

SIEMENS



SINUMERIK 810
SINUMERIK 820
Package 1: Tool Management

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Planning Guide

01/91 Edition

Manufacturer Documentation

SINUMERIK 810 SINUMERIK 820 Package 1: Tool Management

Planning Guide

09.92 Edition

Supplement/Correction

These sheets constitute a **supplement/correction** to the edition

**SINUMERIK 810
SINUMERIK 820
Package 1: Tool Management**

01.91 Edition

Order No.: 6ZB5 410-0DX02-0AA1

09.92



2 Operation
2.1 Input of tool data

Example of a load program:

a) Input of data to be stored in the PLC

%123		
R973 =	} -Tool 1	Location no.
R974 =		T no.
R975 =		Duplo no.
R976 =		Tool life
R977 =		No. of pieces
R978 =		Identifier: "oversize tool"

R979 =	} -Tool 2
•	
•	
R984 =	

•	} -Tool 3
R985 =	
•	
R990 =	

•	} -Tool 4
R991 =	
•	
R996 =	

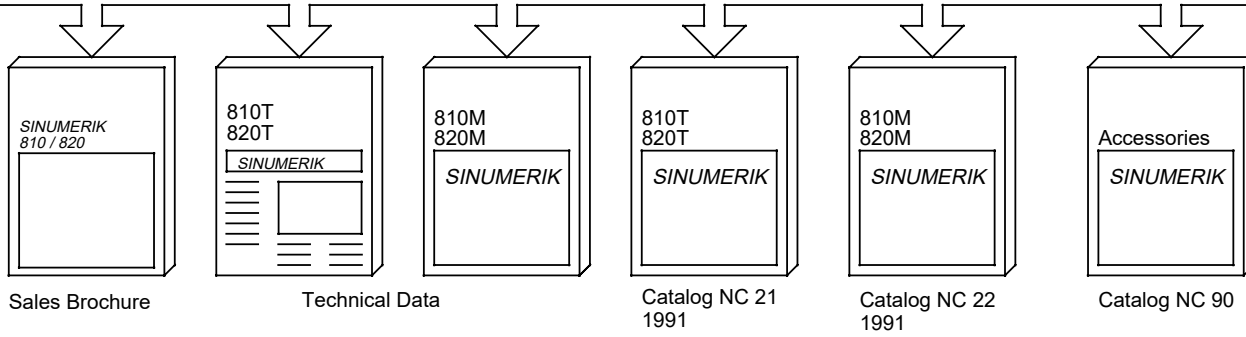
R977 = - Normal size tools, fixed location coding
M52 - Sets flag M201.0 to initiate data transfer to the PLC

R973 =	} - Tools 5 to 8
•	
R996 =	
R997 =	

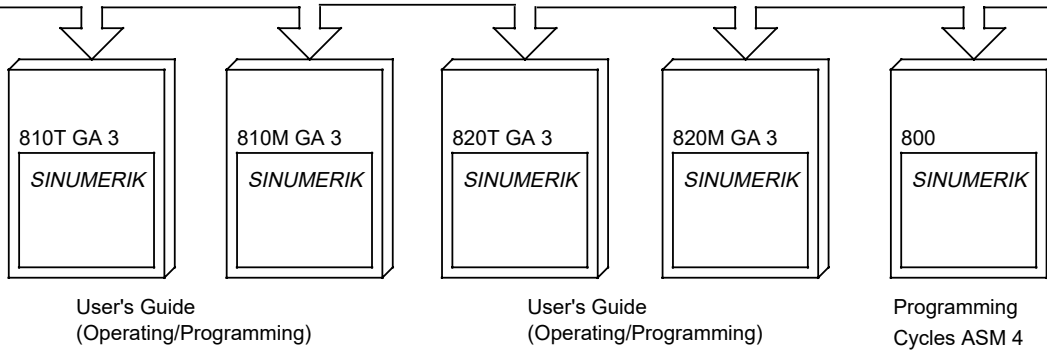
M52

SINUMERIK 810/820, Basic Version 3 (GA 3)

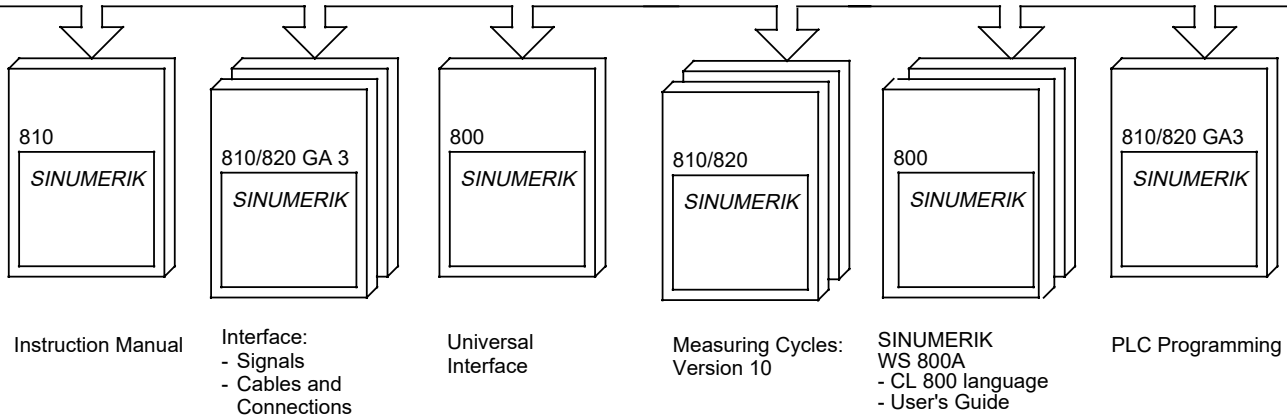
General Documentation



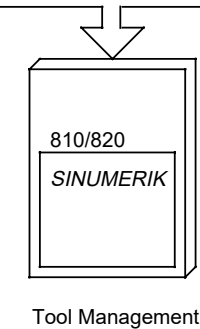
User Documentation



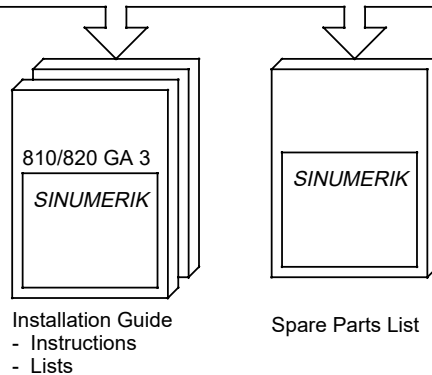
Manufacturer Documentation



Manufacturer Documentation



Service Documentation



SINUMERIK 810 SINUMERIK 820

Package 1: Tool Management

Planning Guide

Manufacturer Documentation

Valid for:

<i>Control</i>		<i>Software version</i>
SINUMERIK 810M	Basic version 2	2
SINUMERIK 810T	Basic version 2	2
SINUMERIK 820M	Basic version 2	2
SINUMERIK 820T	Basic version 2	2
SINUMERIK 810M	Basic version 3	1
SINUMERIK 810T	Basic version 3	1
SINUMERIK 820M	Basic version 3	1
SINUMERIK 820T	Basic version 3	1

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The status of each edition is shown by the code in the "Remarks" column.

Status code in "Remarks" column:

A . . . New documentation **B** . . . Unrevised reprint with new Order No.
C . . . Revised edition with new status. If factual changes have been made on the page since the last edition, this is indicated by a new edition coding in the header on that page.

Edition	Order No.	Remarks
06.90	6ZB5 410-0DX02-0BA0	A
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Other functions not described in this documentation might be executable in the control. This does not, however, represent an obligation to supply such functions with a new control or when servicing.

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Preliminary Remarks

Notes for the reader

This documentation is intended for machine tool manufacturers with SINUMERIK 810 and SINUMERIK 820.

The publication explains the application of the complete "Tool Management" software package, and serves as a manual for machine tool manufacturers when creating the PLC program.

The SINUMERIK documentation is organized in 3 levels:

- User documentation
- Manufacturer documentation
- Service documentation

The **manufacturer documentation** for the **SINUMERIK 810 and SINUMERIK 820** controls is arranged in the following parts:

- Instruction Manual
- Interface
 - Part 1: Signals
 - Part 2: Cables and Devices
- PLC Programming Guide
- Function Blocks

In addition, there are SINUMERIK publications applying to all SINUMERIK controls (e.g. Universal Interface, Measuring Cycles, Cycle Language CL 800).

Please contact your Siemens regional office for further details.

Technical information

This documentation is valid for:

<i>Control</i>	<i>from Software Version</i>	
<i>SINUMERIK 810</i>	<i>Basic version 2</i>	<i>2</i>
<i>SINUMERIK 820</i>	<i>Basic version 2</i>	<i>2</i>
<i>SINUMERIK 810</i>	<i>Basic version 2</i>	<i>1</i>
<i>SINUMERIK 820</i>	<i>Basic version 2</i>	<i>1</i>

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1 Introduction

1.1 General

1.1.1 Tasks of tool management

The tasks of tool management are to support tool changing and to control it to some extent.

The following tasks are handled by tool management:

- Searching for the tool in the magazine
- Selecting the direction of rotation and output of control signals for magazine positioning
- Displaying the magazine table
- Displaying the tool data
- Replacing worn and locked-out tools by replacement tools
- Locking out worn and broken tools to prevent further use
- Storage and management of tool data

1.1.2 Requirements of tool management

The requirements of tool management are:

- Fastest possible tool changing
- Avoidance of rejects by monitoring the tool's operating life
- Avoidance of downtimes and relieving of operating personnel through the use of replacement tools

1.1.3 Features of tool management

This package is particularly suitable for use on small and medium-sized machining centres with chain or rotary-plate magazines.

The package offers the following features:

- Management of up to 97 tools
- Use of replacement tools
- Monitoring of the number of pieces
- Tool life monitoring
- Flexible location coding for tools of normal size
- Fixed location coding for oversize tools
- Fixed location coding, also selectable for tools of normal size
- Screen forms for
 - tool data input
 - displaying the magazine assignments
 - displaying the tool data
 - displaying tools locked out

Since the package consists of fully executable function blocks, the machine manufacturer has a facility for additionally using the functions of these blocks for his own purposes (see Section 1.3).

1.1.4 Software requirements

Option N05 "Tool management" can be applied for the SINUMERIK 810 Basic version 2/ 820 Basic version 2 as from software version 02, and for SINUMERIK 820 Basic version 3/ 820 Basic version 3 as from software version 01.

Additionally, the "Configurability" (N31) and "External data input" (F72) options are needed in order to be able to display and enter tool data via special screen forms.

1.1.5 Supplementary documentation

We recommend that the following documentation be studied in addition to this package description:

- Interface Description, Part 1 - Signals
- Installation Guide
- User's Guide (Operating and Programming)
- Planning Guide, CL800 Cycle Language
- Planning Guide, PLC Programming

1.1.6 Declarations

The following declarations should be observed when using the "Tool management" package:

- The D number is the same as the location number.
- The current tool offsets are always in offset memory D99.
- The offsets of the tool in the tool buffer (gripper, loader) are always in offset memory D98.
- The displays and screen forms provided for displaying and entering tool data are examples which can be modified or rejected. It should be noted, however, that these new displays must then also be supported accordingly by the PLC user program. The displays provided should be incorporated by the user in his menus and link list.

