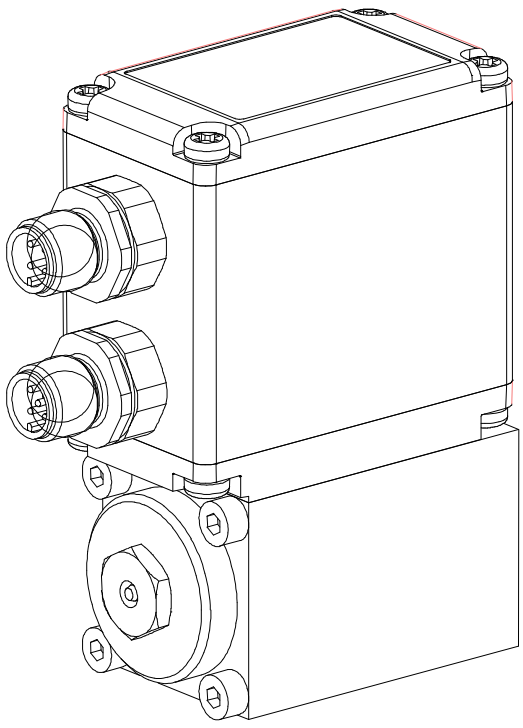
OPERATING INSTRUCTIONS
DSV

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

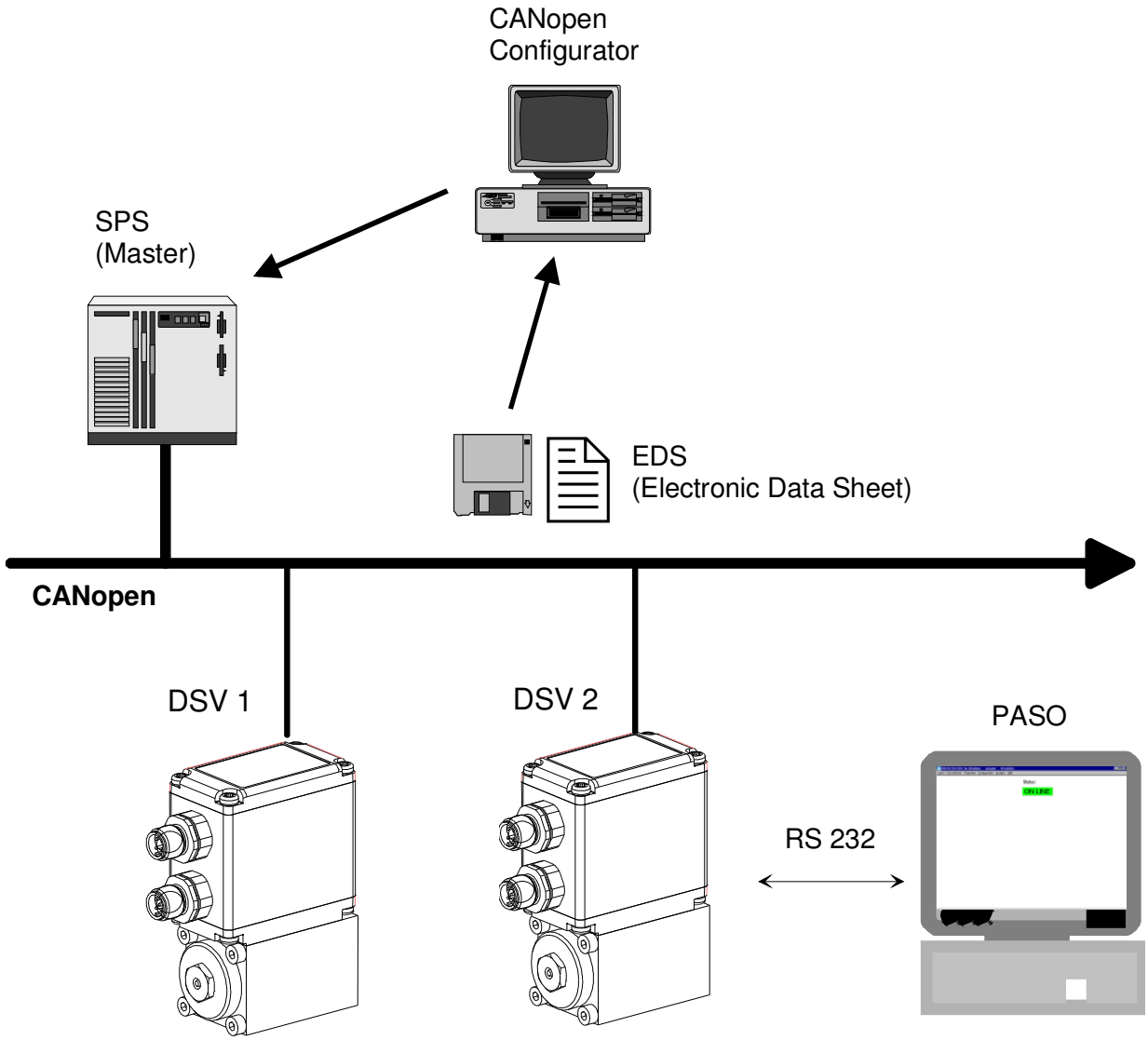
Revision 5



0 Contents

1 CANopen Technology

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), *WANDFLUH* for the DSV Electronics uses the device profile DSP-408 "Device Profile Fluid Power Technology".



1.1 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 – file for the DSV Electronics.
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.

2 Product Description

2.1 General

The present operating instructions represent a CANopen–specific extension of the DSV Electronics operating instructions.
Remark: Please read the operating instructions of the DSV 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.

2.2 Technical Data

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

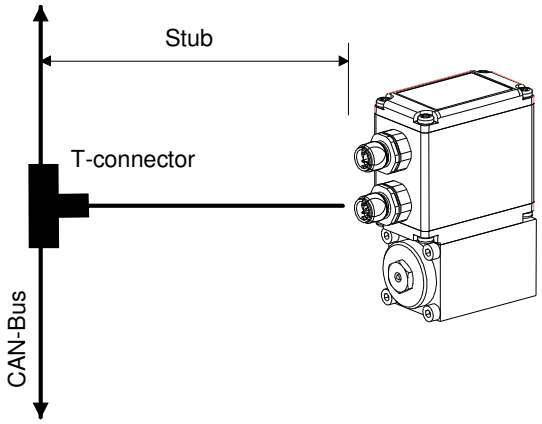
2.2.1 Physical Layer

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 DSV 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.

2.2.2 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).

A T-connector has to be used to interconnect the bus line and the bus node (the T-connector is a passive device for connecting three different connectors, bus line input, bus line output and node output).



The wiring of a CANopen "DSV" takes place through a 5-pole M12 male plug (A-coded), on the housing. The pin assignment corresponds to the specification DRP303-1.

Pin	Signal	Description
1	nc	Not connected (optional CAN screening). This connection must not be used for other purposes.
2	nc	Not connected (optional CAN - external positive supply voltage). This connection must not be used for other purposes.
3	CAN_Gnd	Mass (CAN)
4	CAN_High	Bus signal plus
5	CAN_Low	Bus signal minus

2.2.3 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.

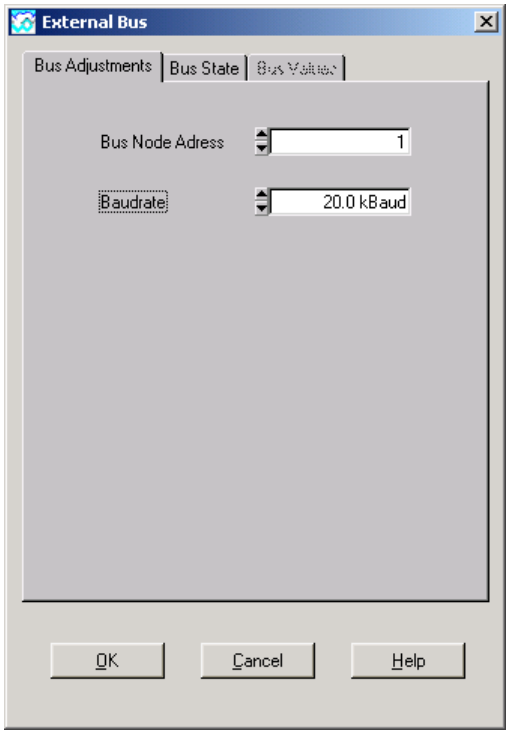
Remark: The transmission speed can be parameterized on the DSV Electronics, resp. set via the parameterization software PASO (menu "Fieldbus-Fieldbus-Info").

2.2.4 Other connectors

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

2.3 Fieldbus Settings

The following settings can be made either via the parameterization software PASO (menu "Fieldbus") 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 DSV can be set. The value set is saved on the DSV in the non-volatile memory.	1 ... 127
Baud rate	With this parameter, the required baud rate for the CAN-Slave DSV can be set. The value set is saved on the DSV in the non-volatile memory.	10, 20, 50,125, 250, 500, 1000kbaud

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

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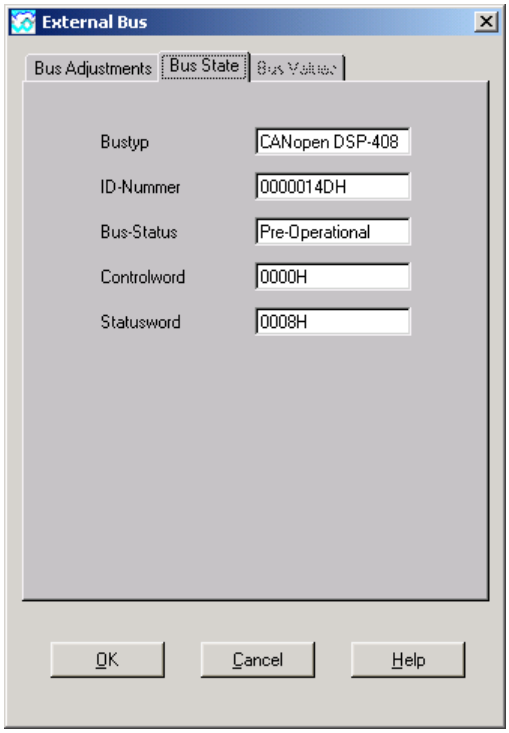
2.4 Fieldbus Diagnostics

A diagnosis of the fieldbus is possible at any time via the parameterization software PASO. This takes place through the menu point "Fieldbus_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 DSV. 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 "Start of the controlling (Boot-Up)".**	Initialization Pre-Operational Operational Stopped
Controlword	Shows the CANopen DSP-408 device controlword according to the object 6040H.	Coding see object 6040H (format in hexadecimal)
Statusword	Shows the CANopen DSP-408 device statusword according to the object 6041H.	Coding see object 6041H (format in hexadecimal)

2.5 Connection Example

As a connection example, reference is made to the operating instructions of the DSV Electronics.
All relevant digital I/O information is transmitted via the fieldbus and they are therefore not wired. As sole signal, the control enable should be connected and looped into the emergency-off path (the enable/disable, however, is not EMERGENCY-OFF (TüV) conforming).

3 Representation of a CAN Message

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	

3.1 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.

4 Communication Profile

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)

4.1 Default- Identifier-Distribution

After switching-on the *WANDFLUH* DSV 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 (FFh)	Time stamp object	1012h, 1013h
Point to point objects (referred to node address)				
Emergency	0001xxxxxxx	128 (80h) + node address	Emergency telegram	1014h, 1015h
Tx_PDO1	0011xxxxxxx	384 (180h) + node address	Transmit PDO1	1800h / 1A00h
Rx_PDO1	0100xxxxxxx	512 (200h) + node address	Receive PDO1	1400h / 1600h
Tx_PDO2	0101xxxxxxx	640 (280h) + node address	Transmit PDO2	1801h / 1A01h
Rx_PDO2	0110xxxxxxx	768 (300h) + node address	Receive PDO2	1401h / 1601h
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

4.2 Process Data Communication (PDO)

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).

