

DMA Profibus Manual

Revision History

Revision	Date	Description
Preliminary	10.08.2006	First printout
Preliminary	14.08.2006	Slave address SDR, Bytecount CNT added New Write, Read, Response telegram definition Read, Write Command changed (according to Modbus Standard)
Preliminary	27.08.2006	Master Read changed from 6 Bytes to 7 Bytes N changed in N-High and N-low (according to Modbus Standard) error #5 timeout (for example: DMA protocol timeout) added
Preliminary	28.08.2006	Parameter description translated in english and updated, DMA SW version added
Preliminary	29.08.2006	Parameter list updated
R_1.0	04.09.2006	Released
R_1.1	11.09.2006	Setting of set values via Profibus possible (ID 31,32,39,40)
R_1.2	31.10.2006	Added information about Hardware address selection and connectors
R_1.3	05.02.2007	Added example for telegram for sending command signal via Profibus
R_1.4	06.02.2007	Added information about Profibus features
R_1.5	16.03.2007	Added information about connection for RS232 at DMA RJ45 connector
R_1.6	25.10.2007	Added parameters for SW Vyy.06 and SW V31.xx Including closed loop parameters
R_1.7	10.01.2008	Introduced Multi-Slave operation. Added CMD=3, CMD=6 in headlines. New structure. CMD=15, Master writes multiple parameters added
R_1.8	21.01.2008	New GSD file HCS0120.GSD
R_1.9	14.02.2008	CMD= 15, example for error response. common feature description transferred from the specification clamping force controller R1.4
R_2.0	01.03.2008	Rework, new functions and parameters for SW versions Vyy.07 implemented
R_2.1	16.10.2008	Definition of DIN_1, DIN_2 in send telegram corrected
R_2.2	19.01.2009	SW Version V32.09x, value range of parameter E18 changed
R_2.3	20.02.2009	SW Version since V32.09c, bit added, to set the Output Error/Comparator directly.
R_2.4	10.09.2010	SW Version since V32.10a, Parameter C1.33 and C2.33 added.. Parameter 0xB0 disable card bit added.
R_2.5	16.01.2014	Rework S7-implementation and some grammar corrected
R_2.6	27.01.2014	Added Troubleshooting
R_2.7	14.04.2014	Added error table, reaction about timeout Profibus signal
R_2.7	10.06.2014	Syntax correction
R_2.7	20.06.2014	Syntax correction, C2.07 Dead band compensation A
R_2.7	30.09.2014	The special function byte will be set to internal 0x00 (reset) when the hardware enable is inactive.
R_2.7	15.10.2014	0x04 = Set Error/Comp output direct to 24V (disable signaling of error output)
R_2.8	10.08.2015	Description Slave-Numbering and E22
R_2.8	22.08.2016	Change of GSD file: HCS0220.gsd
R_2.9	26.10.2017	Correction of example SW15.xx (mode1) (A1.02 gets A2.01)
R_3.0	11.12.2017	Correction of response String SW32.xx (mode3,5) (d1.11,d1.10 swapped)
R_3.1	09.03.2019	Configuration for TIA Portal included
R_3.1	22.10.2020	Writing error Article number
R_3.2	10.02.2021	Added: Version: V46.xxy, closed loop, Mode 5. Version: V49.xxy, closed loop, Mode 5.
R_3.3	07.10.2021	TIA portal description error, setting the Profibus address

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1 Features

- Supports Profibus-DP Slave in accordance with IEC 61158
- Supports Profibus DPV1
- Maximum 244 Byte input and 244 Byte output data
- Supports up to 12 Mbaud (auto detect)
- Electrical isolated and opto-decoupled

1.1 Used GSD File

„HCS0220.GSD“

1.2 Supported DMA SW-versions

Version: V15.xxy, open loop, one valve with two solenoids.
Version: V22.xxy, open loop, two valves with one solenoid each.
Version: V31.xxy, Clamp Force Controller see separate document.
Version: V32.xxy, closed loop, Mode 3,4,6,8.
Version: V46.xxy, closed loop, Mode 5.
Version: V49.xxy, closed loop, Mode 5.

1.3 Special information for Multi-Slave Nodes

In cases where a Profibus node has more than one slave (modules) connected all slaves must be active (connected to the power supply). The hardware enable is connected to all of the DMA modules. Other wise communication is not possible and the node-module will respond with a timeout error message.

The Profibus Address Selector in front of the Profibus-Node is set to the right value (bus error LED is off).

If 3 modules are used then E22 must be set to „1“ for the first module on the left, to „2“ for the second module in the middle and to „3“ for the third module closest to the slave (see Chapter 2.2).

1.4 General information about TADR (Telegram Address)

TADR is a value which may be written (changed) with each cycle but changing of this value is optional and not mandatory. The value will be defined by the DP-Master.

The purpose is to either check the telegrams by the master or also in order to force sending of a new telegram from the node.

The design of the node is made in a way that the slave or slaves (module or modules in case of multi-slave version) are only responding if a received message from the master contains changed (different) data compared to the previous message.

So TADR can be used to force a response from a slave for example in order to get an update on the current status of the slave even if the other data in the message remain unchanged.

TADR value is valid in the range of 0 to 255 or in hexadecimal 0x00 to 0xFF.

1.5 General information about CMD (Command) and SADR (Slave Address)

Different ways of communication between master and slaves (modules) are possible. The difference is in the CMD instruction.

- CMD = 6:** Writing of a single parameter-ID of a slave (module) at a node. The selected SADR in the telegram will define which slave is selected for the communication. In the slave itself the address is set by parameter E22.
Special case: the Profibus node has only one slave (module) connected. In this case SADR is set to 1 (defined in parameter E22). SADR also could be set to any value between 1 and 32.
Theoretically up to 32 slaves (modules) can be connected to one of the Profibus nodes. Which of the slaves (modules) is selected for communication is again defined in the telegram by the SADR and in the slaves (modules) by setting of parameter E22. For more information please refer to section 3.4.
- CMD = 3:** Reading of one or more parameters with parameter-ID in rising order. All other definitions from CMD = 6 are also applicable. For more information please refer to section 3.1.
- CMD = 15:** This instruction allows writing or reading of a (pre-defined) set of parameters. The set of parameters itself is depending on the software version of the slaves (modules); refer also to section 4.5.
With this instruction all slaves (modules) at a given node with the SADR from 1 to 5 can be reached. This instruction cannot be used for slaves (modules) with a SADR > 5. In this case CMD = 3 and CMD = 6 must be used!
The best is to set SADR at the slaves in rising and consecutive order beginning with SADR = 1 (E22 = 1).
In the telegram itself the number of slaves (modules) at the node is defined by SNUM. This at the same time will also define the length of the telegram itself (number of bytes in the telegram).
For more information please refer to section 4.

It is possible to „mix“ the instructions CMD = 3, CMD = 6 and CMD = 15 for one node.

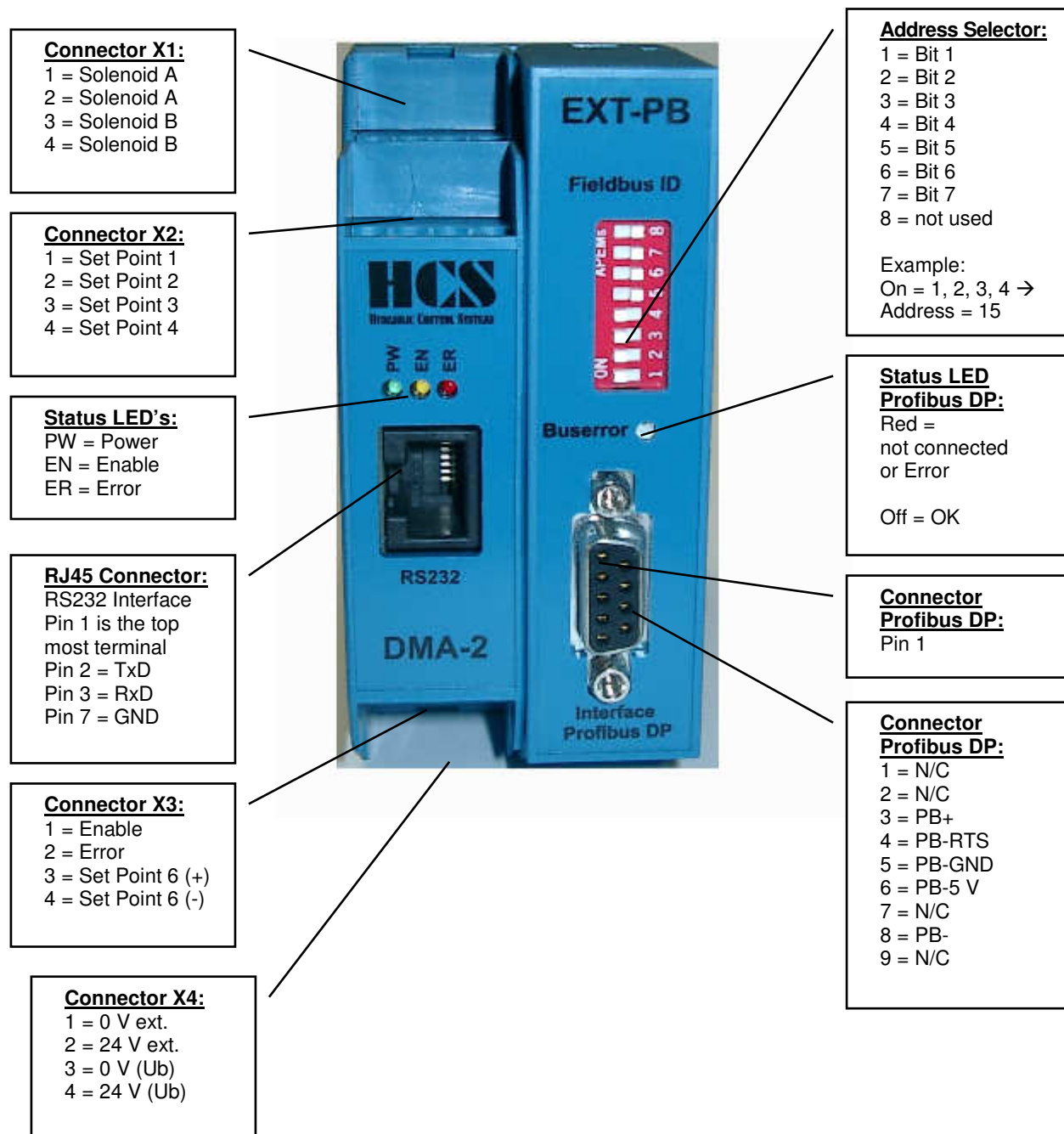
So for example the slaves (modules) with E22 = 1, E22 = 2 and E22 = 3 are actuated by CMD = 15 and/or CMD = 3 and/or CMD = 6,

But another slave (module) with address E22 greater than 5 is only actuated either by CMD = 3 or CMD = 6.

2 Front View: Address Selection and Connectors

2.1 Front View: Single Module Version (node with one module connected)

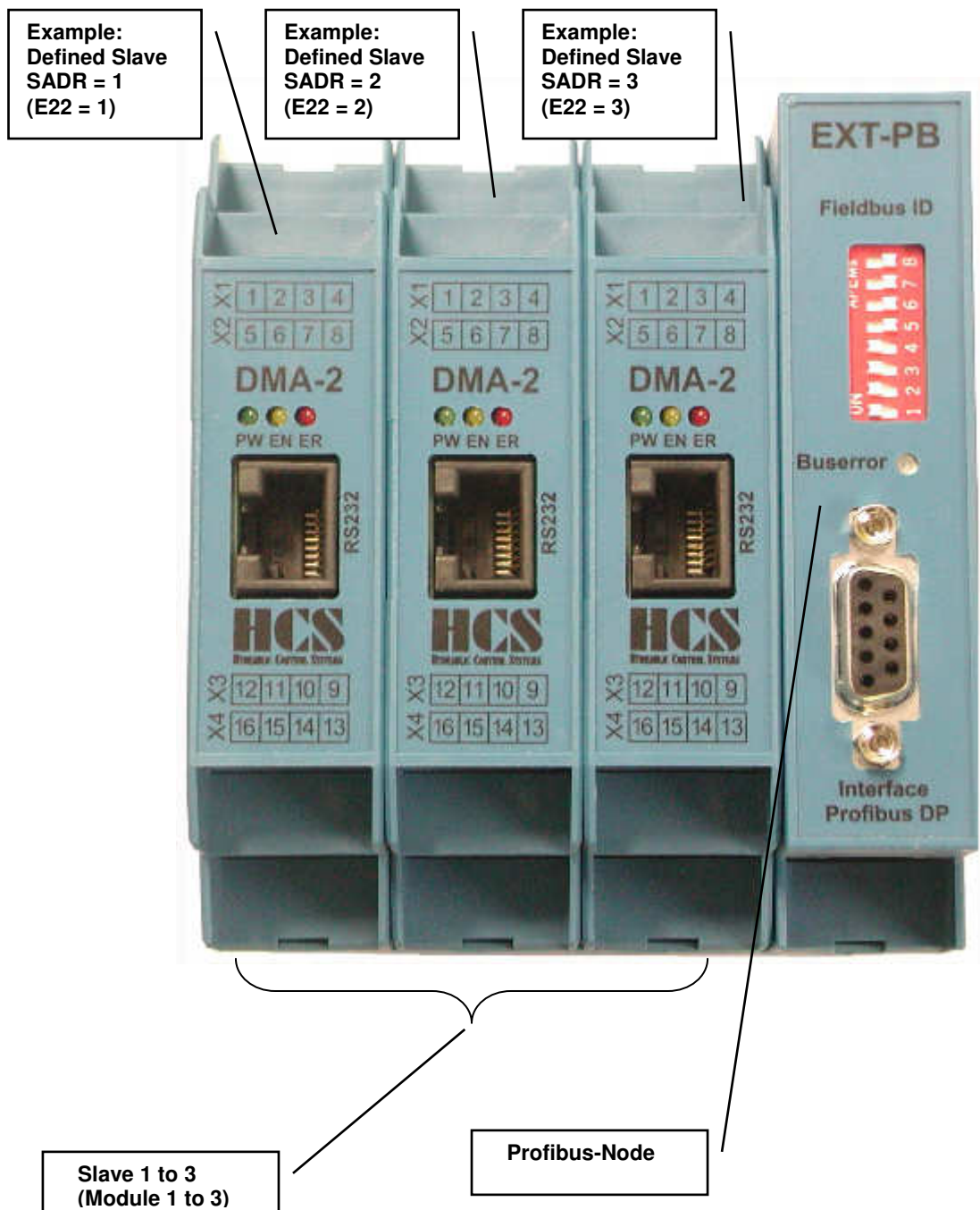
Example for module in version DMA-22-M1-01-x!



2.2 Front View: Multiple-Slave Version (node with multiple modules connected)

Example:

1 Profibus-Node and 3 DMA Modules (Slaves) connected



3 Simple commands

3.1 CMD = 3, Master Read parameters (7 bytes)

Write first...

Byte	Abbreviation	Description
0	TADR	Telegram address, defined by the user, Range 0..255, 0..0xFF
1	SADR	Slave address
2	CMD	Command: 3 = Read multiple parameters by the master
3	IDH	High byte parameter ID of first parameter
4	IDL	Low byte parameter ID of first parameter
5	N-high	High-Byte Number parameters
6	N-low	Low-Byte Number parameters

...Write last

TADR	Telegram address, defined by the DP-Master. (Set by the User)
SADR	Slave address, if more than one Slave is connected to the Profibus port 1 = standard (single slave) 2 to 32 = also possible (E22 defines the slave address)
CMD	Command: 3 = Read parameter by the master
IDH,IDL	H-Byte and Low-Byte of parameter-ID in HEX 0x0000 .. 0x00A2 = Valid ID-range
N-high	High-Byte Number parameters (words), normally zero
N-low	Low-Byte Number parameters (words), 1 to 8 (0x08) (maximal 8 parameters readable at once)

3.2 CMD = 3, Response from Slave (4 + CNT bytes)

Write first...

Byte	Abbreviation	Description
0	TADR	Telegram address, defined by the read command, Range 0..255, 0..0xFF
1	SADR	Slave address
2	CMD	Command: 3 = Read multiple parameters by the master
3	CNT	N*2, Number of data bytes
4	DAT1H	High byte value of first parameter
5	DAT1L	Low Byte value of first parameter

If CNT > 2:

CNT+2 = N	DATnH	High byte value of last (n)parameter
CNT+3 = N	DATnL	Low Byte value of last (n)parameter

...Write last

TADR	Telegram address, defined by the DP-Master. (Set by the read command)
SADR	Slave address, if more than one Slave is connected to the Profibus port 1 = standard (single slave) 2 to 32 = also possible (E22 defines the slave address)
CMD	Command: 3 = Read parameter by the master
CNT	N*2, Number of data bytes (Maximal 16 data bytes)
IDH,IDL	H-Byte and Low-Byte of parameter-ID in HEX 0x0000 .. 0x00B0 = Valid ID-Range
DAT1H.. DAT nH, DAT1L.. DAT nL,	Two data bytes in HEX, without decimal sign 0x7FFF == +32767 0x8000 == -32768

3.3 CMD = 3, Error from Slave (4 bytes)

Write first...