1.1.7 Revisions with respect to package version 01

- The relocating of tool data in the TO memory is now handled by a function block of the package. Cycle L945 is therefore dispensed with.
- The "TEST" function (cycle 946) is no longer implemented because it is very rarely used. Package 1 therefore comprises no cycles. The problems previously occurring with interruptions to the automatic mode are therefore ruled out.

1.2 Data structure

1.2.1 Distribution of data

The data used for tool management are distributed as follows with the SINUMERIK 810/820/T/M:

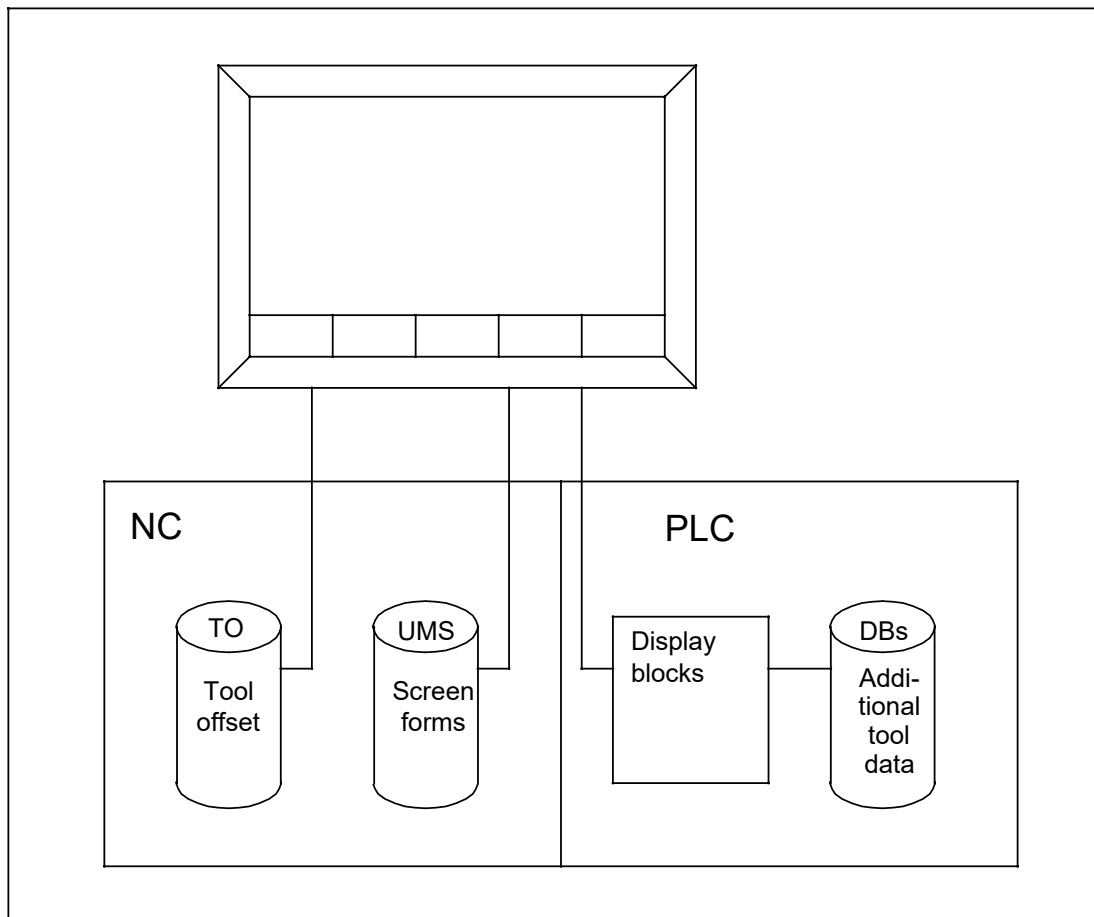


Fig. 1.1 General data structure

The TO memory and the user memory (UM) are assigned to the NC area. Stored in the TO memory are the tool offsets (geometrical data), and in the UMS the screen forms required for displaying the tool data. Additional tool data such as tool life, number of pieces and identifiers are maintained in the PLC. These data are entered in the appropriate screen forms using special display blocks, and therefore made accessible to the operator.

1.2.2 Assignments of the TO memory

	P0	P1	P2 P3 P4	P5 P6 P7	P8 P9
	T No.	Type	Geometry	Wear	Additional compensation
↓ D No.					
.					
.					
.					
.					
.					
.					
.					
.					
Dm					
Dn					

Fig. 1.2 TO memory

The tool data are stored line by line in the individual P memories as compensation blocks.

Each compensation block can be addressed with a D number.

1.2.4 Structure of DBZW

DW8	Old location, loader tool
DW9	Old location, gripper tool
DW10	Old location, spindle tool
<hr/>	
DW17	Number of DBs
DW18	} FB42: auxiliary data word
DW19	
DW20	
DW22	Total number of magazine locations
DW23	FB45: computed arithmetic value
DW24	FB45: status word
DW25	FB42: error message
DW27	FB41: dummy; tool locked out
DW28	FB41: address; search for T no.
DW29	FB42: status word, data transfer
DW30	FB42: auxiliary data word
DW31	FB45: value to be decremented
DW32	FB45: time value
DW51	} FB53: R parameter
.	
.	
.	
DW100	
DW103	FB53: status word
DW105	FB51: status word
DW106	} FB49: subroutine FB42 Status words for tool offsets
.	
.	
.	
DW138	

1.2.5 Meanings of identifier bits in DBn+1

Bit No.

0	Location also occupied by preceding tool
1	Oversize tool
2	Location also occupied by following tool
3	Decrement number of pieces
4	Location reserved
5	Tool with fixed location coding
6	Tool locked out
7	Location assigned
8	Replacement tool
9	Location reserved for "TO in buffer"
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Free for user
15	Free for user

1.3 Application notes

1.3.1 Selection of tool data via T number

A "Search for tool" function can be activated with the unassigned softkey No. 5 in the "Tool data input/output" screen form, by setting a free flag with the softkey; this reads out the T numbers from R parameter R974, R980, R986 and R992 and then enters the corresponding tool data in the appropriate R parameters of this form.

1.3.2 Automatic updating of worn tools

Since updating of the list of worn tools is initiated by pressing softkey No. 1 "DISPLAY" (flag 201.3 = 1), the list can be updated automatically by setting this flag whenever a tool is locked out.

1.3.3 Automatic updating of the tool table

This can be achieved by appropriate measures, as described under 2.2.2. Flag 201.1 must be set after every tool change and after loading/unloading.

1.3.4 Displaying the current T number

This requires that the standard screen forms containing only NC data be extended by a display field, which indicates P memory P1 of tool offset D99 (D99 = active spindle tool, P1 = T number). To display this number in the "TOOLS LOCKED OUT" form, the current T number must be loaded in a free data word which is then configured as an individual field in the table.

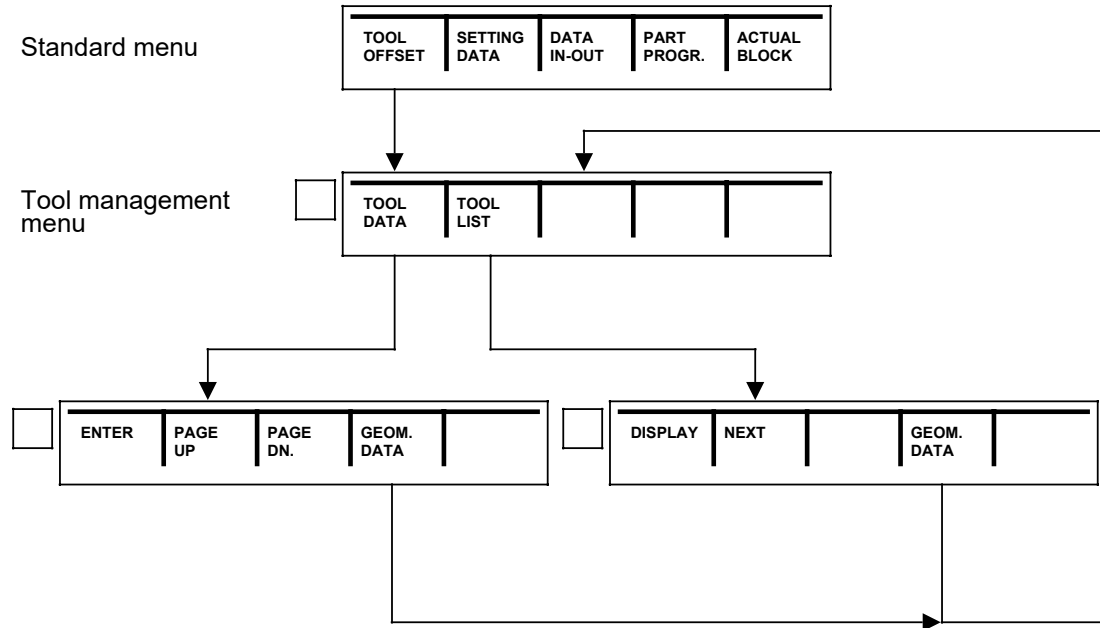
1.3.5 Displaying the current location number

This requires that standard screen forms, containing only NC data, be extended by a display field which indicates, for example, R parameter R960. The current location number must be stored in R960 by a PLC user block; the location number must then be configured in the appropriate screen form. The procedure for the "TOOLS LOCKED OUT" form is similar to that described under 1.3.4. **The disadvantage of this method is that additional PLC memory space is required.**

2 Operation

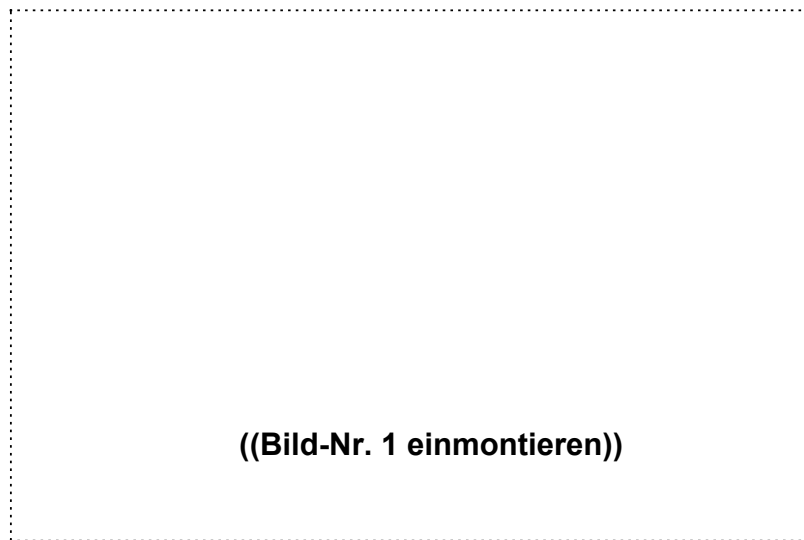
2.1 Input of tool data

From the standard menu, the tool management menu is reached by pressing the "TOOL OFFSET" softkey.



