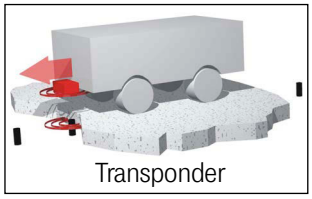
Device Description HG G-71450/1/3/5-A



Transponder-Antenna

HG G-71450/1/3/5-A

PosiPulse & Transponder-Code
Variants HG G-71450-A (RS232) / HG G-71451-A (PROFIBUS®) / HG G-71453-A (CANopen®) / HG G-71455-A (PROFINET®)

English, Revision 08	Date: 04.05.2023	Dev. by: WM/LF	Author(s): RAD/WM/LF/RF

Photo: Variant HG G-71455ZA

GÖTTING

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Summary

Characteristics of the transponder antenna HG G-71450/1/3/5-A:

• Transponder-Antenna for the positioning of automated guided vehicles (AGV) • Indoor, IP 65 • Reading distance 50 mm • max. crossing speed (depending on variant and the functionality in use) 1.0 to 2.0 m/s • Voltage supply +Ub (depending on the variant) 22 - 28 VDC or 18 - 36 VDC, current consumption typically 130 mA @ 24 VDC • Operating frequency (depending on the variant): 409 kHz or 125 kHz • PosiPulse when crossing the center axis in direction of travel, +Ub, 20 mA current source, current limited, not electrically isolated	• Connectors (depending on the variant): Up to 3x M12 • Data interface (depending on the variant): RS 232 (serial), PROFIBUS®, CANopen®, PROFINET® (with integrated switch) • Service interface for configuration and firmware update (depending on the variant): serial RS 232 or USB with USB virtual serial port driver • Display operational state (depending on the variant): Up to 5 LEDs • Transponder programming

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

Contents

1 About this Document

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.

1.1 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.

1.1.1 Symbols

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

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

Indicates one or more links to the Internet.

– www.goetting.de/xxx
– www.goetting.de/yyy

Indicates tips for easier operation of the product.

✓ The check mark lists a requirement.

▶ The arrow shows an action step.

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

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

1.2 Definitions of Terms

Transponder
RFID Tag (mark) in/on the ground or mounted on moving parts, which is inductively supplied with energy by the antenna and then with this energy sends his code at half the frequency.

Posipulse
Also called middle signal, short for position impulse. With the position impulse the time of crossing the reference axis can be transmitted by telegrams without time lag.

Energy coil
Coil whose generated alternating magnetic field supplies the transponder with energy. For some antennas, the code emitted by the transponder is also received via this coil.

Nibble
A nibble (rarely called nybble or nyble) is a amount of data containing four bits; it is also called a half byte (source: Wikipedia). The transponder code comprises 16 bits, i.e. four nibbles. Thus four hexadecimal code digits can be represented.

1.3 Abbreviations

AGV Automated Guided Vehicle

RFID Radio-Frequency Identification

EDS Electronic Data Sheet, configuration file for CAN bus systems

GSD General Station Description, device master data for PROFIBUS® and PROFINET® devices

2 Introduction

Data transmission between various objects (tool carriers, tools, vehicles, etc.) and the control system is crucial for ensuring the operating procedure. Movable objects must be identified and positioned quickly and reliably. Thereby identification systems offer a safe, easy to install and economical solution. They can be used to manage and monitor processes.

Such a system is suitable for almost all areas in which production and transportation processes need to be automated. In order to implement this automation, incoming data on transport route and destination, location and production status must be collected and processed. Special advantages of the inductive identification system are the millimeter-precise positioning, long rage identification and insensitivity to contamination.

2.1 Variants

The transponder antenna is available in several versions.

Table 2 *Variant overview*

Features	Order-No.							
	HG G-71450		HG G-71451		HG G-71453		HG G-71455	
	ZA	YA	ZA	YA	ZA	YA	ZA	YA
Operating frequency [kHz]	409	125	409	125	409	125	409	125
max. crossing speed code output only	2,0 m/s	1,5 m/s	2,0 m/s	1,5 m/s	2,0 m/s	1,5 m/s	2,0 m/s	
max. crossing speed code & PosiPulse	1,5 m/s	1,0 m/s	1,5 m/s	1,0 m/s	1,5 m/s	1,0 m/s	2,0 m/s	
PosiPulse exit	✓		✓		✓		✓	
Data interface	RS 232 (serial)		PROFIBUS®		CANopen®		PROFINET®	
Data output	Code		Code & PosiPuls		Code & PosiPuls		Code & PosiPuls	
Config port	RS 232		RS 232		RS 232		USB	
Logging (CSV)	×		✓		✓		✓	
Supply	22 to 28 VDC						18 to 36 VDC	
Temporary deactivation of antennas					✓ (via CAN)			
PosiPulse delete command v. data interface	✓		✓		✓		✓	
Transponder programming	✓		✓		✓		✓	
Firmware version	2.15		1.13		1.14		1.01	

2.2 Additional Products

The following products of Götting can be used with the transponder antenna (observe the variants of the antenna). Rod transponders are usually installed in the ground, disc transponders usually on the ground. The rod transponders listed below have a slightly higher transmission power than the disc transponders.

