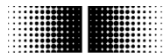


Manual

Absolute encoder with CANopen Lift-Protocol DS-417

Contents

| | | |
|----------|---|-----------|
| 1 | Version overview | 4 |
| 2 | Safety and operating instructions | 5 |
| 3 | Product Assignment..... | 6 |
| 3.1 | Absolute encoder..... | 6 |
| 4 | System Overview | 7 |
| 4.1 | General..... | 7 |
| 4.2 | Supported Profiles | 7 |
| 4.3 | Supported CANopen Services | 7 |
| 4.4 | Function Principle | 7 |
| 4.4.1 | Overview..... | 7 |
| 4.4.2 | Scaling..... | 8 |
| 4.4.3 | Position Range | 9 |
| 4.4.4 | Speed range | 9 |
| 4.5 | Encoder as standard component with embedded software used in safety functions | 9 |
| 5 | NMT Service | 10 |
| 5.1 | Supported commands..... | 10 |
| 5.1.1 | NMT Reset..... | 10 |
| 5.1.2 | NMT Communication Reset..... | 10 |
| 5.2 | Boot-up message..... | 10 |
| 6 | SDO service..... | 11 |
| 6.1 | General..... | 11 |
| 6.2 | Save/load parameters..... | 11 |
| 6.2.1 | Save | 11 |
| 6.2.2 | Load..... | 11 |
| 6.2.3 | Safe non-volatile operation | 11 |
| 7 | PDO Service | 12 |
| 7.1 | General..... | 12 |
| 7.2 | PDO transmission types | 12 |
| 7.3 | COB-ID | 12 |
| 7.4 | PDO mapping | 12 |
| 7.4.1 | Mappable objects..... | 12 |
| 7.4.2 | Default mapping of absolute encoder | 13 |
| 7.5 | Timing..... | 13 |
| 7.6 | Exceptions of accurate calculation of process data | 13 |
| 8 | Emergency Service..... | 14 |
| 8.1 | General..... | 14 |
| 8.2 | COB-ID | 14 |
| 8.3 | Emergency message | 14 |
| 8.4 | Error register..... | 14 |
| 8.4.1 | Communication error | 14 |
| 8.4.2 | Temperature error..... | 14 |
| 8.4.3 | Generic error..... | 14 |
| 8.5 | Error codes | 15 |
| 9 | Alarms, warnings, errors, emergency messages and error behavior | 16 |
| 9.1 | Absolute encoder..... | 16 |
| 9.2 | Error behavior | 17 |
| 9.3 | 0x2117 16-Bit Encoder Diagnostics..... | 17 |



| | | |
|-----------|---|-----------|
| 10 | Heartbeat Service | 19 |
| 10.1 | General..... | 19 |
| 10.2 | COB-ID | 19 |
| 10.3 | Timing..... | 19 |
| 11 | LSS slave..... | 20 |
| 11.1 | General..... | 20 |
| 11.2 | Supported commands..... | 20 |
| 11.3 | LSS address | 20 |
| 12 | Object directory | 21 |
| 12.1 | Communication Profile Area | 21 |
| 12.2 | Manufacturer Specific Profile Area | 22 |
| 12.3 | Standardized Device Profile Area | 23 |
| 13 | Applications | 24 |
| 14 | Discrepancies to the CIA specifications..... | 25 |
| A. | Appendix | 26 |
| a. | Pin Assignments..... | 26 |

1 Version overview

This document is subject to changes. In order to have the most current version please download on www.baumer.com

| Document index | Date | Firmware version | CANopen Revision Number Obj. 1018 | Author | Changes |
|----------------|----------|------------------|--------------------------------------|--------|---|
| 0001 | 11.07.17 | From V01-03 | 0003.0000h | blk | Initial version replaces all draft documents |
| 0002 | 05.01.18 | From V01-03 | 0003.0000h | blk | Object 1017h Producer Heartbeat-Time pre-configured |
| | | | | | |
| | | | | | |

2 Safety and operating instructions

Intended use

- The encoder is a precision measuring device that is used to record 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 encoder, no danger to persons or damage to the system or operating facilities occurs.

Personnel qualification

- Installation and assembly of this product may be performed only by a person qualified in electronics and precision mechanics.

Maintenance

- The encoder is maintenance-free and must not be opened up nor mechanically or electronically modified. Opening up the encoder can lead to injury.

Disposal

- The encoder contains electronic components. At its disposal, local environmental guidelines must be followed.

Mounting

- Solid shaft: Do not connect encoder shaft and drive shaft rigidly. Connect drive and encoder shaft with a suitable coupling.
- Hollow shaft: Open clamping ring completely before mounting the encoder. Foreign objects must be kept at a sufficient distance from the stator coupling. The stator coupling is not allowed to have any contact to the encoder or the machine except at the mounting points.

