DS-DigiTran

DS-Europe
DIGItal TRANsducers

PRELIMINARY MANUAL

Technical Description
User's Guide
Configuration and CAN Interface

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CANopen
DS 406

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Contents

1. Characteristics

The DIGITAL TRANSDUCER allows configuration in a CANopen bus system:

For Communication Profile parametrization
see Table 6-1 on page

For Encoder Profile DS 406 parametrization
see Table 6-2 on page

Parametrization distinguishes between transducer-specific and CAN-specific parameters.

Programmable transducer parameters:
– Setting switchpoints/cams with hysteresis and polarity
– Setting working range
– Setting nullpoint
– Cycle time of the PDO
– Peak value retention (Peak values can be read via SDO only)

CAN communications parameters:
– Sending PDOs
– Setting guard time and life time factor

Bus parameters:
– Setting baud rate
– Setting Node ID

2. Definitions

Baud rate	**Data transmission speed on the CAN bus**
CAN	Controller Area Network
CAL	CAN Application Layer
CiA	CAN in Automation (CiA) International Users and Manufacturers Group e.V.
DS...	CiA Draft Standard ...
NodeID	Node number for device specific identification
PDO	Process Data Object Element for data transfer (process data messages with high priority)
SDO	Service Data Object Element for configuring the bus node (service data messages)
NMT	Network Management Service element for initialization and error handling (administrative messages)

3. System Description of DIGITAL TRANSDUCER on CAN-Bus

3.1. The DS Europe DIGItal TRANsducer concept

DS Europe Digital Transducers are digital versions of the well known DS Europe Load Cell and Pressure transducers, conceived with the Distributed Automation concept in mind.
CiA DS 406 Encoder profile has been chosen because of the similarity between a linear encoder, producing a measure proportional to a mechanical distance, and a Load Cell or Pressure transducer, generating a measure proportional to an applied weight or pressure.
This product can be applied in many weighting or pressure metering applications.

3.2. Node Identification

The DIGITAL TRANSDUCER is operated on the CAN bus and represents a node of the bus system. It works in CAN networks CANopen and Layer 2. Unique identification of the DIGITAL TRANSDUCER is done using the data which are permanently stored in the unit, e.g.:

Manufacturer Device Name:	01-03 DSEurope
Manufacturer Hardware Version:	1.00
Manufacturer Software Version:	1.01
Serial No.:	02000123

The setup of:

- Bus parameters
- Baud rate
- Node ID

can be performed using SDO services, with only the transducer and the CANopen master connected together.

3.3. Operating Parameters

DIGITAL TRANSDUCERs are supplied with Encoder Profile DS 406.
The settable parameters of the CAN Communication Profile can be changed using the SDO service (via master).

Setting through the SDO service:
CAN Communication Profile

- Mapping (when applicable) and transmission or turning off the PDO
- Setting guard time and life time factor

Transducer operating parameters

- Setting switchpoints/cams including hysteresis and polarity
- Working range
- Nullpoint
- Cycle time of the PDO

The CAN communications module integrated into the transducer converts the data generated into it into CAN messages and sends them out on the CAN bus.
The following communications objects are used for sending messages on the CAN bus:

– **Process Data Objects (PDO)**

The DIGITAL TRANSDUCER's data measure and cam status are sent with 1 PDO.
The configuration of the PDO is fixed and cannot be changed by the user.

– **Service Data Object (SDO)**
The SDO is used to send the parameters for configuring the transducer. In addition the SDO can be set to access information in the Object Directory (OD) (e.g., error messages from the error register, measured peak values).
– **Emergency Object**
Emergency Objects are used to report errors. The DIGITAL TRANSDUCER uses the high priority of the Emergency Object also for sending cam status. See Chapter 7.1
– **Synchronization Object** (SYNC)
SYNC is used to establish communications synchronization on the bus.

3.4. System Start

After Power On (or after a Reset) the CAN communication module is started according to the following states.

3.4.1. Initialization state

The CAN communication module is initialized in this state.
Loading of device-specific parameters is initiated by the CAN communication module. The CAN communication module takes over the device-specific configuration parameters. After this the data are ready for transmitting.
After initialization is concluded, the CAN communication module automatically goes into the *Pre-Operational* state. Simultaneously data transmission from the DIGITAL TRANSDUCER module to the CAN communication module is enabled.

3.4.2. Pre-Operational state

In this state the measuring system can be configured using a master application/control through the CAN bus. Communication is done over a 'peer-to-peer' communication channel which is established by using a Service Data Object (SDO). The ID numbers which the SDO needs are determined based on the node number according to the ID allocation procedure used in the CANopen standard.
The ID numbers or the SYNC, Emergency Objects, and Process Data Objects (PDOs) are also assigned according to the ID allocation procedure used in the CANopen standard. If the system is being used in a CANopen network, ID assignment is handled by a distributor (DBT master).
When configuring using a Master application, it should be noted that only correct parameters may be entered in the object directory, since the CAN communication module is not capable of performing any consistency and value range checks.
Configuration of the node number (NodeID) and the baud rate can be carried out in the *Pre-Operational* state. After a change is made, the system starts with the new parameters and the default settings in the object directory, and then returns to the *Pre-Operational* state.

