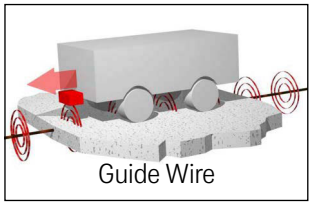
Device Description HG G-7335xZB




Track-Unit

# HG G-7335xZB

Interpreter for the Inductive Track Guidance of Vehicles for the connection of 2 antennas – Interfaces:
CANopen® HG G-73350ZB / Profibus HG G-73351ZB

| English, Revision 07 | Date: 10.05.2023 | Dev. by: WM | Author(s): RAD / MN |
|---|---|---|---|


GÖTTING

Innovation through Guidance

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### Basic characteristics of the Track-Units HG G-73350ZB (CAN bus) and HG G-73351ZB (Profibus)

- Interpreter for inductive track guidance systems
- For the connection of 2 guidance antennas
- 2 identical channels with independent filter frequency setting
- Monitoring of connected antennas for correct operation and wire breakage
- Interfaces:
  - RS 232 service interface (all variants)
  - CAN/CANopen® (HG G-73350)
  - Profibus (HG G-73351)
- Configuration via terminal program (RS 232) or via CAN-open® SDOs



The Götting KG in D-31275 Lehrte has a certified quality management system according to ISO 9001.

# Contents

# 1 About this Document

## 1.1 Validity

This device description applies to the interpreter HG G-7335xZB.

It contains information on correct mounting, electrical installation, commissioning, operation, maintenance and fault rectification.

This device description refers to devices from firmware as specified in section 3.1 on page 12.

The operation of the interpreter is only reasonably possible together with Götting antennas (see section 3.1 on page 12) and a current-carrying guide wire in the ground. In combination with connected antennas and the guide wire we speak of a track guidance system. In the following we will therefore speak of the interpreter (device) or the system, depending on the context.

### 1.1.1 Target Group

This device description is intended for developers, manufacturers or operators of systems or facilities that want to track guide Automated Guided Vehicles (AGV). It is also intended for qualified personnel who

- wants to integrate the system into a vehicle.
- wants to carry out the initial commissioning of the system.
- want to configure the system.

### 1.1.2 Other Applicable Documents

This device description does not include information on the operation of the higher-level system, e.g. an automated guided vehicle (AGV), into which the evaluator is integrated.

▶ Do not put the interpreter and the associated Götting antennas into operation until you have received the operating instructions from the manufacturer or the system operator and have read and understood them.

Supplementary documents for devices from Götting are available on request or directly via our Internet pages. The adjacent QR code will lead you to our homepage www.goetting-agv.com. The following links refer to specific product pages.

- Antenna type HG G-19200
  http://www.goetting-agv.com/components/19200
- Antenna type HG G-19535
  http://www.goetting-agv.com/components/19535

## 1.2 Declaration of Conformity (only HG G-73350)

The product HG G-73350 complies with the relevant harmonisation legislation of the European Union. The relevant harmonized European standards and directives mentioned in the Declaration of Conformity were used to assess conformity.

You can request the EU declaration of conformity from Götting KG or download it from the following address

https://www.goetting-agv.com/components/7335x

## 1.3 Presentation of Information

For you to be able to use your product simply and safely this device description uses consistent warning notices, symbols, terms and abbreviations. Those are described in the following sections.

### 1.3.1 Warning Notices

In this device description warning notices appear before sequences of actions that may lead to damage to persons or property. The listed actions for the danger prevention have to be observed.

Warning notices have the following structure:

**SIGNAL WORD**

**Kind or source of the danger**

Consequences

▶ Danger prevention

- The **warning symbol** (warning triangle) indicates danger to life or risk of injury.
- The **signal word** indicates the severity of the danger.
- The paragraph **kind or source of the danger** names the kind or source of the danger.
- The paragraph **consequences** describes the consequences of not observing the warning notice.
- The paragraphs for **danger prevention** explain, how to avoid the danger.

The signal words have the following meanings:

**Table 1** *Hazard classification according to ANSI Z535.6-2006*

| Warning Symbol, Signal Word | Meaning |
|---|---|
| DANGER | DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury. |
| WARNING | WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. |
| CAUTION | CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. |
| *NOTICE* | NOTICE indicates property damage: The product or the environment could be damaged. |

### 1.3.2 Symbols

In this device description the following symbols and formatting are used:

If this information is ignored the product may not be operated in an optimal way.

Indicates one or more links to the Internet.

- www.goetting.de/xxx
- www.goetting.de/yyy

Indicates tips for easier operation of the product.

✓ The check mark lists a requirement.

▶ The arrow shows an action step.

The indentation shows the result of an action or an action sequence.

- Program texts and variables are indicated through the use of `a fixed width font`.
- Menu items and parameters are shown in *cursive characters*.
- Whenever the pressing of letter keys is required for program entries, the required Letter Keys are indicated as such (for any programs of Götting KG small and capital letters are equally working).

# 2 Safety Instructions

This product has been manufactured in accordance with the generally recognized rules of technology. Nevertheless, there is a risk of personal injury and material damage if you do not observe this chapter and the safety instructions in this documentation.

- ✓ Read this documentation thoroughly and completely before working with the product.
- ✓ Store the documentation in such a way that it is always accessible to all users.
- ✓ Always pass on the product to third parties together with the required documentation.

## 2.1 Intended Use

The interpreter is a component of guide wire track guidance systems for Automated Guided Vehicles. The interpreter detects the deviation from the guide wires laid in the ground by means of the antennas mentioned in section 3.1 on page 12 and transmits it to the vehicle controller. Based on the transmitted values the steering information can be calculated.

The connected antennas are monitored for correct operation as well as for wire breakage. The interpreter is only intended for the use in track guidance systems with a maximum speed of 1 m/s without any passenger transportation.

Main area of application is the steering of automated guided vehicles, thus this is the application we mainly address from here on.

The track guidance system may only be operated by qualified personnel at the operation place (e.g. vehicle) at which it was mounted or initially commissioned by qualified personnel according to this device description. The operating conditions given in section 2.4 on page 9 have to be observed.

The track guidance system does not include safety equipment. It may only be used in applications where the manufacturer and/or the facility operator have ensured that sufficient measures for ensuring the personal safety and the safe detection of obstacles have been established. This includes the safe detection of situations like e.g. the vehicle leaving the track or people or obstacles appearing in front of the vehicle. In these cases moving parts (e.g. vehicles) have to be stopped immediately to rule out material damage and personal injuries.

All persons within the range of influence of an automated facility (e.g. automated guided vehicle, AGV) have to be instructed about the kind of the application and the associated risks.

## 2.2 Improper Use

Any use other than that described in the intended use is not intended and therefore not permitted.

Götting KG does not accept any liability for damage caused by improper use. The risks of improper use lie solely with the user.

Improper use includes:

- The use of the track guidance system in vehicles that are not equipped with safety devices for personal protection and safe detection of obstacles.
- Any departure from the lane or the appearance of a person or an obstacle in the danger area must be reliably detected at all times and immediate stopping of moving parts (e.g. vehicles) must be ensured to prevent damage to property or persons.

## 2.3 Qualification of the Users

The tasks described in this document require basic knowledge of the mechanics and electrics as well as knowledge of the associated technical terms. In order to ensure safe use, these activities must therefore only be carried out by an appropriate specialist or an instructed person under the supervision of a specialist.

A qualified person is someone who, on the basis of his or her specialist training, knowledge and experience as well as knowledge of the relevant regulations, is able to assess the work assigned to him or her, recognize possible dangers and take appropriate safety measures. A qualified person must comply with the relevant technical regulations.

The personnel intended for the installation, commissioning and configuration of the track guidance system:

- ✓ has received a copy of this device description.
- ✓ is familiar with the functionality of the superordinate system (e.g. an automated vehicle).
- ✓ is qualified to perform their tasks and is sufficiently trained to mount and configure the track guidance system, if that is part of their tasks.
- ✓ is familiar with the commissioning of and the telegram exchange via CAN bus or Profibus connections.
- ✓ knows – in case the track guidance system is to be used to position automated vehicles – the dangers emanating from an Automated Guided Vehicles (AGV) and is sufficiently trained in handling the vehicle and any necessary safety precautions to assess the safe working condition of the system.
- ✓ knows – in the event that other equipment or systems with moving parts are used – the risks arising from the application and is sufficiently trained in the handling of the vehicle and any necessary safety precautions to assess the safe working condition of the system.

## 2.4 Operating Conditions

- ✓ Observe the conditions for the installation of the antenna given in the related documents (s. section 1.1.2 on page 5), especially the specifications for metal free areas around the antenna and the interference immunity.
- ✓ Reinforcements close to the surface of the roadway may interfere the antenna and thus distort the position detection. This also applies to any large metal pieces (sheets) on the ground, the proximity of any floor reinforcement and inductive loops, as they are created e.g. by steel building mats. Individual metal poles have little effect. Those may partially be within the metal-free area of the guide wire.
- ✓ For the size of metal-free areas around the antenna please see the appropriate data-sheets listed in section 1.1.2 on page 5.

- ✓ The nominal reading distance between antenna and wire depends on the antenna type and the wire current. In between antenna and guide wire there may be no metal. Non-conducting and non-shielding dirt on the roadway as well as water, oil, tar, earth, fog, snow and ice do not influence the positioning.
- ✓ Even though dirt does not influence the positioning the antenna should be protected against dirt and moisture (e.g. spray water from the vehicle‘s wheels) and cleaned regularly. Otherwise the antenna‘s attrition rate rises.
- ✓ The antenna has to be fixed to the vehicle so firmly that its position does not change during normal operation. Otherwise the superordinate system interprets the position data wrongly and the vehicle might e.g. drive besides the track.
- ✓ After the mounting interferences should not exceed 500 units. This closely relates to the quality of the wire signal. This signal has to be significantly higher than interference signals. The more interference is radiated especially into the *differential antenna*, the less accurate the distance output becomes.
- ✓ Generally interferences should be avoided by keeping sufficient distances to interference sources and consistent reading distances to the guide wire.
- ✓ In the selected frequency area there may be no interference signals from clocked motors etc. This includes interferences transmitted via the metal body of the vehicle. Since magnetic fields may be transmitted via chassis parts it is advisable to perform tests when in doubt.
- ✓ Cables have to be installed with a minimum distance of 150 mm from the antenna since those cables can interfere with the antenna reception. How much they interfere depends on the power and the frequency. Again it‘s important that the interferences are not higher than 500 units.
- ✓ The system is intended to be used indoors. The operating temperature range is 0 to +50° C.
- ✓ Relative humidity 95 % @ 25° C (without condensation).

## 2.5 General Safety Instructions

- The track guidance system does not include safety equipment. It may only be used in applications where the manufacturer and/or the facility operator have ensured that sufficient measures for safeguarding the personal safety and the safe detection of obstacles have been established.
- The manufacturer and/or the facility operator have to ensure the safe detection of situations like e.g. the vehicle leaving the track or people or obstacles appearing in front of the vehicle. In these cases moving parts (e.g. vehicles) have to be stopped immediately to rule out material damage and personal injuries.
- When using the track guidance system the operating conditions from section 2.4 on page 9 have to be observed.
- Ensure that interferences in the ground or on the vehicle do not induce a higher signal than 500 units in the antenna. Make sure that the guide wire has a sufficiently higher signal. Otherwise measuring errors may occur.

## 2.6 Obligations of the Operator

When using the track guidance system, the operator must ensure that

- ✓ all persons within the sphere of influence of an automated system (e.g. Automated Guided Vehicle (AGV)) are informed about the type of application and the associated hazards,
- ✓ the operating conditions specified in section 2.4 on page 9 are observed,

- ✓ all components of the track guidance system is in a technically perfect condition.

The operator may not modify or convert Götting systems, devices and components without authorization.

# 3 Introduction

The interpreter allows to connect two tracking antennas to one device. The interpreter contains two identical channels with an independent setting of the filter frequency. The data output is carried out either via CAN Bus or Profibus, this depends on the Variant (see below). For CAN the CANopen® protocol is implemented (Device Profil DS 401).

