CANopen - Protocol with Device Profile in accordance with CiA DSP 408

Revision 6

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1 CANopen® Technology

1.1 Introduction

CANopen® is an independent of the manufacturer, open fieldbus standard with a wide range of application in manufacturing– and process automation. Independence of the manufacturer and openness are guaranteed by the physical interface in accordance with ISO 11898 and CiA DS-102. With this, the basis is given for a worldwide CAN (Controller Area Network) distribution embracing all manufacturers.
CANopen® provides functionally graded communication protocols (communication profiles), The WANDFLUH -Electronics uses the device profile DSP-408 "Device Profile Fluid Power Technology".

1.2 EDS Files

The characteristic communication features of a CANopen® – device are defined in the form of an electronic data sheet (Electronic Data Sheet, EDS file). WANDFLUH makes available the corresponding EDS.
The EDS files expand the open communication right to the user level. All modern planning tools make it possible to read-in the EDS files during the configuration. As a result, the integration into the CANopen® -system becomes simple and user friendly.

1.3 General

The present operating instructions represent a CANopen®–specific extension of the The *WANDFLUH* -Electronics operating instructions.
Remark: Please read the operating instructions of the the WANDFLUH -Electronics beforehand.

First of all it is important to familiarize oneself with the CANopen®–terms, which occur time and again in these operating instructions. On principle, two CANopen® profiles are referred to:

- The CANopen®–communication profile regulates the "how" of the communication. It specifies elements for the exchanging of real-time data and parameter data as well as a simplified network management.

- The CANopen®–device profile describes the "what" of the communications. The objective of device profiles is to define the data contents independent of the manufacturer, so that the basic functionality of the different device classes can be uniformly addressed.

1.4 Technical Data

1.4.1 General

The physical interface corresponds to the standard ISO 11898.

The CAN–protocol in accordance with ISO 11898 corresponds to the data connection layer Layer 2 in the ISO/OSI–reference model and supports a multi-master operation, i.e., every participant can request the communication through the serial bus.

Used as application layer is the protocol CANopen®, which is standardized in the International Manufacturers and Users Association CAN in Automation (CiA).

Device Profile	DSP-408 (CiA)
Application Layer • CANopen® communication profile (DS-301) • Timing, communication services, network management	**ISO / OSI** Layer 7
These layers are not used	Layer 3 ... 6

Data Link Layer • Message validation • Bus-arbitration • Build-up of the message frame • Receipt acknowledgement (Acknowledge) • Error identification, signaling and suppression • Transmission speed and bus timing	Layer 2
Physical Layer • Signal level and bit representation • Transmission medium	Layer 1

1.4.2 Physical Layer

The transmission medium is an electric two-wire. The signal transmission takes place differentially (3.5/1.5V dominant //2.5V recessive).
The CAN- bus has to be terminated at both ends with a 120 Ohm resistor. The *WANDFLUH* -Electronics itself does not have a termination resistor. After the installation of the CAN-bus and the termination resistors, the resistance between the two lines should be measured with an ohmmeter; it has to be within the range of 60...70 Ohm.

1.4.3 Fieldbus Wiring

The bus wires may be routed parallel, twisted and/or shielded, depending on the EMC requirements. The wiring topology should be as close as possible to a single line structure, in order to minimize reflections. The cable stubs for connection of the bus nodes should be as short as possible, especially at high bit rates. At 1Mbit/s, the length of the cable stubs should not exceed 0,3m (20kBit/s=7,5m, 125kBit/s=3,7m, 500kBit/s=0,7m).

The wiring of a CANopen® SD7 takes place through the 9-poles D-Sub device receptacle X4 (male) on the SD7 housing. The pin assignment corresponds to the following table.

Pin	Signal	Description
2	CAN_Low	Bus Signal minus
3	CAN_Gnd	Masse (CAN)
5	CAN Shield	Shield (CAN), internal connected with the Bus Gnd (Pin 3) verbunden
7	CAN_High	Bus Signal plus

1.4.4 Transmission Speeds

The transmission speed and the maximum admissible bus lengths mutually influence one another:

Fieldbus cable length	Line resistance	Bus-Line cross-section	Termination Resistance	Max. bit rates
0...40m	70mΩ/m	0,25 ... 0,34mm^2 (AWG23, AWG22)	124Ω (1%)	1000 kBit/s at 40m
40...300m	< 60mΩ/m	0,34 ... 0,6mm^2 (AWG22, AWG20)	127Ω (1%)	<= 500 kBit/s at 100m
300...600m	< 40mΩ/m	0,50 ... 0,6mm^2 (AWG20)	150Ω...300Ω	<= 100 kBit/s at 500m
600...1000m	< 26mΩ/m	0,75 ... 0,8mm^2 (AWG18)	150Ω...300Ω	<= 50 kBit/s at 1000m

To minimize the voltage drop on long distances the termination resistor should be higher than in the ISO 11898-2 standard.

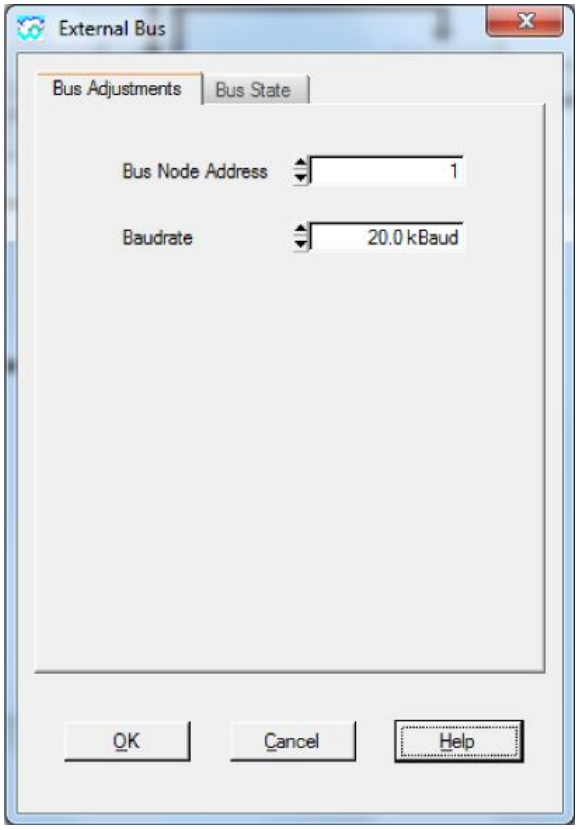
Remark: The transmission speed can be parameterized on the WANDFLUH -Electronics, resp. set via the parameterization software PASO (menu "Fieldbus -Fieldbus-Info").

1.4.5 Other connectors

For all other connectors, please refer to the appropriate operating manual e.g. "Operating instructions WANDFLUH -Electronics".

1.5 Fieldbus Settings

The following settings can be made either via the parameterization software PASO (menu "Fieldbus - Info") or directly from the master via the CANopen® Master:

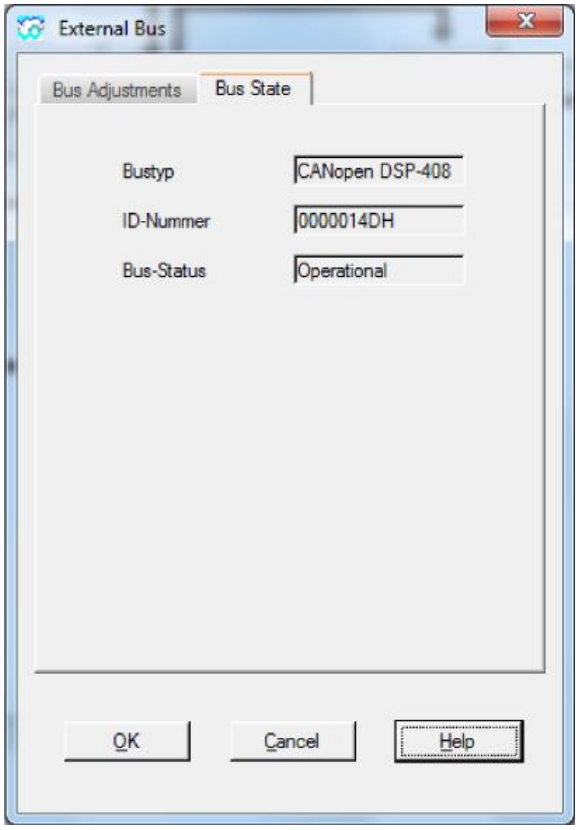


Field	Parameter Description	Display
Node address	With this parameter, the required node address for the CAN-Slave WANDFLUH–Electronics can be set. The value set is saved on the WANDFLUH-Electronics in the non-volatile memory.	1 ... 127
Baud rate	With this parameter, the required baud rate for the CAN-Slave WANDFLUH -Electronics can be set. The value set is saved on the WANDFLUH-Electronics in the non-volatile memory.	20, 50,125, 250, 500, 1000 kBaud

Note: The factory setting for the node address is 1.
The factory setting for the node baudrate is 20kBit/s

1.6 Fieldbus Diagnostics

A diagnosis of the fieldbus is possible at any time via the parameterization software PASO. This takes place through the menu point "Fieldbus_Info".

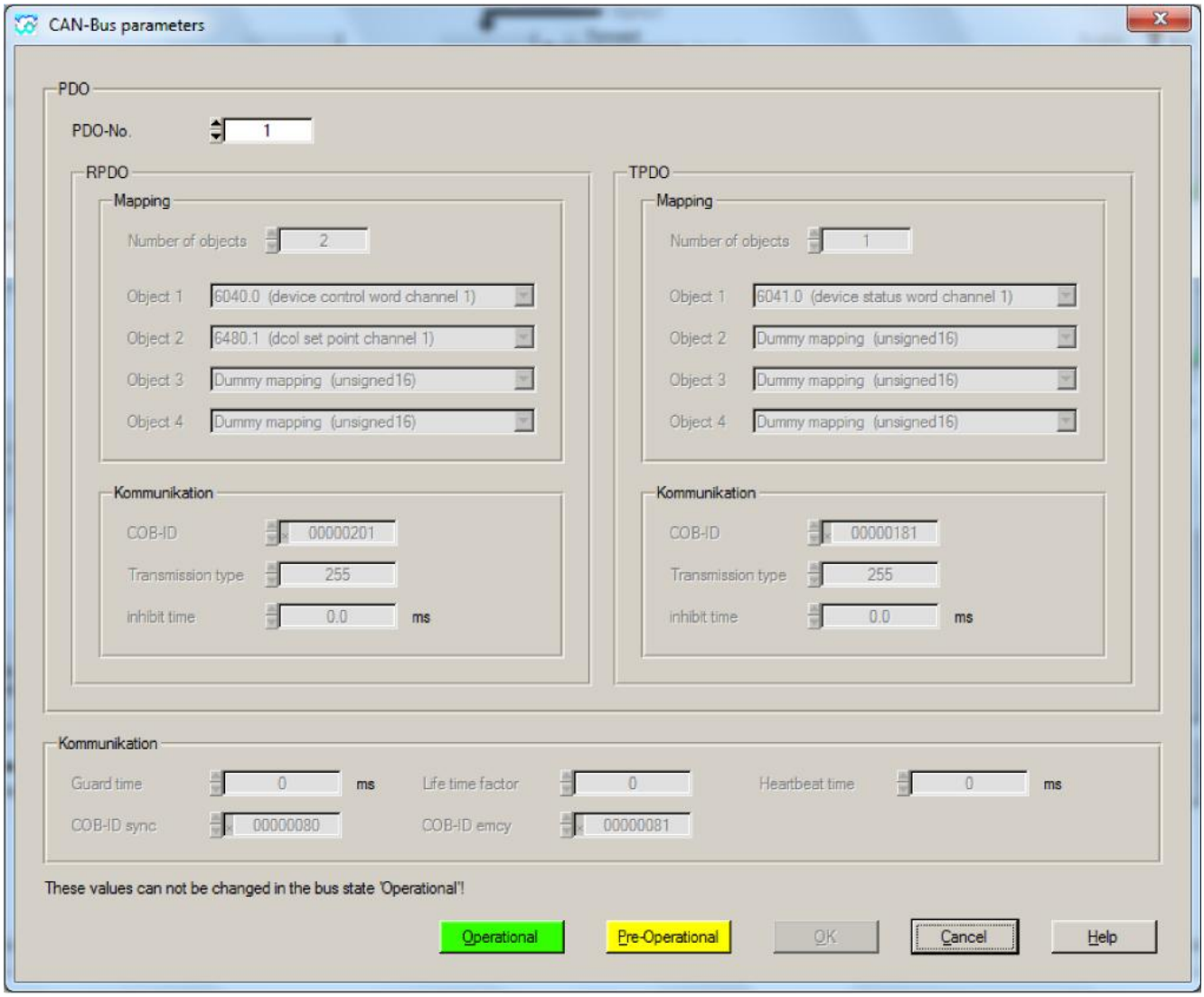


The following bus statuses are displayed:

Field	Parameter description	Display
Bustype	The type of fieldbus connected and the device profile used are displayed here.	CANopen® DSP-408
ID - number	The identification number of the CAN-Slave *WANDFLUH* -Electronics. This number is predefined fixed.	
Bus - status	The status of the communication state machine is displayed in this field. The corresponding description of the individual statuses can be found in the chapter "Device Control Services 20".	Initialization Pre-Operational Operational Stopped

1.7 Fieldbus Parameters

The menu item "Fieldbus - Parameters" in the parameterization software PASO allows the setting of the PDO communication and PDO mapping parameters (refer to "Mapping RxPDO 42" and "Mapping RxTDO 44"). These parameters can only be changed in the bus status "Stop" or "pre-operational" (refer to "Device Control Services 20").



The settings of the PDO mapping is done individually per PDO. In the selection "PDO-No." can be selected, which PDO-setting should be changed.

Only the mapping and the communication parameters can be set per PDO. In the bottom of the window are global communications parameters which are not PDO-dependent.

1.8 Connection examples

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

2 Representation of a CAN Message

2.1 General

In the operating instructions, CAN–messages are described in detail in tables, such as are illustrated below. The split-up corresponds to the usual standard CAN–driver of the software interface (2 byte CAN-Header, 8 byte user data and 3 byte transmission failure detection).

Serial data stream:

	Identifier	RTR	DLC	useful dates	CRC	ACK	EOF
No. of bits	11	1	4	0...64	15	2	7

CAN Header

	Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
M-Byte 0	ID 10	ID 9	ID 8	ID 7	ID 6	ID 5	ID 4	ID 3
M-Byte 1	ID 2	ID 1	ID 0	RTR	DLC 3	DLC 2	DLC 1	DLC 0

CAN Data

M-Byte 2	Data	Data	Data	Data	Data	Data	Data	Data
M-Byte 3	Data	Data	Data	Data	Data	Data	Data	Data
M-Byte 4	Data	Data	Data	Data	Data	Data	Data	Data
M-Byte 5	Data	Data	Data	Data	Data	Data	Data	Data
M-Byte 6	Data	Data	Data	Data	Data	Data	Data	Data
M-Byte 7	Data	Data	Data	Data	Data	Data	Data	Data
M-Byte 8	Data	Data	Data	Data	Data	Data	Data	Data
M-Byte 9	Data	Data	Data	Data	Data	Data	Data	Data

CAN Trailer

M-Byte 10	CRC 14	CRC 13	CRC 12	CRC 11	CRC 10	CRC 9	CRC 8	CRC 7
M-Byte 11	CRC 6	CRC 5	CRC 4	CRC 3	CRC 2	CRC 1	CRC 0	ACK 1
M-Byte 12	ACK 0	EOF 6	EOF 5	EOF 4	EOF 3	EOF 2	EOF 1	EOF 0

M-Byte x :Message Byte x
ID 10 ... ID 0 :CAN-Identifier (COB-ID)
RTR :Remote transmission request-bit
DLC 3 ... DLC 0 :Data length code, length of the user data (value range 0...8, binary coded)
Data :User data
CRC 14 ... CRC 0 :Cyclic redundancy check
ACK 1 ... ACK 0:Acknowledge
EOF 6 ... EOF 0:End of frame

For the following documentation the CAN messages are represented in the following format. Only relevant dates like COB-ID and data bytes are shown.

M-Byte 0...1 (CAN Header)	**M-Byte 2...9 (CAN data)**	**M-Byte 10...12 (CAN Trailer)**
COB-ID	**Byte 0...7 (user data)**	**Not used in further descriptions**
e.g. 384 + node address	e.g. Status word	

2.2 Data Coding with CAN / CANopen®

Fundamental rule of the data coding for CAN / CANopen®:

- **First** transmitted is: the highest value bit of the lowest value byte.
- **Last** transmitted is: the lowest value bit of the highest value byte.

→ **This corresponds to the description known as "Intel" format.**

3 Communication Profile

3.1 General

The CANopen®–communication profile (CiA DS-301) regulates the "how" of the communication. It specifies elements for the exchanging of real-time data and parameter data as well as a simplified network management. In this, particular attention has been paid to the resource-saving implementability and with this to the good performance of the corresponding software layer.
CANopen® uses the following services for the different types of data. The communication profile contains:

- PDO (Process Data Object)
  for real-time data, max. 8 bytes (1 telegram), high priority telegram.
- SDO (Service Data Object)
  for system parameters, data split-up over several telegrams, low priority telegram.
- NMT (Boot_Up)
- Node-guard (life-/node guarding)
- Emergency (status)
- SYNC (synchronization)

3.2 Default- Identifier-Distribution

After switching-on the WANDFLUH -Electronics control system, it has a default–identifier–distribution in accordance with the CANopen® standard CiA DS 301. The following table provides an overview of this distribution from the point of view of the control system:

Object	Identifier (binary)	resulting COB - ID (decimal / hex)	Function	Objects for Comm. parameter / Mapping parameter
Broadcast objects				
NMT	00000000000	0	Boot-Up	-
SYNC	00010000000	128 (80h)	Synch	1005h, 1006h, 1007h
TIME Stamp	00100000000	256 (100h)	Time stamp object	1012h, 1013h
Point to point objects (referred to node address)				
Emergency	0001xxxxxxx	128 (80h) + node address	Emergency telegram	1014h, 1015h
Rx_PDO1	0100xxxxxxx	512 (200h) + node address	Receive PDO1	1400h / 1600h
Rx_PDO2	0110xxxxxxx	768 (300h) + node address	Receive PDO2	1401h / 1601h
Rx_PDO3	1000xxxxxxx	1024 (400h) + node address	Receive PDO3	1402h / 1602h
Rx_PDO4	1010xxxxxxx	1280 (500h) + node address	Receive PDO4	1403h / 1603h
Tx_PDO1	0011xxxxxxx	384 (180h) + node address	Transmit PDO1	1800h / 1A00h
Tx_PDO2	0101xxxxxxx	640 (280h) + node address	Transmit PDO2	1801h / 1A01h
Tx_PDO3	0111xxxxxxx	896 (380h) + node address	Transmit PDO3	1802h / 1A02h
Tx_PDO4	1001xxxxxxx	1152 (480h) + node address	Transmit PDO3	1803h / 1A03h
Tx_SDO	1011xxxxxxx	1408 (580h) + node address	Transmit SDO (Parameter)	1200h
Rx_SDO	1100xxxxxxx	1536 (600h) + node address	Receive SDO (Parameter)	1200h
NMT Error Control	1110xxxxxxx	1792 (700h) + node address	Life - /node guarding	1016h, 1017h

xxxxxxx = Control - ID = node address settable via parameterization software PASO.