Byte	Abbreviation	Description
0	TADR	Telegram address, defined by the read command, Range 0..255, 0..0xFF
1	SADR	Slave address
2	ERR	Error code
3	EXCE	Exception

...Write last

ERR Error code: 0x83 = Read failed

EXCE Exception:
 1 = Command not supported
 2 = Wrong ID
 3 = CNT== 0 or CNT > 16 (0x10)
 4 = Reading of ID failed
 5 = timeout slave, address wrong or not installed or
 Invalid number of connected slaves
 6 = Internal checksum error (Modbus)

Example for error response:

Module 3 is not installed and **SADR** in the master telegram is set to 3

Byte	Abbreviation	Abbreviation	Description
0	0x23	TADR	Response telegram address (defined by the read command)
1	0x03	SADR	Actual slave address
2	0x83	ERR	Error, Bit „7“ with command 0x03 is set
3	0x05	EXCE	timeout slave, address wrong or not installed

3.4 CMD = 6, Master Write single parameter (7 bytes)

Write first...

Byte	Abbreviation	Description
0	TADR	Telegram address, defined by the user, Range 0..255, 0..0xFF
1	SADR	Slave address
2	CMD	Command: 6 = Write single parameter by the master
3	IDH	High byte parameter ID
4	IDL	Low byte parameter ID
5	DATH	High byte of parameter value
6	DATL	Low byte of parameter value

...Write last

TADR	Telegram address, defined by the DP-Master.(Set by the user)
SADR	Slave address, if more than one Slave is connected to the Profibus port 1 = standard (single slave) 2..32 = also possible (E22 defines the slave address)
CMD	Command: 6 = Write single parameter by the master
IDH,IDL	H-Byte and Low-Byte of parameter-ID in HEX 0x0000 .. 0x00B0 = Valid ID-Range
DATH,DATL	Two data bytes in HEX, without decimal sign 0x7FFF == +32767 0x8000 == -32768

3.5 CMD = 6, Response from Slave (7 bytes)

Write first...

Byte	Abbreviation	Description
0	TADR	Telegram address, defined by the write command, Range 0..255, 0..0xFF
1	SADR	Slave address
2	CMD	Command: 6 = Write single parameter by the master
3	IDH	High byte parameter ID
4	IDL	Low byte parameter ID
5	DATH	High byte of second analogue value
6	DATL	Low byte of first analogue value

...Write last

TADR	Telegram address, defined by the DP-Master.(Set by the write command)
SADR	Slave address, if more than one Slave is connected to the Profibus port 1 = standard (single slave) 2..32 = also possible (E22 defines the slave address)
CMD	Command: 6 = Write single parameter by the master
IDH,IDL	H-Byte and Low-Byte of parameter-ID in HEX 0x0000 .. 0x00A2 Valid ID-Range
DATH,DATL	Two data bytes in HEX, without decimal sign 0x7FFF == +32767 0x8000 == -32768

3.6 CMD = 6, Error from Slave (4 bytes)

Write first...

Byte	Abbreviation	Description
0	TADR	Telegram address, defined by the write command, Range 0..255, 0..0xFF
1	SADR	Slave address
2	ERR	Error code
3	EXCE	Exception

...Write last

ERR Error code: 0x86 = write failed

EXCE Exception:
 1 = Command not supported
 2 = Wrong ID
 3 = Wrong Data Value
 4 = Writing of ID failed
 5 = timeout slave, address wrong or not installed or
 Invalid number of connected slaves
 6 = Internal checksum error (Modbus)

Example for error response:

Module 3 is not installed and **SADR** in the master telegram is set to 3

Byte	Abbreviation	Abbreviation	Description
0	0x23	TADR	Response telegram address (defined by the write command)
1	0x03	SADR	Actual slave address
2	0x86	ERR	Error, Bit „7“ with command 0x06 is set
3	0x05	EXCE	timeout slave, address wrong or not installed

3.7 Telegram example CMD = 6, CMD = 3

Master wants to write parameter “C1.07” with value 1.000 V:

ID = 0x0030

DATA = 0x3E8 (= 1000 in decimal)

TADR = 0x23

SADR = 0x01

Byte	Value	Abbreviation
0	0x23	TADR
1	0x01	SADR
2	0x06	CMD
3	0x00	IDH
4	0x30	IDL
5	0x03	DATL
6	0xE8	DATH

Response from slave (module), command was successful executed

ID = 0x0030

DATA = 0x3E8 (= 1.000 V)

Byte	Value	Abbreviation
0	0x23	TADR
1	0x01	SADR
2	0x06	CMD
3	0x00	IDH
4	0x30	IDL
5	0x03	DATL
6	0xE8	DATH

Master wants to read parameter “d1.07”:

ID = 0x0007

N = 1, one parameter

TADR = 0x24

SADR = 0x01

Byte	Value	Abbreviation
0	0x24	TADR
1	0x01	SADR
2	0x03	CMD
3	0x00	IDH
4	0x07	IDL
5	0x00	N-high
6	0x01	N-low

Response from slave (module)

CNT = 2 (2 Bytes)

DATA = 0x0133 (==0.307Af)

Byte	Value	Abbreviation
0	0x24	TADR
1	0x01	SADR
2	0x03	CMD
3	0x02	CNT
4	0x01	DAT1H
5	0x33	DAT1L

3.8 Additional examples CMD = 6

Examples for set value via Profibus (ID = 0x0027):

1.) Command signal 0.000 V = 0x0000:

Byte	Value	Abbreviation
0	0x12	TADR
1	0x01	SADR
2	0x06	CMD
3	0x00	IDH
4	0x27	IDL
5	0x00	DATL
6	0x00	DATH

2.) Set value 5.000 V = 0x1388:

Byte	Value	Abbreviation
0	0x12	TADR
1	0x01	SADR
2	0x06	CMD
3	0x00	IDH
4	0x27	IDL
5	0x13	DATL
6	0x88	DATH

3.) Set value 9.999 V = 0x270F:

Byte	Value	Abbreviation
0	0x12	TADR
1	0x01	SADR
2	0x06	CMD
3	0x00	IDH
4	0x27	IDL
5	0x27	DATL
6	0x0F	DATH

4.) Set value -9.999 V = 0xD8F1

Byte	Value	Abbreviation
0	0x12	TADR
1	0x01	SADR
2	0x06	CMD
3	0x00	IDH
4	0x27	IDL
5	0xD8	DATL
6	0xF1	DATH

4 Complex commands

4.1 CMD = 15, Master writes multiple parameters (3+5-module bytes)

(Fast multi-slave command)

Parameter E22 in the related DMA-module has to be set to the correct value within the range of 1 to 5 depending on the number of connected slaves (modules). The slave at the left side has the address "1" and the slave closest to the Profibus node will have the highest address setting.

Example: If 3 modules are used than E22 must be set to „1“ for the first module on the left, to „2“ for the second module in the middle and to „3“ for the third module closest to the slave (refer also to 2.2).

Response telegrams are automatically multiplexed by the Profibus node (refer also to 4.4.2).

Write first...

address	Byte	Structure					Abbreviation	Description
	0	0..0xFF					TADR	Telegram address, defined by the user, Range 0..255, 0..0xFF
	1	1	2	3	4	5	SNUM	Number of connected slaves (Maximum 5)
	2	15					CMD	Command: 15 = Write multiple parameter by the master
	3	1	1	1	1	1	DAT1.1	Control-Byte Byte for special functions
	4						DAT1.2H	High byte of first "analogue" value
	5						DAT1.2L	Low byte of first "analogue" value
	6						DAT1.3H	High byte of second "analogue" value
	7						DAT1.3L	Low byte of second "analogue" value
	8	2	2	2	2	2	DAT1.1	Control-Byte Byte for special functions
	9						DAT1.2H	High byte of first "analogue" value
	10						DAT1.2L	Low byte of first "analogue" value
	11						DAT1.3H	High byte of second "analogue" value
	12						DAT1.3L	Low byte of second "analogue" value
	13	3	3	3	3	3	DAT3.1	Control-Byte Byte for special functions
	14						DAT3.2H	High byte of first "analogue" value
	15						DAT3.2L	Low byte of first "analogue" value
	16						DAT3.3H	High byte of second "analogue" value
	17						DAT3.3L	Low byte of second "analogue" value
	18	4	4	4	4	4	DAT4.1	Control-Byte Byte for special functions
	19						DAT4.2H	High byte of first "analogue" value
	20						DAT4.2L	Low byte of first "analogue" value
	21						DAT4.3H	High byte of second "analogue" value
	22						DAT4.3L	Low byte of second "analogue" value
	23	5	5	5	5	5	DAT5.1	Control-Byte Byte for special functions
	24						DAT5.2H	High byte of first "analogue" value
	25						DAT5.2L	Low byte of first "analogue" value
	26						DAT5.3H	High byte of second "analogue" value
	27						DAT5.3L	Low byte of second "analogue" value
....Write last		8	13	18	23	28	Overall telegram length in bytes	

TADR	Telegram address, defined by the DP-Master. (defined by the user) Range 0..255
SNUM	Number of connected slaves (Maximum 5). Here for multi slave operation the number of present slaves has to be set properly.
CMD	Command: 15 = Write multiple parameters by the master
DAT^x1.1	Control-Byte. One data byte in HEX, for special functions 0x00 == 0 0xFF == 255
DAT^x1.2H, DAT^x1.2L	Process Value1: Two data bytes in HEX, without decimal sign, for "analogue" values 0x7FFF == +32767 0x8000 == -32768
DAT^x1.3H, DAT^x1.3L	Process Value1: Two data bytes in HEX, without decimal sign, for "analogue" values 0x7FFF == +32767 0x8000 == -32768

x¹) = Module address (set by parameter E22 in each DMA-Module) range 1 to 5.

4.2 CMD = 15, Response from Slave (9 bytes)

Please pay attention to the fact that in case of multiple slave operation SADR will be changed automatically with each new response.

Example:

When using 3 slaves than the slave with the module address "1" (E22 = 1) will respond first. After the next "Master-Write" the slave with module address "2" (E22 = 2) will respond and finally the last slave with address "3" (E22 = 3). Then it starts again with slave "1".

This means that the multiplexer for answering is implemented in the Profibus node. SADR indicates which of the modules has actually send the response.

Write first...

address	Byte	Structure	Abbreviation	Description	
	0	Telegram header	TADR	Telegram address, defined by the user, Range 0..255, 0..0xFF	
	1		SADR	Slave address	
	2		CMD	Command: 15 = Write multiple parameter by the master	
	3	Data of SADR	DAT.1H	Status Word	High byte of module state
	4		DAT.1L		Low byte of module state
	5		DAT.2H	VALUE1	High byte of first "analogue" value
	6		DAT.2L		Low byte of first "analogue" value
	7		DAT.3H	VALUE2	High byte of second "analogue" value
	8		DAT.3L		Low byte of second "analogue" value

...Write last

TADR	Telegram address, defined by the DP-Master.(set by the user)
SADR	Slave address, if more than one Slave is connected to the Profibus port 1 to max 5 depending on number of slaves
CMD	Command: 15 = Write multiple parameters by the master
DAT.1H,DAT.1L	Status word. Two data bytes in HEX, , for module state 0x0000 == 0 0xFFFF == 65535
DAT.2H, DAT.2L, DAT.3H, DAT.3L	VALUE1 VALUE2. Two data bytes in HEX, without decimal sign, for analogue values 0x7FFF == +32767 0x8000 == -32768

4.3 CMD = 15, Error from Slave (4 bytes)

Write first...

address	Byte	Abbreviation	Description
	0	TADR	Telegram address, defined by the write command, Range 0..255, 0..0xFF
	1	SADR	Slave address
	2	ERR	Error code
	3	EXCE	Exception

...Write last

ERR	Error code: 0x8F = write failed
EXCE	Exception: 1 = Command not supported 2 = Wrong ID 3 = Wrong Data Value 4 = Writing of ID failed 5 = timeout (Modbus) 6 = Internal checksum error (Modbus) 7 = Invalid number of connected slaves 8 = timeout slave, address wrong or not installed 9 = Profibus node (SADR = 0) send, received data length to small. The data length of the selected GSD module is too small.

Example for error response:

Module 3 is not installed and SNUM in the master telegram is set to 3

Byte	Abbreviation	Abbreviation	Description
0	0x23	TADR	Response telegram address (defined by the write command)
1	0x03	SADR	Actual slave address
2	0x8F	ERR	Error, Bit „7“ with command 0x0F in decimal 15 is set
3	0x08	EXCE	timeout slave, address wrong or not installed

4.4 Examples, CMD = 15

4.4.1 Single slave (SW Version 15.xxy)

The Profibus Address Selector in front of the Profibus-Node is set to the right value (bus error LED is off).
E22 of the DMA module is set to 1.
Hardware Enable is connected to the DMA module.

Master writes set value of 1.000 V to slave (module):

Byte	Abbreviation	Abbreviation	Description
0	0x23	TADR	Telegram address, defined by the user, Range 0..255, 0..0xFF
1	0x01	SNUM	0x01 means single slave
2	0x0F	CMD	0x0F in decimal 15
3	0x00	DAT1.1	Byte for special functions, 0x00 (default value, no bus-disable)
4	(1000)	DAT1.2H	Set Value A1.01
5		DAT1.2L	0x03E8 (= 1000 in decimal = 1.000V)
6	(0)	DAT1.3H	Set Value A2.01
7		DAT1.3L	0x0000 (= 0 in decimal = 0.000V)

Response slave (module) no.1:

Byte	Abbreviation	Abbreviation	Description
0	0x23	TADR	Response telegram address (defined by the write command)
1	0x01	SADR	Actual slave address
2	0x0F	CMD	0x0F in decimal 15
3	0x40	DAT1.1H	High byte of module state, Hardware Enable is active, no error
4	0x00	DAT1.1L	Low byte of module state, not used, in this case always zero
5	(0)	DAT1.2H	Actual current A
6		DAT1.2L	0x0000 (= 0 in decimal = 0.000A)
7	(270)	DAT1.3H	Actual current B
8		DAT1.3L	0x010E (= 270 in decimal = 0.270A)

(x) = value in decimal.

4.4.2 Multiple-slave (3 DMA modules, SW Version 15.xxy)

The Profibus Address Selector in front of the Profibus-Node is set to the right value (bus error LED is off).
E22 of the three modules is set to 1, 2, 3.
All modules are powered on, hardware enable is connected all of the DMA modules.

Master first write cycle: set value 1.000 V to slave1, 2.000 V to slave2 and - 3.000 V to slave3:

Byte	Abbreviation	Abbreviation	Description
0	0x23	TADR	Telegram address, defined by the user, Range 0..255, 0..0xFF
1	0x03	SNUM	0x03 means three slaves (modules) are connected
2	0x0F	CMD	0x0F in decimal 15
3	0x00	DAT1.1	Byte for special functions, 0x00 (default value, no bus-disable)
4	(1000)	DAT1.2H	Set Value A1.01
5		DAT1.2L	0x03E8 (= 1000 in decimal = 1.000V)
6	(0)	DAT1.3H	Set Value A2.01
7		DAT1.3L	0x0000 (= 0 in decimal = 0.000V)
8	0x00	DAT2.1	Byte for special functions, 0x00 (default value, no bus-disable)
9	(2000)	DAT2.2H	Set Value A1.01
10		DAT2.2L	0x07D0 (= 2000 in decimal = 2.000V)
11	(0)	DAT2.3H	Set Value A2.01
12		DAT2.3L	0x0000 (= 0 in decimal = 0.000V)
13	0x00	DAT3.1	Byte for special functions, 0x00 (default value, no bus-disable)
14	(-3000)	DAT3.2H	Set Value A1.01
15		DAT3.2L	0xF448 (= - 3000 in decimal = - 3.000V)
16	(0)	DAT3.3H	Set Value A2.01
17		DAT3.3L	0x0000 (= 0 in decimal = 0.000V)

(x) = value in decimal.

The node will only send a response if **any** data in the telegram received from the master has been changed! If the data in a telegram have to remain unchanged than a response from the node to a "Master write" can be enforced due to a change of the data TADR.

The data of the write command will be immediately forwarded to all slaves (modules). Each response telegram to a write command will automatically contain "new data" from the next slave (module). The slaves are automatically multiplexed.

Response telegrams are automatically multiplexed by the DMA-Profibus node.
In this example, module 1 answers first

Byte	Abbreviation	Abbreviation	Description
0	0x23	TADR	Response telegram address (defined by the write command)
1	0x01	SADR	Actual slave address
2	0x0F	CMD	0x0F in decimal 15
3	0x40	DAT1.1H	High byte of module state, Hardware Enable is active, no error
3	0x00	DAT1.1L	Low byte of module state, not used, in this case always zero
4	(0)	DAT1.2H	Actual current A, d1.07 of module 1
5		DAT1.2L	0x0000 (= 0 in decimal = 0.000A)
6	(270)	DAT1.3H	Actual current B, d1.08 of module 1
7		DAT1.3L	0x010E (= 270 in decimal = 0.270A)

(x) = value in decimal.

Change telegram address TADR to 0x24 and send same message as before. Next module no. 2 will answer.