3.4.3. Prepared state

In the Prepared state no data communication with the device is possible at all. The device will only handle the node guarding and the NMT-start-stop message.
The CAN communication module is started as follows.
If a *Start_Remote_Node Indication* (see DS 301) is received while in the *Pre-Operational* state, the CAN communication module changes over into the *Operational* state.
When operating in a Layer 2 network, you must ensure that the message-IDs for the other devices do not come into conflict with that of the CANopen device.
In addition, you must ensure that the required start/stop commands are issued by a system master.

3.4.4. Operational state

After the transition to *Operational*, communication using Process Data Objects (PDOs) is enabled. Depending on the parameterization of the object directory (mapping, type of message transmission), the objects are now sent over the CAN bus.
The PDO is sent in one of two ways. Either the PDO is initiated and sent (continuously) by the module, or the PDO is initiated when a SYNC is received (query driven).

3.5. Power-On messages

The Power-on message is issued right after power up. It consists of the Nodeguard Message (identifier 700H) + NodeID with the data field being 0, meaning the node is in Unknown State. After 1 s wait time, the second message is issued (depending on whether default bootup Fig. 1 or EEPROM bootup Fig. 2). For the Power-on messages so-called Emergency messages are used (see chapter 7).

Example of Power-On Message:

DIGITAL TRANSDUCER with NodeId = 1 and CAM 1 and 3 active:
after Power On:
701 00
after ca. 1 sec:
081 00 00 00 00 00 00 00 00
081 00 F0 00 05 00 00 00 00

Default Bootup: Identifier 80h + NodeID

00	FF	00	Transducer Code	00	00	00	00

Transducer Type	Transducer Code	Tx PDO1		Tx PDO2	
LOAD CELL	01	Measure, Cam	4 Byte int 1 Byte int.	No TxPDO2	
PRESSURE TRANSDUCER	02	Measure, Cam	4 Byte int 1 Byte int.	No TxPDO2	
Other...	RESERVED				

Fig. 1: Default Bootup

Standard Bootup (EEPROM values valid): COB-ID per Index 1014

00	00	00	00	00	00	00	00

Fig. 2: EEPROM-Bootup

Reset by watchdog (generated by µC crash or executing Reset Node command or storing LMT data)

00	FF	00	FF	00	00	00	00

Fig. 3: Reset by watchdog

3.6. Estimating transmission time

Since there are dependencies between the CAN bus line length and the baud rate as well as the selection of the data interval, it is important to estimate the transmission time for continuous transmission for the baud rate and data interval settings.
In the LOAD CELL Mapping, the total length of the message is 87 bits:
1. Transmit-PDO = 87 bits, including 4 bytes for measure and 1 byte for camstatus;
2. Transmit-PDO = 0 Bit. PDO is switched off.

At a baud rate of 1,000 kBit/sec, a transmission time of 87 µs is required, i.e., the data are completely sent if, after the shortest data interval, the next data are provided by the transducer.

Baud Rate [kbaud]	Transmission Time [ms]	Possible data intervals [ms]
1000	0.087	≥0.5
800	0.109	≥0.5
500	0.174	≥0.5
250	0.348	≥0.5
125	0.696	≥1
100	0.870	≥2
50	1.740	≥3
20	4.350	≥6

Table 1: Relationship between baud rate, transmission time and possible data interval (sampling rate) per DS 301 for transmitting 1 PDO

4. Transducer data in the TxPDO

0 .. .. 7 MSB LSB	8 .. .. 15 MSB LSB	16 .. .. 23 MSB LSB	24 .. .. 31 MSB LSB	32 .. .. 39 MSB LSB
Low Byte	Middle Byte 1	Middle Byte 2	High Byte	1 Byte
Measure				**Cam status**

Fig. 4: Typical structure of the TxPDO1 for a DIGITAL TRANSDUCER

1 PDO of 5 bytes is available for sending data. Measure and Cam status data are statically mapped into the bytes of the PDO and then sent over the bus.

4.1. Data format for measure

Current DIGITAL TRANSDUCER data are provided as data type Int.32 (measure) and Unsigned Int 8 (Cam status). Coding is per ICC 754-1985 and can therefore be directly processed by most compilers and processors without additional calculations.