Electrical commissioning

- Do not proceed any electrical modifications at the encoder.
- Do not proceed any wiring work while encoder is live.
- Do not remove or plug on connector whilst under power supply.
- Ensure that the entire system is installed in line with EMC/EMI requirements. Operating environment and wiring have an impact on the electromagnetic compatibility of the encoder. Install encoder and supply cables separately or far away from sources with high emitted interference (frequency converters, contactors, etc.).
- When working with consumers with high emitted interference provide separate encoder supply voltage.
- Completely shield encoder housing and connecting cables.
- Connect encoder to protective earth (PE) using shielded cables. The braided shield must be connected to the cable gland or connector. Ideally, aim at dual connection to protective earth (PE), i.e. housing by mechanical assembly and cable shield by the downstream devices.

Supplementary information

- The present manual is intended as a supplement to already existing documentation (e.g. catalogues, data sheets or mounting instructions).

3 Product Assignment

3.1 Absolute encoder

| Product | Product-Code | Device Name | EDS-file |
|----------------------------|--------------|----------------|-------------------|
| Absolute encoder multiturn | 0x0074 | EAMxxx MT Lift | EAMxxx_0x0074.eds |

4 System Overview

4.1 General

The encoder is a rotary measuring system with a CANopen interface. It supports scaling and presetting.

4.2 Supported Profiles

Following CANopen profiles are supported:

- CiA 301 / Version 4.1 (Communication)
- CiA 305 / Version 1.0 (LSS)
- CiA 417 / Version 2.0 (Encoder Profile)

4.3 Supported CANopen Services

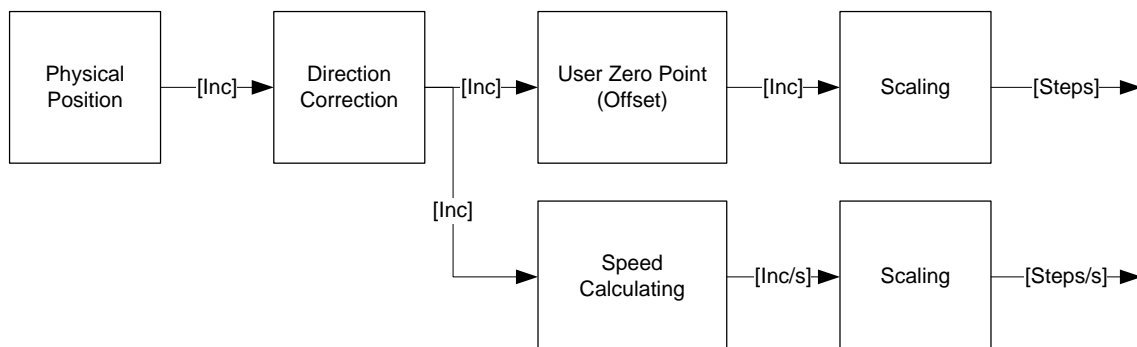
Following CANopen services are supported:

- 1 Network Management (according to CiA 301)
- 1 SDO Server (according to CiA 301)
- 2 TPDOs (according to CiA 301/CiA 417)
- 1 Emergency Producer (according to CiA 301)
- 1 Heartbeat Producer (according to CiA 301)
- 1 Node guarding (according to CiA 301)
- 1 LSS Client (according to CiA 305)

4.4 Function Principle

4.4.1 Overview

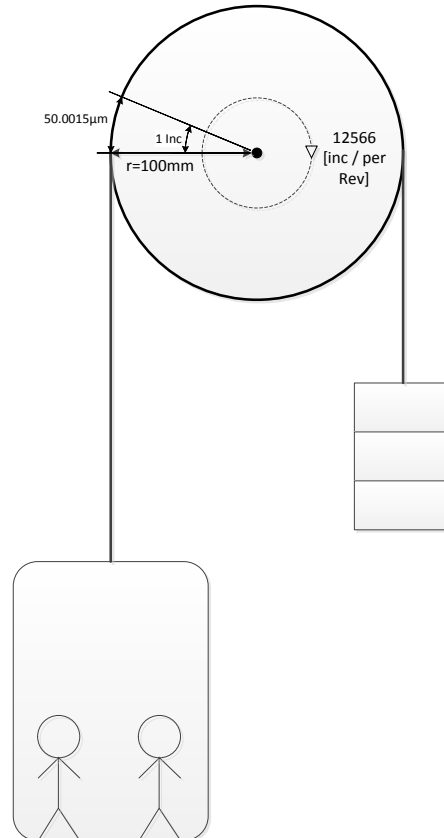
Figure 1: Function principle overview



4.4.2 Scaling

The scaling of the position object can be adapted in the object 6381h and 6384-1h. Speed object can be adapted in the object 6384-2h.

