GEFRAN

CANopen GSH-A

Digital output

Single version
Redundant version

Cod. 80782 Edit.09/2023 - ENG

SUMMARY

1. SAFETY INSTRUCTIONS

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 requires appropriate safety equipment that excludes any risk of personal injury.!

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

Before connecting the sensor to the CANbus the devices have to be checked for correct bitrate and unique node-IDs.

After power-on the sensor will enter pre-operational state and send a boot-up message indicating that it is ready for configuration by Service Data Objects. Parameters configured by the user can be stored nonvolatile 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

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 (see diagram) and put it around your wrist.
Do not remove the mounting loop before the cable is 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 GSH-A sensor is to transform a linear position and an angular position into an electric signal. It is composed of two parts: the first transduces the linear position and the second one transduces the angular position.

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 contactless angle sensor (in HALL 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 Encoders and C.i.A. DSP-305 Layer Setting Services and Protocol V1.1.1.

Angular position is determined by an inclination sensor with CANopen interface that enables angle levelling in many applications. The sensor is based on state-of-the-art MEMS capacitive 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-410 Device Profile for Inclinometers V3.1 (not completely implemented) 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..

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.

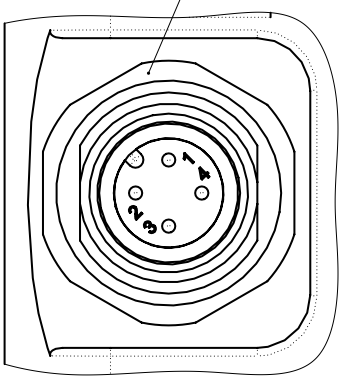
Note: The numbers followed by the suffix “h” or with the prefix “0x” represent a hexadecimal value, with suffix “b” a binary value, and with suffix “d” a decimal value. The value is decimal unless specified otherwise.

3. ELECTRICAL CONNECTIONS

For the connections refer to following images:

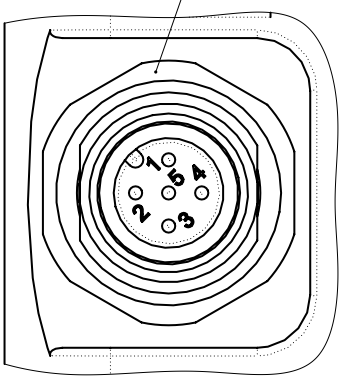
SINGLE VERSION	**M-1-S**	**SINGLE VERSION**	**N-1-S**
REDUNDANT VERSION	**M-1-R/ M-2-R**	**REDUNDANT VERSION**	**N-1-R/ N-2-R**

