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Option board PROFIBUS-DP

for V-Controller

Manual

E	5.98037.05

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Title	Manual
Product	**Option board PROFIBUS-DP for V-Controller**
Version	5.98037.05
Date	08.11.2005

Obligatory

These operating instructions are part of the equipment/machine. These operating instructions must be available to the operator at all times and must be in a legible condition. If the equipment/machine is sold or moved to a different location these operating instructions must be passed on by the owner together with the equipment/machine.
After any sale of the equipment/machine this original and all copies must be handed over to the buyer. After disposal or any other end of use this original and all copies must be destroyed.

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1

INTRODUCTION

The option board PROFIBUS-DP for the V-Controller enables the V-Controller to be connected to the wide-spread industrial standard field-bus PROFIBUS-DP.

PROFIBUS-DP is a high-performance serial field-bus system, enabling to form a network of different actuators and sensors. It offers transmission rates between 9.6 Kbit/s and 12 Mbit/s and offers a wide range of diagnostics and troubleshooting. The characteristics of PROFIBUS-DP are defined according to the european standard EN 50170.

The PROFIBUS option board controls the entire drive using the fieldbus standard. Transmission of status and control data and up to 8 setpoint- and actual values is possible. Furthermore a non-cyclic data communication exists for diagnostic and parameterization tasks.

NOTE

PROFIBUS is an asynchronous bus system. The determination of value transmission at any given time is only limited. However it is possible to define the refresh period for both the set-point and the actual values by use of the bus system. This refresh period and the maximum achievable bus transmissionrate depends on the bus nodes and the controller used.

Make sure before you configure bus systems to handle individual product areas that the selected systems meet the given requirements.

1.1 Terms used

These operating instructions cover the application of the PROFIBUS-DP card within the Baumüller V-controller. The term BUS 6 VC is used for the V-controller also.

A list of all abbreviations used you will find in the ▹Appendix A - Abbreviations◃ from page 73.

1.2 Scope of delivery

- Option board PROFIBUS-DP for V-Controller, permanently installed
- These operating instructions
- Diskette with:
  - Device data file (GSD file) BNF_00D0.GSD (V1.41 of 22.11.1999)
  - Bitmaps BNF_NORN.BMP and BNF_ERRN.BMP

1.3 Functionality

- Transmission of max. 8 cyclic setpoint values (32 bit format)
- Transmission of max. 8 cyclic actual values (32 bit format)
- Full access (read and write) on all parameters of the controller by using the non cyclic data communication (32 bit format)
- Change of the actual/setpoint value configuration by using the non cyclic data communication
- Setting of the configuration values by using the operating program for the V-Controller
- Storing of the configuration settings within the boot data record of the V-Controller
- Automatic test of the setpoint/actual value configuration at every commissioning
- Automatic recognition of the transmission rate up to 12 Mbit/s
- Automatic recognition of bus errors with parameterizable fault reaction of the V-Controller
- Automatic recognition of communication breakdown on the PROFIBUS with parameterizable fault reaction of the V-Controller

2

BASIC SAFETY NOTES

These operating instructions contain the information required for appropriate utilization of the products described within. They are intended for qualified technical personnel, which has been specially trained and is well known to all warnings and maintainance measures.
The units are state-of-the-art manufactured and safety reliable. They can be mounted without danger, put into service and run free of trouble when it is secured that all information given in this manual is being respected.

2.1 Safety information

The information herein is for the personal safety of the user and also for the safety against damage of the described products or connected devices.

A hazard is always classified into one of the three danger classes. Each danger class is characterized by one of the following signal words:

DANGER

▸ Danger indicates an imminently hazardous situation which, if not avoided, **will** result in death or serious injury.

WARNING

▸ Warning indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury.

CAUTION

▸ Caution used with the safety alert (exclamation point in triangle) symbol indicates a potentially hazardous situation which, if not avoided, **may** result in minor or moderate injury.
Caution used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, **may** result in property damage.

A product safety sign consists of a signal word plus a message panel. The panel area of the safety sign has a distinctive background color different from adjacent areas of the sign or which is clearly delineated by a line border or margin.

2.1.1 Safety information used

DANGER

Danger indicates an imminently hazardous situation which, if not avoided, **will** result in death or serious injury.

WARNING

Warning indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury.

CAUTION

Caution used with the safety alert (exclamation point in triangle) symbol indicates a potentially hazardous situation which, if not avoided, **may** result in minor or moderate injury.

2.2 Icons

NOTE

This is a substantial information.

2.3 Qualified Personnel

Qualified personnel with respect to the safety related information in this manual or on the products themselves are persons who are familiar with the mounting, setup and service of the product and have proven their qualification for the tasks to be carried out.

- Training or instruction or authorization to take into service, to earth and to designate electrical circuits and devices according to the electrical safety instructions standards,
- Training or instruction in maintenance and application of adequate safety equipment according to the electrical safety instructions standards.

2.4 Appropriate Utilization

WARNING

Warning indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury.

The unit/system shall only be operated within the service modes described in the manual and is only to be used together with third-party units or components which are requested or approved by BAUMÜLLER NÜRNBERG GmbH.

For safety reasons, alterations or unapproved reconstructions of the units are not allowed. The user must report all alterations due to service which influence the safety of the unit/the system immediately.

3

INSTALLATION

In this chapter you will learn about wiring and the respective settings on the card.

3.1 Front view

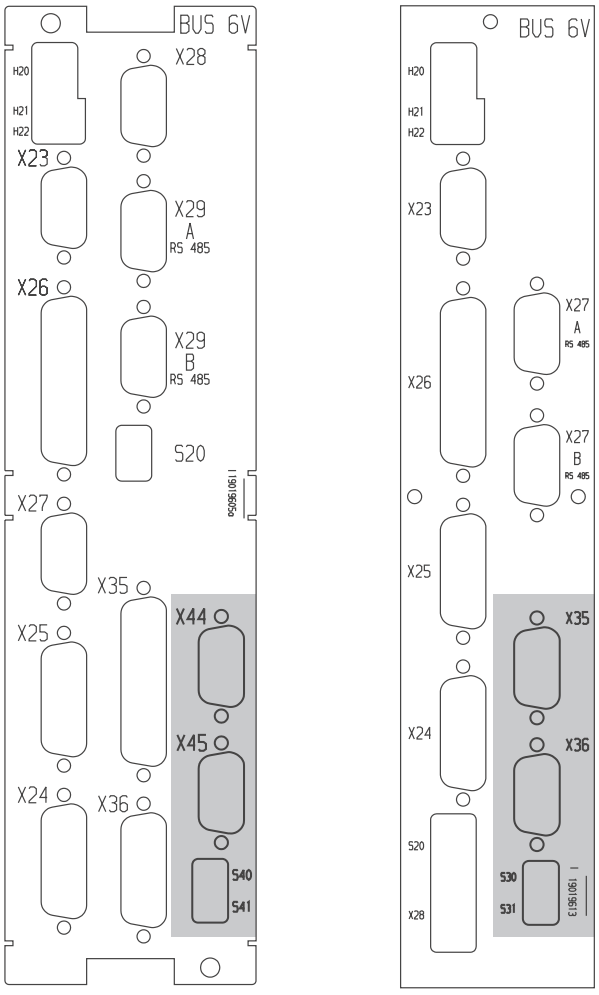
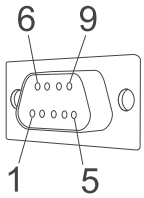


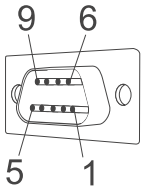
Figure 1: Terminal assignment

3.2 Connector pin assignment

Female connector X35/X44



Male connector X36/X45



Pin No.	Pin assignment
1	n. c.
2	n. c.
3	Data line B
4	Request To Send RTS
5	Data Ground (GND)
6	5 V_{DC}
7	n. c.
8	Data line A
9	n. c.

Figure 2: Female connector X35/X44 and male connector X36/X45

The PROFIBUS option board has a 9 pin SUB-D male connector and a 9 pin SUB-D female connector interface to PROFIBUS-DP. The connector pin assignment is in accordance with PROFIBUS standard EN 50170. If standard connectors are used all signals will be connected properly.

For interconnection we request to use pre-assembled PROFIBUS connectors with integrated terminating resistors and (optionally) integrated programming device (PG) interface. The connection is then made by the 9 pin SUB-D female connector X35/X44 only. Take care that only cables for the PROFIBUS network are used which have an explicit approval for this application. The terminating resistor must be activated on the first and the last PROFIBUS participants.

3.3 Connectors and cables for the PROFIBUS network

Based on the standardized wiring of PROFIBUS systems you may use components of different manufacturers to build your own automation network. Simply take care that all components and cables comply with the PROFIBUS standard.

NOTE

If you intend to use a bus analyzer to facilitate troubleshooting, we require that at least one connector per PROFIBUS ring structure have a programming device (PG) female connector to easily connect the PROFIBUS analyzer.

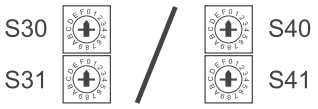
Selection of SIEMENS connectors

Cable outlet	90° cable outlet	35° cable outlet
Transmission rate	9.6 kbit/s...12 Mbit/s	9.6 kbit/s...12 Mbit/s
Terminating resistor	integrated, switchable	integrated, switchable
Order No.	6ES7 972	6ES7 972
without	0BA11-0XA0	0BA40-0XA0
with PG interface	0BB11-0XA0	0BB40-0XA0

3.4 EMC information

Information about EMC guidelines applicable on the setup of your drive system is included in the description of the basic unit (e. g. BUM 62 T, BUG 622, 623, BUC 624, 625...) as well as in the installation guideline for PROFIBUS-DP/FMS (Order No.: 2.112 of the PROFIBUS users organization, PROFIBUS Nutzerorganisation e.V., Karlsruhe, Federal Republic of Germany, or at your local representative).

3.5 Rotary switches



Setting: Slave Address 0...126
upper 4 bits
lower 4 bits

Figure 3: Rotary switches S30 and S31

The rotary switches S30 and S31 are used to determine the PROFIBUS participant address. Prior to commissioning set this address on the V-Controller because it can only be read out during initialization.

3.5 Rotary switches

4

COMMISSIONING

The V-Controller with PROFIBUS card commissioning is divided into commissioning of the V-Controller the setting of the interface parameters on both the V-Controller and the PLC side.

4.1 V-Controller commissioning

First step of V-Controller should be the commissioning of service modes and optimization. For safety reasons you should store all data on the PC after the commissioning is completed. So if there is an error in the drive control using PROFIBUS you will have backup data.

4.2 Interface commissioning

For the service of the PROFIBUS card the following settings are required:

- Setting the PROFIBUS participant address (S30/31 resp. S40/S41 rotary switches)
- Setting of the requested transmission range (number of setpoint/actual values) in the master (GSD file)
- Setting of the communication source and monitoring in V-Controller
- Setting of setpoint/actual values (ZK parameters) to be transmitted
- Setting of BAPS transmission mode (time slice procedure or 2 setpoint- and (2 resp. 4) actual values per cycle)
- Store data set in controller (as a boot data set)
- Complete system restart (controller and PROFIBUS master)

At system restart the PROFIBUS card is now initialized with the ZK parameter settings.

5

BASICS OF COMMUNICATION

5.1 Communication sources

To enable control of V-Controller using PROFIBUS, you must activate the controller´s communication source for the BAPS interface. This is done by using parameter *communication source (P 126)* of the V-Controller. To learn about the meaning and specialties of this parameter please refer to the actual documentation of the V-Controllers.

5.1.1 Communication source parameter (P 126)

In the *communication source (P 126)* parameter the communication source is set. Each single communication source is bit-coded as follows:

Bit	Display_hex	Meaning
0	1_hex	Enable RS 232 service interface for drive parameterization
1	2_hex	Enable RS 485 interface
2	4_hex	Enable cyclic communication using BAPS interface; required for PROFIBUS card
3	8_hex	Enable non-cyclic communication using BAPS interface; required for non cyclic communication using PROFIBUS - must be enabled during initialization because the non cyclic data will be scanned during initialization

To operate the V-Controllers using PROFIBUS enable of cyclic and non-cyclic data communication by use of bit 2 and bit 3 is required.

NOTE
The parameterization of the cyclic communication is possible using non-cyclic data communication. If you intend to use this possibility, you must enable non-cyclic data communication. Enable of cyclic communication to the controller can be evaluated in bit *Remote* (bit 9) in the V-Controller´s cyclic status word within the PLC (see description of V-Controller).