Byte	Abbreviation	Abbreviation	Description
0	0x24	TADR	Response telegram address (defined by the write command)
1	0x02	SADR	Actual slave address
2	0x0F	CMD	0x0F in decimal 15
3	0x40	DAT1.1H	High byte of module state, Hardware Enable is active, no error
3	0x00	DAT1.1L	Low byte of module state, not used, in this case always zero
4	(0)	DAT1.2H	Actual current A, d1.07 of module 2
5		DAT1.2L	0x0000 (= 0 in decimal = 0.000A)
6	(540)	DAT1.3H	Actual current B, d1.08 of module 2
7		DAT1.3L	0x021C (= 540 in decimal = 0.540A)

(x) = value in decimal.

Change telegram address TADR to 0x25 and send same message as before. Next module no. 3 will answer.

Byte	Abbreviation	Abbreviation	Description
0	0x25	TADR	Response telegram address (defined by the write command)
1	0x03	SADR	Actual slave address
2	0x0F	CMD	0x0F in decimal 15
3	0x40	DAT1.1H	High byte of module state, Hardware Enable is active, no error
3	0x00	DAT1.1L	Low byte of module state, not used, in this case always zero
4	(810)	DAT1.2H	Actual current A, d1.07 of module 3
5		DAT1.2L	0x032A (= 810 in decimal = 0.810A)
6	(0)	DAT1.3H	Actual current B, d1.08 of module 3
7		DAT1.3L	0x0000 (= 0 in decimal = 0.000A)

(x) = value in decimal.

Change telegram address TADR to 0x26 and send same message as before. Next module no. 1 will answer.

Byte	Abbreviation	Abbreviation	Description
0	0x26	TADR	Response telegram address (defined by the write command)
1	0x01	SADR	Actual slave address
2	0x0F	CMD	0x0F in decimal 15
3	0x40	DAT1.1H	High byte of module state, Hardware Enable is active, no error
3	0x00	DAT1.1L	Low byte of module state, not used, in this case always zero
4	(0)	DAT1.2H	Actual current A, d1.07 of module 1
5		DAT1.2L	0x0000 (= 0 in decimal = 0.000A)
6	(270)	DAT1.3H	Actual current B, d1.08 of module 1
7		DAT1.3L	0x010E (= 270 in decimal = 0.270A)

(x) = value in decimal.

4.5 CMD = 15, structure of Profibus telegram definition, depending on SW Versions

4.5.1 General

4.5.1.1 Error Message (indication by “Error occurred”)

Errors which are indicated in the Bit (Error occurred) like for example “Over Current” or “Cable Fraction” can be reset with the following action :

- Set input signal for the hardware enable at the according module at terminal X3/1 (9) to “Low” and than go back to “High”
- Setting and resetting of the Bits (0x80) Bus-Disable

Mandatory condition for resetting an error is that the failure causing the error has been cleared or removed.

Error numbers:

The corresponding error numbers can be found in the respective manual of the DMA-Modules.
Generally the following error table is valid:

Slave (Module) Status		Description
Hi-Byte (DAT.1H)	Low-Byte (DAT.1L)	
0x0C	0x01	Error of Operation
0x0C	0x02	Wire break at set point S1.06 (current signal <2mA)
0x0C	0x03	Excess current or short circuit at the output stages (peak current >8A!)
0x0C	0x04	Wire break at set point S1.05 (current signal <2mA)
0x0C	0x05	Over current at set point S1.06 (current signal >25mA)
0x0C	0x06	Over current at set point S1.05 (current signal >25mA)
0x0C	0x07	Not applicable
0x0C	0x08	Over current, short circuit or open circuit at the output stages. The difference between the desired current and the actual current is outside of the defined range. Conditions for error triggering: I _{Error} > 250 mA for t _{Error} approx. 100 ms.
0x0C	0x09	Input signal @ set point S1.06 and selection E15 = 8 (5 ... +/- 4,5 V) out of valid signal range (approx.. < 0,43 V / > 9,58 V)
0x0C	0x0A	Timeout error -no Profibus command recognized- (defined with parameter E23)

Software versions which supports not the error “10” respectively “0x0A”, react with a blinking enable LED about to long time between valid profibus telegrams. Those versions continue with work if a new valid telegram is detected. No separate acknowledge with the enable signal is needed.

Software versions which supports the error “10” respectively “0x0A”, react with a shining Error LED about to long time between valid profibus telegrams. Those versions do not continue with work if a new valid telegram is detected. A separate acknowledge with the enable signal is needed.

Generally the electronic discards every set point in error case and the outputs will be disabled.

4.5.1.2 Explanation for “Hardware Enable” and “Software Disable”:

Generally speaking the hardware enable must be present (“high” level) in order to get a signal (current) at the output stages. Besides the hardware enable a software disable can be used in order to “override” the hardware enable. So even if the hardware signal is present, with the according software command the module can be disabled!

This means that the hardware enable can be hardwired and the software disable can be used in order to drop the output signal to zero or also in order to quit errors.

4.5.1.3 Explanation of special functions and module state bits

Attention: Functions and module state bits depend on the used SW version

HW_ENABLE	The signal "D-In Enable" (HW Enable) is activated at the module.
ERROR	An Error has occurred in the DMA module. Different possible problems can cause this. Please refer to the manual for the according DMA version
BUS_DISABLE	The Enable signal was reset by means of Profibus (DMA module is disabled).
Din_1	The "enable function" for the „remote loop controller“ (function switches from open loop to closed loop) via the comparator „KOMP_1“ is enabled and can be used. Additional mandatory condition: C1.00 must be set to 2 or 4! Remark: d1.12 and d1.13 remain at „0.000 V“ as long as the condition for activation „Din_1“ has not be set. This will prevent a premature activation of the comparator „KOMP_1“.
Dout_1	Indicates that the function „remote loop controller“ is active. The module is now working in closed loop mode. Additional mandatory conditions for transition from open loop to closed loop: C1.00 must be set to 2 or 4 Signal Din_1 must be present Comparator KOMP_1 has to be outside of the window, hence signal KOMP_1 = 0. The module will remain in closed loop operation as long as signal Din_1 stays on "High".
DKOMP_1	Output signal of comparator „KOMP_1“, s used in order to monitor the signal defined by C1.25. This signal can also be used in order to switches over from open to closed loop: 0 = comparator is not active (out of the determined limits and time delays) 1 = comparator is active (inside the determined limits and time delays).
DKOMP_11	Output signal of comparator „KOMP_11“, is used in order to monitor the signal defined by C1.32 0 = comparator is not active (out of the determined limits and time delays) 1 = comparator is active (inside the determined limits and time delays).
Din_2	The "enable function" for the „remote loop controller“ (function switches from open loop to closed loop) via the comparator „KOMP_2“ is enabled and can be used. Additional mandatory condition: C2.00 must be set to 2 or 4! Remark: d2.12 and d2.13 remain at „0.000 V“ as long as the condition for activation „Din_2“ has not be set. This will prevent a premature activation of the comparator „KOMP_2“..
Dout_2	Indicates that the function „remote loop controller“ is active. The module is now working in closed loop mode. Additional mandatory conditions for transition from open loop to closed loop: C2.00 must be set to 2 or 4 Signal Din_2 must be present Comparator KOMP_2 has to be outside of the window, hence signal KOMP_2 = 0. The module will remain in closed loop operation as long as signal Din_2 stays on "High".
DKOMP_2	Output signal of comparator „KOMP_2“, s used in order to monitor the signal defined by C2.25. This signal can also be used in order to switches over from open to closed loop: 0 = comparator is not active (out of the determined limits and time delays) 1 = comparator is active (inside the determined limits and time delays).
DKOMP_22	Output signal of comparator „KOMP_22“, is used in order to monitor the signal defined by C2.32 0 = comparator is not active (out of the determined limits and time delays) 1 = comparator is active (inside the determined limits and time delays).
TST_CMP	Set Error/Comp output direct to 24V (disable signaling of error output). Used to test the comparator or fault output.
CNTRL_1..4	Reserved for special functions
STAT_1..5	Reserved for special functions

4.5.2 Version: V15.xxy, open loop, one valve with two solenoids, , Mode 1

Telegram structure example with 1 DMA module (SNUM = 1), Master writes multiple parameters (3+5.module bytes)

Write first...

Comment	Byte	Structure	Abbreviation	Description
	0	Telegram header	TADR	Telegram address, defined by User, Range 0..255, 0..0xFF
	1		SNUM	Number of connected slaves (Maximum 5)
	2		CMD	Command: 15 = Write multiple parameter by the master
	3	Module Data	DAT1.1	Control byte Byte for special functions
	4		DAT1.2H	Process Value1 = A1.01 Module 1
	5		DAT1.2L	Set value input (Profibus)
	6		DAT1.3H	Process Value2 = A1.01 Module 1 (normally not used)
	7		DAT1.3L	Set value input (Profibus)
....Write last		8	Overall telegram length in bytes	

Explanation of Byte for special functions (**Control byte**):

Description	Abbreviation	Function of each bit
Byte for special functions	DATx.1	0x80 = BUS_DISABLE (Module disable via Profibus) In this mode not applicable, reserved: 0x01 = Din_1 0x02 = CNTRL_1 0x04 = TST_CMP 0x08 = CNTRL_2 0x10 = Din_2 0x20 = CNTRL_3 0x40 = CNTRL_4
		Reset = 0x00 (Enable inactive)

Response telegram:

Write first...

Comment	Byte	Structure	Abbreviation	Description
	0	Telegram header	TADR	Telegram address, defined by write command, Range 0..255, 0..0xFF
	1		SADR	Slave address
	2		CMD	Command: 15 = Write multiple parameter by the master
	3	Data of SADR Module	DAT.1H	Status word High byte of module state
	4		DAT.1L	Low byte of module state
	5		DAT.2H	VALUE1 = d1.07 from module with related SADR
	6		DAT.2L	Actual current A
	7		DAT.3H	VALUE2 = d1.08 from module with related SADR
	8		DAT.3L	Actual current B
....Write last		9	Overall telegram length in bytes	

Explanation of High and low byte of module state (**Status word**):

Description	Abbreviation	Explanation of each bit
High byte of module state	DAT.1H	0x04 = HW_ENABLE , hardware enable is active 0x08 = ERROR , error is pending 0x80 = BUS_DISABLE is set In this mode not applicable, reserved: 0x01 = STAT_1 0x02 = STAT_2 0x10 = STAT_3 0x20 = STAT_4 0x40 = STAT_5
Low byte of module state	DAT.1L	if " ERROR " bit is set: error number otherwise: always zero In this mode not applicable, reserved: 0x01 = Din_1 active 0x02 = Dout_1 active 0x04 = DKOMP_1 active 0x08 = DKOMP_11 active 0x10 = Din_2 active 0x20 = Dout_2 active 0x40 = DKOMP_2 active 0x80 = DKOMP_22 active

4.5.3 Version: V22.xxy, open loop, two valves with one solenoid each, , Mode 2

Telegram structure example with 1 DMA module (SNUM = 1), Master writes multiple parameters (3+5-module bytes)

Write first...

Comment	Byte	Structure	Abbreviation	Description
	0	Telegram header	TADR	Telegram address, defined by User, Range 0..255, 0..0xFF
	1		SNUM	Number of connected slaves (Maximum 5)
	2		CMD	Command: 15 = Write multiple parameter by the master
	3	Module Data	DAT1.1	Control byte Byte for special functions
	4		DAT1.2H	Process Value1 = A1.01
	5		DAT1.2L	Set value input (Profibus) for (Branch 1)
	6		DAT1.3H	Process Value2 = A1.01
	7		DAT1.3L	Set value input (Profibus) for (Branch 2)
....Write last		8		Overall telegram length in bytes

Explanation of Byte for special functions

Description	Abbreviation	Function of each bit
Byte for special functions	DATx.1	Can be set only if the hardware enable is active. 0x80 = BUS_DISABLE (Module disable via Profibus) In this mode not applicable, reserved: 0x01 = Din_1 0x02 = CNTRL_1 0x04 = TST_CMP 0x08 = CNTRL_2 0x10 = Din_2 0x20 = CNTRL_3 0x40 = CNTRL_4 The special function byte will be set to internal 0x00 (reset) when the hardware enable is inactive.

Response telegram:

Write first...

Comment	Byte	Structure	Abbreviation	Description
	0	Telegram header	TADR	Telegram address, defined by write command, Range 0..255, 0..0xFF
	1		SADR	Slave address
	2		CMD	Command: 15 = Write multiple parameter by the master
	3	Data of SADR Module	DAT.1H	Status word High byte of module state
	4		DAT.1L	Low byte of module state
	5		DAT.2H	VALUE1 = d1.07 from module with related SADR
	6		DAT.2L	Actual current A
	7		DAT.3H	VALUE2 = d1.08 from module with related SADR
	8		DAT.3L	Actual current B
....Write last		9		Overall telegram length in bytes

Explanation of High and low byte of module state (**Status word**):

Description	Abbreviation	Explanation of each bit
High byte of module state	DAT.1H	0x04 = HW_ENABLE, hardware enable is active 0x08 = ERROR, error is pending 0x80 = BUS_DISABLE is set In this mode not applicable, reserved: 0x01 = STAT_1 0x02 = STAT_2 0x10 = STAT_3 0x20 = STAT_4 0x40 = STAT_5
Low byte of module state	DAT.1L	if "ERROR" bit is set: error number otherwise: always zero In this mode not applicable, reserved: 0x01 = Din_1 active 0x02 = Dout_1 active 0x04 = DKOMP_1 active 0x08 = DKOMP_11 active 0x10 = Din_2 active 0x20 = Dout_2 active 0x40 = DKOMP_2 active 0x80 = DKOMP_22 active

4.5.4 Version: V32.xxy, V72.xxy, closed loop, Mode 3, 4; V46.xxy, V49.xxy Mode 5

Telegram structure example with 1 DMA module (SNUM = 1), Master writes multiple parameters (3+5-module bytes)

Write first...

Comment	Byte	Structure	Abbreviation	Description
	0	Telegram header	TADR	Telegram address, defined by User, Range 0..255, 0..0xFF
	1		SNUM	Number of connected slaves (Maximum 5)
	2	Module Data	CMD	Command: 15 = Write multiple parameter by the master
	3		DAT1.1	Control byte Byte for special functions
	4		DAT1.2H	Process Value1 = A1.01
	5		DAT1.2L	Set value input (Profibus) for (Branch 1)
	6		DAT1.3H	Process Value2 = A1.02
	7		DAT1.3L	Feedback value input (Profibus) for (Branch 1)
....Write last	8			Overall telegram length in bytes

Explanation of Byte for special functions (**Control byte**)

Description	Abbreviation	Function of each bit
Byte for special functions	DATx.1	Can be set only if the hardware enable is active. 0x01 = Din_1; Set signal Din_1 to active 0x04 = TST_CMP; Set Error/Comp output direct to 24V (disable signaling of error output) 0x10 = Din_2; Set signal Din_2 to active 0x80 = BUS_DISABLE (Module disable via Profibus) In this mode not applicable, reserved: 0x02 = CNTRL_1 0x08 = CNTRL_2 0x20 = CNTRL_3 0x40 = CNTRL_4 The special function byte will be set to internal 0x00 (reset) when the hardware enable is inactive.

Response telegram:

Write first...

Comment	Byte	Structure	Abbreviation	Description
	0	Telegram header	TADR	Telegram address, defined by the write command, Range 0..255, 0..0xFF
	1		SADR	Slave address
	2	Data of SADR Module	CMD	Command: 15 = Write multiple parameter by the master
	3		DAT.1H	Status word
	4		DAT.1L	
	5		DAT.2H	VALUE1 = d1.11 from module with related SADR
	6		DAT.2L	Actual value, feedback value (Branch 1)
	7		DAT.3H	VALUE2 = d1.10 from module with related SADR
	8		DAT.3L	Set value (internal value) (Branch 1)
....Write last	9			Overall telegram length in bytes

Explanation of High and low byte of module state (**Status word**):

Description	Abbreviation	Explanation of each bit
High byte of module state	DAT.1H	0x04 = HW_ENABLE, hardware enable active 0x08 = ERROR, Error is pending 0x80 = BUS_DISABLE is set In this mode not applicable, reserved: 0x01 = STAT_1 0x02 = STAT_2 0x10 = STAT_3 0x20 = STAT_4 0x40 = STAT_5
Low byte of module state	DAT.1L	if "Error occurred" bit is set: error number otherwise: 0x01 = Din_1 active 0x02 = Dout_1 active 0x04 = DKOMP_1 active 0x08 = DKOMP_11 active 0x10 = Din_2 active 0x20 = Dout_2 active 0x40 = DKOMP_2 active 0x80 = DKOMP_22 active

4.5.5 Version: V32.xxy, closed loop, Mode 6

Telegram structure example with 1 DMA module (SNUM = 1), Master writes multiple parameters (3+5-module bytes)

Write first...

