Baumer

Passion for Sensors

Manual

Cable transducer GCA3/5/8/12/20 with CANopen

Inclinometer Integrated (option)

GCA3/5 Firmware Version 3.81
GCA8/12/20 Firmware Version 3.01

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Contents

1 Safety and operating instructions

1.1 Supplementary information

- This manual is intended as a supplement to already existing documentation (catalogues, data sheets and assembly instructions).
- The manual must be read without fail before initial commissioning of the equipment.

1.2 Intended purpose of the equipment

- The cable transducer is a precision measuring device that is used to record linear positions and speeds. It provides measuring values as electronic output signals for the subsequently connected device. It must not be used for any other purpose.

- Unless this product is specially labeled, it may not be used for operation in potentially explosive environments. Make sure by appropriate safety measures, that in case of error or failure of the cable transducer, no danger to persons or damage to the system or operating facilities occurs.

1.3 Commissioning

- I Installation and assembly of this product may be performed only by a person qualified in electronics and precision mechanics.
- Consider also the operation manual of the machine manufacturer.

1.4 Safety remarks

- Prior to commissioning the equipment, check all electrical connections.
- If installation, electrical connection or any other work performed at the cable transducer or at the equipment is not correctly executed, this can result in a malfunction or failure of the cable transducer.
- Steps must be taken to exclude any risk of personal injury, damage to the plant or to the operating equipment as a result of encoder failure or malfunction by providing suitable safety precautions.
- cable transducers must not be operated outside the specified limited values (see detailed product documentation).

Failure to comply with the safety remarks can result in malfunctions, personal injury or damage to property.

1.5 Transport and storage

- Only ever transport or store cable transducers in their original packaging.
- Never drop cable transducers or expose them to major vibrations.

1.6 Assembly

- Avoid impacts or shocks on the housing.
- Avoid any twist or torsion on the housing.
- Do not open the cable transducer or make any mechanical changes to it.

The shaft, ball bearings or electronic components can be damaged. In this case, safe and reliable operation cannot be guaranteed.

1.7 Electrical commissioning

- Do not modify the cable transducer electrically and remove power supply while connecting it electrically.
- The electrical connection must not be attached or removed under power supply.
- Ensure that the entire plant is installed in line with EMC requirements. The installation environment and wiring affect the electromagnetic compatibility of the cable transducer. Install the cable transducer and supply cables separately or at a long distance from cables with high interference emissions (frequency converters, contactors etc.)
- Where working with consumers which have high interference emissions, make available a separate power supply for the cable transducer.
- Unused outputs must not be connected.

Failure to observe these instructions can result in malfunctions, material damage or personal injury.

2 Product Assignment

2.1 Cable transducer

Product	Device Name	EDS-file
GCA3/5 cable transducers redundant	GCA3/5	GCA3-5.eds
GCA3/5 cable transducers redundant with inclinometer integrated	GCA3/5	GCA3-5-336.eds
GCA8/12/20 cable transducers GCA8/12/20 cable transducers redundant	GCA8/12/20	GCA8-12-20.eds
GCA8/12/20 cable transducers with inclinometer integrated	GCA8/12/20	GCA8-12-20-136.eds
GCA8/12/20 cable transducers redundant with redundant inclinometer integrated	GCA8/12/20	GCA8-12-20-336.eds
SDS5000 cable transducers redundant	SDS5000	SDS5000.eds
SDS5000 cable transducers redundant with inclinometer integrated	SDS5000	SDS5000-RL.eds
SDS3/6/10/20 cable transducers	SDS3/6/10/20	SDS3-6-10-20.eds
SDS3/6/10/20 cable transducers with inclinometer integrated	SDS3/6/10/20	SDS3-12-20-L.eds
SDS3/6/10/20 cable transducers redundant with redundant inclinometer integrated	SDS3/6/10/20	SDS3-6-10-20-RL.eds

3 System Overview

3.1 General

The cable transducer is a linear measuring system with a CANopen interface. It supports scaling and presetting.
In consideration of “CAN in Automation” (CiA) Profile 406 for Encoders, it’s an absolute linear encoder - Class C2 (exception diagnostic part). It has also the possibility to implement inclination sensors, in according to CiA) Profile 410 for Inclinometers.

