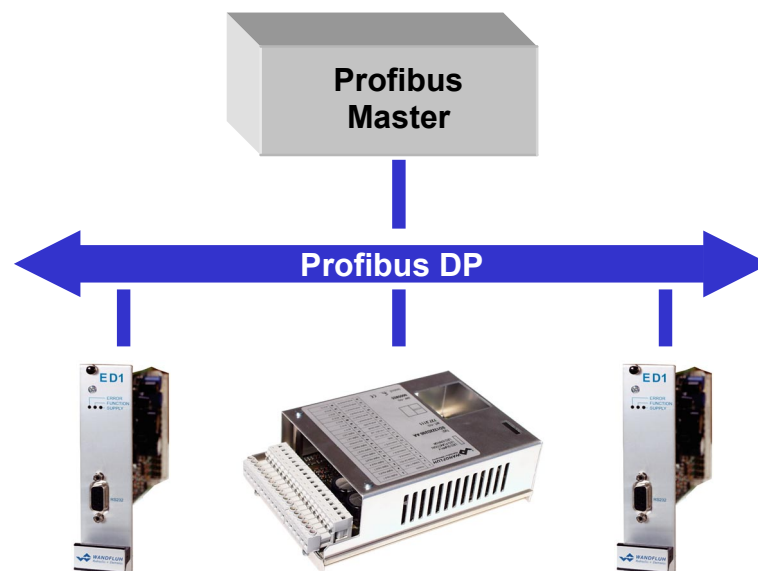


OPERATING INSTRUCTIONS ED1/SD1

PROFIBUS-DP Device-Profile in accordance with Fluid Power Technology

Version 1.0



0 Contents

0	Contents	2
1	PROFIBUS-DP Technology.....	4
1.1	General.....	4
1.2	Master and Slaves.....	5
1.3	Data exchange	5
1.4	Communication from words and double words	5
1.5	GSD Files	5
2	General of cyclical data exchange	6
2.1	Data structure.....	6
2.2	Telegram structure by the cyclical data communication.....	6
2.3	Available telegrams	6
2.4	General.....	6
3	Product Description	7
3.1	General.....	7
3.2	Technical Data.....	7
3.2.1	Transmission technology and baudrate	7
3.3	Operating and Indicating elements.....	7
3.3.1	Front plate view	8
3.3.2	Dimensions	8
3.4	Fieldbus Settings	9
3.5	Fieldbus Diagnostics	10
3.6	Connection Example	11
3.7	Parameterisation	11
4	Description of the Function of Device Profile DSP-408.....	12
4.1	Device architecture.....	12
4.2	Device Control	13
4.2.1	Local control.....	13
4.2.2	Device State Machine	14
4.3	Program Control	17
4.3.1	Device Modes	17
4.3.2	Description of the device control mode	17
4.4	Parameter Dictionary.....	19
4.5	Cyclical process data exchange (PZD)	21
4.5.1	Telegram types	21
4.5.2	Receive data (Master → Slave, set values)	21
4.5.3	Transmit data (Slave → Master, actual values)	21
4.6	Cyclical parameter data exchange (PKW)	22
4.6.1	Description of the parameter transmission process.....	23
4.7	Scaling.....	25
4.7.1	Factor displacement unit (FactReference).....	25
4.7.2	Factor solenoid current (FactSolCurrent).....	25
4.7.3	Factor Percentage (FactPercentage).....	25
4.7.4	Factor Interface (FactInterface).....	25
4.8	Parameter description	26
4.8.1	db_ErrorCode.....	26
4.8.2	db_ControlWord.....	27
4.8.3	db_StatusWord	28
4.8.4	db_DeviceMode	29
4.8.5	db_ControlMode.....	29
4.8.6	db_Local	29
4.8.7	db_Capability	30
4.8.8	db_StoreParameter.....	30
4.8.9	db_ResetDefault	30
4.8.10	dav_InterfaceNo.....	31
4.8.11	dav_transducer_Type	31
4.8.12	dav_ActualValUnit.....	31
4.8.13	dav_Invert	32

4.8.14	dav_Cablebreak	32
4.8.15	dav_InterfaceType	32
4.8.16	dav_transducer_Offset	33
4.8.17	dav_transducer_Auflösung	33
4.8.18	dop_drivePos_AsideVal	33
4.8.19	dop_drivePos_AsideMaxVal	34
4.8.20	dop_drivePos_BsideVal	34
4.8.21	dop_drivePos_BsideMaxVal	34
4.8.22	dop_dither_Type	35
4.8.23	dop_dither_FreqVal	35
4.8.24	dop_dither_AmplVal	35
4.8.25	dop_drivePos_SystemInvert	36
4.8.26	dpc_SetpointVal	36
4.8.27	dpc_ramp_Type	37
4.8.28	dpc_ramp_AccTimeNegVal	37
4.8.29	dpc_ramp_AccTimePosVal	37
4.8.30	dpc_ActualVal	38
4.8.31	dpc_CtrlDeviationVal	38
4.8.32	dpc_integrator_Type	38
4.8.33	dpc_integrator_TiVal	39
4.8.34	dpc_integrator_TiValNeg	39
4.8.35	dpc_integrator_DXVal	39
4.8.36	dpc_integrator_DXValNeg	40
4.8.37	dpc_window_Type	40
4.8.38	dpc_window_ThresholdVal	40
4.8.39	dpc_window_ThresholdHystVal	41
4.8.40	dpc_Schwelle	41
4.8.41	dpc_SchwelleNeg	41
4.8.42	dpc_PropFact1	42
4.8.43	dpc_PropFact1Neg	42
4.8.44	dpc_PropFact2	43
4.8.45	dpc_PropFact2Neg	43
4.8.46	dpc_window_SolenoidInPos	43
4.8.47	dpc_window_DigOutInPos	44
5	Commissioning	45
5.1	Presupposition for the DP-Slave controller card	45
5.2	Presupposition and information for the PROFIBUS-DP Master	45
5.3	Delivery state	46
5.4	Parameterisation	46
5.5	Setting the preset value via Fieldbus	46
5.6	Start after an error	46
6	Diagnostic and error detection	47
6.1	Diagnostic LED	47
6.2	Diagnostic about the Fieldbus	47
7	Version index	47

1 PROFIBUS-DP Technology

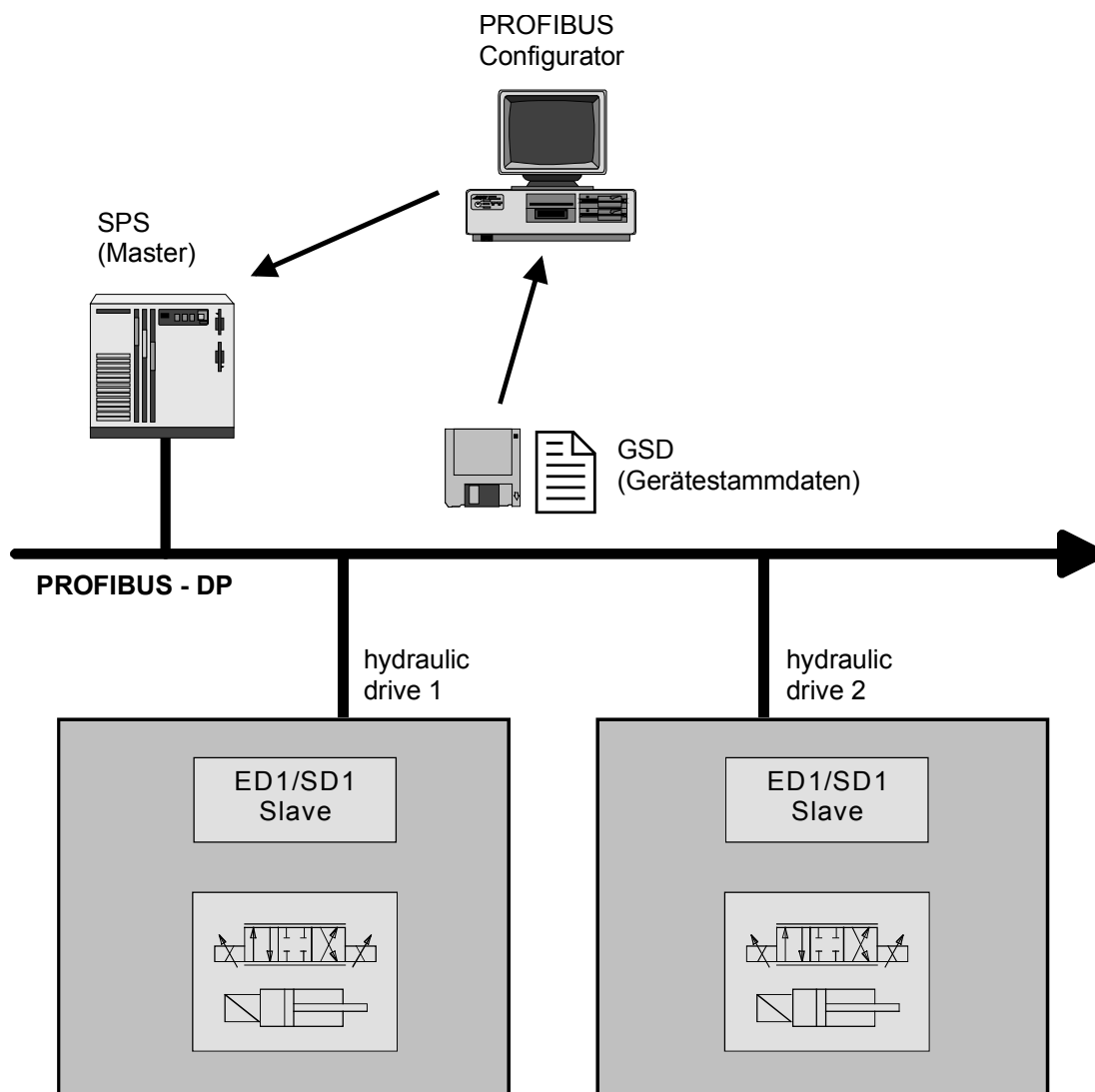
1.1 General

PROFIBUS-DP is a vendor-independent, open field bus standard for a wide range of applications in manufacturing and process automation. Vendor-independence and openness are ensured by the international standards EN 50170 and EN 50254.

