GEFRAN

CANopen GSF

digital output

Code 85204B **Edition** 03-2019

1.SAFETY INSTRUCTION

If total failure or malfunction of the sensor can cause danger or injury to the operator or damage to the machinery or equipment it is recommended that additional safety measures should be incorporated into the system.
Any alteration, reconstruction or extension of the sensor is not allowed. Sensor must be operated only within values specified in the datasheet.
Connection to power supply must be performed in accordance with safety instructions for electrical facilities and performed only by trained staff.
Disregard of this advice can lead to malfunctions, damage to property or personal injury and releases the manufacturer from product liability.

Do not open sensor
Release of spring under tension can result in injury!

Do not snap cable
Uncontrolled cable retraction can break off cable fixing.
Broken fixing and cable can result in injury. Also sensor will be damaged!

Do not travel over range
Uncontrolled cable retraction can result in injury. Also sensor will be damaged!

Special attention during mounting and operation of metal cable sensors
Risk of injury by the measuring cable!

Sensors without cover / housing (OEM sensors)
Risk of injury by moving parts. Mounting and operation of the sensor only with appropriate safety equipment that an injury is impossible!

Do not exceed maximum operating voltage listed in the catalog
Risk of injury. Sensor will be damage.

Before connecting the sensor to the CANbus the devices have to be checked for correct bitrate and

- unique node-IDs. Both parameters are configurable by Layer-Setting-Service (LSS) or by Service Data Object (SDO).
- After power-on the sensor will enter pre-operational state and send a bootup message being ready for configuration by Service Data Objects. Parameters configured by the user can be stored non-volatile by SAVE command.
- On receiving„ „NMT-Node-Start“the sensor transits to operational state and starts process data transmission.
- When „Auto-Start“is configured the sensor will automatically transit to operational after boot-up without a need for the Node-Start message. Node monitoring is supported by Heartbeat protocol. The Heartbeat protocol provides automatic transmission of the node status (heartbeat message) by the slave within producer heartbeat time window.
- Following the CAN example protocols included in this manual the sensor may be used without CANopen master device.

- Do not damage cable!
- Cable must not be oiled or lubricated!
- Do not snap cable!
- Do not travel over range!
- Do not crack cable!.
- Cable travel should be axial to the cable outlet (no misalignment allowed!)
- Do not drag cable along objects!

Precautions

Do not let snap the cable
Uncontrolled retraction of cable may damage sensor.
No warranty will be granted for snapped cables

Mounting hints for unfavorable conditions
If possible fasten cable fixing with cable in retracted position.
For example, fit a mounting loop and put it around your wrist.
Do not remove the mounting loop before the cable ist fastened.
The cable clip may be opened for easy attachment.

Mounting
To ensure proper operation, install the sensor only as described in this manual.

2. INTRODUCTION

The purpose of GSF position sensors is to transform position of a linear and guided movement into an electrical signal. Specifications of measuring range, environment, handling and connections as specified in the catalog, must be followed.

The catalog is part of this instruction manual. If the catalog is not available it may be requested by stating the respective model number. Linear motion of the measuring cable (flexible stainless steel) is converted into rotation by means of a precision cable drum. A spring motor provides torque for the cable retraction. Special design assures precise and reproducible winding of the measuring cable. Cable extraction or retraction is transformed into an electrical signal.

The sensor is based on state-of-the-art multiturn potentiometric technology implementing the functions of a CAN BUS network slave device conforming to standard CANopen protocol proposed by C.i.A. (Can in Automation) and described in the document entitled “CANOpen Application Layer and Communication Profile DS 301 v. 4.2” and in other documents mentioned below. Other reference documents used are C.i.A. DS-406 Device Profile for encoder and C.i.A. DSP-305 Layer Setting Services and Protocol V1.1.1.

This document describes the standard CANopen implementations created. It is addressed to CANopen network system integrators and to CANopen device designers who already know the content of the above-mentioned standards defined by C.i.A.. The details of aspects defined by CANopen do not pertain to the purpose of this text. For further information on the protocol you can also contact us via e-mail: at www.gefran.com or contact the GEFRAN office nearest to you.

Definition and Shortening

CAN: Controller Area Network.
Describes a serial communication bus that implements the “physical” level 1 and the “data link” level 2 of the ISO/OSI reference model.

CAL: CAN Application Layer.
Describes implementation of the CAN in the level 7 “application” of the ISO/OSI reference model from which CANopen derives.

CMS: CAN Message Specification.
CAL service element. Defines the CAN Application Layer for the various industrial applications.

COB: Communication Object.
Unit of transport of data in a CAN network (a CAN message). A maximum of 2048 COBs may be present in a CAN network, each of which may transport from 0 to a maximum of 8 bytes.

COB-ID: COB Identifier.
Identifying element of a CAN message. The identifier determines the priority of a COB in case of multiple messages in the network.

D1 – D8: Data from 1 to 8.
Number of bytes in the data field of a CAN message.

DLC: Data Length code.
Number of data bytes transmitted in a single frame.

ISO: International Standard Organization.
International authority providing standards for various merchandise sectors.

NMT: Network Management.
CAL service element. Describes how to configure, initialize, manage errors in a CAN network.

PDO: Process Data Object.
Process data communication objects (with high priority).

RXSDO: Receive SDO.
SDO objects received from the remote device.

SDO: Service Data Object.
Service data communication objects (with low priority). The value of this data is contained in the “Objects Dictionary” of each device in the CAN network.

TXPDO: Transmit PDO.
PDO objects transmitted by the remote device.

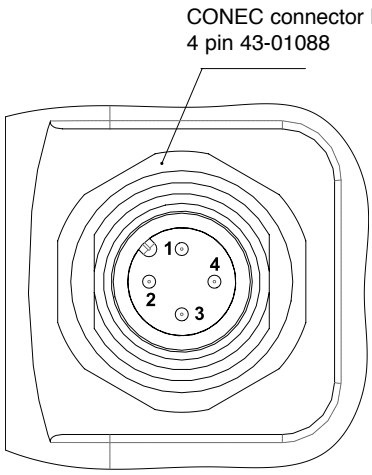
TXSDO: Transmit SDO.
SDO objects transmitted by the remote device.

N.B.: The numbers followed by the suffix “h” represent a hexadecimal value, with suffix “b” a binary value, and with suffix “d” a decimal value. The value is decimal unless specified otherwise.

3. ELECTRICAL CONNECTIONS

For the connections refer to following images:

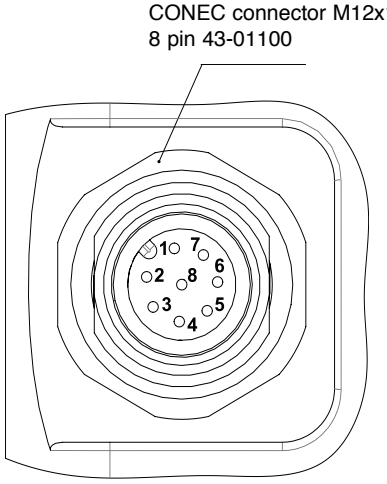
SINGLE VERSION



CONNECTIONS	
1	+SUPPLY
2	GROUND
3	OUTPUT
4	n.c.