Example for unit settings:



1. Setting measuring units per revolution (6381-1h)
 - a. To set the measuring units per revolution, the resulting measuring step should be considered. The measuring step (6384-1h), has a granularity of $10 \mu\text{m}$.
 - b. The circumference of the bobbin is $U = 2 * \pi * r = 2 * \pi * 100'000 \mu\text{m} = 628318.531 \mu\text{m}$
 - c. For the example above, the measuring units per revolution should be set to

$$((6381 - 1h) = \frac{U}{10 \mu\text{m}} = \frac{628318.531 \mu\text{m}}{10 \mu\text{m}} = 62831.85, \text{ because the object 6381-1h only supports 14-Bit Resolution, the highest possible units per revolution is set } \rightarrow (6381 - 1h) = \frac{62831.85}{5} = 12566, \text{ which will result in a position measuring step value of } \frac{U}{6381-1h} = \frac{628318.531 \mu\text{m}}{12566} = 50.0015 \mu\text{m}$$
2. Setting position measure step setting (6384-1h)
 - a. Measuring step setting is $(6384 - 1h) = \frac{U}{6381-1h * 10 \mu\text{m}} = \frac{628318.531}{12566 * 10 \mu\text{m}} = 5$
3. Speed measure step setting (6384-2h)
 - a. To get the user-unit in $[\text{cm/s}]$ the object $(6384 - 2h) = \frac{\text{Unit_User}}{0.1 \text{ mm/s}} = \frac{1[\frac{\text{cm}}{\text{s}}]}{0.1[\frac{\text{mm}}{\text{s}}]} = 10$

4.4.3 Position Range

The range of the position is depending on the position step setting (object 6381h) and number of distinguishable revolutions (object 63C2h).

4.4.4 Speed range

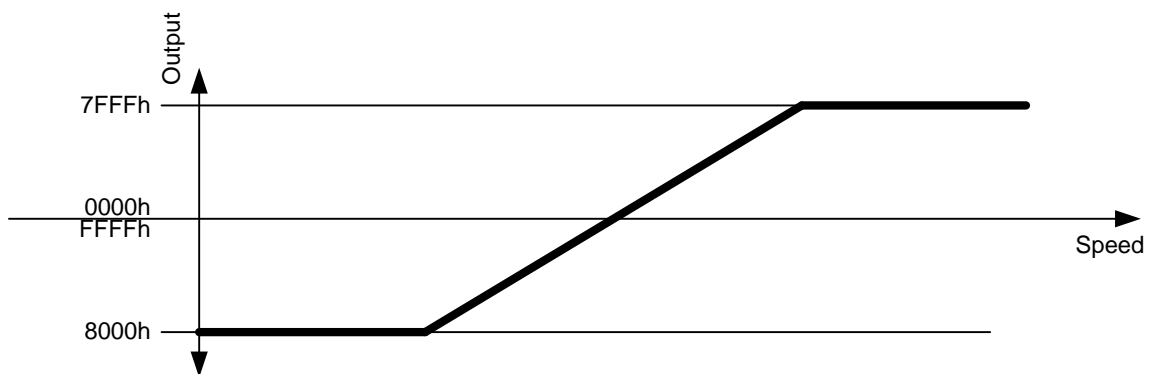
0x6390

This object provides a 16-Bit Speed information, which has the user-unit, according to 6384-2h (default = [1 cm/s]).

The range for object 6390h-1 Speed encoder A is -8000h...7FFF'h.

If the scaled speed value exceeds this range, the output is -8000h or 7FFFh (Saturated Logic).

Figure 2: Speed range



4.5 Encoder as standard component with embedded software used in safety functions

If this standard encoder is used in safety functions, please request the according "Application Note MAGRES EAM" for further information.

5 NMT Service

5.1 Supported commands

Following NMT commands are supported:

| NMT Command | Byte 0 |
|-------------------------|--------|
| NMT Start | 0x01 |
| NMT Preoperational | 0x80 |
| NMT Stop | 0x02 |
| NMT Reset | 0x81 |
| NMT Communication Reset | 0x82 |

NMT Frame:

| COB ID | Byte 0 |
|---------|--------|
| node ID | xx |

5.1.1 NMT Reset

This NMT command performs a complete reset of the encoder, which can take up to 170 ms until the new bootup-message is sent (restarting of the micro controller, be aware that all unsaved configurations will be lost).

5.1.2 NMT Communication Reset

This NMT command performs a restarting of the CAN Controller, which can take up to 5 ms until the new bootup-message is sent (be aware that all unsaved configurations will be lost). When NMT communication reset is performed, emergency messages (0x6503, 0x6505, 0x1001) are not send again automatically.

5.2 Boot-up message

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

| COB ID | Byte 0 |
|----------------|--------|
| 700h + node ID | 00 |

6 SDO service

6.1 General

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

6.2 Save/load parameters

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

6.2.1 Save

Writing “save” to 1010h-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 the saving of the parameters is performed.

6.2.2 Load

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

6.2.3 Safe non-volatile operation

To ensure safe non-volatile operation, the user must ensure no power interruption immediately after sending of the save command to object 1010h-x (otherwise, the factory values are restored at the next power up).

7 PDO Service

7.1 General

The device supports TPDO263 and TPDO264. PDOs are only transmitted in NMT operational mode.

7.2 PDO transmission types

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

- Synchronous transmission (1-240)
- Asynchronous transmission (255)
- Manufacturer transmission (254)
- RTR-only transmission, event-driven (253)

Both PDO support all transmission types.

Transmission type 253: The PDO is only transmitted on request (remote transmission request).

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.

As default, Transmission type 255 is set for the PDO.

7.3 COB-ID

The COB-ID for both PDO are not changeable.

Default Values are:

TPDO263: 18Ch

TPDO264: 18Dh

Changes will be applied immediately.