3.2 Supported Profiles

Following CANopen profiles are supported:

- CiA 301 / Version 4.1 (Communication)
- CiA 305 / Version 1.0 (LSS)
- CiA 406 / Version 3.2 (Encoder Profile)
    - Absolute encoder redundant with cable-pull: Absolute linear encoder
- CiA 410 / Version 1.0 (Inclinometer Profile)

3.3 Supported CANopen Services

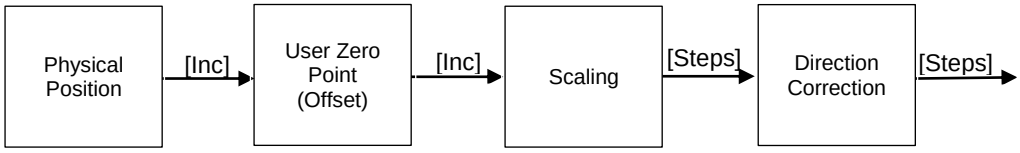
Following CANopen services are supported:

- 1 Network Management (according to CiA 301)
- 1 SDO Server (according to CiA 301)
- 2 TPDOs (according to CiA 301/CiA 406/ CiA 410)
- 1 Emergency Producer (according to CiA 301/CiA 406/ CiA 410)
- 1 Heartbeat Producer (according to CiA 301)

3.4 Function Principle

3.4.1 Overview

Figure 1: Function principle overview



3.4.2 Scaling

The step size for all position objects can be adapted in the object 0x6005. The basic unit is nanometer
Example 1: A position step setting of 1’000’000 nm/step means that the position output unit is 1mm.

4 NMT Service

4.1 Supported commands

Following NMT commands are supported:

- NMT Start
- NMT Preoperational
- NMT Stop
- NMT Reset
- NMT Communication Reset

There is no difference between NMT Reset and NMT Communication Reset

4.2 Boot up message

Send NMT message to initialize the device

COB-ID	**Len**	**D0**	**D1**
0x000	2	0x01	ID

Note: ID can be 0 for broadcast initialization

After a power-on or NMT reset, the device will send a Boot up message.

COB ID	Byte 0
700h + node ID	00

5 SDO service

5.1 General

The device supports 1 SDO server (Expedited read/write, segmented read)

5.2 Save/load parameters

The device supports saving parameters to a non-volatile memory.

5.2.1 Save

Writing “save” to 0x1010-x saves the corresponding objects to the non-volatile memory. After a reset or power-on, the parameters are loaded from the non-volatile memory. The SDO request to 1010h-x is answered after saving.

5.2.2 Load

Writing “load” to 1011h-x restores the corresponding objects. The parameters are restored after a reset or power-on.

5.2.3 Safe non-volatile operation

To ensure safe non-volatile operation, the time between access object 1010h-x or 1011h-x and a reset or power-on has to be at least 600 ms.

5.2.4 Side effect

Save/Load operations interrupt the updating of position.

5.3 Examples writing parameters

5.3.1 How to save data

See paragraph 5.2.1 respectively send SDO message

COB-ID	Len	D0	D1	D2	D3	D4	D5	D6	D7
0x600 + ID	8	0x23	0x10	0x10	0x01	0x73	0x61	0x76	0x65

5.3.2 How to change the node ID

Send the SDO message

COB-ID	Len	D0	D1	D2	D3	D4	D5	D6	D7
0x600 + ID	8	0x2F	0x01	0x30	0x00	ID	0x00	0x00	0x00

Note: values below 1 or above 127 are not accepted and the existing setting remains valid. After setting the new entries a SAVE command (see par. “How to save data”) followed by a turnoff and on.

5.3.3 How to change the baud rate

Send the SDO message

COB-ID	Len	D0	D1	D2	D3	D4	D5	D6	D7
0x600 + ID	8	0x2F	0x00	0x30	0x00	BR	0x00	0x00	0x00

Note: Values above 7 are not accepted and the existing setting remains valid. After setting the new entries a SAVE command (see par. “How to save data”) followed by a turnoff and on.

5.3.4 How to change the length direction

There are 2 ways for changing direction.

5.3.4.1 reverse both channels simultaneously

send the SDO message.

COB-ID	Len	D0	D1	D2	D3	D4	D5	D6	D7
0x600 + ID	8	0x2B	0x00	0x60	0x00	PAR	0x00	0x00	0x00

where PAR is the parameter setting as follow

PAR	MEANING
0x00	Positive direction (length increase pulling the cable), length expressed in 0.1mm unit
0x01	Negative direction (length decrease pulling the cable), length expressed in 0.1mm unit
0x04	Positive direction (length increase pulling the cable), resolution depends on object 0x6005
0x05	Negative direction (length decrease pulling the cable), resolution depends on object 0x6005

5.3.4.2 reverse both channels individually

send the SDO message for channel 1

COB-ID	Len	D0	D1	D2	D3	D4	D5	D6	D7
0x600 + ID	8	0x2F	0x02	0x21	0x01	DIR	0x00	0x00	0x00

send the SDO message for channel 2[1]

COB-ID	Len	D0	D1	D2	D3	D4	D5	D6	D7
0x600 + ID	8	0x2F	0x02	0x21	0x02	DIR	0x00	0x00	0x00

where DIR is the direction: 0 = positive, 1 = negative

Note1: if at least one of the two channels has the positive direction, the object 6000 specifies a positive direction.
Note2: after setting the new entries a SAVE command (see par. “How to save datas”) followed by a turnoff and on.