3.3 Process Data Communication (PDO)

3.3.1 General

The real-time data transfer is performed by means of "Process Data Objects (PDO)". The transfer of PDOs is performed with no protocol overhead. CANopen® also defines the default settings for the process data exchange, such as, e.g. identifiers used, data assignment and communication behavior. The default setting for the data assignment (default-mapping) can be modified through so-called mapping parameters.
PDOs can be transmitted either event-controlled (asynchronous) or synchronized. Also the requirements via the CAN-Feature "Remote-Transmit-Request" are supported. With this, it is possible to flexibly meet the requirements of the application.
There are two kinds of use for PDOs. The first is data transmission and the second is data reception. It is distinguished in Transmit-PDOs (TPDOs) and Receive-PDOs (RPDOs).

3.3.2 PDO Communication Parameters

The PDO communication parameters (index 1400...1403 and 1800...1805) describe the transmission behavior of the PDOs. There the PDO identifiers, the type of transmission, the transmission inhibit time and the CMS priority group are listed.

Sub-index	Field in the PDO structure	Data type
0	Number of entries	Unsigned8
1	COB-ID	Unsigned32
2	Type of transmission	Unsigned8
3	Transmission inhibit time	Unsigned16

The type of transmission (sub-index 2) defines the transmission-/receiving characteristics of a PDO. A differentiation between a synchronous and an asynchronous transmission type is made. The asynchronous PDOs are transmitted event-controlled or in case of a remote request, the synchronous ones are triggered through a SYNC signal or transmitted by means of a time control.

Type of transmission:

Type of transmission	PDO transmission					
(decimal)	Cyclic	Acyclic	Synchro-nous	Asynchro-nous	RTR only	Remarks
0		X	X			Transmission related to SYNC.
1-240	X		X			Transmission related to SYNC, 1...240 x SYNC for one PDO.
241-251	Reserved					
252			X		X	Transmission only on remote transmission request
253				X	X	Transmission only on remote transmission request.
254				X		Only for TPDOs. Manufacturer specific.
255				X		Defined in the Device-Profile (TPDO immediate after RPDO).

COB-ID Code:

Bit number	Value	Description
31 (MSB)	0 1	PDO available PDO not available
30	0 1	RTR permitted RTR not permitted
29	0 1	11-bit ID 29-bit ID
28 – 11	0 X	If bit 29 = 0 If bit 29 = 1, COB-ID
10 – 0 (LSB)	X	COB-ID

A remote transmission request (RTR) must always be transmitted with the number of requested data bytes (DLC), otherwise the *WANDFLUH* -Electronics answers without any data bytes.
Note: The CiA does not recommend using RTR.

Important: The designation of the process data objects takes place from the point of view of the *WANDFLUH* -Electronics control system.

The representation of a CANopen® message for a PDO can be seen from the following table.

COB-ID	Byte 0 ... 7
384 + node address	Mapped Tx_PDO1 bytes (refer to object 1A00H)

COB-ID	Byte 0 ... 7
512 + node address	Mapped Rx_PDO1 bytes (refer to object 1600H)

The corresponding COB-ID is calculated as follows:
COB-ID_TX-PDO1 = 384 + node address
COB-ID_RX-PDO1 = 512 + node address

3.3.3 Example for PDO

RPDO1 Output data (controlword and command value, refer to object 1600h):

With Control Mode 1, 3 and 4:

COB-ID	Byte 0 + 1	Byte 2 + 3	Byte 4 + 5	Byte 6 + 7
512 + node address	controlword Channel 1	Command value VPOC Channel 1	Not used	Not used

RPDO1 Output data (controlword and command value, refer to object 1601h):

With Control Mode 1, 3 and 4:

COB-ID	Byte 0 + 1	Byte 2 + 3	Byte 4 + 5	Byte 6 + 7
768 + node address	controlword Channel 2	Command value VPOC Channel 2	Not used	Not used

RPDO1 Output data (controlword and command value, refer to object 1602h):

With Control Mode 1, 3 and 4:

COB-ID	Byte 0 + 1	Byte 2 + 3	Byte 4 + 5	Byte 6 + 7
1024 + node address	controlword Channel 3	Command value VPOC Channel 3	Not used	Not used

RPDO1 Output data (controlword and command value, refer to object 1603h):

With Control Mode 1, 3 and 4:

COB-ID	Byte 0 + 1	Byte 2 + 3	Byte 4 + 5	Byte 6 + 7
1280 + node address	controlword Channel 4	Command value VPOC Channel 4	Not used	Not used

TPDO1 Input data (statusword, refer to object 1A00h):

With Control Mode 1 and 3:

COB-ID	Byte 0 + 1	Byte 2 + 3	Byte 4 + 5	Byte 6 + 7
384 + node address	statusword Channel 1	Not used	Not used	Not used

TPDO2 Input data (statusword, refer to object 1A01h):

With Control Mode 1 and 3:

COB-ID	Byte 0 + 1	Byte 2 + 3	Byte 4 + 5	Byte 6 + 7
640 + node address	statusword Channel 2	Not used	Not used	Not used

TPDO3 Input data (statusword, refer to object 1A02h):

With Control Mode 1 and 3:

COB-ID	Byte 0 + 1	Byte 2 + 3	Byte 4 + 5	Byte 6 + 7
896 + node address	statusword Channel 3	Not used	Not used	Not used

TPDO4 Input data (statusword, refer to object 1A03h):

With Control Mode 1 and 3:

COB-ID	Byte 0 + 1	Byte 2 + 3	Byte 4 + 5	Byte 6 + 7
1152 + node address	statusword Channel 4	Not used	Not used	Not used

3.4 Service Data Communication (SDO)

3.4.1 General

The device parameters in the object directory are read and written via service data objects. Service data objects (SDO) are data structures of any size. In the case of CANopen®, they are addressed via a 16-bit - index and an 8-bit sub-index.
The WANDFLUH –Electronics control systems operate as servers, at the request of the client (e.g., SPS), they make data available (upload), or receive data from the client (download). A transmission with the number of data bytes <= 4 byte is called *Expedited Transfer* and a transmission with the number of data bytes > 4 byte is called *Segmented Transfer*.

Upload:
- The client requests data together with index and sub-index of the required device parameter.
- The server responds with device parameters (including index and sub-index).

Download:
- The client transmits date together with the index and sub-index.
- The server confirms the correct receipt.

The representation of a CANopen® message for an SDO can be seen from the following illustration.

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4...7
1408 + node address	Control word value xxH	Index low-byte	Index high-byte	Sub-index	Data bytes

The corresponding COB-ID is calculated as follows:
COB-ID_SDOTX = 1408 + node address
COB-ID_SDORX = 1536 + node address

On principle a handshake takes place between the client and the server. If the parameter to be transmitted comprises up to 4 bytes, then a single handshake is sufficient (a telegram pair).

During the download, the client transmits the data together with the index, sub-index and the server confirms the receipt. During the upload, the client requests the data, in that it transmits the index and sub-index of the required parameter and the server transmits the parameter (incl. index and sub-index) in its response telegram. For upload and download the same identifier pair is used.

3.4.2 Upload SDO Protocol

Client → Server, Initiate Upload Request

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4...7
1536 + node address	Control word value 40H	Index low-byte	Index high-byte	Sub-index	reserved

Server → Client, Upload Response (Expedited Transfer)

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4...7
1408 + node address	Control word value 40H + ((4 – noB) * 4 + 3)	Index low-byte	Index high-byte	Sub-index	Data bytes

Server → Client, Upload Response (Segmented Transfer)

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4...7
1408 + node address	Control word value 41H	Index low-byte	Index high-byte	Sub-index	Number of bytes to be uploaded

Client → Server, Upload Request (only for segmented Transfer)

COB-ID	Byte 0	Byte 1...7
1536 + node address	Control word value 60H or 70H (toggle bit)	reserved

Client → Server, Upload Response (only for segmented Transfer)

COB-ID	Byte 0	Byte 1...7
1408 + node address	Control word value 00H or 10H (toggle bit) if no more segments + ((7 – noB) * 2 + 1)	Segmented data bytes

noB: number of valid data bytes (min. 1)

3.4.3 Download SDO Protocol

Client → Server, initiate Download Request (Expedited Transfer)

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4...7
1536 + node address	Control word value 20H + ((4 – noB) * 4 + 3)	Index low-byte	Index high-byte	Sub-index	Data bytes

Server → Client, Download Response

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4...7
1408 + node address	Control word value 60H	Index low-byte	Index high-byte	Sub-index	reserved

3.4.4 Abortion of a Parameter Communication

In the case of a faulty parameter communication, it is aborted. To do this, the client, resp. the server transmits an SDO telegram with the following structure:

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4 + 5	Byte 6	Byte 7
1408 + node address	Control word value 80H	Index low-byte	Index high-byte	Sub-index	Additional code	Error code	Error class

The following error descriptions from DS 301 are supported by the *WANDFLUH* control system:

Error class	Error code	Additional code	
0x05	0x03	0x0000	Toggle-bit error
0x05	0x04	0x0000	SDO protocol timed out
0x05	0x04	0x0001	Client/server command specifier not valid or unkown
0x05	0x04	0x0002	Invalid block size (block mode only)
0x05	0x04	0x0004	CRC error (block mode only)
0x05	0x04	0x0005	Out of memory
0x06	0x01	0x0000	Not supported access to an object
0x06	0x01	0x0001	Attemp to read a write only object
0x06	0x01	0x0002	Attemp to write a read only object
0x06	0x02	0x0000	Object does not exist in the object dictionary
0x06	0x04	0x0041	Object cannot be mapped to the PDO
0x06	0x04	0x0042	PDO length exceeded
0x06	0x04	0x0043	Value invalid
0x06	0x04	0x0047	Initialization error
0x06	0x06	0x0000	Access failed due to an hardware error
0x06	0x07	0x0010	Data type, length of service parameter does not match
0x06	0x07	0x0012	Data type, length of service parameter too high
0x06	0x07	0x0013	Data type, length of service parameter too low
0x06	0x09	0x0011	Sub-index does not exist
0x06	0x09	0x0031	Value of parameter written too high
0x06	0x09	0x0032	Value of the parameter written too low
0x08	0x00	0x000	General error
0x08	0x00	0x0020	Data cannot be transferred or stored to the application
0x08	0x00	0x0021	No data transfer because of local control
0x08	0x00	0x0022	No data transfer because of present device state

3.5 Emergency Objects (EMCY)

3.5.1 General

If an internal error occurs, then the *WANDFLUH* -Electronics transmits an 8 byte long emergency telegram. This telegram is transmitted with the highest priority. An emergency object is transmitted only once per "error event". As long as no new errors on the device occur, no further emergency objects are transmitted.

3.5.2 Emergency Object Data

The emergency telegram consists of the following 8 bytes:

COB_ID	Byte 0 + 1	Byte 2	Byte 3...7
128 + node address	Error code (refer to the table below)	Error register (object 1001h)	Manufacturer-specific errors

The part "Manufacturer-specific errors" is not used.

Error Code

In the case of an error on the *WANDFLUH* -Electronics, here a value corresponding to the error is indicated. In the object 0x1003 the last occurring errors are filed. In doing so, the sub-index 0 indicates the number of the current errors. The following table lists all possible errors with the corresponding error code:

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
6000	Communication Software	Communication Reset or stop node transition (see communication state machine)	FAULT
8100	Communication	Fieldbus off or passive error.	FAULT
8110	CAN overrun (objects lost)	Hard- or software buffer overflow.	FAULT
8130	Life guard error	CANopen node guarding error.	FAULT
8300	Closed loop control monitoring	Trailing error too excides limit.	FAULT

Error Register

As long as an error is present, it can be read out through the object 1001H (description under "Error register (Flag) 35").

3.6 Network Management Objects (NMT)

3.6.1 General

The Network Management (NMT) is node oriented and follows a master-slave structure. NMT objects are used for executing NMT services. Through NMT services, nodes are initialised, started, monitored, resetted or stopped. All nodes are regarded as NMT slaves.
NMT requires that one device in the network fulfils the function of the NMT Master.

3.6.2 Device Control Services

CANopen® makes it possible to start the control system with a single telegram. When switching-on (Power-On), the control system carries out an initialization and switches into the status PRE-OPERATIONAL.
With a single telegram (Start_Remote_Node), the control system now can be switched into the status OPERATIONAL.

COB-ID	Byte 0	Byte 1
0 (NMT)	Command specifier	Node address

The following states and state commands are possible:

Designation	Command-specifier	Function
Start_Remote_Node	1(dec) = 01(hex)	Starts the control system, enables the outputs, starts the transmission of PDOs
Stop_Remote_Node	2(dec) = 02(hex)	Stops the communication. Only NMT objects can still be transmitted.
Enter_Pre-Operational_State	128(dec) = 80(hex)	Stops the PDO transmission, SDO continues to be active
Reset_Node	129(dec) = 81(hex)	Carries out a control system reset
Reset_Communication	130(dec) = 82(hex)	Carries out a reset of the communication functions

Status	Description
Initialisation	This state is divided into three sub-states in order to enable a complete or partial reset of the node. • Reset-Application: In this state the manufacturer specific parameters and the profile area parameters are set to their power-on values. After this, the state Reset Communication is entered autonomously. • Reset-Communication: In this state the parameters of the communication profile area are set to their power-on values. After this the state Initialising is entered autonomously. • Initialising: This is the first sub-state the device enters after power-on. After finishing the basic node initialisation the device executes the write boot-up object service and enters the state Pre-Operational autonomously.
Pre-Operational	• All communication objects are allowed, with the exception of the PDO objects • PDO communication is not allowed • Device parameters and allocation of applications objects (PDO-mapping) are allowed
Operational	• All communication objects are allowed, resp. active • Access via SDO is possible, the application, resp. device state machine can, however, disable certain objects
Stopped	• In this status the whole communication is stopped, only the node guarding and heartbeat objects are still active.

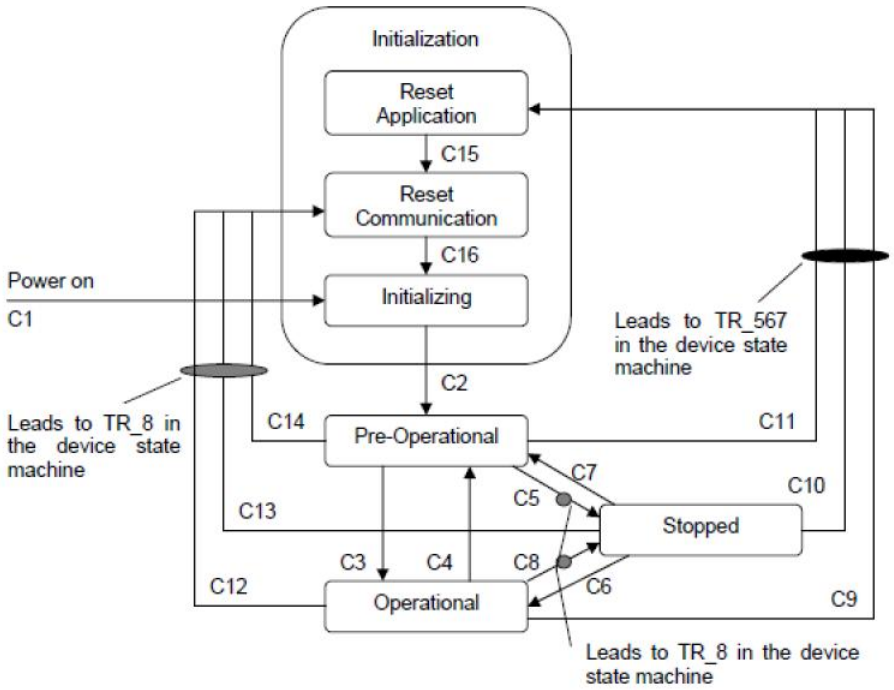
States and Communication Object Relation

The table below shows the relation between communication states and communication objects. Services on the listed communication objects may only be executed if the device is in the appropriate communication state.

	INITIALISING	PRE-OPERATIONAL	OPERATIONAL	STOPPED
PDO			X	
SDO		X	X	
Synchronisation Object		X	X	
Emergency Object		X	X	
Boot-up Object	X			
Network Management Object		X	X	X

Communication state machine:

Transition	Description
C1	When switching-on the power supply, the control system automatically passes into the initialization status
C2	Initialization completed – automatic change into the status PRE-OPERATIONAL
C3, C6	Start_Remote_Node indication
C4, C7	Enter_Pre-Operational_State indication
C5, C8	Stop_Remote_Node indication
C9, C10, C11	Reset_Node indication
C12, C13, C14	Reset_Communication indication
C15	Application reset carried out
C16	Communication reset carried out



3.6.3 Error Control Services

Through Error control services the NMT detects failures in a CAN-based Network. This is principally achieved through periodically transmitting of messages by a device. There exist two possibilities to perform the error control. It is not possible to use both error control mechanisms (Node Guarding Protocol and Heartbeat Protocol) at the same time.

Heartbeat Protocol
The WANDFLUH -Electronics can produce a cyclic heartbeat; this can be read by the master, in order to see whether the valve is still "alive" and in what condition it is. The heartbeat protocol defines an error service, which does not require a remote frame. The cycle time for the heartbeat is set through the object 1017H, with the time 0 the heartbeat is switched off.

COB-ID	DLC	Byte 0
1792 + node address	1	0 = Boot-up 4 = Stopped 5 = Operational 127 = Pre-operational

It is not possible to use the Heartbeat Protocol if the Node Guarding Protocol is active.

Node Guarding Protocol
The guarding is achieved through transmitting guarding requests (Node guarding protocol) by the NMT Master. If a NMT Slave has not responded within a defined span of time (Node life time) or if the NMT Slave's communication status has changed, the NMT Master informs its Application about that event.

Guarding is an outdated method of checking whether the device to be guarded is still working in the correct network state or not. Therefore e.g. the CANopen manager requests the error control message via a CAN remote frame (RTR). The device to be guarded replies with a CAN data frame, which indicates the current NMT state. As this is an RTR-based service, the Heartbeat protocol is recommended for error control purposes in new designs.

COB-ID	RTR	DLC
1792 + node address of the WANDFLUH -Electronics to be monitored	1	1

The *WANDFLUH* -Electronics addressed responds with the following telegram:

COB-ID	DLC	Byte 0
1792 + node address of the WANDFLUH -Electronics addressed	1	State of the WANDFLUH -Electronics 4 / 132(toggled) = stopped 5 / 133(toggled) = operational 127 / 255(toggled) = pre-operational The bit 7 is toggled after every telegram. If the bit is not toggled, then the NMT-Master assumes an error of this node.

The Guard Time is filed in the object 100Ch and the Life Time Factor in the object 100Dh. These entries can be read and changed by the master NMT-Master by means of an SDO - access. The time, which may pass between the node guarding telegrams until the WANDFLUH -Electronics issues an error, is called Life Time.
Calculation of the Life Time:
Life Time = Guard Time x Life Time factor

If the Life Time is exceeded, the NMT-Master does not transmit a node guarding anymore, then the WANDFLUH -Electronics transmits a corresponding emergency telegram.

It is not possible to use the Node Guarding Protocol if the Heartbeat Protocol is active.

3.6.4 Bootup Service

Through this service, the NMT slave indicates that a local state transition occurred from the state INITIALISING to the state PRE-OPERATIONAL.

COB-ID	Byte 0
1792 + node address	0

3.7 Synchronous Transmission (SYNC)

Synchronous transmission of message means that the transmission of the message is fixed in time with respect to the transmission of the SYNC telegram. The synchronous message is transmitted within a given time window with respect to the SYNC transmission, and at most once for every period of the SYNC.
The synchronous mechanism is intended for transferring commanded values and actual values on a fixed timely base.
In general the fixing of the transmission time at synchronous PDO messages coupled with the periodicity of transmission of the SYNC message guarantees that devices may arrange to sample process variables from a process environment and apply their actuation in a co-ordinated fashion.