CONNECTIONS	
1	+SUPPLY
2	GROUND
3	CANH
4	CANL

REDUNDANT VERSION



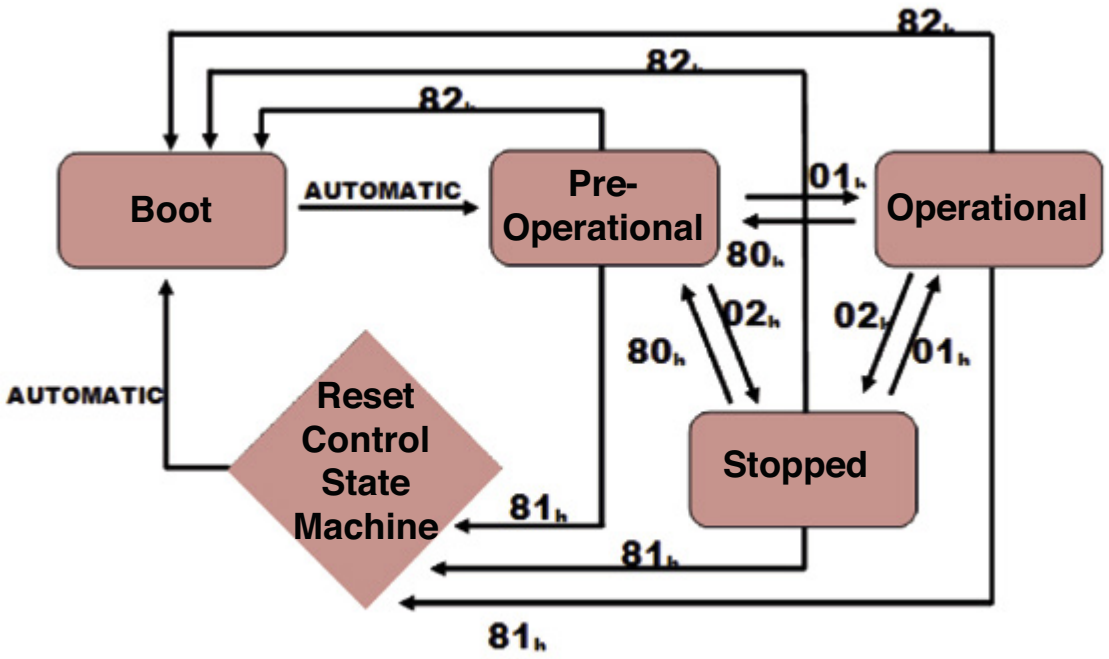
CONNECTIONS	
1	+SUPPLY
2	GROUND
3	OUTPUT 1
4	n.c.
5	+SUPPLY
6	GROUND
7	OUTPUT 2
8	n.c.

CONNECTIONS	
1	+SUPPLY
2	GROUND
3	CANH1
4	CANL1
5	+SUPPLY
6	GROUND
7	CANH2
8	CANL2

Note: please make sure that the CANbus is terminated.
The impedance measured between CAN H and CAN L must be 60 ohm that means the cable must be connected to a 120 ohm resistor on each ends of the bus line. Internally the transducer is not terminated with the resistor of 120 ohm.
Do not confuse the signal lines of the CAN bus, otherwise communication with the transducer is impossible.

4. NETWORK MANAGEMENT (NMT)

The device supports CANopen network management functionality NMT Slave (Minimum Boot Up):



Every CANopen device contains an internal Network Management server that communicates with an external NMT master. One device in a network, generally the host, may act as the NMT master.
Through NMT messages, each CANopen device's network management server controls state changes within its built-in **Communication State Machine**.
This is independent from each node's operational state machine, which is device dependant and described in **Control State Machine**.
It is important to distinguish a CANopen device's operational state machine from its Communication State Machine.
CANopen sensors and I/O modules, for example, have completely different operational state machines than servo drives.

The "**Communication State Machine**" in all CANopen devices, however, is identical as specified by the DS301. NMT messages have the highest priority. The 5 NMT messages that control the **Communication State Machine** each contain 2 data bytes that identify the node number and a command to that node's state machine.
Table 1 shows the 5 NMT messages supported, and Table 2 shows the correct message construction for sending these messages.

Table 1 NMT messages supported

NMT Message	COB-ID	Data Bytes 1	Data Bytes 2
Start Remote Node	0	01h	Node-ID*
Stop Remote Node	0	02h	Node-ID*
Pre-operational State	0	80h	Node-ID*
Reset Node	0	81h	Node-ID*
Reset Communication	0	82h	Node-ID*

** Node-ID = Drive address (da 1 a 7Fh)*

Table 2 NMT message construction

Arbitration Field		**Data Field**							
COB-ID	RTR	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
000h	0	See Table 1	See Table2	These bytes not sent					

5. BAUD RATE

Node ID can be configurable via SDO communication object 0x20F2 and 0x20F3 (see communication examples at the end of this document).

The default Baud rate is 250kbit/s.

Important Note:
Changing this parameter can disturb the network! Use this service only if one device is connected to the network!

6. Node-ID

Node ID can be configurable via SDO communication object 0x20F0 and 0x20F1 (see communication examples at the end of this document).

The default Node-ID is 7F.

Important Note:
Changing this parameter can disturb the network! Use this service only if one device is connected to the network!

7. PARAMETER SETTINGS

All object dictionary parameters (objects with marking PARA) can be saved in a special section of the internal EEPROM and secured by checksum calculation.
The special LSS parameters (objects with marking LSS-PARA), also part of the object dictionary, will be also saved in a special section of the internal EEPROM and secured by checksum calculation.
Due to the internal architecture of the microcontroller the parameter write cycles are limited to 100,000 cycles.

8. RESTORE DEFAULT PARAMETERS

All object dictionary parameters (objects with marking PARA) can be restored to factory default values via SDO communication (index 0x1011).

9. HEARTBEAT

The heartbeat mechanism for this device is established through cyclic transmission of the heartbeat message done by the heartbeat producer.
One or more devices in the network are aware of this heartbeat message. If the heartbeat cycle fails from the heartbeat producer the local application on the heartbeat consumer will be informed about that event.

The implementation of either guarding or heartbeat is mandatory.

The device supports **Heartbeat Producer** functionality. The producer heartbeat time is defined in object 0x1017.

Heartbeat Message

COB-ID	Byte	0
700+Nodo-ID	Content	NMT State

10. ERROR HANDLING

Principle

Emergency messages (EMCY) shall be triggered by internal errors on device and they are assigned the highest possible priority to ensure that they get access to the bus without delay (**EMCY Producer**).
By default, the EMCY contains the error field with pre-defined error numbers and additional information.

Error Behavior (object 0x4000)

If a serious device failure is detected the object 0x4000 specifies, to which state the module shall be set:

0: pre-operational
1: no state change (default)
2: stopped

EMCY Message

The EMCY COB-ID is defined in object 0x1014. The EMCY message consists of 8 bytes.
It contains an emergency error code, the contents of object 0x1001 and 5 byte of manufacturer specific error code.
This device uses only the 1st byte as manufacturer specific error code

Byte	**Byte1** **Byte2**	**Byte3**	**Byte4**	**Byte5**	**Byte6** **Byte7** **Byte8**
Description	Emergency Error Code [1)]	Error Register (object 0x1001[2)])	Manufacturer specific error code (always 0x00)	Manufacturer specific error code (object 0x4001)	Manufacturer specific error code NOT IMPLEMENTED (always 0x00)
[1)] **Error Code**		0x0000 Error Reset or no Error (Error Register = 0 0x1000 Generic error			
[2)] **Always 0**					

Supported Manufacturer Specific Error Codes (object 0x4001)

Manufacturer Specific Error Code (bit field)	**Description**
0bxxxxxxx1	Generic Error (e.g. potentiometric signal under/above limits, temperature under/above limits)
0bxxx1xxxx)	Program checksum error
0bxx1xxxxx	Flash limit reached - error
0bx1xxxxxx	LSS Parameter checksum error

11. COMMUNICATION AND READ/WRITE COMMANDS

The device fulfils the **SDO Server** functionality.

With **Service Data Object (S.D.O.)** the access to entries of a device Object Dictionary is provided.
As these entries may contain data of arbitrary size and data type SDOs can be used to transfer multiple data sets from a client to a server and vice versa.

Structure of SDO-request by the Master

COB-ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
600+Node-ID	8	CMD	Index		Sub-Index	Data	Data	Data	Data

Structure of SDO-answer by the Slave

COB-ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
580+Node-ID	8	RES	Index		Sub-Index	Data	Data	Data	Data

Write Access, Data Transfer from Host to Slave

Each access to the object dictionary is checked by the slave for validity. Any write access to nonexisting objects, to read-only objects or with a non-corresponding data format are rejected and answered with a corresponding error message.

CMD determines the direction of data transfer and the size of the data object:
- 23 hex Sending of 4-byte data (bytes 5...8 contain a 32-bit value)
- 2B hex Sending of 2-byte data (bytes 5, 6 contain a 16-bit value)
- 2F hex Sending of 1-byte data (byte 5 contains an 8-bit value)

The slave answers:

RES Response of the slave:
- 60 hex Data sent successfully
- 80 hex Error,

Read Access, Data Transfer from Slave to Host

Any read access to non-existing objects is answered with an error message.