5.3.5 How to change the length resolution

Set the parameters as explained in previous paragraph, then send the SDO message

COB-ID	Len	D0	D1	D2	D3	D4	D5	D6	D7
0x600 + ID	8	0x23	0x05	0x60	0x01	R0	R1	R2	R3

where R0...R3 represents the unit of measure of the output length, expressed in nm (nanometer).
For example, to obtain a resolution of 1mm:
R0 = 0x40, R1 = 0x42, R2 = 0x0F, R3 = 0x00
It means R = 0x000F4240 (1000000 decimal) = 1000000nm = 1mm.

Note: after setting the new entries a SAVE command (see par. “How to save data”) followed by a turnoff and on.

5.3.6 How to set the length zero

Send the SDO message to set the zero of channel 1

COB-ID	Len	D0	D1	D2	D3	D4	D5	D6	D7
0x600 + ID	8	0x23	0x10	0x60	0x01	0x00	0x00	0x00	0x00

Send the SDO message to set the zero of channel 2

COB-ID	Len	D0	D1	D2	D3	D4	D5	D6	D7
0x600 + ID	8	0x23	0x10	0x60	0x02	0x00	0x00	0x00	0x00

Note: after setting the new entries a SAVE command (see paragraph 5.2 Save/load) followed by a turnoff and on.

5.3.7 How to change the Angle resolution

This object shall indicate the resolution of the Slope long16 (object 6810h/7010h) based on 0,001°.
This resolution is also valid for the 32-bit value objects (6910h and 7110h). In case of low resolution, the value is 10d. In case of high resolution the value is 1d. The following table describes all possible resolutions:

Resolution (6800h/7000h)	
Value	**Description**
01h (1d)	0,001°
Ah (10d)	0,01°
64h (100d)	0,1°
3E8h (1000d)	1°

5.3.8 Operating Parameters (6811h/6911h/7011h/7111h)

The above mentioned operating parameter influences the output inclination in the following manner:
Bit Mask:

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Reserved						s	i
Default	-						1	0

i = Inversion (0 = Do not enable inversion; 1 = Enable inversion)
s = Scaling (0 = Do not enable scaling; 1 = Enable scaling)

Scaling means that the following equation is applied:

Inclination = A + B + C

where

A is a physically measured angle;
B is a differential slope offset;
C is a slope offset.

The operating parameters are applied for the according slope (i.e. 6811h operating parameter influences 6810h slope).

The 16bit and 32bit values are hardwired internally (i.e. changing the operating parameter at 6811h changes the operating parameter at 6911h)

5.3.9 Offset parameters and calculation

This object shall indicate the application offset of the longitudinal axis. The value shall be given in angular degrees with the resolution given in object 6000h. The following formula applied:

Slope offset = A –B –C

where

A is a slope preset value at t_{acc};
B is a slope physical measured at t_{acc};
C is a differential slope offset and t_{acc} = time when accessing object a preset object

The 16bit and 32bit values are hardwired internally (i.e. changing the differential offset at 6814h changes the differential offset at 6914h)

i.e: Send the SDO message to set the zero of both angles:

COB-ID	Len	D0	D1	D2	D3	D4	D5	D6	D7
0x600 + ID	8	0x2B	0x12	0x68	0x00	0x00	0x00	0x00	0x00

5.3.10 Digital Filter Configuration (2603h)

The digital filter's cut-off frequency can be adjusted through this object.
The IIR coefficient is expressed in % (lower values->more filtering).

An example table is the following:

Coeff [%]	Response Time [ms]
100	Not Filtered
80	15
60	40
40	90
20	240
1	5940

6 PDO Service

6.1 General

The device supports TPDO1 and TPDO2. PDOs are only transmitted in NMT operational mode.

6.2 PDO transmission types

The following transmission types are supported (object 180x-2):

- Synchronous transmission (1-240)
- Asynchronous transmission (255)
- Manufacturer transmission (254)

Both PDOs support all transmission types.

Transmission type 255 and 254: The PDO is transmitted timer driven. The time interval between 2 PDOs can be adapted in the object 180xh-5

Transmission type 1-240: The PDO is transmitted after the n-th sync frame.

Transmission type 1: The PDO is transmitted after one sync frame.

Transmission type 2: The PDO is transmitted after two sync frames.

etc.

