Operating Manual

Transponder Antenna

HG G-98830YB/HG G-98835YB

2-dimensional Position Detection & Identification
Outdoor | Serial | CAN/PROFINET®

Revision 06 | EN
Date: 24.02.2025
Developed by: WM/LF
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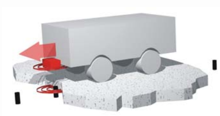


Summary

Basic characteristics of the transponder antenna HG G-98830YB/HG G-98835YB:

• Transponder antenna for Automated Guided Vehicles (AGV) • Flat casing, sealed electronics • Indoor & outdoor, IP 64 • Mounting directly on or flush with metal • Reading distance 20 to 80 mm, nominal reading distance 50 mm • Active area for positioning 200 mm x 200 mm • Max. crossing speed 4 m/s • Voltage supply 18 - 36 V, current consumption max. 1 A when programming transponders, typically 300 mA @ 24 V	• Connectors: 3 x M12 5 pin, A coded: 1x Power (incl. serial RS 232 + PosiPulse) / 2x CAN or 2x PROFINET® • PosiPulse when crossing the middle axis in direction of travel, 24 V 20 mA power source, not isolated • Serial interface either usable as service interface for the configuration (default, also for firmware updates) or data interface (telegram contents can be configured) • Programming of Transponders

Contents

1 About this Operating Manual

1.1 Validity

This operating manual applies to the transponder antenna HG G-98830YB/HG G-98835YB.

The manual comprises information on correct mounting, electrical installation, commissioning, operation, maintenance and troubleshooting.

This operating manual refers to devices with Firmware 98830YB_1.00, 98835YB 1.00 or higher (see Figure 24 on page 55).

1.1.1 Target group

This operating manual is intended for

- developers, manufacturers or operators of systems who want to position moving parts or automatically guide vehicles with the support of the transponder antenna HG G-98830YB/HG G-98835YB,
- any technical staff of a manufacturer planning to integrate the transponder antenna into an Automated Guided Vehicle (AGV) or to use the RFID-based position detection and identification function in another way,
- qualified persons who integrate the transponder antenna into a vehicle or mobile robot, put it into operation for the first time or configure it.

1.1.2 Additional Applicable Documents

This manual does not provide any information concerning the operation of the higher-level system, e.g. an Automated Guided Vehicle (AGV), in which the transponder antenna is integrated.

▶ Do not put the transponder antenna into operation until you have received the manual of the manufacturer or the system operator and have read and understood them.

Supplementary documents are available on request or directly from our website. The QR code on the right takes you to our homepage www.goetting-agv.com. The following links refer to specific product pages.

- Disc transponder HW DEV00095/00098
  https://www.goetting-agv.com/components/00095
- Rod transponder HG G-71325XA
  https://www.goetting-agv.com/components/71325
- Transponder programming device HG G-81840
  https://www.goetting-agv.com/components/81840
- Navigation controller HG G-73650 (optional)
  https://www.goetting-agv.com/components/73650

1.2 Declaration of conformity

This product complies with the relevant European Union harmonization legislation. The relevant harmonized European standards and directives stated in the Declaration of Conformity were used for the compliance assessment.

You can obtain the EU Declaration of Conformity from Götting or by downloading it from the following link.

http://www.goetting-agv.com/components/98830

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 these operating instructions, warnings are given before a sequence of actions which poses a risk of personal injury or damage to property. The measures described must be observed.

Warning notices have the following structure:

⚠ SIGNAL WORD

Kind or source of the hazard

Consequences

▶ Hazard 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 heeding the warning.
- 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.

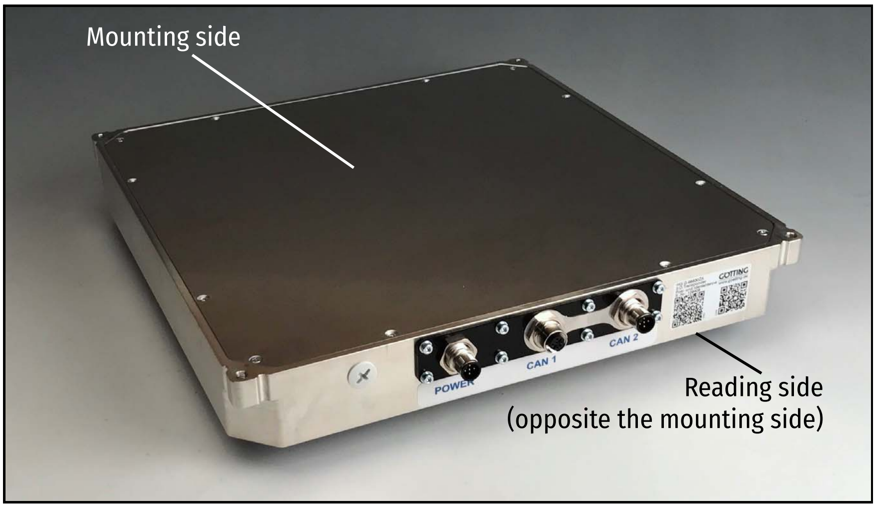
- Program texts and variables are indicated through the use of `a fixed width font`.
- Menu items and parameters are shown in *cursive characters*.
- Whenever the pressing of letter keys is required for program entries, the required [L]etter [K]eys are indicated as such (for most programs by Götting small and capital letters are equally working).

1.4 Definitions

1.4.1 Reading and Mounting Side

- The large metal side is the mounting side for installing the antenna e.g. on a vehicle.
- The sealed side is the reading side, which has to face the transponder. When mounted under an AGV, it has to point towards the ground.

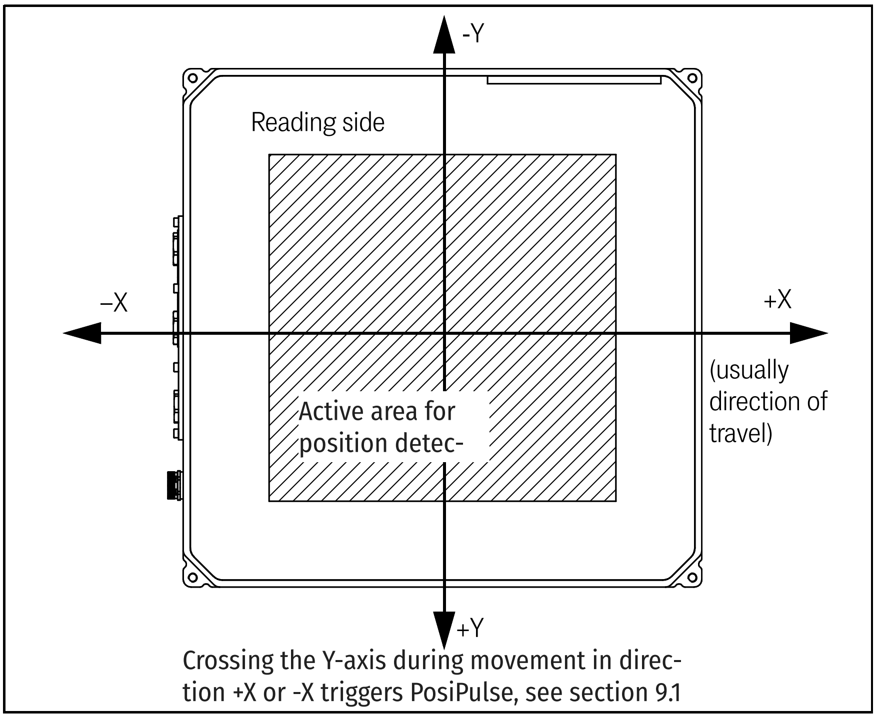
Figure 1 *Reading and mounting side of the transponder antenna*



1.4.2 Coordinate System of the Antenna

The signs and coordinates given in this operating manual are defined as shown in the following figure:

Figure 2 *Output polarity (for sign and coordinate output)*



1.5 Abbreviations

Table 2 *Abbreviations*

Abbreviation	Meaning
AGV	Automated Guided Vehicle
CAN	Controller Area Network
CANopen®	Controller Area Network open
EDS	Electronic Data Sheet
PDO	Process Data Object
PLC	Programmable Logic Controller or PC that performs control functions
RFID	Radio-Frequency Identification
SDO	Service Data Object

2 Safety Instructions

Our product has been designed and manufactured in accordance with the generally recognized rules of technology. Nevertheless, there is a risk of personal injury and damage to property 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.
- ▶ Ensure that the documentation is kept in such a way that it is accessible to all users at all times.
- ▶ Always pass the product on to third-parties together with the relevant documentation.

2.1 Intended Use

The transponder antenna HG G-98830YB/HG G-98835YB is designed to calculate the relative position of matching RFID tags (transponders) and to output it to a higher-level control system. Either the transponders or the antenna must be in a fixed position. Possible applications are:

- Position detection of an Automated Guided Vehicle (AGV), i.e. the antenna moves with the vehicle and the transponders have a fixed position.
- Position detection of moving parts (e.g. on mobile robots or electric monorail conveyors), i.e. the transponders move, the antenna is located at a fixed position.

The field of application of the transponder antenna HG G-98830YB/HG G-98835YB is the position detection of Automated Guided Vehicles (AGV).

The transponder antenna HG G-98830YB/HG G-98835YB may only be used by qualified personnel at the place of installation (e.g. vehicle) where it has been installed and commissioned for the first time by qualified personnel in accordance with these operating instructions. The operating conditions specified in this operating manual must be observed.

The transponder antenna HG G-98830YB/HG G-98835YB does not contain any safety equipment and may therefore only be used in applications where the manufacturer or the system operator has ensured that sufficient measures are implemented for the protection of persons and the safe detection of obstacles.

Leaving the track or the appearance of a person or an obstacle in the danger area must be safely detected at all times and immediate stopping of moving parts (e.g. vehicles) must be ensured in order to exclude damage to property or personal injury.

2.2 Improper Use

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

Götting accepts no liability for damage resulting from improper use. The risks associated with improper use lie solely with the user.

The improper use of the product includes:

- The use of the transponder antenna in vehicles that are not equipped with safety devices for the protection of persons and the safe detection of obstacles.

2.3 User Qualification

The operations described in this document require basic knowledge of mechanics and electrics as well as knowledge of the associated technical terms. To ensure safe use, these activities may therefore only be performed by an appropriate specialist or an instructed person under the direction of a specialist.

A specialist is someone who, on the basis of his technical training, knowledge and experience as well as his knowledge of the relevant regulations, is able to assess the work assigned to him, recognize possible hazards and take suitable safety measures. A specialist must comply with the relevant technical rules.

The personnel designated for the assembly, commissioning and configuration of the transponder antenna

- has received this operating manual.
- is familiar with the operation of the higher-level system (e.g. a vehicle).
- is competent to perform his activities and is sufficiently trained in the installation and configuration of the transponder antenna, if this is part of their activities.
- is – in case the CAN bus interface is to be used – familiar with the commissioning of and telegram exchange via CAN bus connections.
- knows – in the event that the transponder antenna is to be used for position detection of automated vehicles – the dangers emanating from an automated guided vehicle (AGV) and has been sufficiently instructed in the handling of the vehicle and any necessary safety precautions to assess the safe working condition of the system.
- knows – in case other devices or systems with moving parts are used – the risks arising from the application and is sufficiently instructed in the safety precautions that may be necessary to assess the safe working condition of the system.

2.4 General Safety Instructions

- Ensure that the transponder antenna HG G-98830YB/HG G-98835YB is used only in applications,
  - where sufficient measures for personal protection and safe detection of obstacles are implemented,
  - that reliably detect when the vehicle leaves the track or a person or obstacle appear in the danger zone at any time and immediately stop all moving parts (e.g. vehicles).

- Ensure that interference in the ground or on the vehicle does not trigger a signal higher than 100 units in the antenna and that all transponders are read at a sufficiently high distance from this signal. Otherwise, false readings or unrecognized transponders may occur. Possibilities for eliminating interference are described in section 13.2 “Reducing Interferences” on page 84.
- Mount the transponder antenna so firmly on the vehicle that its position cannot change during normal operation. Otherwise, the position data will be incorrectly evaluated by the higher-level system and the vehicle may drive off track.
- Although dirt does not affect the position detection itself, the transponder antenna should be protected from dirt and moisture (e.g. splash water from the wheels of the vehicle) and cleaned regularly, otherwise wear and tear on the antenna will increase.

2.5 Obligations of the Operator

When using the transponder antenna, the operator must ensure that

- all persons within the area 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 this operating manual are observed,
- the transponder antenna is in a technically perfect condition.

The operator must not modify or alter the transponder antenna without authorization. Otherwise, the operating permit will become invalid.

3 Scope of Delivery

The scope of supply includes:

- one transponder antenna HG G-98830YB/HG G-98835YB
- protective caps for the M12 connectors
- an operation manual

3.1 Variants of the Transponder Antenna

The transponder antenna is available in the following two variants, which differ in the bus interface. Both variants are described in this document.

Table 3 *Variant Overview*

Order No. Transponder Antenna	Bus Interface
HG G-98830YB	CAN/CANopen®
HG G-98835YB	PROFINET®

3.2 Required Accessories

The transponder antenna alone is not sufficient for position detection of vehicles with transponders.

To operate a driverless transport system you also need:

- a connection cable for connecting the antenna to the vehicle electronics,
- several transponders in the ground.

i The connection cables can be assembled by the customer (see section 7.2 “Preparation of Connection Cables” on page 25) or ordered from Götting (see below).

▶ Refer to Table 4 for the order numbers of the required accessories.

Table 4 *Required accessories*

Order No.	Description
HW CAB00001	For connector POWER: Connection cable PUR, 5 m with M12 angular coupling, 5-pin, A-coded
HW CAB00064	For connector CAN 2: Connection cable CAN bus, 10 m, with shielding, one end M12 socket 5-pin straight, A-coded (can also be used for connector POWER)
HW CON00055	For connector CAN 1: CAN terminating resistor (terminator), M12 plug 5-pin, A-coded
HW DEV00095	Disc transponder Usually mounting on the roadway 
HW DEV00098	Disc transponder pre-programmed Usually mounting on the roadway 
HG G-71325XA	Rod transponder Usually mounting in the ground 

3.3 Optional Accessories

▶ Refer to Table 5 for the order numbers of the optional accessories.

Table 5 *Optional accessories*

Order No.	Description
HG G-73650ZD	Navigation controller for calculating the courses of the vehicle
HG G-81840ZA	Transponder programming device for reading and programming of transponder codes The transponders can also be programmed via the antenna, but this is more complicated when installed, as it usually requires driving the vehicle over the transponder to be programmed.

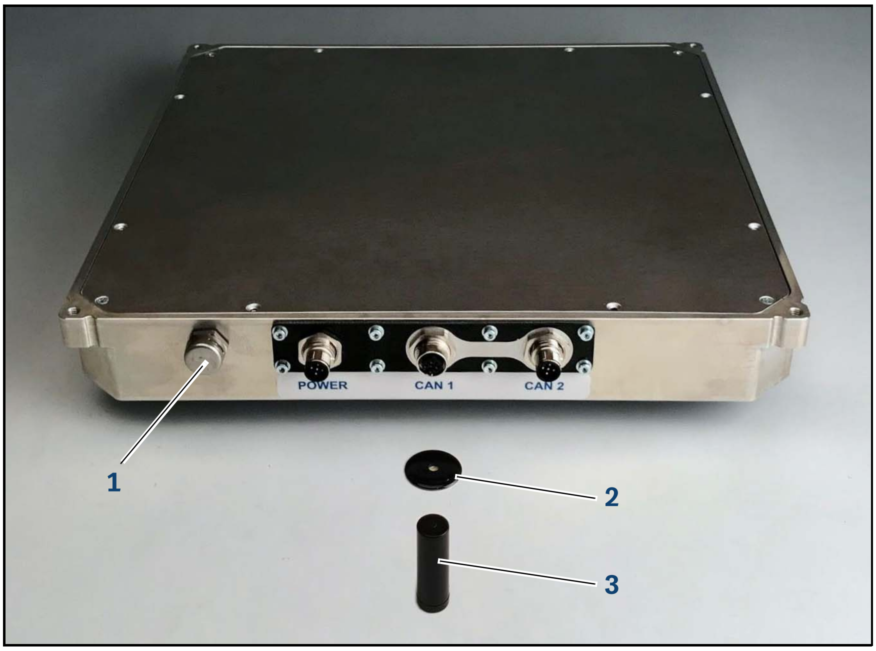
4 Device Overview

4.1 System Components

An Automated Guided Vehicle (AGV) requires at least one antenna, connection cables to the vehicle electronics and transponders in the ground. Optionally, you can use a transponder programmer.

If the vehicle manufacturer or the plant operator does not yet have a controller for calculating the paths of the vehicle, we recommend the navigation controller from Götting.

Figure 3 *System components (excerpt)*



1 Transponder antenna HG G-98830YB/HG G-98835YB

Transponder for mounting in or on the roadway:

2 Disc transponder (usually on the track)

3 Rod transponder (usually in the ground)

4.2 Components in the Ground

4.2.1 Transponders

Transponders with trovan® coding are used as reference marks for the track guidance (see 3.2 “Required Accessories” on page 15). Further documents can be obtained from our Internet server (see 1.1.2 “Additional Applicable Documents” on page 7).

4.2.2 Structure of the Transponder Code

The antenna HG G-98830YB/HG G-98835YB evaluates only the data block 2 with its 20 useful bits.

The data protection is carried out for the transponders via row (for 3 bits each) and column parities. The transmission time for a complete code telegram is 8 ms.

4.3 Transponder Antenna

Figure 4 *Transponder antenna HG G-98830YB/HG G-98835YB*

1 Housing ventilation

2 Connection POWER

3 Connection CAN 1/PROFINET 1

4 Connection CAN 2/PROFINET 2

The antenna systems including preamplifier and evaluator are built into one housing. All cable connections are located on one side of the housing. The electronics in the housing are sealed.

▶ For dimensions, see Figure 40 on page 90.

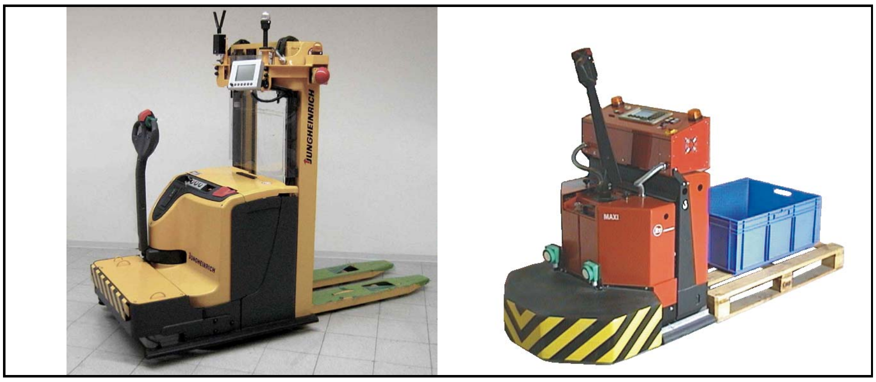
The antenna has three M12 connections with 5 pins each. The pin assignments can be found in section 7.2 “Preparation of Connection Cables” on page 25.

5 Operating Principle

The transponder antenna detects the position of moving parts by means of passive transponders. Downstream navigation systems (e.g. vehicle PLC, Götting navigation controller HG G-73650ZA), which process the data detected by the antennas, can be used to control automated guided vehicles (AGVs) contact-free.

All important settings, calibrations and updates can be made via serial interface or CANopen®.

Figure 5 *Examples of driverless vehicles with transponders*



In position detection with transponders, a transponder antenna detects a transponder at the nominal reading distance and determines its position in the antenna field. Typically, the transponders are mounted at fixed positions on the ground and the antenna moves above them, e.g., by being attached to a vehicle moving over a course.

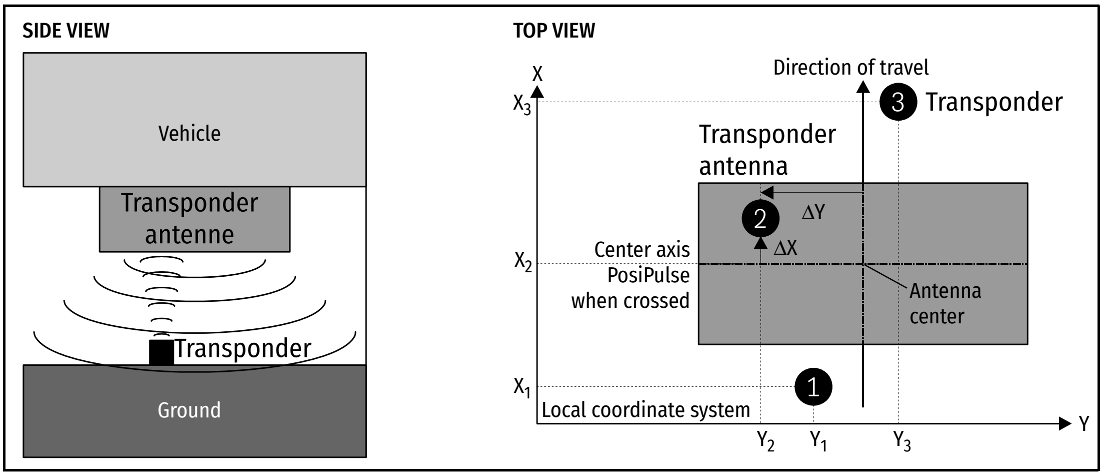
Alternatively, the antenna may be mounted at a fixed position and the plant part with transponder moves relative to it, e.g., an arm of a robot or an electric monorail.

In the following, we refer to the application on automated guided vehicles (AGVs) with transponders in or on the ground and the antenna installed on the vehicle.

5.1 Position Detection with Transponders

In position detection with transponders, the antenna permanently irradiates the area under its reading side with its transmission frequency. The transponders are passive and do not require an energy supply of their own. As soon as the antenna passes over a transponder, it is inductively supplied with energy via the antenna's energy field. It automatically wakes up and uses the received energy to send back its code at half the transmission frequency of the antenna. Thus, only pairings of antennas and transponders whose transmit and receive frequencies match are possible. Furthermore, there are other systems for transmitting and decoding the code which are not described in this operating manual.

Figure 6 *Sketch: Position detection with transponders*

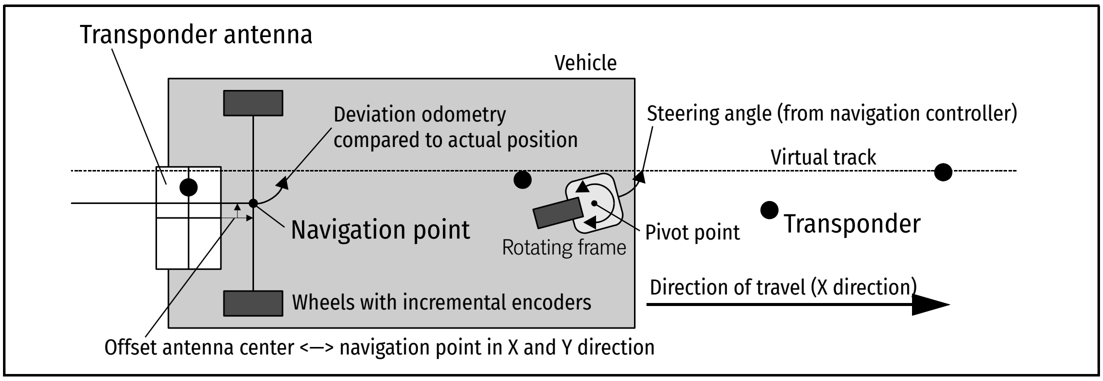


As soon as a transponder begins to transmit within the antenna field, the antenna reads the individual transponder code and interpolates the position of the transponder's electromagnetic field within the antenna field. It passes this information on to the higher-level control system via its interfaces. The vehicle thus knows where a transponder is located underneath the antenna and what code it has. In addition, the antenna emits the so-called positioning pulse (PosiPulse) when the transponder crosses the center of the antenna in the X direction (usually the direction of travel). With this positioning pulse, the time of crossing the reference axis can be transmitted by telegrams without any time delay.

