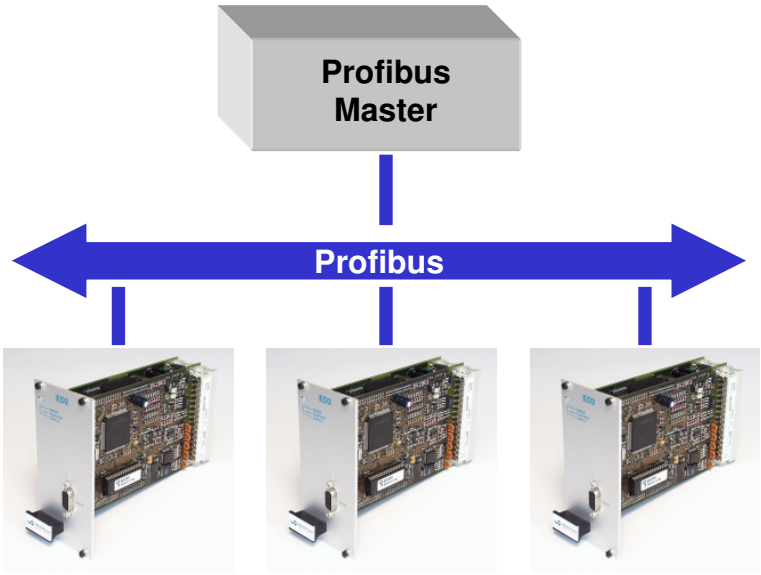
OPERATING GUIDE
AXIS CONTROLLER ED2/ED3

APPENDIX

PROFIBUS – DP Device-Profil
Fluid Power Technology

Version 1.3



0 Contents

1 PROFIBUS technology

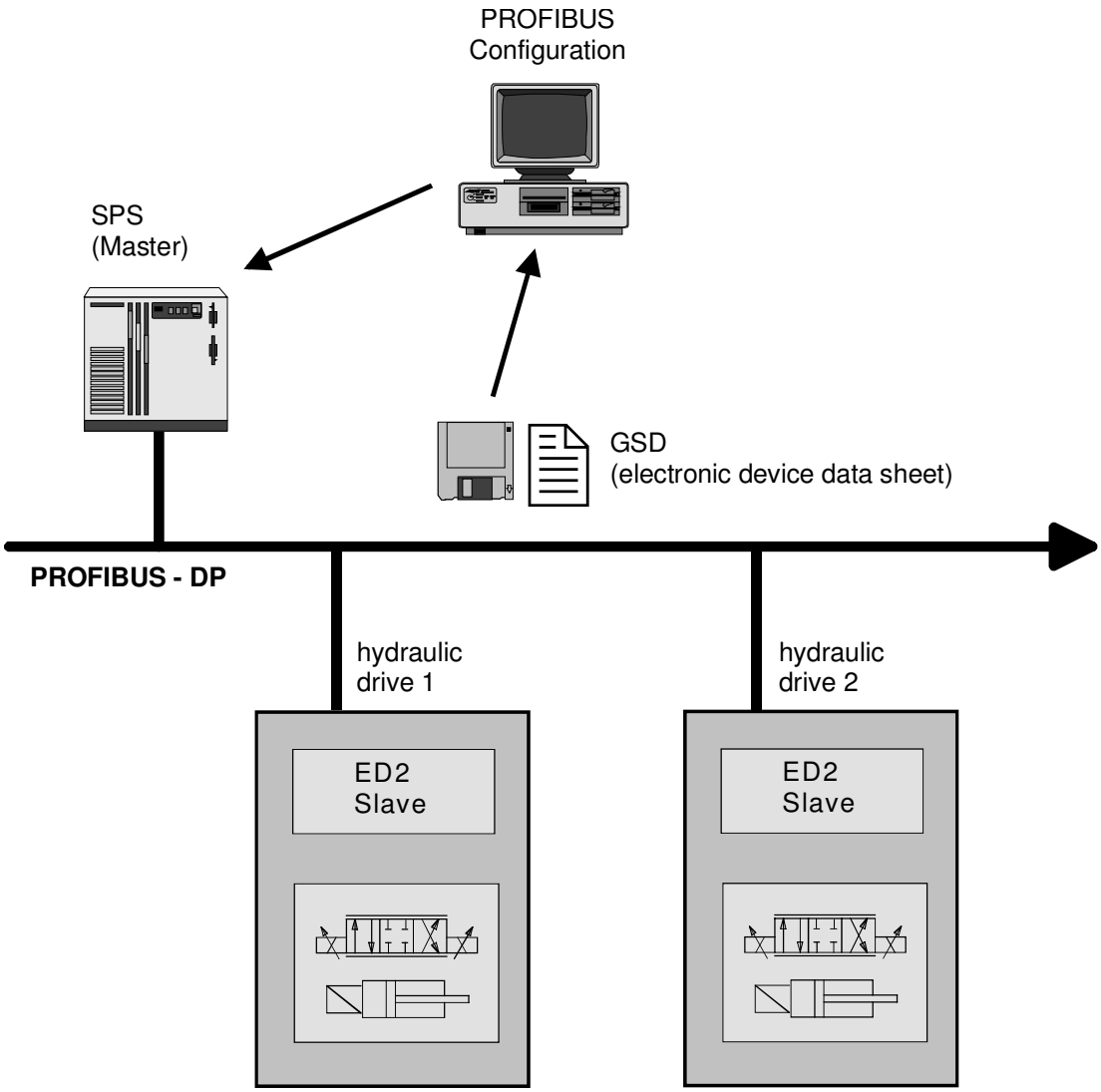
1.1 General

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** (**d**ecentralised **p**eriphery).

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, once 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

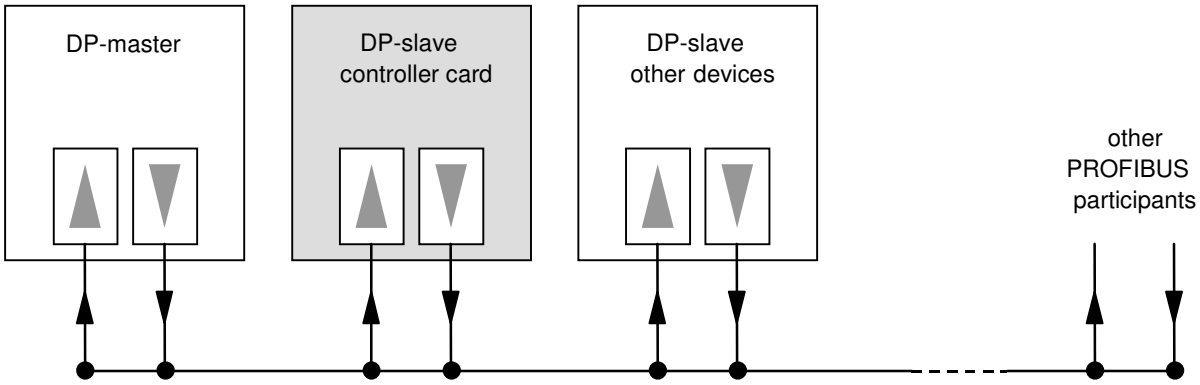
- **Slaves (passive Fieldbus participants)**
  These devices can only receive messages and send data and messages to the Master only on a request.

  The WANDFLUH ED2/ED3 axis 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 (Gerätestammdatei, 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 morn 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:

	Data structure (telegram)		
Protocol frame (Header)	**Parameter-Kennung-Value (PKW)**	**Prozessdaten (PZD)**	Protocol frame (Trailer)

2.3 Available telegrams

For a description about all available telegram types refer to section "Telegram types" page 27.

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 25.
- **By controlling several axis (several axis in individual control or synchronism control), the corresponding telegram type must be selected and transmit for each axis seperate. The data exchange will happen serial.**

3 Product Description

3.1 General

The present operating instructions represent a PROFIBUS-DP specific extension of the "ED2 2-axis controller" resp. "ED3 1-axis controller" card operating instructions.

Remark: Please read the operating instructions of the "ED2 2-axis controller" resp. "ED3 1-axis controller" card beforehand.

The DP-Slave controller can be operated in the follow 2 device modes::

- **Synchronism control**
  Both axis will move synchronous (automatic synchronismn average value)

- **Individual control**
  Both axis will move independent of each other

The switch over between the 2 device mode is made with the parameter "DeviceMode".