6.3 COB-ID

The COB-ID for both PDOs is changeable (in Object 180xh-1)
The format of the TPDO is:

TPDO1

COB-ID	Len	D0	D1	D2	D3	D4	D5	D6	D7
0x180 + ID	8	P0a	P1a	P2a	P3a	P0b	P1b	P2b	P3b

where P is the actual position value in 0.1mm or other scale (depending on the resolution settings) and the suffixes 'a' and 'b[1]' refers to channels 'a' and 'b[1]' respectively.

Interpretation example
Considering a resolution of 0.1mm:
P0 = 0x10, P1 = 0x27, P2 = P3 = 0
It means P = 0x00002710 (10000 decimal) = 1000mm
The channel 'b' is represented in a similar way (but typically in a reverse order so, in the zero position, channel 'b' is 4700mm and at FS his value is 0).

TPDO2 (Enabled in case of Inclinometer)

COB-ID	Len	D0	D1	D2	D3	D4	D5	D6	D7
0x280 + ID	8	R0a	R1a	0	0	R0b	R1b	0	0

where R is the actual rotation value in degrees or tenths of degrees (depending on the resolution settings).

Interpretation example
Considering a resolution of 0.1°:
P0 = 0x84, P1 = 0x03
It means P = 0x00000384 (900 decimal) = 90°
The channel 'b[1]' is represented in a similar way.

6.4 PDO mapping

The encoder supports dynamic mapping.

6.4.1 Mappable objects

The following objects are mappable (see Object dictionary at Par.10 for further specifications):

Mapping content	Mapping entry	Description
Length raw channel 1 value	0x20000120	Object 2000h Subindex 01h, data length 32 Bit
Length raw channel 2[1] value	0x20000220	Object 2000h Subindex 02h, data length 32 Bit
Length channel 1 value	0x21100120	Object 2110h Subindex 01h, data length 32 Bit
Length channel 2[1] value	0x21100220	Object 2110h Subindex 02h, data length 32 Bit
Firmware version	0x21950008	Object 2195h Subindex 00h, data length 8 Bit
String Customer	0x21960020	Object 2196h Subindex 00h, data length 32 Bit
Dummy double word	0x21970020	Object 2197h Subindex 00h, data length 32 Bit
Dummy word	0x21980010	Object 2198h Subindex 00h, data length 16 Bit
Dummy byte	0x21990008	Object 2199h Subindex 00h, data length 8 Bit
Length channel 1 value	0x60040020	Object 6004h Subindex 00h, data length 32 Bit
Length channel 1 value	0x60200120	Object 6020h Subindex 01h, data length 32 Bit
Length channel 2 value	0x60200220	Object 6020h Subindex 02h, data length 32 Bit
Channel 1 speed value	0x60300120	Object 6030h Subindex 01h, data length 32 Bit
Channel 2 speed value	0x60300220	Object 6030h Subindex 02h, data length 32 Bit
Slope Long 16bit Angle 1	0x68100010	Object 6810h Subindex 00h, data length 16 Bit
Slope Long 32bit Angle 1	0x69100020	Object 6910h Subindex 00h, data length 32 Bit
Slope Long 16bit Angle 2	0x70100010	Object 7010h Subindex 00h, data length 16 Bit
Slope Long 32bit Angle 2	0x71100020	Object 7110h Subindex 00h, data length 32 Bit

To change PDO mapping first disable the mapping by writing 0 to 0x1A0x-0. Write the desired mapping entry and enable the mapping again by writing the number of PDO contents to 0x1A0x-0.

6.4.2 Default mapping of absolute encoder redundant with cable-pull

The mappings for both PDOs are the same. The position will be transmitted in byte 0..3.

ID	DLC	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
184h	8	xx	xx	xx	xx	yy	yy	yy	yy

Byte 0..3: Length A (Object 6020h-1)

Byte 4..7: Length B[1] (Object 6020h-2)

ID	DLC	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
284h	8	xx	xx	00	00	yy	yy	00	00

Byte 0..3: Angle A (Object 6910h-0)
Byte 4..7: Angle B[1] (Object 7110h-0)

[1] In case of redundant sensor

6.5 Timing

The minimal cycle time for TPDOs is 20 ms (100 ms to update the Data if the inclinometer is present)

6.6 Exceptions of accurate calculation of process data

The following operations could interrupt the accurate calculation of process data such as position, speed, warnings and alarms:

- Non-volatile operations
- Changing the scaling parameters

7 Emergency Service

7.1 General

If there is an error on the device, the device commits an emergency message and sets the corresponding bits in the error register (Object 1001h).
Error codes are accessible by the error field (object 1003h-x). A history of maximal 8 error codes is stored in the error field.

7.2 COB-ID

The COB-ID for the emergency message can be modified in object 1014h.
Default Value: 80h + node ID
Changes will be applied immediately.