The SYNC telegram is a CAN-Message with high priority and without process dates. One device in the network generates the SYNC telegram (SYNC producer), all other devices with a synchronous PDO behavior (refer to the PDO transmission type) react to it.

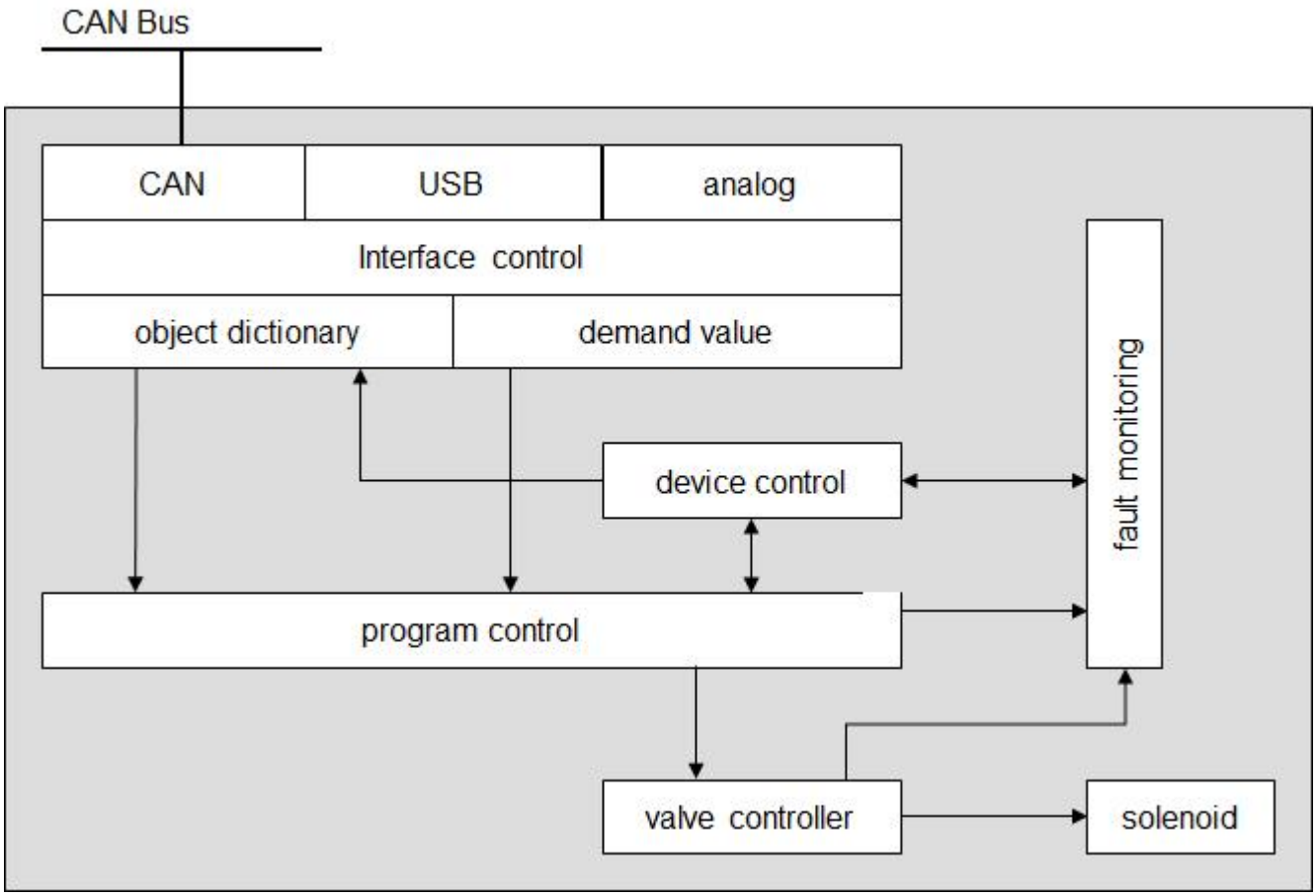
To transmit a synchronous command value, the value has to be transmitted with a synchronous receive-PDO (transmit type 0...244) first. The command value will be processed until the next SYNC telegram is received. Likewise a synchronous transmit-PDO will only be sent after a SYNC telegram received.

4 The Device Profile DSP-408 (in accordance with CiA)

4.1 General

The device profile explains the data and their format, which are exchanged between the CANopen® master and the WANDFLUH -Electronics Electronics (slave). 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.

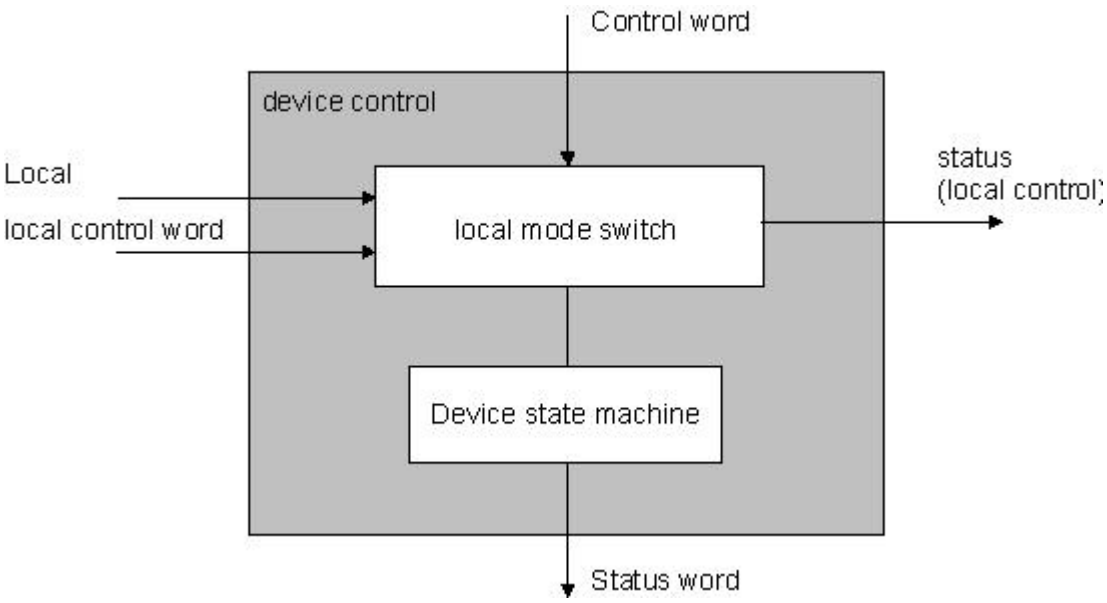
The Fieldbus control is made through a higher level Fieldbus Master.

The local control can be made via the parameterisation software PASO.

4.3 Device Control

4.3.1 General

The following picture shows the principle function of the CAN-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 27")

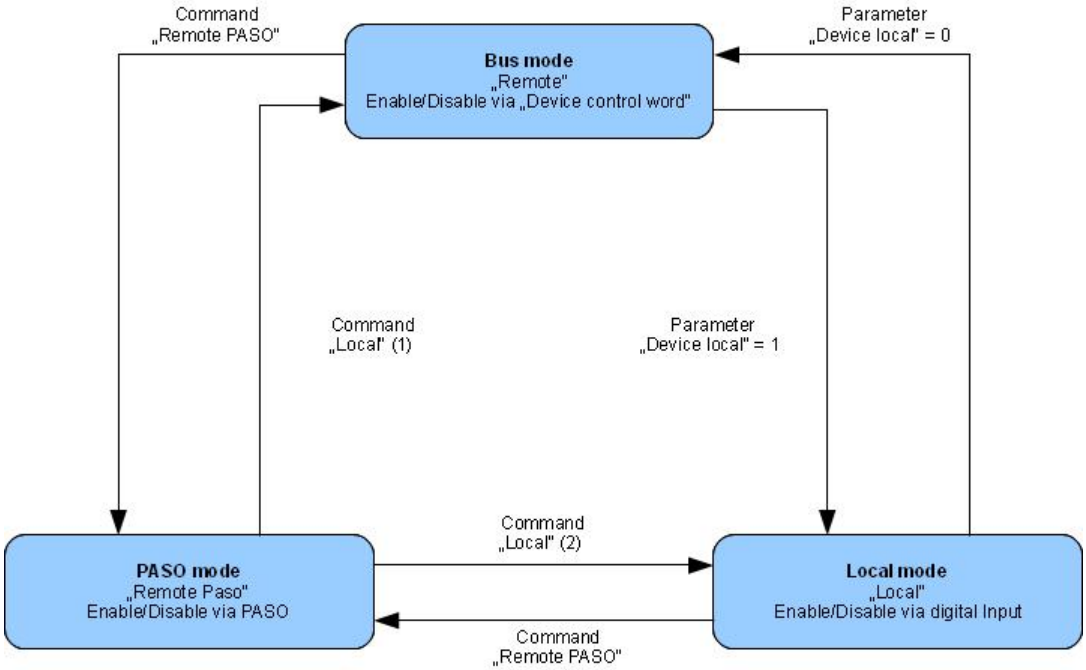
PASO mode ("Remote PASO")
In the PASO mode, the control commands will be set direct through the PASO. The PASO mode has 2 states: "Disabled" and "Enabled", switch over through the PASO command "Enable" resp. "Disable". This mode can be activated as follows:
- via PASO:
  With the parameter "Operating 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 27")

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 27"), 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 27")

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

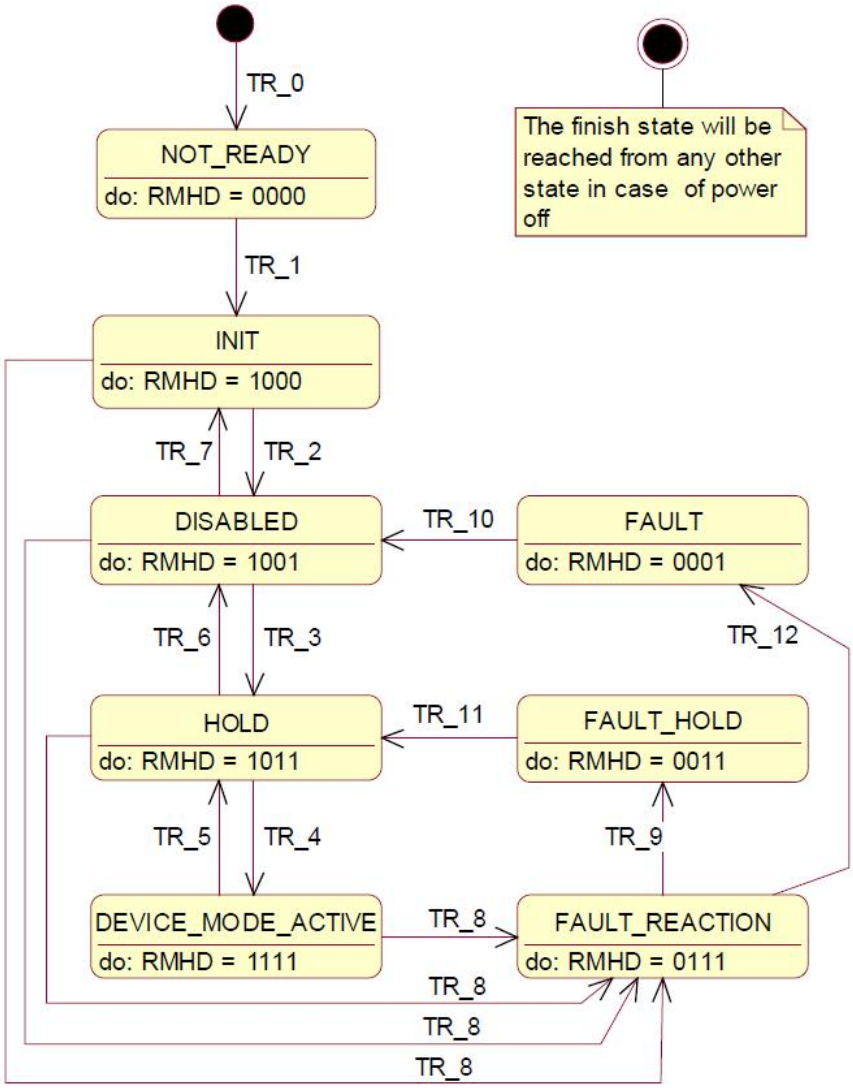
- In state „PASO mode“ sending of parameter "Device local" through fieldbus also possible.

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 CANopen®-slave *WANDFLUH*-Electronics takes place and which statuses are reached when and how. Certain transitions are automatically forced by the communication state machine (refer to the chapter "Boot-up").

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

Status	Description
NOT_READY	• The supply voltage is present on the *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
DISABLED	• Device parameters can be set • The device functions are disabled • In this state, the different device modes like "Device Mode", "operating mode" and "Device Local mode" can be set.
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 "Control Mode" and the device mode selected with the parameter "Device Mode" are active • Changing the operating mode is not possible (the writing of the parameter "Device Mode" is responded to negatively)
FAULT_HOLD	• Device parameters can be set • The actual value present is read or the set-point value of the HOLD status is active • To leave this state, the corresponding transitions in the table below have to be executed.
FAULT	• Device parameters can be set • The device functions are disabled • To leave this state, the corresponding transitions in the table below have to be executed.
FAULT_REACTION	This status is reached, if the device is not anymore ready for operation • Device parameters can be set • The device function can be disabled or enabled



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

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

Transition	Description	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 initialization 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 controlword 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 controlword 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 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 31",

4.6 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 50 - Signal type Command value 72 - Min Interface Command value 74 - Max Interface Command value 74 - Min Interface Command value via Feldbus 75 - Max Interface Command value via Feldbus 75 - Min Reference Command value 75 - Max Reference Command value 75 - Controller mode 50 (only when switching from Open Loop to Closed Loop or vice versa)	- Deadband Command value 76 - Command value fixed 82 - Speed Command value 83 (only in Closed Loop) - Acceleration Command value 83 (only in Closed Loop) - Deceleration Command value 83 (only in Closed Loop) - Speed manual mode 96 (only in Closed Loop) - Switching thresholds 84 (only if Selection = Command value) - Min Reference Analog output 96 (only if Signal = Command value) - Max Reference Analog output 98 (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 76 - Signal type Feedback value 76 - Min Interface Feedback value 79 - Max Interface Feedback value 79 - Min Interface Feedback value via Feldbus 79 - Max Interface Feedback value via Feldbus 79 - Min Reference Feedback value 80 - Max Reference Feedback value 80 - SSI Sensor Resolution 81 - Displayed unit 84 - Controller mode 50 (only when switching from Open Loop to Closed Loop)	- Control deviation for 100% control value 85 - I-Window outside 86 - I-Window inside 86 - Threshold for n-Punkt Controller 87 - Window control 83 - Trailing window threshold (depends on controller mode: vprc Trailing window threshold 54, dsc Trailing window threshold 56, dpc Trailing window threshold 58, n-point Controller Trailing window Threshold 88) - Schaltschwellen 83 (only if Selection = Feedback value) - Min Reference Analog output 96 (only if Signal = Feedback value) - Max Reference Analog output 98 (only if Signal = Feedback value)

4.7 Interface

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

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% Duty-Cycle, resolution 0.001 %

4.8 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	PD2
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	0 .. 16384: 0 .. 2450mA
current not measured	0 .. 16384: 0 .. 100% Duty-Cycle			

4.9 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 Object Dictionary

5.1 General

(In accordance with CiA DS-301 and DSP-408 "Device Profile Fluid Power Technology")

The most important part of a device profile is the Object Dictionary description. The Object Dictionary is essentially a grouping of objects accessible via the network in ordered pre-defined fashion. Each object is addressed using a 16-bit index.

The overall layout of the standard Object Dictionary is shown below.

Index (Hex)	Object
0000	Not used
0001 – 001F	Static Data Types
0020 – 003F	Complex Data Types
0040 – 005F	Manufacturer Specific Complex Data Types
0060 – 007F	Device Profile Specific Static Data Types
0080 – 009F	Device Profile Specific Complex Data Types
00A0 – 0FFF	Reserved for further use
1000 – 1FFF	Communication Profile Area 34
2000 – 5FFF	Manufacturer Specific Profile Area 58
6000 – 9FFF	Standardised Device Profile Area 46 Standardised Device Profile Area
A000 – FFFF	Reserved for further use

5.2 Communication Profile Area

Parameter	Index
Device Type 34	0x1000
Error register (Flag) 35	0x1001
Predefined Error Field 35	0x1003
COB-ID SYNC 36	0x1005
Guard Time 36	0x100C
Life Time Factor 36	0x100D
Save Parameter 37	0x1010
Restore Defaults 38	0x1011
COB-ID Emergency 39	0x1014
Producer Heartbeat Time 40	0x1017
Identity Object 40	0x1018
Communication parameter RxPDO 41	0x1400 0x1401
Mapping RxPDO 42	0x1600 0x1601
Communication parameter TxPDO 43	0x1800 0x1801
Mapping TxPDO 44	0x1A00 0x1A01

5.2.1 Device Type

Indicates the sub-assembly type code of the device specified in the device profile (DSP-408).

Object description

Object number	0x1000
Variable name	Device Type
Object code	VAR (0x7)
Data type index	Unsigned32 (0x7)
Length	4

Values-Description

Sub–Index	0
Description	Code of the device type [Read Only] Bit 0-15 = Device profile number (408 dec) Bit 16-30 = reserved Bit 31 = 1 (modular device) Value: 0x10000198h
Prescribed range	Unsigned32

5.2.2 Error register (Flag)

This object is an error register for the device. The device can map internal errors to this byte. The object is a part of the emergency object. These bits are fixed assigned by the standard!

Object description

Object number	0x1001
Variable name	Error register
Object code	VAR (0x7)
Data type index	Unsigned8 (0x5)

Values-Description

Sub-index	0
Description	Error register [Read Only] Bit 0 = General error Bit 1 = Current Bit 2 = Voltage Bit 3 = Temperature Bit 4 = Communication error Bit 5 = Device profile-specific Bit 6 = Reserved (value always 0) Bit 7 = Manufacturer-specific
Prescribed range	Unsigned8

5.2.3 Predefined Error Field

This object contains the occurred errors of the device, which have been indicated through the emergency object. It therefore contains a history of errors.

1. The entry in sub-index 0 indicates the number of the current errors, which have been recorded in the list. This list starts with the sub-index 1 of this object.
2. Every new error is saved in the sub-index 1, the older errors are moved down by one place on the list.
3. If a "0" is written to the sub-index 0, then all history entries are deleted.
4. The error numbers are of the type UNSIGNED32 and they are composed of a 16-bit error code and a 16- bit field with additional error information. The additional error information is manufacturer-specific error information and it is located in the higher 2 bytes (MSB). The error code is located in the lower 2 bytes (LSB). If the object is supported, then it has to consist of at least two entries: the length entry in the sub-index 0 as well as at least one error entry in the sub-index 1.

Object description

Object number	0x1003
Variable name	Predefined Error Field
Object code	ARRAY (0x8)
Data type index	Unsigned32 (0x7)

Values-Description

Sub – Index	0x00
Description	Number of errors [Read/Write]
Default Value	0
Prescribed range	0 - 254

Sub – Index	0x01
Description	Standard error field [Read Only]

Default Value	none
Prescribed range	Unsigned32

Sub – Index	0x02 - 0xFE
Description	Standard error field [Read Only]
Default Value	none
Prescribed range	Unsigned32

5.2.4 COB-ID SYNC

This object defines the COB-ID of the "SYNC" object (SYNC).