CMD determines the direction of data transfer:
- 40 hex read access (in any case)

The slave answers:

RES Response of the slave:
- 42 hex Bytes used by node when replying to read command with 4 or less data
- 43 hex Bytes 5...8 contain a 32-bit value
- 4B hex Bytes 5, 6 contain a 16-bit value
- 4F hex Byte 5 contains an 8-bit value
- 80 hex Error,

Transmit PDO #0 – Length calculation GSF-xxx

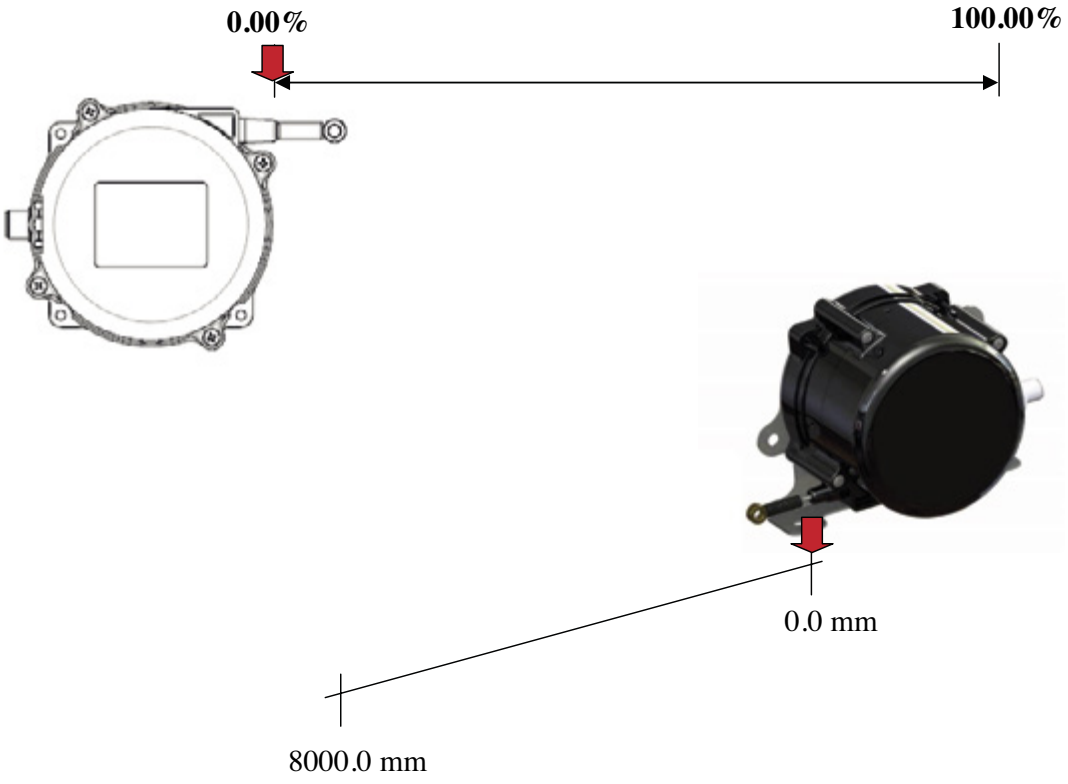
This PDO transmits the length value of the position sensor. The Tx PDO #0 shall be transmitted cyclically, if the cyclic timer (object 0x1800.5) is programmed > 0. Values between 4ms and 65535 ms shall be selectable by parameter settings.
The Tx PDO #0 will be transmitted by entering the "Operational" state.

Byte	Byte1	Byte2	Byte3	Byte4	Byte5 Byte6 Byte7 Byte8
Description	POSITION VALUE (object 0x6004) Low-Byte LSB	POSITION VALUE (object 0x6004) …	POSITION VALUE (object 0x6004) …	POSITION VALUE (object 0x6004) High-Byte MSB	(0x00)

12.1 EXAMPLE 1: TPDO #0 length 0.0 mm

In the following figures an example of PDO mapping is reported in the case of:

- Node-ID = 7Fh
- Baude-rate = 250 kBaud
- Linear-encoder Cia406 setting as follow:
  - I. Total Measuring Range (object 0x6002.0) = 8000 mm (800 steps x 10 mm)
  - II. Preset Value (object 0x6003.0) = 0 mm (0 steps x 10^3 nm)
  - III. Measuring Step (object 0x6005.0) = 1 mm (500 steps x 10^3 nm)
  - IV. Position Value (object 0x6004.0):



ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
1FFh	00h	00h	00h	00h	00h	00h	00h	00h

Position Value:

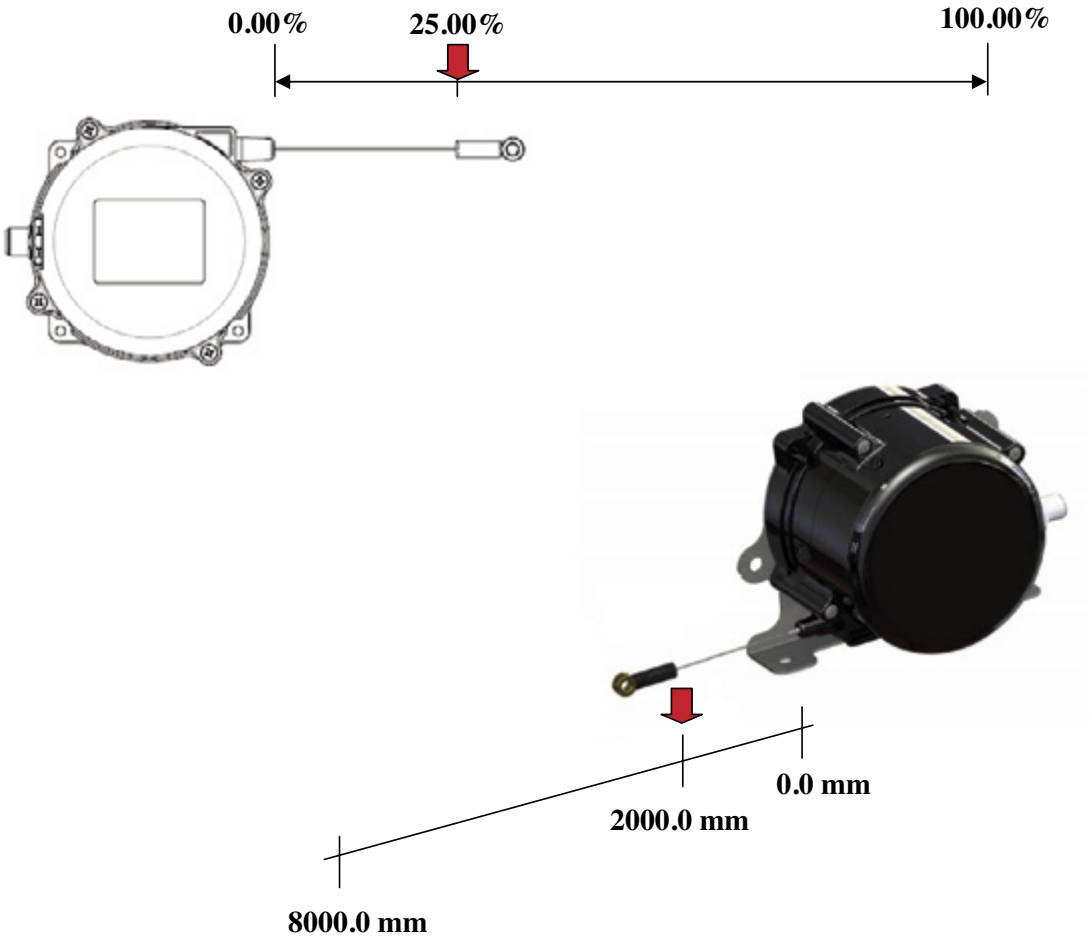
Byte 1 LSB (00h) = 00h
Byte 2 = 00h
Byte 3 = 00h
Byte 4 (MSB) = 00h

Position Value = 00000000h to decimal 0d (resolution 1 mm) = 0 mm

12.2 EXAMPLE 2: TPDO #0 length 2000.0 mm

In the following figures an example of PDO mapping is reported in the case of:

- Node-ID = 7Fh
- Baude-rate = 250 kBaud
- Linear-encoder Cia406 setting as follow:
  - I. Total Measuring Range (object 0x6002.0) = 8000 mm (800 steps x 10 mm)
  - II. Preset Value (object 0x6003.0) = 0 mm (0 steps x 10^3 nm)
  - III. Measuring Step (object 0x6005.0) = 1 mm (500 steps x 10^3 nm)
  - IV. Position Value (object 0x6004.0):



ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
1FFh	A0h	0Fh	00h	00h	00h	00h	00h	00h

Position Value:

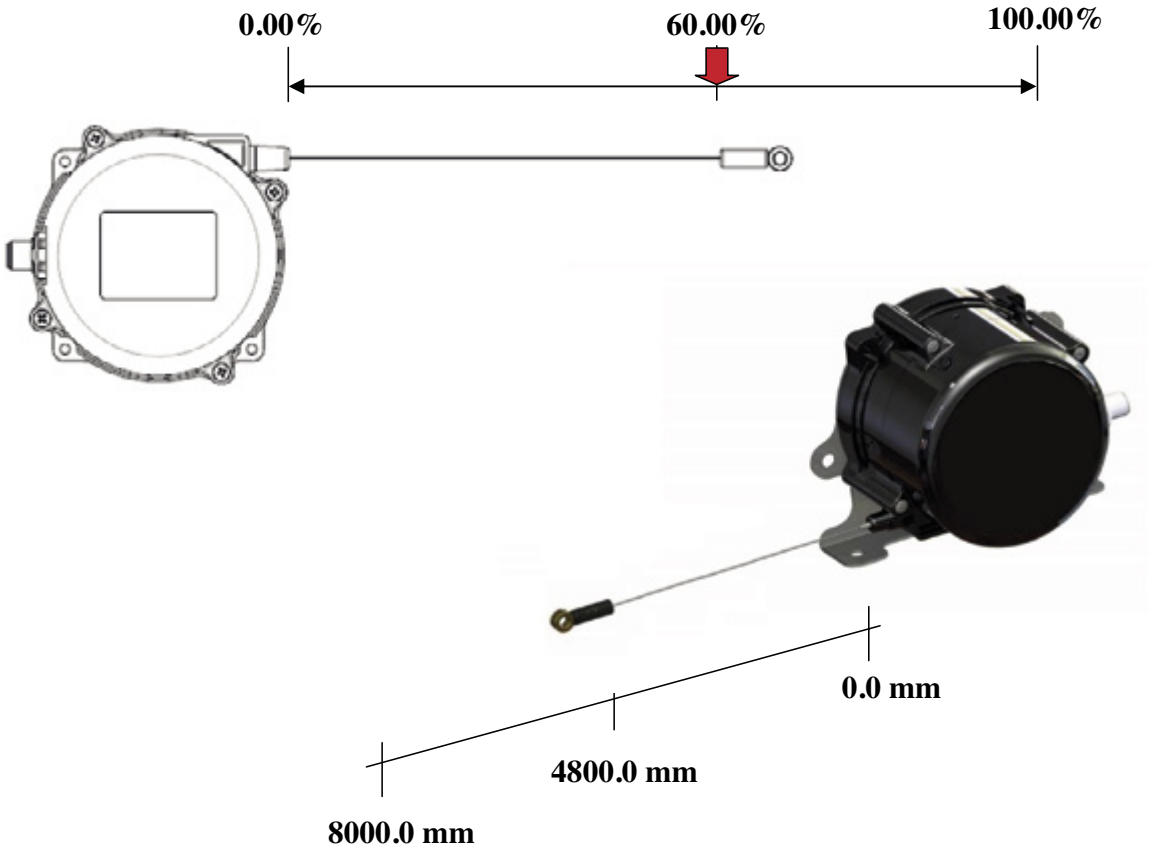
Byte 1 (LSB) = A0h
Byte 2 = 0Fh
Byte 3 = 00h
Byte 4 (MSB) = 00h

Position Value = 00000FA0h to decimal 4000d (resolution 1mm) = 2000.0 mm

12.3 EXAMPLE 3: TPDO #0 length 4800.0 mm

In the following figures an example of PDO mapping is reported in the case of:

- Node-ID = 7Fh
- Baude-rate = 250 kBaud
- Linear-encoder Cia406 setting as follow:
  - I. Total Measuring Range (object 0x6002.0) = 8000 mm (800 steps x 10 mm)
  - II. Preset Value (object 0x6003.0) = 0 mm (0 steps x 10^3 nm)
  - III. Measuring Step (object 0x6005.0) = 1 mm (500 steps x 10^3 nm)
  - IV. Position Value (object 0x6004.0):



ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
1FFh	80h	25h	00h	00h	00h	00h	00h	00h

Position Value:

Byte 1 (LSB) = 80h
Byte 2 = 25h
Byte 3 = 00h
Byte 4 (MSB) = 00h

Position Value = 00002580h to decimal 9600d (resolution 1 mm) = 4800.0 mm

13. CANopen FEATURES SUMMARY

Communication profile

The parameters which are critical for communication are determined in the Communication profile.
This area is common for all CANopen devices.

Index	Sub Index	Name	Type	Access	Default value	Comments
1000h		Device Profile	Unsigned 32	Ro	0x0008019A	Profile DS-406: Device Profile for encoder.
1001h		Error Register	Unsigned 8	Ro	0x00	Always ZERO
1005h		COB-ID SYNC	Unsigned 32	Rw	0x00000080	Always ZERO
1008h		Manufacturer Device Name	String	Const	“GSF”	Refer to GEFRAN products catalogue: GSF: Draw wire sensor
1009h		Manufacturer HW Version	String	Const	“1.00”	
100Ah		Manufacturer SW Version	String	Const	“1.10”	
1010h	0	Number of Entries	Unsigned 8	Ro	1	“save” (0x65766173) to store all parameters (objects with marking PARA)
	1	Save all Parameters	Unsigned 32	Wo		
1011h	0	Restore Default Parameters	Unsigned 8	Ro	1	"load" (0x64616F6C) to restore all parameters (objects with marking PARA and LSS-PARA).
	1	Load all parameters	Unsigned 32	Wo		
1014h	0	Emergency ID	Unsigned 32	Ro	0x80 + Nodo-ID	
1017h	0	Producer Time / Heart Beat -PARA	Unsigned 16	Rw	0	Min= 0 & Max=65535 with unit = 1ms If 0: NOT USED From 1 to 19 NOT ACCEPTED From 20 to 65535 ACCEPTED
1018h	0	Identity Object	Unsigned 8	Ro	4	Refer to “Gefran Product Overview CANopen” Gefran Vendor ID:0x0000093
	1	Vendor ID	Unsigned 32	Ro	0x0000093	
	2	Product Code	Unsigned 32	Ro	0x0000067	
	3	Revision Number	Unsigned 32	Ro	0x0000001	
	4	Serial Number	Unsigned 32	Ro	0x0000000	
1200h		SDO Server Parameter				
	0	Number of Entries	Unsigned 8	Ro	2	
	1	COB-ID Client to Server (Rx)	Unsigned 32	Ro	0x600+ Node-ID	
	2	COB-ID Server to Server (Tx)	Unsigned 32	Ro	0x580+ Node-ID	
1800h	0	Tx PDO #0 Parameter	Unsigned 8	Ro	5	
	1	COB-ID Trans PDO	Unsigned 32	Ro	180h + Node-ID	
	2	Transmission Type Trans PDO - PARA	Unsigned 8	Rw	254 (0xFE)	0x01...0xF0 = synch cyclic Outputs are only updated after "n" synch objects. n = 0x01 (1) ... 0xF0 (240) 0xFC not implemented 0xFD not implemented 0xFE = asynch 0xFF = not implemented
	5	Event timer Trans PDO-PARA	Unsigned 16	Rw	100 (0X64)	0 = Inactive Min= 4 & Max=65535 with unit = 1ms
1802h	0	Tx PDO #2 Parameter	Unsigned 8	Ro	5	
	1	COB-ID Trans PDO	Unsigned 32	Ro	380h + Node-ID	0x01...0xF0 = synch cyclic Outputs are only updated after "n" synch objects. n = 0x01 (1)...0xF0 (240) 0xFC not implemented 0xFD not implemented 0xFE = asynch 0xFF = not implemented 0= inactive Min=4 & Max=65535 with unit = 1ms
	2	Transmission Type Trans PDO	Unsigned 8	Rw	254 (0xFE)	
	5	Event Timer Trans PDO- PARA	Unsigned 16	Rw	100 (0x64	
1A00h		Tx PDO [X] 0 Mapping Parameter				Wire Length is indicated in Idx 6004
	0	Number of entries	Unsigned 8	Ro	1	
	1	1° Mapped Object	Unsigned 32	Ro	0x60040020	
1A02h		Tx PDO [X] 2 Mapping Parameter				Wire Length is indicated in Idx 6300
	0	Number of entries	Unsigned 8	Ro	1	
	1	1° Mapped Object	Unsigned 32	Ro	0x63000108	

Manufacturer Specific Profile Objects

In this section you will find the manufacturer specific profile indices for the transducer.

Index	Sub Index	Name	Type	Access	Default value	Comments
20F0h	0	Setting of the Node ID	Unsigned 8	Rw	0x7F (=127d)	The node ID used to access the sensor in the CANopen network
20F1h	0	Setting of the Node ID	Unsigned 8	Rw	0x7F (=127d)	The node ID used to access thes ensor in the CANopen network

A change of the Node ID is only accepted if the entries 20F0 and 20F1 contain the same changed value.
Values below 1 / above 127 are not accepted; the existing setting remains valid.
After setting the new entries a reset must be made so that the new entries become valid (switch off the module for a short time).