5.2 Track Guidance with Transponders

Automated guided vehicles (AGVs) follow a predefined course. For this purpose, the vehicles are usually equipped with sensors for position estimation by means of distance measurement, a so-called odometry. Incremental encoders count the revolutions of the wheels. From this, a downstream navigation system uses the circumference of the wheels and the steering angle to calculate the distance traveled and the orientation of the vehicle. Odometry has the advantage that it is available without interruption. However, the position calculated with odometry deteriorates – e.g. due to slippage – the further the vehicle travels.

Figure 7 *Sketch: Track guidance with odometry and transponders*



This is where the transponder system comes into play. The transponders in the ground are located at highly accurate positions and are used to determine the actual position of the vehicle at specific points. The downstream navigation system or the navigation controller (neither of which is part of the transponder antenna) resets its estimated position at these points to the precisely determined value.

The distances between the transponders can therefore be at most so large that it is ensured that the vehicle with the odometry does not deviate so far from the track that the transponder antenna no longer hits the next transponder. The closer together the transponders are, the higher the accuracy of the tracking. However, for complex driving maneuvers many transponders are needed in some sections. On the other hand, it must be ensured that the transponder antenna never receives more than one transponder signal at a time.

i

When two transponder antennas are used on a vehicle, omnidirectional vehicles in particular can localize themselves and also clearly determine their orientation.

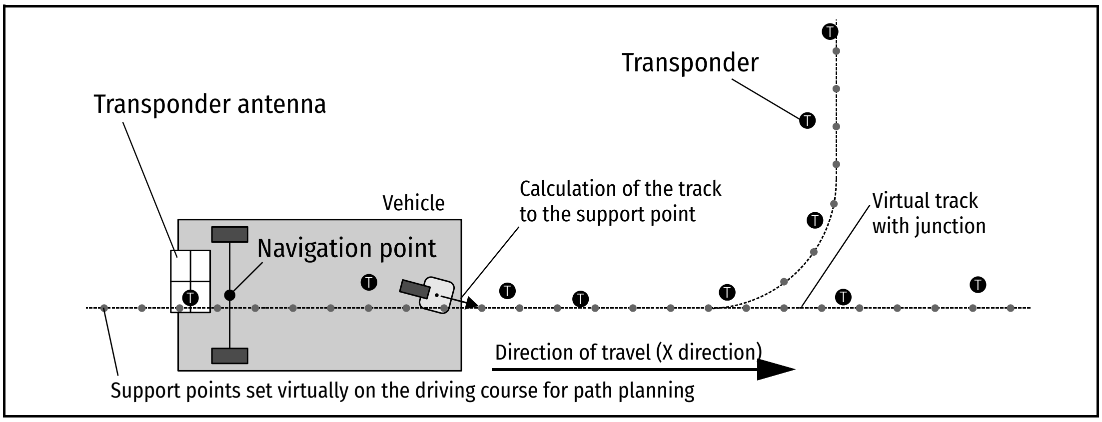
5.3 Position Detection with a Navigation Controller

A downstream navigation system such as the Götting navigation controller calculates the position of the vehicle within the facility from the following data:

- The known position of the antenna on the vehicle (usually with offset to the navigation point).
- The measured relative position of the transponder under the antenna.
- The known position of the transponder in the local coordinate system (defined by the transponder list).

Once several transponders have been read in succession, the controller can also determine the orientation of the vehicle.

Figure 8 *Sketch: Track guidance / free navigation with transponders*



For path planning, a driving course consisting of segments is stored in the navigation controller. This course is subdivided into virtual support points, which form the virtual track. The navigation controller can thus calculate a sequence of segments for each destination that the vehicle must travel. It then guides the vehicle from support point to support point. To do this, it interpolates the route over several support points, specifies the driving speed and calculates the required steering angles in curves. Whenever it can determine the deviation between the odometrically estimated and the actual position via the localization of a transponder, it also calculates the correction path that brings the navigation point back onto the virtual track.

i Götting has developed the navigation controller HG G-73650, which can process the data of certain common incremental encoder types. It is also able to use different Götting positioning systems to adjust the actual position.

The navigation controller HG G-73650 can use, for example, the transponder antenna described here, the laser scanner, guide wire sensors, magnetic sensors and also GPS signals for position detection. It also manages courses and converts the positions of the sensors mounted on the vehicle into the coordinate system of the facility. Based on this information and taking into account the technical capabilities of the vehicle (possible curve radii, wheel diameters, maximum speed, etc.), it calculates routes and can thus tell the vehicle computer in which direction and at what speed the vehicle should move.

Information on the navigation controller can be found at:

https://www.goetting-agv.com/components/73650

6 Storage

NOTICE

Danger due to improper storage

The device can be damaged

▶ Observe the storage conditions.

The storage temperature is -20 °C to +60 °C

▶ Store the device in closed rooms only.
▶ Make sure that the storage room is sufficiently ventilated and dry.
▶ Protect the device from damage caused by dirt, dust or moisture.

7 Mounting

NOTICE

Malfunction or detuning of the antenna

If you do not comply with the operating conditions, the position detection may be faulty or the antenna may fail completely.

- ▶ Always comply with the operating conditions specified in chapter 7.3 “Mounting the Transponder Antenna” on page 27, in particular regarding metal-free areas and the routing of live cables around the antenna.

We recommend the following procedure for mounting the transponder antenna:

- ▶ First prepare the connection cables (see 7.2 “Preparation of Connection Cables” on page 25).
- ▶ Lay the connection cables in the vehicle.
- ▶ Then mount the antenna at the desired position (see 7.3 “Mounting the Transponder Antenna” on page 27).
- ▶ Close unused connectors with the supplied M12 closing caps.

Even if you only use the bus interface, we recommend to lead out the POWER connector. This allows you to connect a PC for configurations via the control box without having to connect the serial cable to the connector directly on the antenna under the vehicle.

Depending on whether you want the antenna to communicate only via CAN bus or only via the serial interface, some of the connectors may remain permanently unused.

7.1 Mounting the Transponders

7.1.1 Operating Conditions for Transponders

Transponders must not be permanently mounted in standing water. The plastic can absorb water over a longer period of time and weaken the transponder signal.

Reinforcements laid tightly under the road surface can interfere not only with the transponders but also with the antennas and thus falsify the position detection. The influence on positioning accuracy and range depends on the size and distance of metal parts.

- ▶ Observe the minimum distances specified in the associated data sheets (see 1.1.2 “Additional Applicable Documents” on page 7).

- ▶ A minimum distance of 500 mm is required between two transponders.
- ▶ Mount the transponders as horizontally (HW DEV00095/HW DEV00098) or vertically (HG G-71325) as possible.

7.2 Preparation of Connection Cables

i

Connection cables are not part of the scope of delivery. Suitable cable types are available from Götting (see 3.2 “Required Accessories” on page 15). Compatible cables are also available from many manufacturers (e.g. Binder 79-3444-32-05 M12 line 2 m PUR 5 x 025). The standard length is 2 m. Cables must be used that are suitable in terms of impedance and have a shield.

7.2.1 All Variants: Connecting POWER

The POWER connection contains the voltage supply, the serial interface and the positioning pulse. The output for the positioning pulse is supplied via +Ub (24 V) and is limited to 20 mA.

If you want to use the serial interface:

- ▶ Please refer to chapter 10 on page 53.

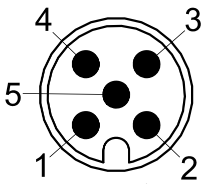
NOTICE

Damage to the transponder antenna

If voltage is applied to pin 3 or 4, the RS232 interface may be damaged.

- ▶ Never connect voltage to pin 3 or 4.

Table 6 *Pin allocation POWER*

POWER	Pin	Signal	Comment
 M12, 5-Pin, A coded, male	1	+Ub (24 V)	Voltage supply
	2	Posi	Positioning pulse limited to 20 mA see 9.1 “Alle Variants: PosiPulse” on page 38
	3	TxD	RS232 data output
	4	RxD	RS232 data input
	5	GND	Ground

7.2.2 Variant HG G-98830: Connecting the CAN bus

The CAN bus is connected to the antenna via two connectors. These connections can be used for voltage supply. They are labeled CAN1 and CAN2 and have the following pin allocations:

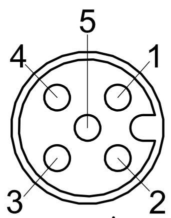
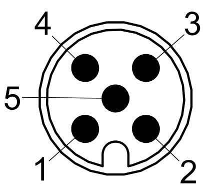
NOTICE

Damage to CAN bus devices

If voltage is applied to pin 4 or 5, other devices connected to the CAN bus may be damaged.

- Never connect voltage to pin 4 or 5.

Table 7 *Pin allocations CAN1 and CAN2*

CAN1	CAN2	Pin	Signal
 M12, 5 pin, A coded, female	 M12, 5 pin, A coded, male	1	Not connected
		2	+Ub (24 V)
		3	Ground
		4	CAN_H
		5	CAN_L

The connections via the inputs CAN1/CAN2 are connected in parallel, i.e. there is no input or output.

If the antenna is connected at the end of the bus:

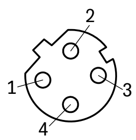
- Mount a CAN terminator.

> **i** These terminators can be obtained from various manufacturers and are available in versions for many sockets and connectors. A terminator for the CAN1 socket is also offered by Götting (see 3.2 “Required Accessories” on page 15).

7.2.3 Variant HG G-98835: Connecting PROFINET®

PROFINET® is connected to the localization sensor via the two connectors Bus 1 and Bus 2. Bus 1 and Bus 2 are connected internally via a switch, they therefore have an identical pin assignment.

Table 8 *PROFINET®: Pin assignments Bus 1 & Bus 2*

Bus 1 & Bus 2	Pin	Signal
 M12, 4-Pin, D coded, female	1	TX+
	2	RX+
	3	TX-
	4	RX-

7.3 Mounting the Transponder Antenna

7.3.1 Operating Conditions of the Antenna

The transponder antenna HG G-98830YB/HG G-98835YB is approved for indoor and outdoor use. It may be used in a temperature range from 0 to +50° C. The relative humidity at 25° C may be max. 95 % (without condensation).

i For extended operating temperature ranges and outdoor use, Götting offers other antenna types with integrated heating. Please contact the sales department for details.

The transponder antenna must be mounted firmly on the vehicle so that its position cannot change during normal operation. Otherwise, the position data will be incorrectly evaluated by the higher-level system and the vehicle may e.g. drive off-track.

- ▶ Use tightening torques that make sure that the antenna is mounted firmly but that are not so high that the mounting material is damaged.

No interference signals from clocked motors etc. may be present in the frequency range 64 ±4 kHz. This also includes interference frequencies that lie on the metal body of the vehicle.

- ▶ Eliminate any interfering signals that may be present.

The transponder antenna must be mounted on the vehicle in such a way that the housing ventilation is not obstructed.

- ▶ Make sure that the air can circulate unhindered through the housing ventilation.

7.3.2 Minimum Distance Between Antenna and Transponder

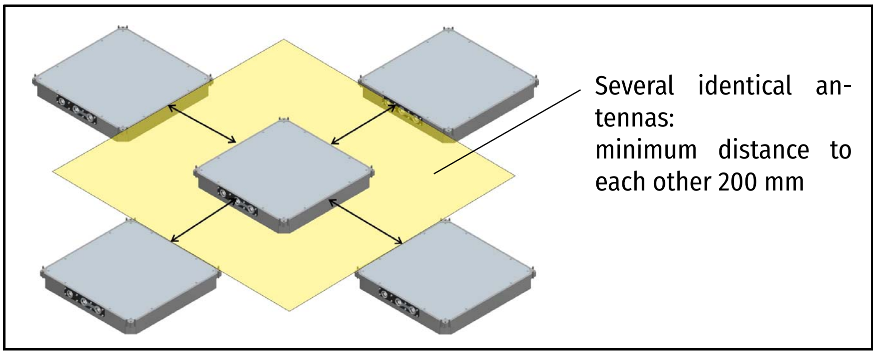
The nominal reading distance between transponder antenna and transponder is 50 mm.

There must be no metal between the antenna and the transponder.

i Non-conductive and non-shielding dirt on the road as well as water, fog, snow and ice have no influence on the accuracy of the position detection.

7.3.3 Minimum Distance Between Identical Transponder Antennas

Figure 9 *Minimum distance between identical transponder antennas*



Two or more transponder antennas operating at the frequencies 128/64 kHz must maintain a minimum distance from each other in order not to interfere with each other. The minimum distance between two HG G-98830YB/HG G-98835YB transponder antennas is 200 mm.

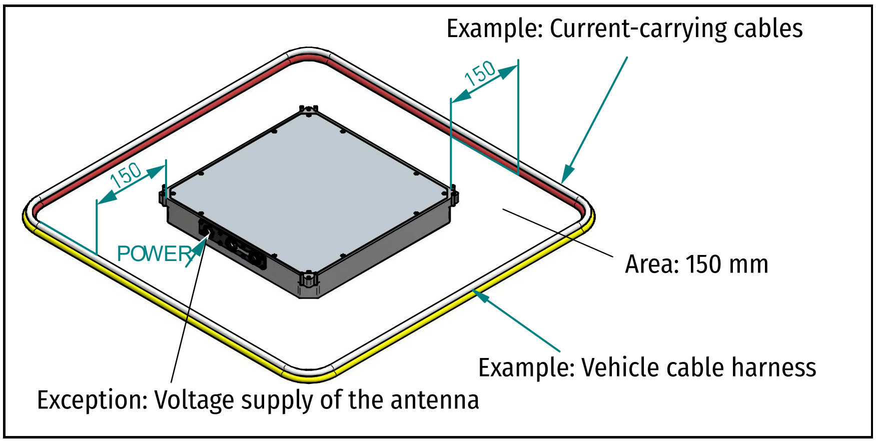
> **i** As a matter of principle, larger transponder antennas must maintain a greater distance. For safety reasons, smaller transponder antennas must nevertheless maintain a minimum distance of 200 mm.

If you suspect that magnetic fields are transmitted via the chassis construction:

▶ If in doubt, carry out tests before assembly.

7.3.4 Minimum Distance to Current-Carrying Wires Around the Transponder Antenna and Metal-Free Areas

Figure 10 *Minimum distance to current-carrying wires around the transponder antenna*

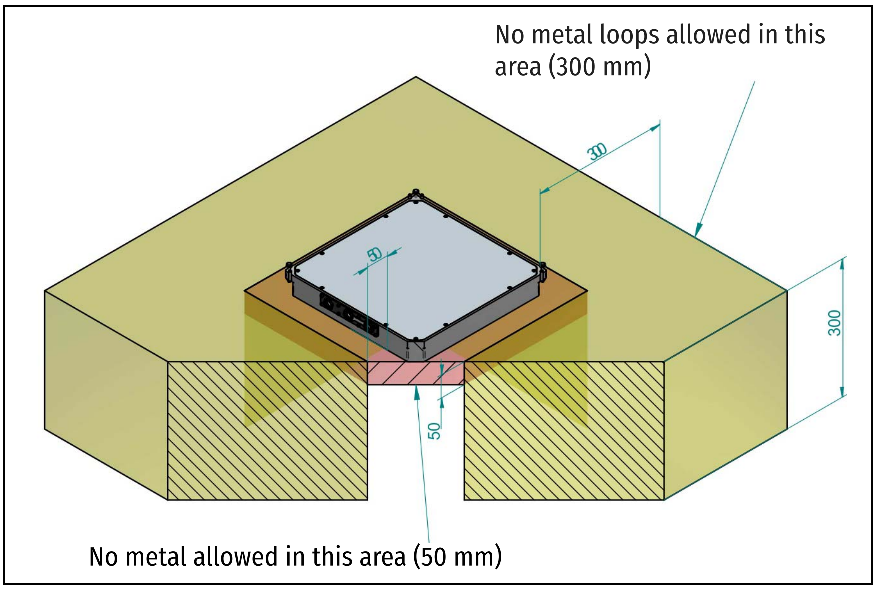


Except for the connection cable of the transponder antenna, current-carrying cables must be laid at least 150 mm away from the antenna, as these can interfere with the antenna depending on the power and frequency. It is also important here that there are no interference effects that exceed 100 units.

The following applies to the reading side of the antenna with the plastic surface:

- no closed electrically conductive loops within 300 mm (in or on the floor)
- no single metal parts or metal surfaces closer than 50 mm

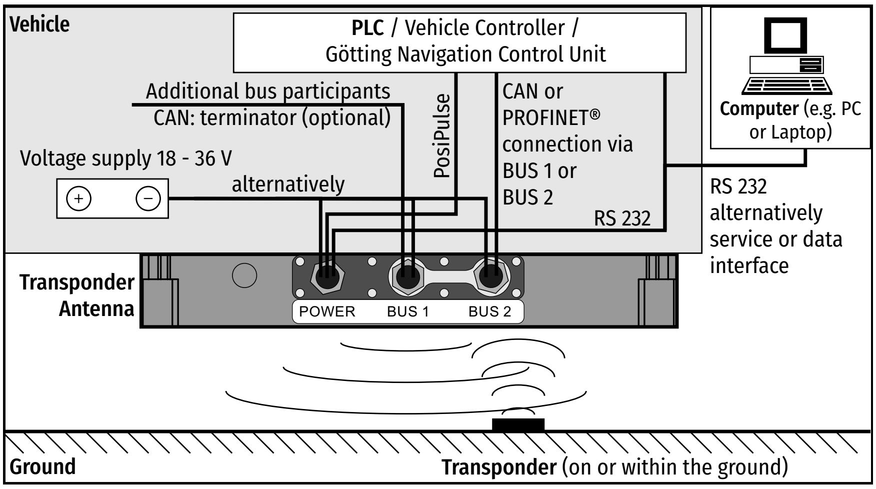
Figure 11 *Metal-free areas around the transponder antenna*



7.3.5 Connection Example

The transponder antenna is shielded on 5 sides. This means that the antenna can be mounted directly on or flush with the metal (see section 7.3.6 on page 30). Figure 12 shows a connection example.

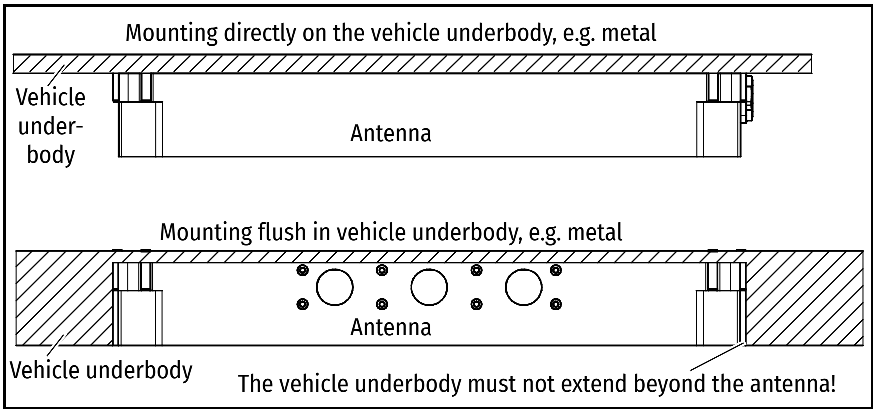
Figure 12 *Connection example*



7.3.6 Mounting the Antenna on the Vehicle

You can install the transponder antenna with its shielded sides on a metal surface or flush with the metal. On the reading side of the antenna you have to observe the free spaces mentioned in chapter 7.3.4 “Minimum Distance to Current-Carrying Wires Around the Transponder Antenna and Metal-Free Areas” on page 28.

Figure 13 *Mounting on or in metal*



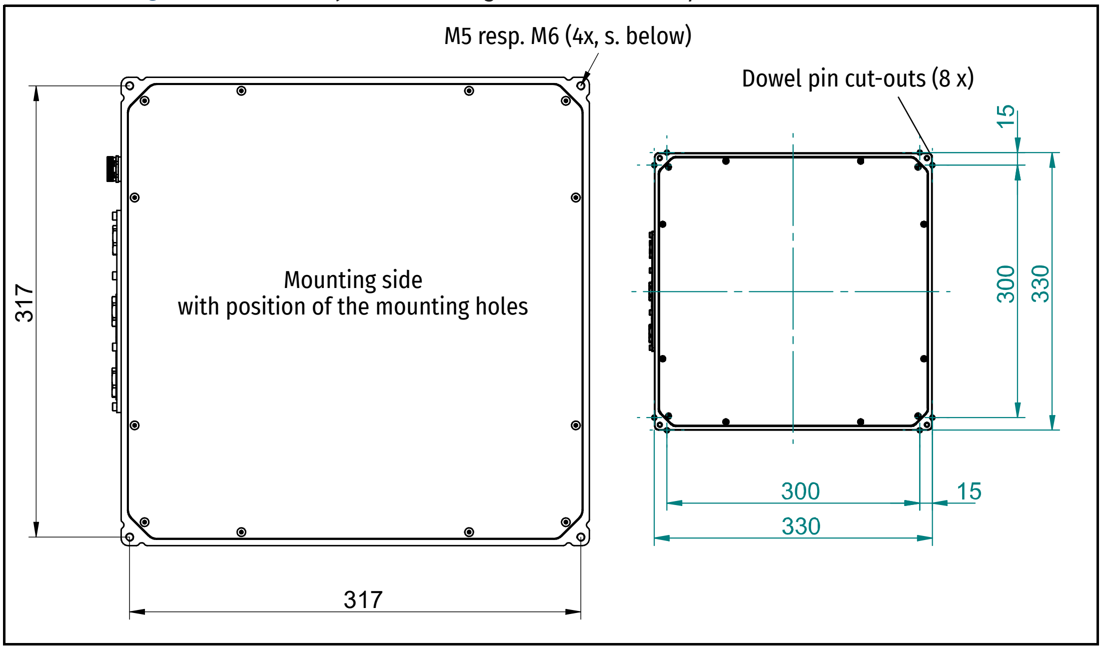
The transponder antenna has four holes with M6 thread. The position of the mounting holes is shown in Figure 14. The antenna also has openings for dowel pins on the vehicle, which can optionally be used to facilitate positioning during installation.

If you want to use dowel pins:

- ▶ Provide at least four dowel pins on diagonally opposite sides for accurate fixation.

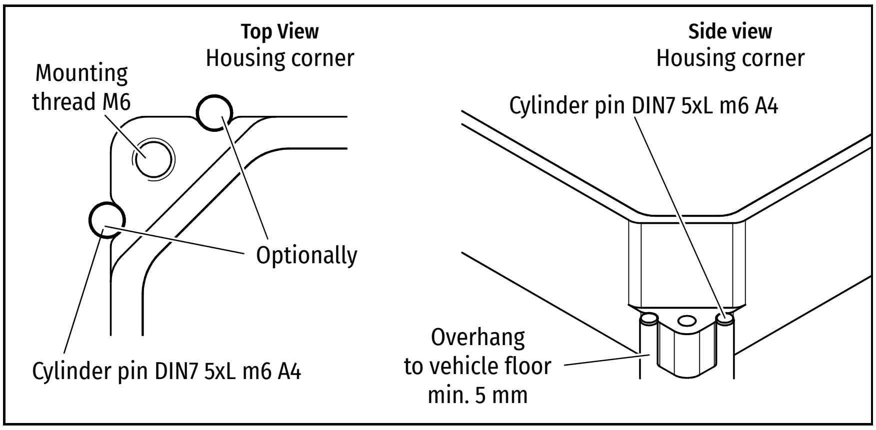
i If you use dowel pins, you can replace a defective antenna and continue to operate the new antenna with the configuration of the defective antenna, as identical mounting on the vehicle is ensured.