2.1.1 Input via operator panel

- Select the "TOOL DATA INPUT/OUTPUT" screen form.
- Enter the data for up to 4 tools in the form, and use the "ENTER" softkey to transfer the data to the PLC and store them.
- The tool offset form is selected by pressing the "GEOM. DATA" softkey, and the geometrical data can be entered there. For example, the data of the tool at location 5 should be entered in memory D 5, etc..



Notes on the screen form for "TOOL DATA INPUT/OUTPUT":

(R nnn)

Number of the R parameter in which the displayed data is stored.

(M 201.a)

On operating the softkey the pertinent flag is set.

When the "ENTER" softkey is operated:

FB53 allows the values of the R parameter mentioned above to be transferred to the magazine table in the PLC. This is a two-stage process. The R parameters are first transferred to the DBWZ and are then accepted into the magazine table.

When the "PAGE UP" and "PAGE DOWN" keys are operated:

FB53 allows the values in the magazine table to be transferred into the R parameter mentioned above. Here again the DBWZ acts as an intermediary stage.

The user program must allow the necessary parameters to be fetched from FB53. (See example in appendix.)

Data words 51 to 100 of the DBWZ are reserved for data transfer.

Allocation of R parameter - Data word in DBWZ:

		DBWZ	
R 973	↔	DW 51, DW 52	1st location in the display
R 974	↔	DW 53, DW 54	
R 975	↔	DW 55, DW 56	
R 976	↔	DW 57, DW 58	
R 977	↔	DW 59, DW 60	
R 978	↔	DW 61, DW 62	
R 979	↔	DW 63, DW 64	2nd location in the display
R 980	↔	DW 65, DW 66	
R 981	↔	DW 67, DW 68	
R 982	↔	DW 69, DW 70	
R 983	↔	DW 71, DW 72	
R 984	↔	DW 73, DW 74	
R 985	↔	DW 75, DW 76	3rd location in the display
R 986	↔	DW 77, DW 78	
R 987	↔	DW 79, DW 80	
R 988	↔	DW 81, DW 82	
R 989	↔	DW 83, DW 84	
R 990	↔	DW 85, DW 86	
R 991	↔	DW 87, DW 88	4th location in the display
R 992	↔	DW 89, DW 90	
R 993	↔	DW 91, DW 92	
R 994	↔	DW 93, DW 94	
R 995	↔	DW 95, DW 96	
R 996	↔	DW 97, DW 98	
R 997	↔	DW 99, DW 100	Fixed place coding Y/N

When the "GEOM. DATA" softkey or is operated:

The tool offset screen form appears.

2.1.2 Input via punched tape

During the input of tool data via punched tape, a distinction must be made as to whether the data are to be stored in the NC (TO memory) or in the PLC (magazine table). In both cases, the data are stored in the appropriate memory area via suitable parts programs. Program examples are given in the following for both cases.

Where tool data are to be stored in the PLC (Example a), data transfer R par. --> PLC is initiated via an M function (M52). Decoding of this M function must be carried out by the machine manufacturer. The read inhibit must also be applied to the relevant channel with M52. FB53:WZ-DAT must then be assigned parameters and started for data input. One data record can be transferred per call. When the transfer has ended, M52 must be cleared to be able to initiate another transfer. Where the tool data are to be stored in the TO memory (Example b), data transfer R par. --> TO memory is executed by a subroutine (L124) which must be called in the main program (%124).



Example of a load program:

a) Input of data to be stored in the PLC

%123
 R973 =
 R974 =
 R975 =
 R976 =
 R977 =
 R978 =

-Tool 1

Location no.
 T no.
 Duplo no.
 Tool life
 No. of pieces
 Identifier: "oversize tool"

R979 =
 •
 •
 R984 =

-Tool 2

•
 R985 =
 •
 •
 R990 =

-Tool 3

•
 R991 =
 •
 •
 R996 =
 R977 =
 M52

-Tool 4

- Normal size tools, fixed location coding
- Sets flag M201.0 to initiate data transfer to the PLC

R973 =
 •
 R996 =
 R997 =
 M52

- Tools 5
 to 8



b) Input of data to be stored in the TO area

There are two methods of transferring these data:

1. The geometrical data are loaded directly in the TO memory as a TO file via the V.24 interface.
2. The data are loaded in the TO memory via a parts program:

Program example:

```

%124
R50 =
R51 = (P0)
R52 = (P1)
R53 = (P2)
R54 = (P3)
R55 = (P4)
R56 = (P5)
R57 = (P6)
R58 = (P7)
R59 = (P8)
R60 = (P9)
L124P1
.
.
.
R50 =
.
.
.
R60 =
L124P1
M30
    
```

} Tool 1

} Tool n

Location number = D number
T number
Tool type
- Geometry

- Wear

Additional compensation 1
Additional compensation 2

.
 .
 .
 .

Location number = D number

The corresponding subroutine L124 is as follows:

```

L124
@420 K0 R50 K0 R51
@420 K0 R50 K0 R52
.
.
@420 K0 R50 K0 R60
R50 = 0
M17
    
```

The load programs can be started from the operator panel or from the PLC.

2.2 Displaying tool data

2.2.1 Displaying the geometrical data

Select the "TOOL OFFSET" screen form:

- from the standard menu via the "TOOL OFFSET" softkey;
- from the tool management menu via the "GEOM. DATA" softkey. The data located under D number XY pertain to the tool situated at the location with the same number XY.
- In this screen form, the corresponding softkeys can be used to page forwards and backwards through the table as required, or a D number can be preselected and the data displayed immediately with the Search key.



2.2.2 Displaying the data stored in the PLC

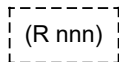
- Select the "TOOL DATA INPUT/OUTPUT" screen form via the "TOOL DATA" softkey in the "TOOL OFFSET" screen form.
- You can page down and up through the magazine table by pressing the appropriate softkeys.
- You can return to the standard menu by pressing the "RECALL" key twice.

2.2.3 Displaying locked-out tools

- Select the "WORN TOOLS" screen form via the "TOOL LIST" softkey in the "TOOL OFFSET" screen form.



Notes on the screen form for the display of worn tools:



Number of the R parameter in which the displayed data is stored.

(M 201.a)

On operating the softkey the pertinent flag is set.

- The first six locked-out tools are displayed in ascending order of location numbers by pressing the "DISPLAY" softkey. Other tools are displayed by pressing the "NEXT" softkey. It is not possible to page backwards through this table, but you can move to the beginning of the table by pressing the "DISPLAY" softkey.
- You can return to the standard menu by pressing the "RECALL" key twice.

3 Description of Function Blocks

3.1 FB40: SUCH

Search

3.1.1 Description

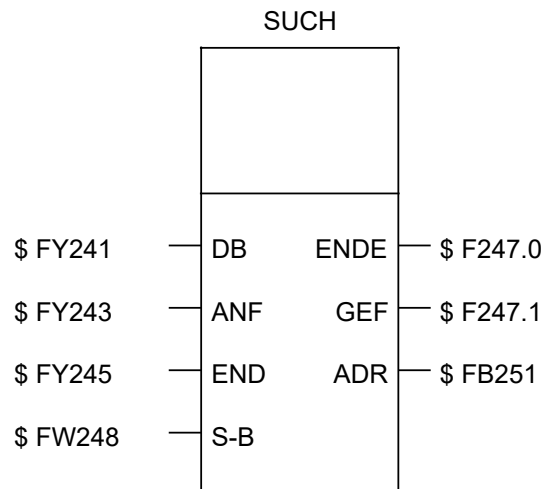
This block is called by FB41:SUCH-ROU; it searches through the tool table defined via flag bytes, for a given search term. To search through the entire range, specify the data words of the first and last magazine locations with parameters ANF and END.

When the desired term is found, FB40 transfers the data word address which FB41:SUCH-ROU interprets as the specified position. In addition, output GEF is also set when the term is found. When all data words have been scanned, output END is also issued.

3.1.2 Block data

Lib. No.	:	
FBs to be loaded	:	FB40
DBs to be loaded	:	Data blocks of the magazine table
Type of FB call	:	Unconditional
DBs to be input	:	None
Error messages	:	None

3.1.3 Block call



3.1.4 Signal descriptions

DB	Data block: Number of the data block for search
ANF	Start: Start address (DW no.) of the search range
END	End: End address (DW no.) of the search range
S-B	Search term: Term to be searched for
ENDE	End: End of the search operation
GEF	Found: Search term has been found
ADR	Address: Address (binary); DW no. of the value found

3.1.5 Parameter assignments

The tool with number 17 is to be searched for with FB40:SUCH. The magazine has a total of 32 locations; the first one is assigned to data word 11. The number of the corresponding data block is 152.

```
: L   KB152   DB number
: T   FY241
: L   KB11
: T   FY243   1st DW
: L   KB42
: T   FY245   Last DW
: L   KH17   T No.
: T   FW248
: JU  FB40
NAME : SUCH
: ***
```

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3.2 FB41: SUCH-ROU

Search routine

3.2.1 Description

Via FB41, the tool table is scanned in conjunction with FB40:SUCH for a tool defined by parameter "T-W", T word. By applying parameter "SGWZ" it is possible to search for locked-out tools independently of the tool number. Additionally, this function block is able to search for an empty location for the spindle tool by applying parameter "S-SP". Depending on whether the tool is a normal one or has fixed location coding, a new empty location is sought or the retained old location is output.

To search for an empty magazine location for magazine tooling, "0" should be entered for parameter "T-W".

When FB40:SUCH has determined the location number of the tool and transferred it to FB251, FB41:SUCH-ROU computes the shortest path between the actual and setpoint positions; the actual value contains the current location at the tool changing position and the setpoint contains the location found. As long as there is a difference between the setpoint and actual positions, a logic high is present at "MPO". If they are identical, this signal changes from one to zero and a logic high is present at "MIPO".