The parameters inside the interpreter can either be set via a serial interface using a terminal program (e.g. HyperTerm) or for the CAN version via the various SDOs of the CANopen® protocol.

## 3.1 Variant Overview

The interpreter is available in two variants that differ in the interface:

**Table 2** *Variant Overview*

| Variant | Interface |
|---|---|
| HG 73350ZB | CAN-Bus / CANopen® |
| HG 73351ZB | Profibus |

This manual describes the hardware revision 73350ZA2 starting at firmware 73350A01.14 (HG G-73350ZB) resp. 73350YA2 with firmware 73351A01.00 (HG G-73351ZB).

## 3.2 System Components

At the time this manual was printed, the interpreter can be combined with the following antennas:

- HG G-19200
- HG G-19535
- HG G-19536

Technical informations in PDF format about these antennas can be found on our website at

http://www.goetting-agv.com/components/inductive

## 3.3 Accessories

The pin assignments of the interpreter's connectors are given in section 4.2 on page 14.

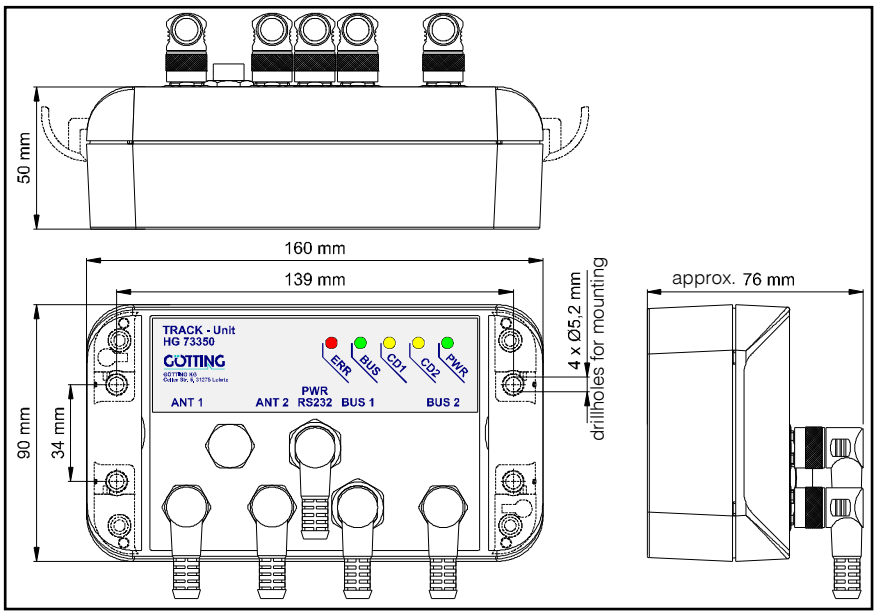
- Cable for voltage supply
  Sensor cable 5 pin, shielded, socket, A-coded, max. length 30 m
- Cable for connecting the antennas
  Sensor cable 4-pin, shielded, plug or socket, A-coded, max. length 30 m

- Cable for CAN-Bus
  Bus cable 2 pin or sensor cable 5 pin (incl. voltage supply), shielded, plug or socket, A-coded, max. length 30 m
  cable length influences max. baud rate, e.g. 2 pin bus cable, baud rate 1 MBit, max. length 30 m
  e.g. Götting HW CAB00064 (5 pin sensor cable, female, straight, connection to BUS1)
- CAN terminator for M12 connectors
  e.g. Götting HW CON00055 (male, connection to BUS2) / HW CON00096 (female, connection to BUS1)
- Cable for Profibus
  Bus cable 2 pin, shielded, plug (5 pin) or socket (5 pin), B-coded, length depending on baud rate but max. 30 m
  e.g. Götting HW CAB00002 (male, straight, connection to BUS2) /
  HW CAB00003 (female, straight, connection to BUS1) / HW CAB00044 (female, right-angled, connection to BUS1)
- Profibus terminator for M12 connectors
  e.g. Götting HW CON00003 (male, connection to BUS2)

# 4 Mounting

## 4.1 Casing Dimensions

**Figure 1** *Casing dimensions interpreter HG G-73350/HG G-73351*



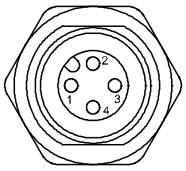

## 4.2 Connectors

All connectors are M12 panel plugs/jacks, except for the B-coded Profibus connectors they are A-coded. The casings of all connectors are connected to the device GND (Pin 5 in Table 6 on page 16). Notes on matching connection cables are given in section 3.3 on page 12.

### 4.2.1 Antenna Sockets on the Interpreter

The steering antennas are connected via a 1:1 cable to the corresponding 4-pin A-coded M12 panel jack. The two panel jacks are shown in Figure 1, labeled ANT1 and ANT2. They are allocated as follows:

**Table 3** *Pin allocation antenna sockets, connectors ANT1 and ANT2*

| ANT1 / ANT2 (female) | Pin | Signal |
|---|---|---|
|  | 1 | +UB 24 V |
| | 2 | GND |
| | 3 | Usum |
| | 4 | Udiff |
| A-coded | Casing | GND |

These panel jacks provide connection to the antennas. It is irrelevant whether one or two antennas are connected. When using only one antenna, ANT1 or ANT2 can be chosen. The displaying of CD1/CD2 on the front panel (Siehe „Position of the LEDs“ auf Seite 19.) refers to the corresponding antenna input. The input voltage of ANT1 and ANT2 are processed internally as US1/UD1 or US2/UD2.

### 4.2.2 CAN Bus (HG G-73350)

**NOTICE**

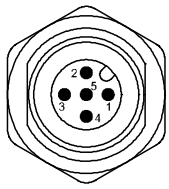
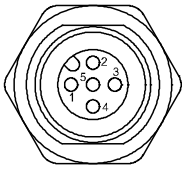
**Damage to the device**

If the voltage on the bus lines is too high, the bus driver in the interpreter and possibly even other devices connected to the bus can be damaged.

▶ Pin 4 or 5 must not be connected to voltages > 24 V!

The CAN bus is connected to the device via two 5-pin A-coded M12 connectors male/female (Siehe „Casing dimensions interpreter HG G-73350/HG G-73351“ auf Seite 14.). There they can be found as BUS1 and BUS2, which are allocated as follows:

**Table 4** *Pin allocation CAN bus, connectors BUS1 and BUS2*

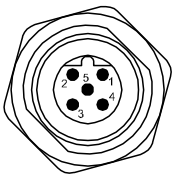
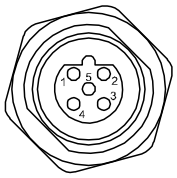
| BUS1 (male) | BUS2 (female) | Pin | Signal |
|---|---|---|---|
|  |  | 1 | n.c. |
| | | 2 | +24 V |
| | | 3 | GND |
| | | 4 | CAN_H |
| | | 5 | CAN_L |
| A-coded | | Casing | GND |

The connectors of the inputs BUS1/BUS2 are connected in parallel, i.e. there is no input or output. If the interpreter is installed at the end of the bus line, a CAN terminator has to be installed. Those terminators can be ordered form different manufacturers and are available for most plugs and jacks. The CAN connectors can also be used as power supply.

### 4.2.3 Profibus (HG G-73351)

Two 5-pin B-coded M12 male/female, indicated as BUS1 and BUS2 in Figure 1 above. There they can be found as BUS1 and BUS2, which are allocated as follows:

**Table 5** *Pin allocation Profibus, connectors BUS1 and BUS2*

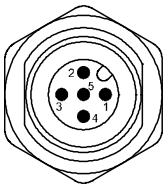
| BUS1 (male) | BUS2 (female) | Pin | Signal |
|---|---|---|---|
|  |  | 1 | Bus +5 V |
| | | 2 | Bus A |
| | | 3 | RTS |
| | | 4 | Bus B |
| | | 5 | Bus GND |
| B-coded | | Casing | GND |

The connectors of the inputs BUS1/BUS2 are connected in parallel, i.e. there is no input or output. If the interpreter is installed at the end of the bus line, a bus terminator has to be provided. Those terminators can be ordered from different manufacturers and are available for most plugs and jacks.

### 4.2.4 Power supply and serial interface

Here a 5-pin A-coded M12 panel plug is used, in Figure 1 referred to as PWR RS232.

**Table 6** *Pin allocation of power supply and serial interface, connector PWR / RS232*

| PWR / RS232 (male) | Pin | Signal | Annotation |
|---|---|---|---|
|   | 1 | +UB 24 V | |
| | 2 | — | n.c. |
| | 3 | TxD | Serial RS 232 data output |
| | 4 | RxD | Serial RS 232 data input |
| | 5 | GND | |
| A-coded | Casing | GND | |

This connection serves as the power supply. Additionally the serial interface RS 232 can be used for configuration, see chapter  on page 20.

# 5 Commissioning

After mounting or changing the antennas, a position calibration is recommended. Please see sections 7.3.2 on page 23 and 8.5.4.18 on page 42. The position calibration has to be carried out for each antenna individually.

Only by processing this position calibration the interpreter is able to calculate and display the deviation scaled to mm.

For a position calibration the following things are required:

- ✓ A *single wire* system. The calculation algorithms that are used map this system exactly.
- ✓ An antenna mounted at nominal height. This nominal height must match the one set in the interpreter (see also sections 7.3.2 on page 23 and 8.5.4.17 on page 41).
- ✓ A guide wire fed with nominal current (if possible 10 kHz).
- ✓ To compensate for asymmetries caused by the installation environment, a separate calibration value is formed for the right and left deviation.
- ✓ The antenna must be moved to the left and right over the wire in a range corresponding to twice the installation height.

The calibration can be started by using the serial interface or the CAN bus (see sections 7.3.2 on page 23 and 8.5.4.18 on page 42).

# 6 Hardware

The casing of the interpreter is made of plastic. All wires etc. can be connected via M12 connectors on the front panel. The input signals (two per antenna) are amplified, filtered with an adjustable band filter (frequency input, see Figure 14 on page 49) and rectified synchronously. Afterwards the direct current is smoothened by a low-pass filter (see block diagram, Figure 12 on page 48)

## 6.1 Monitoring

The function of the antennas is controlled: the horizontal component of the field (sum antenna) is usually controlled by the threshold bits in the system status as a reference.

The vertical component of the field (difference antenna) equals 0 above the middle of the wire, but a defective difference channel would always cause a deviation of 0. That is why both channels are controlled by a DC monitoring. In front of the receiving inductors, 5V are fed into the circuit, which are passed on from amplifier to amplifier until reaching the interpreter. If this voltage is applied, the status bits DC1-OK respectively DC2-OK are set.

## 6.2 Presettings

To run the interpreter under different conditions without having to change the circuit board, the input signals have been scaled: An input amplitude of 1 $V_{pp}$ reaches a full range of 75 % between sum channel and the difference channel. The Node-ID is preset to 1. The maximal incoming signal of all data streams having other frequencies is 5 $V_{pp}$.

As the parameters of the device (reading height, wire current) can be altered, it is no problem that the antennas are having different dimensions or being adjusted differently.

The interpreter is preset to a frequency of 10 kHz. The threshold for the calculation of the distances referring itself to 1000 units is preset on input voltage S1 respectively S2. If the sum voltage lies above this value, the corresponding bit is set in the system status and the corresponding LED CDx lights up. These presettings can be modified using a serial terminal (for example HyperTerm on a PC) or via the various SDOs of the CANopen® protocol (s. Table 26 on page 35).

The two channels of the interpreter have the same presettings.

## 6.3 Processing the Signal

The four voltages of the four channels are checked every 500 µs and are summed up during a period of 8 ms. Each 10 ms the CANopen® resp. Profibus protocol are provided with the measured values. The scaled distances are put out in mms. To calculate those distances the quotients are formed (current compensated).