Figure 14 *Position of the mounting holes and dowel pin cut-outs*



If dowel pins are to be provided on the vehicle, the following specifications apply to them:

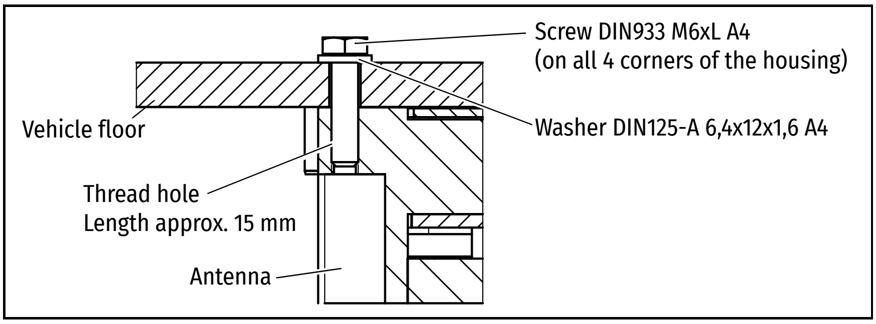
Figure 15 *Specifications for dowel pins on the vehicle floor*



The four prepared mounting holes have an M6 thread. For mounting, you can either use these threads or alternatively fasteners in the vehicle floor, depending on the vehicle manufacturer's specifications. Two consecutive threads cannot be used technically, so there are the following alternatives for mounting the transponder antenna:

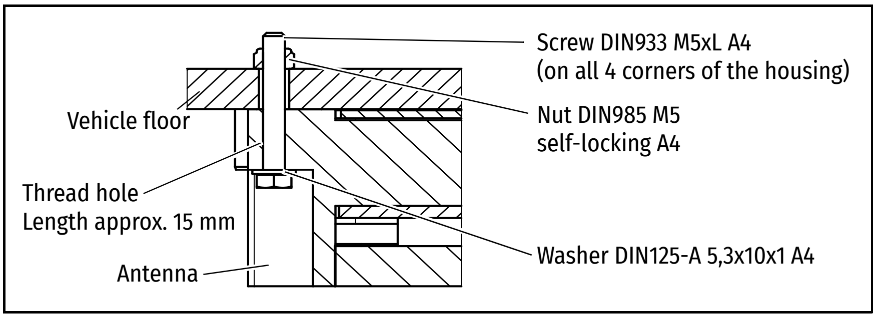
4x M6-Screw: Four holes are provided in the vehicle floor or a mounting plate through which M6 screws are screwed into the threads of the antenna holes from the vehicle.

Figure 16 *Mounting with M6 screws*



4x M5 Screw: The M5 screws are fed through the thread of the antenna hole and then screwed into a thread in the vehicle floor or secured with a nut.

Figure 17 *Mounting with M5-Screws*



7.3.7 Antenna Switch-On

After applying the operating voltage, the antenna software first waits 10 seconds. During this time, you can start a firmware update (see 10.2.15 “(U)pdate Firmware” on page 78).

After this time, the actual antenna program starts. If you have configured the Auto-Tune function (see Figure 28 on page 66), an automatic adjustment of the transmitting coil is now performed. This process takes another 16 seconds.

8 Commissioning

WARNING

Danger due to lack of safety measures

The transponder antenna HG G-98830YB/HG G-98835YB does not contain any safety devices.

- ▶ Only use this antenna in applications where sufficient measures for personal protection and safe detection of obstacles have been implemented.

Requirements:

- ✓ The antenna has to be wired correctly.
- ✓ The antenna must be connected to the voltage supply.
- ✓ Ensure that the cable is not located directly next to power cables (see 7.3.4 “Minimum Distance to Current-Carrying Wires Around the Transponder Antenna and Metal-Free Areas” on page 28).

The purpose of commissioning is to parameterize the transponder antenna for a specific application:

Commissioning consists of several steps

- Connection of the serial interface of a computer (e.g. laptop) to the serial interface of the antenna (see section 8.1 below).
- Starting the terminal program on the computer (see 8.2 “Configuring the Terminal Program” on page 34).
- Parameterization of the antenna using the antenna-internal monitor program (see 8.3 “Configuring the Antenna (Monitor Program)” on page 36).
- Saving the values and restarting the system (see 8.4 “Finish Commissioning” on page 37).

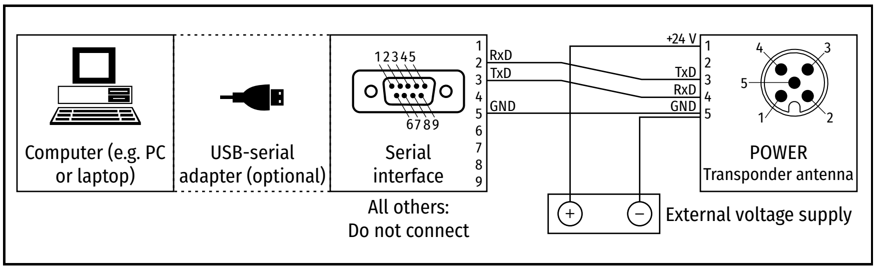
8.1 Connecting the Antenna to a Computer

You can configure the system using a software running in the antenna. To do so, you need a self-configured cable with the pin allocation shown in Figure 18.

To use the software:

- ▶ Connect the POWER connector of the antenna to the serial port of your computer.
- ▶ Then start a terminal program on the computer.

Figure 18 *Connection example: Connection to the serial interface of a computer*



8.2 Configuring the Terminal Program

Any compatible terminal program can be used. We refer to TeraTerm® in the following. TeraTerm is an open source terminal emulator and can be downloaded free of charge at the following address:

https://ttssh2.osdn.jp/

However, you can use any other terminal program that can handle the VT100 emulation. If you use another terminal program:

- ✓ Please refer to the documentation supplied with the terminal program.
- ✓ Set the values listed in Table 9 below in the terminal program.

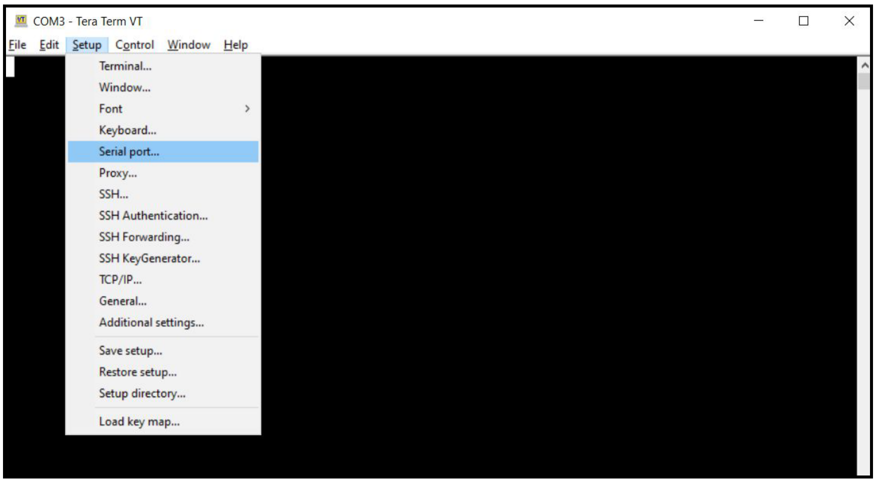
Table 9 *Terminal settings for the monitor program*

Terminal settings monitor program	
baud rate	19200, 38400 or 115200 Bd depending on the system configuration, default 38400 Bd
terminal emulation	VT100
parity	even
data bits	8
stop bits	1
character delay	1 ms
line delay	0 ms
PC interface (port)	COM1 can vary depending on the PC (see below)

In TeraTerm you set up the parameters as follows:

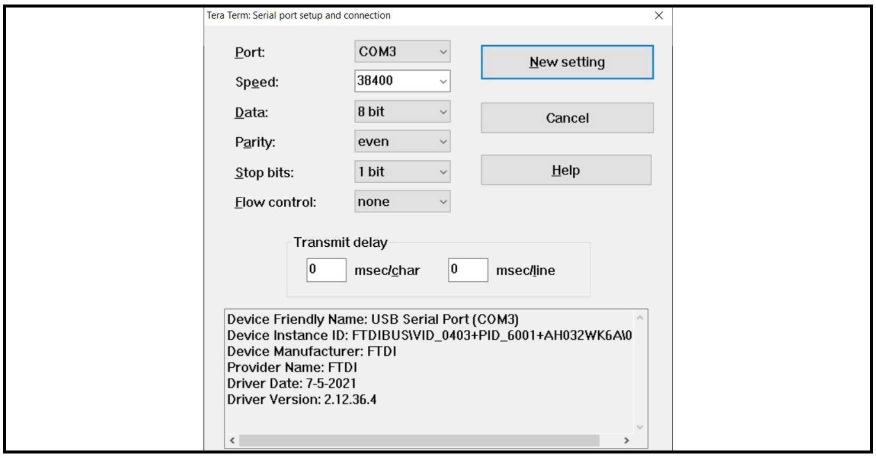
▶ Start TeraTerm and go to *Setup –> Serial Port*.

Figure 19 *Screenshot: Tera Term*



▶ The following dialog opens:

Figure 20 *Screenshot: Tera Term –> Setup –> Serial Port*



▶ Select the COM port to which the localization sensor is connected and make the settings from Table 9 above. Pay attention to whether changes have been made to the settings in the localization sensor; if so, the baud rate, for example, may differ.

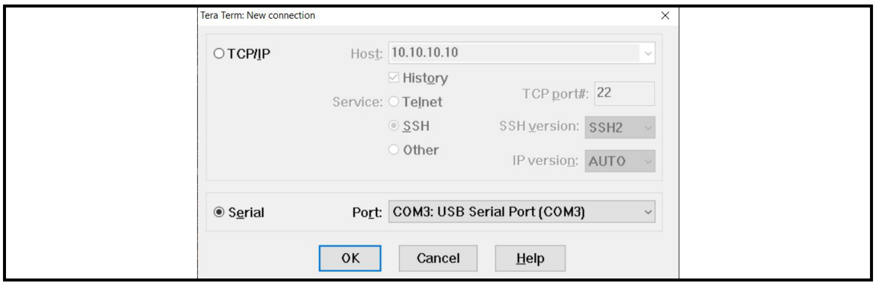
▶ Confirm the dialog with the button *New Setting* and save the settings permanently via *Setup –> Save Setup*.

TeraTerm is now configured for establishing a connection with the localization sensor.

To establish the connection to the localization sensor, proceed as follows:

▶ Select *File –> New Connection*, the following dialog opens.

Figure 21 *Screenshot: Tera Term –> File –> New Connection*



- Select *Serial* and click *OK*.

  The connection to the transponder antenna is established.

8.3 Configuring the Antenna (Monitor Program)

8.3.1 Set Parameters

Once a connection to the antenna is established via the terminal program (see above), the antenna can be set via the monitor program. By default, the system uses the monitor only procedure at 38,400 baud. Note, however, that another user may have changed this setting.

To adjust the antenna:

- Set the required transmission parameters for the CAN bus or the serial interface (see 10.2.8 “Basic C(A)N-Parameters” on page 68, 10.2.9 “CA(N)-Open-Parameters” on page 71 and 10.2.5 “(S)erial Output” on page 57).
- Perform the tuning of the transmitting antenna (see 10.2.7 “(F)requency & Antenna Tuning” on page 66).
- Position a transponder under the antenna and check whether all values arrive in your system via the corresponding interface (CAN or serial). Also use the status display in the basic menu for this purpose (see 10.2.1 “Main Menu” on page 55).

  The antenna is now ready for operation.

8.3.2 Minimize Interferences

i After mounting the antenna, interference must not exceed 100 units. The influence of the interferences strongly depends on the level of the transponder signal. The transponder signal must be clearly above the interference signal.

To reduce interferences, please proceed as follows:

- Carry out a measurement run along the entire installation and log it run using the CSV output (see 10.2.11 “Cs(v)” on page 75).
- Adjust the reception thresholds specifically (see 10.2.7 “(F)requency & Antenna Tuning” on page 66).

  The interference is reduced.

Further strategies for detecting interference can be found in chapter 13.2 "Reducing Interferences" on page 84. In some cases, you can filter out interference by adjusting limits and thresholds. In general, however, you should avoid interference by keeping sources of interference at a sufficient distance from the transponder antenna and maintaining constant reading distances to the transponders.

8.4 Finish Commissioning

If no errors have occurred:

- ▶ Save the changed values (Load Userparameters to EEprom in the main menu (see 10.2.1 "Main Menu" on page 55).
- ▶ Exit the monitor program.

You must restart the system for the changes to become active.

- ▶ Disconnect the antenna from the operating voltage for a short time and reconnect it.

  The transponder antenna is now properly commissioned.

If you need a reference file for later settings:

- ▶ Archive the file (see 10.2.15.1 "P(r)int Parameters" on page 79).

9 Interfaces

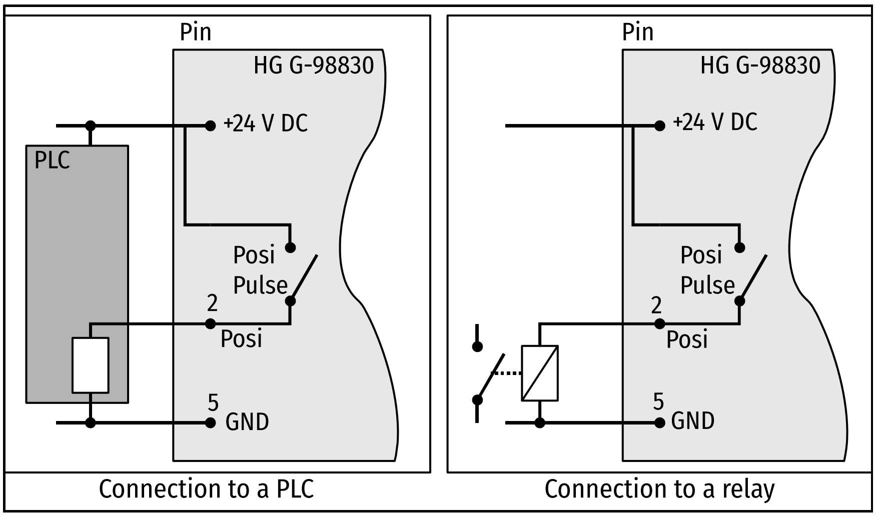
9.1 Alle Variants: PosiPulse

The digital positioning pulse at pin 2 of the POWER connector transmits the crossing of the center of the antenna in the direction of movement. Its duration can be set in millisecond increments. You can limit the positioning pulse to one pulse per crossing, see section 10.2.6 “(T)ime & Code” on page 61.

i The PosiPuls can be transmitted alternatively to the way described here in the status of the serial or CAN telegram. In this case, however, the latency of the data output period must be taken into account. Furthermore, a CAN telegram (without data content) can also be triggered directly by the positioning pulse, see section 9.3.2.4 “CAN Message Object – P-Identifier, Send Object” on page 47.

The positioning pulse output is internally connected to +24 V (no potential separation). For safety reasons, a 20 mA current limit is implemented in the antenna for this output. If, for example, a 24 V voltage output is required, pin 2 can be connected to GND via a resistor of 1 kOhm as shown in the following figure.

Figure 22 *Connection options positioning pulse*



The content of the telegrams (serial and CAN) can be "frozen" for an adjustable number of telegrams to the values at the time of the positioning pulse (see 10.2.5 “(S)erial Output” on page 57 and 10.2.8 “Basic C(A)N-Parameters” on page 68.

9.2 All Variants: Serial Interface (RS232)

The serial interface is used in the following way:

- either as a data interface (as described here)
- or as a service interface (see chapter 10 on page 53).

In the state as delivered, the serial interface is in *Monitor only* mode. You can then use the serial interface via a computer as a service interface for configuration.

To use the serial interface as a data interface (described below), it must be set to the protocol *transparent* or to *3964R* (see 10.2.5 “(S)erial Output” on page 57).

The transmission rates 19200 and 38400 baud (standard) can be set. You can select the following output protocols:

- *Monitor only* (service/configuration, see “Configuration of the System via the Service Interface” on page 53)
- *transparent* (data, see 15.3 “Procedure transparent” on page 93)
- *3964R* (for data, see 15.2 “Procedure 3964R” on page 92)

You can configure the telegram contents for the protocols transparent and 3964R. You can include the desired parameters from a list into the telegram (see 10.2.5 “(S)erial Output” on page 57).

9.2.1 List of system values that can be output

A telegram consists of a maximum of 24 user bytes. The minimum update rate at 19,200 baud thus results from

Figure 23 *Equation: Minimum update rate*

$$24\frac{\text{Byte}}{\text{Telegramm}} \times 11\frac{\text{Bit}}{\text{Byte}} \;/\; 19200\frac{\text{Bit}}{\text{s}} = 13,75\frac{\text{ms}}{\text{Telegramm}}$$

Since this is a binary transfer, you can – when using the 3964R procedure – insert additional (DLE) characters from this procedure. You can configure all multi-byte variables so that either the high byte is output first or the low byte is output first. The 8-bit checksum is only output when using the transparent protocol and includes the start character. You cannot remove the start character as well as the checksum (protocol transparent) from the data block.

Table 10 *Bytes and data words of a telegram with 24 byte length (part 1 of 2)*

Byte-No.	Length	Value	Type	Meaning
1	1 Byte	0x0000.0001	ASCII-061: „=“	Start character (Default value: „=“)
2,3	2 Byte	0x0000.0002	signed int	Y-Position: Y [mm] in the range from -125 … 0 … +125 in case of an invalid value (no transponder detected) = 32767
4,5	2 Byte	0x0000.0004	signed int	X-Position: X [mm] in the range from -125 … 0 … +125 in case of an invalid value (no transponder detected) = 32767
6,7,8,9	4 Byte	0x0000.0008	unsigned long	20 Bit transponder code (R/W transponder)
10,11	2 Byte	0x0000.0010	unsigned int	Voltage generated by the transponder in the reference coil [units] (Usum)
12,13	2 Byte	0x0000.0020	signed int	Voltage generated by the transponder in the positioning coil [units] (Udif)

Table 10 *Bytes and data words of a telegram with 24 byte length (part 2 of 2)*

Byte-No.	Length	Value	Type	Meaning
14	1 Byte	0x0000.0040	unsigned char	Supply voltage applied to the antenna in [100 mV] resolution (e.g. 245 corresponds to 24.5 V)
15	1 Byte	0x0000.0080	unsigned char	Current consumption in [10 mA] resolution (e.g. 100 corresponds to 1000 mA)
16	1 Byte	0x0000.0100	unsigned char	Temperature measured in the antenna [°C]
17	1 Byte	0x0000.0200	unsigned char	Number of code readings of the last transponder crossing
18,19	2 Byte	0x0000.0400	unsigned int	Frequency of the receiver [10 Hz]
20,21	2 Byte	0x0000.0800	unsigned int	Frequency of the transmitter [10 Hz]
22,23	2 Byte	0x0000.1000	unsigned int	System status in binary coding, see Table 11 on page 40
(24)	1 Byte		unsigned char	Check sum (only for transparent protocol)

Table 11 lists the binary coding of the system status (for bytes 22 and 23 from Table 10):

i

The error 0x0002 can also occur during a normal transponder crossing if the code transmission is aborted by decreasing level. It has no meaning if there is no transponder in the field.

Table 11 *Possible system states (part 1 of 2)*

Value	Name	Meaning
0x0001	DEC_HW_ERROR	Code decoder hardware faulty
0x0002	CODE_PAR_ERR	Transponder code received with parity error or wrong hi-nibble (highest code digit)
0x0004	RX_NOISE	Set if TRANS_IN_FIELD was set but no codes are read
0x0008		
0x0010	EEPROM_ERROR	Parameter E^2Prom not addressable
0x0020	PARAM_CRC_ER	Parameter set no longer safe
0x0040	POT_ERROR	IIC bus potentiometers not addressable
0x0080	F_ERROR	Transmit oscillator or receive oscillator not on set frequency
0x0100	ESTIMATE_Y	Crosswise to the direction of travel: If the exact transponder position cannot be determined due to incorrect reading distances or e.g. reinforcements in the ground, then an estimated value with the accuracy of ±10 mm is determined and this bit is set.
0x0200	TRANS_IN_FIELD	Transponder is detected *)
0x0400	CODE_OK	Code correctly decoded *)
0x0800	SEGMENT-	Is set when the transponder is in the antenna area -X (see Figure 2 on page 11)
0x1000	POSIPULS	Transponder has crossed the center of the antenna *)

Table 11 *Possible system states (part 2 of 2)*

Value	Name	Meaning
0x2000	ESTIMATE_X	In direction of travel: If the exact transponder position cannot be determined due to incorrect reading distances or e.g. reinforcements in the ground, then an estimated value with the accuracy of ±10 mm is determined and this bit is set.
0x4000		
0x8000		
*) These bits are deleted after the transponder leaves the antenna field.		

Example System status `0x0014` = `0x0004` + `0x0010` = `EEPROM_ERROR` and `RX_NOISE`.

9.2.2 List of System Commands

A command telegram always consists of four bytes, containing the command and the corresponding parameters. In the case of the procedure *transparent*, a start character and a checksum (XOR operation of all bytes including the start character) are also transmitted.

There are 21 predefined commands.

> **i** The following table applies to the High Byte First transmission. For Low Byte First transmission, the sequence of commands and parameters must be changed. The maximum duration of the *Tune Antenna Once* command is 10 seconds for 16 tuning steps.

> **i** The monitor mode must not be used in normal operation, e.g. from a PLC, as the subsequent output is no longer in accordance with transparent or 3964R protocol, but is only suitable for display on a VT52 terminal and is used to change parameters manually.