4.2.1 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 DSV-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 DSV 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

4.2.2 Example for DSV Electronics PDO:

RPDO1 Output data (controlword and preset 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	preset value	not used	not used

With Control Mode 6, 7 and 9:

COB-ID	**Byte 0 + 1**	**Byte 2 + 3**	**Byte 4 + 5**	**Byte 6 + 7**
512 + node address	controlword	preset value	preset value	not used

RPDO2 Output data (controlword and preset value, refer to object 1601h):

With Control Mode 1 and 3:

COB-ID	**Byte 0 + 1**	**Byte 2 + 3**	**Byte 4 + 5**	**Byte 6 + 7**
512 + node address	controlword	preset value A	preset value B	not used

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

With Control Mode 1, 3 and 6:

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

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

With Control Mode 4:

COB-ID	**Byte 0 + 1**	**Byte 2 + 3**	**Byte 4 + 5**	**Byte 6 + 7**
384 + node address	statusword	actual value	actual value	not used

With Control Mode 7 and 9:

COB-ID	**Byte 0 + 1**	**Byte 2 + 3**	**Byte 4 + 5**	**Byte 6 + 7**
384 + node address	statusword	actual value	actual value	not used

4.3 Service Data Communication (SDO)

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* DSV electronic 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.

4.3.1 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)

4.3.2 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

4.3.3 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
0x06	0x01	0x0000	Not supported access to an 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	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
0x08	0x00	0x0000	General error

4.4 Emergency Objects (EMCY)

If an internal error occurs, then the DSV 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.

4.4.1 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 DSV, here a value corresponding to the error is indicated. In the object 1003H 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	Output current	Output current too high, short circuit detection	FAULT
3412	Power supply voltage too low	The DSV 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
5520	RAM	Profile data cannot be read from, resp. saved in memory	FAULT
5510	EPROM / EEPROM	Profile data cannot be updated after a resolution change	FAULT
5411	Valve	Solenoid A cable break or short-circuit	FAULT
5412		Solenoid B cable break or short-circuit	FAULT
8100	Communication	Communication Reset or stop node transition (see communication state machine)	FAULT

Error Register

As long as an error is present, it can be read out through the object 1001H (description under "Objects communication profile").

4.5 Network Management Objects (NMT)

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.

4.5.1 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.

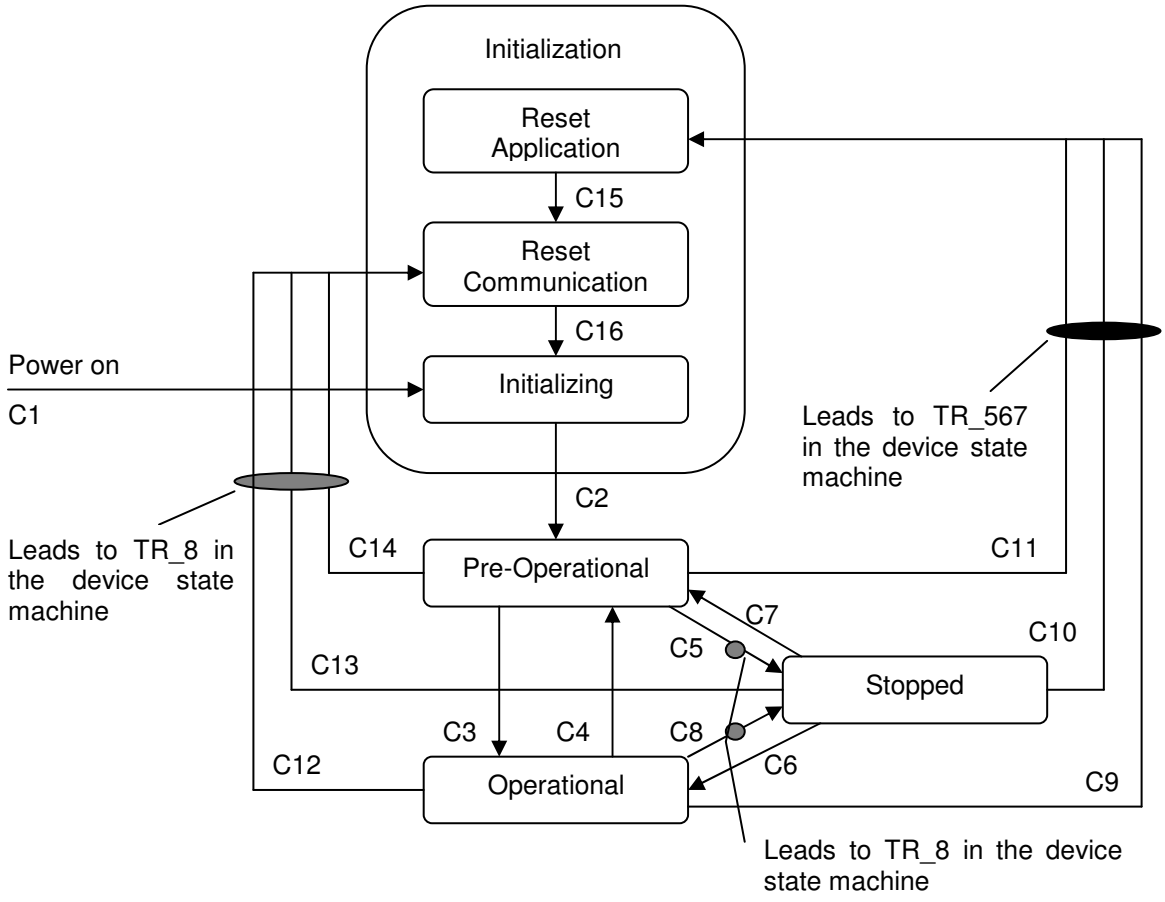
States and Communication Object Relation

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



4.5.2 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.

Heartbeat Protocol
The DSV 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

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.

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

The DSV addressed responds with the following telegram:

COB-ID	DLC	Byte 0
1792 + node address of the DSV addressed	1	Status of the DSV 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 DSV 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 DSV transmits a corresponding emergency telegram.

4.5.3 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

4.6 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.

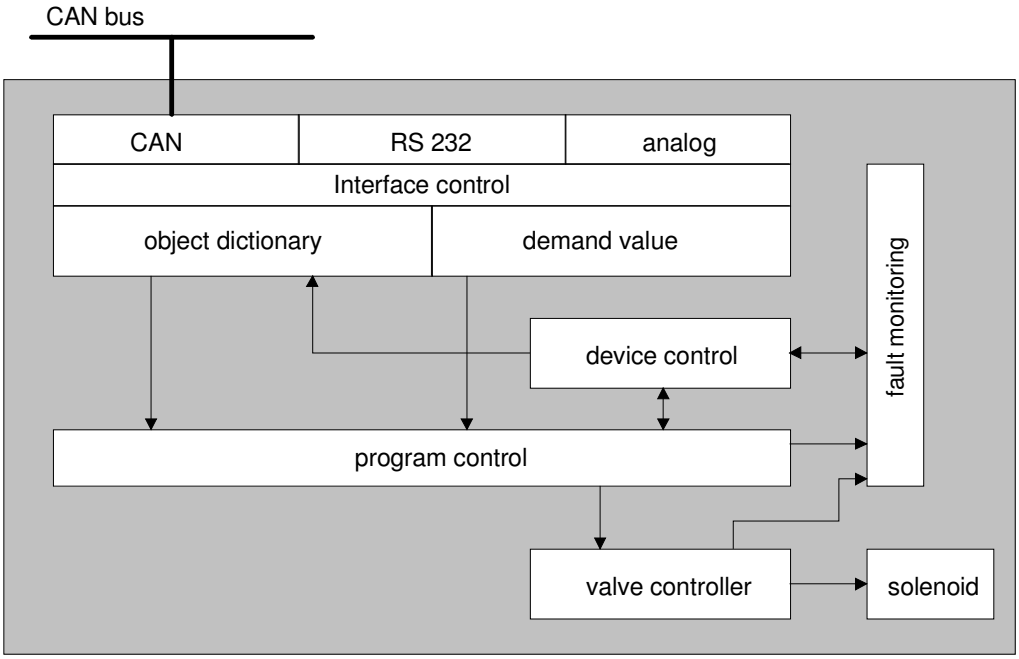
The SYNC telegram is a CAN-Message with high priority and without process dates. One device in the network generates the SYNC telegram (SYNC producer), all other devices with a synchronous PDO behavior (refer to the PDO transmission type) react to it.

To transmit a synchronous preset value, the value has to be transmitted with a synchronous receive-PDO (transmit type 0...244) first. The preset 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.

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

The device profile explains the data and their format, which are exchanged between the CANopen master and the DSV 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.

5.1 Device architecture



The DP-Slave controller card contains the complete Hardware of the DSV Electronics. This Hardware includes the interface for the Fieldbus and the interface for the parameterisation software PASO. Also included are 1 or 2 solenoid outputs for the cylinder.

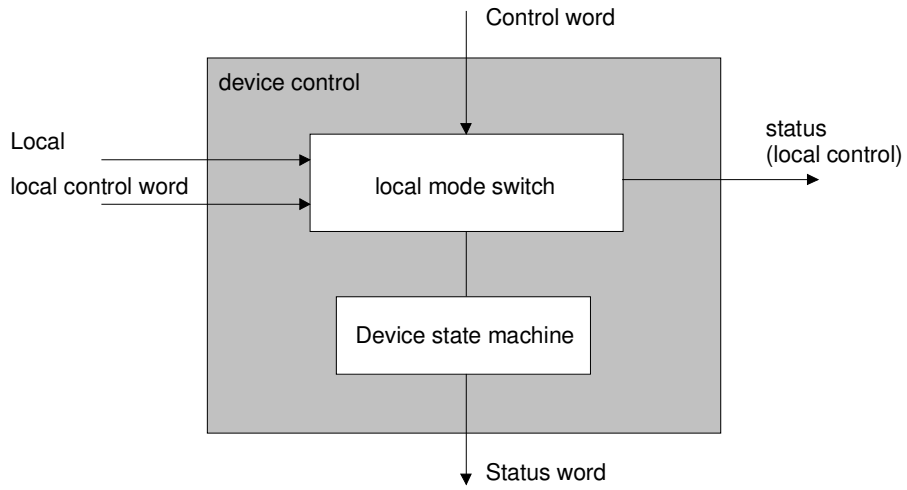
The Fieldbus control is made through a higher level Fieldbus Master.

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

5.2 Device Control

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

5.2.1 Local control

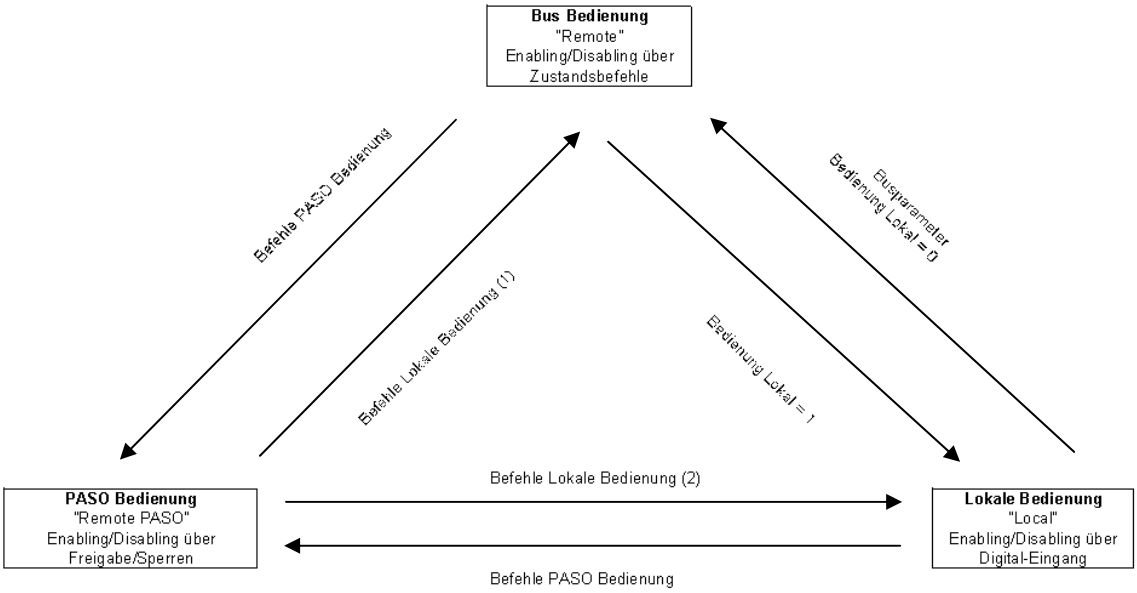


Local mode ("local")
In the local mode, the control commands and the current states will be set resp. displayed through the parameterisation software PASO. **Except of the parameter "Local", all values coming through the Fieldbus are ignored.** The local mode has 2 states: "Disabled" and "Enabled", switch over through the digital input.
To activate the local mode from the bus mode, the bus parameter "Device local=1" must be sent via the CAN-bus (condition: DSV-state "Init" or "Disabled").