Table 3 *Additional products*

Order-No.	Description	Compatible with transponder antenna							
		HG G-71450		HG G-71451		HG G-71453		HG G-71455	
		ZA	YA	ZA	YA	ZA	YA	ZA	YA
HW CAB00001	Plug ST1: cable PUR, 5 m with M12 elbow socket, 5-pol., A-coded	✓	✓	✓	✓	✓	✓	✓	✓
HW CAB00002	Plug ST2: cable PROFIBUS® PUR, 5m, M12 5-pol. plug straight, B-coded, open end			✓	✓				
HW CON00003	Plug ST2: alternatively PROFIBUS® terminating resistor			✓	✓				
HW CAB00003	Plug ST3: cable PUR PROFIBUS®, 5m, M12 5-pol. socket straight, B-coded, open end			✓	✓				
HW CON00055	Plug ST2: CAN terminating resistor (Terminator), M12 Plug 5-pol., A-coded					✓	✓		
HW CAB00064	Plug ST3: cable CAN-Bus, 10 m, with shielding, M12 socket 5-pol. straight, A-coded, open end					✓	✓		
HG G-71325YA	Transponder (rod) 409 kHz	✓		✓		✓		✓	
HG G-71325ZA	Transponder (rod) 125 kHz		✓		✓		✓		✓
HW DEV00033	Transponder (disc) 125 kHz		✓		✓		✓		✓
HW DEV00034	Transponder (disc) 125 kHz, pre-programmed		✓		✓		✓		✓
HG G-81840ZA	Transponder programming device	✓	✓	✓	✓	✓	✓	✓	✓
HG G-06150XA	Serial/parallel Interface	✓	✓						
HG G-20960ZA	Connection box M12-5-8-USB							✓	✓

2.3 Additional Documents

Additional documents are sent upon request or available on our website. The QR-Code on the right leads you to our homepage www.goetting-agv.com. Below you will find links to the specific product pages.

- Transponders HG G-71325-A
  http://www.goetting-agv.com/components/71325
- Transponders HW DEV00033/00034
  http://www.goetting-agv.com/components/00033
- Transponders programming device HG G-81840-A
  http://www.goetting-agv.com/components/81840
- Connection box HG G-20960ZA
  http://www.goetting-agv.com/components/20960
- Serial/parallel interface
  https://www.goetting-agv.com/components/06150

2.4 Operating conditions

The following requirements apply to the use of the transponder antenna:

- ✓ As shown in Figure 12 on page 24, the antenna can be installed upright or crosswise on the vehicle. The shielded rear side may not point towards the transponder, see Figure 11 on page 24.
- ✓ The antenna can be installed with its back directly on metal.
- ✓ Things that can interfere with the antenna: Conductive materials, conductor loops and reinforcements in the reading area of the antennas or near the transponder (see transponder data sheet). Interfering signals from clocked drives and their power supply cables must be avoided (see section 4.3 on page 24).
- ✓ Between two transponder antennas there has to be a minimum distance of 1500 mm. With some antenna variants, this can be circumvented by temporarily deactivating individual antennas via the data interface, see Table 2 on page 8.
- ✓ Between two transponders there has to be a minimum distance of 500 mm. There may always be at most one transponder within the reading area of the antenna.
- ✓ When changing the direction of travel, incorrect PosiPulses can occur as a matter of the principle. Changes of direction should therefore be avoided in the system or compensated in the evaluation. For this purpose e.g. a PosiPulse delete command can be given via the data interface. You can see which variants support this in Table 2 on page 8.
- ✓ When used in systems with inductive power transmission (only antenna variants with 409 kHz can be used here), a minimum lateral distance of 200 mm must be maintained from the wires of the energy line, the power electronics and the connecting lines of the pickups, see section 4.3.2 on page 25.

2.5 Application Examples for the Automation

Automation can be performed for:

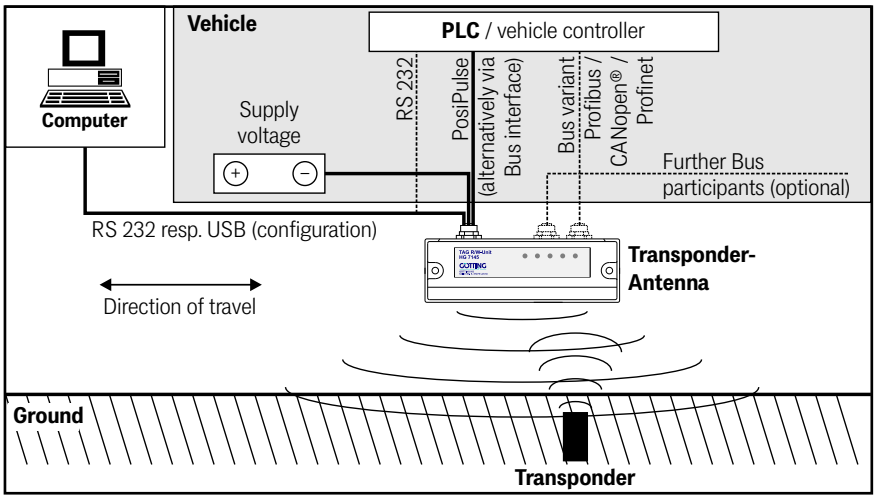
- Warehousing / production lines / material flow control systems
- Location determination of vehicles and containers

- Identification of containers
- Management of loading and unloading processes
- Positioning of vehicles in production areas
- Location determination for public transport

2.6 System Layout

The transponder antenna is usually mounted under a vehicle and connected to the vehicle computer (e. g. a PLC), which evaluates the PosiPulse and the transponder code. The corresponding transponders are installed in or on the floor. See the following sections for the operating principle.

Figure 1 *Block diagram system layout (example)*



2.7 Functional Description

2.7.1 General Functional Description

The transponder antenna is used in identification systems with positioning. It outputs the transponder code and a position impulse (PosiPulse) of 100 ms duration when the transponder crosses the center of the antenna (see below). This enables the detection of exactly defined positions.