4.2. Cam status in the PDO

The Cam status byte is configured as follows:

Bit No	Contents
7 MSB	-
6	-
5	-
4	-
3	Cam 4
2	Cam 3
1	Cam 2
0 LSB	Cam 1

Table 2: Cam status byte configuration

The polarity of the switchpoint and the hysteresis are set using the SDO service (see section 10.4). Bits 0 to 3 contain the current switching state of the respective cam. Depending on the configuration, the active state of the cam is indicated by a 0 or a 1 (see Fig.):

0 = Low state
1 = High state

Hysteresis is always added to the current switchpoint in the direction of travel (see Fig. 5). If no hysteresis is desired, this value is set to zero. When data processing starts (first detection of cam status), the cam for measures between 'switchpoint lower' and 'switchpoint upper +hysteresis' is switched active, and for measures outside this value range the cam is switched inactive. See also Fig. 6. Any change in the cam (active/inactive) leads to a change of the cam status in the Emergency Object (see also section 7.1).

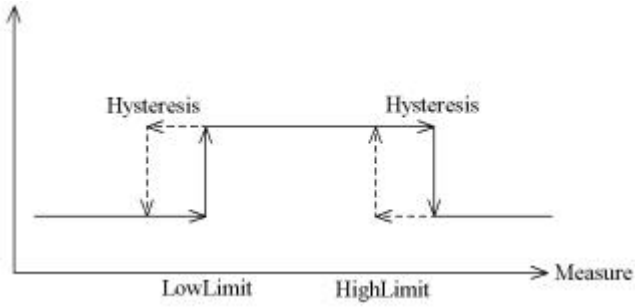


Fig. 5: Usage of Hysteresis

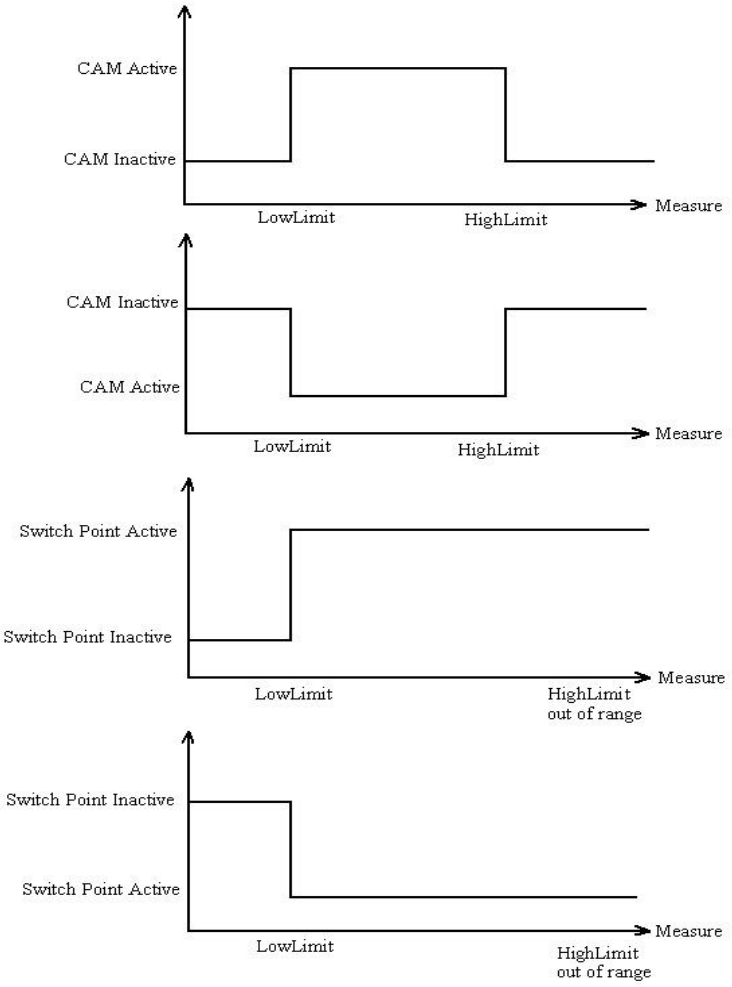


Fig. 6: Usage of cam's and switch points

5. Peak value monitoring

Istantaneous positive and negative peak values (Max peak and Min peak) are continuously monitored and stored into Manufacturer's Profile parameters 2060.1 and 2061.1.
Peak values are not PDO mappable and can be accessed only via SDO.
User can selectively reset the peak values by means of Reset Config parameter, 2070.2.

6. Zero Reset operation with the RxPDO

0 .. .. 7 MSB LSB	8 .. .. 15 MSB LSB	16 .. .. 23 MSB LSB	24 .. .. 31 MSB LSB
Low Byte	Middle Byte 1	Middle Byte 2	High Byte
Zero Reset Command			

Fig. 7: Typical structure of the RxPDO1 for a DIGITAL TRANSDUCER

1 PDOs of 4 bytes is available for receiving data; the PDO is statically mapped into object 2030.1, and allows access to Zero Reset parameter via a PDO transfer.