M12x1 4-pin male connector



CONNECTIONS	
1	+SUPPLY
2	GROUND
3	CANH
4	CANL

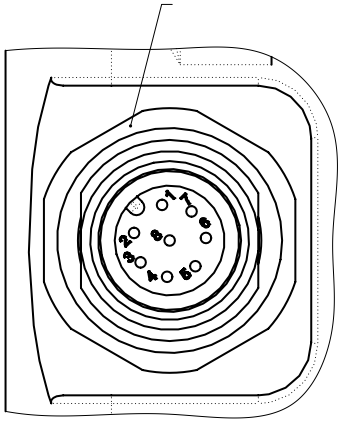
M12x1 5-pin male connector



CONNECTIONS	
1	n.c.
2	+SUPPLY
3	GROUND
4	CANH
5	CANL

REDUNDANT VERSION **O-1-R**

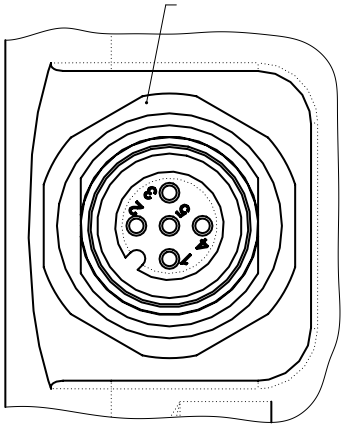
M12x1 8-pin male connector



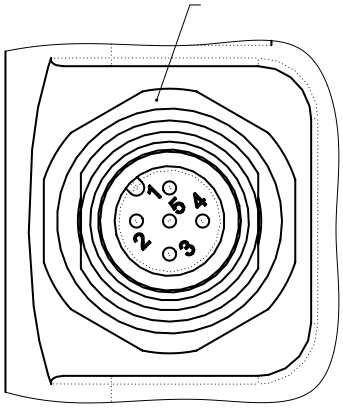
CONNECTIONS	
1	+SUPPLY 1
2	GROUND 1
3	CANH 1
4	CANL 1
5	+SUPPLY 2
6	GROUND 2
7	CANH 2
8	CANL 2

SINGLE/REDUNDANT IN-OUT VERSION **N-3-(S/R)**

M12x1 5-pin female connector



M12x1 5-pin male connector

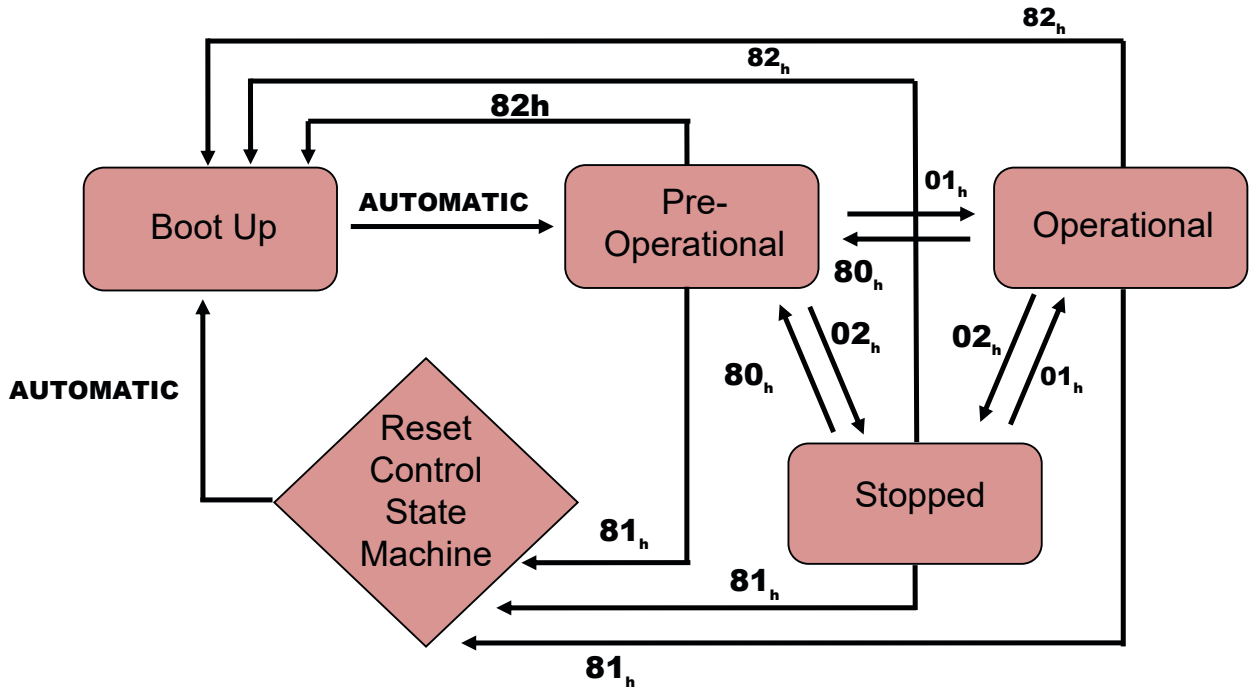


CONNECTIONS	
1	GROUND
2	+SUPPLY
3	GROUND
4	CANH
5	CANL

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 dependent and described in **Control State Machine**.

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.