Comment	Byte	Structure	Abbreviation	Description
	0	Telegram header	TADR	Telegram address, defined by User, Range 0..255, 0..0xFF
	1		SNUM	Number of connected slaves (Maximum 5)
	2		CMD	Command: 15 = Write multiple parameter by the master
	3	Module Data	DAT1.1	Control byte Byte for special functions
	4		DAT1.2H	Process Value1 = A1.01
	5		DAT1.2L	Set value input (Profibus) for (Branch 1)
	6		DAT1.3H	Process Value2 = A2.02
	7		DAT1.3L	Feedback value input (Profibus) for (Branch 2)
....Write last		8	Overall telegram length in bytes	

Explanation of Byte for special functions (**Control byte**)

Description	Abbreviation	Function of each bit
Byte for special functions	DATx.1	Can be set only if the hardware enable is active. 0x01 = Din_1; Set signal Din_1 to active 0x04 = TST_CMP; Set Error/Comp output direct to 24V (disable signaling of error output) 0x10 = Din_2; Set signal Din_2 to active 0x80 = BUS_DISABLE (Module disable via Profibus) In this mode not applicable, reserved: 0x02 = CNTRL_1 0x08 = CNTRL_2 0x20 = CNTRL_3 0x40 = CNTRL_4 The special function byte will be set to internal 0x00 (reset) when the hardware enable is inactive.

Response telegram:

Write first...

Comment	Byte	Structure	Abbreviation	Description
	0	Telegram header	TADR	Telegram address, defined by the write command, Range 0..255, 0..0xFF
	1		SADR	Slave address
	2		CMD	Command: 15 = Write multiple parameter by the master
	3	Data of SADR Module	DAT.1H	Status word High byte of module state
	4		DAT.1L	
	5		DAT.2H	VALUE1 = d1.11 from module with related SADR
	6		DAT.2L	Actual value, feedback value (Branch 1)
	7		DAT.3H	VALUE2 = d2.11 from module with related SADR
	8		DAT.3L	Actual value, feedback value (Branch 2)
....Write last		9	Overall telegram length in bytes	

Explanation of High and low byte of module state (**Status word**):

Description	Abbreviation	Explanation of each bit
High byte of module state	DAT.1H	0x04 = HW_ENABLE, hardware enable active 0x08 = ERROR, Error is pending 0x80 = BUS_DISABLE is set In this mode not applicable, reserved: 0x01 = STAT_1 0x02 = STAT_2 0x10 = STAT_3 0x20 = STAT_4 0x40 = STAT_5
Low byte of module state	DAT.1L	if "Error occurred" bit is set: error number otherwise: 0x01 = Din_1 active 0x02 = Dout_1 active 0x04 = DKOMP_1 active 0x08 = DKOMP_11 active 0x10 = Din_2 active 0x20 = Dout_2 active 0x40 = DKOMP_2 active 0x80 = DKOMP_22 active

4.5.6 Version: V32.xxy, closed loop, Mode 8

Telegram structure example with 1 DMA module (SNUM = 1), Master writes multiple parameters (3+5-module bytes)

Write first...

Comment	Byte	Structure	Abbreviation	Description
	0	Telegram header	TADR	Telegram address, defined by User, Range 0..255, 0..0xFF
	1		SNUM	Number of connected slaves (Maximum 5)
	2		CMD	Command: 15 = Write multiple parameter by the master
	3	Module Data	DAT1.1	Control byte Byte for special functions
	4		DAT1.2H	Process Value1 = A1.01
	5		DAT1.2L	Set value input (Profibus) for (Branch 1)
	6		DAT1.3H	Process Value2 = A2.01 S
	7		DAT1.3L	Set value input (Profibus) for (Branch 2)
....Write last		8	Overall telegram length in bytes	

Explanation of Byte for special functions (**Control byte**)

Description	Abbreviation	Function of each bit
Byte for special functions	DATx.1	Can be set only if the hardware enable is active. 0x01 = Din_1; Set signal Din_1 to active 0x04 = TST_CMP; Set Error/Comp output direct to 24V (disable signaling of error output) 0x10 = Din_2; Set signal Din_2 to active 0x80 = BUS_DISABLE (Module disable via Profibus) Not applicable, reserved: 0x02 = CNTRL_1 0x08 = CNTRL_2 0x20 = CNTRL_3 0x40 = CNTRL_4 The special function byte will be set to internal 0x00 (reset) when the hardware enable is inactive.

Response telegram:

Write first...

Comment	Byte	Structure	Abbreviation	Description
	0	Telegram header	TADR	Telegram address, defined by the write command, Range 0..255, 0..0xFF
	1		SADR	Slave address
	2		CMD	Command: 15 = Write multiple parameter by the master
	3	Data of SADR Module	DAT.1H	High byte of module state
	4		DAT.1L	Status word Low byte of module state
	5		DAT.2H	VALUE1 = d1.11 from module with related SADR
	6		DAT.2L	Actual value, feedback value (Branch 1)
	7		DAT.3H	VALUE2 = d2.11 from module with related SADR
	8		DAT.3L	Actual value, feedback value (Branch 2)
....Write last		9	Overall telegram length in bytes	

Explanation of High and low byte of module state (**Status word**):

Description	Abbreviation	Explanation of each bit
High byte of module state	DAT.1H	0x04 = HW_ENABLE, hardware enable active 0x08 = ERROR, Error is pending 0x80 = BUS_DISABLE is set Not applicable, reserved: 0x01 = STAT_1 0x02 = STAT_2 0x10 = STAT_3 0x20 = STAT_4 0x40 = STAT_5
Low byte of module state	DAT.1L	if "Error occurred" bit is set: error number otherwise: 0x01 = Din_1 active 0x02 = Dout_1 active 0x04 = DKOMP_1 active 0x08 = DKOMP_11 active 0x10 = Din_2 active 0x20 = Dout_2 active 0x40 = DKOMP_2 active 0x80 = DKOMP_22 active

5 Siemens S7 implementation of the “Multiple-slave” (5 DMA modules)

5.1 Hardware configuration

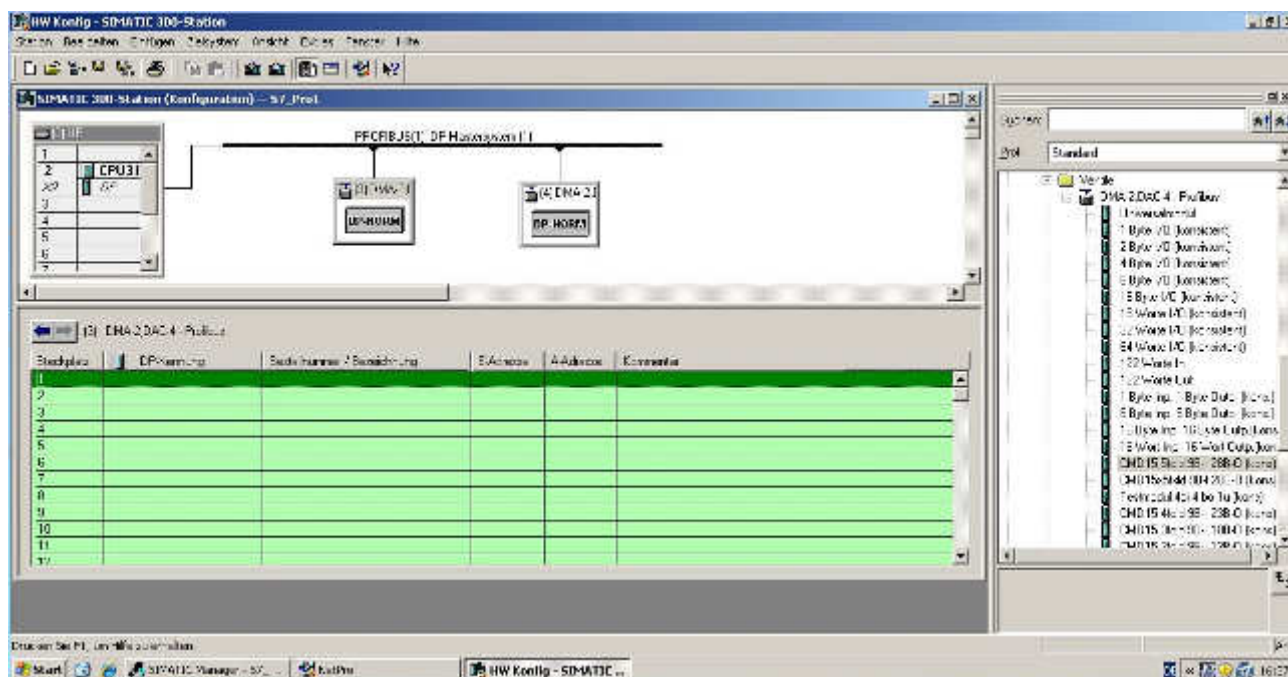
Hardware configuration with program “HW KONFIG”, where you can find the DMA Profibus node.

Select the right byte number of bytes for the output and input buffer depending on number of slaves used.
In this case, with 5 slaves (modules), the output buffer is fixed to a minimum of 28 bytes, the input buffer to a minimum of 9 bytes.

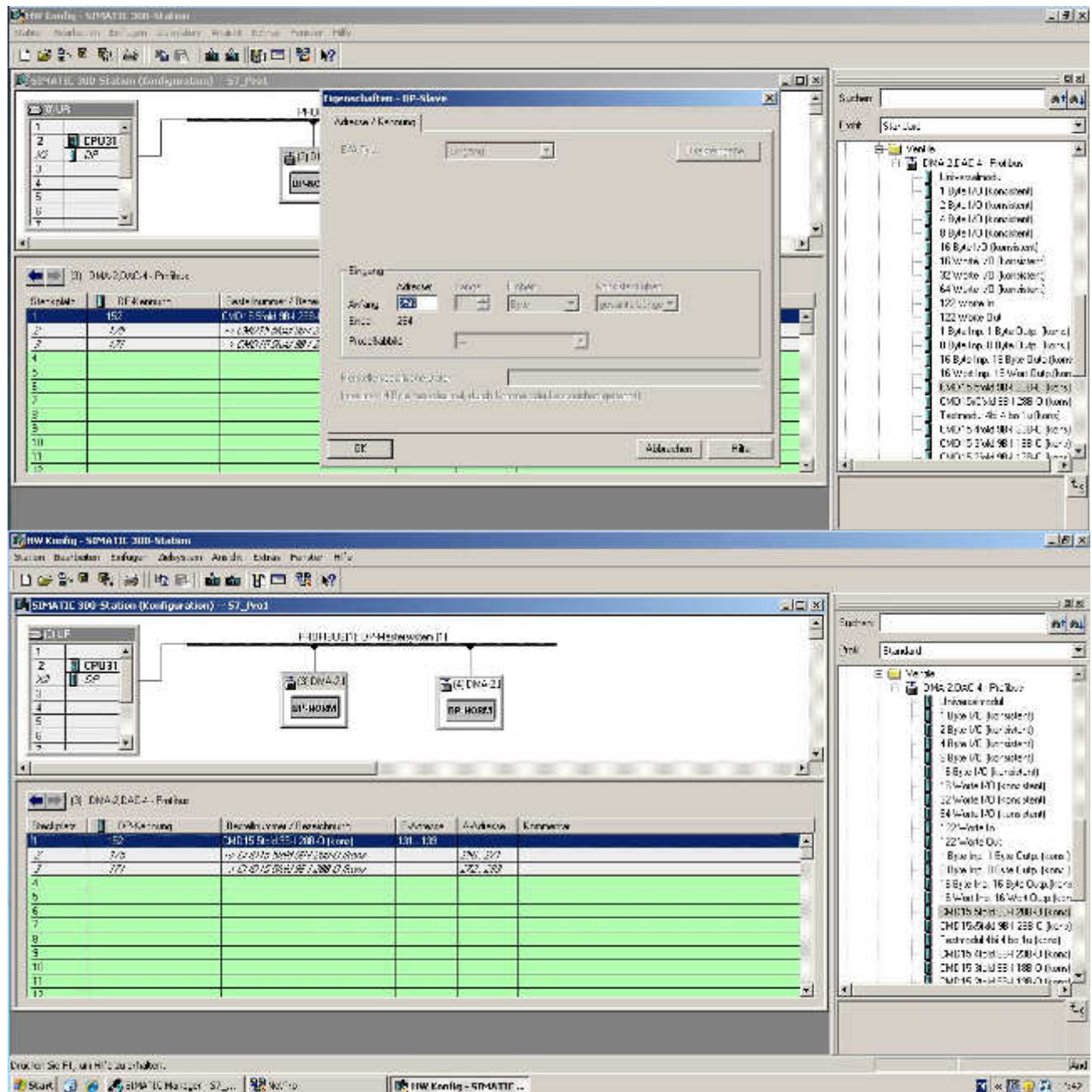
Valves (Ventile) → “DMA-2 – Profibus”. Chose for this example the “CMD15 5fold 9B-I 28B-O” profile.

Select the correct Profibus address, in this example #03 = 0x03.

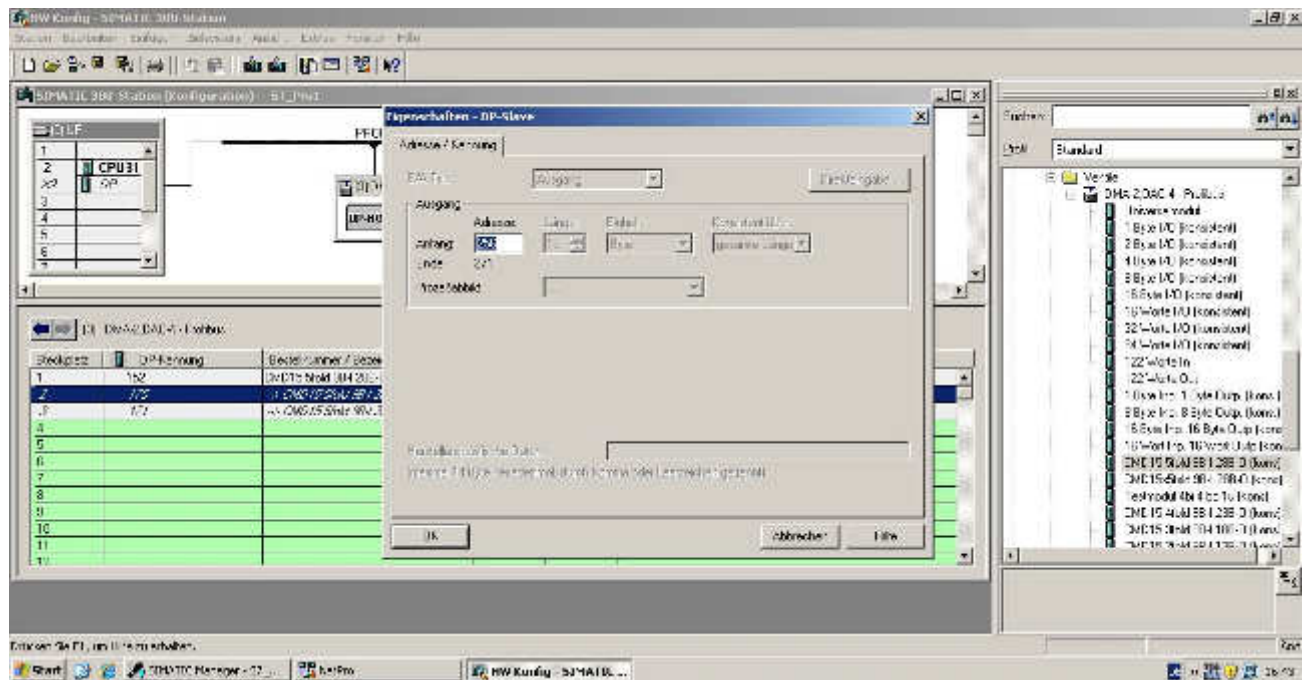
Adjust the Profibus address at the Front of the DMA module (DIP-Switch).