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	D-SUB-plug connector 9-pole female on front plate, in accordance with RS485 galvanic separated • 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-salve 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:

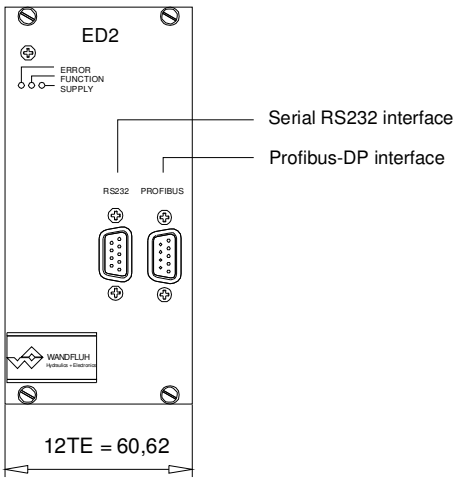
9.6kBaud / 19.2kBaud / 45.45kBaud / 93.75kBaud / 187.5kBaud / 500kBaud / 1.5MBaud / 3.0MBaud / 6.0Mbaud / 12Mbaud

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

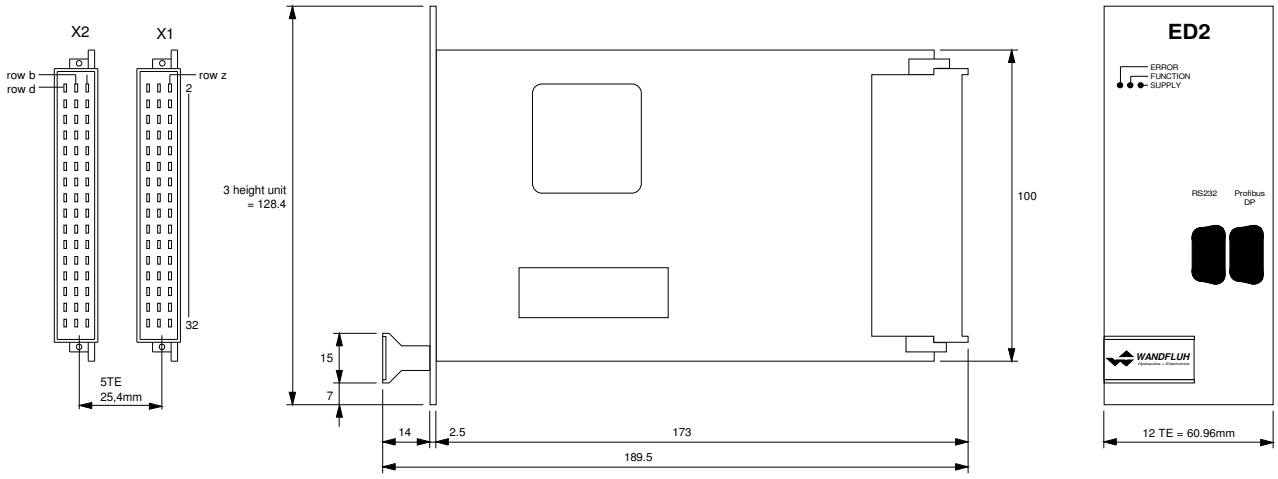
3.3 Operating and Indicating elements

The DP-Slave controller card is built in the Eurocard format with two connector strips 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

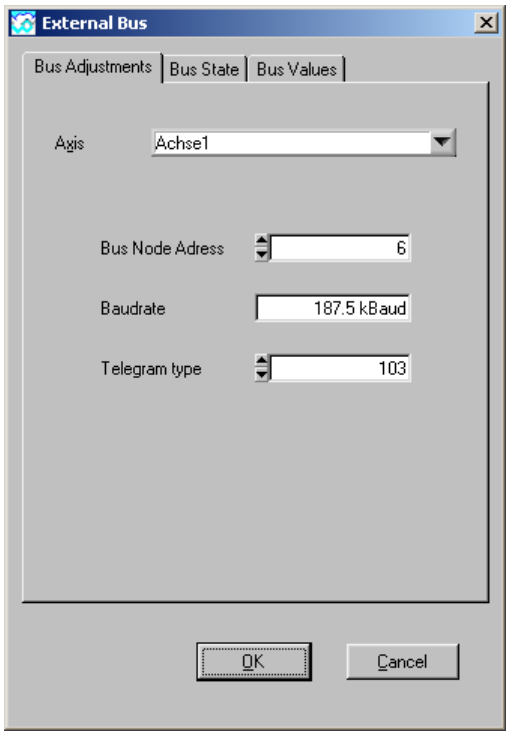


3.4 Fieldbus Settings

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

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

This settings can be made in the menu item "Help_Bus Info extern".

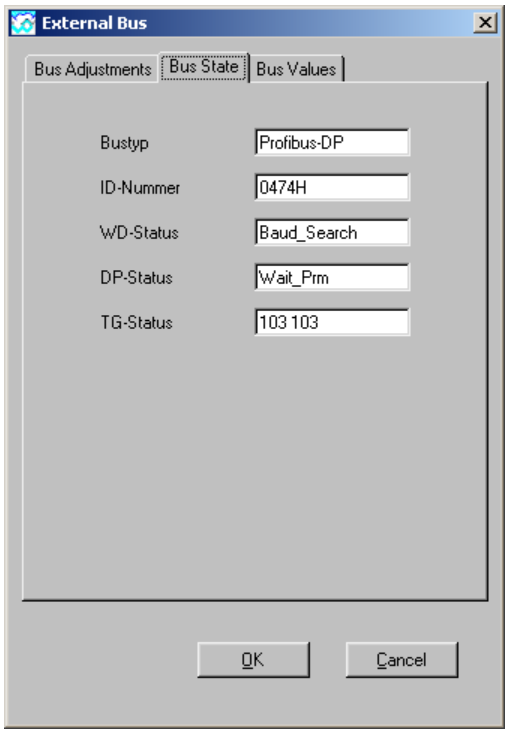


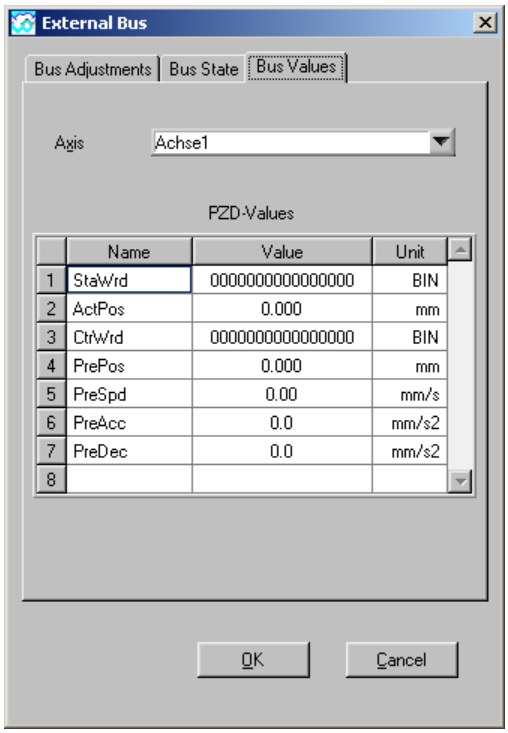
The following parameters can be set resp. will be displayed:

Field	Parameter description	Display
Axis	In this field, the active axis can be selected. (Axis, for which the settings apply).	
Bus Node Adress	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 27.	

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	The communication on the Fieldbus is supervised permanent through the Watchdog. The current state of the Watchdog is displayed here.	
	Baud_Search The baudrate will be searched	Baud_Search
	Baud_Control The found baudrate will be checked	Baud_Control
	DP_Control The found baudrate is ok. The Watchdog for the Fieldbus is active.	DP_Control

DP-Status	The DP-Slave controller card can be in different states. The current state will be displayed here. **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. **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. **Data_Exchange** If the parameter telegram as well as the configuration telegram were ok, the data exchange via the Fieldbus is enable and possible.	 Wait_Prm Wait_Cfg Data_Exchange
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 "ED2 2-axis controller" resp. "ED3 1-axis controller".

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 Release control
- DigInp 6 *Limit switch positive axis 2
- DigInp 7 *Limit switch negative axis 2
- DigInp 16 *Limit switch positive axis 1
- DigInp 17 *Limit switch negative axis 1

These signals are used by all means in the local control for the release of the device function (refer to section "Local control" page 14).

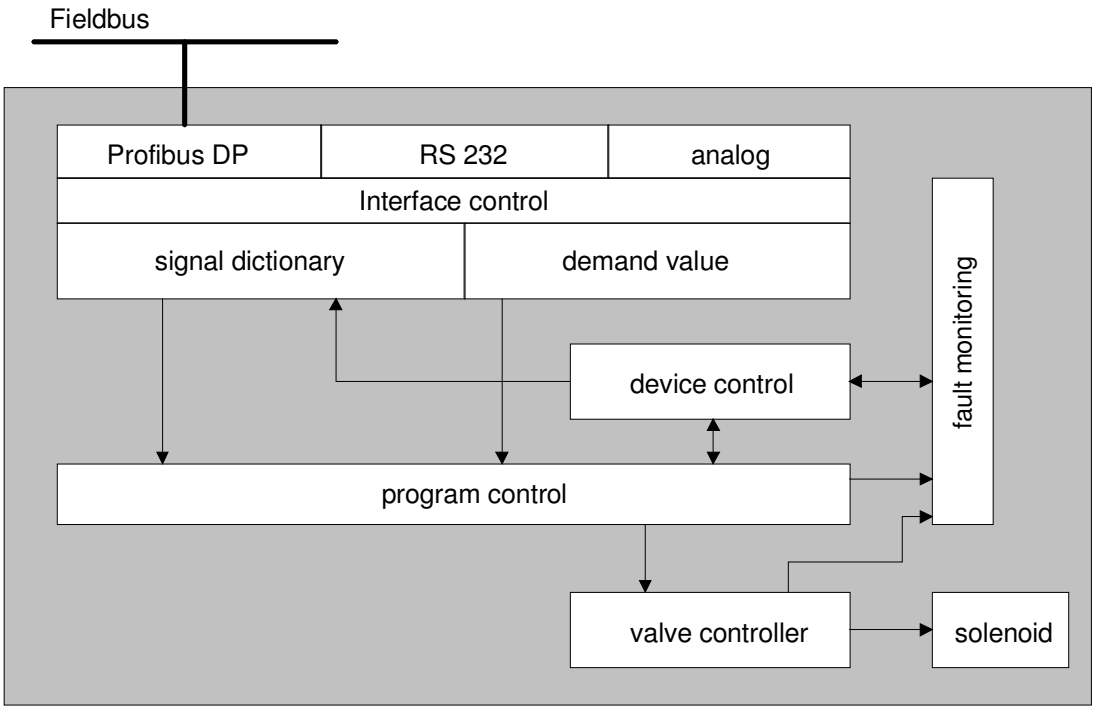
3.7 Parameterisation

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.