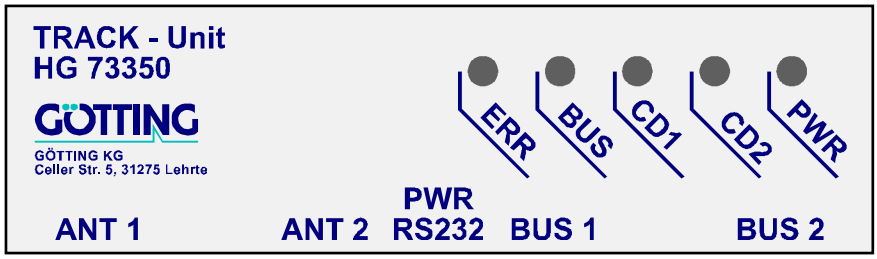
The 16x oversampling and the use of a 10bit A/D converter lead to a value range of the sum voltage of 16384, of the difference voltage of ±8192.

As in this range the DC offsets of the channels **have to** be compensated, a range of about 16000 resp. ±8000 units is usable. Further information may be found in chapter  on page 28 (CAN Bus) resp. chapter  on page 45 (Profibus).

## 6.4 The Control LEDs

On the front panel a group of 5 LEDs can be found.

**Figure 2** *Position of the LEDs*




- PWR: Green, presents the power voltage of the device
- CD1, CD2: Yellow, show the exceeding of the sum voltage and the set thresholds for channel 1 and 2.

The green LED (BUS) and the red LED (ERR) behave differently depending on the interface, CANopen® or Profibus.

### 6.4.1 CAN Bus (HG G-73350)

- The green LED (BUS) flashes after turning on the device. It shows the status of the device:
  - *Node stop:* LED flashes slowly
  - *Node reset communication* and *node preoperational:* LED flashes fast

- *Node operational:* LED is lit continously
  - The red LED (ERR) starts to flash as soon as a CAN bus error occurs. Additionally the red flashing LED displays an error in the set of parameters.

### 6.4.2 Profibus (HG G-73351)

- BUS: Green, is lit while data is exchanged with the Profibus master.
- ERR: Red, is activated if one of the following error conditions occurs:
  - EEPROM parameter checksum is not correct.
  - Profibus protocol chip hardware error.
  - Profibus buffer error, if modules other than those specified in the GSD file are displayed.

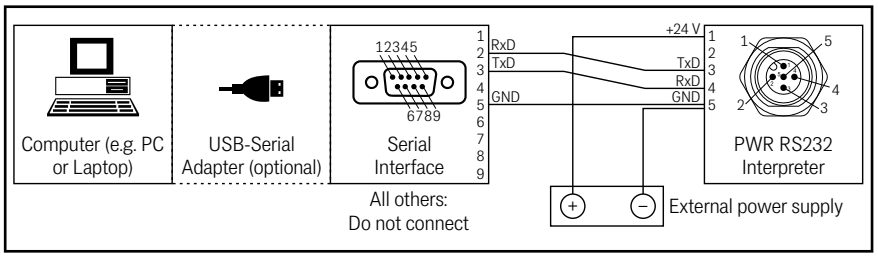
- CD1/CD2 lights up if there is a sum level, but a wire break on the differential channel has been detected.

# 7 Software

## 7.1 Connection to a PC via the Serial Interface

The interpreter has a serial interface included in the 5 pin PWR RS232. This interface can be used for its diagnosis, configuration or a software update. A PC with a serial RS 232 interface is needed. For PCs that don't have a serial interface a USB to RS 232 adapter can be ordered from electronics retailers.

**Figure 3** *Connection example: Connection to the serial interface of a PC*




The interpreter's serial interface has the following communication settings. Those have to be configured in the terminal program on the PS (see below).

**Table 7** *Transmission parameters of the serial RS 232 interface*

| Setting | |
|---|---|
| Bits per second | 38,400 |
| Data bits | 8 |
| Parity | Even |
| Stop bits | 1 |
| Terminal emulation | ANSI |

## 7.2 Terminal Program

Every terminal program compatible with the transmission parameters shown above can be used, examples are HyperTerminal® or Tera Term®. HyperTerminal has been included in earlier versions of Microsoft® Windows®. Additionally it can be downloaded from the following address:

https://www.hilgraeve.com/hyperterminal/

## 7.3 Monitor Program

Connect the PC to the interpreter and start the Terminal program.The monitor will start after pressing ‘m‘ or M.

### 7.3.1 Main Menu

Depending to the variant the following menu appears:

**Figure 4** *Screenshot: Main menu of the monitor program (HG G-73350 with CAN Bus)*

```
S1:   1  D1:  -10  S2: 10816  D2: -4403  X1:-256 mm  X2: -50 mm   Status: 0x40


         (1) Select Antenna System 1
         (2) Select Antenna System 2
         (C)AN Menue

         (L)oad Values to EEProm
         (O)utput CSV-Data  (press 'a' to abort)
         (U)pdate Firmware
         (S)ervicemenue

         (Q)uit

Software Version  73350A01.05 / 15.MAR.2005    Serial Number: 9999999
```

**Figure 5** *Screenshot: Main menu of the monitor program (HG G-73351 with Profibus)*

```
S1:  6418  D1:     65  S2:     0  D2:    -16  X1:   +0  X2: -256  Status: 0x80



         (1) Select Antenna System 1
         (2) Select Antenna System 2

         (P)rofibus Menu

         (L)oad Values to EEProm
         (O)utput CSV-Data  (press 'a' to abort)
         (U)pdate Firmware
         (S)ervicemenue

         (Q)uit


Software Version  73351A01.00 / 03.SEP.2008    Serial Number: 7385277
```

The first two lines represent the input.

#### S1, S2, D1, D2

The values for `S1`, `D1`, `S2`, and `D2` are each the sum of the 16 samplings. The range for the sum voltage is 0 to 16383 and for the difference voltage -8192 to +8191.

#### X1, X2

X1 and X2 present the calculated values for the collateral deviation of the antennas above the guide wire in a range from -255 to +255 in mm. The value of the threshold will be -256 if the corresponding voltages of S1 respectively S2 fall below the set threshold.

#### Status

The hexadecimal output of binary coded system statuses in the same format as output via the serial telegram, PDO_1 (CAN) or Profibus.

**Table 8** *Meaning of the possible values in the status output*

| Hex value | Meaning |
|---|---|
| 0x80 | S1 has exceeded the set threshold for channel 1 |
| 0x40 | S2 has exceeded the set threshold for channel 2 |
| 0x20 | not connected |
| 0x10 | calibration in progress |
| 0x08 | DC1_OK (difference channel 1 connected galvanically with interpreter) |
| 0x04 | DC2_OK (difference channel 2 connected galvanically with interpreter) |
| 0x02 | not connected |
| 0x01 | check sum of the two parameters is wrong |

**Example:** If 0xCC is put out, the thresholds in both channels have been exceeded and both difference channels are operational.

### Selecting a menu

- with 1 respectively 2 the menus for the two antenna systems can be chosen, see 7.3.2 on page 23
- C opens the CAN menu, see 7.3.3 on page 24
- P opens the Profibus menu, see 7.3.4 on page 26
- changed parameters can be saved in the EEProm by pressing L. To confirm those changes the password `815` has to be entered immediately after.
- to protocol data, the output in CSV (Comma Separated Values) mode can be activated by pressing O. Then the values of the status line will be displayed separated by comma and terminated by CrLF:
  Example:
  `44,0,-15,9627,-3335,-256,50`
  `44,0,-17,9626,-3333,-256,51`
  In this example the first number “44“ presents the current status of the device (here: threshold 2 exceeded), then Us1= 0 and Ud1= 17, followed by Us2= 9626 and Ud2= -3333. The last displayed numbers show the collateral deviations for antenna 1 and antenna 2. If no wire was detected, -256 is displayed as distance value.
  By using the protocol function of Hyperterm the data can be logged. A stops the output.
- with U the firmware can be updated, see 7.5 on page 26
- the Servicemenu cannot be modified by the user

### 7.3.2 Antenna Menu

In this chapter the sub menu for antenna 1 will be explained. The sub menu for antenna 2 is identical.

**Figure 6** *Screenshot: Antenna menu*

```
S1:     1  D1:   -10  S2: 10816  D2: -4403 X1:-256 mm  X2: -50 mm   Status: 0x40


         (F)req 1 select                [/Hz]:   10000
         (D)etect Level 1               [/Smpl]:  1000
         (H)eight of Antenna mounting   [/mm]:      60
         (I)nternal height              [/mm]:      35
         (C)alibrate



         (Q)uit
```

- By pressing F the frequency in the range of 1 to 28 kHz can be modified. **Please note that the antenna HG 19210-C works in a range from 3 to 25 kHz!**
- D helps adjusting the threshold which refers to the sum voltage. When this threshold is exceeded, the front LED CDx and the corresponding bits in the system status are set.
- By using H the distance between the guide wire and the bottom of the sensor can be modified.
- With I the internal height, which is specified for each type of antenna, can be entered.

The sum of the values entered under H and I are used to calculate the distance.

- C starts the calibration of the distance output. Now the corresponding antenna has to be moved in an area of ±2x height over the guide wire. For the calibration a 10 kHz wire frequency is recommended as the frequency compensation is also referred to this frequency.
- With Q the menu can be left.

### Calibration Menu

The calibration menu (here: antenna 1) is made up as follows:

**Figure 7** *Screenshot: Calibration menu antenna 1*

```
S1:  3780  D1:   3617  S2:  3133  D2:   4590  X1:  +62  X2:  +99  Status: 0xc0

Us1:    3795     Udl1:       0     Udr1:    3645



shift Antenna 1 from -2*H to +2*H and press any key when ready
```

During the calibration the maximum of the voltage `S1` is saved in `Us1`. In `Udl1` and `Udr1` the maximum of the voltage `D1` on the left and right side from the wire is saved. During this procedure the sensor has to be moved e.g. ±120 mm above the wire if the reading height is 60 mm. This equals a value of reading height multiplied with two.

After pressing any key the calibration values are calculated using the maxima and the reading height, which was entered in the antenna menu. To save these values permanently ↵ has to be pressed in the main menu.

## 7.3.3 CAN Menu (HG G-73350)

You can find general information about the CAN Bus and the corresponding terms in chapter  on page 28. The CAN menu is made up as follows:

**Figure 8** *Screenshot: CAN menu (HG G-73350)*

```
S1:     0  D1:     -6  S2:     0  D2:    -40  X1: -256  X2: -256  Status: 0x00

Bus online     Operational         Last Err: 0000


         (N)ode ID                            [1..127]:     1
         CAN-(B)audrate[20,50,125,250,500,800,1000 kB]:   500
         (C) TPDO_1 mode                   [1..240,255]:   255
         (D) TPDO_1 inhibit time      [0,10..10000 ms]:     0
         (E) TPDO_1 event time        [0,10..10000 ms]:    10
         (F) TPDO_2 mode                   [1..240,255]:   255
         (G) TPDO_2 inhibit time      [0,10..10000 ms]:     0
         (H) TPDO_2 event time        [0,10..10000 ms]:    10
         (I) Heartbeat time              [0..65535 ms]:     0
         (A)utostart                                        1
         (L)owbyte first                                    0

         (Q)uit
```

In addition to the above described staus line, the status of the CAN bus is displayed: `Bus online` changes to `Bus offline` if e.g. the CAN bus is unplugged or because of lacking a terminator. Besides that the `CAN open Node` statuses `stopped`, `preoperational` or `operational` are displayed. The following keys have a specific function:

- with N the node address in a range from 1 to 127 can be chosen.
- by pressing B one of the listed baudrates can be chosen, the function auto-baud is not implemented.
- by using key C the `PDO_1` operational mode can be selected. Choosing a value between 1 and 240 the synchronous, cyclical mode can be picked. By selecting 255 the asynchronous mode is set. The two following modes are only available in the asynchronous mode:
  - D is the inhibit time of `PDO_1.` In `PDO_1` the system status and the calculated distances are transmitted. The inhibt time is the shortest time period between two periods that can be achieved.
  - E is the time of the cycle of the `PDO_1` transmission. If both values are 0, `PDO_1` will no be transmitted.

