OPERATION MANUAL

PROFIBUS
Model 9163

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Valid from: 18.06.2008

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EG-Konformitätserklärung

Certificate of Conformity

Gemäß ISO/IEC Leitfaden 22 und EN 45014 erklärt

According to ISO/IEC guidelines 22 and EN 45014 standard

Name des Herstellers: *Manufacturer*	burster präzisionsmeßtechnik gmbh & co kg
Adresse des Herstellers: *Address of the manufacturer*	Talstr. 1-7. 76593 Gernsbach
dass das Produkt **Produktname:** *Declares that the product with name*	Sensormaster *Sensormaster*
Modellnummer(n) (Typ): *Model / Type*	9163
Produktoptionen: *Options*	alle Optionen / Zubehör *all options / accessories*

mit den folgenden Produktspezifikationen übereinstimmt

is conform with following specifications of product

Sicherheit *Safety requirements*	IEC 61010-1	EN 61010-1:2001	Schutzklasse III *safety class*
EMV Störaussendung *EMC Generic emission*		EN 61326:1997 + A1:1998 + A2:2001	
EMV Störfestigkeit *EMC Generic immunity*		EN 61326:1997 + A1:1998 + A2:2001	Industrie Bereich *Industrial environment*

RoHS (2002/96/EC) Restriction of Hazardous Substances in Electrical and Electronic Equipments

WEEE (2002/95/EC). Waste of Electric and Electronic Equipments Reg.-Nr. DE 18021906

Kategorie 9: Überwachungs- und Kontrollinstrumente für ausschließlich gewerbliche Nutzung

Category 9: monitoring and control instruments used in industrial installations

Ergänzende Informationen :

Additional Information

Gernsbach den 10.09.2007	Unterschrift des Herstellers oder Einführers	i.V. Alfred Großmann (Leitung Qualitätswesen)
Place / Date	*Signature of manufacturer*	*Quality Manager*


Typ 9163
49.523
burster
PEAK
CAL
RST
F

Warning!

The following instructions must be followed to prevent electric shock and injuries:

- ➔ Observe all safety notices and instructions.
- ➔ Do not connect voltages that are higher than those specified. The voltage ranges supported are listed in the technical specifications.
- ➔ Disconnect the digital indicator from the power supply before opening it.
- ➔ Make sure that all the parameter sets are correct before operating the instrument.
- ➔ Do not use the instrument if it is damaged.
- ➔ Never use the instrument in explosive areas.

Caution!

The following points must be observed to prevent injuries and damage to property:

- ➔ The 230 V unit has Class II protection and is classified as Installation Category II.
- ➔ Instruments with 20...27 V AC/DC power supply must only be supplied from a current source with Class III protection.
- ➔ Connect a two-pole circuit breaker (with CE mark) in the input supply to the instrument to disconnect the power supply. The circuit breaker must be installed in the immediate vicinity of the instrument within easy reach of the user. One circuit breaker can be used for more than one instrument.
- ➔ External control circuits connected to the instrument must have Class II insulation.
- ➔ The circuit boards in the instrument are sensitive to electrostatic voltage. Take suitable precautions when handling the boards.
- ➔ Never use hydrocarbon-based cleaning solvents (e.g. benzene etc.)

Contents

1. Introduction

The 9163 digital indicator is a high-performance instrument with PROFIBUS DP interface. This provides a straightforward means of interfacing the instrument to an automation system.

This manual only describes the digital indicator/PROFIBUS-DP network interface and the data transfer protocol.

It assumes that you are already familiar with the 9163 digital indicator.

If you need further information on the PROFIBUS, please go to the PROFIBUS User Organization (www.PROFIBUS.com).

Should you need an operating manual for the 9163 digital indicator, please contact burster präzisionsmesstechnik gmbh.

2. Technical features

- PROFIBUS-DP V0 slave
- Data transfer with a PROFIBUS master.
- 16 I/O configurable process words with a minimum refresh interval of 35 ms.
- Automatic baud-rate adjustment in the range 9600 baud to 12 Mbaud.
- Address can be selected in the range 1 to 99 using two rotary switches.
- Additional address-selection option using “SET_SLAVE_ADD” telegram, as alternative to hardware preset.
- LEDs for diagnostics and status of PROFIBUS network.
- Standard RS485 connection in compliance with standard EN 50 170.
- Galvanically isolated power supply.

3. Installation

The operating manual for the 9163 digital indicator contains full installation details.

3.1 Connection to the digital indicator

Note:

Use a shielded cable, grounded at one end, as the connecting cable to the digital indicator.

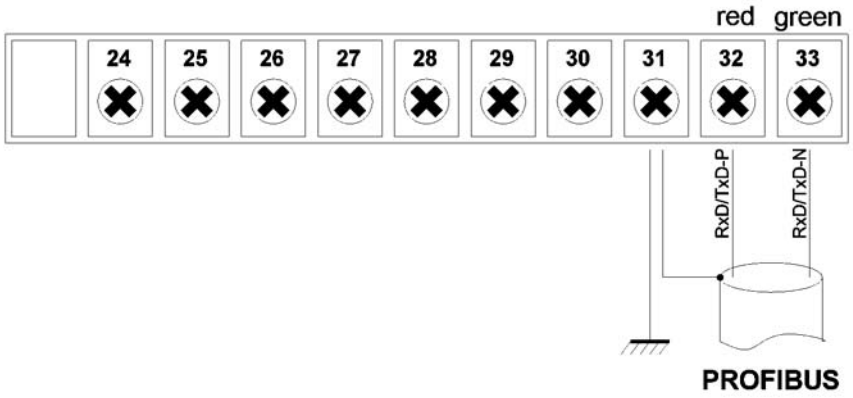
According to standard EN 50 170, the shielded cable must have certain properties to ensure correct communication between PROFIBUS devices up to 12 Mbaud:

Table 1: Cable specifications

Parameters	Values
Impedance in Ω	135…165
Capacitance in pF/m	< 60
Resistance in Ω /Km	< 110
Wire diameter in mm	> 0.64
Wire cross-section in mm^2	> 0.34 (AWG22)

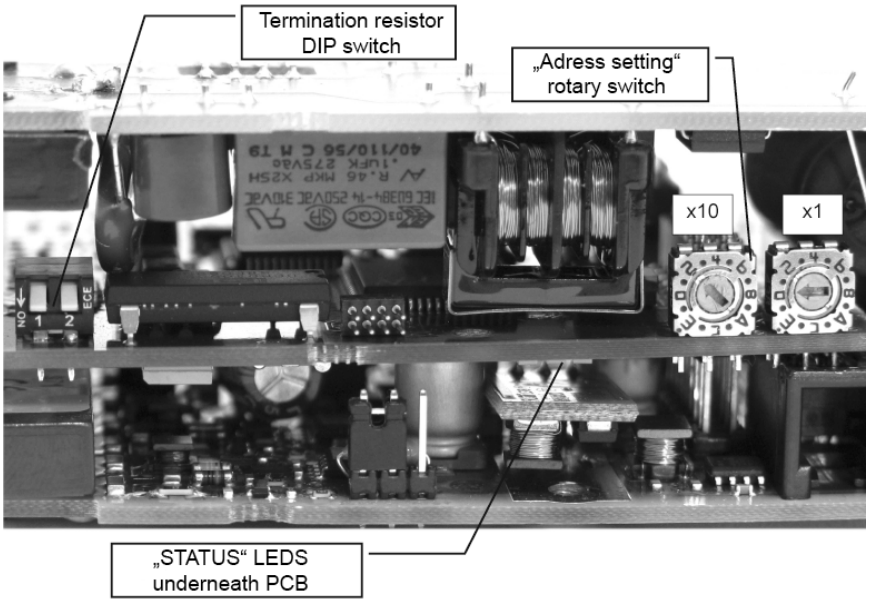
Table 2: Transmission rate as a function of cable length.