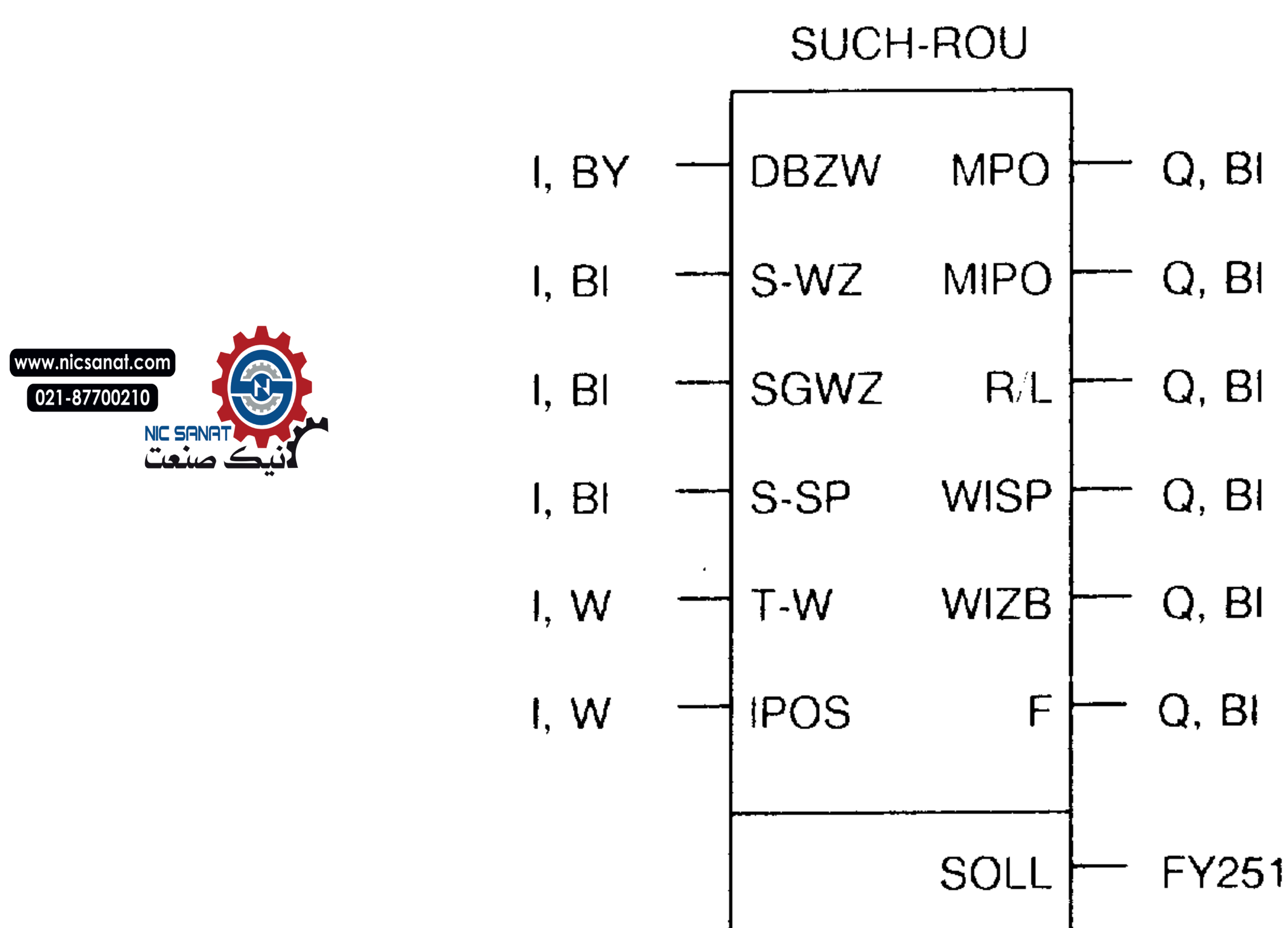
Depending on the optimum direction of rotation of the magazine, output "R/L" exhibits a "0" for clockwise rotation or a "1" for counter-clockwise rotation.

When a tool number is sought, a machining tool is sought in the first run. If no tool with this number is found, a second search run starts automatically; in this run, the first replacement tool found with this number is declared to be the valid tool and is output.

3.2.2 Block data

Lib. No.	:	
FBs to be loaded	:	FB41, FB40
DBs to be loaded	:	Data blocks of the magazine table
Type of FB call	:	Unconditional
DBs to be input	:	None
Error messages	:	Error if the tool is not in the list

3.2.3 Block call



3.2.4 Signal descriptions

- DBZW** Status word DB:
1st DB of the magazine table; tool table begins with DBWZ + 1.
- S-WZ** Search for tool:
If a logic 1 is present, the block will be activated to search for a tool defined with "T-W".
- SGWZ** Search for locked-out tool:
The block scans through the tool table for locked-out tools. To find all locked-out tools, the block must be initiated repeatedly.
- S-SP** Search for empty location for spindle tool:
To clear the spindle, "1" should be assigned to this parameter. Either an empty location is searched for (normal tool) or the old location is output (oversize tool or tool with fixed location coding).
- T-W** Tool number:
The tool number for searching is entered via this parameter. If "0" is entered, an empty location will be searched for.
- IPOS** Actual position:
The actual position specifies the magazine location at the tool changing position.
- SOLL** Setpoint position:
The desired tool is situated at this magazine location.

- MPO** Position the magazine:
As long as a "1" is present here the setpoint position has not yet been reached; the magazine must be positioned further, taking "R/L" into account.
- MIPO** Magazine is positioned:
A logic "1" is present when the setpoint position is the same as the actual position.
- R/L** Clockwise/counter-clockwise rotation of magazine:
R/L = 0 CCW
R/L = 1 CW
- F** Error: No search term has been found
- WISP** Tool in spindle:
The desired tool is situated in the spindle.
- WIZB** Tool in loader:
The desired tool is situated in the gripper or loader.

3.2.5 Parameter assignments

A tool is to be searched for via a T no. from Channel 1 with FB41:SUCH-ROU. DBZW has number 150. As long as the magazine is being positioned, there is a logic high at output 0.0. When it is positioned there is a "1" at output 0.1. The direction of rotation of the magazine can be detected at output 0.2: it is rotating clockwise when there is a logic low at output 0.2, and counter-clockwise when a logic high is present. In the event of an error, output 0.3 is set.

: L KB150 No. of DBZW
: T FY140
: JU FB41
NAME : SUCH-ROU
DBZW : FY140
S-WZ : F 25.4 T change signal
SGWZ : F 158.1
S-SP : F 158.2
T-W : FW 75 T word
IPOS : IW 35
MPO : Q 0.0
MIPO : Q 0.1
R/L : Q 0.2
F : Q 0.3
WIZB : Q 0.4
WISP : Q 0.5
: BE



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3.3 FB42: TRANSFER

Transfer of tool data

3.3.1 Description

Function block FB42:TRANSFER is used for every relocating function occurring during a tool change. This requires that the FB parameters be reassigned for each relocating function, and the block started. After each data transfer, all memory locations of the source data are erased. Additionally, identifier bit DBn + 1 bit 4 (location reserved for new tool or reserved for tool in the tool buffer) is set when the source data have been erased.

The bit assumes a dummy function here to prevent overtooling of the magazine. Additionally, the number of the old location is maintained in DBZW for the tool for which the old location is being reserved. This is not, however, a tool with fixed location coding; the old location serves to allow clearing of bit 4 in DBn + 1 if the tool is not replaced in the old location.

The block distinguishes between two variants during the assignment of the destination parameter:

a) Assignment of the value 0 to parameter ZIEL:

During a data interchange between the tool buffer and the tool magazine, bit 5 in DBn + 1 (tool with fixed location coding) is evaluated. If it is at logic high, the data are stored at the old location which is maintained. If it is not a tool with fixed coding or if the data transfer is in the opposite direction, i.e. from the tool magazine to the tool buffer, output "F" is set and the data transfer is aborted.

b) Assignment of a value other than 0 to parameter ZIEL:

If the value specified is not 0, the identifier bits of the tools are not evaluated. The data transfer is always executed if the destination location is not occupied. The error output is reset upon restart of the FB.

A data transfer is always executed over the entire width of the magazine table, but without DBZW.

For a transfer to the spindle and from the spindle, R parameters of the NC are assigned defaults so that the data in the TOA memory can also be relocated. For this transfer, two¹⁾ data bytes must be made available by the user in the interface data block (DB 36). However, only the first byte is specified; the program automatically adopts the next bytes.

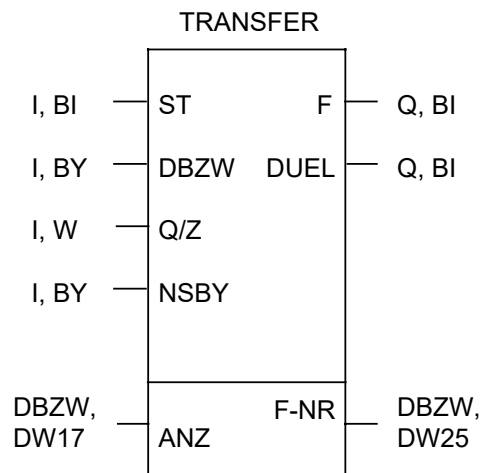
1) four data bytes as from software version 58

For a tool change, the FB is called twice in succession with the addresses valid for this transfer in each case. However, the second call for the FB may only become active when the data transfer of the first FB call is completed. FB42 must therefore be called conditionally, depending on signal "DUEL" (data transfer active).

3.3.2 Block data

Lib. No.	:	
FBs to be loaded	:	FB42, FB49
DBs to be loaded	:	Data blocks of the magazine table
Type of FB call	:	Conditional
DBs to be input	:	None
Error messages	:	1: Destination = 0 Tool has no fixed location coding
	:	2: Magazine location occupied (destination address DBn+1/bit 7 set)
	:	3: Destination = 0 and source > 10
	:	4: D no. destination is occupied (Important: in this case the PLC data have already been relocated.)

3.3.3 Block call



3.3.4 Signal descriptions

- ST** Start:
The block can be started via the start parameter when all other parameters have been assigned.
Note: There is **no** "signal edge evaluation".
- DBZW** Status word DB:
1st DB of the magazine table; tool table begins with DBWZ+1.
- Q/Z** Source/destination:
Specification of data words in which the source data are stored or are to be stored (destination).
- NSBY** Interface byte in DB36:
This indicates the current state of processing of the data transfer (only DLx, DRx permissible) (x = 0 to 29).
- DUEL** Data transfer active:
This parameter indicates that the data transfer between NC and PLC has not yet ended. As long as this parameter is at logic "1", a second relocating operation with the transfer block must not be executed.
- F, F-Nr.** Error, error number:
If a data transfer cannot be executed, this parameter is at logic "1". The error number is stored in DBZW/DW25.
- ANZ** Number:
Magazine DB specification; the data is stored in DBZW, DW17 by FB43:EINR-MAG.

3.3.5 Parameter assignments

The data are to be transferred from the tool location at the tool changing position to the tool buffer with FB42:TRANSFER. The data are stored in the DW of the gripper (DW9) in the tool buffer. The 1st DB of the magazine table is DB150. The first magazine location corresponds to DW11; the interface byte is DR 12.

```

: L   KB150
: T   FY140   DBZW
: L   FY251   DW no. tool location (actual value)
: T   FY142   Source DW
: L   KB9
: T   FY143   Destination DW (buffer)
:
: A   I30.5   Tool from magazine gripper
: AN  F 150.1
: S   F 150.1
: =   F 150.2
: AN  I30.5
: R   F 150.1
: O   F 150.2
: O   Q 4.5
: JU  FB42
NAME : TRANSFER
ST   : F 150.2
DBZW : FY140
Q/Z  : FW142
NSBY : DR12
DUEL : Q 4.5
F    : Q 0.5
: BE

```

3.4 FB43: EINR-MAG

Creating the magazine table

3.4.1 Description

Upon cold start (F2.1 = 1), the data blocks of the magazine table are created with FB43:EINR-MAG, with the specified number and length.

