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

Revision 6

Inhaltsverzeichnis

1 PROFIBUS-DP Technology

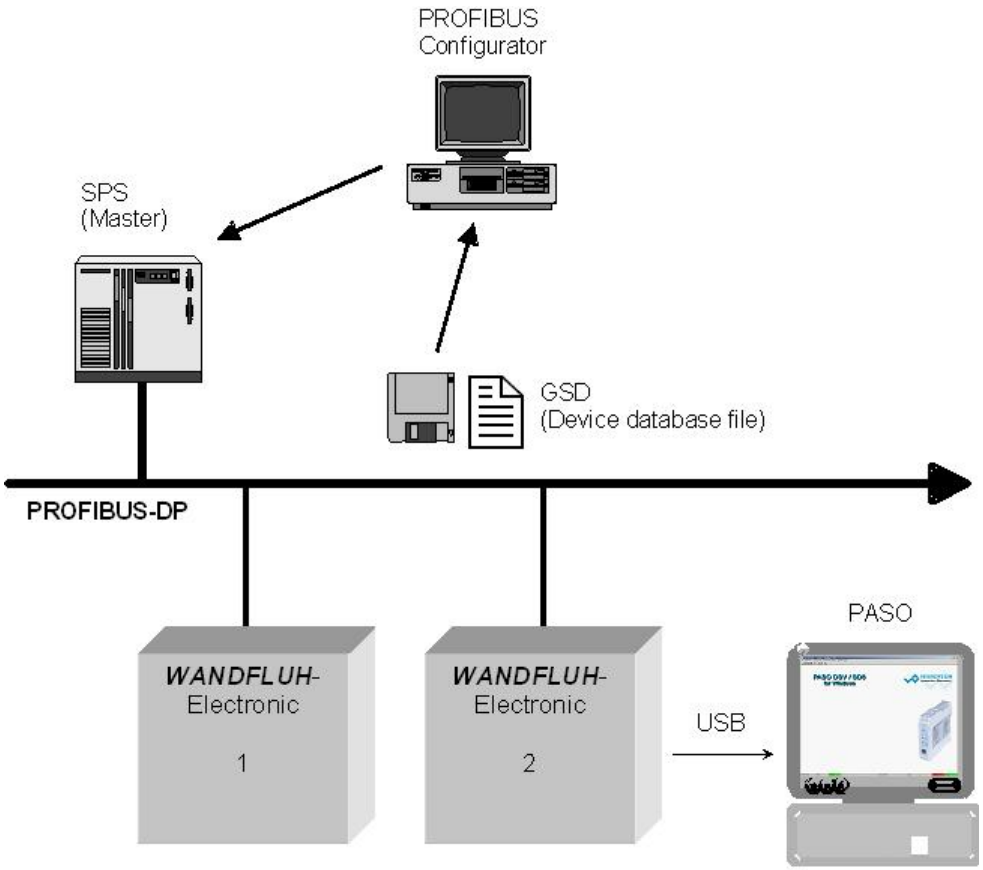
1.1 General

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 SD6 Electronics 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 the DSP-408 "Device Profile Fluid Power Technology" profile for its devices.



1.2 Master and Slaves

With -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

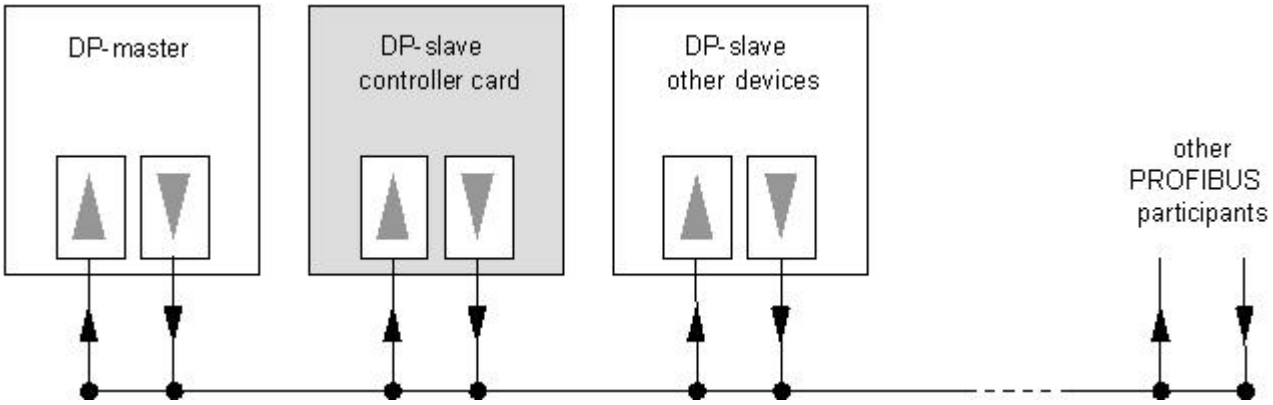
- **Slaves (passive Fieldbus participants)**
  These devices can only receive messages and send data and messages to the Master only on a request.

  The WANDFLUH Electronics 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 (Device database, GSD file). WANDFLUH makes available the corresponding GSD file for the DP-Slave 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 feedback values. With the process data, the following data will be transmitted:

  - Control words and preset values (Master => Slave)
  - Status words and feedback 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:

Protocol frame (Header)	**Data structure (telegram)**		Protocol frame (Trailer)
	Parameter-Id (PKW)	**Processdata (PZD)**	

2.3 Available telegrams

For a description about all available telegram types refer to section "Telegram types 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 description 31".

3 Product Description

3.1 General

The present operating instructions represent a PROFIBUS-DP specific extension of the WANDFLUH-Electronics operating instructions.

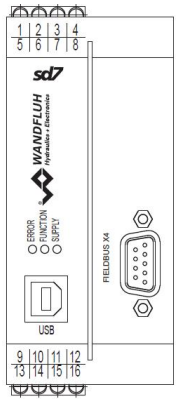
Remark: Please read the corresponding operating instructions beforehand.

An application example with a Siemens Step 7 as DP-Master can be downloaded from http://www.wandfluh.com/download/software.

3.2 Wiring

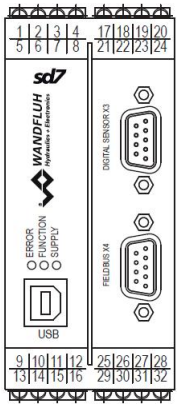
3.2.1 Connection on Wandfluh DP-Slave

On the Wandfluh DP-Slave SD7 the Profibus DP connection is made with the 9-pole D-Sub receptacle (female) X4 direct on the front plate.



D-Sub receptacle Profibus DP (female) X4

SD7 Amplifier und
SD7 Controller Basic



D-Sub receptacle Profibus DP (female) X4

SD7 Controller Enhanced

The pin assignment is as follows:

D-Sub receptacle (female) 9-pole:	RS485 galvanic separated • Pin 1 = Reserved • Pin 2 = Reserved • Pin 3 = RxD/TxD-P (receive-/transmit data positive, B-line) • Pin 5 = DGND (Ground for data signals and VP) • Pin 6 = VP (Power supply for the terminating resistors 5VDC) • Pin 7 = Reserved • Pin 8 = RxD/TxD-N (receive-/transmit data negative, A-line) • Pin 9 = Reserved

3.2.2 Profibus DP connection

3.2.2.1 Profibus DP cable

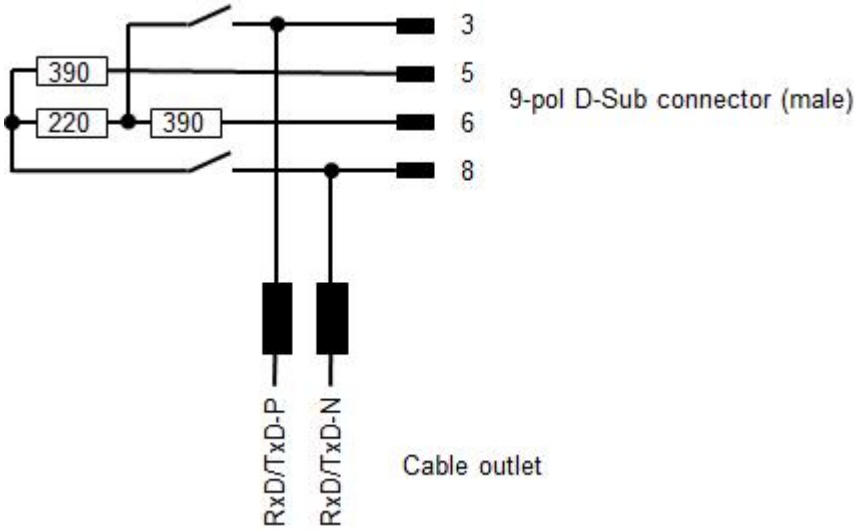
As a Profibus DP cable only the cable type A should be used. During installation the cable should not be bent or injured. In particular the Profibus DP cable should not be stretched or compressed and the minimum bend radius (typically 75mm for wire cables and 45 - 65mm for strand cables) is always observed.

The max. cable length depends on the transmission rate and should not exceed the following values:

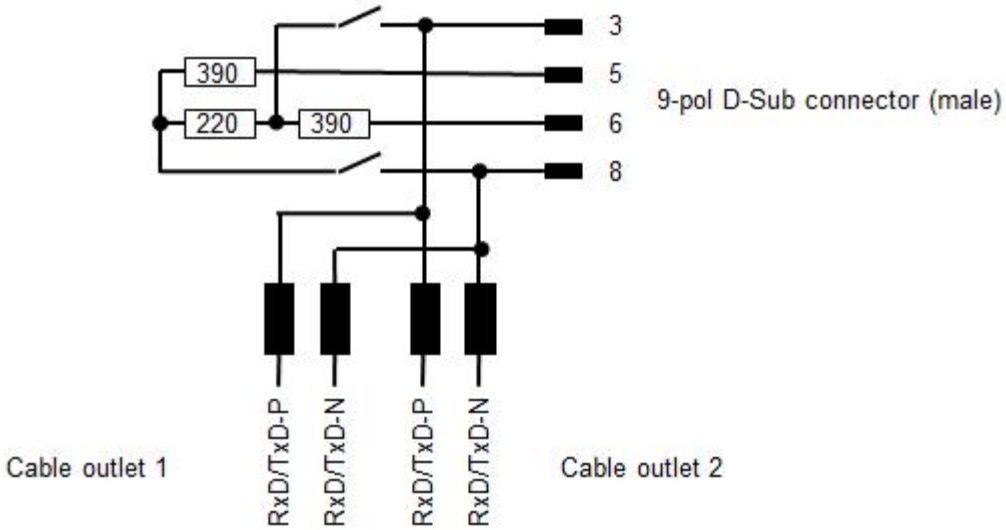
Baud rate in kbit/s	max. cable length in m
9.6	1200
19.2	1200
45.45	1200
93.75	1200
187.5	1000
500.0	400
1500.0	200
3000.0	100
6000.0	100
12000.0	100

3.2.2.2 D-Sub connector

The 9-pole D-Sub connector with one cable outlet should have the following structure:



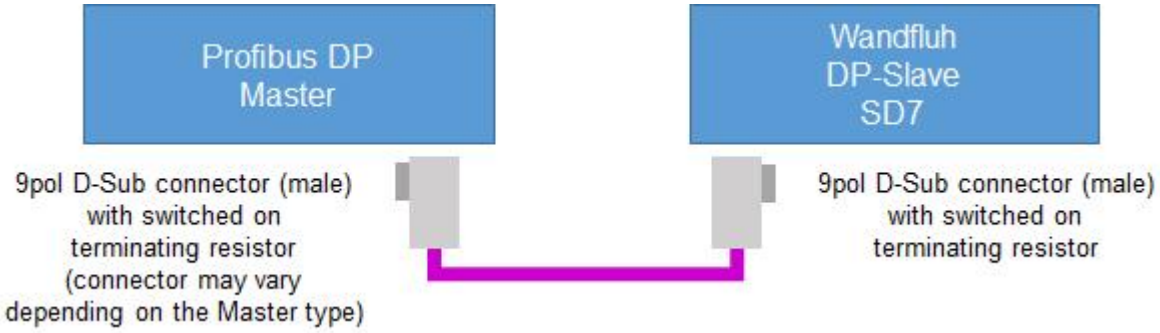
The 9-pole D-Sub connector with an additional cable outlet should have the following structure:



Start and end of the line must be terminated!

3.2.3 Connection to Profibus DP-Master

If the Wandfluh DP-Slave is the only device on the Profibus network, the connection is made as follows



3.2.4 Connection with several Profibus DP-Slaves

If there are several slaves (Wandfluh DP-Slaves or other participants) on the Profibus network, the connection is made as follows

3.3 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.

3.4 Operating and Indicating elements

The DP-Slave controller card is equipped with a USB-plug for the connection to the parameterisation PASO and provides a 9-pole D-SUB-plug for the PROFIBUS-DP interface.

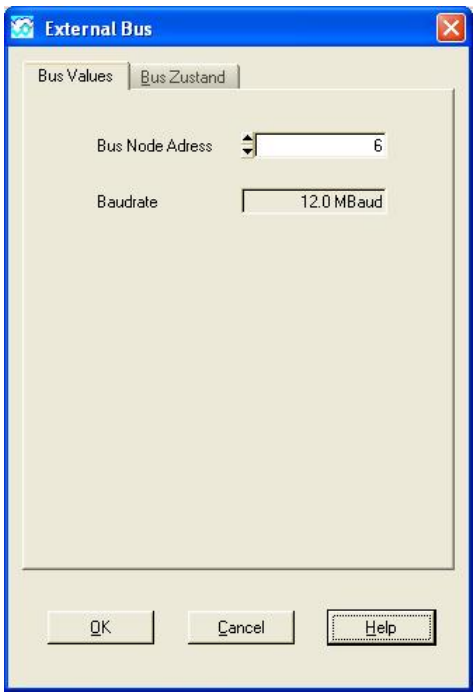
3.5 Fieldbus Settings

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

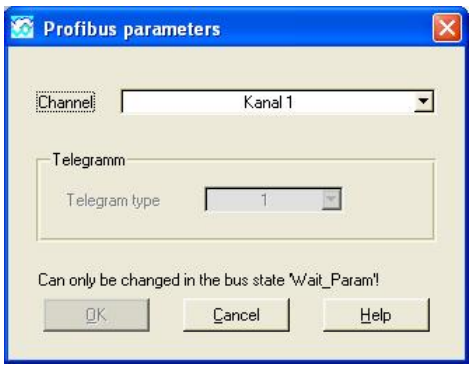
- Bus Node Adress (write and read)
- Baudrate (read only)
- Telegram type (write and read)

This settings can be made in the menu item "Fieldbus_Info" and "Fieldbus_Parameters".

Menu Fieldbus_Info



Menu Fieldbus_Parameters

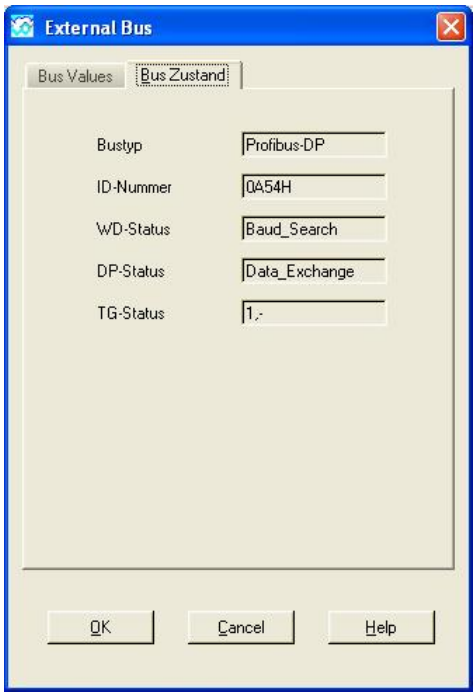


The following parameters can be set resp. will be displayed:

Field	Parameter description	Display
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.	0 ... 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	With this parameter, the default telegram type can be set for each available channel.	1, 2, 3, 4

3.6 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_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_Control** The found baudrate will be checked **DP_Control** The found baudrate is ok. The Watchdog for the Fieldbus is active.	 Baud_Search Baud_Control 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**	 Wait_Prm 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.	Data_Exchange
TG-Status	The current telegram type will be displayed here	

3.7 Connection Example

As a connection example, reference is made to the corresponding operating instructions of the WANDFLUH -Electronics.