The COB-ID is stored internally as a difference to the default COB-ID. Example:
Node ID: 4 COB-ID Emergency: 84h (Default value)
COB-ID Emergency: 87h (Changed by user)
Node ID: 9 COB-ID Emergency: 89h (Adapted automatic)

7.3 Emergency message

The emergency message is transmitted if an error is indicated in the error register.

COB-ID	DLC	Byte0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
80h+node ID	8	Error code		Error register (object 1001h)	-	-	-	-	-

7.4 Error register

Error register (object 1001h)							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Manufacturer error	-	-	Communication error				Generic error

7.4.1 Communication error

Communication errors are indicated if the internal CAN message buffers are overflowed or there are malformed CAN frames on the bus. After a communication error the device changes to pre-operational mode.

7.4.2 Generic error

A generic error is indicated for all other errors.
An encoder specific alarm or warning will also cause a generic error.
After a generic error the device changes to pre-operational mode.

7.5 Error codes / EMCY messages

The following error codes are generated by the device:

Error Code	Meaning
0x0000000000000000	Error reset or no error
0x0010010000000000	Generic error
0x1081110000000000	CAN RX overflow
0x1082110000000000	PDO not processed due to length error
0x01FF810000000000	Wire break
0x02FF810000000000	Error reading length
0x03FF810000000000	Error reading hall sensor (only for GCA3/5)

8 Heartbeat Service

8.1 General

The device supports a heartbeat producer according CiA 305.
Example for a heartbeat protocol:

COB-ID	Data/Remote	Byte 0
701h	D	7Fh(127d)

The heartbeat messages consist of the COB ID and one byte. In this byte, the NMT status is supplied.

0: BootUp-Event
4: Stopped
5: Operational
127: Pre-operational

In other words, the sensor is in the pre-operational mode (7Fh = 127).

8.2 COB-ID

The COB-ID for the heartbeat message is 700h + node ID.

8.3 Timing

The minimal cycle time for heartbeat messages is 10 ms.

9 LSS slave

9.1 General

The baud rate and node ID can be configured by LSS (according to CiA 305). Another possibility to change the baud rate and node ID is to access to the objects 0x3000 and 0x3001 (see object directory).
The LSS service is only available in NMT Stopped Mode.

9.2 Supported commands

- Switch state global
- Switch state selective
- Configure node ID protocol
- Configure bit timing parameters
- Store configuration
- Inquire identity serial number
- Inquire identity node ID

9.3 LSS address

The needed value for LSS addressing as serial number is printed on a label on the encoder housing.

10 Object directory

The following tables provide a summary of all SDO objects supported by the encoder.

Object Object number
Name Object name
Format U/I = Unsigned/Integer , No. = no of bits, ARR = Array, REC = Record, STR = String
Access ro = read only, wo = write only, rw = read write, m = mappable
Default Default value on first init
Description Additional information

10.1 Communication Profile Area

Object	Sub-index	Name	Type	Default value	Description
0x1000	0	Device type	U32, ro	0x00080196	CiA406
0x1001	0	Error register	U8, ro	0x00	Bit-coded to profile CiA406 0x00: no error 0x01: generic error 0x10: communication error 0x20: device profile error 0x80: manufacturer specific error
0x1003	0	Predefined error list	U8, ro	0x00	Errors in the list (up to 8)
	1…8	History errors	U32, ro	0x00000000	Errors occured according to the Error codes list, the last error is in the sub-index
0x1005	0	COB ID Sync object	U32, rw	0x00000080	Sensor generates no sync message (bit 30 =0) 11-bits indentifier system (bit 29=0)
0x1008	0	Device name	str, ro	-	Device designation (see paragraph 2.1)
0x1009	0	HW version	str, ro	1.0	Hardware version
0x100A	0	FW version	str, ro	-	Software version (ASCII Characters i.e version 3.81 = 33 56 38 31)
0x1010	0	Numbers of save-options	U8, ro	0x01	
	1	“save all parameters”	U32, rw	0x00000001	The parameters are saved only writing the key string “save” (0x73-0x61-0x76-0x65)
0x1011	0	Numbers of restore-options	U8, ro	0x01	
	1	Reset for all parameters	U32, rw	0x00000001	If the key string “load” (0x6C-0x6F-0x61-0x64) is entered here, the parameters are assigned to the factory default values and are valid after the next reset.
0x1014	0	COB ID Emergency	U32, rw	0x40000080+ID	bit 30 = 1 The sensor generates EMCY message
0x1017	0	Producer heartbeat time	U16, rw	0x00	Time interval [ms] where sensor generates a producer heartbeat
0x1018	0	Numbers of identity-options	U8, ro	0x01	
	1	Vendor ID	U32, ro	0x0000005F	
	2	Product code	U32, ro	0x00000000	
	3	Revision number	U32, ro	-	It’s the FW version
	4	Serial number	U32, ro	-	Depending by the SN of the product
0x1200	0	Server SDOs	U8, ro	0x02	
	1	COB ID Rx SDO	U32, ro	0x600 + ID	bit 31=0 –> valid SDO
	2	COB ID Tx SDO	U32, ro	0x580 +ID	bit 31=0 –> valid SDO
0x1800	0	TPDO1	U8, rw	0x05	Number of the entries TPDO1
	1	COB ID TPDO1	U32, rw	0x180+Node ID	Bit 31 = 0 -> TPDO activated Bit 31 = 1 -> TPDO not activated (not transmitted)
	2	Transmission type	U8, rw	0xFE	Transmission type (synchronous/asynchronous)
	3	Inhibit time	U16, rw	0x0000	Minimum interval time between consecutive TPDOs
	5	Event time TPDO1	U16, rw	0x0064	Used if 1800.02 is 0xFE or 0xFF
0x1801	0	TPDO2	U8, rw	0x05	Number of the entries TPDO2
	1	COB ID TPDO2	U32, rw	0x280+Node ID	Bit 31 = 0 -> TPDO activated Bit 31 = 1 -> TPDO not activated (not transmitted)
	2	Transmission type	U8, rw	0xFE	Transmission type (synchronous/asynchronous)
	3	Inhibit time	U16, rw	0x0000	Minimum interval time between consecutive TPDOs
	5	Event time TPDO2	U16, rw	0x0064	Used if 1801.02 is 0xFE or 0xFF
0x1A00	0	TPDO1 mapping	U8, ro	0x02	Number of objects integrated in TPDO1
	1	index in obj directory	U32, ro	0x60200120	Cable length channel 1
	2	index in obj directory	U32, ro	0x60200220	Cable length channel 2[1]
0x1A01	0	TPDO2 mapping	U8, ro	0x02	Number of objects integrated in TPDO2
	1	index in obj directory	U32, ro	0x69100020	Angle channel 1
	2	index in obj directory	U32, ro	0x71100320	Angle channel 2[1]