As soon as a transponder is within the reading area of the antenna, it is supplied inductively with energy by the energy coil without contact and then cyclically sends its code back to the antenna. Otherwise, the transponder is completely passive and does not require a power supply or battery. Only one transponder at a time is allowed in the reading area of the antenna.

The transponder code can be reprogrammed via the antenna for compatible read/write transponders (see Table 3 on page 9).

If several antennas are expected to operate simultaneously, the necessary minimum distance must be observed (see section 2.4 on page 10).

For some antenna variants, individual antennas can temporarily be deactivated via the data interface. This can be used, for example, if the antennas do not necessarily have to be used at the same time – e.g. if one is used to detect transponders in longitudinal direction, while the other is used for lateral driving. Table 2 on page 8 shows which variants support the deactivation.

2.7.2 Scope and Function

The positioning occurs according to the field compensation method. Centrically to the antenna the measured field for the transponder is erased, resulting in the data-free area D, which has a width of 25 to 30 mm at the nominal reading distance S and in which no telegrams are output, see Figure 2 below.

The field strength of the alternating magnetic field decreases with increasing distance between transponder and reading antenna. The exchange of information is therefore only possible within the detection areas 1 and 2 (Figure 2). Viewed from above, the detection areas are limited by the field length L and the field width B, see Figure 3.

Figure 2 *Detection area 1 and 2, data-free area D and nominal reading distance S, side view*

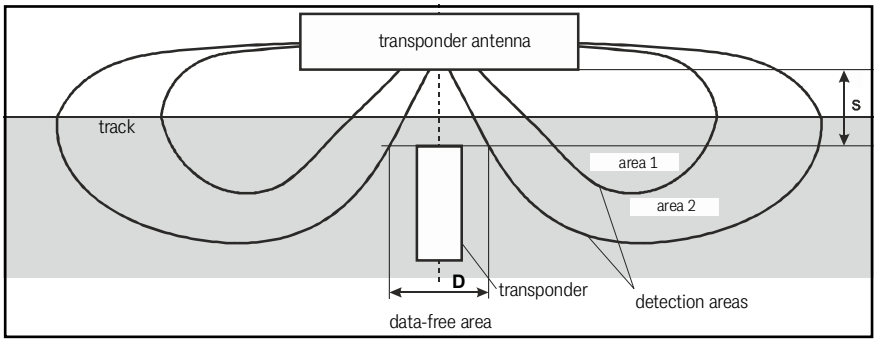
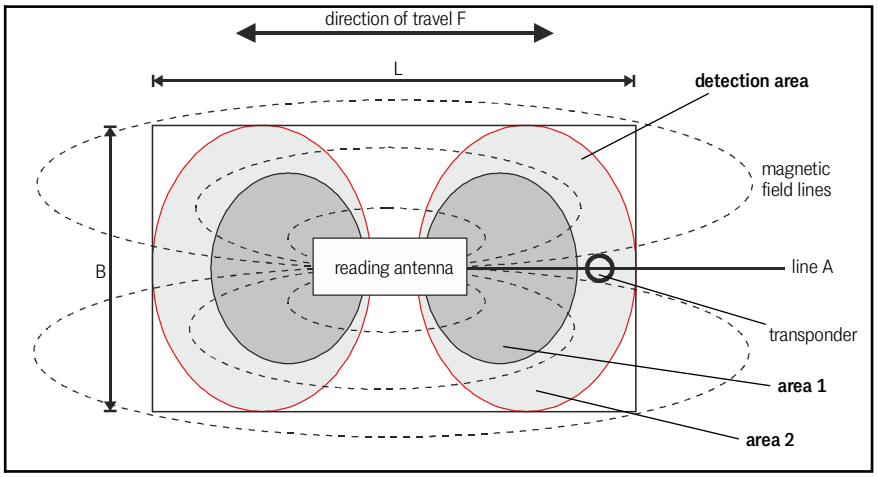
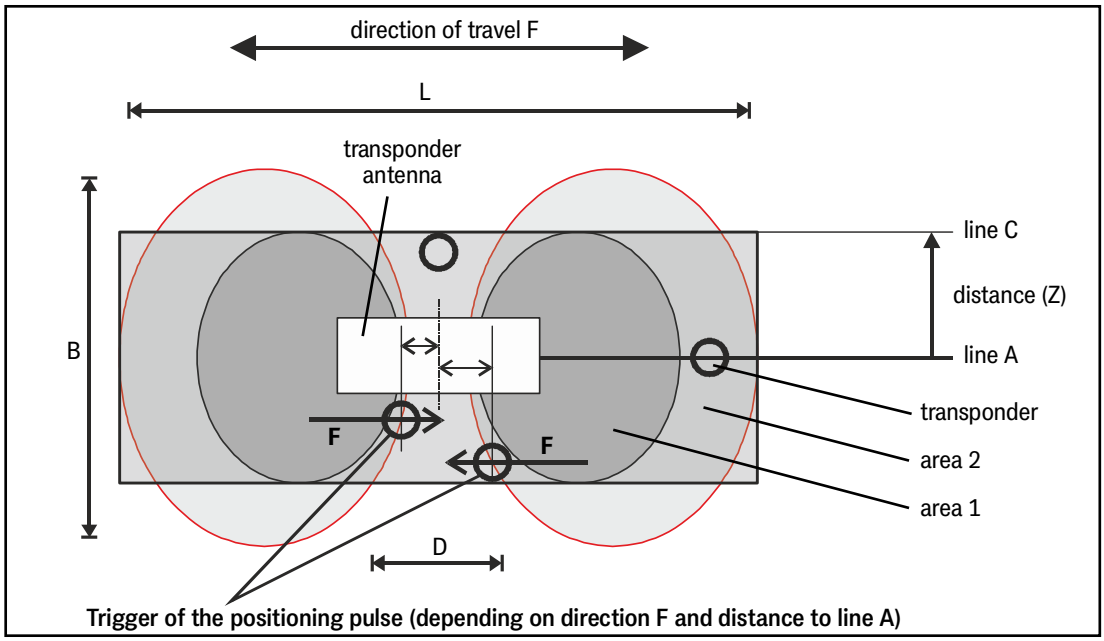


Figure 3 *Detection areas, top view*



Only a maximum of one transponder is allowed in the detection area of the antenna at all times! The following image shows several transponders to explain the different transponder positions.