PROFIBUS-DP offers functionally graduated communication protocols (Communication Profiles), WANDFLUH is using for the ED1/SD1 controller cards the communication profile **DP** (decentralised periphery).

PROFIBUS-DP is optimised for fast, time critical data exchange on the field layer. The Fieldbus is used for cyclical and not cyclical data exchange between a Master and its slaves.

PROFIBUS-DP can be used for different device profiles. WANDFLUH is using for the ED1/SD1 controller cards the device profile DSP-408 "Device Profile Fluid Power Technology".



1.2 Master and Slaves

With PROFIBUS-DP, one differs between Master- and Slave-Devices:

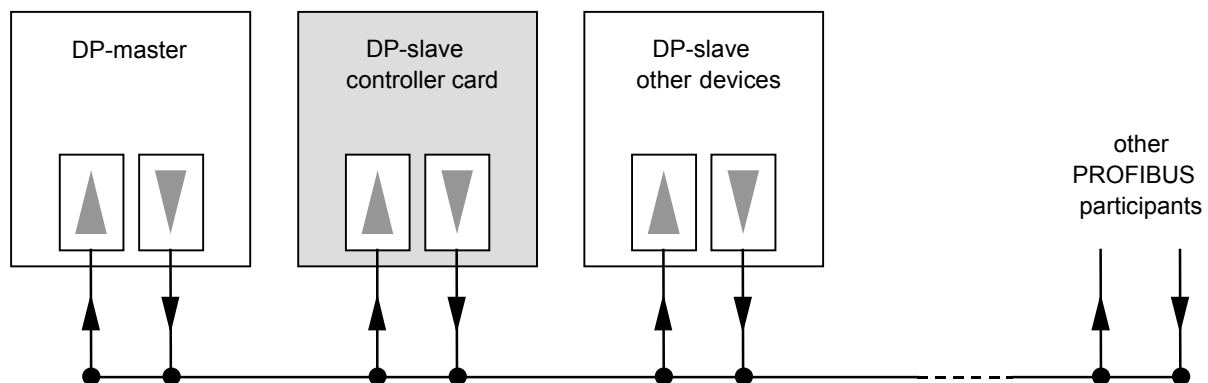
- **Master (active Fieldbus participants)**
These devices determine the data exchange on the Fieldbus and are named therefore as active Fieldbus participant
- **Slaves (passive Fieldbus participants)**
These devices can only receive messages and send data and messages to the Master only on a request.

The WANDFLUH ED1/SD1 controller cards are always slaves. In the further documentation, this slave will be named always DP-Slave controller card.

1.3 Data exchange

The data exchange is made through the Master - slave procedure, where the drives are always the slaves. This permits a very fast cyclical data exchange.

For the parameterisation, diagnostic and error handling during the current cyclical data exchange, also not cyclical communication functions are used in additional.



1.4 Communication from words and double words

All used size of words and double words are transmitted in the little endian format. Therefore, the low byte resp. the low word will be transmitted before the high byte resp. the high word (word = 16 bit, double word = 32 bit).

1.5 GSD Files

The characteristic communication features of a PROFIBUS-DP device are defined in the form of an electronic data sheet (Gerätstamdatei, GSD file). WANDFLUH makes available the corresponding GSD - file for the ED1/SD1 controller card.

The GSD files expand the open communication right to the user level. All modern planning tools make it possible to read-in the GSD files during the configuration. As a result, the integration into the PROFIBUS-DP system becomes simple and user friendly.

2 General of cyclical data exchange

2.1 Data structure

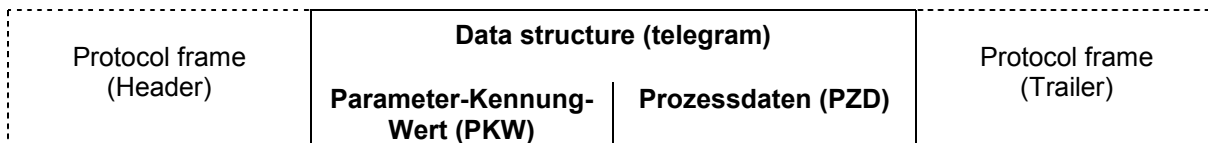
The data structure by the cyclical data communication is shared into 2 parts, which will be transmitted in each telegram:

- **Parameter data exchange (PKW, parameter channel)**
 This part of the telegram serves for read and/or write of parameters and for read of error messages.
- **Process data exchange (PZD, process data)**
 This part contains the control word, preset values resp. additional information and actual values. With the process data, the following data will be transmitted:
 - Control words and preset values (Master => Slave)
 - Status words and actual values (Slave => Master)

During the boot up of the Fieldbus system, the Master determines the used telegram type. The selected telegram type will be send automatically to the DP-Slave controller card via the configuration telegram.

2.2 Telegram structure by the cyclical data communication

The telegrams by the cyclical data communication have the following structure:



2.3 Available telegrams

For a description about all available telegram types refer to section "Telegram types" page 21.

2.4 General

- The selection between the different telegram types with different data length is depending on the performance of the device in the Fieldbus compound.
- For a detailed description about each parameter please refer to section "Parameter Dictionary" page 19.

3 Product Description

3.1 General

The present operating instructions represent a PROFIBUS-DP specific extension of the ED1/SD1 controller card operating instructions.

Remark: Please read the operating instructions of the ED1/SD1 controller card beforehand.

3.2 Technical Data

The connection to the PROFIBUS-DP is made via the D-SUB connector on the front plate. The pin occupation correspond to the standard.

PROFIBUS-DP Interface	<p>D-SUB-plug connector 9-pole female on front plate, in accordance with RS485 galvanic separated</p> <ul style="list-style-type: none"> • Pin 3 = RxD/TxD-P (receive-/transmit data-positive, B-line) • Pin 8 = RxD/TxD-N (receive-/transmit data -negative, A-line) • Pin 5 = DGND (data transmitting potential Ground to 5V) • Pin 6 = VP (power supply of the bus terminator-P P5V)
------------------------------	---

The DP-slave controller card is using the PROFIBUS-DP V0 specifications.

3.2.1 Transmission technology and baudrate

The DP-Slave controller card detects automatically the adjusted baudrate on the Fieldbus. The following baudrates are possible:

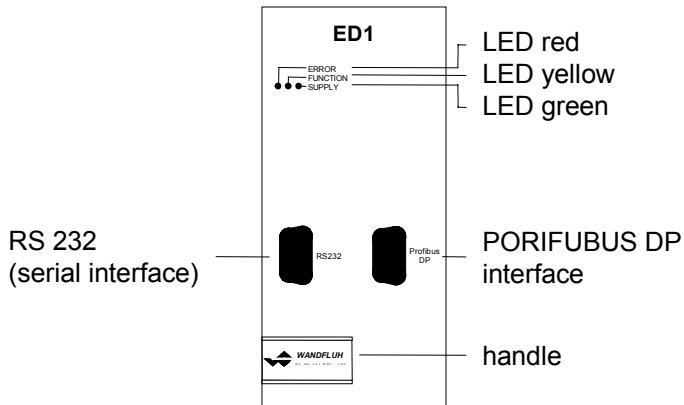
9.6kBaud / 19.2kBaud / 45.45kBaud / 93.75kBaud / 187.5kBaud / 500kBaud / 1.5MBaud / 3.0MBaud / 6.0Mbaud / 12Mbaud

During the setup of the fields system, the Master will set baudrate uniform for all devices on the bus.

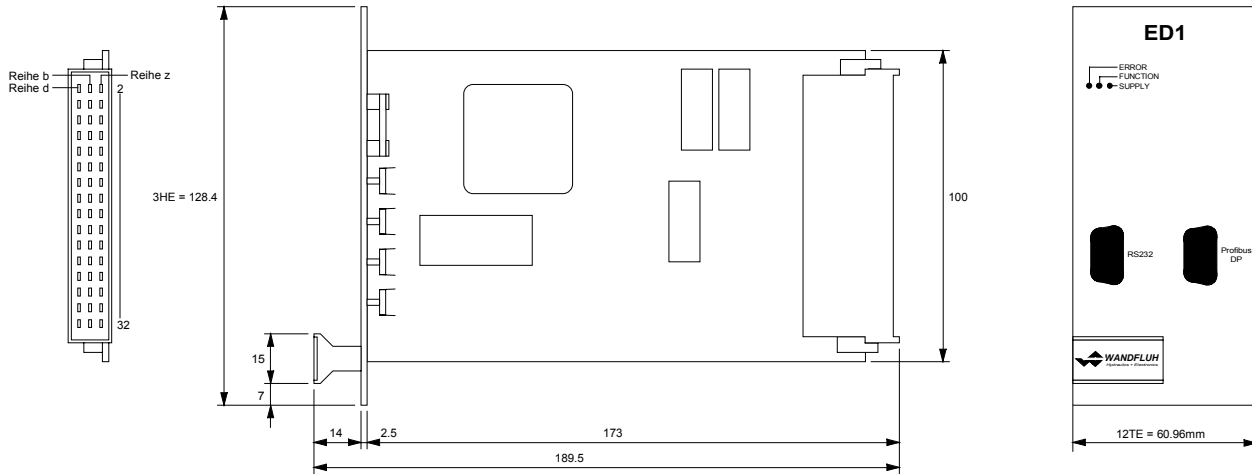
3.3 Operating and Indicating elements

The DP-Slave controller card is built in the Eurocard format with a connector strip according to DIN41612, type F48 and is equipped with a front plate in its standard version. The front plate provides a 9-pole plug for an RS 232 interface, through which the configuration and the parameterisation are carried out and through which also some diagnostic functions can be called up via the parameterisation PASO and provides another 9-pole plug for the PROFIBUS-DP interface.