Table 12 *List of system commands (part 1 of 4)*

No.	Procedure		Start	Command Bytes	Parameter Bytes	Check-sum *)	Description
1	3964R	HEX		$4D_{16}4F_{16}$	$4E_{16}49_{16}$		Switch to monitor mode (see “Configuration of the System via the Service Interface” on page 53)
1	3964R	ASCII		MO	NI		Switch to monitor mode (see “Configuration of the System via the Service Interface” on page 53)
1	transparent	HEX	$3D_{16}$	$4D_{16}4F_{16}$	$4E_{16}49_{16}$	38_{16}	Switch to monitor mode (see “Configuration of the System via the Service Interface” on page 53)
1	transparent	ASCII	=	MO	NI	8	Switch to monitor mode (see “Configuration of the System via the Service Interface” on page 53)
2	3964R	HEX		$54_{16}55_{16}$	$4E_{16}45_{16}$		Tune antenna once
2	3964R	ASCII		TU	NE		Tune antenna once
2	transparent	HEX	$3D_{16}$	$54_{16}55_{16}$	$4E_{16}45_{16}$	37_{16}	Tune antenna once
2	transparent	ASCII	=	TU	NE	7	Tune antenna once
3	3964R	HEX		$53_{16}54_{16}$	$30_{16}31_{16}$		Set tuning value to 1
3	3964R	ASCII		ST	01		Set tuning value to 1
3	transparent	HEX	$3D_{16}$	$53_{16}54_{16}$	$30_{16}31_{16}$	38_{16}	Set tuning value to 1
3	transparent	ASCII	=	ST	01	8	Set tuning value to 1

Table 12 *List of system commands (part 2 of 4)*

No.	Procedure		Start	Command Bytes	Parameter Bytes	Check-sum *)	Description
4	3964R	HEX		$53_{16}54_{16}$	$30_{16}32_{16}$		Set tuning value to 2
		ASCII		ST	02		
	transpar-ent	HEX	$3D_{16}$	$53_{16}54_{16}$	$30_{16}32_{16}$	$3B_{16}$	
		ASCII	=	ST	02	;	
5	3964R	HEX		$53_{16}54_{16}$	$30_{16}33_{16}$		Set tuning value to 3
		ASCII		ST	03		
	transpar-ent	HEX	$3D_{16}$	$53_{16}54_{16}$	$30_{16}33_{16}$	39_{16}	
		ASCII	=	ST	03	9	
6	3964R	HEX		$53_{16}54_{16}$	$30_{16}34_{16}$		Set tuning value to 4
		ASCII		ST	04		
	transpar-ent	HEX	$3D_{16}$	$53_{16}54_{16}$	$30_{16}34_{16}$	$3E_{16}$	
		ASCII	=	ST	04	>	
7	3964R	HEX		$53_{16}54_{16}$	$30_{16}35_{16}$		Set tuning value to 5
		ASCII		ST	05		
	transpar-ent	HEX	$3D_{16}$	$53_{16}54_{16}$	$30_{16}35_{16}$	$3F_{16}$	
		ASCII	=	ST	05	?	
8	3964R	HEX		$53_{16}54_{16}$	$30_{16}36_{16}$		Set tuning value to 6
		ASCII		ST	06		
	transpar-ent	HEX	$3D_{16}$	$53_{16}54_{16}$	$30_{16}36_{16}$	$3C_{16}$	
		ASCII	=	ST	06	<	
9	3964R	HEX		$53_{16}54_{16}$	$30_{16}37_{16}$		Set tuning value to 7
		ASCII		ST	07		
	transpar-ent	HEX	$3D_{16}$	$53_{16}54_{16}$	$30_{16}37_{16}$	$3D_{16}$	
		ASCII	=	ST	07	=	
10	3964R	HEX		$53_{16}54_{16}$	$30_{16}38_{16}$		Set tuning value to 8
		ASCII		ST	08		
	transpar-ent	HEX	$3D_{16}$	$53_{16}54_{16}$	$30_{16}38_{16}$	32_{16}	
		ASCII	=	ST	08	2	
11	3964R	HEX		$53_{16}54_{16}$	$30_{16}39_{16}$		Set tuning value to 9
		ASCII		ST	09		
	transpar-ent	HEX	$3D_{16}$	$53_{16}54_{16}$	$30_{16}39_{16}$	33_{16}	
		ASCII	=	ST	09	3	
12	3964R	HEX		$53_{16}54_{16}$	$31_{16}30_{16}$		Set tuning value to 10
		ASCII		ST	10		
	transpar-ent	HEX	$3D_{16}$	$53_{16}54_{16}$	$31_{16}30_{16}$	$3B_{16}$	
		ASCII	=	ST	10	;	

Table 12 *List of system commands (part 3 of 4)*

No.	Procedure		Start	Command Bytes	Parameter Bytes	Check-sum *)	Description
13	3964R	HEX		$53_{16}54_{16}$	$31_{16}31_{16}$		Set tuning value to 11
		ASCII		ST	11		
	transpar-ent	HEX	$3D_{16}$	$53_{16}54_{16}$	$31_{16}31_{16}$	$3A_{16}$	
		ASCII	=	ST	11	:	
14	3964R	HEX		$53_{16}54_{16}$	$31_{16}32_{16}$		Set tuning value to 12
		ASCII		ST	12		
	transpar-ent	HEX	$3D_{16}$	$53_{16}54_{16}$	$31_{16}32_{16}$	39_{16}	
		ASCII	=	ST	12	9	
15	3964R	HEX		$53_{16}54_{16}$	$31_{16}33_{16}$		Set tuning value to 13
		ASCII		ST	13		
	transpar-ent	HEX	$3D_{16}$	$53_{16}54_{16}$	$31_{16}33_{16}$	38_{16}	
		ASCII	=	ST	13	8	
16	3964R	HEX		$53_{16}54_{16}$	$31_{16}34_{16}$		Set tuning value to 14
		ASCII		ST	14		
	transpar-ent	HEX	$3D_{16}$	$53_{16}54_{16}$	$31_{16}34_{16}$	$3F_{16}$	
		ASCII	=	ST	14	?	
17	3964R	HEX		$53_{16}54_{16}$	$31_{16}35_{16}$		Set tuning value to 15
		ASCII		ST	15		
	transpar-ent	HEX	$3D_{16}$	$53_{16}54_{16}$	$31_{16}35_{16}$	$3E_{16}$	
		ASCII	=	ST	15	>	
18	3964R	HEX		$53_{16}54_{16}$	$31_{16}36_{16}$		Set tuning value to 16
		ASCII		ST	16		
	transpar-ent	HEX	$3D_{16}$	$53_{16}54_{16}$	$31_{16}36_{16}$	$3D_{16}$	
		ASCII	=	ST	16	=	
19	3964R	HEX		$53_{16}50_{16}$	0 … $3E8_{16}$		Set positioning level (0 <= level < 1024)
		ASCII		SP	**)		
	transpar-ent	HEX	$3D_{16}$	$53_{16}50_{16}$	0 … $3E8_{16}$	***)	
		ASCII	=	SP	**)	**)	
	***) Checksum in this case depending on the values used. Examples: – Level should be set to 1000 (3E816) The transparent telegram is: $3D_{16}53_{16}50_{16}03_{16}E8_{16}$**D516** – Level should be set to 300 ($12C_{16}$) The transparent telegram is $3D_{16}53_{16}50_{16}01_{16}2C_{16}$**1316**						
20	3964R	HEX		$53_{16}15_{16}$			Delete the previous pro-gramming command
		ASCII		CP			
	transpar-ent	HEX	$3D_{16}$	$53_{16}15_{16}$		$3E_{16}$	
		ASCII	=	CP			

Table 12 *List of system commands (part 4 of 4)*

No.	Procedure		Start	Command Bytes	Parameter Bytes	Check-sum *)	Description
21	3964R	HEX		$50_{16}4C_{16}$	Code in the format $tt_{16}tt_{16}$ For code „1234“ e.g. $12_{16}34_{16}$		Transmission of the least significant 16 bits of the transponder code to be programmed.
		ASCII		PL			
	transpar-ent	HEX	$3D_{16}$	$50_{16}4C_{16}$		07_{16}	
		ASCII	=	PL			
22	3964R	HEX		$50_{16}48_{16}$	Code in the format $tt_{16}tt_{16}$ For code „1234“ e.g. $12_{16}34_{16}$		Transmission of the most significant bits of the tran-sponder code to be pro-grammed and start of programming
		ASCII		PH			
	transpar-ent	HEX	$3D_{16}$	$50_{16}48_{16}$		03_{16}	
		ASCII	=	PH			

- *) XOR concatenation of all bytes incl. the start character. Depending on the parameters used.
- **) No ASCII-coded values

9.3 Variant HG G-98830: CAN Bus

9.3.1 Introduction

9.3.1.1 Definitions CAN and CANopen®

The CAN or CANopen® configuration is structured according to ISO 11898 or EN 50325-4. As an aid, important terms and abbreviations are explained in this chapter. For more detailed information, you can refer to the standards.

The technical specifications of the CANopen® standard can be downloaded from the following link after a free registration:

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

For devices that support CANopen®, EDS files (Electronic Data Sheet) are available for download on the Götting KG website. The complete configuration is stored in these files.

To access EDS files, you can use e.g. CANopen Magic from PEAK System.

http://www.canopenmagic.com

Table 13 *Definitions CAN/CANopen®*

Abbreviation	Name	Meaning
PDO	Process data objects	Maximum 8 bytes process data
TPDO	Transmit-PDO	The process data sent by a device
RPDO	Receive-PDO	The process data received by a device
SDO	Service data objects	Used to read and write 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	For CANopen® the address of the device, which is added to the CAN identifier

9.3.1.2 Operating Modes and States

Table 14 *CANopen®: Parameter PDO operating mode*

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

Note that not every device supports every operating mode. Devices from Götting normally support the operating modes 1 to 240 and 255.

Table 15 *CANopen®: PDO operating modes*

Operating mode	Explanation
Cyclic	Data is transmitted every nth sync telegram
Acylic	Transmits if an event has occurred since the last Sync telegram
Synchronous	Data is transmitted after receipt of a sync telegram
Asynchronous	Data is transmitted event-driven
RTR	Only on request by a remote frame
Inhibit Time	Minimum time period which has to pass before the next transmission of the same PDO
Event Time	Triggers an event on expiry. Is re-started after each event.

Table 16 *CAN: Bit and byte sequences*

Name	Meaning
Low Byte First	Little-endian format, Intel format The least significant byte of a multibyte value is sent first.
High Byte First	Big-Endian format, Motorola format The respective most significant byte of a multi-byte value is sent first
Left-aligned	Order of the bits in a byte from left (most significant) to right (least significant).

Table 17 *CANopen® Operation mode*

Name	Meaning
Stopped	Only network management services executable
Pre-Operational	Full configuration possible, no sending of PDOs
Operational	Full configuration possible, set PDOs are sent

Note that a CAN identifier or, in the case of CANopen®, the combination of CAN identifier and node identifier must always be unique!

9.3.2 CAN

The internal Full CAN module is based on the CAN specification V2.0 Part B. Both standard and extended frames can be sent. You can set the CAN parameters (bit timing, identifier, standard/extended frames) via the system monitor (see "Configuration of the System via the Service Interface" on page 53).

Different CAN message objects can be output. You can configure whether telegrams are output permanently with the adjustable update rate or only when a transponder is in the field. In addition, remote operation can also be set. The objects are activated by entering an address other than 0 in the CAN menu (see section 10.2.8 "Basic C(A)N-Parameters" on page 68).

9.3.2.1 CAN Message Object – Y-Identifier, Send Object

Table 18 *Structure of the CAN Message Object – Y Identifier*

Byte #	Length	Type	Meaning
1,2	2 Byte	unsigned int	System status notes according to Table 11 on page 40
3,4,5,6	4 Byte	unsigned long	20 bit transponder code (R/W transponder)
7,8	2 Byte	signed int	Distance Y [mm]

9.3.2.2 CAN Message Object – X-Identifier, Send Object

Table 19 *Structure of the CAN Message Object – X Identifier*

Byte #	Length	Type	Meaning
1,2	2 Byte	unsigned int	System status notes according to Table 9 on page 37
3,4,5,6	4 Byte	unsigned long	20 Bit transponder code (R/W Transponder)
7,8	2 Byte	signed int	Distance X [mm]

9.3.2.3 CAN Message Object – D-Identifier, Send Object

Table 20 *Structure of the CAN Message Object – D Identifier*

Byte #	Length	Type	Meaning
1,2	2 Byte	unsigned int	Voltage generated by the transponder in the Reference Antenna
3,4	2 Byte	signed int	Voltage generated by the transponder in the Positioning Antenna
5	1 Byte	unsigned char	Number of code readings of the last transponder crossing
6	1 Byte	unsigned char	Operating voltage (see telegram description in Table 10 on page 39)
7	1 Byte	unsigned char	Operating current (see telegram description in Table 10 on page 39)
8	1 Byte	signed char	Operating temperature (see telegram description in Table 10 on page 39)

9.3.2.4 CAN Message Object – P-Identifier, Send Object

If activated, this telegram is output when the antenna triggers a PosiPulse. It has a data content of 0 byte (empty). With the help of this telegram, e.g. a PLC can detect a PosiPulse via the CAN bus without having to connect the corresponding output of the POWER connector.

9.3.2.5 CAN Message Object – S-Identifier, Send Object

This message object is used for special applications not described in this documentation. It is irrelevant for normal operation, how this message object is set.

9.3.2.6 CAN Message Object – Programming, Receive Object

Commands can be sent to the antenna via the Message Object Programming. It has the same ID as the send object Message Object Y-Identifier and a length of 6 bytes.

Table 21 *Structure of the CAN Message Object Programming*

Byte #	Length	Type	Meaning
1,2	2 Byte	Unsigned int	Command (see Table 22 below)
3,4,5,6	4 Byte	Unsigned long	Parameter (see Table 22 below)

Table 22 *Coding of the commands CAN Message Object Programming*

Command	Meaning	Parameter
0000_{16}	No command	–
0001_{16}	Tune antenna once	–
0002_{16}	Set tuning level (see 10.2.7 “(F)requency & Antenna Tuning” on page 66)	Tuning value 0000.0001_{16} bis 0000.0010_{16}
0004_{16}	Set positioning level (see 10.2.6 “(T)ime & Code” on page 61)	Positioning level 0000.0000_{16} bis $0000.03E8_{16}$
0008_{16}	Program Transponder	Transponder code in the range of $0x0000.0000_{16}$ to $0x000F.FFFF_{16}$

The programming process is initiated by sending 0008_{16} in the command bytes of the CAN message object. The transponder code to be programmed must be in the 4 parameter bytes. These bytes should be reset after 8 to 100 ms.

The now initiated, one-time programming process takes 100 to maximum 200 ms. Afterwards, the new code can be read out in the corresponding message object.

If the programming process was not successful, you must repeat the procedure. A new programming is always triggered only if the command byte is set from 0000_{16} to 0008_{16}.

9.3.3 CANopen®

The Node ID and the transmission rate are selected via the associated SDOs or set via the serial interface (see 10.2.9 “CA(N)-Open-Parameters” on page 71). The measured values of the system are transmitted via so-called TxPDOs. SDOs are used to set parameters. The CAN identifiers are derived from the node address (1 ... 127).

9.3.3.1 Description of the Process Data Objects (PDO)

The measured values are assigned to fixed positions in the PDO, dynamic mapping is not supported. You can set the PDO operating mode to cyclic, synchronous or asynchronous. To avoid a too high bus load by constant changes in the asynchronous operation mode with non-cyclic transmission (Event-Time = 0), you can set the so-called Inhibit Time in the CAN menu of the monitor program. The PDO can also be transmitted cyclically. For this you must select the Event-Time accordingly and enter 0 for the Inhibit Time.

You can permanently deactivate a TxPDO by selecting the asynchronous operating mode (255) with Inhibit-Time = 0, Event_time = 0 and saving the parameters. In addition, you can temporarily de-/activate a TxPDO by setting or deleting the most significant bit in the associated PDO COB identifier.

PDO_1 is transmitted with identifier 0x180 + node address. It contains 8 bytes, which include the status from the monitor program. The transmission order is status, transponder code and deviation in Y-direction.

Table 23 *Variables in PDO_1*

Value	Variable	Value range	Comment
Status	unsigned 16	0 ... 0xffff	Status bits according to Table 11 on page 40
Code	unsigned 32	0 ... ffff.ffff	20 Bit transponder-Code (R/W Transponder)
Devia-tion	signed 16	0xff83 ... 0x007d	Y-deviation, ±125 mm In case of invalid values (e.g. no transponder found) = 32767

PDO_2 is transmitted with identifier 0x280 + node address. It contains 8 bytes, which include the status from the serial monitor. The transmission order is status, transponder code and deviation in X-direction.

Table 24 *Variables in PDO_2*

Value	Variable	Value range	Comment
Status	unsigned 16	0 ... 0xffff	Status bits according to Table 11 on page 40
Code	unsigned 32	0 ... ffff.ffff	20 Bit transponder-Code (R/W Transponder)
Devia-tion	signed 16	0xff83 ... 0x007d	X-deviations, ±125 In case of invalid values (z. B. no transponder found) = 32767

PDO_3 is transmitted with identifier 0x380 + node address. It consists of the following 8 bytes.

Table 25 *Variablen in PDO_3*

Value	Variable	Value range	Comment
Sum Voltage	unsigned 16	0 ... 1023	Voltage of reference coil
Dif Voltage	signed 16	0 ... ±1023	Voltage of the positioning coil
Codes read	unsigned 8	0 ... 255	Number of code readings
Voltage	unsigned 8	0 ... 255	The voltage applied to the antenna Operating voltage [100 mV].
Current	unsigned 8	0 ... 255	Antenna current consumption [10 mA]
Temperature	signed 8	-23 ... 61	Temperature measured in the antenna [°C]

The synchronous identifier is 0x80. You can read this parameter under index [1005,00], but you cannot change it.

9.3.3.2 Heartbeat

The device supports the heartbeat mode. If you set a heartbeat time > 0 in the CAN menu, the device state is sent under the identifier 0x700 + node address with each expiration of the heartbeat timer. The guard time is then set to 0.

Table 26 *Codes of the Heartbeat mode*

Device status	Code
stopped	0x04
preoperational	0x7f
operational	0x05

9.3.3.3 Node-Guarding

If a heartbeat time equal to 0 is entered, the device responds to a remote transmission request of the identifier (0x700 + node address) with the device status (see Table 26) where the most significant bit changes. The device does not monitor the regular input of RTR frames.

9.3.3.4 Description of Service Data-Objects (SDOs)

The service data object is used for accesses to the object directory. An SDO is transmitted acknowledged, i.e. each receipt of a message is acknowledged. The identifiers for read and write access are:

Table 27 *Identifier for read and write access*

Access mode	Identifier
Read access	0x600 + Node-Address
Write access	0x580 + Node-Address

The SDO telegrams are described in the CiA standard DS-301. The error codes due to a faulty communication are:

Table 28 *Possible error codes SDO telegram*

Name	Number	Meaning
SDO_ABORT_UNSUPPORTED	0x06010000	Unsupported access to a Object
SDO_ABORT_READONLY	0x06010001	Write access to a read-only object
SDO_ABORT_NOT_EXISTS	0x06020000	Object is not implemented
SDO_ABORT_PARA_VALUE	0x06090030	Parameter value range exceeded
SDO_ABORT_PARA_TO_HIGH	0x06090031	Parameter value too high
SDO_ABORT_SIGNATURE	0x08000020	When saving or loading parameters, the signature save or load was not used.

9.3.3.5 Object Directory

All objects relevant for the device are entered in the CANopen® object dictionary. The complete object directory is listed in section 15.4 “Overview of the CANopen® Directory” on page 94.

9.3.3.6 CAN EDS Configuration File

EDS = Electronic Data Sheet (EDS). You can request the EDS file from Götting KG or download it from the following link. The file name is `98830ZA.EDS`.

https://www.goetting-agv.com/components/98830

9.4 Variant HG G-98835: PROFINET®

The PROFINET® interface is configured using the GSDML file (see section 9.4.3 on page 52).

9.4.1 Input Bytes

22 Input Bytes according to the following table.

Table 29 *Structure of the PROFINET® Input Bytes*

Byte	Length	Type	Meaning
1,2	2 Byte	uint16_t	Status according to Table 11 on page 40
3,4,5,6	4 Byte	uint32_t	Code
7,8	2 Byte	int16_t	Position deviation in X direction [mm]
9,10	2 Byte	int16_t	Position deviation in Y direction [mm]
11,12	2 Byte	uint16_t	Sum (level)
13,14	2 Byte	int16_t	Difference (level)
15	1 Byte	uint8_t	Current consumption in 10 mA
16	1 Byte	uint16_t	Number of code readings
17	1 Byte	uint8_t	CMD (mirroring, the receiving CMD is transmitted back here)
18	1 Byte	uint8_t	Address (mirroring, the receiving address is transmitted back here)
19,20,21,22	4 Byte	int32_t	RX Value (for the result of read commands, see below)

9.4.2 Output Bytes

6 Output Bytes according to the following table.

Table 30 *Structure of the PROFINET® Output Bytes*

Byte	Länge	Typ	Bedeutung
1	1 Byte	uint8_t	CMD, read resp. write command, see below
2	1 Byte	uint8_t	Address, see Table 31 below
3,4,5,6	4 Byte	Int13_t	TX_Value

The most significant bit of byte *CMD* (0x80) determines whether it is a write or read command:

- If bit (0x80) is set, it is a write command.
- If bit (0x80) is not set, it is a read command.

The second byte *Address* determines the address (see Table 31 below) to which writing or reading takes place. Write commands are only possible to the addresses marked RW in the table. Read commands are possible to all addresses. With read commands, the content of the corresponding address is read, written to RX_Value and output via the input bytes (see Table 29 above).

Table 31 *Addresses for the PROFINET® read/write command*

Address	Meaning	Values/Range	Type *)
0x00	Life counter	0 to 2^32-1	RO
0x01	Level for Positioning	0 to 1023	RW
0x02	Threshold for Decoding	0 to 1023	RW
0x03	PosiPulse Config	0 to 255	RW
0x04	PosiPulse Time	0 to 1023	RW
0x05	Number of equal codes	0 to 15	RW
0x06	Transmitter	0: switched off 1: switched on	RW
0x07	Tune	0 to 15	RW
0x08	Autotune once	0 / 1	RW
0x10	– Write command: Transponder is programmed with the code contained in TX_Value – Read command: The last programmed code is output.	0 to 2^20-1	RW
*) RO = Read-Only / RW = Read/Write			

Example 1 A write command:
- CMD = 0x80
- Address = 0x10 (program transponder)
- Tx_Value = transponder code to be programmed

The transponder antenna programs a transponder in the reading area with the value transferred in TX_Value. The one-time programming process triggered by this takes 100 to a maximum of 200 ms. The new code can then be read out via the input bytes.

Example 2 A read command:
- CMD = 0x00 (example, everything except 0x80 is possible)
- Address = 0x02 (read value for *Threshold for Decoding*)
- Tx_Value is not evaluated for read commands

The transponder antenna reads the currently defined value for *Threshold for Decoding* and writes it to the Rx_Value of the input bytes.

9.4.3 GSDML File

You can download the latest version of the GSDML file for the PROFINET® configuration from our Internet server.

https://www.goetting-agv.com/components/98830

10 Configuration of the System via the Service Interface

The transponder antenna can be parameterized via the monitor program. To be able to call up the monitor program, a connection to the antenna must be established via the serial interface. Then a terminal program must be started, see 8.1 “Connecting the Antenna to a Computer” on page 33 and 8.2 “Configuring the Terminal Program” on page 34. The monitor program can then be called up in the terminal program.

In the monitor program you can configure the system menu-driven. To use the monitor program, you must know which protocol is set in your antenna. The different transmission procedures are:

Table 32 *Modes of the serial interface*

Mode	Description
Monitor only	Standard mode, service interface (see 10.2 “Using the Monitor Program” on page 55)
3964R	3964R data interface for direct PLC control (see 15.2 “Procedure 3964R” on page 92)
transparent	Data interface for direct PLC control (see 15.3 “Procedure transparent” on page 93)

The changes of the data rate mode are described in section 10.2.5 “(S)erial Output” on page 57.

10.1 Starting the Monitor Program

How the monitor program is started differs depending on the currently active procedure. In the delivery state, that is *Monitor only*.

10.1.1 Procedure Monitor Only

If the antenna is set to the procedure *Monitor only*, the monitor mode will be started 10 s after the system is activated. In this case you do not need to transfer any files and can go directly to chapter 10.2 “Using the Monitor Program” on page 55.

10.1.2 Procedure 3964R or Procedure Transparent

If you have set the antenna to procedure *3964R* or *transparent*, the serial interface is used as data interface (see 10.2.5 “(S)erial Output” on page 57). You can then still call the monitor program from a PC. For this purpose, a command to switch to monitor mode is transmitted. In this case, you need some configuration files (small text files) to start the monitor program.

You can download the configuration files in the latest version from our Internet server at any time:

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

- Start the monitor program on the PC.
  You can now transfer the appropriate text file with the monitor program.

The following four files are available:

1. `Mon3964r.txt`
   Transfer this if the system is switched to procedure **3964R** with "**HighByte first**".The file contains the following characters in hexadecimal notation:
   `0x02 0x4D 0x4F 0x4E 0x49 0x10 0x03 0x16`
2. `Mon6439r.txt`
   Transfer this if the system is switched to procedure **3964R** with "**LowByte first**". The file contains the following characters in hexadecimal notation:
   `0x02 0x4F 0x4D 0x49 0x4E 0x10 0x03 0x16`
3. `Montrans.txt`
   Transfer this if the system is switched to procedure **Transparent** with "**HighByte first**". The file following contains the characters in hexadecimal notation:
   `0x3D 0x4D 0x4F 0x4E 0x49 0x38`
4. `Transmon.txt`
   Transfer this if the system is switched to procedure **Transparent** with "**LowByte first**" .The file contains the following characters in hexadecimal notation:
   `0x3D 0x4F 0x4D 0x49 0x4E 0x38`

- Switch to the storage location of the files and select the corresponding *.txt file.
- Click on *Open*.
  The file is transferred and (if correctly selected) the monitor program is started. The menus then appear directly in the Terminal window. You will first see the main menu from Figure 24 on page 55.

