 without LF</p>
261	<p><u>No Coincidence Found in Block Search</u> The alarm is displayed if, during block search, the desired block or subroutine could not be found by the end of the program, i.e. the desired block or subroutine is not stored in the memory.</p>
271	<p><u>Character Parity Error</u> Depending on the definition of program start "%" or "EOR", the control automatically specifies the code in ISO or EIA when this character is received. All subsequent characters are checked for parity; if it does not tally with the newly established parity, alarm 271 is triggered.</p>

Alarm Number	Description and Remedy
272	<p data-bbox="512 320 1125 365"><u>IRRELEVANT EIA CHARACTER</u></p> <p data-bbox="512 388 1759 566">Alarm 272 is activated if a character not defined in EIA code is entered, in spite of its correct parity.</p>
273	<p data-bbox="512 715 972 759"><u>Block Parity Error</u></p> <p data-bbox="512 783 1682 946">If the block parity monitor (bit-oriented user data) is active, all characters of a block are counted.</p> <p data-bbox="512 970 1803 1210">Alarm 273 is displayed if an odd number is counted. The control always punches a tape with even block parity, irrespective of the setting datum; it punches blanks if necessary.</p>
274	<p data-bbox="512 1353 1398 1397"><u>Block with more than 120 Characters</u></p> <p data-bbox="512 1421 1808 1659">Alarm 274 is activated if a block with more than 120 characters is read. Only stored characters are counted, i.e. carriage returns (CR), sprocket holes and blanks other than comments are not counted.</p> <p data-bbox="512 1682 1451 1727">- Split the block into several blocks</p>

Alarm Number	Description and Remedy
275	<p><u>Tape Input Inhibited</u></p> <p>Alarm 275 is triggered if:</p> <ul style="list-style-type: none"> a) during reading of part programs and subroutines, the key-operated switch is in the OFF position with machine datum "key-operated switch active during part program entry" set, b) during reading of "TE" machine data, the data protection switch on the 03 840 board is not in the "free" position (upper position).
276	<p><u>Tape Format Error</u></p> <p>Alarm 276 is displayed if:</p> <ul style="list-style-type: none"> a) the admissible number of decades after an address is wrong, b) a decimal point appears in a wrong position, c) part programs or subroutines are not properly defined or terminated.
277	<p><u>Stored Program \neq Tape Program</u></p> <p>If a tape is read more than once, its contents are compared block-by-block with the program stored during the first reading.</p> <p>If any discrepancies are noted, alarm 277 is displayed. This alarm is triggered particularly when an attempt is made to store a program under the same number as that of a program already in memory. This stored program must then be deleted. In contrast to storage, the "AVAILABLE MEMORY" number remains unchanged during comparison.</p>

Alarm Number	Description and Remedy
278	<p><u>Memory Overflow</u></p> <p>If the memory area is no longer sufficient during storage, alarm 278 is displayed.</p> <p>The available memory area can be checked via the "AVAILABLE MEMORY" number. Programs not required can be deleted and the program re-input.</p>
	<p>Irreparable Programming Errors =====</p>
281	<p><u>General</u></p> <p>The error is indicated in the "corection block display" with an additional comma beneath each character.</p>
285	<p><u>General Decoding Error for 3G</u></p>
286	<p><u>Gxx80 Programmed Several Times</u></p>
288	<p><u>Subroutine Error</u></p> <ul style="list-style-type: none"> - M17 in main program - Nesting depth exceeded

Alarm Number	Description and Remedy
301	<p><u>Circle Not in Selected Plane</u> Interpolation parameters are not correct for the selected plane.</p>
302	<p><u>Option not Available</u> Check functions options with machine data: Options A03, A04, B41, E85 and E version</p> <p>Remedy: Check software options and machine data.</p>
304	<p><u>Zero offset: impermissible value</u> Double word overflows are possible with values of six or more digits.</p>
307	<p><u>No Half or Full Degree Positions for Rotary Axis</u> (axis in indexing table mode) The rotary axis may only be positioned to full or half degrees. The programmed position including zero offsets and other compensation values does not yield a full or half degree position.</p>

