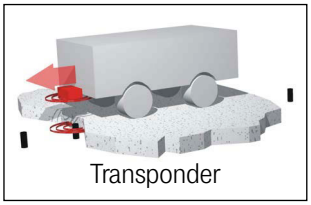
Device Description HG G-98870-A

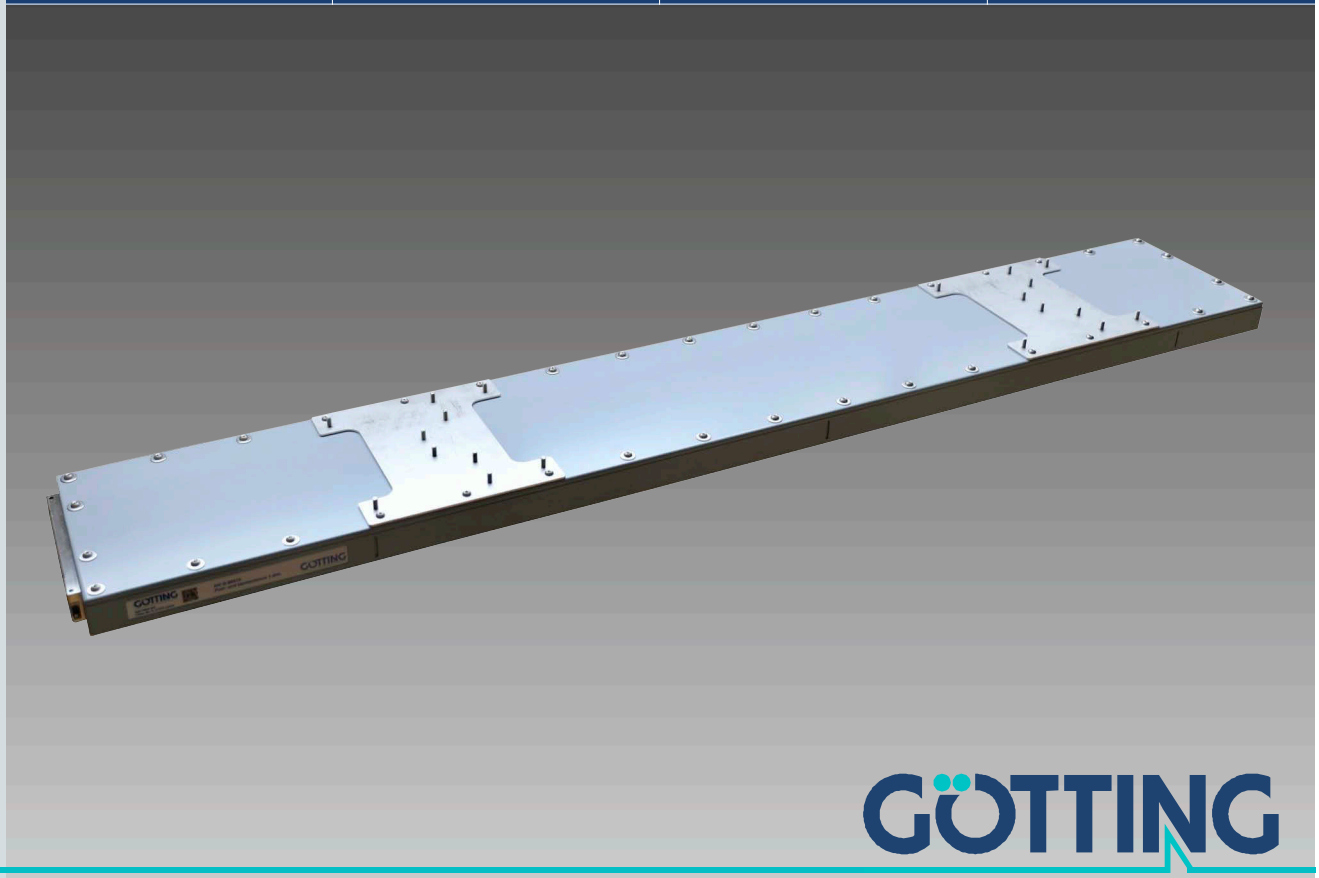


1D Transponder Antenna with Continuous Localization

HG G-98870-A

CAN/CANopen® or PROFINET® interface

English, Revision 01	Date: 25.06.2024	Dev. by: GB	Author(s): RAD / GB



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Main Features of the Transponder Antenne HG G-98870-A

- Transponder antenna for continuous position measurement on e.g. RMGs
- Outdoor use, IP67
- For use with passive transponders (128/64 kHz)
- Internal transponder list
- Continuous position output (always at least 1 transponder and max. 2 transponders in the detection range)
- Output of absolute position in X-direction (direction of travel)
- Interfaces: USB, Ethernet, bus interface depending on the variant CAN/ CANopen® or PROFINET®
- Reading distance: 130 to 210 mm, nominal reading distance: 170 mm (depending on transponder)
- High accuracy
- High crossing speed
- Visualization of operating status by LEDs
- Configuration via Ethernet with web browser (Google Chrome, Opera, Firefox, Edge and others)

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

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1 About this Document

1.1 Validity

This device description applies to the transponder antenna with continuous localization (hereafter also referred to as antenna) HG G-98870-A.

It contains information on correct assembly, electrical installation, commissioning, operation, maintenance and troubleshooting. The configuration via the web pages is also shown.

This device description refers to devices with firmware 98870ZA_V001 or higher (you can see the version of the firmware running in the antenna in the menus of the configuration web pages, see section 10.2.1 on page 50).

1.1.1 Target Group

This device description is intended for

- developers, manufacturers or operators of plants, harbors or container terminals who wish to automatically guide rail-guided vehicles, such as RMGs, with the support of the HG G-98870-A transponder antenna,
- technical personnel of a manufacturer who would like to integrate the transponder antenna into an automated guided vehicle (AGV) or use transponder-based position detection in another way,
- qualified persons who are integrating the transponder antenna into a vehicle or a mobile robot, putting it into operation for the first time or configuring it.

1.1.2 Other Applicable Documents

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

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

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

- Glass transponder HG G-70633
  http://www.goetting.agv.com/components/70633
- Puck transponder HG G-70652
  http://www.goetting.agv.com/components/70652
- Puck transponder HG G-70653
  http://www.goetting.agv.com/components/70653
- Marking nail transponder HG G-70654
  http://www.goetting.agv.com/components/70654
- Transponder programmer HG G-81840
  http://www.goetting.agv.com/components/81840

1.2 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.

1.2.1 Warning Notices

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

Warning notices have the following structure:

SIGNAL WORD

Kind or source of the danger

Consequences

▶ Danger prevention

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

The signal words have the following meanings:

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

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

1.2.2 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 any programs of Götting KG small and capital letters are equally working).

1.3 Variants of the Transponder Antenna

Table 2 *Variant overview HG G-98870-A*

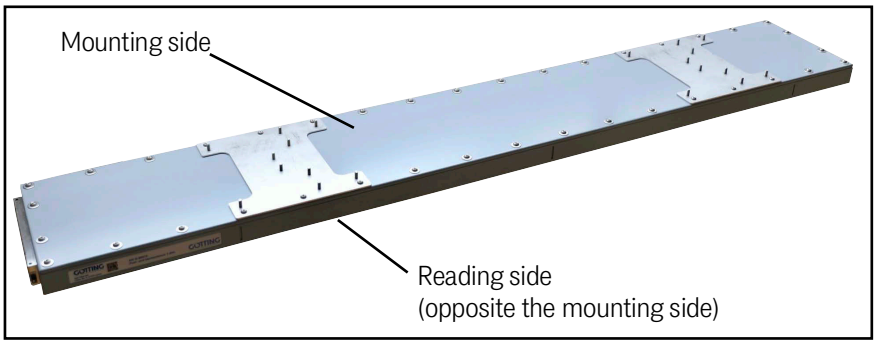
HG G-98870	
Variant	**Interface**
ZA	CAN/CANopen®
YA	PROFINET®

1.4 Definitions

1.4.1 Reading and Mounting Side

- The side with the screwed-in cover is the *mounting side*, with which the antenna is mounted on the vehicle, for example.
- The closed side is the *reading side*, which must face the transponders. When mounted under an AGV, it faces the ground.

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

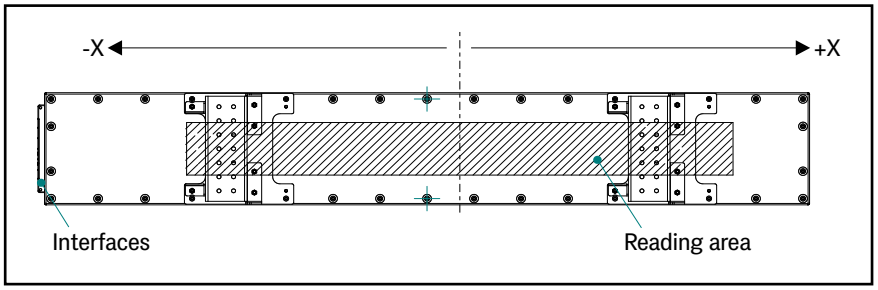


1.4.2 Coordinate System of the Transponder Antenna

The transponder antenna HG G-98870-A is a one-dimensional antenna. The coordinate system shown in the following image shows the relative coordinate system of the antenna.

The antenna can be moved forwards and backwards in the X direction. However, it expects the transponder positions to be in ascending order in the +X direction. If it is mounted the other way round, the position calculation can be inverted, see Mounting Direction in section 10.2.8 on page 60.

Figure 2 *Relative coordinate system of the antenna*

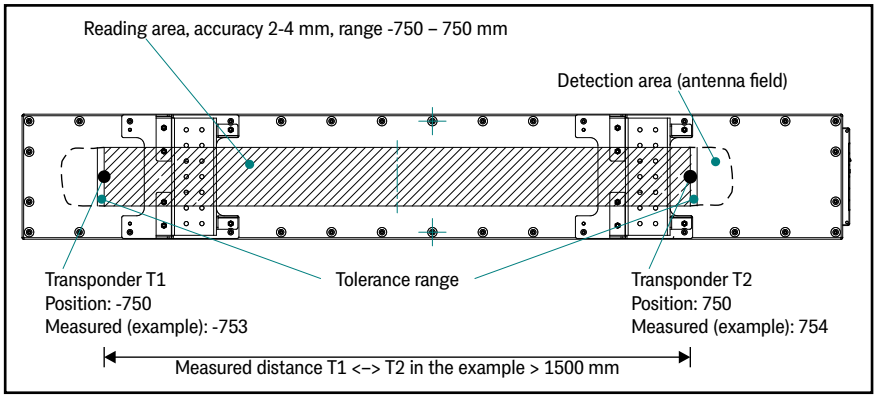


The transponder antenna outputs an absolute position using the stored transponder list, which is based on the absolute coordinate system of the system.

The output of the relative positions of the transponders can be set via the RX receive objects of the bus interface (CAN/CANopen®/PROFINET®).

1.4.3 Detection Area (Antenna Field) and Reading Area

Figure 3 *Detection area and reading area with example of the tolerance at the edges of the reading area*



The term detection area or antenna field refers to the area under the antenna in which it can receive the signal from a transponder. The detection area is larger than the reading area, but its dimensions cannot be precisely defined.

The term reading area refers to the area under the antenna in which the absolute position of the antenna is calculated based on the measurement of the relative position of a transponder. The antenna indicates in the status when the absolute position is calculated on the basis of the simultaneous measurement of two transponders. The reading area is specified in the technical data (see section 19.1 on page 97). The specified accuracy of the transponder antenna only applies in the reading area.

Tolerance in the reading area

Two transponders can be detected simultaneously with the reading area up to a distance of 1500 mm. If the distance between the transponders is more than 1500 mm, the antenna does not output a position. With the accuracies applicable in the reading area, it is possible that if both transponders are placed exactly 1500 mm apart they may be measured slightly above the actual position and therefore have a greater distance, see Figure 3 above. To compensate for this, a tolerance range applies at the edges of the reading area. By default, this is 5 mm in both directions in order to slightly exceed the accuracy range.

The tolerance range should not be changed, so it cannot be set via the configuration web pages. In exceptional cases, however, it can be set by editing the configuration file, see chapter 12 on page 78.

1.5 Abbreviations

Table 3 *Abbreviations*

Abbreviation	Meaning
AGV	Automated Guided Vehicle
CAN	Controller Area Network
CANopen®	Controller Area Network open
PDO	Process Data Object
PLC	Programmable logic controller or PC that performs control functions
PROFINET®	Process Field Network
RAGV	Rail-guided AGV
RMG	Rail Mounted Gantry
RFID	Radio-Frequency Identification
SDO	Service Data Object

2 Safety Information

The product has been manufactured in accordance with the generally recognised 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.
- Keep the documentation 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 required documentation.

2.1 Intended Use

The functional principle of the HG G-98870-A transponder antenna is designed to calculate the one-dimensional absolute position of matching RFID tags (transponders) and output it to a higher-level controller. The transponders must be in a fixed position. Possible applications are

- Position detection of a rail-guided automated guided vehicle (RAGV).

The HG G-98870-A transponder antenna is used to detect the position of rail-guided automated guided vehicles (RAGVs), such as RMGs in container terminals.

The transponder antenna HG G-98870-A may only be used by qualified personnel at the place of use (e.g. vehicle) at which it was installed and put into operation for the first time by qualified personnel in accordance with this device description. The operating conditions specified in this device description must be observed.

The transponder antenna HG G-98870-A does not contain any safety devices and may therefore only be used in applications where the manufacturer or the system operator has ensured that adequate measures for personal protection and the safe detection of obstacles are implemented. This includes the safe detection of situations like e.g. the vehicle leaving the track or people or obstacles appearing in front of the vehicle. In these cases moving parts (e.g. vehicles) have to be stopped immediately to rule out material damage and personal injuries.

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

2.2 Improper Use

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

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

Improper use includes:

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

2.3 Qualification of the Users

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

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

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

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

2.4 General Safety Information

- Ensure that the transponder antenna HG G-98870-A is only used in applications
  - in which sufficient measures have been implemented for personal protection and the safe detection of obstacles,
  - in which the appearance of a person or an obstacle in the danger zone is reliably detected at all times and all moving parts (e.g. vehicles) are stopped immediately.

- Ensure that interference in the ground or on the vehicle is kept to a minimum so that it does not distort the position calculation. Options for eliminating interference are described in section 18.2 „Reducing Interferences“ auf Seite 95.
- 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 has no influence on the position detection itself, the transponder antenna should be protected from dirt and moisture (e.g. splash water from the vehicle's wheels) and cleaned regularly, as otherwise the wear on the antenna will increase.

- It must not be sprayed directly into the gap between the base of the housing and the cover using a high-pressure cleaner or similar, as this may damage the seal and cause water to penetrate the device.
- Intentional / unintentional removal of the sticker over the LEDs will result in the LEDs losing their impermeability. As a result, water may penetrate the LEDs.
- The USB connection must not be plugged in when the power supply is live. Always de-energize the transponder antenna first, otherwise damage may occur to a connected computer. This can range from defective USB ports to a total failure of the computer.
- The protection class of the housing (IP67) only applies if all M12 connectors of the antenna are fitted with protective caps or cables/wires with at least the same protection class.

2.5 Obligations of the Operator

When using the transponder antenna, the operator must ensure that

- all persons within the sphere of influence of an automated system (e.g. Automated Guided Vehicle (AGV)) are informed about the type of application and the associated hazards,
- the operating conditions specified in section 7.3.1 on page 27 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 delivery includes

- one transponder antenna HG G-98870-A
- this device description in digital form, available at

https://www.goetting-agv.com/components/98870

3.1 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,
- an Ethernet cable for the configuration of the antenna,
- several transponders in the ground.

The connection cables can be assembled by the customer (see section 7.2 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 (part 1 of 2)*

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 1: 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 CON00096	For connector CAN 1: CAN terminating resistor (terminator), M12 socket 5-pin, A-coded
HW CON00055	For connector CAN 2: CAN terminating resistor (terminator), M12 plug 5-pin, A-coded
Ethernet (Service)	Available as an accessory from other suppliers: Cable, approx. 2 m, RJ45 plug to M12 plug, D-coded, shielded
HG G-70633ZB	Glass transponder usually mounted in the ground 

Table 4 *Required accessories (part 2 of 2)*

Order No.	Description	
HG G-70652ZC	Puck transponder usually mounted on the ground	
HG G-70653ZA	Puck transponder usually mounted on the ground	
HG G-70654ZB	Marking nail transponder mounted on the ground	

3.2 Optional Accessories

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

Table 5 *Optional accessories*

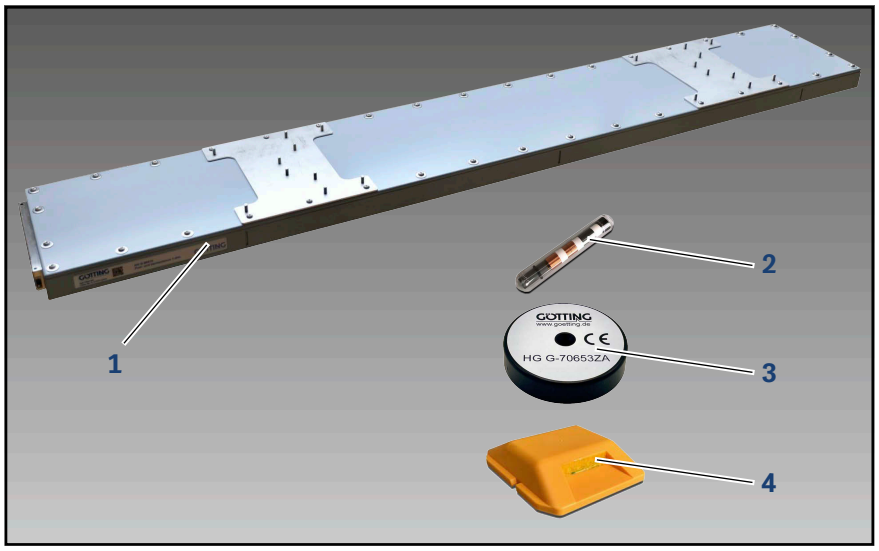
Order No.,	Description
HG Z-98870-001	Mounting bracket set (includes 2x mounting brackets, s. section 7.3.7 on page 31)
HG G-81840ZA	Transponder programming device for reading and programming transponder codes

4 Device Overview

4.1 System Components

An Automated Guided Vehicle (AGV) requires at least one antenna, connection cables to the vehicle electronics, a ready-made Ethernet cable for the one-off configuration and transponders in the ground. Optionally, you can use a transponder programmer.

Figure 4 *System components (excerpt)*



1 Transponder antenna HG G-98870-A

Transponder for mounting in or on the ground:

2 Glass transponder (usually in the ground)

3 Puck transponder (usually on the ground)

4 Marking nail transponder (on the ground)

4.2 Components in the Ground

4.2.1 Transponder

Transponders with trovan® coding are used as reference marks for the track guidance (see section 3.1 on page 15). Further documents can be obtained from our Internet server (see section 1.1.2 on page 7).

4.2.2 Structure of the Transponder Code

The antenna HG G-98870-A evaluates 20 useful bits. The transmission time for a complete code telegram is 8 ms.

4.2.3 Reading Distances of the Transponders

The range of the transponders differs. The following table shows the achievable reading distances of the transponder types recommended in Table 4 on page 15.

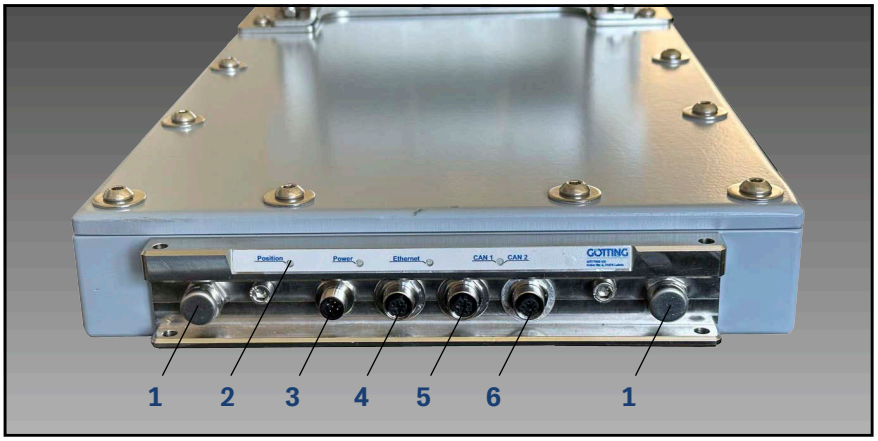
Table 6 *Reading distances of the transponders*

Transponder type	Min. reading distance [mm]	Nominal reading dist. [mm]	Max. reading distance [mm]
HG G-70633ZB	90	130	170
– HG G-70652ZC – HG G-70653ZB – HG G-70654ZB	130	170	210

4.3 Transponder Antenna

4.3.1 Connections

Figure 5 *Transponder antenna HG G-98870-A (in the photo variant HG G-98870ZA)*



1 Housing ventilation
2 LEDs
3 Connection Power
4 Connection Ethernet
5 Connection CAN 1
6 Connection CAN 2

All cable connections are located on one side of the housing.

▶ For dimensions, see Figure 54 on page 98.

The antenna has four M12 connectors, the type of connector depends on the antenna variant:

- HG G-98870ZA (CAN-Bus): 3x 5 pin A coded, 1x 4 pin D coded
- HG G-98870YA (PROFINET®): 3x 4 pin D coded, 1x 5 pin A coded

For pin assignments see section 7.2 on page 25.

4.3.2 Displays (LEDs)

The LEDs differ for the antenna variants.

Table 7 *LEDs transponder antenna HG G-98870ZA CAN bus*

No.	Designation	Color	Meaning
1	Position	Green	Absolute position can be calculated.
		Red	Absolute position cannot be calculated (s. section 18.1 on page 92).
2	Power	Green	Device is running, there is no system-relevant error.
		Red	There is a system-relevant error (see section 18.1 on page 92).
		Orange	Busy Mode. Device is busy and not in normal operation, see section 4.3.3 below
3	Eth. Link	Green	Ethernet link LED – Lights up when there is a connection – Flashes when data is exchanged
		Red	(This LED is not used)
4	CAN1 / CAN2	Green	CAN connection is present, data is being sent.
		Red	Flashes in the event of CAN bus errors

Table 8 *LEDs transponder antenna HG G-98870YA PROFINET®*

No.	Designation	Color	Meaning
1	Position	Green	Absolute position can be calculated.
		Red	Absolute position cannot be calculated (s. section 18.1 on page 92).
2	Power	Green	Device is running, there is no system-relevant error.
		Red	There is a system-relevant error (see section 18.1 on page 92).
		Orange	Busy Mode. Device is busy and not in normal operation, see section 4.3.3 below
3	Eth. Link	Green	Ethernet link LED – Lights up when there is a connection – Flashes when data is exchanged
		Red	(This LED is not used)
4	PN SF	Green	(This LED is not used)
		Red	Lights up for PROFINET® errors
5	PN RDY / BF	Green	– Lights up when PROFINET® is ready. – Flashes when waiting for synchronization.
		Red	– Flashes if there is a connection but no communication to the PROFINET® controller. – Lights up when there is no connection

4.3.3 Busy Mode

The antenna switches from normal operation to busy mode for functions that briefly utilize the antenna to its full capacity, such as saving parameters. While busy mode is active, the power LED lights up orange. In busy mode, the functions from normal operation are not available and the antenna also stops communicating via the interfaces (CAN bus, PROFINET®, TCP logging).

Once the functions that require busy mode have been completed, the antenna automatically switches back to normal operation.

In this device description, it is indicated when functions trigger busy mode.

5 Operating Principle

The transponder antenna detects the position of moving parts using passive transponders. Downstream navigation systems (e.g. vehicle PLC), which process the data determined by the antennas, can be used to control rail-guided automated guided vehicles (RAGVs) without contact.

All settings, calibrations and software updates required for operation are carried out via the web interface.

Figure 6 *Example of an RMG crane*

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.

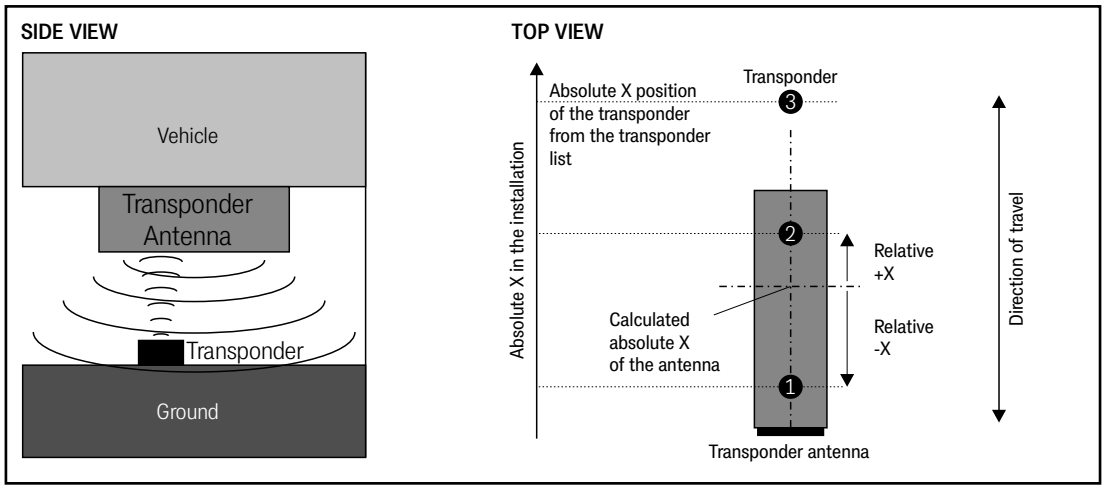
Alternatively, the antenna may be mounted at a fixed position and the plant part with transponder moves relative to it, e.g., an arm of a robot or an electric monorail.

In the following, we refer to the application on automated rail-guided vehicles (RAGVs) 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.

Bild 7 *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.

Based on this relative position and the transponder list stored in the antenna, the antenna determines the absolute position in the system and passes this information on to the higher-level control system via its interfaces.

5.2 Track Guidance with Transponders

Rail-guided driverless transport vehicles (RAGV) are tied to a track and, apart from changing track, can only move forwards and backwards on it. This means that the use of a 1-dimensional antenna covers the application perfectly.

Thanks to the antenna's ability to read two transponders simultaneously, at least one transponder is always within the antenna's reading range. This means that odometry, which uses an additional incremental encoder to count the revolutions of the wheels, is not necessary.

The transponders in the ground are located at highly accurately measured positions and are used to permanently determine the actual position of the vehicle. By storing the transponder positions in the antenna, the antenna is not only able to determine the relative position of the transponders under the antenna, but the absolute position of the antenna is also determined and output.

However, the transponders must not be positioned too close together, otherwise reading errors will occur (s. section 7.1.1 on page 24) Also, no more than two transponders may be in the antenna field at the same time.

6 Storage

NOTICE

Danger due to improper storage

The device can be damaged

- Observe the storage conditions.