Index	Sub Index	Name	Type	Access	Default value	Comments
20F2h	0	Setting of the Baude rate	Unsigned 8	Rw	0x03 (250 kBaud)	Baud rate of the CAN network 0 = 1000 kBaud 1 = 800 kBaud 2 = 500 kBaud 3 = 250 kBaud (default) 4 = 125 kBaud 5 = 100 kBaud 6 = 50 kBaud 7 = 20 kBaud
20F3h	0	Setting of the Baude rate	Unsigned 8	Rw	0x03 (250 kBaud)	Baud rate of the CAN network 0 = 1000 kBaud 1 = 800 kBaud 2 = 500 kBaud 3 = 250 kBaud (default) 4 = 125 kBaud 5 = 100 kBaud 6 = 50 kBaud 7 = 20 kBaud

A change of the Baude rate is only accepted if the entries 20F2 and 20F3 contain the same changed value.
Values above 7 are not accepted; the existing setting remains valid.
After setting the new entries a reset must be made so that the new entries become valid (switch off the module for a short time).

Manufacturer Specific Profile Objects

In this section you will find the manufacturer specific profile indices for the transducer.

Index	Sub Index	Name	Type	Access	Default value	Comments
4000h		Error Behavior - PARA	Unsigned 8	Rw	1	0: Pre-operational 1: no state change 2: stopped Min=0 & Max=255
4001h		Error code	Unsigned 8	Ro	0	0: no error Min=0 & Max=255
5000h		Automatic NMT Start after Power-On - PARA	Unsigned 8	Rw	0	0:not activated, 1: activated Min=0 & Max=1
5001h		PDO coding used-PARA	Unsigned 8	Rw	1	0:Big Endian; 1: Little Endian

Manufacturer Specific Profile Objects (according to CiA DS-406)

In this section you will find the manufacturer specific profile indices for the transducer as LINEAR ENCODER.

Index	Sub Index	Name	Type	Access	Default value	Comments
6000h	0	Operating Parameters -PARA	Unsigned 16	Ro	0x00 (0d)	Contain the functions for code sequence, commissioning diagnostic control and scaling function control. (*) *Optional functions NOT activated in standard versions (always 0x00).*
6002h	0	Total Measuring Range	Unsigned 32	Ro	-	Measuring range in 10 mmm steps. *Example*: Measuring Range 8000 mm Total Measuring Range = 0x0320 (800d)
6003h	0	Preset Value	Unsigned 32	Rw	0x00 (0d)	The Preset function supports adaption of the GSF zero point to the mechanical zero point of the system. The output position value is set to the parameter „Preset value“ and the offset from the position value is calculated and stored in the GSF
6004h	0	Position Value	Unsigned 32	Ro	-	The object 6004h „Position value“ defines the output position value for the communication objects 1800h.
6005h	0	Measuring Steps	Unsigned 32	Rw	0x000003E8 (1000d) 10^3 nm	The parameter „Linear encoder measuring step settings“defines the measuring step settings for the position value. 10^3 … 10^6 nm

In this section you will find the manufacturer specific profile indices for the transducer as CAM (*optional functions NOT activated in standard version*)

Index	Sub Index	Name	Type	Access	Default value	Comments
6300h	0	CAM State Register	Unsigned 8	Ro	0x00 (0d)	The parameter „Cam state register“ defines the status bit of the cam in a cam channel. The status bit set to 1 defines „cam active“. The status bit set to 0 defines „cam inactive“. If the polarity bit of a cam is set (refer to index 6302h) the actual cam state will be inverted.
6301h	0	CAM Enable Register	Unsigned 8	Rw	0x00 (0d)	Each Cam_enable_channel contains the calculation state for a maximum of 8 cam´s for one position channel. If the enable bit is set to 1, the cam state will be calculated by the device. In the other case the cam state of the related cam will be set permanently to 0.

Index	Sub Index	Name	Type	Access	Default value	Comments
6302h	0	CAM Polarity Register	Unsigned 8	Rw	0x00 (0d)	Each Cam_polarity_channel contains the actual polarity settings for a maximum of 8 cam´s for one position channel. If the polarity bit is set to 1, the cam state of an active cam will signal by setting the related cam state bit to zero. In the other case the cam state of the related cam will not be inverted.
6310h	0	CAM 1 – LOW LIMIT	Unsigned 32	Rw	0x00 (0d)	Each Cam_low_limit_channel contains the switch point for the lower limit setting for a maximum of 8 cam´s for one position channel.
6311h	0	CAM 2 – LOW LIMIT	Unsigned 32	Rw	0x00 (0d)	Each Cam_low_limit_channel contains the switch point for the lower limit setting for a maximum of 8 cam´s for one position channel.
6312h	0	CAM 3 – LOW LIMIT	Unsigned 32	Rw	0x00 (0d)	Each Cam_low_limit_channel contains the switch point for the lower limit setting for a maximum of 8 cam´s for one position channel.
6313h	0	CAM 4 – LOW LIMIT	Unsigned 32	Rw	0x00 (0d)	Each Cam_low_limit_channel contains the switch point for the lower limit setting for a maximum of 8 cam´s for one position channel.
6314h	0	CAM 5 – LOW LIMIT	Unsigned 32	Rw	0x00 (0d)	Each Cam_low_limit_channel contains the switch point for the lower limit setting for a maximum of 8 cam´s for one position channel.
6315h	0	CAM 6 – LOW LIMIT	Unsigned 32	Rw	0x00 (0d)	Each Cam_low_limit_channel contains the switch point for the lower limit setting for a maximum of 8 cam´s for one position channel.
6316h	0	CAM 7 – LOW LIMIT	Unsigned 32	Rw	0x00 (0d)	Each Cam_low_limit_channel contains the switch point for the lower limit setting for a maximum of 8 cam´s for one position channel.
6317h	0	CAM 8 – LOW LIMIT	Unsigned 32	Rw	0x00 (0d)	Each Cam_low_limit_channel contains the switch point for the lower limit setting for a maximum of 8 cam´s for one position channel.
6320h	0	CAM 1 – HIGH LIMIT	Unsigned 32	Rw	0x00 (0d)	Each Cam_high_limit_channel contains the switch point for the higher limit setting for a maximum of 8 cam´s for one position channel.
6321h	0	CAM 2 – HIGH LIMIT	Unsigned 32	Rw	0x00 (0d)	Each Cam_high_limit_channel contains the switch point for the higher limit setting for a maximum of 8 cam´s for one position channel.
6322h	0	CAM 3 – HIGH LIMIT	Unsigned 32	Rw	0x00 (0d)	Each Cam_high_limit_channel contains the switch point for the higher limit setting for a maximum of 8 cam´s for one position channel.
6323h	0	CAM 4 – HIGH LIMIT	Unsigned 32	Rw	0x00 (0d)	Each Cam_high_limit_channel contains the switch point for the higher limit setting for a maximum of 8 cam´s for one position channel.
6324h	0	CAM 5 – HIGH LIMIT	Unsigned 32	Rw	0x00 (0d)	Each Cam_high_limit_channel contains the switch point for the higher limit setting for a maximum of 8 cam´s for one position channel.
6325h	0	CAM 6 – HIGH LIMIT	Unsigned 32	Rw	0x00 (0d)	Each Cam_high_limit_channel contains the switch point for the higher limit setting for a maximum of 8 cam´s for one position channel.
6326h	0	CAM 7 – HIGH LIMIT	Unsigned 32	Rw	0x00 (0d)	Each Cam_high_limit_channel contains the switch point for the higher limit setting for a maximum of 8 cam´s for one position channel.
6327h	0	CAM 8 – HIGH LIMIT	Unsigned 32	Rw	0x00 (0d)	Each Cam_high_limit_channel contains the switch point for the higher limit setting for a maximum of 8 cam´s for one position channel.
6330h	0	CAM 1 – HYSTERESIS	Unsigned 32	Rw	0x00 (0d)	Each Cam_ hysteresis _channel contains the delay setting of switch points for a maximum of 8 cam´s for one position channel. For illustration of the hysteresis functionality refer below.
6331h	0	CAM 2 – HYSTERESIS	Unsigned 32	Rw	0x00 (0d)	Each Cam_ hysteresis _channel contains the delay setting of switch points for a maximum of 8 cam´s for one position channel. For illustration of the hysteresis functionality refer below.