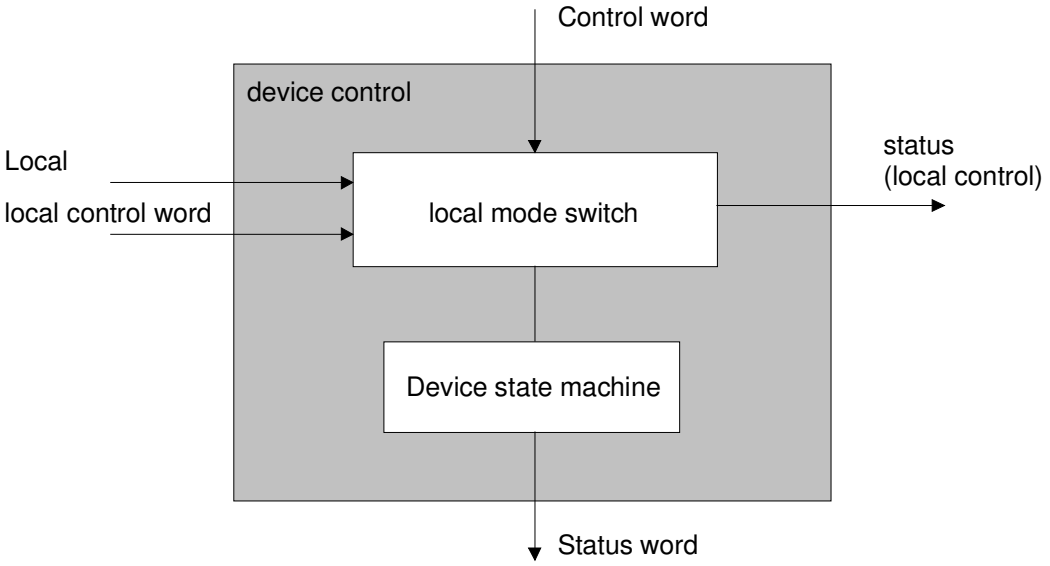
The Fieldbus control is made through a higher level Fieldbus Master.

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.

If the DP-Slave axis controller is started without field-bus connection, then the following bus-independent functions are possible:

- **Direct valve actuation**
  In this function, the driving of the solenoids takes place directly through the solenoid outputs of the DP-Slave axis controller. The axis is not moved with positional control, therefore there is no monitoring of the acceleration, speed and deceleration. Consequently also no measuring systems have to be connected. The driving takes place either through the parameterisation software PASO by means of the menu point "Commands_Valve Actuation" (DigInp1 = active, DigInp3 = not active) or in the open loop movement through the analogue inputs (DigInp1 = active, DigInp3 = active).

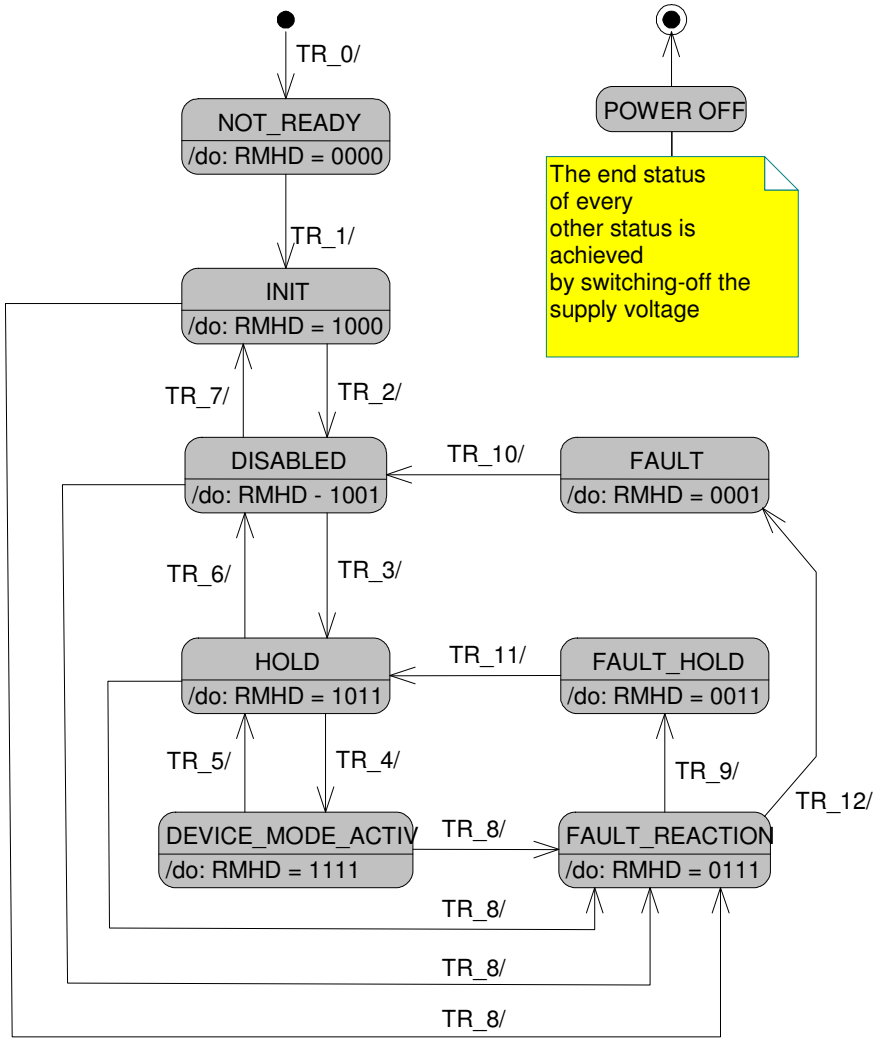
- **Manual operation**
  In this function, the axis moves with a predefined speed in positive (forwards) or negative (reverse) direction. A monitoring of the acceleration, speed and deceleration takes place. Therefore measuring systems have to be connected and the controller parameters of the DP-Slave axis controller have to be correspondingly set. The driving takes place either through the digital inputs DigInp9 - DigInp12 (DigInp1 = active) or the parameterisation software PASO by means of the menu point "Commands_Manual Operation (DigInp1 = active, the digital inputs DigInp9 - DigInp12 in this case must not be active). The synchronized operation is not possible. Therefore, DigInp 14 must be set to active (= Manual Individual) resp. in the PASO the parameter "Move axis separately" must be set to active.

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	• The supply voltage is present on the DSV • Self test is running • The device functions are disabled
INIT	• 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	• 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	• 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	• 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	• 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	• 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 • 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 R 2 M 1 H 0 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 → x x x x 1 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 → x x x x 1 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

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

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). Preset position, max. acceleration, deceleration and speed are set via the parameterisation software PASO.
Profile position control (-1)	In this mode, the motion profiles are set, started and stopped via the fieldbus resp. local. Acceleration, deceleration and speed are also set via the fieldbus.
Manual control (-2)	In this mode, the axis will move with a fixed speed either in positiv or negativ direction.

A detailed description of the different control modes will follow in the section "Description " page 18.

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)".

4.3.1 Description of control mode

4.3.1.1 Open loop movement

For activating this mode, the device mode must be set to "Preset value setting locally (2)".
The solenoid outputs from the DP-Slave controller are controlled direct from a Joy-Stick via the analog inputs. In this mode, the DP-Slave controller is working in an open loop system. Depending on the value on the analog input, the solenoid outputs are controlled direct. There is the following connection between the input signal (preset value) and the output signal (solenoid current):

0 %	...	50% preset value	=	Imax	...	Imin solenoid B
50 %	...	100% preset value	=	Imin	...	Imax solenoid A

The movement of the axis will be stopped if the corresponding limit switches are reached (DigInp6, DigInp7, DigInp16 and DigInp17), therefore its only possible to move the axis inside the range of the limit switches. But the overrun of a limit switch will not produce an error message.

There is an different analog input for each axis. **Synchronism control is not possible in this control mode.**

In this control mode, the position of the axis is not controlled, there is no control of the acceleration, speed and deceleration. The control of the solenoid is made direct via the solenoid outputs from the DP-Slave controller!

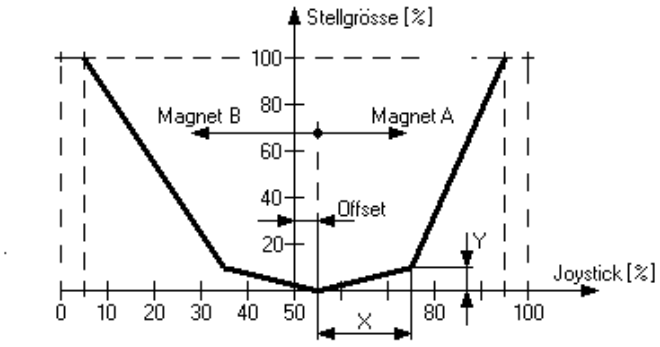
There are 4 more parameters available in this control mode:

- **Central position offset**
  Setting of the valve resp. central position of thet joystick
  Value range: 0 .. ±50%V, Step 0.1%, Defaultwert: 0%

- **Fine control range X**
  Horizontal break point of the characteristic (see below picture)
  Value range: 0 .. +50%, Step 0.1%, Defaultwert: 30%

- **Fine control range Y**
  Vertical break point of the characteristic (see below picture)
  Value range: 0 .. +100%, Step 0.1%, Defaultwert: 20%

- **Cable signal monitoring**
  On/Off of the short circuit- / cablebreak monitoring
  (Cablebreak monitoring U_{IN}<2.5%, Short circuit monitoring U_{IN}>97.5%V)
  Value range: 0 / 1, Defaultwert: 1



The connection of the preset values is as follows:

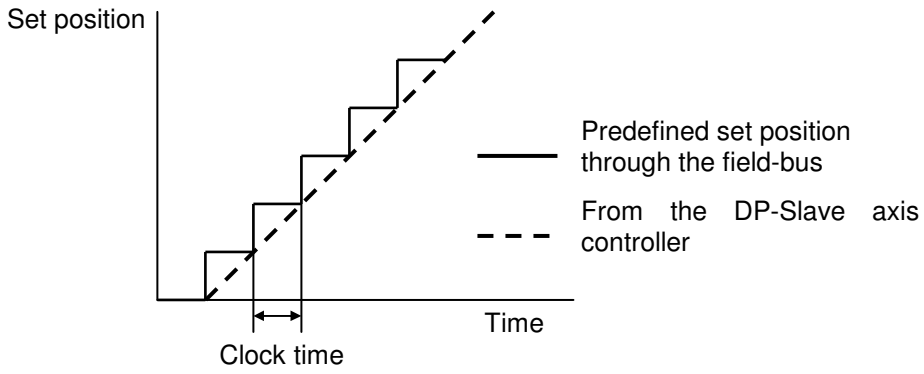
- analog input 5 preset value for axis 1 (solenoid A and B)
- analog input 6 preset value for axis 2 (solenoid C and D)

In additional, there are 2 more digital inputs for the limit switches for the axis 2 available. The connection of the digital inputs is as follows:

- DigInp1 Release control
- DigInp6 *Limit switch pos for axis 2
- DigInp7 *Limit swtich neg for axis 2
- DigInp16 *Limit swtich pos for axis 1
- DigInp17 *Limit swtich neg for axis 1

4.3.1.2 Position control axis

The set position is transmitted from the master to the DP-Slave axis controller with a constant clock time. The DP-Slave axis controller then interpolates respectively between the set position received before the last one and the last received set position. In doing so, the maximum values for the acceleration, speed and deceleration predefined as parameters are adhered to, resp., not exceeded.



Single axis operation:

In this device mode, the two axes can be operated completely independently of one another. **The parameter "Controller type" in the menu "Configuration_Controller type", however, has to be set to "Synchronous controller".**

The following limitations, however, have to be observed:

- The measuring systems of the two axes have to be of the same type (either analogue or digital ones)
- In the case of the digital measuring systems, the signal type "Incremental" cannot be selected.

In addition, two further digital inputs for the connection of sensor inputs for monitoring the maximum stroke of the axis 2 as well as one further digital output for the indication of the position reached for the axis 2 are present. The assignment of the digital I/Os is as follows:

- DigInp1 Enable control
- DigInp6 *Limit switch pos for axis 2
- DigInp7 *Limit switch neg for axis 2
- DigInp16 *Limit switch pos for axis 1
- DigInp17 *Limit switch neg for axis 1

- DigOut1 Contouring error axis 1
- DigOut2 Contouring error axis 2
- DigOut3 Profile end axis 1 (= position reached axis 1)
- DigOut4 Profile end axis 2 (= position reached axis 2)

A detailed description of the individual I/Os can be found in the "Operating Instructions for the 2-Axis Controller ED2".

Synchronized operation:

In this device mode, the two axes can be operated as synchronised controllers. The synchronization control is based on the average value principle. The assignment of the digital I/Os is as follows:

- DigOut1 Enable control
- DigOut16 *Limit switch pos for axis 1
- DigOut17 *Limit switch neg for axis 1

- DigOut1 Contouring error axis 1
- DigOut3 Profile end axis 1 (= position reached axis 1)

A detailed description of the individual I/Os can be found in the "Operating Instructions for the 2-Axis Controller ED2".

4.3.1.3 Profile position control

In this mode, apart from the set position also the speed is transmitted to the DP-Slave axis controller. On the basis of this value and the predefined acceleration and deceleration (in the case of the telegram types 101 and 103 the acceleration and deceleration are also predefined through the field-bus, in the case of the other telegram types these are parameters), the DP-Slave axis controller then calculates the corresponding movement profile.

The movement profile predefinition from the PROFIBUS-Master to the DP-Slave axis controller takes place through a defined sequence (handshaking). This sequence is described in more detail in the following.

Travelling to individual positions:

After the axis has reached the target position, the DP-Slave axis controller signal this with the "Target position reached“ bit in the status word. Only after a renewed predefinition of a new target position value does the axis continue to move.

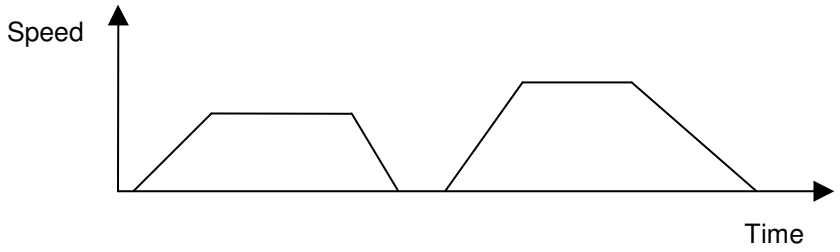
The position data are controlled, resp. predefined by the timing (resp., handshaking) of the bits "New_setpoint“ in the control word and "Setpoint_acknowledge“ in the status word. The bit "New_setpoint“ is flank-triggered.

These bits enable a "Request – response“ mechanism, in order to make ready, resp., transmit a new position value while the axis controller is already travelling to a position. This minimizes the reaction time of a superimposed control system.

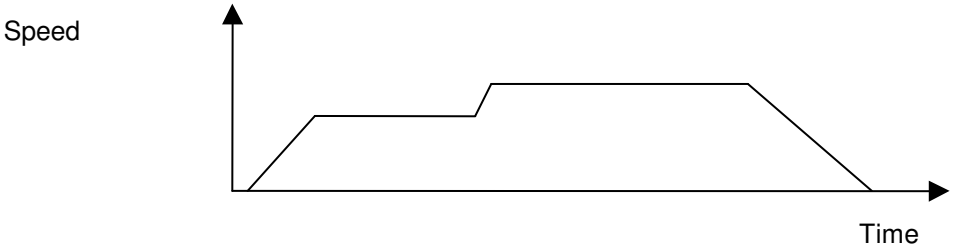
Sequence of a position predefinition from a master:

First the movement data (target position, speed, acceleration, deceleration) have to be transmitted. This is signalled to the DP-Slave axis controller by the master with the change of the bit "New_setpoint“ to "1“. The DP-Slave axis controller responds with "Setpoint_acknowledge“ to "1“, as soon as it has internally passed on the movement data to the profile generator. The master control system now can take the bit "New_setpoint“ back to "0“, in order that the DP-Slave axis controller can set its "Setpoint_acknowledge“ bit back to "0“, so that in this manner it signals its readiness to receive new movement data.
Remark: The axis controller therefore can only accept movement data, when the "Setpoint_acknowledge“ bit is at "0“.

The described mechanism leads to the consequence, that a target position is always reached with the final speed zero and that only after this a new position can be travelled to. If the transmitted movement data are to be taken over immediately (i.e., the data of the movement in progress are overwritten), then the bit "Force_setpoint" in the control word has to be set to "1".



Force_setpoint = 0



Force_setpoint = 1

Single axis operation:

In this device mode, the two axes can be operated completely independently of one another. **The parameter "Controller type" in the menu "Configuration_Controller type", however, has to be at "Synchronous controller".**

The following limitations however have to be observed:

- The measuring system of the two axes have to be of the same type (either analogue or digital ones)
- In the case of the digital measuring systems, the signal type "Incremental" cannot be selected.

In addition, 2two further digital inputs for the connection of sensor input for monitoring the maximum stroke of the axis 2 as well as one further digital output for the indication of the position reached for the axis 2 are present. The assignment of the digital I/Os is as follows:

- DigOut1 Enable control system
- DigOut6 *Limit switch pos for axis 2
- DigOut7 *Limit switch neg for axis 2
- DigOut16 *Limit switch pos for axis 1
- DigOut17 *Limit switch neg for axis 1

- DigOut1 Contouring error axis 1
- DigOut2 Contouring error axis 2
- DigOut3 Profile end axis 1 (= position reached axis1)
- DigOut4 Profile end axis 2 (= position reached axis2)

A detailed description of the individual I/Os can be found in the "Operating Instructions for the 2-Axis Controller ED2".

Synchronized operation:

In this device mode, the two axes can be operated as synchronised controllers. The synchronization control is based on the average value principle. The assignment of the digital I/Os is as follows:

- DigOut1 Enable control
- DigOut16 *Limit switch pos for axis 1
- DigOut17 *Limit switch neg for axis 1

- DigOut1 Contouring error axis 1
- DigOut3 Profile end axis 1 (= position reached axis 1)

A detailed description of the individual I/Os can be found in the "Operating Instructions for the 2-Axis Controller ED2".

4.3.1.4 Manual control

In this function, the axis moves with a predefined speed in positive (forwards) or negative (reverse) direction. A monitoring of the acceleration, speed and deceleration takes place. Therefore measuring systems have to be connected and the controller parameters of the DP-Slave axis controller have to be correspondingly set. The driving takes place through the corresponding control values.

Single axis operation:

In this device mode, the two axes can be operated completely independently of one another. **The parameter "Controller type" in the menu "Configuration_Controller type", however, has to be at "Synchronous controller".**

The following limitations however have to be observed:

- The measuring system of the two axes have to be of the same type (either analogue or digital ones)
- In the case of the digital measuring systems, the signal type "Incremental" cannot be selected.