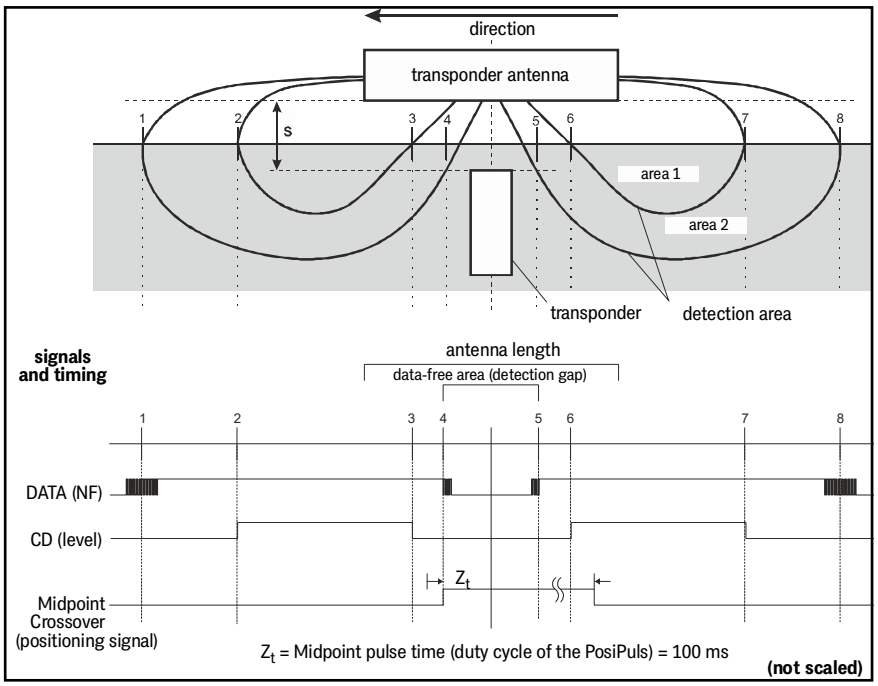
Figure 4 *Core area of the reading antenna with positioning pulse (top view)*



The code of the transponder is read in both detection areas. For an additional PosiPulse to be triggered, the transponder must first have moved through area 1. The maximum lateral offset to the antenna center is determined by line C. In this case, the PosiPulse is generated as soon as the transponder reaches the crossing to the data-free area D. Since both detection areas have a curved course, the point at which a PosiPulse is triggered shifts the further away the transponder is from the center of the antenna (line A) (center deviation). The absolute values are given in Table 76 on page 68. In area 2 the DATA LED lights up, in area 1 also the LED CD.

2.7.3 Signals and Timing

Figure 5 *Signals and Timing*



At first the data is „uncertain“ and the signal strength is still low (area 2). When approaching further the signals of the data become stronger and can be read completely. Finally, the inner detection area (area 1) is reached. Leaving the detection area is detected by decreasing of the thresholds (3 and 4).

Crossing the field boundary triggers the PosiPulse (center signal). By passing through the next detection areas (5 to 8) the data is read and displayed again. At the field boundary at point 8 no center signal is triggered now. The centre signal is also not set if the vehicle stops and drives back in the detection gab (4 and 5) after passing through points 1 to 4. The PosiPulse is only emitted again for this transponder if in the meantime another transponder with a new code has been read or – depending on the variant, see Table 2 on page 8 – a PosiPulse delete command (= delete last transponder code) has been sent via the data interface.

i

If a vehicle stops before the PosiPulse is triggered and changes direction, a „wrong“ center pulse is generated at position 1 or 8. These positions are not exactly definable. **The identification system should therefore only be used in systems without change of direction.**
If data errors are generated by interference signals in areas 2 and 3 (or 6 and 7), a positioning impulse is accordingly generated at the **wrong** position!

3 Hardware

3.1 Transponder

The Götting transponders listed in Table 3 on page 9 are used as reference marks in the ground. The transponder code consists of 16 bits.

3.2 Transponder Antenna (Variants)

3.2.1 Applies to all Variants

The antenna system is located in a 156.5 x 31 x 53 mm (L x D x H) housing made out of PC (polycarbonate). Depending on the variant, the height including connectors is max. 70 mm.

3.2.1.1 Switch-On Behavior

After applying the supply voltage, the positioning output PosiPulse is active for the duration of the reset (approx. 500 ms). To check their function, all LEDs are switched on for 500 ms, respectively. After approx. 2 s the device is ready for operation.

3.2.1.2 Switch-Off Behavior

The behavior of the PosiPulse output during switch-off is random. Levels of undefined height up to max. +Ub can occur until the voltage in the device has completely dropped. These levels can be falsely processed as positioning pulses by the downstream evaluation/control system.

i The subsequent evaluation must be adapted so that it ignores PosiPulses when the antenna is switched off.