Index	Sub Index	Name	Type	Access	Default value	Comments
6332h	0	CAM 3 – HYSTERESIS	Unsigned 32	Rw	0x00 (0d)	Each Cam_ hysteresis _channel contains the delay setting of switch points for a maximum of 8 cam´s for one position channel. For illustration of the hysteresis functionality refer below.
6333h	0	CAM 4 – HYSTERESIS	Unsigned 32	Rw	0x00 (0d)	Each Cam_ hysteresis _channel contains the delay setting of switch points for a maximum of 8 cam´s for one position channel. For illustration of the hysteresis functionality refer below.
6334h	0	CAM 5 – HYSTERESIS	Unsigned 32	Rw	0x00 (0d)	Each Cam_ hysteresis _channel contains the delay setting of switch points for a maximum of 8 cam´s for one position channel. For illustration of the hysteresis functionality refer below.
6335h	0	CAM 6 – HYSTERESIS	Unsigned 32	Rw	0x00 (0d)	Each Cam_ hysteresis _channel contains the delay setting of switch points for a maximum of 8 cam´s for one position channel. For illustration of the hysteresis functionality refer below.
6336h	0	CAM 7 – HYSTERESIS	Unsigned 32	Rw	0x00 (0d)	Each Cam_ hysteresis _channel contains the delay setting of switch points for a maximum of 8 cam´s for one position channel. For illustration of the hysteresis functionality refer below.
6337h	0	CAM 8 – HYSTERESIS	Unsigned 32	Rw	0x00 (0d)	Each Cam_ hysteresis _channel contains the delay setting of switch points for a maximum of 8 cam´s for one position channel. For illustration of the hysteresis functionality refer below.

Ro = the parameter can be read only
Rw = the parameter can be read and also written
Wo = the parameter can be written only

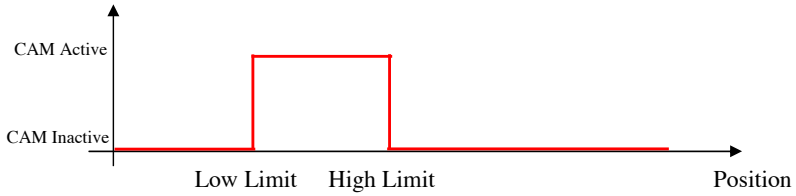
(*) **Operating Parameters (Object 0x6000)**

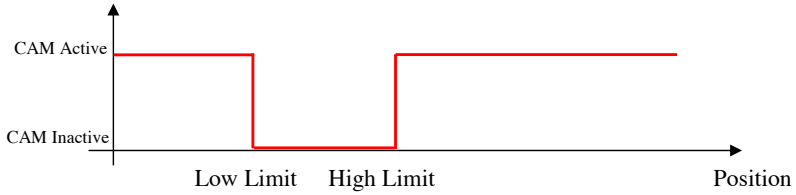
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
-	-	-	-	-	-	-	-	-	-	-	-	**MD**	**SF**	-	-
MSB	**...**	**...**	**...**	**...**	**...**	**...**	**...**	**...**	**...**	**...**	**...**	**...**	**...**	**...**	**LSB**

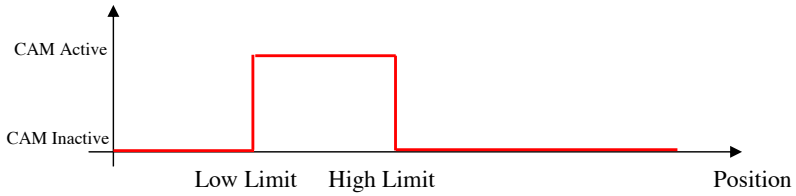
MD = 0/1 Measuring Direction UP/DOWN
SF = 0/1 Scaling Function DISABLE/ENABLE

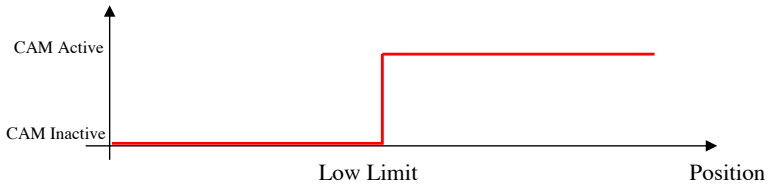
GSF Cams functionality *(optional functions NOT activated in standard version)*

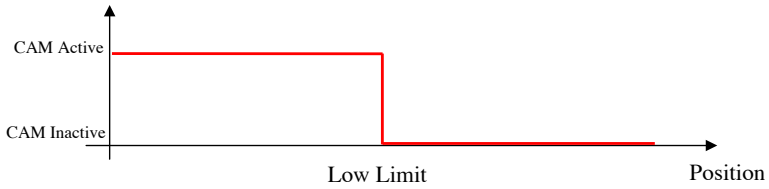
Each Cam has parameters for the minimum switch point, the maximum switch point and setting a hysteresis to the switch points. Possible usage of cam's and switch points:

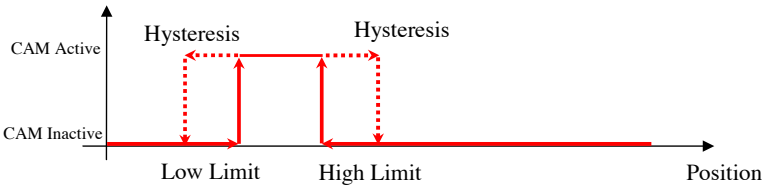






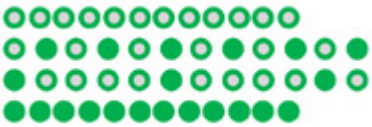


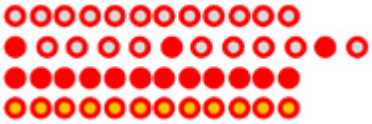




14. Status LED

The integrated two color Status LED signals the recent device state (Run LED, green) as well as CAN communication errors that might have occurred (Error LED, red).
The color and the flashing frequency of the LED distinguish the different device states as shown below.

Status LED RUN LED	**LED State**	**Desciption**
	Off	No power supply is connected
	Blinking	The device is in state Pre-Operational
	Single Flash	The device is in state Stopped
	On	The device is in state Operational

LED di Errore LED in funzione	**LED State**	**Description**
	Off	The device is in working condition
	Single Flash	CAN Warning Limit reached
	On	The device is in state Bus-Off
	Red/Green On	Limit Angles reached (110% FS or ± 87°)

Legend	
	= LED green OFF
	= LED green ON
	= LED Red OFF
	= LED Red ON
	= LEDs Red & Green ON together
	= LED Green Blinking (200 ms ON/OFF)
	= LEDs Green single Flash (500 ms ON/OFF)

EXAMPLE 1

How to change the Baud Rate Setting from 250 kbaud (current setting) to 500 kbaud

With Service Data Object (S.D.O.) the access to entries of a device Object Dictionary is provided.
As these entries may contain data of arbitrary size and data type SDOs can be used to transfer multiple data sets from a client to a server and vice versa.

Structure of SDO-request by the Master

COB-ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
600+Node-ID	8	CMD	Index		Sub-Index	Data			

CMD determines the direction of data transfer and the size of the data object:
23 hex Sending of 4-byte data (bytes 5...5 contain a 32-bit value)
2B hex Sending of 2-byte data (bytes 5, 6 contain a 16-bit value)
2F hex Sending of 1-byte data (byte 5 contains an 8-bit value)

Structure of SDO-answer by the Slave

COB-ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
580+Node-ID	8	CMD	Index		Sub-Index	Data			

RES Response of the slave:
60 hex Data sent successfully
80 hex Error,
A change of the Baud rate is only accepted if the entries 0x20F2 and 0x20F3 contain the same changed value. With the aim to change the baud rate from 250kBaud (0x03) to 500 kBaud (0x02) write a first SDO (in the example the Node-ID = 0x7F).

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
67Fh	2Fh	F2h	20h	00h	02h	00h	00h	00h

A change of the Baud rate is only accepted if the entries 0x20F2 and 0x20F3 contain the same changed value. With the aim to change the baud rate from 250kBaud (0x03) to 500 kBaud (0x02) write a second SDO (in the example the Node-ID = 0x7F).