3.8 Parameterisation

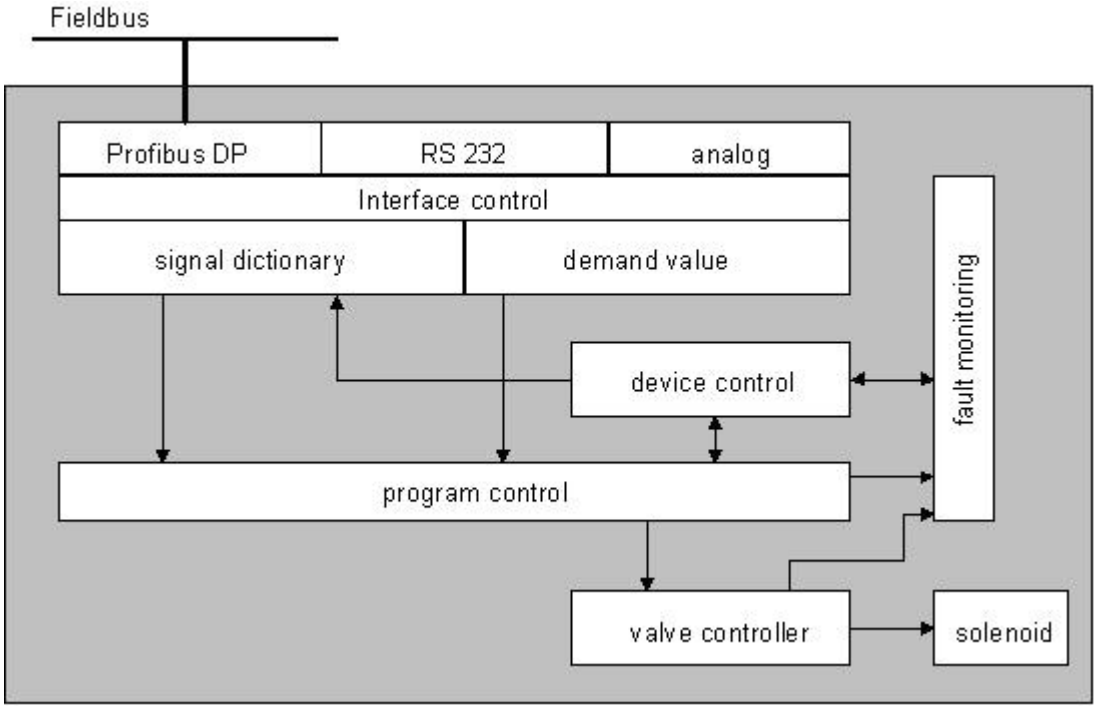
The DP-Slave controller card can be parameterised either through the PROFIBUS-DP or through the parameterisation software PASO.

4 Description of the Function of Device Profile DSP-408

4.1 General

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.

4.2 Device architecture



The DP-Slave controller card contains the complete Hardware of the *WANDFLUH*-Electronics. This Hardware includes the interface for the Fieldbus and the interface for the parameterisation software PASO. Also included are the solenoid outputs for the cylinder.

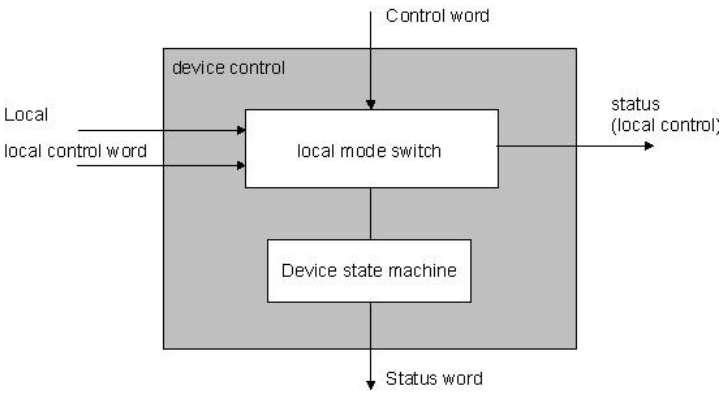
The Fieldbus control is made through a higher level Fieldbus Master.

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

4.3 Device Control

4.3.1 General

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



4.3.2 Operating mode

Local mode ("local")
In the local mode, the control commands will be set direct on the device through the digital inputs. The local mode has 2 states: "Disabled" and "Enabled", switch over through the digital input. This mode can be activated as follows:
- via PASO:
  With the parameter "Operating mode = local" (window "Enable channel")
- via Fieldbus:
  With the parameter "Device local (Operating mode) = 1"

In both cases, the state of the WANDFLUH electronics must be "Init" or "Disabled" (refer to section "Device state machine 16")

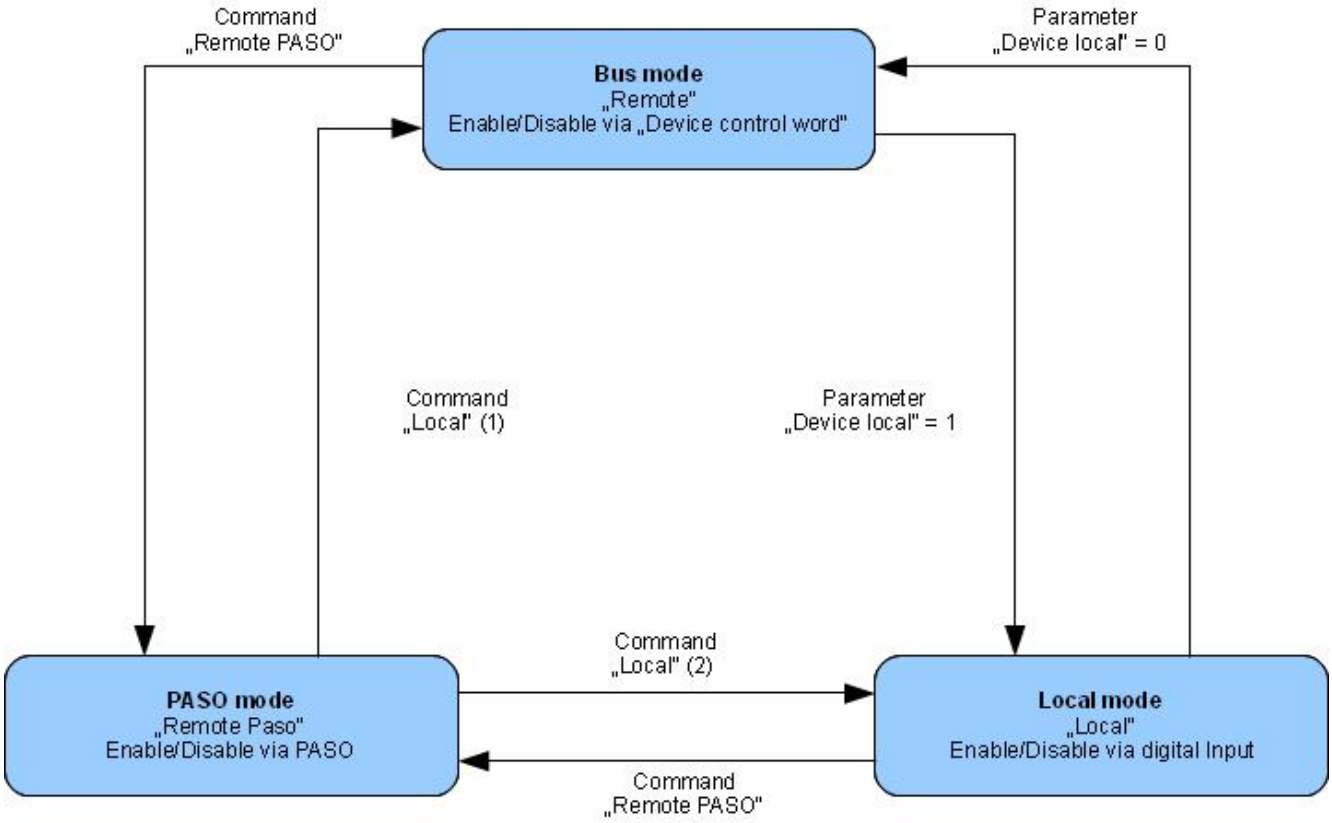
PASO mode ("Remote PASO")
In the PASO mode, the control commands will be set direct through the PASO. The PASO mode has 2 states: "Disabled" and "Enabled", switch over through the PASO command "Enable" resp. "Disable". This mode can be activated as follows:
- via PASO:
  With the parameter "Operating mode = Remote PASO". This only possible in the menu "Commands_Valve operation", "Commands_Manual operation" or "Commands_Command simulation"
- via Fieldbus:
  This mode can not be activated via the fieldbus

In both cases, the state of the WANDFLUH electronics must be "Init" or "Disabled" (refer to section "Device state machine 16")

Bus mode ("Remote")
In the Bus mode, the control commands will be set through the Fieldbus. The Bus mode has several states (refer to section "Device state machine 16"), switch over through the Bus parameter "Device control word". This mode can be activated as follows:
- via PASO:
  With the parameter "Operating mode = bus" (window "Enable channel")
- via Fieldbus:
  With the parameter "Device local (Operating mode) = 0"

In both cases, the state of the WANDFLUH electronics must be "Init" or "Disabled" (refer to section "Device state machine 16")

This picture shows the different possibilities of switch over the different states.



- A transition to a new mode is only possible if the device is in state "Init" or "Disable".

- (1) if "Device local" = 0
- (2) if "Device local" = 1

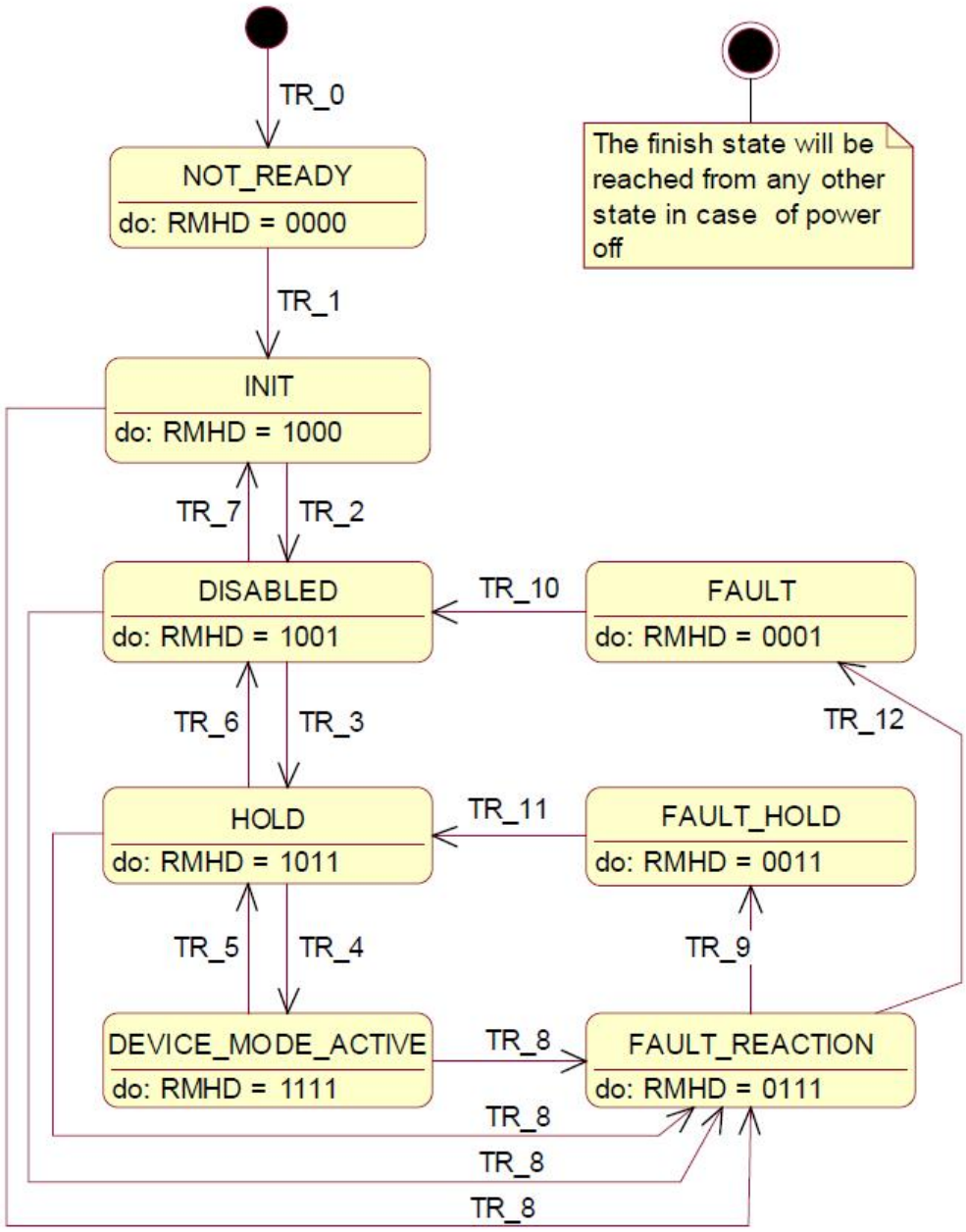
- In state „PASO mode“ sending of parameter "Device local" through fieldbus also possible.

4.3.3 Device state machine

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

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

Zustand	description
NOT_READY	• The supply voltage is present on the *WANDFLUH*-Electronics • 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 "Device control mode (Controller mode)" and "Device mode (Command value 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 "Device control mode (Controller mode)" and the device mode selected with the parameter "Device mode (Command value mode)" are active • Changing the operating mode is not possible (the writing of the parameter "Device mode (Command value mode)" is responded to negatively)
FAULT_HOLD	• Device parameters can be set • The feedback 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	Controlwort 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	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							

RMHD = R: Controlword "Reset Fault" (Bit 3)
M: Controlword "Device mode active enable" (Bit 2)
H: Controlword "Hold enable" (Bit 1)
D: Controlword "Disable" (Bit 0)

4.4 Program Control

The WANDFLUH-Electronics through the fieldbus can be set to the following operating modes; in doing so, one differentiates between the Control mode and the Device mode:

Control mode	Description
Local operating mode	The WANDFLUH-Electronic is operated through the local possibilities such as e.g. the digital inputs and outputs or PASO. **This control mode is active after switch on the WANDFLUH-Electronic.**
Spool position control open loop vpoc (1)	A proportional spool valve is driven with a set-point value, the set-point value is proportional to the valve opening. The spool position is not recorded and controlled (open loop). **This control mode is only selectable with amplifier and controller.**
Pressure control valve open loop vprc (3)	A proportional pressure control valve is driven with a set-point value; the set-point value is proportional to the valve pressure. The pressure is not measured and controlled with a pressure sensor (open loop). **This control mode is selectable with amplifier and controller.**
Pressure control valve closed loop vprc (4)	A proportional pressure control valve with 1 solenoid is driven with a set-point value; the set-point value is proportional to the valve pressure. The pressure is measured and controlled with a pressure sensor (closed loop). **This control mode is only selectable with controller.**
Open loop movement dcol (6)	A proportional spool valve is driven with a set-point value; the set-point value is proportional to the valve opening. The position is not measured and controlled with a position sensor (open loop). **This control mode is only selectable with controller.**
Velocity control axis dsc (7)	A proportional flow valve is driven with a set-point value; the set-point value is proportional to the valve flow. The flow is measured and controlled with a flow sensor (closed loop). **This control mode is only selectable with controller.**
Position control axis dpc (9)	A proportional spool valve is driven with a set-point value; the set-point value is proportional to the position of the axis. The position is measured and controlled with a position sensor (closed loop). **This control mode is only selectable with controller.**
Pressure control valve closed loop (2-sol((-5)	Wandfluh - specific. Like vprc (4), but for 2 solenoids. **This control mode is only selectable with controller.**
2-Point controller 1-sol. (-6)	Wandfluh – specific. 2-point controller for 1 solenoid. **This control mode is only selectable with controller.**
2-Point controller 2-sol. (-7)	Wandfluh – specific. 2-point controller for 2 solenoid. **This control mode is only selectable with controller.**
3-Point controller 2-sol. (-8)	Wandfluh – specific. 3-point controller for 1 solenoid. **This control mode is only selectable with controller.**

Device mode	Description
Set-point value setting through the bus	The set-point-value setting for the WANDFLUH-Electronics takes place through the fieldbus. This corresponds to the standard device mode.
Set-point value setting locally	The set-point value setting for the WANDFLUH-Electronics takes place locally.

4.5 Profile Position Mode

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, 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.

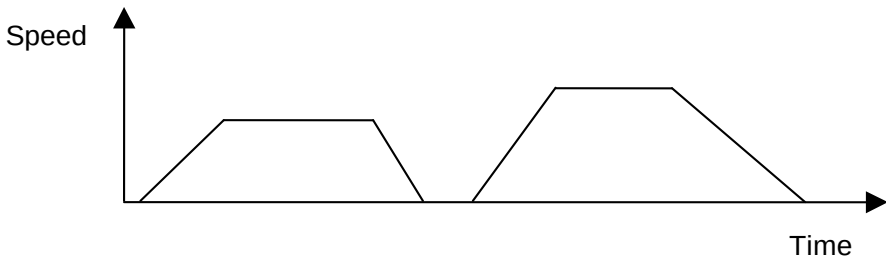
The position data are controlled, resp. predefined by the timing (resp., handshaking) of the bits "New_setpoint“ in the Control Word and "Setpoint_acknowledge“ in the Status Word. The bit "New_setpoint“ is flank-triggered.

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.

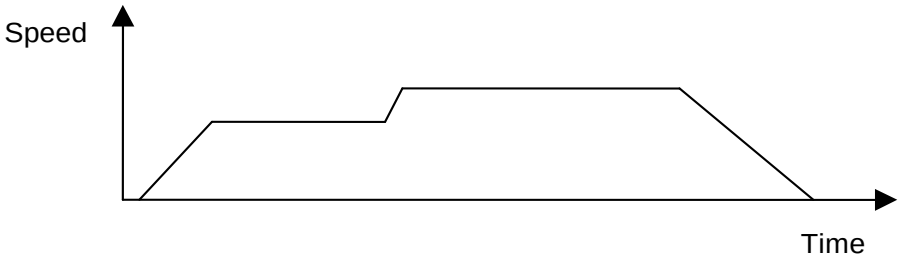
Sequence of a position predefinition from a master:

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

4.6 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 through the corresponding bits in the Control Word.