The data required for creation are indicated to the FB via parameters.

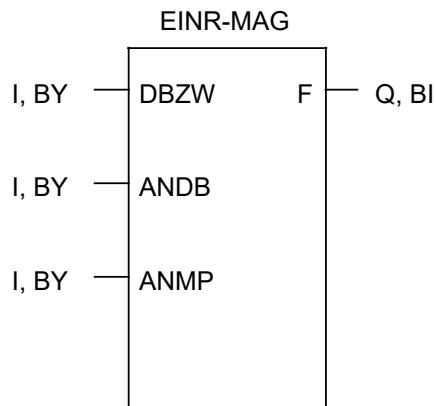
DBZW, which must not be taken into account in the specification of data blocks, has a preset length of 150 data words.

If the user attempts to occupy more than 97 magazine locations, an error message is issued and the creating operation is interrupted.

3.4.2 Block data

Lib. No.	:	
FBs to be loaded	:	FB43
DBs to be loaded	:	None
Type of FB call	:	Unconditional
DBs to be input	:	None
Error messages	:	Number of magazine locations is more than 97

3.4.3 Block call



3.4.4 Signal descriptions

DBZW	Status word DB: 1st DB of the magazine table; tool table begins with DBZW + 1.
ANDB	Number of DBs: Number (quantity) of data blocks to be created without DBZW
ANMP	Number of magazine locations
F	Error: Error bit is "1" if the number of magazine locations is more than 97.

3.4.5 Parameter assignments

The magazine for the PLC is to be set up with FB43:EINR-MAG. The data blocks must be contiguous.

DBZW has the number 150; four DBs are to be created with a length of 32 data words. The error output is output 0.0

	: L	KB150	No. of DBZW
	: T	FY140	
	: L	KB4	Number of DBs to be created
	: T	FY150	
	: L	KB32	Number of magazine locations
	: T	FY152	
	: JU	FB43	
NAME	:	MAG-EINR	
DBZW	:	FY140	
ANDB	:	FY150	
ANMP	:	FY152	
F	:	Q 0.0	
	:	BE	

3.5 FB44: STUECK

Monitoring the number of pieces

3.5.1 Description

This block serves for wear detection by monitoring the number of pieces. An empirically determined number of workpieces to be machined (max. batch size 9998, BCD) is preset for each tool. When a tool is mounted (BEAR = "1") the value stored for the number of pieces is decremented by 1 and identifier bit 3 for "No. of pieces decremented" is set in DBn+1. If the number of pieces is not to be monitored for a tool, the value "9999" should be entered in the relevant data word.

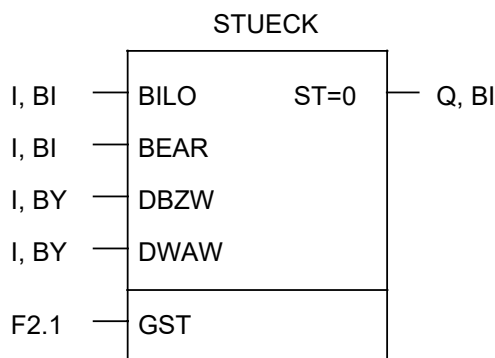
When the number of pieces reached is zero the tool is immediately locked out. Simultaneously, the signal for "Pieces = 0" is output for one cycle.

The batch size is stored in a data block in the PLC. The input and processing of a prewarning limit are not supported by this block.

3.5.2 Block data

Lib. No.	:	
FBs to be loaded	:	FB44
DBs to be loaded	:	Data blocks of the magazine table
Type of FB call	:	Unconditional
DBs to be input	:	None
Error messages	:	None

3.5.3 Block call



3.5.4 Signal descriptions

BILO	Clear bit: Clearing of bit 3 for "No. of pieces decremented" in the identifier DB for all marked tools of the magazine table.
BEAR	Machining: The parameter must be at logic "1" when the active tool has been mounted. If its identifier bit 3 for "No. of pieces decremented" in DBn+1 is not set, the number of pieces will be decremented by 1.
DBZW	Status word DB: 1st DB of the magazine table; tool table begins with DBZW+1.
DWAW	Data word address, active tool Specification of the data word (binary) in which the data for the active tool are stored.
ST=0	Pieces = 0: The parameter is at logic "1" for one cycle when the number of pieces has reached the value 0.
GST	Initial setting (F2.1 is evaluated internally).

3.5.5 Parameter assignments

The tool situated in the spindle (DW10) has a value of 13 for the number of pieces. Depending on input 30.2, the bit for "Decrement number of pieces" in the identifier data block will be cleared.

	: L	KB150	DBZW
	: T	FY140	
	: L	KB10	Data word address: active tool
	: T	FY152	
	: JU	FB44	
NAME	: STUECK		
BILO	: I 30.2	Clear bit	
BEAR	: F 150.1	Machining active	
DBZW	: FY140		
DWAW	: FY152		
ST=0	: Q 2.0		
	: BE		

3.6 FB45: STAZEIT

Tool life monitor

3.6.1 Description

This block serves for tool wear detection by monitoring the tool life. A maximum possible machining time (tool life), preset by the user, is reduced as a function of a time weighting factor K (2 decades; BCD). The tool life is entered in minutes (4 decades; BCD) and the maximum value is 9998 minutes. If 9999 is entered, no tool life monitoring will take place.

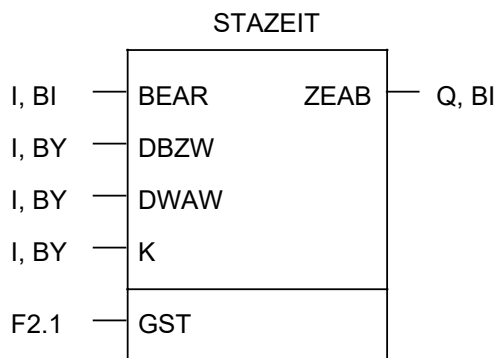
During machining (BEAR="1") a count is reduced step by step at a 1s rate. If the count reaches a value of less than 0, the tool life is decremented by 1 and the count reduction starts again. Down-counting can be accelerated via a factor K (K=01 to 09) or slowed down (K=11 to 98). If K=0 or 99 the block will not be processed. If K=10, decrementing will be at the 1-minute rate.

When the tool life of the tool has elapsed, bit 6 for "Tool locked out" is set in the identifier DB. The input and processing of a prewarning limit is not supported by this block. The block automatically corrects timing errors created by different PLC cycle times. This requires that PLC MD 2003 bit 7 (enable diagnostics DB1) is set.

3.6.2 Block data

Lib. No.	:	
FBs to be loaded	:	FB45
DBs to be loaded	:	Data blocks of the magazine table
Type of FB call	:	Unconditional
DBs to be input	:	None
Error messages	:	None
Timers to be loaded	:	T0

3.6.3 Block call



3.6.4 Signal descriptions

BEAR	Machining: The parameter must be logic "1" when the active tool has been mounted.
DBZW	Status word DB: 1st DB of magazine table; tool table begins with DBZW+1.
DWAW	Data word address, active tool: Specification of the data word (binary) in which the data for the current tool are stored.
K	Time weighting factor K (2 decades/BCD); value range 00 to 99: K = 00: Terminate block processing K < 10: Accelerate tool life down-counting K = 10: Tool life reduction in minutes K > 10: Slow down tool life down-counting K = 99: Terminate block processing
ZEAB	Timeout: The parameter is at logic "1" for one cycle when the tool life of the active tool has elapsed.
GST	Initial setting

3.6.5 Parameter assignments

The default values for tool life are stored in the PLC in the data block. DBZW has the number 150. The tool life is measured in minutes (K factor=10). The tool is situated in the spindle; its data word address is therefore DW10. When the time has elapsed, output 2.1 is to be set.

```

: L   KB10
: T   FY151
: L   KH0010   Time weighting factor = 10
: T   FY152
: L   KB150   DBZW
: T   FY153
: JU  FB45
NAME : STAZEIT
BEAR : FY150.0   Machining active
DBZW : FY153
DWAU : FY151
K     : FY152
ZEAB : Q 2.1
: BE

```

3.7 FB50: SATZVORL

Correction of tool compensation during block search

3.7.1 Description

During block search, this block corrects the tool compensations, i.e. it updates the tool data in offset memory D99 after each tool call and so prevents incorrect initiation of certain alarms during block search.

This block is active only when block search is active. First of all, the current offsets are saved from D99. An initiation signal ("WZWE"=1) causes a search to start for the current T word and its compensations are transferred to D99. The values remain active until "WZWE" is again "1" following a new T call. In this case, D99 is overwritten with the compensation values of the new T word.

At the end of block search, the original compensations are entered in D99.

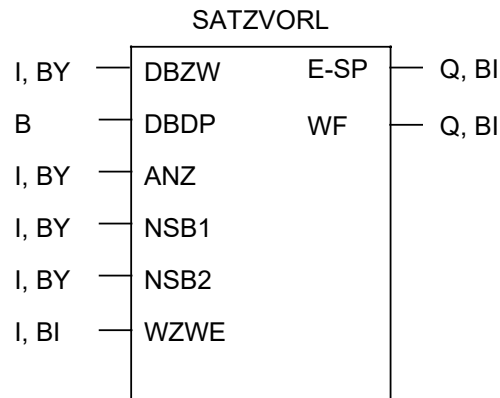
While this block is active, a "1" signal is output at the "E-SP" parameter (read-in disable). This signal must be gated by the user with the interface signal "Read-in enable" Q87.5.

This block uses FB40 as search routine.

3.7.2 Block data

Lib. No.	:	
FBs to be loaded	:	FB50, FB40
DBs to be loaded	:	Data blocks of magazine table, DB data buffer
Type of FB call	:	Unconditional
DBs to be input	:	None
Error messages	:	None

3.7.3 Block call



3.7.4 Signal descriptions

- DBZW** Data block with status words:
First DB in the magazine table; the magazine table itself begins at DBZW+1.
- DBDP** DB for data buffering:
The data block is created automatically by FB50 at Power On with a length of 65DW.
- ANZ** Number of magazine locations
- NSB1** Interface byte 1:
Byte from DB36 for the first data transfer between PLC and NC with FB61.
- NSB2** Interface byte 2:
Byte from DB36 for the second data transfer between PLC and NC with FB62 (only DLx or DRx allowed, NSB1 and NSB2 must not be identical).
- WZWE** Tool change has been performed:
This signal may exist only for the duration of one PLC cycle. Updating of the tool compensations in D99 is initiated with this signal.
- E-SP** Read-in disable:
Block search is stopped with this signal until all updated data is contained in D99. The signal must be gated with the interface signal "Read-in enable" Q87.5.
- WF** Tool missing:
A tool that was called during block search cannot be found in the magazine table.

3.7.5 Additional conditions

Machine data 5460 must be set such that the T word and another auxiliary function (in this example the H word) are output even during word search.