Object description

Object number	0x1005
Variable name	COB-ID SYNC message
Object code	VAR (0x7)
Data type index	Unsigned32 (0x7)
Length	4

Values-Description

Description	COB-ID used by the SYNC [Read / Write]
Prescribed range	Unsigned32
Default Value	0x80

5.2.5 Guard Time

The guard time together with the life time factor defines the cycle time for the life guarding protocol, in case of the value 0, the life guarding is switched-off. The time is indicated in ms.
This object can only be changed if the producer heartbeat time is set to 0. If not, the device send a abort SDO transfer (abort code: 060A 0023h).

Object description

Object number	0x100C
Variable name	Guard Time
Object code	VAR (0x7)
Data type index	Unsigned16 (0x6)
Length	2

Values-Description

Sub–Index	0
Description	Value in ms
Prescribed range	Unsigned16

5.2.6 Life Time Factor

The life time factor multiplied with the guard time results in the cycle time for the life guarding protocol, in the case of the 0, the life guarding is switched-off.
This object can only be changed if the producer heartbeat time is set to 0. If not, the device send a abort SDO transfer (abort code: 0x060A 0023).

Object description

Object number	0x100D

Variable name	Life Time Factor
Object code	VAR (0x7)
Data type index	Unsigned8 (0x5)

Values-Description

Sub–Index	0
Description	Value as multiplier for the guard time
Prescribed range	Unsigned8

5.2.7 Save Parameter

Through this object, the changed parameters can be saved in the EEPROM of the *WANDFLUH*-Electronics. Through sub-index 1, all parameters can be saved. In order to save more selectively, the parameters in addition have been classified in groups:

1. Communication parameters (sub-index 2): This group comprises the communication-specific parameters in the object directory range 0x1000...0x1FFF. Saved here are the following parameters:

Parameter	Index	Sub-Index
Communication parameter RxPDO1	0x1400	0x01, 0x02
Communication parameter RxPDO2	0x1401	0x01, 0x02
Communication parameter TxPDO1	0x1800	0x01, 0x02
COB-ID SYNC object	0x1005	0x00
Guard time	0x100C	0x00
Life time factor	0x100D	0x00
COB-ID Emergency object	0x1014	0x00
Producer heartbeat time	0x1017	0x00

2. Application parameters (sub-index 3): this group comprises the parameters in the object directory range 0x6000...0x9FFF as well as the manufacturer-specific parameters 0x2000...0x5FFF.

In order to prevent an inadvertent saving, a certain signature ("save") has to be written to the respective sub-index. In the hex-code, the 32-bit signature has the following appearance:

Signature	**MSB**			**LSB**
ASCII	e	v	a	s
hex	0x65	0x76	0x61	0x73

If a correct signature is received in the corresponding sub-index, the device saves the parameters and confirms this with an SDO response (initiate download response). If the saving operation has failed, the device responds with an Abort SDO Transfer (abort code: 0606 0000h).
In the case of a wrong signature, the device refuses to save and responds with an Abort SDO Transfer (abort code: 0x0800 002x)

In the case of a read access to a sub-index, the subassembly with the value 1h indicates, that the respective parameter group can be selectively saved.
The saved values remain valid after the Reset or Power-On of the device. Through the object 0x1011 they can be reset to the default values.

Object description

Object number	0x1010
Variable name	Save Parameter
Object code	ARRAY (0x88)

Data type index	Unsigned8 (0x5)

Values-Description

Sub–Index	0x00
Description	Number of elements (sub-indexes) [Read Only]
Prescribed range	Unsigned8
Prescribed range	none

Sub–Index	0x01
Description	Saving of all parameters (through signature "save") [Read/Write]
Prescribed range	Unsigned32
Prescribed range	none

Sub–Index	0x02
Description	Save communication parameters (through signature "save") [Read/Write]
Prescribed range	Unsigned32
Prescribed range	none

Sub–Index	0x03
Description	Save application parameters (through signature "save") [Read/Write]
Prescribed range	Unsigned32
Prescribed range	none

5.2.8 Restore Defaults

With this object, the device parameters can be reset to default values in accordance with DS301, resp. DSP 408 and WANDFLUH-specific values. Through sub-index 1, all parameters can be set to default values. In order to be able to load more selectively, the parameters additionally have been classified in groups:

1. Communication parameters (sub-index 2): this group comprises the communication-specific parameters in the object directory range 0x1000...0x1FFF. The list of the parameters can be found at object 0x1010.

2. Application parameters (sub-index 3): this group comprises the parameters in the object directory range 6000h...9FFFh as well as the manufacturer-specific parameters 0x2000...0x5FFF.

In order to prevent an inadvertent resetting, a certain signature ("load") has to be written to the respective sub-index. In the Hex-Code, the 32-bit signature has the following appearance:

Signature	**MSB**			**LSB**
ASCII	d	a	o	l
hex	0x64	0x61	0x6F	0x6C

If a correct signature is received in the corresponding sub-index, the device restores the appropriate parameters and confirms this with an SDO response (initiate download response). If the restoring has failed, then the device responds with an Abort SDO Transfer (abort code: 0x0606 0000).
In case of a wrong signature, the device refuses to restore and responds with an Abort SDO Transfer (abort code: 0800 002xh)
The default values are set valid after the device is reset by a "communication reset". After that the parameters have to be stored to keep them after a power-on.

In case of a read access, the sub-assembly with the value 1h indicates, that the respective parameter group can

be selectively reset.
In order to make the default values valid, a reset has to be carried out. If the default values are to be saved, then after the reset a "Save" command has to be transmitted via object 0x1010.

Object description

Object number	0x1011
Variable name	Restore Defaults
Object code	ARRAY (0x8)
Data type index	Unsigned8 (0x5)

Values-Description

Sub-index	0x00
Description	Number of elements (sub-indexes) [Read Only]
Prescribed range	Unsigned8
Prescribed range	none

Sub-index	0x01
Description	Restore all default parameters (through signature "load") [Read/Write]
Prescribed range	Unsigned32
Prescribed range	none

Sub-index	0x02
Description	Restore communication default parameters (through signature "load") [Read/Write]
Prescribed range	Unsigned32
Prescribed range	none

Sub-index	0x03
Description	Restore application default parameters (through signature "load") [Read/Write]
Prescribed range	Unsigned32
Prescribed range	none

5.2.9 COB-ID Emergency

This object defines the COB-ID of the "Emergency" object (EMCY).

Description COB-ID:

	MSB				LSB
Bits	31	30	29	28-11	10-0
11-bit-ID	0 / 1	0 / 1	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	11-Bit Identifier
29-bit-ID	0 / 1	0 / 1	1	29-Bit Identifier	

Object description

Object number	0x1014
Variable name	COB-ID Emergency Object
Object code	VAR (0x7)
Data type index	Unsigned32 (0x7)

Length	4

Values-Description

Description	COB-ID by the EMCY [Read / Write]
Prescribed range	Unsigned32
Default Value	0x80 + Node-ID

5.2.10 Producer Heartbeat Time

The producer heartbeat time defines the cycle time for the heartbeat, in case of the value 0, the heartbeat is switched-off.
This object can only be changed if the guard time is set to 0. If not, the device send a abort SDO transfer (abort code: 0x060A 0023).

Object description

Object number	0x1017
Variable name	Producer Heartbeat Time
Object code	VAR (0x7)
Data type index	Unsigned16 (0x6)
Length	2

Values-Description

Description	Value in ms
Prescribed range	Unsigned16

5.2.11 Identity Object

The object contains general information about the device. The sub-index 01 contains the Vendor ID. This is a unique value allocated to each manufacturer.

Object description

Object number	0x1018
Variable name	Identity Object
Object code	RECORD (0x9)
Data type index	IDENTITY (0x23)
Length	4

Values-Description

Sub–Index	0x00
Description	Number of entries [Read Only]
Prescribed range	Unsigned8 (1 to 4)
Default Value	1

Sub–Index	0x01
Description	Manufacturer identification (CiA Vendor-ID) [Read only]
Prescribed range	Unsigned32
Default Value	0x0000014D

Sub–Index	0x02

Description	Product code [Read Only]
Prescribed range	Unsigned32
Default Value	none (this value is not used)

Sub–Index	0x03
Description	Revision number [Read Only]
Prescribed range	Unsigned32
Default Value	none

Sub–Index	0x04
Description	Serial number [Read Only]
Prescribed range	Unsigned32
Default Value	none

5.2.12 Communication parameter RxPDO

Contains the communication parameters from Receive PDO1 (object 0x1400) to PDO8 (object 0x1407). The communication parameters can be changed in any way required by the user. The setting can also be made through the PASO.

Description COB-ID:

	MSB				LSB
Bits	31	30	29	28-11	10-0
11-bit-ID	0 / 1	0 / 1	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	11-Bit Identifier
29-bit-ID	0 / 1	0 / 1	1	29-Bit Identifier	

Bit Number	Value	Description
31 (MSB)	0	PDO active
	1	PDO not active
30	0	RTR to this PDO permitted
	1	No RTR to this PDO permitted
29	0	11-bit ID (CAN 2.0A)
	1	29-bit ID(CAN 2.0B)
28-11	0	If bit 29=0
	X	If bit 29=1: bits 28-11 of the 29-bit-COB_IDs
10-0 (LSB)	X	Bits 10-0 of the COB-ID

The transmission type (refer to sub-index 02) defines the transmission characteristics of the corresponding process data object. The significance is explained in chapter "PDO – Communication Parameters 12".

Object description

Object number	0x1400h – 0x1407
Variable name	RxPDO1-8 communications parameter
Object code	RECORD (0x9)
Data type index	PDO CommPar (0x20)

Values-Description

Sub-index	0x00
Description	Number of the communication parameter [Read only]

Prescribed range	Unsigned8
Default Value	2

Sub-index	0x01
Description	COB-ID used by the PDO [Read only]
Prescribed range	Unsigned32
Default Value	384 + Node-ID (RxPDO1), 640 + Node-ID (RxPDO2) 896 + Node-ID (RxPDO3), 1152 + Node-ID (RxPDO4)

Sub-index	0x02
Description	Transmission type [Read / Write] For details refer to "PDO – Communication Parameters 12"
Prescribed range	Unsigned 8
Default Value	255

5.2.13 Mapping RxPDO

Receive PDO Mapping. The WANDFLUH-Electronics electronics supports dynamic PDO mapping. The mapping of the receive data can be set with the object 0x1600 to 0x1607 and through the PASO.

To set the mapping objects, the following information about the mapped object are required:
- object index (4 Byte)
- object sub-index (2 Byte)
- object size in Bit (2Byte)

These values are put together to a hex-value.

Example for object 0x6040 (Device control word channel 1):
- object index: 0x6040
- object sub-index : 0x00
- object size: 16 [Dez] → 0x10 [Hex]

As a result the value 0x60400010 is the value for the mapping entry.

For changing the mapping, first the PDO must be blocked (refer to "Communication parameter RxPDO 41") and the number of mapping (sub-index 0) entries must be set to 0.

The following tabel shows the standard mapping.
The RxPDO 5-8 are deactivated as standard.

PDO	Object 1	Object 2	Object 3	Object 4	Transmission type	Device control mode
RxPDO1	Controllword Channel 1	Command Value VPOC Channel 1	-	-	255	1, 3
RxPDO2	Controllword Channel 2	Command Value VPOC Channel 2	-	-	255	1, 3
RxPDO3	Controllword Channel 3	Command Value VPOC Channel 3	-	-	255	1, 3
RxPDO4	Controllword Channel 4	Command Value VPOC Channel 4	-	-	255	1, 3

Object description

Object number	0x1600-0x1607
Variable name	RxPDO1 – RxPDO8 Mapping
Object code	RECORD (0x9)
Data type index	PDO mapping parameter (0x21)

Values-Description

Sub-index	0x00
Description	Number of mapped objects [Read/Write]
Prescribed range	Unsigned8 (0 to 64)
Default Value	Refer to above table

Sub-index	0x01
Description	1. mapped object [Read/Write]
Prescribed range	Unsigned32
Default Value	Refer to above table

Sub-index	0x02
Description	2. mapped object [Read/Write]
Prescribed range	Unsigned32
Default Value	Refer to above table

Sub-index	0x03
Description	3. mapped object [Read/Write]
Prescribed range	Unsigned32
Default Value	Refer to above table

Sub-index	0x04
Description	4. mapped object [Read/Write]
Prescribed range	Unsigned32
Default Value	Refer to above table

5.2.14 Communication parameter TxPDO

Contains the communication parameters from Transmit PDO1 (object 0x1800) to PDO8 (object 0x1807). The communication parameters can be changed in any way required by the user. The setting can also be made through the PASO.

Description COB-ID:

	MSB				LSB
Bits	31	30	29	28-11	10-0
11-bit-ID	0 / 1	0 / 1	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	11-Bit Identifier
29-bit-ID	0 / 1	0 / 1	1	29-Bit Identifier	

Bit Number	Value	Description
31 (MSB)	0	PDO active
	1	PDO not active
30	0	RTR to this PDO permitted
	1	No RTR to this PDO permitted

29	0	11-bit ID (CAN 2.0A)
	1	29-bit ID(CAN 2.0B)
28-11	0	If bit 29=0
	X	If bit 29=1: bits 28-11 of the 29-bit-COB_IDs
10-0 (LSB)	X	Bits 10-0 of the COB-ID

The transmission type (refer to sub-index 02) defines the transmission characteristics of the corresponding process data object. The significance is explained in chapter "PDO – Communication Parameters 12".

Object description

Object number	0x1800 – 0x1807
Variable name	TxPDO1-8 communications parameter
Object code	RECORD (0x9)
Data type index	PDO CommPar (0xx20)

Values-Description

Sub-index	0x00
Description	Number of the communication parameter [Read only]
Prescribed range	Unsigned8
Default Value	2

Sub-index	0x01
Description	COB-ID used by the PDO [Read / Write]
Prescribed range	Unsigned32
Default Value	384 + Node-ID (TxPDO1), 640 + Node-ID (TxPDO2) 896 + Node-ID (TxPDO3), 1152 + Node-ID (TxPDO4)

Sub-index	0x02
Description	Transmission type [Read / Write] For details refer to "PDO – Communication Parameters 12"
Prescribed range	Unsigned 8
Default Value	255

5.2.15 Mapping TxPDO

Transmit PDO Mapping. The WANDFLUH-Electronics electronics supports dynamic PDO mapping. The mapping of the receive data can be set with the object 0x1600 to 0x1607 and through the PASO.

To set the mapping objects, the following information about the mapped object are required:
- object index (4 Byte)
- object sub-index (2 Byte)
- object size in Bit (2Byte)

These values are put together to a hex-value.

Example for object 0x6040 (Device control word channel 1):
- object index: 0x6040
- object sub-index : 0x00
- object size: 16 [Dez] → 0x10 [Hex]

As a result the value 0x60400010 is the value for the mapping entry.

For changing the mapping, first the PDO must be blocked (refer to "Communication parameter TxPDO 43") and the number of mapping (sub-index 0) entries must be set to 0.

The following tabel shows the standard mapping.
The TxPDO 5-8 are deactivated as standard.

PDO	Object 1	Object 2	Object 3	Transmission type	Device control mode
TxPDO1	Statusword Channel 1	-	-	255	1, 3
TxPDO2	Statusword Channel 2	-	-	255	1, 3
TxPDO3	Statusword Channel 3	-	-	255	1, 3
TxPDO4	Statusword Channel 4	-	-	255	1, 3

Object description

Object number	0x1A00 - 0x1A07
Variable name	TxPDO1 – TxPDO8 Mapping
Object code	RECORD (0x9)
Data type index	PDO Mapping parameter (0x21)

Werte-Beschreibung

Sub-index	0x00
Description	Number of mapped objects [Read/Write]
Prescribed range	Unsigned8 (0 to 64)
Default Value	Refer to above table

Sub-index	0x01
Description	1. mapped object [Read/Write]
Prescribed range	Unsigned32
Default Value	Refer to above table

Sub-index	0x02
Description	2. mapped object [Read/Write]
Prescribed range	Unsigned32
Default Value	Refer to above table

Sub-index	0x03
Description	3. mapped object [Read/Write]
Prescribed range	Unsigned32
Default Value	Refer to above table

Sub-index	0x04
Description	4. mapped object [Read/Write]
Prescribed range	Unsigned32
Default Value	Refer to above table

5.3 Standardised Device Profile Area

Index	Sub-Index	Description	Controlmode	Datatype	min. Value	max. Value	PDO-Mapping
0x6040	0	Device control word 48		UINT16	-32768	32767	Yes
0x6041	0	Device Statusword 49		UINT16			Yes
0x6042	0	Device mode (Command value mode) 50		UINT8	1	2	Yes
0x6043	0	Device control mode (Controller mode) 50		INT8	-128	127	Yes
0x604F	0	Device local (Operating mode) 50		UINT8	0	1	Yes
0x6050	0	Device version 50		VSTRING			No
0x6052	0	Device serial number 50		VSTRING			No
0x6054	0	Device model description 50		VSTRING			No
0x6057	0	Device vendor name 50		VSTRING			No
0x605F	0	Device capability 51		UINT32			No
0x6300	0	vpoc set point 51	vpoc	UINT8			No
	1		vpoc	INT16	-32768	32767	Yes
0x6330	0	vpoc ramp type 51	vpoc	INT8	-128	127	No
0x6332	0	vpoc dvg ramp acceleration time positive 51	vpoc	UINT8			No
	1		vpoc	UINT16	0	51000	No
0x6333	0	vpoc dvg ramp acceleration time negative 52	vpoc	UINT8			No
	1		vpoc	UINT16	0	51000	No
0x6335	0	vpoc dvg ramp deceleration time positive 52	vpoc	UINT8			No
	1		vpoc	UINT16	0	51000	No
0x6336	0	vpoc dvg ramp deceleration time negative 52	vpoc	UINT8			No
	1		vpoc	UINT16	0	51000	No
0x6380	0	vprc set point 52	vprc (open-loop) vprc (closed-loop)	UINT8			No
	1		vprc (open-loop) vprc (closed-loop)	INT16	-32768	32767	Yes
0x6381	0	vprc actual value 52	vprc (closed-loop)	UINT8			No
	1		vprc (closed-loop)	INT16			Yes
0x63B0	0	vprc ramp type 53	vprc (open-loop)	INT8	-128	127	No
0x63B2	0	vprc dvg ramp acceleration time positive 53	vprc (open-loop)	UINT8			No
	1		vprc (open-loop)	UINT16	0	51000	No
0x63B3	0	vprc dvg ramp acceleration time negative 53	vprc (open-loop)	UINT8			No
	1		vprc (open-loop)	UINT16	0	51000	No
0x63B5	0	vprc dvg ramp deceleration time positive 53	vprc (open-loop)	UINT8			No
	1		vprc (open-loop)	UINT16	0	51000	No
0x63B6	0	vprc dvg ramp deceleration time negative 53	vprc (open-loop)	UINT8			No
	1		vprc (open-loop)	UINT16	0	51000	No
0x63D0	0	vprc control deviation 53	vprc (closed-loop)	UINT8			No
	1		vprc (closed-loop)	INT16			Yes
0x63D1	0	vprc cm type 54	vprc (closed-loop)	INT8	-2	2	No
0x63D2	0	vprc cm delay time 54	vprc (closed-loop)	UINT8			No
	1		vprc (closed-loop)	INT16	0	100	No
0x63D3	0	vprc cm threshold 54	vprc (closed-loop)	UINT8			No
	1		vprc (closed-loop)	INT16	0	16384	No
0x6480	0	dcol set point 54	dcol	UINT8			No
	1		dcol	INT32	-2147483648	2147483647	Yes
0x64B0	0	dcol ramp type 54	dcol	INT8	-128	127	No
0x64B2	0	dcol dvg ramp acceleration time positive 55	dcol	UINT8			No
	1		dcol	UINT16	0	51000	No
0x64B3	0	dcol dvg ramp acceleration time negative 55	dcol	UINT8			No
	1		dcol	UINT16	0	51000	No