4.7 Cyclical process data exchange (PZD)

4.7.1 General

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 "Communication from words and double words 4").

In the operation of several channels, the appropriate telegram type must be selected and transmitted separately for each axis. The separation the channels is implemented with the "Separator module" in the GSD file.

4.7.2 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
- Data exchange **with** parameter channel
  with 4 words for parameters and 2 words for data exchange → telegram type 3
- Data exchange **without** parameter channel
  with 2 words for data exchange → telegram type 4
- Data exchange **with** parameter channel
  with 4 words for parameters and 7 words for data exchange → telegram type 103
- Data exchange **without** parameter channel
  with 7 words for data exchange → telegram type 101

	Control Mode						
	1 (Spool valve open loop)	3 (Pressure/flow valve open loop	4, -5 (Pressure/flow valve closed loop)	6 (Position open loop)	7 (Speed control closed loop)	9 (Position closed loop)	-6, -7, -8 (n-point controller)
Telegram type	3 / 4	3 / 4	3 / 4 / 101 / 103	1 / 2	1 / 2 / 101 / 103	1 / 2 / 101 / 103	1 / 2
Profibus-Amplifier	selectable		not selectable				
Profibus-Controller	selectable						

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

	Word 0	Word 1		Word 2	Word 3
Parameter (PKW)	PKE	Res	IND	PWE	

	Word 4	Word 5	Word 6
PZD receive data	Control Word	Command value	

	Word 4	Word 5	Word 6
PZD transmit data	Status Word	Feedback value	

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

	word 0	word 1	word 2
PZD receive data	Control Word	Command value	

	word 0	word 1	word 2
PZD transmit data	Status Word	Feedback value	

Standard telegram 3
The telegram type 3 is defined by the "PROFIBUS Profile Fluid Power Technology" (standard telegram).

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

	word 4	word 5
PZD receive data	Control Word	Command value

	word 4	word 5
PZD transmit data	Status Word	Feedback value

Standard telegram 4
The telegram type 4 is defined by the "PROFIBUS Profile Fluid Power Technology" (standard telegram).

	word 0	word 1
PZD receive data	Control Word	Command value

	word 0	word 1
PZD transmit data	Status Word	Feedback value

Device Telegram 103
The telegram type 103 is defined by WANDFLUH (user defined telegram) and is used for the "Profile position control 20"

	Word 0	Word 1		Word 2	Word 3
Parameter (PKW)	PKE	Res	IND	PWE	

	Word 4	Word 5	Word 6
PZD receive data	Control Word	Command value	

	Word 7	Word 8	Word 9	Word 10
PZD receive data	Velocity		Acceleration	Deceleration

	Word 4	Word 5	Word 6
PZD transmit data	Status Word	Feedback value	

Device Telegram 101
The telegram type 101 is defined by WANDFLUH (user defined telegram) and is used for the "Profile position control 20"

	Word 0	Word 1	Word 2
PZD receive data	Control Word	Command value	

	Word 3	Word 4	Word 5	Word 6
PZD receive data	Velocity		Acceleration	Deceleration

	Word 0	Word 1	Word 2
PZD transmit data	Status Word	Feedback value	

4.7.3 Receive data (Master à Slave, command values)

Parameter	Length (word)	Resolution
Control word	1	
Command value	Telegram type 1 / 2: 2 Telegram type 3 / 4: 1	Min ..Max Bus Interface Min ..Max Bus Interface
Velocity	Telegram type 103/101: 1	1/100 from the unit
Acceleration Deceleration	Telegram type 103/101: 1	1/10 from the unit

4.7.4 Transmit data (Slave à Master, feedback values)

Parameter	Length (word)	Resolution
Status word	1	
Feedback value	Telegram type 1 / 2: 2 Telegram type 3 / 4: 1	vprc (closed loop): -16384 .. 16383: refer to Internal bus resolution dsc, dpc , n-point: Min .. Max Reference: refer to Scaled parameter
Velocity	Telegram type 103/101: 1	1/100 from the unit
Acceleration Deceleration	Telegram type 103/101: 1	1/10 from the unit

4.8 Cyclical parameter data exchange (PKW)

4.8.1 General

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.

4.8.2 Structure of the PKW

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		Res	IND	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
3	undefined IND
5	data type error
18	other errors
201	Invalid parameter
202	The selected parameter can't be read
203	The solenoid choice contained in the value is except range
204	The array index contained in the value is except range
205	The array element cannot be read
206	The array element cannot be described
207	The characteristic optimisation cannot be switched on because of incorrect characteristic values

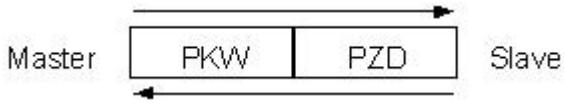
Remark:
An error message can occur, if a value assignment is not certified in the current control mode or status or in the current mode of operation. Further informations you will find in the associated parameter description.

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

4.8.3 Description of the parameter transmission process

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



Example 1:
The parameter "Imin solenoid 1" should be written with the value 450mA.

- data type = uint16 → parameter length = word → AK = 0x0h
- parameter number = 6 → PNU = 0x06
- block number = 250 → IND = 0xFA
- value = 450 x 16384 / 1877 = 3927 → PWE = 0x00000F57

Instruction signature (Master → Slave):

PKW								
word 0			word 1		word 2		word 3	
PKE			Res	IND	PWE			
AK	RES	PNU						
2	0	06	00	FA	00	00	0F	57

Response signature (Slave → Master):

PKW								
word 0			word 1		word 2		word 3	
PKE			Res	IND	PWE			
AK	RES	PNU						
1	0	06	00	FA	00	00	00	00

- AK = 0X01 → 1 = positive response signature for a parameter length = word

Because the transmission is done in the little endian format (refer to section "Communication from words and double words 4"), the bytes are transmitted as follows:

Instruction signatur (Master → Slave)

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
20	06	FA	00	57	0F	00	00

Response signatur (Slave → Master)

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
10	06	FA	00	00	00	00	00

Example 2:
The parameter "Enable solenoid 1" should be read.

- data type = uint8 → parameter length = byte → AK = 0x01
- parameter number = 1 → PNU = 0x01
- block number = 250 → IND = 0xFA

Instruction signature (Master → Slave):

PKW								
word 0			word 1		word 2		word 3	
PKE			Res	IND	PWE			
AK	RES	PNU						
1	0	01	00	FA	00	00	00	00

Response signature (Slave → Master):

PKW								
word 0			word 1		word 2		word 3	
PKE			Res	IND	PWE			
AK	RES	PNU						
B	0	01	00	FA	00	00	00	02

- AK = 0x0b → 11 = positive response signature for a parameter length = byte
- PWE = 0x00000002 → 2 = value of the parameter (2 = external)

Because the transmission is done in the little endian format (refer to section "Communication from words and double words 4"), the bytes are transmitted as follows:

Instruction signatur (Master → Slave)

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
10	01	FA	00	00	00	00	00

Response signatur (Slave → Master)

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
B0	01	FA	00	02	00	00	00

4.9 Scaled parameter

For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29",

4.10 Device internal resolution

Parameter with a unit (e.g. mm, psi, l/min, etc.), are stored on the device with an internal resolution. This resolution depends on the adjusted scaling.

Therefore all parameters with an unit must be re-sent if the scaling has changed.

Some parameters depend on the command scaling:

Modification on one or more of the parameters listed:	Parameters that need to be re-sent mandatory:
- Command value mode 35 - Signal type Command value 54 - Min Interface Command value 56 - Max Interface Command value 56 - Min Interface Command value via Feldbus 56 - Max Interface Command value via Feldbus 56 - Min Reference Command value 57 - Max Reference Command value 57 - Controller mode 35 (only when switching from Open Loop to Closed Loop or vice versa)	- Deadband Command value 57 - Command value fixed 62 - Speed Command value 64 (only in Closed Loop) - Acceleration Command value 64 (only in Closed Loop) - Deceleration Command value 64 (only in Closed Loop) - Speed manual mode 75 (only in Closed Loop) - Switching thresholds 64 (only if Selection = Command value) - Min Reference Analog output 76 (only if Signal = Command value) - Max Reference Analog output 77 (only if Signal = Command value)

Some parameters depend on the feedback scaling:

Modification on one or more of the parameters listed:	Parameters that need to be re-sent mandatory:
- Feedback value mode 57 - Signal type Feedback value 58 - Min Interface Feedback value 60 - Max Interface Feedback value 60 - Min Interface Feedback value via Feldbus 60 - Max Interface Feedback value via Feldbus 60 - Min Reference Feedback value 61 - Max Reference Feedback value 61 - SSI Sensor Resolution 61 - Displayed unit 65 - Controller mode 35 (only when switching from Open Loop to Closed Loop)	- Control deviation for 100% control value 66 - I-Window outside 66 - I-Window inside 66 - Threshold for n-Punkt Controller 68 - Window control 64 - Trailing window threshold (depends on controller mode: vprc Trailing window threshold 39, dsc Trailing window threshold 40, dpc Trailing window threshold 41, n-point Controller Trailing window Threshold 68) - Schaltschwellen 64 (only if Selection = Feedback value) - Min Reference Analog output 76 (only if Signal = Feedback value) - Max Reference Analog output 77 (only if Signal = Feedback value)

4.11 Interface

For setting the interface parameters, the adjusting range and the resolution depends on the selected signal type. The following table shows the relationship (refer also to section "Device internal resolution 29"):

Signal type	Range
Voltage	-10000 .. 10000: -10 .. +10V, resolution 0.001 V
Current	0 .. 20000: 0 .. +20mA, resolution 0.001 mA
Digital	0 .. 1: 0 (off), 1 (on)
Frequency	0 .. 5000000: 0 .. 5000 Hz, resolution 0.001 Hz
PWM	0 .. 100000: 0 .. 100%, resolution 0.001 %

4.12 Solenoid current

For setting the solenoid parameters, the adjusting range and the resolution depends on the selected solenoid type. The following table shows the relationship

Solenoid-type	Range		
	DSV	MD2	SD7
Current measured	0 .. 16384: 0 .. 1534mA bei 24V 0 .. 16384: 0 .. 2557mA bei 12V	0 .. 16384: 0 .. 2112mA	0 .. 16384: 0 .. 1877mA bei 24V 0 .. 16384: 0 .. 2346mA bei 12V
Current not measured	0 .. 16384: 0 .. 100% Duty-Cycle		

4.13 Internal bus resolution

In the Device Profile in accordance with DSP-408 device profile "Fluid Power Technology", an internal resolution value is defined. This value is -16384 ... 16383. This scaling can be adjusted with the help of PASO.

5 WANDFLUH-Electronics Parameter directory

5.1 General

In the following section, all parameters, which can be adjusted via PKW (refer to section "Cyclical parameter data exchange (PKW) 25") will be descripted.

The error code 0 (invalid PNU) can be sent back for different reasons:
- if the current hardware or software execution does not support the parameter
- if the selected control mode (refer to section „Device control mode“ page 40) does not support the parameter
- if the selected mode of operation (refer to section "Mode of operation" page 42) does not support the parameter

The error code 1 (Selected parameter can’t be changed) can be sent back for different reasons:
- the parameter can be only read
- the parameter can be only changed, if thedevice is blocked (status „INIT“ or "DISABLED")

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.

Note:
A detailed description about the function of each parameter you will find in the corresponding operating instructions of the WANDFLUH-Electronics

5.2 Standard Device Parameters

IND	PNU	Description	Controller mode	Data type	min. value	max. value
0	36	Error code 33		UINT16	0	65535
0	37	Device control word 33		UINT16	0	65535
0	38	Device status word 35		UINT16	0	65535
0	39	Device mode (Command value mode) 35		UINT8	1	2
0	40	Device control mode (Controller mode) 35		INT8	-128	127
0	41	Device local (Operating mode) 36		UINT8	0	1
0	50	Capability 36		UINT32		
0	51	Store Parameter 36		INT32	-2147483648	2147483647
0	52	Reset Default 36		INT32	-2147483648	2147483647
21	21	vpoc Command value 36	vpoc	INT16	-32768	32767
21	43	vpoc Ramp type 37	vpoc	INT8	-128	127
21	50	vpoc Ramp A up 37	vpoc	UINT16	0	51000
21	47	vpoc Ramp A down 37	vpoc	UINT16	0	51000
21	59	vpoc Ramp B up 37	vpoc	UINT16	0	51000
21	56	vpoc Ramp B down 37	vpoc	UINT16	0	51000
22	21	vprc Command value 37	vprc (open-loop) vprc (closed-loop)	INT16	-32768	32767
22	144	vprc Feedback value 38	vprc (closed-loop)	INT16		
22	43	vprc Ramp type 38	vprc (open-loop)	INT8	-128	127
22	50	vprc Ramp A up 38	vprc (open-loop)	UINT16	0	51000
22	47	vprc Ramp A down 38	vprc (open-loop)	UINT16	0	51000
22	59	vprc Ramp B up 38	vprc (open-loop)	UINT16	0	51000
22	56	vprc Ramp B down 38	vprc (open-loop)	UINT16	0	51000
22	147	vprc Control deviation 38	vprc (closed-loop)	INT16		
22	150	vprc Trailing window type 38	vprc (closed-loop)	INT8	-2	2
22	157	vprc Trailing window delay time 39	vprc (closed-loop)	INT16	0	100
22	160	vprc Trailing window threshold 39	vprc (closed-loop)	INT16	0	16384
11	21	dcol Command value 39	dcol	INT32	-2147483648	2147483647
11	42	dcol Ramp type 39	dcol	INT8	-128	127
11	49	dcol Ramp A up 39	dcol	UINT16	0	51000
11	46	dcol Ramp A down 39	dcol	UINT16	0	51000
11	55	dcol Ramp B up 39	dcol	UINT16	0	51000
11	58	dcol Ramp B down 39	dcol	UINT16	0	51000
13	21	dsc Command value 40	dsc	INT32	-2147483648	2147483647
13	100	dsc Feedback value 40	dsc	INT32		
13	103	dsc Control deviation 40	dsc	INT32		
13	112	dsc Trailing window type 40	dsc	INT8	-2	2
13	119	dsc Trailing window delay time 40	dsc	INT16	0	100
13	122	dsc Trailing window threshold 40	dsc	INT32	0	2147483647
12	21	dpc Command value 41	dpc	INT32	-2147483648	2147483647
12	100	dpc Feedback value 41	dpc	INT32		
12	103	dpc Control deviation 41	dpc	INT32		
12	140	dpc Trailing window type 41	dpc	INT8	-2	2
12	147	dpc Trailing window delay time 41	dpc	INT16	0	100
12	150	dpc Trailing window threshold 41	dpc	INT32	0	2147483647

5.2.1 Error code

IND	PNU	Data type	Range
0	36	UINT16	Active error in the channel

Possible error codes and its description:

Error Code (Hex)	Name	Description	Reaction
0000	No error	No error is present	
1000	General error	A general error is present	FAULT
2300	Current output	Short circuit dig. output (sourcing outputs only).	FAULT
2311	Solenoid output	Solenoid driver 1 cable break or short-circuit	FAULT
2312		Solenoid driver 2 cable break or short-circuit	FAULT
3412	Power supply voltage too low	The *WANDFLUH* -Electronics supply voltage is too low	FAULT
3422	Control voltage too low	The control (analog command signal) voltage is too low or there occurred a cable break	FAULT
4211	Temperature too high	The temperature of the electronic device is too high	FAULT
5000	Communication Hardware	Error while initialising the Communication Hardware	FAULT
5530	EEPROM	Error on EEPROM access	FAULT
8100	Communication	Fieldbus off or passive error.	FAULT
8300	Closed loop control monitoring	Trailing error too excides limit.	FAULT

5.2.2 Device control word

IND	PNU	Data type	Range
0	37	UINT16	siehe folgende 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	Name	Description
0	Disable (D)	These bits form the device control commands. Refer to the description of the device state machine 16.
1	Hold enable (H)	
2	Device mode active (M)	
3	Reset fault (R)	Resets an error/fault
4	Reserviert	
5	Reserviert	
6	Reserviert	
7	Reserviert	

8	Reserviert		
9	Forward	Manual mode	Moves the axis forward
10	Backward	Manual mode	Moves the axis backward
	Force_setpoint	Profile Position mode	The transmitted motion profile values will be take over immediately
11	Reserviert		
12	Reserviert		
13	Fast speed	Manual mode	Fast speed will be active
	New_setpoint	Profile Position mode	Send new motion profile values to the DP-Slave controller
	Start	Profile generator	Run the selected profile
14	Stop	Profile generator	Stop the active profile
15	Single sequence	Profile generator	Profile is executed in single sequences

5.2.3 Device status word

IND	PNU	Data type	Range
0	38	UINT16	siehe folgende Description

The status word is bit coded, i.e., each individual bit has a status display 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	Name	Description	
0	Disable (D)	These bits determine the device condition. Refer to the description of the device state machine 16.	
1	Hold enable (H)		
2	Device mode active (M)		
3	Ready (R)		
4	Local control	Is active, if the WANDFLUH Electronics is operated locally	
5	Reserved		
6	Reserved		
7	Reserved		
8	Reserved		
9	Ramp running	The command value ramp is active (open-loop modes only)	
10	Reserved		
11	Trailing window active	The trailing window error is active (closed-loop modes only)	
12	Target window reached	The target window is reached (closed-loop modes only)	
13	Setpoint-_acknlowdege	Profile Position Mode	New motion profiles values are take over from the DP-Slave controller
14	Reserved		
15	Manufacturer-specific		

5.2.4 Device mode (Command value mode)

IND	PNU	Data type	Range
0	39	UINT8	1: Command value via fieldbus 2: Command value local (refer to section "Device internal resolution 29")

5.2.5 Device control mode (Controller mode)

IND	PNU	Data type	Range
0	40	INT8	1: Spool position control open loop (vpoc) 3: Pressure/flow valve open loop (vprc) 4: Pressure/flow valve closed loop (vprc) 6: Position open loop (dcol) 7: Speed control closed loop (dsc) 9: Position closed loop (dpc)

IND	PNU	Data type	Range
			-5: Pressure control closed loop 2-sol (vprc) -6: 2-point controller 1-sol (n-point) -7: 2-point controller 2-sol (n-point) -8: 3-point controller 2-sol (n-point)

5.2.6 Device local (Operating mode)

IND	PNU	Data type	Range
0	41	UINT8	0: Control-Word via fieldbus 1: Control-Word local

5.2.7 Capability

IND	PNU	Data type	Range
0	50	UINT32	Bit 0..13 = reserved Bit 14 = n-point controller (WANDFLUH specific) Bit 15 = Vendor specific Bit 16 = Hydraulic drive Bit 17 = Position open loop Bit 18 = Speed controller Bit 19 = P/Q controller Bit 20 = Position controller Bit 21-23 = reserved Bit 24 = Hydraulic proportional valve Bit 25 = Spool position control open loop (without LVDT) Bit 26 = Spool position control closed loop (with LVDT) Bit 27 = Pressure control valve open loop (without feedback sensor) Bit 28 = Pressure control valve closed loop (with feedback sensor) Bit 29 = P/Q Valve Bit 30 = reserved Bit 31 = Modular device (can have various functions)

5.2.8 Store Parameter

Store all changed device parameters into non-volatile memory (EEPROM).