In addition, 2two further digital inputs for the connection of sensor input for monitoring the maximum stroke of the axis 2 as well as one further digital output for the indication of the position reached for the axis 2 are present. The assignment of the digital I/Os is as follows:

- DigInp1 Enable control system
- DigInp6 *Limit switch pos for axis 2
- DigInp7 *Limit switch neg for axis 2
- DigInp10 Foreward axis 1 (must not be active when controled via PASO)
- DigInp11 Backward axis 1 (must not be active when controled via PASO)
- DigInp12 Fast speed / *Slow speed axis 1 (must not be active when controled via PASO)
- DigInp13 Forward axis 2 (must not be active when controled via PASO)
- DigInp14 Backward axis 2 (must not be active when controled via PASO)
- DigInp15 Fast speed / *Slow speed axis 2 (must not be active when controled via PASO)
- DigInp16 *Limit switch pos for axis 1
- DigInp17 *Limit switch neg for axis 1

- DigOut1 Contouring error axis 1
- DigOut2 Contouring error axis 2
- DigOut3 Profile end axis 1 (= position reached axis1)
- DigOut4 Profile end axis 2 (= position reached axis2)

A detailed description of the individual I/Os can be found in the "Operating Instructions for the 2-Axis Controller ED2".

Synchronized operation:

In this device mode, the two axes can be operated as synchronised controllers. The synchronization control is based on the average value principle. The assignment of the digital I/Os is as follows:

- DigInp1 Enable control system
- DigInp9 Axis 1 / *Axis 2
- DigInp10 Foreward axis
- DigInp11 Backward axis
- DigInp12 Fast speed / *Slow speed axis
- DigInp14 Single axis operation / *Synchronized operation
- DigInp16 * Limit switch pos for axis 1
- DigInp17 * Limit switch neg for axis 1

- DigOut1 Contouring error axis 1
- DigOut3 Profile end axis 1 (= position reached axis1)

A detailed description of the individual I/Os can be found in the "Operating Instructions for the 2-Axis Controller ED2".

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).

ATTENTION: Parameters, which can be transmitted either as PKW or as PZD will become always the value of the PZD transmission. Because of this, it makes no sense to overwrite these parameters with another PKW-value.

Parameters from Device Block (db)							
IND	PNU	Parameter name	Data type	Persistence	Attribute	PZD-Number	Page
0	36	db_ErrorCode	uint16	V	r	105	33
0	37	db_ControlWord	uint16	V	w	001	34
0	38	db_StatusWord	uint16	V	r	002	35
0	39	db_DeviceMode	int8	N	r/w	103 Low 104 Low	36
0	40	db_ControlMode	int8	N	r/w	103 High 104 High	36
0	41	db_Local	int8	N	r/w	-	36
0	51	db_StoreParameter	int32	V	w	-	37
0	53	db_AchsBetrieb	int8	N	r/w	-	37

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	N	r/w	-	37
1	22	dav_transducerType	int8	N	r	-	38
1	84	dav_ActualValUnit	uint8	N	r/w	-	38
1	97	dav_transducerAddType	uint8	V	r/w		39
1	98	dav_transducer_Offset	int32	N	r/w	-	39
1	99	dav_transducer_Auflösung	uint32	N	r/w	-	40
1	100	dav_limit_neg	int32	N	r/w	-	40
1	101	dav_limit_pos	int32	N	r/w	-	40
1	102	dav_ref_search	uint32	N	r/w	-	41
1	103	dav_ref_search2	uint32	N	r/w	-	41
1	104	dav_ref_type	int8	N	r/w	-	42
1	105	dav_ref_enable	int8	N	r/w	-	42
1	106	dav_limit_enable	int8	N	r/w	-	42

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	N	r/w	-	43
3	76	dop_drivePos_BsideVal	uint16	N	r/w	-	43
3	94	dop_drivePos_OffsetVal	int32	N	r/w	-	43
3	98	dop_dither_FreqVal	uint8	N	r/w	-	44
3	101	dop_dither_AmplVal	uint8	N	r/w	-	44
3	129	dop_drivePos_AsideMaxVal	uint16	N	r/w	-	45
3	130	dop_drivePos_BsideMaxVal	uint16	N	r/w	-	45
3	131	dop_drivePos_SystemInvert	int8	N	r/w	-	45
3	132	dop_drivePos_GainVal	int32	N	r/w	-	46
3	133	dop_drive_type	int8	N	r/w	-	46

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	V	r/w	-	46
12	42	dpc_ramp_Type	int8	N	r	-	47
12	61	dpc_ramp_Vel	uint32	N	r/w	100	47
12	64	dpc_ramp_Acc	uint32	N	r/w	101	47
12	100	dpc_ActualVal	int32	V	r	-	48
12	103	dpc_CtrlDeviationVal	int32	V	r	-	48
12	116	dpc_integrator_TiVal	uint32	N	r/w	-	48
12	119	dpc_integrator_DXVal	uint32	N	r/w	-	49
12	162	dpc_monitor_Error	int32	N	r/w	-	49
12	163	dpc_monitor_Error2	int32	N	r/w	-	49
12	164	dpc_monitor_Delay	uint16	N	r/w	-	50
12	178	dpc_window_ThresholdVal	int16	N	r/w	-	50
12	207	dpc_stellVer	uint32	N	r/w	-	51
12	208	dpc_stellVerNeg	uint32	N	r/w	-	51
12	209	dpc_PVal	uint32	N	r/w	-	51
12	210	dpc_PValNeg	uint32	N	r/w	-	52
12	211	dpc_integrator_DXValNeg	uint32	N	r/w	-	52
12	212	dpc_integrator_TiValNeg	uint32	N	r/w	-	52
12	213	dpc_window_ThresholdHystVal	int16	N	r/w	-	53
12	216	dpc_hand_fastVel	uint32	N	r/w	-	53
12	217	dpc_hand_slowVel	uint32	N	r/w	-	54
12	218	dpc_hand_Acc	uint32	N	r/w	-	54
12	219	dpc_contr_type	int8	N	r/w	-	54
12	220	dpc_preset_type	uint8	N	r/w	-	55
12	221	dpc_preset_No	uint8	N	r/w	-	55
12	223	dpc_preset_Auflösung	int32	N	r/w	-	55
12	224	dpc_digInp	uint16	N	r/w	-	56
12	225	dpc_digOut	uint16	N	r/w	-	56

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).

By controlling several axis (several axis in individual control or synchronism control), the corresponding telegram type must be selected and transmit for each axis seperate. The data exchange will happen serial.

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 Worten for parameters and 3 Worten für Prozessdaten => telegram type 1
  with 4 Worten for parameters and 4 resp. 6 words for data exchange => telegram type 102
  with 4 Worten for parameters and 7 resp. 3 words for data exchange => telegram type 103

- Nutzdaten **ohne** Parameterbereich
  with 3 Worten für Prozessdaten => telegram type 2
  with 4 resp. 6 words for data exchange => telegram type 100
  with 7 resp. 3 words for data exchange => telegram type 101

4.5.1.1 Standard telegram 1

The telegram type 1 is defined by the "PROFIBUS Profile Fluid Power Technology" (standard telegram 1).

	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

4.5.1.2 Standard Telegramm 2

The telegram type 1 is defined by the "PROFIBUS Profile Fluid Power Technology" (standard telegram 2).

	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

4.5.1.3 Device telegram 100

The telegram type 100 is defined by WANDFLUH (user defined telegram).

	word 0	word 1	word 2	word 3
PZD receive data	db_Controlword	db_DeviceMode db_ControlMode	dpc_SetpointVal	dpc_SetpointVal

	word 0	word 1	word 2	word 3
PZD transmit data	db_Statusword	db_DeviceMode db_ControlMode	dpc_ActualVal	dpc_ActualVal

	word 4	word 5
PZD transmit data	db_ErrorCode	stat_DigInp

4.5.1.4 Device telegram 101

The telegram type 101 is defined by WANDFLUH (user defined telegram).

	word 0	word 1	word 2	word 3
PZD receive data	db_Controlword	dpc_SetpointVal	dpc_SetpointVal	dpc_ramp_Vel

	word 4	word 5	word 6
PZD receive data	dpc_ramp_Vel	dpc_ramp_Acc	dpc_ramp_Dec

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

4.5.1.5 Device telegram 102

The telegram type 102 is defined by WANDFLUH (user defined telegram).

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

	word 0	word 1	word 2	word 3
PZD receive data	db_Controlword	db_DeviceMode db_ControlMode	dpc_SetpointVal	dpc_SetpointVal

	word 0	word 1	word 2	word 3
PZD transmit data	db_Statusword	db_DeviceMode db_ControlMode	dpc_ActualVal	dpc_ActualVal

	word 4	word 5
PZD transmit data	db_ErrorCode	stat_DigInp

4.5.1.6 Device telegram 103

The telegram type 103 is defined by WANDFLUH (user defined telegram).

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

	word 0	word 1	word 2	word 3
PZD receive data	db_Controlword	dpc_SetpointVal	dpc_SetpointVal	dpc_ramp_Vel

	word 4	word 5	word 6
PZD receive data	dpc_ramp_Vel	dpc_ramp_Acc	dpc_ramp_Dec

	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	34
db_DeviceMode	Device mode	1	103 Low	36
db_ControlMode	Control mode	1	103 High	36
dpc_SetpointVal	Preset value	2	012	46
dpc_ramp_Vel	Speed	2	100	47
dpc_ramp_Acc	Acceleration	1	101	47
dpc_ramp_Dec	Deceleration	1	102	

4.5.3 Transmit data (Slave → Master, actual values)

Parameter	Parameter name	Length (word)	Signal number	Page
db_StatusWord	Statusword	1	002	35
db_DeviceMode	Device mode	1	104 Low	36
db_ControlMode	Control mode	1	104 High	36
dpc_ActualVal	Actual value	2	003	48
db_ErrorCode	Error code	1	105	33
stat_DigInp	State of the digital inputs	1	106	-

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 responses 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:

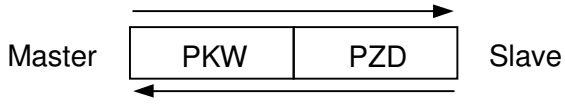
error code	semantic
0	undefined PNU
1	parameter not changeable
2	lower or upper value range limit overflow
5	data type error
18	other errors

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

4.7 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

4.8 Parameter description

In the following section, all parameters, which can be adjusted via PKW (refer to section "Cyclical parameter data exchange (PKW)" page 30) will be descripted.