3.2.1.3 Code Output

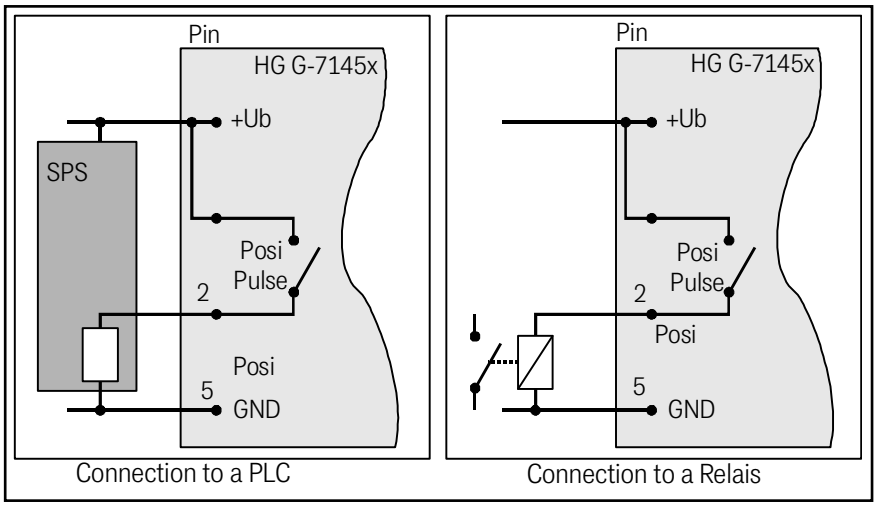
The code transmitted by the transponder consists of a sequence of 24 bits in which 16 bits are encoded. These are output via the respective interface. Transponders can also be programmed via the antenna, see chapter 10 on page 60.

3.2.1.4 PosiPulse

The transponder antenna provides an output for the PosiPulse via ST 1 in all variants. The positioning pulse is triggered at center crossing of the antenna. Its duration is 100 ms. When activated, +Ub with a current limitation of 20 mA is switched on the corresponding output (not electrically isolated). For the sequence of a transponder crossing and the triggering of the PosiPulse see section 2.7.3 „Signals and Timing“ auf Seite 14.

If, for example, a +Ub voltage output is desired, contact 2 can be connected to GND via a resistor of 1 KOhm, as shown in the following picture.

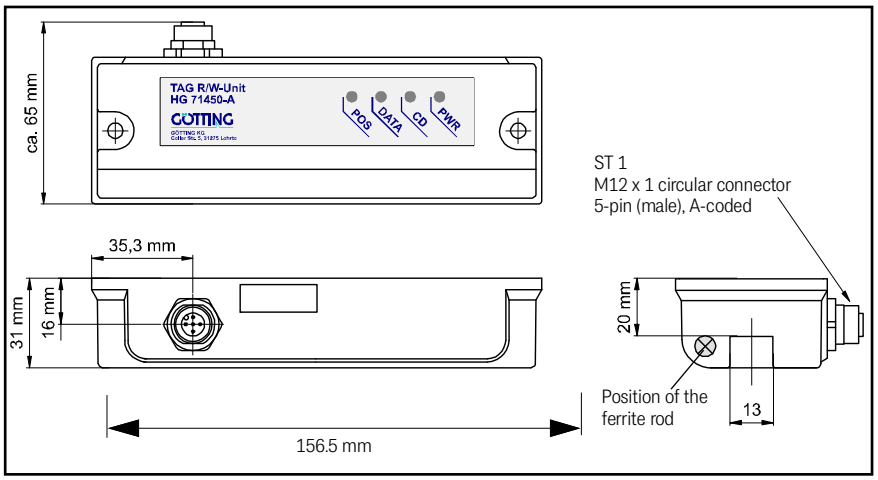
Figure 6 *Connection options PosiPulse*



3.2.2 Transponder Antenna HG G-71450 (RS 232)

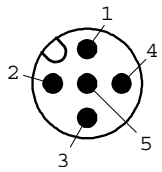
The connection of the antenna occurs via a 5-pin cable. The ST 1 connector is a M12 circular connector (see Figure 7). An angular connector with connection cable is available as an accessory (see Table 3 on page 9).

Figure 7 *HG G-71450: Housing Dimensions Transponder Antenna*



3.2.2.1 Pin assignments

Table 4 *HG G-71450: Pin assignment of the 5 pin circular connector ST 1, male, A-coded*

ST1, male, A-coded	Pin	Assignment
	1	$+U_B$
	2	POSI out (20 mA)
	3	TxD (RS 232) *)
	4	RxD (RS 232) *)
	5	GND (Data and supply)
*) The specifications for TxD and RxD apply from the point of view of the antenna.		

3.2.2.2 LEDs

There are 4 LEDs for function control:

Table 5 *HG G-71450: Meaning of the 4 LEDs*

LED	Meaning
PWR	Indicates that operating voltage is available
CD	Carrier Detect, permanently lit when a transponder is in area I (see Figure 2 on page 12)
DATA	– flickers when a transponder approaches (area II in Figure 2 on page 12) – permanently lit when the transponder is read reliably
POS	PosiPulse, corresponds to the positioning output

3.2.2.3 RS 232-Interface

For the telegrams of the RS 232 interface and the configuration of the interface parameters see chapter 5 on page 27.