Baud rate in kbit/sec	9.6	19.2	45.45	93.75	187.5	500	1500	3000	6000	12000
Max. length in meters.	1200	1200	1200	1200	1000	400	200	100	100	100



Note:

If the indicator is the last PROFIBUS device in the network, the terminating resistor must be enabled. To do this set the DIP switch to "ON".



3.2 Configuring the PROFIBUS address

3.2.1 Setting the PROFIBUS address in hardware

The hexadecimal rotary switches on the indicator are used for setting the PROFIBUS address in the network. The instrument reads the setting during power-up of the digital indicator.

The switches are factory set to "00". You can set the address between 01 and 99.

Setting the address:

Warning!

You will get an electric shock if the voltage is connected!

Disconnect the digital indicator from the power supply before opening the case.

Caution!

Risk of damage from electrostatic voltages!

Take suitable precautions when handling the boards.

- Disconnect the digital indicator from the power supply.
- Unscrew the fixing screw on the front panel.
- Pull the digital indicator out of the case.
- Use a small screwdriver to set the two rotary switches to the new address.
- Slide the digital indicator back into the case.
- Screw in the fixing screw.
- Reconnect the digital indicator to the power supply.

3.2.2 Setting the PROFIBUS address in software

Note:

Not all PROFIBUS masters support this function.

Using the SAP 55 telegram, you can set the PROFIBUS address in the range 1 to 124; further details are given in section 4.1: "Changing the PROFIBUS address using SAP 55" on page19.

As soon as you have assigned an address via software, the rotary switches are disabled.

To re-enable the address set via the rotary switches, send the address "125" to the instrument.

Example of address configuration:

1) Rotary switch “x10” in position 1 and “x1” in position 0.
   The PROFIBUS address reads "10".
2) Address 2 is sent to the indicator by PROFIBUS software.
   The PROFIBUS address changes to "2".
3) Rotary switch “x10” in position 4 and “x1” in position 1.
   This change does not affect the PROFIBUS address, which retains the value "2".
4) Address 125 is sent via software.
   The address selected by the rotary switches is re-enabled.

   Only now does the PROFIBUS address change to "41".

4. PROFIBUS-DP data structure

When the automation system starts up, the PROFIBUS master uses the "Configuration telegram" (SAP62) to check the existing configuration of the PROFIBUS station before it starts the actual data transfer (SAP DEFAULT).

The data structure of the digital indicator is composed of 7 consistent bytes, defined as **Parameter data**. This parameter data can be used to change each parameter of the digital indicator.

A second area contains 32 I/O bytes, defined as process data; this data contains the 16 read variables and the 16 write variables of the digital indicator.

You can use the "Parameter telegram" (SAP 61) to change the content of the process data to suit your needs.

4.1 Changing the PROFIBUS address using SAP 55

If you are using a Class 2 PROFIBUS master, you can change the slave address using the "Set_Slave_Add" function.

BYTE	DESCRIPTION	VALUE (hex)
1	New address	n
2	Identifying number (high byte)	0A
3	Identifying number (low byte)	40
4	Enable (00)\Disable (01)	00

4.2 Configuration telegram (SAP 62)

Before the PROFIBUS master starts data transfer, it checks the configuration. A bus error is generated if there is an error.

Table 3: Configuration telegram, SAP 62

BYTE	DESCRIPTION	VALUE (hex)
0	Parameter data (7 bytes I/O consistent)	0xB6
1	PROCESS DATA 1 (1 word I/O)	0x70
2	PROCESS DATA 2 (1 word I/O)	0x70
3	PROCESS DATA 3 (1 word I/O)	0x70
4	PROCESS DATA 4 (1 word I/O)	0x70
5	PROCESS DATA 5 (1 word I/O)	0x70
6	PROCESS DATA 6 (1 word I/O)	0x70
7	PROCESS DATA 7 (1 word I/O)	0x70
8	PROCESS DATA 8 (1 word I/O)	0x70
9	PROCESS DATA 9 (1 word I/O)	0x70
10	PROCESS DATA 10 (1 word I/O)	0x70
11	PROCESS DATA 11 (1 word I/O)	0x70
12	PROCESS DATA 12 (1 word I/O)	0x70
13	PROCESS DATA 13 (1 word I/O)	0x70
14	PROCESS DATA 14 (1 word I/O)	0x70
15	PROCESS DATA 15 (1 word I/O)	0x70
16	PROCESS DATA 16 (1 word I/O)	0x70

4.3 Parameter telegram (SAP 61)

The PROFIBUS master uses this protocol, prior to actual data transfer, to specify the process input and output addresses on the basis of the supplied GSD file.

Bytes 11 onwards denote user-defined process data.

Table 4: Parameter telegram SAP 61

BYTE	DESCRIPTION	DEFAULT	HEX
1≈7	In accordance with EN50170		-
8≈10	Spare		00
11	Process data Input 1 (MSB)	(530) PV1 LSW	02
12	Process data Input 1 (LSB)		12
13	Process data Input 2 (MSB)	(531) PV1 MSW	02
14	Process data Input 2 (LSB)		13
15	Process data Input 3 (MSB)	(536) Input 1 LSW	02
16	Process data Input 3 (LSB)		18
17	Process data Input 4 (MSB)	(537) Input 1 MSW	02
18	Process data Input 4 (LSB)		19
19	Process data Input 5 (MSB)	(538) Input 2 LSW	02
20	Process data Input 5 (LSB)		1A
21	Process data Input 6 (MSB)	(539) Input 2 MSW	02
22	Process data Input 6 (LSB)		1B
23	Process data Input 7 (MSB)	(540) Input 3 LSW	02
24	Process data Input 7 (LSB)		1C
25	Process data Input 8 (MSB)	(541) Input 3 MSW	02
26	Process data Input 8 (LSB)		1D
27	Process data Input 9 (MSB)	(542) Input 4 LSW	02
28	Process data Input 9 (LSB)		1E
29	Process data Input 10 (MSB)	(543) Input 4 MSW	02
30	Process data Input 10 (LSB)		1F
31	Process data Input 11 (MSB)	(544) Math funct. A LSW	02
32	Process data Input 11 (LSB)		20
33	Process data Input 12 (MSB)	(545) Math funct. A MSW	02
34	Process data Input 12 (LSB)		21
35	Process data Input 13 (MSB)	(546) Math funct. B LSW	02

BYTE	DESCRIPTION	DEFAULT	HEX
36	Process data Input 13 (LSB)		22
37	Process data Input 14 (MSB)	(547) Math funct. B MSW	02
38	Process data Input 14 (LSB)		23
39	Process data Input 15 (MSB)	(1189) Controller status	04
40	Process data Input 15 (LSB)		A5
41	Process data Input 16 (MSB)	(1192) Alarm status	04
42	Process data Input 16 (LSB)		A8
43	Process data output 1 (MSB)	(554) Alarm Point 1 LSW	02
44	Process data output 1 (LSB)		2A
45	Process data output 2 (MSB)	(555) Alarm Point 1 MSW	02
46	Process data output 2 (LSB)		2B
47	Process data output 3 (MSB)	(556) Alarm Point 2 LSW	02
48	Process data output 3 (LSB)		2C
49	Process data output 4 (MSB)	(557) Alarm Point 2 MSW	02
50	Process data output 4 (LSB)		2D
51	Process data output 5 (MSB)	(558) Alarm Point 3 LSW	02
52	Process data output 5 (LSB)		2E
53	Process data output 6 (MSB)	(559) Alarm Point 3 MSW	02
54	Process data output 6 (LSB)		2F
55	Process data output 7 (MSB)	(560) Alarm Point 4 LSW	02
56	Process data output 7 (LSB)		30
57	Process data output 8 (MSB)	(561) Alarm Point 4 MSW	02
58	Process data output 8 (LSB)		31

The process data is user definable and corresponds to the Modbus addresses of the digital indicator. The Appendix of the operating manual for the 9163 digital indicator contains an address list.