The storage temperature is -20 °C to +70 °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 section 7.3 „Mounting the Transponder Antenne“ auf Seite 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“ auf Seite 25).
- Lay the connection cables in the vehicle.
- Then mount the antenna at the desired position (see 7.3 „Mounting the Transponder Antenne“ auf Seite 27).
- Close unused connectors with the supplied M12 closing caps.

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

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.

However, the glass transponder HG G-70633 may also be installed in standing water.

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 section 1.1.2 on page 7).
- ✓ A minimum distance of 1000 mm is required between two transponders.

7.2 Preparation of Connection Cables

Connection cables are not part of the scope of delivery. Suitable cable types are available from Götting (see section 3.1 on page 15). Compatible cables are also available from many manufacturers. The standard length is 2 m. For CAN bus and PROFINET® connections we recommend cables with shielding.

Depending on the variant, the antenna has the following four connections:

Table 9 *Connectors of the Antenna Variants*

HG G-98870ZA (CAN-Bus)	HG G-98870YA (PROFINET®)
– POWER, M12, 5 pin, male, A coded – Ethernet, M12, 4 pin, female, D coded – CAN-Bus, M12, 5 pin, male, A coded – CAN-Bus, M12, 5 pin, female, A coded	– POWER, M12, 5 pin, male, A coded – Ethernet, M12, 4 pin, female, D coded – PROFINET®, M12, 4 pin, female, D coded – PROFINET®, M12, 4 pin, female, D coded

7.2.1 All Variants: Connecting POWER

The POWER connector contains the power supply and the USB interface.

If you want to use USB for an emergency update:

▶ Refer to sectio 11.2 on page 77.

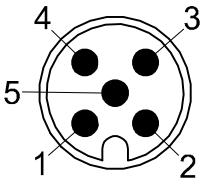
NOTICE

Damage to the transponder antenna

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

▶ Never connect voltage to pin 3 or 4.

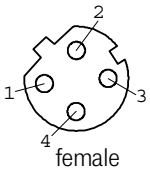
Table 10 *Pin allocation POWER (M12, 5 pin, A coded)*

POWER	Pin	Signal	Comment
 male	1	+UB	Voltage supply
	2	GND	Ground
	3	D+	USB
	4	D-	USB
	5	GND	Ground Data and Supply

7.2.2 All Variants: Connecting Ethernet

Ethernet is used to make settings via a web browser on your PC. To avoid interference, it is advisable to use a pre-assembled cable. Suitable cables are available from accessory retailers. The Ethernet interface has the following pin assignment:

Table 11 *Pin allocation Ethernet (M12, 4 pin, D coded)*

Ethernet	Pin	Signal
	1	TX+
	2	RX+
	3	TX-
	4	RX-

7.2.3 Variant HG G-98870ZA: 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:

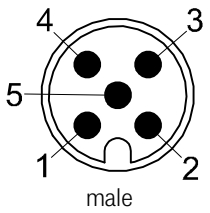
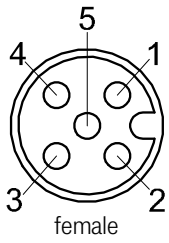
NOTICE

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 12 *Pin allocations CAN1 and CAN2 (M12, 5 pin, A coded)*

CAN1	CAN2	Pin	Signal
		1	Shield
		2	+UB
		3	CAN_GND
		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:

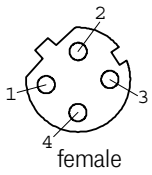
- ▶ Mount a CAN terminator.

These terminators can be obtained from various manufacturers and are available in versions for many sockets and connectors. Terminators for the CAN1 and CAN2 connectors are also offered by Götting (see 3.1 „Required Accessories“ auf Seite 15).

7.2.4 Variant HG G-98870YA: Connecting PROFINET®

PROFINET® is connected to the antenna via two connections. The connections are internally connected to a switch. The second connection is used to connect additional PROFINET® devices behind the antenna to the PROFINET® bus if required. To avoid interference, it is advisable to use a pre-assembled cable. Appropriate cables are available from accessory dealers. The PROFINET® connections are labeled PN1 and PN2 and have the following pin assignments:

Table 13 *Pin allocations PN1 and PN2 (M12, 4 pin, D coded)*

PN1 & PN2	Pin	Signal
 female	1	TX+
	2	RX+
	3	TX-
	4	RX-

7.3 Mounting the Transponder Antenne

7.3.1 Operating Conditions of the Antenna

The transponder antenna HG G-98870-A is approved for indoor and outdoor use. It may be used in a temperature range from -20° C bis +50° C. The relative humidity at 25° C may be max. 95 % (without condensation).

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, see section 18.2 on page 95.

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

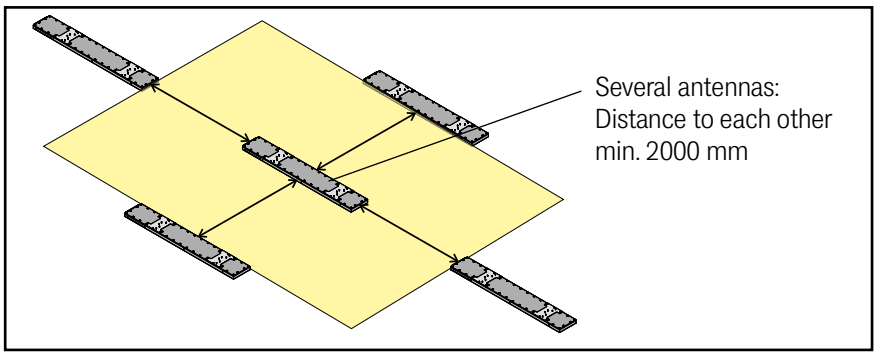
The possible reading distances between the different transponder types and the antenna can be found in Table 6 on page 18.

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

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 Transponder Antennas

Figure 8 *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-98870-A transponder antennas is 2000 mm.

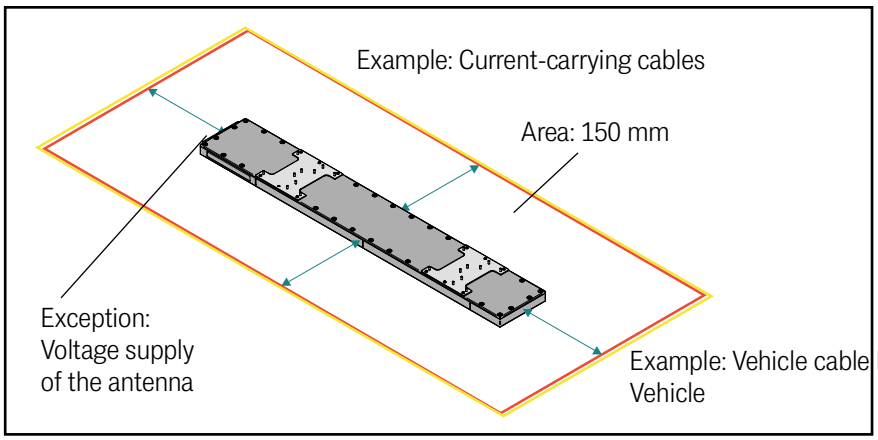
As a matter of principle, larger transponder antennas must maintain a greater distance. For safety reasons, smaller transponder antennas must nevertheless maintain a minimum distance of 2000 mm.

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 9 *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.

This must be observed:

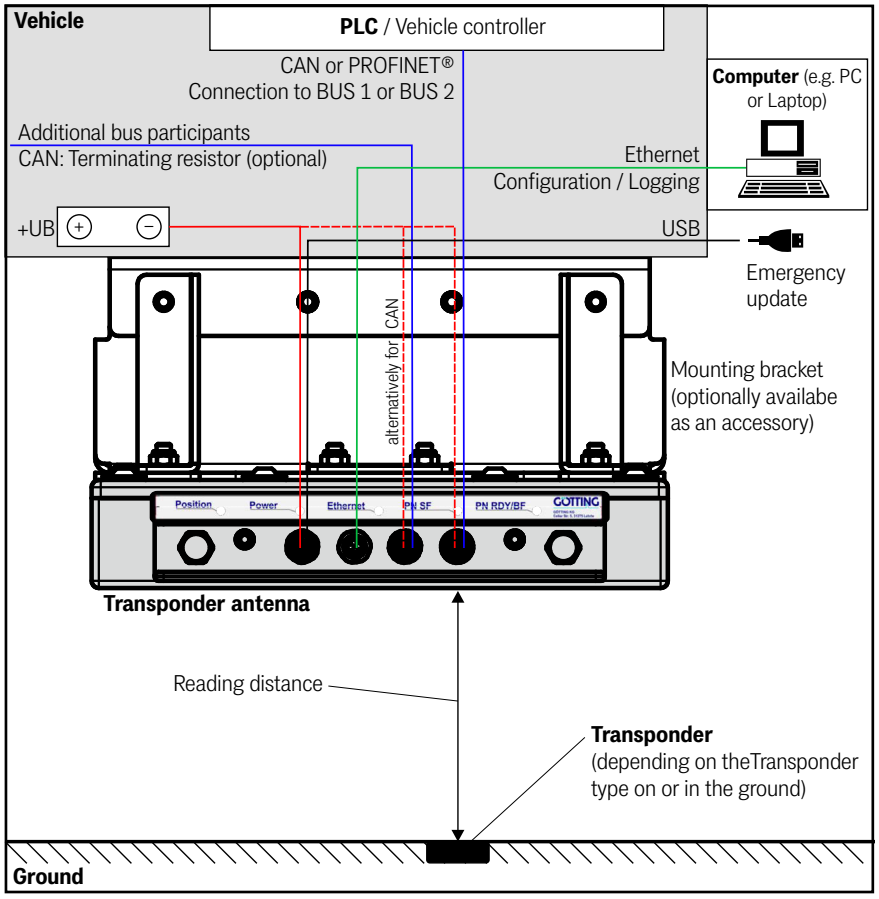
✓ At least 50 mm distance from the side of the antenna to metals.
✓ A minimum distance of 100 mm from the base of the antenna to metal.
✓ No closed metal loops above, below or around the antenna at a distance of 400 mm.
✓ No metal plates above or around the antenna at a distance of 400 mm.

The minimum distance to metal does not apply to the area directly above the mounting plates on the antenna mounting side.

7.3.5 Connection Example

In the following connection example, the optionally available mounting brackets were used, see also section 7.3.6 below.

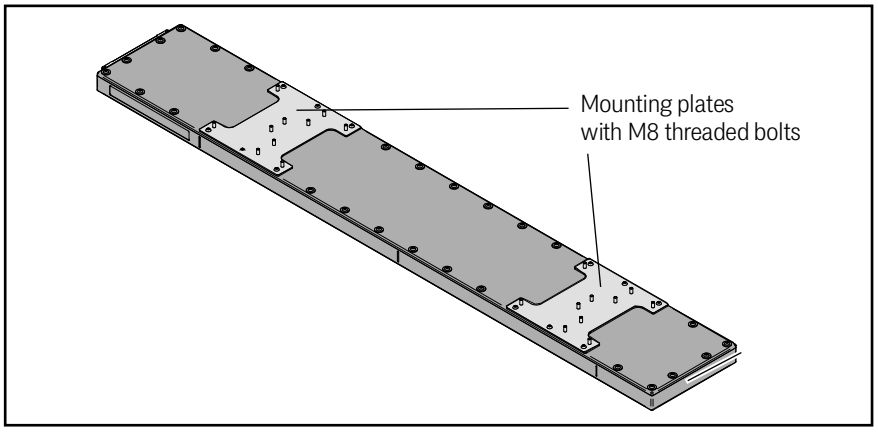
Bild 10 *Connection example (with optional mounting brackets)*



7.3.6 Mounting / Attaching the Antenna to the Vehicle

When mounting, observe the minimum distances to metals specified in section 7.3.4 on page 28.

Bild 11 *Antenna with mounting plates*



The transponder antenna has two mounting plates on the mounting side, from which eight bolts with M8 threads protrude. The mounting plates can be used in the following ways:

1. The mounting brackets available from Götting (see section 7.3.7 on page 31) can be attached to the bolts.
2. Alternatively, you can attach your own brackets to the mounting plates.

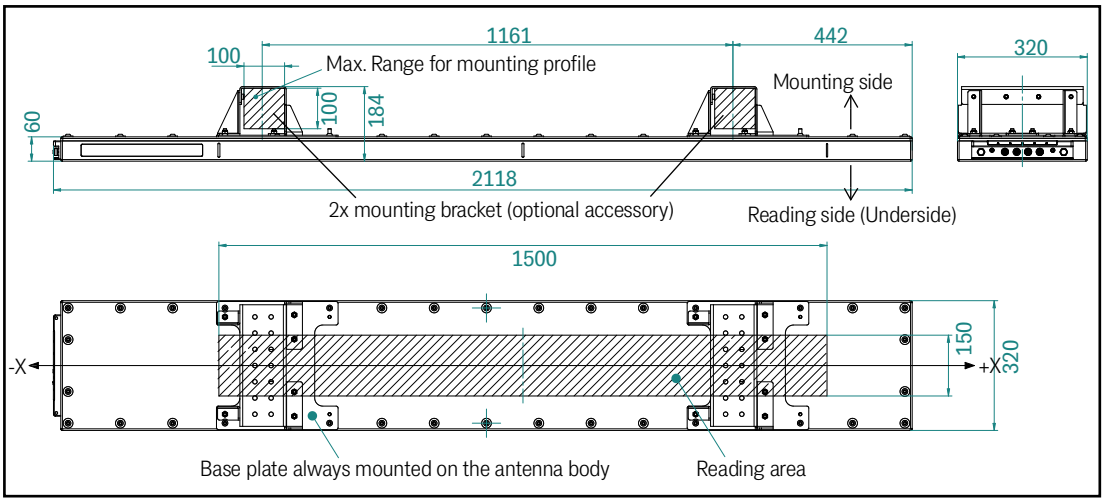
NOTICE

Damage to the antenna

The transponder antenna may be damaged if you install your own mounting brackets. Proceed carefully and observe the following points:

- Do not overtighten the screw connections on the M8 threaded bolts, otherwise they may break off.
- Weld carefully so that there are no welding stains on the antenna cover, otherwise it may leak.
- Mounting brackets must not vibrate.
- Mounting brackets must not protrude beyond the mounting plates.
- Do not open or use the screws with which the mounting plates are attached to the antenna housing, otherwise the antenna may become unsealed.

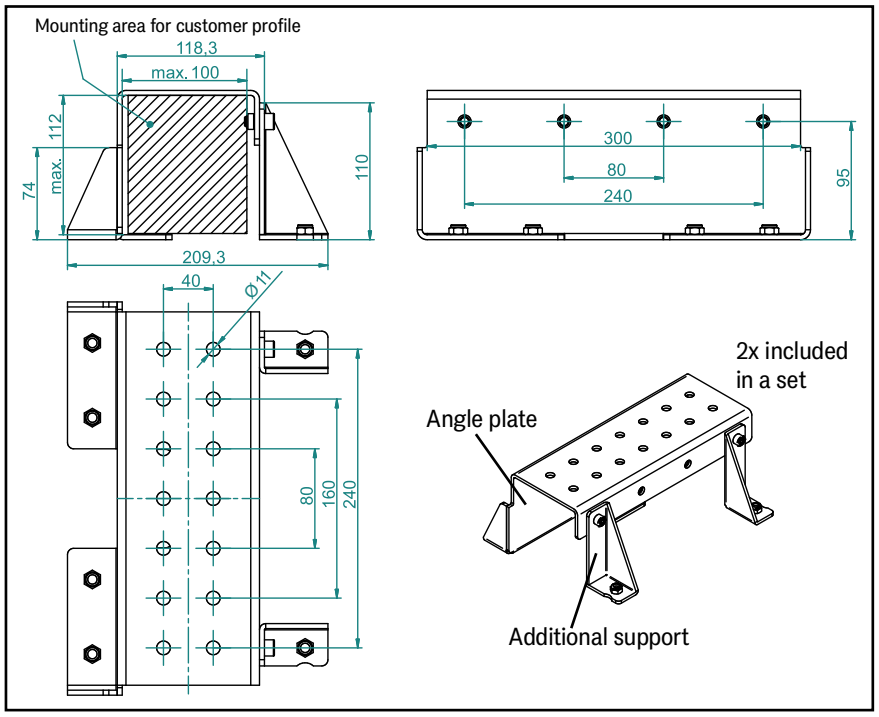
Figure 12 *Dimensions of the transponder antenna HG G-98870-A, pictured with the optional mounting brackets*



7.3.7 Mounting with the Optionally Available Mounting Kit HG Z-98870-001

The mounting kit is available from Götting, see section 3.2 on page 16. It contains two mounting brackets.

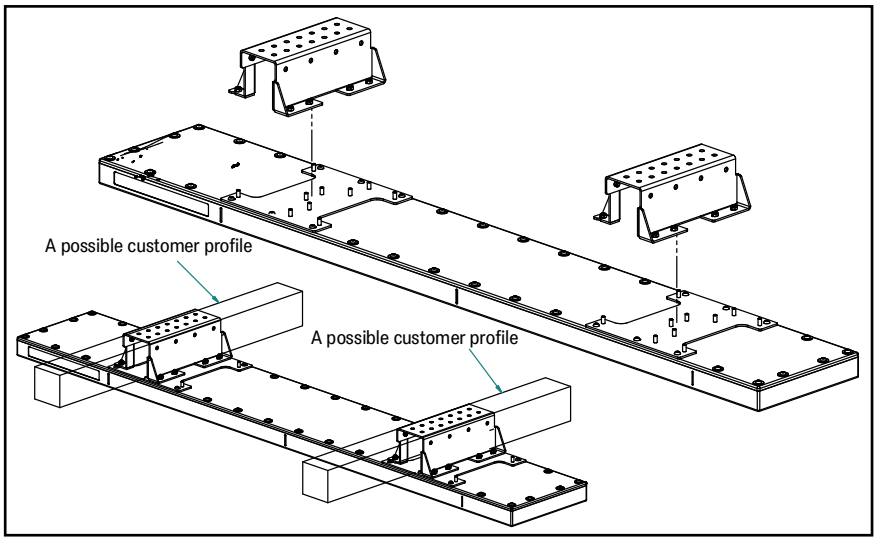
Figure 13 *Components of the optional mounting kit*



The following applies when installing the mounting kit:

- ✓ Never use the angle plate without the additional supports, otherwise the angle plate could vibrate.
- ✓ All self-locking nuts are tightened with a tightening torque of approx. 18.7 Nm.
- ✓ If you apply some medium-strength threadlocking adhesive to the M8x16 cylinder head bolts, you can also tighten them to approx. 18.7 Nm.

Figure 14 *Mounting the optional mounting kit*



- Screw the angle plate to the four M8 bolts in a row on the mounting plate using the self-locking M8 A4 stainless steel nuts.
- Place each of the angle plates on a beam with a maximum cross-section of 100x100 mm (customer profile) and screw them in place with at least four screws using the holes on the top of the angle plates. It is recommended to use the left and right penultimate two holes.
- Fasten the two additional supports to the open side of the angle plate. First screw the additional supports to the M8 bolts on the mounting plate. Use self-locking M8 A4 stainless steel nuts again. Then use M8x16 cylinder head screws to fasten the support corners to the angle plate.

8 Commissioning

WARNING

Danger due to lack of safety measures

The transponder antenna HG G-98870-A does not contain any safety devices.

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

Prerequisite:

✓ The antenna must be wired correctly.

✓ The antenna must be connected to the voltage supply.

✓ The cable must not be located directly next to power supply cables (see section 7.3.4 on page 28).

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

Commissioning consists of several steps:

- Connection of the Ethernet interface of a computer (e.g. laptop) with the Ethernet interface of the antenna (see section 8.2 below)
- Parameterization of the antenna via the configuration web pages (see section 8.3 on page 35)
- Save the values and restart the system (see section 8.4 on page 37)

8.1 Switch on the Antenna

After the operating voltage is applied, the antenna boots up and is ready for use after a short time; the power LED must light up. It takes a maximum of 1 minute before configuration is possible via the Ethernet connection.

8.2 Connecting the Antenna to a Computer

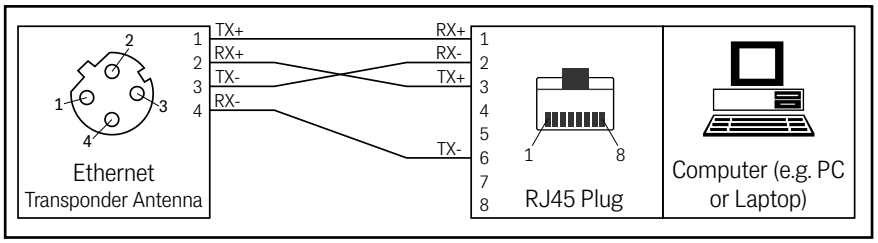
You can configure the system using software running in the antenna, which provides configuration web pages that can be operated using a browser.

8.2.1 Establish the Ethernet Connection

You will need an Ethernet connection cable. You can configure a suitable cable yourself, but suitable cables are also available from accessory retailers. Computers usually have an RJ45 socket, so the cable should have an RJ45 plug as the termination for the computer and an M12 plug as the termination on the sensor to match the pin assignment shown in the Table 11 on page 26.

We recommend the use of ready-made, high-quality cables, as large amounts of data are transmitted via Ethernet and this provides more effective interference immunity.

Figure 15 *Connection example: Connection to the Ethernet interface of a computer*



▶ Using the adapter cable, connect the Ethernet connection of the antenna to the Ethernet interface of your computer.

8.2.2 Adjust Ethernet settings

The transponder antenna has the following default setting on the Ethernet interface:

- IP-Adresse: `10.10.10.10`
- Subnet mask: `255.255.255.0`

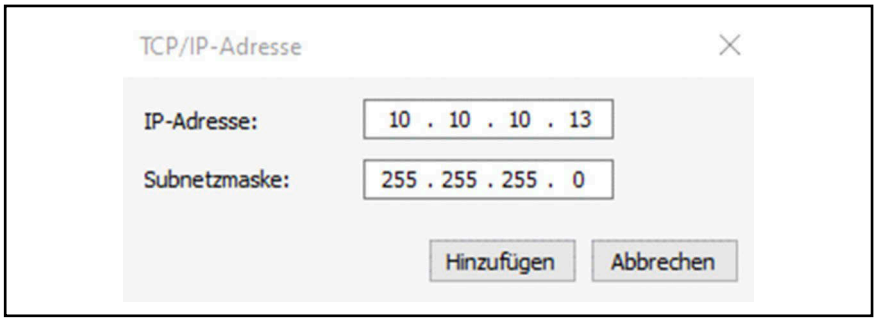
The IP address of the antenna can be changed via the configuration web pages, see section 10.2.10 on page 66. If the address is changed, the information in this section applies analogously, but must then match the changed address. However, the settings on the computer may also remain unchanged if the antenna settings are selected to match the network.

If the IP address of the antenna is unknown and no longer corresponds to the default settings, you can determine the current IP address with the program *IP-Config.exe*, see chapter 14 on page 82.

For the computer to be able to communicate with the antenna via its Ethernet interface, its interface must be set to match the antenna. The following information is important for configuring the computer's IP address:

- These are the *TCP/IP* settings for the Ethernet interface of the computer that is connected to the antenna.
- A *static IPv4 address* (no DHCP) is required, which matches the IP address of the antenna but is not identical to it or to the IP address of other devices in the network. Static addresses are often also referred to as *manual*. If the antenna uses the default setting (see above), the `10.10.10.13` matches, for example.
- The *subnet mask* must match the subnet mask of the antenna. If the antenna uses the default setting (see above), then

Figure 16 *Example: Ethernet settings of the computer*



How the computer's IP address is set differs depending on the operating system. Please consult the documentation for your operating system. You will find descriptions for the most common operating systems under the following links:

TCP/IP settings in various Windows versions: https://support.microsoft.com/de-de/windows/%C3%A4ndern-der-tcp-ip-einstellungen-bd0a07af-15f5-cd6a-363f-ca2b6f391ace

TCP/IP settings under Linux: https://www.linux-praxis.de/tcp-ip-konfiguration-und-problemloesung

TCP/IP settings in macOS: https://support.apple.com/de-de/guide/mac-help/mh14129/mac

8.3 Configuring the Antenna via the Configuration Web Pages

8.3.1 Opening the Web Pages

The following points must be met in order to access the web pages:

- ✓ Antenna and computer are connected via an Ethernet cable.
- ✓ Antenna and computer have matching TCP/IP settings.

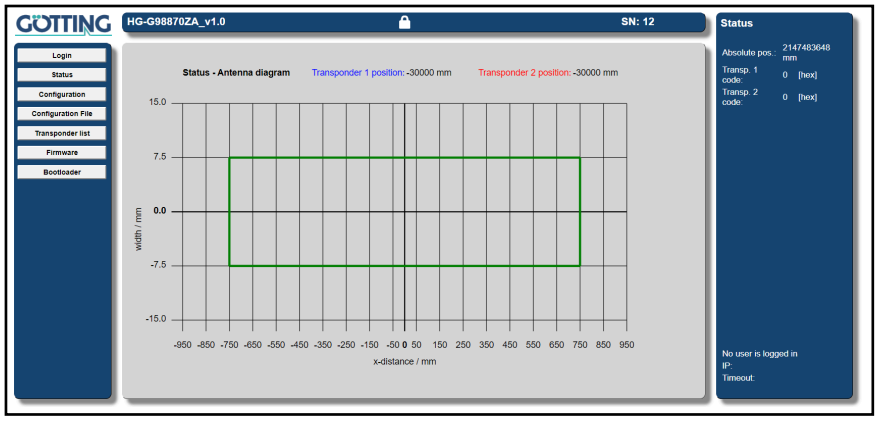
Then access the web pages as follows:

- ▶ Start a current web browser (e.g. Google Chrome, Firefox, Microsoft Edge, ...) on the computer.
- ▶ Enter the IP address of the antenna in the address bar of the browser. The default is `10.10.10.10`.
- ▶ Confirm the entry with Enter.

If the Ethernet connection has been established correctly, the following will now happen:

- The Ethernet LED of the antenna starts flashing because data is being transmitted.
- The following antenna menu opens in the web browser.

Figure 17 *Basic menu of the antenna after successfully calling up the web pages*



If the menu does not appear, make sure that:

- the antenna is supplied with voltage and has been switched on for at least 1 min.
- the antenna is not in busy mode (see section 4.3.3 on page 20).
- the Ethernet connection is established correctly via high-quality cable, the *Eth-Link* LED is flashing and the network is not overloaded.
- the TCP/IP settings are correct, that there are no other devices with identical IP addresses in the network and that the antenna has the IP address that you call up in the browser.

  Then try to access the web pages again.

8.3.2 Set parameters

After accessing the web pages, you will see the basic menu shown above. To change the configuration of the antenna, you must log in via *Login* (see section 10.2.3.1 on page 53. You can then make the following adjustments:

- Set the transmission parameters for the bus interface.
- Change the Ethernet settings.
- Calibration of the transmitting coil.
- Setting the antenna position, definition of an offset if necessary.

All menus of the configuration web pages are described in section 10.2 on page 49.

▶ Finally, position a transponder under the antenna and check whether all values are arriving in your system via the interface used. You can also use the status display in the *Status* menu.

  The antenna is now ready for use.