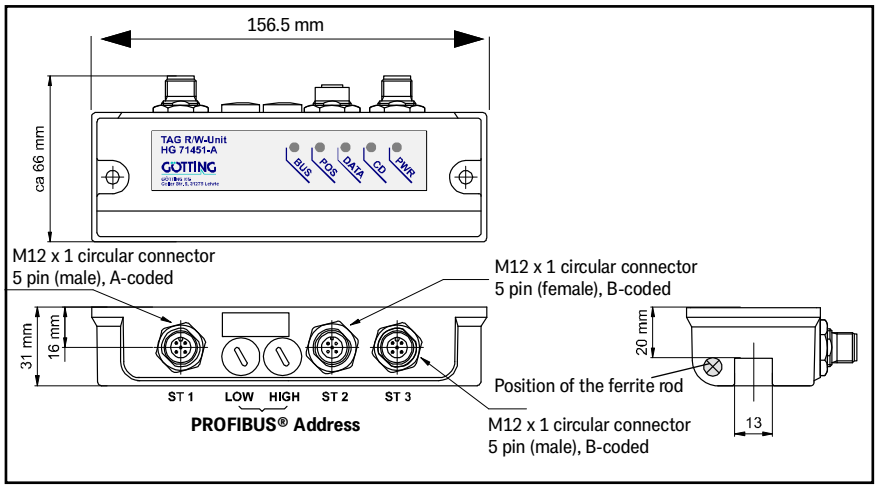
3.2.2.4 Serial/Parallel Interface HG G-06150XA (optional)

It is possible to convert the output from serial to parallel, see section 5.6 on page 30.

3.2.3 Transponder Antenna HG G-71451-A (PROFIBUS®)

The antenna is connected via a 5-pin cable. The connectors are M12 circular connectors. Connection cable with M12 connectors or a PROFIBUS® terminating resistor are available as accessories (see Table 3 on page 9).

Figure 8 *HG G-71451: Housing Dimensions of the Transponder Antenna*



3.2.3.1 Pin Assignments

Table 6 *HG G-71451: Pin assignment of the 5 pin circular connector ST1, male, A-coded*

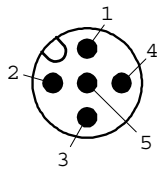
ST1, male, A-coded	Pin	Assignment
	1	$+U_B$
	2	POSI out (20 mA)
	3	TxD (RS 232) *)
	4	RxD (RS 232) *)
	5	GND (data and supply)
***)** The specifications for TxD and RxD apply from the point of view of the antenna.		

Table 7 *HG G-71451: Pin assignment of the 5 pin circular connector ST2, female, B-coded*

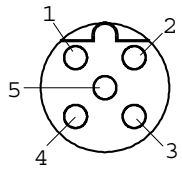
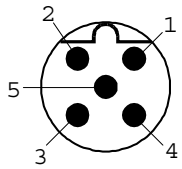
ST2, female, B-coded	Pin	Assignment
	1	Bus +5 V
	2	Bus A
	3	RTS
	4	Bus B
	5	Bus GND

Table 8 *HG G-71451: Pin assignment of the 5 pin circular connector ST3, male, B-coded*

ST3, male, B-coded	Pin	Assignment
	1	Bus +5 V
	2	Bus A
	3	RTS
	4	Bus B
	5	Bus GND

3.2.3.2 LEDs

There are 5 LEDs for function control:

Table 9 *HG G-71451: Meaning of the 5 LEDs*

LED	Meaning
PWR	indicates that operating voltage is available
CD	Carrier Detect, permanently lit when a transponder is in area I (see Figure 2 on page 12)
DATA	– flickers when a transponder approaches (area II in Figure 2 on page 12) – permanently lit when the transponder is read reliably
POS	Corresponds to the positioning output ♦ additional indicator function: – Blinks once if an address >126 has been set – Blinks 2 or 3 times for internal PROFIBUS® errors
BUS	lit during data exchange with the PROFIBUS® master

3.2.3.3 Switch-On Behaviour

The switch-on behavior follows the sequence described in section 3.2.1.1 on page 15 with one difference: The BUS LED is not switched on.

3.2.3.4 PROFIBUS®-Interface

For this antenna the data as well as a status byte are transmitted via the PROFIBUS®. Further information on the PROFIBUS® interface and on setting the PROFIBUS® address via the Hex-turn-switch can be found in chapter 6 on page 31.

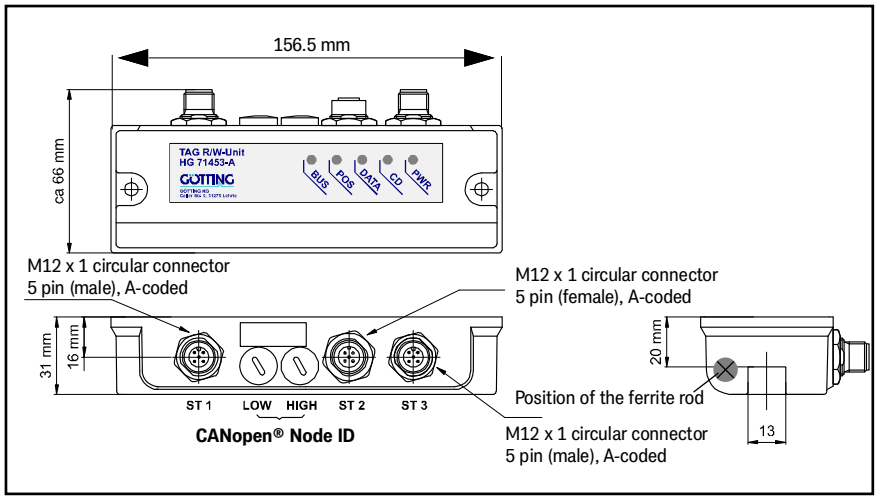
3.2.3.5 RS 232-Interface

The RS232 interface is used for logging and for the internal monitor program for configuration, see chapter 9 on page 48.