4.4 Diagnostics telegram (SAP 60)

If the PROFIBUS master requests diagnostic data from the digital indicator, the instrument sends six data bytes and three product-specific error bytes.

BYTE	DESCRIPTION	VALUE (hex)
1 ≈ 6	In accordance with standard EN50170	-
7	Length of diagnostic bytes	2
8	MSB diagnostic byte	xx
9	LSB diagnostic byte	xx

If there is no error present, "xx" takes the value "00".

If there is an error present, "xx" takes the value "FF".

4.5 Data transfer (SAP DEFAULT)

Once all the start-up protocols are done, the master starts cyclical data transfer.

As already mentioned, the process input data and process output data are composed of parameter data (7 bytes) and process data (32 bytes).

Table 5: Output data (from PROFIBUS master to slave)

Parameter data							**Process data**											
"REQUEST"							**WORD 1**		**WORD 2**		**WORD 3**		**WORD 4**		≈	**WORD 16**	
							MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB		MSB	LSB
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		38	39

Table 6: Input data (from PROFIBUS slave to master)

Parameter data							**Process data**											
"REPLY"							**WORD 1**		**WORD 2**		**WORD 3**		**WORD 4**		≈	**WORD 16**	
							MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB		MSB	LSB
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		38	39

Note:

You can use the "**Parameter data**" to access every Modbus address of the digital indicator.

Table 7: Parameter data

BYTE	PARAMETER	DESCRIPTION
1	TRG	TRIGGER BYTE: The value of the trigger byte must be incremented after every request. The request has been performed if the trigger byte of the request contains the same value as the reply.
2	ADD SLAVE	Modbus address of digital indicator (always = 1)
3	FC	Function code of request: read/write a bit/word
4	DATUM 1	Depends on function code
5	DATUM 2	Depends on function code
6	DATUM 3	Depends on function code
7	DATUM 4	Depends on function code

4.5.1 Parameter data: reading a bit

Request bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB	NB MSB	NB LSB
Trigger byte	1	1 or 2	Bit address	Bit address	Number of bits. (always 00)	Number of bits. (always 01)

Reply bytes

TRG	ADD SLAVE	FC	NB	BIT	#	#
Request trigger byte = reply trigger byte	1	1 or 2 Same as request	Number of read bits (always 1)	Bit status: 0 or FF	Empty	Empty

4.5.2 Parameter data: reading a word

Request bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB	NW MSB	NW LSB
Trigger byte	1	3 or 4	Address	Address	Number of bytes. (always 00)	Number of bytes. (always 01)

Reply bytes

TRG	ADD SLAVE	FC	NB	W MSB	W LSB	#
Request trigger byte = reply trigger byte	1	1 or 2 Same as request	Number of read bytes (always 2)	MSB value	LSB value	Empty

4.5.3 Parameter data: writing a bit

Request bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB	BIT	00
Trigger byte	1	5	Bit address	Bit address	Bit value (00 or FF)	Always 00

Reply bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB	BIT	00
Request trigger byte = reply trigger byte	1	5 Same as request	Bit address	Bit address	Bit value (00 or FF)	Always 00

4.5.4 Parameter data: writing a word

Request bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB	W MSB	W LSB
Trigger byte	1	6	Word address	Word address	Value	Value

Reply bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB	W MSB	W LSB
Request trigger byte = reply trigger byte	1	6	Word address	Word address	Value	Value

Note:

If an error occurs, the value 80 hex. is added to the function code in the reply. The error code appears in the next byte.

Reply bytes

TRG	ADD SLAVE	FC	CODE	#	#	#
Request trigger byte = reply trigger byte	1	Process code + 80 hex	Error code	Empty	Empty	Empty

Error codes:

1	=	Illegal function	6	=	Indicator busy
2	=	Illegal address	9	=	Illegal number of data items
3	=	Illegal value	10	=	Read-only data

4.5.5 Process input data

You can use the process input data to read the main process data directly.

Table 8: PROCESS INPUT DATA

BYTE	PARAMETER	Digital indicator
1	Process data Input 1 (MSB)	PV1 LSW
2	Process data Input 1 (LSB)	
3	Process data Input 2 (MSB)	PV1 MSW
4	Process data Input 2 (LSB)	
5	Process data Input 3 (MSB)	Input 1 LSW
6	Process data Input 3 (LSB)	
7	Process data Input 4 (MSB)	Input 1 MSW
8	Process data Input 4 (LSB)	
9	Process data Input 5 (MSB)	Input 2 LSW
10	Process data Input 5 (LSB)	
11	Process data Input 6 (MSB)	Input 2 MSW
12	Process data Input 6 (LSB)	
13	Process data Input 7 (MSB)	Input 3 LSW
14	Process data Input 7 (LSB)	
15	Process data Input 8 (MSB)	Input 3 MSW
16	Process data Input 8 (LSB)	
17	Process data Input 9 (MSB)	Input 4 LSW
18	Process data Input 9 (LSB)	
19	Process data Input 10 (MSB)	Input 4 MSW
20	Process data Input 10 (LSB)	
21	Process data Input 11 (MSB)	Math function A LSW
22	Process data Input 11 (LSB)	
23	Process data Input 12 (MSB)	Math function A MSW

BYTE	PARAMETER	Digital indicator
24	Process data Input 12 (LSB)	
25	Process data Input 13 (MSB)	Math function B LSW
26	Process data Input 13 (LSB)	
27	Process data Input 14 (MSB)	Math function B MSW
28	Process data Input 14 (LSB)	
29	Process data Input 15 (MSB)	Controller status
30	Process data Input 15 (LSB)	
31	Process data Input 16 (MSB)	Alarm status
32	Process data Input 16 (LSB)	

4.5.6 Process output data

The process output data is transferred cyclically to the digital indicator.