6.1. Zero Reset (2070.1) and Zero Config (2070.2) operations

Zero Reset parameter (2070.1) allows instant and asynchronous access to zeroing functions of the transducer.
By sending the signature 'zero' (0x6f72637a) with this PDO, the system can perform an immediate initialization of the ZeroDyn, Min Peak, Max Peak parameters, i.e. the Master performs a transducer Zero initialization before a measuring cycle.
The new values of ZeroDyn, Min Peak, Max Peak are NOT SAVED into nonvolatile storage and are lost upon a transducer reset or power off.

Zero Config parameter (2070.2) allows the configuration of the Zero Reset behavior: this byte enables or disables the effect of the Zero Reset command as follows:
Bit 0: If set, ZeroDyn will be reset upon a Zero Reset command.
Bit 1: If set, MinPeak will be reset upon a Zero Reset command.
Bit 2: If set, MaxPeak will be reset upon a Zero Reset command.
Any modification of Zero Config parameter (2070.2) made via SDO is immediately saved in Non Volatile storage and restored upon a system reset.
It is possible to substitute the final 'o' (ASCII 0x6f) letter of the 'zero' signature with the Zero Config parameter, in order to simultaneously send via PDO the 'zero' command and the Zero Config parameter; when Zero Config parameter is sent via PDO, its new value becomes immediately effective but is NOT SAVED in Non Volatile memory.

The following table reports an example of the zero signature command combined with the Zero Config parameter

Signature	**Meaning**
0x0172637a	Zero of ZeroDyn only
0x0372637a	Zero of ZeroDyn and MinPeak
0x0572637a	Zero of ZeroDyn and MaxPeak
0x0472637a	Zero of MaxPeak only

7. Messages in the Emergency Object

The Emergency Object has the structure shown in Fig. 8. It consists of 2 bytes of error code (low word) and 2 bytes of additional error code (high word). Any errors which occur are stored in chronological order under object 1003h starting at Subindex 1. The most recent error is always located at Subindex 1. The emergency message is always sent before the PDO. The errors shown in Table 4 can be sent using the Emergency Object.

Transmission over the CAN bus:

LSB first.

Example:

AD Converter failure:

Identifier 082H

082 00 90 01 07 00 00 00 00

Transducer out of working range:

082 00 90 01 06 00 00 00 00

Transducer back in working range:

082 00 00 00 06 00 00 00 00

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Error Code		Error Register	Additional Error Code		00	00	00
Low Word Index 1003H		Index 1001H	High Word Index 1003H				

Fig. 8: Organization of the emergency message

7.1. Cam Emergencies

In addition, the current status of the cams is output using the Emergency Objects (see Table 3). This allows a message to be generated and sent with highest priority if there is a change in the state of a switchpoint. Transmission of the Emergency Object for the cam emergencies (see Fig. 9) is done when there is a cam status change. Messages which are still in the transmit queue are deleted to assure immediate transmission of the emergency message. This ensures that any overtravel of a cam switchpoint is immediately reported to the controller.

Error code (MSB - LSB)	Meaning
00 00 00 00 XX 00 F0 00	Status message, change in a switchpoint XX = current cam status

Table 3: Message for change in cam status in SDO (Cam Emergencies)

00	F0	00 Error field	Cams	00	00	00	00

Fig. 9: Organization of cam status messages (Cam Emergencies)

7.2. Error messages

The following error messages (see Table 4) are covered by an emergency message (Emergency Object)

TRANSDUCER

– Not in measuring area of transducer, Transducer Overload
– Measure reached (using the cams as set).

CAN

– Other CAN-specific hard- or software errors. This includes such errors as:
- Send or receive queue overflow,
- Change of CAN controller from error-active to error-passive state, etc.

Error code		Meaning
additional error code	**error-code**	
0000	0000	CAN communication module is error-free, Transducer is ready
0001	5000	CAN controller: data buffer overflow
0101	5000	CAN Error State Set: CAN controller is in the error-passive state
0201	5000	CAN-Bus-Off: CAN controller is not responding
0003	6000	RX-Queue: overflow
0004	6000	TX-Queue: overflow
0005	6000	Node-Guarding failure
0007	9000	A/D Converter failure
0008	9000	Transducer Positive Overload
0009	9000	Transducer Negative Overload

Table 4: Emergency Object error messages

8. Parameterization of the CANopen interface with SDO Services

The transducer CANopen interface can be configured by means of the SDO protocol; Transducer must be the only node connected to a CANopen Master during this operation, this is a mandatory condition to correctly perform the parameterization.

8.1. Assigning baud rate

The baud rate can be changed using the SDO service, by setting the desired value into the Baudrate parameter of the DS Europe Manufacturer's Profile. The selection of the maximum possible baud rate is determined by the length of the entire CAN bus cable.

Line length in m	Baud rate in kBaud	Data-byte 3
<25	1000	00
<50	800	01
<100	500	02
<250	250	03
<500	125	04
<500	100	05
<1000	50	06
<2500	20	07
<5000	10	08

Table 5: Baud rate as a function of cable length per DS 301

As shipped, the baud rate corresponds to the default value listed in the DS Europe Manufacturer's profile.