If the monitor program does not start:

- Check the following points:
  - Did you transfer the correct configuration file?
  - Did you choose the correct baud rate?
  - Did you use the appropriate text document?
  - Is the system configured correctly?
  - Did you wait at least 10 (or 26) seconds after switching on the antenna?
  - Are you using a different monitor program and did not set a character delay of 1 ms?

If you change interface parameters, they will only become active when the system is switched off and on again (system reset).

10.2 Using the Monitor Program

NOTICE

Modifying the antenna parameters may detune the antenna!

The changes to the antenna parameters described below can detune the antenna to such an extent that normal operation is no longer possible!

- Save the transponder antenna configuration before each change so that you can restore it if necessary (see 10.2.15.2 “(1) Import User Parameter from Host to Antenna / (2) Export User Parameter from Antenna to Host” on page 79).

10.2.1 Main Menu

Figure 24 *Main menu of the monitor program*

```
S:0006  D:+006  D_X:+32767  D_Y:+32767   Code: 00000001  Read:  42: N:   0
Frx[/Hz]:66800  Ftx[/Hz]:127990
U[/mV]:24000  I[/mA]: 270  T[Grd.C]:+33     E: 0002  Noise    0

    (S)erial Output
    (T)ime & Code
    (F)requency & Antenna tuning
    Basic C(A)N-Parameters
    CA(N)-Open-Parameters

    (D)isplay Systemstatus
    Cs(v) [38,4 KB Code,Us,X,Y,Tr,Co,S-,Pos,N,E,Cnt<crlf>](abort with <a>)
    (Y) display Histogram
    (W)rite Transponder
    [L]oad Userparameters to EEProm
    [U]pdate Firmware
    (1) Import User Parameter from Host to Antenna
    (2) Export User Parameter from Antenna to Host

    P(r)int Parameters


    (Q)uit Monitor
    Software Version  98830A21.004 / Oct 20 2016    Serial Number: 0
```

The item (Q)uit Monitor will only appear if the serial interface is set to a procedure other than Monitor only. In this case, quit the monitor program with [Q], so that the serial interface switches back to the configured 3964R or transparent output.

10.2.2 Display of System Variables and Status Messages

The following information is shown in each of the menu screens:

- In the uppermost lines important system variables (see Table 33). The display corresponds to the structure of the telegram sent by the antenna (see 9.2.1 “List of system values that can be output” on page 39).
- In the last line of the screen possible status messages, e.g., if valid value ranges were ignored during data input.

Table 33 *Meanings of the system variables (monitor program)*

Meanings of the system variables	
S	Measured voltage of reference coil in units (max. 1023)
D	Measured voltage of positioning coil in units (max. 1023)
D_X [mm]	Transponder position in direction of travel in millimeters (max. ±125, 32767 for invalid position)
D_Y [mm]	Transponder position transverse to direction of travel in millimeters (max. ±125, 32767 for invalid position)
Code	The code bits of the transponder in hexadecimal format. The Code is output when the voltage S exceeds the threshold "Threshold for Decoding" (see Figure 27 on page 62).
Read	The number of code readings per transponder crossing (max. 255). The value is held until a new transponder is detected. Is also deleted by Noise.
N	The number of reading errors per transponder crossing. The value is held until a new transponder is detected.
Frx [Hz] and Ftx [Hz]	Display of important system frequencies for transmission and reception. These frequencies are permanently monitored and taken into account in the system status word E (see below).
U [mV]	Supply voltage of the processor board measured to an accuracy of 100 mV. Due to various protective measures it is always slightly below the supplied supply voltage.
I [mA]	Current consumed by the antenna measured to an accuracy of 10 mA
T [Grd.C]	Approximate temperature measured in the antenna in 5° C steps
E	System state in hexadecimal format. The meaning of the individual bits is explained in Table 11 on page 40.
Noise	Output of a counter: – If the reference voltage S rises above the *Threshold for Decoding*, the counter is incremented every 8 ms until it reaches the *Level to Noise Error* value. – If S falls below this threshold, it counts down to 0. If a code is decoded, the counter is immediately set to 0. This mechanism is used to check whether a transponder or a foreign signal is present. If this counter exceeds an adjustable value (see 10.2.6 “(T)ime & Code” on page 61), then the `RX_NOISE` bit is set in the system status.

10.2.3 Activate Sub Menus

The main menu shows a list of sub menus:

To activate sub menus:

▶ Enter the bracketed keyboard symbol.

The sub menu is displayed.

To leave the individual menus.

▶ Press the key Q.
The main menu is displayed.

The following menu items are described one after the other in this chapter:

- (S)erial Output (see 10.2.5 on page 57)
- (T)ime & code (see 10.2.6 on page 61)
- (F)requency & Antenna tuning (see 10.2.7 on page 66)
- Basic C(A)N-Parameters (see 10.2.8 on page 68)
- CA(N)open Parameters (see 10.2.9 on page 71)
- Display Systemstatus (see 10.2.10 on page 75)
- Cs(V) (see 10.2.11 on page 75)
- (Y) display Histogram (see 10.2.12 on page 77)
- (W)rite transponder (see 10.2.13 on page 78)
- (L)oad values to EEProm (see 10.2.14 on page 78)
- (U)pdate Firmware (see 10.2.15 on page 78)
- (1) Import / (2) Export User Parameter (see 10.2.15.2 on page 79)
- P(R)int Parameters (see 10.2.15.1 on page 79).

10.2.4 Setting and Permanently Saving Parameters

You can set the parameters in the sub menus as follows.

▶ Enter the bracketed keyboard symbol.
The parameter is activated.

▶ Enter a value using the keyboard.
▶ Confirm the parameter input with Enter Enter.

Before changed values are transferred to the permanent memory, they have to be saved.

i To prevent accidental saving, you have to enter the password in the menu *(L)oad values to EEProm*. 0815 and 815 will work alternatively.

▶ Save the parameters as described in chapter 10.2.14 “(L)oad values to EEProm” on page 78.
The parameters will be permanently stored.

10.2.5 (S)erial Output

i Changes in the (S)erial Output menu item only take effect after you have permanently saved them (see 10.2.14 “(L)oad values to EEProm” on page 78) and briefly disconnected the antenna from the supply voltage (system reset). Depending on the changes made, you may then have to use a different baud rate or a different text document to call up the monitor (see 10.1 “Starting the Monitor Program” on page 53).

To switch from the main menu to the *(S)erial Output* menu:

▶ Press the key [S].
The following screen will be displayed:

Figure 25 *Menu: (S)erial Output*

```
S:0006  D:+006  D_X:+32767  D_Y:+32767   Code: 00000001  Read:  42: N:   0
Frx[/Hz]:66800  Ftx[/Hz]:127990
U[/mV]:24000  I[/mA]: 260  T[Grd.C]:+33     E: 0000  Noise    0



    (B)audrate:                                   38400
    (P)rocedure                                   3964R
    (O)rder of Data Transfer (0= HiByte first):       0
    (T)elegram Content Mask      [0..1FFF]:   00001fff
    (D)isplay Telegram Content
    (C)har-Delaytime            [1..220ms]:        220

    (A)ck-Delaytime (3964R)     [1.1680ms]:       1680
    Co(n)tinous Telegrams                             0
    (S)erial Data Period        [4.500mS]:            8
    (F)reeze Values for n Telegrams:[0..10]:          0


    (Q)uit Menue
```

Switch baud rate

With the parameter (B)audrate you define the speed with which the telegrams are transmitted via the serial interface. The baud rate must be set the same for all serial devices.

Selection:

- 19200 Baud
- 38400 Baud

To switch the baud rate:

▶ Press the key [B] and enter the desired value.

Setting the procedure for telegram transmission

The parameter *(P)rocedure* is used to set the procedure for the monitor program at the antenna:

Selection:

- Monitor only (Service/Configuration)
- 3964R (Data)
- transparent (Data)

For setting the procedure for the data transmission:

▶ Press the key [P] and enter the desired value.

Additionally you can define the acknowledgment delay time [A] for procedure 3964R (see „Setting the acknowledgment delay time“ auf Seite 60).

Setting the byte order

Use the parameter *(O)rder of Data Transfer* to select whether the highest byte should be output first or last.

If you connect a Siemens PLC, this parameter has to be set to 0 (HiByte first)

Selection:

- 0 = HiByte first
- 1 = LowByte first

For setting the byte order:

▶ Press the key [O] and enter the desired value.

Setting the content of the output telegram

With the parameter *(T)elegram Content Mask* you can define the desired components of your telegram by hexadecimal addition. The sequence of the parameters cannot be influenced. It always corresponds to the sequence in Table 10 on page 39.

Value range:

- 0 ... 1FFF (see column *Value* Table 10 on page 39)

The length of the telegram will be adjusted automatically.

In order to specify the components of your telegram:

▶ Press the key [T] and enter the desired value.

Example

You only want to output the *start character*, the *lateral deviation Y*, the *Code* and the *system status*. In accordance with the table, add the values 0x0000.0001, 0x0000.0002, 0x0000.0008 and 0x0000.01000, resulting in 0x0000.100B. This means you have to enter 0x100b for the “([T])elegram Content Mask”.

Checking the generated telegram

With the parameter *(D)isplay Telegram Content* you can call up the generated telegram (see Figure 26). In the example the mask has the value 0x1fff and the telegram length is 23.

Selection:

- none, display function only

To display the generated telegram:

▶ Press the key [D].
The following screen appears:

Figure 26 *Output at (D)isplay Telegram Content*

```
S:0006  D:+006  D_X:+32767  D_Y:+32767   Code: 00000001  Read:  42: N:   0
Frx[/Hz]:66760  Ftx[/Hz]:127990
U[/mV]:24000  I[/mA]: 260  T[Grd.C]:+33     E: 0000  Noise    0


    STX         1 Bytes from Position: 1
    Delta_Y     2 Bytes from Position: 2
    Delta_X     2 Bytes from Position: 4
    CODE        4 Bytes from Position: 6
    Usum        2 Bytes from Position: 10
    Udif        2 Bytes from Position: 12
    Vcc         1 Bytes from Position: 14
    Current     1 Bytes from Position: 15
    Temp.       1 Bytes from Position: 16
    CodesRd     1 Bytes from Position: 17
    Rx-Freq     2 Bytes from Position: 18
    Tx-Freq     2 Bytes from Position: 20
    STATUS      2 Bytes from Position: 22




    (Q)uit Menue
```

To return to the menu *Serial Output*:

▶ Press any key.

Setting character delay time (3964R)/timeout-time (transparent)

The parameter *(C)har Delaytime* is the so-called character delay time for the procedure *3964R* (see 15.2 “Procedure 3964R” on page 92) and the timeout time for incoming characters for the procedure *transparent* (see 15.3 “Procedure transparent” on page 93).

Value range:

- 1 ... 220 ms

To set the character delay time or the timeout time:

▶ Press the key C and enter the desired value.

Setting the acknowledgment delay time

If you use the procedure *3964R*, youalso set the parameter *(A)ck-Delaytime*:

Value range:

- 1 ... 1680 ms

To adjust the acknowledgment delay time:

▶ Press the key A and enter the desired value.

Setting the output type

With the parameter *Conti(n)ous Telegrams* you determine whether data is sent permanently or only after a transponder has been detected:

Selection:

- 0 = Output only occurs when a transponder is decoded in the field
- 1 = The output is permanent according to the set (S)*erial Data Period*

To adjust the output type:

▶ Press the key [N] and enter the desired value.

Setting the interval of data transmission

If you have selected the output type *permanent (1)* you have to define the intervals of data transmission with the parameter *(S)erial Data Period*.

Value range:

- 4 ... 500 ms

To set the interval of data transmission:

▶ Make sure that the configured telegram can be transmitted at the selected baud rate in the set time (see Figure 23 on page 39).
▶ Press the key [S] and enter the desired value.

Freezing the telegram output

With the parameter *(F)reeze Values for n Telegrams* you can "freeze" the output of the Y-deviation for 0 to 10 telegrams, i.e. the values are retained at the time of the positioning pulse output.

Value range:

- 0 ... 10

In order to freeze the telegram output:

▶ Press the key [F] and enter the number of telegrams.

10.2.6 (T)ime & Code

In the *(T)ime & Code* menu, you set the values for the transponder decoding, the position calculation and the positioning pulse.

To switch from the main menu to the menu *(T)ime & Code*:

▶ Press the key [T].
The following menu is shown:

Figure 27 *Menu: (T)ime & Code*

```
S:0006  D:+006  D_X:+32767  D_Y:+32767   Code: 00000001  Read:  73: N:   0
Frx[/Hz]:66800  Ftx[/Hz]:127980
U[/mV]:24000  I[/mA]: 270  T[Grd.C]:+33     E: 0000  Noise    0



    (B)Level to Noise Error            [0..1000]:   1000
    (S)elect Code Channel                              S
    (H)igh-Nibble of RW-Code           [0..F,>F]:     10
    (N)umber of equal Codes              [0..15]:      1
    (T)hreshold for Decoding           [20.1023]:    256

    PosiPulse (a)fter Decoding                         1
    (L)evel for Positioning/Calculation [20.1023]:   256
    (P)osi-Pulse Time                    [n*1ms]:    100
    (O)ne Positioning Pulse per Crossing               0
    (X) Timed Positioning Pulse                        1
    (C)CODE_OK -> POSI_OUT                             1

    Th(r)eshold MAX-Detection          [10.1023]:    400


    (Q)uit Menue
```

Setting the threshold for generating the RX_NOISE bit

Use the *(B)Level to Noise Error* parameter to set the threshold mentioned in Table 33 on page 56 under *Noise* for generating the *RX_NOISE* bit in the system status word:

Value range:

- 0 ... 1000

To set the threshold for generating the RX_NOISE bit:

▶ Press the key B and enter the desired value.

Selection of the reception channel for code transmission

With the *(S)elect Code Channel* parameter, you define which of the two available reception channels is used for code transmission. As a rule, this is the reference channel S. However, it is also possible to select the positioning channel to minimize interference.

> i If you use the positioning channel, the code is dropped in the middle (at x ≈ 0) in a narrowly defined area! The error counter *N* and the noise counter increase, the bit *Noise* and *wrong Codeparity* in the system status are set.

Selection:

- S = The reference channel S is selected.
- P = The positioning channel D for minimization of interferences is selected.

To select the reception channel for code transmission:

▶ Press the key S and enter the desired value.

Checking the highest four bits for a preset value (0-F)

Since code transmission is only secured by simple parity checking, the following two security strategies have been implemented:

1. With the parameter *(H)igh-Nibble of RW-Code* you can check the highest four bits of RW transponders for a preset value (0-F). This value can be set here and must then also be programmed accordingly into the transponders together with the desired code. With entries greater than F, the check is switched off.

Value range:

- 0 ... F, > F

To check the highest four bits for a predefined value (0-F)::

▶ Press the key H and enter the desired value.

Set number of codes to be compared

2. The parameter *(N)umber of equal Codes* allows you to set the number of codes to be compared between 0 and 15. If you enter `0` each received code is output immediately, if you enter `1`, a received code is compared with the code received exactly before it, etc.

> **i** Note that this procedure reduces the maximum possible crossing speed, as the required transmission time will increase with (n+1) x 8 ms.

Value range:

- 0 ... 15

To define the number of codes to be compared:

▶ Press the key N and enter the desired value.

Setting the voltage for code decoding and position calculation

You can use the *(T)hreshold for Decoding* parameter to suppress decoding attempts if the signal is too weak, if necessary. You determine at which voltage S the code decoding starts and the position calculation is performed.

Value range:

- 20 ... 1023

To set the voltage for code decoding and position calculation:

▶ Press the key T and enter the desired value.

Enabling output of a positioning pulse after decoding

By setting the parameter *PosiPulse (a)fter Decoding* you enable the output of a positioning pulse only after the decoding of a transponder. This avoids faulty positioning pulses in an environment influenced by interference frequencies.

> **i** Note that this procedure reduces the maximum possible crossing speed, since the preset number of identical codes must have been read by the middle of the antenna.

Selection:

- 0 = The positioning pulse can be output independently of the code reading on center crossing. Positioning pulses can also be output if interference is present.
- 1 = The positioning pulse will is only enabled after decoding a transponder.

To activate the output of a positioning pulse after decoding:

▶ Press the key [A] and enter the desired value.

Setting the voltage for the positioning pulse output

The *(L)evel for Positioning/Calculation* parameter determines the voltage S at which the positioning pulse output is activated to suppress false outputs caused by antenna side lobes (see Figure 36 on page 83).

With the parameter *(L)evel for Positioning/Calculation* you determine from which voltage S the positioning pulse output is enabled to suppress false outputs due to antenna side lobes (see Figure 38 on page 87).

Value range:

- 20 ... 1023

To set the voltage for the positioning pulse output:

▶ Press the key [L] and enter the desired value.

Setting the duration of the positioning pulse

With the parameter *(P)osi-Pulse Time* you determine the duration of the positioning pulse in 1 ms intervals.

Value range

- n * 1 ms

To determine the duration of the positioning pulse:

▶ Press the key [P] and enter the desired value.

Setting the number of positioning pulses

With the parameter *(O)ne Positioning Pulse per Crossing* you define whether each crossing of the antenna center axis generates a positioning pulse (e.g. when moving back and forth directly over a transponder), or whether only one pulse is output per crossing of a transponder.

To release the positioning pulse again, the voltage S must then fall below the *Threshold for Calculation-Positioning* (see 10.2.5 “(S)erial Output” on page 57).

Selection:

- 0 = Several positioning pulses are output when the same transponder is passed over several times.
- 1 = Only one positioning pulse is output when the same transponder is passed over several times.

To select this function:

▶ Press the key O.

To deactivate this function again:

▶ Press the key O one more time.

Setting the switch-off behavior of the positioning pulse

With the parameter *(X) Timed Positioning Pulse* you can choose whether the corresponding bit of the positioning pulse in the system status is switched off after the time set with P or after the voltage S drops below the threshold set with L.

Selection:

- 0 = The positioning pulse switches off when the voltage S falls below the threshold defined in the *(L)evel for Positioning/Calculation* parameter.
- 1 = The positioning pulse switches off after the time defined in the *(P)osi Pulse Time* parameter.

To select this function:

▶ Press the key X.

To switch this function off again:

▶ Press the key X again.

Defining the behavior of the positioning pulse output

With the parameter (C)CODE_OK -> POSI_OUT you define the behavior of the PosiPulse output.

Selection:

- 0 = The CODE_OK-Bit is switched to the output.
- 1 = The positioning pulse is switched to the output.

To select this function:

▶ Press the key C.

To switch this function off again:

▶ Press the key C again.

Setting the threshold for the scan coils

With the parameter *Th(r)eshold MAX-Detection* you can set a threshold value for the scan coils that must be reached so that the transverse deviation in X and Y direction is calculated. For setting the thresholds, refer to chapter 8 on page 33.

Value range:

- 10 ... 1023

To set the threshold value for the scan coils:

▶ Press the button R and enter the desired value.

10.2.7 (F)requency & Antenna Tuning

Use the *(F)requency & Antenna Tuning* menu to enter the frequency for the antenna and tune it.

To switch from the main menu to the menu *(F)requency & Antenna Tuning*:

▶ Press the key F.
The following menu is shown:

Figure 28 *Menu: (F)requency & Antenna Tuning*

```
S:0006  D:+006  D_X:+32767  D_Y:+32767   Code: 00000001  Read:  73: N:   0
Frx[/Hz]:66800  Ftx[/Hz]:128000 Csel:1
U[/mV]:23100  I[/mA]: 530  T[Grd.C]:+24     E: 0002  Noise    0



    (R)x_Frequency [/Hz]:       1553000   ( 66750 Hz)

    A(u)to-Tune                      0
    (A)ntenna-Tuning [0..15,+,-]:    4
    switch (T)ransmitter:            1





    (Q)uit Menue
```

Setting the receive frequency

The receive frequency F_{rx} to be set is calculated with F_{ZF} = 455 kHz and the bandwidth B = 5.5 kHz according to the following equation:

Figure 29 *Equation: Calculation of the receive frequency for the upper and lower sidebands*

$$F_{rx} = 4 \times \left(F_{ZF} - 64\ \text{kHz} \pm \frac{B}{2}\right)$$

Since the transponder antenna is a device with single sideband reception, you must set 1553000 Hz for the lower sideband and 1575000 Hz for the upper sideband according to this equation (see chapter 8 on page 33).

Value range:

- 0 ... 1600000

Values between 0 and 1600000 are mainly important for internal test purposes. In practice, 1553000 Hz or 1575000 Hz have proven to be optimal.

To set the receive frequency:

▶ Press the button [R] and enter the desired value.

Activating Autotuning

With the parameter *A(u)totune* you activate autotuning. After activation, this function is immediately executed once. This process takes approx. 16 sec. After that, the transmitter circuit is also re-tuned after each power-on. Subsequently, the tuning is checked every 10 sec. during operation (if there is no transponder in the field) and retuned if necessary.

Selection:

- 0 = Auto tuning is deactivated.
- 1 = Auto tuning is activated.

To set auto tuning:

▶ Press the key [U] and enter the desired value.

Tuning the transmitting antenna

With the parameter *(A)ntenna tuning* you can tune the transmitting antenna by setting the current consumption to maximum. This will give you the greatest range.

Value range:

- 0 ... 15, +, -

To tune the transmitting antenna:

▶ Press the key [A].

▶ Enter a value or adjust the values using the keys [+] and [-].

Switch transmitter on/off for control purposes

With the parameter *switch (T)ransmitter* you can switch the transmitter on or off for control purposes. When leaving the monitor, the value is automatically set to 1.

Selection:

- 0 = The transmitter is switched off.
- 1 = The transmitter is switched on.

To switch the transmitter on or off for control purposes:

▶ Press the key [T] and enter the desired value.

10.2.8 Basic C(A)N-Parameters

In the *Basic C(A)N-Parameters* menu you can set the different parameters for the CAN bus.

To switch from the main menu to the menu Basic *C(A)N-Parameters* you have to:

▶ Press the key A.

The following menu is shown:

Figure 30 *Menu: C(A)N-Parameters*

```
SR = 63:        ACK ERROR   /      /      / EWRN /

    (!)Antenna-ID: front (01)
    (C)AN active                                YES
    (E)xtended CAN                         STANDARD
    (Y)dentifier:    TX  [0..2047]:              80
    (X)-Identifier:  TX  [0..2047]:              82
    (D)-Identifier:  TX  [0..2047]:              81
    (S)-Identifier:  TX  [0..2047]:               0

    CAN-(B)aud [20,50,125,250,500,1000 kB]:  250.0
        B(R)P Baudrate Prescaler [0..63]:         1
        S(J)W Sync Jump Width     [0..3]:         0
        Tseg(1)                  [2..15]:        15
        Tseg(2)                   [1..7]:         2  sp:  80 %

    (P)eriod                      [4.500mS]:      8
    Co(n)tinous Telegrams                         1
    CAN on Re(m)ote Request                       0
    (F)reeze Values for n Telegrams [0..20]:      0
    (O)rder of Data Transfer (0= HiByte first):  0

    (Q)uit Menue
```

Requirements:

✓ The CAN interface has to be activated in the *Basic C(A)N-Parameters* menu before you can use it.

To activate the CAN interface:

▶ Press the key C.

▶ Select the setting *YES* in the parameter *(C)AN active*.

The CAN interface is now active. The CANopen® interface is deactivated at the same time.

Display of the CAN status register

The CAN status register is output in the header of the Basic C(A)N parameter menu. The information can be used for a simple diagnosis.

i The parameters *(!)Antenna-ID:* and *(S)-Identifier:* refer to a special function not described here. For normal operation it is irrelevant how these values are set.

Selecting the frame for the telegram

With the parameter *(E)xtended CAN* you can generate telegrams as standard frames according to CAN 2.0A (11 bit value) or as extended frames according to CAN 2.0B (29 bit value).