PASO mode ("Remote PASO")
In the PASO mode, the control commands and the current states will be set resp. displayed through the parameterisation software PASO (equal to the local mode). The local mode has 2 states: "Disabled" and "Enabled", switch over through the PASO command "Enable" resp. "Disable".
To activate the PASO mode from the bus resp. local mode, the PASO command "PASO Control" must be activated (condition: DSV-state "Init" or "Disabled").

Bus mode ("Remote")
In the Bus mode, the control commands and the current states will be set resp. displayed through the CAN-bus. The Bus mode has several states (refer to chapter "Device State Machine" page 24), switch over through the Bus parameter "control word".
The DSV parameterisation is possible either through the Bus or through the PASO.
To activate the Bus mode from the PASO mode, the PASO command "Local Control" must be activated (condition: DSV-state "Init" or "Disabled").
To activate the Bus mode from the local mode, the bus parameter "Device local=0" must be sent via the CAN-bus (condition: DSV-state "Init" or "Disabled").

The picture on the next page shows the different possibilities of switch over the different states.



Verlassen eines Bedienungszustandes nur
wenn DSV-Zustand auf Init oder Disabled

(1) wenn Bedienung Lokal = 0
(2) wenn Bedienung Lokal = 1

Im Bedienungszustand 'PASO Disabled' ist das Senden des
Busparameters 'Bedienung Lokal' ebenfalls möglich

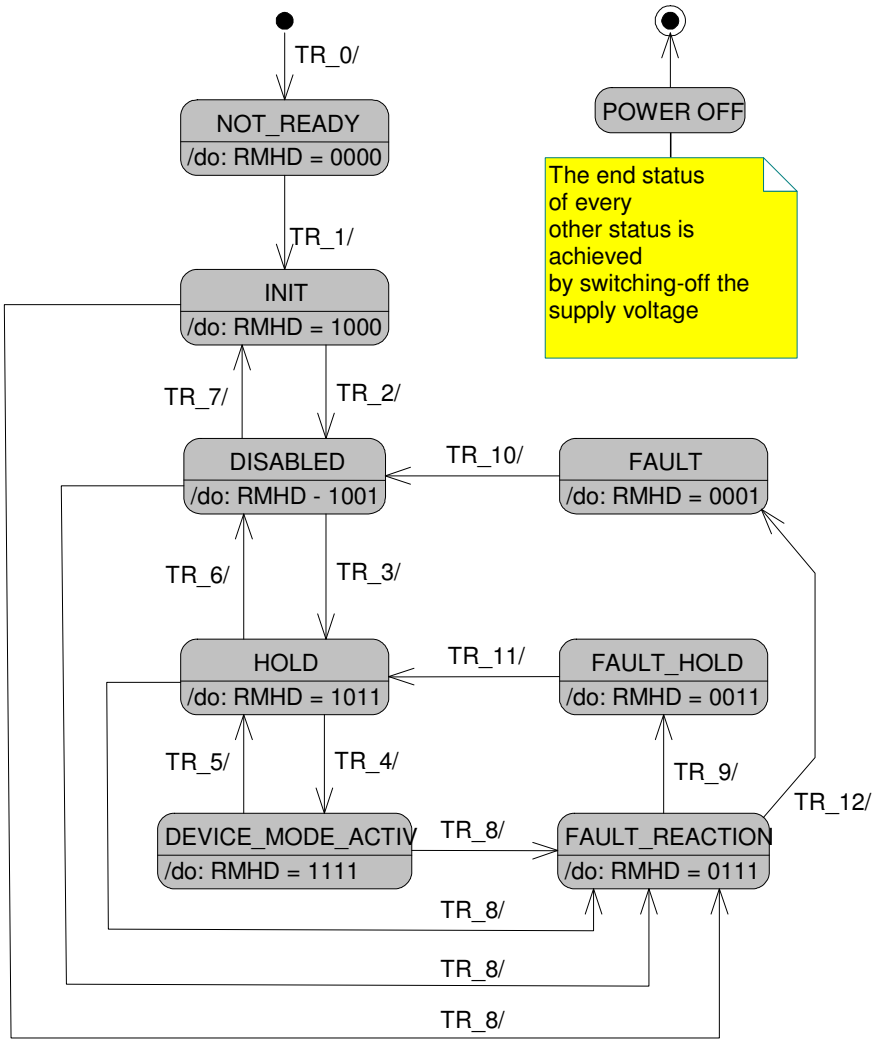
Switch over the different states

5.2.2 Device State Machine

In the following, with the help of a status diagram it is described, how the start-up of the CANopen-slave DSV 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 DSV • Self test is running • The device functions are disabled
INIT	• Device parameters can be set • Initialisation of device parameters with stored values • The device functions are disabled
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	Control word bit 7 6 5 4 3 R 2 M 1 H 0 D
TR_0	Switching-on the supply voltage	Internal transition
TR_1	Device 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. This transition can also be forced by the communication state machine (transition C5, C8, C12, C13, C14)	Internal transition
TR_9	Error reaction successful (HOLD active)	Internal transition
TR_10	Error reset (return to the status DISABLED). The "reset fault" bit in the 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
TR_567	This transition can be forced by the communication state machine (transition C9, C10, C11). Or else by the input Enable from 1 → 0	x x x x x 0 0 0

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

5.3 Program Control

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

Device Control mode	Description
Local operating mode	The DSV is operated through the local possibilities such as e.g. the digital inputs and outputs or PASO.
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 DSV amplifier.**
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 only selectable with DSV amplifier.**
Pressure control valve closed loop vprc (4)	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 measured and controlled with a pressure sensor (closed loop). **This control mode is only selectable with DSV 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 position of the axis. The Position is not measured and controlled with a position sensor (open loop). **This control mode is only selectable with DSV 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 DSV 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 DSV controller.**

Device mode	Description
Set-point value setting through the bus	The set-point-value setting for the CANopen-Slave DSV takes place through the fieldbus. This corresponds to the standard device mode.
Set-point value setting locally	The set-point value setting for the CANopen-Slave DSV takes place locally. This device mode is only possible for certain types of DSV.

The DSV can be parameterized through the CANopen; correspondingly parameter objects are available for this purpose. Depending on the Device control mode only the appropriate objects (parameters) are accessible.

5.4 DSV Object Dictionary

(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
2000 – 5FFF	Manufacturer Specific Profile Area
6000 – 9FFF	Standardised Device Profile Area
A000 – FFFF	Reserved for further use

5.4.1 Scaled parameter

By parameter with an unit (e.g. mm, psi, l/min, etc.), the adjusting range and the resolution depends on the control mode and the selected unit. The following table shows the connection::

Control mode pressure control valve open loop vprc (4)

Unit:	bar	psi	kN	mPa
Range:	0...500000	0...8000000	0...1000000	0...50000
Resolution:	1/1000	1/1000	1/1000	1/1000

Control mode velocity control axis dsc (7)

Unit:	l/min	mm/s	inch/s	mPa/Min	Grad/s
Range:	0...500000	0...2000000	0...10000000	0...100000	0...360000
Resolution:	1/1000	1/1000	1/1000	1/1000	1/1000

Control mode position control axis dpc (9)

Unit:	mm	Grad	Zoll
Range:	0...2000000	0...360000	0...100000
Resolution:	1/1000	1/1000	1/1000

The DSV has also an internal resolution. This internal resolution determines the adjusting precision for the scaled parameters. The internal resolution depends on the adjusted reference- and interface values. The calculation is as follows::

internal resolution = reference range [unit] / interface range

reference range = max reference [unit] - min reference [unit]

interface range with voltage actual value = (max interface [V] - min interface [V]) x 1024 / 10 [V]
interface range with current actual value = (max interface [mA] - min interface [mA]) x 1024 / 20 [mA]

The current internal resolution can be read out also through the object 2050 (refer to section "Internal resolution" page 70).

5.4.2 Internal bus resolution

In the Device Profile in accordance with CiA DSP 408, an internal resolution value is defined. This value is 0 ... 16384. It corresponds to the range of the "Signal type actual value" (refer to section "Signal type actual value" page 53).

Examples:

Signal type actual value = 0 ... 10V:	0	=	0	V
	8192	=	5	V
	16384	=	10	V
Signal type actual value = 0 ... 20mA	0	=	0	mA
	8192	=	10	mA
	16384	=	20	mA
Signal type actual value = 4 ... 20mA	3277	=	4	mA
	9831	=	12	mA
	16384	=	20	mA

5.4.3 Overview DSV Object Dictionary

vpoc (1): Spool position control open loop (open loop)
vprc (3): Pressure control valve open loop (open loop)
vprc (4): Pressure control valve closed (closed loop)
dcol (6): Open loop movement (open loop)
dsc (7): Velocity control axis (closed loop)
dpc (9): Position control axis (closed loop)

Communication parameter:

Parameter	vpoc (1)	vprc (3)	vprc (4)	dcol (6)	dsc (7)	dpc (9)	page
Device Type	1000	1000	1000	1000	1000	1000	32
Error register (Flag)	1001	1001	1001	1001	1001	1001	32
Predefined Error Field	1003	1003	1003	1003	1003	1003	32
COB-ID SYNC	1005	1005	1005	1005	1005	1005	33
Guard Time	100C	100C	100C	100C	100C	100C	33
Life Time Factor	100D	100D	100D	100D	100D	100D	34
Save Parameter	1010	1010	1010	1010	1010	1010	34
Restore Defaults	1011	1011	1011	1011	1011	1011	35
COB-ID Emergency	1014	1014	1014	1014	1014	1014	36
Producer Heartbeat Time	1017	1017	1017	1017	1017	1017	37
Identity Object	1018	1018	1018	1018	1018	1018	37
Communication parameter RxPDO1 / RxPDO2	1400 1401	1400 1401	1400 1401	1400 1401	1400 1401	1400 1401	38
Mapping RxPDO1 / RxPDO2	1600 1601	1600 1601	1600 1601	1600 1601	1600 1601	1600 1601	39
Communication parameter TxPDO1 / TxPDO2	1800 1801	1800 1801	1800 1801	1800 1801	1800 1801	1800 1801	40
Mapping TxPDO1 / TxPDO2	1A00 1A01	1A00 1A01	1A00 1A01	1A00 1A01	1A00 1A01	1A00 1A01	41

Function parameter:

Parameter	vpoc (1)	vprc (3)	vprc (4)	dcol (6)	dsc (7)	dpc (9)	page
Device control word	6040	6040	6040	6040	6040	6040	42
Device status word	6041	6041	6041	6041	6041	6041	43
Device control mode	6043	6043	6043	6043	6043	6043	44
Device local	604F	604F	604F	604F	604F	604F	44
Device version	6050	6050	6050	6050	6050	6050	45
Device serial number	6052	6052	6052	6052	6052	6052	45
Device model description	6054	6054	6054	6054	6054	6054	45
Device vendor name	6057	6057	6057	6057	6057	6057	45
Device capability	605F	605F	605F	605F	605F	605F	46
Mode of operation	2042	2042	-	2042	-	-	46
Device temperatur	2002	2002	2002	2002	2002	2002	47
Device node	2000	2000	2000	2000	2000	2000	47
Device node baudrate	2001	2001	2001	2001	2001	2001	47
Error handling	2043	2043	2043	2043	2043	2043	48

Ramps:

Parameter	vpoc (1)	vprc (3)	vprc (4)	dcol (6)	dsc (7)	dpc (9)	page
Ramp type	6330	63B0	-	64B0	-	-	49
Ramp A up	6332	63B2	-	64B2	-	-	50
Ramp A down	6335	63B5	-	64B5	-	-	51
Ramp B up	6333	63B3	-	64B3	-	-	50
Ramp B down	6336	63B6	-	64B6	-	-	51
Speed positive	-	-	22B2	-	22B2	22B2	52
Speed negative	-	-	22B3	-	22B3	22B3	52

Analog input preset values:

Parameter	vpoc (1)	vprc (3)	vprc (4)	dcol (6)	dsc (7)	dpc (9)	page
Inverting preset value	62F0	62F0	-	-	-	-	53