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	105
Parameter name	db_ErrorCode
Data type	uint16
Parameter length (Byte)	2
Access	r

Value description

Code	Parameter name	Description	Reaktion
0000	No error	No error is present	
1000	General error	A general error is present	FAULT
5100	Power voltage	The supply voltage is too low or too high	FAULT_HOLD
5520	RAM	Device parameter can not be stored or read in or from the non-volatile memory	FAULT
5510	EPROM / EEPROM	Device parameter can not be actualised after a change of the resolution	FAULT
5211	Limit switch positive axis 1	The sensor for the max. stroke on the positive side from axis 1 is active	FAULT
5212	Limit switch negative axis 1	The sensor for the max. stroke on the negative side from axis 1 is active	FAULT
5213	Limit switch positive axis 2	The sensor for the max. stroke on the positive side from axis 2 is active	FAULT
5214	Limit switch negative axis 2	The sensor for the max. stroke on the negative side from axis 2 is active	FAULT
5231	Measuring system axis 1	Value with error	FAULT
5232		Cable break or short circuit	FAULT
5233		Measuring range overflow	FAULT
5235	Measuring system axis 2	Value with error	FAULT
5236		Cable break or short circuit	FAULT
5237		Measuring range overflow	FAULT
5411	Valve axis 1	Solenoid A cablebreak or short circuit	FAULT
5412		Solenoid B cablebreak or short circuit	FAULT
5413	Valve axis 2	Solenoid A cablebreak or short circuit	FAULT
5414		Solenoid B cablebreak or short circuit	FAULT
5301	Joystick 1	Cablebreak	FAULT
5302	Joystick 2	Cablebreak	FAULT

8230	contouring error axis 1	Control difference preset value - actual value from axis 1 is to high	FAULT_HOLD
8231	contouring error axis 2	Control difference preset value - actual value from axis 2 is to high	FAULT_HOLD

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 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
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	Switch parameter set		
7	Switch parameter set		
8	Control mode specific		
9	Control mode 6		
	Control mode 9		
	Control mode -1		
	Control mode -2	Positive	Moves the axis backward
10	Control mode 6		
	Control mode 9		
	Control mode -1	Force_setpoint	The transmitted motion profile values will be take over immediately
	Control mode -2	Negative	Moves the axis forward
11	Control mode specific		
12	Reserved		
13	Control mode -1	New_setpoint	Send new motion profile values to the DP-Slave controller
	Control mode 6, 9	Start	Starts the movement of axis X.
	Control mode -2	Fast speed	The fast speed will be acitve
14	Stop	The movement of axis X will be stopped	
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 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
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	Control 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	Reserved		
7	Reserved		
8	Control mode specific		
9	Control mode specific		
10	Control mode 6, 9	Limit touched	The axis X is outside the stroke limitation (refer to the parameter "Stroke limitation" in the operating instructions of the ED2/ED3 axis controller) resp. one of the inputs "limit switche" is active
	Control mode -1		
	Control mode -2		
11	Control mode 6		
	Control mode 9, -1, -2	Control error	A contouring error on axis X is active
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 ED2/ED3 axis controller	
13	Control mode 6		
	Control mode 9		
	Control mode -1	Setpoint_ acknlowdege	New motion profiles values are take over from the DP-Slave controller
	Control mode -2		
14			
15			

4.8.4 db_DeviceMode

Parameter description

Description	Set the device mode
IND	0
PNU	39
PZD-number	103 Low Byte for receive data (Master => Slave) 104 Low Byte for transmit data (Slave => Master)
Parameter name	db_DeviceMode
Data type	int8
Parameter length (Byte)	1
Access	r/w

Value description

1	Preset value via bus (can only be set if db_ControlMode is not set to Open loop movement (6))
2	Preset value locally (can only be set if db_ControlMode is set to Position control axis 9))

4.8.5 db_ControlMode

Parameter description

Description	Set the device control mode
IND	0
PNU	40
PZD-number	103 High Byte for receive data (Master => Slave) 104 High Byte for transmit data (Slave => Master)
Parameter name	db_ControlMode
Data type	int8
Parameter length (Byte)	1
Access	r/w

Value description

6	Open loop movement (db_DeviceMode is set automatically to Preset value locally (2))
9	Position control axis
-1	Profile position control (db_DeviceMode is set automatically to Preset value via bus (1))
-2	Manual control (db_DeviceMode is set automatically to Preset value via bus (1))

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_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

4.8.8 db_AchsBetrieb

Parameter description

Description	Specifies the kind of the axis control by a 2-axis controller
IND	0
PNU	53
PZD-number	-
Parameter name	db_AchsBetrieb
Data type	int8
Parameter length (Byte)	1
Access	r/w

Value description

0	2-axis synchronism control
1	2-axis individual control control (can only be set if db_DeviceMode = Preset value via bus (1))

4.8.9 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 **if dav_transducerType = Inc (64), SSI bin (65) or SSI gray (66)**

8	DigIn1
9	DigIn2

Value description	**if dav_transducerType = Analog (67)**
0	Analog input 1
1	Analog input 2
2	Analog input 3
3	Analog input 4

4.8.10 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

64	Position Transducer Incremental
65	Position Transducer SSI binary
66	Position Transducer SSI gray
67	Position Transducer Analog

4.8.11 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

1	mm
2	Deg
3	Inch

4.8.12 dav_transducerAddType

Parameter description

Description	Interface type (= 'Signaltype Actual value' from PASO)
IND	1
PNU	97
PZD-number	-
Parameter name	dav_transducerAddType
Data type	uint8
Parameter length (Byte)	1
Access	r/w

Value description **if dav_transducerType = Inc (64)**

0	Incremental

Value description **if dav_transducerType = SSI bin (65) or SSI gray (66)**

0	SSI Bin/13 Bit or SSI Gray/13 Bit
1	SSI Bin/24 Bit or SSI Gray/24 Bit
2	SSI Bin/25 Bit or SSI Gray/25 Bit

Value description **if dav_transducerType = Analog (67)**

0	0-5 VDC
1	0-10 VDC
2	0-20 mA
3	4-20 mA
4	±5 VDC
5	±10 VDC

4.8.13 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	-99999900 ... 99999900
Unit	1/100 Unit
Default Value	0
Step	1 (= 0.01 Unit)

4.8.14 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	uint32
Parameter length (Byte)	4
Access	r/w

Value description

Range	1000 ... 10'000'000 if dav_transducerType = Inc (64), SSI bin (65) or SSI gray (66) 100'000 ... 1'000'000'000 if dav_transducerType = Analog (67)
Unit	1/1'000'000 Unit
Default Value	10'000'000
Step	1 (= 0.000001 Unit)

4.8.15 dav_limit_neg

Parameter description

Description	Negative stroke limitation (= 'Neg. stroke limitation' from PASO)
IND	1
PNU	100
PZD-number	-
Parameter name	dav_limit_neg
Data type	int32
Parameter length (Byte)	4
Access	r/w

Value description **can be only set if dav_limit_enable = 1**

Range	-400'000 ... 400'000
Unit	1/10 Unit
Default Value	0
Step	1 (= 0.1 Unit)

4.8.16 dav_limit_pos

Parameter description

Description	Positive stroke limitation (= 'Pos. stroke limitation' from PASO)
IND	1
PNU	101
PZD-number	-
Parameter name	dav_limit_pos
Data type	int32
Parameter length (Byte)	4
Access	r/w

Value description	can be only set if dav_limit_enable = 1
Range	-400'000 ... 400'000
Unit	1/10 Unit
Default Value	0
Step	1 (= 0.1 Unit)

4.8.17 dav_ref_search

Parameter description

Description	Search speed for reference run (= 'Reference search speed' from PASO)
IND	1
PNU	102
PZD-number	-
Parameter name	dav_ref_search
Data type	uint32
Parameter length (Byte)	4
Access	r/w

Value description	**can only be set if dav_transducerType = Inc (64)**
Range	-100'000 ... 100'000
Unit	1/10 Unit
Default Value	0
Step	1 (= 0.1 Unit)

4.8.18 dav_ref_search2

Parameter description

Description	Search speed 2 for reference run (= 'Reference switch speed' from PASO)
IND	1
PNU	103
PZD-number	-
Parameter name	dav_ref_search2
Data type	uint32
Parameter length (Byte)	4
Access	r/w

Value description	**can only be set if dav_transducerType = Inc (64)**
Range	-100'000 ... 100'000
Unit	1/10 Unit
Default Value	0
Step	1 (= 0.1 Unit)

4.8.19 dav_ref_type

Parameter description

Description	Type of reference (= 'Type of reference' from PASO)
IND	1
PNU	104
PZD-number	-
Parameter name	dav_ref_type
Data type	uint8
Parameter length (Byte)	1
Access	r/w

Value description **can only be set if dav_transducerType = Inc (64)**

1	Auswahl 1
2	Auswahl 2
3	Auswahl 3
4	Auswahl 4
5	Auswahl 5
6	Auswahl 6
7	Auswahl 7
8	Auswahl 8
9	Auswahl 8
10	Auswahl 10

4.8.20 dav_ref_enable

Parameter description

Description	Enable reference run (= 'Reference run check' from PASO)
IND	1
PNU	105
PZD-number	-
Parameter name	dav_ref_enable
Data type	uint8
Parameter length (Byte)	1
Access	r/w

Value description **can only be set if dav_transducerType = Inc (64)**

0	Reference run disabled
1	Reference run enabled

4.8.21 dav_limit_enable

Parameter description

Description	Enable stroke limitation (= 'Stroke limitation' from PASO)
IND	1
PNU	106
PZD-number	-
Parameter name	dav_limit_enable
Data type	uint8
Parameter length (Byte)	1
Access	r/w