Selection:

- STANDARD
- EXTENDED IDs

To select the frame for the telegram:

▶ Press the key E and enter the desired value:

Setting identifiers for message objects

- (Y)-Identifier: CAN address of the corresponding message object, see section 9.3.2.1 on page 46.
- (X)-Identifier: CAN address of the corresponding message object, see section 9.3.2.2 on page 47.
- (D)-Identifier: CAN address of the corresponding message object, see section 9.3.2.3 on page 47.
- (P)-Identifier: CAN address of the corresponding message object, see section 9.3.2.4 on page 47.
- (S)-Identifier: CAN address of the corresponding message object, see section 9.3.2.5 on page 47.

Value range:

- 0 ... 2047 for STANDARD
- 0... 536.870.911 for EXTENDED-IDs

By entering 0, the particular message object will be deactivated.

To enter the CAN addresses for the Message Objects:

▶ Press the keys Y, X, D, P or S and enter the respective CAN address.

Setting the CAN baud rate

You can either select a predefined data rate or adjust the bit timing. If you adjust the bit timing, the corresponding baud rate and sample point are always displayed.

i Normally the predefined baud rates are sufficient. Adjust the bit timings only if you are familiar with the timing of CAN controllers!

With the parameter *CAN-(B)aud* you select a predefined data rate.

Selection:

- 20, 50, 125, 250, 500, 1000 kB

To select a predefined baud rate:

▶ Press the key B and enter the desired value.

With the parameters *B(R)P Baudrate Prescaler*, *S(J)W Sync Jump Width*, *Tseg(1)* and *Tseg(2)* you can adjust the Bit timing.

Value ranges:

- *B(R)P Baudrate Prescaler*: 0 ... 63
- *S(J)W Sync Jump Width:* 0 ... 3
- *Tseg(1)*: 2 ... 15
- *Tseg(2)*: 1 ... 7

To adjust the Bit-Timing :

▶ Press the keys R, J, 1 or 2 and enter the desired value.

Setting the output behavior

With the parameter *(T)ime Period* you set how often a permanent output of the data should take place. The parameter *Co(n)tinous Telegrams* must be set to 1.

Value ranges:

- 4 ... 500 ms

To set the time between two data outputs:

▶ Press the key T and enter the desired value.

With the parameter *Co(n)tinous Telegrams* you set whether a permanent output takes place according to the time period set with T, or whether the output takes place when a transponder is decoded in the field.

Selection:

- 0 = The output occurs when a transponder is decoded in the field..
- 1 = The output is permanent.

To select this function:

▶ Press the key N.

To switch off this function again:

▶ Press the key N again.

Setting remote operation

The parameter *CAN on Re(m)ote Request* allows remote operation. In this case no telegrams will be generated independently from the setting of parameter *Continous Telegrams* but only remote frames with the corresponding address will be answered..

With the parameter *CAN on Re(m)ote Request* the remote operation is enabled. Independent of the setting of the parameter *Continous Telegrams* no telegrams are generated independently, but only remote frames with the corresponding address are answered.

Selction:

- 0 = Remote operation is switched off
- 1 = Enable remote operation

To select this function:

▶ Press the key M.

To switch this function off again:

▶ Press the key M again.

Freeze telegram output

With the parameter *(F)reeze Values for n Telegrams* you can "freeze" the output of the Y-deviation for 0 to 20 telegrams, i.e. the values are retained at the time of the positioning pulse output.

Value range:

- 0 ... 20

To freeze the telegram output:

▶ Press the key F and enter the number of messages.

Set byte order

With the parameter *(O)rder of Data Transfer* you select whether the highest byte is to be output first or last.

If you connect a Siemens PLC, this parameter must be set to 0 (HiByte first).

Selection:

- 0 = HiByte first
- 1 = LowByte first

To set the byte order:

▶ Press the key O and enter the desired value.

10.2.9 CA(N)-Open-Parameters

Use the menu *CA(N)-Open-Parameters* to adjust the different parameters for the CANopen®.

To switch from the main menu to the menu *CA(N)Open-Parameters*:

▶ Press the key N.
The following menu is shown:

Figure 31 *Menu: CA(N)-Open-Parameters*

```
CAN offline    :                  / int.Status: 8801  TxBuf: 20
SR = 60:        NO ERROR    /      /      / EWRN /

    (C)ANopen active                                    1
    (N)ode ID:                          [1..127]:       1
    CAN-(B)aud   [20,50,125,250,500,1000 kB]:       250.0

    (1) TPDO 1 mode                 [1..240,255]:     255
    (2) TPDO 1 Event time        [0,8..32000 ms]:       8
    (3) TPDO 1 Inhibit time      [0,8..32000 ms]:       0
    (4) TPDO 2 mode                 [1..240,255]:     255
    (5) TPDO 2 Event time        [0,8..32000 ms]:       8
    (6) TPDO 2 Inhibit time      [0,8..32000 ms]:       0
    (7) TPDO 3 mode                 [1..240,255]:     255
    (8) TPDO 3 Event time        [0,8..32000 ms]:       8
    (9) TPDO 3 Inhibit time      [0,8..32000 ms]:       0

    (H)eartbeat time            [0,10..32000 ms]:       0
    (A)utostart                                         1
    (F)reeze Values for n Telegrams    [0..20]:         0
    (O)rder of Data Transfer (0= HiByte first):         0


    (Q)uit Menue
```

Requirement:

✓ The CANopen® interface needs to be activated in the menu *CA(N)-Open-Parameters* before you can use it.

To activate the CANopen® interface:

▶ Press the button C.

▶ Select setting 1 in the *(C)ANopen active* parameter.

The CANopen® interface is then activated and the CAN interface is deactivated at the same time.

Display of the CAN status register

In the header of the *CA(N)-Open-Parameters* menu, the content of the CANopen® status register is output.

In addition, the status of the CANopen® interface is displayed: *CAN online* changes to *CAN offline* if, for example, the CANopen® interface is not connected or no CAN termination is installed.

Furthermore, the *CAN open node* states *stopped*, *preoperational* or *operational* are displayed.

The information can be used for simple diagnostics.

Select node address

With the parameter *(N)ode ID* you can set the node address.

Value range:

- 1 ... 127

To select the node address:

▶ Press the key N and enter the desired value.

Set CANopen® baud rate

With the parameter *CAN-(B)aud* you can select a pre-defined data rate.

Selection:

- 20, 50, 125, 250, 500, 1000 kB

To select a preset baudrate:

▶ Press the key B and enter the desired value.

> i Autobaud is not implemented. Deviating baud rates and sample points can be defined via the normal CAN menu (see 10.2.8 "Basic C(A)N-Parameters" on page 68).

Setting the operating states of the PDOs

With the parameters *(1) TPDO 1 mode*, *(4) TPDO 2 mode* and *(7) TPDO 3 mode* you can set the operating state of the respective PDOs.

- In PDO_1 the system status and the calculated distances are transmitted.
- In PDO_2 and PDO_3 the four analog antenna voltages are transmitted.

Value range:

- 1 ... 240, 255

To select the synchronous, cyclic mode:

▶ Press the keys 1, 4 or 7 and enter a value between 1 and 240.

To select the asynchronous mode:

▶ Press the keys 1, 4 or 7 and enter the value 255.

Parameters in asynchronous mode

The parameters *(2), (5)* and *(8) TPDO ... Event time* and (3), (6) and (9) *TPDO ... Inhibit time* are only available in asynchronous mode.

> i If both the *Event time* and the *Inhibit time* are set to 0, the respective PDO will not be transmitted.

(2), (5) and (8) *TPDO ... Event time* is the cycle time of the PDO transmission.

Value range:

- 0
- 8 ... 32000 ms

To specify the cycle time of the PDO transmission:

▶ Press the keys 2, 5 or 8 and enter the desired values.

With the parameters (3), (6) and (9) *TPDO ... Inhibit time* you can adjust the inhibit time of the respective PDO. The inhibit time is the shortest time interval between two periods that can be achieved..

Value range:

- 0
- 8 ... 32000 ms

To specify the inhibit time of the PDO transmission:

▶ Press the keys 3, 6 or 9 and enter the desired value.

Sending a control message (heartbeat)

With the parameter *(H)eartbeat time* you can change the so-called heartbeat time. A control message is then sent cyclically.

If you set the time to 0, no message will be transmitted and Node Guarding will be activated (see 9.3.3.3 “Node-Guarding” on page 50).

Value range

- 0
- 10 ... 32000 ms

To send a control message:

▶ Press the key H and enter the desired value.

(D)eactivate Autostart

With the parameter *(A)utostart* you can (de)activate the autostart.

Selection:

- 0 = Autostart is deactivated. After power-on only the heartbeat message will be transmitted (if it is activated). The antenna changes to mode *preoperational*.
- 1 = Autostart is activated. After power-on the heartbeat-message (if it is activated) and the PDOs will be transmitted. The antenna changes to mode *operational*.

To (de)activate Autostart:

▶ Press the key A and enter the desired value.

Freeze telegram output

With the parameter *(F)reeze Values for n Telegrams* you can "freeze" the output of the Y-deviation for 0 to 20 telegrams, i.e. the values are retained at the time of the positioning pulse output.

Value range:

- 0 ... 20

To freeze the telegram output:

▶ Press the button F and enter the number of telegrams.

Set byte order

With the parameter *(O)rder of Data Transfer* you select whether the highest byte is to be output first or last.

- 0 = HiByte first
- 1 = LowByte first

To set the byte order:

▶ Press the key O and enter the desired value.

10.2.10 (D)isplay Systemstatus

In the menu *(D)isplay Systemstatus*, you can output the value of the status bit (see Table 11 on page 40). All status values that are set are displayed. As soon as a value is reset, it is hidden again.

To switch from the main menu to the menu *(D)isplay Systemstatus*:

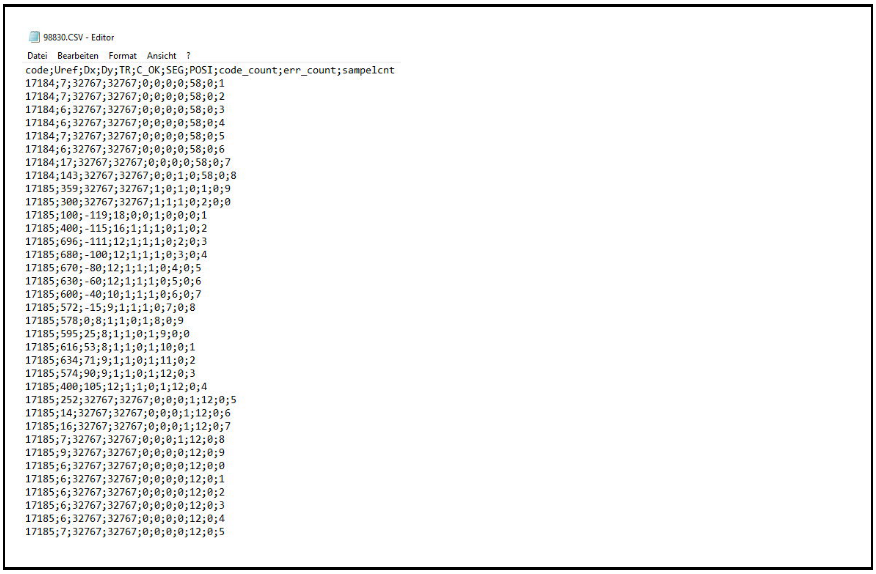
▶ Press the key D.

To exit the display:

▶ Press the key Q.
The main menu is shown.

10.2.11 Cs(v)

Figure 32 *Example of a CSV text file*



```
98830.CSV - Editor
Datei  Bearbeiten  Format  Ansicht  ?
code;Uref;Dx;Dy;TR;C_OK;SEG;POSI;code_count;err_count;sampelcnt
17184;7;32767;32767;0;0;0;0;58;0;1
17184;7;32767;32767;0;0;0;0;58;0;2
17184;6;32767;32767;0;0;0;0;58;0;3
17184;6;32767;32767;0;0;0;0;58;0;4
17184;7;32767;32767;0;0;0;0;58;0;5
17184;6;32767;32767;0;0;0;0;58;0;6
17184;17;32767;32767;0;0;0;0;58;0;7
17184;143;32767;32767;0;0;1;0;58;0;8
17185;359;32767;32767;1;0;1;0;1;0;9
17185;300;32767;32767;1;1;1;0;2;0;0
17185;100;-119;18;0;0;1;0;0;0;1
17185;400;-115;16;1;1;1;0;1;0;2
17185;696;-111;12;1;1;1;0;2;0;3
17185;680;-100;12;1;1;1;0;3;0;4
17185;670;-80;12;1;1;1;0;4;0;5
17185;630;-60;12;1;1;1;0;5;0;6
17185;600;-40;10;1;1;1;0;6;0;7
17185;572;-15;9;1;1;1;0;7;0;8
17185;578;0;8;1;1;0;1;8;0;9
17185;595;25;8;1;1;0;1;9;0;0
17185;616;53;8;1;1;0;1;10;0;1
17185;634;71;9;1;1;0;1;11;0;2
17185;574;90;9;1;1;0;1;12;0;3
17185;400;105;12;1;1;0;1;12;0;4
17185;252;32767;32767;0;0;0;1;12;0;5
17185;14;32767;32767;0;0;0;1;12;0;6
17185;16;32767;32767;0;0;0;1;12;0;7
17185;7;32767;32767;0;0;0;1;12;0;8
17185;9;32767;32767;0;0;0;0;12;0;9
17185;6;32767;32767;0;0;0;0;12;0;0
17185;6;32767;32767;0;0;0;0;12;0;1
17185;6;32767;32767;0;0;0;0;12;0;2
17185;6;32767;32767;0;0;0;0;12;0;3
17185;6;32767;32767;0;0;0;0;12;0;4
17185;7;32767;32767;0;0;0;0;12;0;5
```

For diagnostic purposes, you can output the following values in CSV format to read them into spreadsheets, for example:

- `Code`
- $U_{Reference}$
- `X-, Y-DEVIATION`
- the states of `Transponder in the field` (see Table 11 on page 40)

- `CODE_OK` (see Table 11 on page 40)
- `SEGMENT-` (see Table 11 on page 40)
- `POSIPULSE` (see Table 11 on page 40)
- Number of code readings
- Number of false readings
- A telegram counter

The output is at 38.400 Baud, 8 Bit and even parity.

To switch from the main menu to the menu *Cs(v)*:

▶ Press the key [V].

You can save the CSV output e.g. with the help of the monitor program. Use e. g. Tera Term for this purpose, for example. You then proceed as follows:

▶ Choose *Log* in the menu *File* and enter a file name.
▶ Save the file with the extension `.csv`, so that the spreadsheet can automatically identify the file later.
▶ You can now start the CSV output by pressing any key.

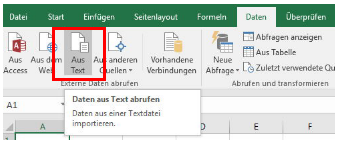
To end the output:

▶ Press the key [A].
Depending on which mode was stored, a system reset is triggered and the antenna is back in the default state with the saved parameters.

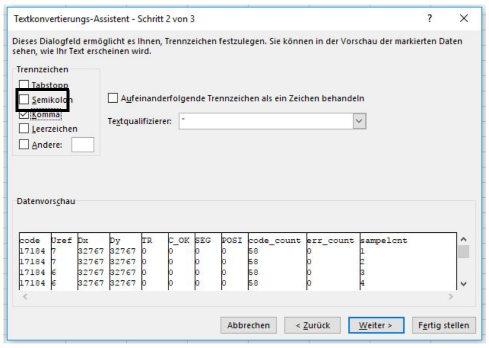
After the file is recorded and closed Tera Term (via *File –> Stop Logging*):

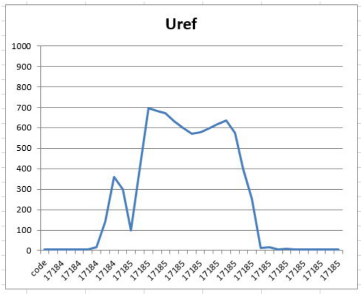
▶ Open the CSV file in a spreadsheet (e.g. Microsoft® Excel®, OpenOffice® Calc®, ...)
You can now format the data in chart form (see Figure 33) or save them as native spreadsheet file for further distribution.

Figure 33 *Importing CSV data into a spreadsheet (using Excel® as an example)*



Open the CSV file in Excel by double-clicking or insert it into an empty table via „Data –> From Text".





Run through the text conversion wizards and specify in step 2 that the data are separated by commas.

Select the 1st column "Code" as X value and the 2nd column "Uref" as Y value and create a line chart.

10.2.12 (Y) display Histogram

In the *(Y) display Histogram* menu, the voltages induced by a transponder in the scan coils are displayed for the X and Y directions.

To switch from the main menu to the menu *(Y) display Histogram*:

- ▶ Press the key Y.

  The following menu is shown:

Figure 34 *Menu: (Y) display Histogram*

```
Y_Histogram, press any key to return


           dev. Y                                  dev. X
    >1000:................                  >1000:................
    > 900:................                  > 900:................
    > 800:................                  > 800:................
    > 700:................                  > 700:................
    > 600:................                  > 600:................
    > 500:................                  > 500:................
    > 400:........oo......                  > 400:........ooo.....
    > 300:......oOOOOo....                  > 300:......oOOOOo....
    > 200:.....OOOOOOOO...                  > 200:......OOOOOOo...
    > 100:....oOOOOOOOO...                  > 100:.....OOOOOOOOo..
          ---+---+---+---+                        ---+---+---+---+
          1  4   8  12  16                        1  4   8  12  16
              <<<<|>>>>                               <<<<|>>>>>
         0      27      34:     34               0      25      31:     31
```

The channel numbers are shown on the horizontal axis, each column representing a coil. On the vertical axis, the dimensionless received strength is shown. A voltage is represented by a bar of "O"s. The values have already been converted with the correction values.

Directly below the axis label, the symbols <<<<|>>>> indicate which values are used for the respective distance calculation.

Below this line, the calculated distance with minimum value, instantaneous value, maximum value and the maximum difference between minimum and maximum value is displayed in [mm].

To exit the menu:

- ▶ Press any key.
  The main menu is shown.

10.2.13 (W)rite Transponder

The *(W)rite Transponder* menu allows you to program transponders in the antenna field (at nominal reading distance).

> **i** Optionally, you can program transponders using the corresponding system command (see Table 12 on page 41 and Table 22 on page 48).

To switch from the main menu to the menu *(W)rite Transponder*:

- ▶ Press the key W.

To program a transponder.

- ▶ Enter the 5-digit code in hexadecimal format.
- ▶ Start the programming with Enter.

10.2.14 (L)oad values to EEProm

With the menu *(L)oad values to EEProm* you store the parameters in the non-volatile memory.

To switch from the main menu to the menu *(L)oad values to EEProm* menu:

- ▶ Press the key L.

To save the parameters permanently.

- ▶ Enter the password 815.
- ▶ Confirm the password with Enter.

10.2.15 (U)pdate Firmware

In the menu *(U)pdate Firmware* you can perform a software update without disconnecting and reconnecting the supply voltage of the device.

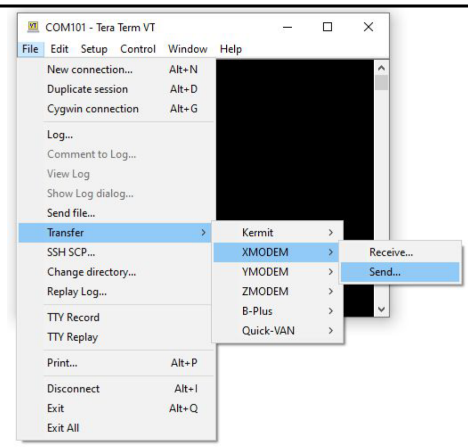
- ▶ Start the firmware update with U.
- ▶ Enter the password *0815* when prompted.
  The localization sensor starts in bootloader mode. The following menu is shown:

Figure 35 *Screenshot: Bootloader menu*

```
Bootloader
1: Upload FW via XMODEM
2: Jump to Application
```

- ▶ Select 1 (Upload FW via XMODEM).
- ▶ Go to the following function in TeraTerm:

Figure 36 *Screenshot: Tera Term –> Transfer –> XMODEM –> SEND*



- ▶ Select the .bin file with the new firmware.

  The file is transferred and the new firmware is loaded into the localization sensor. During the transmission Tara Term shows a progress indicator.

- ▶ After the transfer, the localization sensor starts with the monitor program. In case the bootloader is displayed again, start the monitor program with 2 (Jump to Application). Check in the main menu that the new firmware version is displayed in the status line.

  The firmware update is completed.

10.2.15.1 P(r)int Parameters

Enables writing the system parameters into a file with the terminal program.

10.2.15.2 (1) Import User Parameter from Host to Antenna / (2) Export User Parameter from Antenna to Host

It is possible to store or load all user parameters on or from a host PC via XMO-DEM file transfer protocol:

- With 1 you can import a parameter file from a host. After pressing that key you should start an XMODEM file transfer within 50 seconds. When using Tara Term go to *File* > *Transfer* > *XMODEM* > *Send* ... If the message `Success` is displayed the file has been checked and loaded into the parameter RAM. To preserve the loaded values you should transfer them into the EEPROM (see 10.2.14 on page 78).

- With 2 you can export user parameters to a host. After pressing that key you should start an XMODEM file transfer. When using Tara Term go to *File* > *Transfer* > *XMODEM* > *Receive* ... and then specify a file name. The file is transferred and the message `Success` should be displayed.

11 Maintenance

The system is largely maintenance-free. The maintenance is limited to

- the visual inspection of the antennas (tight fit of all screws, cables and plugs properly fastened).
- cleaning the antenna if it is dirty.

To check the functionality of the antennas, you must regularly check the current consumption and the voltage supply.

▶ To do so, please use the values in the menus of the monitor program.

For keeping the antenna software up to date:

▶ Check date and version of the current antenna software in the main menu (see 10.2.1 “Main Menu” on page 55).

▶ If necessary update the operating software (see 10.2.15 “(U)pdate Firmware” on page 78 and “Update the Antenna Software” on page 82).

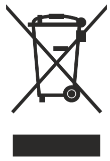
i New firmware files are available by e-mail on request.

12 Disposal

- Dispose of the transponder antenna in accordance with the legal requirements of your country.

For EU countries only:

- Do not dispose of the transponder antenna in household waste. Collect used electrical equipment separately in compliance with European Directive 2012/19/EU on Waste Electrical and Electronic Equipment and recycle it in an environmentally friendly manner via a local recycling company



13 Troubleshooting

In the following you will find a tabular list of possible errors. A possible cause is given for each error in the second column. In the third column, you will find instructions on how to narrow down the error and, ideally, how to correct it.

If you could not correct the error that occurred using the error table:

▶ Please contact Götting. You will find the address on the back of this manual.

13.1 Error table

Table 34 *Error table*

Error	Possible Causes	Possible Diagnosis/Remedy
No system function No serial output, although there is a transponder within the detection range	Voltage supply too low	Measure the input voltage as close as possible to the M12 screw terminals.
No contact possible; incomprehensible characters are sent	Missing signal ground	Check the corresponding connections. Connect the signal grounds if necessary.
	Wrong transmission procedure selected.	
	Wrong transmission parameters set.	Select only 19200 or 38400 Baud, 8 Bit, even parity.
	Wrong transmission parameters set.	Set the correct procedure etc. using your PC and the monitor program
Output values not reproducible, lack of accuracy	Interference frequencies	Refer to 13.2 “Reducing Interferences” on page 84
Transponders are read unreliably / positioning pulses unreliable	Interference frequencies	Refer to 13.2 “Reducing Interferences” on page 84
	The corresponding positioning thresholds (see also Figure 27 “Menu: (T)ime & Code” on page 62) are not properly adjusted.	Perform commissioning as described in chapter 8 on page 33
	Calibration failed.	Carry out the calibration of the transmitting antenna (see 10.2.7 “(F)requency & Antenna Tuning” on page 66).
	Reinforcements in the floor that form loops and affect the signal	Refer to 7.1.1 “Operating Conditions for Transponders” on page 24.
Set values are not retained after antenna restart	Modified values are not transferred to the EEProm.	Save values permanently as described in 10.2.14 “(L)oad values to EEProm” on page 78.