8.2. Assigning NodeID

Each CAN bus module connected on the CAN bus must have a node number (NodeID) assigned to it. This number may be used only once in the network. The numbers from 1 to 127 are permissible. The transducer is factory set to NodeID = 26. The NodeID can be changed using the SDO service, by setting the desired value into the Address parameter of the DS Europe Manufacturer's Profile.

8.3. Saving the settings

The parameter 1010 in the Standard Communication Profile (see Table 8) is used to transfer the new settings and save them as the Transducer standard. A reset is done, after which the new settings become effective. (See also 10.6).

9. Parameterization of the Measuring system with SDO Services

The transducer internal A/D converter can operate at different Output Data Rates, depending on the desired bandwidth and resolution.

NOTE: The Output Data Rate indicates the frequency at which the Measure data is internally refreshed and is independent from any of the CANopen network settings.

I.e.: an Output Data Rate of 15 Hz means that the transducer produces 15 measure samples per second; if the CANopen master reads the transducer at 150 Hz (150 PDO readings per second), the master will read the same sample 10 times.

9.1. Output Data Rate setup

The Output Data Rate can be changed using the SDO service, by setting the desired value into the AD Speed parameter of the DS Europe Manufacturer's Profile.

Following table relates the AD Speed setup to typical Transducer's performances, based on DS Europe system's design.

AD Speed parameter	AD converter output data rate	Internal A/D filter frequency (Hz) @ -3dB	AD Resolution (bit)
2	960	230	12
3	480	122	13
4	240	62	13
5	120	31	14
6	60	15.5	15
7	30	7.75	15
8	15	3.88	16
9	7.5	1.94	16

As shipped, the AD Output Data Rate corresponds to the default value listed in the DS Europe Manufacturer's profile.

9.2. Output value measurement units

The Transducer can be configured to produce the Measure value either in a raw format (AD converter raw data) or in Physical units; parameter Mechanical Conversion (2010-4) can be used to choose the operating mode. Physical Units measure is computed based on the Transducer characterization parameters (Index 2000).

9.3. Saving the settings

The Manufacturer specific parameters are automatically saved in Non Volatile Memory when modified by the user.

A reset must be done, after which the new settings become effective.

10. Node configuration

10.1. Node identification

The configuration is carried out via SDO accessing the relevant objects in the Object Directory.

10.2. Mode (type of message transmission)

Depending on which conditions apply to using the transducer, Transducer data may be sent continuously via the PDO or on demand.

PDO continuous:

– This setting is for sending all transducer values every 10 ms.
  Communication Profile Index 1800
  Subindex 2
  254 = continuous

PDO on demand:

– Transmission is started by the master application/controller using the request message (SYNC).
  Communication Profile Index 1800
  Subindex 2
  1 = using SYNC-Object

10.3. Setting data transmission/update rate

The factory set time interval of 10 ms can be changed in steps of 1 ms.
Use Table 6 as a guide for making these settings.

Data interval	Baud rate [kBaud]
1 ms	≥ 250
3 ms	≥ 100
10 ms	≥ 50

Table 6: Baud rate as a function of data interval when sending PDOs

– **Communication Profile Index 1800**
  Subindex 5
  x = Event Timer Value in steps of [1 ms]

10.4. Setting cams

Within the nominal stroke (maximum measuring range), up to 4 cams can be defined with an adjustable hysteresis and polarity (see Fig. 5 and Fig. 6).

- **Encoder Profile Index 6301 Cam Enable**
  Subindex 0
  Number of entries
  0 = no cam function
  1 = Entry in Subindex 1 is valid
  Subindex 1
  00 =no cam function
  01 =Cam 1 active
  02 =Cam 2 active
  04 =Cam 3 active
  08 =Cam 4 active

- **Encoder Profile Index 6302 Cam Polarity**
  Subindex 0
  1 = Entry in Subindex 1 is valid
  Subindex 1
  00 =Polarity of all cams low-high-low
  Polarity of individual cams
  01 =Cam 1 high-low-high
  02 =Cam 2 high-low-high
  04 =Cam 3 high-low-high
  08 =Cam 4 high-low-high

- **Encoder Profile Index 6310 CAM 1 Low Limit**
  Subindex 0
  Number of entries
  0 = no entries valid
  1 = Entry in Subindex 1 is valid
  Subindex 1
  XX = Switchpoint lower (low limit)
  Set in multiples of the resolution selected with Index 6005

- **Encoder Profile Index 6311 CAM 2 Low Limit**
  Entries for the 2nd cam as in Index 6310

- **Encoder Profile Index 6312 CAM 3 Low Limit**
  Entries for the 3rd cam as in Index 6310

- **Encoder Profile Index 6313 CAM 4 Low Limit**
  Entries for the 4th cam as in Index 6310