8.3.3 Minimize Interferences by Adjusting the Thresholds

Function of the thresholds:

The thresholds determine the signal strength at which a transponder is classified as relevant and taken into account for the calculation and output of the position. A distinction is made between the *antenna threshold* and the *transponder threshold*.

- Antenna Threshold refers to the sum signal above the antenna (*Antenna Level*, see section 10.2.8 on page 60).
- The transponder threshold refers to the maximum signal level of the individual transponders (*Transponder Level*, see section 10.2.8 on page 60). The antenna only outputs the transponder level if the transponder is recognized by the antenna and classified as valid.

Thresholds do not filter out interference signals. The interference remains on the signal. For sections with interference, the thresholds should ensure that the interference is ignored. If interference and transponder signal overlap, the transponder signal will still be distorted. It is therefore strongly recommended to eliminate interferences and to establish a high signal-to-noise ratio, see also section 18.2 on page 95.

Increasing the thresholds reduces the detection range of the antenna. Do not set the thresholds too high, as otherwise the reading range and the maximum reading distance of the antenna will also be reduced or it will no longer be possible to read transponders at all.

Which interferences can be minimized by adjusting the thresholds?

- Crosstalk signals of a transponder. These are transponders that are not located in the antenna field, but whose signal is transmitted to the antenna via metals.
- The poor or faulty reading of a transponder at the edge of the detection range.

Procedure for adjusting the thresholds:

See section 10.2.8 on page 60.

Detection of interference using the antenna/transponder level:

See section 18.2 on page 95.

8.4 Completing Commissioning

To make changed parameters permanently effective, they must be saved permanently on the respective menu page using the *Save* button.

Some parameters require a restart of the antenna for them to be applied. This is indicated in the status column of the configuration web pages. To trigger the restart:

▶ Use the web page menu *Configuration -> Restart* (see section 10.2.13 on page 69).

The transponder antenna is now properly commissioned.

If you need a reference file of the antenna parameters for later settings:

▶ Archive the file (see section 10.2.14 on page 70).

9 Interfaces

9.1 USB

The USB interface on pins 3 and 4 of the ST1 power connector is only used for emergency updates: As soon as the software has an error that stops the function of the antenna for several seconds, a bootloader is enabled on the USB interface.

As soon as this occurs, contact Götting to obtain the software and description for the emergency update. The following applies to the connection to the USB interface:

NOTICE

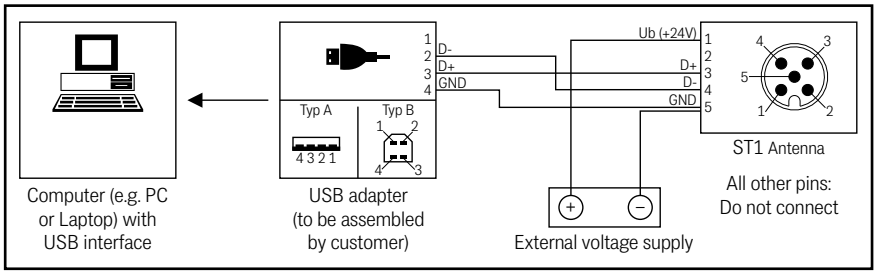
Damage to the transponder antenna or other devices connected via USB

The USB interface does not have a leading ground contact. If USB plugs are inserted or removed while the power supply is connected, voltage spikes can occur that damage the devices connected via USB.

- Always disconnect the transponder antenna from the power supply before plugging or unplugging the USB connector. This applies, for example, to the USB connector on the computer and the *Power* connector on the antenna.

The 5-pin connector ST1 (power) can be used to establish a connection to a PC. A PC with a USB interface is required.

Figure 18 *Connection example USB connection with the USB interface of a PC*



Optionally, the *connection box M12-5-8-USB* HG G-20960 can be connected between the device and PC. This allows the antenna to be connected via standard M12 cables.

Further information on the connection box can be found at http://goetting-agv.com/components/20960

9.2 CAN Bus

9.2.1 Definitions CAN and CANopen®

The CAN or CANopen® configuration is structured in accordance with ISO 11898 or EN 50325-4. Important terms and abbreviations are explained in this chapter as an aid. For more detailed information, please 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 website. These contain the complete configuration.

To access EDS files, you can use CANopen Magic from PEAK System, for example.

http://www.canopenmagic.com

Table 14 *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

9.2.2 Operating Modes and States

Table 15 *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 16 *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 17 *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 18 *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 CAN

The internal Full CAN module is based on the CAN specification V2.0 Part B. Standard frames are sent. The CAN parameters (bit timing, identifier, standard/extended frames) can be set via the configuration web pages (see chapter 10 on page 49). The output rate of the CAN messages can be set in 1 millisecond steps.

9.3.1 CAN Message Object – Main telegram

The main telegram contains the absolute position of the antenna, the status bytes of the device, the current track and an output counter.

The CAN Tx ID can be set via the web configuration pages. The value can be set from 0 to 2047_{DEC} (or 0 to $7FF_{Hex}$).

This telegram is sent cyclically depending on the parameter *Can output rate* (default 10 ms).

Table 19 *Structure of the CAN message object - main telegram*

Byte #	Length	Type	Meaning
1,2	2 Byte	unsigned int_16	Status according to Table 20 below
3,4,5,6	4 Byte	signed int_32	Absolute position of the antenna in mm
7	1 Byte	unsigned int_8	The current rail
8	1 Byte	unsigned int_8	CAN output counter
Low Byte First			

The absolute position is based on the electronic center of the antenna. However, it is possible to move this point by changing the *mounting offset* parameter (see section 10.2.8 on page 60).

In this CAN telegram, the rail of transponder slot *transponder 1* is preferred. If only transponder slot *transponder 2* is in use, this will be used.

Table 20 *CAN Status: Possible system states (part 1 of 2)*

Value	Name	Meaning
0x0001	NO_TRANSP_LIST	There is no transponder list available.
0x0002	ERR_TRANSP_NOT_FIND	A read transponder could not be found in the transponder list (see also section 17.4 on page 88).
0x0004	ERR_NOT_NEXT_TRANSP	The new transponder in the field is not the previous or next transponder in the transponder list (see also section 17.5 on page 89).
0x0008	ERR_ILLOGICAL_TRANSP	According to the transponder list, two transponders in the field are much further apart than the antenna can detect (see also section 17.6 on page 90).
0x0010	ERR_NO_CODE	No code can be read (see also section 17.3 on page 88).
0x0020	ERR_EQUAL_TRANSP	Two transponders in the field have the same code (see also section 17.7 on page 91).
0x0040	ERR_POS_DIF_T1_T2	The difference between the position of two transponders in the read range is too large (see also section 17.8 on page 91).
0x0080	Reserve	–
0x0100	FIRST_TRANSP	The first transponder is expected or read (see also section 17.2 on page 87).
0x0200	TRANSP_IM_FIELD	Transponder in the field
0x0400	ABS_POS_OK	Absolute position is fine.
0x0800	Reserve	–
0x1000	Reserve	–

Table 20 *CAN Status: Possible system states (part 2 of 2)*

Value	Name	Meaning
0x2000	USE_BOTH_ TRANSP	Both transponders are used to calculate the absolute position (see section 1.4.3 on page 10 for details).
0x4000	T1_REL_POS_OK	Relative position of transponder slot 1 is OK
0x8000	T2_REL_POS_OK	Relative position of transponder slot 2 is OK

9.3.2 CAN Message Object – Additional Telegrams

Additional CAN telegrams can be switched on via the Rx message (see section 9.3.3 on page 43). The first two additional telegrams contain the relative positions of the individual transponders as well as their code and level. The last additional telegram contains the tune, the tune current, the antenna level and the difference between the absolute positions of transponder 1 and transponder 2. The CAN IDs for these telegrams are based on the CAN ID of the main telegram.

The first additional telegram for transponder slot *transponder 1* has an ID that is 100 hex / 256 dec higher, the second additional telegram for transponder slot *transponder 2* has an ID that is 200 hex / 512 dec higher and the third additional telegram with the other data has an ID that is 300 hex / 768 dec higher than the CAN-Tx-ID set for the main telegram. Take this into account when changing the ID of the main telegram. If it is too high, there will be an overflow and you will not be able to receive the additional telegrams.

Like the main telegram, the additional telegrams are sent cyclically depending on the *Can output rate* parameter (default 10 ms).

9.3.2.1 Additional Telegram Transponder Slot Transponder 1

CAN message object *Transponder 1* is transmitted with identifier 0x100 + CAN-Tx-ID address.

Table 21 *Structure of the CAN message object transponder 1 (additional telegram 1)*

Byte	Length	Type	Meaning
1, 2	2 Byte	unsigned int_16	Transponder 1 level
3,4,5,6	4 Byte	unsigned int_32	Transponder 1 code
7,8	2 Byte	signed int_16	Transponder 1 relative position
Low Byte First			

9.3.2.2 Additional Telegram Transponder Slot Transponder 2

CAN message object *Transponder 2* is transmitted with identifier 0x200 + CAN-Tx-ID address.

Table 22 *Structure of the CAN message object transponder 2 (additional telegram 2)*

Byte	Length	Type	Meaning
1, 2	2 Byte	unsigned int_16	Transponder 2 level
3,4,5,6	4 Byte	unsigned int_32	Transponder 2 code
7,8	2 Byte	signed int_16	Transponder 2 relative position
Low Byte First			

9.3.2.3 Additional Telegram Other Data

CAN message object *other data* is transmitted with identifier 0x300 + CAN Tx ID address.

Table 23 *Structure of the CAN message object other data (additional telegram 3)*

Byte	Length	Type	Meaning
1	1 Byte	unsigned int_8	Tune
2	1 Byte	unsigned int_8	Measured current
3,4	2 Byte	signed int_16	Antenna level
5,6	2 Byte	signed int_16	Difference between the absolute position of T1 and T2
7,8	2 Byte	signed int_16	Reserved
Low Byte First			

9.3.3 CAN Message Object – Receive object

The additional telegrams for the transponder slots *transponder 1* and *transponder 2* can be activated in the receive object. Both can only be deactivated/activated at the same time.

The CAN Rx ID can be set via the web configuration pages. The value can be set from 0 to 2047_{DEC} (or 0 to $7FF_{Hex}$).

Table 24 *Structure of the CAN message object - receive object*

Byte	Length	Type	Meaning
1,2	2 Byte	unsigned int_16	RX command according to Table 25 below
3,4,5,6	4 Byte	unsigned int_32	RX value
7, 8	2 Byte	unsigned int_16	Reserved
Low Byte First			

Table 25 *CAN Rx command (part 1 of 2)*

Value	Name	Meaning
0x01	RX_MASK_MORE_MESSAGES	Deactivate/activate the additional telegrams: – Set to 1 to activate – Set to 0 to deactivate
0x02	RX_MASK_TAKE_TUNE	Writes the value from RX-Value to the tune (value is not saved)
0x04	RX_MASK_AUTO_TUNE	Activates the *Dynamic Auto-Tune* function. (value is not saved) see section 9.6 on page 48
0x08	RESERVE	Reserved
0x10	RESERVE	Reserved
0x20	RESERVE	Reserved

Table 25 *CAN Rx command (part 2 of 2)*

Value	Name	Meaning
0x40	RESERVE	Reserved
0x80	RESERVE	Reserved

9.4 CANopen®

The node ID and the transmission rate are selected via the associated SDOs or set via the configuration web pages (see 10.2.9 on page 63). The transmission rate can also be set via the associated SDO.

The system's measured values are transmitted via so-called TxPDOs. SDOs are used to activate certain functions or set parameters. The CAN identifiers are derived from the node address 1 to 127_{Dec} (or 1 to $7F_{Hex}$).

The event and inhibit time of the TxPDO can be set. The output TxPDOs contain the position, the angle and a status.

9.4.1 Description of the Transmit Process Data Objects (TxPDO)

The measured values are assigned to fixed locations in the PDO; dynamic mapping is not available. You can set the PDO operating mode to cyclical, synchronous or asynchronous. To avoid excessive bus load due to constant changes in asynchronous operating mode with non-cyclical transmission (*event time* = 0), you can set the so-called *inhibit time* in the CAN menu of the configuration web pages. The PDO can also be transmitted cyclically. To do 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. You can also temporarily deactivate/activate a TxPDO by setting or deleting the most significant bit in the associated PDO COB identifier.

The content of the CANopen® and CAN telegrams is the same, but the IDs are different.

9.4.1.1 CANopen® TxPDO_1 – Main Telegram, Send Object

TxPDO_1 is transmitted with identifier 0x180 + node address.

Table 26 *Variables in TxPDO_1 (main telegram)*

Byte	Length	Tape	Meaning
1,2	2 Byte	unsigned int_16	Status according to Table 20 on page 41
3,4,5,6	4 Byte	signed int_32	Absolute position of the antennas in mm
7	1 Byte	unsigned int_8	The current rail
8	1 Byte	unsigned int_8	CAN output counter
Low Byte First			

9.4.1.2 CANopen® TxPDO_2 – Additional Telegram 1, Send Object

TxPDO _2 is transmitted with identifier 0x280 + node address. TxPDO _2 is the additional telegram of the transponder slot *Transponder 1*. The event and inhibit time of this telegram is set to 0 by default, so it is not transmitted by default.

Table 27 *Variables in TxPDO_2 (additional telegram 1)*

Byte	Length	Type	Meaning
1,2	2 Byte	unsigned int_16	Transponder 1 level
3,4,5,6	4 Byte	unsigned int_32	Transponder 1 Code
7,8	2 Byte	signed int_16	Transponder 1 relative position
Low Byte First			

9.4.1.3 CANopen® TxPDO_3 – Additional telegram 2, Send Object

TxPDO _3 is transmitted with identifier 0x380 + node address. TxPDO _3 is the additional telegram of the transponder slot *Transponder 2*. The event and inhibit time of this telegram is set to 0 by default, so it is not transmitted by default.

Table 28 *Variables in TxPDO_3 (additional telegram 2)*

Byte	Length	Type	Meaning
1,2	2 Byte	unsigned int_16	Transponder 2 level
3,4,5,6	4 Byte	unsigned int_32	Transponder 2 code
7,8	2 Byte	signed int_16	Transponder 2 relative position
Low Byte First			

9.4.1.4 CANopen® TxPDO_4 – Additional Telegram 3, Send Object

TxPDO _4 is transmitted with identifier 0x480 + node address. TxPDO _4 is the additional telegram *other data*. The event and inhibit time of this telegram is set to 0 by default, so it is not transmitted by default.

Table 29 *Variables in TxPDO_4 (additional telegram 3)*

Byte	Length	Type	Meaning
1	1 Byte	unsigned int_8	Tune
2	1 Byte	unsigned int_8	Measured current
3,4	2 Byte	signed int_16	Antenna level
5,6	2 Byte	signed int_16	Difference between the absolute position of T1 and T2
7,8	2 Byte	signed int_16	Reserved
Low Byte First			

9.4.2 Description of the Service Data Objects (SDOs)

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

Table 30 *Identifier for read and write access*

Access type	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 faulty communication are:

Table 31 *Possible error codes SDO telegram*

Name	Number	Meaning
SDO_ABORT_UNSUPPORTED	0x06010000	Unsupported access to an 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	The signature *save* or *load* was not used when saving or loading parameters.

9.4.3 Object Directory

All objects relevant to the device are specified in the CANopen object dictionary. The complete object dictionary is listed in section 20.1 on page 99.

9.4.4 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 *HG98870.eds*.

https://www.goetting-agv.com/components/98870

9.5 PROFINET®

The antenna has an internal PROFINET® switch. The PROFINET® interface is configured using the GSDML file (see section 9.5.3 on page 48).

There are 32 input bytes and 8 output bytes available.

9.5.1 Input Bytes

Table 32 *Structure of the PROFINET® input bytes (part 1 of 2)*

Byte	Length	Type	Meaning
1,2	2 Byte	unsigned int_16	Status according to Table 20 on page 41
3,4,5,6	4 Byte	signed int_32	Absolute position of the antennas in mm
7	1 Byte	unsigned int_8	The current rail
8	1 Byte	unsigned int_8	Output counter
9,10	1 Byte	unsigned int_16	Transponder 1 level

Table 32 *Structure of the PROFINET® input bytes (part 2 of 2)*

Byte	Length	Type	Meaning
11,12,13,14	4 Byte	unsigned int_32	Transponder 1 code
15,16	2 Byte	signed int_16	Transponder 1 relative position
17,18	1 Byte	unsigned int_16	Transponder 2 level
19,20,21,22	4 Byte	unsigned int_32	Transponder 2 code
23,24	2 Byte	signed int_16	Transponder 2 relative position
25	1 Byte	unsigned int_8	Tune
26	1 Byte	unsigned int_8	Measured current
27,28	2 Byte	unsigned int_16	Antenna level
29,30	2 Byte	unsigned int_16	Difference between the absolute position of T1 and T2
31,32	2 Byte	unsigned int_16	Reserved
Low Byte First			

9.5.2 Output Bytes

Table 33 *Structure of the PROFINET® output bytes*

Byte	Length	Type	Meaning
1,2	2 Byte	unsigned int_16	RX-Command according to Table 34 below
3,4,5,6	4 Byte	unsigned int_32	RX value
7, 8	2 Byte	unsigned int_16	Reserved
Low Byte First			

Table 34 *PROFINET® RX command*

Value	Length	Meaning
0x01	RESERVE	Reserved
0x02	RX_MASK_TAKE_TUNE	Writes the value from RX value to the tune (value is not saved)
0x04	RX_MASK_AUTO_TUNE	Activates the *Dynamic Auto-Tune* function. (value is not saved) see section 9.6 on page 48
0x08	RESERVE	Reserved
0x10	RESERVE	Reserved
0x20	RESERVE	Reserved
0x40	RESERVE	Reserved
0x80	RESERVE	Reserved

9.5.3 GSDML File

You can download the latest version of the GSDML file for PROFINET® configuration from our Internet server. The file name is *GSDML-Vx.xx-GOETTING-HG98870YA-date.xml*.

https://www.goetting-agv.com/components/98870

9.6 Dynamic Auto-Tune

Tuning the transmitting coil is important, as transponders cannot be read by the antenna without tuning or the maximum read range of the antenna cannot be achieved. Tuning the transmitting coil is normally carried out once statically when the antenna is permanently installed in the vehicle and the vehicle is at the place of use (see *auto coil adjustment* in section 10.2.8 on page 60).

However, it can happen that the value to be tuned changes due to significant physical changes or other circumstances, resulting in measurement problems. It is therefore possible to dynamically activate Auto-Tune while driving.

The dynamic tune value is not permanently saved.

Activate dynamic auto-tune

The dynamic auto-tune function is activated with the RX_MASK_AUTO_TUNE bit (value 0x04) of the RX command. This is done via the command telegrams of CAN bus (Table 24 on page 43), CANopen® (Table 83 on page 108) and PROFINET® (Table 33 on page 47).

The function is triggered when a change of the corresponding bit from 0 to 1 has been sent:

- Send a 0 on this bit once and then a 1.

The auto-tune function takes approx. 2 seconds to execute.

The tune value created in this way is not saved and is deleted when the function is called up again or the antenna is restarted.

While the dynamic auto-tune function is running, the antenna goes into busy mode (see section 4.3.3 on page 20).

10 Configuring the System via the Configuration Web Pages

10.1 Introduction

The transponder antenna can be parameterized via the configuration web pages. The following requirements must be met in order to access the web pages:

- ✓ Antenna and computer are connected via an Ethernet cable, see section 8.2.1 on page 33.
- ✓ Antenna and computer have matching TCP/IP settings, see section 8.2.2 on page 34.
- ▶ The configuration web pages can then be called up via a browser, see section 8.3.1 on page 35.

10.2 Using the Configuration Web Pages

NOTICE

Changes to the antenna parameters can detune the antenna!

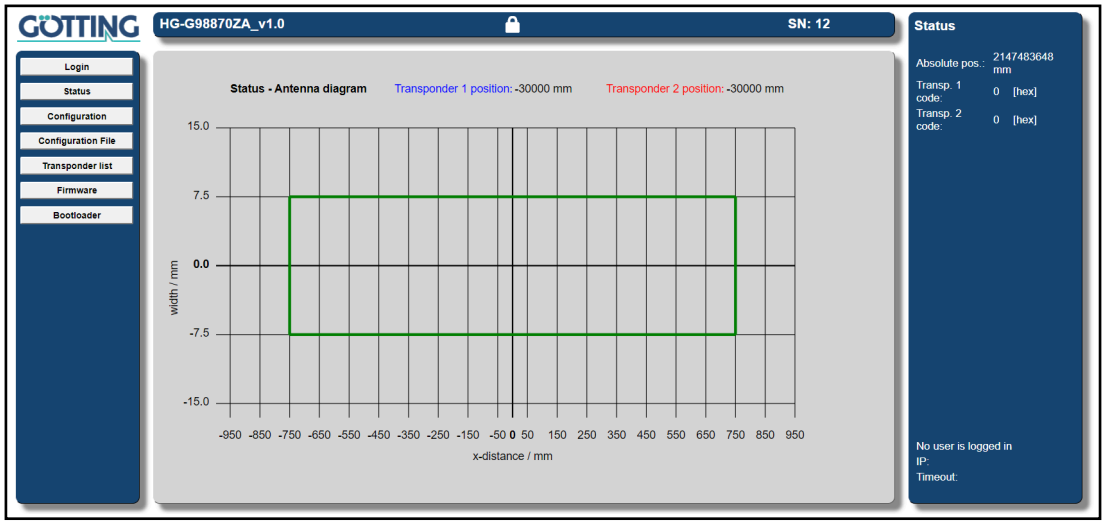
The changes to the antenna parameters described below can detune the antenna to such an extent that normal operation is no longer possible!

- ▶ Save the configuration of the transponder antenna before each change so that you can restore it if necessary (see section 10.2.14 on page 70).

10.2.1 Basic Menu

You always start in the *Status - Antenna diagram* menu and can then change the menu in the menu column on the left.

Figure 19 *Configuration web pages: Basic menu (Status - Antenna diagram)*



10.2.2 Header, Menu Column and Status Column

At the top of the header, you will see the version number on the left, the serial number of your device on the right and a lock symbol in the middle, which indicates whether you are logged in or logged out. On the left-hand side below the Götting logo is the menu column.

Pressing one of the menu buttons

- opens a submenu if the menu item has sub-items.
- changes the main area to the right of the menu column directly if there are no submenus.

The following menus are available:

Table 35 *List of the menus of the configuration web pages (part 1 of 2)*

Button name	Menu type	Description
Login	Main menu	Opens an option to enter a password for the login. Is hidden when a user is logged in.
Logout	Main menu	Only visible when logged in. Logs the user out and opens the basic menu.
Status	Main menu	Shows the following submenus.
Measurement	Submenu	Displays all relevant measured values
Antenna diagram (basic menu)	Submenu	A diagram in which the calculated transponder positions are displayed.
Error	Submenu	Displays all current errors and warnings of the device.
Configuration	Main menu	Displays the following submenus.
Settings	Submenu	Parameters for adjusting or calibrating the antenna.

Table 35 *List of the menus of the configuration web pages (part 2 of 2)*

Button name	Menu type	Description
CAN parameter (only for the variant HG G-98870ZA)	Submenu	Parameters for CAN bus and CANopen® ID format.
Network	Submenu	Parameters for the IPv4 address of the antenna.
Logging	Submenu	Parameters for TCP logging of the measured data.
Security	Submenu	The password for the login can be changed here.
Restart	Submenu	The antenna can be restarted here.
Configuration File	Main menu	Update and download of the antenna configuration file
Transponder list	Main menu	Update and download of the transponder list
Firmware	Main menu	Update of the firmware of the antenna
Bootloader	Main menu	Update of the bootloader of the antenna

The status column on the right-hand side of the screen shows the absolute position, transponder codes, users and error and warning messages.

Figure 20 *Configuration web pages: Status column*

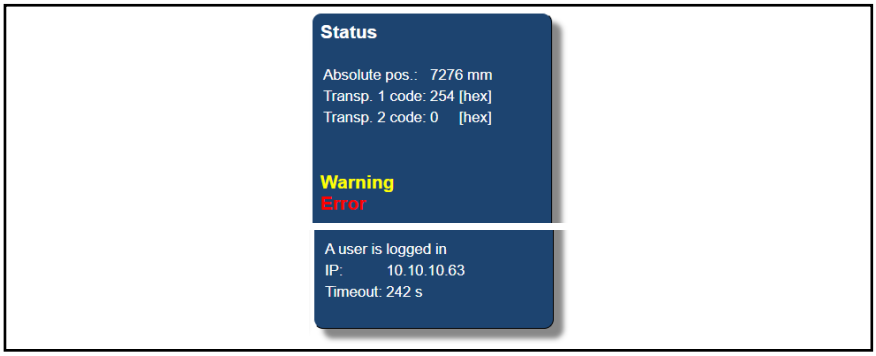


Table 36 *Configuration web pages: List of possible error and warning messages (part 1 of 2)*

Message	Meaning
Absolute Pos.	Displays the absolute position of the antenna calculated from the position of the two transponders.
Transp. 1 code	Displays the code of slot *Transponder 1*.
Transp. 2 code	Displays the code of slot *Transponder 2*.
Warning	There is a warning message in the device. This can be viewed on the web page *Status -> Errors*, see section 10.2.7 on page 58. Warning messages flash in color in the status column.
Device needs a restart!	The device requires a restart, e.g. to make changed interface or network parameters effective.

Table 36 *Configuration web pages: List of possible error and warning messages (part 2 of 2)*

Message	Meaning
Error	There is an error message in the device. This can be viewed on the web page *Status -> Errors* see section 10.2.7 on page 58. Error messages flash in color in the status column.
No user is logged in	No user is logged in.
A user is logged in	One user is logged in. Only one user can log in at a time. For more information, see section 10.2.3 below.
IP	If a user has logged in, the IP of the logged-in user is displayed here. Visible to all.
Timeout	The timeout of the logged-in user is displayed here, see section 10.2.3 below. Visible to all.

10.2.3 Login / Logout

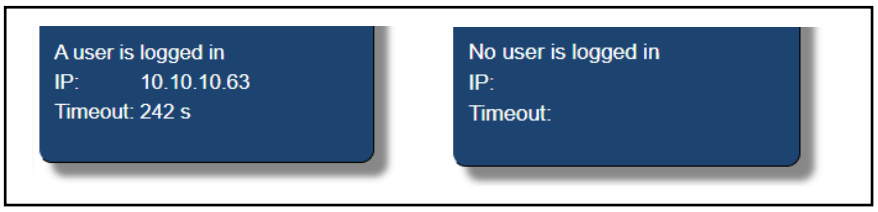
The lock symbol in the header indicates whether you are logged in or logged out.

- If the lock is closed, you are logged out.
  When you are logged out, you can only view values and settings, but not change them.
- If the lock is open, you are logged in.
  To be able to change settings and parameters or to trigger a restart of the antenna, you must be logged in.

To prevent errors due to simultaneous access, only one user can be logged in at a time. Other users can only view parameters and status pages and may have to wait until the currently logged-in user logs out. If they try to log in anyway, a warning is displayed after entering the password.