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*

Table 1. NMT messages supported

** Node-ID = Drive address (from 01h to 7Fh)*

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	Node-ID	Bytes not sent					

Table 2. NMT message construction

5. BAUD RATE

Baud rate can be configurable via SDO communication object 0x3000 (see communication examples at the end of this document).

The default Baud rate is 250 kbit/s.

Important Note:
Changing this parameter can disturb the network! Only change this setting if a single device is connected to the network!

6. NODE-ID

Node ID can be configurable via SDO communication object 0x3001 (see communication examples at the end of this document).

The default Node-ID can vary depending on the version, as follows:

- **Single version** **0x13 (channel 1)**
- **Redundant version** **0x13 (channel 1)**
  0x14 (channel 2)

Important Note:
Changing this parameter can disturb the network! Only change this setting if a single device is connected to the network!

7. PARAMETER SETTING

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. 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.

Heartbeat Message:

COB-ID	**Byte**	**0**
700+Node-ID	Content	NMT State

9. ERROR HANDLING

Alarm

PDO has 2 bytes that indicate the alarm, if present.
The bytes are mapped as in the table below.

	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
BYTE 1	-	-	Magnet field too low	Magnet field too high	-	Over extension alarm	Under extension alarm	-
BYTE 2	-	-	-	-	-	Tilt primary element alarm	Extension primary element alarm	-

10. SDO 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.

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 non-existing objects, to read-only objects or with a non-corresponding data format are rejected and answered with a corresponding error message.

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

CMD filed determines the direction of data transfer and the size of the data object:

23h Sending of 4-byte data (bytes 5...8 contain a 32-bit value)
2Bh Sending of 2-byte data (bytes 5, 6 contain a 16-bit value)
2Fh Sending of 1-byte data (byte 5 contains an 8-bit value)

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

RES field determines the correct/incorrect answer of the slave:

60h Data sent successfully
80h Error

Read Access, Data Transfer from Slave to Host

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

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

CMD field determines the direction of data transfer for any size of the data object:

40h Read access of data (1-, 2- or 4-byte)

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

RES field determines the answer of the slave:

43h Sending of 4-byte data (bytes 5...8 contain a 32-bit value)
4Bh Sending of 2-byte data (bytes 5, 6 contain a 16-bit value)
4Fh Sending of 1-byte data (Byte 5 contains an 8-bit value)
80h Error

11. PDO COMMUNICATION

Transmit PDO #0 – Length and angle calculation GSH-A

The PDO transmits the measurements, in particular:

- Single version, one PDO is transmitted containing length measurement, angle measurement and alarms.
- Redundant version, one PDO is transmitted for each channel. PDO #0 containing length measurement, angle measurement and alarms of channel 1 and PDO #1 containing length measurement, angle measurement and alarms of channel 2.

The PDOs shall be transmitted cyclically, the cyclic timer has default value equal to 50ms. However, cyclic timer of PDOs is programmable through object 0x1800 sub-index5 (and 0x1801 sub-index5, for redundant version). Values between 4ms and 65535ms shall be selectable by parameter settings.
The PDO #0 (and PDO #1, for redundant version) will be transmitted by entering the “Operational” state.

Single version, structure of PDO:

Byte 1 and 2 contain the length measurement of channel 1, unsigned integer 16-bit value with forward direction.
Byte 3 and 4 contain the angle measurement of channel 1, unsigned integer 16-bit value with forward direction.

Byte1	**Byte2**	**Byte3**	**Byte4**	**Byte5, Byte6**	**Byte7**	**Byte8**
Position value Channel 1 LSB	Position value Channel 1 MSB	Angle value Channel 1 LSB	Angle value Channel 1 MSB	Alarm	Counter	Checksum

Table 3. Structure of PDO, single version

Redundant version, structure of PDO:

Byte 1 and 2 contain the length measurement of channel 1, unsigned integer 16-bit value with forward direction.
Byte 3 and 4 contain the angle measurement of channel 1, unsigned integer 16-bit value with forward direction.