Index	Sub-Index	Description	Controlmode	Datatype	min. Value	max. Value	PDO-Mapping
0x64B5	0	dcol dvg ramp deceleration time positive 55	dcol	UINT8			No
	1		dcol	UINT16	0	51000	No
0x64B6	0	dcol dvg ramp deceleration time negative 55	dcol	UINT8			No
	1		dcol	UINT16	0	51000	No
0x6500	0	dsc set point 55	dsc	UINT8			No
	1		dsc	INT32	-2147483648	2147483647	Yes
0x6501	0	dsc actual value 55	dsc	UINT8			No
	1		dsc	INT32			Yes
0x6550	0	dsc control deviation 56	dsc	UINT8			No
	1		dsc	INT32			Yes
0x6551	0	dsc cm type 56	dsc	INT8	-2	2	No
0x6552	0	dsc cm delay time 56	dsc	UINT8			No
	1		dsc	INT16	0	100	No
0x6553	0	dsc cm threshold 56	dsc	UINT8			No
	1		dsc	INT32	0	2147483647	No
0x6600	0	dpc set point 56	dpc	UINT8			No
	1		dpc	INT32	-2147483648	2147483647	Yes
0x6601	0	dpc actual value 57	dpc	UINT8			No
	1		dpc	INT32			Yes
0x6650	0	dpc control deviation 57	dpc	UINT8			No
	1		dpc	INT32			Yes
0x6651	0	dpc cm type 57	dpc	INT8	-2	2	No
0x6652	0	dpc cm delay time 57	dpc	UINT8			No
	1		dpc	INT16	0	100	No
0x6653	0	dpc cm threshold 58	dpc	UINT8			No
	1		dpc	INT32	0	2147483647	No

5.3.1 Device control word

Index	Sub Index	Datatype	Range
0x6040	0	UINT16	see description below

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 27.	
1	Hold enable (H)		
2	Device mode active (M)		
3	Reset fault (R)	Resets an error/fault	
4	Reserved		
5	Reserved		
6	Reserved		
7	Reserved		
8	Reserved		
9	Reserved	Manual mode	Moves the axis forward
10	Reserved	Manual mode	Moves the axis backward
11	Reserved		
12	Reserved		
13	Reserved	Manual mode	The fast speed is active
14	Reserved		
15	Manufacturer-specific		

5.3.2 Device Statusword

Index	Sub Index	Datatype	Range
0x6041	0	UINT16	see description below

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 27.
1	Hold enable (H)	
2	Device mode active (M)	
3	Ready (R)	
4	Reserved	Is active, if the WANDFLUH device is operated in local mode
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 error	The trailing window error is active (closed-loop modes only)
12	Target window reached	The target window is reached (closed-loop modes only)
13	Reserved	
14	Reserved	
15	Manufacturer-specific	

5.3.3 Device mode (Command value mode)

Index	Sub-Index	Datatype	Range
0x6042	0	UINT8	1: Command value from fieldbus 2: Command value local (refer to section "Device internal resolution 31")

5.3.4 Device control mode (Controller mode)

Index	Sub-Index	Datatype	Range
0x6043	0	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) -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)

5.3.5 Device local (Operating mode)

Index	Sub-Index	Datatype	Range
0x604F	0	UINT8	0: Control-word via fieldbus 1: Control-word local

5.3.6 Device version

Index	Sub-Index	Datatype	Range
0x6050	0	VSTRING	Visible String (0x09) [RO] Contains the device software version (= software version)

5.3.7 Device serial number

Index	Sub-Index	Datatype	Range
0x6052	0	VSTRING	Visible String (0x09) [RO] Contains the device serial number.

5.3.8 Device model description

Index	Sub-Index	Datatype	Range
0x6054	0	VSTRING	Visible String (0x09) [RO] It contains the device model description.

5.3.9 Device vendor name

Index	Sub-Index	Datatype	Range
0x6057	0	VSTRING	Wandfluh AG [RO] It contains the device vendor name.

5.3.10 Device capability

Index	Sub-Index	Datatype	Range
0x605F	0	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)

5.3.11 vpoc set point

Control-mode	Index	Sub-Index	Datatype	Range
vpoc (open-loop)	0x6300	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface
vprc (open-loop) vprc (closed-loop)	0x6380	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface
dcol (open-loop)	0x6480	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min ..Max Bus Interface
dsc	0x6500	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min ..Max Bus Interface
dpc	0x6650	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min ..Max Bus Interface
n-point	0x22D0	0	INT32	Min ..Max Bus Interface

5.3.12 vpoc ramp type

Index	Sub-Index	Datatype	Range
0x6330	0	INT8	0: Ramp off 3: Ramp on -1: enable ramp via dig. Input

5.3.13 vpoc dvg ramp acceleration time positive

Index	Sub-Index	Datatype	Range
0x6332	0	UINT8	1 [RO]
	1	UINT16	0 .. 50000, Resolution 10ms

5.3.14 vpoc dvg ramp acceleration time negative

Index	Sub-Index	Datatype	Range
0x6333	0	UINT8	1 [RO]
	1	UINT16	0 .. 50000, Resolution 10ms

5.3.15 vpoc dvg ramp deceleration time positive

Index	Sub-Index	Datatype	Range
0x6335	0	UINT8	1 [RO]
	1	UINT16	0 .. 50000, Resolution 10ms

5.3.16 vpoc dvg ramp deceleration time negative

Index	Sub-Index	Datatype	Range
0x6336	0	UINT8	1 [RO]
	1	UINT16	0 .. 50000, Resolution 10ms

5.3.17 vprc set point

Control-mode	Index	Sub-Index	Datatype	Range
vpoc (open-loop)	0x6300	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface
vprc (open-loop) vprc (closed-loop)	0x6380	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface
dcol (open-loop)	0x6480	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min ..Max Bus Interface
dsc	0x6500	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min ..Max Bus Interface
dpc	0x6650	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min ..Max Bus Interface
n-point	0x22D0	0	INT32	Min ..Max Bus Interface

5.3.18 vprc actual value

Control-mode	Index	Sub-Index	Datatype	Range
vprc (closed-loop)	0x6381	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface
dsc	0x6501	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min- .. Max-Reference: refer to Scaled parameter 31
dpc	0x6601	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min- .. Max-Reference: refer to Scaled parameter 31
n-point	0x2281	0	INT32	Min- .. Max-Reference: refer to Scaled parameter 31

5.3.19 vprc ramp type

Index	Sub-Index	Datatype	Range
0x63B0	0	INT8	0: Ramp off 3: Ramp on -1: enable ramp via dig. Input

5.3.20 vprc dvg ramp acceleration time positive

Index	Sub-Index	Datatype	Range
0x63B2	0	UINT8	1 [RO]
	1	UINT16	0 .. 50000, Resolution 10ms

5.3.21 vprc dvg ramp acceleration time negative

Index	Sub-Index	Datatype	Range
0x63B3	0	UINT8	1 [RO]
	1	UINT16	0 .. 50000, Resolution 10ms

5.3.22 vprc dvg ramp deceleration time positive

Index	Sub-Index	Datatype	Range
0x63B5	0	UINT8	1 [RO]
	1	UINT16	0 .. 50000, Resolution 10ms

5.3.23 vprc dvg ramp deceleration time negative

Index	Sub-Index	Datatype	Range
0x63B6	0	UINT8	1 [RO]
	1	UINT16	0 .. 50000, Resolution 10ms

5.3.24 vprc control deviation

Control-mode	Index	Sub-Index	Datatype	Range
vprc (closed-loop)	0x63D0	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface
dsc	0x6550	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min- .. Max-Reference: refer to Scaled parameter 31
dpc	0x6650	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min- .. Max-Reference: refer to Scaled parameter 31
n-point	0x22D0	0	INT32	Min- .. Max-Reference: refer to Scaled parameter 31

5.3.25 vprc cm type

Index	Sub-Index	Datatype	Range
0x63D1	0	INT8	0: off 2: Trailing window monitoring on -2: Trailing window monitoring on (raises error)

5.3.26 vprc cm delay time

Index	Sub-Index	Datatype	Range
0x63D2	0	UINT8	1 [RO]
	1	INT16	0 .. 100: 0 .. 100ms

5.3.27 vprc cm threshold

Index	Sub-Index	Datatype	Range
0x63D3	0	UINT8	1 [RO]
	1	INT16	0 .. 16384: 0 .. 100% (refer to section "Device internal resolution 31")

5.3.28 dcol set point

Control-mode	Index	Sub-Index	Datatype	Range
vpoc (open-loop)	0x6300	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface
vprc (open-loop) vprc (closed-loop)	0x6380	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface
dcol (open-loop)	0x6480	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min ..Max Bus Interface
dsc	0x6500	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min ..Max Bus Interface
dpc	0x6650	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min ..Max Bus Interface
n-point	0x22D0	0	INT32	Min ..Max Bus Interface

5.3.29 dcol ramp type

Index	Sub-Index	Datatype	Range
0x64B0	0	INT8	0: Ramp off 3: Ramp on -1: enable ramp via dig. Input

5.3.30 dcol dvg ramp acceleration time positive

Index	Sub-Index	Datatype	Range
0x64B2	0	UINT8	1 [RO]
	1	UINT16	0 .. 50000, Resolution 10ms

5.3.31 dcol dvg ramp acceleration time negative

Index	Sub-Index	Datatype	Range
0x64B3	0	UINT8	1 [RO]
	1	UINT16	0 .. 50000, Resolution 10ms

5.3.32 dcol dvg ramp deceleration time positive

Index	Sub-Index	Datatype	Range
0x64B5	0	UINT8	1 [RO]
	1	UINT16	0 .. 50000, Resolution 10ms

5.3.33 dcol dvg ramp deceleration time negative

Index	Sub-Index	Datatype	Range
0x64B6	0	UINT8	1 [RO]
	1	UINT16	0 .. 50000, Resolution 10ms

5.3.34 dsc set point

Control-mode	Index	Sub-Index	Datatype	Range
vpoc (open-loop)	0x6300	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface
vprc (open-loop) vprc (closed-loop)	0x6380	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface
dcol (open-loop)	0x6480	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min ..Max Bus Interface
dsc	0x6500	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min ..Max Bus Interface
dpc	0x6650	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min ..Max Bus Interface
n-point	0x22D0	0	INT32	Min ..Max Bus Interface

5.3.35 dsc actual value

Control-mode	Index	Sub-Index	Datatype	Range
vprc (closed-loop)	0x6381	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface

dsc	0x6501	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min- .. Max-Reference: refer to Scaled parameter 31
dpc	0x6601	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min- .. Max-Reference: refer to Scaled parameter 31
n-point	0x2281	0	INT32	Min- .. Max-Reference: refer to Scaled parameter 31

5.3.36 dsc control deviation

Control-mode	Index	Sub-Index	Datatype	Range
vprc (closed-loop)	0x63D0	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface
dsc	0x6550	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min- .. Max-Reference: refer to Scaled parameter 31
dpc	0x6650	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min- .. Max-Reference: refer to Scaled parameter 31
n-point	0x22D0	0	INT32	Min- .. Max-Reference: refer to Scaled parameter 31

5.3.37 dsc cm type

Index	Sub-Index	Datatype	Range
0x6551	0	INT8	0: off 2: Trailing window monitoring on -2: Trailing window monitoring on (raises error)

5.3.38 dsc cm delay time

Index	Sub-Index	Datatype	Range
0x6552	0	UINT8	1 [RO]
	1	INT16	0 .. 100: 0 .. 100ms

5.3.39 dsc cm threshold

Index	Sub-Index	Datatype	Range
0x6553	0	UINT8	1 [RO]
	1	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 31"

5.3.40 dpc set point

Control-mode	Index	Sub-Index	Datatype	Range
vpoc (open-loop)	0x6300	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface
vprc (open-loop) vprc (closed-loop)	0x6380	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface
dcol (open-	0x6480	0	UINT8	0 .. 255: element count [RO]

loop)		1	INT32	Min ..Max Bus Interface
dsc	0x6500	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min ..Max Bus Interface
dpc	0x6650	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min ..Max Bus Interface
n-point	0x22D0	0	INT32	Min ..Max Bus Interface

5.3.41 dpc actual value

Control-mode	Index	Sub-Index	Datatype	Range
vprc (closed-loop)	0x6381	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface
dsc	0x6501	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min- .. Max-Reference: refer to Scaled parameter 31
dpc	0x6601	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min- .. Max-Reference: refer to Scaled parameter 31
n-point	0x2281	0	INT32	Min- .. Max-Reference: refer to Scaled parameter 31

5.3.42 dpc control deviation

Control-mode	Index	Sub-Index	Datatype	Range
vprc (closed-loop)	0x63D0	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface
dsc	0x6550	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min- .. Max-Reference: refer to Scaled parameter 31
dpc	0x6650	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min- .. Max-Reference: refer to Scaled parameter 31
n-point	0x22D0	0	INT32	Min- .. Max-Reference: refer to Scaled parameter 31

5.3.43 dpc cm type

Index	Sub-Index	Datatype	Range
0x6651	0	INT8	0: off 2: Trailing window monitoring on -2: Trailing window monitoring on (raises error)

5.3.44 dpc cm delay time

Index	Sub-Index	Datatype	Range
0x6652	0	UINT8	1 [RO]
	1	INT16	0 .. 100: 0 .. 100ms

5.3.45 dpc cm threshold

Index	Sub-Index	Datatype	Range
0x6653	0	UINT8	1 [RO]
	1	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 31"

5.4 Manufacturer Specific Profile Area

Index	Sub-Index	Description	Controlmode	Datatype	min. Value	max. Value
0x2000	0	Device node address 65				
0x2001	0	Device node baudrate 65				
0x2010	0	Supply Error Auto Reset 68		UINT8	0	1
0x2020	0	Number of Digital inputs 68		UINT8	0	255
0x2020	1 - 8	Configuration Digital input 1 ... 8 68		UINT8	0	2
0x2021	0	Number of Digital outputs 68		UINT8	0	255
0x2021	1 - 8	Configuration Digital output 1 ... 8 68		UINT8	0	2
0x2022	0	Number of internal signals 69		UINT8	0	255
0x2022	1 - 8	Configuration internal signal 1 ... 8 69		UINT8	0	2
0x2030	0	States of the Digital inputs 69		UINT8	0	255
0x2031	1	States of the Digital outputs 69		UINT8	0	255
0x2032	2	States of the internal signals 70		UINT8	0	255
0x2033	3	Active device errors 71		UINT8	0	255
0x2050 0x2051 0x2052 0x2053	0 2 4 6	Filter for analog inputs type Analog input 1 71 Filter for analog inputs type Analog input 2 71 Filter for analog inputs type Analog input 3 71 Filter for analog inputs type Analog input 4 71		UINT8	0	1
0x2050 0x2051 0x2052 0x2053	1 3 5 7	Filter for analog inputs smoothing factor Analog input 1 71 Filter for analog inputs smoothing factor Analog input 2 71 Filter for analog inputs smoothing factor Analog input 3 71 Filter for analog inputs smoothing factor Analog input 4 71		UINT8	3	6
0x2200 0x2203	0 0	Feedback value 1 Mode 68 Feedback value 2 Mode 68	n-point Controller vprc (closed-loop) dpc dsc	UINT8	1	2
0x2201 0x2204	0 0	Feedback value 1 input 16 Bit 76 IFeedback value 2 input 16 Bit 76	n-point Controller vprc (closed-loop) dpc dsc	INT16	-32768	32767
0x2202 0x2205	0 0	Feedback value 1 input 32 Bit 76 Feedback value 2 input 32 Bit 76	n-point Controller vprc (closed-loop) dpc dsc	INT32	-2147483648	2147483647
0x2209	0	Command value 2 Mode 72		UINT8	1	2
0x220A	0	Command value 2 input 16 Bit 72		INT16	-32768	32767
0x220B	0	Command value 2 input 32 Bit 72		INT32	-2147483648	2147483647
0x2220 0x2261	0 0	Signal type Feedback 1 76 Signal type Feedback 2 76	n-point Controller vprc (closed-loop) dpc dsc	UINT8	0	4
0x2221 0x2262	0 0	Analog input Feedback value 77 Analog input Feedback value 2 77	n-point Controller vprc (closed-loop) dpc	INT8	-1	Number Analog-eingänge -1

Index	Sub-Index	Description	Controlmode	Datatype	min. Value	max. Value
			dsc			
0x2222 0x2263	0 0	Digital input Feedback value 1 77 Digital input Feedback value 2 77	n-point Controller vprc (closed-loop) dpc dsc	INT8	-1	Number Digital-eingänge - 1
0x2224 0x2264	0 0	Cablebreak detection Feedback value 1 77 Cablebreak detection Feedback value 2 77	n-point Controller vprc (closed-loop) dpc dsc	UINT8	0	1
0x2225 0x2265	0 0	Lower cablebreak limit Feedback value 1 77 Lower cablebreak limit Feedback value 2 77	n-point Controller vprc (closed-loop) dpc dsc	INT32	0	2147483647
0x2226 0x2266	0 0	Upper cablebreak limit Feedback value 1 78 Upper cablebreak limit Feedback value 2 78	n-point Controller vprc (closed-loop) dpc dsc	INT32	0	2147483647
0x2227 0x2267	0 0	Min. Interface Feedback value 1 79 Min. Interface Feedback value 2 79	n-point Controller vprc (closed-loop) dpc dsc	INT32	-2147483648	2147483647
0x2228 0x2268	0 0	Max. Interface Feedback value 1 79 Max. Interface Feedback value 2 79	n-point Controller vprc (closed-loop) dpc dsc	INT32	-2147483648	2147483647
0x2229 0x2269	0 0	Min. Interface Feedback value 1 via Fieldbus 79 Min. Interface Feedback value 2 via Fieldbus 79	n-point Controller vprc (closed-loop) dpc dsc	INT32	-32768	32767
0x222A 0x226A	0 0	Max. Interface Feedback value 1 via Fieldbus 79 Max. Interface Feedback value 2 via Fieldbus 79	n-point Controller vprc (closed-loop) dpc dsc	INT32	-32768	32767
0x222B 0x226B	0 0	Min. Reference Feedback value 1 80 Min. Reference Feedback value 2 80	n-point Controller vprc (closed-loop) dpc dsc	INT32	0	2147483647
0x222C 0x22AC	0 0	Max. Reference Feedback value 1 80 Max. Reference Feedback value 2 80	n-point Controller vprc (closed-loop) dpc dsc	INT32	0	2147483647
0x2230	0	Sensor input Feedback value 1 80	n-point Controller vprc (closed-loop) dpc dsc	INT8	-1	Number Sensor-eingänge -1
0x2231	0	SSI Sensor Bit number 80	n-point Controller vprc (closed-loop) dpc dsc	UINT8	8	25
0x2232	0	SSI Sensor Sign 80	n-point Controller vprc (closed-loop) dpc dsc	UINT8	0	1
0x2233	19	SSI Sensor Offset 80	n-point Controller vprc (closed-loop) dpc dsc	INT32	-32768	32767
0x2234	0	SSI Sensor Resolution 81	n-point Controller vprc (closed-loop) dpc dsc	UINT16	0	65535
0x2260	0	Function Feedback value input 2 81	n-point Controller vprc (closed-loop) dpc dsc	UINT8	0	2