Whether a user is currently logged in is displayed in the status column:

Figure 21 *Configuration web pages: Status column - Login status*



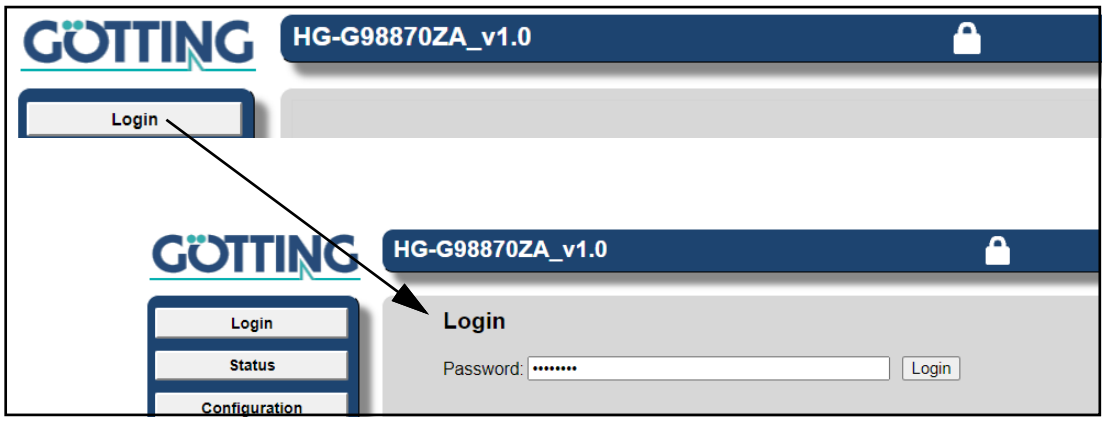
The *Timeout* of logged-in users is also displayed there. The *timeout* is used to ensure that logged-in users who forget to log out are automatically logged out after 300 seconds (5 min). The *timeout* starts after login and is reset to 300 sec for the following activities:

- Switch between the web page menus.
- Saving parameters with *Save*.
- Uploading files with *Upload*.

Logged-in users can also be logged out by restarting the antenna.

10.2.3.1 Login

Figure 22 *Configuration web pages: Login*



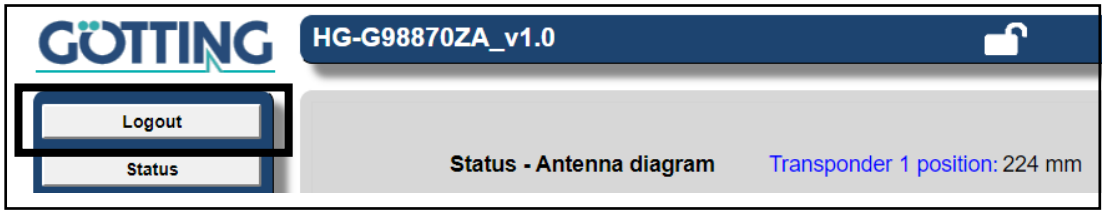
- ▶ Click on the login button in the menu column.
  The login dialog opens.

- ▶ Enter the password of the antenna (default: `password`). The password can be changed, see section 10.2.12.
- ▶ Click on the *Login* button.
  You are logged in.

After logging in, the lock symbol in the header is open and the status column says *A user is logged in*. This means that settings can now also be changed.

10.2.3.2 Logout

Figure 23 *Configuration web pages: Logout*



- ▶ Click on the Logout button in the menu column.
  You are logged out.

  After logging out, the lock icon in the header is closed and the status column says *No user is logged in*. Settings can no longer be changed.

10.2.4 Set parameters and save them permanently

In some configuration menus, parameters can be changed after logging in. In the corresponding menus, the two buttons *Save* and *Cancel* appear at the top.

Figure 24 *Configuration web pages: Save and Cancel button*

- ♦ With *Save*, the changed parameters are permanently stored and used.

Each time *Save* is clicked, the antenna goes into busy mode for a short time (see section 4.3.3 on page 20).

- With *Cancel* or by leaving the menu page, the changed parameters are not saved and discarded.

In some cases, the antenna must be restarted after clicking *Save* for changed parameters to take effect. In these cases, the message *Warning Device needs a restart* appears in the status column. The restart can be triggered via the *Configuration –> Restart* menu (see section 10.2.13 on page 69).

The following parameter types are available:

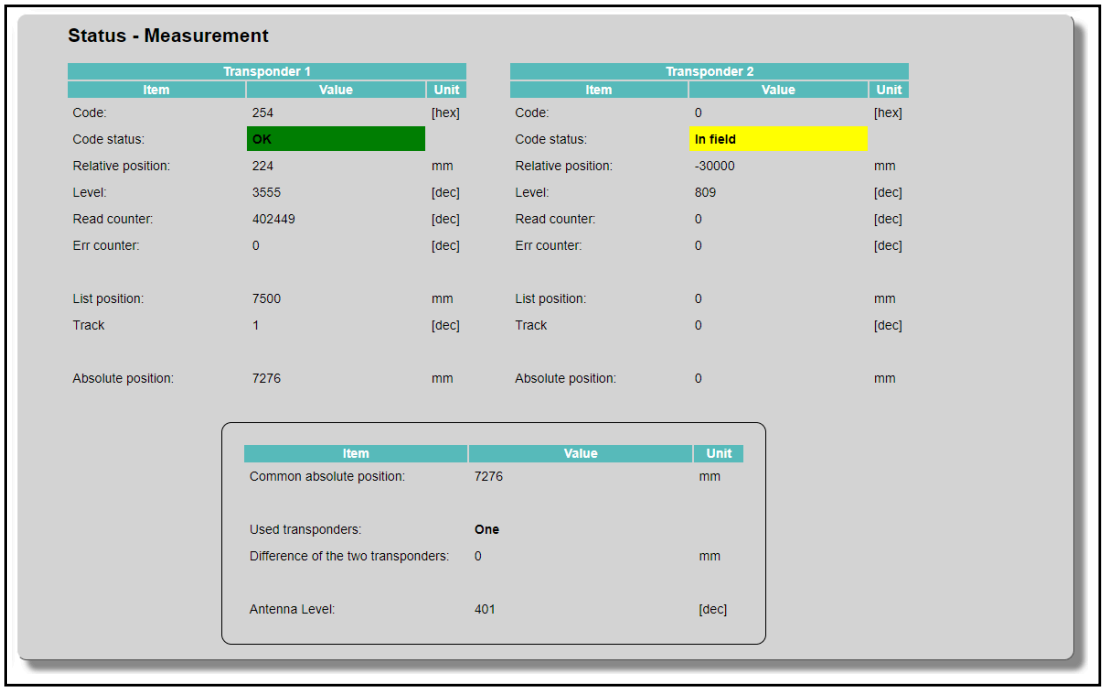
Table 37 *Configuration web pages: Parameter types*

Parameter type	Parameter class	Condition
Input Field	Freely selectable value	Select field by clicking and enter values with the keyboard
Selection	List of suitable options	After clicking on the field, a drop-down menu opens from which you can select the desired option
Checkbox	Enable individual options	Depending on the current setting, the field is checked or unchecked when you click on it. Thus individual options can be deactivated/ activated
Button	Clickable button	Self-determining value that is determined internally by a function and then stores itself
File field	File selection for e.g. configuration files	Click on the button, a dialog opens where you can select files
Idle	Status & progress bar	Where appropriate, the antenna shows status messages and progress bars, e.g. during firmware updates. The start message is then often *idle*. Progress bars are time-driven, not process-driven.

10.2.5 Status – Measurement

The configuration page *Measurement* is a submenu of the *Status* menu. On this page you will find all the important measurement data to track the absolute position output.

Figure 25 *Configuration web pages: Status – Measurement*



On this page, two tables are displayed with all the measured values of the transponders and, in the middle below, the absolute position calculated from the transponders. The antenna can read a maximum of two transponders at the same time. For these, two slots are allocated according to the following scheme:

- Starting position: There is no transponder in the antenna's reading field.
- A transponder enters the detection range of the antenna and its code is read: This transponder is assigned to slot 1.
- While the first transponder is still in the detection area, a second transponder enters the detection range and its code is read: This transponder is assigned to slot 2. The transponder retains this slot until it leaves the detection area, even if the transponder in slot 1 leaves the detection area before then.

Table 38 *Configuration web page: Status – Measurement: List of output fields (part 1 of 2)*

Object	Description
Code	Read code of the transponder.
Code status	Read status of the transponder with the following states: – OK = Code is read – In field = transponder in the field or nearby, code cannot be read yet – Error = No transponder near the detection areas
Relative position	The measured relative position of the transponder under the antenna.
Level	The measured maximum signal strength of the transponder.
Read counter	Counter of the number of successful transponder readings.

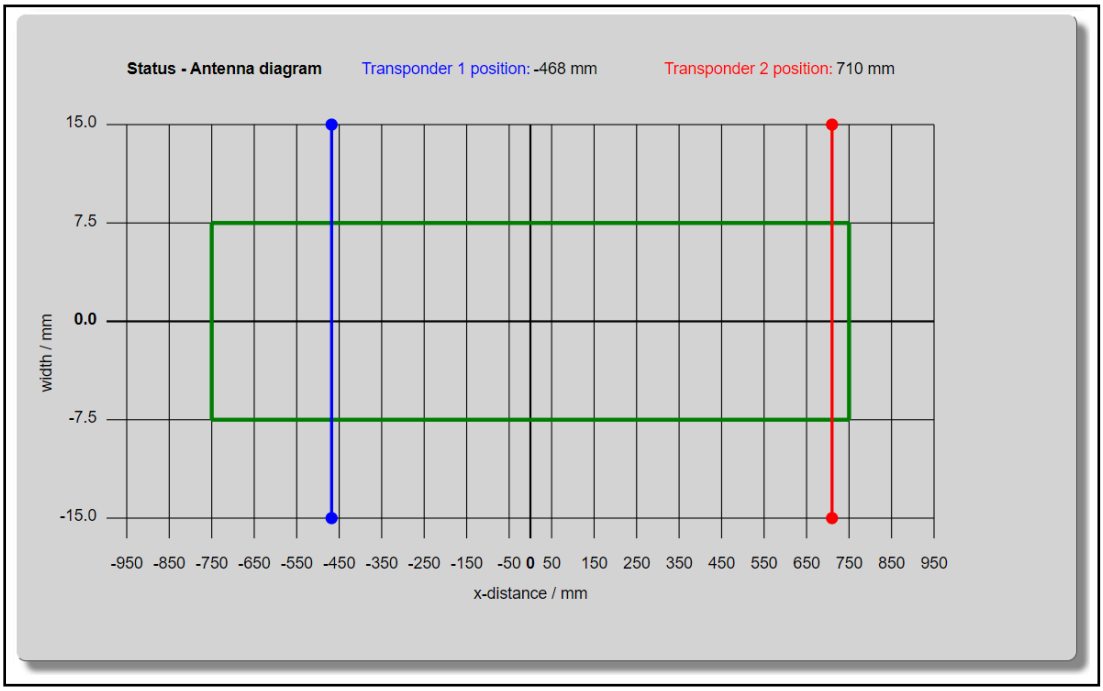
Table 38 *Configuration web page: Status – Measurement: List of output fields (part 2 of 2)*

Object	Description
Err counter	Counter of the number of errors occurring with a transponder.
List position	Absolute position of the read transponder taken from the stored transponder list (see section 10.2.15 on page 72).
Track	Rail segment of the read transponder taken from the stored transponder list (see section 10.2.15 on page 72).
Absolute position	Absolute position of the antenna depending on the measured relative position, the set *mounting direction*, the set *mounting offset* (see Section 10.2.8 on page 60) and the read absolute position of the transponder (see section 10.2.15 on page 72).
Common absolute position	Mean value of the two absolute positions of the antennas resulting from the two transponders read. This value is the output absolute position of the antenna.
Used transponders	– None: No transponder is used for the absolute position. – One: The transponder located in the reading area is used for the absolute position. – Both: Both transponders, which are located in the reading range, are used for the absolute position.
Difference of the two transponders	Difference between the absolute position of transponder 1 and transponder 2
Antenna Level	Antenna level

10.2.6 Status – Antenna Diagram

The *Antenna diagram* configuration page is a submenu of the *Status* menu. This page is also the basic menu. This page graphically shows where the transponders are located under the antenna. It thus also serves to check the function of the system.

Figure 26 *Configuration web pages: Status – Antenna diagram*



A graph is displayed showing the relative position of the transponders under the antenna.

Since the HG G-98870-A is a 1-dimensional antenna, there is only the X axis in the diagram. The vertical axis is adapted to the width of the antenna for visual reasons.

The green frame indicates the reading area of the antenna. The blue marker belongs to the slot *transponder 1* and the red marker to the slot *transponder 2*. How the antenna assigns the transponders to the slots is described in Section 10.2.5 on page 55 . For each of the slots, the relative position is output. If the relative position is the unrealistic value *-30000.00m* , this indicates that the transponder is outside the detection range.

10.2.7 Status – Errors

The *Errors* configuration page is a submenu of the *Status* menu. This page displays all current errors and warnings from the antenna. The page lists the errors and warnings and shows where an error occurred with colored dots in front of it.

Figure 27 *Configuration web pages: Status – Errors*

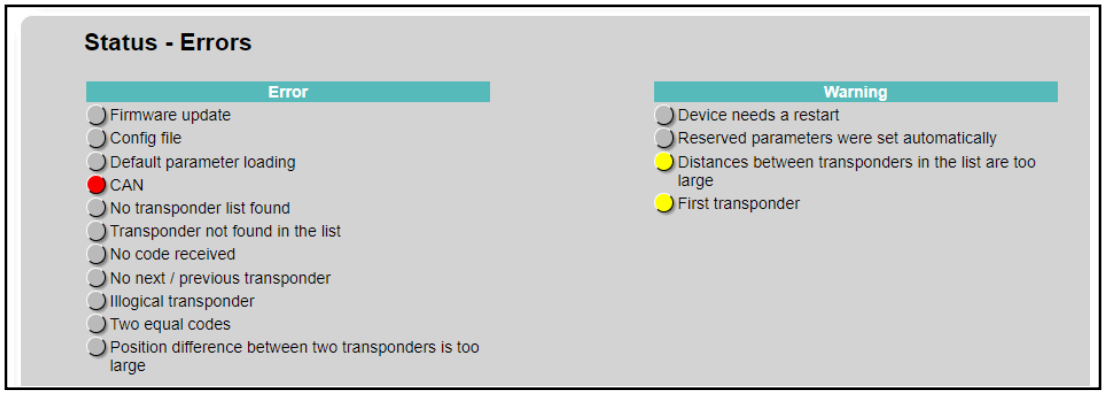


Table 39 *Configuration web pages: Status – Errors: List of possible error messages (part 1 of 2)*

Error	Meaning	Proposal for rectification
Firmware update	A firmware update failed	In most cases, the reason is an incorrect firmware that does not belong to the device. – Restart device or upload appropriate files.
Config file	Uploading a configuration file failed	In most cases, the reason is an incorrect configuration file that does not belong to the device. – Restart device or upload appropriate files.
Default parameter loading	The saved parameters could not be loaded and the default parameters were loaded	– Check the parameters. – If necessary, upload a saved configuration file. – When pressing the *save* button or after uploading a configuration file, the error disappears. – Try restarting the antenna. If the error occurs again, there is a strong suspicion that your parameter memory is broken. In this case, please contact the service, see chapter 18 on page 92
CAN (only for the variant HG G-98870ZA)	CAN Bus Error	Most of the time it is due to the CAN bus connection – CAN bus is not connected – CAN bus has no terminating resistor – CAN bus is overloaded
PROFINET® (only for the HG G-98870YA variant)	PROFINET® Error	– Check PROFINET® cable – Check PROFINET® LEDs (see section 4.3.2 on page 19)
No transponder list found	No transponder list was found	No transponder list with a valid format could be found in the data memory – Update the transponder list (see section 10.2.15 on page 72)

Table 39 *Configuration web pages: Status – Errors: List of possible error messages (part 2 of 2)*

Error	Meaning	Proposal for rectification
Transponder not found in the list	The newly read transponder cannot be found in the transponder list	– Check the stored transponder list – Check read code – Upload a new transponder list to the antennas or change the code of the transponder
No code received	No code is read	– The threshold for the detection of transponders is too large – There are too many interferences nearby
Not next / previous transponder	The newly read transponder is not the successor of the last read transponder	– Check the stored transponder list – Check the read code Upload a new transponder list to the antennas or change the code of the transponder – Check if the missing transponder is defective.
Illogical transponder	According to the transponder list, two transponders in the field are much further apart than the antenna can detect.	– Check the stored transponder list – Check the read code Upload a new transponder list to the antennas or change the code of the transponder
Two equal transponder codes	Two transponders with the same code are in the antenna field.	– Check the stored transponder list – Check the read code Upload a new transponder list to the antennas or change the code of the transponder
Position difference of two transponders too large	The difference in the position of two transponders in the reading range is too great.	– Check the x position of the transponders in the transponder list – If necessary, load a new, adapted transponder list into the antenna – Check the installation height – Check the environment for sources of interference

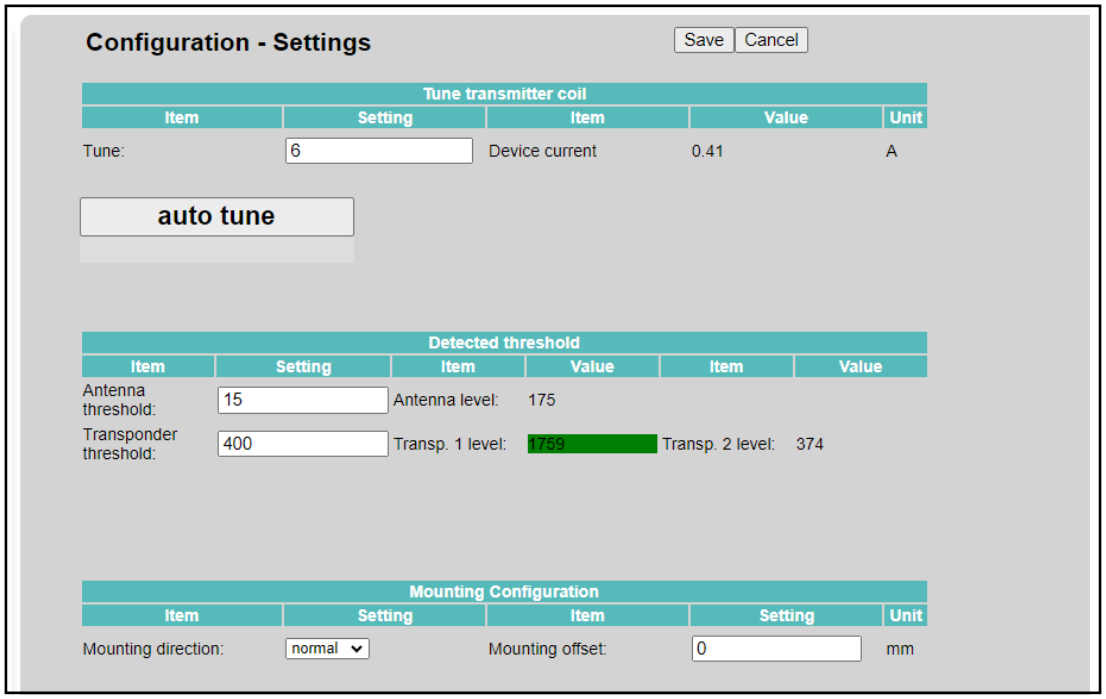
Table 40 *Configuration web pages: Status – Errors: List of possible warnings*

Warnings	Meaning	Proposal for rectification
Device needs a restart	Antenna needs a restart	Perform a reboot, see Section 10.2.13 on page 69
Reserved parameters were set automatically	A reserved parameter is used after the firmware update and has been overwritten with the default value	– Check the set parameters or upload a saved configuration file. – When pressing the *save* button or after uploading a configuration file, the error disappears.
Distances between transponders in the list are too large	The loaded list has one or more transponder distances greater than 1.5 m.	– Check the stored transponder list. – If necessary, load a new transponder list into the antenna.
First transponder	The first transponder is expected or read	– The antenna has been restarted or a plausibility error has occurred (see also section 17.2 on page 87). – Move over two consecutive transponders (order as in the internally sorted transponder list, see chapter 13 on page 79).

10.2.8 Configuration – Settings

The configuration page *Settings* is a submenu of the *Configuration* menu. On this page there are parameters and functions for setting the antenna.

Figure 28 *Configuration web pages: Configuration – Settings*



The *Settings* page has three sections.

10.2.8.1 Tune Transmitter Coil

This section is used to adjust the transmitter coil so that it has the maximum transmission power depending on the installation conditions. This section has the following controls:

Table 41 *Configuration web pages: Parameter adjustment transmitter coil*

Parameters	Type	Description
Adjustment value	Input field	Set the adjustment of the coil in the range 0 to 15. Note: You can also have this value determined automatically using the button *auto coil adjustment* (see below).
Device current	Display of a value	This value indicates the current required to tune the antenna. When the current is at its highest, the transmitting coil is ideally tuned. At 24 V, the current should be approx. 0.41 A.
auto coil ad-justment	Button	With this button, the ideal adjustment value for the transmitter coil is automatically determined (see below).

The transmitter coil must be adjusted once after the antenna has been installed. We recommend automatic tuning with the *auto coil adjustment* button.

After tuning via *auto coil adjustment*, the determined value is automatically saved. Even with the *Cancel* button, the previous value can no longer be restored.

The automatic tuning via *auto coil adjustment* takes about 20 seconds. During this time, a progress bar appears below the button and the antenna goes into busy mode (see section 4.3.3 on page 20).

10.2.8.2 Detected Threshold

The transponder detection threshold can be set in this section. For the antenna to detect a transponder, the transponder signal must be above the set *Threshold*. This section has the following controls:

Table 42 *Configuration web pages: Parameter Detected threshold*

Parameters	Type	Description
Antenna Threshold	Input field	Set the antenna threshold in the range 0 to 5000 (see below).
Antenna level	Value	Displays the sum signal of the antenna.
Transponder Threshold	Input field	Set the threshold for transponder detection in the range 0 to 5000 (see below).
Transp. 1 level	Displaying a value	Displays the signal strength of the transponder assigned to slot *Transponder 1*. If the code status is OK (see 10.2.5 on page 55), the value is highlighted in green.
Transp. 2 level	Displaying a value	Displays the signal strength of the transponder assigned to slot *Transponder 2*. If the code status is OK (see 10.2.5 on page 55), the value is highlighted in green.

Ideally, you do not need to change the thresholds. Only set the transponder threshold if you have a fault on the route that occupies one of the transponder slots.

Signals below the threshold are not filtered out and have a negative effect on the position determination. Therefore, you should always have a high signal-to-noise ratio for interfering signals (see section 18.2 on page 95).

Antenna Threshold

Increasing the thresholds reduces the detection range of the antenna. Do not set the thresholds too high, as otherwise the reading range and the maximum reading distance of the antenna will also be reduced or it will no longer be possible to read transponders at all.

- Drive to a location where there is no transponder under the antenna. Make a note of the *Antenna Level* displayed.
- Now carry out a measurement run over several transponders and log them with the help of the CSV output (see sections 10.2.11 on page 66 and 20.3 on page 109).

- Now use the logged *antenna level* values to set the threshold so high that potential interference is below the threshold and the signal strength of the transponder is well above the threshold with sufficient buffer.
- Click *Save*.

Transponder Threshold:

If the transponder threshold is set too high, transponders in the reading range are no longer recognized if their signal strength is below the threshold. The two slots then display the value 0.

- Drive over a transponder so that it is in the middle of the reading range.
- In the first step, set the *Transponder Threshold* as low as possible so that the transponder can be recognized and assigned to a slot in any case.
- Click *Save* to save the parameter in the antenna.
  Transp. 1 level should now show a value and be highlighted in green.
- Then set the threshold so high that the potential interference is below the threshold and the signal strength of the transponder is well above the threshold with sufficient buffer.
- Click *Save*.

10.2.8.3 Mounting Configuration

The information in this section can be used to include a deviating antenna mounting position in the position evaluation. This section has the following controls:

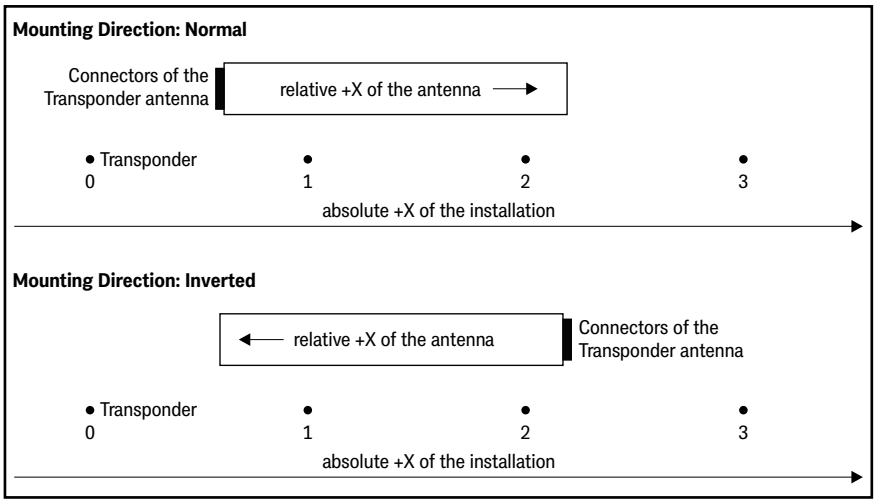
Table 43 *Configuration web pages: Parameter Mounting Configuration*

Parameters	Type	Description
Mounting direction	Selection	Set the mounting direction of the antenna (see below), possible values are – Normal – Inverted
Mounting offset	Input field	Set the offset of the center of the antenna in the range 0 to 2^32 (corresponding to 4,294,967,296 mm, see below)

Mounting direction

The antenna can be moved forwards and backwards in the X direction. However, it expects the transponder positions to be in ascending order in the +X direction. If it is mounted the other way around, the *mounting direction* can be inverted here.

Figure 29 *Mounting direction: Mounting positions normal and inverted*



The setting of *Mounting direction* has no influence on the relative position. However, when determining the absolute position, the *Mounting direction* setting is taken into account.

- Adjust the *Mounting direction* setting if necessary.
- Click *Save*.

Mounting offset

By setting a *mounting offset*, you can move the center of the antenna virtually, e.g. so that the calculated antenna center corresponds to the center of the vehicle. Again, this value only affects the calculation of the absolute position of the antenna.

- Measure the distance of the center of the antenna to the center of the vehicle.
- Enter the measured value at *Mounting offset*.
- Click *Save*.

We recommend checking the *Mounting Configuration* settings by hovering the antenna over a transponder and going to the *Status –> Measurement* page (see section 10.2.5 on page 55).

10.2.9 Configuration – CAN Bus

The *CAN-Bus* configuration page is a submenu of the *Configuration* menu. On this page you will find parameters and functions for adjusting the CAN bus settings of the antenna.

The layout of the page differs depending on whether you are in CANopen® (*CAN format CANopen*) or CAN (*CAN format CAN)* mode.