3.2.4 Transponder Antenna HG G-71453-A (CANopen®)

The antenna is connected via a 5 pin cable. The connectors are M12 circular connectors. Connection cables with M12 connectors or a CAN terminating resistor (CAN Terminator) are available as accessories (see Table 3 on page 9).

Figure 9 *HG G-71453: Housing Dimensions Transponder Antenna*



3.2.4.1 Pin Assignments

Table 10 *HG G-71453: Pin assignments of the 5 pin circular connector ST1 (pin)*

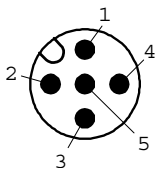
ST1, male, A-coded	Pin	Assignment
	1	$+U_B$
	2	POSI out (20 mA)
	3	TxD (RS 232) *)
	4	RxD (RS 232) *)
	5	GND (data and supply)
***)** The specifications for TxD and RxD apply from the point of view of the antenna.		

Table 11 *HG G-71453: Pin assignment of the 5 pin circular conn. ST2 (socket)*

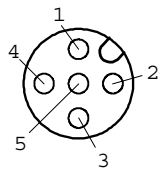
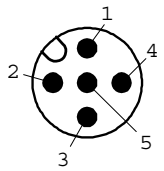
ST2, female, A-coded	Pin	Assignment
	1	n. c. *)
	2	n. c. *)
	3	CAN_GND
	4	CAN_H
	5	CAN_L
***)** The pins 1 or 2 are connected between ST2 and ST3.		

Table 12 *HG G-71453: Pin assignment of the 5 pin circular connector ST3 (pin)*

ST3, male, A-coded	Pin	Assignment
	1	n. c. *)
	2	n. c. *)
	3	CAN_GND
	4	CAN_H
	5	CAN_L
***)** The pins 1 or 2 are connected between ST2 and ST3.		

3.2.4.2 LEDs

There are 5 LEDs for function control:

Table 13 *Meaning of the 5 LEDs*

LED	Meaning
PWR	indicates that operating voltage is available
CD	Carrier Detect, permanently lit when a transponder is in area I (see Figure 2 on page 12)
DATA	– flickers when a transponder approaches (area II in Figure 2 on page 12) – permanently lit when the transponder is read reliably
POS	corresponds to the positioning output
BUS	– permanently lit in „operational“ state – blinks in „pre-operational“ state – flashes in „stopped“ state – does not light up in case of CAN bus errors

3.2.4.3 Data Interface CANopen®

In case of this antenna, the data and a status byte are emitted via the CAN bus. Further information on the CANopen® interface and on setting the CAN Node addresses via the Hex-turn-switch can be found in chapter 7 on page 34.

3.2.4.4 RS 232-Interface

The RS232 interface is used for logging and for the internal monitor program for configuration, see chapter 9 on page 48.

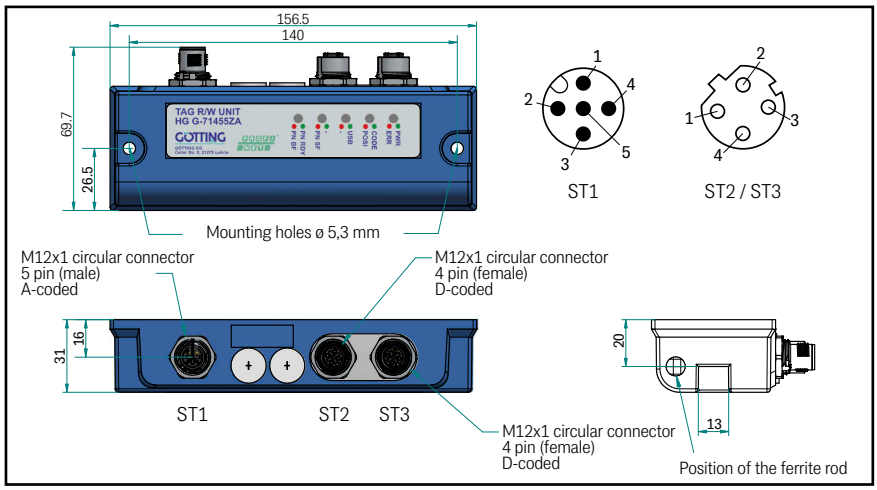
3.2.4.5 PosiPulse Filter

For this antenna variant, a filter for the PosiPulse can be set for slow vehicles, see section 9.4.3.2 on page 55.

3.2.5 Transponder Antenna HG G-71455-A (PROFINET®)

The antenna is connected via a 5 pin and 4 pin cable. The connectors are M12 circular connectors. Connection cable for ST 1 is available as an accessory (see Table 3 on page 9). ST2 and ST3 are internally connected via a switch. They therefore have an identical pin assignment.

Figure 10 *HG G-71455: Housing Dimensions Transponder Antenna*



3.2.5.1 Pin Assignments

Table 14 *HG G-71455: Pin assignments of the 5 pin circular connector ST 1 (pin)*

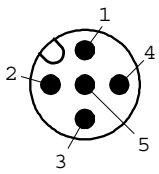
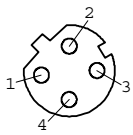
ST1, male, A-coded	Pin	Assignment
	1	$+U_B$
	2	POSI out (20 mA)
	3	D+ (USB)
	4	D- (USB)
	5	GND (data and supply)

Table 15 *HG G-71455: Pin assignment of the 4 pin circular connector ST 2 & ST 3 (socket)*

ST2 & ST 3, female, D-coded	Pin	Assignment
	1	TX+
	2	RX+
	3	TX-
	4	RX-

3.2.5.2 LEDs

There are 5 two-color LEDs for function control:

Table 16 *Meaning of the 5 LEDs*

LED	Colour	Meaning
PWR	green	indicates that operating voltage is available
ERR	red	lights up in case of errors
Code	green	lights up when a transponder is read
POSI	red	corresponds to the positioning output
USB	green	lights up when USB connection to the PC is established
PN SF	red	lights up in case of PROFINET® errors
PN RDY	green	– lights up when PROFINET® is ready. – blinks when waiting for synchronization
PN BF	red	– blinks red if a connection exists but no communication to the PROFINET® Controller is present. – lights up red if there is no connection

3.2.5.3 Data Interface PROFINET®

For this antenna, the data and a status byte are output via PROFINET®. Further information about the PROFINET® interface can be found in chapter 8 on page 46.