3.3.1 Front plate view



3.3.2 Dimensions

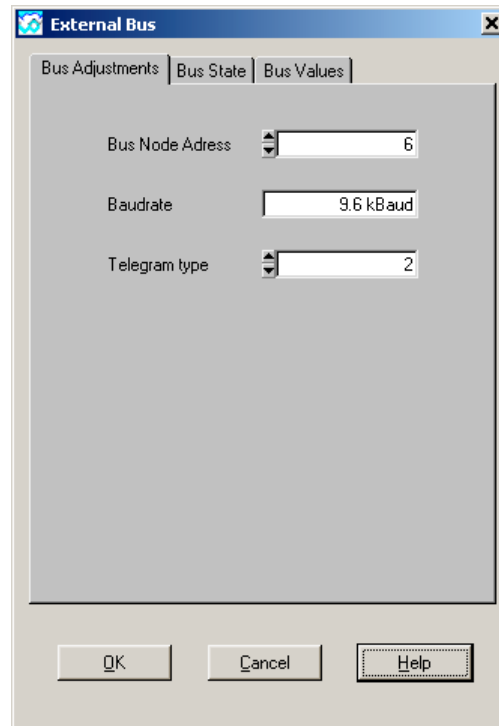


3.4 Fieldbus Settings

The following settings can be made via the parameterisation software PASO:

- Bus Node Address (write and read)
- Baudrate (read only)
- Telegram type (write and read)

This settings can be made in the menu item "Fieldbus_Fieldbus-Info".

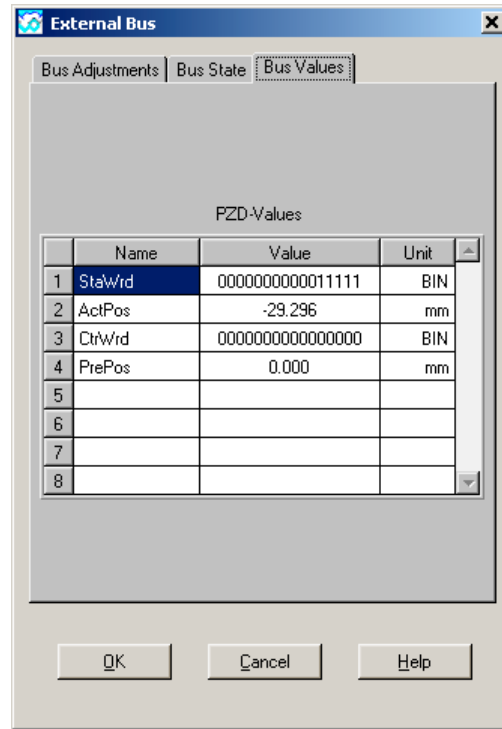
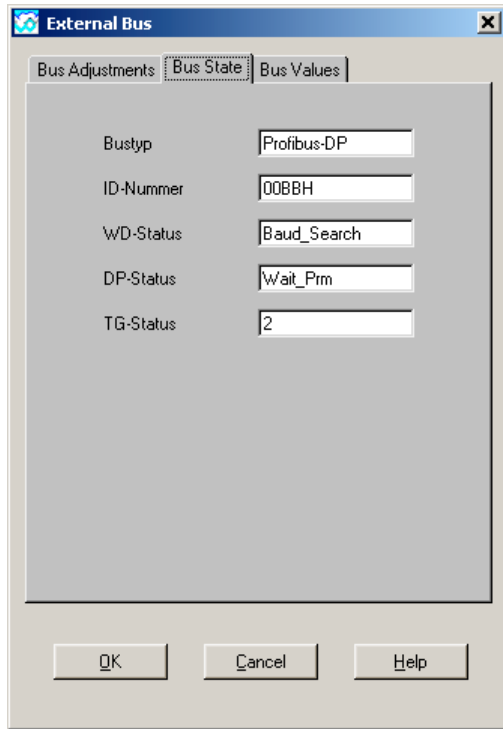


The following parameters can be set resp. will be displayed:

Field	Parameter description	Display
Bus Node Address	With this parameter, the required node address for the DP-Slave controller card can be set. The value set is saved on the DP-Slave controller card in the non-volatile memory.	1 ... 126
Baudrate	The adjusted Baudrate will be displayed. During the setup of the fields system, the Master will set the Baudrate uniform for all devices on the bus.	9.6kBaud, 19.2kBaud, 45.45kBaud, 93.75kBaud, 187.5kBaud, 500kBaud, 1.5Mbaud, 3.0Mbaud, 6.0Mbaud, 12Mbaud
Telegram type	In the "Off Line"-mode, the required telegram type can be set. In the "On Line"-mode, the current telegram type will be displayed. For more information about the telegram type, please refer to section "Telegram types" page 21.	

3.5 Fieldbus Diagnostics

A diagnosis of the Fieldbus is possible at any time via the parameterisation software PASO. This takes place through the menu point "Fieldbus-Fieldbus-Info".



The following bus statuses are displayed:

Field	Parameter description	Display
Bus type	The type of the connected Fieldbus	PROFIBUS-DP
ID - number	The identification number of the DP-Slave controller card. This number is predefined fixed.	
WD-Status	<p>The communication on the Fieldbus is supervised permanent through the Watchdog. The current state of the Watchdog is displayed here.</p> <p>Baud_Search The baudrate will be searched</p> <p>Baud_Control The found baudrate will be checked</p> <p>DP_Control The found baudrate is ok. The Watchdog for the Fieldbus is active.</p>	<p>Baud_Search</p> <p>Baud_Control</p> <p>DP_Control</p>

DP-Status	<p>The DP-Slave controller card can be in different states. The current state will be displayed here.</p> <p>Wait_Prm After the start-up, the DP-Slave controller card is waiting for a parameter telegram. All other telegram types will not be handled. No data exchange is possible.</p> <p>Wait_Cfg The DP-Slave controller card is waiting for a configuration telegram. All other telegram types will not be handled. No data exchange is possible.</p> <p>Data_Exchange If the parameter telegram as well as the configuration telegram were ok, the data exchange via the Fieldbus is enable and possible.</p>	<p>Wait_Prm</p> <p>Wait_Cfg</p> <p>Data_Exchange</p>
TG-Status	The current telegram type will be displayed here	

The following bus values are displayed:

Field	Parameter description	Display
PZD-Values	In this table, the PZD-values will be displayed. The PZD-values are the real data on the bus. The displayed value depends on the selected telegram type.	

3.6 Connection Example

As a connection example, reference is made to the corresponding operating instructions of the ED1/SD1 controller card.

All relevant digital I/O information is transmitted via the Fieldbus. Therefore no digital inputs should be connected from external. The following signals are an exception:

- DigInp 1 Start
- DigInp 3 Enable control

These signals are used by all means in the local control for the release of the device function (refer to section "Local control" page 13).

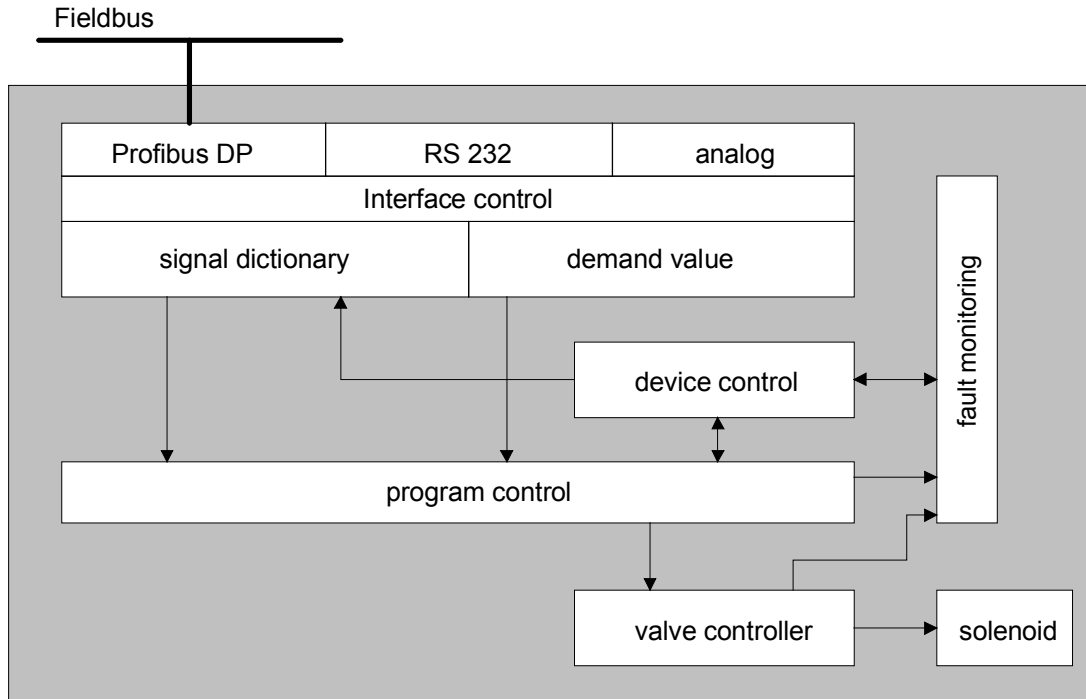
3.7 Parameterisation

The DP-Slave controller card can be parameterised either through the PROFIBUS-DP or through the parameterisation software PASO.