- **Encoder Profile Index 6320 CAM 1 High Limit**
  Subindex 0
  Number of entries
  0 = no entries valid

1 = Entry in Subindex 1 is valid
Subindex 1
XX = Switchpoint upper (high limit)
Set in multiples of the resolution selected with Index 6005

- **Encoder Profile Index 6321 CAM 2 High Limit**
  Entries for the 2nd cam as in Index 6320

- **Encoder Profile Index 6322 CAM 3 High Limit**
  Entries for the 3rd cam as in Index 6320

- **Encoder Profile Index 6323 CAM 4 High Limit**
  Entries for the 4th cam as in Index 6320

- **Encoder Profile Index 6330 CAM 1 Hysteresis**
  Subindex 0
  Number of entries
  0 = no entries valid
  1 = Entry in Subindex 1 is valid
  Subindex 1
  XX = Hysteresis
  Set in multiples of the resolution selected with Index 6005

- **Encoder Profile Index 6331 CAM 2 Hysteresis**
  Entries for the 2nd cam as in Index 6330

- **Encoder Profile Index 6332 CAM 3 Hysteresis**
  Entries for the 3rd cam as in Index 6330

- **Encoder Profile Index 6333 CAM 4 Hysteresis**
  Entries for the 4th cam as in Index 6330

10.5. Object Mapping

Object mapping is used to define the arrangement of the transducer data to be sent in the Process Data Object (PDO). Fig. 1-2 shows the factory setting. The information for measure and status is statically defined and can not be changed by the user.

- **Encoder Profile Index 1A00 1st Transmit-PDO**
  Subindex 0
  Number of elements
  2 = Default
  Subindex 1
  1st object
  6004 = Measure
  Subindex 2
  2nd object
  6300, 1 = Cam status (CAM State Channel)

10.6. Saving the new settings

Once all the settings have been made and the transducer reply was correct each time, i.e., no error message was sent, the settings are saved to Index 1010H, Subindex 1 using an additional SDO transfer and the signature ***'save'***. The power should be on for at least 5 s to make sure all settings are stored completely.

11. Object Directory

The object directory of the CAN communication module in the transducer is divided into two ranges which are represented in the following table. The data (measure, cams) as well as the configuration parameters are placed in the communication object.

11.1. Encoder Profile

For fast comparison of the switchpoints and the working range, all values are stored unsigned as absolute values in the object directory. The communication tool handles the appropriate conversion based on the current setting.

11.2. Communication Profile

The parameters which are critical for communication are determined in the communication profile. This includes the data for manufacturer's product nomenclature, for identification, or the parameters for object mapping.

Abbreviations used in Tables:

ro = read only
rw = read / write
UI8 = Unsigned8
UI16 = Unsigned16
UI32 = Unsigned32
I32 = Signed32
VS = VisibleString

11.3. Communication Profile (Tables)

Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
1000	0	Device Type	UI32	ro	Value per DS301 or DS406	Device type. 0x00080196: Device Profile 406, absolute linear encoder
1001	0	Error Register	UI8	ro	0	0: No error Bit 0: General error in Transducer Module Bit 4: Error in CAN communication module Bit 7: Manufacturer-specific error
1003	0 1 ... 10H	Predefined error field Error array	UI8 UI32 UI32	ro ro ro	0 no no	Number of different errors which occured Memory location into which an error is entered. (Memory management is done chronologically in a history list; the most recent error is always found in Subindex 01.) A maximum of 16 different errors are managed.
1005	0	COB ID Sync messg.	UI32	rw	80H	COB-ID of the SYNC object
1008	0	Manufacturer Device Name	VS	ro	01-03 DSEurope	Device name of the communication module
1009	0	Manufacturer Hardware Version	VS	ro	1.00	Hardware version number
100A	0	Manufacturer Software Version	VS	ro	1.01	Software version number
100C	0	Guard Time Cycle time for node monitoring	UI16	rw	0	Cycle time in ms, set by the NMT Master or the configuration tool.
100D	0	Life Time Factor Wait time if no guarding	UI8	rw	0	Wait time is set by the NMT Master or the configuration tool.