Alarm Number	Description and Remedy
308	<p><u>Circle End Position Error</u> Machine datum "circle end position monitor" (TE #355). The programmed circle end position does not lie on the circle. The entered limit is exceeded.</p>
314	<p><u>Thread Lead Incorrectly Programmed</u> Thread lead is programmed under I <u>or</u> K and <u>always</u> refers to the <u>leading</u> axis, otherwise alarm 314 is activated. (e.g. X 20 000 Z 10 000 K 1000)</p>
316	<p><u>No F word programmed</u> e.g. no F value in program or F word too large in feed rate per revolution.</p>
317	<p><u>Too Many Axes Programmed</u> Too many axes traversing on account of G41/G42.</p>
322	<p><u>Inadmissible Block for GWRC</u> <u>Grinding Wheel Radius Compensation (GWRC)</u> With GWRC selected, G33 must not be programmed. Remedy: First program G40 or G41/G42, G05</p>

Alarm Number	Description and Remedy
331	<u>Modulo Number = 0 for Rotary Axes</u> A modulo number must be defined in TE #280...283 for rotary axes.
351	<u>NC Start without Reference Point</u>
371	<u>Incorrect Format, Programmable Operator Prompting</u>
373	<u>Incorrect Block Number, Programmable Operator Prompting</u>

Alarm Number	Description and Remedy
380	<u>Format block number</u>
383	<u>Format comment</u>
385	<u>Address Character Not Allowed</u> Displayed, for instance, if T is programmed.
386	<u>G Function Format</u> - G function programmed with sign, decimal point or too many digits. - Code number for 4-digit G function missing.
387	<u>G Function Not Allowed</u>
388	<u>Dwell time too long</u> Contents to parameter programmed after G04 greater than 700 000.
389	<u>GWRC Option Not Available</u> for the following options: B61, B62, E42, H12, K72
390	<u>1st or 3rd Axis is Rotary Axis</u> First and third axes must not be defined as rotary axes in machines with an inclined axis/wheel.
391	<u>Rotary Axis: G93 or Diameter Programming</u>
392	<u>Rotary Axis: modulo number missing</u>
393	<u>Gxx33: Axis or I/K Parameters Missing</u>

Alarm Number	Description and Remedy
394	<u>Rotary axis must not oscillate</u>
395	<u>Linear axis pitch</u> A modulo number is stated for a linear axis
396	<u>No Division Programmed</u> A division number (Gxx69) has been programmed in the NC program. The previous number (Gxx68) is missing.
397	<u>Axis for Dividing Unit Missing</u> No axis programmed in block with Gxx68/Gxx69.
398	<u>Incorrect Division Number</u> Division number exceeds 65000.
399	<u>No Axis Feedrate</u>
400	<u>Format Error in Feedrate Programming</u>
401	<u>Feedrate Value Negative</u> e.g. F1 = 100 - R20 is programmed and R20 = -500.
402	<u>Format Error in Parameter Assignment</u>
403	<u>Axis Not Available</u> The programmed address character is not entered in machine datum TE #434...437.
404	<u>Format Error in Positional Data</u>

Alarm Number	Description and Remedy
405	<u>G Function in Wrong Sequence</u>
406	<u>Positional Data and Parameters for Interpolation Incomplete</u>
407	<u>Format Error in Interpolation Parameter Assignment</u>
408	<u>Too Many Interpolation Parameters in One Block</u>
409	<u>Too Many Parameter Calculations</u> - Number of parameter calculations including M17 exceeds 10.
410	<u>Target parameter missing</u>
411	<u>Equals Sign Missing</u>
412	<u>Decimal Point in Parameter Calculation Incorrect</u>
413	<u>Character in Parameter Assignment Not Allowed</u>
414	<u>Format error in parameter calculation</u>
415	<u>Incorrect Arithmetic Calculation Sign</u>