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
67Fh	2Fh	F3h	20h	00h	02h	00h	00h	00h

Object:

20F2h	0	Setting of the Baude rate	Unsigned 8	Rw	0x03 (250 kBaud)	Baud rate of the CAN network 0 = 1000 kBaud 1 = 800 kBaud 2 = 500 kBaud 3 = 250 kBaud (default) 4 = 125 kBaud 5 = 100 kBaud 6 = 50 kBaud 7 = 20 kBaud
20F3h	0	Setting of the Baude rate	Unsigned 8	Rw	0x03 (250 kBaud)	Baud rate of the CAN network 0 = 1000 kBaud 1 = 800 kBaud 2 = 500 kBaud 3 = 250 kBaud (default) 4 = 125 kBaud 5 = 100 kBaud 6 = 50 kBaud 7 = 20 kBaud

The supported baudrate are listed in the following table:

Byte5	Baudrate
07h	20 kBaud
06h	50 kBaud
05h	100 kBaud
04h	125 kBaud
03h	250 kBbaud
02h	500 kBbaud
01h	800 kBbaud
00h	1000 kBbaud

The answer after successful storing you will receive is:

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
5FFh	60h	F2h	20h	00h	00h	00h	00h	00h

and

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
5FFh	60h	F3h	20h	00h	00h	00h	00h	00h

IMPORTANT NOTE:
A change of the Baud rate is only accepted if the entries 0x20F2 and 0x20F3 contain the same changed value.
Values above 7 are not accepted; the existing setting remains valid.
After setting the new entries a reset must be made so that the new entries become valid (switch off the module for a short time).

EXAMPLE2

How to change the ID-Node from 0x7Fh (127d) (current setting) to 0x06h (6d)

With Service Data Object (S.D.O.) the access to entries of a device Object Dictionary is provided.
As these entries may contain data of arbitrary size and data type SDOs can be used to transfer multiple data sets from a client to a server and vice versa.

Structure of SDO-request by the Master

COB-ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
600+Nodo-ID	8	CMD	Indice		Sotto Indice	Data			

CMD determines the direction of data transfer and the size of the data object:
23 hex Sending of 4-byte data (bytes 5...5 contain a 32-bit value)
2B hex Sending of 2-byte data (bytes 5, 6 contain a 16-bit value)
2F hex Sending of 1-byte data (byte 5 contains an 8-bit value)

COB-ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
580+Nodo-ID	8	CMD	Indice		Sotto Indice	Data			

RES Response of the slave:
60 hex Data sent successfully
80 hex Error,
A change of the Node ID is only accepted if the entries 0x20F0 and 0x20F1 contain the same changed value. With the aim to change the Node ID from 127 (0x7F) to 6 (0x06) write a first SDO (in the example the Node-ID = 0x7F).

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
67Fh	2Fh	F0h	20h	00h	06h	00h	00h	00h

A change of the Node ID is only accepted if the entries 0x20F0 and 0x20F1 contain the same changed value. With the aim to change the Node ID from 127 (0x7F) to 6 (0x06) write a second SDO (in the example the Node-ID = 0x7F).

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
67Fh	2Fh	F1h	20h	00h	06h	00h	00h	00h

Object:

20F0h	0	Setting of the Node ID	Unsigned 8	Rw	0x7F (= 127d)	The Node ID used to access the sensor in the CANopen
20F1h	0	Setting of the Node ID	Unsigned 8	Rw	0x7F (= 127d)	The Node ID used to access the sensor in the CANopen

The supported Node-ID are 0x01 to 0x7F The answers after successful storing you will receive is:

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
5FFh	60h	F0h	20h	00h	00h	00h	00h	00h

and

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
5FFh	60h	F1h	20h	00h	00h	00h	00h	00h

IMPORTANT NOTE:
A change of the Node ID is only accepted if the entries 0x20F0 and 0x20F1 contain the same changed value. Values below 1 / above 127 are not accepted; the existing setting remains valid. After setting the new entries a reset must be made so that the new entries become valid (switch off the module for a short time).

EXAMPLE 3

How to change the PDO rate (time interval) from 100 ms (current setting)to 20 ms

With Service Data Object (S.D.O.) the access to entries of a device Object Dictionary is provided.
As these entries may contain data of arbitrary size and data type SDOs can be used to transfer multiple data sets from a client to a server and viceversa.

Structure of SDO-request by the Master

COB-ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
600+Node-ID	8	CMD	Index		Sub-Index	Data	Data		

CMD determines the direction of data transfer and the size of the data object:
23 hex Sending of 4-byte data (bytes 5...5 contain a 32-bit value)
2B hex Sending of 2-byte data (bytes 5, 6 contain a 16-bit value)
2F hex Sending of 1-byte data (byte 5 contains an 8-bit value)

Structure of SDO-answer by the Slave

COB-ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
580+Node-ID	8	CMD	Index		Sub-Index	Data	Data		

RES Response of the slave:
60 hex Data sent successfully
80 hex Error,
With the aim to change the PDO rate from 100 ms (0x64) to 20 ms (0x14) write (in the example the Node-ID = 0x7F).

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
67Fh	2Bh	00h	18h	05h	14h	00h	00h	00h

Object:

1800h	0	1st Transmit PDO Parameter	Unsigned 8	Ro		
	1	COB-ID	Unsigned 32	Ro	180h+ Node-ID	
	2	Transmission Type	Unsigned 8	Rw	254	Asynchronous transmission.
	3	Inhibit Time	Unsigned 16	Ro	0	Min=0 & Max=65535 with unit=1ms
	4	Reserved	//	//		
	5	Timer	Unsigned 16	Rw	100 (64_h)	Min=0 & Max=65535 with unit=1ms

The answer after successful storing you will receive is:

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
5FFh	60h	00h	18h	05h	00h	00h	00h	00h

With the aim to save functionality write the “save” command as below:

Write (in the example the Node-ID = 0x7F)

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
67Fh	23h	10h	10h	01h	73h	61h	76h	65h

Note: save command is given by sending the code:

73h	61h	76h	65h

Where:
73h = ASCII code “**s**”
61h = ASCII code “**a**”
76h = ASCII code “**v**”
65h = ASCII code “**e**”

The answer after successful storing you will receive is:

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
5FFh	60h	10h	10h	01h	00h	00h	00h	00h

IMPORTANT NOTE:
After setting the new entries a reset must be made so that the new entries become valid (switch off the module for a short time).

EXAMPLE 4

How to activate an automatic NMT Start after Power ON (the PDO will be send automatically after power ON)

With Service Data Object (S.D.O.) the access to entries of a device Object Dictionary is provided. As these entries may contain data of arbitrary size and data type SDOs can be used to transfer multiple data sets from a client to a server and vice versa.

Structure of SDO-request by the Master

COB-ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
600+Node-ID	8	CMD	Index		Sub-Index	Data			

CMD determines the direction of data transfer and the size of the data object:
23 hex Sending of 4-byte data (bytes 5...5 contain a 32-bit value)
2B hex Sending of 2-byte data (bytes 5, 6 contain a 16-bit value)
2F hex Sending of 1-byte data (byte 5 contains an 8-bit value)

Structure of SDO-answer by the Slave

COB-ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
580+Node-ID	8	CMD	Index		Sub-Index	Data			

RES Response of the slave:
60 hex Data sent successfully
80 hex Error,
With the aim to activate an automatic NMT Start after power ON write (in the example the Node-ID = 0x7F).

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
67Fh	2Fh	00h	50h	00h	01h	00h	00h	00h

Object:

5000h		Automatic NMT Start after Power-On - PARA	Unsigned 8	Rw	1	0: not activated 1: activated Min=0 & Max=1

The answer after successful storing you will receive is:

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
5FFh	60h	00h	50h	00h	00h	00h	00h	00h

With the aim to save functionality write the “save” command as below:

Write (in the example the Node-ID = 0x7F)

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
67Fh	23h	10h	10h	01h	73h	61h	76h	65h

Note: save command is given by sending the code:

73h	61h	76h	65h

Where:
73h = ASCII code “**s**”
61h = ASCII code “**a**”
76h = ASCII code “**v**”
65h = ASCII code “**e**”

The answer after successful storing you will receive is:

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
5FFh	60h	10h	10h	01h	00h	00h	00h	00h

IMPORTANT NOTE:

After setting the new entries a reset must be made so that the new entries become valid (switch off the module for a short time).

EXAMPLE 5

How to Preset the Position Value (via object 0x6003.0) to 0 mm

The value "...Preset Value" (object 0x6003.0) affects the display of the Position Value. The value entered in "...Preset Value" immediately corrects the measured value of the sensor cell at the instant tacc. A typical application is the compensation of display errors due to mounting (e.g. sensor zeroing).
The sensor must first be brought to a defined position.

With Service Data Object (S.D.O.) the access to entries of a device Object Dictionary is provided. As these entries may contain data of arbitrary size and data type SDOs can be used to transfer multiple data sets from a client to a server and vice versa.