5.2 Communication monitoring

Furthermore, the V-Controller offers the possibility to monitor the communication with the PROFIBUS card and - by this way- bus communication itself. Any interrupted communication will be detected by the controller and corresponding fault reactions will be generated. Which communication sources are to be monitored you can select by setting parameter *communication monitoring (P 127)* of the V-Controller.
To be able to detect a bus master breakdown, the PROFIBUS Watchdog function for the slave must be activated additionally. For further information see ▹Watchdog function◃ on page 40.

To ensure the drive´s switch-off in case of a bus error or a faulty controller we strongly recommend to activate the V-Controller communication monitoring. For cyclic communication it should be set to the shortest possible time (e.g. 50 ms).

Monitoring of the non-cyclic communication is in most cases less reasonable because this takes place in the time left. On top of that, for monitoring of the non-cyclic data communication the controller must request transmission regularly.

WARNING

Warning indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury.
To monitor communication between V-Controller and PROFIBUS-DP, the monitoring function of the Dual-Port-RAM (cyclic data) must be activated using parameter *communication monitoring (P 127)*, which will after an adjustable time cause a fault reaction in the drive.
To make the communication monitoring of the drive work, the PROFIBUS settings must have the watchdog function for the slave activated.
If this monitoring is not activated, bus errors can cause undefined system states in the drive, which are unpredictable.

5.3 Data transmission PROFIBUS card to V-Controller

Because of different applications requirements on data transmission between V-Controller and additional cards two different data exchange procedures are available. These are the time-slice procedure and the transmission of 2 setpoint- and 2 (resp. 4) actual values in one communications cycle.
Setup of the desired procedures is realized in the V-Controller by use of *ZK-parameter ZK30 (P 498)*.

5.3.1 Time-slice procedure

At this commonly used transmission mode, the cyclic setpoint- and actual values are transmitted in a time-slice procedure. The interval for the internal communication between V-Controller and the optional PROFIBUS-DP board is 0.5 ms.
The following actualization times between option board and V-Controller for parameterized set-point- / actual values will be achieved:

setpoint- / actual value-No.	1	2	3	4	5	6	7	8
actualization times	1 ms	2 ms	4 ms	8 ms	16 ms	32 ms	64 ms	128 ms

The following table shows the transmission sequence of the individual values using the BAPS-interface between PROFIBUS card and V-Controller related on a 20 ms interval:

Time [ms]	0	0.5	1		2		3		4		5		6	
setpoint- / actual value-No.	X	X	1	2	1	3	1	2	1	4	1	2	1	3
actualization times	X	X	1	2	1	4	1	2	1	8	1	2	1	4
Time [ms]	7		8		9		10		11		12		13	
setpoint- / actual value-No.	1	2	1	5	1	2	1	3	1	2	1	4	1	2
actualization times	1	2	1	16	1	2	1	4	1	2	1	8	1	2
Time [ms]	14		15		16		17		18		19		20	
setpoint- / actual value-No.	1	3	1	2	1	6	1	2	1	3	1	2	1	4
actualization times	1	4	1	2	1	32	1	2	1	4	1	2	1	8

NOTE
The actualization times of the individual cyclic setpoint- and actual values for the complete system depend on the number of cyclic setpoint- and actual values, the preset transmission rate, the number of connected participants and the cycle time of the PLC program.

5.3.2 2 setpoint- and 2 actual values per cycle

With this transmission mode between V-Controller and PROFIBUS card only 2 setpoint- and 2 (resp. 4) actual values can be used, which are then transmitted between V-Controller and PROFIBUS card in every communication cycle. The interval for communication between V-Controller and PROFIBUS card is also 0.5 ms. This means that the status- and control word as well as the setpoint- and actual values will be actualized every 0.5 ms.
With this rapid data exchange the actualization time of a setpoint value now only depends on the processing time of the PROFIBUS card and the cycle time in the PROFIBUS master.

NOTE
From firmware version 3.09 of the V-Controller 2 setpoint- and 4 actual values will be supported with this transmission mode.

5.3.3 BAPS-interface configuring

The operation mode of the interface to the controller is set in the controller using ZK-parameter 30 as follows:

ZK30 = 0 time-slice system (standard) data transmission
ZK30 = 4 transmission of 2 setpoint- and 2 (resp. 4) actual values in same cycle

5.3.4 Evaluation interval of PROFIBUS card

For data transmission from PROFIBUS master to the drive, besides the actualization time of the controller also the PROFIBUS option board´s processing time is important.
The card is able, depending on the number of cyclic setpoint- and actual values, to evaluate PROFIBUS master telegrams in certain intervals. The following table holds information about available evaluation times depending on the configuration.

No. of cyclic setpoint- and actual values	Evaluation interval
1 setpoint value, 1 actual value, **no** non-cyclic data	350 µs
1 setpoint value, 1 actual value, non-cyclic data	450 µs
2 setpoint values, 2 actual values, non-cyclic data	550 µs
8 setpoint values, 8 actual values, **no** non-cyclic data	850 µs
8 setpoint values, 8 actual values, non-cyclic data	950 µs

In the evaluation interval represents the processing time of the PROFIBUS card, which is the time until a new telegram from the master can be processed at the slave. The actualization time to the controller is not included herein, because it depends on the procedure selected (time-slice procedure or 2 setpoint- and 2 (resp. 4) actual values per cycle).

5.3.5 Example actualization time of whole system

System configuration

S7-300 DP; 1 ET 200 input module, 1 ET 200 output module, 2 V-Controllers with PROFIBUS card; PROFIBUS with 1.5 Mbit/s transmission rate; Controller with non-cyclic data / control- and status word / 8 setpoint values and 8 actual values; time-slice procedure for data exchange between V-Controller and card; cycle time in S7 between 6 and 10 ms.

Loop measure

The setpoint value is written cyclically from the PLC to the controller and is read back from there as a cyclic actual value. The value read is increased by 1 in the PLC and is written as setpoint value in turn. The setpoint value is also transferred to the analog output of the controller and measured with an oscilloscope. The time, until this value changes, is the actualization time for the whole system.

This measurement clearly shows, that the actualization time of the first setpoint- / actual values does not depend on the PROFIBUS card, but is determined by the cycle time of the PLC.

Setpoint value with No.	Actualization time of loop
1	8 – 16 ms
2	8 – 16 ms
3	8 – 16 ms
4	8 – 16 ms
5	16 ms
6	32 ms
7	64 ms
8	128 ms

5.4 Configuration of setpoint- and actual values

For the process data communication all parameter numbers of the setpoint- and actual values must be determined. These settings can be carried out either by using special commands of the non-cyclic data communication or else being set and stored in the controller.
Keep in mind, that using non-cyclic data communication only the parameter numbers of the setpoint- and actual values can be changed, not the respective number of setpoint-/actual values or the BAPS transmission mode. We recommend however to carry out fundamental settings directly at the controller.
Enabled by the special commands of the non-cyclic data communication, the PLC can do the respective parameterization of the V-Controller at plant initialization using PROFIBUS.
The configuration is written to the ZK-parameters (option board parameters) of the V-Controller and is saved also when the data set is saved. The PROFIBUS option board reads the ZK-parameter at each commissioning of the controller (24 V-supply) and by this way can carry out a test with the configuration of the PROFIBUS master. If an error is detected during the test, the card will report error code 84 or 85 in the non-cyclic data area (if non-cyclic data area has been configured for PROFIBUS).
The parameter numbers are displayed hexadecimal in the ZK-parameters.

Setting the parameter numbers directly using the operating program

The numbers for the cyclic setpoint- and actual values must be entered in increasing order without gap into the parameter range of the ZK parameters. A 0 as a parameter number is interpreted as EOF and leads to the end of the initialisation of the respective parameter type (setpoint- or actual value).
To ensure these settings, the data set must be saved by the functionality of the V-Controller´s data set management (see documentation of the V-Controller).

Setting the parameter numbers using non-cyclic data communication

Setting the parameter numbers is also possible using the non-cyclic data communication. For the exact sequence see sections ▹PZD initialize setpoint values◃ on page 54 and ▹PZD actual value initialization◃ on page 59. Here we also recommend to save the settings of parameter numbers within the V-Controllers's data set.

5.4.1 ZK-parameter of V-Controller

The meaning of ZK parameters is shown in the table below.

Parameter	Name	Meaning
468	ZK 0	parameter-No. setpoint value 1
469	ZK 1	parameter-No. setpoint value 2
470	ZK 2	parameter-No. setpoint value 3
471	ZK 3	parameter-No. setpoint value 4
472	ZK 4	parameter-No. setpoint value 5
473	ZK 5	parameter-No. setpoint value 6
474	ZK 6	parameter-No. setpoint value 7
475	ZK 7	parameter-No. setpoint value 8
476	ZK 8	
477	ZK 9	
478	ZK 10	
479	ZK 11	
480	ZK 12	
481	ZK 13	
482	ZK 14	
483	ZK 15	
484	ZK 16	parameter-No. actual value 1
485	ZK 17	parameter-No. actual value 2
486	ZK 18	parameter-No. actual value 3
487	ZK 19	parameter-No. actual value 4
488	ZK 20	parameter-No. actual value 5
489	ZK 21	parameter-No. actual value 6
490	ZK 22	parameter-No. actual value 7
491	ZK 23	parameter-No. actual value 8
492	ZK 24	
493	ZK 25	
494	ZK 26	
495	ZK 27	
496	ZK 28	
497	ZK 29	
498	ZK 30	
499	ZK 31	

The settings in the ZK parameters are stored in the EEPROM of the controller and are used after the next commissioning of the controller to initialize the PROFIBUS card.

Example

The following parameters shall be setup as cyclic setpoint- and actual values (normal interface operation mode):

setpoint value 1	HLG input 1	P002	0002_hex
setpoint value 2	N M-limit bipolar	P053	0035_hex
actual value 1	N actual value	P051	0033_hex
actual value 2	I apparent current	P099	0063_hex
actual value 3	M error code	P124	007C_hex
actual value 4	M error index	P125	007D_hex

Parameter	Name	Meaning	Value
468	ZK 0	parameter-No. setpoint value 1	0002_hex
469	ZK 1	parameter-No. setpoint value 2	0035_hex
470	ZK 2	parameter-No. setpoint value 3	0000_hex
:::	:::		0000_hex
484	ZK 16	parameter-No. actual value 1	0033_hex
485	ZK 17	parameter-No. actual value 2	0063_hex
486	ZK 18	parameter-No. actual value 3	007C_hex
487	ZK 19	parameter-No. actual value 4	007D_hex
488	ZK 20	parameter-No. actual value 5	0000_hex
:::	:::		0000_hex
497	ZK 29		0000_hex
498	ZK 30	BAPS-interface configuration	0000_hex
499	ZK 31		0000_hex

NOTE

All unused ZK parameters must be set to 0.

Do not forget to *enable the communication source* and *Save data set*.

5.5 Value transmission and data formats

The data format of the respective setpoint- and actual values depends on the respective parameter and must be considered in the overlaid control. The most common used standard for the V-Controller parameters is:

Value in %	Format in controller (decimal)	Format in controller (hexadecimal)
100%	16383_dez	3FFF_hex
0%	0_dez	0000_hex
-100%	-16383_dez	C001_hex

Not all parameters of the V-Controllers shown here are standardized. For closer information about standardization see V-Controller description.

NOTE
Using cyclic communication, the controller accepts values within permissible limits only. A setpoint value beyond min.- or max.-limits is rejected without error code and ignored. The old value is kept instead.
If you use non-cyclic data communication, the requested operation is terminated with the error code *value out of MIN / MAX limit* and the old value is kept.

5.6 Initialisation routine V-Controller with PROFIBUS card

The following diagram shows the initialization routine of the PROFIBUS card with a V-Controller and as follows at PROFIBUS-DP.
After the 24V-supply is switched on, at first the PROFIBUS card is initialized and then reads the ZK-parameter settings in the boot- data set of the V-Controller. If there is no correct setting found in the den ZK-parameters, the card on request of the PROFIBUS master tries to build up communication. While doing so, the settings of the master- and slave system (number of setpoint- / actual values; non-cyclic data) are checked for being equal.
If there are differences between master and slave, an error code will be displayed in the BAPS-parameters of the V-Controller and in the non-cyclic data area of the PROFIBUS transmission.