13.2 Reducing Interferences

NOTICE

Changes of the antenna parameters can detune the antenna!

The following modifications to the antenna parameters can detune the antenna to such an extent that a normal function is no longer possible.

▶ Save the transponder antenna configuration before each change so that you can restore it if necessary (see 10.2.15.2 “(1) Import User Parameter from Host to Antenna / (2) Export User Parameter from Antenna to Host” on page 79).

13.2.1 Which Interfering Influences are There?

If the values measured with the antenna are unreliable and/or inaccurate, the following interferences may be the reason, for example:

- Metallic objects
- Electrical loops
- Interference frequencies in the range of 64 ±4 kHz
- Interference voltages due to current-carrying lines laid too close together (exception: supply line of the antenna itself).
- Transmission of interference via the metallic floor of a vehicle.

To detect such interference and either eliminate it or reduce its influence, proceed as follows:

▶ Always try to avoid external interference first by observing the operating conditions specified in this manual.

▶ Only then re-adjust the positioning thresholds.

The adjustable thresholds are defined in sections 10.2.6 “(T)ime & Code” on page 61 and 10.2.7 “(F)requency & Antenna Tuning” on page 66.

In order to tune the antenna so that it reads the transponders correctly, but is not affected by interference on the entire driving course as far as possible, we recommend adjusting the following values:

- *Level to Noise Error*
- *Threshold for Decoding*
- *Level for Positioning/Calculation*

13.2.2 What happens when Crossing a Transponder?

To illustrate the meaning of the individual threshold values and their correct setting, the process during a transponder crossing is described below.

- Every 2 ms a check is made whether the reference voltage exceeds the limit *Threshold for Decoding*.
  If that is the case, the Bit *TRANS_IN_FIELD* is set and the *NOISE* counter is incremented.

- An attempt is made to read a code every 8 ms.
  If the code was read successfully, the *NOISE* counter is reset and then the sum of codes defined in *Number of equal Codes* is compared.
  If this test was successful, the *CODE_OK* bit is set.
- As soon as the *NOISE* counter exceeds the *Level to Noise Error* limit, the *RX_NOISE* bit is set. This means that noise signals hinder the decoding of codes.
- The *CODE_OK* bit is held until either the reference voltage falls below the *Threshold for Decoding* or the *RX_NOISE* bit is set.
- A new transponder code can only be read again when the *CODE_OK* bit has been reset.

This means, for example, that in the event of strong interference voltages in the 64 kHz range, the antenna will not read in a new transponder for 2 ms x *Level to Noise Error* even after the transponder has left the reception range. If another transponder enters the reception range during this time, the *NOISE* counter is automatically reset, but the previously stored code is retained.

13.2.3 Setting Positioning Thresholds

Requirements:

For the exact setting of the positioning thresholds, you must comply with the following conditions.

- ✓ It must be possible to drive the vehicle on the installation or on a test installation that is as similar as possible.
- ✓ The vehicle must be positioned at the nominal reading distance above an installed transponder.
- ✓ For an entire driving course, you must log a complete drive over the facility.

For setting the positioning thresholds you can use the serial interface of the antenna (see 9.2 “All Variants: Serial Interface (RS232)” on page 38) or the CAN-Bus Message Object 3 (see Table 20 on page 47). Using CANopen® you can adjust the parameters under Index 2000.

The following questions will help you set the positioning thresholds:

- What signal strength does not yet trigger the detection of a transponder?
- At what point is a transponder read?

To set the positioning thresholds and to detect interferences, proceed as follows:

- ▶ Connect the serial interface of the transponder antenna to a PC as described in chapter 9 on page 38 and start a monitor program on the PC to establish a connection with the antenna software.
- ▶ Place a transponder under the antenna.
  In the status line of the monitor program, the voltage S must increase significantly. The code must be recognized immediately and the number of readings must count up steadily to 255.
- ▶ Remove the transponder from under the antenna.
  If there is no transponder in the field, the voltage S must drop to very small

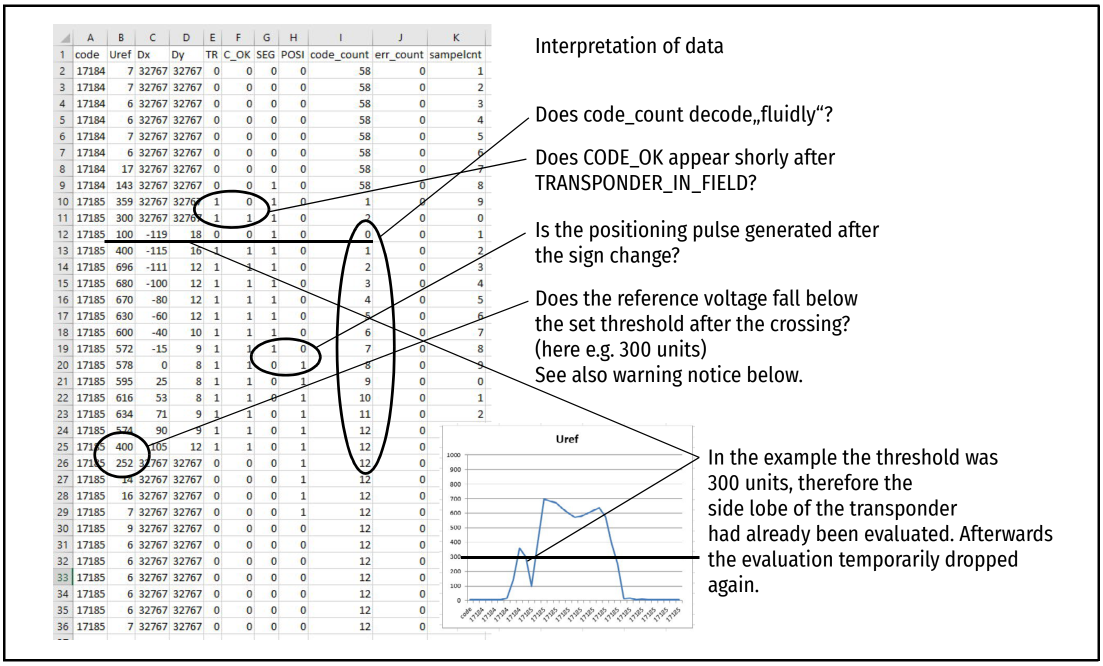
values. The code display and any display of the number of readings remain. If this is not the case, interference is induced in the frequency range of 64 kHz. In some cases the critical frequency range can be bypassed by changing the sideband (see 10.2.7 “(F)requency & Antenna Tuning” on page 66).

> **i** If you want to adjust the antenna to environmental influences, you can try to readjust the positioning thresholds and tune the current consumption of the antenna to a maximum or activate the Autotune function (see 10.2.7 “(F)requency & Antenna Tuning” on page 66).

- ▶ For the time being, adjust the positioning thresholds so that a signal that is up to 50% weaker would still trigger a positioning pulse (see Figure 39 on page 87).

A normal transponder crossing, recorded as a CSV file, results in the following table in e.g. Excel®.

Figure 37 *Transponder reading as CSV-file imported into Excel with comments*



	A	B	C	D	E	F	G	H	I	J	K
1	code	Uref	Dx	Dy	TR	C_OK	SEG	POSI	code_count	err_count	sampelcnt
2	17184	7	32767	32767	0	0	0	0	58	0	1
3	17184	7	32767	32767	0	0	0	0	58	0	2
4	17184	6	32767	32767	0	0	0	0	58	0	3
5	17184	6	32767	32767	0	0	0	0	58	0	4
6	17184	7	32767	32767	0	0	0	0	58	0	5
7	17184	6	32767	32767	0	0	0	0	58	0	6
8	17184	17	32767	32767	0	0	0	0	58	0	7
9	17184	143	32767	32767	0	0	1	0	58	0	8
10	17185	359	32767	32767	1	0	1	0	1	0	9
11	17185	300	32767	32767	1	1	1	0	2	0	0
12	17185	100	-119	18	0	0	1	0	0	0	1
13	17185	400	-115	16	1	1	1	0	1	0	2
14	17185	696	-111	12	1	1	1	0	2	0	3
15	17185	680	-100	12	1	1	1	0	3	0	4
16	17185	670	-80	12	1	1	1	0	4	0	5
17	17185	630	-60	12	1	1	1	0	5	0	6
18	17185	600	-40	10	1	1	1	0	6	0	7
19	17185	572	-15	9	1	1	1	0	7	0	8
20	17185	578	0	8	1	1	0	1	8	0	9
21	17185	595	25	8	1	1	0	1	9	0	0
22	17185	616	53	8	1	1	0	1	10	0	1
23	17185	634	71	9	1	1	0	1	11	0	2
24	17185	574	90	9	1	1	0	1	12	0	
25	17185	400	105	12	1	1	0	1	12	0	
26	17185	252	32767	32767	0	0	0	1	12	0	
27	17185	14	32767	32767	0	0	0	1	12	0	
28	17185	16	32767	32767	0	0	0	1	12	0	
29	17185	7	32767	32767	0	0	0	1	12	0	
30	17185	9	32767	32767	0	0	0	0	12	0	
31	17185	6	32767	32767	0	0	0	0	12	0	
32	17185	6	32767	32767	0	0	0	0	12	0	
33	17185	6	32767	32767	0	0	0	0	12	0	
34	17185	6	32767	32767	0	0	0	0	12	0	
35	17185	6	32767	32767	0	0	0	0	12	0	
36	17185	7	32767	32767	0	0	0	0	12	0	

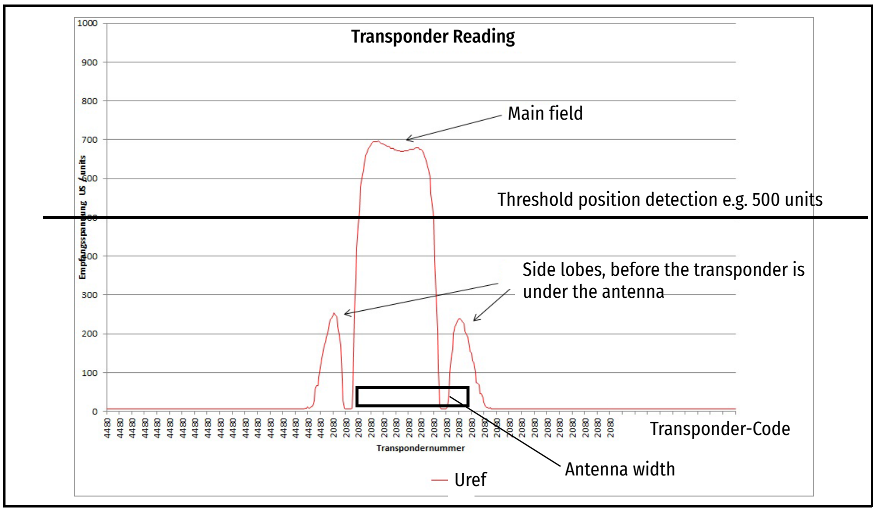
NOTICE

Transponder signal is not output!

A new transponder is only read if the reference voltage falls below the set threshold once! If the positioning thresholds are set too low, the antenna may receive new transponder signals but not output them.

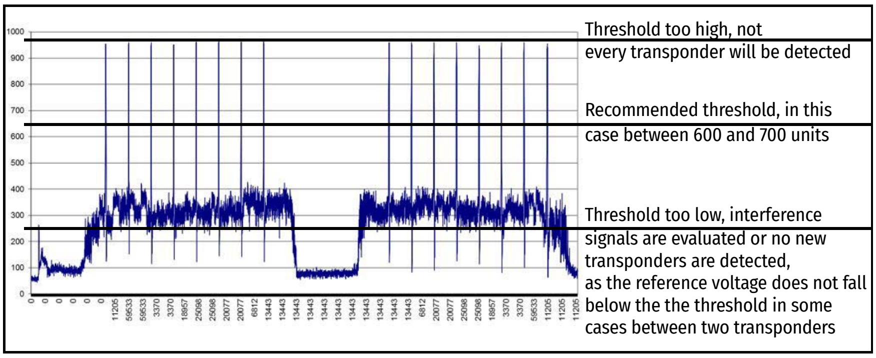
- ▶ Set the positioning thresholds on the basis of the recorded values in such a way that reliable position detection is possible, but no faulty triggering occurs due to transponder side lobes that always occur.
- ▶ To do this, select approximately half the distance between interference pulses (such as side lobes, see Figure 38 on page 87) and the peak value for read transponders, so that reserves are available in both directions.

Figure 38 *Positioning threshold for a normal transponder reading with side lobes*



For the complete installation, values must be found that take all transponders into account.

Figure 39 *Test drive over several transponders*



14 Technical Data

14.1 General Technical Data

Table 35 *General Technical Data Antenna HG G-98830YB/HG G-98835YB (part 1 of 2)*

Antenna HG G-98830YB/HG G-98835YB	
Work safety	according to BGV B11 area 1
Housing	see Figure 40 on page 90
Weight	approx. 8 kg
Effective antenna range	220 x 220 mm (functional range position detection)
Operating temperature	0 °C to +50 °C
Storage temperature	-20 °C to +60 °C
Mechanical load capacity	5 g 11 ms / 2 g 10 to 55 Hz
Protection class	IP 64
Relative humidity	95% at 25 °C (without condensation)
Metal- and interference-free area	see 2.4 “General Safety Instructions” on page 14
Max. crossing speed	4 m/s
Reading distance (distance transponder – underside reading antenna)	– 20 to 60 mm (with HW DEV00095/HW DEV00098) – 40 to 80 mm (with HG G-71325XA)
Nominal reading distance	50 mm
Static positioning accuracy	1σ = 1 mm at nominal reading distance within ±90 mm around antenna centre with HG G-71325XA/HW DEV00095 (see 15.1 “Signal Strength and Accuracy of Position Calculation” on page 91)
Supply Voltage	18 to 36 V
Current consumption	– aprox. 300 mA at 24 V – up to 1 A current consumption during programming of transponders
Transmission/receive frequency	– The antenna transmits its energy field at 128 kHz – The transponders respond with half the transmission frequency, 64 kHz
Connection	3 M12 connectors: – All variants: POWER (5 pin, A coded, male) – Variant HG G-98830: CAN 1 (5 pin, A coded, female) | CAN 2 (5 pin, A coded, male) – Variant HG G-98835: PROFINET 1 | PROFINET 2 (4 pin, D coded, female)
Signal processing time	8 ms
Output RS232	Output is done with 19200 or 38400 Baud. The telegram content is configurable. Protocol *3964R* or *transparent*

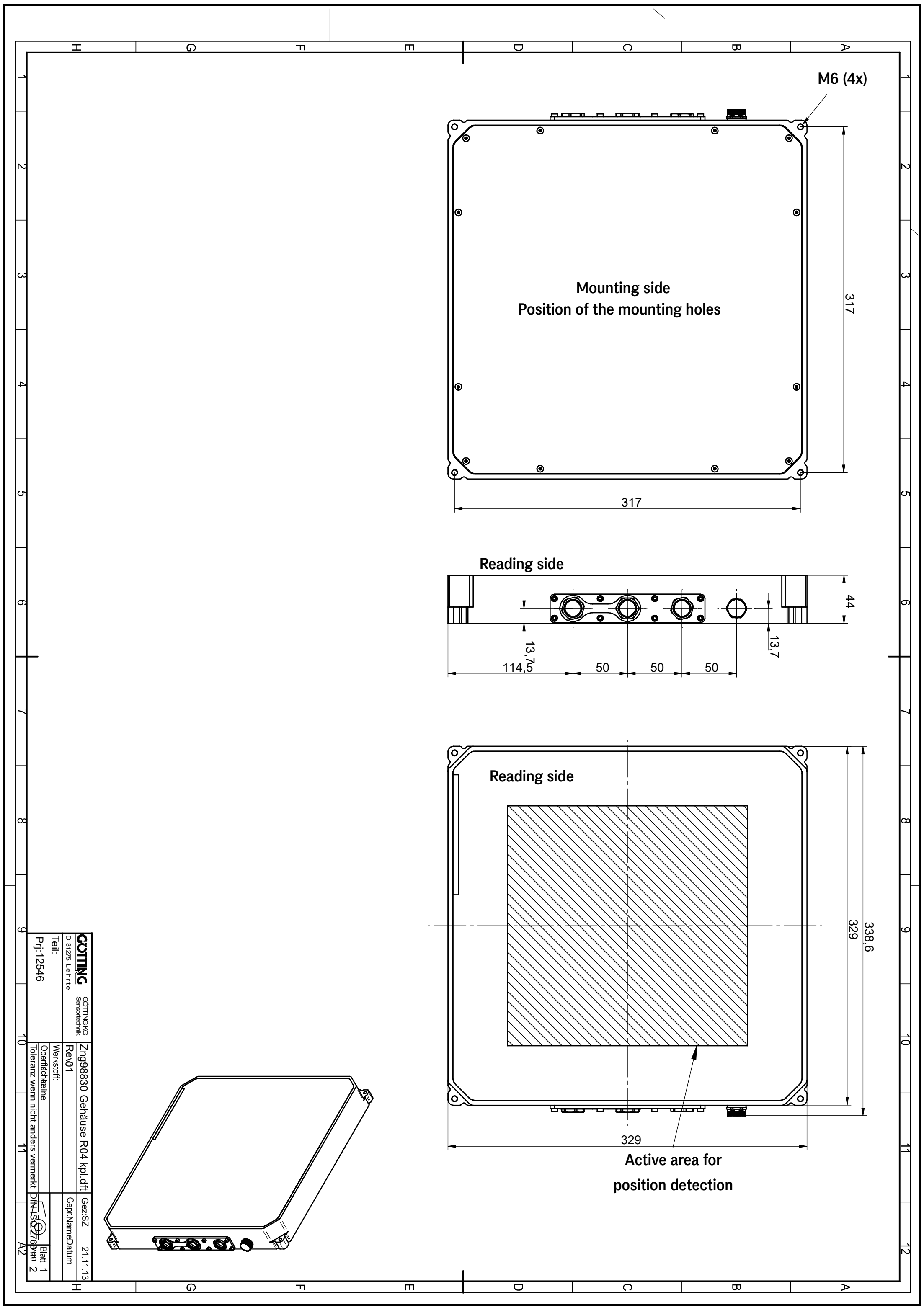
GÖTTING

Table 35 *General Technical Data Antenna HG G-98830YB/HG G-98835YB (part 2 of 2)*

Antenna HG G-98830YB/HG G-98835YB	
Output positioning pulse	24 V / 20-mA-current source, not potentially separated
Variant HG G-98830: CAN interface	– not potentially separated Terminating resistor (Terminator) not integrated Full CAN – Basic CAN: According to ISO/DIS 11898 Identifier, Data rate, Standard/Extended Frames; adjustable via serial interface – CANopen®: Device Profil DS 401, Node ID and data rate adjustable via serial interface or SDOs
Variant HG G-98835: PROFINET® interface	With integrated switch

14.2 Scale Drawing of the Antenna with Dimensions

Figure 40 *Scale drawing of the antenna with dimensions*



15 Appendix

15.1 Signal Strength and Accuracy of Position Calculation

Figure 41 *Signal strength of reference voltage in X and Y direction with Transponder HW DEV00095 on the respective center axes*

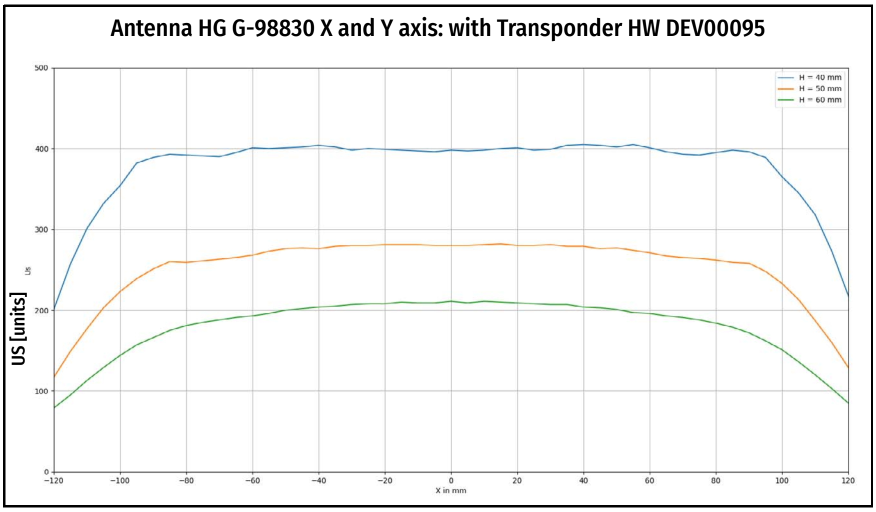


Figure 42 *Typical accuracy of the distance calculation in X direction (driving direction) with Transponder HW DEV00095*

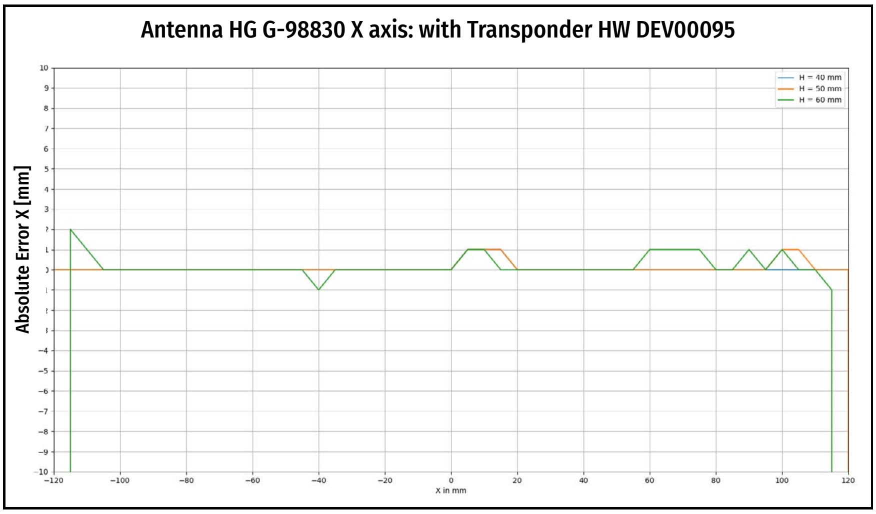
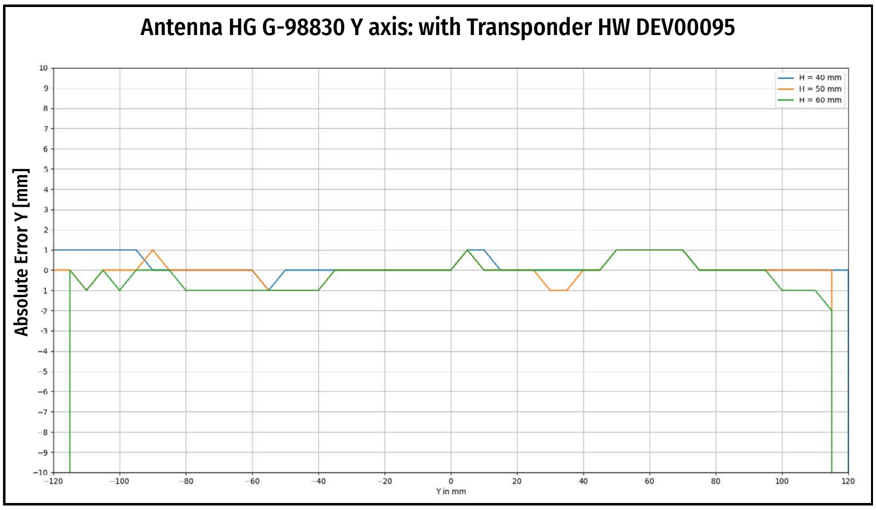


Figure 43 *Typical accuracy of the deviation calculation in Y direction (transverse to the direction of travel) with Transponder HW DEV00095*



15.2 Procedure 3964R

For the connection antenna <–> PLC you can use the 3964R protocol. Since the data output from the antenna is cyclic, there are some simplifications when implementing the 3964R procedure. In the following the procedure is described by state diagrams.