Structure of SDO-request by the Master

COB-ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
600+Node-ID	8	CMD	Index		Sub-Index	Data	Data	Data	Data

CMD determines the direction of data transfer and the size of the data object:
23 hex Sending of 4-byte data (bytes 5...5 contain a 32-bit value)
2B hex Sending of 2-byte data (bytes 5, 6 contain a 16-bit value)
2F hex Sending of 1-byte data (byte 5 contains an 8-bit value)

Structure of SDO-answer by the Slave

COB-ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
580+Node-ID	8	CMD	Index		Sub-Index	Data	Data	Data	Data

RES Response of the slave:
60 hex Data sent successfully
80 hex Error,

Consider the actual reading value (Node ID = 0x7F) is:

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
1FFh	05h	01h	00h	00h	00h	00h	00h	00h

Position Value:

Byte 1 (LSB) = 05h
Byte 2 = 01h
Byte 3 = 00h
Byte 4 (MSB) = 00h

Position Value = 00000105h to decimal 261d (measuring steps 1 mm) = 261 mm

Whit the aim to PRESET the reading value to 0 mm write (in the example the Node-ID = 0x7F):

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
67Fh	23h	03h	60h	00h	05h	01h	00h	00h

Object:

6003h	0	Preset Value	Unsigned 32	Rw	0x00 (0d)	The Preset function supports adaption of the GSF zero point to the mechanical zero point of the system (user offset).

The answer after successful storing you will receive is:

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
5FFh	60h	03h	60h	00h	00h	00h	00h	00h

With the aim to save functionality write the “save” command as be high:

Write (in the example the Node-ID = 0x7F)

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
67Fh	23h	10h	10h	01h	73h	61h	76h	65h

Note: save command is given by sending the code:

73h	61h	76h	65h

Where:
73h = ASCII code “**s**”
61h = ASCII code “**a**”
76h = ASCII code “**v**”
65h = ASCII code “**e**”

The answer after successful storing you will receive is:

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
5FFh	60h	10h	10h	01h	00h	00h	00h	00h

IMPORTANT NOTE:
After setting the new entries a reset must be made so that the new entries become valid (switch off the module for a short time).

EXAMPLE 6

How to send the command RESTORE

With Service Data Object (S.D.O.) the access to entries of a device Object Dictionary is provided. As these entries may contain data of arbitrary size and data type SDOs can be used to transfer multiple data sets from a client to a server and vice versa.

Structure of SDO-request by the Master

COB-ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
600+Node-ID	8	CMD	Index		Sub index	Data	Data	Data	Data

CMD determines the direction of data transfer and the size of the data object:
23 hex Sending of 4-byte data (bytes 5...5 contain a 32-bit value)
2B hex Sending of 2-byte data (bytes 5, 6 contain a 16-bit value)
2F hex Sending of 1-byte data (byte 5 contains an 8-bit value)

Structure of SDO-answer by the Slave

COB-ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
580+Node-ID	8	RES	Index		Sub index	Data	Data	Data	Data

RES Response of the slave:
60 hex Data sent successfully
80 hex Error,

With the aim to restore all parameters to default write (in the example the Node-ID = 0x7F):

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
67Fh	23h	11h	10h	01h	6Ch	6Fh	61h	64h

Object:

1011h	1	Load all parameters	Unsigned 8	Wo		"load" (0x64616F6C) to restore all parameters (objects with marking PARA and LSS-PARA).

The answer after successful storing you will receive is:

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
5FFh	60h	11h	10h	01h	00h	00h	00h	00h

IMPORTANT NOTE:

After setting the new entries a reset must be made so that the new entries become valid (switch off the module for a short time).

EXAMPLE 7

How to disable the Asynchronous Transmission (Asynchronous TPDO inactive)

With Service Data Object (S.D.O.) the access to entries of a device Object Dictionary is provided. As these entries may contain data of arbitrary size and data type SDOs can be used to transfer multiple data sets from a client to a server and vice versa.

Structure of SDO-request by the Master

COB-ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
600+Node-ID	8	CMD	Index		Sub index	Data	Data		

CMD determines the direction of data transfer and the size of the data object:
23 hex Sending of 4-byte data (bytes 5...5 contain a 32-bit value)
2B hex Sending of 2-byte data (bytes 5, 6 contain a 16-bit value)
2F hex Sending of 1-byte data (byte 5 contains an 8-bit value)

Structure of SDO-answer by the Slave

COB-ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
580+Node-ID	8	RES	Index		Sub index				

RES Response of the slave:
60 hex Data sent successfully
80 hex Error,

With the aim to disable the asynchronous transmission write theSDO (in the example the Node-ID = 0x7F):

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
67Fh	2Bh	00h	18h	05h	00h	00h	00h	00h

Object:

1800h	0	1st Transmit PDO Parameter	Unsigned 8	Ro		
	1	COB-ID Trans PDO	Unsigned 32	Ro	180h + Node-ID	
	2	Transmission Type Trans PDO - PARA	Unsigned 8	Rw	254 (0xFE)	0x01...0xF0=synch cyclic Outputs are only updated after "n" synch objects. n = 0x01 (1) ... 0xF0 (240) 0xFC not implemented 0xFD not implemented 0xFE = asynchronous 0xFF = not implemented
	5	Event timer Trans PDO- PARA	Unsigned 16	Rw	100 (0x64)	0 = inactive Min= 4 & Max=65535 with unit = 1ms

The answers after successful storing you will receive is:

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
5FFh	60h	00h	18h	05h	00h	00h	00h	00h

With the aim to save functionality write the “save” command as below:

Write (in the example the Node-ID = 0x7F)

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
67Fh	23h	10h	10h	01h	73h	61h	76h	65h

Note: save command is given by sending the code:

73h	61h	76h	65h

Where:
73h = ASCII code “**s**”
61h = ASCII code “**a**”
76h = ASCII code “**v**”
65h = ASCII code “**e**”

The answer after successful storing you will receive is:

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
5FFh	60h	10h	10h	01h	00h	00h	00h	00h

IMPORTANT NOTE:
After setting the new entries a reset must be made so that the new entries become valid (switch off the module for a short time).

EXAMPLE 8

How to enable the Synchronous Transmission (Synchronous TPDO active after 1st sync message)

With Service Data Object (S.D.O.) the access to entries of a device Object Dictionary is provided. As these entries may contain data of arbitrary size and data type SDOs can be used to transfer multiple data sets from a client to a server and vice versa.

Structure of SDO-request by the Master

COB-ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
600+Node-ID	8	CMD	Index		Sub index	Data			

CMD determines the direction of data transfer and the size of the data object:
23 hex Sending of 4-byte data (bytes 5...5 contain a 32-bit value)
2B hex Sending of 2-byte data (bytes 5, 6 contain a 16-bit value)
2F hex Sending of 1-byte data (byte 5 contains an 8-bit value)

Structure of SDO-answer by the Slave

COB-ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
580+Node-ID	8	RES	Index		Sub index				

RES Response of the slave:
60 hex Data sent successfully
80 hex Error,

With the aim to enable the synchronous transmission with TPDO active after 1st sync message, write the SDO (in the example the Node-ID = 0x7F)

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
67Fh	2Fh	00h	18h	02h	01h	00h	00h	00h

Object:

1800h	0	1st Transmit PDO Parameter	Unsigned 8	Ro		
	1	COB-ID Trans PDO	Unsigned 32	Ro	180h + Node-ID	
	2	Transmission Type Trans PDO- PARA	Unsigned 8	Rw	254 (0xFE)	0x01...0xF0 = synch cyclic Outputs are only updated after "n" synch objects. n = 0x01 (1) ... 0xF0 (240) 0xFC not implemented 0xFD not implemented 0xFE = asynchronous 0xFF = not implemented
	5	Event timer Trans PDO- PARA	Unsigned 16	Rw	100 (0x64)	0 = inactive Min= 4 & Max=65535 with unit = 1ms

The answers after successful storing you will receive is:

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
5FFh	60h	00h	18h	02h	00h	00h	00h	00h

With the aim to save functionality write the “save” command as below:

Write (in the example the Node-ID = 0x7F)

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
67Fh	23h	10h	10h	01h	73h	61h	76h	65h

Note: save command is given by sending the code::

73h	61h	76h	65h

Where:
73h = ASCII code “**s**”
61h = ASCII code “**a**”
76h = ASCII code “**v**”
65h = ASCII code “**e**”

The answer after successful storing you will receive is:

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
5FFh	60h	10h	10h	01h	00h	00h	00h	00h

IMPORTANT NOTE:
After setting the new entries a reset must be made so that the new entries become valid (switch off the module for a short time).