Table 9: PROCESS OUTPUT DATA

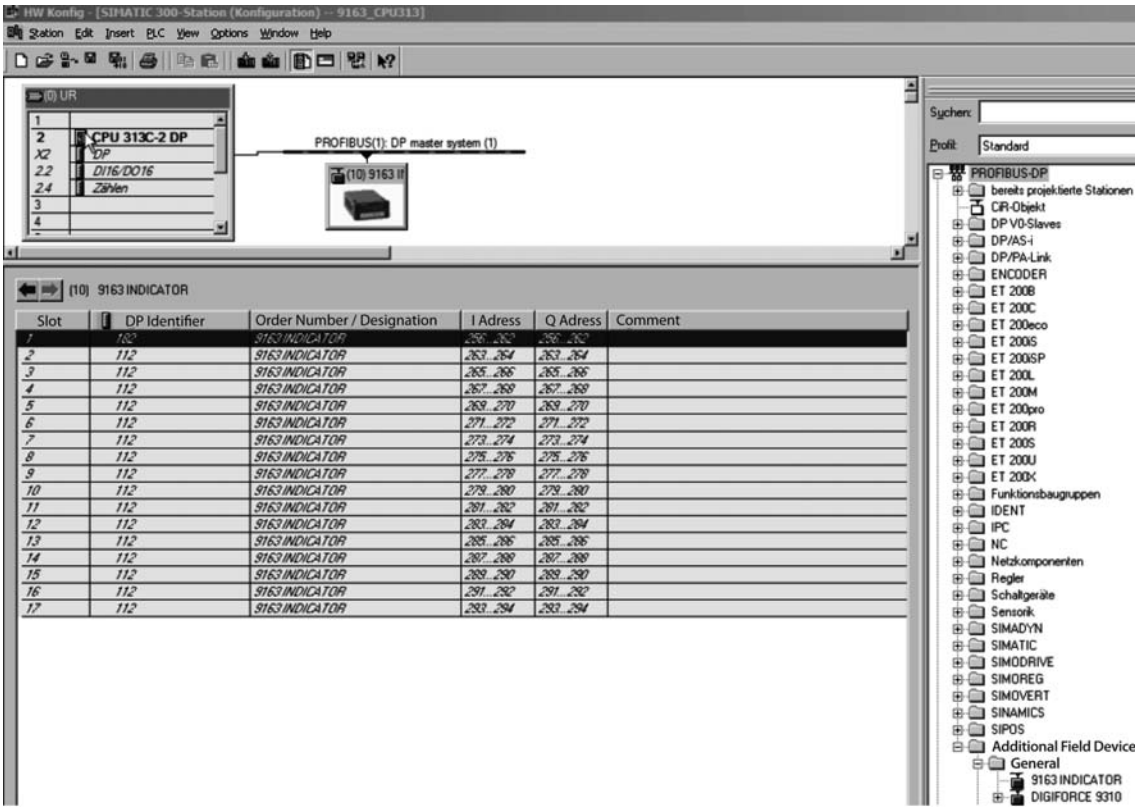
BYTE	PARAMETER	Digital indicator
1	Process data output 1 (MSB)	Alarm Point 1 LSW
2	Process data output 1 (LSB)	
3	Process data output 2 (MSB)	Alarm Point 1 MSW
4	Process data output 2 (LSB)	
5	Process data output 3 (MSB)	Alarm Point 2 LSW
6	Process data output 3 (LSB)	
7	Process data output 4 (MSB)	Alarm Point 2 MSW
8	Process data output 4 (LSB)	
9	Process data output 5 (MSB)	Alarm Point 3 LSW
10	Process data output 5 (LSB)	
11	Process data output 6 (MSB)	Alarm Point 3 MSW
12	Process data output 6 (LSB)	
13	Process data output 7 (MSB)	Alarm Point 4 LSW
14	Process data output 7 (LSB)	
15	Process data output 8 (MSB)	Alarm Point 4 MSW
16	Process data output 8 (LSB)	

5. The digital indicator in a Step 7 programming environment

5.1 Configuration

Installation of the GSD file

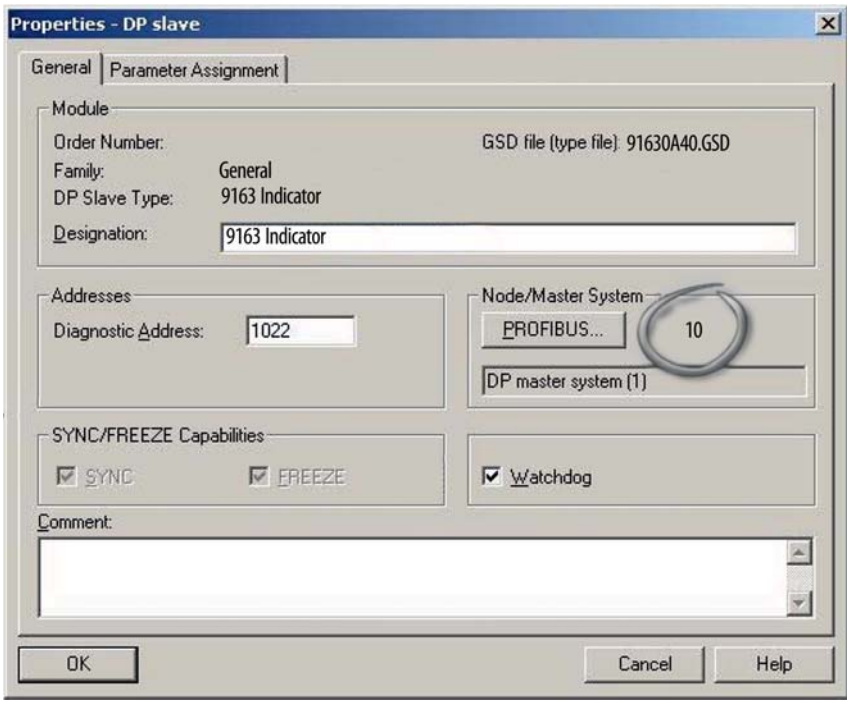
- Open the Hardware Configurator in the project.
- In the "Extras" menu, open the sub-menu "Install GSD files".
- Select the drive and folder containing the "GSD File".



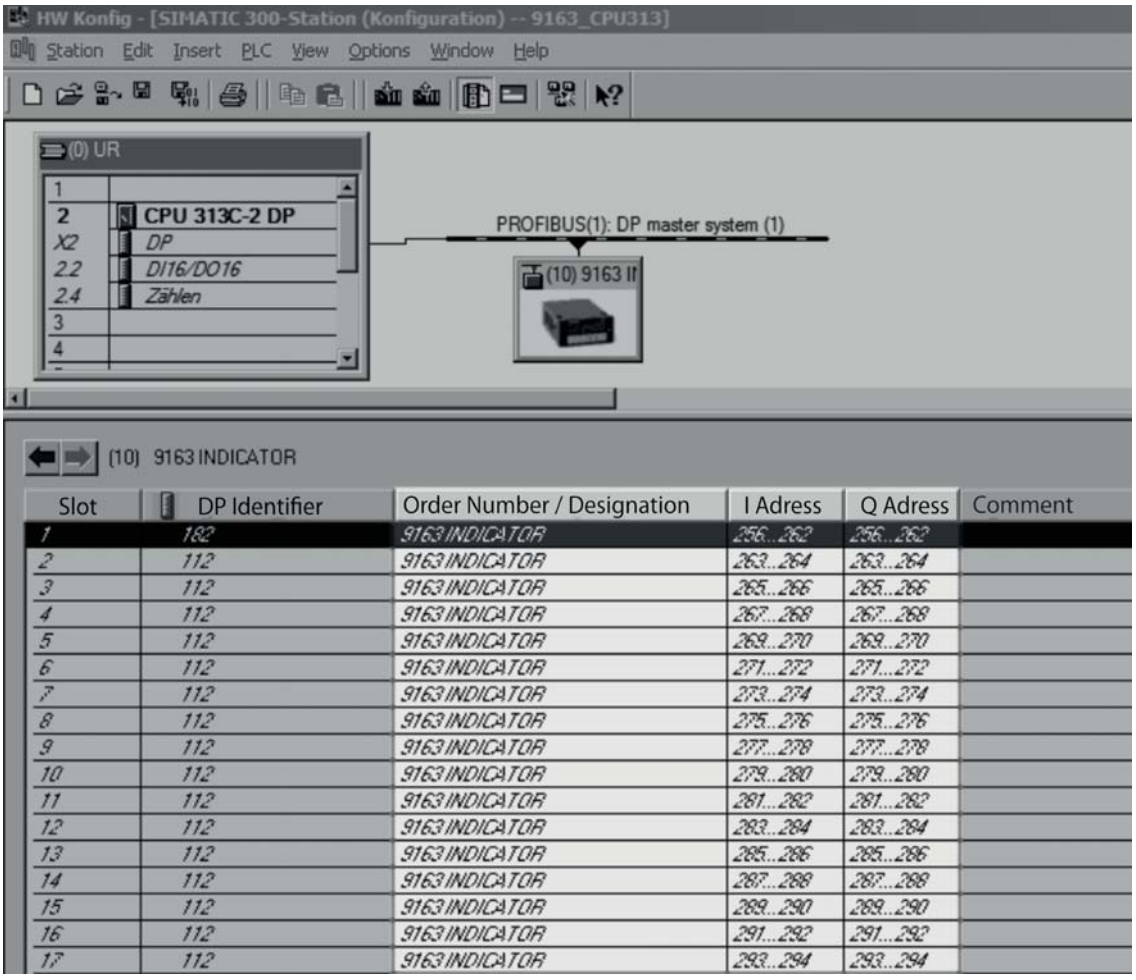
The 9163 digital indicator (9163 INDICATOR) now appears in the folder called "PROFIBUS_DP / Weitere Feldgeräte / Regler"

- Click on "9163 INDICATOR" and hold down the mouse button.
- Now, with the mouse button still pressed, drag "9163 INDICATOR" to your PROFIBUS master system.