- by pressing F the operational mode PDO_2 is selected. Choosing a value between 1 and 240 the synchronous, cyclical mode can be chosen. By selecting 255 the asynchronous mode is set. The two following modes are only available in the asynchronous mode:
  - G is the inhibit time of `PDO_2`. In `PDO_2` the four analog antenna voltages are transmitted. The inhibt time is the shortest time period between two periods that can be achieved.
  - H is the time of the cycle of the `PDO_2` transmission. If both values are 0, `PDO_2` will no be transmitted.

- I changes the so called `Heartbeat time`. At the chosen interval of this cycle time a control message is sent. If the time equals 0 no message is sent.
- with A the autorun function is (de)activated.
  - if autorun is deactivated only the `Heartbeat` message (if activated) is sent after turning on the device. The mode of the device is `preoperational`.
  - if autorun is activated the `Heartbeat` message (if activated) and the `PDOs` are sent immediately after turning on the device. The mode of the device is `operational`.

- by pressing L the order of the bytes within the `PDOs` is changed: by choosing `Lowbyte first = 1` the low order byte of a 16bit word is transmitted first.

### 7.3.4 Profibus Menu (HG G-73351)

The specification of the Profibus telegrams is shown in chapter  on page 45. The Profibus menu is made up as follows:

**Figure 9** *Screenshot: Profibus-Menu (HG G-73351)*

```
S1:  6453  D1:     65  S2:     0  D2:    -13  X1:   +0  X2: -256  Status: 0x80

Byte #  Master-Input            Profibus-Status:  NO_ERROR
   0        80
   1        00
   2        00                (N)ode ID        [0..126]:     2
   3        00                (L)owbyte first                0
   4        ff


                             (Q)uit


Byte #  Master-Output
   0        00
   1        00
   2        00
   3        00
```

In this menu the following keys have a specific function:

- N for choosing the node address in a range of 0 to 126
- L for inverting the order of the bytes of the variables X1, X2 and F2 within the master- input and output data fields. Setting `(L)owbyte first = 1` the low byte of a 16 Bit word ist transmitted first.
- Press Quit to return to the main menu.

If pre-defined, the content of the master input or the output bytes will be displayed in this menu. The status of the profibus is output as well.

## 7.4 Switching to Different Environment Parameters

The interpreter can also be used in combination with tracking systems which have another guide wire current or another reading height. Minor changes in the surrounding of the device (e.g. guide wire current between 35mA and 100mA at the same reading height) are compensated by the dynamic range of the device.

The different guide wire currents, distances between the conductors and reading heights are adapted to the antennas by changing the amplification factor. To change these factors the monitor program has to be started, the displayed voltages Sx and Dx have to get noticed.

The maximum of the sum voltage can be found above the conductor. By using the corresponding potentiometer for the antenna, it has to be trimmed to approx. 12000 units. The maximum of the difference voltage can be found at a corresponding distance collateral from the conductor. By using the corresponding potentiometer for the antenna it has to be trimmed to 6000 units.

## 7.5 Firmware-Update

The processor inside the interpreter can be programmed via a Flashloader using the serial interface. Therefor a serial connection to a PC has to be established.

1. Establish a connection with HyperTerm.

The XON/XOFF flow control has to be activated!

2. Start the interpreter's main menu (description see above) and choose U for (U)pdate firmware. Then enter the password `815`.

On the screen the following image appears:

**Figure 10** *Screenshot: Firmware update*

```
Please wait for 'R' and transfer Intel-Hex file as ASCII upload

--------------
 Flash Loader
  T89C51CC03
(c)GoettingKG
   18.10.04
--------------
    73350A0
--------------
P
```

Now wait until the deletion of the flash memory is getting confirmed with `<R>`. Then choose the menu `<Transmisson>` `<Send Text file>` in Hyperterminal and enter the name of the software which should be programmed. The progress of the programming is displayed by `<.>` points. The symbol `<o>` shows that the procedure is finished.

**Figure 11** *Screenshot: Firmware upload*

```
Please wait for 'R' and transfer Intel-Hex file as ASCII upload

--------------
 Flash Loader
  T89C51CC03
(c)GoettingKG
   18.10.04
--------------
    73350A0
--------------
PR.......................................................................
.......................................................................
.......................................................................
.......................................................................
.......................................................................
.......................................................................
.......................................................................
.......................................................................o
```

Afterwards the new firmware is started immediately. If the transmission was not successful neither the old nor the new firmware can be found in the device. Yet the flash loader is always available and starts automatically after rebooting the device.

# 8 CAN Interface (HG G-73350)

The node ID and the transfer rate have to be selected by using the serial monitor (described in section 7.2 on page 20) or the corresponding SDOs.

The measured values of the system are transmitted via two so called TxPDOs. They can be parametrized using the SDOs. Additionally the frequencies of the two wires can be altered using a non-cyclical RPDO. The CAN identifier can be deduced ny the node address (1 to 127).

## 8.1 Definition of the Terms CAN and CANopen®

The CAN / CANopen® configuration is implemented according to ISO 11898 resp. EN 50325-4. As an assistance some of the terms and abbreviations are explained in this section. For more specific information please refer to the corresponding norms or open the website

http://www.can-cia.org/en/standardization/technical-documents/

where – after a free registration – you can download the technical specifications of the CANopen® standard. For devices that support CANopen® Götting offers EDS files (Electronic Data Sheet) for download from its website (see appendix 12.3 on page 52). In those files the complete CAN configuration is defined. In order to use those files to e.g. configure CAN workflows with several devices a software like e.g. CANopen® Magic by PEAK System has to be used:

http://www.canopenmagic.com

**Table 9** *Parameters PDO operation mode*

| Value | cyclic | acyclic | synchronous | asynchronous | on request only (RTR) |
|---|---|---|---|---|---|
| 0 | | x | x | | |
| 1-240 | x | | x | | |
| 241-251 | reserved | | | | |
| 252 | | | x | | x |
| 253 | | | | x | x |
| 254 | | | | x | |
| 255 | | | | x | |

Please observe that not each device supports all operation modes. Devices by Götting usually support the modes 1 to 240 and 255.

**Table 10** *PDO operation modes*

| Operation Mode | Explanation |
|---|---|
| Cyclic | every n‘th Sync telegram data is transmitted |
| Acyclic | transmits if an event has occurred since the last Sync telegram |
| Synchronous | data is transmitted after a Sync telegram is received |
| Asynchronous | data is transmitted event-driven |
| RTR | solely upon request via a Remote Frame |
| Inhibit Time | minimum time span that has to pass before the same PDO is sent again |
| Event Time | Whenever this time span ends an event is initiated. Is restarted after each event. |

**Table 11** *Definition of terms CAN/CANopen®*

| Abbreviation | Name | Meaning |
|---|---|---|
| PDO | Process Data Objects | maximum 8 Byte process data |
| TxPDO | Transmit-PDO | the process data sent by a device |
| RxPDO | Receive-PDO | the process data received by a device |
| SDO | Service Data Objects | serves for reading and writing device parameters, no size limit |
| Sync | Synchronization Telegram | bus-wide telegram sent by the CANopen® Master |
| – | CAN Identifier | the address on which a PDO,SDO is sent |
| – | Node ID | CANopen®: the address of the device that is added to the CAN identifier |

**Table 12** *Bit and Byte order*

| Name | Meaning |
|---|---|
| Low Byte First | Little-Endian-Format, Intel Format<br>the low byte of each multibyte value is sent first |
| High Byte First | Big-Endian-Format, Motorola Format<br>the high byte of each multibyte value is sent first |
| Left-aligned | Order of the bits in a byte from left (high, most significant) to right (low) |

**Table 13** *CANopen® operation states*

| Name | Meaning |
|---|---|
| Stopped | only network management service can be executed |
| Pre-Operational | full configuration possible, PDOs are not transmitted |
| Operational | full configuration possible, PDOs are transmitted |

Please observe that a CAN Identifier (for CANopen® the combination of a CAN Identifier and Node Identifier) always has to be unique!

## 8.2 Description of the Process Data Objects (PDOs)

### 8.2.1 Transmission Objects

The measured data are allocated to particular places in the PDO, a dynamical mapping is not provided. The PDO mode can be set to cyclical, synchronous or a asynchronous. In order to prevent high bus load during the non-cyclical transmission (asynchronous mode) the inhibit time in the CAN menu can be adjusted using the serial monitor (see 7.3.3 on page 24). This is important as the constant changes may affect the BUS. A PDO can be transmitted cyclical instead. The corresponding event time is to be chosen accordingly and the inhibit time has to be set to 0.

A TxPDO can be deactivated permanently by choosing the asynchonous mode (255) with inhibit time = 0, event time = 0 and saving of the parameters. Additionally, it can be deactivated/activated temporarily by setting/deleting the highest bit in the corresponding PDO-COB identifier [1800,01] or [1801,1].

#### 8.2.1.1 PDO_1

PDO_1 is sent with the identifier 0x180 + node address. It contains 5 bytes in which the displayed status on the serial monitor as well as two distance values (left-aligned) are contained. The order of the transmission is status, X1, X2.

The order of the bytes within a 16bit word can be altered using point L from within the CAN menu (see 7.3.3 on page 24) or the SDO with the index 0x2002,03 (Node config).

**Table 14** *CAN: displayed numbers for PDO_1*

| Value | Format | Value range | Annotation |
|---|---|---|---|
| Status | unsigned 8 | 0..0xff | status bits according to Table 15 |
| X1 | signed 16 | -32640.....+32640 | -128 x 255 [mm].....+128 x 255 [mm] *) |
| X2 | signed 16 | -32640.....+32640 | -128 x 255 [mm].....+128 x 255 [mm] *) |
| *) Hinweise zu der Umrechnung der Abstandswerte finden Sie underneath Table 15 below. | | | |

The meaning of the status bits is determined as follows:

**Table 15** *CAN: meaning of the status bits*

| Bit no. | Value | Meaning |
|---|---|---|
| 7 | 0x80 | Us1 exceeds chosen threshold for channel 1 |
| 6 | 0x40 | Us2 exceeds chosen threshold for channel 2 |
| 5 | 0x20 | Toggle-Bit, changes its status after each transmission of PDO_1 |
| 4 | 0x10 | calibration is active |
| 3 | 0x08 | DC monitoring Ud1 is OK |
| 2 | 0x04 | DC monitoring Ud2 is OK |
| 1 | 0x02 | not connected |
| 0 | 0x01 | Checksum of the EEprom - parameter is wrong. |

The interpreter works internally with a 16 bit signed integer *signed int16* to indicate the deviation from the guide wire. The MSB (Most Significant Bit) is left-aligned, it is indicating the algebraic sign: 1 for negative numbers, 0 for positive numbers.

Directly after the MSB the 8-Bit representation of the deviation value (marked green in the below tables) does follow, while the remaining Bits of lower value are filled with 0.

The internal deviation value in fact is a signed 9-bit number which has been shifted by 7 digits to the left, which equals a multiplication by 128 (2^7).

**Table 16** *CAN: Calculation of negative deviation values (example: maximum)*

| MSB | | | | | | | | | | | | | | | LSB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| -255 | | | | | | | | | x 128 | | | | | | |
| = -32640 | | | | | | | | | | | | | | | |

**Table 17** *CAN: Calculation of positive deviation values (example: maximum)*

| MSB | | | | | | | | | | | | | | | LSB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 255 | | | | | | | | | x 128 | | | | | | |
| = 32640 | | | | | | | | | | | | | | | |

The deviation value ranges between -32640 (=-255 x 128) and 32640 (255 x 128). It is changing by 128 with each millimeter of change in the real deviation from the guide wire. To obtain a millimeter value from the internal distance value you have to divide this 16 bit number by 128.

In case of a loss of wire a value of 256 mm will be returned which equals an internal deviation value of -32768 (-256 x 128).

**Table 18** *CAN: Deviation value output for loss of wire*

| MSB | | | | | | | | | | | | | | | LSB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| -256 | | | | | | | | | x 128 | | | | | | |
| = -32768 | | | | | | | | | | | | | | | |

The millimeter value is generally indicated via the RS232 interface, while the internal value is returned by the CAN bus from the interpreter. The values sent by CAN bus have to be divided by 128 to obtain the millimeter values. The table below shows some example values.