7.4 PDO mapping

The encoder supports dynamic mapping.

7.4.1 Mappable objects

The following objects are mappable:

| Mapping content | Mapping entry | Description |
|------------------|---------------|---|
| Position encoder | 0x60040020 | Object 6004h Subindex 00h, data length 32 Bit |
| Speed encoder | 0x60300120 | Object 6030h Subindex 01h, data length 32 Bit |
| Alarms | 0x65030010 | Object 6503h Subindex 00h, data length 16 Bit |
| Warnings | 0x65050010 | Object 6505h Subindex 00h, data length 16 Bit |
| Diagnostic | 0x21170010 | Object 2117h Subindex 00h, data length 16 Bit |
| Speed [rpm] | 0x21180010 | Object 2117h Subindex 00h, data length 16 Bit |
| Time Stamp | 0x21200010 | Object 2120h Subindex 00h, data length 16 Bit |

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

7.4.2 Default mapping of absolute encoder

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 |
|-----------|-----|--------|--------|--------|--------|--------|--------|
| 18Ch/18Dh | 6 | xx | xx | xx | xx | xx | xx |

Byte 0...3: Position value (Object 6383-1h)

Byte 4...5: Speed value (Object 6390-1h)

PDO264 is disabled by default, because a second sensor is not built in.

7.5 Timing

The minimal cycle time for TPDOs is 1 ms, the default time is set to 0.

7.6 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:

- Changing the scaling parameters

8 Emergency Service

8.1 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.

8.2 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:

| | |
|-------------------|--|
| <i>Node ID: 1</i> | <i>COB-ID Emergency: 81h (Default value)</i> |
| | <i>COB-ID Emergency: 87h (Changed by user)</i> |
| <i>Node ID: 3</i> | <i>COB-ID Emergency: 89h (Adapted automatic)</i> |

8.3 Emergency message

The format of the emergency messages is according to CiA 301. Additionally, the encoder sends the warning and alarm fields (object 6503h, 6505h).

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) | Manufacturer specific | | | | |
| | | | | | Alarms 6503h | | Warning 6505h | | Not used |

8.4 Error register

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

8.4.1 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 corresponding operation (described in object 1029h-1) is executed.

8.4.2 Temperature error

This error is indicated, when the internal temperature of the encoder is above a certain threshold level, at which the position can't be guaranteed.

8.4.3 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 corresponding operation (described in object 1029h-2) is executed.

8.5 Error codes

The following error codes are generated by the device:

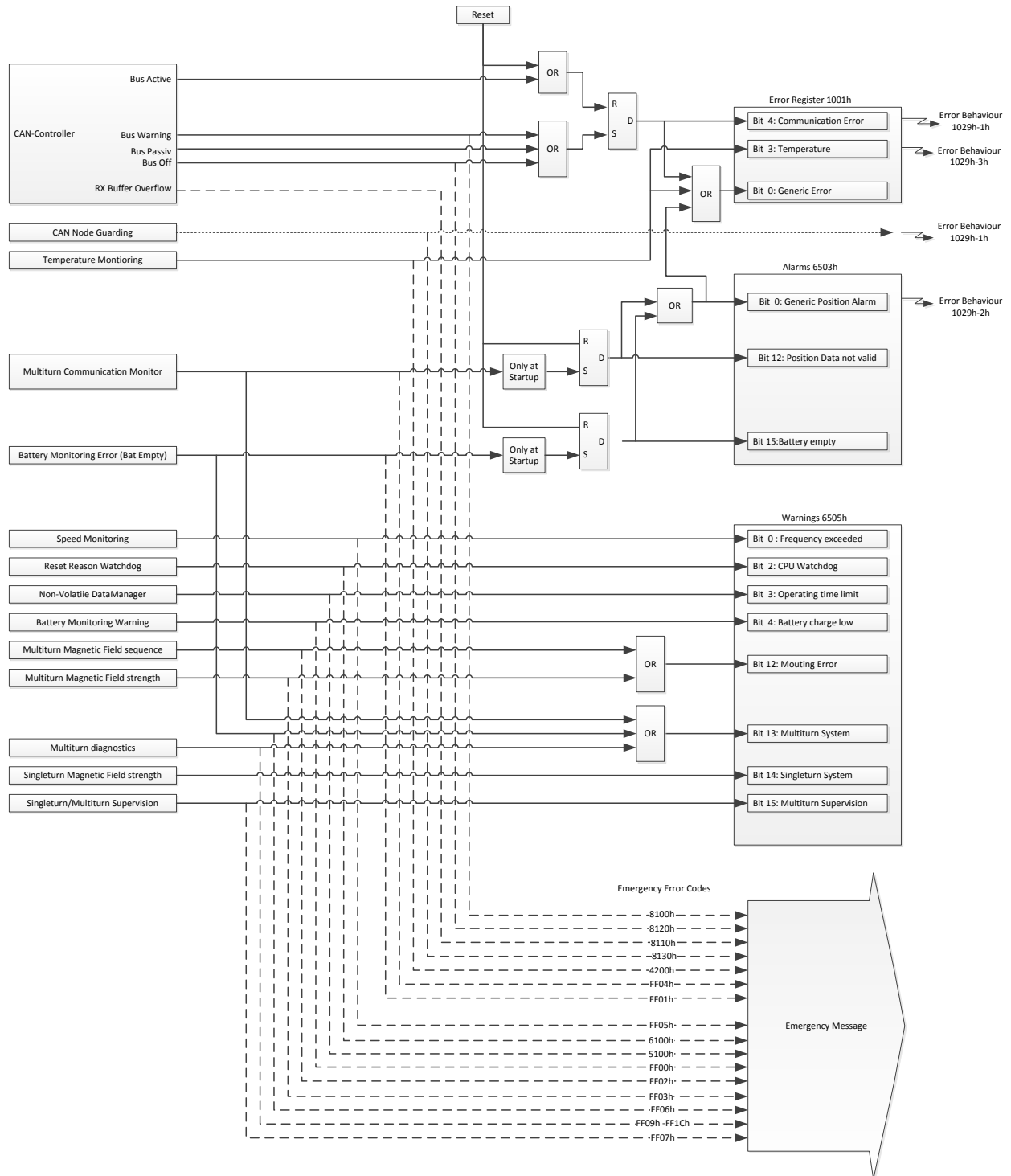
| Error Code (hex) | Meaning |
|------------------|---|
| 0000h | Error reset or no error |
| 4200h | Temperature out of range |
| 5100h | EEPROM error |
| 6100h | Software fault (watchdog) |
| 8100h | Communication error (bus warning) |
| 8110h | CAN RX overflow |
| 8120h | CAN in error passive mode |
| 8130h | Life guard error or heartbeat error |
| FF00h | Battery low warning (early warning) |
| FF01h | Battery empty error |
| FF02 ... FF03h | Multiturn sensor weak magnetic field warning (position may be incorrect) |
| FF04h | Internal communication error |
| FF05h | Speed out of range |
| FF06h | Singleturn sensor magnetic field out of range |
| FF07h | Multiturn and singleturn sensor out of sync |
| FF08h ... FFFFh | Manufacturer reserved error codes |