Value description

0	Stroke limitation disabled
1	Stroke limitation enabled

4.8.22 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 **can only be set if dop_drive_type = 0**

Range	0 ... 950
Unit	mA
Default Value	150
Step	2

4.8.23 dop_drivePos_BsideVal

Parameter description

Description	Minimum current solenoid B (= 'Imin 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 **can only be set if dop_drive_type = 0**

Range	0 ... 950
Unit	mA
Default Value	150
Step	2

4.8.24 dop_drivePos_OffsetVal

Parameter description

Description	Offset from the ±10 VDC Output (= 'Offset Control valve setting' from PASO)
IND	3
PNU	94
PZD-number	-
Parameter name	dop_drivePos_OffsetVal
Data type	int32
Parameter length (Byte)	4
Access	r/w

Value description	**can only be set if dop_drive_type = 1**
Range	-200 ... 200
Unit	1/10 %
Default Value	0
Step	1 (= 0.1 %)

4.8.25 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	**can only be set if dop_drive_type = 0**
Range	20 ... 500 = 20 ... 500Hz
Unit	Hz
Default Value	100 = 100Hz
Step	only values 1000/value = integer are possible

4.8.26 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	**can only be set if dop_drive_type = 0**
Range	0 ... 200
Unit	mA
Default Value	100
Step	2 x FaktSolCurrent

4.8.27 dop_drivePos_AsideMaxVal

Parameter description

Description	Maximum current solenoid A (= 'Imax 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 **can only be set if dop_drive_type = 0**

Range	0 ... 1800
Unit	mA
Default Value	700
Step	2

4.8.28 dop_drivePos_BsideMaxVal

Parameter description

Description	Maximum current solenoid B (= 'Imax 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 **can only be set if dop_drive_type = 0**

Range	0 ... 1800
Unit	mA
Default Value	700
Step	2

4.8.29 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)

4.8.30 dop_drivePos_GainVal

Parameter description

Description	Amplification from ±10 VDC Output (= 'Gain Control valve settings' from PASO)
IND	3
PNU	132
PZD-number	-
Parameter name	dop_drivePos_GainVal
Data type	int32
Parameter length (Byte)	4
Access	r/w

Value description **can only be set if dop_drive_type = 1**

Range	50 ... 100
Unit	%
Default Value	100
Step	1 (= 1 %)

4.8.31 dop_drive_type

Parameter description

Description	Valve type (= 'Valve type' from PASO)
IND	1
PNU	133
PZD-number	-
Parameter name	dav_drive_type
Data type	uint8
Parameter length (Byte)	1
Access	r/w

Value description

0	Proportional valve
1	Valve interface ±10 VDC

4.8.32 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

Range	0 ... 999999000
Unit	1/1000 Unit
Default Value	0
Step	1 (= 0.001 Unit)

4.8.33 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

Value description

5	Profile generator linear (Acceleration, Speed and Deceleration)

4.8.34 dpc_ramp_Vel

Parameter description

Description	Speed (= 'Max. Speed' from PASO)
IND	12
PNU	61
PZD-number	-
Parameter name	dpc_ramp_Vel
Data type	uint32
Parameter length (Byte)	4
Access	r/w

Value description

Range	0 ... 100'000
Unit	1/10 Unit/s^2
Default Value	100
Step	1 (= 0.1 Unit/s)

4.8.35 dpc_ramp_Acc

Parameter description

Description	Acceleration (= 'Max. Acceleration' from PASO)
IND	12
PNU	64
PZD-number	-
Parameter name	dpc_ramp_Acc
Data type	uint32
Parameter length (Byte)	4
Access	r/w

Value description

Range	0 ... 100'000
Unit	1/10 Unit/s^2
Default Value	100
Step	1 (= 0.1 Unit/s^2)

4.8.36 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 ... 999999000
Unit	1/1000 Unit
Default Value	0
Step	1 (= 0.001 Unit)

4.8.37 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 ... 999999000
Unit	1/1000 Unit
Default Value	0
Step	1 (= 0.001 Unit)

4.8.38 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	1 ... 50'000
Unit	1/100 s
Default Value	1000
Step	1 (= 0.01 s)

4.8.39 dpc_integrator_DXVal

Parameter description

Description	Integrator window positive (= 'I-Limitation 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 ... 100'000
Unit	1/100 %
Default Value	0
Step	1 (= 0.01 %)

4.8.40 dpc_monitor_Error

Parameter description

Description	Countouring error fine (= ' Countouring error threshold fine ' from PASO)
IND	12
PNU	162
PZD-number	-
Parameter name	dpc_monitor_Error
Data type	int32
Parameter length (Byte)	4
Access	r/w

Value description

Range	0 ... 99'999'900
Unit	1/100 Unit
Default Value	5000
Step	1 (= 0.01 Unit)

4.8.41 dpc_monitor_Error2

Parameter description

Description	Countouring error rough (= ' Countouring error threshold rough ' from PASO)
IND	12
PNU	163
PZD-number	-
Parameter name	dpc_monitor_Error2
Data type	int32
Parameter length (Byte)	4
Access	r/w

Value description

Range	0 ... 99'999'900
Unit	1/100 Unit
Default Value	5000
Step	1 (= 0.01 Unit)

4.8.42 dpc_monitor_Delay

Parameter description

Description	Countouring error delay (= 'Countouring error after' from PASO)
IND	12
PNU	164
PZD-number	-
Parameter name	dpc_monitor_Delay
Data type	uint16
Parameter length (Byte)	2
Access	r/w

Value description

Range	0 ... 3000
Unit	1/100 s
Default Value	0
Step	1 (= 0.01 s)

4.8.43 dpc_window_ThresholdVal

Parameter description

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

Value description

Range	0 ... 10'000
Unit	1/100 Unit
Default Value	10
Step	1 (= 0.01 Unit)

4.8.44 dpc_stellVer

Parameter description

Description	Proportional coefficient positive (= ' Proportional coefficient Pos.' from PASO)
IND	12
PNU	207
PZD-number	-
Parameter name	dpc_stellVer
Data type	uint32
Parameter length (Byte)	4
Access	r/w

Value description

Range	0 ... 50'000
Unit	1/100 %
Default Value	10'000
Step	1 (= 0.01 %)

4.8.45 dpc_stellVerNeg

Parameter description

Description	Proportional coefficient negative (= ' Proportional coefficient Neg.' from PASO)
IND	12
PNU	208
PZD-number	-
Parameter name	dpc_stellVerNeg
Data type	uint32
Parameter length (Byte)	4
Access	r/w

Value description

Range	0 ... 50'000
Unit	1/100 %
Default Value	10'000
Step	1 (= 0.01 %)

4.8.46 dpc_PVal

Parameter description

Description	P-Proportion positive (= 'P-Proportion Pos.' from PASO)
IND	12
PNU	209
PZD-number	-
Parameter name	dpc_PVal
Data type	uint32
Parameter length (Byte)	4
Access	r/w

Value description

Range	0 ... 10'000
Unit	1/100 %
Default Value	10'000
Step	1 (= 0.01 %)

4.8.47 dpc_PValNeg

Parameter description

Description	P-Proportion negative (= 'P-Proportion Neg.' from PASO)
IND	12
PNU	210
PZD-number	-
Parameter name	dpc_PVal
Data type	uint32
Parameter length (Byte)	4
Access	r/w

Value description

Range	0 ... 10'000
Unit	1/100 %
Default Value	10'000
Step	1 (= 0.01 %)

4.8.48 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

4.8.49 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	1 ... 50'000
Unit	1/100 s
Default Value	1000
Step	1 (= 0.01 s)

Value description

Range	0 ... 100'000
Unit	1/100 %
Default Value	0
Step	1 (= 0.01 %)

4.8.50 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 ... 10'000
Unit	1/100 Unit
Default Value	10
Step	1 (= 0.01 Unit)

4.8.51 dpc_hand_fastVel

Parameter description

Description	Rapid speed for manual control (= 'Rapid speed' from PASO)
IND	12
PNU	216
PZD-number	-
Parameter name	dpc_hand_fastVel
Data type	uint32
Parameter length (Byte)	4
Access	r/w

Value description

Range	0 ... dpc_ramp_Vel (max 100'000)
Unit	1/10 Unit/s
Default Value	200
Step	1 (= 0.1 Unit/s)

4.8.52 dpc_hand_slowVel

Parameter description

Description	Slow speed for manual control (= 'Creep speed' from PASO)
IND	12
PNU	217
PZD-number	-
Parameter name	dpc_hand_slowVel
Data type	uint32
Parameter length (Byte)	4
Access	r/w

Value description

Range	0 ... dpc_ramp_Vel (max 100'000)
Unit	1/10 Unit/s
Default Value	50
Step	1 (= 0.1 Unit/s)

4.8.53 dpc_hand_Acc

Parameter description

Description	Acceleration for manual control (= 'Acceleration' from PASO)
IND	12
PNU	218
PZD-number	-
Parameter name	dpc_hand_Acc
Data type	uint32
Parameter length (Byte)	4
Access	r/w

Value description

Range	0 ... 100'000
Unit	1/10 Unit/s^2
Default Value	100
Step	1 (= 0.1 Unit/s^2)

4.8.54 dpc_contr_type

Parameter description

Description	Controller type (= 'Regulator type' im PASO)
IND	12
PNU	219
PZD-number	-
Parameter name	dpc_contr_type
Data type	int8
Parameter length (Byte)	1
Access	r/w