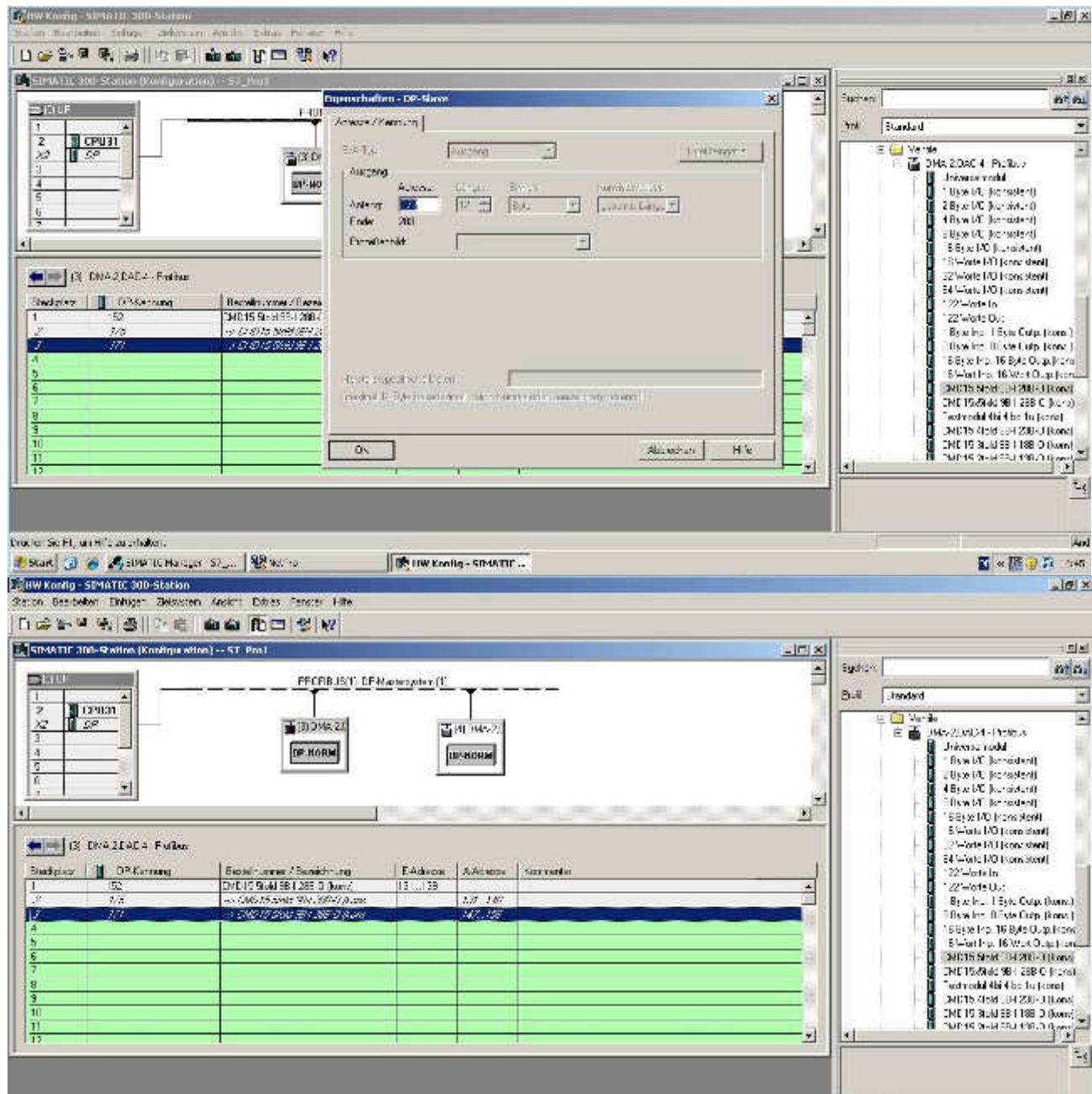
Define 9 byte Inputlength.



adjust the first 16 byte of a total of 28 byte outputlength.



adjust the remaining 12 byte of a total of 28 byte outputlength



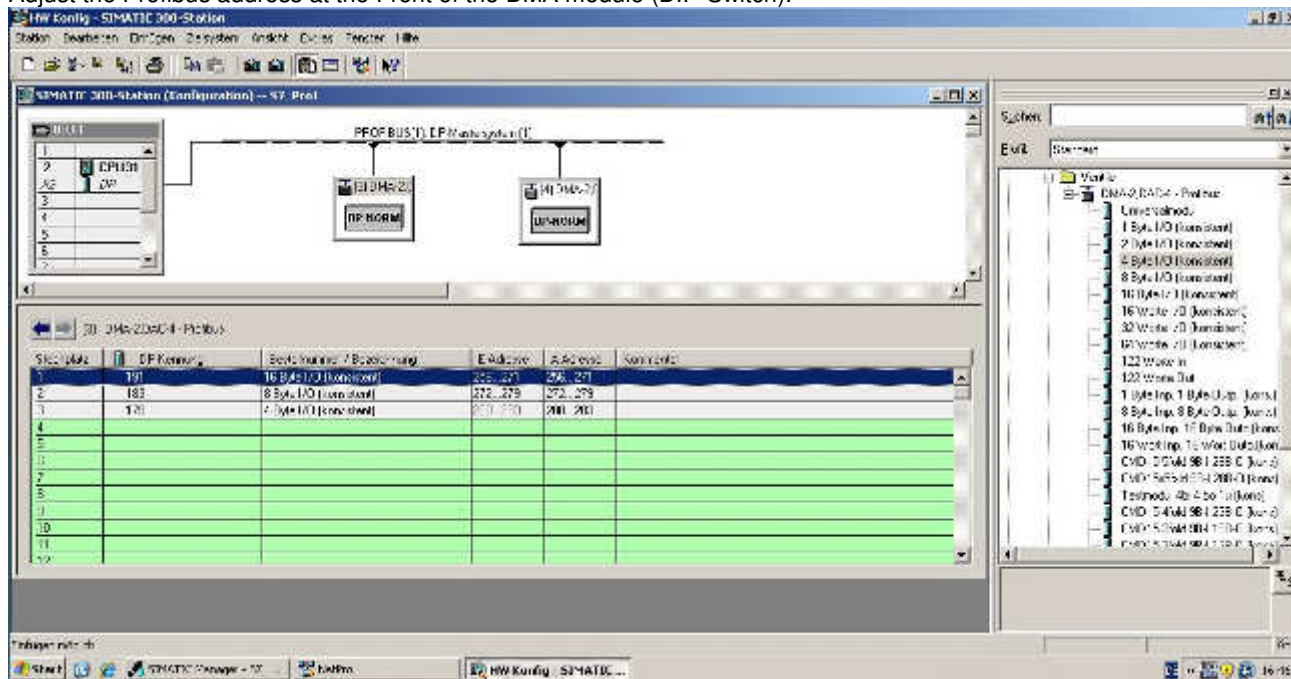
5.1.1 Hardware configuration for devices without CMD15-Modules in the GSD-file

Hardware configuration with program "HW KONFIG", where you can find the DMA Profibus node.

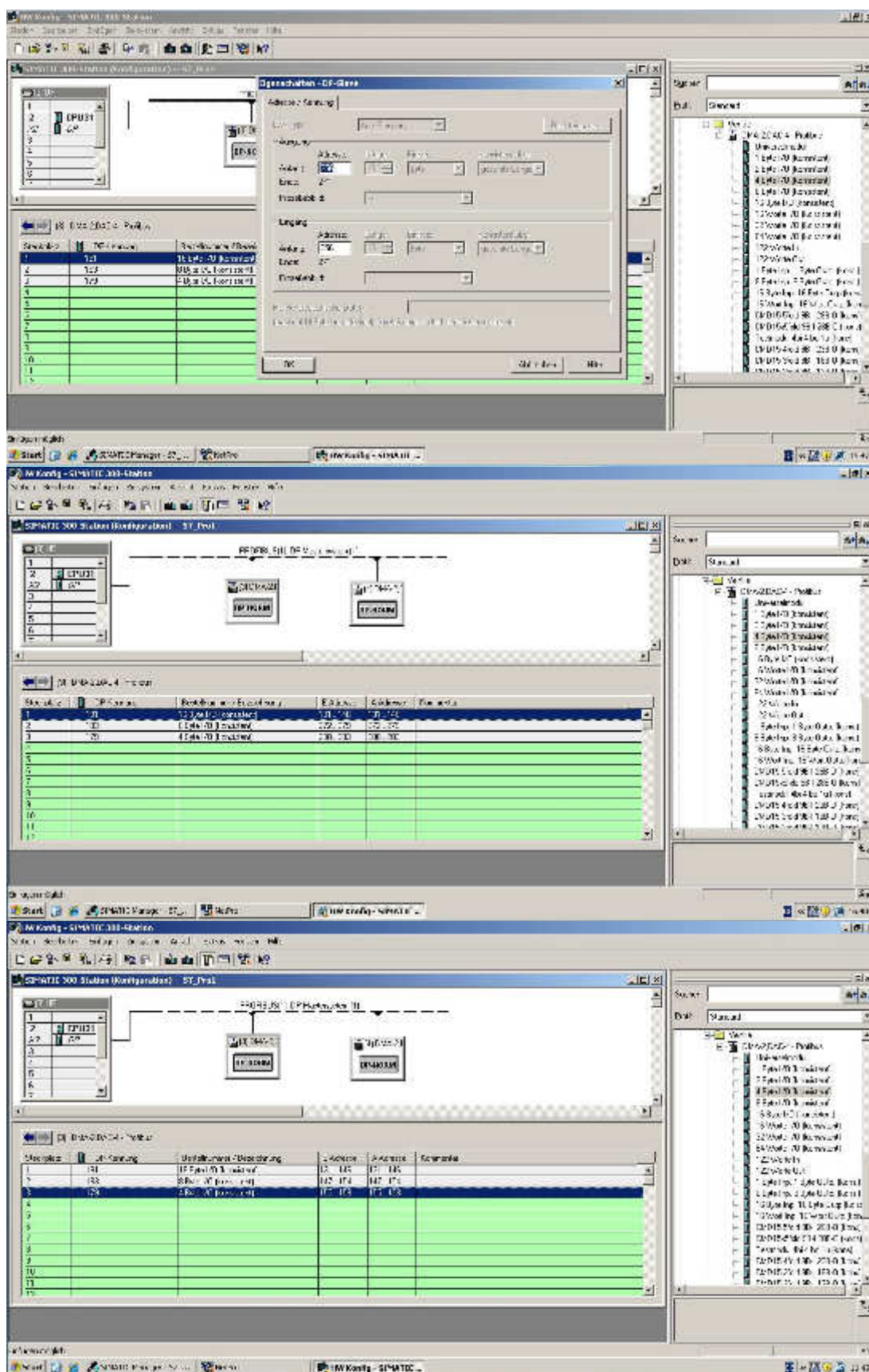
Select the right byte number of bytes for the output and input buffer depending on number of slaves used.
In this case, with 5 slaves (modules) the output buffer is fixed to a minimum of 28 bytes, the input buffer to a minimum of 9 bytes.

Valves (Ventile) → "DMA-2 – Profibus". Chose for this example the following profiles:
"16 Byte I/O (konsistent)" AND "8 Byte I/O (konsistent)" AND "4 Byte I/O (konsistent)"

Select the correct Profibus address, in this example #03 = 0x03.
Adjust the Profibus address at the Front of the DMA module (DIP-Switch).

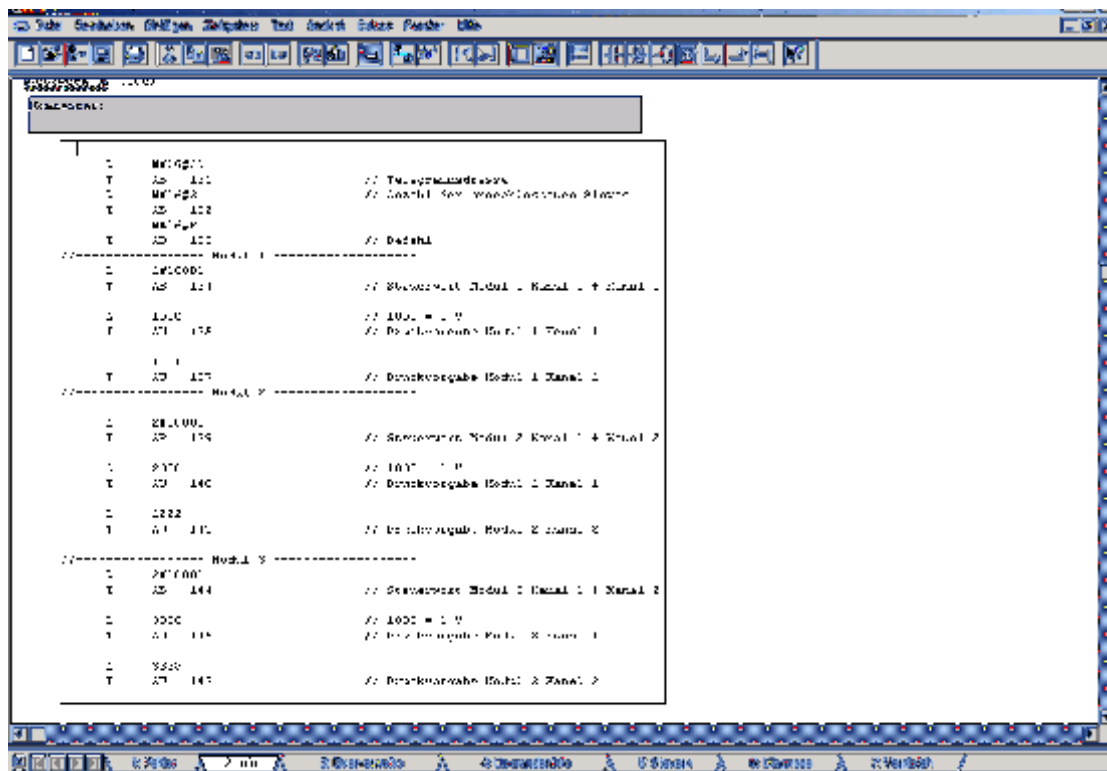


adjust the E/A addresses

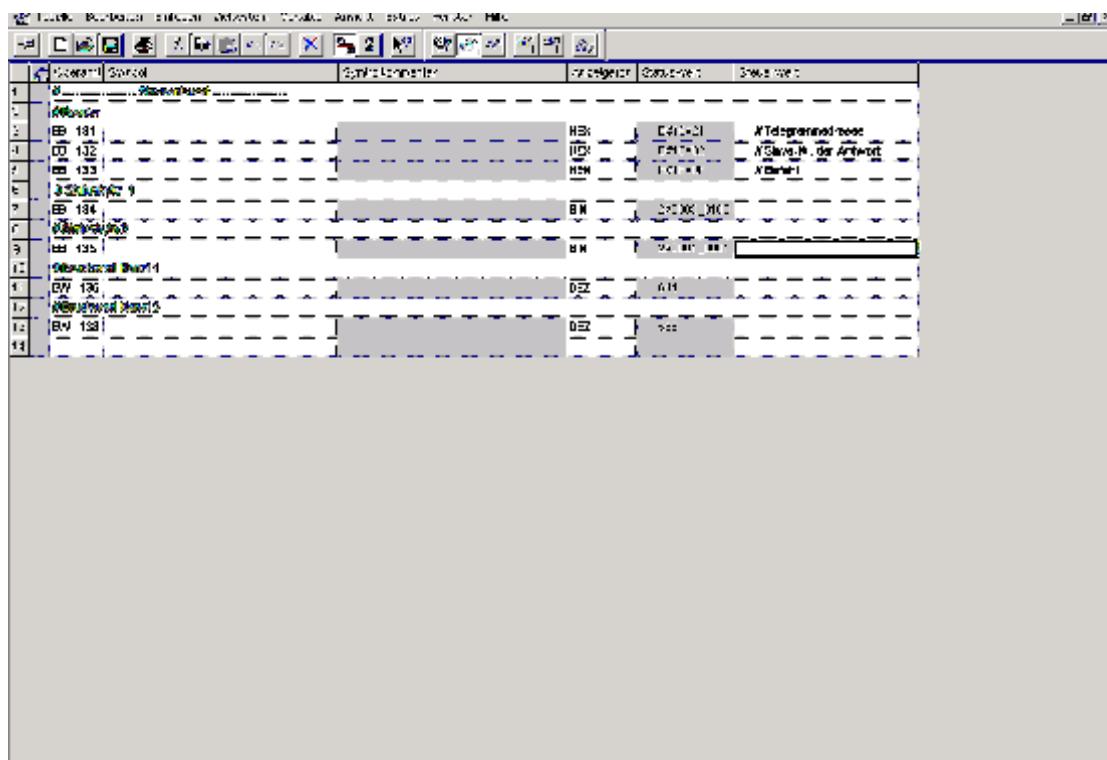


5.2 CMD = 15, protocol configuration

Define the output buffer



Now you can check the input buffer, in this case module 2 have send the response. You can see the received module slave address at input-byte "EB 132".



6 Configuration for the SIEMENS TIA portal

Two Profibus function blocks for the Siemens TIA portal are available, and can be downloaded from the HCS web side. Which one, the user should take, is depending on the used CPU family.

- Siemens CPU series S7-300,400
- Siemens CPU series S7-1200,1500

PB_DMA_2_CLASSIC_DB(Vxx).scl
PB_DMA_2_DB.scl(Vxx).scl

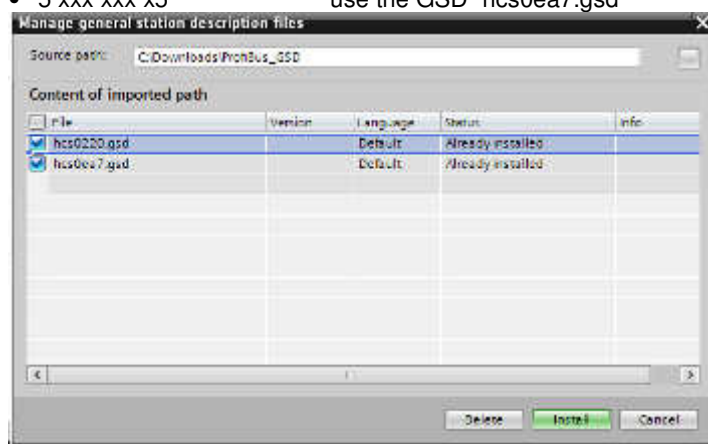
(If the DMA fold is mixed with DMA's, working in different mode's, only the bits for the control-byte and the status-word for the certain DMA module is useable).