10.2 Manufacturer Specific Profile Area

Objekt	Sub-index	Name	Type	Default value	Description
0x2000	0	Length raw channel value	U8, ro	2	Number of the entries
	1	Length raw channel 1 value	U32, ro, m		Channel 1 length in 0.1mm (internal raw value)
	2	Length raw channel 2 value	U32, ro, m		Channel 2 length in 0.1mm (internal raw value)
0x2101	0	Length preset values	U8, ro	2	Number of the entries
	1	Length preset channel 1 value	I32, rw	0	Same as object 6010.01
	2	Length preset channel 2 value	I32, rw	0	Same as object 6010.02
0x2102	0	Length direction	U8, ro	2	Number of the entries
	1	Length channel 1 direction	U8, rw		Channel 1 direction (0=increasing when pull; 1= decreasing when pull)
	2	Length channel 2 direction	U8, rw		Channel 2^1 direction (0=increasing when pull; 1= decreasing when pull)
0x2103	0	Length filter strength	U8, rw	100	IIR coefficient expressed in % (lower values->more filtering)
0x2110	0	Length channel value	U8, ro	2	Number of the entries
	1	Length channel 1 value	U32, ro, m		Channel 1 length in 0.1mm or other scale (depending on resolution)
	2	Length channel 2 value	U32, ro, m		Channel 2^1 length in 0.1mm or other scale (depending on resolution)
0x2119	0	Inversion Length Behaviour	U8, ro	0	If it's equals to 1 means: Length goes from 0 to –FS (only if either 2102.01 or 2102.02 are equal to 1)
0x2194	0	Type of rotation	U8, ro	1	Number of the entries
	1	Axis Rotation	U8, rw	1	Choose the Inclinometer behavior (0=horizontal,1= vertical (it's the only possibility for cable Pull))
0x2195	0	Fw version	U16, ro, m		Obj. 0x100A in 16 bit
0x2196	0	Sring Customer	U32, rw, m	0	4 byte to write the name of the customer
0x2197	0	Dummy double word	U32, ro, m	0	4 byte of empty space to compose PDO with dynamic mapping
0x2198	0	Dummy word	U16, ro, m	0	2 byte of empty space to compose PDO with dynamic mapping
0x2199	0	Dummy byte	U8, ro, m	0	1 byte of empty space to compose PDO with dynamic mapping
0x2603	0	Angle Filter strength	U16, rw	100	IIR coefficient expressed in % (lower values->more filtering)
0x3000	0	Baud rate setting	U8, rw	0x03	0=1000 kBit/s 1=800 kBit/s 2=500 kBit/s 3=250 kBit/s 4=125 kBit/s 5=100 kBit/s 6=50 kBit/s 7=20 kBit/s The baudrate is activated after a reset or power-on (if parameter is saved to non volatile memory)
0x3001	0	Node Id	U8, rw	0x04	0x01...0x7F