You must observe the following settings for data transmission:

- Transponder system has low priority
- The data transmission has the setting 1 start bit, 8 data bits, parity even, 1 stop bit, baud rate 38400 baud (default) or 19200 baud.

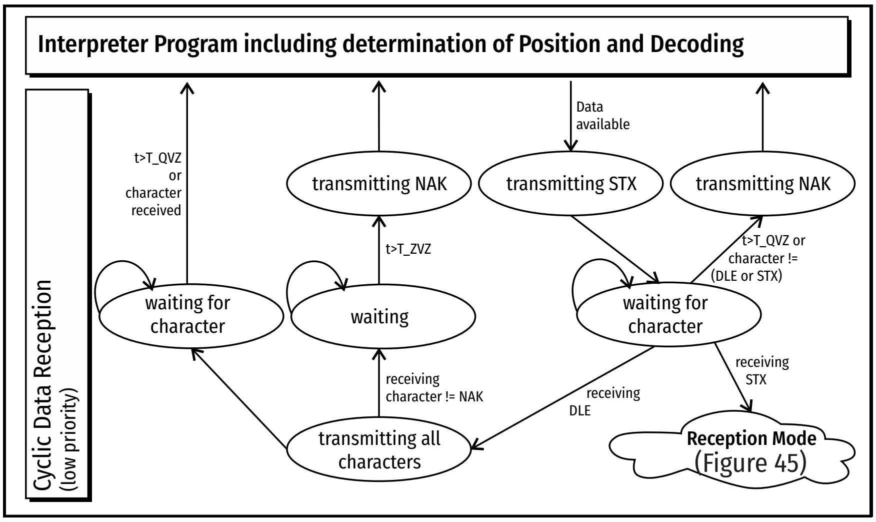
15.2.1 Data Direction Antenna –> PLC

Antenna data are transmitted cyclically from the antenna to the PLC. The data record always starts with an "=" character (hex 0x3d). The cycle time can be parameterized, it must last an integer part - or a multiple of it - of the transponder code transmission. In this system the transponder code transmission time is 8 ms. The minimum cycle time results from the telegram duration and thus depends on the baud rate and the selected telegram content.

Meaning in the state diagrams:

- **T_ZVZ** stands for the programmable character delay time and
- **T_QVZ** for the programmable acknowledgment delay time.

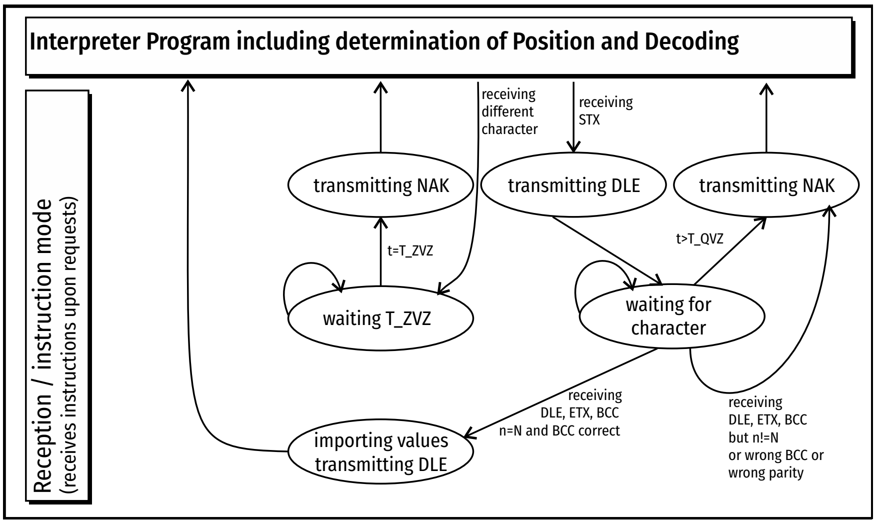
Figure 44 *State diagram procedure 3964R; Antenna –> PLC*



15.2.2 Data Direction PLC –> Antenna

Commands are transmitted from the PLC to the antenna only when required. At present the command to start the monitor is implemented (see 9.2.2 "List of System Commands" on page 41). So that these commands can prevail over the frequent cyclic data output of the antenna, the 3964R procedure of the antenna has a low priority (see Figure 44).

Figure 45 *State diagram procedure 3964R; PLC –> Antenna*



15.3 Procedure transparent

For the connection antenna <—> PLC you can also us the *transparent* protocol.

You must observe the following settings for data transmission:

- 1 start bit, 8 data bits, parity even, 1 stop bit, baud rate 38400 baud (default) or 19200 Baud.

15.3.1 Data Direction Antenna –> PLC

Antenna data is transmitted cyclically from the antenna to the PLC. The cycle time can be parameterized, it must last an integer part – or a multiple of it – of the transponder code transmission. The minimum cycle time results from the telegram duration and thus depends on the baud rate and the selected telegram content.

The data record always starts with an "=" character (hex 0x3d). This is followed by the parameters selected in the corresponding menu. The telegram is terminated with an 8 bit check character over all characters (incl. start character). For the check character, all characters are exclusively processed. The characters are sent without delay.

15.3.2 Data Direction PLC –> Antenna

Commands are transmitted from the PLC to the antenna as required. Each command must start with an "=" character (hex 0x3d). The command format is described in 9.2.2 “List of System Commands” on page 41. The telegram must be terminated with an 8-bit check character over all characters (incl. start character). The characters must be received within the parameterizable character delay time. Otherwise the telegram is discarded.

15.4 Overview of the CANopen® Directory

All objects of the antenna are listed in the CANopen® Object Index. Each entry is a 16-bit index. Sub components are mapped by an 8-bit subindex. RO indicates entries that are read only.

- Communication parameters are marked by a C.
- Manufacture parameters are marked by an M.

The object directory is divided into the following sections:

15.4.1 Communication Specific Entries within the Range of 0x1000 to 0x1FFF

Table 36 *Overview CANopen® object directory I (part 1 of 2)*

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	Device Name	
0x1009	0	RO	Hardware Version	
0x100A	0	RO	Software Version	
0x1010	0	RO	Number of entries of Store 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	
	3	RW	Restore Default Manufacture Parameter	

Table 36 *Overview CANopen® object directory I (part 2 of 2)*

Index	Subindex	Access	Content	EEProm
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	
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
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
0x1802	0	RO	Number of entries of Transmit PDO_3	
	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	
0x1A02	0	RO	Number of Objects mapped to Transmit PDO_3	
	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	
	5	RO	Specification of Appl. Object 5	
	6	RO	Specification of Appl. Object 6	
*) Only the highest bit may be changed to temporarily (de)activate the PDO				

15.4.2 Manufacturer Specific Entries Starting at 0x2000

Table 37 *Overview CANopen® object directory II*

Index	Subindex	Access	Content	EEProm	Refer to
0x2000	0	RO	Number of parameters		
	1	RW	Prog. Transponder	M	
	2	RW	Threshold for decoding	M	10.2.6, page 61
	3	RW	Threshold for positioning	M	10.2.6, page 61
	4	RW	Posipulse time	M	10.2.6, page 61
	5	RW	High nibble of RW code	M	10.2.6, page 61
	6	RW	Number of equal codes	M	10.2.6, page 61
	7	RW	Level to noise error	M	10.2.6, page 61
	8	RW	Rx frequency	M	10.2.7, page 66
	9	RW	Antenna tuning	M	10.2.7, page 66
	a	RW	Freeze values for n telegrams	M	10.2.9, page 71
	b	RW	Threshold max detection X/Y	M	10.2.6, page 61
	c	RW	Config.	M	Table 56, page 103
0x2001	0	RO	Number of Parameter		
	1	RW	Node Baudrate	C	
	2	RW	Node ID	C	

15.4.3 Standardized Device Profile from 0x6000

Table 38 *Overview CANopen® object directory III*

Index	Subindex	Access	Content	Refer to
0x6000	0	RO	Number of 8 Bit Digital Inputs	
	1	RO	Number of codes read	Table 33, page 56
0x6100	0	RO	Number of 16 Bit Digital Inputs	
	1	RO	System Status	Table 33, page 56
0x6120	0	RO	Number of 32 Bit Digital Inputs	
	1	RO	Code	Table 33, page 56
0x6400	0	RO	Number of 8 Bit analog Inputs	
	1	RO	Supply voltage	Table 33, page 56
	2	RO	Supply current	Table 33, page 56
	3	RO	Board Temperature	Table 33, page 56
0x6401	0	RO	Number of 16 Bit analog Inputs	
	1	RO	Y deviation	Table 33, page 56
	2	RO	X deviation	Table 33, page 56
	3	RO	Sum voltage	Table 33, page 56
	4	RO	Dif. voltage	Table 33, page 56

15.5 Details of the CANopen® directory

15.5.1 Device type

Table 39 *CANopen® directory: Device type*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1000	00	Device Type	Unsigned 32	RO	No	0x00050191	Digital/analog Inputs - DS 401

15.5.2 Error Register

The error register is not used, therefore the value 0 is always transmitted here.

Table 40 *CANopen® directory: Error register*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1001	00	Error Register	Unsigned 8	RO	No	0x00	Error Register

15.5.3 COB-ID SYNC Message

Table 41 *CANopen® directory: COB-ID SYNC message*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1005	00	COB-ID SYNC	Unsigned 32	RO	No	0x80000080	Sync Consumer, Sync ID = 0x80

15.5.4 Device name

Table 42 *CANopen® directory: Device name*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1008	00	Device Name	Visible string	RO	No	„9883“	Device name: „G98830ZA“

15.5.5 Hardware-Version

Table 43 *CANopen® directory: Hardware version*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1009	00	Hardware Version	Visible_String	R0	No	„0ZA1“	Version number

15.5.6 Software-Version

Table 44 *CANopen® directory: Software version*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x100A	00	Software Version	Visible_String	R0	No	„1.04“	Version number

15.5.7 Save Parameters

Table 45 *CANopen® directory: Save parameters*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1010	00	Save Parameter	Unsigned 8	RO	No	0x01	number of subindexes
	01	Save All	Unsigned 32	RW	No	0x00000001	Save All is possible

By writing the character string `save` in ASCII code (hex code: 0x65766173) to sub-index 1, all currently used parameters are permanently stored. This is confirmed by a TxSDO (1st byte = 0x60). The actual saving takes place only after the output of the confirmation message.

15.5.8 Restore Default Parameters

Table 46 *CANopen® directory: Restore default parameters*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1011	00	Restore Parameter	Unsigned 8	RO	No	0x03	Number of subindexes
	01	Restore All Parameter	Unsigned 32	RW	No	0x00000001	Restore All is possible
	02	Restore Com. Parameter	Unsigned 32	RW	No	0x00000001	Restore Communication is possible
	03	Restore Manufacture Parameter	Unsigned 32	RW	No	0x00000001	Restore Manufacture is possible

By writing the character string `load` in ASCII code (hex code: 0x64616F6C) to sub-index 1, 2 or 3, the default parameters are loaded into the antenna. Afterwards the antenna must be restarted.

With `Restore All` the Node ID is also set to 1 and the baud rate to 125 kBaud.

15.5.9 Producer Heartbeat Time

Table 47 *CANopen® directory: Producer heartbeat time*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1017	00	Producer Heartbeat Time	Unsigned 16	RW	No	1000	Heartbeat time in ms (approx.)

With 0 this function is switched off.

15.5.10 Identity Object

Table 48 *CANopen® directory: Identity object*

Index	Subindex	Name	Type	Attr.	Map	Default	Descritpion
0x1018	00	Identity Object	Unsigned 8	RO	No	0x04	Number of subindexes
	01	Vendor ID	Unsigned 32	RO	No	0x00000202	Manufacturer number given by CiA
	02	Product Code	Unsigned 32	RO	No	0x00098830	HG Number 98830
	03	Revision	Unsigned 32	RO	No	0x00000100	Version 1.00
	04	Serial Number	Unsigned 32	RO	No	9999999	Serial number

15.5.11 Transmit PDO_1 Parameter

Table 49 *CANopen® directory: Transmit PDO_1 parameter*

Index	Subindex	Name	Type	Attr.	Map	Default	Beschreibung
0x1800	00	TxPDO_1 Parameter	Unsigned 8	RO	No	0x05	Number of subindexes
	01	COB ID	Unsigned 32	RW	No	0x40000180 + Node-ID	PDO_1 valid, ID = 0x180 + Node ID
	02	Transmis-sion Type	Unsigned 8	RW	No	255	Asynchronous event-driven
	03	Inhibit Time	Unsigned 16	RW	No	100	shortest time between transmissions [µs]
	05	Event Time	Unsigned 16	RW	No	10	Cycle time [ms]

15.5.12 Transmit PDO_2 Parameter

Table 50 *CANopen® directory: Transmit PDO_1 parameter*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1801	00	TxPDO_2 Parameter	Unsigned 8	RO	No	0x05	Number of subindexes
	01	COB ID	Unsigned 32	RW	No	0x40000280 + Node-ID	PDO_2 valid, ID = 0x181 + Node ID
	02	Transmis-sion Type	Unsigned 8	RW	No	255	Asynchronous event-driven
	03	Inhibit Time	Unsigned 16	RW	No	100	shortest time between transmissions [µs]
	05	Event Time	Unsigned 16	RW	No	10	Cycle time [ms]

15.5.13 Transmit PDO_3 Parameter

Table 51 *CANopen® directory: Transmit PDO_3 parameter*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1802	00	TxPDO_3 Parameter	Unsigned 8	RO	No	0x05	Number of subindexes
	01	COB ID	Unsigned 32	RW	No	0x40000380 + Node-ID	PDO_3 valid, ID = 0x380 + Node ID
	02	Transmission Type	Unsigned 8	RW	No	255	Asynchronous event-driven
	03	Inhibit Time	Unsigned 16	RW	No	100	shortest time between transmissions [µs]
	05	Event Time	Unsigned 16	RW	No	10	Cycle time [ms]

15.5.14 Mapping TPDO_1

Table 52 *CANopen® directory: Mapping TPDO_1*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
1A00	00	Number of mapped objects	Unsigned 8	RO	No	0x03	Number of subindexes
	01	1st mapped object	Unsigned 32	RO	No	0x61000110	mapped on index 0x6100,01 with 16 bit length (status)
	02	2nd mapped object	Unsigned 32	RO	No	0x61200120	mapped on index 0x6102,01 with 32 bit length (Code)
	03	3rd mapped object	Unsigned 32	RO	No	0x64010110	mapped on index 0x6401,01 with 16 bit length (Y deviation)

15.5.15 Mapping TPDO_2

Table 53 *CANopen® directory: Mapping TPDO_2*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
1A01	00	Number of mapped objects	Unsigned 8	RO	No	0x03	Number of subindexes
	01	1st mapped object	Unsigned 32	RO	No	0x61000110	mapped on index 0x6100,01 with 16 bit length (status)
	02	2nd mapped object	Unsigned 32	RO	No	0x61200120	mapped on index 0x6102,01 with 32 bit length (Code)
	03	3rd mapped object	Unsigned 32	RO	No	0x64010210	mapped on index 0x6401,02 with 16 bit length (X deviation)

15.5.16 Mapping TPDO_3

Table 54 *CANopen® directory: Mapping TPDO_3*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
1A02	00	Number of mapped objects	Unsigned 8	RO	No	0x06	Number of subindexes
	01	1st mapped object	Unsigned 32	RO	No	0x64010310	mapped on index 0x6401,03 with 16 bit length (SUM voltage)
	02	2nd mapped object	Unsigned 32	RO	No	0x64010410	mapped on index 0x6401,04 with 16 bit length (DIF voltage)
	03	3rd mapped object	Unsigned 32	RO	No	0x60000108	mapped on index 0x6000,01 with 8 bit length (Codes read)
	04	4th mapped object	Unsigned 32	RO	No	0x64000108	mapped on index 0x6400,01 with 8 bit length (Supply volt-age)
	05	5th mapped object	Unsigned 32	RO	No	0x64000208	mapped on index 0x6400,02 with 8 bit length (Supply current)
	06	6th mapped object	Unsigned 32	RO	No	0x64000308	mapped on index 0x6400,03 with 8 bit length (Board tem-perature)

15.5.17 Device Parameters

Table 55 *CANopen® directory: Device parameters*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
2000	00	Number of parameters	Unsigned 8	RO	No	12	Number of subindexes
	01	Prog transponder code	Unsigned 32	RW	No		Write transponder *)
	02	Threshold for decoding	Unsigned 16	RW	No	256	10.2.6, page 61
	03	Level for positioning	Unsigned 16	RW	No	256	10.2.6, page 61
	04	Poispulse time	Unsigned 16	RW	No	100	10.2.6, page 61
	05	High nibble of RW code	Unsigned 8	RW	No	16	10.2.6, page 61
	06	Number of equal codes	Unsigned 8	RW	No	1	10.2.6, page 61
	07	Level to noise error	Unsigned 16	RW	No	1000	10.2.6, page 61
	08	Rx frequency	Unsigned 32	RW	No	1553000	10.2.7, page 66
	09	Antenna tuning	Unsigned 8	RW	No		10.2.7, page 66
	10	Freeze values	Unsigned 8	RW	No	0	10.2.9, page 71
	11	Threshold max detection Y	Unsigned 16	RW	No	400	10.2.6, page 61
	12	Config.	Unsigned 32	RW	No		Table 56, page 103
*) To program a transponder, position it with the normal read distance below the antenna and start writing the 20 code bits via index 0x2000,01.							

15.5.18 Codes Relevant in CANopen® for System Configuration

Table 56 *CANopen® directory: Relevant codes for the system configuration*

Value	Name	Description
0x0001	HILOW	Changes the sequence within multi-byte values
0x0002	CODE_SELECT	Select code channel (see 10.2.6 "(T)ime & Code" on page 61)
0x0004		
0x0008		
0x0010	POSI_TIMED	Time or level controlled positioning pulse (see 10.2.6 "(T)ime & Code" on page 61)
0x0020		
0x0040		
0x0080		
0x0100		
0x0200	POSI_MASK	One positioning pulse per transponder crossing (see 10.2.6 "(T)ime & Code" on page 61)
0x0400	AUTO_TUNE	see 10.2.7 "(F)requency & Antenna Tuning" on page 66
0x0800		
0x1000		
0x2000	POSI_TRNSP	Positioning pulse after decoding (see 10.2.6 "(T)ime & Code" on page 61)
0x4000		
0x8000		
0x10000	AUTOSTART	If set, the node starts in *Operational* mode (see 10.2.9 "CA(N)-Open-Parameters" on page 71)

15.5.19 Manufacturer Parameters – Node Parameters

Table 57 *CANopen® directory: Manufacturer parameters - node parameters*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x2001	00	number of parameter	Unsigned 8	RO	No	0x02	number of subindexes
	01	Node baud rate	Unsigned 8	RW	No	0x04	125 kBaud according to Table 58 below *)
	02	Node ID	Unsigned 8	RW	No	0x01	Node address 1 *)
*) After changing these parameters, you must save the changes with <save all> and trigger a node reset.							

Table 58 *CANopen® directory: Manufacturer parameters – node parameters / baud rates*

Value	Baud rate [kBaud]
7	20
6	50
4 (Default)	125
3	250
2	500
0	1000

15.5.20 Bit Digital Input (Transmission in TPDO_2)

Table 59 *CANopen® directory: 8 bit digital input (transmission in TPDO_2)*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x6000	00	number of 8 bit inputs	Unsigned 8	RO	No	0x01	number of 8 Bit inputs
	01	Codes read	Unsigned 8	RO	Yes	./.	Number of codes read see Table 33 on page 56

15.5.21 16 Bit Status (Transmission in TPDO_1)

Table 60 *CANopen® directory: 16 bit status (transmission in TPDO_1)*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x6100	00	number of 16 bit inputs	Unsigned 8	RO	No	0x01	number of 16 bit inputs
	01	16 bit digital input	Unsigned 16	RO	Yes	./.	System status / TxPDO_1 from Table 11 on page 40

15.5.22 32-Bit-Transponder-Code

Table 61 *CANopen® directory: 32 bit transponder code*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x6120	00	number of 8 bit inputs	Unsigned 8	RO	No	0x01	number of 32 Bit inputs
	01	Transponder code	Unsigned 32	RO	Yes	./.	32 bit transponder code

15.5.23 8-Bit Analog Inputs

Table 62 *CANopen® directory: 8 bit analog inputs*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x6400	00	number of 16 bit analog inputs	Unsigned 8	RO	No	0x03	number of the analog 8 bit inputs
	01	Supply voltage	Unsigned 8	RO	Yes	./.	Voltage [100 mV]
	02	Supply current	Unsigned 8	RO	Yes	./.	Current [10 mA]
	03	Board tempera-ture	Integer 8	RO	Yes	./.	Temperature [°C]

15.5.24 16-Bit-Analog-Inputs

Table 63 *CANopen® directory: 16 bit analog inputs*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x6401	00	number of 16 bit analog inputs	Unsigned 8	RO	No	0x03	number of the analog 16 bit inputs
	01	Y deviation	Integer 16	RO	Yes	./.	Y deviation [mm]
	02	X deviation	Integer 16	RO	Yes	./.	X deviation [mm]
	03	Sum voltage	Unsigned 16	RO	Yes	./.	Sum voltage [units]
	04	Dif, voltage	Integer 16	RO	Yes	./.	Dif. voltage [units]

15.6 Glossary

- Nibble
  A nibble (rarely also nybble or nyble) is an amount of data that comprises four bits. It is also called half byte. (Source: Wikipedia). The transponder code comprises 20 bits, i.e. five nibbles. Five hexadecimal code digits can thus be represented.
- Odometry
  From ancient Greek ὁδός hodós *path* and μέτρον métron *measure* – i.e. *path measurement*. Refers to a method of estimating the position and orientation of a mobile system using data from its propulsion system.
- PosiPulse
  Using the positioning impulse, the exact time of crossing the reference axis can be transmitted by telegrams without any time delay.
- Positioning coil
  Coil for receiving the transponder signal, arranged in such a way that the signal at the center axis of the antenna has a characteristic course in the direction of travel by which the position can be measured unambiguously.
- Reference coil
  Coil for receiving the transponder signal, arranged so that the signal is as constant as possible over the entire area. (see Figure 41 on page 91).
- Reference voltage / positioning voltage Logarithmic measure of the field strength of the transponder signal.

- Transponder
  RFID tag (marker) mounted in the ground or on moving part, which is inductively energized by the antenna and then uses this energy to transmit its code at half the frequency

16 List of Figures

17 List of Tables

18 Index

19 Revision History

The following table lists the revisions of this device description that have been published so far with the most important changes in each case.

Table 64 *Document revision history*

Revision	Edited by	Description of changes
01 Date: 24.11.2016	RAD/WM/AF	First version of the manual.
02 Date: 30.04.2019	RAD	Adaption to German manual Rev. 03 + Rev. 04.
03 Date: 22.07.2019	RAD	Changes that occurred when the texts were used as a template for 71915 EN.
04 Date: 07.02.2022	RAD	Switch to newest design.
05 Date: 26.08.2022	RAD	Adaption to German manual Rev. 09.
06 Date: 24.02.2025	RAD	– Apply new MiB design – Add this chapter Changelog – In addition to HG G-98830 (CAN), also describe the variant HG G-98835 (PROFINET®)

20 Copyright and Terms of Liability

20.1 Copyright

20.2 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.

20.3 Trade Marks and Company Names

Unless stated otherwise, the herein mentioned logos and product names are legally protected trade marks of Götting KG. All third party product or company names may be trade marks or registered trade marks of the corresponding companies.

GÖTTING KG, founded in 1965, is an innovative, globally active company based in Lehrte near Hannover, Germany.

The company develops and produces radio data transmission systems and sensors for the guidance and navigation of automated guided vehicles (AGVs).

Another focus is on automated guided transport systems based on series commercial vehicles, in particular for outdoor applications such as trucks, wheel loaders, forklift trucks and industrial tractors.

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