Alarm Number	Description and Remedy
416	<u>Result Parameter in Protected Range</u>
417	<u>No Inclined Axis/Wheel</u> G06/G07 programmed although no angle stated for inclined axis/wheel (TE #299 = 0).
418	<u>Axis Programmed Twice</u>
419	<u>Format Error, M Functions</u> - More than 3 M functions per block - More than 2 (4) digits after M - No digits after M
420	<u>Programming with S1 Not Possible</u>
421	<u>Thread: Too Many Axes Programmed</u>
422	<u>Too Many Sparking-Out Strokes Programmed for Gxx80</u>

Alarm Number	Description and Remedy
423	<u>Format error: I/K parameter incorrect for Gxx82, Gxx83, Gxx84</u>
424	<u>Reciprocation Stroke Not Programmed</u>
425	<u>Reciprocation: Incorrect Axes Programmed</u> Impermissible axis code, e.g. inclined axis
426	<u>Reciprocation: I/K Parameters Missing</u>
427	<u>Reversal Time Too Long</u>
428	<u>Reciprocation: Axis Already Programmed</u>
429	<u>Reciprocation: axis programmed several times</u>
430	<u>Format error in H function</u>
431	<u>Gxx96: Incorrect Axis Stated</u>


Alarm Number	Description and Remedy
432	<u>Thread: Axis for I Missing</u>
433	<u>Rotary Axis Programmed Several Times</u>
434	<u>Format Error in Spindle speed</u>
435	<u>Spindle speed too high</u>
436	<u>Format Error in Jump Conditions</u>
437	<u>Gxx85 Configuration</u>
439	<u>3rd Axis Programmed Simultaneously with G06</u>
440	<u>More than One Measuring Axis Defined</u>
441	<u>3rd Axis must not be a Measuring Axis in Conjunction with Inclined Axis/Wheel</u>
442	<u>No Measuring Axis Defined</u>
443	<u>G93 Programmed Several Times</u>
444	<u>G93 Without Measured-Value Parameters</u>

Alarm Number	Description and Remedy
445	<u>Gxx93: Axis Code Incorrect</u>
446	<u>Gxx93/G91 Not Allowed</u>
447	<u>G93 R.. Without Infeed Axis</u>
449	<u>Axis Feedrate Missing or 0</u>
450	<u>Path Feedrate Missing or 0</u>
452	<u>Combination 3D interpolation/thread grinding</u>
455	<u>Axis programmed several times</u>
459	<u>Circle Radius Error</u>
460	<u>Circle End Position Error</u> Only with direct circle radius programming if circle start and end positions are too close to each other (0.000005 mm).
465	<u>Syntax/format spindle position</u>
469	<u>More than 1 jump condition or subroutine call programmed per block</u>
470	<u>Format Error in Subroutine Call</u>

Alarm Number	Description and Remedy
471	<u>Start Block Number Greater than 9999</u>
472	<u>Nesting Depth Exceeded (Greater than 4)</u>
473	<u>Subroutine: Pass Counter R0</u>
474	<u>Subroutine: M17 in Wrong Sequence</u>
475	<u>Grinding Wheel Radius Compensation: Cutter Position Incorrect</u>
477	<u>Combination R298/3rd Axis</u>
479	<u>No Subsequent Block Available</u>
480	<u>Block Number Not Available in Main Program</u> Required block number or jump destination not in main program, or main program not available.
481	<u>Jump Destination Not in Program Memory</u>
482	<u>Main Program Not Available</u>

Alarm Number	Description and Remedy
483	<u>Block Number Not Available in Subroutine</u> Required block number or jump destination not in subroutine, or subroutine not available.
484	<u>Subroutine Not Available</u>
485	<u>Block Search: Block Not Available</u>
486	<u>External Subroutine Call Prior to NC-Start</u>
488	<u>More than One Auxiliary Axis Programmed</u>
489	<u>Format Error in Setpoints and Feedrates for PLC Auxiliary Axes</u>
490	<u>Overflow on Parameter Calculation</u> F value too large in inch programming.
491	<u>Below Minimum Grinding Wheel Diameter</u>
492	<u>Below minimum grinding wheel width</u>
493	<u>Dressing axis missing in automatic inclusion of grinding wheel width</u> R306, R307 or R308 is not defined
495	<u>Division by zero</u>