Ind	Pnu	Data type	Range
0	51	INT32	0: Do nothing 0x73 0x61 0x76 0x65 (= 's' 'a' 'v' 'e'): Store all parameters into the non-volatile memory

5.2.9 Reset Default

All device parameters will be set to default values.

Ind	Pnu	Data type	Range
0	52	INT32	0: Do nothing 0x6C 0x6F 0x61 0x64 (= 'l' 'o' 'a' 'd'): All device parameters will be set to default values

5.2.10 vpoc Command value

Control-mode	IND	PNU	Data type	Range
vpoc (open-loop)	21	21	INT16	Min ..Max Bus Interface

vprc (open-loop) vprc (closed-loop)	22	21	INT16	Min ..Max Bus Interface
dcol (open-loop)	11	21	INT32	Min .. Max Bus Interface
dsc	13	21	INT32	Min .. Max Bus Interface
dpc	12	21	INT32	Min .. Max Bus Interface
n-point	228	0	INT32	Min .. Max Bus Interface

5.2.11 vpoc Ramp type

IND	PNU	Data type	Range
21	43	INT8	0: Ramp off 3: Ramp on -1: Ramp on via dig. input

5.2.12 vpoc Ramp A up

IND	PNU	Data type	Range
21	50	UINT16	0 .. 50000, resolution 10ms

5.2.13 vpoc Ramp A down

IND	PNU	Data type	Range
21	47	UINT16	0 .. 50000, resolution 10ms

5.2.14 vpoc Ramp B up

IND	PNU	Data type	Range
21	59	UINT16	0 .. 50000, resolution 10ms

5.2.15 vpoc Ramp B down

IND	PNU	Data type	Range
21	56	UINT16	0 .. 50000, resolution 10ms

5.2.16 vprc Command value

Control-mode	IND	PNU	Data type	Range
vpoc (open-loop)	21	21	INT16	Min ..Max Bus Interface
vprc (open-loop) vprc (closed-loop)	22	21	INT16	Min ..Max Bus Interface
dcol (open-loop)	11	21	INT32	Min .. Max Bus Interface
dsc	13	21	INT32	Min .. Max Bus Interface
dpc	12	21	INT32	Min .. Max Bus Interface
n-point	228	0	INT32	Min .. Max Bus Interface

5.2.17 vprc Actual value

Control-mode	IND	PNU	Data type	Range
vprc (closed-loop)	22	144	INT16	-16384 .. 16383: refer to Internal bus resolution
dsc	13	100	INT32	Min- .. Max-Reference: refer to Scaled parameter
dpc	12	100	INT32	Min- .. Max-Reference: refer to Scaled parameter
n-point	228	1	INT32	Min- .. Max-Reference: refer to Scaled parameter

5.2.18 vprc Ramp type

IND	PNU	Data type	Range
22	43	INT8	0: Ramp off 3: Ramp on -1: Ramp on via dig. input

5.2.19 vprc Ramp A up

IND	PNU	Data type	Range
22	50	UINT16	0 .. 50000, resolution 10ms

5.2.20 vprc Ramp A down

IND	PNU	Data type	Range
22	47	UINT16	0 .. 50000, resolution 10ms

5.2.21 vprc Ramp B down

IND	PNU	Data type	Range
22	59	UINT16	0 .. 50000, resolution 10ms

5.2.22 vprc Ramp B up

IND	PNU	Data type	Range
22	56	UINT16	0 .. 50000, resolution 10ms

5.2.23 vprc Control deviation

Control-mode	IND	PNU	Data type	Range
vprc (closed-loop)	22	147	INT16	-16384 .. 16383: refer to Internal bus resolution
dsc	13	103	INT32	Min- .. Max-Reference: refer to Scaled parameter
dpc	12	103	INT32	Min- .. Max-Reference: refer to Scaled parameter
n-point	228	6	INT32	Min- .. Max-Reference: refer to Scaled parameter

5.2.24 vprc Trailing window type

IND	PNU	Data type	Range
22	150	INT8	0: Off 2: Trailing window monitoring on -2: Trailing window monitoring on (raises error)

5.2.25 vprc Trailing window delay time

IND	PNU	Data type	Range
22	157	INT16	0 .. 100: 0 .. 100ms

5.2.26 vprc Trailing window threshold

IND	PNU	Data type	Range
22	160	INT16	0 .. 16384: 0 .. 100% (refer to section "Device internal resolution 29")

5.2.27 dcol Command value

Control-mode	IND	PNU	Data type	Range
vpoc (open-loop)	21	21	INT16	Min ..Max Bus Interface
vprc (open-loop) vprc (closed-loop)	22	21	INT16	Min ..Max Bus Interface
dcol (open-loop)	11	21	INT32	Min .. Max Bus Interface
dsc	13	21	INT32	Min .. Max Bus Interface
dpc	12	21	INT32	Min .. Max Bus Interface
n-point	228	0	INT32	Min .. Max Bus Interface

5.2.28 dcol Ramp type

IND	PNU	Data type	Range
11	42	INT8	0: Ramp off 3: Ramp on -1: Ramp on via dig. input

5.2.29 dcol Ramp A up

IND	PNU	Data type	Range
11	49	UINT16	0 .. 50000, resolution 10ms

5.2.30 dcol Ramp A down

IND	PNU	Data type	Range
11	46	UINT16	0 .. 50000, resolution 10ms

5.2.31 dcol Ramp B up

IND	PNU	Data type	Range
11	58	UINT16	0 .. 50000, resolution 10ms

5.2.32 dcol Ramp B down

IND	PNU	Data type	Range
11	55	UINT16	0 .. 50000, resolution 10ms

5.2.33 dsc Command value

Control-mode	IND	PNU	Data type	Range
vpoc (open-loop)	21	21	INT16	Min ..Max Bus Interface
vprc (open-loop) vprc (closed-loop)	22	21	INT16	Min ..Max Bus Interface
dcol (open-loop)	11	21	INT32	Min .. Max Bus Interface
dsc	13	21	INT32	Min .. Max Bus Interface
dpc	12	21	INT32	Min .. Max Bus Interface
n-point	228	0	INT32	Min .. Max Bus Interface

5.2.34 dsc Actual value

Control-mode	IND	PNU	Data type	Range
vprc (closed-loop)	22	144	INT16	-16384 .. 16383: refer to Internal bus resolution
dsc	13	100	INT32	Min- .. Max-Reference: refer to Scaled parameter
dpc	12	100	INT32	Min- .. Max-Reference: refer to Scaled parameter
n-point	228	1	INT32	Min- .. Max-Reference: refer to Scaled parameter

5.2.35 dsc Control deviation

Control-mode	IND	PNU	Data type	Range
vprc (closed-loop)	22	147	INT16	-16384 .. 16383: refer to Internal bus resolution
dsc	13	103	INT32	Min- .. Max-Reference: refer to Scaled parameter
dpc	12	103	INT32	Min- .. Max-Reference: refer to Scaled parameter
n-point	228	6	INT32	Min- .. Max-Reference: refer to Scaled parameter

5.2.36 dsc Trailing window type

IND	PNU	Data type	Range
13	112	INT8	0: Off 2: Trailing window monitoring on -2: Trailing window monitoring on (raises error)

5.2.37 dsc Trailing window delay time

IND	PNU	Data type	Range
13	119	INT16	0 .. 100: 0 .. 100ms

5.2.38 dsc Trailing window threshold

IND	PNU	Data type	Range
13	122	INT16	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"

5.2.39 dpc Command value

Control-mode	IND	PNU	Data type	Range
vpoc (open-loop)	21	21	INT16	Min ..Max Bus Interface
vprc (open-loop) vprc (closed-loop)	22	21	INT16	Min ..Max Bus Interface
dcol (open-loop)	11	21	INT32	Min .. Max Bus Interface
dsc	13	21	INT32	Min .. Max Bus Interface
dpc	12	21	INT32	Min .. Max Bus Interface
n-point	228	0	INT32	Min .. Max Bus Interface

5.2.40 dpc Actual value

Control-mode	IND	PNU	Data type	Range
vprc (closed-loop)	22	144	INT16	-16384 .. 16383: refer to Internal bus resolution
dsc	13	100	INT32	Min- .. Max-Reference: refer to Scaled parameter
dpc	12	100	INT32	Min- .. Max-Reference: refer to Scaled parameter
n-point	228	1	INT32	Min- .. Max-Reference: refer to Scaled parameter

5.2.41 dpc Control deviation

Control-mode	IND	PNU	Data type	Range
vprc (closed-loop)	22	147	INT16	-16384 .. 16383: refer to Internal bus resolution
dsc	13	103	INT32	Min- .. Max-Reference: refer to Scaled parameter
dpc	12	103	INT32	Min- .. Max-Reference: refer to Scaled parameter
n-point	228	6	INT32	Min- .. Max-Reference: refer to Scaled parameter

5.2.42 dpc Trailing window type

IND	PNU	Data type	Range
12	140	INT8	0: Off 2: Trailing window monitoring on -2: Trailing window monitoring on (raises error)

5.2.43 dpc Trailing window delay time

IND	PNU	Data type	Range
12	147	INT16	0 .. 100: 0 .. 100ms

5.2.44 dpc Trailing window threshold

IND	PNU	Data type	Range
12	150	INT16	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"

5.3 Manufacturer Specific Device Parameters

IND	PNU	Bezeichnung	Controller mode	Data type	min. value	max. value
200	0	Supply Error Auto Reset 51		UINT8	0	1
200	1 - 8	Configuration Digital input 1 ... 8 51		UINT8	0	2
200	9 - 16	Configuration Digital output 1 ... 8 51		UINT8	0	2
200	200	Number of Digital inputs 51		UINT8	0	255
200	201	Number of Digital outputs 51		UINT8	0	255
202	0	Number of internal signals 51		UINT8	0	255
202	1 - 8	Configuration Internal signal 1 ... 8 52		UINT8	0	2
203	0	States of the Digital inputs 52		UINT8	0	255
203	1	States of the Digital outputs 52		UINT8	0	255
203	2	States of the internal signals 52		UINT8	0	255
203	3	Active device errors 53		UINT8	0	255
205 205 205 205	0 2 4 6	Filter for analog inputs type Analog input 1 53 Filter for analog inputs type Analog input 2 53 Filter for analog inputs type Analog input 3 53 Filter for analog inputs type Analog input 4 53		UINT8	0	1
205 205 205 205	1 3 5 7	Filter for analog inputs smoothing factor Analog input 1 53 Filter for analog inputs smoothing factor Analog input 2 53 Filter for analog inputs smoothing factor Analog input 3 53 Filter for analog inputs smoothing factor Analog input 4 53		UINT8	3	6
220 220	0 3	Feedback value 1 Mode 51 Feedback value 2 Mode 51	n-point Controller vprc (closed-loop) dpc dsc	UINT8	1	2
220 220	1 4	Feedback value 1 Input 16 Bit 58 Feedback value 2 Input 16 Bit 58	n-point Controller vprc (closed-loop) dpc dsc	INT16	-32768	32767
220 220	2 5	Feedback value 1 Input 32 Bit 58 Feedback value 2 Input 32 Bit 58	n-point Controller vprc (closed-loop) dpc dsc	INT32	-2147483648	2147483647
220	9	Command value 2 Mode 54		UINT8	1	2
220	10	Command value 2 Input 16 Bit 54		INT16	-32768	32767
220	11	Command value 2 Input 32 Bit 54		INT32	-2147483648	2147483647
222 222	0 65	Signal type Feedback value 1 58 Signal type Feedback value 2 58	n-point Controller vprc (closed-loop) dpc dsc	UINT8	0	4
222 222	1 66	Analog input Feedback value 1 58 Analog input Feedback value 2 58	n-point Controller vprc (closed-loop) dpc dsc	INT8	-1	number of analog inputs - 1
222 222	2 67	Digital input Feedback value 1 58 Digital input Feedback value 2 58	n-point Controller vprc (closed-loop) dpc dsc	INT8	-1	number of digital inputs - 1
222 222	4 68	Cablebreak detection Feedback value 1 58 Cablebreak detection Feedback value 2 58	n-point Controller vprc (closed-loop) dpc dsc	UINT8	0	1
222 222	5 69	Lower cablebreak limit Feedback value 1 59 Lower cablebreak limit Feedback value 2 59	n-point Controller vprc (closed-loop) dpc dsc	INT32	0	2147483647

IND	PNU	Bezeichnung	Controller mode	Data type	min. value	max. value
222 222	6 70	Upper cablebreak limit Feedback value 1 59 Upper cablebreak limit Feedback value 2 59	n-point Controller vprc (closed-loop) dpc dsc	INT32	0	2147483647
222 222	7 71	Min. Interface Feedback value 1 60 Min. Interface Feedback value 2 60	n-point Controller vprc (closed-loop) dpc dsc	INT32	-2147483648	2147483647
222 222	8 72	Max. Interface Feedback value 1 60 Max. Interface Feedback value 2 60	n-point Controller vprc (closed-loop) dpc dsc	INT32	-2147483648	2147483647
222 222	9 73	Min. Interface Feedback value 1 via fieldbus 60 Min. Interface Feedback value 2 via fieldbus 60	n-point Controller vprc (closed-loop) dpc dsc	INT32	-32768	32767
222 222	10 74	Max. Interface Feedback value 1 via fieldbus 60 Max. Interface Feedback value 2 via fieldbus 60	n-point Controller vprc (closed-loop) dpc dsc	INT32	-32768	32767
222 222	11 75	Min. Reference Feedback value 1 61 Min. Reference Feedback value 2 61	n-point Controller vprc (closed-loop) dpc dsc	INT32	0	2147483647
222 222	12 76	Max. Reference Feedback value 1 61 Max. Reference Feedback value 2 61	n-point Controller vprc (closed-loop) dpc dsc	INT32	0	2147483647
222	16	Sensor input Feedback value 1 61	n-point Controller vprc (closed-loop) dpc dsc	INT8	-1	number of Sensoreingänge -1
222	17	SSI Sensor Bit number 61	n-point Controller vprc (closed-loop) dpc dsc	UINT8	8	25
222	18	SSI Sensor Sign 61	n-point Controller vprc (closed-loop) dpc dsc	UINT8	0	1
222	19	SSI Sensor Offset 61	n-point Controller vprc (closed-loop) dpc dsc	INT32	-32768	32767
222	20	SSI Sensor Resolution 61	n-point Controller vprc (closed-loop) dpc dsc	UINT16	0	65535
222	64	Function Feedback value input 2 62	n-point Controller vprc (closed-loop) dpc dsc	UINT8	0	2
224	0	Enable Channel 53	n-point Controller vprc (closed-loop) dpc dsc	UINT8	0	2
224	1	Digital input for Enable Channel 54	n-point Controller vprc (closed-loop) dpc dsc	INT8	-1	1
224	2	Mode of operation 68	vprc (open-loop) dcol vpoc	UINT8	0	3
224	3	Digital input for Solenoid 2 69	vprc (open-loop) dcol vpoc	INT8	-1	1