Value description

0	Position control
2	Automatic synchronism average control

4.8.55 dpc_preset_Type

Parameter description

Description	Preset value type (= 'Signal type Preset value' from PASO)
IND	1
PNU	22
PZD-number	-
Parameter name	dpc_preset_Type
Data type	int8
Parameter length (Byte)	1
Access	r

Value description

4	0-5 VDC
5	0-10 VDC
6	0-20 mA
7	4-20 mA
8	±5 VDC
9	±10 VDC

4.8.56 dpc_preset_No

Parameter description

Description	Preset value number (= 'Used input Preset value' from PASO)
IND	12
PNU	221
PZD-number	-
Parameter name	dpc_preset_No
Data type	uint8
Parameter length (Byte)	1
Access	r/w

Value description

0	Analog input 1
1	Analog input 2
2	Analog input 3
3	Analog input 4
10	Profil

4.8.57 dpc_preset_Auflösung

Parameter description

Description	Resolution preset value (= ' Resolution preset value ' from PASO)
IND	12
PNU	223
PZD-number	-
Parameter name	dpc_preset_Auflösung
Data type	uint32
Parameter length (Byte)	4
Access	r/w

Value description

Range	100'000 ... 1'000'000'000
Unit	1/1'000'000 Unit
Default Value	10'000'000
Step	1 (= 0.000001 Unit)

4.8.58 dpc_digInp

Parameter description

Description	Digital inputs (= 'Digital Inputs' from PASO)
IND	12
PNU	224
PZD-number	-
Parameter name	dpc_digInp
Data type	uint16
Parameter length (Byte)	2
Access	r/w

Value description

High-Byte	number of the desired digital input 1 - 18
Low-Byte	desired value : 0 = Digital input not active 1 = Digital input active 2 = Digital input read-in from external

Example for digital input write:
PWE-Value = 0x0A02: Digital input 10 (=0x0A) is set to external (= 0x02) gesetzt

Example for digital input read:
PWE-Value (request) = 0x0400: Request for digital input 4 (= 0x04)
PWE-Value (response) = 0x0401: Digital input 4 (= 0x04) is set to active (= 0x01)

4.8.59 dpc_digOut

Parameter description

Description	Digital outputs (= 'Digital Outputs' from PASO)
IND	12
PNU	225
PZD-number	-
Parameter name	dpc_digOut
Data type	uint16
Parameter length (Byte)	2
Access	r/w

Value description

High-Byte	number of the desired digital input 1 - 18
Low-Byte	desired value : 0 = Digital input not active 1 = Digital input active 2 = Digital input set from external

Please refer to dpc_digInp for an example for digital output write and read.

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 adress and a PROFIBUS-DP diagnostic can be made via the PASO (refer to section "Fieldbus Settings" page 9).

5.1 Step by step instructions for the first commissioning

For the first commissioning, the following steps should be observed:

5.1.1 Test the hydraulic system

1. Switch off the hydraulic system and separate the mechanical connection between the two axis
2. Switch off the fieldbus master
3. Switch on the DP-Slave controller
4. In the PASO window "Help_Bus Info extern" in the section "Bus State" the following statements will be displayed: WD-Status = Baud_Search and DP-Status = Wait_Prm (refer to section "Fieldbus Diagnostics" page 10)
5. In the PASO status line, the statements "Local" and "INIT" will be displayed
6. Switch on the hydraulic system
7. Set DigInp1 to active and DigInp3 to not active
8. With the PASO Menu "Commands_Valve operation", the solenoids can be operated directly
   ATTENTION: The position of the axis is not controlled (open loop) and not in synchronism control (single axis operation)! Be sure that there is no mechanical connection between the two axis and the axis can move free!
9. Alternative to point 8, a preset value for each axis can be set via the analog inputs 5 and 6 (open loop movement, refer to section "Open loop movement" page 18). Therefore, the DigInp3 must be set to active.
   ATTENTION: The position of the axis is not controlled (open loop) and not in synchronism control (single axis operation)! Be sure that there is no mechanical connection between the two axis and the axis can move free!
10. In the PASO window "Parameters_Valves", the parameters for the minimum (Imin) and maximum (Imax) currrent and the dither signal (frequency and level) can be set

5.1.2 Test the measuring system

1. Connect the measuring system to the corresponding input of the DP-Slave controller
2. In the PASO window "Configuration_Preset / Actual value signals", the adjustments for the actual value signal can be made
3. Set DigInp1 to active, DigInp3 to not acitve
4. With the PASO Menu "Commands_Hand control", each axis can be controlled separate (close loop). Therefore, the parameter "Move axis separately" in the window "Manual operation" must be selected.
   ATTENTION: The axis don't move in synchronism control! Be sure that there is no mechanical connection between the two axis!
5. Alternative to point 3, the manual control can be operated via the digital inputs DigInp9-11. Therefore, DigInp14 must be set to not active.
   ATTENTION: The axis don't move in synchronism control! Be sure that there is no mechanical connection between the two axis!

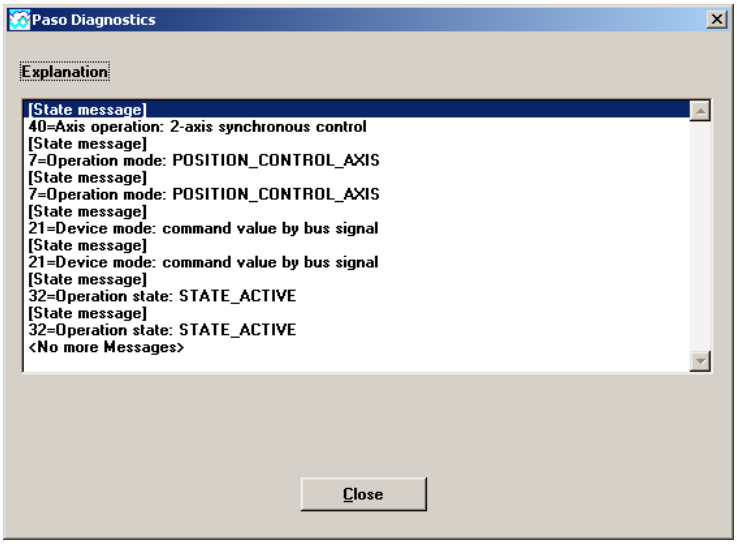
6. During the axis move, the corresponding actual value for each axis can be read out in the PASO Menu "Analysis_Axis values". If necessary, the adjustments for the actual value can be modified in the PASO Menu "Configuration_Preset/Actual values signals"

5.1.3 Test the fieldbus

1. Load the GSD-file in the fieldbus master and select the desired telegram typ (refer to section "Presupposition and information for the PROFIBUS-DP Master" page 59)
2. Adjust the node adress and the telegram type on the DP-Slave controller (refer to section "Presupposition for the DP-Slave controller card" page 59)
3. Switch on the fieldbus master
4. In the PASO window "Help_Bus Info extern" in the section "Bus State" the following statements will be displayed: WD-Status = DP_Control and DP-Status = Data_Exchange (refer to section "Fieldbus Diagnostics" page 10)

5.1.4 Test the control via the fieldbus

1. Set the following parameters in the declared order with the PKW-exchange (refer to section "Cyclical parameter data exchange (PKW)" page 30) (only possible in the state "DISABLE"):
2. Set the parameter "db_Local" to "Control word acting is made via bus (0)" (refer to section "db_Local" Seite 36)
3. Set the parameter "db_AchsBetrieb" to the desired value (refer to section "db_AchsBetrieb" Seite 37). If the value "2-axis synchronism control (0)" is selected, the two axis must be at the same position. The current actual position value can be read out in the PASO Menu "Analysis_Axis values. For moving the axis to the right position, the procedure from section "Test the measuring system" page 57 can be made.
4. With the parameter "db_ControlMode" the desired device control mode can be selected (refer to section "db_ControlMode" Seite 36).
5. With the parameter "db_DeviceMode" the desired device mode can be selected (refer to section "Setting the preset value via Fieldbus" Seite 60)
6. For the release of the DP-Slave controller, the 3 bits "Disable (D)", "Hold enable (H)" and "Device mode active (M)" from the control word (refer to section "db_ControlWord" Seite 34) must be set to logical 1. The DP-Slave controller is now in the state "ACTIVE" and a preset value can be set.



5.2 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 adress from the DP-Slave controller card?**
  The node adress 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 15)

5.3 Presupposition and information for the PROFIBUS-DP Master

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

- **Node adress**
  What is the node adress from the DP-Slave controller card?

- **GSD-file**
  The GSD-file "WAG00474.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)

5.4 Auslieferungszustand

Der DP-Slave Achsenregler wird mit folgender Grundkonfiguration ausgeliefert:

- Adresse 6
- Telegrammtyp 1

5.5 Parameterisation

The parameters of the DP-Slave controller card can be read or changed trough 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 30). 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 37).

5.6 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 18). The switch over is made with the parameter "db_DeviceMode" (refer to section "db_DeviceMode" page 36)

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

5.7 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, the 3 bits "Disable (D)", "Hold enable (H)" and "Device mode active (M)" from the control word (refer to section "db_ControlWord" Seite 34) must be set to logical 1. The DP-Slave controller is now in the state "ACTIVE" and a preset value can be set.

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 33 or in the corresponding operating instructions of the ED2/ED3 axis controller.

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 adress
- Baudrate
- Telegram type
- Bus type
- ID-number
- WD-state
- DP-state
- TG-state
- PZD-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 ED2/ED3 PROFIBUS-DP Device-Profile in accordance with Fluid Power Technology" will be listed. The current version is always the version listed at last.

Version	Bezeichnung	Datum der Freigabe
1.0	Start Version	13.06.02
1.1	Changed PPO in Telegram types	29.10.03
1.2	Schleppfehler, Endschalterfehler von FAULT_HOLD auf HOLD	06.03.03
1.3	Profil B4 (PKW) included	15.08.05