10.3 Standardized Device Profile Area

Object	Sub-index	Name	Type	Default value	Description
0x6000	0	Length parameters	U16, rw	0	see paragraph 'How to change the length direction'
0x6002	0	Length total range	U32, rw	0	Not used
0x6003	0	Length preset channel 1 value	I32, rw		Set the zero length values of channel 1
0x6004	0	Length channel 1 value	I32, ro, m		Length value of channel 1
0x6005	0	Length position setting	U8, ro	2	Number of the entries
	1	Length channel position setting	U32, rw	1000000	Express the resolution in nanometers
	2	Channel speed setting	U32, rw	1000000	Express the resolution in nanometers
0x6010	0	Length preset values	U8, ro	2	Number of the entries
	1	Length preset channel 1 value	I32, rw	0	Preset the value of channel 1
	2	Length preset channel 2 value	I32, rw	0	Preset the value of channel 2[1]
0x6020	0	Length channel value	U8, ro	2	Same as object 2110.00
	1	Length channel 1 value	I32, ro, m		Same as object 2110.01
	2	Length channel 2 value	I32, ro, m		Same as object 2110.02
0x6030	0	Channel speed value	U8, ro	2	Number of the entries
	1	Channel 1 speed value	I32, ro, m		Speed value of channel 1
	2	Channel 2 speed value	I32, ro, m		Speed value of channel 2
0x6800	0	Resolution	U16, rw	64h	This object shall indicate the resolution of Slope long16 (object 6810h) and Slope lateral16 (object 6820h) objects based on 0,001°. This resolution is also valid for the 32-bit value objects (6910h and 6920h).
0x6810	0	Slope Long 16bit	I16, ro, m		This object shall provide the 16-bit slope value of the longitudinal axis. The value shall be given in degree (angle) with the resolution given in object 6800h.
0x6811	0	Slope long operating parameter	U8, rw	2	If scaling is enabled, the Slope long16 value shall be calculated accordingly to the following equation: Slope long16 = physically measured angle + Differential slope long16 offset + Slope long16 offset If scaling is disabled, the Slope long16 value shall be equal to the physical measured angle.
0x6812	0	Slope long 16bit preset value	I16, rw	0	Accessing this object by means of SDO shall set directly the actual longitudinal slope value to a desired longitudinal slope value. The calculated application-offset of the longitudinal slope value is given in Slope long16 offset (object 6813h). The Slope long16 offset is calculated with respect to object 6814h. The value shall be given in degree (angle) with the resolution given in object 6800h.
0x6813	0	Slope long 16bit offset	I16, rw	0	This object shall indicate the application-offset of the longitudinal axis. The value shall be given in degree (angle) with the resolution given in object 6800h. The following equation shall be applied: Slope long16 offset = Slope long16 preset value at tacc – slope physical measured at tacc – Differential slope long16 offset (tacc = time when accessing object 6812h)
0x6814	0	Differential slope long 16bit offset	I16, rw	0	This object shall shift the Slope long16 value (object 6810h) independent of Slope long16 preset value (object 6812h) and Slope long16 offset (object 6813h). The value shall be given in degree (angle) with the resolution given in object 6800h.
0x6820	0	Slope lateral 16bit (only for 2 - Dimension)	I16, ro		Not used
0x6821	0	Slope lateral operating parameter (only for 2 - Dimension)	U8, rw	2	Not used
0x6822	0	Slope lateral 16bit preset value ((only for 2 - Dimension)	I16, rw	0	Not used
0x6823	0	Slope lateral 16bit	I16, rw	0	Not used