9 Alarms, warnings, errors, emergency messages and error behavior

Figure 6 show the surveillance mechanisms. If one of them fails, an alarm or warning will be indicated. The behavior upon an error can be defined and is described in chapter 8.3.

9.1 Absolute encoder

Figure 4: Dataflow of Error, Alarm, Warning and Emergency messages



9.2 Error behavior

The error behaviors are executed when the corresponding bit in object 1001 Error register is set and the device is in the NMT-State Operational.

Example:

The error behavior 1029h-2 is set to "Change to Pre-Operational" (0). The device is in NMT state Operational

1. Generic error bit is set.
→ The device changes to Pre-Operational
2. The device is forced to NMT state Operational with NMT command Start
→ The device changes again to Pre-Operational if the generic error bit is not cleared.

9.3 0x2117 16-Bit Encoder Diagnostics

In order to get more different objects in one PDO message, the Objects Error (0x1001), Alarm (0x6503) and Warning (0x6505) have been summarized in 2 Bytes.

Byte 0: Warnings

| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---------|-------|-------|----------|---------|-----------|-------|---------|
| MTSuper | STSys | MTSys | MountErr | BattLow | OpTimeLim | WDT | FreqExc |

| Byte 0 | Correspondent bit & register | Meaning |
|--------|------------------------------|---|
| Bit 7 | Bit 15 0x6505 Warning | MTSuper: Multiturn supervision Set, when Multi- and Singleturn system are out of sync. |
| Bit 6 | Bit 14 0x6505 Warning | STSys: Singleturn system Set, when Singleturn system error detected |
| Bit 5 | Bit 13 0x6505 Warning | MTSys: Multiturn system (corresponds to Bit 13 of Warning Register 0x6505) Set, when Multiturn system error detected |
| Bit 4 | Bit 12 0x6505 Warning | MountErr: Mounting error Set, when Mounting error has been detected (i.e. magnetic field disturbed) |
| Bit 3 | Bit 4 0x6505 Warning | BattLow: Batterie low charge Set, when the battery of the Multiturn system gets low. Encoder should be replaced to guarantee absolute position. |
| Bit 2 | Bit 3 0x6505 Warning | OpTimeLim: Operating time limit Set, when a possible problem with the non-volatile memory is detected. Encoder should be replaced to guarantee absolute position. |
| Bit 1 | Bit 2 0x6505 Warning | WDT: Watch dog timer triggered Set, when a SW-Reset due to a watchdog timer occurred. Encoder should be replaced to guarantee absolute position. |
| Bit 0 | Bit 0 0x6505 Warning | FreqExc: Frequency exceeded Set, when the maximum guaranteed rotation speed is exceed. |

Byte 1: Errors

| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|----------|--------|---------|---------|----------|----------|----------|----------|
| BattEmpt | PosErr | TempErr | CommErr | Reserved | Reserved | Reserved | Reserved |

| Byte 1 | Correspondent bit & register | Meaning |
|---------|------------------------------|--|
| Bit 7 | Bit 15 0x6503 Alarm | BattEmpt: Battery empty Set, when the battery of the Multiturn system is empty. Absolute position is not guaranteed. |
| Bit 6 | Bit 12 0x6503 Alarm | PosErr: Position Error Set, when Position error occurred (empty battery of magnetic field distortion) |
| Bit 5 | Bit 3 0x1001 Error | TempErr: Temperature Error Set, when the maximum operating temperature is exceeded |
| Bit 4 | Bit 4 0x1001 Error | CommErr: Communication Error Set, when a communication error has been detected (Bus off, Bus Warning, RX overflow) |
| Bit 0-3 | | Reserved fields |

10 Heartbeat Service

10.1 General

The device supports a heartbeat producer according CiA 301.