Analog input actual value:

Parameter	vpoc (1)	vprc (3)	vprc (4)	dcol (6)	dsc (7)	dpc (9)	page
Signal type actual value	-	-	2200	-	2200	2200	53
Used input actual value	-	-	6201	-	6201	6201	53
Cablebreak actual value	-	-	2201	-	2201	2201	54
Measuringsystem typ	-	-	6202	-	6202	6202	54
Displayed unit	-	-	2202	-	2202	2202	55

Solenoid outputs:

Parameter	vpoc (1)	vprc (3)	vprc (4)	dcol (6)	dsc (7)	dpc (9)	page
Imin A	6343	63C3	63C3	62B1	62B1	62B1	55
Imax A	2340	23C0	23C0	2243	2243	2243	56
Imin B	6344	63C4	63C4	62B2	62B2	62B2	57
Imax B	2341	23C1	23C1	2244	2244	2244	57
Deadband compensation type	6342	63C2	-	2242	-	-	58
Deadband threshold A	6345	63C5	-	62B3	-	-	59
Deadband threshold B	6B45	6BC5	-	-	-	-	59
Dither typ	6360	63E0	63E0	62D0	62D0	62D0	60
Dither Frequen	6362	63E2	63E2	62D2	62D2	62D2	60
Dither Amplitude	6361	63E1	63E1	62D1	62D1	62D1	61
Characteristic optimisation	2344	23C4	-	-	-	-	61

Scaling actual value

Parameter	vpoc (1)	vprc (3)	vprc (4)	dcol (6)	dsc (7)	dpc (9)	page
Min Reference	-	-	6220	-	2222	6230	62
Max Reference	-	-	6221	-	2223	6231	63
Min Interface	-	-	6224	-	2220	6233	63
Max Interface	-	-	6225	-	2221	6234	64

General controller parameter:

Parameter	vpoc (1)	vprc (3)	vprc (4)	dcol (6)	dsc (7)	dpc (9)	page
System control	-	-	2044	-	2044	2044	64
Inversion solenoid output A	-	-	2045	-	2045	2045	64
Inversion solenoid output B	-	-	2046	-	2046	2046	65
Imin always active	-	-	2047	-	2047	2047	65
Solenoid 'In Position'	-	-	2048	-	2048	2048	66

Controller specific windows parameter:

Parameter	vpoc (1)	vprc (3)	vprc (4)	dcol (6)	dsc (7)	dpc (9)	page
Target window typ	-	-	63F0	-	6570	6670	66
Target window threshold	-	-	63F3	-	6573	6673	66
Target window delay time	-	-	23F1	-	2571	2671	67
Trailing window typ	-	-	63D1	-	6551	6651	67
Trailing window threshold	-	-	63D3	-	6553	6653	68
Trailing window delay time	-	-	63D2	-	6552	6652	68
Solenoid off window threshold	-	-	23F3	-	2573	2673	69
Solenoid off window delay time	-	-	23F2	-	2572	2672	69
Internal resolution	-	-	2050	-	2050	2050	70

Controller parameter:

Parameter	vpoc (1)	vprc (3)	vprc (4)	dcol (6)	dsc (7)	dpc (9)	page
Preset value offering	-	-	2301	-	2501	2601	70
Speed offering	-	-	2302	-	2502	2602	71
I-part not changed	-	-	2300	-	2500	2600	71
P-amplification positive	-	-	2303	-	6503	6603	72
P-amplification negative	-	-	2304	-	2504	2604	72
Integrator type	-	-	-	-	-	6608	73
I-time positive	-	-	2305	-	6509	6609	73
I-time negative	-	-	2306	-	2506	2606	74
I-window outside positive	-	-	2307	-	650A	660A	74
I-window outside negative	-	-	2308	-	2508	2608	75
I-window inside positive	-	-	230D	-	250D	260D	75
I-window inside negative	-	-	230E	-	230E	260E	76
D-time positive	-	-	2309	-	2509	2609	76
D-time negative	-	-	230A	-	250A	260A	77
D-amplification positive	-	-	230B	-	250B	260B	77
D-amplification negative	-	-	230C	-	250C	260C	78

Signals:

Parameter	vpoc (1)	vprc (3)	vprc (4)	dcol (6)	dsc (7)	dpc (9)	page
Preset value	6300	6380	6380	6480	6500	6600	78
Preset value B	6B00	6B80	-	-	-	-	79
Actual value	-	-	6381	-	6501	6601	80
Control deviation	-	-	63D0	-	6550	6650	80

5.4.4 Device Type

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

Object description

Object number	1000h
Variable name	Device Type
Object code	VAR (7h)
Data type index	Unsigned32 (7h)
Length	4

Values-Description

Sub–Index	0
Description	Code of the device type [Read Only] Bit 0-15 = Device profile number (408dez) Bit 16-30 = reserved Bit 31 = 0 (no modular device) Value: 0000‘0198h
Prescribed range	Unsigned32

5.4.5 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	1001h
Variable name	Error register
Object code	VAR (7h)
Data type index	Unsigned8 (5h)

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

5.4.6 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	1003h
Variable name	Predefined Error Field
Object code	ARRAY (8h)
Data type index	Unsigned32 (7h)

Values-Description

Sub – Index	00h
Description	Number of errors [Read/Write]
Default Value	0
Prescribed range	0 - 254

Sub – Index	01h
Description	Standard error field [Read Only]
Default Value	none
Prescribed range	Unsigned32

Sub – Index	02h - FEh
Description	Standard error field [Read Only]
Default Value	none
Prescribed range	Unsigned32

5.4.7 COB-ID SYNC

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

Object description

Object number	1005h
Variable name	COB-ID SYNC message
Object code	VAR (7h)
Data type index	Unsigned32 (7h)
Length	4

Values-Description

Description	COB-ID used by the SYNC [Read / Write]
Prescribed range	Unsigned32
Default Value	80h

5.4.8 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	100Ch
Variable name	Guard Time
Object code	VAR (7h)
Data type index	Unsigned16 (6h)
Length	2

Values-Description

Sub–Index	0
Description	Value in ms
Prescribed range	Unsigned16

5.4.9 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: 060A 0023h).

Object description

Object number	100Dh
Variable name	Life Time Factor
Object code	VAR (7h)
Data type index	Unsigned8 (5h)

Values-Description

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

5.4.10 Save Parameter

Through this object, the changed parameters can be saved in the EEPROM of the DSV. 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 1000h...1FFFh. Saved here are the following parameters:

Parameter	**Index**	**Sub-Index**
Communication parameter RxPDO1	1400h	01h, 02h
Communication parameter RxPDO2	1401h	01h, 02h
Communication parameter TxPDO1	1800h	01h, 02h
COB-ID SYNC object	1005h	00h
Guard time	100Ch	00h
Life time factor	100Dh	00h
COB-ID Emergency object	1014h	00h
Producer heartbeat time	1017h	00h

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 2000h...5FFFh.

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	65h	76h	61h	73h

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: 0800 002xh)

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 1011h they can be reset to the default values.

Object description

Object number	1010h
Variable name	Save Parameter
Object code	ARRAY (88h)
Data type index	Unsigned8 (5h)

Values-Description

Sub–Index	00h
Description	Number of elements (sub-indexes) [Read Only]
Prescribed range	Unsigned8
Prescribed range	none

Sub–Index	01h
Description	Saving of all parameters (through signature "save") [Read/Write]
Prescribed range	Unsigned32
Prescribed range	none

Sub–Index	02h
Description	Save communication parameters (through signature "save") [Read/Write]
Prescribed range	Unsigned32
Prescribed range	none

Sub–Index	03h
Description	Save application parameters (through signature "save") [Read/Write]
Prescribed range	Unsigned32
Prescribed range	none

5.4.11 Restore Defaults

With this object, the device parameters can be reset to default values in accordance with DS301, resp. DSP 408 and WAG-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 1000h...1FFFh. The list of the parameters can be found at object 1010h.

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 2000h...5FFFh.

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	64h	61h	6Fh	6Ch

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: 0606 0000h).
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 1010h.

Object description

Object number	1011h
Variable name	Restore Defaults
Object code	ARRAY (8h)
Data type index	Unsigned8 (5h)

Values-Description

Sub-index	00h
Description	Number of elements (sub-indexes) [Read Only]
Prescribed range	Unsigned8
Prescribed range	none

Sub-index	01h
Description	Restore all default parameters (through signature "load") [Read/Write]
Prescribed range	Unsigned32
Prescribed range	none

Sub-index	02h
Description	Restore communication default parameters (through signature "load") [Read/Write]
Prescribed range	Unsigned32
Prescribed range	none

Sub-index	03h
Description	Restore application default parameters (through signature "load") [Read/Write]
Prescribed range	Unsigned32
Prescribed range	none

5.4.12 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	1014h
Variable name	COB-ID Emergency Object
Object code	VAR (7h)
Data type index	Unsigned32 (7h)
Length	4

Values-Description

Description	COB-ID by the EMCY [Read / Write]
Prescribed range	Unsigned32
Default Value	80h + Node-ID

5.4.13 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.

Object description

Object number	1017h
Variable name	Producer Heartbeat Time
Object code	VAR (7h)
Data type index	Unsigned16 (6h)
Length	2

Values-Description

Description	Value in ms
Prescribed range	Unsigned16

5.4.14 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	1018h
Variable name	Identity Object
Object code	RECORD (9h)
Data type index	IDENTITY (23h)
Length	4

Values-Description

Sub–Index	00h
Description	Number of entries [Read Only]
Prescribed range	Unsigned8 (1 to 4)
Default Value	1

Sub–Index	01h
Description	Manufacturer identification (CiA Vendor-ID) [Read only]
Prescribed range	Unsigned32
Default Value	0x0000014D

Sub–Index	02h
Description	Product code [Read Only]
Prescribed range	Unsigned32
Default Value	none (this value is not used)

Sub–Index	03h
Description	Revision number [Read Only]
Prescribed range	Unsigned32
Default Value	none

Sub–Index	04h
Description	Serial number [Read Only]
Prescribed range	Unsigned32
Default Value	none

5.4.15 Communication parameter RxPDO1 / RxPDO2

Contains the communication parameters of Receive PDO 1. The communication parameters can be changed in any way required by the user.

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	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".

Object description

Object number	1400/1401h
Variable name	RxPDO1 / RxPDO2 Communication parameter
Object code	RECORD (9h)
Data type index	PDO CommPar (20h)

Values-Description

Sub-index	00h
Description	Number of the communication parameter [Read only]
Prescribed range	Unsigned8
Default Value	2

Sub-index	01h
Description	COB-ID used by the PDO [Read only]
Prescribed range	Unsigned32
Default Value	512 + Node-ID (RxPDO1), 768 + Node-ID (RxPDO2)

Sub-index	02h
Description	Transmission type [Read / Write]
Prescribed range	Unsigned 8
Default Value	255

5.4.16 Mapping RxPDO1 / RxPDO2

Receive PDO mapping. The following mapping of the received data is predefined as fixed. It is dependent on the Device control mode set.

Note: The RxPDO2 is only available with DSV-amplifier and in "operating mode 3" (refer to Mode of operation page 46), the RxPDO1 is available in all other operating modes (refer to Object 2042h).

PDO	Object 1	Object 2	Object 3	Transmission-type	Device control mode(s)
RxPDO1	6040h	6300h	-	255	1
RxPDO2	6040h	6300h	6B00h	255	1
RxPDO1	6040h	6380h	-	255	3 + 4
RxPDO2	6040h	6380h	6B80h	255	3 + 4
RxPDO1	6040h	6480h	-	255	6
RxPDO1	6040h	6500h	-	255	7
RxPDO1	6040h	6600h	-	255	9

Object description

Object number	1600/1601h
Variable name	RxPDO1 / RxPDO2 Mapping
Object code	RECORD (9h)
Data type index	PDO mapping parameter (21h)

Values-Description

Sub-index	00h
Description	Number of the objects mapped [Read only]
Prescribed range	Unsigned8 (0 to 64)
Default Value	1

Sub-index	01h
Description	1. Assigned object (control word) [Read only]
Prescribed range	Unsigned32
Default Value	60‘40‘00‘10h

Sub-index	02h
Description	2. Assigned object (Vpoc / Vprc setpoint A) [Read only]
Prescribed range	Unsigned32
Default Value	63‘00‘01‘10h / 63‘80‘01‘10h

Sub-index	03h (only for RxPDO2 available)
Description	3. Assigned object (Vpoc setpoint B) [Read only]
Prescribed range	Unsigned32
Default Value	6B‘00‘01‘10h / 6B‘80‘01‘10h

5.4.17 Communication parameter TxPDO1 / TxPDO2

Contains the communication parameters of Transmit PDO 1. The communication parameters can be changed in any way required by the user.