IND	PNU	Bezeichnung	Controller mode	Data type	min. value	max. value
224	4	Solenoid type 69		UINT8	0	2
224	5	Error evaluation Mask 73		UINT16	0	65535
224	6	Error evaluation Reaction 73		UINT8	0	3
224	7	Error evaluation Digital output 73		UINT8	-1	0
224	10	Valve type 69		UINT8	0	1
224	20	Number of Functions 74		UINT8	0	255
224	21 - 30	Digital output for Function 75		UINT8	0	255
225	0	Digital input for Enable Ramp 63	vprc (open-loop) dcol vpoc	UINT8	-1	1
228	0	n-point Controller Command value 67	n-point Controller	INT32	-2147483648	2147483647
228	1	n-point Controller Feedback value 67	n-point Controller	INT32		
228	2 - 5	Threshold 1 - 4 for n-Punkt Controller 68	n-point Controller	INT32	-2147483648	2147483647
228	6	n-point Controller Control deviation 68	n-point Controller	INT32		
228	7	n-point Controller Trailing window Type 68	n-point Controller	INT8	-2	2
228	8	n-point Controller Trailing window Delay time 68	n-point Controller	UINT16	0	100
228	9	n-point Controller Trailing window Threshold 68	n-point Controller	UINT32	0	2147483647
232 232	0 28	Signal type Command value 1 54 Signal type Command value 2 54		UINT8	0	4
232 232	1 29	Analog input for Command value 1 54 Analog input for Command value 2 54		INT8	-1	number of analog inputs - 1
232 232	2 30	Digital input for Command value 1 54 Digital input for Command value 2 54		INT8	-1	number of digital inputs - 1
232 232	4 31	Cablebreak detection Command value 1 55 Cablebreak detection Command value 2 55		UINT8	0	1
232 232	5 32	Lower cablebreak limit Command value 1 55 Lower cablebreak limit Command value 2 55		UINT32	0	2147483647
232 232	6 33	Upper cablebreak limit Command value 1 55 Upper cablebreak limit Command value 2 55		UINT32	0	2147483647
232 232	7 34	Min. Interface Command value 1 56 Min. Interface Command value 2 56		INT32	-2147483648	2147483647
232 232	8 35	Max. Interface Command value 1 56 Max. Interface Command value 2 56		INT32	-2147483648	2147483647
232 232	9 36	Min. Interface Command value 1 via fieldbus 56 Min. Interface Command value 2 via fieldbus 56		INT32	-32768	32767
232 232	10 37	Max. Interface Command value 1 via fieldbus 56 Max. Interface Command value 2 via fieldbus 56		INT32	-32768	32767
232 232	11 38	Min. Reference Command value 1 57 Min. Reference Command value 2 57		INT32	0	2147483647
232 232	12 39	Max. Reference Command value 1 57 Max. Reference Command value 2 57		INT32	0	2147483647
232	13	Deadband Function for Command value 57	vprc (open-loop) dcol vpoc	UINT8	0	1
232	14	Deadband Command value 48	vprc (open-loop) dcol vpoc	INT16	0	16384
232	24	Function Input 2 Command value 57		UNIT8	0	4
232 232 232 232 232 232 232 232 232 232	50 51 52 53 54 55 56 57 58 59	Current value Analog input Command value 1 48 Current value Analog input Command value 2 48 Current value Command value after Skalierung 48 Current value Command value after Festsollwerten 48 Current value Command value after Rampe 48 Current value Command value for Magnete 48 Current value Command value for Solenoid driver 1 48		INT32 INT32 INT32 INT32 INT32 INT32 INT32 INT32 UINT32 UINT16	-2147483648 -2147483648 -2147483648 -2147483648 -2147483648 -2147483648 -2147483648 -2147483648 0 0	2147483647 2147483647 2147483647 2147483647 2147483647 2147483647 2147483647 2147483647 2147483647 65535

IND	PNU	Bezeichnung	Controller mode	Data type	min. value	max. value
232 232	60 61	Current value Command value for Solenoid driver 2 48 Current value Active Channel errors 48 Current value Active state of Function 48 Current value Active state of Error 48 Current value Active switching threshold 48		UINT16 UINT8	0 0	65535 255
238	0	Command value selection 62		INT8	0	1
238	1	Number of digital inputs for Comand values fixed / Profile Generator 62		INT8		
238	2 - 4	Selection 1 - 3 digital input for Comand values fixed / Profile Generator 62		INT8	-1	1
238	5	Number of Comand values fixed / Profile 62		INT8		
238	6 - 12	Command value fixed 1 - 7 62		INT32	-2147483648	2147483647
238 238 238 238 238 238	50 51 52 53 54 55	Start Enable 63 Start Digital input 63 Stop Enable 63 Stop Digital input 63 Single Sequence Enable 63 Single Sequence Digital input 63		UINT8 INT8 UINT8 INT8 UINT8 INT8	0	3
238	56 - 62	Profile selection 1 - 7 63		UINT8	-1	6
238 238 238 238 238	100 101 102 103 104	Manual operation Enable 75 Manual operation Enable Digital input 75 Manual operation Forward Digital input 75 Manual operation Backward Digital input 75 Manual operation Fast speed Digital input 75		UINT8 INT8 INT8 INT8 INT8	0	3
238 238 238 238 238 238 238 238 238 238	120 121 122 123 124 125 126 127 128 129	Switching threshold 1 Type 64 Switching threshold 1 Selection 64 Switching threshold 1 Function 64 Switching threshold 1 Threshold 64 Switching threshold 1 Delay time 64 Switching threshold 2 Type 64 Switching threshold 2 Selection 64 Switching threshold 2 Function 64 Switching threshold 2 Threshold 64 Switching threshold 2 Delay time 64		UINT8 UINT8 UINT8 INT32 UINT16 UINT8 UINT8 UINT8 INT32 UINT16	0 0 0 -2147483648 0 0 0 0 -2147483648 0	2 1 1 2147483647 100 2 1 1 2147483647 100
240 240	0 1	Pos. Speed Command value 64 Neg. Speed Command value 64	n-point Controller vprc (closed-loop) dpc dsc	INT32	0	2147483647
240 240 240 240 240 240	2 3 4 5 6 7	Target window Type 64 Target window Delay time 64 Target window Threshold 64 Solenoid-Off window Type 64 Solenoid-Off window Delay time 64 Solenoid-Off window Threshold 64	n-point Controller vprc (closed-loop) dpc dsc	INT8 INT16 INT32 INT8 INT16 INT32	0	2
240	8	Displayed unit 65	n-point Controller vprc (closed-loop) dpc dsc	UINT8	0	12
240	9	Command feed forward 65	n-point Controller vprc (closed-loop) dpc dsc	INT16	0	10000
240	10	Velocity feed forward 65	n-point Controller vprc (closed-loop) dpc dsc	INT16	0	10000
240	11	I type 65	n-point Controller vprc (closed-loop) dpc dsc	INT8	0	1
240	12	I-Term, if control deviation > I-Window 66	n-point Controller vprc (closed-loop) dpc dsc	INT8	0	2

IND	PNU	Bezeichnung	Controller mode	Data type	min. value	max. value
240 240	13 14	P-Ampl. positive 66 P-Ampl. negative 66	n-point Controller vprc (closed-loop) dpc dsc	UINT16	0	25000
240 240	15 16	I-Time positive 66 I-Time negative 66	n-point Controller vprc (closed-loop) dpc dsc	UINT16	0	10000
240 240	17 18	I-Window outside positive 66 I-Window outside negative 66	n-point Controller vprc (closed-loop) dpc dsc	UINT32	0	2147483647
240 240	19 20	I-Window inside positive 66 I-Window inside negative 66	n-point Controller vprc (closed-loop) dpc dsc	UINT32	0	2147483647
240 240	21 22	D-Time positive 67 D-Time negative 67	n-point Controller vprc (closed-loop) dpc dsc	UINT16	0	10000
240 240	23 24	D-Ampl. positive 67 D-Ampl. negative 67	n-point Controller vprc (closed-loop) dpc dsc	UINT16	0	10000
240 240	50 51	Pos. Acceleration Command value 64 Neg. Acceleration Command value 64	n-point Controller vprc (closed-loop) dpc dsc	UINT32	0	2147483647
240 240	52 53	Pos. Deceleration Command value 64 Neg. Deceleration Command value 64	n-point Controller vprc (closed-loop) dpc dsc	UINT32	0	2147483647
240 240	100 101	Slow speed Speed Manual operation 75 Fast speed Speed Manual operation 75	n-point Controller vprc (closed-loop) dpc dsc	UINT32	0	2147483647
240	110	Control deviation Scaling 66	n-point Controller vprc (closed-loop) dpc dsc	UINT8	0	1
240	111	Control deviation for 100% control value 66	n-point Controller vprc (closed-loop) dpc dsc	UINT32	0	2147483647
240 240	150 151	Current value analog input Feedback value 1 48 Current value analog input Feedback value 2 48	n-point Controller vprc (closed-loop) dpc dsc	INT32	-2147483648	2147483647
240	152	Active state of Function 48	n-point Controller vprc (closed-loop) dpc dsc	UINT8	0	255
241	0	Used Analog output 75		INT8	-1	number of Analogausgänge -1
241	1	Signal type Analog output 76		UINT8	0	4
241	2	Min. Interface Analog output 76		INT32	-2147483648	2147483647
241	4	Max. Interface Analog output 76		INT32	-2147483648	2147483647
241	5	Min. Reference Analog output 76		INT32	-2147483648	2147483647
241	7	Max. Reference Analog output 77		INT32	-2147483648	2147483647
241 241	50 51	Current value Control value Analog output 48 Current value Analog output 48		INT32	-2147483648	2147483647
250 252	0 0	Used Solenoid output 1 69 Used Solenoid output 2 69		INT8	-1	1

IND	PNU	Bezeichnung	Controller mode	Data type	min. value	max. value
250 252	1 1	Enable Solenoid 1 69 Enable Solenoid 2 69		UINT8	0	2
250 252	2 2	Digital input for Enable Solenoid 1 69 Digital input for Enable Solenoid 2 69		UINT8	0	1
250 252	3 3	Inversion Solenoid 1 69 Inversion Solenoid 2 69		UINT8	0	1
250 252	4 4	Imin always active Solenoid 1 70 Imin always active Solenoid 2 70		UINT8	0	1
250 252	5 5	Cablebreak detection Solenoid 1 70 Cablebreak detection Solenoid 2 70		UINT8	0	1
250 252	6 6	Imin Solenoid 1 70 Imin Solenoid 2 70		UINT16	0	16384
250 252	7 7	Imax Solenoid 1 70 Imax Solenoid 2 70		UINT16	0	16384
250 252	8 8	Dither Function Solenoid 1 71 Dither Function Solenoid 2 71		UINT8	0	1
250 252	9 9	Dither Frequency Solenoid 1 71 Dither Frequency Solenoid 2 71		UINT16	2	250
250 252	10 10	Dither Level Solenoid 1 72 Dither Level Solenoid 2 72		UINT16	0	16384
250 252	11 11	Switching on Threshold Solenoid 1 72 Switching on Threshold Solenoid 2 72		UINT16	0	16384
250 252	12 12	Switching off Threshold Solenoid 1 72 Switching off Threshold Solenoid 2 72		UINT16	0	16384
250 252	13 13	Reduction time Solenoid 1 72 Reduction time Solenoid 2 72		UINT16	0	10000
250 252	14 14	Reduced value Solenoid 1 72 Reduced value Solenoid 2 72		UINT16	0	16384
250 252	15 15	Lower Imin (S1578/Z465) Solenoid 1 71 Lower Imin (S1578/Z465) Solenoid 2 71		UINT16	0	16384
250 252	16 16	Lower Imax (S1578/Z465) Solenoid 1 71 Lower Imax (S1578/Z465) Solenoid 2 71		UINT16	0	16384
250 250 252 252	50 51 50 51	Current value Command solenoid current Solenoid 1 48 Current value Actual solenoid current Solenoid 2 48 Current value Command solenoid current Solenoid 2 48 Current value Actual solenoid current Solenoid 2 48		UINT16	0	16384
251 253	0 - 10 0 - 10	Characteristic optimisation Solenoid 1 73 Characteristic optimisation Solenoid 2 73		INT8	0	1

5.3.1 Current values (On-Line values)

<table>
<tr><th>IND</th><th>PNU</th><th>Data type</th><th colspan="2">Range</th></tr>
<tr><td>232</td><td>50</td><td>INT32</td><td>Analog input Command value 1</td><td rowspan="4">For setting the interface parameters, the adjusting range and the resolution depends on the selected signal type. The following table shows the relationship (refer also to section "Device internal resolution 29"):
<table><tr><th>Signal type</th><th>Range</th></tr><tr><td>Voltage</td><td>-10000 .. 10000: -10 .. +10V, resolution 0.001 V</td></tr><tr><td>Current</td><td>0 .. 20000: 0 .. +20mA, resolution 0.001 mA</td></tr><tr><td>Digital</td><td>0 .. 1: 0 (off), 1 (on)</td></tr><tr><td>Frequency</td><td>0 .. 5000000: 0 .. 5000 Hz, resolution 0.001 Hz</td></tr><tr><td>PWM</td><td>0 .. 100000: 0 .. 100%, resolution 0.001 %</td></tr></table></td></tr>
<tr><td>232</td><td>51</td><td>INT32</td><td>Analog input Command value 2</td></tr>
<tr><td>240</td><td>150</td><td>INT32</td><td>Analog input Feedback value 1</td></tr>
<tr><td>240</td><td>151</td><td>INT32</td><td>Analog input Feedback value 2</td></tr>
<tr><td>232</td><td>52</td><td>INT32</td><td>Output value command scaling</td><td rowspan="3">Open-Loop:
-16384 .. 16384: -100 .. 100%
Closed-Loop:
For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"</td></tr>
<tr><td>232</td><td>53</td><td>INT32</td><td>Output value command values fixed</td></tr>
<tr><td>232</td><td>54</td><td>INT32</td><td>Output value ramp generator</td></tr>
<tr><td>232</td><td>55</td><td>INT32</td><td>Output value controller</td><td rowspan="3">0 .. 16384: 0 .. 100%</td></tr>
<tr><td>232</td><td>56</td><td>INT32</td><td>Input value Solenoid driver 1</td></tr>
<tr><td>232</td><td>57</td><td>INT32</td><td>Input value Solenoid driver 2</td></tr>
<tr><td>250</td><td>50</td><td>UINT16</td><td>Command solenoid current Solenoid driver 1</td><td rowspan="4">For setting the solenoid parameters, the adjusting range and the resolution depends on the selected solenoid type. The following table shows the relationship:
<table><tr><th rowspan="2">Solenoid type</th><th colspan="3">Range</th></tr><tr><th>DSV</th><th>MD2</th><th>SD7</th></tr><tr><td>Current measured</td><td>0 .. 16384: 0 .. 1534mA at 24V
0 .. 16384: 0 .. 2557mA at 12V</td><td>0 .. 16384: 0 .. 2112mA</td><td>0 .. 16384: 0 .. 1877mA at 24V
0 .. 16384: 0 .. 2346mA at 12V</td></tr><tr><td>Current not measured</td><td colspan="3">0 .. 16384: 0 .. 100% Duty-Cycle</td></tr></table></td></tr>
<tr><td>250</td><td>51</td><td>UINT16</td><td>Actual solenoid current Solenoid driver 1</td></tr>
<tr><td>252</td><td>50</td><td>UINT16</td><td>Command solenoid current Solenoid driver 2</td></tr>
<tr><td>252</td><td>51</td><td>UINT16</td><td>Actual solenoid current Solenoid driver 2</td></tr>
</table>