10.2 COB-ID

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

10.3 Timing

The minimal cycle time for heartbeat messages is 1 ms, which can be configured with object 1017h-0

11 LSS slave

11.1 General

The baudrate and node ID can be configured by LSS (according to CiA 305). Another possibility to change the baudrate and node ID is to access to the objects 2100h and 2101h (see object directory).

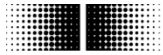
The LSS service is only available in NMT Stopped Mode.

11.2 Supported commands

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

11.3 LSS address

The needed values for LSS addressing as vendor ID, revision number, product code and serial number are printed on a label on the encoder housing.



12 Object directory

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

| | |
|--------------------|---|
| Object | Object number in Hex |
| 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 |
| Save | X = can be stored in the EEPROM |
| Description | Additional information |

12.1 Communication Profile Area

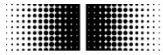
| Object | Sub-Index | Name | Format | Access | Default | Save | Description |
|--------|-----------|----------------------------|--------|--------|---------------|------|--|
| 1000h | | Device Type | U32 | ro | 060001A1h | | 2 ⁰ .. 2 ¹⁵ ProfilNr = 1A1h = 417 encoder lift 2 ¹⁶ .. 2 ²³ Communication model 2 ²⁴ .. 2 ³¹ virtual device code |
| 1001h | | Error Register | U8 | ro | 0h | | Bit0 = Generic error Bit3 = Temperature error Bit4 = Communication error |
| 1003h | | PreDefined ErrorField | ARR | | | | |
| | 00h | Largest Subindex | U8 | rw | 0h | | Number of stored messages (0 - 8) |
| | 01h | Last Entry | U32 | ro | | | Newest Error Code |
| | .. | .. | .. | .. | .. | | ... |
| | 08h | Oldest Entry | U32 | ro | | | Oldest Error Code |
| 1005h | | Sync COB-ID | U32 | rw | 80h | X | COB ID of the sync object |
| 1008h | | DeviceName | STR | ro | | | Devicename = "EAMxxx Lift" |
| 1009h | | Hardware Version | STR | ro | | | Hardware version in ASCII |
| 100Ah | | Software Version | STR | ro | | | Software version in ASCII |
| 100Ch | | Guard time | U16 | rw | 0h | X | Guard time (actual guard time is Object 100Ch*100Dh [ms]) |
| 100D | | Life time factor | U8 | rw | 0h | X | Life time factor |
| 1010h | | Store parameters | ARR | | | | |
| | 00h | Largest Subindex | U8 | ro | 4h | | No. of save possibilities 4 |
| | 01h | Save all parameters | U32 | rw | 1h | | ="evas " (0x65766173) to save |
| | 02h | Communication parameters | U32 | rw | 1h | | ="evas " (0x65766173) to save |
| | 03h | Application parameters | U32 | rw | 1h | | ="evas " (0x65766173) to save |
| 1011h | | Restore default parameters | ARR | | | | |
| | 00h | Largest Subindex | U8 | ro | 4h | | No. of reset possibilities = 4 |
| | 01h | All parameters | U32 | rw | 1h | | ="daol" (0x64616F6C) to load |
| | 02h | Communication parameters | U32 | rw | 1h | | ="daol" (0x64616F6C) to load |
| | 03h | Application parameters | U32 | rw | 1h | | ="daol" (0x64616F6C) to load |
| 1014h | | Emergency COB-ID | U32 | rw | 80h + Node-ID | X | COB ID of the emergency object |
| 1017h | | Producer heartbeat time | U16 | rw | 3E8h | X | Producer heartbeat time in ms (0 = disabled) |
| 1018h | | Identity object | REC | ro | | | |
| | 00h | Largest subindex | U8 | ro | 4h | | |
| | 01h | Vendor ID | U32 | ro | 5Fh | | Vendor ID |
| | 02h | Product code | U32 | ro | | | Product code: 74h = EAMxxx Lift |
| | 03h | Revision number | U32 | ro | | | Product revision number |
| 1029h | | Error behaviour | ARR | | | | |
| | 00h | Largest Subindex | U8 | ro | 2h | | |
| | 01h | Communication error | U8 | rw | 1h | X | 0h = Change to pre-operational mode |
| | 02h | Generic error | U8 | rw | 1h | X | 1h = No state change |
| | 03h | Temperature error | U8 | rw | 1h | X | 2h = Change to stopped mode |