**Table 19** *CAN: Example values for the deviation value output*

| Internal Value | | | Deviation in mm |
|---|---|---|---|
| decimal | binary | hexadecimal | |
| -25600 | 1001 1100 0000 0000 | 9C00 | -200 |
| -10240 | 1101 1000 0000 0000 | D800 | -80 |
| 2560 | 0000 1010 0000 0000 | 0A00 | 20 |
| 15360 | 0011 1100 0000 0000 | 3C00 | 120 |

#### 8.2.1.2 PDO_2

PDO_2 is sent with identifier 0x280 + node address. It contains exactly four 16bit words (left-aligned) in the order Us1, Ud1, Us2, Ud2. The synchronous identifier which is up to be received is 0x80. It can be read in index [1005,00].

**Table 20** *CAN: displayed numbers for PDO_2*

| Channel | Format | Value range |
|---|---|---|
| Us1 | Unsigned 16 | 0..65532 |
| Ud1 | signed 16 | -32768.....+32764 |
| Us2 | Unsigned 16 | 0..65532 |
| Ud2 | signed 16 | -32768.....+32764 |

The values transmitted in PDO_2 are based on the values shown in the status line of the monitor program but are converted according to the following schema:

**Table 21** *Examples for the conversion in PDO_2*

| Channel | Value shown in Monitor | Value in PDO2 *) | | Comment |
|---|---|---|---|---|
| | | Monitor x 4 | Hex | |
| Us | 3000 | 12000 | 2EE0 | example |
| | 12000 | 48000 | BB80 | upper threshold in practice |
| | 16383 | 65532 | FFFC | absolute maximum value |
| Ud | -1000 | -4000 | F060 | example |
| | 1000 | 4000 | 07A0 | |
| | -6000 | -24000 | A240 | upper threshold in practice |
| | 6000 | 24000 | 5DC0 | |
| | -8192 | -32768 | 8000 | absolute maximum value |
| | 8191 | 32764 | 7FFC | |
| *) Values shown in Lowbyte first = 0 order (s. CAN menu, Figure 8 on page 24) | | | | |

### 8.2.2 Receiving Objects

The frequency of the wires can also be changed using a non-cyclical receiving PDO. Additionally, the RPDO can be deactivated/activated by setting/deleting the highest bit in the corresponding PDO-COB identifier [1400,01].

The RPDO is expected on identifier 0x200 + node address. It contains 4 bytes for the frequencies F1 and F2 in Hz. The order of the bytes within the 16bit words can be altered using the CAN menu L (see 7.3.3 on page 24) or the SDO with index 0x2003,02 (Node config).

**Table 22** *CAN: displayed numbers for RPDO*

| Value | Format | Value range | Annotation |
|---|---|---|---|
| F1 | Unsigned 16 | 1000....28000 | frequency of wire channel 1 |
| F2 | Unsigned 16 | 1000....28000 | frequency of wire channel 2 |

If values are transmitted which are not situated within the value range, they will be ignored. Frequency changes are carried out as soon as the time, mentioned as frequency switch in the Technical Data (chapter  on page 47), is reached.

## 8.3 Heartbeat

The device supports the heartbeat mode. If a heartbeat time > 0 is set in the CAN menu the status of the device is sent to the identifier 0x700 + node address after the heartbeat timer has expired.

**Table 23** *CAN: Heartbeat device statuses*

| Device status | Code |
|---|---|
| stopped | 0x04 |
| pre-operational | 0x7f |
| operational | 0x05 |

## 8.4 Writing on Service Data Objects (SDOs)

To access the object directory the service data object (SDO) is used. A SDO is transmitted with an affirmation i.e. each incoming message is confirmed. The identifiers for read and write access are:

Read access: 0x600 + Node - Address

Write access: 0x580 + Node - Address

The SDO telegrams are written according to CiA standard DS-301. The error codes which may occur due to an erroneous communication are listed in the following table:

**Table 24** *CAN: SDO error codes*

| Name | Number | Meaning |
|---|---|---|
| SDO_ABORT_UNSUPPORTED | 0x06010000 | non-supported access to an object |
| SDO_ABORT_READONLY | 0x06010001 | write access to read only object |
| SDO_ABORT_NOT_EXISTS | 0x06020000 | object is not implemented |
| SDO_ABORT_TRANSFER | 0x08000020 | During saving/loading of parameters the signature “load“ or “save“ has not been used. When calling calibration. signature “cali“ has not been used. |
| SDO_ABORT_PARA_VALUE | 0x06090030 | parameter value range exceeded |
| SDO_ABORT_PARA_TO_HIGH | 0x06090031 | parameter value too high |

## 8.5 Object Directory

In the CANopen@ object directory all objects being important for the device are entered. Each entry is marked by a 16 bit index. Sub components are marked by a 8 bit subindex. Read only entries are marked by RO.

Communication parameters are marked by **C** in the overview table, manufacture parameters by **M**.

The object directory is divided into the following parts:

### 8.5.1 Communication specific entries

**Table 25** *CAN: overview of object directory, communication specific entries between 0x1000 and 0x1FFF (part 1 of 2)*

| Communication specific entries located from 0x1000 to 0x1FFF | | | | |
|---|---|---|---|---|
| **Index** | **Subindex** | **Access** | **Content** | **EEProm** |
| 0x1000 | 0 | RO | Device Type | |
| 0x1001 | 0 | RO | Error Register | |
| 0x1005 | 0 | RO | COB ID Sync Message | |
| 0x1008 | 0 | RO | Number of Entries of Device Name | |
| | 1 | RO | Device Name 1 | |
| | 2 | RO | Device Name 2 | |
| | 3 | RO | Device Name 3 | |
| 0x1009 | 0 | RO | Hardware Version | |
| 0x100A | 0 | RO | Software Version | |
| 0x1010 | 0 | RO | Number of entries of Save Parameter | |
| | 1 | RW | Save all | |
| 0x1011 | 0 | RO | Number of entries of Restore Default Parameter | |
| | 1 | RW | Restore Default all | |
| | 2 | RW | Restore Default Communication Parameter | |
| | 4 | RW | Restore Default Manufacture Parameter | |
| 0x1017 | 0 | RW | Producer Heartbeat Time | C |
| 0x1018 | 0 | RO | Number of entries of Identity Object | |
| | 1 | RO | Vendor ID | |
| | 2 | RO | Product Code | |
| | 3 | RO | Revision | |
| | 4 | RO | Serial Number | |
| 0x1400 | 0 | RO | Number of Entries of Receive PDO_1 | |
| | 1 | RW* | COB-ID | |
| | 2 | RO | Transmission Type | |
| 0x1600 | 0 | RO | Number of Objects mapped to Receive PDO_1 | |
| | 1 | RO | Specification of Appl. Object 1 | |
| | 2 | RO | Specification of Appl. Object 2 | |
| 0x1800 | 0 | RO | Number of entries of Transmit PDO_1 | |
| | 1 | RW* | COB-ID | |
| | 2 | RW | Transmission Type | C |
| | 3 | RW | Inhibit Time | C |
| | 5 | RW | Event Time | C |

**Table 25** *CAN: overview of object directory, communication specific entries between 0x1000 and 0x1FFF (part 2 of 2)*

| Communication specific entries located from 0x1000 to 0x1FFF | | | | |
|---|---|---|---|---|
| **Index** | **Subindex** | **Access** | **Content** | **EEProm** |
| 0x1801 | 0 | RO | Number of entries of Transmit PDO_2 | |
| | 1 | RW* | COB-ID | |
| | 2 | RW | Transmission Type | C |
| | 3 | RW | Inhibit Time | C |
| | 5 | RW | Event Time | C |
| 0x1A00 | 0 | RO | Number of Objects mapped to Transmit PDO_1 | |
| | 1 | RO | Specification of Appl. Object 1 | |
| | 2 | RO | Specification of Appl. Object 2 | |
| | 3 | RO | Specification of Appl. Object 3 | |
| 0x1A01 | 0 | RO | Number of Objects mapped to Transmit PDO_2 | |
| | 1 | RO | Specification of Appl. Object 1 | |
| | 2 | RO | Specification of Appl. Object 2 | |
| | 3 | RO | Specification of Appl. Object 3 | |
| | 4 | RO | Specification of Appl. Object 4 | |
| *) Here only the highest bit can be changed in order to temporarily disable/enable the PDO. | | | | |

### 8.5.2 Manufacturer entries

**Table 26** *CAN: overview of object directory, manufacture specific entries from 0x2000 on (part 1 of 2)*

| Manufacturer entries from 0x2000 on | | | | |
|---|---|---|---|---|
| **Index** | **Subindex** | **Access** | **Content** | **EEProm** |
| 0x2000 | 0 | RO | Number of Parameter | |
| | 1 | RW | Frequency 1 | M |
| | 2 | RW | Frequency 2 | M |
| | 3 | RW | Threshold CD1 LED | M |
| | 4 | RW | Threshold CD2 LED | M |
| | 5 | RW | Height of Ant 1 | M |
| | 6 | RW | Height of Ant 2 | M |
| | 7 | RW | Internal Height of Ant 1 | M |
| | 8 | RW | Internal Height of Ant 2 | M |
| 0x2001 | 0 | RO | Number of Parameter | |
| | 1 | W | Start Ant-1 calibration | |
| | | R | Stop Ant-1 calibration | |
| | 2 | W | Start Ant-2 calibration | |
| | | R | Stop Ant-2 calibration | |

**Table 26** *CAN: overview of object directory, manufacture specific entries from 0x2000 on (part 2 of 2)*

| Manufacturer entries from 0x2000 on | | | | |
|---|---|---|---|---|
| **Index** | **Subindex** | **Access** | **Content** | **EEProm** |
| 0x2002 | 0 | RO | Number of Parameter | |
| | 1 | RW | Node Baudrate | C |
| | 2 | RW | Node ID | C |
| | 3 | RW | Node Config | C |

### 8.5.3 Standard device profile

When applying “Restore All“ the node ID is set to 1 and the baud rate to 125 Kbaud.

**Table 27** *CAN: overview object directory, standardized device profile from 0x6000 on*

| Standard device profile from 0x6000 on | | | |
|---|---|---|---|
| **Index** | **Subindex** | **Access** | **Content** |
| 0x6000 | 0 | RO | Number of 8 Bit Digital Inputs |
| | 1 | RO | System status |
| 0x6401 | 0 | RO | Number of 16 Bit analog Inputs |
| | 1 | RO | Analog Input Us1 |
| | 2 | RO | Analog Input Ud1 |
| | 3 | RO | Analog Input Us2 |
| | 4 | RO | Analog Input Ud2 |
| | 5 | RO | X1 [mm] |
| | 6 | RO | X2 [mm] |

### 8.5.4 CANopen Object Dictionary

#### 8.5.4.1 Device Type

**Table 28** *CAN: Device Type*

| Index | Sub Index | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x1000 | 00 | Device Type | Unsigned 32 | RO | No | 0x00050191 | Digital/analog inputs - DS 401 |

#### 8.5.4.2 Error Register

**Table 29** *CAN: Error Register*

| Index | Sub Index | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x1001 | 00 | Error Register | Unsigned 8 | RO | No | 0x00 | Error register |

Displays always 0 (no error)

#### 8.5.4.3 COB-ID SYNC message

**Table 30** *CAN: COB-ID SYNC message*

| Index | Sub Index | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x1005 | 00 | COB-ID SYNC | Unsigned 32 | RO | No | 0x80000080 | Sync Consumer, Sync ID = 0x80 |

#### 8.5.4.4 Device Name

**Table 31** *CAN: Device Name*

| Index | Subindex | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x1008 | 00 | Device Name | Unsigned 8 | RO | NO | 3 | number of sub-indexes |
| | 01 | Name 1 | Vis.-String | RO | NO | „G_73“ | “device name“ |
| | 02 | Name 2 | Vis.-String | RO | NO | „350Z“ | |
| | 03 | Name 3 | Vis.-String | RO | NO | „A “ | |

#### 8.5.4.5 Hardware Version

**Table 32** *CAN: Hardware Version*

| Index | Subindex | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x1009 | 00 | Hardware Ver-sion | Vis.-String | RO | NO | „A2“ | “version of circuit board“ |

#### 8.5.4.6 Software Version

**Table 33** *CAN: Software Version*

| Index | Subindex | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x100A | 00 | Software Ver-sion | Vis.-String | RO | NO | „1.14“ | “firmware version“ |

#### 8.5.4.7 Save Parameter

**Table 34** *CAN: Save Parameter*

| Index | Sub Index | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x1010 | 00 | Save Parame-ter | Unsigned 8 | RO | No | 0x01 | number of sub indexes |
| | 01 | Save All | Unsigned 32 | RW | No | 0x00000001 | Save All is possible |

By writing the signature “save“ in ASCII code (hex-Code: 0x65766173) or “evas“ (hex-Code: 0x73617665) on sub index 1 the current parameters are not quick saved. A succesful save procedure will be confirmed after ca. 400 ms by the TxSDO (1st byte = 0x80). During saving no CAN telegrams can be sent or received.