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 2) defines the transmission characteristics of the corresponding process data object. The significance is explained in chapter "PDO – Communication Parameters".

Object description

Object number	1800h / 1801h
Variable name	TxPDO1 Communication parameters
Object code	RECORD (9h)
Data type index	PDO CommPar (20h)

Values-Description

Sub – Index	00h
Description	Number of the communication parameters [Read only]
Prescribed range	Unsigned8
Default Value	2

Sub – Index	01h
Description	COB-ID used by the PDO [Read only]
Prescribed range	Unsigned32
Default Value	384 + Node-ID (TxPDO1), 640 + Node-ID (TxPDO2)

Sub – Index	02h
Description	Transmission type [Read/Write]
Prescribed range	Unsigned 8
Default Value	255

5.4.18 Mapping TxPDO1 / TxPDO2

Transmit PDO mapping. The following mapping of the transmitted data is predefined as fixed. It is dependent on the device control mode set.

Note: The TxPDO2 is only available with device control mode "closed loop" (4, 7 or 9). the TxPDO1 is available in all other device control modes.

A TPDO with transmission type 255 is to be transmitted immediately after the receipt of a corresponding RPDO. This ensures, that the application (master) always receives the current valve data and status information, as soon as a set-point value or control word is transmitted to the device.

PDO	Object 1	Object 2	Object 3	Transmission-type	Device control mode(s)
TxPDO1	6041h	-	-	255	1
TxPDO1	6041h	-	-	255	3
TxPDO2	6041h	6381	-	255	4
TxPDO1	6041h	-	-	255	6
TxPDO2	6041h	6501	-	255	7
TxPDO2	6041h	6601	-	255	9

Object description

Object number	1A00h / 1A01h
Variable name	TxPDO1 / TxPDO2 Mapping
Object code	RECORD (9h)
Data type index	PDO Mapping parameter (21h)

Values-Description

Sub – Index	00h
Description	Number of the objects [Read only]
Prescribed range	Unsigned8 (0 to 64)
Default Value	1

Sub – Index	01h
Description	1. Assigned object (status word) [Read only]
Prescribed range	Unsigned32
Default Value	60‘41‘00‘10h

Sub – Index	02h
Description	2. Assigned object (actual value) [Read only]
Prescribed range	Unsigned32
Default Value	63‘81‘00‘10h

5.4.19 Device control word

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.
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	
10	Reserved	
11	Reserved	
12	Reserved	
13	Release Solenoid A	Releases the solenoid output A, only for operating mode " Set-point value uni-bipolar (2-solenoid single) "
14	Release Solenoid B	Releases the solenoid output B, only for operating mode " Set-point value uni-bipolar (2-solenoid single) "
15	Manufacturer-specific	

Object description

Object number	6040h
Variable name	Device control word
Object code	VAR (7h)
Data type index	Unsigned16 (6h)
Length	2

Values-Description

Description	Default value: 00‘00h [read / write]
Prescribed range	0...65535

5.4.20 Device status word

The control 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.
1	Hold enable (H)	
2	Device mode active (M)	
3	Ready (R)	
4	Local control	Is active, if the DSV is operated locally
5	Warning	
6	Reserved	
7	Reserved	
8	Reserved	
9	Ramp running	The preset value ramp is active (only in device mode 1 and 3)
10	Reserved	
11	Reserved	
12	Window reached	The target window is reached (only in device mode 4, 7 and 9)
13	Solenoid output A released	Solenoid output A is released, only for operating mode " Set-point value uni-bipolar (2-solenoid single) "
14	Solenoid output B released	Solenoid output B is released, only for operating mode " Set-point value uni-bipolar (2-solenoid single) "
15	Manufacturer-specific	

Object description

Object number	6041h
Variable name	Device status word
Object code	VAR (7h)
Data type index	Unsigned16 (6h)

Values-Description

Description	Default value: 00‘00h [Read Only]
Prescribed range	0...65535

5.4.21 Device control mode

With this parameter the control mode of the device is indicated or switched. The object is read/write, if switching between different control modes is supported, otherwise read only. Supported control modes are indicated in object 605Fh (Device Capability) by associated bits enabled (1).
The value can only be changed in device state "Init" or "Disabled", otherwise the device responds with an Abort SDO transfer (abort code: 0800 0022h).

NOTE: If the control mode has changed, the PDO's must be mapped new. This will be done automatically after a reset resp. if the device will be switched off an on (Attention: save the parameter control mode before).

Value	Description	Art
0	Local operating mode	
1	Spool position control open loop vpoc	open loop
3	Pressure control valve open loop vprc	open loop
4	Pressure control valve closed loop vprc	closed loop
6	Open loop movement dcol	open loop
7	Velocity control axis dsc	closed loop
9	Position control axis dpc	closed loop

Object description

Object number	6043h
Variable name	Device control mode
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 00h [Read Only]
Prescribed range	0, 1, 3, 4, 6, 7 or 9

5.4.22 Device local

The object specifies the source for the control word. It can come via CAN or from a local source. If a local operation is requested by a different commander, e.g. PASO, then this object becomes irrelevant; a write request to this object is "rejected".

Value	Description
0	Operation via CAN
1	Control word comes from a local operation

Object description

Object number	604Fh
Variable name	Device local
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	[read / Write]
Prescribed range	0 or 1

5.4.23 Device version

Device version; corresponds to the PASO field Software Version.

Object description

Object number	6050h
Variable name	Device version
Object code	VAR (7h)
Data type index	Visible String (9h)

Values-Description

Description	"V1.0.0.0" [Read Only]
Prescribed range	ASCII values for numerals and numbers

5.4.24 Device serial number

Device serial number; corresponds to the PASO field Serial Number.

Object description

Object number	6052h
Variable name	Device serial number
Object code	VAR (7h)
Data type index	Visible String (9h)

Values-Description

Description	"123.4567" [Read Only]
Prescribed range	ASCII values for numerals and numbers

5.4.25 Device model description

Valve type description, corresponds to the PASO field Valve Type.

Object description

Object number	6054h
Variable name	Device model description
Object code	VAR (7h)
Data type index	Visible String (9h)

Values-Description

Description	"Valve type" [Read Only]
Prescribed range	ASCII values for numerals and numbers

5.4.26 Device vendor name

Names the manufacturer of the device.

Object description

Object number	6057h
Variable name	Device vendor name
Object code	VAR (7h)
Data type index	Visible String (9h)

Values-Description

Description	"Wandfluh AG" [Read Only]
Prescribed range	ASCII values for numerals and numbers

5.4.27 Device capability

This object contains information about the applications capability of the device.

Object description

Object number	605Fh
Variable name	Device capability
Object code	VAR (7h)
Data type index	Unsigned32 (7h)

Values-Description

Description	Default value: depending on the valve [Read only] Value 0 = disabled / not supported Value 1 = enabled / supported Bit 0 – 15 = Specific information (manufacturer-specific 8000h-FFFFh) Bit 16 – 23 = Drive information (not used) 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)
Prescribed range	Unsigned32

5.4.28 Mode of operation

Also refer to section "Operating mode" in the operating instructions for the DSV Electronics. The possible operating mode depends on the device. If a value will be written which is not possible with the current device, the device responds with an SDO -Abort transfer (abort code: 0609 0032h).
The value can only be changed in the device state "Init" or "Disabled", otherwise the device responds with an SDO -Abort transfer (abort code: 0800 0022h).

Note: In the mode of operation 3 "Preset unipolar (2-Solenoid single)", each solenoid has to be enabled separate via the Control Word (refer to section "Device control word" page 42).

Value	Description
0	Preset unipolar (1-solenoid)
1	Preset unipolar (2-Solenoid)
2	Preset bipolar (2-Solenoid)
3	Preset unipolar (2-Solenoid single)

Object description

Object number	Control Mode 1, 3, 6: 2042h Control Mode 4, 7, 9: -
Variable name	device mode of operation
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 01h [read/write]
Prescribed range	0, 1, 2 or 3

5.4.29 Device temperature

The current temperature inside the device. Corresponds to the "DSV-Temperature" in the PASO Menu "Analysis - Values".

Object description

Object number	2002h
Variable name	device temperature
Object code	VAR (7h)
Data type index	Integer16 (3h)

Values-Description

Description	current Temperature in °C [Read Only]
Prescribed range	-55 ... +150

5.4.30 Device node address

The DSV node address can be set via CAN. The address is set valid after the device is reset by a "communication reset" or a power cycle. The parameter has to be stored to keep after a power-on.

Value	Description
1...127	DSV node address

Object description

Object number	2000h
Variable name	device node address
Object Code	VAR (7h)
Data type index	Unsigned8 (5h)

Values description

Description	Default value: 01h [Read/Write]
Prescribed range	1...127

5.4.31 Device node baudrate

The DSV node baudrate can be set via CAN. The baudrate is set valid after the device is reset by a "communication reset" or a power cycle. The parameter has to be stored to keep after a power-on.

Value	Description
10	10 kBaud
20	20 kBaud
50	50 kBaud
100	100 kBaud
125	125 kBaud
250	250 kBaud
500	500 kBaud
1000	1000 kBaud

Baudrates outside the above list causes an Abort SDO Transfer.

Object description

Object number	2001h
Variable name	Device node baudrate
Object Code	VAR (7h)
Data type index	Unsigned16 (6h)

Values description

Description	Default value: 14h [Read/Write]
Prescribed range	0...65535

5.4.32 Error handling

Corresponds to the "Error Handling" parameter in PASO.

Wert	Beschreibung
0	In case of an error, switch solenoid A+B off
1	In case of an error, switch solenoid A on
2	In case of an error, switch solenoid B on (only possible with a 2-solenoid DSV)
3	In case of an error, switch solenoid A+B on (only possible with a 2-solenoid DSV)

Object description

Object number	2043h
Variable name	device error handling
Object Code	VAR (7h)
Data type index	Unsigned8 (5h)

Values description

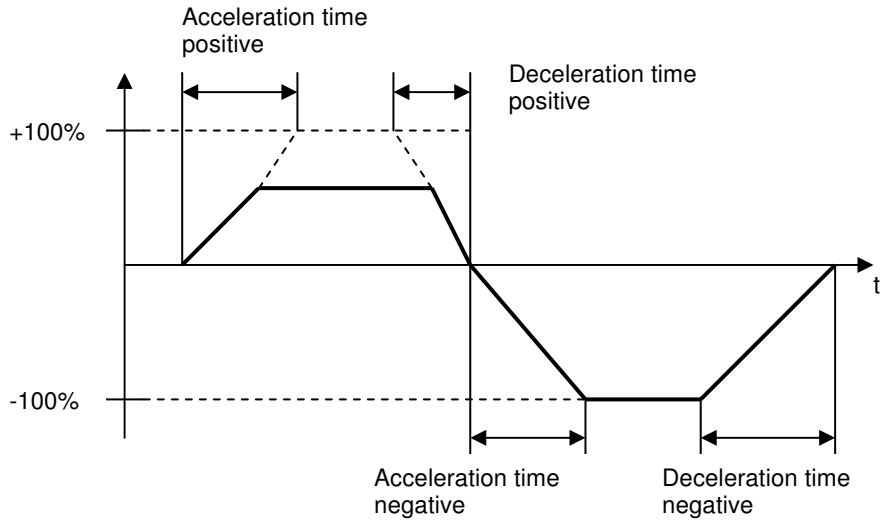
Description	Default value: 00h [read/write]
Prescribed range	0, 1, 2 or 3

5.4.33 Ramp type

With the ramp function, the set-point value is influenced in function of time. The information "Ramp running" is imaged in the status word.

Value	Description
0	No ramp
3	Linear ramp, for all 4 quadrant separate parameters. In case of a 1-solenoid valve 2 parameters, in case of a 2-solenoid valve 4 parameters.