Object	Sub-index	Name	Type	Default value	Description
		offset (only for 2 - Dimension)			
0x6824	0	Differential slope lateral 16bit offset (only for 2 - Dimension)	I16, rw	0	Not used
0x6910	0	Slope Long 32bit	I32, ro, m		Same as object 6810
0x6911	0	Slope long 32bit operating parameter	U8, rw	2	Same as object 6811
0x6912	0	Slope long 32bit preset value	I32, rw	0	Same as object 6812
0x6913	0	Slope long 32bit offset	I32, rw	0	Same as object 6813
0x6914	0	Differential slope long 32bit offset	I32, rw	0	Same as object 6814
0x6920	0	Slope Lateral 32bit (only for 2 - Dimension)	I32, ro		Not used
0x6921	0	Slope lateral 32bit operating parameter (only for 2 - Dimension)	U8, rw	2	Not used
0x6922	0	Slope lateral 32bit preset value (only for 2 - Dimension)	I32, rw	0	Not used
0x6923	0	Slope lateral 32bit offset (only for 2 - Dimension)	I32, rw	0	Not used
0x6924	0	Differential slope lateral 32bit offset (only for 2 - Dimension)	I32, rw	0	Not used
0x6E11	0	Device temperature (only for 2 - Dimension)	I16, ro		Not used
0x7000	0	Resolution Angle 2	U16, rw	64h	This object shall indicate the resolution of Slope long16 (object 7010h) and Slope lateral16 (object 7020h) objects based on 0,001°. This resolution is also valid for the 32-bit value objects (7110h and 7120h).
0x7010	0	Slope Long 16bit Angle 2	I16, ro, m		This object shall provide the 16-bit slope value of the longitudinal axis. The value shall be given in degree (angle) with the resolution given in object 7000h.
0x7011	0	Slope long operating parameter Angle 2	U8, rw	2	If scaling is enabled, the Slope long16 value shall be calculated accordingly to the following equation: Slope long16 = physically measured angle + Differential slope long16 offset + Slope long16 offset If scaling is disabled, the Slope long16 value shall be equal to the physical measured angle.
0x7012	0	Slope long 16bit preset value Angle 2	I16, rw	0	Accessing this object by means of SDO shall set directly the actual longitudinal slope value to a desired longitudinal slope value. The calculated application-offset of the longitudinal slope value is given in Slope long16 offset (object 7013h). The Slope long16 offset is calculated with respect to object 7014h. The value shall be given in degree (angle) with the resolution given in object 7000h.
0x7013	0	Slope long 16bit offset	I16, rw	0	This object shall indicate the application-offset of the longitudinal axis. The value shall be given in degree (angle) with the resolution given in object 7000h. The following equation shall be applied: Slope long16 offset = Slope long16 preset value at tacc – slope physical measured at tacc – Differential slope long16 offset (tacc = time when accessing object 7012h)
0x7014	0	Differential slope long 16bit offset Angle 2	I16, rw	0	This object shall shift the Slope long16 value (object 7010h) independent of Slope long16 preset value (object 7012h) and Slope long16 offset (object 7013h). The value shall be given in degree (angle) with the resolution given in object 7000h.
0x7020	0	Slope lateral 16bit (only for 2 - Dimension) Angle 2	I16, ro		Not used

Object	Sub-index	Name	Type	Default value	Description
0x7021	0	Slope lateral operating parameter (only for 2 - Dimension) Angle 2	U8, rw	2	Not used
0x7022	0	Slope lateral 16bit preset value ((only for 2 - Dimension) Angle 2	I16, rw	0	Not used
0x7023	0	Slope lateral 16bit offset (only for 2 - Dimension) Angle 2	I16, rw	0	Not used
0x7024	0	Differential slope lateral 16bit offset (only for 2 - Dimension) Angle 2	I16, rw	0	Not used
0x7110	0	Slope Long 32bit Angle 2	I32, ro, m		Same as object 7010
0x7E11	0	Slope long 32bit operating parameter Angle 2	U8, rw	2	Same as object 7011
0x7112	0	Slope long 32bit preset value Angle 2	I32, rw	0	Same as object 7012
0x7113	0	Slope long 32bit offset	I32, rw	0	Same as object 7013
0x7114	0	Differential slope long 32bit offset Angle 2	I32, rw	0	Same as object 7014
0x7120	0	Slope Lateral 32bit (only for 2 - Dimension) Angle 2	I32, ro		Not used
0x7121	0	Slope lateral 32bit operating parameter (only for 2 - Dimension) Angle 2	U8, rw	2	Not used
0x7122	0	Slope lateral 32bit preset value (only for 2 - Dimension) Angle 2	I32, rw	0	Not used
0x7123	0	Slope lateral 32bit offset (only for 2 - Dimension) Angle 2	I32, rw	0	Not used
0x7124	0	Differential slope lateral 32bit offset (only for 2 - Dimension) Angle 2	I32, rw	0	Not used
0x7511	0	Device temperature (only for 2 - Dimension) Angle 2	I16, ro		Not used

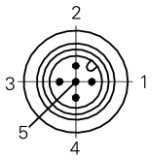
[1] only if the version of GCA is redundant;

Appendix

10.4 Pin Assignments

10.4.1 Pin assignment connector 1 x M12

Pin no.	Signal	Description
1	GND	Ground referred to +Vs
2	+Vs	Supply voltage
3	CAN_GND	CAN bus ground
4	CAN_H	CAN bus signal (dominant High)
5	CAN_L	CAN bus signal (dominant Low)



View to encoder

10.4.2 Cable assignment

Color	Signal	Description
White	GND	Ground referred to +Vs
Brown	+Vs	Supply voltage
Grey	CAN_GND	CAN bus ground
Green	CAN_H	CAN bus signal (dominant High)
Yellow	CAN_L	CAN bus signal (dominant Low)