Table 7: Structure of the Communication profile

Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
1010	0	Store parameter	UI8	ro	3	Number of Store options
	1	Save all parameters	UI32	rw	1	By writing the signature 'save' 0x65766173, all settings are saved on the module.
	2	Save Communication Parameters	UI32	rw	1	By writing the signature 'save' 0x65766173, the Communication Parameters are saved on the module.
	3	Save Application Parameters	UI32	rw	1	By writing the signature 'save' 0x65766173, the Application Parameters are saved on the module.
1011	0	Restore parameter	UI8	ro	2	Number of Store options
	1	Restore all parameters	UI32	rw	1	By writing the signature 'load' 0x64616F6C, all the factory default settings are loaded.
	2	Restore Communication Parameters	UI32	rw	1	By writing the signature 'load' 0x64616F6C, the factory default settings of the communication area are loaded.
1012	0	COB-ID Time Stamp Object	UI32	rw	100H	COB-ID of the Time Stamp Object
1014	0	COB-ID Emergency message	UI32	rw	80H + NodeID	COB-ID of the Emergency Object
1015	0	Emergency Inhibit Time	UI16	rw	0	Emergency Object Inhibit time in multiples of 100µS
1016	0	Consumer Heartbeat Time	UI16	rw	0	Cycle Time of the Heartbeat in multiples of 1mS
1017	0	Producer Heartbeat Time	UI16	rw	0	Cycle Time of the Heartbeat in multiples of 1mS
1018	0	Identity Object	UI8	ro	4	Number of Entries
	1	Vendor ID	UI32	ro		Vendor ID
	2	Product Code	UI32	ro		Product Code
	3	Revision Number	UI32	ro		Revision Number
	4	Serial Number	UI32	ro		Serial Number

Table 8: Structure of the Communication Profile

Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
1200	0	Server SDOs	UI8	ro	1	Number of server SDOs
	1	COB-ID Client->Server(rx)	UI32	ro	600H + NodeID	COB-ID request for server (Request)
	2	COB-ID Server->Client(tx)	UI32	ro	580h + NodeID	COB-ID response to client (Response)
1400	0	Number of elements	UI8	ro	2	Communication parameters of 1st Receive PDO
	1	COB-ID	UI32	rw	200H + NodeID	Determined using the CANopen minimum system ID assignment procedure.
	2	Transmission type	UI8	rw	FFH	Indicate transmission type 0: Transmit on demand using SYNC object after timer runs out. 1: Transmit after each SYNC object. 2..240d: Transmit after 2..240 SYNC objects. 252d: Update PDO on SYNC, transmit PDO only on RTR 253d: Update PDO asynchronously, transmit PDO only on RTR 254d: Continuous transmission. 255d: Continuous transmission.
1600	0	Number of elements	UI8	ro	1	Mapping parameters of the 1st Receive-PDO
	1	1st object	UI32	ro	20300120H	

Table 9: Structure of the Communication Profile

Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
1800	0	Number of elements	UI8	ro	5	Communication parameters of 1st Transmit PDO
	1	COB-ID	UI32	rw	180H + NodeID	Determined using the CANopen minimum system ID assignment procedure.
	2	Transmission type	UI8	rw	1	Indicate transmission type 0: Transmit on demand using SYNC object after timer runs out. 1: Transmit after each SYNC object. 2..240d: Transmit after 2..240 SYNC objects. 252d: Update PDO on SYNC, transmit PDO only on RTR 253d: Update PDO asynchronously, transmit PDO only on RTR 254d: Continuous transmission. 255d: Continuous transmission.
	3	Inhibit Time	UI16	rw	300	Transmit inhibit time of PDO in 100 µs steps. A repeated transmission of the PDO is prevented within the defined interval of the inhibit time.
	5	Event timer	UI16	rw	0	Cyclic sending of PDO value (Default 10 ms)
1A00	0	Number of elements	UI8	ro	2	Mapping parameters of the 1st Transmit-PDO
	1	1st object	UI32	ro	60040020H	Measure
	2	2nd object	UI8	ro	63000108H	CAM State

Table 10: Structure of the Communication Profile

11.4. Encoder Profile DS 406 (Tables)

Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
6000	0	Operating Parameter	UI16	rw	0	Operating Parameter
6003	0	Preset value	UI32	rw	0	Set nullpoint (User Offset)
6004	0	Measure value	UI32	ro	none	Transducer measure
6300	0 1	Cam State Register Value	UI8 UI8	ro ro	1 none	No. of entries Cam Status
6301	0 1	Cam Enable Register Value	UI8 UI8	ro rw	1 0	No. of entries Cam Enable
6302	0 1	Cam Polarity Register Value	UI8 UI8	ro rw	1 0	No. of entries Cam Polarity
6310	0 1	Cam 1 Low Limit Value	UI8 I32	ro rw	1 0	No. of entries Cam 1 Low Limit
6311	0 1	Cam 2 Low Limit Value	UI8 I32	ro rw	1 0	No. of entries Cam 2 Low Limit
6312	0 1	Cam 3 Low Limit Value	UI8 I32	ro rw	1 0	No. of entries Cam 3 Low Limit
6313	0 1	Cam 4 Low Limit Value	UI8 I32	ro rw	1 0	No. of entries Cam 4 Low Limit
6320	0 1	Cam 1 High Limit Value	UI8 I32	ro rw	1 0	No. of entries Cam 1 High Limit
6321	0 1	Cam 2 High Limit Value	UI8 I32	ro rw	1 0	No. of entries Cam 2 High Limit
6322	0 1	Cam 3 High Limit Value	UI8 I32	ro rw	1 0	No. of entries Cam 3 High Limit
6323	0 1	Cam 4 High Limit Value	UI8 I32	ro rw	1 0	No. of entries Cam 4 High Limit