<table>
<tr><th>IND</th><th>PNU</th><th>Data type</th><th colspan="3">Range</th></tr>
<tr><td>241</td><td>50</td><td>INT32</td><td>Input value Analog output</td><td colspan="2">Signal type Analog output = Control value:
-100000 .. 100000: -100 .. 100%
Signal type Analog output = Command value, Feedback value or Regeldifferenz:
For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"
Signal type Analog output = Solenoid current:
For setting the solenoid parameters, the adjusting range and the resolution depends on the selected solenoid type. The following table shows the relationship:
<table>
<tr><th rowspan="2">Solenoid type</th><th colspan="3">Range</th></tr>
<tr><th>DSV</th><th>MD2</th><th>SD7</th></tr>
<tr><td>Current measured</td><td>0 .. 16384: 0 .. 1534mA at 24V
0 .. 16384: 0 .. 2557mA at 12V</td><td>0 .. 16384: 0 .. 2112mA</td><td>0 .. 16384: 0 .. 1877mA at 24V
0 .. 16384: 0 .. 2346mA at 12V</td></tr>
<tr><td>Current not measured</td><td colspan="3">0 .. 16384: 0 .. 100% Duty-Cycle</td></tr>
</table>
</td></tr>
<tr><td>241</td><td>51</td><td>INT32</td><td>Output value Analog output</td><td colspan="2">-10000 .. 10000: -10 .. +10V, resolution 0.001 Volt</td></tr>
<tr><td>232</td><td>58</td><td>UINT 32</td><td>Active channel error</td><td>x10 x9 x8 x7 x6 x5 x4 x3 x2 x1 x0 [RO]</td><td>x0 = "Cablebreak Command value"
x1 = "Short circuit Solenoid driver 1"
x2 = "Cablebreak Solenoid driver 1"
x3 = "Short circuit Solenoid driver 2"
x4 = "Cablebreak Solenoid driver 2"
x5 = "Cablebreak Feedback value"
x6 = "Trailing"
x7 = not present
x8 = not present
x9 = "Short circuit Solenoid-digital output"
x10 = "Device error"

x11 ... x31 are not used

x = 0: corresponding Error is not active
x = 1: corresponding Error is active</td></tr>
<tr><td>232</td><td>59</td><td>UINT 16</td><td>Active state of Function</td><td>x4 x3 x2 x1 x0 [RO]</td><td>x0 = "Solenoid 1 active"
x1 = "Solenoid 2 active"
x2 = "Channel is ready (no Error)"
x3 = "Temperatur Derating active"
x4 = not present

x5 ... x15 are not used

x = 0: corresponding state of Function is not active
x = 1: corresponding state of Function ist aktivs</td></tr>
<tr><td>232</td><td>60</td><td>UINT 16</td><td>Active state of Error</td><td>x10 x9 x8 x7 x6 x5 x4 x3 x2 x1 x0 [RO]</td><td>x0 = "Cablebreak Command value"
x1 = "Short circuit Solenoid driver 1"
x2 = "Cablebreak Solenoid driver 1"
x3 = "Short circuit Solenoid driver 2"
x4 = "Cablebreak Solenoid driver 2"
x5 = "Cablebreak Feedback value"
x6 = "Trailing"
x7 = not present
x8 = not present
x9 = "Short circuit Solenoid-digital output"
x10 = "Device error"

x11 ... x15 are not used

x = 0: corresponding state of Error is not active
x = 1: corresponding state of Error is active</td></tr>
</table>

IND	PNU	Data type	Range		
240	152	UINT 8	Active state of Window	x2 x1 x0 [RO]	x0 = "Target window" x1 = "Trailing window" x2 = "Solenoid off window" x3 ... x7 are not used x = 0: corresponding state of Window is not active x = 1: corresponding state of Window is active
232	61	UINT 8	Active switching threshold	x1 x0 [RO]	x0 = "Switching threshold 1" x1 = "Switching threshold 2" x = 0: corresponding Switching threshold is not active x = 1: corresponding Switching threshold is active

5.3.2 Supply Error Auto Reset

IND	PNU	Data type	Range
200	0	UINT8	0: Auto Reset off 1: Auto Reset on

5.3.3 Number of Digital inputs

IND	PNU	Data type	Value	Description
200	200	UINT8	x [RO]	x = number of available digital inputs

5.3.4 Configuration Digital input 1 - 8

IND	PNU	Data type	Range	
200	1	UINT8	Digital input 1	0: Set digital input by software 1: Reset digital input by software 2: Read digital input from external
200	2	UINT8	Digital input 2	
200	3	UINT8	Digital input 3	
200	4	UINT8	Digital input 4	
200	5	UINT8	Digital input 5	
200	6	UINT8	Digital input 6	
200	7	UINT8	Digital input 7	
200	8	UINT8	Digital input 8	

5.3.5 Number of Digital outputs

IND	PNU	Data type	Value	Description
200	201	UINT8	x [RO]	x = number of available digital outputs

5.3.6 Configuration Digital output 1 - 8

IND	PNU	Data type	Range	
200	9	UINT8	Digital output 1	0: Set output input by software 1: Reset digital output by software 2: Digital output is set in case of the selected function 3: Digital output is set inverted in case of the selected function
200	10	UINT8	Digital output 2	
200	11	UINT8	Digital output 3	
200	12	UINT8	Digital output 4	
200	13	UINT8	Digital output 5	
200	14	UINT8	Digital output 6	
200	15	UINT8	Digital output 7	
200	16	UINT8	Digital output 8	

5.3.7 Number of internal signals

IND	PNU	Data type	Value	Description
202	0	UINT8	x [RO]	x = number of available internal signals

5.3.8 Configuration internal signal 1 - 8

IND	PNU	Data type	Range	
202	1	UINT8	Internal signal 1	0: Set Internal signal by software 1: Reset Internal signal by software 2: Internal signal is set in case of the selected function
202	2	UINT8	Internal signal 2	
202	3	UINT8	Internal signal 3	
202	4	UINT8	Internal signal 4	
202	5	UINT8	Internal signal 5	
202	6	UINT8	Internal signal 6	
202	7	UINT8	Internal signal 7	
202	8	UINT8	Internal signal 8	

5.3.9 States Digital inputs

IND	PNU	Data type	Value	Description
203	0	UINT16	x7 x6 x5 x4 x3 x2 x1 x0 [RO]	x0 = digital input 1 ..... x7 = digital input 8 x8 ... x15 are not used x = 0: corresponding digital input is not active x = 1: corresponding digital input is active

5.3.10 States Digital outputs

IND	PNU	Data type	Value	Description
203	1	UINT16	x3 x2 x1 x0 [RO]	x0 = digital output 1 ..... x3 = digital output 4 x4 ... x15 are not used x = 0: corresponding digital input is not active x = 1: corresponding digital input is active

5.3.11 States internal signals

IND	PNU	Data type	Value	Description
203	2	UINT16	x7 x6 x5 x4 x3 x2 x1 x0 [RO]	x0 = Internal signal 1 ..... x7 = Internal signal 8 x8 ... x15 are not used x = 0: entsprechendes Internal signal is not active x = 1: entsprechendersInternes Signal is active

5.3.12 Active device errors

IND	PNU	Data type	Value	Description
203	3	UINT32	x14 x13 x12 x11 x10 x9 x8 x7 x6 x5 x4 x3 x2 x1 x0 [RO]	x0 = "Supply Error Logic part " x1 = "Supply Error Solenoid outputs" x2 = not present x3 = Memory x4 = not present x5 = not present x6 = not present x7 = not present x8 = not present x9 = "Fieldbus Buffer overflow" x10 = "Fieldbus Bus communication Reset" x11 = "Fieldbus Bus communikation Stop" x12 = "Fieldbus Bus communication Nodeguarding" x13 = "Fieldbus Bus initialisation x14 = "Fieldbus Bus State" x9 ... x14 are only available with devices with fieldbus x15 ... x31 are not used x = 0: corresponding error is not active x = 1: corresponding error is active

5.3.13 Filter for analog inputs type

IND	PNU	Data type	Range	
205	0	UINT8	Analog input 1	0: No filtering is active 1: The corresponding analog input is filterd with the function "exponential smoothing"
205	2	UINT8	Analog input 2	
205	4	UINT8	Analog input 3	
205	6	UINT8	Analog input 4	

5.3.14 Filter for analog inputs Smoothing factor

IND	PNU	Data type	Range	
205	1	UINT8	Analog input 1	3: Speed / Response time = 8 4: Speed / Response time = 16 5: Speed / Response time = 32 6: Speed / Response time = 64
205	3	UINT8	Analog input 2	
205	5	UINT8	Analog input 3	
205	7	UINT8	Analog input 4	

5.3.15 Enable Channel

IND	PNU	Data type	Range
224	0	UINT8	0: off 1: on 2: external (digital input)

5.3.16 Digital input for Enable Channel

IND	PNU	Data type	Range
224	1	INT8	-1: not used 0 .. [number of digital inputs - 1]

5.3.17 Command value 2 Mode

IND	PNU	Data type	Range
220	9	UINT8	1: Command value via fieldbus 2: Command value local

The settings for the Command value 1 is described in section Devie Mode (Sollwertmodus). 35

5.3.18 Command value 2 Input 16 Bit

IND	PNU	Data type	Range
220	10	INT16	Min .. Max Bus Interface

The settings for the Command value 1 is described in section Command value.

5.3.19 Command value 2 Input 32 Bit

IND	PNU	Data type	Range
220	2	INT32	Min .. Max Bus Interface

The settings for the Command value 1 is described in section Command value.

5.3.20 Signal type Command value

IND	PNU	Data type	Range	
232	0	UINT8	Command value 1	0: Voltage 1: Current 2: Digital 3: Frequency 4: PWM (refer also to section "Device internal resolution 29")
232	28	UINT8	Command value 2	

5.3.21 Analog input for Command value

IND	PNU	Data type	Range	
232	1	INT8	Command value 1	-1: not used 0 .. [number of analog inputs - 1]
232	29	INT8	Command value 2	

5.3.22 Digital input for Command value

IND	PNU	Data type	Range	
232	2	INT8	Command value 1	-1: not used 0 .. [number of digital inputs - 1]

IND	PNU	Data type	Range	
232	30	INT8	Command value 2	

5.3.23 Cablebreak detection Command value

IND	PNU	Data type	Range	
232	4	UINT8	Command value 1	0: off 1: on
232	31	UINT8	Command value 2	

5.3.24 Lower cablebreak limit Command value

IND	PNU	Data type	Range	
232	5	INT32	Command value 1	For setting the interface parameters, the adjusting range and the resolution depends on the selected signal type. The following table shows the relationship (refer also to section "Device internal resolution 29"):
232	32	INT32	Command value 2	

Signal type	Range
Voltage	-10000 .. 10000: -10 .. +10V, resolution 0.001 V
Current	0 .. 20000: 0 .. +20mA, resolution 0.001 mA
Digital	0 .. 1: 0 (off), 1 (on)
Frequenc y	0 .. 5000000: 0 .. 5000 Hz, resolution 0.001 Hz
PWM	0 .. 100000: 0 .. 100%, resolution 0.001 %

5.3.25 Upper cablebreak limit Command value

IND	PNU	Data type	Range	
232	6	INT32	Command value 1	For setting the interface parameters, the adjusting range and the resolution depends on the selected signal type. The following table shows the relationship (refer also to section "Device internal resolution 29"):
232	33	INT32	Command value 2	

Signal type	Range
Voltage	-10000 .. 10000: -10 .. +10V, resolution 0.001 V
Current	0 .. 20000: 0 .. +20mA, resolution 0.001 mA
Digital	0 .. 1: 0 (off), 1 (on)
Frequenc y	0 .. 5000000: 0 .. 5000 Hz, resolution 0.001 Hz
PWM	0 .. 100000: 0 .. 100%, resolution 0.001 %

5.3.26 Min. Interface Command value

<table>
<tr><th>IND</th><th>PNU</th><th>Data type</th><th colspan="2">Range</th></tr>
<tr><td>232</td><td>7</td><td>INT32</td><td>Command value 1</td><td rowspan="2">For setting the interface parameters, the adjusting range and the resolution depends on the selected signal type. The following table shows the relationship (refer also to section "Device internal resolution 29"):
<table>
<tr><th>Signal type</th><th>Range</th></tr>
<tr><td>Voltage</td><td>-10000 .. 10000: -10 .. +10V, resolution 0.001 V</td></tr>
<tr><td>Current</td><td>0 .. 20000: 0 .. +20mA, resolution 0.001 mA</td></tr>
<tr><td>Digital</td><td>0 .. 1: 0 (off), 1 (on)</td></tr>
<tr><td>Frequenc y</td><td>0 .. 5000000: 0 .. 5000 Hz, resolution 0.001 Hz</td></tr>
<tr><td>PWM</td><td>0 .. 100000: 0 .. 100%, resolution 0.001 %</td></tr>
</table></td></tr>
<tr><td>232</td><td>34</td><td>INT32</td><td>Command value 2</td></tr>
</table>

5.3.27 Max. Interface Feedback value

<table>
<tr><th>IND</th><th>PNU</th><th>Data type</th><th colspan="2">Range</th></tr>
<tr><td>232</td><td>8</td><td>INT32</td><td>Command value 1</td><td rowspan="2">For setting the interface parameters, the adjusting range and the resolution depends on the selected signal type. The following table shows the relationship (refer also to section "Device internal resolution 29"):
<table>
<tr><th>Signal type</th><th>Range</th></tr>
<tr><td>Voltage</td><td>-10000 .. 10000: -10 .. +10V, resolution 0.001 V</td></tr>
<tr><td>Current</td><td>0 .. 20000: 0 .. +20mA, resolution 0.001 mA</td></tr>
<tr><td>Digital</td><td>0 .. 1: 0 (off), 1 (on)</td></tr>
<tr><td>Frequenc y</td><td>0 .. 5000000: 0 .. 5000 Hz, resolution 0.001 Hz</td></tr>
<tr><td>PWM</td><td>0 .. 100000: 0 .. 100%, resolution 0.001 %</td></tr>
</table></td></tr>
<tr><td>232</td><td>35</td><td>INT32</td><td>Command value 2</td></tr>
</table>

5.3.28 Min. Interface Command value via fieldbus

<table>
<tr><th>IND</th><th>PNU</th><th>Data type</th><th colspan="2">Range</th></tr>
<tr><td>232</td><td>9</td><td>INT32</td><td>Command value 1</td><td rowspan="2">-32768 .. 32767 (refer also to section "Device internal resolution 29")</td></tr>
<tr><td>232</td><td>36</td><td>INT32</td><td>Command value 2</td></tr>
</table>

5.3.29 Max. Interface Command value via fieldbus

<table>
<tr><th>IND</th><th>PNU</th><th>Data type</th><th colspan="2">Range</th></tr>
<tr><td>232</td><td>10</td><td>INT32</td><td>Command value 1</td><td rowspan="2">-32768 .. 32767 (refer also to section "Device internal resolution 29")</td></tr>
<tr><td>232</td><td>37</td><td>INT32</td><td>Command value 2</td></tr>
</table>

5.3.30 Min. Reference Command value

IND	PNU	Data type	Range	
232	11	INT32	Command value 1	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"
232	38	INT32	Command value 2	

5.3.31 Max. Reference Command value

IND	PNU	Data type	Range	
232	12	INT32	Command value 1	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"
232	39	INT32	Command value 2	

5.3.32 Function Input 2 Command value

IND	PNU	Data type	Range
232	24	UINT8	0: not used 1: add 2: multiply 3: alternatively 4: Speed

5.3.33 Deadband Function Command value

IND	PNU	Data type	Range
232	13	UINT8	0: off 1: on

5.3.34 Deadband Command value

IND	PNU	Datentyp	Wertebereich
232	14	INT16	0 ... 16384: 0 ... 50% (refer also to section "Device internal resolution")

5.3.35 Feedback value Mode

IND	PNU	Data type	Range	
220	0	UINT8	Feedback value 1	1: Feedback value via fieldbus 2: Feedback value local (refer to section "Device internal resolution 29")
220	3	UINT8	Feedback value 2	

5.3.36 Feedback value Input 16 Bit

IND	PNU	Data type	Range	
220	1	INT16	Feedback value 1	Min .. Max Bus Interface
220	4	INT16	Feedback value 2	

5.3.37 Feedback value Input 32 Bit

IND	PNU	Data type	Range	
220	2	INT32	Feedback value 1	Min .. Max Bus Interface
220	5	INT32	Feedback value 2	

5.3.38 Signal type Feedback value

IND	PNU	Data type	Range	
222	0	UINT8	Feedback value 1	0: Voltage 1: Current 2: Digital 3: Frequency 4: PWM (refer also to section "Device internal resolution 29")
222	65	UINT8	Feedback value 2	

5.3.39 Analog input for Feedback value

IND	PNU	Data type	Range	
222	1	INT8	Feedback value 1	-1: not used 0 .. [number of analog inputs - 1]
222	1	INT8	Feedback value 2	

5.3.40 Digital input for Feedback value

IND	PNU	Data type	Range	
222	2	INT8	Feedback value 1	-1: not used 0 .. [number of digital inputs - 1]
222	67	INT8	Feedback value 2	

5.3.41 Cablebreak detection Feedback value

IND	PNU	Data type	Range	
222	4	UINT8	Feedback value 1	0: off 1: on
222	68	UINT8	Feedback value 2	

5.3.42 Lower cablebreak limit Feedback value

IND	PNU	Data type	Range
222	5	INT32	Feedback value 1
222	69	INT32	Feedback value 2

For setting the interface parameters, the adjusting range and the resolution depends on the selected signal type. The following table shows the relationship (refer also to section "Device internal resolution 29"):

Signal type	Range
Voltage	-10000 .. 10000: -10 .. +10V, resolution 0.001 V
Current	0 .. 20000: 0 .. +20mA, resolution 0.001 mA
Digital	0 .. 1: 0 (off), 1 (on)
Frequenc y	0 .. 5000000: 0 .. 5000 Hz, resolution 0.001 Hz
PWM	0 .. 100000: 0 .. 100%, resolution 0.001 %

5.3.43 Upper cablebreak limit Feedback value

IND	PNU	Data type	Range
222	6	INT32	Feedback value 1
222	70	INT32	Feedback value 2

For setting the interface parameters, the adjusting range and the resolution depends on the selected signal type. The following table shows the relationship (refer also to section "Device internal resolution 29"):

Signal type	Range
Voltage	-10000 .. 10000: -10 .. +10V, resolution 0.001 V
Current	0 .. 20000: 0 .. +20mA, resolution 0.001 mA
Digital	0 .. 1: 0 (off), 1 (on)
Frequenc y	0 .. 5000000: 0 .. 5000 Hz, resolution 0.001 Hz
PWM	0 .. 100000: 0 .. 100%, resolution 0.001 %