Byte1	Byte2	Byte3	Byte4	Byte5, Byte6	Byte7	Byte8
Position value Channel 1 LSB	Position value Channel 1 MSB	Angle value Channel 1 LSB	Angle value Channel 1 MSB	Alarm	Counter	Checksum

Table 4. Structure of PDO channel 1 (default ID: 0x193), redundant version

Byte 1 and 2 contain the length measurement of channel 2, unsigned integer 16-bit value with backward direction.
Byte 3 and 4 contain the angle measurement of channel 2, unsigned integer 16-bit value with backward direction.

Byte1	Byte2	Byte3	Byte4	Byte5, Byte6	Byte7	Byte8
Position value Channel 2 LSB	Position value Channel 2 MSB	Angle value Channel 2 LSB	Angle value Channel 2 MSB	Alarm	Counter	Checksum

Table 5. Structure of PDO channel 2 (default ID: 0x194), redundant version

The PDO transmits the measurements, in particular:

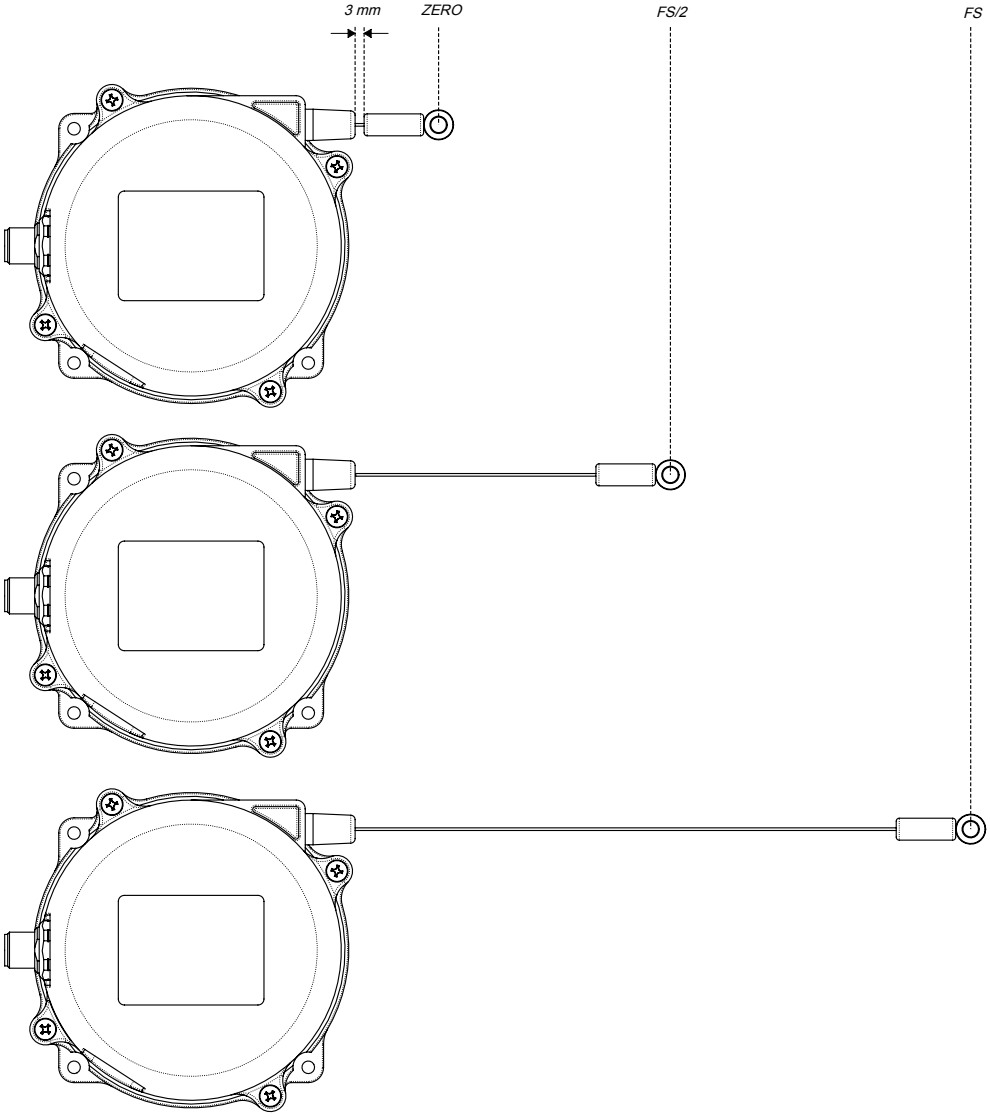
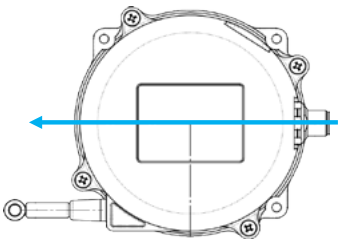
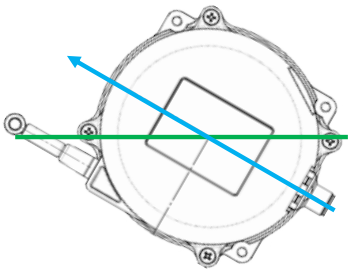
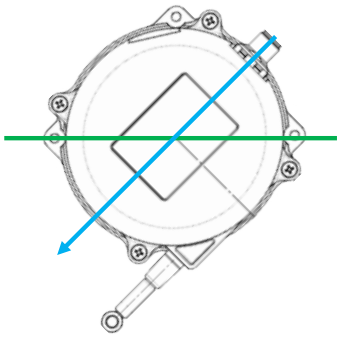