Figure 30 *Configuration web pages: Configuration – CAN-Bus, CAN format CANopen®*

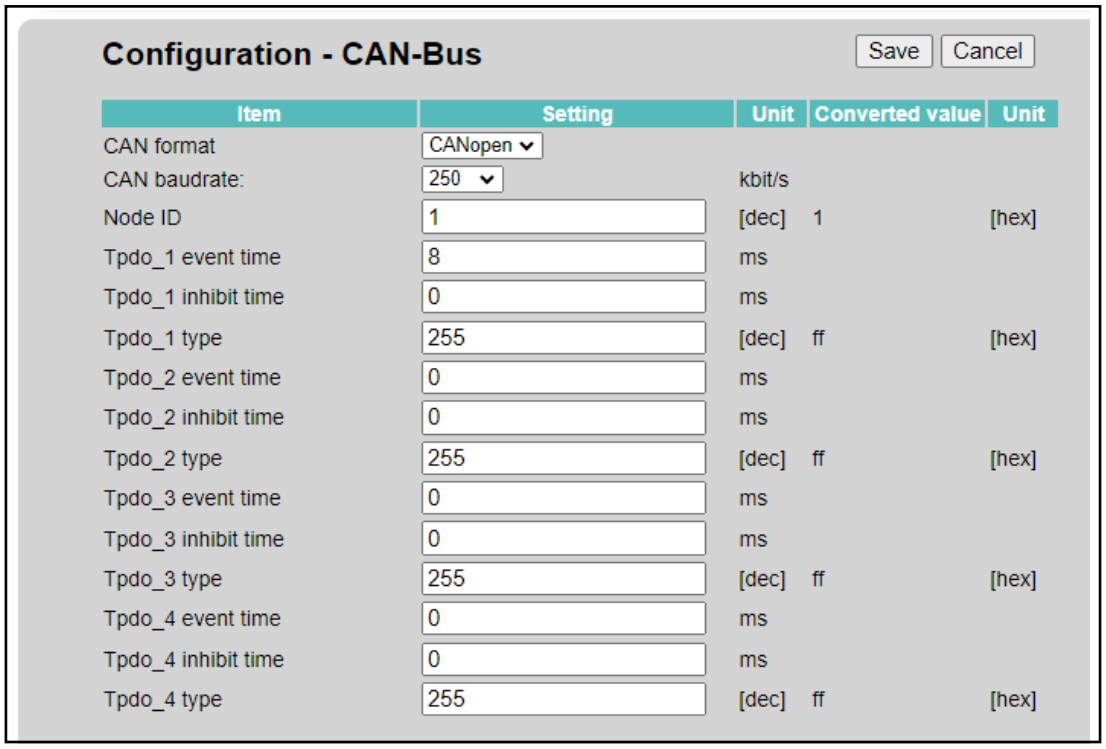
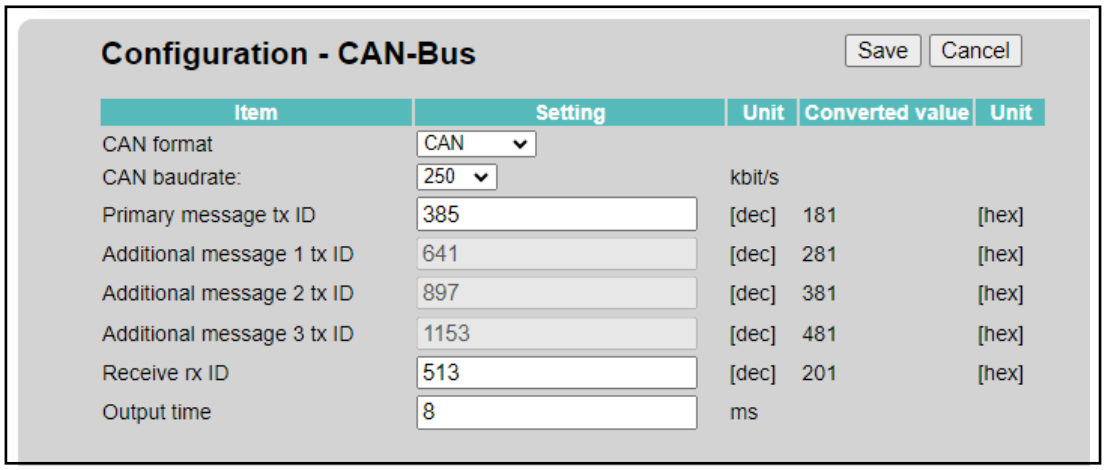


Figure 31 *Configuration web pages: Configuration – CAN-Bus, CAN format CAN*



Where appropriate, converted values of your input are displayed next to the input fields. In the case of decimal numbers, the converted hexadecimal number is displayed on the right. This page has the following controls:

Table 44 *Configuration web pages: Parameter CAN-Bus (part 1 of 2)*

Parameters	Type	Refers to	Description
CAN format	Selection	CAN & CANopen®	Choose whether you want to use CAN or CANopen®. Depending on the selection, the appropriate parameters are displayed and the unnecessary ones are hidden.
CAN baud rate	Selection	CAN & CANopen®	Select the CAN baud rate.
CAN node ID	Input field	CANopen®	Enter the node ID as a decimal number.

Table 44 *Configuration web pages: Parameter CAN-Bus (part 2 of 2)*

Parameters	Type	Refers to	Description
Tpdo 1 event time	Input field	CANopen®	Specify the event time of the TPDO 1 message *node ID + 0x180*
Tpdo 1 inhibit time	Input field	CANopen®	Enter the inhibit time of the TPDO 1 message *node ID + 0x180*
Tpdo 1 type	Input field	CANopen®	Specify the type of TPDO 1 message *node ID + 0x180* as a decimal number
Tpdo 2 event time	Input field	CANopen®	Specify the event time of the TPDO 2 message *node ID + 0x280*
Tpdo 2 inhibit time	Input field	CANopen®	Specify the inhibit time of TPDO 2 message *node ID + 0x280*
Tpdo 2 type	Input field	CANopen®	Specify the type of TPDO 2 message *node ID + 0x280* as a decimal number
Tpdo 3 event time	Input field	CANopen®	Specify the event time of TPDO 3 message *node ID + 0x380*
Tpdo 3 inhibit time	Input field	CANopen®	Specify the inhibit time of TPDO 3 message *node ID + 0x380*
Tpdo 3 type	Input field	CANopen®	Enter the type of the TPDO 3 message *node ID + 0x380* as a decimal number
Tpdo 4 event time	Input field	CANopen®	Specify the event time of the TPDO 4 message *node ID + 0x480*
Tpdo 4 inhibit time	Input field	CANopen®	Specify the inhibit time of TPDO 4 message *node ID + 0x480*
Tpdo 4 type	Input field	CANopen®	Enter the type of the TPDO 4 message *node ID + 0x480* as a decimal number
Primary message tx ID	Input field	CAN	Specify the CAN-Tx-ID for the normal CAN telegram as a decimal number
Additional message 1 tx ID	Displaying a value	CAN	Displays the ID of the additional message 1 as a decimal number. This results from *Primary message tx ID + 0x100*.
Additional message 2 tx ID	Displaying a value	CAN	Displays the ID of additional message 2 as a decimal number. This results from *Primary message tx ID + 0x200*.
Additional message 3 tx ID	Displaying a value	CAN	Displays the ID of the additional message 32 as a decimal number. This results from *Primary message tx ID + 0x300*.
Receive rx ID	Input field	CAN	Enter the CAN Rx ID for the antenna as a decimal number
Output time	Input field	CAN	Specify the output time for the normal CAN telegram

- Adjust the settings to your use case if necessary.
- Click *Save*.

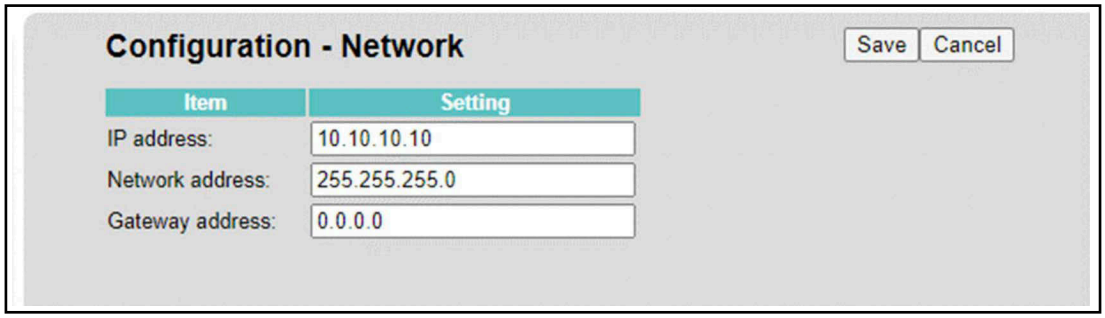
In order for changed CAN bus parameters to take effect, the antenna must be restarted. The restart can be triggered via the *Configuration –> Restart* menu (see Section 10.2.13 on page 69).

10.2.10 Configuration – Network

The *Network* configuration page is a submenu of the *Configuration* menu. On this page you will find parameters and functions for adjusting the network settings of the antenna.

If the IP address of the antenna is unknown and no longer corresponds to the default settings, you can determine the current IP address with the *program IP-Config.exe* , see Chapter 14 on page 82.

Figure 32 *Configuration web pages: Configuration – Network*



This page has the following controls:

Table 45 *Configuration web pages: Configuration – Network*

Parameters	Type	Description
IP address	Input field	Set the IP address here under which the antenna can be reached in the network
Network address	Input field	Adjust the subnet mask here if necessary
Gateway address	Input field	If necessary, set a gateway here

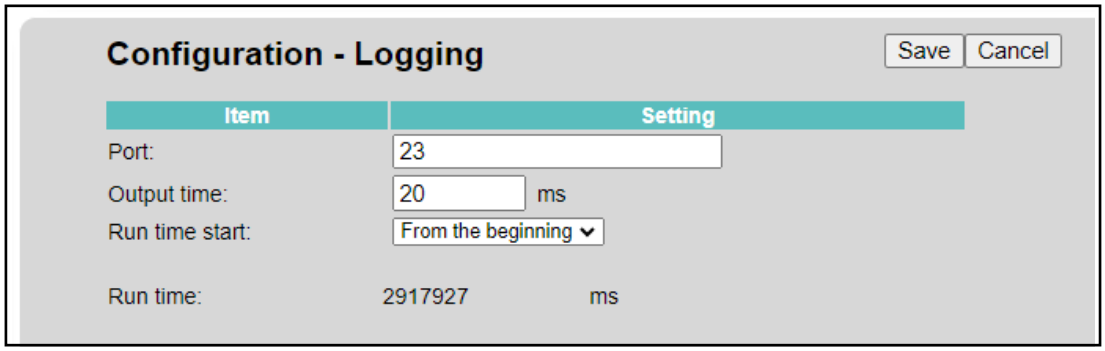
- If necessary, adjust the settings to suit your network.
- Click *Save*.

In order for changed *network* parameters to take effect, the antenna must be restarted. The restart can be triggered via the *menu Configuration –> Restart* (see Section 10.2.13 on page 69).

10.2.11 Configuration – Logging

The configuration page *Logging* is a submenu of the *Configuration* menu. You can record measurement data on this page. This is used to record errors during journeys

Figure 33 *Configuration web pages: Configuration - Logging*



The *logging* takes place via Ethernet. The measurement data is sent as TCP frames. You also need a terminal program that can display and record the TCP frames. The *logging* itself starts as soon as the terminal program establishes a TCP connection with the antenna. In the appendix you will find an example with the terminal program *Tera Term* (see section 20.3 on page 109).

This page has the following controls:

Table 46 *Configuration web pages: Configuration – Logging*

Parameters	Type	Description
Port	Input field	This is the TCP port on which the data is sent
Output time	Input field	Enter the output time of the tcp frames in ms.
Run time start	Selection	Set here when logging should start after a restart of the antenna, possible values are – From the beginning – From connection
Run time	Output of a value	A timer [ms]. Specifies the runtime of the logging. If *Run time start* is set to *From the beginning*, this is also the current runtime of the antenna.

- ▶ Adjust the settings for logging.
- ▶ Click *Save*.

In order for changed *logging* parameters to take effect, the antenna must be restarted. The restart can be triggered via the *menu Configuration –> Restart* (see Section 10.2.13 on page 69).

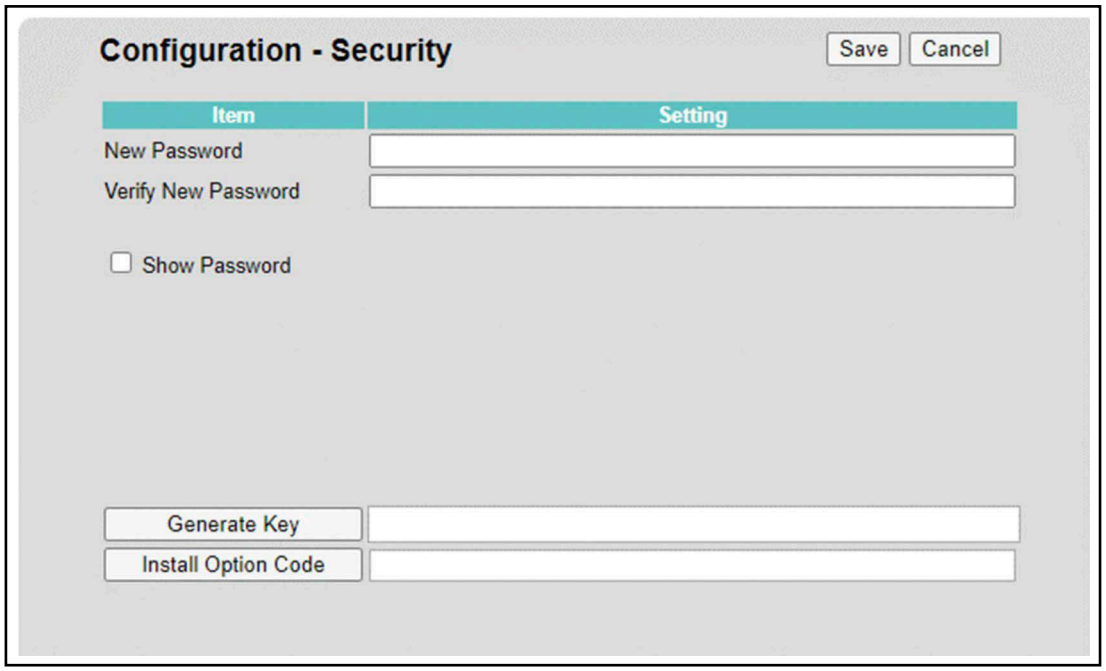
10.2.12 Configuration – Security

The *Security* configuration page is a submenu of the *Configuration* menu. On this page, you can change the password you use to log in to the antenna (see section 10.2.3 on page 52). The page can also be accessed and viewed when another user is logged in. However, only logged-in users can change the password.

A password that differs from the standard password (see section 10.2.3.1 on page 53) offers higher security, as not everyone who has access to this documentation or guesses the intentionally simple standard password has access to the configuration web pages. Document the changed password in a protected location, as after a change, the configuration web pages can only be accessed with the new password.

If you do not know the changed password, you can reset it via *Generate Key* with the help of an *option code* from Götting KG (see below).

Figure 34 *Configuration web pages: Configuration – Security*



This page is divided into two sections.

The upper section has the following controls:

Table 47 *Configuration web pages: Configuration – Security – top section*

Parameters	Type	Description
New Password	Input field	Enter a new password here. The characters entered are hidden so that no one can read along. A password must be 8 to 16 characters long and may consist of the following characters: – a-z – A-Z – 0-9 – *-_.
Verify New Password	Input field	Repeat the new password here to confirm it. The entry must be identical to *New Password* . The characters entered are hidden so that no one can read along.
Show Password	Checkbox	If the field is activated, the password entered is displayed in plain text. Make sure that nobody can read it.

- For logged-in users only: Enter a new, identical password for *New Password* and *Verify New Password*d.
- Click *Save*.

The lower section is used to reset the password to the default password and has the following controls:

Table 48 *Configuration web pages: Configuration – Security – lower section*

Parameters	Type	Description
Generate Key	Button + input field	Generates a key that can then be copied from the input field. The key is valid as long as the antenna remains switched on. Clicking the button again generates a new key and the previous one becomes invalid.
Install Option Code	Button + input field	The option code generated by Götting KG can be inserted into the input field. Use the button to reset the password.

To reset the password:

- Click on *Generate Key*, the following applies:
  - The key generated by the antenna is only valid until the antenna is turned off or *Generate Key* is clicked again.
- Copy the key generated with *Generate Key* from the input field.
- Send the key by e-mail to the following address to the Götting KG service.

service@goetting.de

- Leave the antenna switched on.
- The Götting Service will send you an *option code* by e-mail:
  - The *option code* is calculated to match the key generated by *Generate Key* and only works if no new key has been generated in the meantime. Therefore, the antenna must not be switched off until the *option code* is inserted and *Generate Key* must not have been clicked again in the meantime.
- Paste the code sent by Götting into the input field at *Install Option Code* and click on the *Install Option Code* button.

  The password is reset to the default (see section 10.2.3 on page 52).

10.2.13 Configuration – Restart

The *Restart* configuration page is a submenu of the *Configuration* menu. On this page, you can trigger an antenna restart without interrupting the power supply.

Figure 35 *Configuration web pages: Configuration – Restart*

This page has the following controls:

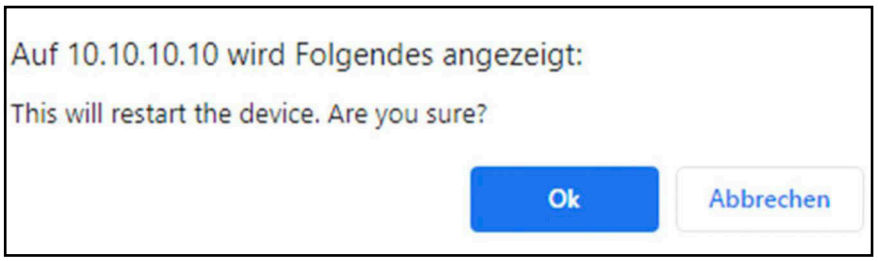
Table 49 *Configuration web pages: Configuration – Restart*

Parameters	Type	Description
Restart	Button	Triggers an antenna restart

To trigger a restart:

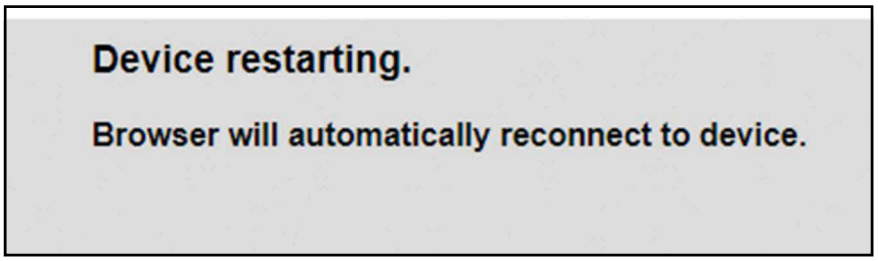
- Click the *Restart* button.
- The following dialog appears in the browser:

Figure 36 *Configuration web pages: Configuration – Restart query*



- Click on *OK*.
- The antenna restarts, while the following message is displayed:

Figure 37 *Configuration web pages: Configuration – Restart message*



- After the restart, the basic menu is automatically displayed again (see section 10.2.1 on page 50).

  The restart is complete.

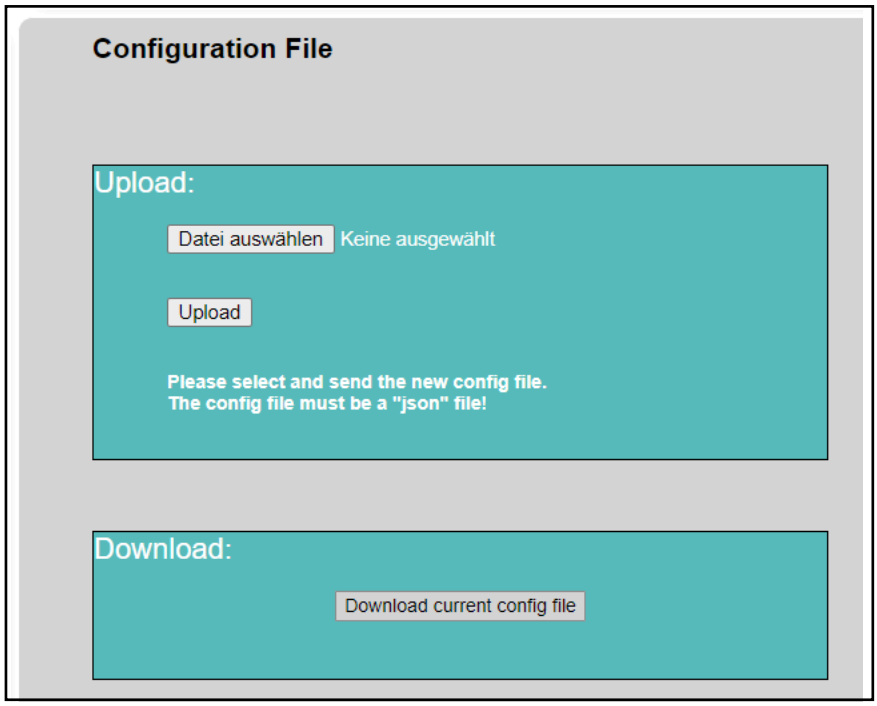
10.2.14 Configuration File

The configuration page *Configuration File* allows you to upload or download valid configuration files. For example, the settings of a parameterized antenna can be transferred to an antenna with factory settings. The last functioning settings can also be saved before changes are made.

Only files of type **.json* can be uploaded. Uploaded files are checked in the antenna to prevent confusion with configuration files for other devices.

You can find out more about the function of the configuration file in Chapter 12 on page 78.

Figure 38 *Configuration web pages: Configuration File*



This page is divided into two sections.

The *Upload* section has the following controls:

Table 50 *Configuration web pages: Configuration File – Upload*

Parameters	Type	Description
Select file	File field	Clicking on the button opens a file selection dialog where you can select the JSON configuration file
Upload	Button	Triggers the upload of the selected file to the antenna

To upload a configuration file:

- Click the *Select File* button.
- Select the appropriate configuration file in JSON format in the file selection dialog.
- Click the *Upload* button.

  The file is transferred to the antenna, where it is checked and applied if the format is suitable.

The antenna goes into busy mode during the upload (see section 4.3.3 on page 20). If the configuration file contains changed interface parameters, the antenna must be restarted after upload. This is also pointed out in the status column.

The *Download* section has the following controls:

Table 51 *Configuration web pages: Configuration File – Download*

Parameters	Type	Description
Download current config file	Button	Triggers the download of the configuration file from the antenna

To download a configuration file:

▶ Click the *Download current config file* button.

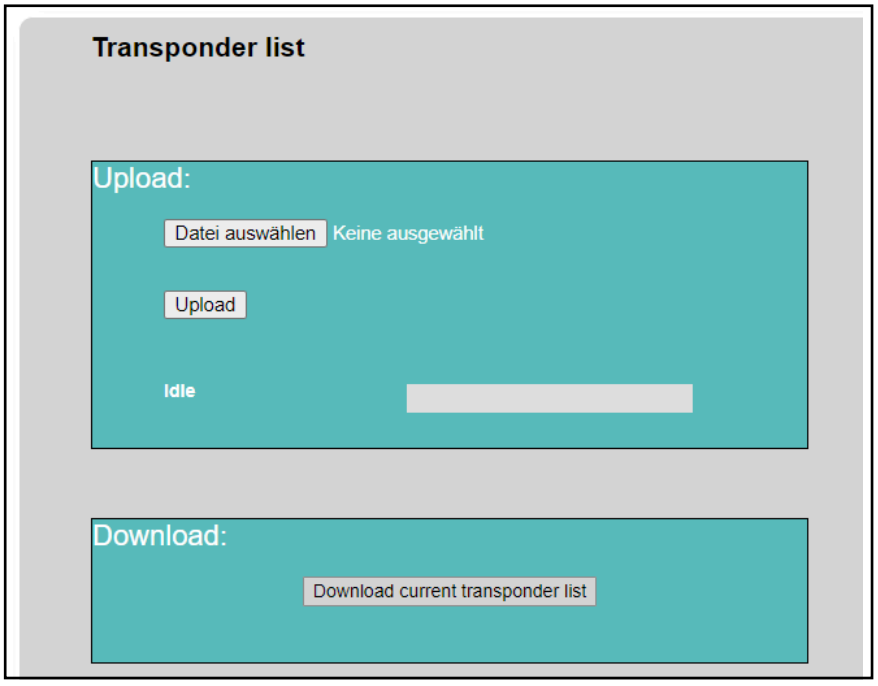
Depending on the browser settings, a download dialog will appear or the file will be downloaded directly.

10.2.15 Transponder list

The *configuration page Transponder list* allows you to upload or download transponder lists. The transponder list is necessary so that the antenna can calculate an absolute position. Only files of type **.csv* can be uploaded.

The structure of the transponder list is explained in more detail in chapter 13 on page 79.

Figure 39 *Configuration web pages: Transponder list*



This page is divided into two sections.

The *Upload* section has the following controls:

Table 52 *Configuration web pages: Transponder list - Upload*

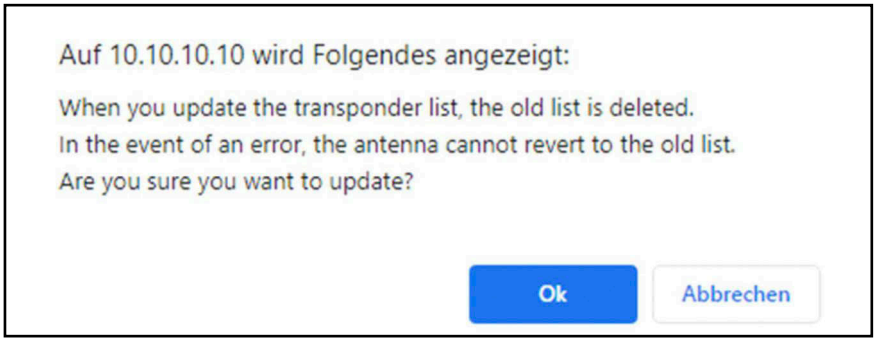
Parameters	Type	Description
Select file	File field	Click on the button to open a file selection dialog where you can select the CSV transponder list file
Upload	Button	Triggers the upload of the selected file to the antenna
Idle	Progress bar	Displays status messages and progress

As soon as a transponder list is uploaded, the previous transponder list in the antenna is automatically deleted and cannot be restored. Therefore, a security prompt is given before the upload. We recommend downloading the current transponder list via the Download section before uploading a new one, so that you can restore the working list if necessary.

To upload a transponder list:

- Click the *Select File* button.
- Select the appropriate configuration file in CSV format in the file selection dialog.
- Click the *Upload* button.
- The following dialog appears in the browser:

Figure 40 *Configuration web pages: Transponder list upload – security prompt*



- If you are sure, click *OK*.
  The file is transferred to the antenna and used as the new transponder list.