5.3.44 Min. Interface Feedback value

<table>
<tr><th>IND</th><th>PNU</th><th>Data type</th><th colspan="2">Range</th></tr>
<tr><td>222</td><td>7</td><td>INT32</td><td>Feedback value 1</td><td rowspan="2">For setting the interface parameters, the adjusting range and the resolution depends on the selected signal type. The following table shows the relationship (refer also to section "Device internal resolution 29"):
<table>
<tr><th>Signal type</th><th>Range</th></tr>
<tr><td>Voltage</td><td>-10000 .. 10000: -10 .. +10V, resolution 0.001 V</td></tr>
<tr><td>Current</td><td>0 .. 20000: 0 .. +20mA, resolution 0.001 mA</td></tr>
<tr><td>Digital</td><td>0 .. 1: 0 (off), 1 (on)</td></tr>
<tr><td>Frequenc y</td><td>0 .. 5000000: 0 .. 5000 Hz, resolution 0.001 Hz</td></tr>
<tr><td>PWM</td><td>0 .. 100000: 0 .. 100%, resolution 0.001 %</td></tr>
</table></td></tr>
<tr><td>222</td><td>71</td><td>INT32</td><td>Feedback value 2</td></tr>
</table>

5.3.45 Max. Interface Feedback value

<table>
<tr><th>IND</th><th>PNU</th><th>Data type</th><th colspan="2">Range</th></tr>
<tr><td>222</td><td>8</td><td>INT32</td><td>Feedback value 1</td><td rowspan="2">For setting the interface parameters, the adjusting range and the resolution depends on the selected signal type. The following table shows the relationship (refer also to section "Device internal resolution 29"):
<table>
<tr><th>Signal type</th><th>Range</th></tr>
<tr><td>Voltage</td><td>-10000 .. 10000: -10 .. +10V, resolution 0.001 V</td></tr>
<tr><td>Current</td><td>0 .. 20000: 0 .. +20mA, resolution 0.001 mA</td></tr>
<tr><td>Digital</td><td>0 .. 1: 0 (off), 1 (on)</td></tr>
<tr><td>Frequenc y</td><td>0 .. 5000000: 0 .. 5000 Hz, resolution 0.001 Hz</td></tr>
<tr><td>PWM</td><td>0 .. 100000: 0 .. 100%, resolution 0.001 %</td></tr>
</table></td></tr>
<tr><td>222</td><td>72</td><td>INT32</td><td>Feedback value 2</td></tr>
</table>

5.3.46 Min. Interface Feedback value via fieldbus

<table>
<tr><th>IND</th><th>PNU</th><th>Data type</th><th colspan="2">Range</th></tr>
<tr><td>222</td><td>9</td><td>INT32</td><td>Feedback value 1</td><td rowspan="2">-32768 ... 32767 (refer also to section "Device internal resolution 29")</td></tr>
<tr><td>222</td><td>73</td><td>INT32</td><td>Feedback value 2</td></tr>
</table>

5.3.47 Max. Interface Feedback value via fieldbus

<table>
<tr><th>IND</th><th>PNU</th><th>Data type</th><th colspan="2">Range</th></tr>
<tr><td>222</td><td>10</td><td>INT32</td><td>Feedback value 1</td><td rowspan="2">-32768 ... 32767</td></tr>
<tr><td>222</td><td>74</td><td>INT32</td><td>Feedback value 2</td></tr>
</table>

5.3.48 Min. Reference Feedback value

IND	PNU	Data type	Range	
222	11	INT32	Feedback value 1	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"
222	75	INT32	Feedback value 2	

5.3.49 Max. Reference Feedback value

IND	PNU	Data type	Range	
222	12	INT32	Feedback value 1	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"
222	76	INT32	Feedback value 2	

5.3.50 Sensor Input for Feedback value

IND	PNU	Data type	Range
222	16	INT8	-1: not used 0 .. [number of Sensoreingänge - 1]

5.3.51 SSI Sensor Bit number of

IND	PNU	Data type	Range
222	17	UINT8	0 ... 25 Bits

5.3.52 SSI Sensor Sign

IND	PNU	Data type	Range
222	18	UINT8	0: Handling of the sign off 1: Handling of the sign on

5.3.53 SSI Sensor Offset

IND	PNU	Data type	Range
222	19	INT32	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"

5.3.54 SSI Sensor Resolution

IND	PNU	Data type	Range
222	20	UINT16	1 ... 1000, resolution 0.001 (refer also to section "Device internal resolution 29")

5.3.55 Function Feedback value input 2

IND	PNU	Data type	Range
222	64	UINT8	0: not used 1: differentiel 2: absolute differentiel

5.3.56 Command value selection

IND	PNU	Data type	Range
238	0	UINT8	0: Command value fixed / Profile Generator / Profile Position Mode not active 1: Comand values fixed active 2: Profile Generator active 3: Profile Position Mode 20 active

5.3.57 Number of Digital inputs for Comand values fixed / Profile Generator

IND	PNU	Data type	value	Description
238	1	UINT8	x [RO]	Number of Digital inputs for Comand values fixed / Profile Generator

5.3.58 Selection Digital input for Comand values fixed / Profile Generator

IND	PNU	Data type	Range	
238	2	INT8	Selection 1	-1: not used 0 .. [number of digital inputs - 1]
238	3	INT8	Selection 2	
238	4	INT8	Selection 4	

Depending on Number of Digital inputs for Comand values fixed / Profile Generator 62 this parameter is may be not present.

5.3.59 Number of Comand values fixed / Profile

IND	PNU	Data type	value	Description
238	5	UINT8	x [RO]	Number of Comand values fixed / Profiles

5.3.60 Command value fixed

IND	PNU	Data type	Range	
238	6	INT32	Command value fixed 1	Open-Loop: -16384 .. 16384: -100 .. 100% Closed-Loop: For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"
238	7	INT32	Command value fixed 2	
238	8	INT32	Command value fixed 3	
238	9	INT32	Command value fixed 4	
238	10	INT32	Command value fixed 5	

IND	PNU	Data type	Range	
238	11	INT32	Command value fixed 6	
238	12	INT32	Command value fixed 7	

Depending Number of Comand values fixed / Profile 62 this parameter is may be not present.

5.3.61 Profile Generator Command

IND	PNU	Data type	Range	
238	50	UINT8	Start Enable	0: off 1: on 2: external (digital input) 3: external inverted (digital input)
238	51	INT8	Start Digital input	-1: not used 0 .. [number of digital inputs - 1]
238	52	UINT8	Stop Enable	0: off 1: on 2: external (digital input) 3: external inverted (digital input)
238	53	INT8	Stop Digital input	-1: not used 0 .. [number of digital inputs - 1]
238	54	UINT8	Single Sequence Enable	0: off 1: on 2: external (digital input) 3: external inverted (digital input)
238	55	INT8	Single Sequence Digital input	-1: not used 0 .. [number of digital inputs - 1]

5.3.62 Profile selection

IND	PNU	Data type	Range	
238	56	UINT8	Profile selection 1	-1: not used 0 .. [number of Comand values fixed / Profile - 1]
238	57	UINT8	Profile selection 2	
238	58	UINT8	Profile selection 3	
238	59	UINT8	Profile selection 4	
238	60	UINT8	Profile selection 5	
238	61	UINT8	Profile selection 6	
238	62	UINT8	Profile selection 7	

Abhängig von der Number of Comand values fixed / Profile 62 ist dieser Parameter ev. not present.

5.3.63 Digital input for Enable Ramp

IND	PNU	Data type	Range
225	0	UINT8	-1: not used 0 .. [number of digital inputs - 1]

5.3.64 Speed Command value

IND	PNU	Data type	Range	
240	0	INT32	positive	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"
240	1	INT32	negative	

5.3.65 Acceleration Command value

IND	PNU	Data type	Range	
240	50	UINT32	positive	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"
240	51	UINT32	negative	

5.3.66 Deceleration Command value

IND	PNU	Data type	Range	
240	52	UINT32	positive	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"
240	53	UINT32	negative	

5.3.67 Window control

IND	PNU	Data type	Range	
240	2	INT8	Target window Type	0: off 2: on
240	3	INT16	Target window Delay time	0 .. 100: 0 .. 100ms
240	4	INT32	Target window Threshold	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"
240	5	INT8	Solenoid-Off window Type	0: off 2: on
240	6	INT16	Solenoid-Off window Delay time	0 .. 100: 0 .. 100ms
240	7	INT32	Solenoid-Off window Threshold	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"

5.3.68 Switching threshold control

IND	PNU	Datentyp	Wertebereich	
238 238	120 125	UINT8	Switching threshold 1 Type Switching threshold 2 Type	0: off 1: on with error 2: on without error
238 238	121 126	UINT8	Switching threshold 1 Selection Switching threshold 2 Selection	0: Command value 1: Feedback value

IND	PNU	Datentyp	Wertebereich	
238 238	122 127	UINT8	Switching threshold 1 Function Switching threshold 2 Function	0: < (less than) 1: > (more than)
238 238	123 128	INT32	Switching threshold 1 Threshold Switching threshold 2 Threshold	**Switching threshold Selection = Command value (Open loop):** -100000 .. 100000: -100 .. 100% **Switching threshold Selection = Command value (Closed loop) or Feedback value:** For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"
238 238	124 129	INT16	Switching threshold 1 Delay time Switching threshold 2 Delay time	0 .. 100: 0 .. 100ms

5.3.69 Displayed unit

IND	PNU	Data type	Range
240	8	UINT8	0: Free unit 1: mm 2: Deg 3: Inch 4: bar 5: psi 6: kN 7: MPa 8: l/min 9: m/s 10: Inch/s 11: 1/Min 12: Deg/s (refer also to section "Device internal resolution 29")

5.3.70 Command feed forward

IND	PNU	Data type	Range
240	9	INT16	0 .. 10000: 0 .. 10, resolution 0.001

5.3.71 Velocity feed forward

IND	PNU	Data type	Range
240	10	INT16	0 .. 10000: 0 .. 10, resolution 0.001

5.3.72 I type

IND	PNU	Data type	Range
240	11	INT8	0: off 1: on

5.3.73 I-Term, if control deviation > I-Window

IND	PNU	Data type	Range
240	12	INT8	0: set to 0 1: leave value 2: reduce

5.3.74 Control deviation Scaling

IND	PNU	Data type	Range
240	110	UINT8	0: no 1: yes

5.3.75 Control deviation for 100% control value

IND	PNU	Data type	Range
240	111	UINT32	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"

5.3.76 P-Ampl.

IND	PNU	Data type	Range	
240	13	UINT16	positive	0 .. 25000: 0 .. 25, resolution 0.001
240	14	UINT16	negative	

5.3.77 I-Time

IND	PNU	Data type	Range	
240	15	UINT16	positive	0 .. 10000: 0 .. 10s, resolution 0.001s
240	16	UINT16	negative	

5.3.78 I-Window outside

IND	PNU	Data type	Range	
240	17	UINT32	positive	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"
240	18	UINT32	negative	

5.3.79 I-Window inside

IND	PNU	Data type	Range	
240	19	UINT32	positive	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"
240	20	UINT32	negative	

5.3.80 D-Time

IND	PNU	Data type	Range	
240	21	UINT16	positive	0 .. 10000: 0 .. 10s, resolution 0.001s
240	22	UINT16	negative	

5.3.81 D-Ampl.

IND	PNU	Data type	Range	
240	23	UINT16	positive	0 .. 10000: 0 .. 10, resolution 0.001
240	24	UINT16	negative	

5.3.82 n-point Controller Command value

IND	PNU	Data type	Range
228	0	INT32	

Controller mode	IND	PNU	Data type	Range
vpoc (open-loop)	21	21	INT16	Min ..Max Bus Interface
vprc (open-loop) vprc (closed-loop)	22	21	INT16	Min ..Max Bus Interface
dcol (open-loop)	11	21	INT32	Min .. Max Bus Interface
dsc	13	21	INT32	Min .. Max Bus Interface
dpc	12	21	INT32	Min .. Max Bus Interface
n-point	228	0	INT32	Min .. Max Bus Interface

5.3.83 n-point Controller Feedback value

IND	PNU	Data type	Range
228	1	INT32	

Controller mode	IND	PNU	Data type	Range
vprc (closed-loop)	22	144	INT16	-16384 .. 16383: refer to Internal bus resolution
dsc	13	100	INT32	Min- .. Max-Reference: refer to Scaled parameter
dpc	12	100	INT32	Min- .. Max-Reference: refer to Scaled parameter
n-point	228	1	INT32	Min- .. Max-Reference: refer to Scaled parameter

5.3.84 Threshold for n-Punkt Controller

IND	PNU	Data type	Range	
228	2	INT32	Threshold 1	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"
228	3	INT32	Threshold 2	
228	4	INT32	Threshold 3	
228	5	INT32	Threshold 4	

5.3.85 n-point Controller Control deviation

IND	PNU	Data type	Range
228	6	INT32	

Regelmodus	IND	PNU	Data type	Range
vprc (closed-loop)	22	147	INT16	-16384 .. 16383: refer to Internal bus resolution
dsc	13	103	INT32	Min- .. Max-Reference: refer to Scaled parameter
dpc	12	103	INT32	Min- .. Max-Reference: refer to Scaled parameter
n-point	228	6	INT32	Min- .. Max-Reference: refer to Scaled parameter

5.3.86 n-point Controller Trailing window type

IND	PNU	Data type	Range
228	7	INT8	0: off 2: on without error -2: on with error

5.3.87 n-point Controller Trailing window Delay time

IND	PNU	Data type	Range
228	8	UINT16	0 .. 100: 0 .. 100ms

5.3.88 n-point Controller Trailing window Threshold

IND	PNU	Data type	Range
228	9	UINT32	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"

5.3.89 Mode of operation

IND	PNU	Data type	Range
224	2	UINT8	0: Command value unipolar (1-sol) 1: Command value unipolar (2-sol) 2: Command value bipolar (2-sol) 3: Command value unipolar (2-sol with DigEin)

5.3.90 Digital input for Solenoid 2

IND	PNU	Data type	Range
224	3	INT8	-1: not used 0 .. [number of digital inputs - 1]

5.3.91 Valve type

IND	PNU	Data type	Range
224	10	UINT8	0: Standard 2-solenoid 1: 4/3-way 1-solenoid

5.3.92 Solenoid type

IND	PNU	Data type	Range
224	4	UINT8	0: Proportional solenoid without current measurement 1: Proportional solenoid with current measurement 2: Schaltmagnet without current measurement

5.3.93 Used Solenoid output

IND	PNU	Data type	Range	
250	0	INT8	Solenoid driver 1	-1: not used 0 .. [number of solenoid outputs - 1]
252	0	INT8	Solenoid driver 2	

5.3.94 Enable Solenoid

IND	PNU	Data type	Range	
250	1	UINT8	Solenoid driver 1	0: off 1: on 2: external (digital input)
252	1	UINT8	Solenoid driver 2	

5.3.95 Digital input for Enable Solenoid

IND	PNU	Data type	Range	
250	2	UINT8	Solenoid driver 1	-1: not used 0 .. [number of digital inputs - 1]
252	2	UINT8	Solenoid driver 2	

5.3.96 Inversion Solenoid

IND	PNU	Data type	Range	
250	3	UINT8	Solenoid driver 1	0: no 1: yes

IND	PNU	Data type	Range	
252	3	UINT8	Solenoid driver 2	

5.3.97 Imin always active

IND	PNU	Data type	Range	
250	4	UINT8	Solenoid driver 1	0: no 1: yes
252	4	UINT8	Solenoid driver 2	

5.3.98 Cablebreak detection Solenoid

IND	PNU	Data type	Range	
250	5	UINT8	Solenoid driver 1	0: off 1: on
252	5	UINT8	Solenoid driver 2	

5.3.99 Imin

IND	PNU	Data type	Range	
250	6	UINT16	Solenoid driver 1	For setting the solenoid parameters, the adjusting range and the resolution depends on the selected solenoid type. The following table shows the relationship:
252	6	UINT16	Solenoid driver 2	

Solenoid type	Range		
	DSV	MD2	SD7
Current measured	0 .. 16384: 0 .. 1534mA at 24V 0 .. 16384: 0 .. 2557mA at 12V	0 .. 16384: 0 .. 2112mA	0 .. 16384: 0 .. 1877mA at 24V 0 .. 16384: 0 .. 2346mA at 12V
Current not measured	0 .. 16384: 0 .. 100% Duty-Cycle		

5.3.100 Imax

IND	PNU	Data type	Range	
250	7	UINT16	Solenoid driver 1	For setting the solenoid parameters, the adjusting range and the resolution depends on the selected solenoid type. The following table shows the relationship:
252	7	UINT16	Solenoid driver 2	

Solenoid type	Range		
	DSV	MD2	SD7
Current measured	0 .. 16384: 0 .. 1534mA at 24V 0 .. 16384: 0 .. 2557mA at 12V	0 .. 16384: 0 .. 2112mA	0 .. 16384: 0 .. 1877mA at 24V 0 .. 16384: 0 .. 2346mA at 12V
Current not measured	0 .. 16384: 0 .. 100% Duty-Cycle		