  A new PROFIBUS slave is created.



- Set the PROFIBUS address to equal the switch setting on the digital indicator.



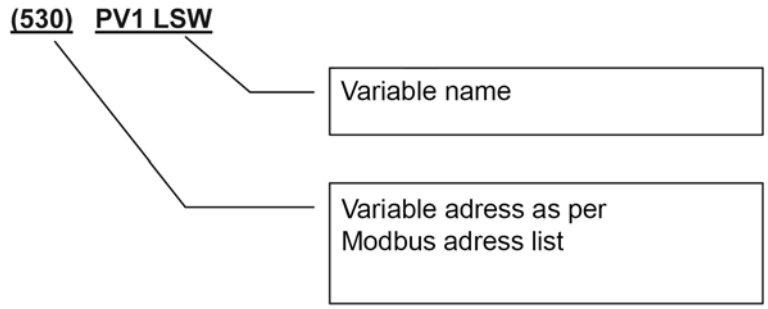
The first 7 bytes, starting at address 256, contain parameter data. These are followed by 32 bytes of process data.

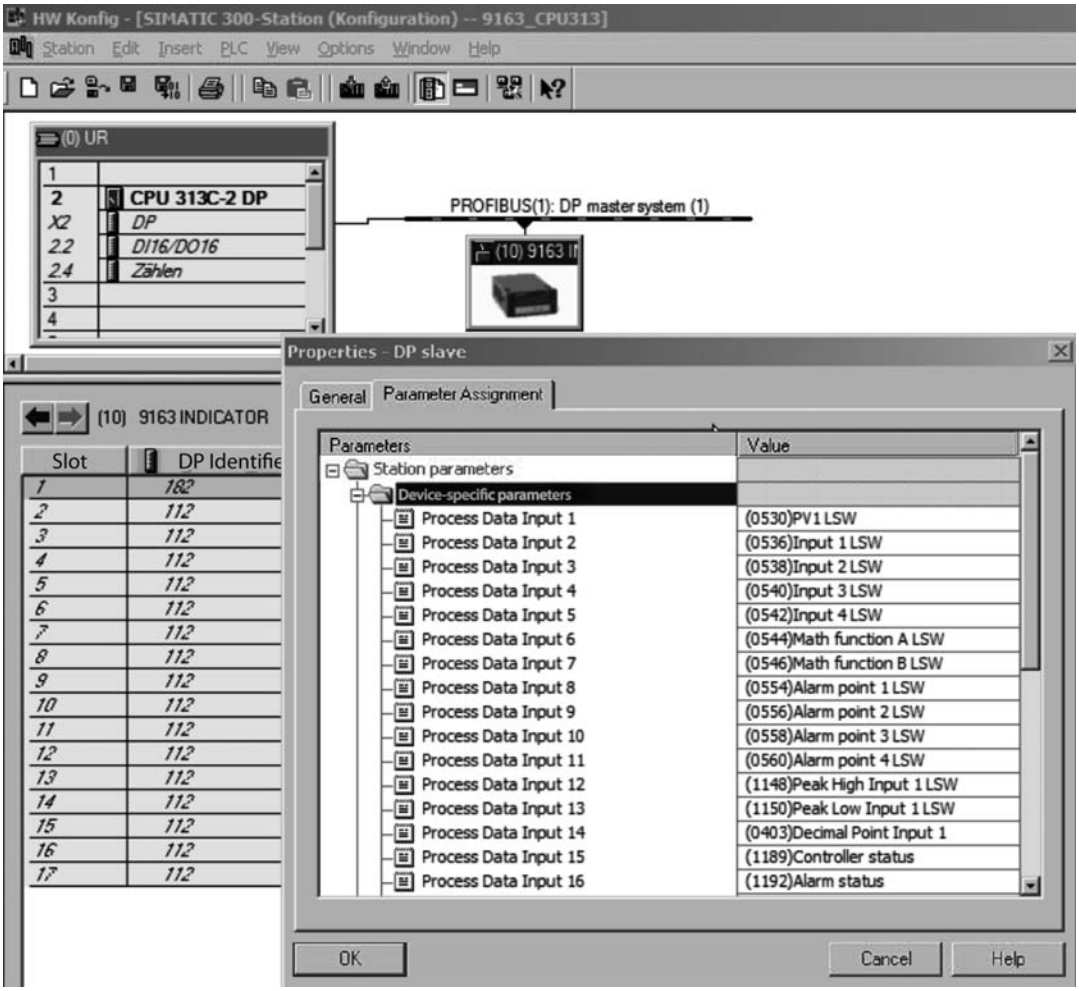
Note:

If the blocks FC3 “CFG INST” (see section 5.3.2) or FC4 “PD_INST” (see section 5.3.3) are used, all the data must lie consecutively in one address area. The input and output addresses must also have the same address values.

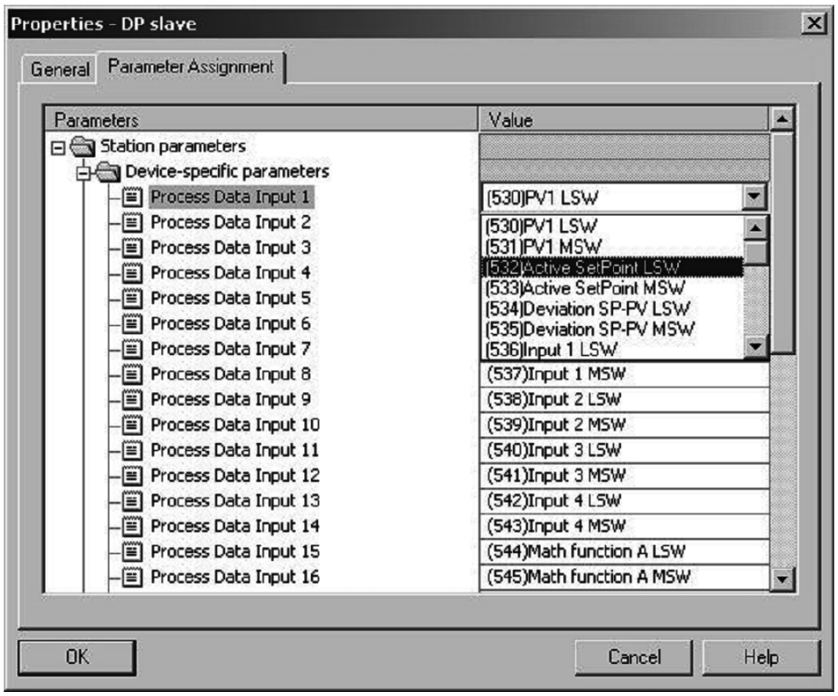
5.2 Parameterization

You can assign display values to the process data in the Properties of the DP slave.





You can change the assignments by clicking in the "Value" column.