4 Description of the Function of Device Profile DSP-408

The device profile explains the data and their format, which are exchanged between the PROFIBUS-DP Master and the DP-Slave controller card. The device profile is based on the specification of the profile „Fluid Power Technology“ as defined by the VDMA (the German Engineering Federation). The device profile has been defined for hydraulic devices, such as: proportional valves, hydrostatic pumps and hydrostatic drives.

4.1 Device architecture



The DP-Slave controller card contains the complete Hardware of the ED1/SD1. This Hardware includes the interface for the Fieldbus and the interface for the parameterisation software PASO. Also included are all digital and analog inputs and outputs as well as 2 solenoid outputs for the cylinder.

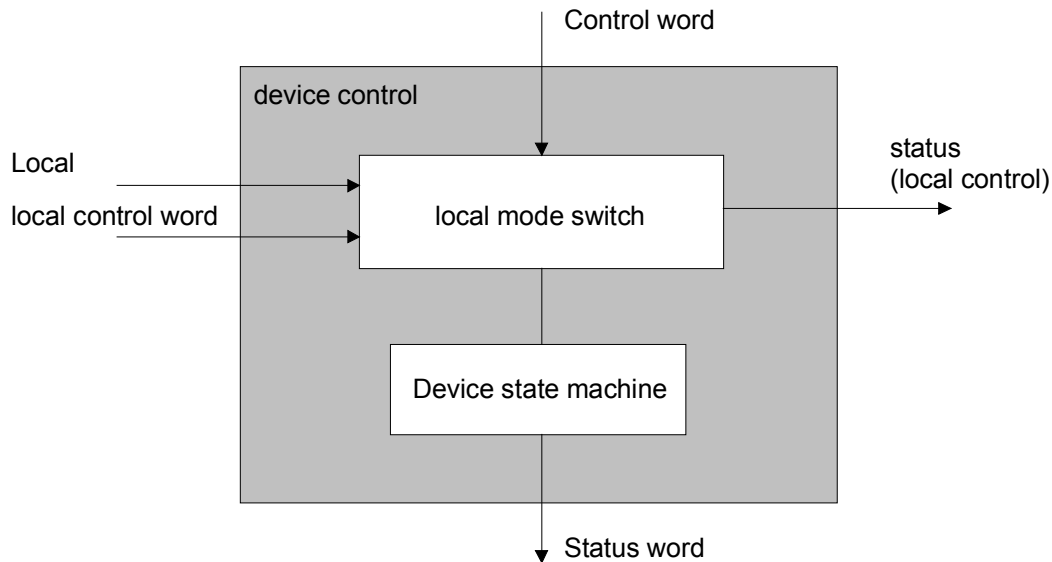
The Fieldbus control is made through a higher level Fieldbus Master.

The local control can be made either via digital in- and outputs or via the parameterisation software PASO.

4.2 Device Control

The following picture shows the principle function of the DP-Slave controller card.

4.2.1 Local control



The parameter "Local" indicates the source of the control word acting on the device state machine.

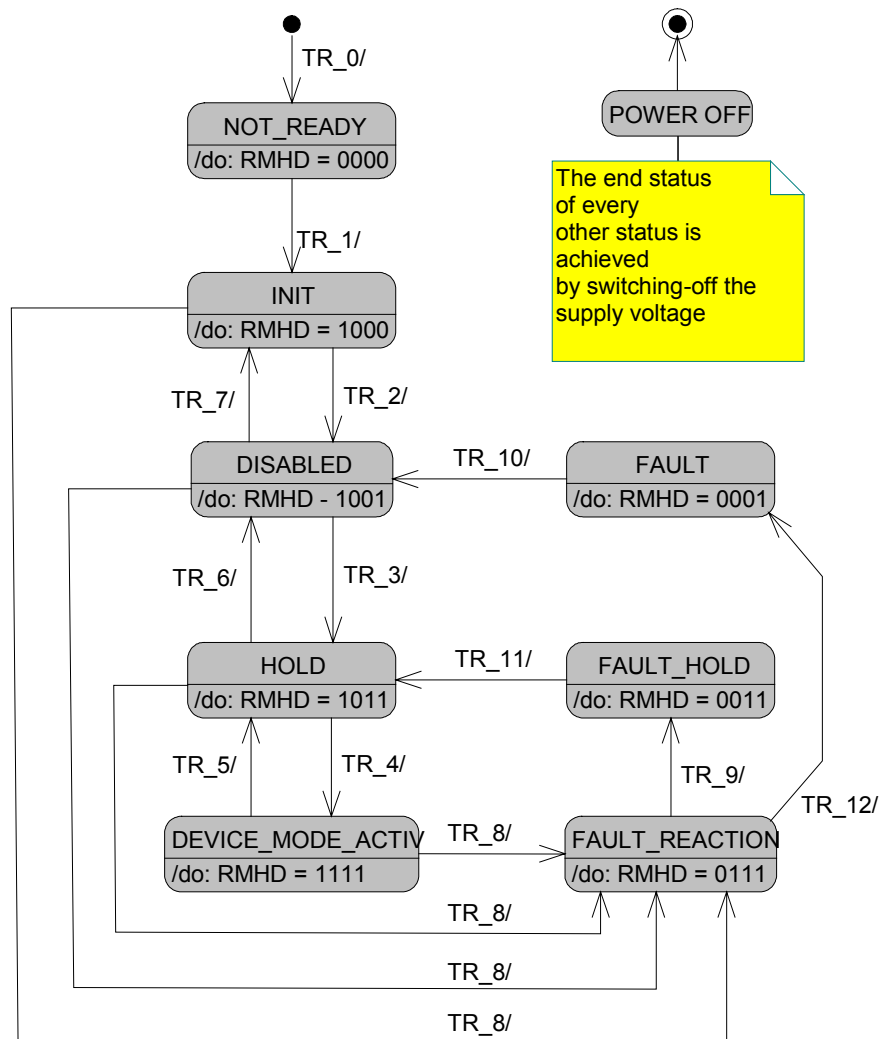
In the local mode, the control commands and the current states will be set resp. displayed either through the inputs/outputs or through the parameterisation software PASO. Except of the parameter "Local", all values coming through the Fieldbus are ignored.

4.2.2 Device State Machine

In the following, with the help of a status diagram it is described, how the start-up of the PROFIBUS-DP-slave DSV takes place and which statuses are reached when and how.

The following table describes the possible states and what is done in these states:

Status	Description
NOT_READY	<ul style="list-style-type: none"> • The supply voltage is present on the DSV • Self test is running • The device functions are disabled
INIT	<ul style="list-style-type: none"> • Device parameters can be set • Initialisation of device parameters with stored values • The device functions are disabled • It's possible to activate the "PASO remote" mode
DISABLED	<ul style="list-style-type: none"> • Device parameters can be set • The device functions are disabled • In this state, the different device modes like "Device Mode", "operating mode" and "Device Local mode" can be set. • It's possible to activate the "PASO remote" mode
HOLD	<ul style="list-style-type: none"> • Device parameters can be set • The last set-point value present is maintained active • The set-point value of the status DEVICE_MODE_ACTIVE is not active • Device modes setting is disabled
DEVICE_MODE_ACTIVE	<ul style="list-style-type: none"> • Device parameters can be set • The operating mode selected with the parameter "ControlMode" and the device mode selected with the parameter "DeviceMode" are active • Changing the operating mode is not possible (the writing of the parameter "DeviceMode" is responded to negatively)
FAULT_HOLD	<ul style="list-style-type: none"> • Device parameters can be set • The actual value present is read or the set-point value of the HOLD status is active • To leave this state, the corresponding transitions in the table below have to be executed.
FAULT	<ul style="list-style-type: none"> • Device parameters can be set • The device functions are disabled • To leave this state, the corresponding transitions in the table below have to be executed.
FAULT_REACTION	This status is reached, if the device is not anymore ready for operation <ul style="list-style-type: none"> • Device parameters can be set • The device function can be disabled or enabled



RMHD = R: Status word "Ready" (bit 3)
 M: Status word "Device mode active enable" (bit 2)
 H: Status word "Hold enable" (bit 1)
 D: Status word "Disable" (bit 0)

The following table describes the transitions from one status to the next one:

Transition	Description	Control word bit
		7 6 5 4 3 2 1 0 R M H D
TR_0	Switching-on the supply voltage	Internal transition
TR_1	Device initialisation successfully completed	Internal transition
TR_2	Bit "Disable" active	x x x x x x x 1
TR_3	Bit "Hold enable" active	x x x x x x 1 1
TR_4	Bit "Device mode active enable" active	x x x x x 1 1 1
TR_5	Bit "Device mode active enable " not active	x x x x x 0 x x
TR_6	Bit "Hold enable" not active	x x x x x 0 0 x
TR_7	Bit "Disable" not active	x x x x x 0 0 0
TR_8	Error present. This transition can also be forced by the communication state machine (transition C5, C8, C12, C13, C14)	Internal transition
TR_9	Error reaction successful (HOLD active)	Internal transition
TR_10	Error reset (return to the status DISABLED). The "reset fault" bit in the control word imperatively has to change from 0 to 1	x x x x 0 x 0 x
		→
TR_11	Error reset (return to status HOLD). The "reset fault" bit in the control word imperatively has to change from 0 to 1	x x x x 0 x 1 x
		→
TR_12	Error reaction successful (DISABLED active)	Internal transition
TR_567	This transition can be forced by the communication state machine (transition C9, C10, C11). Or else by the input Enable from 1 → 0	x x x x x 0 0 0

RMHD = R: Control word "Reset fault" (bit 3)
 M: Control word "Device mode active enable" (bit 2)
 H: Control word "Hold enable" (bit 1)
 D: Control word "Disable" (bit 0)

4.3 Program Control

4.3.1 Device Modes

The DP-Slave controller card can be set through the parameter "db_ControlMode" in the following device control modes:

Device Control mode	Description
Open loop movement (6)	The DP-Slave controller card is driven in a open loop system. The solenoid outputs are driven direct from a preset value signal.
Position control axis (9)	The DP-Slave controller card is following the preset position given through the Fieldbus resp. the local preset value (closed loop)

A detailed description of the different device control modes will follow in the section "Description if the device control mode" page 17.