	FIGURE 1	FIGURE 2	FIGURE 3
CH1	0 deg	330 deg	45 deg
CH2	0 deg	30 deg	315 deg
			

PDO EXAMPLES (REDUNDANT VERSION)

Please, consider that a redundant GSH-A is a sensor with two independent channels, each of them producing a measurement and transmitting it through PDO communication. Channel 1 and 2 can be considered as two independent sensors, each of them with his Node-ID.
An example of a PDO is shown below with the following parameters:

- Node-ID = 13h for channel 1, 14h for channel 2
- Baud-rate = 250 kBaud
- Redundant version GSH-A
- Linear-encoder Cia406 setting as follow:
    I. Position Value (object 0x6004) indicates the length measurement
    II. Position Step (object 0x6005) = 1 mm (1 000 000 steps x 1 nm)
- Inclinometer Cia410 setting as follow:
    III. Resolution (object 0x6800) = 0.1 deg (100 steps x 0.001 deg)
    IV. Slope long 16 (object 0x6810) indicates the slope value in degrees

• *PDO channel #1 mapping:*

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
193h	34h	00h	22h	00h	00h	00h	04h	59h

- Byte 1 (LSB) = 34h
- Byte 2 (MSB) = 00h
Position channel 1: 0034h = 52d. Resolution = 1 mm. Value: 52 mm.
- Byte 3 (LSB) = 22h
- Byte 4 (MSB) = 00h
Angle channel 1: 0022h = 34d. Resolution = 0,1 deg. Value: 3,4 deg.

• *PDO channel #2 mapping:*

ID	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
194h	26h	1Fh	E6h	0Dh	00h	00h	04h	3Ch

Byte 1 (LSB) = 26h
Byte 2 (MSB) = 1Fh
Position channel 2: 1F26h = 7974d. Resolution = 1 mm. Value: 7974 mm.
Byte 3 (LSB) = E6h
Byte 4 (MSB) = 0Dh
Angle channel 2: 0DE6h = 3558d. Resolution = 0,1 deg. Value: 355,8 deg.