Note:

If the block FC4 “PD_INST” (see section 5.3.3) is used, the process input data is read cyclically and written to the associated data module. The process output data, in contrast, is only written if output values in the data block change.

5.2.1 Data in double format

All process data is represented in double-word format: bits 0 to 15 in the LSW, bits 16 to 31 in the MSW.

In the Siemens format, the MSB is stored in the lower address, the LSB in the higher address.

For example, if process variable 1 is to be read, then the process data word 1 must contain the variable "(531)PV1 MSW" and the process data word 2 the variable "(530)PV1 LSW".

PID 263 = PV1

Order of bytes in the PID (process input data)

	PIB 263	PIB 264	PIB 265	PIB 266
Bit:	31..24	23..16	15..8	7..0

Process data word 1 and Process data word 2 are assigned as follows:

PIW 263 = PV1 MSW

PIW 265 = PV1 MSW

5.3 S7 blocks for data communication

The following blocks are provided:

- UDT5 (User Data Type) Symbolic name “Inst.Data”
- UDT6 (User Data Type) Symbolic name “Inst.DataPD"
- FC3 (Function Call) Symbolic name “CFG_INST”
- FC4 (Function Call) Symbolic name “PD_INST”
- FB1 (Function Block) Symbolic name “OPG”
- FB15 (Function Block) Symbolic name “RCP”

Function Call "FC3"

In conjunction with FB1, enables the reading and writing of parameter data of the digital indicator. (see section 4.5.1 to 4.5.4).

Function Call "FC4"

Performs the cyclical data transfer of "process data" (see section 4.5.5 and 4.5.6).

Both FCs can be used at the same time. Communication is handled via a data block created by UDT 5 and UDT 6 (see section 5.3.1).

Note:

OB82 can be very useful in the project. No program code needs to be saved in the block. The block is only executed in the event of a diagnostic alarm. If the block is not there, the CPU goes into the "Stop" state.

5.3.1 Creating the dataex DB using UDT5 “INST.DATA” and UDT6 “INST.DATAPD”

The UDTs generate the structure of the Dataex data block (Dataex DB). Communication with the digital indicator is handled via this data block.

If communication is limited to just parameterization data and FC3, then only UDT 5 "Inst.Data" is needed to generate the data block.

If access to the parameter data is also required, then the data block must be generated using UDT 6 "Inst.DataPD".

The UDT 5 "Inst.Data" generates a Dataex DB with this structure:

DBx.DBB0	Trigger (reserved)
DBx.DBB0	Counter (reserved)
DBx.DBB2 . .DBx.DBB8	Write parametric data (7 bytes)
DBx.DBB9 . .DBx.DBB15	Read parametric data (7 bytes)
DBx.DBW16	Error message when writing to POW (process output word) area. This error message is taken directly from the Siemens SFC 15. You can find further information in the Siemens manuals.
DBx.DBW18	Error message when reading from PIW (process input word) area. This error message is taken directly from the Siemens SFC 14. You can find further information in the Siemens manuals.

The UDT 6 "Inst.DataPD" generates a Dataex DB with this structure:

DBx.DBB0	Trigger (reserved)
DBx.DBB0	Counter (reserved)
DBx.DBB2 . .DBx.DBB8	**Write** parametric data (7 bytes)
DBx.DBB9 . .DBx.DBB15	**Read** parametric data (7 bytes)
DBx.DBW16	Error message when writing to POW (process output word) area. This error message is taken directly from the Siemens SFC 15. You can find further information in the Siemens manuals.
DBx.DBW18	Error message when reading from PIW (process input word) area. This error message is taken directly from the Siemens SFC 14. You can find further information in the Siemens manuals.
DBx.DBW20	INPUT 1 PROCESS DATA
DBx.DBW22	INPUT 2 PROCESS DATA
≈	≈
DBx.DBW50	INPUT 16 PROCESS DATA
DBx.DBW52	OUTPUT 1 PROCESS DATA
DBx.DBW54	OUTPUT 2 PROCESS DATA
≈	≈
DBx.DBW82	OUTPUT 16 PROCESS DATA

5.3.2 FC3 “CFG INST”

This function call (FC) writes and reads the required data to/from the PIW and POW area in the previously generated Dataex data blocks (Dataex DB). This data area is addressed via FB1. FB1 in turn handles the transfer of parameterization data. (see section 5.3.4)

```
Network   1: FC3
---



CALL  "CFG_Inst"
 FirstByte:=256
 DBNr     :=10
```

FC 3 must be invoked cyclically, e.g. in OB1.

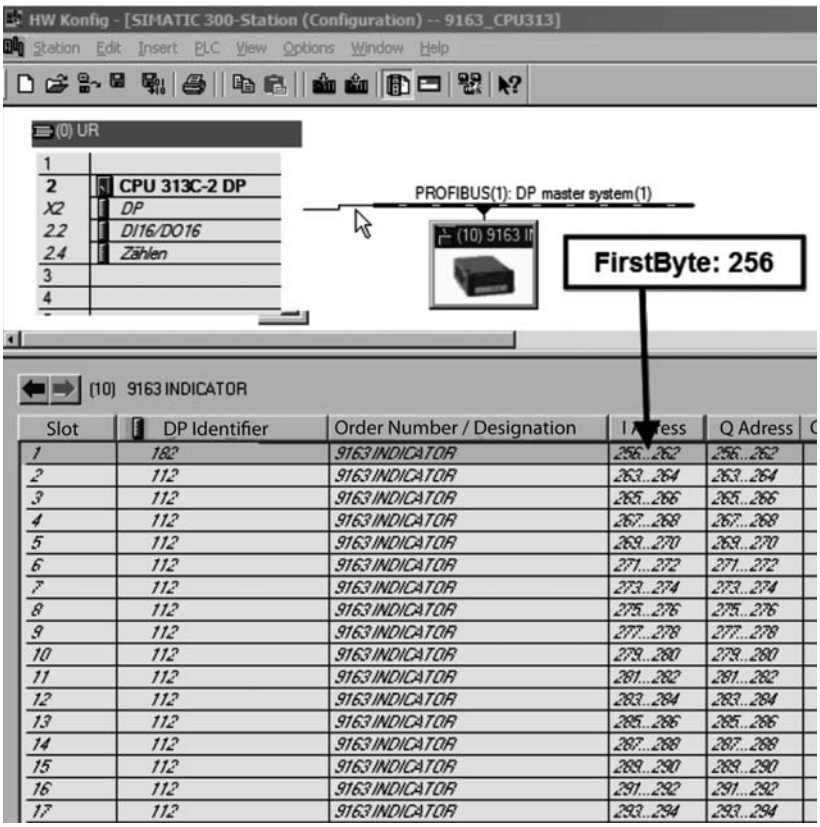
Two input parameters are required:

- FirstByte (INT):

  This is the first byte address of the digital indicator, which was assigned in the hardware configuration (see page **Fehler! Textmarke nicht definiert.**)

- DBNr (INT):

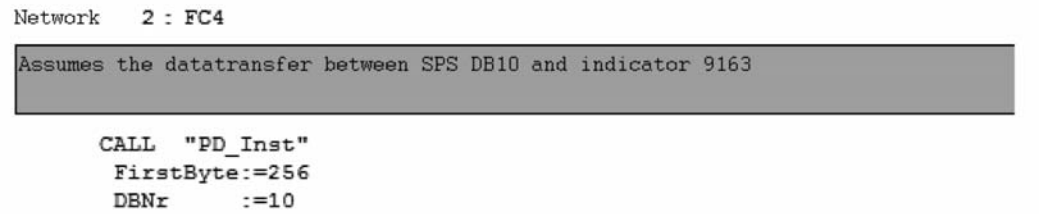
  This is the number of the Dataex DB.