6.1 Setup the network configuration for the DMA module

6.1.1 Download and install the GSD file.

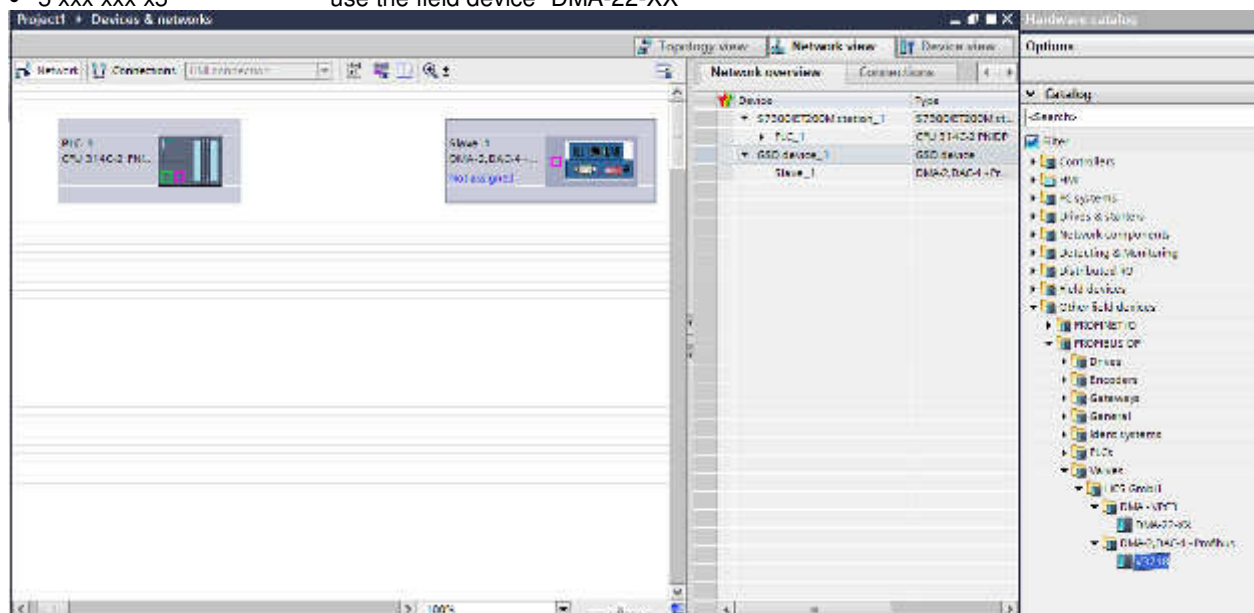
Please chose the correct GSD file for the DMA- Module. The last two digits of the product number are important.

- 5 xxx xxx x1 to x4 use the GSD "hcs0220.gsd"
- 5 xxx xxx x5 use the GSD "hcs0ea7.gsd"

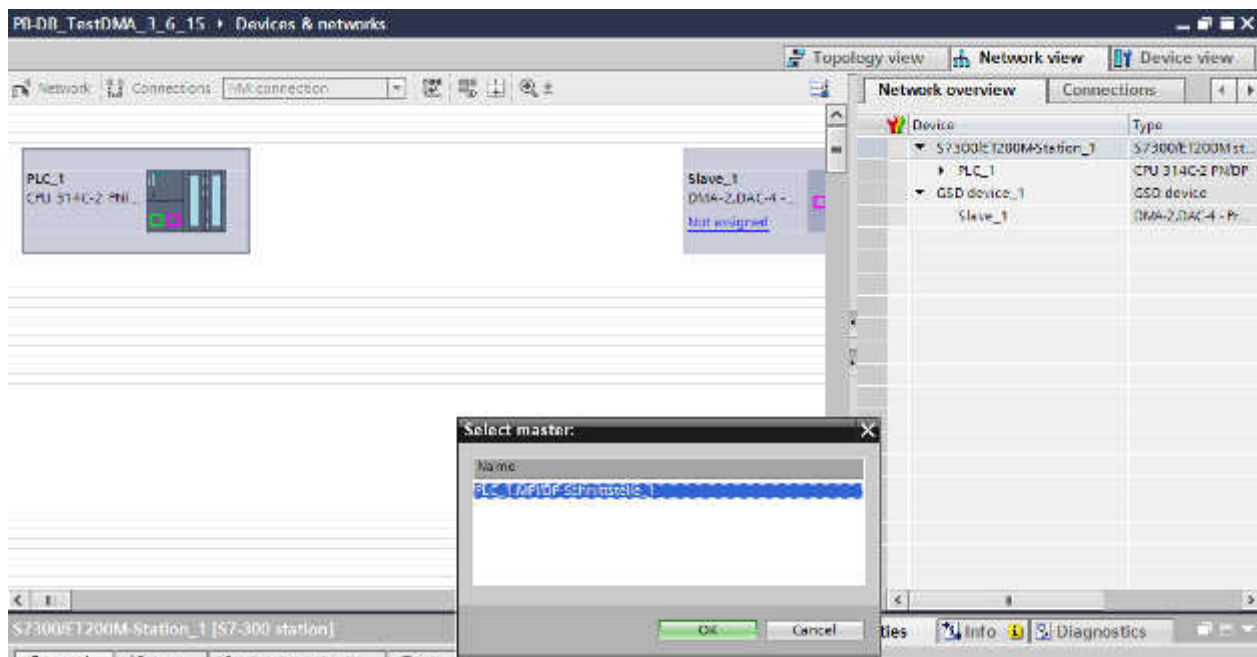


6.1.2 Add the new device to the network

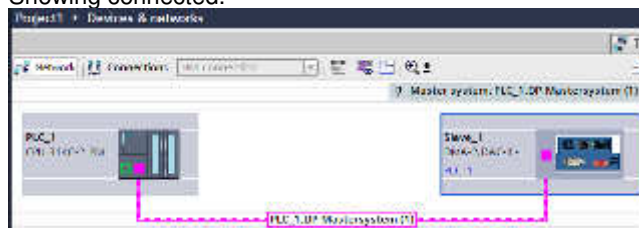
- 5 xxx xxx x1 to x4 use the field device "V3218"
- 5 xxx xxx x5 use the field device "DMA-22-XX"



6.1.3 Assign the Slave_1 device to the PLC_1 Profibus master

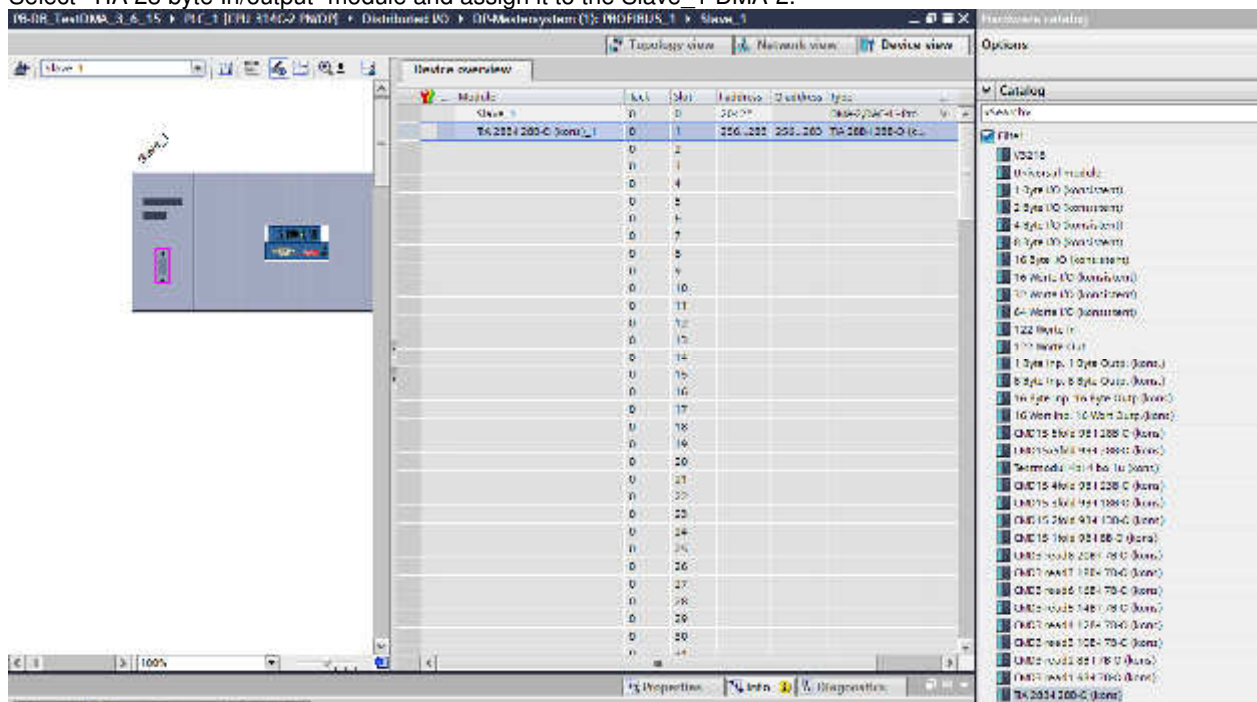


Showing connected.



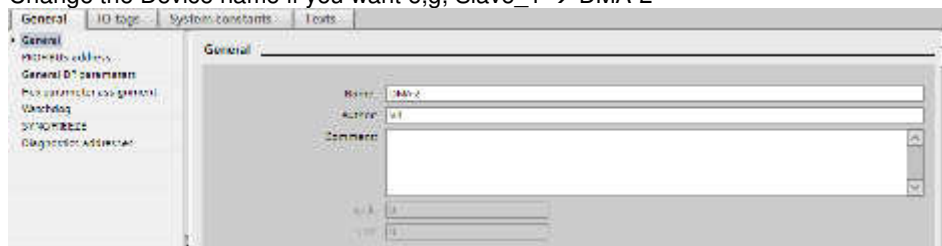
6.1.4 Define the communication module from the GSD

Select "TIA 28 byte In/output" module and assign it to the Slave_1 DMA-2.



6.1.5 Define the Profibus address of the DMA module

Change the Device name if you want e.g, Slave_1 → DMA-2

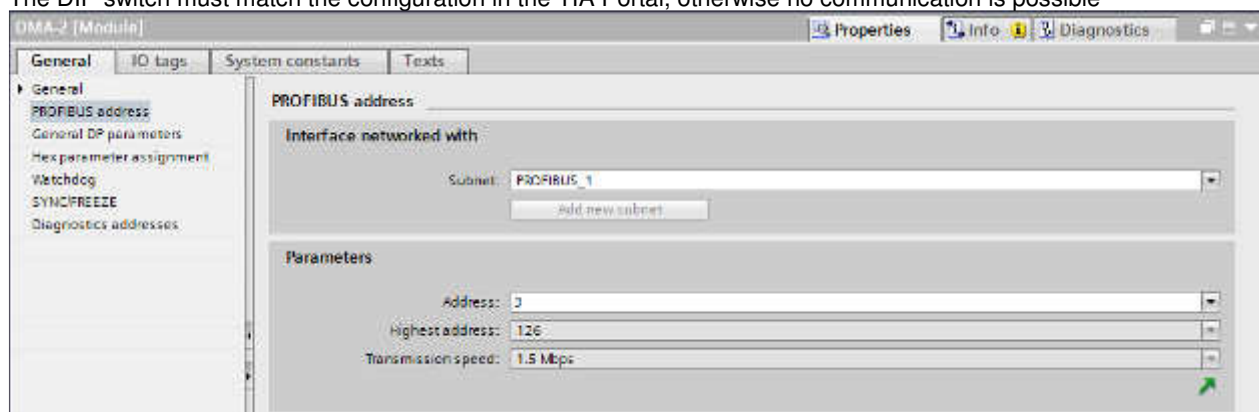


The DIP switch “Fieldbus ID” for the Profibus slave address. For this purpose, the DMA-2 module, which sits directly next to the Profibus node, must be parameterized accordingly.

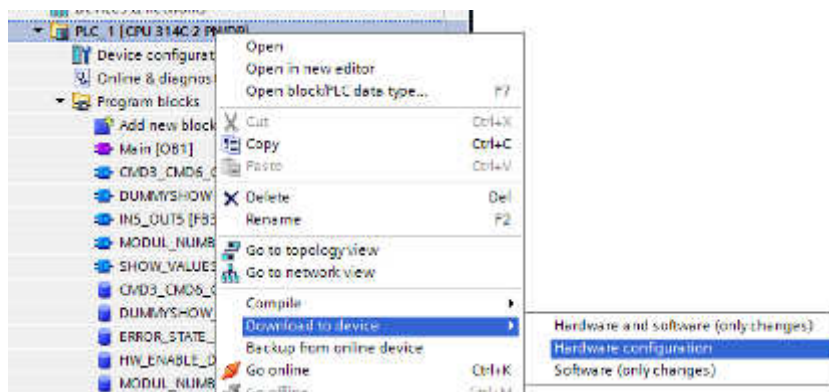


e.g. set to „3“, Switch1+Switch2 = ON.

The DIP switch must match the configuration in the TIA Portal, otherwise no communication is possible



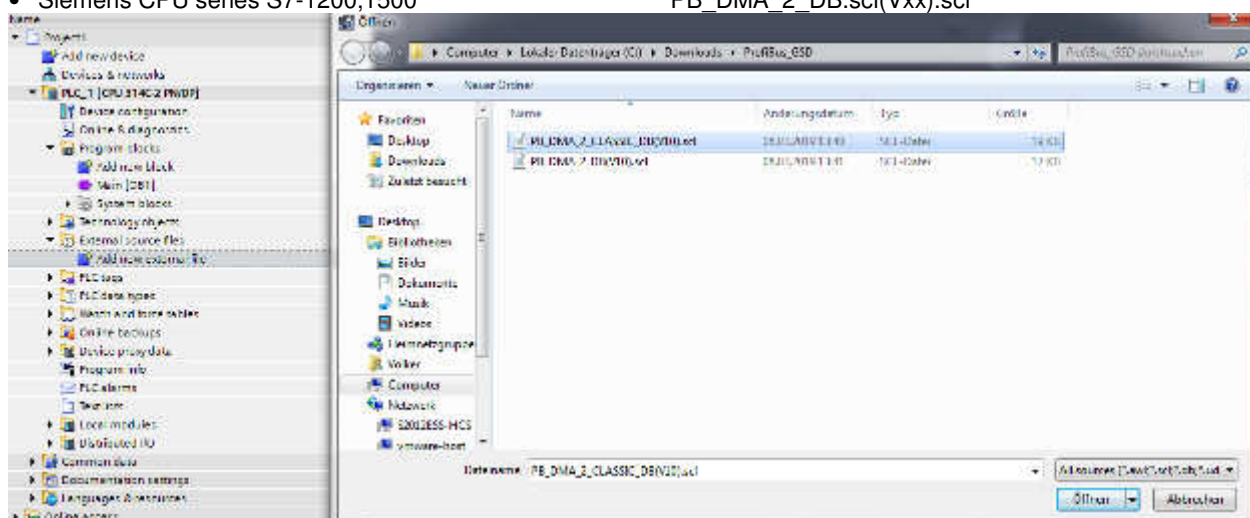
6.1.6 Download the new hardware configuration to the PLC



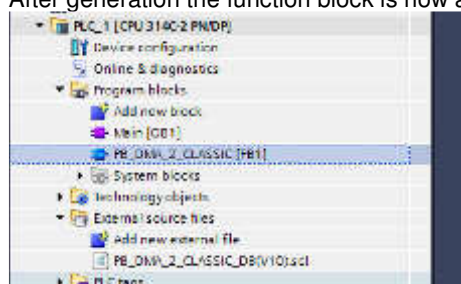
6.1.7 Install the function block

Add new external file, chose the function block according your used CPU series:

- Siemens CPU series S7-300,400 PB_DMA_2_CLASSIC_DB(Vxx).scl
- Siemens CPU series S7-1200,1500 PB_DMA_2_DB.scl(Vxx).scl



Right click on the selected file and "Generate blocks from the source"
After generation the function block is now available.

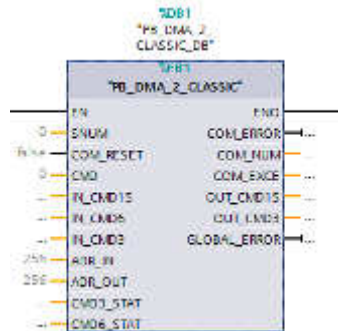


6.2 Explanation of the function block

6.2.1 General

In this chapter we describe, how to use the function block in the different command modes.

The structure and function for CMD 3, CMD 6 is the same in every working mode of the DMA-2. Only the CMD 15 differs depending on the DMA-2 operation mode.



The Bus slave address SNUM of every connected DMA-2 is defined by the parameter E 22.

■ SNUM	Int
--------	-----

The COM_ERROR is obtained from the telegram header, which is transmitted from the Profibus node to the PLC.

When this error is pending, the slave address source and the cause can be found out by analyze the COM_EXCE code.

(See [3.3 CMD = 3, Error from Slave \(4 bytes\)](#) or [3.6 CMD = 6, Error from Slave \(4 bytes\)](#))

■ COM_ERROR	Bool
■ COM_NUM	Int
■ COM_EXCE	Int

Reset an communication error can by set the input #COM_RESET

■ COM_RESET	Bool
-------------	------

An GLOBAL_ERROR occurs if any communication error or/and internal DMA-2 error is pending.