| | | | | | | | |
|-------|-----|---------------------------|-----|----|------------|---|---|
| 1906h | | Transmit PDO263 parameter | REC | | | X | |
| | 00h | Largest Subindex | U8 | ro | 5h | X | |
| | 01h | COB ID | U32 | ro | 18Ch | X | |
| | 02h | PDO type | U8 | rw | FFh | X | Transmission type FFh = cyclic |
| | 05h | Event timer | U16 | rw | 0 | X | Cycle time in ms |
| 1907h | | Transmit PDO264 parameter | REC | | | X | |
| | 00h | Largest Subindex | U8 | ro | 5h | X | |
| | 01h | COB ID | U32 | ro | 18Dh | X | COB ID for TPDO264 |
| | 02h | PDO type | U8 | rw | 1h | X | Transmission type |
| | 05h | Event timer | U16 | rw | 0 | X | Cycle time in ms |
| 1B06h | | Transmit PDO263 mapping | ARR | | | X | |
| | 00h | Largest Subindex | U8 | rw | 2 | X | Maximum value is 8 |
| | 01h | Content of PDO263 | U32 | rw | 6383'0120h | X | Position encoder |
| | 02h | Content of PDO263 | S16 | rw | 6390'0110h | X | Speed encoder |
| 1B07h | | Transmit PDO264 mapping | ARR | | | X | |
| | 00h | Largest Subindex | U8 | rw | 0 | X | Maximum Value is 8 |
| | 01h | 1st mapping parameter | U32 | rw | 0 | X | Position encoder |
| 1F80h | | NMTStartup | U32 | rw | 0 | X | 0h = NMT slave needs to be started by NMT master 8h = NMT slave enters the NMT state <i>Operational</i> autonomously (self starting) |

12.2 Manufacturer Specific Profile Area

| Object | Sub-index | Name | Format | Access | Default | Save | Description |
|--------|-----------|-------------------------------|--------|--------|---------|------|--|
| 2100h | | Baudrate | U8 | rw | 5h | X | 0=10 kBit/s 1=20 kBit/s 2=50 kBit/s 3=100 kBit/s 4=125 kBit/s 5=250 kBit/s 6=500 kBit/s 7=800 kBit/s 8=1000 kBit/s The baudrate is activated after a reset or power-on (if parameter is saved to non volatile memory) |
| 2101h | | Node ID | U8 | rw | 4h | X | Node number 1...127 possible The new node ID is activated after a reset or power-on (if parameter is saved to non volatile memory) |
| 2110h | | Feature control | U16 | rw | 0008h | X | Bit 3: CAN Bus Off behavior 1 = Automatic CANopen restarting 0 = Encoder behaves according obj. 1029h |
| 2114h | | Manufacturer Reserved | U32 | rw | 0 | | |
| 2117h | | Encoder diagnostic | U16 | ro, m | | | Encoder diagnostic bits |
| 2118h | | Speed [rpm] | S16 | ro, m | | | Speed value of Encoder in [rpm] |
| 2120h | | Time stamp [us] | U16 | ro, m | | | Time stamp in [us] of current position acquisition |
| 2300h | | Customer EEPROM | ARR | | | | Customer EEPROM to save any data |
| | 00h | Largest Subindex | U8 | ro | 4 | | |
| | 01h | CustomerEEPROM[0] | U32 | rw | 0 | X | |
| | 02h | CustomerEEPROM[1] | U32 | rw | 0 | X | |
| | 03h | CustomerEEPROM[2] | U32 | rw | 0 | X | |
| | 04h | CustomerEEPROM[3] | U32 | rw | 0 | X | |
| 4001h | | Speed sampling interval in ms | U16 | rw | 0Ah | X | The speed sampling interval sets up the sampling interval of the speed calculation Changing this parameter to a value above 4'000 can cause problems (internal overflows) with the speed object (6390h-1) |