3.7.6 Example of call

FB255 Example of block search

```
: L   KH6666  H word for activating the block search FB
: L   FW81    H word
: !   =F
: A   F25.5   H modification
: =   F 170.0 WZWE
: L   KB150
: T   FY160   No. DBZW
: L   KB30
: L   FY161   Quantity of locations
:
: JU   FB50
NAME : SATZVORL
DBZW : FY160
DBDP : DB170
ANZ  : FY161
NSB1 : DL1
NSB2 : DR2
WZWE : F 170.0
E-SP : F 170.1
WF   : F 170.2

: O   F 170.1
: O   F 170.2
: R   Q 87.5  Read-in enable

: BE
```

Associated tool change program:

```
L06
@ 714
M06 H6666
D99
M17
```

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3.8 FB51: GWZ-PUFF

Entering locked-out tools in the buffer

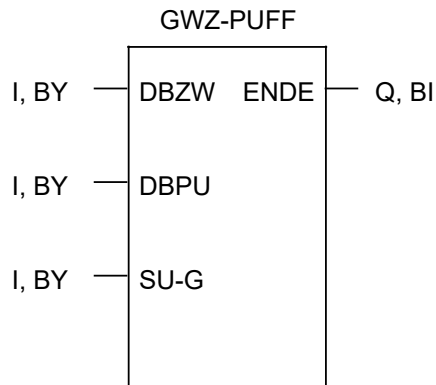
3.8.1 Description

When requested (SU-G = "1"), the block scans the magazine table for locked-out tools and enters their location, T and duplo numbers in a data buffer. In the initialization routine (M2.1="1") the data blocks are created for the tool buffer (a total of 3 DBs, each with 70 data words). When the FB has scanned through the entire magazine, it issues the message "ENDE" = 1 for one PLC cycle.

3.8.2 Block data

Lib. No.	:	
FBs to be loaded	:	FB51
DBs to be loaded	:	Data blocks of magazine table
Type of FB call	:	Unconditional
DBs to be input	:	None
Error messages	:	None

3.8.3 Block call



3.8.4 Signal descriptions

DBZW	Status word DB 1st DB of the magazine table; tool table begins with DBZW+1.
DBPU	Data block for buffer First DB of data buffer; a total of three DBs are required. These are created by the FB during initialization with 70 DWs each (DBs used: DBPU, DBPU+1, DBPU+2).
SU-G	Search for locked-out tools The FB becomes active with a logic "1", scans the magazine table for locked-out tools and enters them in the data buffer. (The signal may only be applied for one PLC cycle.)
ENDE	End of the search The entire magazine has been scanned.

3.8.5 Parameter assignments

The tool table is to be scanned for locked-out tools. DBZW has the number 150; the number of the first buffer data block is 156. The search operation is started with a softkey, F 201.3. This must be reset after the FB call.

	: L	KB150	No. of DBZW
	: T	FY140	
	: L	KB156	No. of 1st DB of buffer
	: T	FY142	
	: JU	FB51	
NAME	:	GWZ-PUFF	
DBZW	:	FY140	
DBPU	:	FY142	
SU-G	:	F201.3	Softkey flag
ENDE	:	F150.0	
	:	A F 201.3	Softkey flag
	:	R F 201.3	
	:	BE	

3.9 FB52: ANZ-GWZ

Displaying locked-out tools

3.9.1 Description

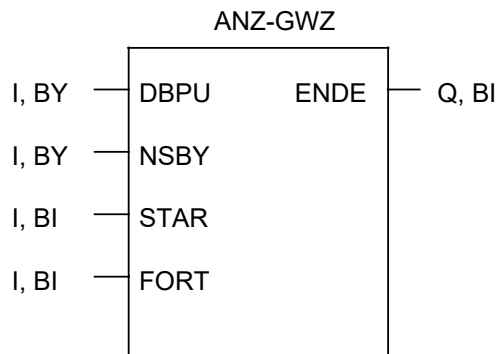
The block transfers tool data (location number and T number) for locked-out tools from a buffer area (DBs) to R parameters which can be displayed on the NC screen. When parameter "ANZ" is at logic "1" the first six tools are displayed. To allow displaying of additional tools, parameter "FORT" must be at logic "1". A maximum of 24 locked-out tools can be displayed in this manner (logic "1" three times at parameter "FORT").

The FB can only be used expediently with a configured display.

3.9.2 Block data

Lib. No.	:	
FBs to be loaded	:	FB52
DBs to be loaded	:	DBPU, DBPU+1, data blocks of magazine table
Type of FB call	:	Unconditional
DBs to be input	:	None
Error messages	:	None

3.9.3 Block call



3.9.4 Signal descriptions

DBPU	First data block of data buffer: 2 data blocks are required (DBPU and DBPU+1).
NSBY	Interface byte: Byte from DB36 for data transfer between PLC and NC with FB61, FB62 (Only DLx or DRx are permissible; x = 0 to 31).
STAR	Start of display: With a logic "1", the first six tools will be transferred from the data buffer to R parameters (signal may only be applied for one cycle).
FORT	Continue display: With a logic "1", a further six tools will be displayed (three times max. = total of 24 tools). The signal may only be applied for one PLC cycle.
ENDE	End of transfer: Transfer of tool data to R parameters is complete; the values in the R parameters are valid.

3.9.5 Parameter assignments

Flag byte 201 used in the following relates to the softkeys of the existing displays. If these flags are to be used, ensure that they are reset after the relevant FB call.

FB52:ANZ-GWZ must be called for displaying on the NC screen. When the "START" key (menu key) is pressed, the first six tools and their location numbers will be output; with the "Continue" key, the next six will be output, until the maximum number of 24 tools has been output. If the preconfigured displays are to be used, the FB should be assigned parameters as in the following example. Here too, ensure that the flags used of flag byte 201 are reset.

: L	KB156	DB no. of 1st buffer DB
: T	FY142	
: L	KB150	No. of DBZW
: T	FY140	
: JU	FB52	
NAME	: ANZ-GWZ	
DBPU	: FY142	
DBZW	: FY140	
STAR	: F150.0	End signal of FB51
FORT	: F201.4	Softkey flag
ENDE	: F105.1	
	: A F 201.4	Softkey flag
	: R F 201.4	

3.10 FB53: WZ-DAT

Accepting and displaying tool data

3.10.1 Description

The block enters in the magazine table the tool data which were stored in an R parameter display on the NC screen, in accordance with the specified location numbers. A maximum of four magazine locations can be loaded at one time; the locations need not be contiguous and consecutive (parameter "UEBE"="1").

Caution: No collision monitoring takes place.

A magazine location is deleted by entering "T No.=0" and "UEBE=1". During deletion of a tool, it is also necessary to specify whether it is a normal tool or oversize tool.

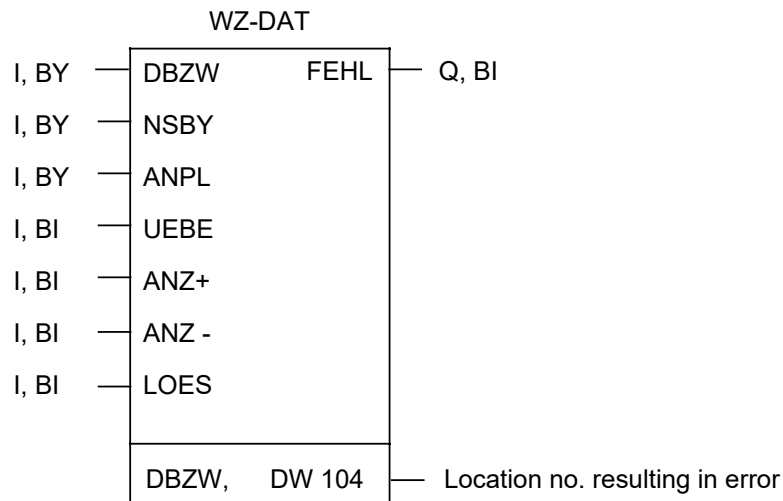
Tool data can be overwritten as long as the tools are of the same size (normal tool or oversize tool), otherwise an error message will be output (output "FEHL"="1" and the location number at which incorrect loading was carried out will be specified in DW104 of DBZW).

Additionally, tool data already entered in the table can be displayed with the block and the corresponding NC display (parameter "ANZ+" or "ANZ-"="1"). Displaying of four magazine locations begins with the first location. Upon repeated keystroke, the next (ANZ+=1) or previous (ANZ-=1) four locations are displayed, etc..

3.10.2 Block data

Lib. No.	:	
FBs to be loaded	:	FB53, FB54, FB55
DBs to be loaded	:	Data blocks of the magazine table
Type of FB call	:	Unconditional
DBs to be input	:	None
Error messages	:	Error during loading a nonexistent magazine location

3.10.3 Block call



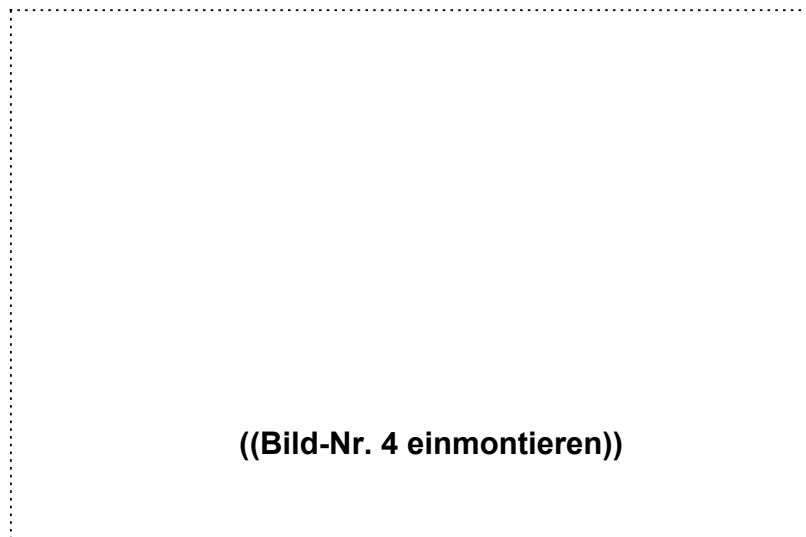
3.10.4 Signal descriptions

- DBZW** Data block with status words:
First DB of magazine table; magazine table itself begins with DBZW+1.
- NSBY** Interface byte:
Byte from DB36 for PLC <-> NC data transfer with FB61, FB62
(Only DLx or DRx are allowed; x = 0 to 31).
- ANPL** Number of magazine locations
- UEBE** Input into magazine table:
With a logic "1", the values will be read into the PLC from the NC screen form and transferred to the magazine table (the signal may only be applied for one PLC cycle).
- ANZ+** Displaying of tool data
- ANZ -** With a logic "1", the data of the magazine table will be transferred to the NC screen form. Four locations will be displayed starting with location 1. If ANZ + is pressed again, the next four locations will be displayed. If ANZ - is pressed the previous four locations will be displayed. The signal may only be applied for one PLC cycle.
- LOES** Deletion of input parameters:
The R parameters of the loading screen form are deleted with a logic "1" (e.g. when exiting the loading form).
- FEHL** Error:
Logic "1" if a location which does not exist in the magazine is to be loaded.