The DP-Slave controller card can be set through the parameter "db_DeviceMode" in the following device modes:

Device mode	Description
Preset value setting through the bus (1)	The preset value setting for the DP-Slave controller card takes place through the Fieldbus. Local preset values will be ignored.
Preset value setting locally (2)	The preset value setting for the DP-Slave controller card takes place locally. Preset values through the Fieldbus will be ignored.

The device mode "Preset value setting through bus (1)" can only be selected if the parameter "Local" is set to "Device control bus (2)".

If the parameter "Local" will be set to "Device control local (1)", the parameter device mode will be changed automatically to "Preset value setting locally (2)".

4.3.2 Description if the device control mode

Open loop movement

The following description is only valid the ED1/SD1 card "Position controller PLUS".

The solenoid outputs of the DP-Slave controller card are driven direct from a preset value signal via analog inputs or via Fieldbus. In this mode, the DP-Slave controller card is working as a normal amplifier in a open loop system. A solenoid current corresponding to the preset value signal is output:

$$\begin{array}{l}
 0\% \quad \dots \quad 50\% \text{ preset value} \quad = \quad I_{\max} \quad \dots \quad I_{\min} \text{ solenoid B} \\
 50\% \quad \dots \quad 100\% \text{ preset value} \quad = \quad I_{\min} \quad \dots \quad I_{\max} \text{ solenoid A}
 \end{array}$$

In this device control mode, the position of the cylinder is not controlled, the DP-Slave controller card is working in an open loop system.

Position control axis

The following description is only valid the ED1/SD1 card "Position controller PLUS".

The preset position is given either via an analog input or through the Fieldbus from the Master. Also the fixed preset values can be used locally via the PASO.

As soon as the start signal is active (DigInp1 in the local mode, automatically in the Fieldbus mode), the axis will move to the desired position. The limitation of the speed (settable with a parameter) will not be exceeded.

In this device control mode, the position of the cylinder is controlled, the DP-valve controller card is working in a closed loop system. The control response can be adjusted via the controller parameter.

A detailed description of the possibilities in this device control mode you will find in the corresponding operating instructions of the ED1/SD1 controller card

4.4 Parameter Dictionary

In the following table, all parameters which can be write (w) or read (r) through the PROFIBUS-DP are listed.

All parameters with an entry in the column "PZD-number" can be transmitted as process data (PZD) or as parameter data (PKW). All other parameters can only be transmitted as parameter data (PKW).

Parameters from the device block (db)							
IND	PNU	Parameter name	Data type	Persistence	Attribute	PZD-Number	Page
0	36	db_ErrorCode	uint16	N	r	-	26
0	37	db_ControlWord	uint16	N	w	001	27
0	38	db_StatusWord	uint16	N	r	002	28
0	39	db_DeviceMode	int8	V	r/w	-	29
0	40	db_ControlMode	int8	V	r/w	-	29
0	41	db_Local	int8	V	r/w	-	29
0	50	db_Capability	uint32	V	r	-	30
0	51	db_StoreParameter	int32	N	w	-	30
0	52	db_ResetDefault	int32	N	w	-	30

Parameters from the drive actual value conditioning transducer block (dav)							
IND	PNU	Parameter name	Data type	Persistence	Attribute	PZD-Number	Page
1	20	dav_InterfaceNo	uint8	V	r/w	-	30
1	22	dav_transducer_Type	int8	V	r	-	31
1	84	dav_ActualValUnit	uint8	V	r/w	-	31
1	95	dav_Invert	uint8	V	r/w	-	32
1	96	dav_Cablebreak	uint8	V	r/w	-	32
1	97	dav_InterfaceType	uint8	V	r/w	-	32
1	98	dav_transducer_Offset	int32	V	r/w	-	33
1	99	dav_transducer_	uint32	V	r/w	-	33

Parameters from the drive output processing block (dop)							
IND	PNU	Parameter name	Data type	Persistence	Attribute	PZD-Number	Page
3	73	dop_drivePos_AsideVal	uint16	V	r/w	-	33
3	76	dop_drivePos_BsideVal	uint16	V	r/w	-	34
3	129	dop_drivePos_AsideMaxVal	uint16	V	r/w	-	34
3	130	dop_drivePos_BsideMaxVal	uint16	V	r/w	-	34
3	97	dop_dither_Type	int8	V	r/w	-	34
3	98	dop_dither_FreqVal	uint8	V	r/w	-	35
3	101	dop_dither_AmplVal	uint8	V	r/w	-	35
3	131	dop_drivePos_SystemInvert	int8	V	r/w	-	36

Parameters from the drive position control loop function block (dpc)							
IND	PNU	Parameter name	Data type	Persistence	Attribute	PZD-Number	Page
12	21	dpc_SetpointVal	int32	N	r/w	012	36
12	42	dpc_ramp_Type	int8	V	r/w	-	37
12	46	dpc_ramp_AccTimeNegVal	uint16	V	r/w	-	37
12	49	dpc_ramp_AccTimePosVal	uint16	V	r/w	-	37
12	100	dpc_ActualVal	int32	N	r	003	38
12	103	dpc_CtrlDeviationVal	int32	N	r	-	38
12	115	dpc_integrator_Type	int8	V	r/w	-	38
12	116	dpc_integrator_TiVal	uint32	V	r/w	-	39
12	212	dpc_integrator_TiValNeg	uint32	V	r/w	-	39
12	119	dpc_integrator_DXVal	uint32	V	r/w	-	39
12	211	dpc_integrator_DXValNeg	uint32	V	r/w	-	40
12	177	dpc_window_Type	int8	V	r/w	-	40
12	178	dpc_window_ThresholdVal	int16	V	r/w	-	40
12	213	dpc_window_ThresholdHystVal	int16	V	r/w	-	41
12	205	dpc_Schwelle	uint16	V	r/w	-	41
12	206	dpc_SchwelleNeg	uint16	V	r/w	-	41
12	207	dpc_PropFact1	uint8	V	r/w	-	42
12	208	dpc_PropFact1Neg	uint8	V	r/w	-	42
12	209	dpc_PropFact2	uint8	V	r/w	-	43
12	210	dpc_PropFact2Neg	uint8	V	r/w	-	43
12	214	dpc_window_SolenoidInPos	int8	V	r/w	-	43
12	215	dpc_window_DigOutInPos	int8	V	r/w	-	44

Persistence: V = Volatile: Value will be lost at power down
 N = Non volatile: Value is persistent and is saved within buffered EERPOM inside the device after an explicit store command

Attribute: r = read only
 w = write only
 r/w = read/write

4.5 Cyclical process data exchange (PZD)

The data exchange is made with consistence about the whole length of the input- and output data. The transmission correspond to the little endian format (refer to section "Data exchange" page 5).

4.5.1 Telegram types

The following telegram types are available on the DP-Slave controller card. They are shared into:

- Data exchange **with** parameter channel
with 4 words for parameters and 3 words for data exchange => telegram type 1
- Data exchange **without** parameter channel
with 3 words for data exchange => telegram type 2

Standard telegram 1

The telegram type 1 is defined by the "PROFIBUS Profile Fluid Power Technology" (standard telegram 1) and is used for the ED1/SD1 card type "Position controller PLUS".

	word 0	word 1	word 2	word 3
Parameter (PKW)	PKE	IND RES	PWE	PWE

	word 4	word 5	word 6
PZD receive data	db_ControlWord	dpc_SetpointVal	dpc_SetpointVal

	word 4	word 5	word 6
PZD transmit data	db_StatusWord	dpc_ActualVal	dpc_ActualVal

Standard telegram 2

The telegram type 2 is defined by the "PROFIBUS Profile Fluid Power Technology" (standard telegram 2) and is used for the ED1/SD1 card type "Position controller PLUS".

	word 0	word 1	word 2
PZD receive data	db_ControlWord	dpc_SetpointVal	dpc_SetpointVal

	word 0	word 1	word 2
PZD transmit data	db_StatusWord	dpc_ActualVal	dpc_ActualVal

4.5.2 Receive data (Master → Slave, set values)

Parameter	Parameter name	Length (word)	Signal number	Page
db_ControlWord	Controlword	1	001	27
dpc_SetpointVal	Preset value	2	012	36

4.5.3 Transmit data (Slave → Master, actual values)

Parameter	Parameter name	Length (word)	Signal number	Page
db_StatusWord	Status word	1	002	28
dpc_ActualVal	Actual value	2	003	38

4.6 Cyclical parameter data exchange (PKW)

The parameter data exchange is made via the PKW (parameter channel). With the PKW, parameter can be written (Master → Slave) or read (Slave → Master) through the Fieldbus. Exactly one parameter can be written resp. read in one telegram.

The below table shows the structure of the PKW:

PKW							
word 0		word 1		word 2		word 2	
byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
PKE		IND	Res	PWE			

PKE: parameter signature value
 IND: block number
 Res: reserved
 PWE: parameter value

The instructions and responses are coded in the parameter signature word PKE:

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

AK: instruction / response signature
 Res: reserved
 PNU: parameter number

The below table shows the possible instruction / response signatures:

AK			
instruction signature	function	response signature	
		positive	negative
0	no instruction	0	
1	parameter value read	1, 2, 11	7
2	parameter value write (word)	1	7
3	parameter value write (double word)	2	7
4 - 9	reserved		
10	parameter value write (byte)	11	7

In case an instruction can not be processed, the slave responses with a negative response signature (negative = error code), in normal case with a positive response signature.