■ GLOBAL_ERROR	Bool
----------------	------

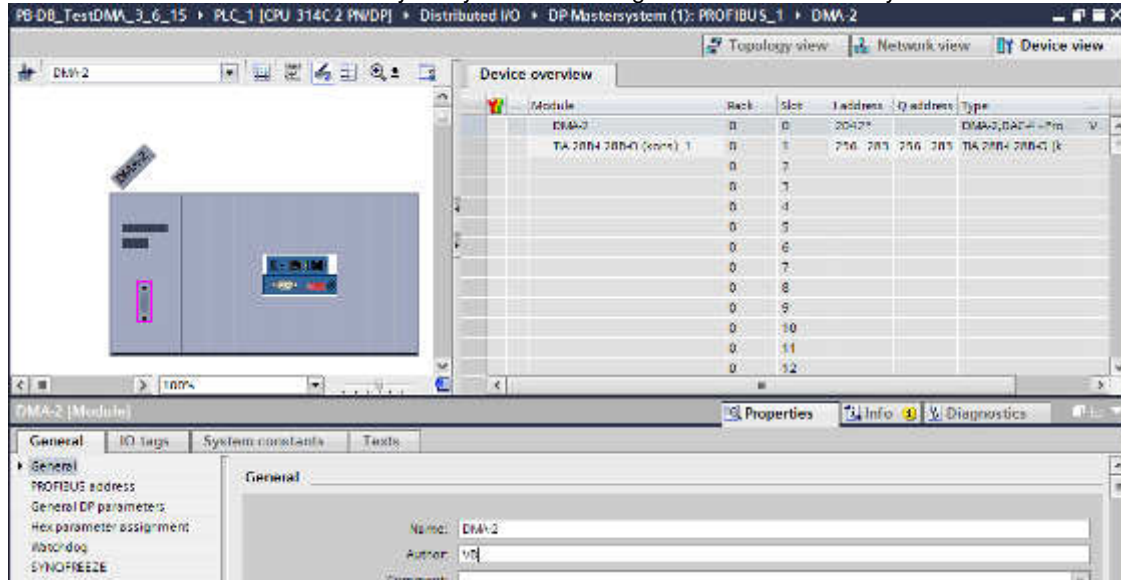
6.2.2 Classic CPU 300,400: Definition of the data buffer address

Unlike the CPU 1200, 1500, the E-address and A-address must be assigned to the variables #ADR_IN and #ADR_OUT here.

The Data buffer address #ADR_IN, #ADR_OUT is predefined to 256.

256 ADR_IN
256 ADR_OUT

Please check the correct address of your system and change the value if necessary.



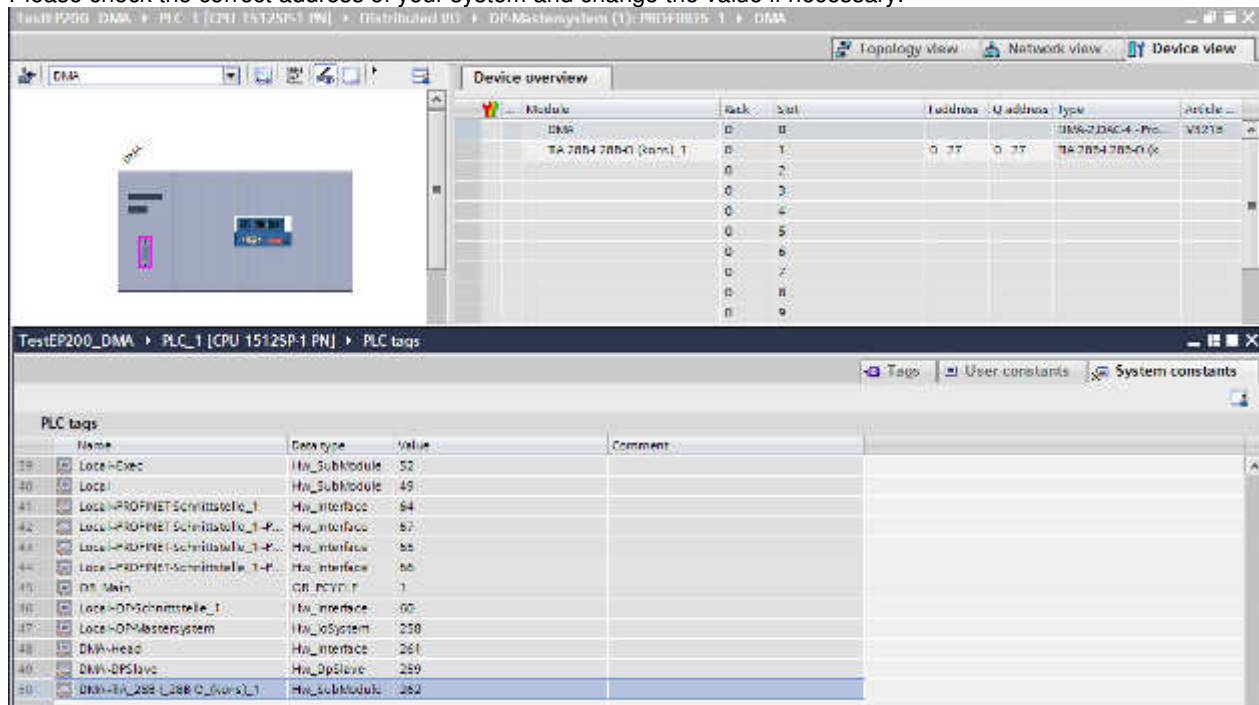
6.2.3 CPU 1200,1500: Specification of the data buffer address based on the hardware identifier

In contrast to CPU 300, 400, the hardware ID for the GSD I / O module must be assigned to the variable #DEV_ID.

The data buffer address #ADR_IN, #ADR_OUT is predefined at 262.

DEV_ID HW_IO 44.0 262

Please check the correct address of your system and change the value if necessary.



6.2.4 CMD 3, Reading values from one DMA-2 node

Every DMA-2 module connected to the Profibus node has an own SNUM (slave number). Together with this number it is possible to read an set of parameter of this specific DMA-2.
The parameter-ID's are shown in table [7 List of parameters](#).

An reading access is done as followed:

- Define the slave number SNUM of the DMA-2 from which the parameters are to be read.

■ SNUM Int

E.g. for slave 1

#SNUM := 1;

- Setup the CMD:

■ CMD Int

#CMD := 3;

- Write the starting address of the first parameter ID which should be read by the structure

▼ IN_CMD3 Struct
■ PAR_ID Int

E.g. parameter 22, S1.01

#IN_CMD3.PAR_ID := 22;

- Define the number of parameters to be read (maximum 8)

▼ IN_CMD3 Struct
■ PAR_ID Int
■ PAR_N Int

E.g. 4 parameters S1.01..S1.04

#IN_CMD3.PAR_N := 4;

- Definition of the states in #CMD3_STAT:

0	no action
1	Start of reading
2	Reading in process
4	Reading finished
8	Reading error occurred.

- Start the process, by writing

■ CMD3_STAT Int

#CMD3_STAT := 1; (CMD_START)

- When #CMD3_STAT reaches the value 4 (CMD_FINISH), Reading is finished, and the values can be read in the structure #OUT_CMD.VALUE[1..8]. In addition the number of received bytes will be shown in the structure #OUT_CMD.CNT. Every read parameter needs to 2 bytes.

▼ OUT_CMD Struct
■ CNT Int
▼ VALUE Array[1..8] of Real
■ VALUE[1] Real
■ VALUE[2] Real
■ VALUE[3] Real
■ VALUE[4] Real
■ VALUE[5] Real
■ VALUE[6] Real
■ VALUE[7] Real
■ VALUE[8] Real

- If an reading error occurred, the reason for the error can be analyzed by checking the #COM_xxxxx outputs of the function block.

■ COM_ERR01 Int
■ COM_ERR02 Int
■ COM_ERR03 Int

6.2.5 CMD 6, Writing Parameters to one DMA-2 node

The written values are stored in a non-volatile memory.

Every DMA-2 module connected to the Profibus node has an own SNUM (slave number). Together with this number it is possible to write an new parameter value to the parameter ID of this specific DMA-2.

The parameter-ID's are shown in table 7 [List of parameters](#).

An parameter writing access is done as followed:

- Define the slave number SNUM of the DMA-2 whose parameters are to be changed.

■ SNUM Int

E.g. for slave 1 #SNUM := 1;

- Setup the CMD:

■ CMD Int

CMD := 6;

- Define the parameter ID and the value which should be changed.

■ IN_CMD6 Struct
■ PAR_ID Int
■ PAR_VALUE Int

E.g. parameter 22, S1.01 = 1000 (1.0 V)

#IN_CMD3.PAR_ID := 22;

#IN_CMD3.PAR_VALUE := 1000;

- Definition of the states in #CMD6_STAT:

0	no action
1	Start of writing
2	Writing in process
4	Writing finished
8	Writing error occurred.

0: no action

1: Start of writing

2: Writing in process

4: Writing finished

8: Writing error occurred.

- Start the process, by writing #CMD6_STAT := 1; (CMD_START)

■ CMD6_STAT Int

- When #CMD6_STAT reaches the value 4 (CMD_FINISH), writing is finished

- If a writing error occurred, the reason for the error can be analyzed by checking the #COM_xxxxx outputs of the function block.

■ COM_XXXXX	Int
■ COM_XXXXX	Int
■ COM_XXXXX	Int

6.2.6 CMD 15, Writing and Reading once to all connected DMA nodes

With the CMD 15 it is possible to write an set of parameters to all DMA-2, connected to the Profibus one node, at once. In this case, the variable SNUM (slave number) hold the maximum number of connected DMA-2. (different to CMD 3 or CMAD6).

The meaning of the process values depending on the mode of the DMA-2 working at.

See [4.5 CMD = 15, structure of Profibus telegram definition, depending on SW Versions](#)

This also may be different to each module due to the DMA-2 fold composition. Also the Control-Byte is depending on the working mode. Explanation of the bits see [4.5.1.3 Explanation of special functions and module state bits](#)

An CMD 15 access is done as followed:

- Define the number of slaves SNUM of the modules connected to the Profibus node.

■ SNUM Int

E.g. If using a 3-fold DMA-2 #SNUM := 3;.

- Setup the CMD: # CMD := 15;

■ CMD Int

- Write the process data you want to send to the DMA-2 modules in the structure provided. The array index corresponds to the SADR (parameter E 22) of the connected modules

0	00000000	Word
1	00000001	Word
2	00000002	Word
3	00000003	Word
4	00000004	Word

Module with SADR = 1 (parameter E 22 = 1)

Module with SADR = 5 (parameter E 22 = 5)

Structure of the transmit data set:

0	00000000	Word
1	00000001	Word
2	00000002	Word
3	00000003	Word
4	00000004	Word
5	00000005	Word
6	00000006	Word
7	00000007	Word
8	00000008	Word
9	00000009	Word
10	0000000A	Word
11	0000000B	Word
12	0000000C	Word
13	0000000D	Word
14	0000000E	Word
15	0000000F	Word

Control Byte

Process values to DMA

- The internal telegram address is changed automatically so an return telegram is initiating every function block call. The array index corresponds to the SADR (parameter E 22) of the connected modules

Structure of the receive data set.

0	00000000	Word
1	00000001	Word
2	00000002	Word
3	00000003	Word
4	00000004	Word
5	00000005	Word
6	00000006	Word
7	00000007	Word
8	00000008	Word
9	00000009	Word
10	0000000A	Word
11	0000000B	Word
12	0000000C	Word
13	0000000D	Word
14	0000000E	Word
15	0000000F	Word
16	00000010	Word
17	00000011	Word
18	00000012	Word
19	00000013	Word
20	00000014	Word
21	00000015	Word
22	00000016	Word
23	00000017	Word
24	00000018	Word
25	00000019	Word
26	0000001A	Word
27	0000001B	Word
28	0000001C	Word
29	0000001D	Word
30	0000001E	Word
31	0000001F	Word

Status Word

Process values from DMA

- If an error has occurred, the cause of the error can be analyzed by evaluating the outputs #COM_xxxxx of the function block.

0	00000000	Word
1	00000001	Word
2	00000002	Word

7 List of parameters

Parameters in grey letters are not yet implemented in the DMA Software.
All values in decimal, for usage as data values they must be converted into Hex
R = read only parameter.
X = implemented, but not active (no access)
W/R = writing and reading possible.

ID _{Hex}	ID _{dec}	W/R	Name	Function	Unit	Step	Min	Max	Description
0x00	0	R	Vers	Software version	---	---	xx.xx	xx.xx	Depends on HW
0x01	1	R	d1.01	Sum of analogue set value	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V
0x02	2	R	d1.02	Sum of all post ramp set values	V	1	-9999	9999	
0x03	3	R	d1.03	Set values after linearization	V	1	-9999	9999	
0x04	4	R	d1.04	Value after gain adjustment.	V	1	-9999	9999	
0x05	5	R	d1.05	Signal A	V	1	-9999	9999	
0x06	6	R	d1.06	Signal B	V	1	-9999	9999	
0x07	7	R	d1.07	Current A	A	1	0	5000	1000 == 1.000 A
0x08	8	R	d1.08	Current B	A	1	0	5000	
0x09	9	R	d1.09	Total current	A	1	0	5000	
0x0A	10	R	d1.10	Desired value	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V
0x0B	11	R	d1.11	Actual value, feedback value	V	1	-9999	9999	
0x0C	12	R	d1.12	Lag error	V	1	-9999	9999	
0x0D	13	R	d1.13	Controller output	V	1	-9999	9999	
0x0E	14	R	d2.01	Sum of analogue set value	V	1	-9999	9999	
0x0F	15	R	d2.02	Sum of all post ramp set values	V	1	-9999	9999	
0x10	16	R	d2.03	Set values after linearization	V	1	-9999	9999	
0x11	17	R	d2.04	Value after gain adjustment.	V	1	-9999	9999	
0x12	18	R	d2.10	Desired value	V	1	-9999	9999	
0x13	19	R	d2.11	Actual value, feedback value	V	1	-9999	9999	
0x14	20	R	d2.12	Lag error	V	1	-9999	9999	
0x15	21	R	d2.13	Controller output	V	1	-9999	9999	
0x16	22	R/W	S1.01	Set Value1	V	1	-9999	9999	
0x17	23	R/W	S1.02	Set Value2	V	1	-9999	9999	
0x18	24	R/W	S1.03	Set Value3	V	1	-9999	9999	
0x19	25	R/W	S1.04	Set Value4	V	1	-9999	9999	
0x1A	26	X	S1.08	reserved					---
0x1B	27	R/W	r1.01	Ramp from 0 ⇒ -	s	1	0	3950	1 == 10ms 0 == Ramp function off
0x1C	28	R/W	r1.02	Ramp from - ⇒ 0	s	1	0	3950	
0x1D	29	R/W	r1.03	Ramp from 0 ⇒ +	s	1	0	3950	
0x1E	30	R/W	r1.04	Ramp from + ⇒ 0	s	1	0	3950	
0x1F	31	R/W	A1.01	Profibus set value (Branch 1)	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V This value is, when written, always active. Cleared by reset, or writing "0". For switching off of the analogue set-value, set E17 = "2"
0x20	32	R/W	A1.02	Profibus feedback value (Branch 1)	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V C1.09 has to be switched off in order to avoid interferences
0x21	33	R/W	S2.01	Set Value1 (Branch 2)	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V
0x22	34	R/W	S2.02	Set Value2 (Branch 2)	V	1	-9999	9999	
0x23	35	R/W	r2.01	Ramp from 0 ⇒ -	s	1	0	3950	1 == 10ms 0 == Ramp function off
0x24	36	R/W	r2.02	Ramp from - ⇒ 0	s	1	0	3950	
0x25	37	R/W	r2.03	Ramp from 0 ⇒ + (Branch 2)	S	1	0	3950	
0x26	38	R/W	r2.04	Ramp from + ⇒ 0 (Branch 2)	S	1	0	3950	