Table 11: Structure of the Encoder Profile (DS 406)

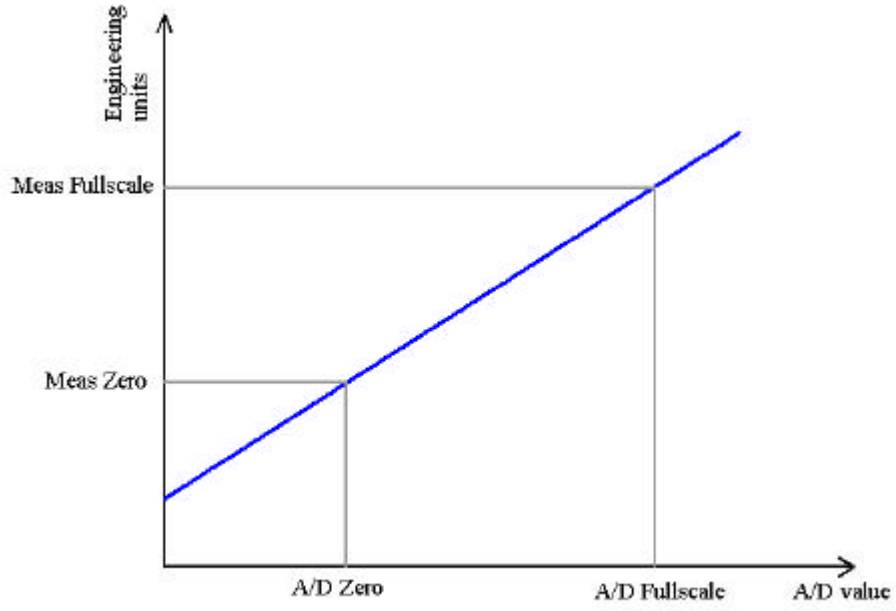
Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
6330	0 1	Cam 1 Hysteresis Value	UI8 I32	ro rw	1 0	No. of entries Cam 1 Hysteresis
6331	0 1	Cam 2 Hysteresis Value	UI8 I32	ro rw	1 0	No. of entries Cam 2 Hysteresis
6332	0 1	Cam 3 Hysteresis Value	UI8 I32	ro rw	1 0	No. of entries Cam 3 Hysteresis
6333	0 1	Cam 4 Hysteresis Value	UI8 I32	ro rw	1 0	No. of entries Cam 4 Hysteresis

Table 12: Structure of the Encoder Profile (DS 406)

11.5. DS Europe Standard Manufacturer's Profile

Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
2000	0	Transducer Characterization table	UI8	ro	4	No. of entries
	1	AD Zero	UI32	ro	none	A/D converter value in A/D measurement units with Transducer at mechanical Zero point
	2	AD Fullscale	UI32	ro	none	A/D converter value in A/D measurement units with Transducer at mechanical Fullscale point
	3	Meas Zero	UI32	ro	none	Zero point measure in mechanical units
	4	Meas Fullscale	UI32	ro	none	Fullscale point measure in mechanical units
2050	0	Manufacturer's parameter table	UI8	ro	4	No. of entries
	1	AD Speed	UI8	rw	3	AD Speed
	2	Address	UI8	rw	26	Address
	3	Baudrate	UI8	rw	2	Baudrate
	4	Mechanical conversion	UI8	rw	0	0 = the Measure value is in AD converter units 1 = the Measure value is converted in mechanical units
2060	0	Measured Peak value	UI8	ro	1	No. of entries
	1	Min Peak value	UI32	ro	none	Peak value during Max to Min travel
2061	0	Measured Peak value	UI8	ro	1	No. of entries
	1	Max Peak value	UI32	ro	none	Peak value during Min to Max travel
2070	0	Offset calibration parameter	UI8	ro	2	No. of entries
	1	Zero Reset	UI32	rw	0	By writing the signature 'zero' 0x6f72637a, the currently measured value can be stored into ZeroDyn, Min Peak, Max Peak parameters. Action of this command is configured by the Zero Config parameter. The new value of ZeroDyn, Min Peak, Max Peak is NOT SAVED into nonvolatile storage and is lost upon a transducer reset or power off.
	2	Zero Config	UI8	rw	0x07	This byte configures the effect of the Zero Reset command: Bit 0: If set, ZeroDyn will be reset upon a Zero Reset command. Bit 1: If set, MinPeak will be reset upon a Zero Reset command. Bit 2: If set, MaxPeak will be reset upon a Zero Reset command. Any value written into this parameter is NOT SAVED in nonvolatile storage and is lost upon a transducer reset or power off.

Table 13: DS Europe Manufacturer specific functions


Engineering units
Meas Fullscale
Meas Zero
A/D Zero
A/D Fullscale
A/D value