12.3 Standardized Device Profile Area

| Object | Sub-Index | Name | Format | Access | Default | Save | Description |
|--------|-----------|---------------------------------------|--------|--------|---------|------|---|
| 6001h | | Lift number | U8 | rw | 01h | X | Lift Number 1..8, Bit0=Lift 1, Bit1=Lift 2, ... |
| 6380h | | Operating Parameter | | | | | |
| | 00h | Largest subindex | U8 | ro | 01h | | |
| | 01h | Position Unit 1 | U16 | rw | 04h | X | Bit0 = 0 Position CW 1 Position CCW Bit 2 = 0 Scaling function disabled 1 Scaling function enabled |
| 6381h | | Resolution | ARR | | | | |
| | 00h | Largest subindex | U8 | ro | 01h | | |
| | 01h | Position Unit 1 | U32 | rw | 4000h | X | Resolution in steps/turn 4000h = 16384 = 14 Bit |
| 6382h | 00h | Preset value in steps | ARR | | | | |
| | 01h | Largest subindex | U8 | ro | 01h | | |
| | | Position Unit 1 | U32 | rw | 00h | X | Preset in steps → Offset |
| 6383h | | Position in steps | ARR | | | | |
| | 00h | Largest subindex | U8 | ro | 01h | | |
| | 01h | Position Unit 1 | U32 | ro | 00h | X | Position value incl. offset in steps |
| 6384h | | Encoder measuring step setting | ARR | | | | Position Unit 1 |
| | 00h | Largest subindex | U8 | ro | 03h | | |
| | 01h | Measuring step | U32 | rw | 0Ah | X | Unit of measuring step, multiple of 10 µm |
| | 02h | Speed Measuring step | U32 | rw | 0Ah | X | Unit of speed, multiple of 0.1 mm/s |
| | 03h | Acceleration Measuring step | U32 | rw | 01h | X | Unit of acceleration, multiple of 1 mm/s² |
| 6390h | | Speed value car | ARR | | | | |
| | 00h | Largest subindex | U8 | ro | 01h | | |
| | 01h | Position Unit 1 | I16 | ro | 00h | | Speed (see Object 6384 for unit) |
| 63C0h | | Operating Status | ARR | | | | |
| | 00h | Largest subindex | U8 | ro | 01h | | |
| | 01h | Position Unit 1 | U16 | ro | 04h | | Bit0 = 0 Position CW 1 Position CCW Bit 2 = 0 Scaling function disabled 1 Scaling function enabled |
| 63C1h | | Resolution | ARR | | | | |
| | 00h | Largest subindex | U8 | ro | 01h | | |
| | 01h | Position Unit 1 | U32 | ro | 1000h | | Resolution in steps/turn |
| 63C2h | | Number of distinguishable revolutions | ARR | | | | |
| | 00h | Largest subindex | U8 | ro | 01h | | |
| | 01h | Position Unit 1 | U32 | ro | 40000h | | Maximum number of rotations |
| 63C4h | | Supported Warnings | ARR | | | | |
| | 00h | Largest subindex | U8 | ro | 01h | | |
| | 01h | Position Unit 1 | U16 | ro | 14h | | Following warnings are supported: Bit2 = CPU watchdog status Bit4 = Battery charge |
| 63C5h | | Warnings | ARR | | | | |
| | 00h | Largest subindex | U8 | ro | 01h | | |
| | 01h | Position Unit 1 | U16 | ro | 00h | | Following warnings are supported: Bit2 = CPU watchdog status Bit4 = Battery charge |
| 63C6h | | Supported Alarms | ARR | | | | |
| | 00h | Largest subindex | U8 | ro | 01h | | |
| | 01h | Position Unit 1 | U16 | ro | 1001h | | Following alarms are supported: Bit0 = Position-Error Bit12 = Data Not Valid Encoder A |
| 63C7h | | Alarms | ARR | | | | |
| | 00h | Largest subindex | U8 | ro | 01h | | |
| | 01h | Position Unit 1 | U16 | ro | 00h | | Following alarms are supported: Bit0 = Position-Error Bit12 = Data Not Valid Encoder A |
| 63C8h | | Operating Time | ARR | | | | |
| | 00h | Largest subindex | U8 | ro | 01h | | |
| | 01h | Position Unit 1 | U32 | ro | 00h | | Time in 1/10 hours since last Reset |
| 63C9h | | Offset Wert | ARR | | | | |
| | 00h | Largest subindex | U8 | ro | 01h | | |
| | 01h | Position Unit 1 | U32 | ro | 00h | | Offset calculated from Preset (6382 h) |

13 Applications

Changing the node ID and baud rate with LSS

The node ID and baud rate can be changed without having to use these to address the encoder. With the LSS service, the sensors are addressed and configured via the product code, revision no., vendor ID and serial number.

Changing the node ID (node no.)

The node ID can be changed in object 2101h between 1 and 127. A save routine should then be executed using object 1010h. On the next initialization, the encoder logs on with the new node ID.

Changing the baud rate

The baud rate can be changed in the object 2100h. An index is written into the object, not the effective baud rate.

The baud rate now still has to be saved using object 1010-1. On next initialization, the encoder logs on to the new baud rate. However, before this the baud rate of the master should be changed.

14 Discrepancies to the CIA specifications

| Object | Sub-Index | Name | Discrepancy |
|--------|-----------|---------------------------------------|---|
| 0x1029 | 1 | Error behavior | Default Value is 1 instead of 0 (Do not change NMT-State on Communication-Errors. |
| | 3 | Error behavior | Default Value is 1 instead of 0 (Do not change NMT-State on Communication-Errors. |
| 0x63C2 | 0 | Number of distinguishable revolutions | Unsigned32 instead of Unsigned 16 due to 18-Bit Multiturn resolution. |
| 1B06h | 0 | Transmit PDO263 mapping | Speed object 6390h is additionally mapped to PDO |

A. Appendix

a. Pin Assignments

Assignment cable (connection – L)

| Cable colour | Signal |
|--------------|---------|
| grey | CAN_GND |
| brown | +Vs |
| white | 0 V |
| green | CAN_H |
| yellow | CAN_L |

Pin assignment connector 1 x M12 (connection – N)

| Pin | Signal |
|-----|---------|
| 1 | CAN_GND |
| 2 | +Vs |
| 3 | 0 V |
| 4 | CAN_H |
| 5 | CAN_L |