#### 8.5.4.8 Restore Default Parameter

**Table 35** *CAN: Restore Default Parameter*

| Index | Sub Index | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x1011 | 00 | Restore Parameter | Unsigned 8 | RO | No | 0x04 | number of sub indexes |
| | 01 | Restore All | Unsigned 32 | RW | No | 0x00000001 | Restore All is possible |
| | 02 | Restore Communication | Unsigned 32 | RW | No | 0x00000001 | Restore Communication is possible |
| | 04 | Restore Manufacture | Unsigned 32 | RW | No | 0x00000001 | Restore Manufacture is possible |

By writing the signature load“ in ASCII code (hex code: 0x64616F6C) or “daol“ (hex code: 0x6C6F6164) on sub index 1, 2 respectively 4 the corresponding default parameters are loaded. A reset is recommended.

#### 8.5.4.9 Producer Heartbeat Time

**Table 36** *CAN: Producer Heartbeat Time*

| Index | Sub Index | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x1017 | 00 | Producer Heartbeat Time | Unsigned 16 | RW | No | 1000 | Heartbeat time in ms (ca.) |

When entering 0 as time, this function is deactivated.

#### 8.5.4.10 Identity Object

**Table 37** *CAN: Identity Object*

| Index | Sub Index | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x1018 | 00 | Identity Object | Unsigned 8 | RO | No | 0x03 | number of sub indexes |
| | 01 | Vendor ID | Unsigned 32 | RO | No | 0x00000202 | manufacturer number, determined by CiA |
| | 02 | Product Code | Unsigned 32 | RO | No | 0x00073350 | name of the device |
| | 03 | Revision | Unsigned 32 | RO | No | 0x00000001 | revision of the device |
| | 04 | Serial Number | Unsigned 32 | RO | No | 73..... | 7-digit serial number of the device |

#### 8.5.4.11 Receive PDO Parameter

**Table 38** *CAN: Receive PDO Parameter*

| Index | Subindex | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x1400 | 00 | RxPDO_1 Parameter | Unsigned 8 | RO | NO | 2 | number of sub indexes |
| | 01 | COB-ID | Unsigned 32 | RW | NO | 0x40000200 + Node ID | RPDO valid, ID = 0x200 + Node ID |
| | 02 | Transmission Type | Unsigned 8 | RO | NO | 255 | asynchronous event-driven |

#### 8.5.4.12 Mapping RPDO_1

**Table 39** *CAN: Mapping RPDO_1*

| Index | Subindex | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x1600 | 00 | Number of mapped objects | Unsigned 8 | RO | NO | 2 | number of sub indexes |
| | 01 | 1st mapped object | Unsigned 32 | RO | NO | 0x20000110 | Mapped on Index 0x2000,01 with 16 Bit length (Frequency 1) |
| | 02 | 2nd mapped object | Unsigned 32 | RO | NO | 0x20000210 | Mapped on Index 0x2000,02 with 16 Bit length (Frequency 2) |

#### 8.5.4.13 Transmit PDO_1 Parameter

**Table 40** *CAN: Transmit PDO_1 Parameter*

| Index | Sub Index | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x1800 | 00 | TxPDO_1 Parameter | Unsigned 8 | RO | No | 0x04 | number of sub indexes |
| | 01 | COB ID | Unsigned 32 | RW | No | 0x40000180 + Node-ID | PDO_1 valid, ID = 0x180 + Node-ID |
| | 02 | Transmission Type | Unsigned 8 | RW | No | 255 | Asynchronous event-driven |
| | 03 | Inhibit Time | Unsigned 16 | RW | No | 100 | shortest time period between to transmissions in a multiple from 100 µs |
| | 05 | Event Time | Unsigned 16 | RW | No | 10 | cycle time in ms |

#### 8.5.4.14 Transmit PDO_2 Parameter

**Table 41** *CAN: Transmit PDO_2 Parameter*

| Index | Sub Index | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x1801 | 00 | TxPDO_2 Parameter | Unsigned 8 | RO | No | 0x04 | number of sub indexes |
| | 01 | COB ID | Unsigned 32 | RW | No | 0x40000280 + Node-ID | PDO_2 valid, ID = 0x280 + Node-ID |
| | 02 | Transmission Type | Unsigned 8 | RW | No | 255 | Asynchronous event-driven |
| | 03 | Inhibit Time | Unsigned 16 | RW | No | 100 | shortest time period between to transmissions in a multiple from 100 µs |
| | 05 | Event Time | Unsigned 16 | RW | No | 10 | cycle time in ms |

#### 8.5.4.15 Mapping TxPDO_1

**Table 42** *CAN: Mapping TxPDO_1*

| Index | Sub Index | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x1A00 | 00 | Number of mapped objects | Unsigned 8 | RO | No | 0x03 | number of sub indexes |
| | 01 | 1st mapped object | Unsigned 32 | RO | No | 0x60000108 | mapped on Index 0x6000,01 with 8 Bit length (Status) |
| | 02 | 2nd mapped object | Unsigned 32 | RO | No | 0x64010510 | mapped on Index 0x6401,05 with 16 Bit length (X1) |
| | 03 | 3rd mapped object | Unsigned 32 | RO | No | 0x64010610 | mapped on Index 0x6401,06 with 16 Bit length (X2) |

#### 8.5.4.16 Mapping TxPDO_2

**Table 43** *CAN: Mapping TxPDO_2*

| Index | Sub Index | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x1A01 | 00 | number of mapped objects | Unsigned 8 | RO | No | 0x04 | number of sub indexes |
| | 01 | 1st mapped object | Unsigned 32 | RO | No | 0x64010110 | mapped on Index 0x6401,01 with 16 Bit length (Us1) |
| | 02 | 2nd mapped object | Unsigned 32 | RO | No | 0x64010210 | mapped on Index 0x6401,02 with 16 Bit length (Ud1) |
| | 03 | 3rd mapped object | Unsigned 32 | RO | No | 0x64010310 | mapped on Index 0x6401,03 with 16 Bit length (Us2) |
| | 04 | 4th mapped object | Unsigned 32 | RO | No | 0x64010410 | mapped on Index 0x6401,04 with 16 Bit length (Ud2) |

#### 8.5.4.17 Manufacture Parameter - parameters of the antenna

**Table 44** *CAN: Manufacture Parameter - parameters of the antenna*

| Index | Sub Index | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x2000 | 00 | number of parameter | Unsigned 8 | RO | No | 0x08 | number of sub indexes |
| | 01 | Frequency 1 | Unsigned 16 | RW | Yes | 10000 | Frequency channel 1 in Hz |
| | 02 | Frequency 2 | Unsigned 16 | RW | Yes | 10000 | Frequency channel 2 in Hz |
| | 03 | Threshold CD 1 LED | Unsigned 16 | RW | No | 1000 | threshold for Us1, after exeeding LED CD1 is lit |
| | 04 | Threshold CD 2 LED | Unsigned 16 | RW | No | 1000 | threshold for Us2, after exeeding LED CD2 is lit |
| | 05 | Height of Ant 1 | Unsigned 8 | RW | No | 60 | distance guide wire - casing - bottom antenna 1 in mm |
| | 06 | Height of Ant 2 | Unsigned 8 | RW | No | 60 | distance guide wire - casing - bottom antenna 2 in mm |
| | 07 | Internal Height of Ant1 | Unsigned 8 | RW | No | 35 | distance coil system -> casing-bottom antenna 1 in mm |
| | 08 | Internal Height of Ant2 | Unsigned 8 | RW | No | 35 | distance coil system -> casing-bottom antenna 2 in mm |

After switching the frequencies, the corresponding detect bit ( bit 6 / bit 7) is deleted for 40 ms in the status (see Table 15 on page 30).

### 8.5.4.18 Manufacture parameter - calibration of the antenna

**Table 45** *CAN: Manufacture Parameter - calibration of the antenna*

| Index | Sub Index | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x2001 | 00 | number of parameter | Unsigned 8 | RO | No | 0x02 | number of sub indexes |
| | 01 | Start Ant-1 calibration | Unsigned 32 | W | No | ./. | *) |
| | | Stop Ant-1 calibration | Unsigned 32 | R | No | 0x00000001 | *) |
| | 02 | Start Ant-2 calibration | Unsigned 32 | W | No | ./. | *) |
| | | Stop Ant-2 calibration | Unsigned 32 | R | No | 0x00000001 | *) |

*) By writing the signature “cali“ in ASCII code (hex-Code: 0x696C6163) or “ilac“ (hex-Code: 0x63616C69) on sub index 1 respectively 2 the corresponding calibrations are started and stopped by reading sub index 1 respectively 2. After that the parameters should be saved. Furthermore a reset is recommended.

During the calibration the corresponding bit is set in the system status (TxPDO 1). For the voltages Us1, Ud1 respectively Us2, Ud2 in TxPDO 2 the maximum values for the calibration are set, like they are output in the calibration menu. The average from Udl and Udr is calculated.

The calibration should be proceeded at 10 kHz wire frequency as the frequency compensation is also referred to this frequency.

### 8.5.4.19 Manufacture parameter - node parameter

**Table 46** *CAN: Manufacture parameter - node parameter*

| Index | Sub Index | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x2002 | 00 | Number of Parameter | Unsigned 8 | RO | No | 0x02 | number of sub indexes |
| | 01 | Node Baud-rate | Unsigned 8 | RW | No | 0x02 | 125 Kbaud, *) see Table 47 |
| | 02 | Node ID | Unsigned 8 | RW | No | 0x01 | node address 1 |
| | 03 | Node Config | Unsigned 8 | RW | No | 0x01 | Start in mode “operational“ Highbyte first **), see Table 48 |

*)

**Table 47** *CAN: coding of the node baudrate*

| input/output value | baudrate / kBaud |
|---|---|
| 7 | 20 |
| 6 | 50 |
| 5 | not used |
| 4 (Default) | 125 |
| 3 | 250 |
| 2 | 500 |
| 1 | 800 |
| 0 | 1000 |

**)

**Table 48** *CAN: coding of the node config byte*

| Value | Meaning |
|---|---|
| xxxx.xxx0 | Start in mode „pre-operational“ |
| xxxx.xxx1 | Start in mode „operational“ |
| xxxx.xx0x | Highbyte first |
| xxxx.xx1x | Lowbyte first |

### 8.5.4.20 8 Bit Digital Input (transmitted in TxPDO 1)

**Table 49** *CAN: 8 bit digital input (transmitted in TxPDO 1)*

| Index | Sub Index | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x6000 | 00 | number of 8 bit inputs | Unsigned 8 | RO | No | 0x01 | number of 8 bit inputs |
| | 01 | 8 bit digital input | Unsigned 8 | RO | Yes | ./. | system status / TxPDO_1 |

### 8.5.4.21 16 Bit Analog Inputs (transmitted in TxPDO 1 und TxPDO 2)

**Table 50** *CAN: 16 bit analog inputs (transmitted in TxPDO 1 und TxPDO 2)*

| Index | Sub Index | Name | Format | Attr. | Map | Default | Meaning |
|---|---|---|---|---|---|---|---|
| 0x6401 | 00 | number of 16 bit analog inputs | Unsigned 8 | RO | No | 0x06 | number of 16 bit analog inputs |
| | 01 | SUM_1 | Unsigned 16 | RO | Yes | ./. | Us1 / TxPDO_2 |
| | 02 | DIF_1 | Signed 16 | RO | Yes | ./. | Ud1 / TxPDO_2 |
| | 03 | SUM_2 | Unsigned 16 | RO | Yes | ./. | Us2 / TxPDO_2 |
| | 04 | DIF_2 | Signed 16 | RO | Yes | ./. | Ud2 / TxPDO_2 |
| | 05 | X1 | Signed 16 | RO | Yes | ./. | X1 / TxPDO_1 |
| | 06 | X2 | Signed 16 | RO | Yes | ./. | X2 / TxPDO_1 |

# 9 Profibus Interface (HG G-73351)

The Node-ID has to be selected via the serial monitor described in section 7.2 on page 20. Using the GSD file `73351A0.GSD` (see section 12.4 on page 52 in the appendix) two different configurations can be displayed, see below. The order of the bytes within a 16 bit word can be altered using the Profibus menu, point L (see section 7.3.4 on page 26).