5.3.3 FC4 “PD INST”

This function call (FC) reads and writes the process data from/to the data block generated by UDT 6 (see section 5.3.1).

The data in the data block is updated every time the FC is invoked.



Like FC3, function call FC4 must also be invoked cyclically.

The input parameters are the same as those for FC3.

- FirstByte (INT)
- DBNr (INT)

5.3.4 FB1 “OPG”

This function block (FB) writes or reads a word or bit of the digital indicator.

This function block needs a free instance data block (DB). The FB continues execution until the "Done" bit is set.

The function block requires five input parameters and returns four output parameters.

```
Network  3: FB1
FB 1 is used to read / write a single Bits or Word

      UN    M      5.0                  // M5.0 starts FB1
      SPB   end1                        //

      CALL  "OPG" , "IstanceOP"
       DBNr     :=10                    // Number of Datablock
       SlaveNr  :=1                     // Modbus adress of 9163
       OPCode   :=MW102                 // 1=read bit; 5=write bit; 3=read word;6= write word
       Address  :=MW104                 // Modbus adress of parameter
       INValue  :=MW106                 // Parameter value
       Done     :=M5.1                  // Function finished
       OUTValue:=MW108                  // Read value
       Error    :=M1.1                  // Error at execution of function
       ErrCode  :=MW110                 // Error code

end1: NOP   0

      U     M      5.1                  // after finished function
      R     M      5.0                  // Function enabled again
      R     M      5.1
```

Input parameters:

- DBNr (INT):

  Number of the data block responsible for data transfer with the indicator (DB3 in our example).

- SlaveNr (INT):

  The address is set to "1" for the indicator.

- OPCode (INT):

  This value defines the function of the request. The following functions are available:

1	Read bit
3	Read word
5	Write bit
6	Write word

- Address (INT):

  Address of parameter to be read/written. The appendix contains a parameter list.

- INWert (INT):

  New value to be written. The read operation is ignored.

Output parameters:

- Done (BOOL):
  This bit is set when the operation is finished.
- OUTWert (INT):
  The parameter value that has been read.

  For write operations, the byte contains the value "1" if there are no errors.

  If there is an error, the byte has the value "0".
- Error (BOOL):
  Error bit; set at the end of a function containing an error.
- ErrCode (INT):
  Error code:

1	Illegal function
2	Illegal data address
3	Illegal data value
6	Slave device busy
9	Illegal number data
10	Read only data
20	Timeout Communication
21	Input value error

Example 1

```
Network  3: FB1
FB 1 is used to read / write a single Bits or Word

      UN    M      0.5                 // M5.0 starts FB1
      SPB   end1                       //

      CALL  "OPG" , "IstanceOP"
       DBNr     :=3                    // Number of Datablock
       SlaveNr :=1                     // Modbus adress of 9163
       OPCode  :=3                     // 1=read bit; 5=write bit; 3=read word;6= write word
       Address :=400                   // Modbus adress of parameter
       INValue :=0                     // Parameter value
       Done    :=M1.0                  // Function finished
       OUTValue:=MW108                 // Read value
       Error   :=M1.1                  // Error at execution of function
       ErrCode :=MW110                 // Error code

end1: NOP   0

      U     M      1.0                 // after finished function
      R     M      0.5                 // Function enabled again
      R     M      1.0 400
```

In this example, the input sensor type of input 1 is read.

- The associated Dataex DB is "3".
- The Modbus device address is "1" (this value always has the default value "1")
- Function code has the value "3", which means "Read word".
- The input sensor type 1 has the address "400" in the device
- The "INValue" parameter is irrelevant for this operation.

When the "Done" bit is set to "1", MW 108 contains the numerical value of the input type of input "1".

If an error occurs, bit M1.1 is set and MW 110 written to.

FB1 must execute until M1.0 is set.

In the example, FB1 is executed by setting M0.5; M0.5 is disabled by setting M1.0 and execution of FB1 terminates.

Example 2

```
Network   3 : FB1
FB 1 is used to read / write a single Bits or Word

      UN    M      0.5                  // M5.0 starts FB1
      SPB   end1                        //

      CALL  "OPG" , "IstanceOP"
       DBNr     :=3                     // Number of Datablock
       SlaveNr  :=1                     // Modbus adress of 9163
       OPCode   :=6                     // 1=read bit; 5=write bit; 3=read word;6= write word
       Address  :=400                   // Modbus adress of parameter
       INValue  :=24                    // Parameter value
       Done     :=M1.0                  // Function finished
       OUTValue:=MW108                  // Read value
       Error    :=M1.1                  // Error at execution of function
       ErrCode  :=MW110                 // Error code

end1: NOP   0

      U     M      1.0                  // after finished function
      R     M      0.5                  // Function enabled again
      R     M      1.0
```

In this example, the input sensor type of input 1 is configured to 0..10 V.

- The associated Dataex DB is 3.
- The Modbus device address is "1" (this value is always "1" for the indicator)
- Function code has the value "6", which means "write word".
- The input sensor type 1 has the address "400" in the device.
- 0...10 V input means value "24" (see section 8.1.1 "Configuring a main input“ in the operating manual for the 9163 digital indicator).

When the "Done" bit is set to "1", MW 108 contains the numerical value of the input type of input 1.

If an error occurs, bit M1.1 is set and MW 110 written to.

FB1 must execute until M 1.0 is set.

In the example, FB1 is executed by setting M0.5; M0.5 is disabled by setting M1.0 and execution of FB1 terminates.

5.3.5 FB15 “RCP”

The FB15 function block reads and writes a predefined parameter set.

FB15 uses FB1 internally to read and write the individual parameters. In addition, it needs one instance data block (DB), the instance DB for FB1, the Dataex DB, a data block containing the parameter addresses and a data block containing the parameter values for writing/reading.

The function block is only executed on request. It must continue execution until the "Done" bit is set.

If an error occurs, execution is terminated and the error bit is set. In this case, the "ErrorCode" output parameter contains the error message of the FB1.

The “ErrorParamNr” contains the value "1".

```
Network   4 : FB15
FB 15 is used to read / write whole parameterblocks e.g. the configuration

      UN    M      5.2
      SPB   end2
      CALL  "Rcp" , DB15
       DB_GFX      :=10                 // Data transfer block
       DBIST       :="IstanceOP"        // Instance DB of FB1
       GFXNr       :=1                  // Modbus adress of 9163
       RCP_DB      :=110                // Datablock with read / written values
       Funct       :=M6.0               // 0=Read / 1=write Parameters
       ParamNr     :=34                 // Number of parameters that should be read / written
       ParamListDB:=109                 // List of parameter adress
       Done        :=M5.3
       Error       :=M1.2
       ErrCode     :=MW112
       ErrParamNr  :=MW114

end2: NOP   0

      U     M      5.3
      R     M      5.2
      R     M      5.3
```

Input parameters:

- DBNr (INT):

  Number of the Dataex DB

- DBIST (BLOCK_DB):

  Instance DB of FB1, written out, e.g. DB1I

- SlaveNr (INT):

  The slave number is always "1".

- RCP_DB (INT):

  Recipe DB; contains the parameter values of the indicator that are read/written.

- Funct (BOOL):

  This parameter defines whether the recipe is read or written.

- ParamNr (INT):

  This is the number of parameters that are read/written. It equals the number of addresses in the parameter addresses DB.

- ParamListDB (INT):

  This is the number of the parameter addresses DB.

Output parameters:

- Done (BOOL):

  Is set as soon as execution of FB15 is finished.

- Error (BOOL):

  Is set if an error has occurred during execution.

- ErrorCode (INT):

  Contains the error code of FB1 in the event of an error.

- ErrorParamNr (INT):

  Contains the value "1" in the event of an error.