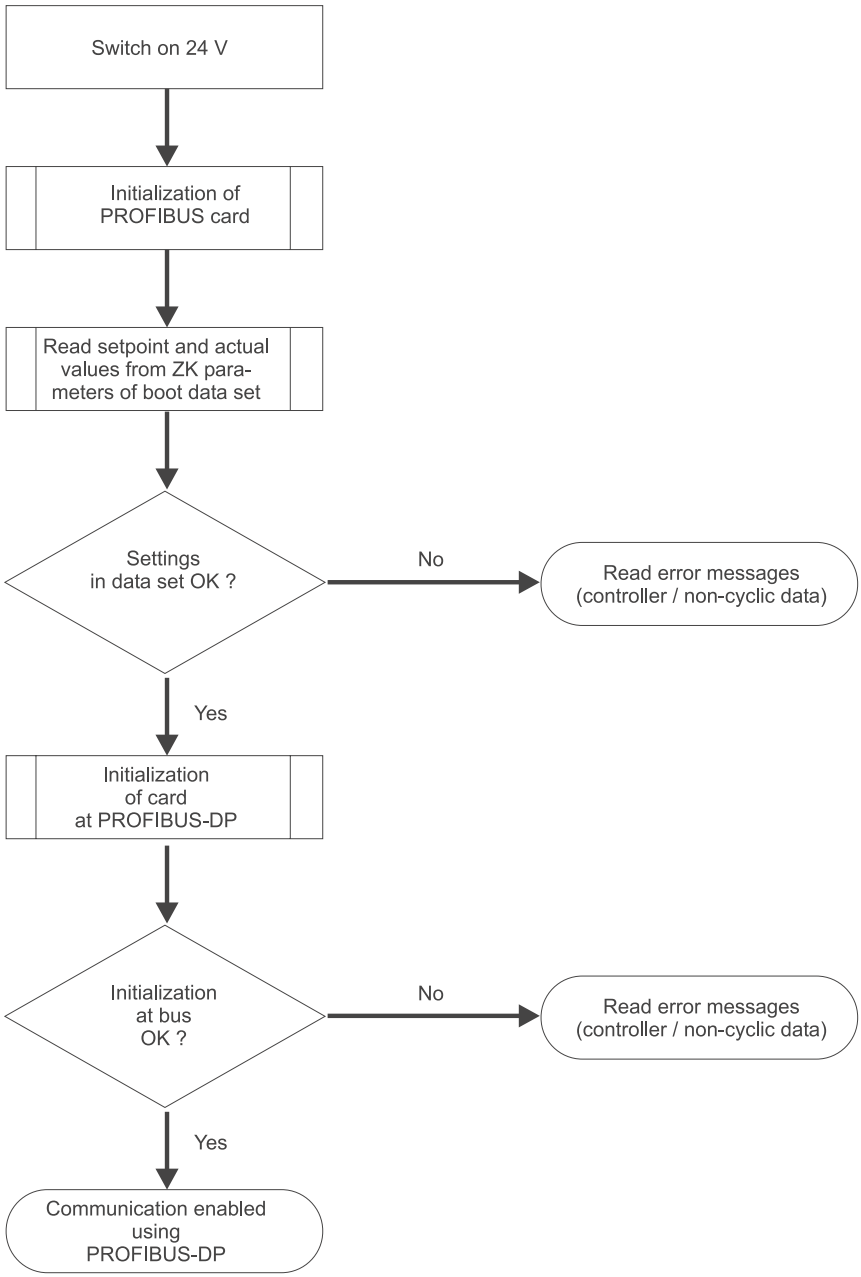


Figure 4: Initialization routine

5.7 Error handling

The data exchange between the PROFIBUS card and the V-Controller is interrupted after the following system conditions and can be recovered only in certain limits:

- bus error detection by PROFIBUS card.
- diagnostic function activated at master and use of cyclic data area to transmit data.
- initialization fault detected.

Partially the controller must be restarted anyway, for the consistence of the data can no longer be guaranteed because of the controlling by the PLC. The respective error codes can be evaluated either in the non-cyclic data area of the PLC or in the BAPS-parameters within the V-Controller.

6

PROFIBUS CONFIGURATION

6.1 Configuration of PROFIBUS participant address

At intialization for PROFIBUS each participant must get an address to be associated individually at the bus system.
This is achieved at the additional card by means of two rotary switches (S30/S40 and S31/S41). At commissioning of the device the address preset by the switches is read out and initialization at the bus is performed.
The address must be entered in hexadecimal code, whereas the lower nibble (4 bit) must be set at the lower rotary switch (S31/S41) and the upper nibble at the upper rotary switch (S30/S40).
Transmission of the address takes place after the 24 V power supply is restarted. The V-Controller therefore must be restarted after setup to make the changes become efficient.
At address configuration take care of limitations of the maximum possible slave address in the PROFIBUS master.

Example

Setting of PROFIBUS address 25:
25 corresponds to 19_hex, therefore the lower nibble is 9_hex and the upper nibble is 1_hex.

- turn upper rotary switch (S30/S40) to 1
- turn lower rotary switch (S31/S41) to 9

6.2 Master configuration

The PROFIBUS master must be configured with the software supplied. You must give the following information about the slave to the master:

- PROFIBUS participant address of the slave
- Input and output area of the slave (observe maximum input and output area limitation of PROFIBUS master at consistent transmission).
- Special characteristics of the slave

NOTE
If you change settings at the PROFIBUS master the whole system must be restarted to perform reinitialization.

6.3 GSD file

To be able to use the PROFIBUS functionality, the master must be given different informations about each slave. For configuration of PROFIBUS master systems the supplied GSD file (device data file) is required. The GSD file complies with *EN 50170 Volume 2 PROFIBUS* standard and contains determined information about every participant which is used to configure data transmission and commissioning behavior of the bus system.
We recommend to copy the GSD file and the two bitmap files supplied on the diskette to the configuring tool directory of the PROFIBUS master. A GSD file printout you will find in ▹GSD file◃ from page 77.

6.4 Determination of address range

6.4.1 Basics of data transmission

For data transmission on PROFIBUS the size of the data area to be transmitted must be determined. This transmission area (also address area) is adjusted by the number of data to be transmitted and must be configured in the PROFIBUS master accordingly. Alteration in the running process is not possible. You need to restart the bus system in order to make changes become active.
The size of the transmission area depends on the number of cyclic setpoint- and actual values and is influenced opon if the non-cyclic data transmission shall be used or not.
The required transmission area can be determined as follows:

- For transmission of controller control- and status word always determine an area of 2 words each for the input and for the output area. The control- and status word is always transmitted within the first word. The second word (PZD 2) is at the time not used in the V-Controller and is parameterized as reserve for reasons of compatibility with future applications.
- For every cyclic actual value, you must configure an area of 2 words as input area. For every cyclic setpoint value, you must configure an area of 2 words as output area at the PROFIBUS master. A range of 2 words is always required, even if the setpoint- or actual value in the V-Controller has 1 word width only.
  Usage of PPO type transmission (predefined transmission types for PROFIBUS) is not possible because these are based on single-word format. The option board, on the contrary requires a 2 word = 32 bit format.
- To use non-cyclic data communication you must define an area of 4 words as input- and output area.

The entire address range, consisting of non-cyclic and cyclic data, is also referred to as net data block. For the structure of the net data block see section ▹Structure of net data block◃ on page 41.

6.4.2 Area consistent data transmission

In the normal case, the PROFIBUS transmits data with 2 word consistency. This means that all data within these 2 words are guaranteed to be out of the same master cycle. This can lead to problems with the non-cyclic data communication within different master systems, because the consistency of the data over the entire non-cyclic date range of 4 words can no longer be guaranteed. Therefore the PROFIBUS card supports also the area consistent data transmission, i. e. consistency of data over the entire transmission range.
If the data transmission consistency is used, the required transmission range of the inputs and outputs must be supported by the PROFIBUS master. There are differences between the various PROFIBUS masters, so for instance the Siemens S7 can only transmit a transmission range of 32 byte consistently. In addition, the respective system functions of the master interface must be activated to ensure master transmission consistency.

6.4.3 Setting I/O area of standard modules

Setting the size of the transmission area is done in the PROFIBUS master by using setup-codes. To facilitate these settings, we have provided common used standard modules within the GSD file. These standard modules contain always a status- and control word as well as a defined number of setpoint- and actual values, but **no** non-cyclic data communication (see also ▹Standard modules without non-cyclic data communication◃ on page 34 up to ▹Standard modules for area consistent transmission◃ on page 35).
If standard modules are used (without non-cyclic data communication), the master must be configured as follows:

Module / code	Name	I-Adr.	O-Adr.	Remarks
0	x act. value(s), x setp. value(s)	xxxx	xxxx	fill in desired standard module
1				
2				
3				

However it is possible to configure in addition to a standard module a non-cyclic data module. In this case the master must be configured this way:

Module / code	Name	I-Adr.	O-Adr.	Remarks
0	non-cyclic data module	xxxx	xxxx	fill in non-cyclic data module
1	x act. value(s), x setp. value(s)	xxxx	xxxx	fill in desired standard module
2				
3				

It is important here to parameterize the non-cyclic data module before the standard module. (see also ▹Structure of net data block◃ on page 41).

NOTE

When the non-cyclic data communication shall be used, we generally recommend the application of area consistent transmission.

For the area consistent transmission there are standard modules available. They always consist of status- and control word, a defined number of setpoint- and actual values and non-cyclic data communication. Further keep in mind, that a combination of modules for area consistent transmission with additional single modules is not possible.

If you use the standard modules “consistency total address range” the master must be configured as follows:

Module / code	Name	I-Adr.	O-Adr.	Remarks
0	range x act./setp. value	xxxx	xxxx	fill in desired standard module
1				
2				
3				

To use consistent data transmission in the PROFIBUS master the related system functions must be activated to transmit data according to the slave´s settings.
A list of the individual modules you will find in section ▹I/O area codes◃ on page 34.

6.4.4 General setup of I/O area

Apart from transmission range setup over the standard modules there is also a possibility to setup using the single modules. Here the required area can be configured exactly to the number of setpoint- and actual values. However there is no consistency across the whole range possible.

To calculate the required I/O area you can use the following formula:

Formula to calculate the total I/O area

Input area = 4AI word non-cycl. data + 2AI stat. word + (No. cycl. act. val. x 2AI word)
Output area = 4AO word non-cycl. data + 2AO control word + (No. cycl. setp. val. x 2AO word)
The PROFIBUS master must be parameterized for this application as follows:

Module / code	Name	I-Adr.	O-Adr.	Remarks
0	non-cyclic data module	xxxx	xxxx	fill in non-cyclic data module
1	status/control module	xxxx	xxxx	fill in status/control module
2	x actual value(s)	xxxx		select desired number of actual values from list
3	x setpoint value(s)		xxxx	select desired number of setpoint values from list

NOTE
At the configuration the sequence of the single modules must be kept.

When the non-cyclic data transmission is desired, you must enter the non-cyclic data module always before the status-/control word module and the setpoint-/actual value modules. The status-/control word module must always be present and entered before the setpoint-/actual values. At least 1 cyclic setpoint value and 1 cyclic actual value per controller must be parameterized. The codes of the modules can be taken from the overview in section ▹I/O area codes◃ on page 34.
Because of the hereby fixed settings, the PROFIBUS card is able to perform a configuration check at commissioning and detect parameterization errors.
The transmission format of the individual values is generally 32 bit. The control- and status word on the PROFIBUS card side is also fixed on 32 bit, whereas the low-word (PZD 2) of the control word is presently unused.

6.5 I/O area codes

The transmission range setup in the PROFIBUS master is managed by the codes of the individual modules. To facilitate configuring, these are included with their name in the supplied GSD file and are displayed with this name normally within the operational software of the PROFIBUS master.

The order of the individual selection criteria in the respective configuring desktop menu of the master systems cannot be influenced by the GSD file. Therefore at each new configuration of a participant the menu may appear in another sequence at the PC.

The following codes with the respective name will contribute to a better overview over the possible settings or may be used for verification purposes. The code itself is listed in the column *PROFIBUS-DP code*, it contains all information necessary for the master to adjust system configuration.

6.5.1 Standard modules without non-cyclic data communication

Name	Non-cyclic data	Status- and control word	Address area	PROFIBUS-DP code
1 act.l val., 1 setp. val.	no	yes	4 AI/AO	0x73 (115_dec.)
2 act.l val., 2 setp. val.	no	yes	6 AI/AO	0x75 (117_dec.)
4 act.l val., 4 setp. val.	no	yes	10 AI/AO	0x79 (121_dec.)
8 act.l val., 1 setp. val.	no	yes	18 AI, 4 AO	0xC0, 81, 67
8 act.l val., 8 setp. val.	no	yes	18 AI, 18 AO	0xC0, 81, 81

NOTE

The standard modules always contain status- and control word and the given number of setpoint- and actual values.