Alarm Number	Description and Remedy
	<p>Reparable Programming Errors</p> <p>=====</p>
501	<p><u>General</u></p> <p>The error is indicated in the "correction block display" (block before decoding) with an additional identifier.</p>
502	<p><u>More than 6 Geometry Parameters</u></p> <p>programmed in one block.</p> <p>(Geometry parameters are: axes, interpolation parameters, radii, angles)</p>
504	<p><u>Incorrect Block Structure</u></p> <p>e.g. N10 G02 X1000 LF (Interpolation parameters missing)</p> <p>N20 G02 Z2000 I20 LF (I20 not allowed in this block)</p>
506	<p><u>GWRC Contour Error</u></p> <p>The intermediate block for the selected offset is too small or the offset calculation produces a direction of motion opposite to the one programmed.</p>
508	<p><u>Axis programmed twice</u></p> <p>Alarm only applies to reciprocating axes</p>

Alarm Number	Description and Remedy
511	<p><u>Input Only in Reset State</u></p> <p>This alarm is displayed when various impermissible functions are selected in automatic mode. These functions are only allowed when the "Reset" key has first been actuated. The alarm can be cleared by depressing  .</p>
512	<p><u>Input Inhibited</u></p> <p>Input is only possible when the key-operated switch is in the "free" position or if the data protection switch on the 03 840 board is in the "upper" position, or in the event of input in the incorrect mode.</p>
513	<p><u>Memory Overflow (in MDI-SE-TE mode)</u></p> <p>This alarm is displayed when the program memory is full. Any programs not being used may be deleted if necessary (see Section 7.1). These operations are only possible if the control is in the Reset state.</p>
514	<p><u>Block with more than 120 Characters</u></p> <p>During manual data input (editing), the number of characters in a block is checked before it is stored in the memory (character 120 must be LF).</p> <p>If this alarm is displayed, the LF entries must be checked. The only remedy is to split the long block into several smaller blocks.</p>

Alarm Number	Description and Remedy
515	<p><u>Preselected Block Number Not Available</u></p> <p>This alarm is displayed if the block number selected is not available in the program. The cursor is then set to the program start and the program is displayed.</p>
516	<p><u>Block cannot be displayed completely</u></p> <p>With certain block configurations, it is not possible to display all the characters, in spite of the fact that the allowed block length (120 characters) has not been exceeded.</p> <p>Remedy: Inserting "LF" produces two blocks, the second of which has no block number. These two blocks can now be edited to generate an executable program.</p>
517	<p><u>Subroutine Start in JOG/INC Prohibited by G06</u></p>
521	<p><u>Strobe Input Error</u></p> <p>This alarm appears during external data input if the wrong code is used, if the word is too long or if % is entered while a program is running.</p>
522	<p><u>Impermissible PLC Signal</u></p>
523	<p><u>Stop During Thread Cutting</u></p> <p>The alarm indicates to the user that a stoppage has occurred during thread cutting, destroying the thread. (Stop in feedrate per revolution)</p>

Alarm Number	Description and Remedy
525	<u>DRF Activated with Gxxl2 Programmed</u>
527	<u>Axis KV Factors Not Equal</u> This alarm is triggered if the measured KV factors for all axes are not equal since inequality may result in a contour error.
528	<u>KV Factors Not Recorded</u> Reminder after power-up and changes to machine data.
541	<u>Reciprocation terminated</u>
542	<u>MIN. grinding wheel diameter</u> The grinding wheel diameter is below the minimum. The program can be continued by pressing the "Clear" key.
543	<u>MIN. grinding wheel width</u> The grinding wheel width is below the minimum. The program can be continued by pressing the "Clear" key.
547	<u>Parameter Values Cannot Be Shown for PLC</u>
548	<u>Parameter Value Too Large for NC-PLC</u>
550	<u>Cycles Operator Prompting</u> Subroutine number different from subroutine numbers following M17 and &.
551	<u>BLOCK NUMBER AFTER &</u> This error occurs when reading in programs with operator prompting when characters have been programmed between &subroutine number and program name, e.g. &L120 N5 (DRESSING).
558	<u>Option Not Available</u>