**1. Reading only of 5 input bytes according to the following table:**

**Table 51** *Format of the 5 Profibus Input Bytes*

| Value | Format | Range | Description |
|---|---|---|---|
| Status | unsigned 8 | 0..0xff | Status bits according to Table 52 below |
| X1 | signed 16 | -255.....+255 | -255 [mm].....+255 [mm] |
| X2 | signed 16 | -255.....+255 | -255 [mm].....+255 [mm] |

The meaning of the status bits is determined as follows:

**Table 52** *Profibus: Meaning of the Profibus Status bits*

| Bit number | Valency | Description |
|---|---|---|
| 7 | 0x80 | Us1 has exceeded the set threshold for channel 1 |
| 6 | 0x40 | Us2 has exceeded the set threshold for channel 2 |
| 5 | 0x20 | Not used |
| 4 | 0x10 | Calibration active |
| 3 | 0x08 | DC supervision Ud1 OK |
| 2 | 0x04 | DC supervision Ud2 OK |
| 1 | 0x02 | Not used |
| 0 | 0x01 | The checksum of the EEPROM parameters is wrong |

**2. In addition to item 1 the frequencies of the two wires can be adjusted**

**Table 53** *Profibus: Structure of the Profibus Output Bytes*

| Wire | Format | Range | Description |
|---|---|---|---|
| F1 | Unsigned 16 | 1000....28000 | Wire frequency channel 1 [kHz] |
| F2 | Unsigned 16 | 1000....28000 | Wire frequency channel 2 [kHz] |

If values outside of the defined value range are transmitted they will be ignored. Frequency changes are carried out with the frequency switch time specified in the Technical Data.

# 10 Troubleshooting

The following table contains a list of errors that might occur. For each error, a symptom description is given. In the third column you will find a description of how to locate and possibly correct the error.

If you should not be able to correct an occurring error, please use the table below to locate the source of the error as exactly as possible (nature of malfunction, at which point of time did the error occur, etc.) before contacting us.

**Table 54** *Troubleshooting*

| Error | Possible cause(s) | Diagnosis/correction |
|---|---|---|
| No function. | – Power supply not sufficient. | Is PWR LED lit? |
| No connection can be established. (CAN) | 1. CAN_H and CAN_L inverted.<br>2. Signal ground not connected, potential difference between interpreter and receiver being too high.<br>3. Wrong transmission parameters set.<br>4. No terminator. | 1. Control the connections.<br>2. Connect the signal grounds.<br>3. Choose the right parameter using the monitor program (see section 7.2 on page 20). |
| No connection can be established. (Profibus) | 1. Bus A and Bus B inverted.<br>2. Signal ground not connected, potential difference between interpreter and receiver being too high.<br>3. Wrong transmission parameters set.<br>4. No terminator. | 1. Control the connections.<br>2. Connect the signal grounds.<br>3. Choose the right parameter using the monitor program (see section 7.2 on page 20). |
| No values for distance presented in spite of guide wire. | 1. Wrong frequency is chosen.<br>2. Threshold set too high. | Set the correct frequency and lower the thresholds (see 7.2 on page 20) |
| Distances are displayed inexactly. | 1. No position calibration.<br>2. Reading heights wrong. | Process a position calibration using the monitor program (see section 7.2 on page 20) respectively correct the reading heights. |

# 11 Technical Data

**Table 55** *Technical Data HG G-7335xZB*

| Technical Data HG G-7335xZB | | |
|---|---|---|
| Dimensions | 160 mm x 90 mm x 50 mm | |
| Weight | 400 g | |
| Protection class | IP 64 | |
| Relative humidity at 25$^{0}$ C | 95% (without bedewing) | |
| Operating temperature | 0$^{0}$ C to +50$^{0}$ C | |
| Storage temperature | -20$^{0}$ C to +70$^{0}$ C | |
| Operating voltage | +24 V ±25% | |
| Current consumption | approx. 100 mA | |
| Input sensitivity | 1 $V_{pp}$ for 3/4 full range at rated frequency | |
| Max. input voltage | 5 $V_{pp}$ (sum of all frequencies) | |
| Output | CAN-Bus<br>HG G-73350 | – not electrically insulated<br>– CANopen®, Device Profil DS 401<br>– Node-ID and baud rate can be configured via the serial interface.<br>– A terminating resistor (terminator) is not integrated. |
| | Profibus<br>HG G-73351 | – not electrically insulated<br>– DP-V0 according to IEC61158/ EN50170<br>– node ID and transmission rate can be configured via the serial interface.<br>– A terminating resistor (terminator) is not integrated. |
| | Monitor serial | 38400 baud, 8 data bits, parity even, 1 stop bit, not electrically insulated |
| Update rate | 10 ms | |
| Frequency range | – 3 to 25 kHz (see Figure 14 on page 49)<br>– lateral deviation X is compensated from 1 kHz to 28 kHz (see Figure 15 on page 49) | |
| Frequency switch | approx. 40 ms | |
| Band filter quality | >= 20 | |

# 12 Appendix

## 12.1 Block Diagrams

**Figure 12** *Block diagram HG G-73350 (CAN-Bus)*

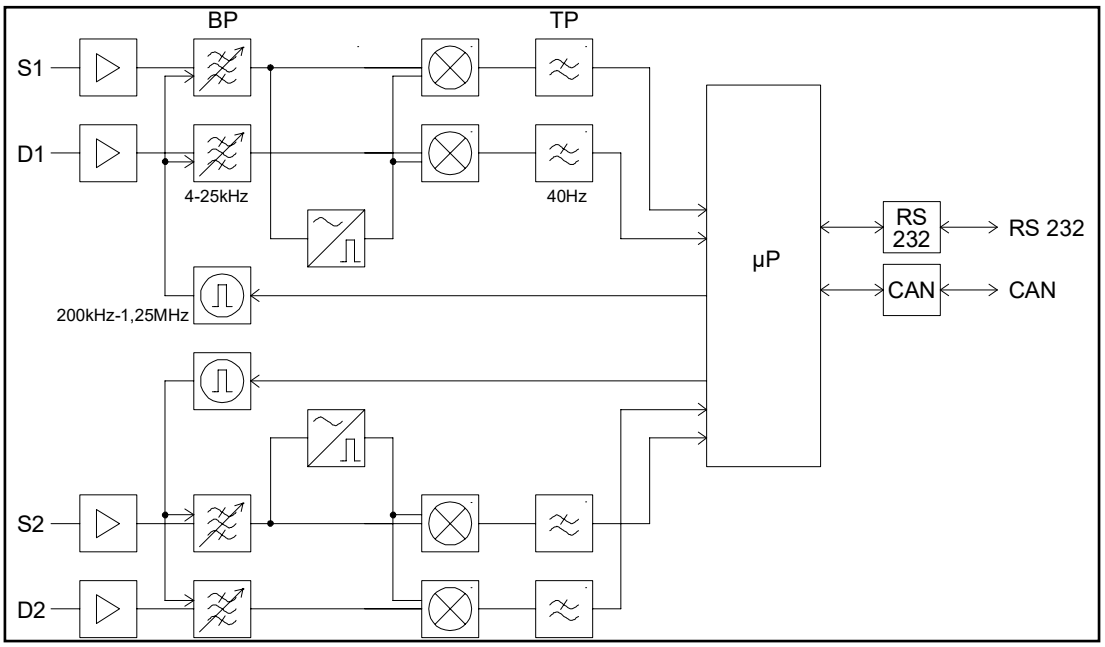
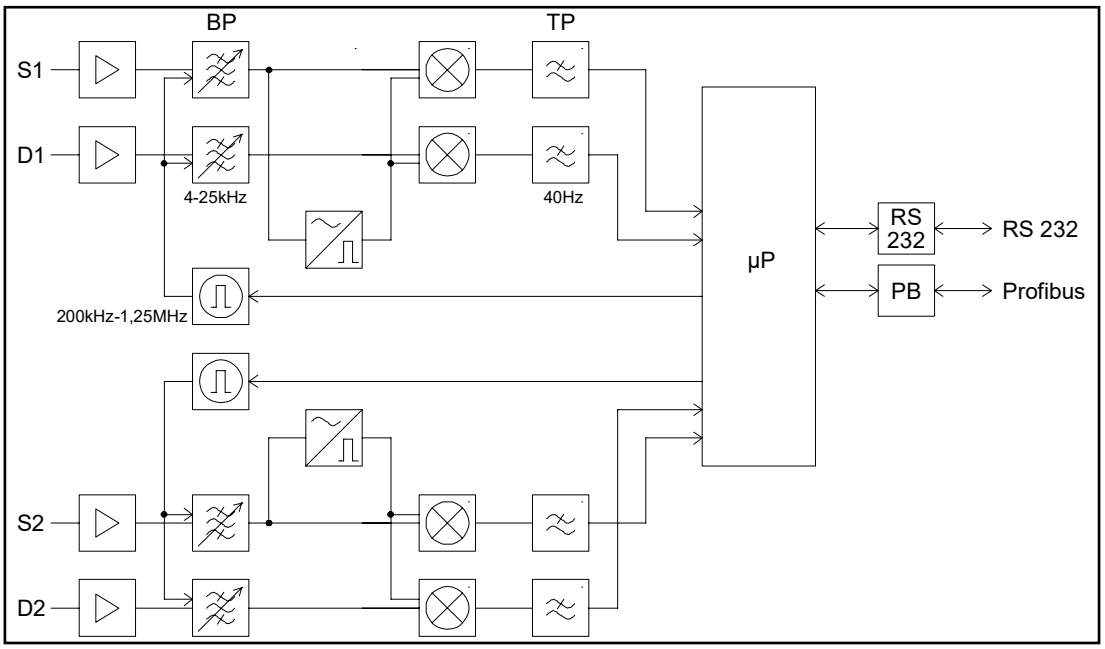