6.5.2 Single modules for configuration

Name	Address area	PROFIBUS-DP code
Non-cyclic data	4 AI/AO	0x73 (115_dec.)
Status- and control word	2 AI/AO	0x71 (113_dec.)
1 actual value	2 AI	0x51 (81_dec.)
2 actual values	4 AI	0x53 (83_dec.)
3 actual values	6 AI	0x55 (85_dec.)
4 actual values	8 AI	0x57 (87_dec.)
5 actual values	10 AI	0x59 (89_dec.)
6 actual values	12 AI	0x5B (91_dez)
7 actual values	14 AI	0x5D (93_dec.)
8 actual values	16 AI	0x5F (95_dec.)
1 setpoint value	2 AO	0x61 (97_dec.)
2 setpoint values	4 AO	0x63 (99_dec.)
3 setpoint values	6 AO	0x65 (101_dec.)
4 setpoint values	8 AO	0x67 (103_dec.)
5 setpoint values	10 AO	0x69 (105_dec.)
6 setpoint values	12 AO	0x6B (107_dec.)
7 setpoint values	14 AO	0x6D (109_dec.)
8 setpoint values	16 AO	0x6F (111_dec.)

6.5.3 Standard modules for area consistent transmission

Name	Non-cyclic data	Status- and control word	Address area	PROFIBUS-DP code
1 actual value, 1 setpoint value	yes	yes	8 AI/AO	0xF7 (247_dec.)
2 actual values, 2 setpoint values	yes	yes	10 AI/AO	0xF9 (249_dec.)
4 actual values, 4 setpoint values	yes	yes	14 AI/AO	0xFB (251_dec.)
5 actual values, 5 setpoint values	yes	yes	16 AI/AO	0xFD (253_dec)
6 actual values, 6 setpoint values	yes	yes	18 AI/AO	0xFF (255_dec)
7 actual values, 7 setpoint values	yes	yes	20 AI, 20 AO	0xC0,209, 209
8 actual values, 1 setpoint value	yes	yes	22 AI, 8 AO	0xC0, 213, 199
8 actual values, 8 setpoint values	yes	yes	22 AI, 22 AO	0xC0, 213, 213

NOTE

To use area consistent transmission this must be supported by the PROFIBUS master also. Here there are different maximum area sizes possible.

Pay further attention to the fact, that the combination of modules for area consistent transmission with additional single modules is not possible.

6.6 Example: address allocation

The following example will show the configuration of the transmission area.

A configuration of 3 cyclic setpoint values and 1 cyclic actual value with non-cyclic data communication shall be set. The size of the address area will be automatically configured by the controller as follows:

Input area in master (Answer non-cyclic data and cyclic actual values):

4 AI	non-cyclic data (PKE, IND, PWE 1, PWE 2)
2 AI	status word
2 AI	actual value 1

The input area at PLC´s PROFIBUS-DP consists also of 8 input words (8 AI).

Output area in master (Request non-cyclic data and cyclic setpoint values):

4 AO	non-cyclic data range
2 AO	control word
6 AO	setpoint values 1 to 3

The output area at PLC´s PROFIBUS-DP consists also of 12 output words (12 AO).

Settings of the I/O area for this parameterization

Module / code	Name	I-Adr.	O-Adr.	Remarks
0	Non-cyclic data module	xxxx	xxxx	Fill in non-cyclic data module
1	Status/control module	xxxx	xxxx	Fill in status/control module
2	1 actual value	xxxx		Fill in 1 cyclic actual value
3	3 setpoint values		xxxx	Fill in 3 cyclic setpoint values

6.7 S7 Configuration example

In this section the configuration of the PROFIBUS card within a Siemens S7 is shown.

Before use of the PROFIBUS card first step must be to implement it into the programming tool of the PLC (refer to the Siemens documentation for the respective used version of the programming tool).
After that you generate the respective configuration of the PROFIBUS master system (here S7-300 DP), to setup a PROFIBUS communication:

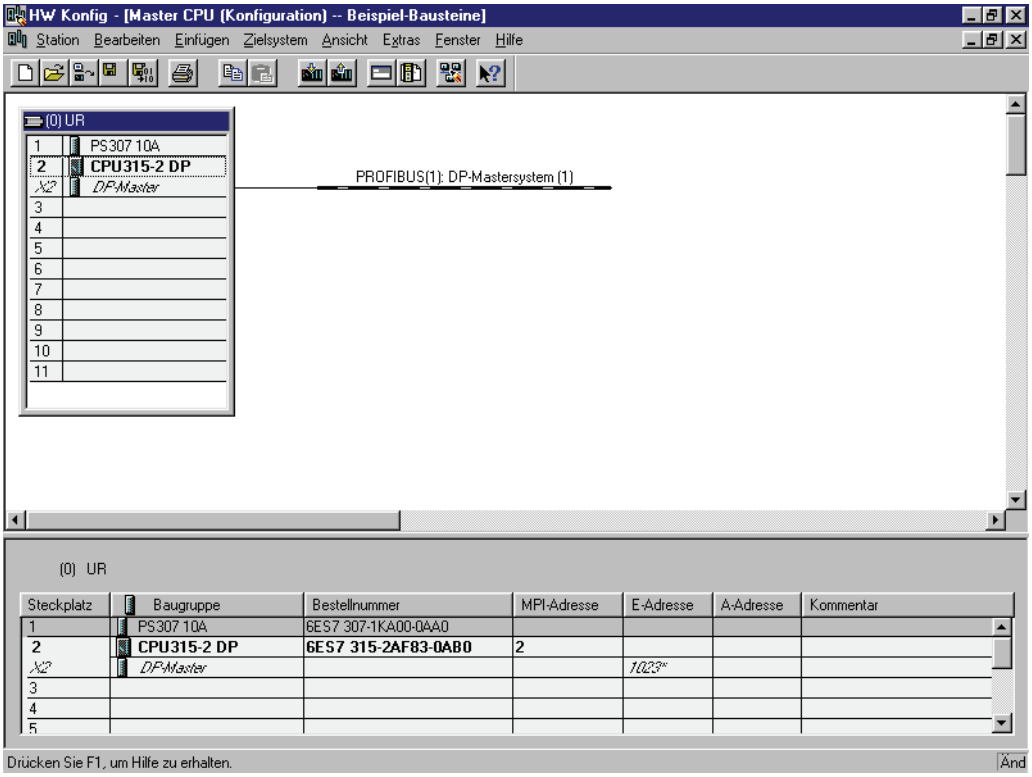


Figure 5: Configuration of PROFIBUS master system

After activation of the hardware catalog of the program desktop you can find, after import of the Baumüller GSD file, the module *BAPS-PBDP-01* can be found in the directory of the PROFIBUS components under *Other field devices -> drives*.
For setup of the Baumüller PROFIBUS participant the communication path *PROFIBUS* must be active (fat line below the PROFIBUS-DP lettering). If you doubleclick on the entry *BAPS-PBDP-01* you can setup a PROFIBUS participant. After you doubleclick, a window opens where you can make the required bus address settings of your participant.

After entering the address and return, the following hardware configuration window will appear at the program surface:

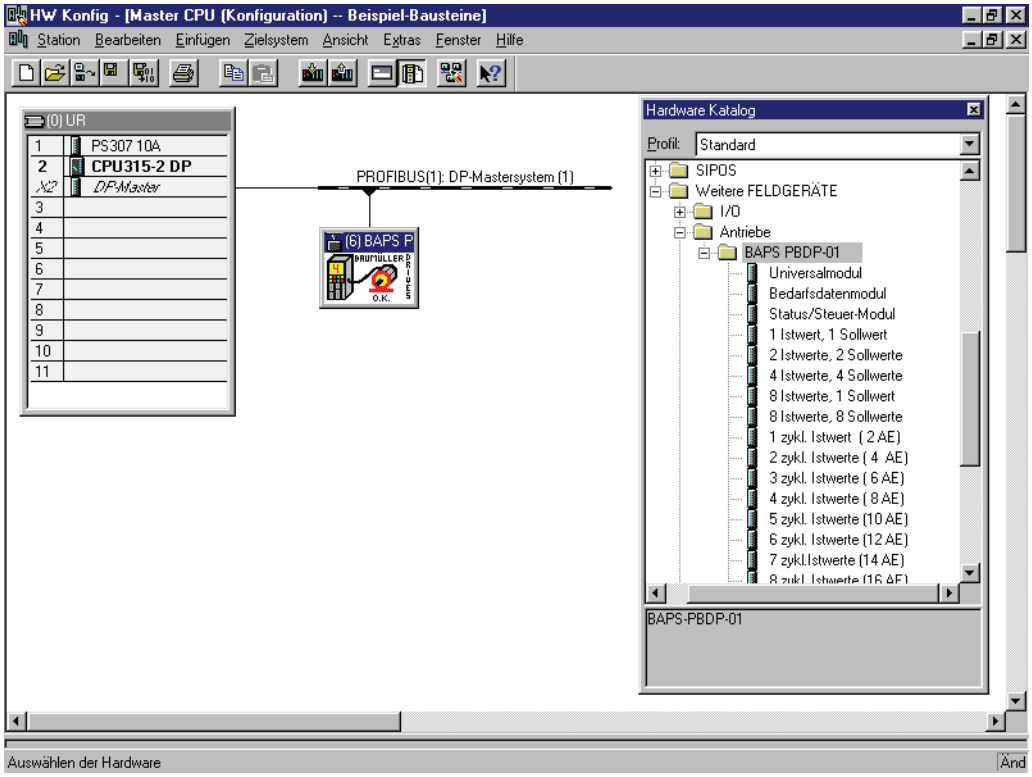


Figure 6: Configuration - select participant

To setup configuration of the Baumüller PROFIBUS participant you now must select the respective participant with your mouse -> a window *Slot, module/ DP code, ...* turns active. For input of the necessary data (example: parameterization 8 setpoint- / actual values and non-cyclic data) you must select *slot 0* with your mouse. If you doubleclick on *Non-cyclic data module* in the hardware catalog you will install this communication part.

Thereafter you must perform by the same way the settings of *Status-/control module*, the *8 cyclic actual values* and the *8 cyclic setpoint values*. Address setup of the individual communication parts can be freely selected by the user.

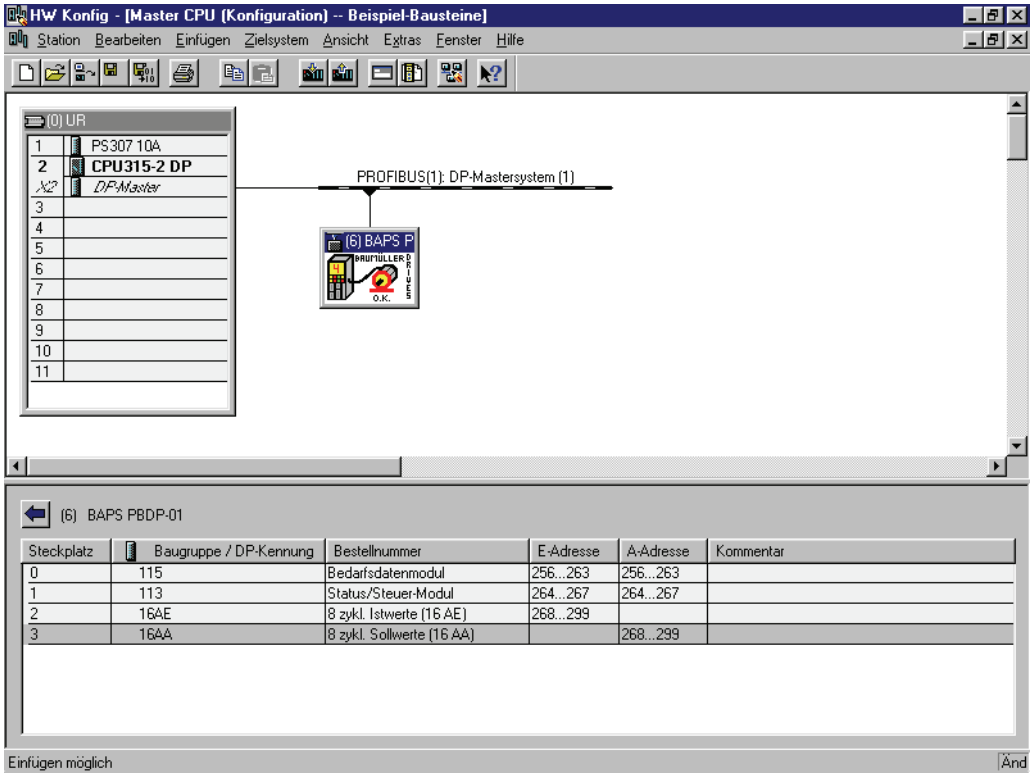


Figure 7: Configuration - module setup

After all necessary parameterization is done the now generated configuration must be transferred to the target system. Before transmission of the data you can perform a consistence test in the program to detect errors in the parameterization.

After restart of the plant (master and slaves) the PROFIBUS-DP should start without communications problems. If errors are displayed at the S7, by using the online diagnostics of the hardware configuration you can detect the cause of the error and eliminate it.