Index	Sub-Index	Description	Controlmode	Datatype	min. Value	max. Value
0x2240	0	Enable Channel 72	n-point Controller vprc (closed-loop) dpc dsc	UINT8	0	2
0x2241	0	Digital input for Enable Channel 72	n-point Controller vprc (closed-loop) dpc dsc	INT8	-1	1
0x2242	0	Mode of operation 88	vprc (open-loop) dcol vpoc	UINT8	0	3
0x2243	0	Digital input for Solenoid 2 89	vprc (open-loop) dcol vpoc	INT8	-1	1
0x2244	0	Solenoid type 89		UINT8	0	2
0x2245	0	Error evaluation Maskske 94		UINT16	0	65535
0x2246	0	Error evalutation Reaction 94		UINT8	0	3
0x2247	0	Error evalutation Digital outputs 94		UINT8	-1	0
0x224A	0	Valve t ype 89		UINT8	0	1
0x2249	0	Number of Function 94		UINT8	0	255
0x2249	1 - 10	Digital output for Function 95		UINT8	0	255
0x2250	0	Digital input for Enable Ramp 83	vprc (open-loop) dcol vpoc	UINT8	-1	1
0x2280	0	n-point Controller Command value 86	n-point Controller	INT32	-2147483648	2147483647
0x2281	0	n-point Controller Feedback value 87	n-point Controller	INT32		
0x22A0 0x22A1 0x22A2 0x22A3	0 0 0 0	Threshold 1 for n-point Controller 87 Threshold 2 for n-point Controller 87 Threshold 3 for n-point Controller 87 Threshold 4 for n-point Controller 87	n-point Controller	INT32	-2147483648	2147483647
0x22D0	0	n-point Controller Control deviation 88	n-point Controller	INT32		
0x22D1	0	n-point Controller Trailing window type 88	n-point Controller	INT8	-2	2
0x22D2	0	n-point Controller Trailing window Delay time 88	n-point Controller	UINT16	0	100
0x22D3	0	n-point Controller Trailing window Threshold 88	n-point Controller	UINT32	0	2147483647
0x2320 0x233A	0 0	Signal type Command value 1 72 Signal type Command value 2 72		UINT8	0	4
0x2321 0x233B	0 0	Analog input for Command value 1 73 Analog input for Command value 2 73		INT8	-1	Number Analog-eingänge -1
0x2322 0x233C	0 0	Digital input for Command value 1 73 Digital input for Command value 2 73		INT8	-1	Number Digital-eingänge -1
0x2324 0x233D	0 0	Cablebreak detection Command value 1 73 Cablebreak detection Command value 2 73		UINT8	0	1
0x2325 0x233E	0 0	Lower cablebreak limit Command value 1 73 Lower cablebreak limit Command value 2 73		UINT32	0	21474836470
0x2326 0x233F	0 0	Upper cablebreak limit Command value 1 74 Upper cablebreak limit Command value 2 74		UINT32	0	2147483647
0x2327 0x2340	0 0	Min. Interface Command value 1 74 Min. Interface Command value 2 74		INT32	-2147483648	2147483647
0x2328 0x2341	0 0	Max. Interface Command value 1 74 Max. Interface Command value 2 74		INT32	-2147483648	2147483647
0x2329 0x2342	0 0	Min. Interface Command value 1 via Fieldbus 75 Min. Interface Command value 2 via Fieldbus 75		INT32	-32768	32767
0x232A 0x2343	0 0	Max. Interface Command value 1 via Fieldbus 75 Max. Interface Command value 2 via Fieldbus 75		INT32	-32768	32767
0x232B 0x2344	0 0	Min. Reference Command value 1 75 Min. Reference Command value 2 75		INT32	0	2147483647
0x232C	0	Max. Reference Command value 1 75		INT32	0	2147483647

Index	Sub-Index	Description	Controlmode	Datatype	min. Value	max. Value
0x2345	0	Max. Reference Command value 2 75				
0x232D	0	Deadband Function for Command value 76	vprc (open-loop) dcol vpoc	UINT8	0	1
0x232E	0	Deadband Command value 65	vprc (open-loop) dcol vpoc	INT16	0	16384
0x2338	0	Function Input 2 Command value 75		UNIT8	0	4
0x2350 0x2351 0x2352 0x2353 0x2354 0x2355 0x2356 0x2357 0x2358 0x2359 0x235A 0x235B	0 0 0 0 0 0 0 0 0 0 0 0	Current value Analog input Command value 1 65 Current value Analog input Command value 2 65 Current value Command value after Scaling 65 Current value Command value after Command value fixed 65 Current value Command value after Ramp 65 Current value Command value for Solenoids 65 Current value Command value for Solenoid driver 1 65 Current value Command value for Solenoid driver 2 65 Current value Active channel errors 65 Current value Active Function states 65 Current value Active Error states 65 Current value Active switching threshold 65		INT32 INT32 INT32 INT32 INT32 INT32 INT32 INT32 UINT32 UINT16 UINT16 UINT8	-2147483648 -2147483648 -2147483648 -2147483648 -2147483648 -2147483648 -2147483648 -2147483648 0 0 0 0	2147483647 2147483647 2147483647 2147483647 2147483647 2147483647 2147483647 2147483647 2147483647 65535 65535 255
0x2380	0	Command of value selection 81		INT8	0	1
0x2381	0	Number of Digital inputs for Command values fixed / Profiles 81		INT8		
0x2381	1 - 3	Selection 1 - 3 Digital input for Command values fixed / Profiles 81		INT8	-1	1
0x2382	0	Number of Command values fixed / Profiles 81		INT8		
0x2382	1 - 7	Command values fixed 1 - 7 82		INT32	-2147483648	2147483647
0x2390 0x2391 0x2392 0x2393 0x2394 0x2395	0 0 0 0 0 0	Start Enable 82 Start Digital input 82 Stop Enable 82 Stop Digital input 82 Single Sequence Enable 82 Single Sequence Digital input 82		UINT8 INT8 UINT8 INT8 UINT8 INT8	0	3
0x2396	1 - 7	Profile selection 1 - 7 82		UINT8	-1	6
0x23A0 0x23A1 0x23A2 0x23A3 0x23A4	0 0 0 0 0	Manual operation Enable 95 Manual operation Enable Digital input 95 Manual operation ForwardDigital input 95 Manual operation Backward Digital input 95 Manual operation Fast speed Digital input 95		UINT8 INT8 INT8 INT8 INT8	0	3
0x23B0 0x23B1 0x23B2 0x23B3 0x23B4 0x23B5 0x23B6 0x23B7 0x23B8 0x23B9	0 0 0 0 0 0 0 0 0 0	Switching threshold 1 Type 84 Switching threshold 1 Selection 84 Switching threshold 1 Function 84 Switching threshold 1 Threshold 84 Switching threshold 1 Delay time 84 Switching threshold 2 Type 84 Switching threshold 2 Selection 84 Switching threshold 2 Function 84 Switching threshold 2 Threshold 84 Switching threshold 2 Delay time 84		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
0x2400 0x2401	0 0	Pos. Speed Command value 83 Neg. Speed Command value 83	n-point Controller vprc (closed-loop) dpc dsc	INT32	0	2147483647
0x2402 0x2403 0x2404 0x2405 0x2406 0x2407	0 0 0 0 0 0	Target window Type 83 Target window Delay time 83 Target window Threshold 83 Solenoid-Off window Type 83 Solenoid-Off window Delay time 83 Solenoid-Off window Threshold 83	n-point Controller vprc (closed-loop) dpc dsc	INT8 INT16 INT32 INT8 INT16 INT32	0	2
0x2420	0	Displayed unit 84	n-point Controller vprc (closed-loop)	UINT8	0	12

Index	Sub-Index	Description	Controlmode	Datatype	min. Value	max. Value
			dpc dsc			
0x2422	0	Command value feed forward 85	n-point Controller vprc (closed-loop) dpc dsc	INT16	0	10000
0x2423	0	Velocity feed forward 85	n-point Controller vprc (closed-loop) dpc dsc	INT16	0	10000
0x2424	0	I-type 85	n-point Controller vprc (closed-loop) dpc dsc	INT8	0	1
0x2425	0	I-term, if control deviation > I-Window 85	n-point Controller vprc (closed-loop) dpc dsc	INT8	0	2
0x2426 0x2427	0 0	P-Ampl. positive 85 P-Ampl. negative 85	n-point Controller vprc (closed-loop) dpc dsc	UINT16	0	25000
0x2428 0x2429	0 0	I-Time positive 86 I-Time negative 86	n-point Controller vprc (closed-loop) dpc dsc	UINT16	0	10000
0x242A 0x242B	0 0	I-Window outside positive 86 I-Window outside negative 86	n-point Controller vprc (closed-loop) dpc dsc	UINT32	0	2147483647
0x242C 0x242D	0 0	I-Window inside positive 86 I-Window inside negative 86	n-point Controller vprc (closed-loop) dpc dsc	UINT32	0	2147483647
0x242E 0x242F	0 0	D-Time positive 86 D-Time negative 86	n-point Controller vprc (closed-loop) dpc dsc	UINT16	0	10000
0x2430 0x2431	0 0	D-Ampl. positive 86 D-Ampl. negative 86	n-point Controller vprc (closed-loop) dpc dsc	UINT16	0	10000
0x244A 0x24EB	0 0	Pos. Acceleration Command value 83 Neg. Acceleration Command value 83	n-point Controller vprc (closed-loop) dpc dsc	UINT32	0	2147483647
0x244C 0x244D	0 0	Pos. Deceleration Command value 83 Neg. Deceleration Command value 83	n-point Controller vprc (closed-loop) dpc dsc	UINT32	0	2147483647
0x2460 0x2461	0 0	slow speed Speed Manual operation 96 Fast speed Speed Manual operation 96	n-point Controller vprc (closed-loop) dpc dsc	UINT32	0	2147483647
0x2470	0	Control deviation Scaling 85	n-point Controller vprc (closed-loop) dpc dsc	UINT8	0	1
0x2471	0	Control deviation for 100% control value 85	n-point Controller vprc (closed-loop) dpc dsc	UINT32	0	2147483647
0x2480 0x2481	0 0	Current value Analog input Feedback value 1 65 Current value Analog input Feedback value 2 65	n-point Controller vprc (closed-loop) dpc dsc	INT32	-2147483648	2147483647

Index	Sub-Index	Description	Controlmode	Datatype	min. Value	max. Value
0x2482	0	Active state of windows 65	n-point Controller vprc (closed-loop) dpc dsc	UINT8	0	255
0x24A0	0	Used Analog output 96		INT8	-1	Number Analog-ausgämge -1
0x24A1	0	Signal types Analog output 96		UINT8	0	4
0x24A2	0	Min. Interface Analog output 96		INT32	-2147483648	2147483647
0x24A4	0	Max. Interface Analog output 96		INT32	-2147483648	2147483647
0x24A5	0	Min. Reference Analog output 96		INT32	-2147483648	2147483647
0x24A7	0	Max. Reference Analog output 98		INT32	-2147483648	2147483647
0x24B0 0x24B1	0 0	Current value Control value Analog output 65 Current value Analog output 65		INT32	-2147483648	2147483647
0x2500 0x2580	0 0	Used Solenoid output 1 89 Used Solenoid output 2 89		INT8	-1	1
0x2501 0x2581	0 0	Enable Solenoid 1 89 Enable Solenoid 2 89		UINT8	0	2
0x2502 0x2582	0 0	Digital input for Enable Solenoid 1 89 Digital input for Enable Solenoid 2 89		UINT8	0	1
0x2503 0x2583	0 0	Invertierung Solenoid 1 90 Invertierung Solenoid 2 90		UINT8	0	1
0x2504 0x2584	0 0	Imin always active Solenoid 1 90 Imin always active Solenoid 2 90		UINT8	0	1
0x2505 0x2585	0 0	Cablebreak detection Solenoid 1 90 Cablebreak detection Solenoid 2 90		UINT8	0	1
0x2506 0x2586	0 0	Imin Solenoid 1 90 Imin Solenoid 2 90		UINT16	0	16384
0x2507 0x2587	0 0	Imax Solenoid 1 91 Imax Solenoid 2 91		UINT16	0	16384
0x2508 0x2588	0 0	Dither-Function Solenoid 1 92 Dither-Function Solenoid 2 92		UINT8	0	1
0x2509 0x2589	0 0	Dither Frequency Solenoid 1 92 Dither Frequency Solenoid 2 92		UINT16	2	250
0x250A 0x258A	1 0	Dither Level Solenoid 1 92 Dither Level Solenoid 2 92		UINT16	0	16384
0x250B 0x258B	0 0	Switching on Threshold Solenoid 1 93 Switching on Threshold Solenoid 2 93		UINT16	0	16384
0x250C 0x258C	0 0	Switching off Threshold Solenoid 1 93 Switching off Threshold Solenoid 2 93		UINT16	0	16384
0x250D 0x258D	0 0	Reduction time Solenoid 1 93 Reduction time Solenoid 2 93		UINT16	0	10000
0x250E 0x258E	0 0	Reduced value Solenoid 1 93 Reduced value Solenoid 2 93		UINT16	0	16384
0x250F 0x258F	0 0	Lower Imin (S1578) Solenoid 1 91 Lower Imin (S1578) Solenoid 2 91		UINT16	0	16384
0x2510 0x2590	0 0	Upper Imax (S1578) Solenoid 1 91 Upper Imax (S1578) Solenoid 2 91		UINT16	0	16384
0x2530 0x2531 0x25B0 0x25B1	0 0 0 0	Current value Command solenoid current Solenoid 1 65 Current value Actual solenoid current Solenoid 2 65 Current value Command solenoid current Solenoid 2 65 Current value Actual solenoid current Solenoid 2 65		UINT16	0	16384
0x2520 0x2521 0x2521 0x25B0	0 0 1 - 9 0	Characteristic optimisation Solenoid 1 93 Characteristic optimisation Solenoid 1 93 Characteristic optimisation Solenoid 1 93 Characteristic optimisation Solenoid 2 93		UINT8 UINT8 UINT32 UINT8	0 0 0 0	1 255 2147483647 1

Index	Sub-Index	Description	Controlmode	Datatype	min. Value	max. Value
0x25B1	0	Characteristic optimisation Solenoid 2 93		UINT8	0	255
0x25B1	1 - 9	Characteristic optimisation Solenoid 2 93		UINT32	0	2147483647

5.4.1 Device node address

The node address of the WANDFLUH device can be set via CAN. The set node address is just active when the device will be reset with the command "communication reset". The same is possible with switch off and on again, but the parameter must be saved before.

Index	Sub-Index	Datatype	Range
0x2000	0	UINT8	1 .. 127

5.4.2 Device node baudrate

The baudrate of the WANDFLUH device can be set via CAN. The set node address is just active when the device will be reset with the command "communication reset". The same is possible with switch off and on again, but the parameter must be saved before.

Index	Sub-Index	Datatype	Range
0x2001	0	UINT16	20 : 20kBaud 50 : 50kBaud 100 : 100kBaud 125 : 125kBaud 250 : 250kBaud 500 : 500kBaud 1000 : 1000kBaud

5.4.3 Current values (On-Line value)

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Datatype</th><th colspan="2">Range</th></tr>
<tr><td>0x2350</td><td>0</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
<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% Duty-Cycle, resolution 0.001 %</td></tr></table></td></tr>
<tr><td>0x2351</td><td>0</td><td>INT32</td><td>Analog input Command value 2</td></tr>
<tr><td>0x2480</td><td>0</td><td>INT32</td><td>Analog input Feedback value 1</td></tr>
<tr><td>0x2481</td><td>0</td><td>INT32</td><td>Analog input Feedback value 2</td></tr>
<tr><td>0x2352</td><td>0</td><td>INT32</td><td>Command value after 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 31"</td></tr>
<tr><td>0x2353</td><td>0</td><td>INT32</td><td>Command value after Command values fixed</td></tr>
<tr><td>0x2354</td><td>0</td><td>INT32</td><td>Command value after Ramp</td></tr>
<tr><td>0x2355</td><td>0</td><td>INT32</td><td>Command value for Solenoids</td><td rowspan="3">0 .. 16384: 0 .. 100%</td></tr>
<tr><td>0x2356</td><td>0</td><td>INT32</td><td>Command value for Solenoid driver 1</td></tr>
<tr><td>0x2357</td><td>0</td><td>INT32</td><td>Command value for Solenoid driver 2</td></tr>
<tr><td>0x2530</td><td>0</td><td>UINT16</td><td>Command solenoid current Solenoid driver 1</td><td>For setting the solenoid parameters, the adjusting range and the resolution depends on the selected solenoid type. The following table shows the relationship</td></tr>
</table>

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Datatype</th><th>Range</th></tr>
<tr><td>0x2531</td><td>0</td><td>UINT16</td><td>Actual solenoid current Solenoid driver 1</td><td rowspan="4">
<table>
<tr><th rowspan="2">Solenoid type</th><th colspan="4">Range</th></tr>
<tr><th>DSV</th><th>MD2</th><th>SD7</th><th>PD2</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><td>0 .. 16384: 0 .. 2450mA</td></tr>
<tr><td>current not measured</td><td colspan="4">0 .. 16384: 0 .. 100% Duty-Cycle</td></tr>
</table>
</td></tr>
<tr><td>0x25B0</td><td>0</td><td>UINT16</td><td>Command solenoid current Solenoid driver 2</td></tr>
<tr><td>0x25B1</td><td>0</td><td>UINT16</td><td>Actual solenoid current Solenoid driver 2</td></tr>
<tr><td>0x24B0</td><td>0</td><td>INT32</td><td>Control value Analog output</td><td>
Signal type analog output = Control value:
-100000 .. 100000: -100 .. 100%
Signal type analog output = Command value, Feedback value or Control deviation:
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 31"
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="4">Range</th></tr>
<tr><th>DSV</th><th>MD2</th><th>SD7</th><th>PD2</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><td>0 .. 16384: 0 .. 2450mA</td></tr>
<tr><td>current not measured</td><td colspan="4">0 .. 16384: 0 .. 100% Duty-Cycle</td></tr>
</table>
</td></tr>
<tr><td>0x24B1</td><td>0</td><td>INT32</td><td>Analog output</td><td colspan="2">-10000 .. 10000: -10 .. +10V, Resolution 0.001 Volt</td></tr>
<tr><td>0x2358</td><td>0</td><td>UINT32</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>0x2359</td><td>0</td><td>UINT16</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 = "Temperature 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 is active</td></tr>
</table>

Index	Sub-Index	Datatype	Range		
0x235A	0	UINT16	Active state of Error	x10 x9 x8 x7 x6 x5 x4 x3 x2 x1 x0 [RO]	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
0x2482	0	UINT8	Active state of Window	x2 x1 x0 [RO]	x0 = "Target window" x1 = "Traling 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
0x235B	0	UINT8	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

5.4.4 Supply Error Auto Reset

Index	Sub-Index	Datatype	Range
0x2010	0	UINT8	0: Auto Reset off 1: Auto Reset on

5.4.5 Number of Digital inputs

Index	Sub-Index	Datatype	Wert	Beschreibung
0x2020	0	UINT8	x [RO]	x = number of available Digital inputs