Ramp type 3:



Object description

Object number	Control Mode 1: 6330h Control Mode 3: 63B0h Control Mode 4: - Control Mode 6: 64B0h Control Mode 7: - Control Mode 9: -
Variable name	Control Mode 1: vpoc dvg ramp type Control Mode 3: vprc dvg ramp type Control Mode 4: - Control Mode 6: dcol dvg ramp type Control Mode 7: - Control Mode 9: -
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 0h [read/write]
Prescribed range	0, 3

5.4.34 Ramp A up

Corresponds to the "Ramp A up" parameter in PASO.

Object description

Object number	Control Mode 1: 6332h Control Mode 3: 63B2h Control Mode 4: - Control Mode 6: 64B2h Control Mode 7: - Control Mode 9: -
Variable name	Control Mode 1: vpoc dvg ramp acceleration time positive Control Mode 3: vprc dvg ramp acceleration time positive Control Mode 4: - Control Mode 6: dcol dvg ramp acceleration time positive Control Mode 7: - Control Mode 9: -
Object code	RECORD (9h)
Data type index	Control Mode 1, 3: Value parameter record Unsigned16 (81h) Control Mode 4: Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...51000 = 0...51s, Resolution 0.001s

5.4.35 Ramp B up

Corresponds to the "Ramp B up" parameter in PASO.

Object description

Object number	Control Mode 1: 6333h Control Mode 3: 63B3h Control Mode 4: - Control Mode 6: 64B3h Control Mode 7: - Control Mode 9: -
Variable name	Control Mode 1: vpoc dvg ramp acceleration time negative Control Mode 3: vprc dvg ramp acceleration time negative Control Mode 4: - Control Mode 6: dcol dvg ramp acceleration time negative Control Mode 7: - Control Mode 9: -
Object code	RECORD (9h)
Data type index	Control Mode 1, 3: Value parameter record Unsigned16 (81h) Control Mode 4: Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...51000 = 0...51s, Resolution 0.001s

5.4.36 Ramp A down

Corresponds to the "Ramp A down" parameter in PASO.

Object description

Object number	Control Mode 1: 6335h Control Mode 3: 63B5h Control Mode 4: - Control Mode 6: 64B5h Control Mode 7: - Control Mode 9: -
Variable name	Control Mode 1: vpoc dvg ramp deceleration time positive Control Mode 3: vprc dvg ramp deceleration time positive Control Mode 4: - Control Mode 6: dcol dvg ramp deceleration time positive Control Mode 7: - Control Mode 9: -
Object code	RECORD (9h)
Data type index	Control Mode 1, 3: Value parameter record Unsigned16 (81h) Control Mode 4: Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...51000 = 0...51s, Resolution 0.001s

5.4.37 Ramp B down

Corresponds to the "Ramp B down" parameter in PASO.

Object description

Object number	Control Mode 1: 6336h Control Mode 3: 63B6h Control Mode 4: - Control Mode 6: 64B6h Control Mode 7: - Control Mode 9: -
Variable name	Control Mode 1: vpoc dvg ramp deceleration time negative Control Mode 3: vprc dvg ramp deceleration time negative Control Mode 4: - Control Mode 6: dcol dvg ramp deceleration time negative Control Mode 7: - Control Mode 9: -
Object code	RECORD (9h)
Data type index	Control Mode 1, 3: Value parameter record Unsigned16 (81h) Control Mode 4: Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...51000 = 0...51s, Resolution 0.001s

5.4.38 Speed positive

Corresponds to the "Speed +" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: 22B2
Variable name	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: drv dvg speed positive
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	internal resolution...2000000 [unit]/s, resolution = internal resolution (refer to section "Scaled parameter" page 28)

5.4.39 Speed negative

Corresponds to the "Speed -" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: 22B3
Variable name	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: drv dvg speed negative
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	internal resolution...2000000 [unit]/s, resolution = internal resolution (refer to section "Scaled parameter" page 28)

5.4.40 Inverting preset value

Corresponds to the "Inversion preset value" parameter in PASO.

Value	Description
0, 1	Not invert
-1	Invert

Object description

Object number	Control Mode 1, 3: 62F0 Control Mode 4, 6, 7, 9: -
Variable name	Control Mode 1, 3: drv controller output inverting sign Control Mode 4, 6, 7, 9: -
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 01h [read/write]
Prescribed range	-1 or 1

5.4.41 Signal type actual value

Corresponds to the "Signal type actual value" parameter in PASO.

Value	Description
0	0...10V (voltage input)
2	0...20mA (current input)
3	4...20mA (current input)

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: 2200
Variable name	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: drv avc min speed transducer signal
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 00h [read/write]
Prescribed range	0, 2 or 3

5.4.42 Used input actual value

Corresponds to the "Used input actual value" parameter in PASO.

Value	Description
2	Analog input 3 (AnaInp3)

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: 6201
Variable name	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: drv avc interface number
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 02h [read/write]
Prescribed range	2

5.4.43 Cablebreak actual value

Corresponds to the "Cablebreak actual value" parameter in PASO.

Value	Description
0	Cablebreak detection off
1	Cablebreak detection on (only possible with signal type = 3)

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: 2201
Variable name	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: drv avc interface cablebreak
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 00h [read/write]
Prescribed range	0 or 1

5.4.44 Measuringsystem type

Value	Description
-1	Speed sensor
2	Pressure sensor
67	Analog measuring sensor

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: 6202
Variable name	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: drv avc type
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 00h [read/write]
Prescribed range	-1, 2 or 67

5.4.45 Displayed unit

Corresponds to the "Displayed unit" parameter in PASO.

Value	Description		
	Control Mode 4	**Control Mode 7**	**Control Mode 9**
0	bar	l/min	mm
1	psi	m/s	Grad
2	kN	Inch/s	Zoll
3	-	1/min	-
4	MPa	Grad/s	-

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: 2202
Variable name	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: drv avc actual value unit
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 00h [read/write]
Prescribed range	0, 1, 2, 3 or 4

5.4.46 Imin A

Corresponds to the "Imin A" parameter in PASO.
The maximum value has to be smaller as the adjusted Imax A, for all values above the device responds with an SDO -Abort transfer (abort code: 0609 0031h).

Object description

Object number	Control Mode 1: 6343 Control Mode 3: 63C3 Control Mode 4: 63C3 Control Mode 6: 62B1 Control Mode 7: 62B1 Control Mode 9: 62B1
Variable name	Control Mode 1: vpoc dvg dead band compensation A side Control Mode 3: vprc dvg dead band compensation A side Control Mode 4: vprc dvg dead band compensation A side Control Mode 6: drv co dead band compensation A side Control Mode 7: drv co dead band compensation A side Control Mode 9: drv co dead band compensation A side
Object code	RECORD (9h)
Data type index	Control Mode 1, 3, 6: Value parameter record Integer16 (84h) Control Mode 6, 7, 9: Value parameter record Integer32 (85h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	Valve dependend
Prescribed range	0...16384 = 0...1536mA, Resolution = 16 (= 1.5mA) with 24V 0...16384 = 0...2560mA, Resolution = 16 (= 3.0mA) with 12V Upper limit = adjusted Imax A

5.4.47 Imax A

Corresponds to the "Imax A" parameter in PASO.
The minimum value has to be higher as the adjusted Imin A, for all values above the device responds with an SDO -Abort transfer (abort code: 0609 0032h).

Object description

Object number	Control Mode 1: 2340 Control Mode 3: 23C0 Control Mode 4: 23C0 Control Mode 6: 2243 Control Mode 7: 2243 Control Mode 9: 2243
Variable name	Control Mode 1: vpoc dvg max current A side Control Mode 3: vprc dvg max current A side Control Mode 4: vprc dvg max current A side Control Mode 6: drv co max current A side Control Mode 7: drv co max current A side Control Mode 9: drv co max current A side
Object code	RECORD (9h)
Data type index	Control Mode 1, 3, 6: Value parameter record Integer16 (84h) Control Mode 6, 7, 9: Value parameter record Integer32 (85h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	Valve dependend
Prescribed range	0...16384 = 0...1536mA, Resolution = 16 (= 1.5mA) with 24V 0...16384 = 0...2560mA, Resolution = 16 (= 3.0mA) with 12V Lower limit = adjusted Imin A Upper limit depends to the valve type

5.4.48 Imin B

Corresponds to the "Imin B" parameter in PASO.
The maximum value has to be smaller as the adjusted Imax B, for all values above the device responds with an SDO -Abort transfer (abort code: 0609 0031h).

Object description

Object number	Control Mode 1: 6344 Control Mode 3: 63C4 Control Mode 4: 63C4 Control Mode 6: 62B2 Control Mode 7: 62B2 Control Mode 9: 62B2
Variable name	Control Mode 1: vpoc dvg dead band compensation B side Control Mode 3: vprc dvg dead band compensation B side Control Mode 4: vprc dvg dead band compensation B side Control Mode 6: drv co dead band compensation B side Control Mode 7: drv co dead band compensation B side Control Mode 9: drv co dead band compensation B side
Object code	RECORD (9h)
Data type index	Control Mode 1, 3, 6: Value parameter record Integer16 (84h) Control Mode 6, 7, 9: Value parameter record Integer32 (85h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	Valve dependent
Prescribed range	0...16384 = 0...1536mA, Resolution = 16 (= 1.5mA) with 24V 0...16384 = 0...2560mA, Resolution = 16 (= 3.0mA) with 12V Upper limit = adjusted Imax B

5.4.49 Imax B

Corresponds to the "Imax B" parameter in PASO.
The minimum value has to be higher as the adjusted Imin A, for all values above the device responds with an SDO -Abort transfer (abort code: 0609 0032h).

Object description

Object number	Control Mode 1: 2341 Control Mode 3: 23C1 Control Mode 4: 23C1 Control Mode 6: 2244 Control Mode 7: 2244 Control Mode 9: 2244
Variable name	Control Mode 1: vpoc dvg max current B side Control Mode 3: vprc dvg max current B side Control Mode 4: vprc dvg max current B side Control Mode 6: drv co max current B side Control Mode 7: drv co max current B side Control Mode 9: drv co max current B side
Object code	RECORD (9h)
Data type index	Control Mode 1, 3, 6: Value parameter record Integer16 (84h) Control Mode 6, 7, 9: Value parameter record Integer32 (85h)

Values-Description

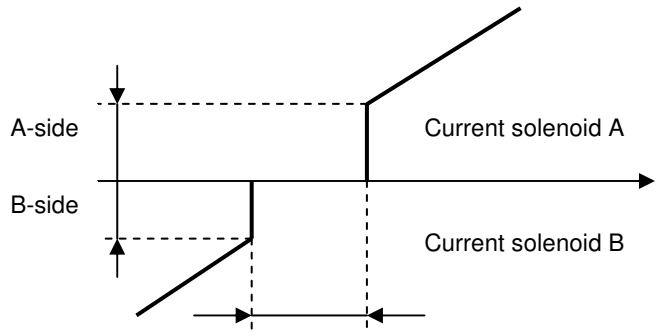
Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	Valve dependent
Prescribed range	0...16384 = 0...1536mA, Resolution = 16 (= 1.5mA) with 24V 0...16384 = 0...2560mA, Resolution = 16 (= 3.0mA) with 12V Lower limit = adjusted Imin A Upper limit depends to the valve type

5.4.50 Deadband compensation type

Value	Description
0	Deadband compensation off
1	Type 1 Deadband compensation (jump at threshold value).

Deadband compensation type 1:



Object description

Object number	Control Mode 1: 6342 Control Mode 3: 63C2 Control Mode 6: 2242 Control Mode 4, 7, 9: -
Variable name	Control Mode 1: vpoc dvg dead band compensation type Control Mode 3: vprc dvg dead band compensation type Control Mode 6: drv co dead band compensation type Control Mode 4, 7, 9: -
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 0h [read/write]
Prescribed range	0 or 1

5.4.51 Deadband threshold A

Corresponds to the "Deadband A" parameter in PASO.

Object description

Object number	Control Mode 1: 6345 Control Mode 3: 63C5 Control Mode 6: 62B3 Control Mode 4, 7, 9: -
Variable name	Control Mode 1: vpoc dvg dead band compensation threshold Control Mode 3: vprc dvg dead band compensation threshold Control Mode 6: drv co dead band compensation threshold Control Mode 4, 7, 9: -
Object code	RECORD (9h)
Data type index	Value parameter record Integer16 (84h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...16384 = 0...50%, Resolution = 32 (= 0.1%)

5.4.52 Deadband threshold B

Corresponds to the "Deadband B" parameter in PASO.