3.10.5 Parameter assignments

The user has the facility for assigning defaults to the data blocks required for tool management via a menu. This requires that FB53:WZ-DAT is called. Additionally, this function block allows displaying of the current magazine assignments at any time. To assign defaults to the data blocks, the appropriate data for the relevant magazine location are entered on the NC screen. The magazine locations need not be in ascending order.

The display for the "TOOL DATA INPUT/OUTPUT" is as follows:



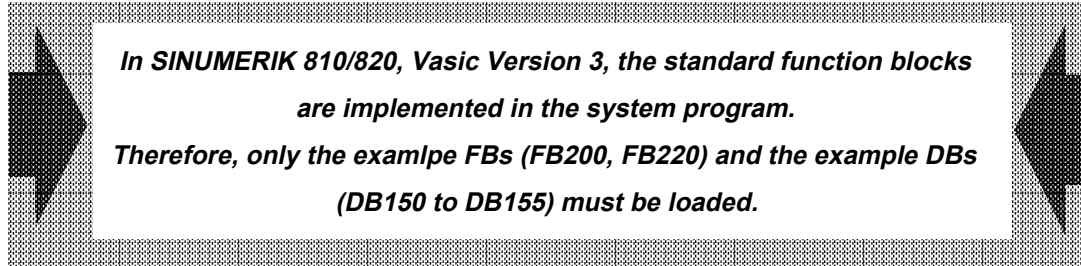
Four magazine locations can be programmed with appropriate data per display; these are transferred to the relevant DBs by pressing the "ENTER" key. The current magazine location assignment is displayed by pressing the "DISPLAY" softkey.

A total of 32 magazine locations are to be assigned. The number of DBZW is 150.

: L KB 150	No. of DBZW
: T FY 140	
: L KB 32	Number of magazine locations
: T FY 144	
: JU FB53	
NAME : WZ-DAT	
DBZW : FY 140	
NSBY : DL 1	
ANPL : FY 144	
UEBE : F 201.0	Softkey flag
ANZ+ : F 201.1	Softkey flag
ANZ - : F 201.2	Softkey flag
LOES : F 201.5	
FEHL : Q 3.7	
: A F 201.0	
: R F 201.0	
: A F 201.1	
: R F 201.1	
: A F 201.2	Reset for softkey flags
: R F 201.2	
: A F 201.5	
: R F 201.5	

4 Program Example

All data and function blocks required for the example described in the following can be found on the standard software floppy disk. The defaults for the data blocks are the example data described. To enter one's own values, it is merely necessary to transfer the function blocks to the PLC and create the data blocks during startup. This is also achieved by calling the example FB (FB 200) which is called on the floppy disk in OB1. (To assign defaults to the data blocks see Section 5: Appendix.)



The example is based on the following parts program:

N5	F100	T17	M06	
N10	G04	X10		Waiting time (substitute for processing time)
N15	T3			
N20	G04	X10		Waiting time (substitute for processing time)
N25	M06			
N30	G04	X10		Waiting time (substitute for processing time)
M30				

In this example there are:

32	magazine locations
5	oversize tools
5	tools with tool life monitoring
5	tools with monitoring of the number of pieces

The following data blocks are first created during startup with FB43:EINR-MAG:

DWZW		Fixed data word selection
DBn+1	Identifiers	Quantity depends on no. of mag. locations
DBn+2	T numbers	Quantity depends on no. of mag. locations
DBn+3	Duplo numbers	Quantity depends on no. of mag. locations
DBn+4	Tool life	Quantity depends on no. of mag. locations
DBn+5	No. of pieces	Quantity depends on no. of mag. locations

In this example, DBZW has the number 150. All DBs are in succession and the no. of pieces DB has the number 155. DBs 158-160 must also be created as display buffer for the screen form for locked-out tools.

Search for a tool:

The tool with the number 17 is required for machining. FB41:SUCH-ROU is therefore called and assigned the appropriate parameters. In this example, tool 17 is at DW26 which corresponds to magazine location 16. The address is output in FY251. After determining this address, the FB computes the shortest direction of rotation. This is passed on to the tool magazine controller with the relevant position signals.

If the tool is to be loaded from the magazine into the loader, FB42:TRANSFER is called so that the specific data can also be transferred. This FB is therefore programmed with the source and destination, FY251 and DW9 respectively in this case. It may now be necessary to clear the spindle, and FB-SUCHROU must therefore be initiated again. If the spindle tool and the new tool to be mounted are of the same size, they are merely interchanged. In both cases, FB42:TRANSFER must be initiated so that the data of the spindle tool are transferred to the data word of the new magazine.

The tool situated in the loader must then be brought to the spindle; the data are relocated again by initiating FB42:TRANSFER.

If wear monitoring is to be implemented, a choice can be made between monitoring the number of pieces or tool life monitoring.

5 Appendix

5.1 Printout of the PLC program example

FB 200

A:BEISPIST.S5D

LAE = 109
SHEET 1

Network 1

OVERALL EXAMPLE

NAME : GESAMT

```

0005      :L   KB 150
0006      :T   FY 140          NO. OF DBZW
0007      :L   KB 5
0008      :T   FY 141          QTY. OF DBs
0009      :L   KB 32
000A      :T   FY 142          QTY. OF MAG. LOCATIONS
000B      :JU  FB 43
000C NAME :EINR-DB
000D DBZW :   FY 140
000E ANDB :   FY 141
000F ANMP :   FY 142
0010 F    :   Q   0.0
0011      :
0012      :L   KB 156
0013      :T   FY 144          NO. OF FIRST BUFFER DB
0014      :JU  FB 51
0015 NAME :GWZ-PUFF
0016 DBZW :   FY 140
0017 DBPU :   FY 144
0018 SU-G :   F 201.3          SOFTKEY FLAG
0019 ENDE :   F 150.0
001A      :JU  FB 52
001B NAME :ANZ-GWZ
001C DBPU :   FB 142
001D NSBY :   DR 2
001E STAR :   F 150.0          END SIGNAL OF FB51
001F FORT :   F 201.4          SOFTKEY
0020 ENDE :   F 150.7
0021      :A   F 201.3
0022      :R   F 201.3
0023      :A   F 201.4
0024      :R   F 201.4
0025
0026      :JU  FB 53
0027 NAME :WZ-DAT
0028 DBZW :   FY 140
0029 NSBY :   DL 1
002A ANPL :   FY 142
002B UEBE :   F 201.0          SOFTKEY

```

5.1 Printout of the PLC program example

FB 200

A:BEISPIST.S5D

LAE = 109
SHEET 2

```

002C ANZ+ : F 201.1      SOFTKEY
002D ANZ- : F 201.2      SOFTKEY
002E LOES . F 201.5      SOFTKEY
002F FEHL : Q 3.7
0030      :A F 201.0
0031      :R F 201.0      RESET SOFTKEY FLAG
0032      :A F 201.1
0033      :R F 201.1
0034      :A F 201.2
0035      :R F 201.2
0036      :A F 201.5
0037      :R F 201.5
0038
0039      :A F 25.4       T CHANGE
003A      := F 137.7
003B      :L FW 75       T WORD
003C      :T FW 160
003D      :JU FB 41
003E NAME :SUCH-ROU
003F DBZW : FY 140
0040 S-WZ : F 137.7
0041 SGWZ : F 0.0
0042 S-SP : F 137.0      EMPTY LOC. FOR SPINDLE TOOL
0043 T-W   : FW 160
0044 IPOS : FW 170       ACTUAL POSITION
0045 MPO  : Q 0.1
0046 MIPO : Q 0.2
0047 R/L  : Q 0.3
0048 F    : Q            0.4
0049 WIZB : Q 0.5
004A WISP : Q 0.6
004B      :
004C      :
004D      :JU FB 220     UPDATE TOOL DATA
004E NAME :UMLAD        UPON TOOL CHANGE
004F      :
0050      :
0051      :
0052      :
0053      :L KB 10
0054      :T FY 141     CURRENT DW (SPINDLE)
0055      :JU FB 44
0056 NAME :STUECK
0057 BILO : I 31.0
0058 BEAR : I 31.1
0059 DBZW : FY 140
005A DWAU : FY 141
005B ST=0 : Q 1.7
005C      :
005D      :L KB 10
005E      :T FY 142     TIME WEIGHTING FACTOR K
005F      :JU FB 45

```

FB 200

A:BEISPIST.S5D

LAE = 109
SHEET 3

```
0060 NAME :STAZEIT
0061 BEAR :    I 31.2
0062 DBZW :    FY 140
0063 DWAU :    FY 141
0064 K    :    FY 142
0065 ZEAB :    Q    1.1
0066      :
0067      :BE
```

FB 220

A:BEISPIST.S5D

LAE = 49

SHEET 1

NETWORK 1

NAME : UMLAD

```

0005      :A   Q   12.0      DATA TRANSFER STILL ACTIVE
0006      :JC  =FB42
0007      :AN  F 165.0 *    TOOL FROM MAGAZINE TO GRIPPER
0008      :JC  =GREI
0009      :L   FY 251      DW NO. OF MAGAZINE LOC.
000A      :T   FY 160
000B      :L   KB 9        DW NO. OF GRIPPER
000C      :T   FY 161
000D      :JC  =FB42
000E GREI :AN  F 165.1 *    TOOL FROM GRIPPER TO SPINDLE
000F      :JC  =SPIN
0010      :L   KB 9
0011      :T   FY 160
0012      :L   KB 10      DW NO. OF SPINDLE
0013      :T   FY 161
0014      :JC  =FB42
0015 SPIN :AN  F 165.2 *    TOOL FROM SPINDLE TO MAGAZINE
0016      :JC  =END
0017      :L   KB 10
0018      :T   FY 160
0019      :L   FY 251      DW NO. OF MAGAZINE LOC.
001A      :T   FY 161
001B FB42 :L   KB 170      NO. OF DBZW
001C      :T   FY 159
001D      :O   F 165.0
001E      :O   F 165.1
001F      :O   F 164.2
0020      :=   F 158.0
0021      :O   F 158.0
0022      :O   Q   12.0
0023      :JC  FB 42
0024 NAME :TRANSFER
0025 ST   :   F 158.0
0026 DBZW :   FY 159
0027 Q/Z  :   FW 160
0028 NSBY :   DR 1
0029 F    :   Q 10.0
002A DUEL :   Q 12.0
002B END  :BE

```

* F165.0, 165.1, and 165.2 are locations for user signals. They may only be effective for the duration of one PLC cycle.