The parameter value is located to the PWE in the following bytes::

- with parameter length 'word' (instruction signature = 2): byte 6 and byte 7
- with parameter length 'double word' (instruction signature = 3): byte 4, byte 5, byte 6 and byte 7
- with parameter length 'byte' (instruction signature = 10): byte 7

In case the slave responds with an error (response signature = 7), an error message will be located in byte 6 and byte 7 of the PWE. The below table shows the possible error codes:

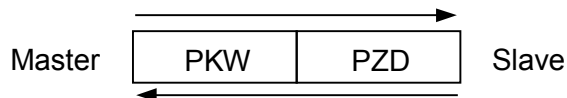
error code	semantic
0	undefined PNU
1	parameter not changeable
2	lower or upper value range limit overflow
5	data type error
18	other errors

The below table shows the connection between the data type and parameter length:

data type	parameter length
int8	byte (1 byte)
uint8	byte (1 byte)
int16	word (2 bytes)
uint16	word (2 bytes)
int32	double word (4 bytes)
uint32	double word (4 bytes)
float	double word (4 bytes)
vstring(n)	n bytes

4.6.1 Description of the parameter transmission process

On each request from the Master, the slave will send a response.



Example 1:

The parameter "dop_drivePos_AsideVal" should be written with the value 450mA.

- data type = uint16 → parameter length = word → AK = 2h
- parameter number = 73 → PNU = 49h
- block number = 3 → IND = 03h
- value = 450 → PWE = 00h 00h 01h c2h

Instruction signature (Master → Slave):

PKW								
word 0			word 1		word 2		word 3	
PKE			IND	RES	PWE			
AK	RES	PNU						
2h	0h	49h	03h	00h	00h	00h	01h	C2h

Response signature (Slave → Master):

PKW								
word 0			word 1		word 2		word 3	
PKE			IND	RES	PWE			
AK	RES	PNU						
1h	0h	49h	03h	00h	00h	00h	01h	C2h

- AK = 1h → 1 = positive response signature for a parameter length = word

Example 2:

The parameter "dop_dither_AmplVal" should be read.

- data type = uint8 → parameter length = byte → AK = 1h
- parameter number = 98 → PNU = 62h
- block number = 3 → IND = 03h

Instruction signature (Master → Slave):

PKW								
word 0			word 1		word 2		word 3	
PKE			IND	RES	PWE			
AK	RES	PNU						
1h	0h	62h	03h	00h	00h	00h	00h	00h

Response signature (Slave → Master):

PKW								
word 0			word 1		word 2		word 3	
PKE			IND	RES	PWE			
AK	RES	PNU						
Bh	0h	62h	03h	00h	00h	00h	00h	64h

- AK = Bh → 11 = positive response signature for a parameter length = byte
- PWE = 00h 00h 00h 64h → 100 = value of the parameter

4.7 Scaling

Parameter with an unit (e.g. mm, V, mA, etc.) will be converted on the DP-Slave controller card. Therefore, the adjustment step is not 1 for these parameters. The step correspond to a certain factor.

Because this factor is a floating point value, there can be a rounding error

Example:

Adjusted value for dav_drivePos_AsideVal:	60mA
Scaled value (60 / 1.78):	33.7 => 33
Read value (33 x 1.78):	58.74 => 58mA

4.7.1 Factor displacement unit (FactReference)

All parameters with a displacement unit (mm, Deg, Inch) have to be scaled by the factor "FactReference".

This factor will be calculated as follows:

$$\text{FactReference} = \frac{\text{maxReferenceValue} \times \text{maxInterfaceRange}}{\text{maxInterfaceValue} \times 4096}$$

maxReferenceValue:	maximum value of the measuring system in the displacement unit
maxInterfaceRange:	range between the min. and max. value of the measuring system in the displacement unit
maxInterfaceValue:	maximum value of the measuring system in the signal unit

Example:

measuring system:	4 ... 20mA	maxInterfaceValue = 20, maxInterfaceRange = 16
measuring range:	0 ... 500mm	maxReferenceValue = 500

$$\text{FactReference} = \frac{500 \times 16}{20 \times 4096} = 0.09765625 \Rightarrow \text{possible steps} = 97\mu\text{m}$$

4.7.2 Factor solenoid current (FactSolCurrent)

All parameters for the solenoid current (mA) have to be scaled by the factor "FactSolCurrent".

This factor is a fixed value from 1.78.

4.7.3 Factor Percentage (FactPercentage)

All parameters with the unit % have to be scaled by the factor "FactPercentage".

This factor is a fixed value from 97.65625.

4.7.4 Factor Interface (FactInterface)

All parameters with the unit V have to be scaled by the factor "FactInterface".

This factor is a fixed value from 0.009765625.

4.8 Parameter description

In the following section, all parameters, which can be adjusted via PKW (refer to section "Cyclical parameter data exchange (PKW)" page 22) will be described.

Note: A detailed description about the function of each parameter you will find in the corresponding operating instructions of the ED1/SD1 controller card

4.8.1 db_ErrorCode

Parameter description

Description	Error code
IND	0
PNU	36
PZD-number	--
Parameter name	db_ErrorCode
Data type	uint16
Parameter length (byte)	2
Access	r

Value description

Code (Hex)	Name	Description	Reaction
0000	No error	No error is present	
1000	General error	A general error is present	FAULT
3412	Power supply voltage too low	The supply voltage is too low	FAULT
3422	Control voltage too low	The preset value (analog signal) voltage is too low or there occurred a cable break	FAULT
5231	Transducer sensor 1	The actual value (analog signal) voltage is too low or there occurred a cable break	FAULT
5510	EPROM / EEPROM	Device parameter can not be stored or read in or from the non-volatile memory	FAULT
8100	Communication	Bus communication is interrupted	FAULT

4.8.2 db_ControlWord

Parameter description

Description	Control the device
IND	0
PNU	37
PZD-number	001
Parameter name	db_ControlWord
Data type	uint16
Parameter length (byte)	2
Access	r/w

Value description

The control word is bit coded, i.e., each individual bit has a certain control function. The table below lists the individual functions with the bit belonging to it.

MSB								LSB							
Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
High - Byte								Low - Byte							

Bit	Parameter name	Description
0	Disable (D)	Set the DP-Slave controller card in the state "DISABLED".
1	Hold enable (H)	Set the DP-Slave controller card in the state "HOLD"
2	Device mode active (M)	Set the DP-Slave controller card in the state "DEVICE MODE ACTIVE".
3	Reset fault (R)	Reset an error
4	Reserved	
5	Reserved	
6		
7		
8		
9		
10		
11		
12		
13		
14	Stop	The movement of the axis will be stopped. As long as this bit is set, the axis will stay controlled in the current position.
15		

4.8.3 db_StatusWord

Parameter description

Description	State of the device
IND	0
PNU	38
PZD-number	002
Parameter name	db_StatusWord
Data type	uint16
Parameter length (byte)	2
Access	r

Value description

The status word is bit coded, i.e., each individual bit has a certain control function. The table below lists the individual functions with the bit belonging to it.

MSB								LSB							
Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit	Bit
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
High - Byte								Low - Byte							

Bit	Parameter name	Description
0	Disable (D)	Is active, if the DP-Slave controller card is in the state "DISABLED"
1	Hold enable (H)	Is active, if the DP-Slave controller card is in the state "HOLD"
2	Device mode active (M)	Is active, if the DP-Slave controller card is in the state "DEVICE_MODE_ACTIVE"
3	Ready (R)	Is active, if the DP-Slave controller card is in the state "INIT" and no error is active
4	Local control	Is active, if the DP-Slave controller card is operated locally
5	Warning	
6		
7		
8		
9		
10		
11		
12	Actual value reached target window	The axis is in position (refer to the parameter "Window" and "Windows hysteresis" in the operating instructions of the ED1/SD1 position controller PLUS
13		
14		
15		

4.8.4 db_DeviceMode

Parameter description

Description	Set the device mode
IND	0
PNU	39
PZD-number	-
Parameter name	db_DeviceMode
Data type	int8
Parameter length (byte)	1
Access	r/w

Value description

1	Preset value via bus
2	Preset value locally

4.8.5 db_ControlMode

Parameter description

Description	Set the device control mode
IND	0
PNU	40
PZD-number	-
Parameter name	db_ControlMode
Data type	int8
Parameter length (byte)	1
Access	r/w

Value description

6	Open loop movement
9	Position control axis

4.8.6 db_Local

Parameter description

Description	Specifies the source for the control word
IND	0
PNU	41
PZD-number	-
Parameter name	db_Local
Data type	int8
Parameter length (byte)	1
Access	r/w

Value description

0	Control word acting is made via bus
1	Control word acting is made locally

4.8.7 db_Capability

Parameter description

Description	Contains information about the applications capability of the device.
IND	0
PNU	50
PZD-number	-
Parameter name	db_Capability
Data type	uint32
Parameter length (byte)	4
Access	r

Value description

0x00 0x13 0x00 0x00	Hydraulic Drive, Controller mode open loop movement supported, controller mode position control supported
---------------------	---

4.8.8 db_StoreParameter

Parameter description

Description	The changed device parameters will be stored into the EEPROM from the DP-Slave controller card (non-volatile memory)
IND	0
PNU	51
PZD-number	-
Parameter name	db_StoreParameter
Data type	int32
Parameter length (byte)	4
Access	w

Value description

0	Do nothing
0x73 0x61 0x76 0x65 (= 's' 'a' 'v' 'e')	Store all parameters into the non-volatile memory

4.8.9 db_ResetDefault

Parameter description

Description	All device parameters will be set to default values
IND	0
PNU	52
PZD-number	-
Parameter name	db_ResetDefault
Data type	int32
Parameter length (byte)	4
Access	w