Object description

Object number	Control Mode 1: 6B45 Control Mode 3: 6BC5 Control Mode 4, 6, 7, 9: -
Variable name	Control Mode 1: vpoc dvg dead band compensation threshold B Control Mode 3: vprc dvg dead band compensation threshold B Control Mode 4, 6, 7, 9: -
Object code	RECORD (9h)
Data type index	Value parameter record Integer16 (84h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...16384 = 0...50%, Resolution = 32 (= 0.1%)

5.4.53 Dither type

Value	Description
0	Dither off
1	Dither on with square function

Object description

Object number	Control Mode 1: Control Mode 3, 4: Control Mode 6, 7, 9:	6360 63E0 62D0
Variable name	Control Mode 1: Control Mode 3, 4: Control Mode 6, 7, 9:	vpoc dither type vprc dither type drv co dither type
Object code	VAR (7h)	
Data type index	Integer8 (2h)	

Values-Description

Description	Default value: 0h [read/write]
Prescribed range	0 or 1

5.4.54 Dither Frequency

Corresponds to the "Dither Frequency" parameter in PASO.

Object description

Object number	Control Mode 1: Control Mode 3, 4: Control Mode 6, 7, 9:	6362 63E2 62D2
Variable name	Control Mode 1: Control Mode 3, 4: Control Mode 6, 7, 9:	vpoc dither frequency vprc dither frequency drv co dither frequency
Object code	RECORD (9h)	
Data type index	Value parameter record Integer16 (84h)	

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write] Resolution: 1Hz
Default Value	Valve type dependent
Prescribed range	Only the following values are possible: 20, 25, 30, 35, 40, 45, 50, 55, 60, 70, 80, 100, 125, 165, 250, 500

5.4.55 Dither Amplitude

Corresponds to the "Dither Level" parameter in PASO.

Object description

Object number	Control Mode 1: 6361 Control Mode 3, 4: 63E1 Control Mode 6, 7, 9: 62D1
Variable name	Control Mode 1: vpoc dither amplitude Control Mode 3, 4: vprc dither amplitude Control Mode 6, 7, 9: drv co dither amplitude
Object code	RECORD (9h)
Data type index	Value parameter record Integer16 (84h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	Valve type dependent
Prescribed range	0...4266 = 0...400mA, Resolution = 32 (= 3mA)

5.4.56 Characteristic optimisation

Corresponds to the adjustments in the menu "Parameters - Valves - Characteristic optimisation" in PASO.

Object description

Object number	Control Mode 1: 2344 Control Mode 3: 23C4 Control Mode 4, 6, 7, 9: -
Variable name	Control Mode 1: vpoc dvg characteristic optimisation Control Mode 3: vprc dvg characteristic optimisation Control Mode 4, 6, 7, 9: -
Object code	ARRAY (8h)
Data type index	Unsigned16 (6h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0 = Characteristic optimisation off 1 = Characteristic optimisation on

Sub-index	02h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0 = set solenoid A active (for Sub-index 4 and 5) 1 = set solenoid B active (for Sub-index 4 and 5)

Sub-index	03h
Description	Value [Read/Write]
Default Value	1
Prescribed range	1...11 = Index for Sub-index 4 and 5

Sub-index	04h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...100 = 0...100% Preset (X-axis), Resolution = 1% The input has the form value[index][solenoid]

Sub-index	05h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...1000 = 0...100% solenoid current (Y-axis), Resolution = 0.1% The input has the form value[index][solenoid]

5.4.57 Min Reference

Corresponds to the "Min. Reference actual value" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 6220 Control Mode 7: 2222 Control Mode 9: 6230
Variable name	Control Mode 1, 3, 6: - Control Mode 4: drv avc_min_pressure Control Mode 7: drv avc min speed Control Mode 9: drv avc min reference
Object code	RECORD (9h)
Data type index	Value parameter record Integer32 (85h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	Depends on the control mode and the selected unit (refer to section "Scaled parameter" page 28)

5.4.58 Max Reference

Corresponds to the "Max. Reference actual value" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 6221 Control Mode 7: 2223 Control Mode 9: 6231
Variable name	Control Mode 1, 3, 6: - Control Mode 4: drv avc_max_pressure Control Mode 7: drv avc max speed Control Mode 9: drv avc max reference
Object code	RECORD (9h)
Data type index	Value parameter record Integer32 (85h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	Depends on the control mode and the selected unit (refer to section "Scaled parameter" page 28)

5.4.59 Min Interface

Corresponds to the "Min. Interface actual value" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 6224 Control Mode 7: 2220 Control Mode 9: 6233
Variable name	Control Mode 1, 3, 6: - Control Mode 4: drv avc min transducer signal Control Mode 7: drv avc min speed transducer signal Control Mode 9: drv avc min interface
Object code	RECORD (9h)
Data type index	Value parameter record Integer32 (85h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...10000 = 0...10V by voltage actual value, Resolution = 0.001V 0...20000 = 0...20mA by current actual value, Resolution = 0.001mA

5.4.60 Max Interface

Corresponds to the "Max. Interface actual value" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 6225 Control Mode 7: 2221 Control Mode 9: 6234
Variable name	Control Mode 1, 3, 6: - Control Mode 4: drv avc max transducer signal Control Mode 7: drv avc max speed transducer signal Control Mode 9: drv avc max interface
Object code	RECORD (9h)
Data type index	Value parameter record Integer32 (85h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...10000 = 0...10V by voltage actual value, Resolution = 0.001V 0...20000 = 0...20mA by current actual value, Resolution = 0.001mA

5.4.61 System control

Corresponds to the "System control" parameter in PASO.

Value	Description
0	System control not inverted
1	System control inverted

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: 2044
Variable name	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: device system control
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 0h [read/write]
Prescribed range	0 or 1

5.4.62 Inversion solenoid output A

Corresponds to the "Output solenoid A" parameter in PASO.

Value	Description
0	Solenoid output A not inverted
1	Solenoid output A inverted

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: 2045
Variable name	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: device inversion solenoid A
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 0h [read/write]
Prescribed range	0 or 1

5.4.63 Inversion solenoid output B

Corresponds to the "Output solenoid A" parameter in PASO.

Value	Description
0	Solenoid output A not inverted
1	Solenoid output A inverted

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: 2046
Variable name	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: device inversion solenoid B
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 0h [read/write]
Prescribed range	0 or 1

5.4.64 Imin always active

Corresponds to the "Imin always active" parameter in PASO.

Value	Description
0	Imin always active yes
1	Imin always active NO

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: 2047
Variable name	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: device inversion solenoid B
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 0h [read/write]
Prescribed range	0 or 1

5.4.65 Solenoid 'In Position'

Corresponds to the "Solenoid 'In Position'" parameter in PASO.

Value	Description
0	Solenoids are not active inside the solenoid off window
1	Solenoids are also active inside the solenoid off window

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: 2048
Variable name	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: device in position solenoid off
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 0h [read/write]
Prescribed range	0 or 1

5.4.66 Target window type

Value	Description
0	Target window monitoring off
2	Target window monitoring on

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 63F0 Control Mode 7: 6570 Control Mode 9: 6670
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc twm type Control Mode 7: dsc twm type Control Mode 9: dpc twm type
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 0h [read/write]
Prescribed range	0, 2

5.4.67 Target window threshold

Corresponds to the "Target window threshold" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 63F3 Control Mode 7: 6573 Control Mode 9: 6673
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc twm threshold Control Mode 7: dsc twm threshold Control Mode 9: dpc twm threshold
Object code	RECORD (9h)
Data type index	Value parameter record Integer32 (85h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	Depends on the selected unit (refer to section "Scaled parameter" page 28)

5.4.68 Target window delay time

Corresponds to the "Target window delay time" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 23F1 Control Mode 7: 2571 Control Mode 9: 2671
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc twm delay time Control Mode 7: dsc twm delay time Control Mode 9: dpc twm delay time
Object code	RECORD (9h)
Data type index	Value parameter record Integer32 (85h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...100 = 0...100ms, Resolution 1ms

5.4.69 Trailing window type

Value	Description
0	Trailing window monitoring off
2	Trailing window monitoring on

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 63D1 Control Mode 7: 6551 Control Mode 9: 6651
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc cm type Control Mode 7: dsc cm type Control Mode 9: dpc cm type
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 0h [read/write]
Prescribed range	0, 2

5.4.70 Trailing window threshold

Corresponds to the "Trailing window threshold" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 63D3 Control Mode 7: 6553 Control Mode 9: 6653
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc cm threshold Control Mode 7: dsc cm threshold Control Mode 9: dpc cm threshold
Object code	RECORD (9h)
Data type index	Value parameter record Integer32 (85h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	Depends on the selected unit (refer to section "Scaled parameter" page 28)

5.4.71 Trailing window delay time

Corresponds to the "Trailing window delay time" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 63D2 Control Mode 7: 6552 Control Mode 9: 6652
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc cm delay time Control Mode 7: dsc cm delay time Control Mode 9: dpc cm delay time
Object code	RECORD (9h)
Data type index	Value parameter record Integer32 (85h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...100 = 0...100ms, Resolution 1ms

5.4.72 Solenoid off window threshold

Corresponds to the "Solenoid off window threshold" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 23F3 Control Mode 7: 2573 Control Mode 9: 2673
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc solenoid off threshold Control Mode 7: dsc solenoid off threshold Control Mode 9: dpc solenoid off threshold
Object code	RECORD (9h)
Data type index	Value parameter record Integer32 (85h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	Depends on the selected unit (refer to section "Scaled parameter" page 28)

5.4.73 Solenoid off window delay time

Corresponds to the "Solenoid off window delay time" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 23F2 Control Mode 7: 2572 Control Mode 9: 2672
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc solenoid off delay time Control Mode 7: dsc solenoid off delay time Control Mode 9: dpc solenoid off delay time
Object code	RECORD (9h)
Data type index	Value parameter record Integer32 (85h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...100 = 0...100ms, Resolution 1ms

5.4.74 Internal resolution

Current internal resolution (= adjusting precision) for scaled parameters (refer to section "Scaled parameter" page 28)

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: 2050
Variable name	Control Mode 1, 3, 6: - Control Mode 4, 7, 9: device resolution
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read Only]
Default Value	1
Prescribed range	Control Mode 4, 7, 9: 0...maxReference, Resolution refer to section "Scaled parameter" page 28, (refer to section "Max Referen" page 63)

5.4.75 Preset value offering

Corresponds to the "Preset value addition" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 2301 Control Mode 7: 2501 Control Mode 9: 2601
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc preset offering Control Mode 7: dsc preset offering Control Mode 9: dpc preset offering
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...10000 = 0...10, Resolution 0.1

5.4.76 Speed offering

Corresponds to the "Speed addition" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 2302 Control Mode 7: 2502 Control Mode 9: 2602
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc speed offering Control Mode 7: dsc speed offering Control Mode 9: dpc speed offering
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...10000 = 0...10, Resolution 0.1

5.4.77 I-part not changed

Corresponds to the "I-Proportion, if control deviation > I-window outside" parameter in PASO.