12. 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	COMMENT
0x1000		Device Type	Unsigned32	ro	0xFFFF0196	Multiple logical device with ds406 device profile as the first logical device
0x1001		Error Register	Unsigned8	ro	0x00	Always 0.
0x1005		COB-ID SYNC	Unsigned32	rw	0x00000080	
0x1008		Manufacturer Device Name	String	const	“GSHA”	Refer to GEFRAN products catalogue: GSH-A
0x1009		Manufacturer Hardware Version	String	const	“1.xx”	“Maj.MinMin”
0x100A		Manufacturer Software Version	String	const	“1.xx”	“Maj.MinMin”
0x1010		Store Parameters				
	0x0	Number of Entries	Unsigned8	ro	4	
	0x1	Save all Parameters	Unsigned32	wo		“save” (0x65766173) to save all parameters
0x1018		Identity Object				
	0x0	Number of Entries	Unsigned8	ro	4	
	0x1	Vendor ID	Unsigned32	ro	0x00000093	Refer to “Gefran Product Overview CANopen”.
						Gefran Vendor ID: 0x00000093
	0x2	Product Code	Unsigned32	ro	0x00000067	Refer to “Gefran Product Overview CANopen”.
	0x3	Revision Number	Unsigned32	ro	0x00000001	Revision number
	0x4	Serial Number	Unsigned32	ro	-	Serial number (Indicated on sensor label)
0x1200		SDO #0 Server Parameter				
	0x0	Number of Entries	Unsigned8	ro	2	
	0x1	COB-ID Client to Server	Unsigned32	ro	0x600 + Node-ID	
	0x2	COB-ID Server to Client	Unsigned32	ro	0x580 + Node-ID	
0x1800		Tx PDO #0 Communication Parameter				
	0x0	Number of Entries	Unsigned8	ro	5	
	0x1	COB-ID	Unsigned32	ro	0x180 + Node-ID	
	0x2	Transmission Type	Unsigned8	ro	254	1..240: Synchronous Transmission
			Unsigned8			254: Asynchronous transmission, transmission event is manufacturer specific, i.e. event timer.
	0x3	Inhibit Time	Unsigned16	ro	0x0004	Minimum interval time for PDO #0
	0x4	Reserved	Unsigned8	ro	0	
	0x5	Event Timer - PARA	Unsigned16	rw	100	In the EDS file this default value must be set to 0, otherwise errors will be generated.
0x1A00		Tx PDO #0 Mapping Parameter				

Index	Sub-index	Name	Type	ACCESS	DEFAULT	COMMENT
	0x0	Number of Entries	Unsigned8	ro	2	
	0x1	1st Object	Unsigned16	ro	0x60040010	PDO mapping for the 1st application object
	0x2	2nd Object	Unsigned16	ro	0x68100010	PDO mapping for the 2nd application object

Note: The access to CanOpen variables can be ro (the parameter can be read only), rw (the parameter can be read and also written), wo (the parameter can be written only) or const (the parameter is always constant).

Manufacturer Specific Profile Objects

Index	Sub-index	Name	Type	ACCESS	DEFAULT	COMMENT
0x3000		Setting of the Baud Rate	U8	rw	0x03	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
0x3001		Setting of the Node ID	U8	rw	0x13	The node ID used to access the sensor in the CANopen network
0x5000		Automatic NMT Start after Power On – PARA	U8	rw	1	0: not activated 1: activated

Note: The access to CanOpen variables can be ro (the parameter can be read only), rw (the parameter can be read and also written), wo (the parameter can be written only) or const (the parameter is always constant).

Index	Sub-index	Name	Type	ACCESS	DEFAULT	COMMENT
0x6000		Operating Parameters – PARA	Unsigned16	ro	0x0000	
0x6004		Position Value	Unsigned32	ro	-	The object 6004h „Position value“ defines the output position value for the communication objects 1800h.
0x6005		Position step settings [nm/Step]	Unsigned32	ro	0x000F4240	Position step setting in nm. - 1000000 for millimeter
0x67FF		Device Type	Unsigned32	ro	0x000A0196	Multi-sensor encoder interface with DS-406 device profile
0x6800		Resolution	Unsigned16	ro	0x0064	Tilt step setting in 0.001 deg. - 100 for 0.1 deg;
0x6810		Slope long 16	Unsigned16	ro	-	Slope value of the longitudinal axis
0x6811		Slope long 16 operating parameters	Unsigned8	ro	0x00	
0x6FFF		Device Type	Unsigned32	ro	0x0002019A	Multi-sensor encoder interface with DS-410 device profile

Note: The access to CanOpen variables can be ro (the parameter can be read only), rw (the parameter can be read and also written), wo (the parameter can be written only) or const (the parameter is always constant).