If you use consistent data transmission, the respective SFC`s within the S7 must be used to transmit consistent data.
For further information see section ▹Area consistent data transmission◃ on page 31.

6.8 Initialization problem at configuration errors

When the configuration of the number of setpoint- and actual values in the PROFIBUS master doesn´t match the configuration in the ZK parameters, the card displays this fact in an error code in the non-cyclic data area (see also ▹PKW area (non-cyclic data)◃ on page 43). The card then remains in initialisation mode and the data exchange of setpoint- and actual values with the V-Controller is cancelled.

If there was no non-cyclic data area configured, this error can be tracked by checking the BAPS parameters in the V-Controller:

The parameter P 176 (command word BAPS cyclic) and P 177 (acknowledge BAPS cyclic) then both will show the value 2. A correctly performed initialisation both will show the value 1.

6.9 Watchdog function

To be able to detect a bus master failure at the slave, at the configuration of the PROFIBUS master the Watchdog function for slaves must be activated. This option is not activated automatically by all masters. The Siemens S7 usually activates it automatically, Beckhoff systems do not.

Here at the settings for each slave there is a field „watchdog“. This has to be activated, so that the slave can detect a bus system failure. The watchdog time must be set depending on the respective bus cycle time. We recommend a 25% reserve.
To make the drive react on this, the communication monitoring within the V-Controller must be set respectively (see also ▹Basics of communication◃ from page 17).

WARNING

Warning indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury.
To monitor communication between V-Controller and PROFIBUS-DP, the monitoring function for the dual-port-RAM (cyclic data) must be activated by means of parameter *Communications monitoring (P 127)*, which will, after a adjustable time, release a fault reaction within the drive.

To activate the communications monitoring of the drive, the PROFIBUS settings must have the watchdog function for the slave activated.

If this monitoring is not activated bus errors can cause undefined system states in the drive which are unpredictable.

7

NET DATA BLOCK

In this chapter you will learn about the structure of the net data block as well as the sequence and the protocol of the non-cyclic data communication.

7.1 Structure of net data block

The net data block (corresponds to the address area in the master) consists of 2 areas:

- PKW (parameter code value) = non-cyclic data area
- PZD (process data area) = cyclic area

The PKW area is the data area of the non-cyclic data communication. It is there only when it has been configured in PROFIBUS. The size of the PKW area is limited to 4 words and cannot be altered.
The process data area is used for cyclic data communication with the Controller, being the fastest way of data transmission of status- and control word as well as setpoint- and actual values. The size of this area depends on the configuration selected. (see also section ▹Determination of address range◃ on page 30).

In the following you will learn about a configuration example containing non-cyclic data, status- and control word as well as 2 cyclic setpoint- and actual values.
Example: Net data block for non-cyclic data, status- and control word, 2 cyclic setpoint- and actual values:

PKW area				**PZD area**					
PKE	IND	PWE 1	PWE 2	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6
0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
4 AI for answer non-cyclic data				status word	res.	cyclic actual value 1		cyclic actual value 2	
4 AO for request non-cyclic data				control word	res.	cyclic setpoint value 1		cyclic setpoint value 2	
				6 AI / AO for request / answer PZD					

Settings I/O range for this parameterization

For this configuration the following settings in the PROFIBUS master are required:

- 4 AI/AO for non-cyclic data
- 6 AI for cyclic status word and 2 cyclic actual value
- 6 AO for cyclic control word and 2 cyclic setpoint value

This can be achieved either using standard modules or by combination of single modules. The options possible are shown below A), B) and C):

A) Configuration of address range using standard modules

Module / code	Name	I-Addr.	O-Addr.	PROFIBUS-DP code
0	non-cyclic data module	xxxx	xxxx	0x73
1	2 actual values, 2 setpoint values (incl. status-/control word)	xxxx	xxxx	0x75

B) Address range setup using single modules

Module / code	Name	I-Addr.	O-Addr.	PROFIBUS-DP code
0	non-cyclic data module	xxxx	xxxx	0x73
1	status- and control module	xxxx	xxxx	0x71
2	2 actual values	xxxx		0x53
3	2 setpoint values		xxxx	0x63

C) Using area-consistent transmission

Module / code	Name	I-Addr.	O-Addr.	PROFIBUS-DP code
0	area 2 act.-/setp. val. (incl. status-/control word and non-cyclic data)	xxxx	xxxx	0xF9

Comments to the above settings

All of the 3 parameterizations configure the same address range for data transmission. The examples above show the card´s possibilities of configuration.

Both parameterizations (A and B) are identical in functionality, but the B parameterization can be more easily changed for a new and even different number of cyclic setpoint- and actual values because only one entry with address range determination must be changed.

The C variant in contrary has a different function too because data are being transmitted area-consistent. However this must be supported by the PROFIBUS master, too.

Address assignment in a S7 for above example

The address assignment shown serves as an example only. Normally it will look different depending on the application. Here we will point to the relation of the net data block configured within PROFIBUS and input and output addresses of the automation system.

Input area: actual values and answer non-cyclic data

PKW area				PZD area					
PKE	IND	PWE 1	PWE 2	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6
0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
4 AI for answer non-cyclic data				status word	res.	cyclic actual value 1		cyclic actual value 2	
ED10		ED14		ED18		ED22		ED26	
EW10	EW12	EW14	EW16						

Output area: setpoint values and request non-cyclic data

PKW area				PZD area					
PKE	IND	PWE 1	PWE 2	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6
0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
4 AI for request non-cyclic data				control word	res.	cyclic setpoint value 1		cyclic setpoint value 2	
AD10		AD14		AD16		AD22		AD26	
AW10	AW12	AW14	AW16						

7.2 PKW area (non-cyclic data)

The PKW area of the net data block is used for transmission of non-cyclic data communication. This area exist only if the non-cyclic data communication is configured in the PROFIBUS master. The size of this area is restricted to 4 words and cannot be altered.

7.3 Design of PKW area

The complete PKW area is divided into PKE areas (parameter-code, for parameter number and request- or answer code), IND (index, for access on parameter specific informations) and PWE 1 as well as PWE 2 (for the value to be transmitted). The design is the same for data transmission from master to slave as well as vice versa.

The meaning of the single sections will be learned in the following. An overview of the partitions is shown in the table below:

1 word	1 word	1 word	1 word
PKE	IND	PWE 1	PWE 2
Request / answer code	Index	High-word value	Low-word value

7.3.1 Design of parameter code (PKE)

PKE		
AK	R	PNU
15 14 13 12	11	10 9 8 7 6 5 4 3 2 1 0

The parameter code *PKE* in the PKW area is divided into parameter number *PNU* (bit 0 through 10), a reserve bit *R* (bit 11) and the request- or answer code *AK* (bit 12 through 15). Based on this partition of the parameter code (PKE) every parameter can be read or written in the Controller.
The parameter code is different at send or receive mode (seen from the PROFIBUS master) only in the meaning of the AK field. At “send“ the request code is placed here, at “receive“ the answer code of the Controller.

These request- or answer codes determine the exact significance of the other fields in the PKW area.

For the process of the non-cyclic data communication it is important, that the PKE field is written last with the new request, surely after the other fields (IND and PWE) were written to. At the end of a request the PKE field must be set to 0 first place. Only now it is ensured, that no invalid request will be sent.

7.3.2 Request code PLC to V-Controller

The master determines the ordered action by means of the request code. An overview over the valid request codes is given in the following table. A detailed description with examples is located in the section ▹Non-cyclic data communication◃ on page 50.

PKE (w/o PNU)	Function	Description
0000_hex	no request	no request for non-cyclic data
1xxx_hex	request PWE	read parameter from V-Controller
2xxx_hex	change PWE (word)	write parameter word-format to V-Controller
3xxx_hex	change PWE (double word)	write parameter double word to V-Controller
4xxx_hex	request PBE-element	read parameter description
8xxx_hex	initialize PZD setpoint values	initialize cyclic setpoint values
9xxx_hex	initialize PZD actual values	initialize cyclic actual values

7.3.3 Answer code V-Controller to PLC

After processing, each request is confirmed by the Controller with an answer. The respective answer codes are predefined.

PKE (w/o PNU)	Function	Meaning
0000_hex	no answer	no answer
1xxx_hex	PWE word transmitted	parameter word-format transmitted
2xxx_hex	PWE double-word transmitted	parameter double-word transmitted
3xxx_hex	PBE element transmitted	parameter description element transmitted
7xxx_hex	request not executable	error detected in PWE -> error log
8xxx_hex	PZD setpoint value initialized	cyclic setpoint values initialized
9xxx_hex	PZD actual value initialized	cyclic setpoint values initialized

If the request is carried out successfully, the respective answer code is sent and the value of the respective input area is reported back as mirrored value.

If a request is not executable, the answer code “request not executable“ is sent and within PWE 2 a error code is reported back which can be interpreted by the PROFIBUS master.

7.3.4 PWE 2 error codes

If a request is not executable by the Controller , the answer code *7xxx_hex* for *request not executable* is delivered back. In the PWE 2 area an error code is reported back additionally

PWE 2 value	Meaning
0000_hex	no error
0001_hex	parameter cannot be altered
0002_hex	value out of MIN / MAX limits
0003_hex	false index entry
0004_hex	no array
0005_hex	false data type
0006_hex	setting not permitted
0007_hex	description element cannot be altered
0008_hex	forbidden parameter number
0009 - 0079_hex	reserved
0080_hex	received command cannot be interpreted
0081_hex	no configuration / initialization carried out
0082_hex	cannot read actual value
0083_hex	cannot write setpoint value
0084_hex	actual value – configuration error
0085_hex	setpoint value – configuration error
0086 - 0100_hex	reserved
0101_hex	indefinite error
0102_hex	service not implemented
0103_hex	parameter format exceeds PKW area
0104_hex	no parameter Info (request using index)

Partially the error codes are displayed within V-Controller Parameter P 177 (BAPS Z slave acknowledge). Somehow not all error codes can be displayed, because some of the codes can be sent to the master by use of PROFIBUS-DP only.

7.3.5 Meaning of IND (Index) field

Index value	Read action
0001_hex	parameter attribute
0002_hex	parameter info
0005_hex	parameter minimum value
0006_hex	parameter maximum value

The above given meaning of the *IND* (Index) field is valid only together with the request codes *request parameter description element (PBE)*. For this request, the IND value must determine, which element must be read from the parameter description.

Furthermore, this field is used for the requests *PZD initialize setpoint values* and *PZD initialize actual values* if single setpoint- and actual values shall remain unparameterized. It is then used to enter setpoint- and actual value numbers.

NOTE

At requests other than *request parameter description element (PBE), initialize setpoint values* or *PZD initialize actual values* the IND field must be 0 (zero)!

7.3.6 Read acknowledgement value parameter attribute

When reading the parameter attributes using *request PBE*, the Controller reports back a specially coded attribute information in the element PWE 2. The meaning of the individual bits is shown in the following table

Bit	Meaning	Determination	Description
0 – 1	data length of element in byte	00 1 byte 01 2 byte 10 4 byte 11 8 byte	
2 – 3	data type of element	00 SIGNED 01 UNSIGNED 10 FLOAT	integer with sign integer without sign floating point number
4 – 5	number of elements	00 FIXED 01 VARIABLE	one element variable number of elements
6 – 7	element type	00 DATA 01 COMMAND	
8 – 11	display format	0000 BIN 0001 DEC 0010 HEX 0100 NORM 0101 FIX 0110 SCI 0111 ENG 1000 ASCII	binary decimal hexadecimal floating point without exponent floating point with fixed exponent floating point scientific floating point technical ASCII character
12 – 15	decimal place	0000 0 1111 15	no decimal place 15 decimal places

7.3.7 Read acknowledgement value parameter info

On reading the parameter info using the *request PBE* the V-Controller reports back additional parameter information in the element PWE 2. This information is coded bit-wise too. The meaning is shown in the following table

Bit	Meaning	Determination	Description
0 – 2	write protection	000 UNPROTECTED 001 PROTECTED	not protected write protected
3	store mode	00 NONSTORE 01 STORE	parameter value will not be stored parameter value will be stored in set of data
4 – 15	reserved		

7.4 Non-cyclic data communication sequence

The non-cyclic data communication is required for parameterization- and diagnostic functions. The processing of the non-cyclic data requests is executed in the Controller with low priority, so we cannot state any guaranteed processing- or actualization times.

The following sequence of non-cyclic data communication must be kept:

- enter PWE and IND values
- after (!) that, enter parameter number and request code within PKE
- wait for the Controller answer (or error code of card)
- read the values received by the Controller
- end the request by erasing (setting to zero) the PKE, PWE and IND

Furthermore, the non-cyclic data communication has the following basics:

- Only one request per slave must be active, this means the sequence of the non-cyclic data communication always has to be like this:
  1. activate non-cyclic data function from the masters side.
  2. wait for answer of Controller.
  3. deactivate non-cyclic data function by writing zero into address area *non-cyclic data*.