Value	Description
0	Set I-part to 0 if control deviation > I-window outside
1	Leave I-part value if control deviation > I-window outside

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 2300 Control Mode 7: 2500 Control Mode 9: 2600
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc I part not changed Control Mode 7: dsc I part not changed Control Mode 9: dpc I part not changed
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 0h [read/write]
Prescribed range	0, 1

5.4.78 P-amplification positive

Corresponds to the "P-Ampl. positive" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 2303 Control Mode 7: 6503 Control Mode 9: 6603
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc Kp Control Mode 7: dsc Kp Control Mode 9: dpc Kp
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...25000 = 0...25, Resolution 0.1

5.4.79 P-amplification negative

Corresponds to the "P-Ampl. negative" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 2304 Control Mode 7: 2504 Control Mode 9: 2604
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc Kp negative Control Mode 7: dsc Kp negative Control Mode 9: dpc Kp negative
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...25000 = 0...25, Resolution 0.1

5.4.80 Integrator type

Value	Description
0	Switched integrator off
1	Standard switched integrator on

Object description

Object number	Control Mode 1, 3, 4, 6, 7: - Control Mode 9: 6608
Variable name	Control Mode 1, 3, 4, 6, 7: - Control Mode 9: dpc switched integrator type
Object code	VAR (7h)
Data type index	Integer8 (2h)

Values-Description

Description	Default value: 0h [read/write]
Prescribed range	0, 1

5.4.81 I-time positive

Corresponds to the "I-Time positive" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 2305 Control Mode 7: 6509 Control Mode 9: 6609
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc switched integrator Ti Control Mode 7: dsc switched integrator Ti Control Mode 9: dpc switched integrator Ti
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...10000 = 0...10s, Resolution 0.001s

5.4.82 I-time negative

Corresponds to the "I-Time negative" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 2306 Control Mode 7: 2506 Control Mode 9: 2606
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc switched integrator Ti negative Control Mode 7: dsc switched integrator Ti negative Control Mode 9: dpc switched integrator Ti negative
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...10000 = 0...10s, Resolution 0.001s

5.4.83 I-window outside positive

Corresponds to the "I-Window outside positive" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 2307 Control Mode 7: 650A Control Mode 9: 660A
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc switched integrator dX Control Mode 7: dsc switched integrator dX Control Mode 9: dpc switched integrator dX
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	Depends on the selected unit (refer to section "Scaled parameter" page 28)

5.4.84 I-window outside negative

Corresponds to the "I-Window outside negative" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 2308 Control Mode 7: 2508 Control Mode 9: 2608
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc switched integrator dX negative Control Mode 7: dsc switched integrator dX negative Control Mode 9: dpc switched integrator dX negative
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	Depends on the selected unit (refer to section "Scaled parameter" page 28)

5.4.85 I-window inside positive

Corresponds to the "I-Window inside positive" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 230D Control Mode 7: 250D Control Mode 9: 260D
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc I window inside Control Mode 7: dsc I window inside Control Mode 9: dpc I window inside
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	Control Mode 4: 0...16384 = 0...100%, Resolution 0.1% Control Mode 7, 9: Depends on the selected unit (refer to section "Scaled parameter" page 28)

5.4.86 I-window inside negative

Corresponds to the "I-Window inside negative" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 230E Control Mode 7: 250E Control Mode 9: 260E
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc I window inside Control Mode 7: dsc I window inside Control Mode 9: dpc I window inside
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	Depends on the selected unit (refer to section "Scaled parameter" page 28)

5.4.87 D-time positive

Corresponds to the "D-time positive" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 2309 Control Mode 7: 2509 Control Mode 9: 2609
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc D time Control Mode 7: dsc D time Control Mode 9: dpc D time
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...10000 = 0...10s, Resolution 0.001s

5.4.88 D-time negative

Corresponds to the "D-time negative" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 230A Control Mode 7: 250A Control Mode 9: 260A
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc D time negative Control Mode 7: dsc D time negative Control Mode 9: dpc D time negative
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...10000 = 0...10s, Resolution 0.001s

5.4.89 D-amplification positive

Corresponds to the "D-Ampl. positive" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 230B Control Mode 7: 250B Control Mode 9: 260B
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc D val Control Mode 7: dsc D val Control Mode 9: dpc D val
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...10000 = 0...10, Resolution 0.1

5.4.90 D-amplification negative

Corresponds to the "D-Ampl. negative" parameter in PASO.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 230C Control Mode 7: 250C Control Mode 9: 260C
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc D val negative Control Mode 7: dsc D val negative Control Mode 9: dpc D val negative
Object code	RECORD (9h)
Data type index	Value parameter record Unsigned32 (82h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	0...10000 = 0...10, Resolution 0.1

5.4.91 Preset value

Corresponds to the preset value for the device.

Object description

Object number	Control Mode 1: 6300 Control Mode 3: 6380 Control Mode 4: 6380 Control Mode 6: 6480 Control Mode 7: 6500 Control Mode 9: 6600
Variable name	Control Mode 1: vpoc setpoint Control Mode 3: vprc setpoint Control Mode 4: vprc setpoint Control Mode 6: dcol setpoint Control Mode 7: dsc setpoint Control Mode 9: dpc setpoint
Object code	RECORD (9h)
Data type index	Control Mode 1: Value parameter record Integer16 (84h) Control Mode 3: Value parameter record Integer16 (84h) Control Mode 4: Value parameter record Integer16 (84h) Control Mode 6: Value parameter record Integer32 (85h) Control Mode 7: Value parameter record Integer32 (85h) Control Mode 9: Value parameter record Integer32 (85h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	Control Mode 1, 3: -16384...+16384 (refer to section "Internal bus resolution" page 29) Control Mode 4: 0...+16384 (refer to section "Internal bus resolution" page 29) Control Mode 6: -100000...+100000 = ±100%, resolution: 98 = 0.098% Control Mode 7, 9: 0...maxReference (refer to section "Max Reference" page 63)

5.4.92 Preset value B

Corresponds to the preset value for the solenoid B in mode of operation 4.

Object description

Object number	Control Mode 1: 6B00 Control Mode 3: 6B80 Control Mode 4, 6, 7, 9: -
Variable name	Control Mode 1: vpoc setpoint B Control Mode 3: vprc setpoint B Control Mode 4, 6, 7, 9: -
Object code	RECORD (9h)
Data type index	Value parameter record Integer16 (84h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	-16384...+16384 (refer to section "Internal bus resolution" page 29)

5.4.93 Actual value

Corresponds to the actual value from the device.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 6381 Control Mode 7: 6501 Control Mode 9: 6601
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc actual value Control Mode 7: dsc actual value Control Mode 9: dpc actual value
Object code	RECORD (9h)
Data type index	Control Mode 4: Value parameter record Integer16 (84h) Control Mode 7: Value parameter record Integer32 (85h) Control Mode 9: Value parameter record Integer32 (85h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	Control Mode 1, 3, 6: - Control Mode 4: 0...+16384 (refer to section "Internal bus resolution" page 29) Control Mode 7, 9: 0...maxReference (refer to section "Max Reference" page 63)

5.4.94 Control deviation

Corresponds to the control deviation value from the device.

Object description

Object number	Control Mode 1, 3, 6: - Control Mode 4: 63D0 Control Mode 7: 6550 Control Mode 9: 6650
Variable name	Control Mode 1, 3, 6: - Control Mode 4: vprc control deviation Control Mode 7: dsc control deviation Control Mode 9: dpc control deviation
Object code	RECORD (9h)
Data type index	Control Mode 4: Value parameter record Integer16 (84h) Control Mode 7: Value parameter record Integer32 (85h) Control Mode 9: Value parameter record Integer32 (85h)

Values-Description

Sub-index	00h
Description	Number of entries [Read Only]
Prescribed range	0...255

Sub-index	01h
Description	Value [Read/Write]
Default Value	0
Prescribed range	Control Mode 1, 3, 6: - Control Mode 4: 0...+16384 (refer to section "Internal bus resolution" page 29) Control Mode 7, 9: 0...maxReference (refer to section "Max Reference" page 63)

6 Commissioning

To support the DSV-CAN commissioning, the parameterisation software PASO-DSV can be connected. PASO offers the possibility to show certain process data like preset value, valve current, device state (state machine) and so on. The bus-node settings (node address and baudrate) can also be made with PASO, as well as certain CAN-bus diagnostics (refer to section "Fieldbus Diagnostics" page 9);.

6.1 Step by step instructions for the first commissioning

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

6.1.1 Test the hydraulic system

1. Switch off the hydraulic system
2. Switch off the fieldbus master
3. Switch on the DSV-CAN
4. In the PASO window "Fieldbus_Fieldbus-Info" in the section "Bus State" the following statement will be displayed: Bus-Status = Pre-Operational (refer to section "Fieldbus Diagnostics" page 9)
5. In the PASO status line, the statements "Local" and "Init" will be displayed
6. Switch on the hydraulic system
7. Set the control of the device to PASO with the PASO Menu "Commands_PASO Control". In the PASO status line, the statements "Remote PASO" and "Init" will be displayed
8. Enable the device with the PASO Menu "Commands_Enable". In the PASO status line, the statements "Remote PASO" and "Active" will be displayed
9. 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.
10. In the PASO window "Parameters_Valves", the parameters for the minimum (Imin) and maximum (Imax) current and the dither signal (frequency and level) can be set
11. Disable the device with the PASO Menu "Commands_Disable". In the PASO status line, the statements "Remote PASO" and "Disabled" will be displayed
12. Set the control of the device to Local with the PASO Menu "Commands_Local Control". In the PASO status line, the statements "Remote" and "Init" will be displayed

6.1.2 Connect the measuring system (only DSV controller)

13. Connect the measuring system to the corresponding input of the DSV
14. In the PASO window "Configuration_Control mode", the adjustments for the desired control mode can be made
15. In the PASO window "Configuration_Signal scaling", the adjustments for the actual value signal can be made

6.1.3 Adjust the mode of operation (only DSV amplifier)

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

6.1.4 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" page 84)
2. Adjust the node address and the baudrate on the DSV (refer to section "Presupposition for the DP-Slave controller card" page 83)
3. Switch on the fieldbus master
4. The DSV can be set via the fieldbus master with the NMT-services to the status "Pre-Operational" resp. "Operational" (refer to section "Device Control Services" page 17)
5. In the PASO window "Fieldbus_Fieldbus-Info" in the section "Bus State" the following statement will be displayed: Bus-Status = Pre-Operational resp. Operational (refer to section "Fieldbus Diagnostics" page 9)

6.1.5 Test the control via the fieldbus

1. Set the following parameters in the declared order with the SDO-services (refer to section "Service Data Communication (SDO)" page 14) (only possible in the state "DISABLE"):
2. Set the parameter "Device local" to "Control Operation via CAN (0)" (refer to section "Device local" page 44)
3. With the parameter "Device control mode" the desired device control mode can be selected (refer to section "Device control mode" page 44).

   IMPORTANT: If the control mode has changed, the PDO's must be mapped new. This will be done automatically after a reset resp. if the device will be switched off an on (Attention: save the parameter control mode before).
4. For the release of the DSV, the 3 bits "Disable (D)", "Hold enable (H)" and "Device mode active (M)" from the control word (refer to section "Device control word" page 42) must be set to logical 1. The DP-Slave controller is now in the state "ACTIVE".
5. With the SDO-services (refer to section "Service Data Communication (SDO)" page 14) resp. the PDO-services (refer to section "Process Data Communication (PDO) " page 12), a preset value can now be set via the fieldbus.

6.2 Presupposition for the DP-Slave controller card

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

- **What is the node address from the DSV?**
  The node address can be set via the parameterisation software PASO in the menu item "Fieldbus_Fieldbus-Info" (refer to section "Fieldbus Settings" page 8)

- **What is the device control mode for the DP-Slave controller card?**
  The device control mode can be set via the parameter "Device control mode". 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 DSV is in the state "INIT" or "DISABLE" (refer to section "Device State Machine" page 24)

6.3 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 DSV?

- **EDS-file**
  The EDS-file "WAGDSVC1.eds" must be present on the Master side. If not, this file must be copied into the project tool of the Master.

6.4 Delivery state

The DSV is delivered with the following basic configuration:

- Node address 1
- Baudrate 20kBaud

6.5 Settings

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

After the DSV 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" page 34).

6.6 CAN Bus demand value

In the standard version the valve can only be controlled through the CAN-bus or for test reasons through PASO.

The following start up sequence need to be done after each power on:

- The DSV 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.
- Through the NMT service the DSV can be set to state "operational (refer to section "Device Control Services" page 17). In this state PDO's and SYNC telegrams can be transmitted and the DSV responds accordingly.
- To release the DSV the 3 bits "D", "H" and "M" of the statusword have to be set to logical 1 (refer to section "Device control word" page 42). The DSV is now in state "active", a preset value can now be received from the setpoint object (e.g. 6300h) or an RxPDO transmission.

6.7 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" page 24).

7 Diagnostic and error detection

7.1 Diagnostic about the Fieldbus

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

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

A detailed description of the diagnostic function you will find in the section "Fieldbus Diagnostics" page 9.

8 Version Index

In the following table, an index about the different version of the " Operating Instructions for DSV Electronics CANopen - Protocol with Device Profile DSP 408" will be listed. The current version is always the version listed at last.

Version	Bezeichnung	Datum der Freigabe
0.1	Start Version	08.09.04
1.0	Description of the parameters added	29.11.04
2.0	Changed to Device-Profile FPT	30.07.07