Alarm Number	Description and Remedy
702	<u>Incorrect Address Code in Machine Datum</u> Machine data must be changed (name, axis).
707	<u>Memory areas displaced</u> Cancel 4 is required. Alarm can also occur if the contents of parameters are too large or if the system software has been changed.
708	ABSOLUTE VALUE INCORRECT
711	<u>Battery Alarm</u> Check the voltage of the battery on the 03500 board (power supply unit). Replace battery if necessary. <u>Important:</u> In order to prevent the contents of the 03210 or 03260 C-MOS memory from being erased, the battery must be replaced while the control is powered up. <u>Caution:</u> For control types in which both the NC and PLC are mounted in a single-tier subrack, the PLC stops if the battery voltage fails. This also renders the NC inoperative. This condition is indicated by a red LED flashing at approx. 5 Hz on the 03 840 board. <u>No</u> alarm appears on the CRT monitor.

11.6 SINUMERIK 3G Program key

Group	EIA	ISO	Code	Function and meaning
	EOR	%		Program start
	EOR ... EOB	% ... LF	1...9999	Program no.
	n	N	1...9999	Block no.
	. + -	. + -		Decimal point Positive sign (can be omitted) Negative sign
	+ - * / = sin cos tan cot sqr	+ - * / = SIN COS TAN COT SQR		Addition Subtraction Multiplication Division Equals sign Sine Cosine Tangent Cotangent Square root
G1	g	G	00 01 ●	Rapid traverse Feedrate
G2	g	G	02 03 05 ● 06 07 08 xx33	Circular interpolation clockwise Circular interpolation counterclockwise Straight cut Fixed angle interpolation Compensating movement in Z Linear interpolation Thread grinding
G3	g	G	04 □ *	Parametered dwell
G4	g	G	xx12 □	"Handwheel override"
G5	g	G	21 ● 22	Select grinding wheel edge left Select grinding wheel edge right
G6	g	G	xx27 □	Fast input
G7	g	G	28 □	Disable external subroutine call
G8	g	G	36 □ 37 □ 38 □ 39 □ xx36 □ Δ xx37 □ Δ xx38 □ Δ xx39 □ Δ	Abort dwell by signal 1 Abort dwell by signal 2 Abort dwell by signal 3 Abort dwell by signal 4 Abort traverse movement by signal 1 Abort traverse movement by signal 2 Abort traverse movement by signal 3 Abort traverse movement by signal 4

SINUMERIK 3G Program key (continuation)

Group	EIA	ISO	Code	Function and meaning
G9	g	G	40 ● 41 42	Grinding wheel radius compensation off Grinding wheel radius compensation left active Grinding wheel radius compensation right active
G10	g	G	51 52 53 54 ●	Suppress compensation Suppress dressing sum Suppress zero offset Compensation, dressing sum and zero offset effective
G11	g	G	61 ● xx63	Feedrate compensation in all axes effective Feedrate compensation ineffective for specific axes
G12	g	G	60 ● 64 □ xx64 □ xx62 □	Exact stop Contouring control for all axes Contouring control for all axes Contouring control for all axes
G13	g	G	xx65 ● xx66 xx67	Endless turning rotary axis off Endless turning rotary axis clockwise Endless turning rotary axis counterclockwise
G14	g	G	xx68 △ xx69 △ □	Number of divisions, dividing head Division number, dividing head
G15	g	G	70 ● 71 ● ●	Input system inch Input system metric
G16	g	G	xx80 ● △ xx81 △ xx82 △ xx83 △ xx84 △ xx85	Abort reciprocation Reciprocation with continuous infeed on Reciprocation with infeed in reversal points on Reciprocation with infeed in left reversal point on Reciprocation with infeed in right reversal point on Spark out
G17	g	G	90 ● 91	Absolute dimension input Incremental dimension input
G18	g	G	92 □ ★	Set actual value memory, spindle speed limitation
G19	g	G	93 □ xx93 □	Scan measuring caliper actual value
G20	g	G	94 ● xx95	Feedrate in mm/min, degree/min, inch/min Feedrate in mm/rev, inch/rev
G21	g	G	xx96 97 ●	Constant grinding wheel surface speed in m/s, ft/s Spindle speed in rev/min
G22	g	G	29	3D interpolation