  ▸ An actual request can always be erased with the function *no request* (enter zero in address area non-cyclic data).
- Within the master it must be assured either by the program or by *command / monitor variable*, that the PKE value is entered only after the PWE and IND values have been entered.
- If the master receives an answer code different from expected this must be intercepted within the master (PLC).
- The Controller awaits no acknowledgement from the PLC whether the Controller´s answer has been arrived.
- The non-cyclic data communication takes place asynchronous to the cyclic communication of the setpoint- and actual values. For a distinctive time the card tries to carry out the requested function. If the function cannot be carried out at the actual time, an error code is reported back and you can start another attempt to carry out the function.

7.5 Non-cyclic data communication

7.5.1 Read parameters (word or double-word)

Design of the PKW area sent:

PKE	IND	PWE 1	PWE 2
1xxx	0000	0000	0000

- request code for read parameter value: 1
- parameter number in PNU field of the PKE.
- index field (IND) always 0.

In accordance to the parameter format (word or double-word) the following answers are delivered back, if the execution was error-free:

The word-parameters answer code is 1 and the parameter´s content is displayed in PWE 2.

PKE	IND	PWE 1	PWE 2
1xxx	0000	0000	xxxx

The double-word parameters answer code is 2 and the parameter´s content is displayed in PWE 1 (high word) and PWE 2 (low word).

PKE	IND	PWE 1	PWE 2
2xxx	0000	xxxx	xxxx

If an error occurs throughout execution, the answer code 7 (request not executable) is reported back and the reason of the error is specified closer in the PWE 2 field:

PKE	IND	PWE 1	PWE 2
7xxx	0000	0000	xxxx

Possible error reasons

- The parameter to be read is parameterized as a cyclic setpoint- or actual value and a non-cyclic data communication is not possible at present.
- No release of non-cyclic data communication; check Controller´s ▸ P 126.
- Prior non-cyclic data communication not erased with *no request* (PKE = 0).

Example

Parameter 218 L Rev-actual value shall be read using non-cyclic data communication. For this the following settings must be applied to the output area of the non-cyclic data:

PKE	IND	PWE 1	PWE 2
10DA	0000	0000	0000

As a return code for *read without error* the following answer will be reported at the input area:

PKE	IND	PWE 1	PWE 2
20DA	0000	xxxx	xxxx

In PWE 1 and PWE 2 the double-word value of parameter 218 L Rev-actual value will be present.
In case of an error the following will be reported:

PKE	IND	PWE 1	PWE 2
70DA	0000	0000	0082

PWE 2 holds the error code 82_hex. This value cannot be read.

7.5.2 Write parameter (word)

Design of the PKW area sent:

PKE	IND	PWE 1	PWE 2
2xxx	0000	0000	xxxx

- request code for write word-parameter: 2
- parameter number in PNU field of PKE.
- index field (IND) always 0.
- value to be written in PWE 2

The error-free execution is confirmed by answer code 1 (PWE transmitted word) and the value written being at PWE 2.

PKE	IND	PWE 1	PWE 2
1xxx	0000	0000	xxxx

If there is an execution error, the answer code 7 (request not executable) is reported back and the error cause is specified closer in the PWE 2 field:

PKE	IND	PWE 1	PWE 2
7xxx	0000	0000	xxxx

Possible error reasons

- The parameter to be written is parameterized as a cyclic setpoint- or actual value and a non-cyclic data communication is not possible at present.
- No release of non-cyclic data communication; check Controller´s ▸ P 126.
- Prior non-cyclic data communication not erased with *no request* (PKE = 0).

Example

Parameter *P127 M communication monitoring* shall be set to the value 4 (activate monitoring of cyclic data communication).

PKE	IND	PWE 1	PWE 2
207F	0000	0000	0004

As feedback for *write without error* the following answer will be:

PKE	IND	PWE 1	PWE 2
107F	0000	0000	0004

PWE will hold a copy of the value written.

In case of an error the following will be reported:

PKE	IND	PWE 1	PWE 2
707F	0000	0000	0083

PWE 2 holds the error code 83_hex. This value cannot be written.

7.5.3 Write parameter (double-word)

Design of the PKW area sent:

PKE	IND	PWE 1	PWE 2
3xxx	0000	xxxx	xxxx

- request code for request of parameter description element: 3
- parameter number in PNU field of PKE.
- index field (IND) always 0.
- value to be written in PWE 1 (High-word) and PWE 2 (Low-word).

The error-free execution is confirmed by answer code 2 (PWE transmitted double-word) and the value written being at PWE 1 and PWE 2.

PKE	IND	PWE 1	PWE 2
2xxx	0000	xxxx	xxxx

If there is an execution error, the answer code 7 (request not executable) is reported back and the error cause is specified closer in the PWE 2 field:

PKE	IND	PWE 1	PWE 2
7xxx	0000	0000	xxxx

Possible error reasons

- The parameter to be written is parameterized as a cyclic setpoint- or actual value and a non-cyclic data communication is not possible at present.
- No release of non-cyclic data communication; check Controller´s ▸ P 126.
- Prior non-cyclic data communication not erased with *no request* (PKE = 0).

7.5.4 Request parameter description element (PBE)

Design of the PKW area sent:

PKE	IND	PWE 1	PWE 2
4xxx	xxxx	0000	0000

- request code to order a parameter description element: 4
- parameter number in PNU field of PKE.
- index field (IND) on desired description element.

The error-free execution is confirmed by answer code 3 (PBE element transmitted) and the requested element in being at PWE 2.

PKE	IND	PWE 1	PWE 2
3xxx	xxxx	0000	xxxx

If there is an execution error, the answer code 7 (request not executable) is reported back and the error cause is specified closer in the PWE 2 field:

PKE	IND	PWE 1	PWE 2
7xxx	xxxx	0000	xxxx

Possible error reasons

- The parameter to be written is parameterized as a cyclic setpoint- or actual value and a non-cyclic data communication is not possible at present.
- No release of non-cyclic data communication; check Controller´s ▸ P 126.
- Prior non-cyclic data communication not erased with *no request* (PKE = 0).

Example

The maximum value shall be read from parameter *126 M communication source*.

PKE	IND	PWE 1	PWE 2
407E	0006	0000	0000

The following answer is sent in case of error-free reading:

PKE	IND	PWE 1	PWE 2
307E	0006	0000	000F

PWE will hold the maximum value of parameter 126: 000F_hex.
In case of an error the following is reported back:

PKE	IND	PWE 1	PWE 2
707E	xxxx	xxxx	xxxx

PWE 2 holds the respective error code.

7.5.5 PZD initialize setpoint values

NOTE
With *PZD initialize setpoint values* the ZK parameters are not altered.
At switch-off of the Controller the initialized setpoint values are not erased.

There are two possible ways of cyclic setpoint value initialization:

- total cyclic setpoint value alteration (prerequisite: number cyclic setpoint values = number cyclic actual values).
- alteration of single cyclic setpoint values (always setup new all setpoint values from the first altered setpoint value, even the setpoint values that haven't changed).

Initialize new all setpoint values

- prerequisite: number of cyclic setpoint values meets the number of cyclic actual values.
- request code for initialize PZD setpoint values: 8
- no parameter number (PNU to 0)
- index field (IND) and PWE to 0.
- enter parameter numbers of setpoint values in respective PZD addresses (setpoint value 1 in PZD 4, setpoint value 2 in PZD 6, setpoint value 3 in PZD 8 ...)

PKE	IND	PWE 1	PWE 2	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6	PZD 7	PZD 8
8000	0000	0000	0000	0000	0000	0000	xxxx	0000	xxxx	0000	xxxx
PKW area				control word	res.	parameter No. of setpoint value 1		parameter No. of setpoint value 2		parameter No. of setpoint value 3	

In case of error-free initialization, the preset setpoint values are reported back as a copy and the respective answer code is displayed:

PKE	IND	PWE 1	PWE 2	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6	PZD 7	PZD 8
8000	0000	0000	0000	0000	0000	0000	xxxx	0000	xxxx	0000	xxxx
PKW area				status word	res.	copy of param. no. of setpoint value 1		copy of param. no. of setpoint value 2		copy of param. no. of setpoint value 3	

In case of an error the answer code 7 is reported back:

PKE	IND	PWE 1	PWE 2	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6	PZD 7	PZD 8
7000	0000	0000	xxxx	0000	0000	0000	xxxx	0000	xxxx	0000	xxxx
PKW area				status word	res.	copy of param. no. of setpoint value 1		copy of param. no. of setpoint value 2		copy of param. no. of setpoint value 3	

The exact error code will be reported back within PWE 2 where it can be used for closer interpretation.

Possible error reasons

- No release of non-cyclic data communication; check Controller ▸ P 126.
- Prior non-cyclic data communication not erased with *no request* (PKE = 0).

Example

Prerequisite:
The Controller address area has been switched to 2 cyclic setpoint- and actual values with non-cyclic data module.
The following 2 cyclic setpoint values shall be altered using *PZD setpoint value initialization*:

setp. value1	HLG input 1	P 002 (002_hex)
setp. value 2	N M-limit bipolar	P 053 (035_hex)

PKE	IND	PWE 1	PWE 2	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6
8000	0000	0000	0000	0000	0000	0000	0002	0000	0035
write non-cyclic data				control word	res.	Parameter No. of setpoint value 1		Parameter No. of setpoint value 2	

NOTE

This function requires all setpoint values to be initialized. To do so, the respective setpoint value numbers must be entered into the data fields PZD 4, PZD 6, PZD 8, PZD 10, PZD 12, PZD 14, PZD 16, PZD 18.

In case of error-free initialization the preset setpoint values are reported back as a copy and the respective answer code is set:

PKE	IND	PWE 1	PWE 2	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6
8000	0000	0000	0000	0000	0000	0000	0002	0000	0035
read non-cyclic data				status word	res.	Copy of parameter No. of setpoint value 1		Copy of parameter No. of setpoint value 2	

In case of an error, the following will be reported back:

PKE	IND	PWE 1	PWE 2	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6
7000	0000	0000	0000	0000	0000	0000	0002	0000	0035
read non-cyclic data				status word	res.	Copy of parameter No. of setpoint value 1		Copy of parameter No. of setpoint value 2	

Change cyclic setpoint value

Using the same request code, a single cyclic setpoint value´s parameterization can be altered. To do so, you must enter the number of the setpoint value (1 to 8) to be altered into the index field (IND).

NOTE

Certainly the initialization must be carried out from this setpoint value up to the last available setpoint value.

Values of PKW area

- initialize request code for setpoint value: 8
- state no parameter number (PNU field of PKE to 0).
- enter setpoint value to be altered into index field (IND).
- enter desired parameter number for this setpoint value in PWE

PKE	IND	PWE 1	PWE 2
8000	xxxx	0000	xxxx
write non-cyclic data			

If initialization of setpoint value is error-free, the setpoint value is reported back within PWE as a copy:

PKE	IND	PWE 1	PWE 2
8000	xxxx	0000	xxxx
read non-cyclic data			

In case of an error, the answer code 7 (request not executable) is reported back together with a detailed error code:

PKE	IND	PWE 1	PWE 2
7000	xxxx	0000	xxxx
read non-cyclic data			

After the non-cyclic data interface is erased, the following will be reported back at incomplete setpoint value initialization:

PKE	IND	PWE 1	PWE 2
7000	0000	0000	0085
read non-cyclic data			

This means that cyclic setpoint value initialization is no longer valid and must be followed to the end (carry out individual initialization to the last setpoint value).

Possible error cause

- No release of non-cyclic data communication; check Controller ▸ P 126.
- Prior non-cyclic data communication not erased with *no request* (PKE = 0).
- not all setpoint values have been adjusted new (always setup new all setpoint values from the first altered setpoint value, even the setpoint values that haven't changed).

Example

As an example the 6th setpoint value of parameter number *P 248 G2 Delta Phi 32* shall be changed.

PKE	IND	PWE 1	PWE 2
8000	0006	0000	00F8
write non-cyclic data			

If initialization is error-free, the setpoint value is reported back and a respective answer code is set:

PKE	IND	PWE 1	PWE 2
8000	0006	0000	00F8
read non-cyclic data			

In case of an error the following will be reported back:

PKE	IND	PWE 1	PWE 2
7000	0006	0000	xxxx
read non-cyclic data			

After the non-cyclic data interface is erased in case of incomplete setpoint value initialization the following will be reported back:

PKE	IND	PWE 1	PWE 2
7000	0000	0000	0085
read non-cyclic data			

This means that cyclic setpoint value initialization is no longer valid and must be followed to the end (carry out individual initialization to the last setpoint value).