The antenna goes into busy mode during the upload (see section 4.3.3 on page 20).

The *Download* section has the following controls:

Table 53 *Configuration web pages: Transponder list – Download*

Parameters	Type	Description
Download current transponder list	Button	Triggers the download of the transponder list from the antenna

To download a transponder list:

- Click the *Download current transponder list* button.

  Depending on the browser settings, a download dialog will appear or the file will be downloaded directly.

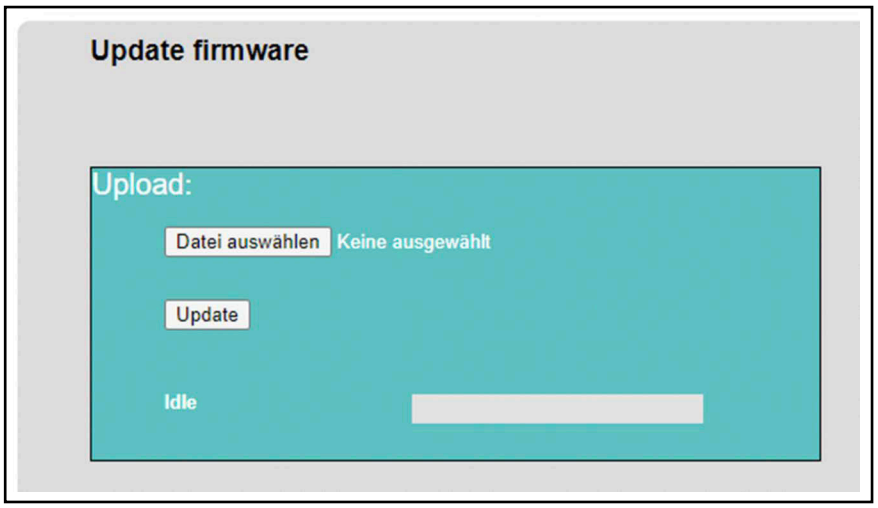
10.2.16 Update Firmware

The configuration page *Update firmware* allows firmware files to be uploaded. Only files of type **.sfu* can be uploaded.

New firmware files are available on request from Götting. Please use the following e-mail address or the contact details given on the back of this device description.

service@goetting.de

Figure 41 *Configuration web pages: Update firmware*



This page has the following controls:

Table 54 *Configuration web pages: Update firmware*

Parameters	Type	Description
Select file	File field	Clicking on the button opens a file selection dialog where you can select the SFU firmware file
Upload	Button	Triggers the upload of the selected file to the antenna
Idle	Progress bar	Displays status messages and progress

To upload a firmware file:

- Click the *Select File* button.
- In the file selection dialog, select the appropriate firmware file in SFU format.
- Click the *Upload* button.
  - The message *Erase running* appears with a progress bar.
  - The message *Prog running* appears with a progress bar.
  - The message *Restart sensor* appears with a progress bar.

– After the restart, the basic menu is automatically displayed again (see section 10.2.1 on page 50). The version of the new firmware is displayed in the header.

The firmware update is complete.

Possible errors during the firmware update:

- If an incorrect file is transferred or the transfer is not complete, an error message is displayed in the browser after the loading bar *Prog running*.
- The update has also failed if no error message appears after *Prog running* but *Restart sensor* is not displayed immediately. This error occurs, for example, if the connection between the antenna and PC is faulty.

In both cases, the firmware is not changed and the antenna starts with the previous firmware version after a reboot.

Problems that can lead to the errors:

- Attempting to upload a file in a wrong format.
- Ethernet cable is not connected properly or has a broken cable.
- Faults on the Ethernet line.
- Ethernet network is overloaded by other participants.
- Power supply does not supply the antenna continuously.

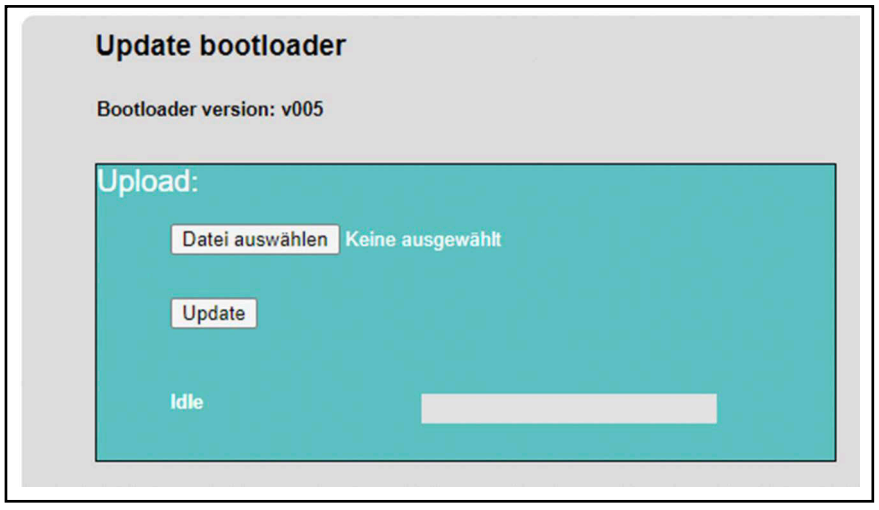
If there are problems with the firmware update, try to rule out the sources of error mentioned before starting a new update.

In the case of serious errors that cause the antenna to no longer be usable, an emergency update can help, see section 11.2 on page 77.

10.2.17 Update bootloader

The *Update bootloader* configuration page allows you to upload bootloader files. The bootloader controls the start-up of the antenna and the execution of firmware updates. Only files of the type **.sfu* can be uploaded. Uploaded files are checked in the antenna to avoid confusion with bootloader files for other devices.

Figure 42 *Configuration web pages: Update bootloader*



This page has the following controls:

Table 55 *Configuration web pages: Update bootloader*

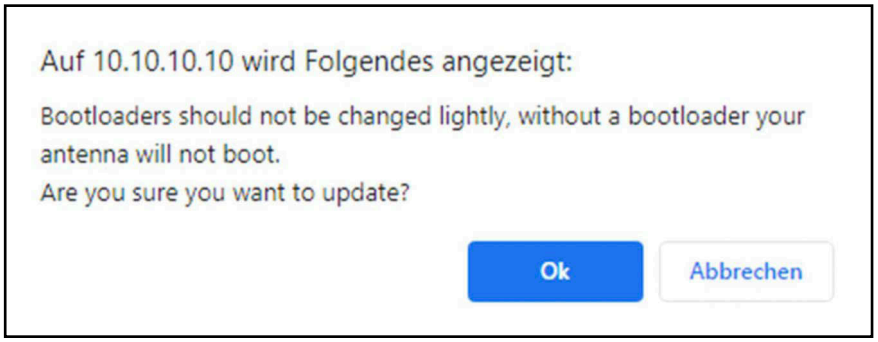
Parameters	Type	Description
Select file	File field	Clicking on the button opens a file selection dialog where you can select the SFU bootloader file
Upload	Button	Triggers the upload of the selected file to the antenna
Idle	Progress bar	Displays status messages and progress

Installing an incorrect version can therefore mean that the antenna can no longer be used and must be sent in for servicing. A security prompt therefore appears before the upload.

To upload a bootloader file:

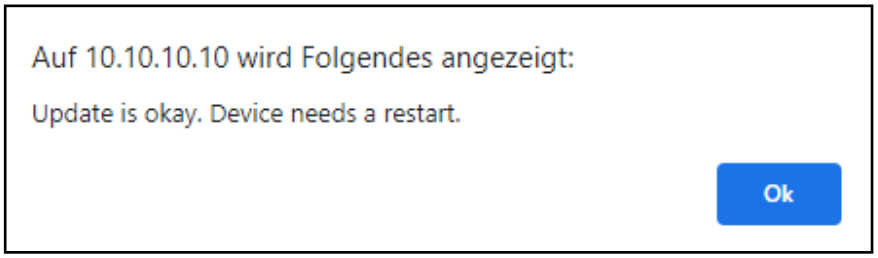
- Click the *Select File* button.
- In the file selection dialog, select the appropriate bootloader file in SFU format.
- Click the *Upload* button.
- The following dialog appears in the browser:

Figure 43 *Configuration web pages: Update bootloader - security prompt*



- If you are sure, click *OK*.
  - The message *Erase running* appears with a progress bar.
  - The message *Prog running* appears with a progress bar.
  - The following message appears in the browser:

Figure 44 *Configuration web pages: Update bootloader – Update OK*



- Trigger a restart of the antenna (*restart*, see section 10.2.13 on page 69). The antenna restarts and shows the basic menu (see section 10.2.1 on page 50).

  The bootloader update is complete.

11 Update Antenna Software

11.1 Normal Firmware Update

The normal firmware update is described in section 10.2.16 on page 74.

11.2 Emergency Update

Emergency updates can restore the function of the antenna if:

- there is a serious error in the software and
- the hardware is functional.

An error of this type is probably present if the function of the antenna stops for several seconds and a normal firmware update (see above) is not possible. In this case, you have two options:

1. Contact the Götting service department at the following e-mail address or using the contact details given on the back of the device description. You will then receive the relevant files and documentation to carry out the emergency update.

service@goetting.de

2. Send the antenna in for repair. In this case, please also contact the service department before sending the antenna.

12 Configuration File

The configuration file is in JSON format and contains all parameters. The file can be downloaded from the antenna or uploaded to the antenna (see section 10.2.14 on page 70). When uploading, the antenna checks whether the configuration file matches the device, otherwise the file is discarded.

Downloading fulfills several purposes:

- If the configuration file is downloaded before changes are made, these changes can be undone if necessary by uploading an earlier version of the file again.
- If several identical antennas are used in the same installation, only one needs to be configured appropriately. The same configuration can then be applied to the other devices: Download the configuration file from configured antenna A and upload it to the other antennas.
- A downloaded configuration file can be opened and edited with a text editor:
  - Parameters that can be changed via the configuration web pages can also be found in the configuration file and can be changed.
  - Parameters such as serial number, calibration data and MAC address can be found in the configuration file, but cannot be changed. Not changeable means that they can be changed in the text file with the editor, but the antenna does not apply these parameters during an upload.

Recommendations for handling configuration files:

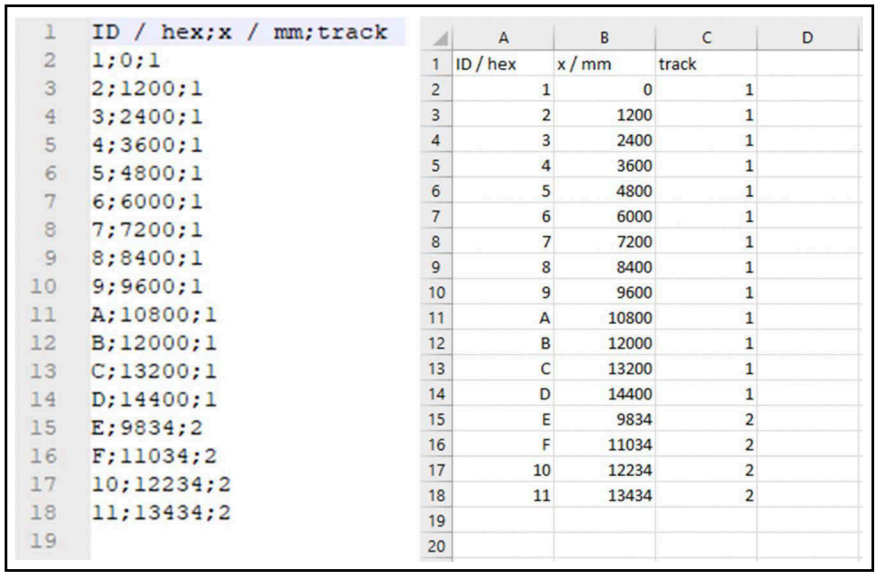
- Convert files: Newer firmware versions can introduce additional parameters. Older configuration files can then be converted by uploading them to an antenna with the new firmware. The antenna reports missing parameters when uploading, but is compatible with the old configuration files. It applies the known parameters. The configuration file is then downloaded again and has the new format.
- Create a sample file for a text editor: Theoretically, configuration files can be created completely in a text editor, but this is prone to errors. It is better to download a configuration file from an antenna and then adapt it in the editor.

13 Transponder List

The transponder positions are defined in the transponder list. It has the format CSV. This refers to a text file with additional information that results in a table structure. The transponder list can therefore be created and/or edited both with pure text editors and with spreadsheets, as shown in the following image.

If you want to create a transponder list, it is advisable to download the transponder list from the antenna (see section 10.2.15 on page 72), even if no transponder list has been uploaded beforehand. The antenna then generates a sample file in which the values can be entered. This ensures that the file has the correct format.

Figure 45 *Format of the transponder list using the example of Notepad++® (left) and Microsoft® Excel® (right)*



```
ID / hex;x / mm;track
1;0;1
2;1200;1
3;2400;1
4;3600;1
5;4800;1
6;6000;1
7;7200;1
8;8400;1
9;9600;1
A;10800;1
B;12000;1
C;13200;1
D;14400;1
E;9834;2
F;11034;2
10;12234;2
11;13434;2
```

	A	B	C	D
1	ID / hex	x / mm	track	
2	1	0	1	
3	2	1200	1	
4	3	2400	1	
5	4	3600	1	
6	5	4800	1	
7	6	6000	1	
8	7	7200	1	
9	8	8400	1	
10	9	9600	1	
11	A	10800	1	
12	B	12000	1	
13	C	13200	1	
14	D	14400	1	
15	E	9834	2	
16	F	11034	2	
17	10	12234	2	
18	11	13434	2	
19				
20				

13.1 Format of the CSV file

The following specifications apply to the CSV file:

- The first line is not evaluated by the antenna and is only used to describe the columns.
- There is a semicolon ; between two values in the other lines.
- All lines must be terminated with Carriage Return + Line Feed `\r\n` (under Windows® this is generated by the Enter key), including the last line of content. There is therefore always a blank line at the end.

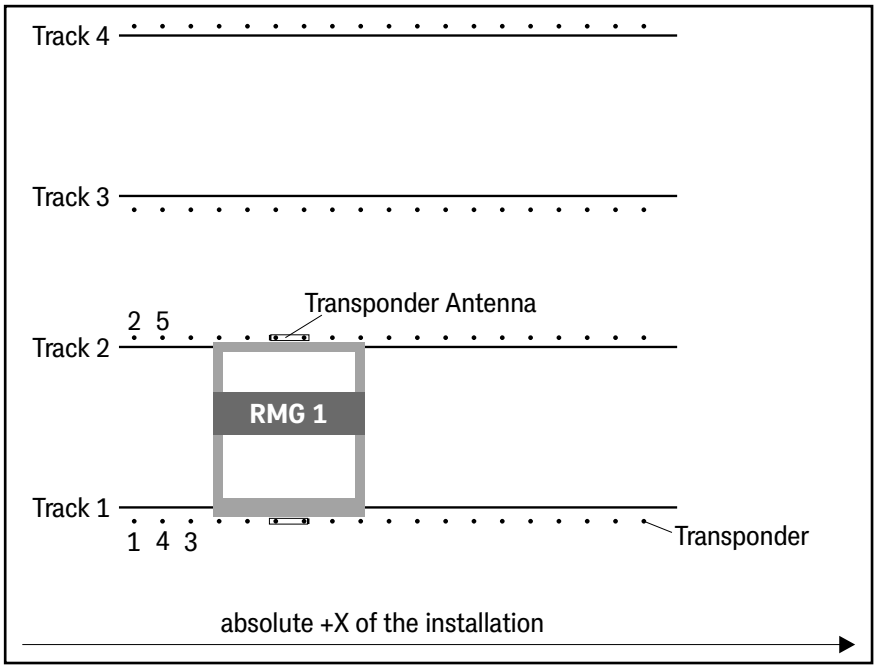
13.2 Structure of the Transponder List

The transponder list consists of three columns with rows for all transponders.

- Column 1 ID/hex: Transponder number/code. A code from 0 to $0xFFFFFFFFFF_{hex}$ can be entered here. Please note that each code may only exist once in the transponder list.

- Column 2 x/mm: Absolute X-position of the transponder in mm. The X position in the range 0 to 4,294,967,296 mm can be entered here.
- Column 3 track: Track number. You can use the track number to define track segments that run parallel or identify a different local section. A number from 0 to 128 can be entered here.

Figure 46 *Example of a system with transponders and tracks*



13.3 Internal Sequence of the Transponder List

The transponder list is sorted internally by the antenna each time the list is uploaded and each time the antenna is started. The antenna sorts in ascending order by track (track / [dec]) and for each track in ascending order by transponder x-position (x / mm). Based on the example in Figure 46, the transponder list could look like this (only parts are shown):

Table 56 *Example: Section of a transponder list for Figure 46*

Transponder ID	x/mm	Track
1	0	1
2	0	2
3	2400	1
4	1200	1
5	1200	2

The antenna sorts this list internally:

Table 57 *Example: Internally sorted transponder list (part 1 of 2)*

Transponder ID	x/mm	Track
1	0	1
4	1200	1

Table 57 *Example: Internally sorted transponder list (part 2 of 2)*

Transponder ID	x/mm	Track
3	2400	1
2	0	2
5	1200	2

The plausibility check *Not the next/previous transponder* is based on this internally sorted sequence (see section 17.5 on page 89).

13.4 Checking the Transponder List

The transponder list is checked internally by the antenna each time the list is uploaded and each time the antenna is started. On the one hand, the structure of the list is checked – e.g. missing value or separator – and on the other hand, the distance between the x-positions of all transponders and their successor. The following applies:

- The list is not accepted if values or separators are missing. An error message is displayed during upload (see section 10.2.15 on page 72) and there is no list in the antenna.
- The list is not accepted if a distance of <1 m between transponders is determined. An error message is displayed during upload (see section 10.2.15 on page 72) and there is no list in the antenna.
- If the distance determined between transponders is >1.5 m, the list is accepted. A warning is displayed during upload (see section 10.2.15 on page 72). In addition, the message *Distances between transponders in the list are too large* is set in the status (see section 10.2.7 on page 58).

In these cases, correct the transponder list and upload it again.

14 Determining the IP Address of the Antenna

In order to access the configuration web pages, an Ethernet connection must be established from a PC to the antenna, see section 8.2 on page 33. It is important that the computer and antenna have matching TCP/IP settings, for which the IP address of the antenna can also be changed (see section 10.2.10 on page 66). In the event that the IP address of the antenna has been changed but the changed address is not (or no longer) known, it can be determined using the *IP-Config.exe* program.

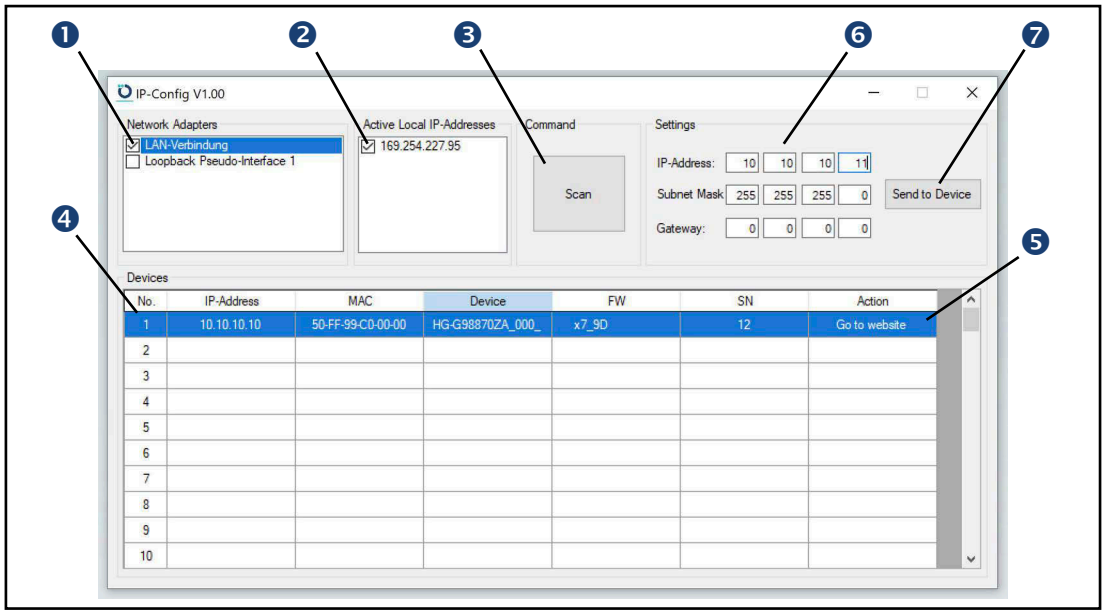
Götting KG devices that can be configured via Ethernet respond to special broadcast telegrams with their IP address, MAC address, version number, serial number and device type. The use of broadcast telegrams means that devices that do not have IP settings compatible with the PC can also be reached. However, devices that are connected to the network via switches cannot be reached via broadcast. In addition, the firewall may have to be deactivated due to the telegram form.

If you would like to determine the IP address of a transponder antenna HG G-98870-A, download the *IP-Config.exe* program here:

https://www.goetting-agv.com/service

The *IP_Config Vxxx.exe* available under the link can be started without installation by double-clicking. The following user interface then appears:

Figure 47 *Screenshot IP-Config V100.exe*



1. In the *Network Adapters* list, activate the connection on your computer that is connected to the network to which the antenna is also connected. If in doubt, activate all of them.
2. If required, deactivate IP addresses under *Active Local IP Addresses*. At least one must be active. If in doubt, leave all activated.

3. After clicking on Scan, the program searches for compatible Götting devices and lists them in the *Devices* section.
4. Click on the desired device in the *Devices* list to select it.
5. Click on *Go to website* to start a browser with the address of the device if required. This will take you to the configuration web pages. However, this only works if the computer and device have compatible network settings, see section 8.2.2 on page 34.
6. The *Settings* area shows the network settings of the device selected in the *Devices* list. These can also be changed here if required.
7. If settings are changed in the *Settings* area, the *Send to Device* button becomes active. Click on the button to reconfigure the selected device to the new network settings.

15 Maintenance

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

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

To keep the antenna software up to date:

- ▶ Check the date and version of the current antenna software in the basic menu (see section 10.2.1 on page 50).
- ▶ If necessary, update the operating software (see section 10.2.16 on page 74).

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

16 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.

17 Operation with Transponder Recognition and Plausibility Checks

In this chapter, you will learn how the antenna operates normally and what error conditions the antenna itself can detect in relation to the transponders, using flow charts and descriptions.

- ✓ The transponder antenna can read two transponders simultaneously.
- ✓ A list of all transponders used is stored in the transponder antenna.

Because of this functionality, the transponder antenna is able to perform internal plausibility checks and report the results of these checks.

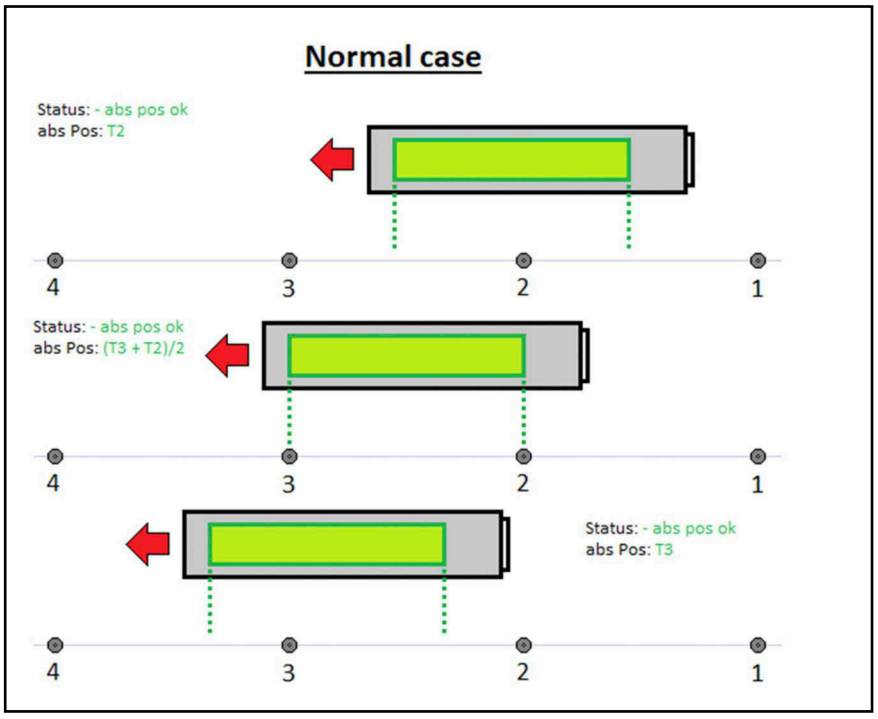
The antenna outputs the cases determined during the plausibility checks as status via the bus telegrams: In the CAN main telegram (see section 9.3.1 on page 40), with CANopen® in the TPDO1 (see section 9.4.1.1 on page 44) and with PROFINET® in the input bytes (see section 9.5.1 on page 46).

A list of possible status messages can be found in Table 20 on page 41. In the following we refer to those that are issued as a result of plausibility checks.

17.1 Normal Operation

Normally, the antenna on the vehicle moves over the course and reads the transponders in the expected order based on the internally sorted transponder list (see section 13.3 on page 80).

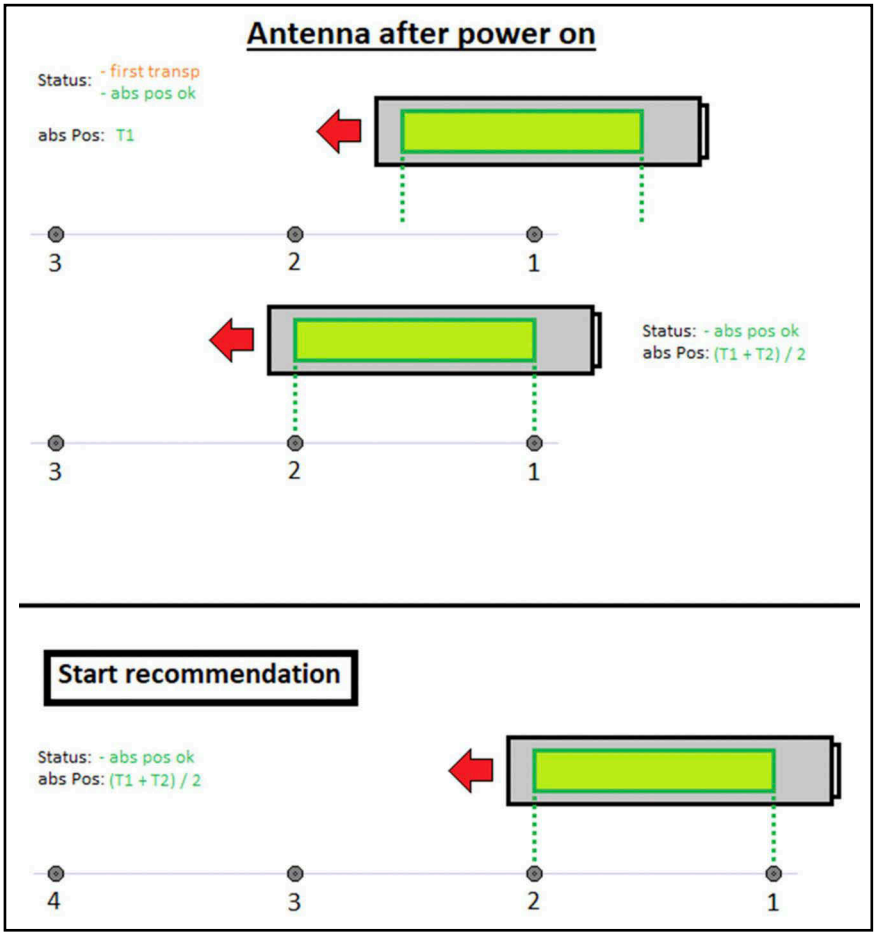
Figure 48 *Sequence sketch: Normal operation of the transponder antenna with transponder identification*



17.2 FIRST_TRANSP

The status message *FIRST_TRANSP* signals that the antenna is waiting for or reading the first transponder. This status is set when the antenna is switched on or when one of the plausibility errors listed below occurs, except for ERR_NO_CODE.