13. COMMUNICATION EXAMPLES

Example 1) How to change the Node-ID from 0x13 (19d) to 0x06 (06d)

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

CMD filed determines the direction of data transfer and the size of the data object:

23h Sending of 4-byte data (bytes 5...8 contain a 32-bit value)
2Bh Sending of 2-byte data (bytes 5, 6 contain a 16-bit value)
2Fh Sending of 1-byte data (byte 5 contains an 8-bit value)

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

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

RES field determines the correct/incorrect answer of the slave:

60h Data sent successfully
80h Error

To change the Node-ID from the standard value 13h to 06h, write the new Node-ID in the object 3001h by using the following SDO message. Then send the Save all parameters SDO and perform a sensor reset.

SDO request 1:

COB-ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
613h	8	2Fh	01h	30h	00h	06h	00h	00h	00h

The answer after successful storing you will receive is:

SDO answer 1:

COB-ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
593h	8	60	01h	30h	00h	00h	00h	00h	00h

In order to save all new customized parameters, send the following SDO message. Then, turn-off and turn-on the power supply to perform the reset

SDO request 2 (SAVE):

COB-ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
67F	8	23h	10h	10h	01h	73h	61h	76h	65h

The answer after successful storing you will receive is: answer 2:

SDO answer 2:

COB-ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
593h	8	60h	10h	10h	01h	00h	00h	00h	00h

Example 2) How to change the PDO rate (time interval) from 100 ms (current setting) to 1000 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 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

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

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

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

RES field determines the correct/incorrect answer of the slave:
60h Data sent successfully
80h Error

To change the PDO event timer from the standard 100ms to 1000ms, write the new event timer in the object 1800h sub-index 5 by using the following SDO message. Then send the Save all parameters SDO and perform a sensor reset.

SDO request 1:

COB-ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
613h	8	2Bh	00h	18h	05h	E8h	03h	00h	00h

The answer after successful storing you will receive is:

SDO answer 1:

COB-ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
593h	8	60h	00h	18h	05h	00h	00h	00h	00h

In order to save all new customized parameters, send the following SDO message. Then, turn-off and turn-on the power supply to perform the reset

SDO request 2 (SAVE):

COB-ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
613h	8	23h	10h	10h	01h	73h	61h	76h	65h

The answer after successful storing you will receive is:

SDO answer 2:

COB-ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
593h	8	60h	10h	10h	01h	00h	00h	00h	00h

Example 3) How to de-activate an automatic NMT Start after Power ON (the PDO will not be sent 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	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

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

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

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

RES field determines the correct/incorrect answer of the slave:
60h Data sent successfully
80h Error

To change the automatic NMT start after power on configuration, write the enable value (0=not activated, 1=activated) in the object 5000h sub-index 0 by using the following SDO message.
Then send the Save all parameters SDO and perform a sensor reset.

SDO request 1:

COB-ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
613h	8	2Fh	00h	50h	00h	00h	00h	00h	00h

The answer after successful storing you will receive is:

SDO answer 1:

COB-ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
593h	8	60h	00h	50h	00h	00h	00h	00h	00h

In order to save all new customized parameters, send the following SDO message. Then, turn-off and turn-on the power supply to perform the reset

SDO request 2 (SAVE):

COB-ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
613h	8	23h	10h	10h	01h	73h	61h	76h	65h

The answer after successful storing you will receive is:

SDO answer 2:

COB-ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
593h	8	60h	10h	10h	01h	00h	00h	00h	00h

GEFRAN

GEFRAN spa
via Sebina, 74 - 25050 PROVAGLIO D'ISEO (BS) - ITALIA
tel. 0309888.1 - fax. 0309839063 Internet: http://www.gefran.com