NOTE
The parameterization of the card can be altered with this function if at commissioning of Controller the error code 85 is reported within PWE 2 of the non-cyclic data area.

7.5.6 PZD actual value initialization

NOTE

With *PZD actual value initialization* the ZK parameters remain unchanged.
If the Controller is switched-off, the actual values initialized are being erased.

There are two ways to initialize the cyclic actual values:

- change together all parameterized cyclic actual values
  (prerequisite: number of cyclic setpoint values = number of cyclic actual values)
- alteration of single cyclic actual values (from the actual value altered up to the last actual value all must be initialized new).

Initialize new all actual values

- initialize request code for PZD actual values: 9
- no parameter number (PNU to 0)
- index field (IND) and PWE to 0.
- enter Parameter numbers of actual values into the respective PZD addresses (actual value 1 in PZD 4, actual value 2 in PZD 6, actual value 3 in PZD 8.)

PKE	IND	PWE 1	PWE 2	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6	PZD 7	PZD 8
9000	0000	0000	0000	0000	0000	0000	xxxx	0000	xxxx	0000	xxxx
PKW area				control word	res.	Parameter No. of actual value 1		Parameter No. of actual value 2		Parameter No. of actual value 3	

NOTE

With this function, all actual values must be initialized. To do so, the respective actual value numbers must be entered in the data fields PZD 4, PZD 6, PZD 8, PZD 10, PZD 12, PZD 14, PZD 16, PZD 18.

In case of error-free initialization the preset actual values are reported back as a copy and the respective answer code is set

PKE	IND	PWE 1	PWE 2	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6	PZD 7	PZD 8
9000	0000	0000	0000	0000	0000	0000	xxxx	0000	xxxx	0000	xxxx
PKW area				status word	res.	copy of param. no. of setpoint value 1		copy of param. no. of setpoint value 2		copy of param. no. of setpoint value 3	

In case of an error, the following will be reported back:

PKE	IND	PWE 1	PWE 2	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6	PZD 7	PZD 8
7000	0000	0000	xxxx	0000	0000	0000	xxxx	0000	xxxx	0000	xxxx
PKW area				status word	res.	copy of param. no. of setpoint value 1		copy of param. no. of setpoint value 2		copy of param. no. of setpoint value 3	

In PWE 2 an error code is reported back which holds information about the exact error cause.

Possible error causes

- No release of non-cyclic data communication; check Controller ▸ P 126.
- Prior non-cyclic data communication not erased with *no request* (PKE = 0).

Example

The following 2 cyclic actual values shall be changed using function *PZD initialize actual values*:

actual value 1	N actual value	P051(0033_hex)
actual value 2	N Controller output	P052(0034_hex)

PKE	IND	PWE 1	PWE 2	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6
9000	0000	0000	0000	0000	0000	0000	0033	0000	0034
write non-cyclic data				ctrl. word	res.	Parameter No. of actual value 1		Parameter No. of actual value 2	

In case of error-free initialization the preset actual values are reported back as a copy and the respective answer code is set:

PKE	IND	PWE 1	PWE 2	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6
9000	0000	0000	0000	0000	0000	0000	0033	0000	0034
read non-cyclic data				stat. word	res.	copy of param. no. of setpoint value 1		copy of param. no. of setpoint value 2	

In case of an error the error the following will be reported back:

PKE	IND	PWE 1	PWE 2	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6
7000	0000	0000	xxxx	0000	0000	0000	0033	0000	0034
read non-cyclic data				status word	res.	copy of param. no. of setpoint value 1		copy of param. no. of setpoint value 2	

Within PWE 2 an error code will be reported back which holds information about the exact error cause.

Change a cyclic actual value

Using the same request code it is possible to change the parameterization of a single cyclic actual value. The number (1 to 8) of the actual value to be changed must be entered into the index field (IND).

NOTE

Certainly the initialization must be carried out from this actual value up to the last available actual value.

PKW area values

Initialize request code for actual value: 9

Enter no parameter number (PNU field of the PKE to 0).

Enter actual value to be altered into index field (IND).
Enter desired parameter number for this actual value into PWE

PKE	IND	PWE 1	PWE 2
9000	xxxx	0000	xxxx
write non-cyclic data			

In case of error-free initialization the actual value is reported back as a copy in the PWE:

PKE	IND	PWE 1	PWE 2
9000	xxxx	0000	xxxx
read non-cyclic data			

In case of an error the answer code 7 (request not executable) is reported back together with a detailed error code to the PWE:

PKE	IND	PWE 1	PWE 2
7000	xxxx	0000	xxxx
read non-cyclic data			

After erasing the non-cyclic data interface the following will be reported back in case of incomplete actual value initialization:

PKE	IND	PWE 1	PWE 2
7000	0000	0000	0084
read non-cyclic data			

This means, that the initialization of the cyclic actual values is no longer valid and must be concluded ▸ carry out each single initialization up to the last setpoint value.

Possible error causes

- No release of non-cyclic data communication; check Controller ▸ P 126.
- Prior non-cyclic data communication not erased with *no request* (PKE = 0).
- Not all actual values have been setup new (always setup new all actual values from the first altered actual value, even the actual values that haven't changed).

Example

For example, the 5th actual value of parameter number *P209 L actual value* (00D1_hex) shall be changed.

PKE	IND	PWE 1	PWE 2
9000	0005	0000	00D1
write non-cyclic data			

In case of error-free initialization the preset actual value is reported back as a copy and the respective answer code is set:

PKE	IND	PWE 1	PWE 2
9000	0005	0000	00D1
read non-cyclic data			

In case of an error the following is reported back:

PKE	IND	PWE 1	PWE 2
7000	0005	0000	xxxx
read non-cyclic data			

After erasing the non-cyclic data interface the following will be reported back in case of incomplete actual value initialization:

PKE	IND	PWE 1	PWE 2
7000	0000	0000	0084
read non-cyclic data			

This means, that the initialization of the cyclic actual values is no longer valid and must be concluded (carry out each single initialization up to the last actual value).

NOTE
By use of this function the parameterization of the card can be altered, if the error code 84 is displayed in PWE 2 of the non-cyclic data area at commissioning of the Controllers.

7.6 PROFIBUS-DP diagnostic function

The integrated diagnostic function of PROFIBUS-DP enable to read-out of status information from the DP slaves. Please keep in mind that the cyclic communication will be terminated with this function and no more setpoint- and actual values are transmitted over the bus.

NOTE
If the Controller´s communication monitor is switched on, the activation of the diagnostic function causes an error reaction, because the cyclic transmission of setpoint- and actual values is stopped.

8

ERROR DETECTION AND TROUBLESHOOTING

In this chapter you will find information about possible errors. The errors are divided into 4 groups. The first 3 groups refer to

- commissioning
- cyclic data communication
- non-cyclic data communication

Errors which cannot be found in one of these groups you will find under

- other

8.1 Commissioning

Problem	Possible cause and help
error 0003_hex (cyclic data monitoring)	The monitoring time for cyclic communication preset on the Controller is up: a) PROFIBUS master takes more than the preset time at commissioning: ▶ set the monitoring time using non-cyclic data as soon as the master is running ▶ switch on the Controller only after master is ready (this however will delay commissioning). b) there are differences in the configuration between PROFIBUS-DP master and V-Controller: ▶ check parameter P 177 acknowledge BAPS Z for error messages. ▶ if parameterization of master differs from slave adapt settings. c) if the V-Controller´s communication is blocked for PROFIBUS-DP: ▶ check communication source parameter P 126 (also see section ▹Communication sources◃ on page 17).
error 0004_hex (non-cyclic data monitoring)	The monitoring time for non-cyclic data communication preset on the V-Controller is up: monitoring of non-cyclic data is in most cases not reasonable, because within the stated time a non-cyclic data communication must be carried out. At request of a non-cyclic data communication the card will monitor execution of the communication. If timeout is exceeded, an error will be reported as an answer code. ▶ switch off non-cyclic data monitoring
no setpoint- or actual value transmission	The PROFIBUS-DP master and V-Controller settings are different: ▶ check for error entries in PWE of non-cyclic data area. or ▶ check acknowledgement BAPS Z of parameter P 177 acknowledge BAPS Z for error messages. ▶ set hardware address area and station address. ▶ check master configuration. ▶ check BAPS parameter in V-Controller: P 175 = 1; P 176 = 2; P 177 = 2; P 178 = 11 ZK-parameter settings are not the same as the master´s requirement. ▶ check settings of additional card operation mode (ZK 30).
bus error at master	▶ check setting of participant number at V-Controller and within hardware configuration of PROFIBUS-DP masters. ▶ activate diagnostics in master system for troubleshooting and follow the instructions.
error code setpoint -or actual value configuration has errors (error code 0084 or 0085_hex in non-cyclic data or Controller)	The Controller configuration doesn't match the PLC´s requirement: ▶ check ZK parameter settings (setpoint- / actual value numbers) see also section ▹Configuration of setpoint- and actual values◃ on page 22 ▶ check bus master parameterization see also section ▹Determination of address range◃ on page 30.

8.2 Cyclic communication

Problem	Possible cause and help
error 0003_hex (cyclic data monitoring)	Monitoring time preset at Controller is up: PROFIBUS DP has passed no more telegrams to the slave within the preset monitoring time. ▶ activate diagnostics in the hardware configuration of the masters to check for error cause: ▶ check PROFIBUS-DP connector at master and all slaves (connection made and terminating resistor activated at beginning and end?). if the V-Controller´s communication is blocked for PROFIBUS-DP ▶ check parameter *P 126 communication source* (see also section ▹Communication sources◃ on page 17). The CPU's service mode in the PLC has been changed ▶ Restart PROFIBUS master
during one program cycle the actual values have changed (start until OB 1 end)	Based on the cycle time of the user program in the PLC and the asynchronous data actualization to it using PROFIBUS-DP it is possible for the program to detect via direct access to the PAE area (process image of inputs) a meanwhile altered actual value (actual value was been actualized by the bus system) within one program cycle. ▶ make changes in the user program of the PLC!
setpoint value of PLC sometimes does not match the desired setpoint value	If you use the PAA`s (process image of outputs) as setpoint selection , it is possible that because of program errors in the PLC a false setpoint value can be transmitted to the Controller. Based on the system characteristics of some PLC systems (e.g. S7), the PAA area cannot be used for status output. ▶ to correct this error either the outputs must be put on intermediate markers first and after that be transferred to the PAA, or with the help of a PROFIBUS analyzer, the telegrams from the master to the slave are logged and interpreted.
actualizing times are not corresponding to the values given in this instruction	Data transmission must be checked by means of auxiliary programs for bus analysis, because the option board represents only a slave participant at the PROFIBUS and reports telegrams only if required by the master. ▶ check settings of PROFIBUS-DP master for wait cycles of bus communication or operation modes of the PROFIBUS master.

8.3 Non-cyclic data communication

Problem	Possible cause and help
error 0004_hex (non-cyclic data monitoring)	The monitoring time preset in Controller is up: The user program has performed no non-cyclic data communication within the preset time. Time monitoring of the non-cyclic data communication is in most cases not required, because non-cyclic data communication is carried out in the spare time.
unforeseen reaction of drive because of non-cyclic data communication	▶ check request- and answer code in non-cyclic data area for communication check. If there are differences between requested- and the reported value of non-cyclic data (PWE area) ▶ the correct sequence must be considered in the activation of the function. If there are still differences between requested- and the reported value although the activation sequence is correct, this may have a cause in not consistent transmission of values by the PROFIBUS master. ▶ use the area-consistent data transmission instead.
required value doesn't match the acknowledgement in answer telegram	If the slave should report within non-cyclic data communication an answer different from that given by the master, this could have the following reason: Last non-cyclic data communication was not completely erased. ▶ check PLC´s user program. The transmission mode "consistent data transmission" must be selected, because the used PROFIBUS master and the respective user program do not guarantee consistent transmission of non-cyclic data areas. ▶ check PLC´s user program. ▶ select consistent data transmission.
acknowledgement *request not executable* (answer PKE 7xxx_hex)	The non-cyclic data function could not be carried out; for error code see PWE entry of non-cyclic data. communication blocked for non-cyclic data communication within V-Controller ▶ check communication source parameter P 126 (see also section ▹Communication sources◃ on page 17). error code parameter cannot be altered (0001_hex) ▶ parameter is used only for display in V-Controller. error code forbidden parameter number (0008_hex) ▶ check if parameter number is present in V-Controller.

8.4 Other

Problem	Possible cause and help
remote bit in status word isn't set	No release of communication source by parameter 126 communication source in V-Controller. ▶ release communication source in Controller.
GSD file cannot be read from	▶ put entry "slave_Family" in " ; " as a comment, because some program surfaces are unable to read from this information in order to create a directory for drives. After renewed read cycle unit is stored to volume "other". ▶ Observe limitations of PROFIBUS master program surface to read GSD files.