5.3.101 Lower Imin (S1578/Z465)

<table>
<tr><th>IND</th><th>PNU</th><th>Data type</th><th colspan="2">Range</th></tr>
<tr><td>250</td><td>15</td><td>UINT16</td><td>Solenoid driver 1</td><td rowspan="2">For setting the solenoid parameters, the adjusting range and the resolution depends on the selected solenoid type. The following table shows the relationship:
<table>
<tr><th rowspan="2">Solenoid type</th><th colspan="3">Range</th></tr>
<tr><th>DSV</th><th>MD2</th><th>SD7</th></tr>
<tr><td>Current measured</td><td>0 .. 16384: 0 .. 1534mA at 24V
0 .. 16384: 0 .. 2557mA at 12V</td><td>0 .. 16384: 0 .. 2112mA</td><td>0 .. 16384: 0 .. 1877mA at 24V
0 .. 16384: 0 .. 2346mA at 12V</td></tr>
<tr><td>Current not measured</td><td colspan="3">0 .. 16384: 0 .. 100% Duty-Cycle</td></tr>
</table></td></tr>
<tr><td>252</td><td>15</td><td>UINT16</td><td>Solenoid driver 2</td></tr>
</table>

5.3.102 Lower Imax (S1578/Z465)

<table>
<tr><th>IND</th><th>PNU</th><th>Data type</th><th colspan="2">Range</th></tr>
<tr><td>250</td><td>16</td><td>UINT16</td><td>Solenoid driver 1</td><td rowspan="2">For setting the solenoid parameters, the adjusting range and the resolution depends on the selected solenoid type. The following table shows the relationship:
<table>
<tr><th rowspan="2">Solenoid type</th><th colspan="3">Range</th></tr>
<tr><th>DSV</th><th>MD2</th><th>SD7</th></tr>
<tr><td>Current measured</td><td>0 .. 16384: 0 .. 1534mA at 24V
0 .. 16384: 0 .. 2557mA at 12V</td><td>0 .. 16384: 0 .. 2112mA</td><td>0 .. 16384: 0 .. 1877mA at 24V
0 .. 16384: 0 .. 2346mA at 12V</td></tr>
<tr><td>Current not measured</td><td colspan="3">0 .. 16384: 0 .. 100% Duty-Cycle</td></tr>
</table></td></tr>
<tr><td>252</td><td>16</td><td>UINT16</td><td>Solenoid driver 2</td></tr>
</table>

5.3.103 Dither Function

IND	PNU	Data type	Range	
250	8	UINT8	Solenoid driver 1	0: off 1: on
252	8	UINT8	Solenoid driver 2	

5.3.104 Dither Frequency

IND	PNU	Data type	Range	
250	9	UINT16	Solenoid driver 1	2 .. 250: 500 .. 4Hz
252	9	UINT16	Solenoid driver 2	

5.3.105 Dither Level

<table>
<tr><th>IND</th><th>PNU</th><th>Data type</th><th colspan="2">Range</th></tr>
<tr><td>250</td><td>10</td><td>UINT16</td><td>Solenoid driver 1</td><td rowspan="2">For setting the solenoid parameters, the adjusting range and the resolution depends on the selected solenoid type. The following table shows the relationship:
<table>
<tr><th rowspan="2">Solenoid type</th><th colspan="3">Range</th></tr>
<tr><th>DSV</th><th>MD2</th><th>SD7</th></tr>
<tr><td>Current measured</td><td>0 .. 16384: 0 .. 1534mA at 24V
0 .. 16384: 0 .. 2557mA at 12V</td><td>0 .. 16384: 0 .. 2112mA</td><td>0 .. 16384: 0 .. 1877mA at 24V
0 .. 16384: 0 .. 2346mA at 12V</td></tr>
<tr><td>Current not measured</td><td colspan="3">0 .. 16384: 0 .. 100% Duty-Cycle</td></tr>
</table></td></tr>
<tr><td>252</td><td>10</td><td>UINT16</td><td>Solenoid driver 2</td></tr>
</table>

5.3.106 Switching on Threshold Solenoid

IND	PNU	Data type	Range	
250	11	UINT16	Solenoid driver 1	0 .. 16384: 0 .. 100%
252	11	UINT16	Solenoid driver 2	

5.3.107 Switching off Threshold Magent

IND	PNU	Data type	Range	
250	12	UINT16	Solenoid driver 1	0 .. 16384: 0 .. 100%
252	12	UINT16	Solenoid driver 2	

5.3.108 Reduction time Solenoid

IND	PNU	Data type	Range	
250	13	UINT16	Solenoid driver 1	0 .. 10000: 0 .. 10s, resolution 0.001s
252	13	UINT16	Solenoid driver 2	

5.3.109 Reduced value Solenoid

IND	PNU	Data type	Range	
250	14	UINT16	Solenoid driver 1	0 .. 16384: 0 .. 100%
252	14	UINT16	Solenoid driver 2	

5.3.110 Characteristic optimisation Solenoid

Characteristic optimisation on/off

IND	PNU	Data type	Wert	Description
251	0	UINT8	0	Characteristic optimisation sol 1 off
			1	Characteristic optimisation sol 1 on
253	0	UINT8	0	Characteristic optimisation sol 2 off
			1	Characteristic optimisation sol 2 on

Characteristic optimisation values

IND	PNU	Data type	Wert	Description
251	1	UINT8	9 [RO]	Characteristic optimisation point count sol 1
	2 .. 10	UINT32		Characteristic optimisation points (see below)
253	1	UINT8	9 [RO]	Characteristic optimisation point count sol 2
	2 .. 10	UINT32		Characteristic optimisation points (see below)

Coding of one characteristic optimisation point as 32-bit integer value.

Solenoid-current output Y-axis (High - Word)		Solenoid-current input X-axis (Low - Word)	
Value	Description	Value	Description
0 .. 16384	0 .. 100% Solenoid current	0 .. 16384	0 .. 100% Command Solenoid current

5.3.111 Error evaluation Mask

IND	PNU	Data type	value	Description
224	5	UINT16	x10 x9 x8 x7 x6 x5 x4 x3 x2 x1 x0	x0 = "Cablebreak Command value" x1 = "Short circuit Solenoid driver 1" x2 = "Cablebreak Solenoid driver 1" x3 = "Short circuit Solenoid driver 2" x4 = "Cablebreak Solenoid driver 2" x5 = "Cablebreak Feedback value" x6 = "Trailing error" x7 = not present x8 = not present x9 = "Short circuit Solenoid-Digital output" x10 = "Device error" x11 ... x15 are not used x = 0: corresponding error does not lead to activating the selected digital output x = 1: corresponding error does lead to activating the selected digital output

5.3.112 Error evaluation Reaction

IND	PNU	Data type	Range
224	6	UINT8	0: Solenoid 1+2 off 1: Solenoid 1 on 2: Solenoid 2 on 3: Solenoid 1+2 on

5.3.113 Error evaluation Digital output

IND	PNU	Data type	Range
224	7	UINT8	-1: not used 0 .. [number of digital outputs - 1]

5.3.114 Number of Functions

IND	PNU	Data type	value	Description
224	20	UINT8	x [RO]	x = Number of available Functions

5.3.115 Digital output for Function

IND	PNU	Data type	Range	
224	21	UINT8	Digital output for Function "Solenoid 1 active"	-1: not used 0 .. [number of ditial outputs - 1]
224	22	UINT8	Digital output for Function "Solenoid 2 active"	
224	23	UINT8	Digital output for Function "Target window reached"	
224	24	UINT8	Digital output for Function "Ready signal"	
224	25	UINT8	Digital output for Function "Trailing window"	
224	26	UINT8	Digital output for Function "Temperature Deraring"	
224	27	UINT8	Digital output for Function "LVDT Trailing window"	
224	28	UINT8	Digital output for Function "Command value 2 active"	
224	29	UINT8	Digital output for Function "Sequence End"	
224	30	UINT8	Digital output for Function "Profile End"	

5.3.116 Manual operation Command

IND	PNU	Data type	Range	
238	100	UINT8	Enable	0: off 1: on 2: external (digital input) 3: external inverted (digital input)
238	101	INT8	Enable Digital input	-1: not used 0 .. [number of digital inputs - 1]
238	102	INT8	Forward Digital input	-1: not used 0 .. [number of digital inputs - 1] In the fieldbus mode (refer to section "Operating mode 14") the control is made via the Control Word.
238	103	INT8	Backward Digital input	-1: not used 0 .. [number of digital inputs - 1] In the fieldbus mode (refer to section "Operating mode 14") the control is made via the Control Word.
238	104	INT8	Fast speed Digital input	-1: not used 0 .. [number of digital inputs - 1] In the fieldbus mode (refer to section "Operating mode 14") the control is made via the Control Word.

5.3.117 Speed Manual operation

IND	PNU	Data type	Range	
240	100	UINT32	Slow speed	For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"
240	101	UINT32	Fast speed	

5.3.118 Used Analog output

IND	PNU	Data type	Range
241	0	INT8	-1: not used 0 .. [number of analog outputs - 1]

5.3.119 Signal type Analog output

IND	PNU	Data type	Range
241	1	UINT8	0: Control value 1: Command value 2: Feedback value 3: Control deviation 4: Solenoid current

5.3.120 Min. Interface Analog output

IND	PNU	Data type	Range
241	2	INT32	-10000 .. 10000: -10 .. 10, resolution 0.001

5.3.121 Max. Interface Analog output

IND	PNU	Data type	Range
241	4	INT32	-10000 .. 10000: -10 .. 10, resolution 0.001

5.3.122 Min. Reference Analog output

<table>
<tr><th>IND</th><th>PNU</th><th>Data type</th><th>Range</th></tr>
<tr><td>241</td><td>5</td><td>INT32</td><td>
Signal type Analog output = Control value:
-100000 .. 100000: -100 .. 100%

Signal type Analog output = Command value, Feedback value or Regeldifferenz:
For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"

Signal type Analog output = Solenoid current:
For setting the solenoid parameters, the adjusting range and the resolution depends on the selected solenoid type. The following table shows the relationship:
<table>
<tr><th rowspan="2">Solenoid type</th><th colspan="3">Range</th></tr>
<tr><th>DSV</th><th>MD2</th><th>SD7</th></tr>
<tr><td>Current measured</td><td>0 .. 16384: 0 .. 1534mA at 24V
0 .. 16384: 0 .. 2557mA at 12V</td><td>0 .. 16384: 0 .. 2112mA</td><td>0 .. 16384: 0 .. 1877mA at 24V
0 .. 16384: 0 .. 2346mA at 12V</td></tr>
<tr><td>Current not measured</td><td colspan="3">0 .. 16384: 0 .. 100% Duty-Cycle</td></tr>
</table>
</td></tr>
</table>

5.3.123 Max. Reference Analog output

<table>
<tr><th>IND</th><th>PNU</th><th>Data type</th><th>Range</th></tr>
<tr><td>241</td><td>7</td><td>INT32</td><td>
Signal type Analog output = Control value:
-100000 .. 100000: -100 .. 100%

Signal type Analog output = Command value, Feedback value or Regeldifferenz:
For parameter with a unit (e.g. mm, psi, l/min, etc.), the adjusting range is always 0 ... 15000000 (with UINTxx) resp. -15000000 ... +15000000 (with INTxx) and the resolution is 1 / 1000. Refer also to section "Device internal resolution 29"

Signal type Analog output = Solenoid current:
For setting the solenoid parameters, the adjusting range and the resolution depends on the selected solenoid type. The following table shows the relationship:
<table>
<tr><th rowspan="2">Solenoid type</th><th colspan="3">Range</th></tr>
<tr><th>DSV</th><th>MD2</th><th>SD7</th></tr>
<tr><td>Current measured</td><td>0 .. 16384: 0 .. 1534mA at 24V
0 .. 16384: 0 .. 2557mA at 12V</td><td>0 .. 16384: 0 .. 2112mA</td><td>0 .. 16384: 0 .. 1877mA at 24V
0 .. 16384: 0 .. 2346mA at 12V</td></tr>
<tr><td>Current not measured</td><td colspan="3">0 .. 16384: 0 .. 100% Duty-Cycle</td></tr>
</table>
</td></tr>
</table>

6 Commissioning

6.1 General

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 telegram type (refer to section "Fieldbus_Settings 10") and a PROFIBUS-DP diagnostic (refer to section "Fieldbus Diagnostics 11") can be made via the PASO.

6.2 Step by step instructions for the first commissioning

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

6.2.1 Test the hydraulic system

1. Switch off the hydraulic system
2. Switch off the fieldbus master
3. Switch on the WANDFLUH-Electronics
4. In the PASO window "Fieldbus_Info" in the section "Bus State" the following statement will be displayed (refer to section "Fieldbus Diagnostics 11"):
   - WD-Status = Baud_Search
   - DP-Status = Wait_Prm
5. In the PASO status line, the statement "Disable" or "Init" will be displayed
6. Switch on the hydraulic system
7. With the PASO Menu "Commands_Valve operation", the solenoids can be operated directly.
   IMPORTANT: The hydraulic moves in an open loop system! Be sure, that the hydraulic system can move free.
8. In the PASO window "Solenoid Driver", the parameters for the minimum (Imin) and maximum (Imax) current and the dither signal (frequency and level) can be set

6.2.2 Adjust the mode of operation

1. In the PASO window "Valve type", the adjustments for the desired mode of operation can be made

6.2.3 Test the fieldbus

1. Load the GSD-Datei in the filedbus master and select the desired telegram type (refer to section " Presupposition and information for the Fieldbus master 79")
2. Adjust the node adress and the telegram type (refer to section "Presupposition for the DP-Slave controller card 79")
3. Switch on the fieldbus master
4. In the PASO window "Fieldbus_Info“ in the section "Bus State" the following statement will be displayed (refer to section "Fieldbus Diagnostics 11"):
   - WD-Status = DP_Control
   - DP-Status = Data-Exchange

6.2.4 Test the control via the fieldbus

Via Paso oder Mittels PKW (siehe Abschnitt "Zyklische Parameterübertragung (PKW) 25") die folgenden Parameter in der angegebenen Reihenfolge setzen :

- Set the parameter "Device local (Operating mode) 36" to "Control-Word via Fieldbus (0)"
- Set the parameter "Device Mode (Command value mode) 35" auf "Command value via Fieldbus (1)"
- Set the parameter"Device control mode (Controller mode) 35" to the desired controller mode
- For the release ot the WANDFLUH-Electronics, the 3 bits "Disable (D)", "Hold (H)" and "Device mode active (M)" from the control word (refer to section "Device Control Word 33") must be set to logical 1. The DP-Slave controller card is now in the state "ACTIVE".
- With the PKW-services (refer to section "Cyclical parameter data exchange (PKW) 25") resp. PZD (refer to section "Cyclical process data exchange (PZD) 21") a command value can now be set via the fieldbus.

IMPORTANT:
The above parameters can only be changed if the WANDFLUH-Electronics is in the state "INIT" or "DISABLE" (refer to section "Device state machine 16")

6.3 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 adresse 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 10").

- **What is the device control mode of operation for the DP-Slave controller card?**
  The desired device control mode can be set via the parameter ""Device control mode (Controller mode) 35"".
  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 WANDFLUH-Electronics is in the state "INIT" or "DISABLE" (refer to section "Device state machine 16")

- **Telegram**
  The desired telegram type must be selected (refer to section "Available telegram types 5"). This adjustment can only be made if the WANDFLUH-Electronics is separated from the Profibus.

6.4 Presupposition and information for the Fieldbus master

For the commissioning of a Fieldbus master, the following presupposition must be cleared:

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

- **Telegram**
  The master must be adjusted to the same type of telegram as the *WANDFLUH*-Electronics.

- **GSD-file**
  The GSD-file for the WANDFLUH.Electronics must be present on the Master side. If not, this file must be copied into the project tool of the Master.

- **Data exchange (consistent / inconsistent)**
  For the programing of the data exchange (consistent / inconsistent) in the appliation program of the master, the following rules are valid:

  - PKW-part

=> consistent data transfer (consistent for the whole length)

- PZD-part
  => consistent data transfer (consistent for the whole length)

6.5 Delivery state

The WANDFLUH-Electronics is delivered with the following basic configuration:

Device	Adress	Telegram type
WANDFLUH-Electronics Amplifier	6	3
WANDFLUH-Electronics Controller	6	1

6.6 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) 25"). 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 "Store Parameter" (refer to section "Store Parameter 36").

6.7 Setting the command 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 19"). The switch over is made with the parameter "Device mode (Command value mode)" 35.

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 "Control mode (Controller mode)" 35 and the command value mode can be set with the parameter "Device mode (Command value mode)" 35
3. For the release of the DP-Slave controller card, the 3 bits D, H and M from the control word (refer to section "State machine 33") must be set to logical 1. The DP-Slave controller card is now in the state "ACTIVE". Now, a preset value can be set.

6.8 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 (refer to section "Device status word").
- For restarting the DP-Slave controller card, the bit "Reset Fault (R)" in the control word must be set once to logical 1 (refer to section "Device state machine 16")

7 Diagnostic and error detection

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

- Node adress
- Telegram type
- Bus type
- ID-number
- WD-state
- DP-state
- TG-state

A detailed description of the diagnostic function you will find in the section "Fieldbus Diagnostics 11".