Value description

0	Do nothing
0x6C 0x6F 0x61 0x64 (= 'l' 'o' 'a' 'd')	All device parameters will be set to default values

4.8.10 dav_InterfaceNo

Parameter description

Description	Interface number (= 'Used input actual value' from PASO)
IND	1
PNU	20
PZD-number	-
Parameter name	dav_InterfaceNo
Data type	uint8
Parameter length (byte)	1
Access	r/w

Value description

0	Analog input 1 [V]
1	Analog input 2 [mA]
2	Analog input 3 [V]
3	Analog input 4 [mA]

4.8.11 dav_transducer_Type

Parameter description

Description	Type of the measuring system (actual value)
IND	1
PNU	22
PZD-number	-
Parameter name	dav_transducer_Type
Data type	int8
Parameter length (byte)	1
Access	r

Value description

67	Position Transducer Analog
----	----------------------------

4.8.12 dav_ActualValUnit

Parameter description

Description	Displacement unit (= 'displacement unit' from PASO)
IND	1
PNU	84
PZD-number	-
Parameter name	dav_ActualValUnit
Data type	uint8
Parameter length (byte)	1
Access	r/w

Value description

0	mm
1	Deg
2	Inch

4.8.13 dav_Invert

Parameter description

Description	Inversion actual value (= 'Inversion actual value' from PASO)
IND	1
PNU	95
PZD-number	-
Parameter name	dav_Invert
Data type	uint8
Parameter length (byte)	1
Access	r/w

Value description

0	Inversion Off
1	Inversion on

4.8.14 dav_Cablebreak

Parameter description

Description	Cablebreak detection actual value (= 'Cablebreak detection actual value' from PASO)
IND	1
PNU	96
PZD-number	-
Parameter name	dav_Cablebreak
Data type	uint8
Parameter length (byte)	1
Access	r/w

Value description

0	Cablebreak detection actual value Off
1	Cablebreak detection actual value on

4.8.15 dav_InterfaceType

Parameter description

Description	Interface type (= 'Signal type' from PASO)
IND	1
PNU	97
PZD-number	-
Parameter name	dav_InterfaceType
Data type	uint8
Parameter length (byte)	1
Access	r/w

Value description

0	0 ... 5V
1	0 ... 8V
2	0 ... 10V
3	0 ... 20mA
4	4 ... 20mA

4.8.16 dav_transducer_Offset

Parameter description

Description	Offset actual value (= 'Offset measuring system' from PASO)
IND	1
PNU	98
PZD-number	-
Parameter name	dav_transducer_Offset
Data type	int32
Parameter length (byte)	4
Access	r/w

Value description

Range	-50 ... +50% from the signal range
Unit	μ[displacement unit]
Default Value	0
Step	FactReference

4.8.17 dav_transducer_Auflösung

Parameter description

Description	Resolution actual value (= 'Resolution actual value' from PASO)
IND	1
PNU	99
PZD-number	-
Parameter name	dav_transducer_Auflösung
Data type	int32
Parameter length (byte)	4
Access	r/w

Value description

Range	1 ... 999999
Unit	μ[Displacement unit]
Default Value	10000
Step	1

4.8.18 dop_drivePos_AsideVal

Parameter description

Description	Minimum current solenoid A (= 'Imin A' from PASO)
IND	3
PNU	73
PZD-number	-
Parameter name	dop_drivePos_AsideVal
Data type	uint16
Parameter length (byte)	2
Access	r/w

Value description

Range	0 ... dop_drivePos_AsideVal (max 950)
Unit	mA
Default Value	150
Step	FactSolCurrent

4.8.19 dop_drivePos_AsideMaxVal

Parameter description

Description	Maximum current solenoid A (= 'I _{max A} ' from PASO)
IND	3
PNU	129
PZD-number	-
Parameter name	dop_drivePos_AsideMaxVal
Data type	uint16
Parameter length (byte)	2
Access	r/w

Value description

Range	dop_drivePos_AsideVal ... 1800
Unit	mA
Default Value	700
Step	FactSolCurrent

4.8.20 dop_drivePos_BsideVal

Parameter description

Description	Minimum current solenoid B (= 'I _{min B} ' from PASO)
IND	3
PNU	76
PZD-number	-
Parameter name	dop_drivePos_AsideVal
Data type	uint16
Parameter length (byte)	2
Access	r/w

Value description

Range	0 ... dop_drivePos_BsideVal (max 950)
Unit	mA
Default Value	150
Step	FactSolCurrent

4.8.21 dop_drivePos_BsideMaxVal

Parameter description

Description	Maximum current solenoid B (= 'I _{max B} ' from PASO)
IND	3
PNU	130
PZD-number	-
Parameter name	dop_drivePos_BsideMaxVal
Data type	uint16
Parameter length (byte)	2
Access	r/w

Value description

Range	dop_drivePos_AsideVal ... 1800
Unit	mA
Default Value	700
Step	FactSolCurrent

4.8.22 dop_dither_Type

Parameter description

Description	Determines the type of the dither function
IND	3
PNU	97
PZD-number	-
Parameter name	dop_dither_Type
Data type	int8
Parameter length (byte)	1
Access	r/w

Value description

0	Dither function Off
1	Dither with square wave

4.8.23 dop_dither_FreqVal

Parameter description

Description	Dither Frequency (= 'Dither Frequency' from PASO)
IND	3
PNU	98
PZD-number	-
Parameter name	dop_dither_FreqVal
Data type	uint8
Parameter length (byte)	1
Access	r/w

Value description

Range	20 ... 500 = 20 ... 500Hz
Unit	Hz
Default Value	100 = 100Hz
Step	only values 1000/value = integer are possible

4.8.24 dop_dither_AmplVal

Parameter description

Description	Dither Amplitude (= 'Dither Level' from PASO)
IND	3
PNU	101
PZD-number	-
Parameter name	dop_dither_AmplVal
Data type	uint8
Parameter length (byte)	1
Access	r/w

Value description

Range	0 ... 200
Unit	mA
Default Value	100
Step	2 x FactSolCurrent

4.8.25 dop_drivePos_SystemInvert

Parameter description

Description	System Inversion (= 'System control' from PASO)
IND	3
PNU	131
PZD-number	-
Parameter name	dop_drivePos_SystemInvert
Data type	int8
Parameter length (byte)	1
Access	r/w

Value description

0	Inversion Off
1	Inversion on (solenoid A and B will be changed)

4.8.26 dpc_SetpointVal

Parameter description

Description	Preset position resp. preset value
IND	12
PNU	21
PZD-number	012
Parameter name	dpc_SetpointVal
Data type	int32
Parameter length (byte)	4
Access	r/w

Value description if db_ControlMode = Open loop movement (6)

Range	0 ... 100000
Unit	%
Default Value	0
Step	FactPercentage

Value description if db_ControlMode = Position control axis (9)

Range	0 ... 4096 x FactReference
Unit	Displacement unit
Default Value	0
Step	FactReference

4.8.27 dpc_ramp_Type

Parameter description

Description	Determines the type of the ramp function
IND	12
PNU	42
PZD-number	-
Parameter name	dpc_ramp_Type
Data type	int8
Parameter length (byte)	1
Access	r/w

Value description

0	Ramp function Off
-1	Linear ramp (2 separate parameters for acceleration positive and negative)

4.8.28 dpc_ramp_AccTimeNegVal

Parameter description

Description	Starting ramp negative (= 'Ramp -' from PASO)
IND	12
PNU	46
PZD-number	-
Parameter name	dpc_ramp_AccTimeNegVal
Data type	uint16
Parameter length (byte)	2
Access	r/w

Value description

Range	0 ... 25000
Unit	ms
Default Value	0
Step	50

4.8.29 dpc_ramp_AccTimePosVal

Parameter description

Description	Starting ramp positive (= 'Ramp +' from PASO)
IND	12
PNU	49
PZD-number	-
Parameter name	dpc_ramp_AccTimePosVal
Data type	uint16
Parameter length (byte)	2
Access	r/w

Value description

Range	0 ... 25000
Unit	ms
Default Value	0
Step	50

4.8.30 dpc_ActualVal

Parameter description

Description	Actual value
IND	12
PNU	100
PZD-number	003
Parameter name	dpc_ActualVal
Data type	int32
Parameter length (byte)	4
Access	r

Value description

Range	0 ... 4096 x FactReference
Unit	Displacement unit
Default Value	0
Step	FactReference

4.8.31 dpc_CtrlDeviationVal

Parameter description

Description	Control deviation
IND	12
PNU	103
PZD-number	-
Parameter name	dpc_CtrlDeviationVal
Data type	int32
Parameter length (byte)	4
Access	r

Value description

Range	0 ... 4096 x FactReference
Unit	Displacement unit
Default Value	0
Step	FactReference

4.8.32 dpc_integrator_Type

Parameter description

Description	Determines the type of the integrator function
IND	12
PNU	115
PZD-number	-
Parameter name	dpc_integrator_Type
Data type	int8
Parameter length (byte)	1
Access	r/w

Value description

0	Integrator function Off
1	Integrator type 1

4.8.33 dpc_integrator_TiVal

Parameter description

Description	Integrator time positive (= 'I-Time pos.' from PASO)
IND	12
PNU	116
PZD-number	-
Parameter name	dpc_integrator_TiVal
Data type	uint32
Parameter length (byte)	8
Access	r/w

Value description

Range	0 ... 10000
Unit	ms
Default Value	0
Step	10

4.8.34 dpc_integrator_TiValNeg

Parameter description

Description	Integrator time negative (= 'I-Time neg.' from PASO)
IND	12
PNU	212
PZD-number	-
Parameter name	dpc_integrator_TiValNeg
Data type	uint32
Parameter length (byte)	8
Access	r/w