9

PARAMETERS

For some of the V-Controller parameters with respect to the PROFIBUS card important special features have to be considered. Information about this is given in the following.

9.1 Parameter P 41 and P 247, Delta Phi 16

By use of these parameters you can input an angular offset directly to the actual position value of the encoder. The setpoint value can be realized by wiring a digital input, because the value is written only once at state change to the respective 16 bit parameter.
Cyclic transmission of a setpoint value directly from the PROFIBUS card to these parameters is not possible, because the actual values are written consecutively from the option board to the controller and therefore at every setpoint value actualization a self-regulation is carried out by the controller. Using the cyclic data exchange on these parameters the controller recognizes a new self-regulation value at each actualization of the PROFIBUS card and adds it to the actual position value of the respective encoder.
To enable this function using PROFIBUS-DP only the non-cyclic data communication can be used:
The value desired is written to the parameter using non-cyclic data communication. After that it is overwritten again by 0 value. By using feedback of the non-cyclic data functions, the execution of the function can be monitored and controlled.

9.2 Parameter P 42 and P 248, Delta Phi 32

For these parameters please refer to the above parameters P 41 and P 247. Writing to these parameters is possible in the above stated procedure.

APPENDIX A - ABBREVIATIONS

AO	output address area (for configuration)
AI	input address area (for configuration)
BAPS interface	internal interface between PROFIBUS card and V-Controller
GSD file	device data file, electronic documentation of PROFIBUS unit characteristics for master configuration
IND	index, determines on which information of a parameter the non-cyclic data communication will have access to
Net data block	useful data area in PROFIBUS telegram, this means without the extensions required for transmission, e.g. participant address, checksum etc.
Nibble	designation for the 4 higher-order resp. 4 lower-order bits of a byte
PAO	peripherals output image
PAI	peripherals input image
PG	Siemens programming unit
PKE	parameter code, parameter number and request code for non-cyclic data communication
PKW	parameter code value; data area within PROFIBUS telegram for non-cyclic data transmission
PLC	programmable logic controller, automation system
PPO	instructions for 16-bit data transmission using PROFIBUS-DP, not supported by this card
PWE	parameter value, value belonging to parameter for non-cyclic data communication
PZD	process data area, data area in PROFIBUS telegram for transmission of process data (cyclic transmission)
ZK parameter	option board parameter; Parameter in V-Controller, used for option board setup

APPENDIX B - ADDITIONAL INFORMATION

B.1 Reference

- Manfred Popp, PROFIBUS-DP/DPV1, Grundlagen, Tipps und Tricks für Anwender, Hüthig Verlag Heidelberg
- Manual „SIMATIC NET“ of Fa. Siemens
  Industrial communications networks
  PROFIBUS-Networks
- Profibus-Protocol description of Fa. Baumüller Nürnberg GmbH
- V-Controller description of Fa. Baumüller Nürnberg GmbH

B.2 Comments about PROFIBUS card versions

B.2.1 Version 2.04

From version 2.04 of the PROFIBUS card the area-consistent data transmission is supported. Further PROFIBUS-codes have been added to the GSD file, which are not supported by older card versions.
Beneath the time-slice procedure for data exchange to the controller the BAPS-transmission mode *2 setpoint- and 2 actual values per cycle* is supported.
The card´s processing time was considerably improved, which leads to a remarkable shorter evaluation interval.

B.2.2 Version 2.02

Version 2.02 of the PROFIBUS card does not support all codes entered within the new, valid with version 2.04 GSD file. The new codes for the area-consistent transmission are not supported. Apart from that, the GSD file can also be used for version 2.02 cards.

The evaluation interval of the card (version 2.02) is not identical with the evaluation interval stated in this description.

For transmission to the controller only the time-slice procedure is supported.

B.2.3 Upgrade from Version 1.x to Version 2.x

If a PROFIBUS card V1.x is exchanged with a V2.x, the following has to be considered:

- For the new functions of the card, a new GSD file with new bitmaps is required. The old GSD file must be kept for parameterization of the old card, because the two GSD files are not compatible.
- New determinations of net data block
  Because of the different address formats of the PROFIBUS master interfaces, a data format of 32 bit was determined generally for driving the PROFIBUS card in the V-Controller. Therefore the same address area must be used for all CPUs, which additionally enables an exchange of software between the individual PLC systems:

PLC system	PROFIBUS basic address
S7-300	addresses can be divided by 2
S7-400	addresses can be divided by 4

NOTE

The data format cannot be altered, because the controller system for position- and direction requirements expects a 32-bit format.

- the required address area must be customized when using the new card;
  ▸ enter reserve word after control- / status word = PZD 2 of 1 word (see ▹Address assignment in a S7 for above example◃ on page 43).
- the card now examines the configuration coincidence of master and slave at every commissioning
  ▸ an error code will be reported in *BAPS parameters of controller* or in the PWE-area of the non-cyclic data communication.
- extended error list for non-cyclic data area ▸ error evaluation must be customized eventually.
- parameter *P 179 BAPS Z fault reaction* is not available for the new card. The monitoring now is done by using the communication monitoring parameter.
- the faster communication from the card to the Controller can lead to unexpected program reactions in the PLC. Therefore an examination of the interlocking and drivers of the program is strongly recommended.

WARNING

Warning indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury.

If the above mentioned information is not considered during PROFIBUS card replacement, this can result in faulty operation and personal injury.

B.3 Status word of V-Controller

In addition a quick overview over the meaning of V-Controller status word (for closer information see V-Controller manual).

Bit No	Meaning	Comment
0	ready for commissioning	status machine device control
1	switched on	status machine device control
2	released for service	status machine device control
3	error	status machine device control
4	power blocked	bit = 0: request *block power* active
5	quick standstill	status machine device control
6	starting lockout	status machine device control
7,8	reserve	reserve
9	**remote**	**bit = 1: V-Controller can be accessed using PROFIBUS card (communication released)**
10	setpoint value reached	requested setpoint value has been reached
11	reserve	reserve
12,13	depending on operation mode	
14	freely configurable	parameterization with P 134
15	freely configurable	parameterization with P 135

B.4 Upgrade to BM-system

In the **Speed requirement 1** operation mode of the V-Controller, the functions are carried out according to DRIVECOM, which eventually enables the use of existing software.

If switch-over between different operation modes is realized, this can lead to problems in the overlaid PLC program, because control word functions are high or low active depending on the operation mode ▸ see V-Controller description.

B.4.1 GSD file

The GSD or type file holds the characteristics of the PROFIBUS slave-participant to enable configuration by the user programs of the PROFIBUS master. The GSD file format is in accordance with *EN 50170 Volume 2 PROFIBUS* standard, enabling every master to read information from the GSD file.

NOTE

If problems occur in reading of the GSD file in PLC program surfaces, please contact first the manufacturer of the PLC about known problems with his surface with reading from the GSD file.

Actual GSD file (in German):

```
;===========================================================================

; Baumüller Nürnberg Electronic GmbH & Co.
; Ostendstr. 80
; D - 90443 Nürnberg
; Tel:      ++49 (0)911 5432-0
; Fax:      ++49 (0)911 5432-417
; Internet: http://www.baumueller.de
;
;===========================================================================
; GSD-Datei für BAPS Baugruppe PROFIBUS-DP PBDP-01
;===========================================================================
;
; Name : BNF_00D0.GSD
; Stand : V 1.41 (22.11.1999)
;
;===========================================================================
;
; Änderungen:
;
; a) Erweiterung der Parametrierung konsistente Datenübertragung
;    gesamter Bereich
;
;===========================================================================
;
#Profibus_DP
; Unit-Definition-List:
GSD_Revision=1
Vendor_Name="BAUMÜLLER"
Model_Name="BAPS PBDP-01"
Revision="REV 1.00"
Ident_Number=0x00D0
Protocol_Ident=0
Station_Type=0
Hardware_Release="REV 1.10"
Software_Release="REV 2.04"
9.6_supp=1
19.2_supp=1
93.75_supp=1
187.5_supp=1
500_supp=1
1.5M_supp=1
3M_supp=1
6M_supp=1
12M_supp=1
MaxTsdr_9.6=60
MaxTsdr_19.2=60
MaxTsdr_93.75=60
MaxTsdr_187.5=60
MaxTsdr_500=100
MaxTsdr_1.5M=150
MaxTsdr_3M=250
MaxTsdr_6M=450
MaxTsdr_12M=800
Redundancy=0
Repeater_Ctrl_Sig=2
24V_Pins=0
Implementation_Type="SPC3"
```

```
Bitmap_Device="bnf_nor"
Bitmap_SF="bnf_err"
Bitmap_Diag="bnf_err"
;
; Slave-Specification:
OrderNumber="BAPS-PBDP-01"
;
Freeze_Mode_supp=1
Sync_Mode_supp=1
Auto_Baud_supp=1
Set_Slave_Add_supp=0
Min_Slave_Intervall=1
Max_Diag_Data_Len=16
Slave_Family=1 ; Antriebe; wenn GSD nicht eingelesen werden kann, diese Zeile auskommentieren mit ";"
;
; UserPrmData: Length and Preset:
User_Prm_Data_Len=5
User_Prm_Data=0x00,0x00,0x00,0x00,0x00
;
Modular_Station=1
Max_Module=4
Max_Input_Len=44
Max_Output_Len=44
Max_Data_Len=88
;
; Module-Definition-List:
;
; Spezielle Module
;
Module="Bedarfsdatenmodul" 0x73
EndModule
Module="Status/Steuer-Modul" 0x71
EndModule
;
; Standardmodule Konsistenz Wort
;
Module="1 Istwert, 1 Sollwert"   0x73
EndModule
Module="2 Istwerte, 2 Sollwerte" 0x75
EndModule
Module="4 Istwerte, 4 Sollwerte" 0x79
EndModule
Module="8 Istwerte, 1 Sollwert"  0xC0,81,67
EndModule
Module="8 Istwerte, 8 Sollwerte" 0xC0,81,81
EndModule
;
; Standardmodule Konsistenz gesamter Adreßbereich
;
Module="Bereich 1 Ist- / Sollwert"  0xF7
EndModule
Module="Bereich 2 Ist- / Sollwerte" 0xF9
EndModule
Module="Bereich 3 Ist- / Sollwerte" 0xFB
EndModule
Module="Bereich 4 Ist- / Sollwert"  0xFD
EndModule
Module="Bereich 5 Ist- / Sollwerte" 0xFF
EndModule
```

```
Module="Bereich 6 Ist- / Sollwerte" 0xC0,209,209
EndModule
Module="Bereich 7 Ist- / Sollwerte" 0xC0,211,211
EndModule
Module="Bereich 8 Ist- / 1 Sollwert" 0xC0,213,199
EndModule
Module="Bereich 8 Ist- / Sollwerte" 0xC0,213,213
EndModule
;
; User Configuration
;
; Module wort-organisiert mit Sendedaten
;
Module = "1 zykl. Istwert  ( 2 AE)"  0x51
EndModule
Module = "2 zykl. Istwerte ( 4 AE)"  0x53
EndModule
Module = "3 zykl. Istwerte ( 6 AE)" 0x55
EndModule
Module = "4 zykl. Istwerte ( 8 AE)"  0x57
EndModule
Module = "5 zykl. Istwerte (10 AE)" 0x59
EndModule
Module = "6 zykl. Istwerte (12 AE)" 0x5B
EndModule
Module = "7 zykl. Istwerte (14 AE)" 0x5D
EndModule
Module = "8 zykl. Istwerte (16 AE)" 0x5F
EndModule
;
; Module wort-organisiert mit Empfangsdaten
;
Module = "1 zykl. Sollwert  ( 2 AA)"  0x61
EndModule
Module = "2 zykl. Sollwerte ( 4 AA)"  0x63
EndModule
Module = "3 zykl. Sollwerte ( 6 AA)"  0x65
EndModule
Module = "4 zykl. Sollwerte ( 8 AA)" 0x67
EndModule
Module = "5 zykl. Sollwerte (10 AA)" 0x69
EndModule
Module = "6 zykl. Sollwerte (12 AA) " 0x6B
EndModule
Module = "7 zykl. Sollwerte (14 AA)" 0x6D
EndModule
Module = "8 zykl. Sollwerte (16 AA)" 0x6F
EndModule
```

B.5 Bitmaps

NOTE

The Bitmap names cannot be changed, for these are associated together with the GSD file in some configuration surfaces of PROFIBUS master systems.

A) Bitmap BNF_NORN.BMP

B) Bitmap BNF_ERRN.BMP

Illustration 8: Icons

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be in motion

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