Figure 49 *Sequence diagram: Antenna reads first transponder (FIRST_TRANSP)*



We recommend positioning the transponder antenna so that it reads the first two transponders when it's switched on or the vehicle is placed on the track, see *Start recommendation* in the picture above.

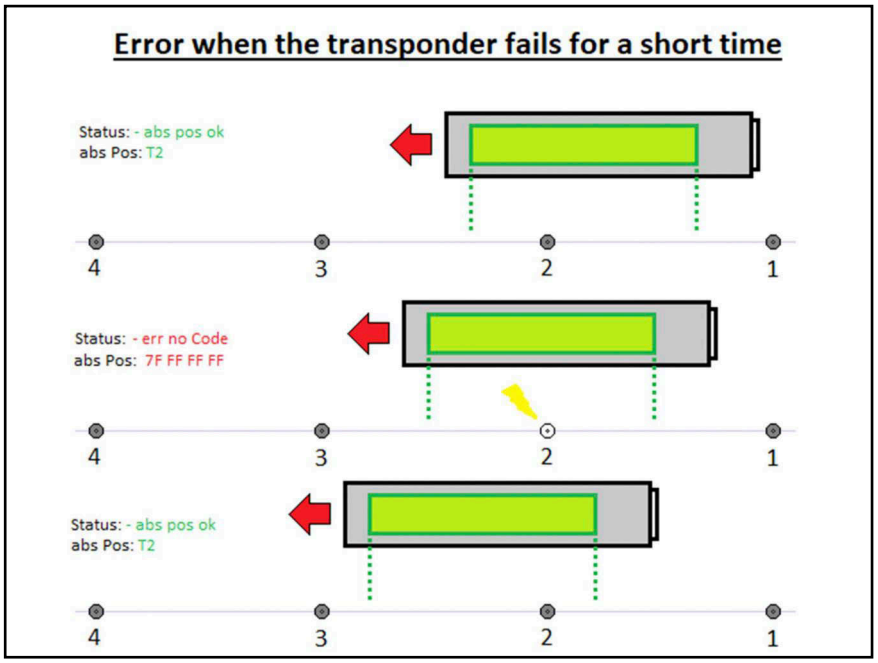
This status is reset as soon as two consecutive transponder codes have been read. The order depends on the internally sorted transponder list (see section 13.3 on page 80).

Both the next and the previous transponder in the list count as consecutive transponders.

17.3 ERR_NO_CODE

The error *ERR_NO_CODE* is set in the status if no transponder code is read.

Figure 50 *Sequence diagram: Antenna does not read code (ERR_NO_CODE)*



In the example, the error occurs because a transponder does not send a signal for a short time. Another possible error is:

- The distance between two transponders is so large that no transponder is in the antenna field.

This error is reset as soon as a transponder code is read again.

While this error occurs, no absolute position is output.

While this error occurs, no relative position is output.

17.4 ERR_TRANSP_NOT_FIND

The error *ERR_TRANSP_NOT_FIND* is set in the status if a transponder is read whose code cannot be found in the transponder list.

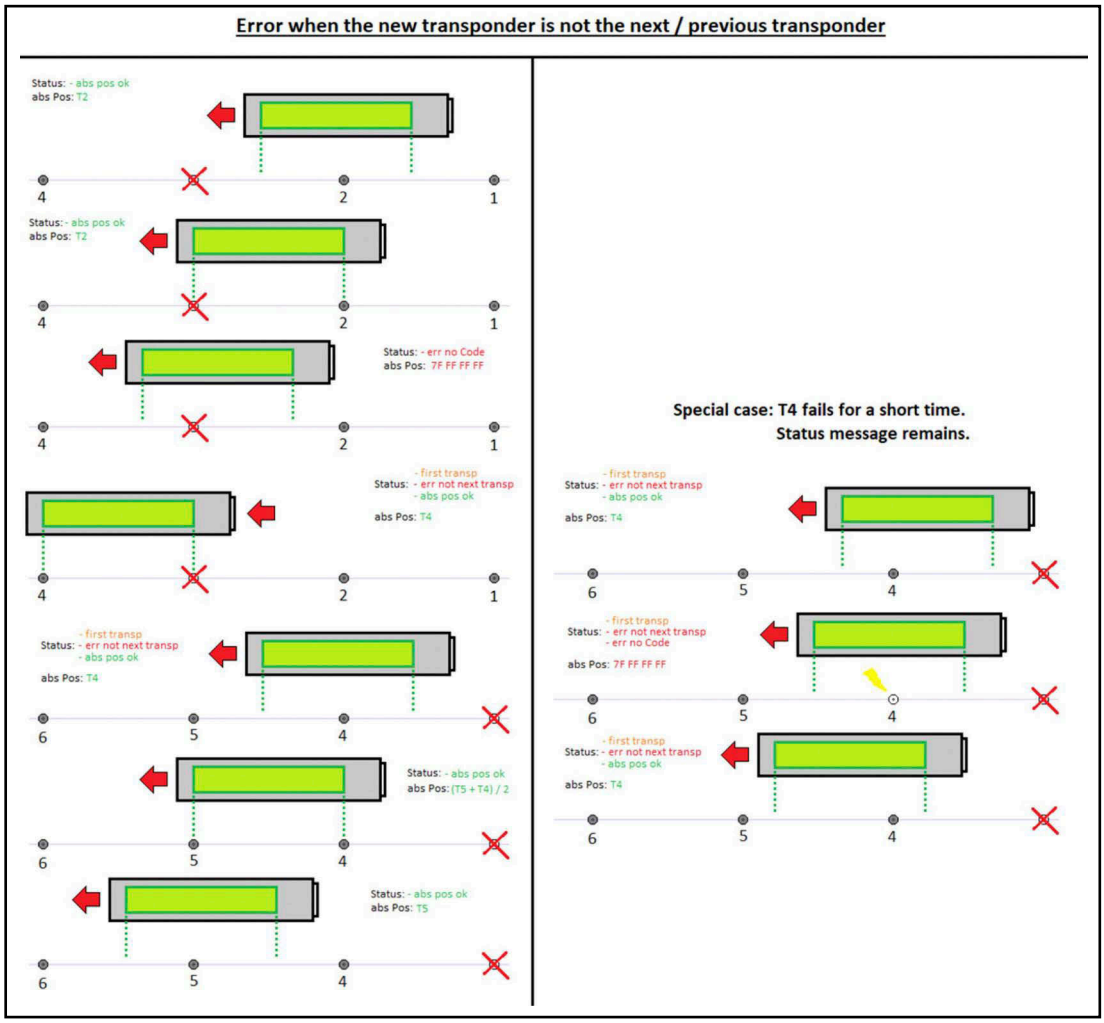
The error is reset as soon as the transponder that is not in the list is no longer read by the antenna.

While this error occurs, no absolute position is output.

17.5 ERR_NOT_NEXT_TRANSP

The error *ERR_NOT_NEXT_TRANSP* is set in the status if the newly read transponder is not the successor or predecessor of the last transponder read. Successor and predecessor are determined according to the internal sorting of the stored transponder list (see section 13.3 on page 80).

Figure 51 *Sequence diagram: Read transponder is not the previous/next in the transponder list (ERR_NOT_NEXT_TRANSP)*



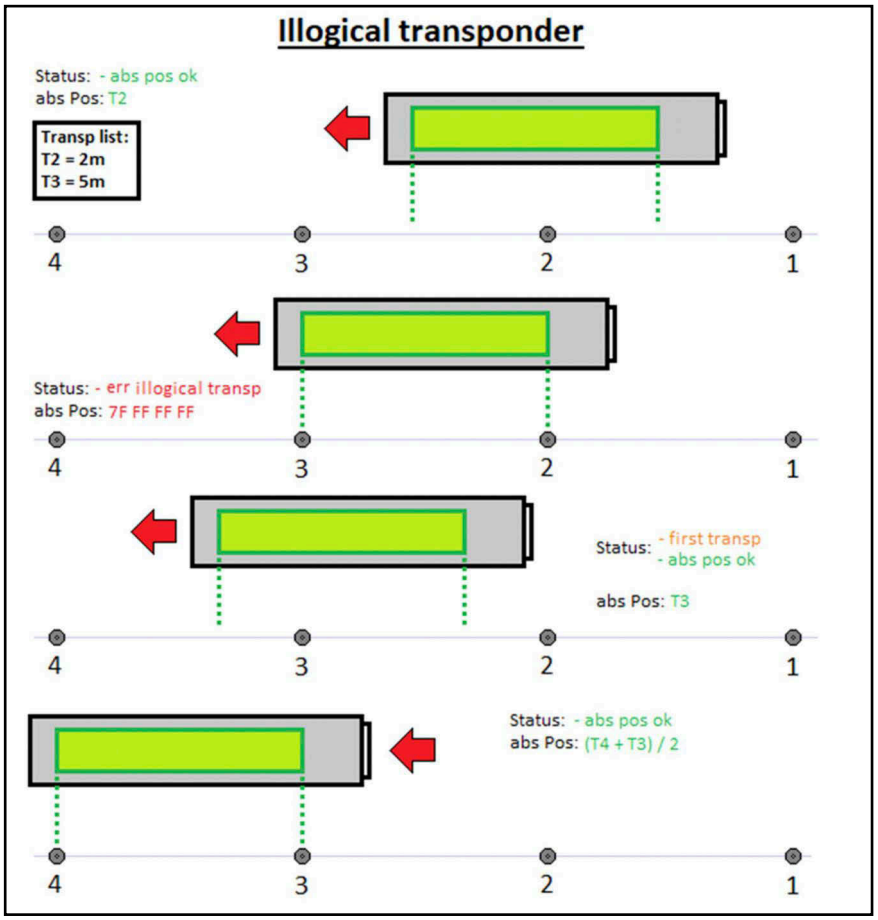
This error is reset as soon as two consecutive transponder codes have been read. The next transponder and the last transponder read do not have to be read in the field at the same time.

While this error occurs, an absolute position is still output.

17.6 ERR_ILLOGICAL_TRANSP

The error *ERR_ILLOGICAL_TRANSP* is set in the status if the difference between the x-positions specified in the transponder list of two transponders read in the field is greater than the detection range of the antenna.

Figure 52 *Sequence diagram: Difference between transponder positions greater than detection range (ERR_ILLOGICAL_TRANSP)*



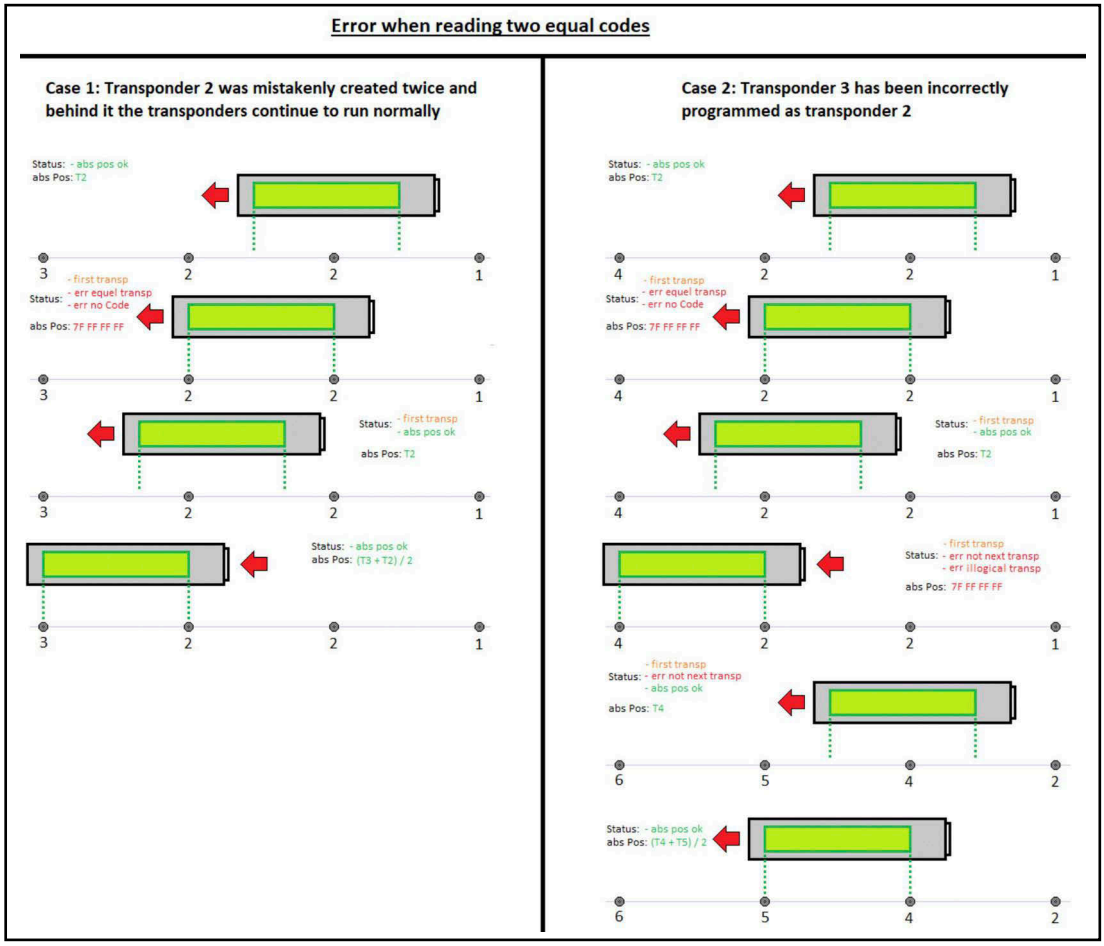
This error is reset as soon as one of the two transponders is no longer read by the antenna.

While this error occurs, no absolute position is output.

17.7 ERR_EQUAL_TRANSP

The error *ERR_EQUAL_TRANSP* is set in the status if two transponders read in the field have the same code.

Figure 53 *Sequence diagram: Two transponders in the field have the same code (ERR_EQUAL_TRANSP)*



This error is reset as soon as one of the two transponders is no longer read by the antenna.

While this error occurs, no absolute position is output.

While this error occurs, no relative position is output.

If this error occurs, both transponder slots are reset, which also sets the error *ERR_NO_CODE*.

17.8 ERR_POS_DIF_T1_T2

The error *ERR_POS_DIF_T1_T2* is set in the status if the difference between the calculated absolute position of two transponders read in the field is too large. A tolerance of 10 mm applies by default.

This error is reset as soon as one of the two transponders is no longer read by the antenna or the difference determined between the two transponders falls below the tolerance limit.

While this error occurs, an absolute position is still output.

18 Troubleshooting

Below 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 rectify it.

If you were unable to rectify the error using the error table:

▶ Please contact Götting. You can find the address on the back of these instructions. The contact options for the service department are listed here:

https://www.goetting-agv.com/service

18.1 Error Table

Table 58 *Error table (part 1 of 4)*

Error	Possible cause	Possible diagnosis / remedy
CAN message is not output	CAN bus is not connected or cable is damaged	– Check CAN bus cable – Check connection to the antenna – Replace CAN bus cable
	CAN bus has no terminating resistor	– Check terminating resistor on CAN bus – If necessary, connect terminating resistor to open CAN connector
	CAN bus is overloaded	Reduce subscribers in the network or throttle permanent transmitters.
	Busy mode is active	LED 2 (Power + Error) lights up orange. Remedy: Wait a short time until busy mode has ended.
	CAN baud rate is set incorrectly	– Check the CAN baud rate of the receiving device. – Check the CAN parameters of the antenna and adjust if necessary (see section 10.2.9 on page 63).
	CANopen is active®	Check the CAN parameters of the antenna and adjust if necessary (see section 10.2.9 on page 63).
CANopen® message is not sent	CAN bus is not connected or cable is damaged	– Check CAN bus cable – Check connection to the antenna – Replace CAN bus cable
	CAN bus has no terminating resistor	– Check terminating resistor on CAN bus – Connect terminating resistor to open CAN connector if necessary
	CAN bus is overloaded	Reduce subscribers in the network or throttle permanent transmitters.
	Busy mode is active	LED 2 (Power + Error) lights up orange. Remedy: Wait a short time until busy mode has ended.

Table 58 *Error table (part 2 of 4)*

Error	Possible cause	Possible diagnosis / remedy
	CAN baud rate is set incorrectly	– Check the CAN baud rate of the receiving device. – Check the CAN parameters of the antenna and adjust if necessary (see section 10.2.9 on page 63).
	CANopen is not active®	Check the CAN parameters of the antenna and adjust if necessary (see section 10.2.9 on page 63).
	Antenna was not set to *Operational* mode	Send the command for *operational mode* via the CAN bus
PROFINET® message is not sent	PROFINET® is not connected or cable is damaged	– Check PROFINET® cable – Check connection to the antenna – Replace PROFINET® cable
	PROFINET® is overloaded	Reduce subscribers in the network or throttle permanent transmitters.
	Busy mode is active	LED 2 (Power + Error) lights up orange. Remedy: Wait a short time until busy mode has ended.
A transponder is not recognized	– Transponder code cannot be read. – The signal strength of the transponder is below the threshold. – The quality of the relative position is too poor.	– The transponder is too far away or too close to the antenna. – An interference signal is present – Interfering metal structures are too close to the antenna
	The distance between two transponders is too short	The distance between two transponders must be between 1 and 1.5 m.
	Transponder defective	If necessary, check and replace the transponder using the programming device (see Table 5 on page 16)
Position LED lights up red and the power LED lights up green	Transponder cannot be found in the list	If necessary, check the transponder code with the programming device (see Table 5 on page 16) and the transponder list stored in the antenna (see section 10.2.15 on page 72). Update the transponder list if necessary.
	There is no transponder under the antenna	– The transponders installed are too far apart. The distance between two transponders must be between 1 and 1.5 m. – The vehicle is on a route without a transponder.
	No transponder is detected under the antenna	See error description for *A transponder is not recognized*
Position LED lights up red and the Power LED lights up red.	There is no transponder list available	Upload a transponder list (see section 10.2.15 on page 72).

Table 58 *Error table (part 3 of 4)*

Error	Possible cause	Possible diagnosis / remedy
	Default parameters are loaded	– Check your settings and save them (see section 10.2.14 on page 70). – Upload a transponder list again (see section 10.2.15 on page 72).
Firmware update does not work.	Wrong sfu file selected	– Check file name – If necessary, request a new firmware file from Götting.
	Interference on the Ethernet cable caused by machines	– Use pre-assembled cable. – Keep Ethernet cables away from machines that emit interference.
	Ethernet network is overloaded by other transmitting devices	Reduce subscribers in the network or throttle permanent transmitters.
	Ethernet cable is not connected correctly or has a cable break	– Check the Ethernet cable – Check connection to the antenna – Replace Ethernet cable.
Configuration web pages cannot be called up in the browser	PC is not in the correct network.	Connect the Ethernet cable to the appropriate network connection
	TCP/IP settings of the PC are not correct	Adjust TCP/IP settings (see section 8.2.2 on page 34)
	Antenna is not on or is still booting up	– Is the power LED lit? – Check power supply. – Wait a moment. Call up the basic menu (see section 8.3.1 on page 35)
	Incorrect IP address entered in the address line	Use the *IP-Config.exe* program to find out the IP of the antenna (see chapter 14 on page 82).
	Multiple devices with the same IP address in the network	– Check IP addresses in the network. – Establish Ethernet direct connection between PC and antenna.
	Faults on the Ethernet line	– Use pre-assembled cable. – Keep Ethernet cables away from machines that emit interference. – Reduce subscribers in the network or throttle permanent transmitters.
Device does not respond. Power LED does not light up.	Power supply too low or off	Check the power supply. Set the power supply to 18 to 30 V, increase the current limit.
	Antenna is defective	Contact Götting Service

Table 58 *Error table (part 4 of 4)*

Error	Possible cause	Possible diagnosis / remedy
	Antenna has a fatal firmware error	– Contact Götting Service. – Perform emergency update (see section 11.2 on page 77). – If necessary, send in or replace the antenna.
Power LED lights up red.	Transponder list is not available / cannot be loaded	– Upload a transponder list (see section 10.2.15 on page 72). If the error occurs more frequently or if saving is not possible, there is a serious memory error. – Contact Götting Service. – If necessary, send in or replace the antenna.
	Memory error. Default parameters are loaded.	– Upload saved configuration file (see section 10.2.14 on page 70). – Adjust parameters and save configuration file. If the error occurs more frequently or if saving is not possible, there is a serious memory error. – Contact Götting Service. – If necessary, send in or replace the antenna.

18.2 Reducing Interferences

NOTICE

Changes to the antenna parameters can 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 configuration of the transponder antenna before making any changes so that you can restore it if necessary (see 10.2.14 on page 70).

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

- metallic objects
- electrical loops
- Interference frequencies in the range 64 ±4 kHz
- Interference voltages due to live cables laid too closely (exception: supply cable of the antenna itself).
- Transmission of interferences via the metallic floor of a vehicle.

The antenna and transponder levels are also an indicator of interference (see section 8.3.3 on page 36):

- If the antenna level is greater than the antenna threshold when there is no transponder under the antenna, an interference signal may be present.
- If the antenna outputs errors or position jumps and the antenna and/or transponder level is higher than at other locations, there is an interference signal.

Take into account:

- that the antenna level is higher with two transponders in the detection area than with one.
- that the transponder level output directly in the center of the antenna may be weaker.

To detect such faults and either eliminate them or reduce their influence, proceed as follows:

- ▶ Always try to avoid external interference first by complying with the operating conditions specified in this manual (see section 7.3.1 on page 27).
- ▶ Use the logging function to record values of the track during measurement runs (see section 10.2.11 on page 66 and section 20.3 on page 109).
- ▶ Only reset the thresholds and antenna tuning in exceptional cases.

The adjustable thresholds and the antenna tuning are described in section 10.2.8 on page 60.

19 Technical Data

19.1 Technical Data of the Transponder Antenna

Table 59 *Technical data antenna HG G-98870-A (part 1 of 2)*

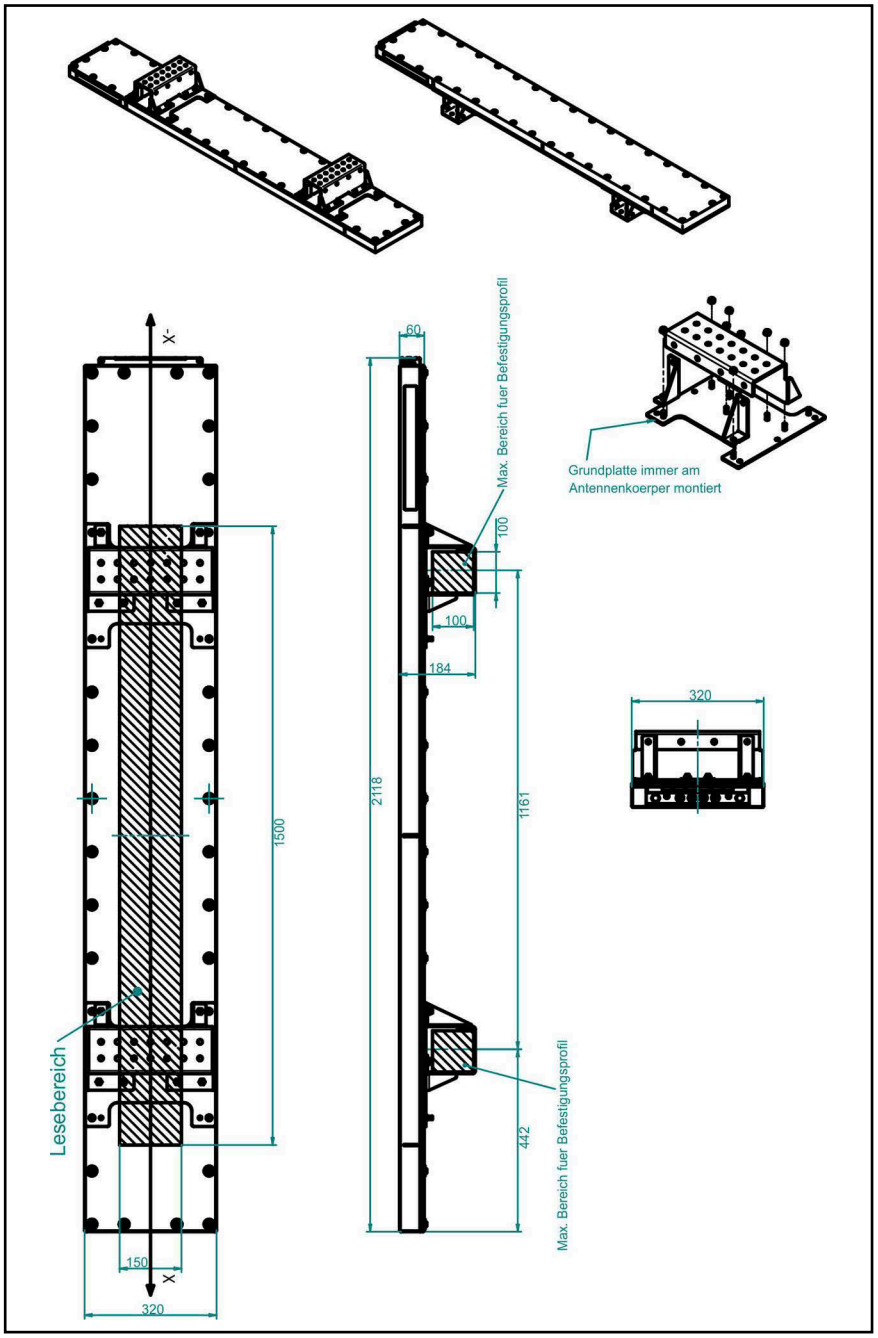
Technical data	
Dimensions	approx. 2118 x 320 x 70 mm (L x W x H) Height with optional mounting brackets: 184 mm
Housing	GRP (Durostone® UPM 203) and stainless steel
Weight	Antenna approx. 44 kg Mounting bracket 3.4 kg each
Reading area	1500x150mm
Reading distance / nominal reading distance	see Table 6 on page 18
Accuracy	≤ 2 mm at nominal reading distance ≤ 4 mm at min.-max. distance at the edges of the reading area
Voltage supply	18 to 36 V, nominal voltage 24 V
Power consumption	approx. 410 mA @ 24 V
Temperature ranges	Operation -20° C to +50° C / Storage -20° C to +70° C
Mechanical resilience	5 g 11 ms / 2 g 10 to 55 Hz
$MTTF_D$	Mean time to dangerous failure: 53 years For information on calculation see https://www.goetting-agv.com/search/node/mttfd
Protection class	IP67
Climatic conditions	relative humidity max. 95%
Frequency	128/64kHz
Transponder	Distance between two transponders: min. 1,000 mm to max. 1,500 mm Maximum length of the transponder list in the device: 8,000 transponders
Decoding Code	8ms
Processing time/ cycle	2ms
Output rate	≥ 2 ms adjustable
Max. crossing speed	12m/s
LEDs	HG G-98870ZA: 4 LEDs / HG G-98870YA: 5 LEDs
Connectors	– All variants: 1x M12 5-pin A-coded: Power (male) | 1x M12 4-pin D-coded: Ethernet (female) – HG G-98870ZA: 2x M12 5-pin A-coded: CAN 1 (male) | CAN 2 (female) – HG G-98870YA: 2x M12 4-pin D-coded: PROFINET 1 & 2 (female)

Table 59 *Technical data antenna HG G-98870-A (part 2 of 2)*

Technical data	
Interfaces	– USB: Emergency update – Ethernet: Configuration via web interface via web browser, logging – CAN (HG G-98870ZA): Not electrically isolated, terminator not integrated, Full CAN according to ISO/DIS 11898, standard frames, identifier and data rate configurable, telegram identifier compatible with CANopen® – PROFINET® (HG G-98870YA): With integrated switch

19.2 Dimensional drawing of the transponder antenna

Figure 54 *Dimensional drawing of the antenna with dimensions, with the opt. mounting bracket in the picture*



20 Appendix

20.1 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 represented by an 8-bit sub-index. RO shows entries that are read-only.