5.4.6 Configuration of Digital inputs 1 - 8

Index	Sub-Index	Datatype	Range	
0x2020	1	UINT8	Digital input 1	0: Reset digital input by software 1: Set digital input by software 2: Read digital input from external
0x2020	2	UINT8	Digital input 2	
0x2020	3	UINT8	Digital input 3	
0x2020	4	UINT8	Digital input 4	
0x2020	5	UINT8	Digital input 5	
0x2020	6	UINT8	Digital input 6	
0x2020	7	UINT8	Digital input 7	
0x2020	8	UINT8	Digital input 8	

5.4.7 Number of Digital outputs

Index	Sub-Index	Datatype	Wert	Beschreibung
0x2021	0	UINT8	x [RO]	x = number of available Digital outputs

5.4.8 Configuration Digital output 1 - 8

Index	Sub-Index	Datatype	Range	
0x2021	1	UINT8	Digital output 1	0: Reset Digital output by software 1: Set 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
0x2021	2	UINT8	Digital output 2	
0x2021	3	UINT8	Digital output 3	
0x2021	4	UINT8	Digital output 4	
0x2021	5	UINT8	Digital output 5	
0x2021	6	UINT8	Digital output 6	
0x2021	7	UINT8	Digital output 7	

Index	Sub-Index	Datatype	Range	
0x2021	8	UINT8	Digital output 8	

5.4.9 Number of internal signals

Index	Sub-Index	Datatype	Wert	Beschreibung
0x2022	0	UINT8	x [RO]	x = number of available Internal signals

5.4.10 Configuration internal signal 1 - 8

Index	Sub-Index	Datatype	Range	
0x2022	1	UINT8	Internal signal 1	0: Reset Internal signal by software 1: Set Internal signal by software 2: Internal signal is set in case of the selected function
0x2022	2	UINT8	Internal signal 2	
0x2022	3	UINT8	Internal signal 3	
0x2022	4	UINT8	Internal signal 4	
0x2022	5	UINT8	Internal signal 5	
0x2022	6	UINT8	Internal signal 6	
0x2022	7	UINT8	Internal signal 7	
0x2022	8	UINT8	Internal signal 8	

5.4.11 States of the Digital inputs

Index	Sub-Index	Datatype	Wert	Beschreibung
0x2031	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

5.4.12 States of the Digital outputs

Index	Sub-Index	Datatype	Wert	Beschreibung

0x2031	0	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

5.4.13 States of the internal signals

Index	Sub-Index	Datatype	Wert	Beschreibung
0x2032	0	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: corresponding Internal signal is not active x = 1: corresponding Internal signal is active

5.4.14 Active device errors

Index	Sub-Index	Datatype	Wert	Beschreibung
0x2033	0	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

5.4.15 Filter for analog inputs type

Index	Sub-Index	Datatype	Range	
0x2050	0	UINT8	Analog input 1	0: No filtering is active 1: The corresponding analog input is filterd with the function "exponential smoothing"
0x2051	2	UINT8	Analog input 2	
0x2052	4	UINT8	Analog input 3	
0x2053	6	UINT8	Analog input 4	

5.4.16 Filter for analog inputs smoothing factor

Index	Sub-Index	Datatype	Range	
0x2050	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
0x2051	3	UINT8	Analog input 2	
0x2052	5	UINT8	Analog input 3	
0x2053	7	UINT8	Analog input 4	

5.4.17 Enable Channel

Index	Sub-Index	Datatype	Range
0x2240	0	UINT8	0: Enable off 1: Enable on 2: external (Digital input)

5.4.18 Digital input for Enable Channel

Index	Sub-Index	Datatype	Range
0x2241	0	INT8	-1: not used 0 .. [number of digital inputs - 1]

5.4.19 Command value 2 Mode

Index	Sub-Index	Datatype	Range
0x2209	0	UINT8	1: Command value via Fieldbus 2: Command value local

The settings for the Command value 1 is described in section Devie Mode (Sollwertmodus) 50

5.4.20 Command value 2 input 16 Bit

Index	Sub-Index	Datatype	Range
0x220A	0	INT16	Min .. Max Bus Interface

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

5.4.21 Command value 2 input 32 Bit

Index	Sub-Index	Datatype	Range
0x220B	0	INT32	Min .. Max Bus Interface

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

5.4.22 Signal type Command value

Index	Sub-Index	Datatype	Range	
0x2320	0	UINT8	Command value 1	0: Voltage 1: Current 2: Digital 3: Frequency 4: PWM (refer also to section "Device internal resolution 31")
0x233A	0	UINT8	Command value 2	

5.4.23 Analog input for Command value

Index	Sub-Index	Datatype	Range	
0x2321	0	INT8	Command value 1	-1: not used 0 .. [number of analog inputs - 1]
0x233B	0	INT8	Command value 2	

5.4.24 Digital input for Command value

Index	Sub-Index	Datatype	Range	
0x2322	0	INT8	Command value 1	-1: not used 0 .. [number of digital inputs - 1]
0x233C	0	INT8	Command value 2	

5.4.25 Cablebreak detection Command value

Index	Sub-Index	Datatype	Range	
0x2324	0	UINT8	Command value 1	0: off 1: on
0x233D	0	UINT8	Command value 2	

5.4.26 Lower cablebreak limit Command value

Index	Sub-Index	Datatype	Range	
0x2325	0	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
0x233E	0	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)
Frequency	0 .. 5000000: 0 .. 5000 Hz, resolution 0.001 Hz
PWM	0 .. 100000: 0 .. 100% Duty-Cycle, resolution 0.001 %

5.4.27 Upper cablebreak limit Command value

Index	Sub-Index	Datatype	Range	
0x2326	0	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
0x233F	0	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)
Frequency	0 .. 5000000: 0 .. 5000 Hz, resolution 0.001 Hz
PWM	0 .. 100000: 0 .. 100% Duty-Cycle, resolution 0.001 %

5.4.28 Min. Interface Command value

Index	Sub-Index	Datatype	Range	
0x2327	0	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
0x2340	0	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)
Frequency	0 .. 5000000: 0 .. 5000 Hz, resolution 0.001 Hz
PWM	0 .. 100000: 0 .. 100% Duty-Cycle, resolution 0.001 %

5.4.29 Max. Interface Feedback value

Index	Sub-Index	Datatype	Range	
0x2328	0	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
0x2341	0	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)
Frequency	0 .. 5000000: 0 .. 5000 Hz, resolution 0.001 Hz

Index	Sub-Index	Datatype	Range		
				PWM	0 .. 100000: 0 .. 100% Duty-Cycle, resolution 0.001 %

5.4.30 Min. Interface Command value via Fieldbus

Index	Sub-Index	Datatype	Range	
0x2329	0	INT32	Command value 1	-32768 .. 32767 (refer also to section "Device internal resolution 31")
0x2342	0	INT32	Command value 2	

5.4.31 Max. Interface Command value via Fieldbus

Index	Sub-Index	Datatype	Range	
0x232A	0	INT32	Command value 1	-32768 .. 32767 (refer also to section "Device internal resolution 31")
0x2343	0	INT32	Command value 2	

5.4.32 Min. Reference Command value

Index	Sub-Index	Datatype	Range	
0x232B	0	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 31"
0x2344	0	INT32	Command value 2	

5.4.33 Max. Reference Command value

Index	Sub-Index	Datatype	Range	
0x232C	0	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 31"
0x2345	0	INT32	Command value 2	

5.4.34 Function Sollwerteingang 2

Index	Sub-Index	Datatype	Range
0x2338	0	UINT8	0: not used 1: add 2: multiply 3: alternatively 4: Speed

5.4.35 Deadband Function Command value

Index	Sub-Index	Datatype	Range
0x232D	0	UINT8	0: off 1: on

5.4.36 Deadband Command value

Index	Sub-Index	Datatype	Range
0x232E	0	UINT16	0 ... 16384: 0 ... 50% (refer to section "Device internal resolution")

5.4.37 Feedback value Mode

Index	Sub-Index	Datatype	Range	
0x2200	0	UINT8	Feedback value 1	1: Feedback value via Fieldbus 2: Feedback value local (refer also to section "Device internal resolution 31")
0x2203	0	UINT8	Feedback value 2	

5.4.38 Feedback value input 16 Bit

Index	Sub-Index	Datatype	Range	
0x2201	0	INT16	Feedback value 1	Min .. Max Bus Interface
0x2204	0	INT16	Feedback value 2	

5.4.39 Feedback value input 32 Bit

Index	Sub-Index	Datatype	Range	
0x2202	0	INT32	Feedback value 1	Min .. Max Bus Interface
0x2205	0	INT32	Feedback value 2	

5.4.40 Signal type Feedback

Index	Sub-Index	Datatype	Range	
0x2220	0	UINT8	Feedback value 1	0: Voltage 1: Current 2: Digital 3: Frequency 4: PWM (refer also to section "Device internal resolution 31")
0x2261	0	UINT8	Feedback value 2	

5.4.41 Analog input Feedback value

Index	Sub-Index	Datatype	Range	
0x2221	0	INT8	Feedback value 1	-1: not used 0 .. [number of analog inputs - 1]
0x2262	0	INT8	Feedback value 2	

5.4.42 Digital input Feedback value

Index	Sub-Index	Datatype	Range	
0x2222	0	INT8	Feedback value 1	-1: not used 0 .. [number of digital inputs - 1]
0x2263	0	INT8	Feedback value 2	

5.4.43 Cablebreak detection Feedback value

Index	Sub-Index	Datatype	Range	
0x2224	0	UINT8	Feedback value 1	0: off 1: on
0x2264	0	UINT8	Feedback value 2	

5.4.44 Lower cablebreak limit Feedback value

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Datatype</th><th colspan="2">Range</th></tr>
<tr><td>0x2225</td><td>0</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
<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% Duty-Cycle, resolution 0.001 %</td></tr></table></td></tr>
<tr><td>0x2265</td><td>0</td><td>INT32</td><td>Feedback value 2</td></tr>
</table>

5.4.45 Upper cablebreak limit Feedback value

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Datatype</th><th colspan="2">Range</th></tr>
<tr><td>0x2226</td><td>0</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
<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% Duty-Cycle, resolution 0.001 %</td></tr>
</table></td></tr>
<tr><td>0x2266</td><td>0</td><td>INT32</td><td>Feedback value 2</td></tr>
</table>

5.4.46 Min. Interface Feedback value

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Datatype</th><th colspan="2">Range</th></tr>
<tr><td>0x2227</td><td>0</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
<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% Duty-Cycle, resolution 0.001 %</td></tr></table></td></tr>
<tr><td>0x2267</td><td>0</td><td>INT32</td><td>Feedback value 2</td></tr>
</table>

5.4.47 Max. Interface Feedback value

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Datatype</th><th colspan="2">Range</th></tr>
<tr><td>0x2228</td><td>0</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
<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% Duty-Cycle, resolution 0.001 %</td></tr></table></td></tr>
<tr><td>0x2268</td><td>0</td><td>INT32</td><td>Feedback value 2</td></tr>
</table>

5.4.48 Min. Interface Feedback value via Fieldbus

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Datatype</th><th colspan="2">Range</th></tr>
<tr><td>0x2229</td><td>0</td><td>INT32</td><td>Feedback value 1</td><td rowspan="2">-32768 ... 32767 (refer also to section "Device internal resolution 31")</td></tr>
<tr><td>0x2269</td><td>0</td><td>INT32</td><td>Feedback value 2</td></tr>
</table>

5.4.49 Max. Interface Feedback value via Fieldbus

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Datatype</th><th colspan="2">Range</th></tr>
<tr><td>0x222A</td><td>0</td><td>INT32</td><td>Feedback value 1</td><td>-32768 ... 32767</td></tr>
</table>

Index	Sub-Index	Datatype	Range	
0x226A	0	INT32	Feedback value 2	

5.4.50 Min. Reference Feedback value

Index	Sub-Index	Datatype	Range	
0x222B	0	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 31"
0x226B	0	INT32	Feedback value 2	

5.4.51 Max. Reference Feedback value

Index	Sub-Index	Datatype	Range	
0x222C	0	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 31"
0x226C	0	INT32	Feedback value 2	

5.4.52 Sensor input Feedback value

Index	Sub-Index	Datatype	Range
0x2230	0	INT8	-1: not used 0 .. [number of sensor inputs - 1]

5.4.53 SSI Sensor Bit number

Index	Sub-Index	Datatype	Range
0x2231	0	UINT8	0 ... 25 Bits

5.4.54 SSI Sensor Sign

Index	Sub-Index	Datatype	Range
0x2232	0	UINT8	0: Handling of the sign off 1: Handling of the sign on

5.4.55 SSI Sensor Offset

Index	Sub-Index	Datatype	Range
0x2233	0	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 31"

5.4.56 SSI Sensor Resolution

Index	Sub-Index	Datatype	Range
0x2234	0	UINT16	1 ... 1000, Resolution 0.001 (refer also to section "Device internal resolution 31")

5.4.57 Function Feedback value input 2

Index	Sub-Index	Datatype	Range
0x2260	0	UINT8	0: not used 1: differentiel 2: absolute differentiel

5.4.58 Command value selection

Index	Sub-Index	Datatype	Range
0x2380	0	UINT8	0: Command value fixed / Profile Generator / Profile Position Mode not active 1: Command values fixed active 2: Profile Generator active 3: Profile Position Mode active

5.4.59 Number Digital inputs for Command values fixed / Profiles

Index	Sub-Index	Datatype	Wert	Beschreibung
0x2381	0	UINT8	x [RO]	number of digital inputs for Command values fixed / Profile Generator

f

5.4.60 Selection Digital input for Command values fixed / Profiles

Index	Sub-Index	Datatype	Range	
0x2381	1	INT8	Selection 1	-1: not used 0 .. [number of digital inputs - 1]
0x2381	2	INT8	Selection 2	
0x2381	3	INT8	Selection 4	

Depending on number of digital inputs for Command values fixed / Profile Generator 81 this parameter is may be not present.

5.4.61 Number of Command values fixed / Profiles

Index	Sub-Index	Datatype	Wert	Beschreibung
0x2382	0	UINT8	x [RO]	Number of Command values fixed / Profiles

5.4.62 Command values fixed

Index	Sub-Index	Datatype	Range	
0x2382	1	INT32	Festsollwert 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 31"
0x2382	2	INT32	Festsollwert 2	
0x2382	3	INT32	Festsollwert 3	
0x2382	4	INT32	Festsollwert 4	
0x2382	5	INT32	Festsollwert 5	
0x2382	6	INT32	Festsollwert 6	
0x2382	7	INT32	Festsollwert 7	

Abhängig von der number of command values fixed / Profiles 81 ist dieser Parameter ev. not present.

5.4.63 Profile generator control

Index	Sub-Index	Datatype	Range	
0x2390	0	UINT8	Start Enable	0: Enable off 1: Enable on 2: external (Digital input) 3: external invertiert (Digital input)
0x2391	0	INT8	Start Digital input	-1: not used 0 .. [number of digital inputs - 1]
0x2392	0	UINT8	Stop Enable	0: Enable off 1: Enable on 2: external (Digital input) 3: external invertiert (Digital input)
0x2393	0	INT8	Stop Digital input	-1: not used 0 .. [number of digital inputs - 1]
0x2394	0	UINT8	Single Sequence Enable	0: Enable off 1: Enable on 2: external (Digital input) 3: external invertiert (Digital input)
0x2395	0	INT8	Single Sequence Digital input	-1: not used 0 .. [number of digital inputs - 1]

5.4.64 Profile selection

Index	Sub-Index	Datatype	Range	
0x2396	1	UINT8	Profile selection 1	-1: not used 0 .. [number of command values fixed / Profiles - 1]
0x2396	2	UINT8	Profile selection 2	
0x2396	3	UINT8	Profile selection 3	
0x2396	4	UINT8	Profile selection 4	

Index	Sub-Index	Datatype	Range	
0x2396	5	UINT8	Profile selection 5	
0x2396	6	UINT8	Profile selection 6	
0x2396	7	UINT8	Profile selection 7	

Abhängig von der number of command values fixed / Profiles 81 ist dieser Parameter ev. not present.

5.4.65 Digital input for Enable Ramp

Index	Sub-Index	Datatype	Range
0x2250	0	UINT8	-1: not used 0 .. [number of digital inputs - 1]

5.4.66 Speed Command value

Index	Sub-Index	Datatype	Range	
0x2400	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 31"
0x2401	0	INT32	negative	

5.4.67 Acceleration Command value

Index	Sub-Index	Datatype	Range	
0x244A	0	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 31"
0x24EB	0	UINT32	negative	

5.4.68 Deceleration Command value

Index	Sub-Index	Datatype	Range	
0x244C	0	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 31"
0x244D	0	UINT32	negative	

5.4.69 Window control

Index	Sub-Index	Datatype	Range	
0x2402	0	INT8	Target window Type	0: off 2: on
0x2403	0	INT16	Target window Delay time	0 .. 100: 0 .. 100ms

Index	Sub-Index	Datatype	Range	
0x2404	0	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 31"
0x2405	0	INT8	Solenoid-off window Type	0: off 2: on
0x2406	0	INT16	Solenoid-off window Delay time	0 .. 100: 0 .. 100ms
0x2407	0	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 31"

5.4.70 Switching threshold control

Index	Sub-Index	Datatype	Range	
0x23B0 0x23B5	0	UINT8	Switching threshold 1 Type Switching threshold 2 Type	0: off 1: on with error 2: on without error
0x23B1 0x23B6	0	UINT8	Switching threshold 1 Selection Switching threshold 2 Selection	0: Command value 1: Feedback value
0x23B2 0x23B7	0	UINT8	Switching threshold 1 Function Switching threshold 2 Function	0: < (less than) 1: > (more than)
0x23B3 0x23B8	0	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 31"
0x23B4 0x23B9	0	INT16	Switching threshold 1 Delay time Switching threshold 2 Delay time	0 .. 100: 0 .. 100ms

5.4.71 Displayed unit

Index	Sub-Index	Datatype	Range
0x2420	0	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 31")

5.4.72 Command feed forward

Index	Sub-Index	Datatype	Range
0x2422	0	INT16	0 .. 10000: 0 .. 10, Resolution 0.001

5.4.73 Velocity feed forward

Index	Sub-Index	Datatype	Range
0x2423	0	INT16	0 .. 10000: 0 .. 10, Resolution 0.001

5.4.74 I-type

Index	Sub-Index	Datatype	Range
0x2424	0	INT8	0: off 1: on

5.4.75 I-Term, if control deviation is > I-Window

Index	Sub-Index	Datatype	Range
0x2425	0	INT8	0: set to 0 1: leave value 2: reduce

5.4.76 Control deviation Scaling

Index	Sub-Index	Datatype	Range
0x2470	0	UINT8	0: no 1: yes

5.4.77 Control deviation for 100% control value

Index	Sub-Index	Datatype	Range
0x2471	0	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 31"

5.4.78 P-Ampl.

Index	Sub-Index	Datatype	Range	
0x2426	0	UINT16	positive	0 .. 25000: 0 .. 25, Resolution 0.001
0x2427	0	UINT16	negative	

5.4.79 I-Time

Index	Sub-Index	Datatype	Range	
0x2428	0	UINT16	positive	0 .. 10000: 0 .. 10s, Resolution 0.001s
0x2429	0	UINT16	negative	

5.4.80 I-Window outside

Index	Sub-Index	Datatype	Range	
0x242A	0	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 31"
0x242B	0	UINT32	negative	

5.4.81 I-Window inside

Index	Sub-Index	Datatype	Range	
0x242C	0	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 31"
0x242D	0	UINT32	negative	