5.2 Printout of data blocks of program example

DB150

LAE = 156

ABS
SHEET 1

```
0 : KH= 0000;
1 : KH= 0000;
2 : KH= 0000;
3 : KH= 0000;
4 : KH= 0000;
5 : KH= 0000;
6 : KH= 0000;
7 : KH= 0000;
8 : KH= 0000;
9 : KH= 0000;
10 : KH= 0000;
11 : KH= 0000;
12 : KH= 0000;
13 : KH= 0000;
14 : KH= 0000;
15 : KH= 0000;
16 : KH= 0000;
17 : KF= +00005;
18 : KH= 0000;
19 : KH= 0000;
20 : KH= 0000;
21 : KH= 0000;
22 : KF= +00032;
23 : KH= 0000;
24 : KH= 0000;
25 : KH= 0000;
26 : KH= 0000;
27 : KH= 0000;
28 : KH= 0000;
29 : KH= 0000;
30 : KH= 0000;
31 : KH= 0000;
32 : KH= 0000;
33 : KH= 0000;
34 : KH= 0000;
35 : KH= 0000;
36 : KH= 0000;
37 : KH= 0000;
38 : KH= 0000;
39 : KH= 0000;
40 : KH= 0000;
41 : KH= 0000;
42 : KH= 0000;
43 : KH= 0000;
44 : KH= 0000;
45 : KH= 0000;
```

5.2 Printout of data blocks of program example

DB150

LAE = 156

ABS
SHEET 2

46 : KH= 0000;
47 : KH= 0000;
48 : KH= 0000;
49 : KH= 0000;
50 : KH= 0000;
51 : KH= 0000;
52 : KH= 0000;
53 : KH= 0000;
54 : KH= 0000;
55 : KH= 0000;
56 : KH= 0000;
57 : KH= 0000;
58 : KH= 0000;
59 : KH= 0000;
60 : KH= 0000;
61 : KH= 0000;
62 : KH= 0000;
63 : KH= 0000;
64 : KH= 0000;
65 : KH= 0000;
66 : KH= 0000;
67 : KH= 0000;
68 : KH= 0000;
69 : KH= 0000;
70 : KH= 0000;
71 : KH= 0000;
72 : KH= 0000;
73 : KH= 0000;
74 : KH= 0000;
75 : KH= 0000;
76 : KH= 0000;
77 : KH= 0000;
78 : KH= 0000;
79 : KH= 0000;
80 : KH= 0000;
81 : KH= 0000;
82 : KH= 0000;
83 : KH= 0000;
84 : KH= 0000;
85 : KH= 0000;
86 : KH= 0000;
87 : KH= 0000;
88 : KH= 0000;
89 : KH= 0000;
90 : KH= 0000;
91 : KH= 0000;
92 : KH= 0000;
93 : KH= 0000;
94 : KH= 0000;
95 : KH= 0000;

DB150

LAE = 156

ABS
SHEET 3

```
96 : KH= 0000;  
97 : KH= 0000;  
98 : KH= 0000;  
99 : KH= 0000;  
100 : KH= 0000;  
101 : KH= 0000;  
102 : KH= 0000;  
103 : KH= 0000;  
104 : KH= 0000;  
105 : KH= 0000;  
106 : KH= 0000;  
107 : KH= 0000;  
108 : KH= 0000;  
109 : KH= 0000;  
110 : KH= 0000;  
111 : KH= 0000;  
112 : KH= 0000;  
113 : KH= 0000;  
114 : KH= 0000;  
115 : KH= 0000;  
116 : KH= 0000;  
117 : KH= 0000;  
118 : KH= 0000;  
119 : KH= 0000;  
120 : KH= 0000;  
121 : KH= 0000;  
122 : KH= 0000;  
123 : KH= 0000;  
124 : KH= 0000;  
125 : KH= 0000;  
126 : KH= 0000;  
127 : KH= 0000;  
128 : KH= 0000;  
129 : KH= 0000;  
130 : KH= 0000;  
131 : KH= 0000;  
132 : KH= 0000;  
133 : KH= 0000;  
134 : KH= 0000;  
135 : KH= 0000;  
136 : KH= 0000;  
137 : KH= 0000;  
138 : KH= 0000;  
139 : KH= 0000;  
140 : KH= 0000;
```

5.2 Printout of data blocks of program example

DB150

LAE = 156

ABS
SHEET 4

```
141 : KH= 0000 ;
142 : KH= 0000 ;
143 : KH= 0000 ;
144 : KH= 0000 ;
145 : KH= 0000 ;
146 : KH= 0000 ;
147 : KH= 0000 ;
148 : KH= 0000 ;
149 : KH= 0000 ;
150 : KH= 0000 ;
151 :
```

DB151

LAE = 48

ABS
SHEET 1

```

0 : KM= 0000000000000000;
1 : KM= 0000000000000000;
2 : KM= 0000000000000000;
3 : KM= 0000000000000000;
4 : KM= 0000000000000000;
5 : KM= 0000000000000000;
6 : KM= 0000000000000000;
7 : KM= 0000000000000000;
8 : KM= 0000000000000000;
9 : KM= 0000000000000000;
10 : KM= 0000000000000000;
11 : KM= 0000000010000000;
12 : KM= 0000000010000000;
13 : KM= 0000000000000100;
14 : KM= 0000000010100010;
15 : KM= 0000000000000001;
16 : KM= 0000000010000000;
17 : KM= 0000000011000000;
18 : KM= 0000000010000000;
19 : KM= 0000000010000000;
20 : KM= 0000000010000000;
21 : KM= 0000000010000000;
22 : KM= 00000000000000100;
23 : KM= 0000000010100010;
24 : KM= 00000000000000001;
25 : KM= 0000000010000000;
26 : KM= 0000000010000000;
27 : KM= 00000000000000100;
28 : KM= 0000000010100010;
29 : KM= 00000000000000001;
30 : KM= 0000000010000000;
31 : KM= 0000000010000000;
32 : KM= 0000000011000000;
33 : KM= 0000000010000000;
34 : KM= 0000000010000000;
35 : KM= 00000000000000100;
36 : KM= 0000000010100010;
37 : KM= 00000000000000001;
38 : KM= 00000000000000100;
39 : KM= 0000000010100010;
40 : KM= 00000000000000001;
41 : KM= 0000000010000000;
42 : KM= 0000000011000000;
43 :

```

5.2 Printout of data blocks of program example

DB152

LAE = 48

ABS
SHEET 1

```
0 : KH= 0000;
1 : KH= 0000;
2 : KH= 0000;
3 : KH= 0000;
4 : KH= 0000;
5 : KH= 0000;
6 : KH= 0000;
7 : KH= 0000;
8 : KH= 0000;
9 : KH= 0000;
10 : KH= 0000;
11 : KH= 0003;
12 : KH= 0009;
13 : KH= 0000;
14 : KH= 0013;
15 : KH= 0000;
16 : KH= 0001;
17 : KH= 0016;
18 : KH= 0012;
19 : KH= 0014;
20 : KH= 0016;
21 : KH= 0002;
22 : KH= 0011;
23 : KH= 0006;
24 : KH= 0000;
25 : KH= 0018;
26 : KH= 0017;
27 : KH= 0022;
28 : KH= 0015;
29 : KH= 0000;
30 : KH= 0010;
31 : KH= 0017;
32 : KH= 0024;
33 : KH= 0008;
34 : KH= 0009;
35 : KH= 0000;
36 : KH= 0021;
37 : KH= 0025;
38 : KH= 0000;
39 : KH= 0019;
40 : KH= 0023;
41 : KH= 0024;
42 : KH= 0025;
43 :
```

DB153

LAE = 48

ABS
SHEET 1

```
0 : KH= 0000;  
1 : KH= 0000;  
2 : KH= 0000;  
3 : KH= 0000;  
4 : KH= 0000;  
5 : KH= 0000;  
6 : KH= 0000;  
7 : KH= 0000;  
8 : KH= 0000;  
9 : KH= 0000;  
10 : KH= 0000;  
11 : KH= 0000;  
12 : KH= 0000;  
13 : KH= 0000;  
14 : KH= 0000;  
15 : KH= 0000;  
16 : KH= 0000;  
17 : KH= 0000;  
18 : KH= 0000;  
19 : KH= 0000;  
20 : KH= 0000;  
21 : KH= 0000;  
22 : KH= 0000;  
23 : KH= 0000;  
24 : KH= 0000;  
25 : KH= 0000;  
26 : KH= 0000;  
27 : KH= 0000;  
28 : KH= 0000;  
29 : KH= 0000;  
30 : KH= 0000;  
31 : KH= 0000;  
32 : KH= 0000;  
33 : KH= 0000;  
34 : KH= 0000;  
35 : KH= 0000;  
36 : KH= 0000;  
37 : KH= 0000;  
38 : KH= 0000;  
39 : KH= 0000;  
40 : KH= 0000;  
41 : KH= 0000;  
42 : KH= 0000;  
43 :
```

5.2 Printout of data blocks of program example

DB154

LAE = 48

ABS
SHEET 1

Tool life DB

If the tool is not to be checked, enter 9999.

```
0 : KH= 0000;
1 : KH= 0000;
2 : KH= 0000;
3 : KH= 0000;
4 : KH= 0000;
5 : KH= 0000;
6 : KH= 0000;
7 : KH= 0000;
8 : KH= 0000;
9 : KH= 0000;
10 : KH= 0000;
11 : KH= 9999;
12 : KH= 9999;
13 : KH= 9999;
14 : KH= 0003;
15 : KH= 9999;
16 : KH= 9999;
17 : KH= 9999;
18 : KH= 0001;
19 : KH= 9999;
20 : KH= 9999;
21 : KH= 9999;
22 : KH= 9999;
23 : KH= 9999;
24 : KH= 9999;
25 : KH= 9999;
26 : KH= 0002;
27 : KH= 9999;
28 : KH= 9999;
29 : KH= 9999;
30 : KH= 9999;
31 : KH= 9999;
32 : KH= 9999;
33 : KH= 0003;
34 : KH= 9999;
35 : KH= 9999;
36 : KH= 9999;
37 : KH= 0004;
38 : KH= 9999;
39 : KH= 9999;
40 : KH= 9999;
41 : KH= 0002;
42 : KH= 9999;
43 :
```

DB155

LAE = 48

ABS
SHEET 1

No. of pieces DB

If the tool is not to be checked, enter 9999.

```
0 : KH= 0000;
1 : KH= 0000;
2 : KH= 0000;
3 : KH= 0000;
4 : KH= 0000;
5 : KH= 0000;
6 : KH= 0000;
7 : KH= 0000;
8 : KH= 0000;
9 : KH= 0000;
10 : KH= 0000;
11 : KH= 9999;
12 : KH= 9999;
13 : KH= 9999;
14 : KH= 9999;
15 : KH= 9999;
16 : KH= 9999;
17 : KH= 9999;
18 : KH= 9999;
19 : KH= 0003;
20 : KH= 0002;
21 : KH= 0002;
22 : KH= 9999;
23 : KH= 9999;
24 : KH= 9999;
25 : KH= 9999;
26 : KH= 9999;
27 : KH= 0003;
28 : KH= 9999;
29 : KH= 9999;
30 : KH= 9999;
31 : KH= 9999;
32 : KH= 9999;
33 : KH= 9999;
34 : KH= 0001;
35 : KH= 9999;
36 : KH= 9999;
37 : KH= 9999;
38 : KH= 9999;
39 : KH= 9999;
40 : KH= 9999;
41 : KH= 9999;
42 : KH= 9999;
43 :
```

5.3 Data input/output

The values in the display do not refer to the previous example in sections 5.1/5.2.

((Bild-Nr. 5 einmontieren))

((Bild-Nr. 6 einmontieren))

((Bild-Nr. 7 einmontieren))

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