The object directory is subdivided into the following areas:

20.1.1 Communication-Specific Entries in the Range 0x1000 to 0x1FFF

Table 60 *Overview CANopen® object directory I (part 1 of 2)*

Index	Subindex	Access	Content
0x1000	0	RO	Device Type
0x1001	0	RO	Error Register
0x1005	0	RO	COB-ID Sync Message
0x1008	0	RO	Manufacturer Device Name
0x1009	0	RO	Hardware version
0x100A	0	RO	Software version
0x1017	0	RW	Producer Heartbeat-Time
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 Communication Parameter 0
	1	RW	COB ID
	2	RW	Transmission Type
	3	RW	Inhibit Time
	4	RW	Compatibility Entry
	5	RW	Event Timer
0x1801	0	RO	Number of entries of Transmit PDO Communication Parameter 1
	1	RW	COB ID
	2	RW	Transmission Type
	3	RW	Inhibit Time
	4	RW	Compatibility Entry
	5	RW	Event Timer

Table 60 *Overview CANopen® object directory I (part 2 of 2)*

Index	Subindex	Access	Content
0x1802	0	RO	Number of entries of Transmit PDO Communication Parameter 2
	1	RW	COB ID
	2	RW	Transmission Type
	3	RW	Inhibit Time
	4	RW	Compatibility Entry
	5	RW	Event Timer
0x1803	0	RO	Number of entries of Transmit PDO Communication Parameter 3
	1	RW	COB ID
	2	RW	Transmission Type
	3	RW	Inhibit Time
	4	RW	Compatibility Entry
	5	RW	Event Timer
0x1A00	0	RO	Number of entries of Transmit PDO Mapping Parameter 0 (abs)
	1	RO	PDO mapping status
	2	RO	PDO mapping abs pos
	3	RO	PDO mapping track
	4	RO	PDO mapping tx counter
0x1A01	0	RO	Number of entries of Transmit PDO Mapping Parameter 1 (Slot 1)
	1	RO	PDO mapping transp 1 level
	2	RO	PDO mapping current
	3	RO	PDO mapping code 1
	4	RO	PDO mapping rel pos 1
0x1A02	0	RO	Number of entries of Transmit PDO Mapping Parameter 2 (Slot 2)
	1	RO	PDO mapping transp 2 level
	2	RO	PDO mapping code 2
	3	RO	PDO mapping rel pos 2
0x1A03	0	RO	Number of entries of Transmit PDO Mapping Parameter 3 (other)
	1	RO	PDO mapping tune
	2	RO	PDO mapping current
	3	RO	PDO mapping antenna level
	4	RO	PDO mapping difference t1 and t2
	5	RO	PDO mapping reserved

20.1.2 Standardized Device Profile from 0x6000

Table 61 *Overview CANopen® object dictionary II*

Index	Subindex	Access	Content
0x6000	0	RO	Number of Elements of Read Input 8 Bit
	1	RW	Track
	2	RW	Tune_RO
	3	RW	tx_counter
0x6100	0	RO	Number of Elements of Read Input 16 Bit
	1	RO	Status bits 0-15
	2	RO	Reserved
0x6120	0	RO	Number of Elements of Read Input 32 Bit
	1	RO	Transponder slot 1 code
	2	RO	Transponder slot 2 code
0x6200	0	RO	Number of Elements of Write Output 8 Bit
	1	RW	Tune_WR
0x6300	0	RO	Number of Elements of Write Output 16 Bit
	1	RW	Command
0x6400	0	RO	Number of Elements of Read analog Output 8 Bit
	1	RO	Current
0x6401	0	RO	Number of Elements of Read Analogue Input 16 Bit
	1	RO	Transponder slot 1 relative position
	2	RO	Transponder slot 2 relative position
	3	RO	Difference t1 and t2
	4	RO	Antenna Level
	5	RO	Transponder slot 1 level
	6	RO	Transponder slot 2 level
0x6402	0	RO	Number of Elements of Read analog Output 32 Bit
	1	RO	Absolute position

20.2 Details of the CANopen® Directory

20.2.1 Device type

Table 62 *CANopen® directory: Device type*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1000	00	Device Type	Unsigned 32	RO	No	0x00070191	Digital/analog inputs Digital outputs - DS 401

20.2.2 Error register

The error register is not used, so the value 0 is always transferred here.

Table 63 *CANopen® directory: Error register*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1001	00	Error Register	Unsigned 8	RO	No	0x0	Error Register

20.2.3 COB-ID SYNC message

Table 64 *CANopen® directory: COB-ID SYNC message*

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

20.2.4 Device name

Table 65 *CANopen® directory: Device name*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1008	00	Device Name	Visible string	CONST	No	"9887"	Device name: "G98870ZA"

20.2.5 Hardware version

Table 66 *CANopen® directory: Hardware version*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1009	00	Hardware version	Visible string	CONST	No	"B1"	Hardware version number

20.2.6 Software version

Table 67 *CANopen® directory: Software version*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x100A	00	Software version	Visible string	CONST	No	"1.00"	Software version number

20.2.7 Producer Heartbeat Timer

Table 68 *CANopen® directory: Producer Heartbeat Timer*

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

This function is switched off with 0.

20.2.8 Identity Object

Table 69 *CANopen® directory: Identity Object*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
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	0x00098870	HG Number 98870
	03	Revision	Unsigned 32	RO	No	0x00000001	Version 001
	04	Serial Number	Unsigned 32	RO	No	9999999	Serial number

20.2.9 Transmit PDO_1 Communication Parameter 0

Table 70 *CANopen® directory: Transmit PDO_1 Communication Parameter 0*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1800	00	TxPDO_1 Parameter	Unsigned 8	RO	No	0x05	Number of subindexes
	01	COB ID	Unsigned 32	RW	No	0x40000180 + Node ID	TxPDO_1 valid, ID = 0x180 + Node ID
	02	Transmission Type	Unsigned 8	RW	No	255	Asynchronous eventdriven
	03	Inhibit Time	Unsigned 16	RW	No	0	shortest time between transmissions [µs]
	04	Compatibility Entry	Unsigned 8	RW	No		
	05	Event Timer	Unsigned 16	RW	No	8	Cycle time [ms]

20.2.10 Transmit PDO_2 Communication Parameter 1

Table 71 *CANopen® directory: Transmit PDO_2 Communication Parameter 1*

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	TxPDO_2 valid, ID = 0x280 + Node ID
	02	Transmission Type	Unsigned 8	RW	No	255	Asynchronous eventdriven
	03	Inhibit Time	Unsigned 16	RW	No	0	shortest time between transmissions [µs]
	04	Compatibility Entry	Unsigned 8	RW	No		
	05	Event Timer	Unsigned 16	RW	No	0	Cycle time [ms]

20.2.11 Transmit PDO_3 Communication Parameter 2

Table 72 *CANopen® directory: Transmit PDO_3 Communication Parameter 2*

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	TxPDO_3 valid, ID = 0x380 + Node ID
	02	Transmission Type	Unsigned 8	RW	No	255	Asynchronous eventdriven
	03	Tpdo 1 inhibit time	Unsigned 16	RW	No	0	shortest time between transmissions [µs]
	04	Compatibility Entry	Unsigned 8	RW	No		
	05	Event Timer	Unsigned 16	RW	No	0	Cycle time [ms]

20.2.12 Transmit PDO_4 Communication Parameter 3

Table 73 *CANopen® directory: Transmit PDO_4 Communication Parameter 3*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1802	00	TxPDO_4 Parameter	Unsigned 8	RO	No	0x05	Number of subindexes
	01	COB ID	Unsigned 32	RW	No	0x40000380 + Node ID	TxPDO_4 valid, ID = 0x480 + Node ID
	02	Transmission Type	Unsigned 8	RW	No	255	Asynchronous eventdriven
	03	Inhibit Time	Unsigned 16	RW	No	0	shortest time between transmissions [µs]
	04	Compatibility Entry	Unsigned 8	RW	No		
	05	Event Timer	Unsigned 16	RW	No	0	Cycle time [ms]

20.2.13 Transmit PDO_1 Mapping Parameter 0 (abs pos)

Table 74 *CANopen® directory: Transmit PDO_1 Communication Parameter 0 (abs pos)*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1A00	00	Number of mapped objects	Unsigned 8	RO	No	0x04	Number of subin-dexes
	01	1st mapping objects (status)	Unsigned 32	RO	No	0x61000110	mapped on index 0x6100,01 with 16 bit length (status)
	02	2nd mapping objects (abs pos)	Unsigned 32	RO	No	0x64020120	mapped on index 0x6402,01 with 32 bit length (abs pos)
	03	3rd mapping objects (track)	Unsigned 32	RO	No	0x60000108	mapped on index 0x6000,01 with 8 bit length (track)
	04	4th mapping objects (tx counter)	Unsigned 32	RO	No	0x60000308	mapped on index 0x6000,03 with 8 bit length (tx counter)

20.2.14 Transmit PDO_2 Mapping Parameter 1 (Slot 1)

Table 75 *CANopen® directory: Transmit PDO_2 Communication Parameter 1 (Slot 1)*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1A01	00	Number of mapped objects	Unsigned 8	RO	No	0x03	Number of subin-dexes
	01	1st mapping objects (transp 1 level)	Unsigned 32	RO	No	0x64010510	mapped on index 0x6401,05 with 16 bit length (transp 1 Level)
	02	2nd mapping objects (Code 1)	Unsigned 32	RO	No	0x61200120	mapped on index 0x6120,01 with 32 bit length (Code 1)
	03	3rd mapping objects (rel pos 1)	Unsigned 32	RO	No	0x64010110	mapped on index 0x6401,01 with 16 bit length (rel pos 1)

20.2.15 Transmit PDO_3 Mapping Parameter 2 (Slot 2)

Table 76 *CANopen® directory: Transmit PDO_3 Communication Parameter 2 (Slot 2)*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1A02	00	Number of mapped objects	Unsigned 8	RO	No	0x03	Number of subindexes
	01	1st mapping objects (transp 2 level)	Unsigned 32	RO	No	0x64010610	mapped on index 0x6401,06 with 16 bit length (transp 2 level)
	02	2nd mapping objects (Code 2)	Unsigned 32	RO	No	0x61200220	mapped on index 0x6120,02 with 32 bit length (Code 2)
	03	3rd mapping objects (rel pos 2)	Unsigned 32	RO	No	0x64010210	mapped on index 0x6401,02 with 16 bit length (re pos 2)

20.2.16 Transmit PDO_4 Mapping Parameter 3 (Other)

Table 77 *CANopen® directory: Transmit PDO_4 Communication Parameter 3 (Other)*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x1A03	00	Number of mapped objects	Unsigned 8	RO	No	0x05	Number of subindexes
	01	1st mapping objects (tune)	Unsigned 32	RO	No	0x60000208	mapped on index 0x6000,02 with 8 bit length (tune)
	02	2nd mapping objects (current)	Unsigned 32	RO	No	0x64000108	mapped on index 0x6400,01 with 8 bit length (current)
	03	3rd mapping objects (antenna level)	Unsigned 32	RO	No	0x64010410	mapped on index 0x6401,04 with 16 bit length (antenna level)
	04	4th mapping objects (difference t1 and t2)	Unsigned 32	RO	No	0x64010310	mapped on index 0x6401,03 with 16 bit length (difference t1 and t2)
	05	5th mapping objects (reserved)	Unsigned 32	RO	No	0x61000210	mapped on index 0x6100,02 with 16 bit length (reserved)

20.2.17 8-bit Digital Input (Transmission in TPDO_1 and TPDO_4)

Table 78 *CANopen® directory: 8-bit digital input (transmission in TPDO_1 and TPDO_4)*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x6000	00	number of 8 bit inputs	Unsigned 8	RO	No	0x03	number of 8 bit inputs
	01	Track	Unsigned 8	RO	Yes	0	The current rail
	02	Tune_RO	Unsigned 8	RO	Yes	0	Tune (value in TPDO_4, therefore RO)
	03	Tx_counter	Unsigned 8	RO	Yes	0	CAN transmit counter

20.2.18 16-bit Digital Input (Transmission in TPDO_1 and TPDO_4)

Table 79 *CANopen® directory: 16-bit digital input (transmission in TPDO_1 and TPDO_4)*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x6100	00	number of 16 bit inputs	Unsigned 8	RO	No	0x02	number of 16 bit inputs
	01	Status 0-15	Unsigned 16	RO	Yes	0	Device status 0-15 bits (see Table 20 on page 41)
	02	Reserved	Unsigned 16	RO	Yes	0	Tune (value in TPDO_4, therefore RO)

20.2.19 32-bit Digital Input (Transmission in TPDO_2 and TPDO_3)

Table 80 *CANopen® directory: 32-bit digital input (transmission in TPDO_2 and TPDO_3)*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x6120	00	number of 32 bit inputs	Unsigned 8	RO	No	0x02	number of 32 bit inputs
	01	Transponder slot 1 code	Unsigned 32	RO	Yes	0	Transponder code of transponder slot 1
	02	Transponder slot 2 code	Unsigned 32	RO	Yes	0	Transponder code, of transponder slot 2

20.2.20 8-bit Digital Output

Table 81 *CANopen® directory: 8-bit digital output*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x6200	00	number of 8 bit output	Unsigned 8	RO	No	0x01	number of 8 bit inputs
	01	Tune_WR	Unsigned 8	RW	Yes	0	Tune value for adjusting the transmitter coil (value is not saved)

20.2.21 16-bit Digital Output

Table 82 *CANopen® directory: 16-bit digital output*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x6300	00	number of 16 bit output	Unsigned 8	RO	No	0x01	number of 16 bit inputs
	01	Command	Unsigned 16	RW	Yes	0	RX-Command according to Table 83 below

Table 83 *CANopen® directory: CANopen®-RX-Command*

Value	Name	Meaning
0x01	RESERVE	Reserved
0x02	RESERVE	Reserved
0x04	RX_MASK_AUTO_TUNE	Activates the dynamic auto tune function, see section 9.6 on page 48. (value is not saved)
0x08	RESERVE	Reserved
0x10	RESERVE	Reserved
0x20	RESERVE	Reserved
0x40	RESERVE	Reserved
0x80	RESERVE	Reserved

20.2.22 8-bit Analog Digital Input (Transmission in TPDO_4)

Table 84 *CANopen® directory: 8-bit analog digital input (transmission in TPDO_4)*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x6400	00	number of 8 bit inputs	Unsigned 8	RO	No	0x01	number of 8 bit inputs
	01	Download current transponder list	Signed 8	RO	Yes	0	Measured current [10mA]

20.2.23 16-bit Analog Digital Input (Transmission in TPDO_2, TPDO_3 and TPDO_4)

Table 85 *CANopen® directory: 16-bit analog digital input (transmission in TPDO_2, TPDO_3 and TPDO_4)*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x6401	00	number of 16 bit inputs	Unsigned 8	RO	No	0x06	number of 16 bit inputs
	01	Transponder slot 1 relative position	Signed 16	RO	Yes	0	Relative transponder position of transponder slot 1 [mm]
	02	Transponder slot 2 relative position	Signed 16	RO	Yes	0	Relative transponder position of transponder slot 2 [mm]
	03	Difference t1 and t2	Signed 16	RO	Yes	0	Difference in the abs. position of transponder 1 and 2
	04	Antenna Level		RO	Yes	0	Antenna level
	05	Transponder slot 1 level		RO	Yes	0	Max level of transponder 1
	06	Transponder slot 2 level		RO	Yes	0	Max level of transponder 2

20.2.24 32-bit Analog Digital Input (Transmission in TPDO_1)

Table 86 *CANopen® directory: 32-bit analog digital input (transmission in TPDO_1)*

Index	Subindex	Name	Type	Attr.	Map	Default	Description
0x6120	00	number of 32 bit inputs	Unsigned 8	RO	No	0x01	number of 32 bit inputs
	01	Absloute position	Signed 32	RO	Yes	0	Absolute position of the antenna [mm]

20.3 Logging with Tera Term

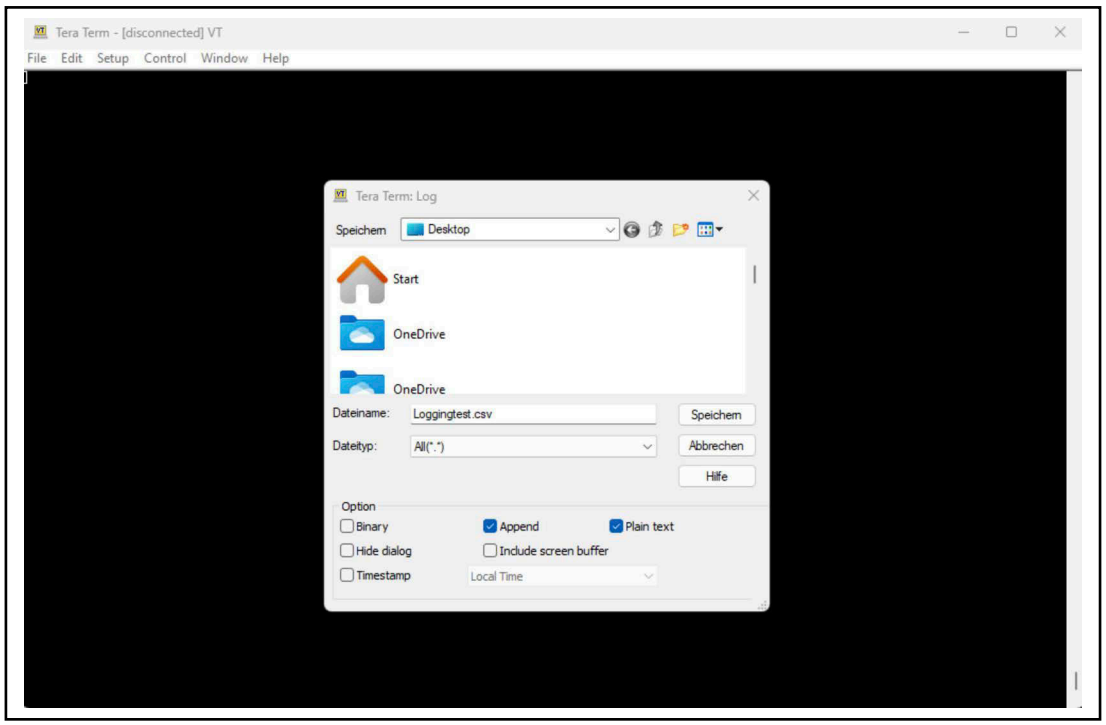
Tera Term is a freely available terminal program. HyperTerminal® is also widespread and can also be used, but is not freely available. In the following, we therefore refer to Tera Term, which you can download from the following address.

https://ttssh2.osdn.jp

After installation, you can use Tera Term for logging.

20.3.1 Record logging

Figure 55 *Tera Term file dialog for logging*

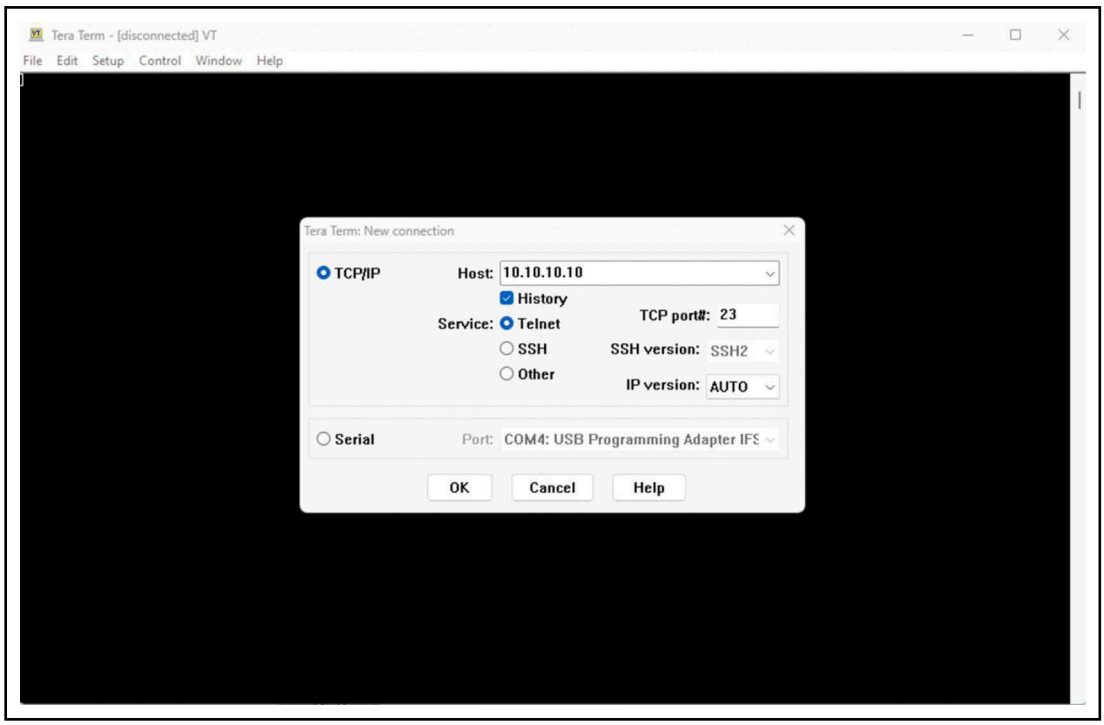


- To start the recording, go to *File –> Log...*
  The dialog shown above opens, in which you specify the storage location and the name of the file with the logging recording. It is best to save the recording as a *CSV* file. Use the extension `.csv` for this. As soon as you click on *Save*, the window closes and the recording starts.
- Now start logging by opening a new TCP connection (see below).

You can stop recording with *File –> Stop logging*.

20.3.2 Start logging

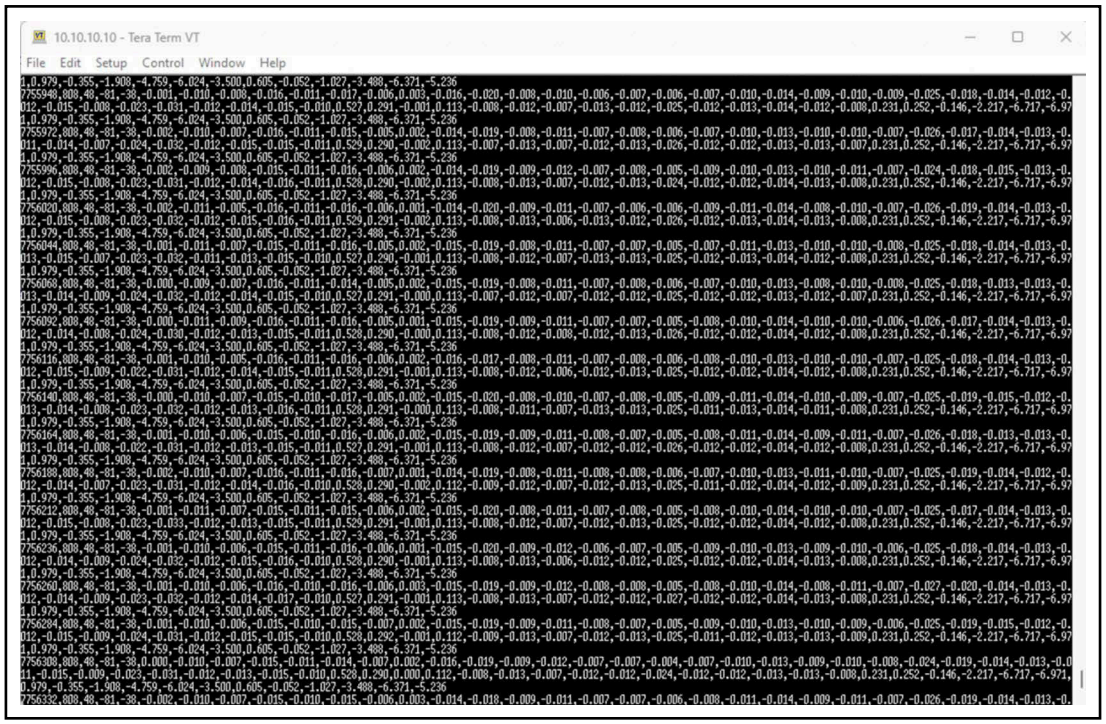
Figure 56 *Tera Term connection setup*



- Open the dialog shown above via *File –> New connection* to establish a new connection.
- In the *New connection* dialog, set the IP address of the antenna as the *host* IP address. This is the same address as for the configuration web pages (see section 8.3.1 on page 35). Enter the port on which the TCP messages are sent (see section 10.2.11 on page 66). You can use the *Telnet* service, but no specific Telnet functions or commands are supported. Click *OK* to establish the connection.

The IP settings of the Ethernet port on the PC must match those of the antenna in order to establish a connection (see section 8.2.2 on page 34).

Figure 57 *Tera Term during logging*



- After recording the desired data, close the connection via *File -> Disconnect*.
- Then close the recording of the log file as described in section 20.3.1 on page 110.

You can now evaluate the log file, e.g. by importing the CSV file into a spreadsheet such as Microsoft® Excel®.

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24 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 87 *Document revision history*

Revision	Edited by	Description of changes
01 Date: 25.06.2024	RAD / GB	First device description, translation of the German Revision 03.

25 Copyright and Terms of Liability

25.1 Copyright

This manual is protected by copyright. All rights reserved. Violations are subject to penal legislation of the Copyright.

25.2 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.

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