Example of the "Parameter addresses" DB (DB 109).

These addresses are read/written by FB15. The contents of these addresses are held in the "parameter values" DB (DB 21).

Adress	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	dPS1	INT	403	Decimal point position for input 1 scale
+2.0	tyP1	INT	400	Input 1 type
+4.0	tyP2	INT	706	Input 2 type
+6.0	tyP3	INT	136	Input 3 type
+8.0	tyP4	INT	724	Input 4 type
+10.0	At1	INT	62	Alarm 1 type
+12.0	At2	INT	63	Alarm 2 type
+14.0	At3	INT	54	Alarm 3 type
+16.0	At4	INT	57	Alarm 4 type
+30.0	Ar1	INT	732	Reference Signal Alarm 1
+32.0	Ar2	INT	737	Reference Signal Alarm 2
+34.0	Ar3	INT	742	Reference Signal Alarm 3
+36.0	Ar4	INT	747	Reference Signal Alarm 4
+50.0	LoAL_LSW	INT	782	lower limit for setting Alarm LSW
+52.0	LoAL_MSW	INT	783	lower limit for setting Alarm MSW
+54.0	HiAL_LSW	INT	784	Upper limit for setting Alarm LSW
+56.0	HiAL_MSW	INT	785	Upper limit for setting Alarm MSW
+58.0	Pro	INT	49	Protection code
+60.0	but1	INT	133	Function of PEAK key
+62.0	but2	INT	134	Function of CAL/RST key
+64.0	but3	INT	135	Function of M/A key
+66.0	diG1	INT	140	Function digital input 1
+68.0	diG2	INT	141	Function digital input 2
=70.0		END_STRUCT		

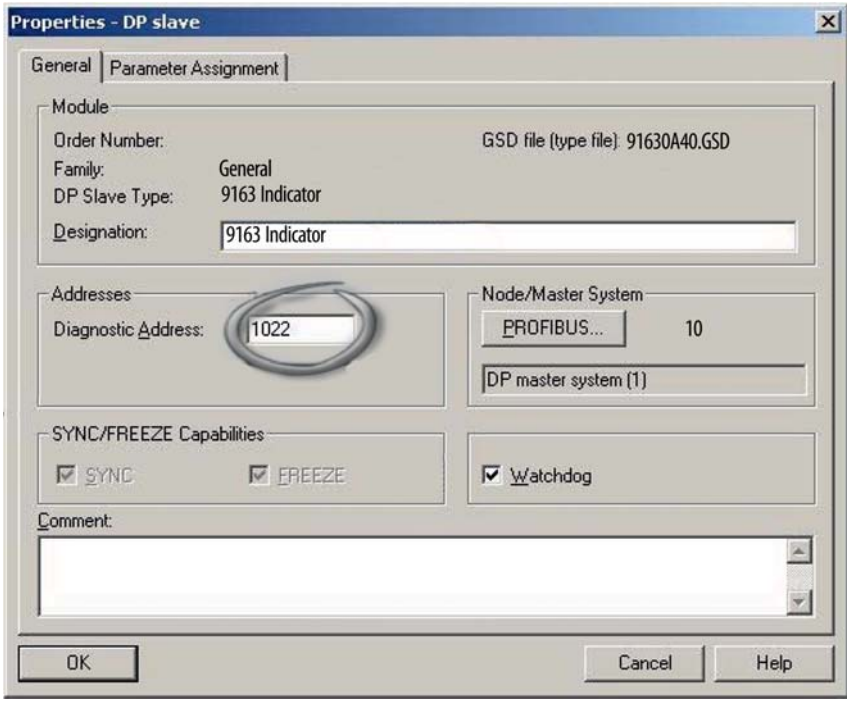
"Parameter values" DB (DB21):

Adress	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	dPS1	INT	0	Decimal point position for input 1 scale
+2.0	tyP1	INT	10	Input 1 type
+4.0	tyP2	INT	10	Input 2 type
+6.0	tyP3	INT	1	Input 3 type
+8.0	tyP4	INT	1	Input 4 type
+10.0	At1	INT	0	Alarm 1 type
+12.0	At2	INT	0	Alarm 2 type
+14.0	At3	INT	0	Alarm 3 type
+16.0	At4	INT	0	Alarm 4 type
+30.0	Ar1	INT	1	Reference Signal Alarm 1
+32.0	Ar2	INT	1	Reference Signal Alarm 2
+34.0	Ar3	INT	1	Reference Signal Alarm 3
+36.0	Ar4	INT	1	Reference Signal Alarm 4
+50.0	LoAL_LSW	INT	0	lower limit for setting Alarm LSW
+52.0	LoAL_MSW	INT	0	lower limit for setting Alarm MSW
+54.0	HiAL_LSW	INT	3500	Upper limit for setting Alarm LSW
+56.0	HiAL_MSW	INT	0	Upper limit for setting Alarm MSW
+58.0	Pro	INT	0	Protection code
+60.0	but1	INT	8	Function of PEAK key
+62.0	but2	INT	23	Function of CAL/RST key
+64.0	but3	INT	3	Function of M/A key
+66.0	diG1	INT	11	Function digital input 1
+68.0	diG2	INT	55	Function digital input 2
=70.0		END_STRUCT		

5.4 PROFIBUS diagnostic functions

In the Hardware Manager, under Properties, it is possible to change the diagnostic address of the digital indicator. You can read this address using the SFB13 "DPNRM_DG".

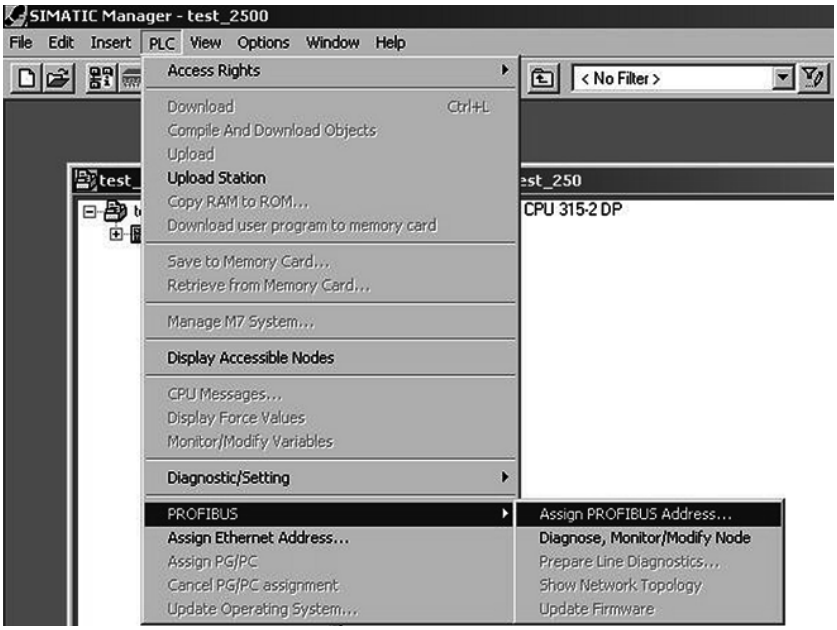
You can find further information in the Siemens Step 7 documentation.



5.5 Changing the PROFIBUS address via software

In the menu "PLC / PROFIBUS / Assign PROFIBUS address" you can assign a new PROFIBUS address via software.

Make sure that your PROFIBUS master supports this function. If you are unsure, connect just one slave to the master for this procedure and change its address.



Active PROFIBUS address:

- Enter the current slave address here.

New PROFIBUS address:

- Enter the new slave address here.

Note:

The address can only be changed if the PROFIBUS master is disabled or the cable is disconnected.

In either case, you can change the address using the programming device.

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