**Figure 13** *Block diagram HG G-73351 (Profibus)*



## 12.2 Diagrams

**Figure 14** *Frequency response interpreter HG G-73350 + antenna HG G-19200Z(Y)C*

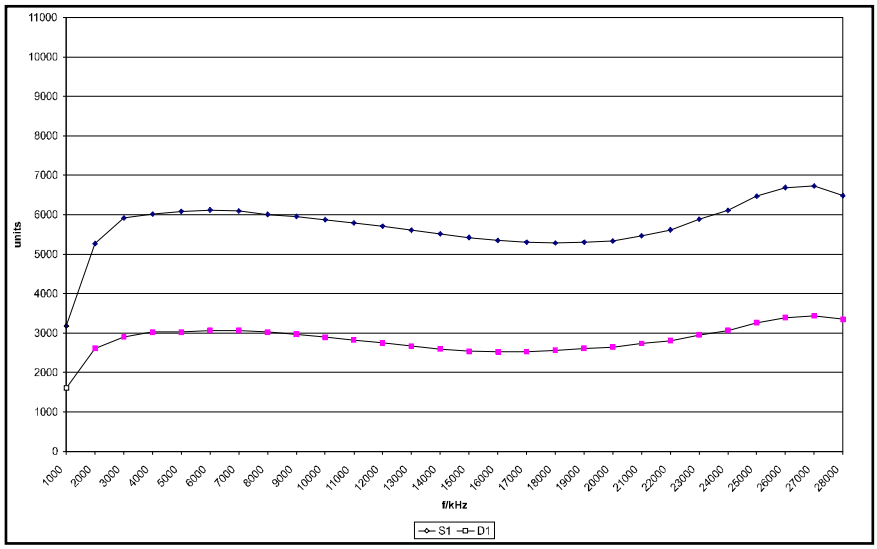



**Figure 15** *Frequency response output compensated)*

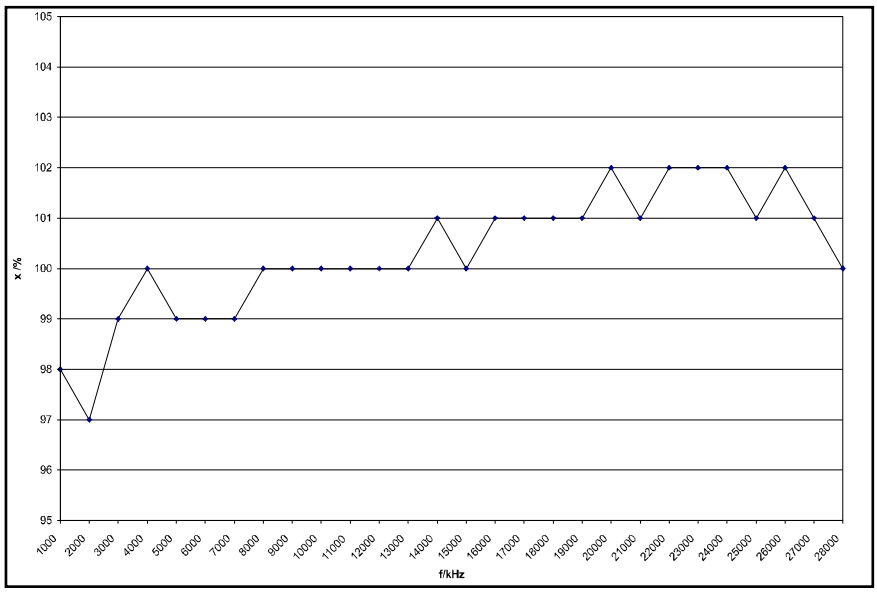


**Figure 16** *Band filter characteristics at 5 kHz (Q=20)*

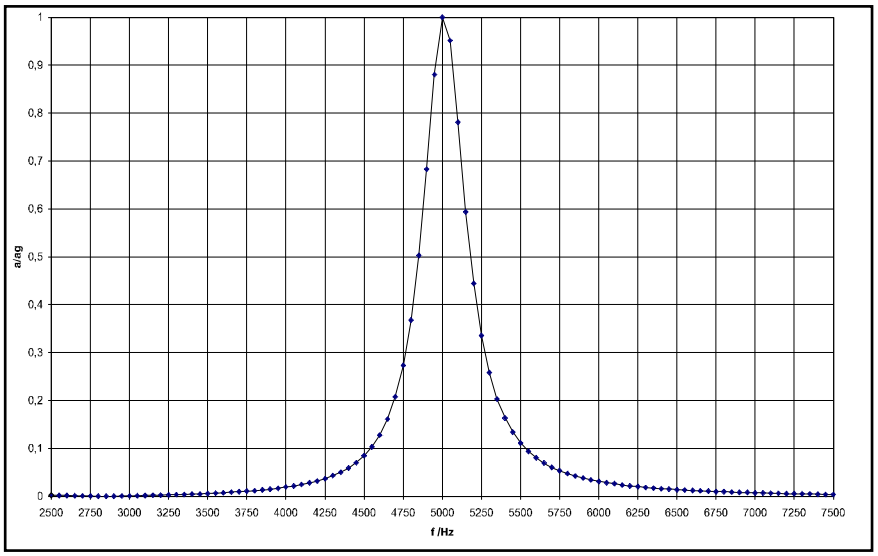



**Figure 17** *Band filter characteristics at 10 kHz (Q=22)*

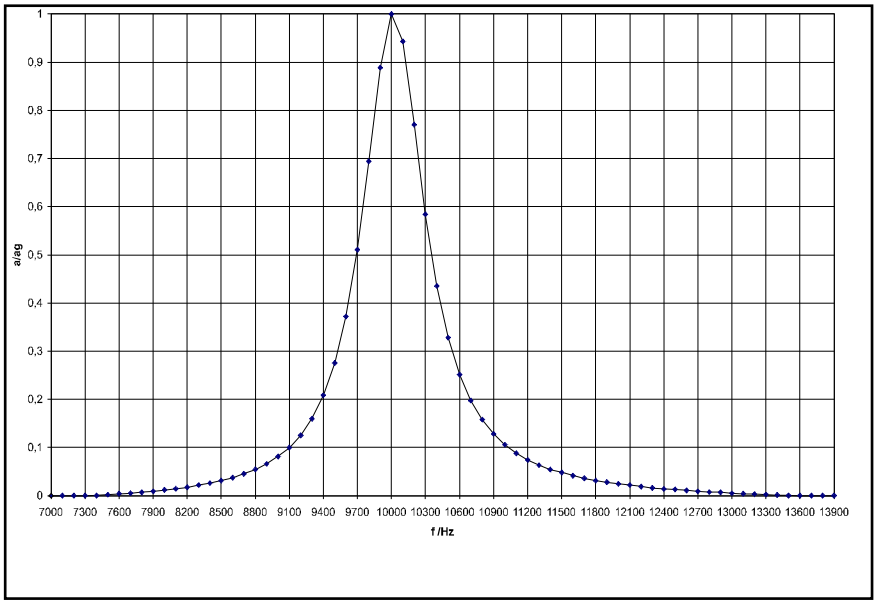


**Figure 18** *Band filter characteristics at 15 kHz (Q=21)*

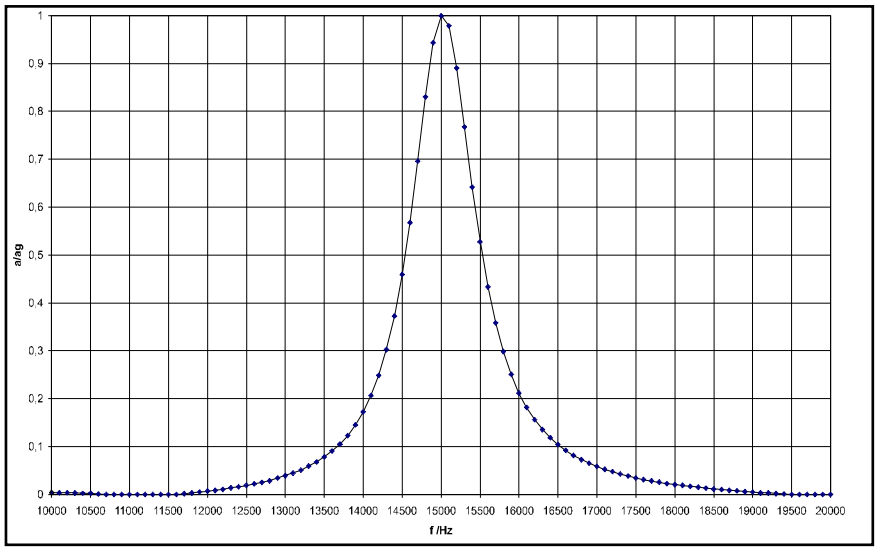



**Figure 19** *Band filter characteristics at 20 kHz (Q=22)*

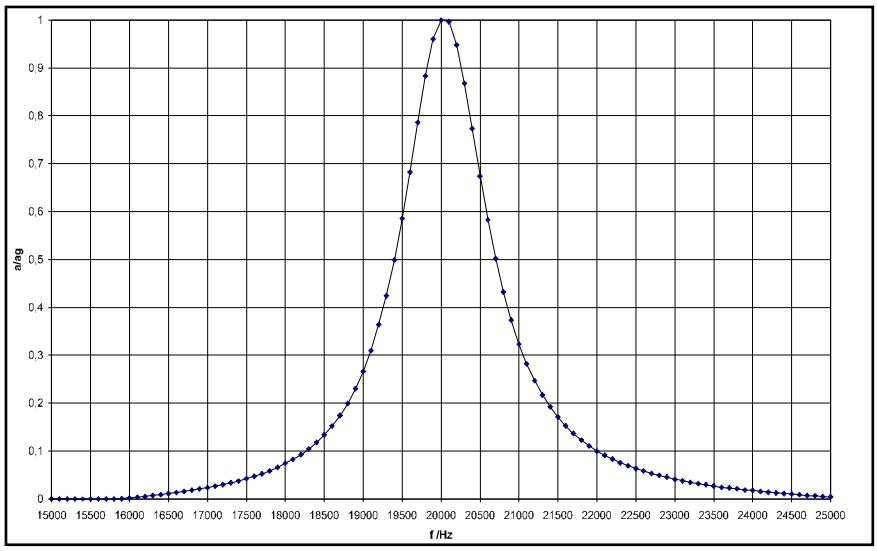
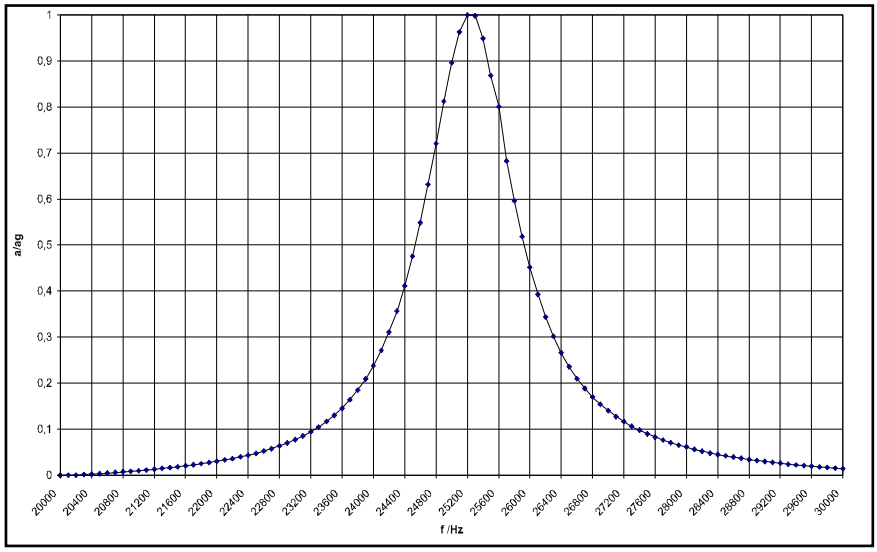



**Figure 20** *Band filter characteristics at 25 kHz (Q=28)*



## 12.3 Electronic Data Sheet (EDS File, HG G-73350)

You can find the latest version of the ESD file for the CAN configuration for download from our homepage.

http://www.goetting-agv.com/components/7335x

## 12.4 GSD File (HG G-73351)

You can find the latest version of the GSD file for the Profibus configuration for download from our homepage. In addition we provide a Bitmap file on that page.

http://www.goetting-agv.com/components/7335x

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# 16 Copyright and Terms of Liability

## 16.1 Copyright



## 16.2 Exclusion of Liability

Any information given is to be understood as system description only, but is not to be taken as guaranteed features. Any values are reference values. The product characteristics are only valid if the systems are used according to the description.

This instruction manual has been drawn up to the best of our knowledge. Installation, setup and operation of the device will be on the customer's own risk. Liability for consequential defects is excluded. We reserve the right for changes encouraging technical improvements. We also reserve the right to change the contents of this manual without having to give notice to any third party.

## 16.3 Trade Marks and Company Names

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