ID _{Hex}	ID _{dec}	W/R	Name	Function	Unit	Step	Min	Max	Description
0x27	39	R/W	A2.01	Profibus set value (Branch 2) except: in mode1 also for branch 1	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V This value is, when written, always active. Cleared by reset, or writing "0". For switching off of the analogue set-value, set E17 = "2"
0x28	40	R/W	A2.02	Profibus feedback value (Branch 2)	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V C2.09 has to be switched off in order to avoid interferences
0x29	41	R/W	C1.00	Controller selection	---	1	0	4	0 = off 1 = P-PT ₁ -I-DT ₁ 2 = Remote 3 = dff 4 = Remote + dff
0x2A	42	R/W	C1.01	Safety function	---	1	0	1	0 = off; 1 = on
0x2B	43	R/W	C1.02	Linearization	---	1	0	5	0 = linear; 1 ... 5 = curve
0x2C	44	R/W	C1.03	Gain A	V/V	1	0	200	100 == Factor 1.00
0x2D	45	R/W	C1.04	Gain B	V/V	1	0	200	100 == Factor 1.00
0x2E	46	R/W	C1.05	Set value sign and gain	V/V	1	-400	400	100 == Factor 1.00 Sign <u>and</u> gain!
0x2F	47	R/W	C1.06	Set value offset	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V
0x30	48	R/W	C1.07	Dead band compensation A	V	1	0	9999	1000 == 1.000 V
0x31	49	R/W	C1.08	Dead band compensation B	V	1	0	9999	9.999 V = max. current depending on solenoid selection
0x32	50	R/W	C1.09	Sensor type Attention: No negative controller output possible when 10, 11 or 12 is selected!	---	1	0	12	0 = off (used for Profibus application) 1 = 0 ... 20 mA 2 = 4 ... 20 mA 3 = 12 mA ± 8 mA 4 = 0 ... 10 V 5 = 0 ... ± 10 V 6 = 6 V ± 2,5 V 7 = 7,5 V ± 2,5 V 8 = 6 V ± 5 V 9 = 7,5 V ± 5 V 10 = 0 ... 20 mA 11 = 4 ... 20 mA 12 = 0 ... 10 V
0x33	51	R/W	C1.10	Actual value gain	V/V	1	0	400	100 == Factor 1.00
0x34	52	R/W	C1.11	Actual value offset	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V
0x35	53	R/W	C1.12	Actual value sign	---	---	- 1	+ 1	- 1 = negative 0 = off + 1 = positive
0x36	54	R/W	C1.13	P-Portion K _{P1}	V/V	1	0	400	100 == Factor 1.00
0x37	55	R/W	C1.14	T-Portion for PT1 (to C1.16)	S	1	0	1000	100 == 1.00
0x38	56	R/W	C1.15	Threshold (C1.13, C1.16)	V	1	0	9999	1000 == 1.000 V
0x39	57	R/W	C1.16	P-Portion K _{P2}	V/V	1	0	400	100 == Factor 1.00
0x3A	58	R/W	C1.17	I-Portion	V/s	1	0	4000	1000 == 1.000
0x3B	59	R/W	C1.18	D-Portion	Vs	1	0	400	100 == 1.00
0x3C	60	R/W	C1.19	T-Portion for DT1	S	1	0	1000	100 == 1.00
0x3D	61	R/W	C1.20	Gain (C1.13 and C1.16)	V/V	1	1	32	2 = Factor 2.00
0x3E	62	R/W	C1.21	Comparator upper level	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V
0x3F	63	R/W	C1.22	Comparator lower level	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V
0x40	64	R/W	C1.23	Comparator delay into window	S	1	0	9999	1 == 10 ms
0x41	65	R/W	C1.24	Comparator delay out of window	S	1	0	9999	0 == no delay
0x42	66	R/W	C1.25	Comparator selection KOMP_1	---	1	0	3	0 = off 1 = Set value 2 = Actual value 3 =Lag error
0x43	67	R/W	C1.26	Cable fracture detection feedback	---	---	0	1	0 = off; 1 = active

ID _{Hex}	ID _{dec}	W/R	Name	Function	Unit	Step	Min	Max	Description
0x44	68	R/W	C2.00	Controller selection	---	1	0	4	0 = off 1 = P-PT ₁ -I-DT ₁ 2 = Remote 3 = dff 4 = Remote + dff
0x45	69	R/W	C2.01	Safety function	---	1	0	1	0 = off; 1 = on
0x46	70	R/W	C2.02	Linearization	---	1	0	5	0 = linear; 1 ... 5 = curve
0x47	71	R/W	C2.03	Gain A	V/V	1	0	200	100 == Factor 1.00
0x48	72	R/W	C2.04	Gain B	V/V	1	0	200	100 == Factor 1.00
0x49	73	R/W	C2.05	Set value sign and gain	V/V	1	-400	400	100 == Factor 1.00 Sign and gain!
0x4A	74	R/W	C2.06	Set value offset	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V
0x4B	75	R/W	C2.07	Dead band compensation A	V	1	0	9999	1000 == 1.000 V
0x4C	76	R/W	C2.08	Dead band compensation B	V	1	0	9999	9.999 V = max. current depending on solenoid selection
0x4D	77	R/W	C2.09	Sensor type Attention: No negative controller output possible when 10, 11 or 12 is selected!	---	1	0	12	0 = off (used for Profibus application) 1 = 0 ... 20 mA 2 = 4 ... 20 mA 3 = 12 mA ± 8 mA 4 = 0 ... 10 V 5 = 0 ... ± 10 V 6 = 6 V ± 2,5 V 7 = 7,5 V ± 2,5 V 8 = 6 V ± 5 V 9 = 7,5 V ± 5 V 10 = 0 ... 20 mA 11 = 4 ... 20 mA 12 = 0 ... 10 V
0x4E	78	R/W	C2.10	Actual value gain	V/V	1	0	400	100 == Factor 1.00
0x4F	79	R/W	C2.11	Actual value offset	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V
0x50	80	R/W	C2.12	Actual value sign	---	---	- 1	+ 1	- 1 = negative 0 = off + 1 = positive
0x51	81	R/W	C2.13	P-Portion K _{P1}	V/V	1	0	400	100 == Factor 1.00
0x52	82	R/W	C2.14	T-Portion for PT1 (to C1.16)	S	1	0	1000	100 == 1.00
0x53	83	R/W	C2.15	Threshold (C1.13, C1.16)	V	1	0	9999	1000 == 1.000 V
0x54	84	R/W	C2.16	P-Portion K _{P2}	V/V	1	0	400	100 == Factor 1.00
0x55	85	R/W	C2.17	I-Portion	V/s	1	0	4000	1000 == 1.000
0x56	86	R/W	C2.18	D-Portion	Vs	1	0	400	100 == 1.00
0x57	87	R/W	C2.19	T-Portion for DT1	S	1	0	1000	100 == 1.00
0x58	88	R/W	C2.20	Gain (C1.13 and C1.16)	V/V	1	1	32	2 = Factor 2.00
0x59	89	R/W	C2.21	Comparator upper level	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V
0x5A	90	R/W	C2.22	Comparator lower level	V	1	-9999	9999	
0x5B	91	R/W	C2.23	Comparator delay into window	S	1	0	9999	1 == 10 ms
0x5C	92	R/W	C2.24	Comparator delay out of window	S	1	0	9999	0 == no delay
0x5D	93	R/W	C2.25	Comparator selection KOMP_2	---	1	0	3	0 = off 1 = Set value 2 = Actual value 3 = Lag error
0x5E	94	R/W	C2.26	Cable fracture detection feedback	---	---	0	1	0 = off; 1 = active

ID _{Hex}	ID _{dec}	W/R	Name	Function	Unit	Step	Min	Max	Description
0x5F	95	R	E00	Operation mode (depends on HW + SW version)	---	1	1	8	1 = Open loop one valve 2 = Open loop two valves 3 = Closed loop one valve 4 = Closed loop on application 6 = Closed loop valve/application 8 = Closed loop application/ application
0x60	96	R/W	E01	Analogue output	---	---	1 and 14	13 and 21	1 = d1.01 to 13 = d1.13 and 14 = d2.01 to 21 = d2.13
0x61	97	R/W	E02	Push-Pull function	---	---	0	1	0 = off 1 = active 2 = common "+" for solenoids (Remark: only for max 0,8 A current) 3 = full bridge 4 = off + solenoid monitoring
0x62	98	R/W	E1.03	Solenoid selection A	---	1	1	7	1 = 0,8 A 2 = 1,1 A 3 = 1,3 A 4 = 1,6 A 5 = 2,4 A 6 = 2,7 A 7 = 3,5 A
0x63	99	R	E1.04	P-Portion current contr. Energization A	---	1	0	9999	Default for 2,700 A solenoid
0x64	100	R	E1.05	I-Portion current contr. Energization A	---	1	0	9999	
0x65	101	R	E1.06	P-Portion cur. contr. de- energization A	---	1	0	9999	
0x66	102	R	E1.07	I-Portion cur. contr. De- energization A	---	1	0	9999	
0x67	103	R/W	E08	Ramp selection	---	1	0	2	0 = digital set v. (time constant) 1 = all set v. (rise constant.)
0x68	104	R/W	E09	Time delay enable signal	s	1	0	9999	1 = 1.00s
0x69	105	R/W	E1.10	Solenoid current adaptation A	---	1	50	110	Variable adjustment of max. current 100 == Factor 1.00
0x6A	106	R/W	E11	Initial current solenoid A	V	1	0	3000	3.000 V = 30 % of max. rated current
0x6B	107	R/W	E12	Initial current solenoid B	V	1	0	3000	
0x6C	108	R/W	E1.13	Dither Amplitude A	V	1	0	3000	
0x6D	109	R/W	E1.14	Dither Frequency A	Hz	1	1	300	---
0x6E	110	R/W	E15	Selection set point S1.06 (U/I)	---	1	0	6	0 = S1.06 voltage input active 1 = 0 ... 20 mA w/o cable fract. det. 2 = 10 mA ± 10 mA w/o cable fract. det. 3 = 4 ... 20 mA w/o cable fract. det. 4 = 4 20 mA with cable fract. det. 5 = 12 mA +- 8 mA w/o cable fract. det. 6 = 12 mA +- 8 mA with cable fract. det.
0x6F	111	R/W	E16	Selection set point S1.05 (U/I)	---	1	0	6	0 = S1.05 voltage input active 1 = 0 ... 20 mA w/o cable fract. det. 2 = 10 mA ± 10 mA w/o cable fract. det. 3 = 4 ... 20 mA w/o cable fract. det. 4 = 4 20 mA with cable fract. det. 5 = 12 mA +- 8 mA w/o cable fract. det. 6 = 12 mA +- 8 mA with cable fract. det.
0x70	112	R/W	E17	Set value activation mode	---	1	0	2	0 = 4 digital, 1 analogue active 2 = only 4 digital active

0x71	113	R/W	E18	Error/Comparator Output (from V32.09*)	---	1	0	8	0 = Error 1 = Comp1. positive logic 2 = Comp1. negative logic 3 = Comp2. positive logic 4 = Comp2. negative logic 5 = Dout_1 positive logic 6 = Dout_1 negative logic 7 = Dout_2 positive logic 8 = Dout_2 negative logic
0x72	114	R/W	E19	Reserved					
0x73	115	R/W	E20	Reserved					
0x74	116	R/W	E21	Reserved					
0x75	117	X	FB1M	Reserved					
0x76	118	X	FB1o	Reserved					
0x77	119	X	FB1f	Reserved					
0x78	120	X	DOUt	Reserved					
0x79	121	X	D_IO	Reserved					
0x7A	122	X	D_IN	Reserved					
0x7B	123	X	Uout	Reserved					
0x7C	124	X	Umon	Reserved					
0x7D	125	X	1_E4	Reserved					
0x7E	126	X	1_E5	Reserved					
0x7F	127	X	1_E6	Reserved					
0x80	128	X	1_E7	Reserved					
0x81	129	X	2_E4	Reserved					
0x82	130	X	2_E5	Reserved					
0x83	131	X	2_E6	Reserved					
0x84	132	X	2_E7	Reserved					
0x85	133	X	3_E4	Reserved					
0x86	134	X	3_E5	Reserved					
0x87	135	X	3_E6	Reserved					
0x88	136	X	3_E7	Reserved					
0x89	137	X	4_E4	Reserved					
0x8A	138	X	4_E5	Reserved					
0x8B	139	X	4_E6	Reserved					
0x8C	140	X	4_E7	Reserved					
0x8D	141	X	5_E4	Reserved					
0x8E	142	X	5_E5	Reserved					
0x8F	143	X	5_E6	Reserved					
0x90	144	X	5_E7	Reserved					
0x91	145	X	6_E4	Reserved					
0x92	146	X	6_E5	Reserved					
0x93	147	X	6_E6	Reserved					
0x94	148	X	6_E7	Reserved					
0x95	149	X	7_E4	Reserved					
0x96	150	X	7_E5	Reserved					
0x97	151	X	7_E6	Reserved					
0x98	152	X	7_E7	Reserved					
0x99	153	X	User	Reserved					

ID _{Hex}	ID _{dec}	W/R	Name	Function	Unit	Step	Min	Max	Description
0x9A	154	R	So.in	Indicator for activated digital set values (depends on HW Version)	---	---	0	1234	1xxx = S1.01 active x2xx = S1.02/S2.01 active xx3x = S1.03 active xxx4 = S1.04 active
0x9B	155	R/W	E2.03	Solenoid selection B	---	1	1	7	1 = 0,8 A 2 = 1,1 A 3 = 1,3 A 4 = 1,6 A 5 = 2,4 A 6 = 2,7 A 7 = 3,5 A
0x9C	156	R	E2.04	P-Portion current contr. Energization B	---	1	0	9999	Default for 2,700 A solenoid
0x9D	157	R	E2.05	I-Portion current contr. Energization B	---	1	0	9999	
0x9E	158	R	E2.06	P-Portion cur. contr. de-energization B	---	1	0	9999	
0x9F	159	R	E2.07	I-Portion cur. contr. De-energization B	---	1	0	9999	
0xA0	160	R/W	E2.10	Solenoid current adaptation B	---	1	50	110	Variable adjustment of max. current 100 == Factor 1.00
0xA1	161	R/W	E2.13	Dither Amplitude B	V	1	0	3000	3000 V = 30 % of max. rated current
0xA2	162	R/W	E2.14	Dither Frequency B	Hz	1	1	300	---
0xA3	163	R/W	E 22	Module Slave Address	---	1	0	32	0 = bus function disabled 1 = Standard (Profibus, CanOpen) 1.5 = Multiple Slave (Profibus)
0xA4	164	R/W	C1.27	Hysteresis command A	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V
0xA5	165	R/W	C2.27	Hysteresis command B	1	1	-9999	9999	
0xA6	166	R/W	C1.28	Comparator upper level	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V
0xA7	167	R/W	C1.29	Comparator lower level	V	1	-9999	9999	
0xA8	168	R/W	C1.30	Comparator delay into window	S	1	0	9999	1 == 10 ms
0xA9	169	R/W	C1.31	Comparator delay out of window	S	1	0	9999	0 == no delay
0xAA	170	R/W	C1.32	Comparator selection KOMP_11	---	1	0	3	0 = off 1 = Set value 2 = Actual value 3 = Lag error
0xAB	171	R/W	C2.28	Comparator upper level	V	1	-9999	9999	-1000 == -1.000 V; 1000 == 1.000 V
0xAC	172	R/W	C2.29	Comparator lower level	V	1	-9999	9999	
0xAD	173	R/W	C2.30	Comparator delay into window	S	1	0	9999	1 == 10 ms
0xAE	174	R/W	C2.31	Comparator delay out of window	S	1	0	9999	0 == no delay
0xAF	175	R/W	C2.32	Comparator selection KOMP_22	---	1	0	3	0 = off 1 = Set value 2 = Actual value 3 = Lag error
0xB0	176	R/W	-	Internal Digital Switches (Read/Set)	---	---	0	8191 0x1FFF	0x0001 = Din_1 active (Read/Write) 0x0002 = Dout_1 active (Read only) 0x0004 = DKOMP_1 active (Read only) 0x0008 = DKOMP_11 active (Read only) 0x0010 = Din_2 active (Read/Write) 0x0020 = Dout_2 active (Read only) 0x0040 = DKOMP_2 active (Read only) 0x0080 = DKOMP_22 active (Read only) 0x0400 = Enable active 0x0800 = Error 0x8000 = Bus Disable Card (Read/Write)
0xB1	177	R/W	E 23	Profibus telegram timeout window	S	1	0	9999	1 == 10 ms 0 == function deactivated
0xB2	178	X	-	Reserved					
0xB3	179	R/W	C1.33	I-portion limitation	V	1	0	9999	0 == 0.000 V; 9999 == 9.999 V
0xB4	180	R/W	C2.33	I-portion limitation	V	1	0	9999	0 == 0.000 V; 9999 == 9.999 V

8 Troubleshooting

8.1 General

The green "Power"-LED at the slave module don't lit:

=> Are all modules supplied with power ? (Supply 24V / Supply 0V)

The yellow "Enable"-LED on the slave module don't lit:

=> Are all modules powered with the decoupled supply? (Ext.24V / Ext.0V)

=> Is the Enable input powered with Ext.24V ?

=> Is the Software enable switched off? (See the special byte in CMD-15-mode)

The current of the solenoid did not reach the desired value:

=> Could the power supply provide enough power?

=> Is the selected type of solenoid type correct?

The red "Error"-LED of one of the DMA slave module is on:

=> The slave module is in error state, to acknowledge this error the enable signal of the module must be switched off/on- Than the error must disappear.

8.2 No profibus communication is possible

The red LED "Bus error" is lit:

=> Check the wiring of the profibus (termination, length of cables, connectors)

The "universal module" is used in PLC-project:

=> This is not allowed, only the module listed in GDS-file are supported.(The universal module is automatically displayed in the S7 configurator, please not chose this one)

8.3 Communication ok, but current outputs are inactive

Could the set point/feedback-value be monitored by the DMA module? (parameter d1.11, d1.01, d1.02):

Yes => Please check the setting of the Ex.xx Cx.xx parameters.

Check also the "Bus slave address" E22 of each module.

No => Apply a manual signal to the analogue inputs, please be sure that the parameter E17 is set to "off". Otherwise analogue inputs would be ignored.

Are the set point/feedback-value now visible?

Yes => The PLC don't send a correct telegram. Please check you PLC program, and modify the PLC commands in your program.

No => Check general errors, see [8.1 General](#)

END of document