5.4.82 D-Time

Index	Sub-Index	Datatype	Range	
0x242E	0	UINT16	positive	0 .. 10000: 0 .. 10s, Resolution 0.001s
0x242F	0	UINT16	negative	

5.4.83 D-Ampl.

Index	Sub-Index	Datatype	Range	
0x2430	0	UINT16	positive	0 .. 10000: 0 .. 10, Resolution 0.001
0x2431	0	UINT16	negative	

5.4.84 n-point Controller Command value

Index	Sub-Index	Datatype	Range				
			Control-mode	Index	Sub-Index	Datatype	Range
0x2280	0	INT32	vpoc (open-loop)	0x6300	0	UINT8	0 .. 255: element count [RO]
					1	INT16	Min ..Max Bus Interface
			vprc	0x638	0	UINT8	0 .. 255: element count [RO]

Index	Sub-Index	Datatype	Range				
			(open-loop) vprc (closed-loop)	0	1	INT16	Min ..Max Bus Interface
			dcol (open-loop)	0x6480	0	UINT8	0 .. 255: element count [RO]
					1	INT32	Min ..Max Bus Interface
			dsc	0x6500	0	UINT8	0 .. 255: element count [RO]
					1	INT32	Min ..Max Bus Interface
			dpc	0x6650	0	UINT8	0 .. 255: element count [RO]
					1	INT32	Min ..Max Bus Interface
			n-point	0x22D0	0	INT32	Min ..Max Bus Interface

5.4.85 n-point Controller Feedback value

Index	Sub-Index	Datatype	Range				
			Control-mode	**Index**	**Sub-Index**	**Datatype**	**Range**
0x2281	0	INT32	vprc (closed-loop)	0x6381	0	UINT8	0 .. 255: element count [RO]
					1	INT16	Min ..Max Bus Interface
			dsc	0x6501	0	UINT8	0 .. 255: element count [RO]
					1	INT32	Min- .. Max-Reference: refer to Scaled parameter 31
			dpc	0x6601	0	UINT8	0 .. 255: element count [RO]
					1	INT32	Min- .. Max-Reference: refer to Scaled parameter 31
			n-point	0x2281	0	INT32	Min- .. Max-Reference: refer to Scaled parameter 31

5.4.86 Threshold for n-point Controller

Index	Sub-Index	Datatype	Range	
0x22A0	0	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 31"
0x22A1	0	INT32	Threshold 2	
0x22A2	0	INT32	Threshold 3	
0x22A3	0	INT32	Threshold 4	

5.4.87 n-point Controller Control deviation

Index	Sub-Index	Datatype	Range

Control-mode	Index	Sub-Index	Datatype	Range
vprc (closed-loop)	0x63D0	0	UINT8	0 .. 255: element count [RO]
		1	INT16	Min ..Max Bus Interface
dsc	0x6550	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min- .. Max-Reference: refer to Scaled parameter 31
dpc	0x6650	0	UINT8	0 .. 255: element count [RO]
		1	INT32	Min- .. Max-Reference: refer to Scaled parameter 31
n-point	0x22D0	0	INT32	Min- .. Max-Reference: refer to Scaled parameter 31

Index	Sub-Index	Datatype	Range
0x22D0	0	INT32	(see nested table)

5.4.88 n-point Controller Trailing window type

Index	Sub-Index	Datatype	Range
0x22D1	0	INT8	0: off 2: on without Error -2: on with Error

5.4.89 n-point Controller Trailing window Delay time

Index	Sub-Index	Datatype	Range
0x22D2	0	UINT16	0 .. 100: 0 .. 100ms

5.4.90 n-point Controller Trailing window Threshold

Index	Sub-Index	Datatype	Range
0x22D3	0	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 31"

5.4.91 Mode of operation

Index	Sub-Index	Datatype	Range
0x2242	0	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 DigInp)

5.4.92 Digital input for Solenoid 2

Index	Sub-Index	Datatype	Range
0x2243	0	INT8	-1: not used 0 .. [number of digital inputs - 1]

5.4.93 Valve type

Index	Sub-Index	Datatype	Range
0x224A	0	UINT8	0: Standard 2-solenoid 1: 4/3-way 1-solenoid

5.4.94 Solenoid type

Index	Sub-Index	Datatype	Range
0x2244	0	UINT8	0: Proportional solenoid without current measurement 1: Proportional solenoid with current measurement 2: Schaltmagnet without current measurement

5.4.95 Used Solenoid output

Index	Sub-Index	Datatype	Range	
0x2500	0	INT8	Solenoid-driver 1	-1: not used 0 .. [number of solenoid outputs - 1]
0x2580	0	INT8	Solenoid-driver 2	

5.4.96 Enable Solenoid

Index	Sub-Index	Datatype	Range	
0x2501	0	UINT8	Solenoid-driver 1	0: off 1: on 2: external (Digital input)
0x2581	0	UINT8	Solenoid-driver 2	

5.4.97 Digital input for Enable Solenoid

Index	Sub-Index	Datatype	Range	
0x2502	0	UINT8	Solenoid-driver 1	-1: not used 0 .. [number of digital inputs - 1]
0x2582	0	UINT8	Solenoid-driver 2	

5.4.98 Inversion Solenoid

Index	Sub-Index	Datatype	Range	
0x2503	0	UINT8	Solenoid-driver 1	0: no 1: yes
0x2583	0	UINT8	Solenoid-driver 2	

5.4.99 Imin always active

Index	Sub-Index	Datatype	Range	
0x2504	0	UINT8	Solenoid-driver 1	0: no 1: yes
0x2584	0	UINT8	Solenoid-driver 2	

5.4.100 Cablebreak detection Solenoid

Index	Sub-Index	Datatype	Range	
0x2505	0	UINT8	Solenoid-driver 1	0: off 1: on
0x2585	0	UINT8	Solenoid-driver 2	

5.4.101 Imin

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Datatype</th><th>Range</th><th></th></tr>
<tr><td>0x2506</td><td>0</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="4">Range</th></tr>
<tr><th>DSV</th><th>MD2</th><th>SD7</th><th>PD2</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><td>0 .. 16384:
0 .. 2450mA</td></tr>
<tr><td>current not measured</td><td colspan="4">0 .. 16384: 0 .. 100% Duty-Cycle</td></tr>
</table></td></tr>
<tr><td>0x2586</td><td>0</td><td>UINT16</td><td>Solenoid-driver 2</td><td></td></tr>
</table>

5.4.102 Imax

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Datatype</th><th colspan="2">Range</th></tr>
<tr><td>0x2507</td><td>0</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="4">Range</th></tr>
<tr><th>DSV</th><th>MD2</th><th>SD7</th><th>PD2</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><td>0 .. 16384: 0 .. 2450mA</td></tr>
<tr><td>current not measured</td><td colspan="4">0 .. 16384: 0 .. 100% Duty-Cycle</td></tr>
</table></td></tr>
<tr><td>0x2587</td><td>0</td><td>UINT16</td><td>Solenoid-driver 2</td></tr>
</table>

5.4.103 Lower Imin (S1578/Z465)

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Datatype</th><th colspan="2">Range</th></tr>
<tr><td>0x250F</td><td>0</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="4">Range</th></tr>
<tr><th>DSV</th><th>MD2</th><th>SD7</th><th>PD2</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><td>0 .. 16384: 0 .. 2450mA</td></tr>
<tr><td>current not measured</td><td colspan="4">0 .. 16384: 0 .. 100% Duty-Cycle</td></tr>
</table></td></tr>
<tr><td>0x258F</td><td>0</td><td>UINT16</td><td>Solenoid-driver 2</td></tr>
</table>

5.4.104 Lower Imax (S1578/Z465)

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Datatype</th><th colspan="2">Range</th></tr>
<tr><td>0x2510</td><td>0</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="4">Range</th></tr>
<tr><th>DSV</th><th>MD2</th><th>SD7</th><th>PD2</th></tr>
</table></td></tr>
<tr><td>0x2590</td><td>0</td><td>UINT16</td><td>Solenoid-driver 2</td></tr>
</table>

Index	Sub-Index	Datatype	Range				
				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	0 .. 16384: 0 .. 2450mA
				current not measured	0 .. 16384: 0 .. 100% Duty-Cycle			

5.4.105 Dither Function

Index	Sub-Index	Datatype	Range	
0x2508	0	UINT8	Solenoid-driver 1	0: off 1: on
0x2588	0	UINT8	Solenoid-driver 2	

5.4.106 Dither Frequency

Index	Sub-Index	Datatype	Range	
0x2509	0	UINT16	Solenoid-driver 1	2 .. 250: 500 .. 4Hz
0x2589	0	UINT16	Solenoid-driver 2	

5.4.107 Dither Level

Index	Sub-Index	Datatype	Range					
0x250A	0	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				
				Solenoid type	**Range**			
					DSV	**MD2**	**SD7**	**PD2**
0x258A	0	UINT16	Solenoid-driver 2	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	0 .. 16384: 0 .. 2450mA
				current not measured	0 .. 16384: 0 .. 100% Duty-Cycle			

5.4.108 Switching on Threshold Solenoid

Index	Sub-Index	Datatype	Range	
0x250B	0	UINT16	Solenoid-driver 1	0 .. 16384: 0 .. 100%
0x258B	0	UINT16	Solenoid-driver 2	

5.4.109 Switching off Threshold Solenoid

Index	Sub-Index	Datatype	Range	
0x250C	0	UINT16	Solenoid-driver 1	0 .. 16384: 0 .. 100%
0x258C	0	UINT16	Solenoid-driver 2	

5.4.110 Reduction time Solenoid

Index	Sub-Index	Datatype	Range	
0x250D	0	UINT16	Solenoid-driver 1	0 .. 10000: 0 .. 10s, Resolution 0.001s
0x258D	0	UINT16	Solenoid-driver 2	

5.4.111 Reduced value Solenoid

Index	Sub-Index	Datatype	Range	
0x250E	0	UINT16	Solenoid-driver 1	0 .. 16384: 0 .. 100%
0x258E	0	UINT16	Solenoid-driver 2	

5.4.112 Characteristic optimisation Solenoid

Characteristic optimisation on/off

Index	Sub-Index	Datatype	Value	Description
0x2520	0	UINT8	0	Characteristic optimisation sol-1 off
			1	Characteristic optimisation sol-1 on
0x25A0	0	UINT8	0	Characteristic optimisation sol-2 off
			1	Characteristic optimisation sol-1 on

Characteristic optimisation values

Index	Sub-Index	Datatype	Value	Description
0x2521	0	UINT8	9 [RO]	Characteristic optimisation point count sol-1
	1 .. 9	UINT32		Characteristic optimisation points (see below)

0x25A1	0	UINT8	9 [RO]	Characteristic optimisation point count sol-2
	1 .. 9	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

5.4.113 Error evalutaiton Mask

Index	Sub-Index	Datatype	Wert	Beschreibung
0x2245	0	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

5.4.114 Error evaluation Reaction

Index	Sub-Index	Datatype	Range
0x2246	0	UINT8	0: Solenoid 1+2 off 1: Solenoid 1 on 2: Solenoid 2 on 3: Solenoid 1+2 on

5.4.115 Error evaluation Digital output

Index	Sub-Index	Datatype	Range
0x2247	0	UINT8	-1: not used 0 .. [number of digital outputs - 1]

5.4.116 Number of function

Index	Sub-Index	Datatype	Wert	Beschreibung
0x2249	0	UINT8	x [RO]	x = number of available Functions

5.4.117 Digital output for Function

Index	Sub-Index	Datatype	Range	
0x2249	1	UINT8	Digital output for Function "Solenoid 1 active"	-1: not used 0 .. [number of digital outputs - 1]
0x2249	2	UINT8	Digital output for Function "Solenoid 2 active"	
0x2249	3	UINT8	Digital output for Function "Target window reached"	
0x2249	4	UINT8	Digital output for Function "Ready signal"	
0x2249	5	UINT8	Digital output for Function "Trailing window"	
0x2249	6	UINT8	Digital output for Function "Temperature Deraring"	
0x2249	7	UINT8	Digital output for Function "LVDT Trailing window"	
0x2249	8	UINT8	Digital output for Function "Command value 2 active"	
0x2249	9	UINT8	Digital output for Function "Sequence End"	
0x2249	10	UINT8	Digital output for Function "Profile End"	

5.4.118 Manual operation Control

Index	Sub-Index	Datatype	Range	
0x23A0	0	UINT8	Enable	0: off 1: on 2: external (Digital input) 3: external invertiert (Digital input)
0x23A1	0	INT8	Enable Digital input	-1: not used 0 .. [number of digital inputs - 1]
0x23A2	0	INT8	Forward Digital input	-1: not used 0 .. [number of digital inputs - 1] In the fieldbus mode (refer to section "Operating mode 25") the control is made via the Control Word.
0x23A3	0	INT8	Backward Digital input	-1: not used 0 .. [number of digital inputs - 1] In the fieldbus mode (refer to section "Operating mode 25") the control is made via the Control Word.
0x23A4	0	INT8	Fast speed Digital input	-1: not used 0 .. [number of digital inputs - 1] In the fieldbus mode (refer to section "Operating mode 25") the control is made via the Control Word.

5.4.119 Speed Manual operation

Index	Sub-Index	Datatype	Range	
0x2400	0	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 31"
0x2401	0	UINT32	Fast speed	

5.4.120 Used Analog output

Index	Sub-Index	Datatype	Range
0x24A0	0	INT8	-1: not used 0 .. [number of analog outputs - 1]

5.4.121 Signal type Analog output

Index	Sub-Index	Datatype	Range
0x24A1	0	UINT8	0: Control value 1: Command value 2: Feedback value 3: Control deviation 4: Solenoid current

5.4.122 Min. Interface Analog output

Index	Sub-Index	Datatype	Range
0x24A2	0	INT32	-10000 .. 10000: -10 .. 10, Resolution 0.001

5.4.123 Max. Interface Analog output

Index	Sub-Index	Datatype	Range
0x24A4	0	INT32	-10000 .. 10000: -10 .. 10, Resolution 0.001

5.4.124 Min. Reference Analog output

Index	Sub-Index	Datatype	Range
0x24A5	0	INT32	**Signal type Analog output = Control value:** -100000 .. 100000: -100 .. 100% **Signal type Analog output = Command value, Feedback value or Control deviation**: 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 31" **Signal type Analog output = Solenoid current:**

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Datatype</th><th>Range</th></tr>
<tr><td></td><td></td><td></td><td>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="4">Range</th></tr>
<tr><th>DSV</th><th>MD2</th><th>SD7</th><th>PD2</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><td>0 .. 16384:
0 .. 2450mA</td></tr>
<tr><td>current not measured</td><td colspan="4">0 .. 16384: 0 .. 100% Duty-Cycle</td></tr>
</table></td></tr>
</table>

5.4.125 Max. Reference Analog output

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Datatype</th><th>Range</th></tr>
<tr><td>0x24A7</td><td>0</td><td>INT32</td><td>
Signal type Analog output = Control value:
-100000 .. 100000: -100 .. 100%

Signal type Analog output = Command value, Feedback value or Control deviation:
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 31"

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="4">Range</th></tr>
<tr><th>DSV</th><th>MD2</th><th>SD7</th><th>PD2</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><td>0 .. 16384: 0 .. 2450mA</td></tr>
<tr><td>current not measured</td><td colspan="4">0 .. 16384: 0 .. 100% Duty-Cycle</td></tr>
</table>
</td></tr>
</table>

6 Commissioning

6.1 General

To support the WANDFLUH-Electronics -CAN commissioning, the parameterisation software PASO can be connected. PASO offers the possibility to show certain process data like command value, valve current, device state (state machine) and so on. The bus-node settings (node address and baudrate, refer to section "Fieldbus Settings 6") can also be made with PASO, as well as certain CAN-bus diagnostics (refer to section "Fieldbus Diagnostics 7").

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 7"):
   - Bus-Status = Pre-Operational)
5. In the PASO status line, the statements "Disabled" 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 EDS-file in the fieldbus master and select the desired baudrate (refer to section "Presupposition and information for the Fieldbus master 100")
2. Adjust the node address and the baudrate on the WANDFLUH-Electronics (refer to section "Presupposition for the DP-Slave controller card 100")
3. Switch on the fieldbus master
4. The WANDFLUH-Electronics can be set via the fieldbus master with the NMT-services to the status "Pre-Operational" resp. "Operational" (refer to section "Device Control Services 20")
5. In the PASO window "Fieldbus_Info" in the section "Bus State" the following statement will be displayed (refer to section "Fieldbus Diagnostics 7"):
   - Bus-Status = Pre-Operational resp. Operational

6.2.4 Test the control via the fieldbus

Set the following parameters in the declared order via PASO or with the SDO-services (refer to section "Service

Data Communication (SDO) 15"):

- Set the parameter "Device local (Operating mode) 50" to "Control-Word via Fieldbus (0)"
- Set the parameter "Device Mode (Command value mode) 50" auf "Command value via Fieldbus (1)"
- Set the parameter"Device control mode (Controller mode) 50" 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 48") must be set to logical 1. The DP-Slave controller card is now in the state "ACTIVE".
- With the SDO-services (refer to section "Service Data Communication (SDO) 15") resp. the PDO-services (refer to section "Process Data Communication (PDO) 12"). 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 27")

6.3 Presupposition for the WANDFLUH-Electronics

For the commissioning of a WANDFLUH-Electronics, the following presupposition must be cleared:

- **What is the node address of the WANDFLUH-Electronics?**
  The node address can be set via the parameterisation software PASO in the menu item "Fieldbus_Info" (refer to section "Fieldbus Settings 6")

- **What is the Device control mode (Control mode) of the WANDFLUH-Electronics?**
  The Device control mode (Control mode) can be set via the parameter ""Device control mode 50"". 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 27")

6.4 Presupposition and information for the Fieldbus master

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

- **Node address**
  What is the node address from the WANDFLUH-Electronics?

- **EDS-file**
  The EDS-file "WAGxxxC1.eds" must be present on the Master side. If not, this file must be copied into the project tool of the Master.

6.5 Delivery state

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

- Node address 1
- Baudrate 20kBaud

6.6 Parameterising

The WANDFLUH-Electronics settings can be read or changed trough CAN-bus or PASO.

After the WANDFLUH-Electronics power on, all parameter settings can be made through an SDO access. To keep the changed settings after a power cycle, they have to be stored in the nonvolatile memory. Settings can be stored with the "Save parameter" object 1010h (refer to section "Save Parameter 37").

6.7 Command value via CAN Bus

In the standard version of the WANDFLUH-Electronics, the command value can be set locally or via the Fieldbus (refer to section "Program Control 30"). The switch over is made with the parameter "Device mode (Command value mode)" 50.

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

1. The WANDFLUH-Electronics is in "pre-operational" state, there is only a communication with SDO- and NMT services available. A PDO or SYNC telegram is not possible, the device does not responds to it.
2. Through the NMT service the WANDFLUH-Electronics can be set to state "operational (refer to section " Device Control Services 20"). In this state PDO's and SYNC telegrams can be transmitted and the WANDFLUH-Electronics responds accordingly.
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 48") 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 Starting after an error

- After an error recognition the device goes immediately into the state disabled by removing the internal release. Because of the error, an emergency object will be sent and the "ready" bit in the statusword (is a part of the transmit PDO) goes to 0.
- To release the device again, the bit "reset fault" (R) has to be changed from 0 → 1 once to reset the error (refer to section "Device State Machine 27").

7 Diagnostic and error detection

A diagnositc 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:

- Bus Node Adress
- Baudrate
- Bustyp
- ID-Nummer
- Bus-Status

A detailed description of the diagnostic function you will find in the section "Fieldbus Diagnostics 7".