Value description

Range	0 ... 10000
Unit	ms
Default Value	0
Step	10

4.8.35 dpc_integrator_DXVal

Parameter description

Description	Integrator Window positive (= 'I-Window pos.' from PASO)
IND	12
PNU	119
PZD-number	-
Parameter name	dpc_integrator_DXVal
Data type	uint32
Parameter length (byte)	4
Access	r/w

Value description

Range	0 ... 4096 x FactReference
Unit	Displacement unit
Default Value	0
Step	4 x FactReference

4.8.36 dpc_integrator_DXValNeg

Parameter description

Description	Integrator Window negative (= 'I-Window neg.' from PASO)
IND	12
PNU	211
PZD-number	-
Parameter name	dpc_integrator_DXValNeg
Data type	uint32
Parameter length (byte)	4
Access	r/w

Value description

Range	0 ... 4096 x FactReference
Unit	Displacement unit
Default Value	0
Step	4 x FactReference

4.8.37 dpc_window_Type

Parameter description

Description	Determines the type of the window function
IND	12
PNU	177
PZD-number	-
Parameter name	dpc_window_Type
Data type	int8
Parameter length (byte)	1
Access	r/w

Value description

0	Window function Off
-1	Window function on

4.8.38 dpc_window_ThresholdVal

Parameter description

Description	Window size inside (= 'Window' from PASO)
IND	12
PNU	178
PZD-number	-
Parameter name	dpc_window_Threshold
Data type	int16
Parameter length (byte)	2
Access	r/w

Value description

Range	0 ... 1020 x FactReference
Unit	Displacement unit
Default Value	16 x FactReference
Step	4 x FactReference

4.8.39 dpc_window_ThresholdHystVal

Parameter description

Description	Window size outside (= 'Window Hysteresis' from PASO)
IND	12
PNU	213
PZD-number	-
Parameter name	dpc_window_ThresholdHystVal
Data type	int16
Parameter length (byte)	2
Access	r/w

Value description

Range	0 ... 510 x FactReference
Unit	Displacement unit
Default Value	8 x FactReference
Step	4 x FactReference

4.8.40 dpc_Schwelle

Parameter description

Description	P-Threshold positive(= 'Threshold pos.' from PASO)
IND	12
PNU	205
PZD-number	-
Parameter name	dpc_Schwelle
Data type	uint16
Parameter length (byte)	2
Access	r/w

Value description

Range	0 ... 10000
Unit	mV
Default Value	100
Step	FactInterface

4.8.41 dpc_SchwelleNeg

Parameter description

Description	P-Threshold negative (= 'Threshold neg.' from PASO)
IND	12
PNU	206
PZD-number	-
Parameter name	dpc_SchwelleNeg
Data type	uint16
Parameter length (byte)	2
Access	r/w

Value description

Range	0 ... 10000
Unit	mV
Default Value	100
Step	FactInterface

4.8.42 dpc_PropFact1
Parameter description

Description	P-Factor 1 positive (= 'PropFact1 pos.' from PASO)
IND	12
PNU	207
PZD-number	-
Parameter name	dpc_PropFact1
Data type	uint8
Parameter length (byte)	1
Access	r/w

Value description

Range	0 ... 255
Unit	-
Default Value	20
Step	1

4.8.43 dpc_PropFact1Neg
Parameter description

Description	P-Factor 1 negative (= 'PropFact1 neg.' from PASO)
IND	12
PNU	208
PZD-number	-
Parameter name	dpc_PropFact1Neg
Data type	uint8
Parameter length (byte)	1
Access	r/w

Value description

Range	0 ... 255
Unit	-
Default Value	20
Step	1

4.8.44 dpc_PropFact2

Parameter description

Description	P-Factor 2 positive (= 'PropFact2 pos.' from PASO)
IND	12
PNU	209
PZD-number	-
Parameter name	dpc_PropFact2
Data type	uint8
Parameter length (byte)	1
Access	r/w

Value description

Range	0 ... 255
Unit	-
Default Value	20
Step	1

4.8.45 dpc_PropFact2Neg

Parameter description

Description	P-Factor 2 negative (= 'PropFact2 neg.' from PASO)
IND	12
PNU	210
PZD-number	-
Parameter name	dpc_PropFact2Neg
Data type	uint8
Parameter length (byte)	1
Access	r/w

Value description

Range	0 ... 255
Unit	-
Default Value	20
Step	1

4.8.46 dpc_window_SolenoidInPos

Parameter description

Description	Function 'Solenoid in position' (= 'Solenoid 'In Position' from PASO)
IND	12
PNU	214
PZD-number	-
Parameter name	dpc_window_SolenoidInPos
Data type	int8
Parameter length (byte)	1
Access	r/w

Value description

0	Function 'Solenoid in position' Off
1	Function 'Solenoid in position' on

4.8.47 dpc_window_DigOutInPos

Parameter description

Description	Function 'DigOut in Position' (= 'Dig. output 'In Position" from PASO)
IND	12
PNU	215
PZD-number	-
Parameter name	dpc_window_DigOutInPos
Data type	int8
Parameter length (byte)	1
Access	r/w

Value description

0	Function 'DigOut in Position' Off
1	Function 'DigOut in Position' on

5 Commissioning

For a support during the commissioning of a DP-Slave controller card, the parameterisation software PASO can be connected to the DP-Slave controller card. PASO offers the possibility to display some process value like preset value, solenoid current, device state (state machine) etc. Also the setting of the node address and a PROFIBUS-DP diagnostic can be made via the PASO (refer to section "Fieldbus Settings" page 9).

5.1 Presupposition for the DP-Slave controller card

For the commissioning of a DP-Slave controller card, the following presupposition must be cleared:

- **What is the node address from the DP-Slave controller card?**
The node address can be set via the parameterisation software PASO in the menu item "Fieldbus_Fieldbus-Info" (refer to section "Fieldbus Settings" page 9)
- **What is the device control mode for the DP-Slave controller card?**
The device control mode can be set via the parameter "db_ControlMode". This selection is important for the for the function range of the DP-Slave controller card.

IMPORTANT: This parameter can only be changed if the DP-Slave controller card is in the state "INIT" or "DISABLE" (refer to section "Device State Machine" page 14)

5.2 Presupposition and information for the PROFIBUS-DP Master

For the commissioning of a PROFIBUS-DP Master, the following presupposition must be cleared:

- **Node address**
What is the node address from the DP-Slave controller card?
- **GSD-file**
The GSD-file "WAGED13?00BB.gsd" must be present on the Master side. If not, this file must be copied into the project tool of the Master.
- **Data exchange (consistence / non consistence)**
For the programming of the data exchange in the application program, the following statements are valid:
 - PKW-part
→ consistence data exchange (consistence about the whole length)
 - PZD-part
→ consistence data exchange (consistence about the whole length)

5.3 Delivery state

The DP-Slave controller card is delivered with the following basic configuration:

- Node address 6
- Telegram type 1

5.4 Parameterisation

The parameters of the DP-Slave controller card can be read or changed through the PROFIBUS-DP or through PASO.

After switch-on the DP-Slave controller card, it can be parameterised by sending parameter via PKW (refer to section "Cyclical parameter data exchange (PKW)" page 22). If the changed parameters should be also present after a switch-Off and switch-on, they must be stored before the switch-Off. This can be made with the parameter "db_StoreParameter" (refer to section "db_StoreParameter" page 30).

5.5 Setting the preset value via Fieldbus

In the standard version of the DP-Slave controller card, the preset value can be set locally or via the Fieldbus (refer to section "Program Control" page 17). The switch over is made with the parameter "db_DeviceMode" (refer to section "db_DeviceMode" page 29)

After each power on, the following commissioning sequence is necessary:

1. The DP-Slave controller card is now in the state "INIT"
2. In this state, the device control mode can be set with the parameter "db_ControlMode" and the device mode can be set with the parameter "db_DeviceMode"
3. For the release of the DP-Slave controller card, the 3 bits D, H and M from the control word (refer to section "Device State Machine" page 14) must be set to logical 1. The DP-Slave controller card is now in the state "ACTIVE". Now, a preset value can be set.

Note: If the DP-Slave controller card is used locally (refer to section "Local control" page 13), the start signal (digital input 1) must be set additionally

5.6 Start after an error

- If the device detects an error, the release will be take away internal and the bit "Ready" from the status word will be set to 0. Via the parameter "db_ErrorCode" or via the menu item "Diagnostic" in the PASO, an error description can be displayed.
- For restarting the DP-Slave controller card, the bit "Reset Fault" in the control word must be set once to logical 1. Therefore, the error will be reset.
- If the error is reset, the bit "Ready" from status word will be set to 1.
- For the release of the DP-Slave controller card, the 3 bit D, H and M from the control word must be set again to logical 1

6 Diagnostic and error detection

6.1 Diagnostic LED

On the DP-Slave controller card, a red LED indicates an error. A detailed description about all the possible error you will find in the section "db_ErrorCode" page 26 or in the corresponding operating instructions of the ED1/SD1 controller card.

6.2 Diagnostic about the Fieldbus

A diagnostic about the Fieldbus is always possible via the parameterisation software PASO. This will be made via the menu item "Fieldbus_Fieldbus-Info". The following values will be displayed:

- Node address
- Baudrate
- Telegram type
- Bus type
- ID-number
- WD-state
- DP-state
- TG-state
- PDZ-values

A detailed description of the diagnostic function you will find in the section "Fieldbus Diagnostics" page 10.

7 Version index

In the following table, an index about the different versions of the " OPERATING INSTRUCTIONS ED1/SD1 PROFIBUS-DP Device-Profile in accordance with Fluid Power Technology" will be listed. The current version is always the version listed at last.

Version	Description	Date of the release
0.1	Start version	08.09.04
1.0	Supplement with the parameter description	29.11.04