SINUMERIK 3G Program key (continuation)

Group	EIA	ISO	Code	Function and meaning
	1. 2. 3. 4.	1. 2. 3. 4.	0.. +99999.99 or 0.. +99999.999 or 0.. +99999.9999	Position data in mm or degrees
			0.. +999.9999 or 0.. +999.99999	Position data in inch
	q11 = . . q19	Q11 = . . Q19	+ 9 decades	Position data for PLC auxiliary axes
	i k	I K	0.. +99999.99 or 0.. +99999.999 or 0.. +99999.9999	Interpolation parameter for circle in mm or degrees, amount of infeed for reciprocation in mm or degrees thread pitch in mm (max. bis 4000/400/40)
			0.. +999.9999 or 0.. +999.99999	Interpolation parameter for circle in inch, amount of infeed for reciprocation in inch or thread pitch in inch (max. 40/4)
	f = f1 = f2 = f3 = f4 =	F = F1 = F2 = F3 = F4 =	0.1.. 300000.0 or 0.01.. 30000.00 or 0.001.. 3000.000	Path feedrate in mm/min or degree/min Axial feedrate in mm/min or degree/min
			0.001.. 3000.000 or 0.0001.. 300.0000	Path/axial feedrate in inch/min
	f11 = . . f19 =	F11 = . . F19 =	+ 9 decades	Feedrate for PLC auxiliary axes
	r	R	0 to 499	Parameter, user-assignable from 0 to 199 and 350 to 499, fixed from 200 to 349 Code according to value assignment for the respective address
	s1 =	S1 =	0 to 9999	Spindle speed spindle 1 in rev/min Grinding wheel surface speed spindle 1 in m/s or ft/s
	s2 =	S2 =	0 to 9999	Spindle speed spindle 2 in rev/min Grinding wheel surface speed spindle 2 in m/s or ft/s
M1	m	M	00 02 17 19 30	Programmed stop End of program End of subroutine Oriented spindle stop, angle under S1 = ... in degrees As M02

SINUMERIK 3G Program key (continuation)

Group	EIA	ISO	Code	Function and meaning
M2	m	M	xx03 xx04 xx05 ●	Spindle rotation clockwise Spindle rotation counterclockwise Spindle stop
M3	m	M	00 to 99	Miscellaneous functions, user-assignable except for groups M1 und M2
	h	H	00 to 999	Auxiliary functions (Parameter substitution, Value = 3 decades)
	l	L	00 to 999	Subroutine number
	p	P	00 to 99999999 1 to 16	Number of passes, subroutine Jump conditions
	f1 = f2 = f3 = f4 =	F1 = F2 = F3 = F4 =	0.01.. 500.00 or 0.001.. 50.000 or 0.0001.. 5.0000	Rotational feedrate in mm/rev
	s1 s2	S1 S2	0.0001.. 5.0000 or 0.00001.. 0.50000	Rotational feedrate in mm/rev
	@	@	98 321	Synchronization Groove signal

- Reset position (reset state after RESET, M02, M30, control power-up)
- Reset position depending on machine data
- Block-by-block, all other modal
- ★ No further functions may be written in this block
- △ Can be called more than once in a block
- xx 3rd + 4th decade with G functions: 3rd decade: spindle number 1 or 2
axis number 1, 2, 3 or 4
4th decade: 0 = spindles
1 = axes

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Suggestions

Corrections

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