3.2.5.4 USB Interface

The USB interface is used for logging and for the internal monitor program for configuration, see chapter 9 on page 48.

4 Installation and Commissioning

During installation observe the operating conditions listed in section 2.4 on page 10.

4.1 Testing Transponders

The transponders can be tested with the transponder antenna and a PC connected to it (see section 9.4 on page 52)

4.2 Installing Transponders

Further information on installing the transponders can be found in the corresponding data sheets:

http://www.goetting-agv.com/components/71325
http://www.goetting-agv.com/components/00033

Range and positioning accuracy are affected by

- larger metal parts lying on the floor (sheets),
- reinforcements placed close to the transponder
- induction loops, such as those formed by reinforcement steel mats.

Single metal rods have only a minor influence and may partially violate the metal free space.

The following have no influence on the positioning accuracy:

- Environmental influences such as snow, ice and water
- Dirt such as oil, tar, etc.

When installing the transponders, observe the following:

- Maintain a **minimum distance** of **at least 500 mm** between the transponders. Only a maximum of one transponder at a time is allowed in the reception area of the antenna.
- Observe the metal-free area around the transponders. The influence on positioning accuracy and range depends on size and range of the metal parts.

4.3 Transponder Antenna

As an example, the following pictures show the HG G-71455 variant with PROFINET® interface, as it has the largest external dimensions including the connectors.

NOTICE

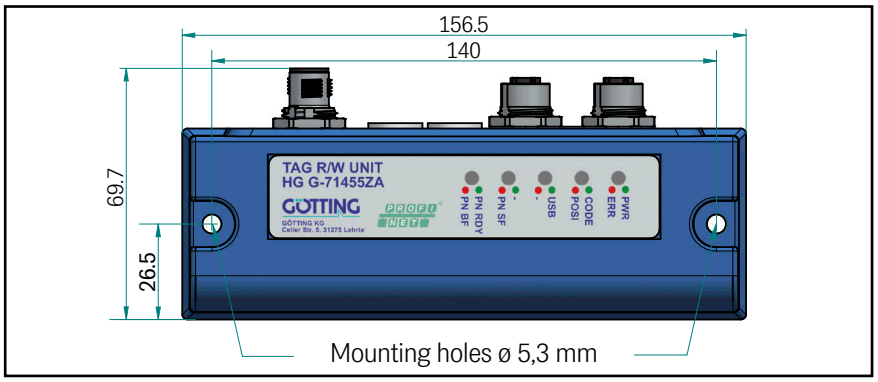
Interferences from other antennas

If several antennas are used in one system, overreach my cause interferences.

- ▶ Install antennas at a minimum distance of 1500 mm to each other or
- ▶ use antenna variants where individual antennas can temporarily be deactivated via the data interface. Table 2 on page 8 shows which variants support the deactivation.

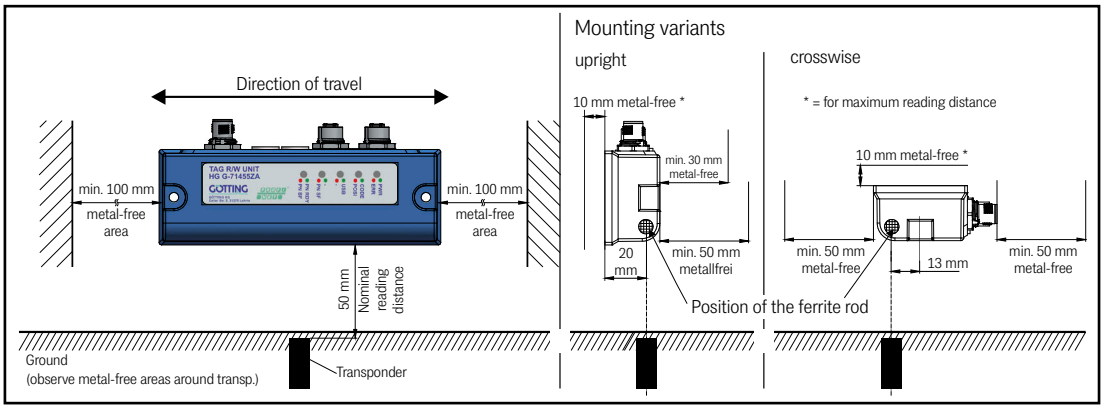
4.3.1 Mounting / Minimum Distances

Figure 11 *Installing the antenna: Position and size of the mounting holes (in the picture variant HG G-71455)*



All further information refers to the position of the ferrite rod in the antenna:

Figure 12 *Nominal reading distances / position of the antenna ferrite rods / metal-free area*



In order to obtain a maximum range (> 50 mm) of the reading distance, it is recommended to install a 10 mm plastic plate or 10 mm distance bolts between steel or aluminum attachments and the reading antenna. If distance bolts are used, a body washer must be installed under the reading antenna.

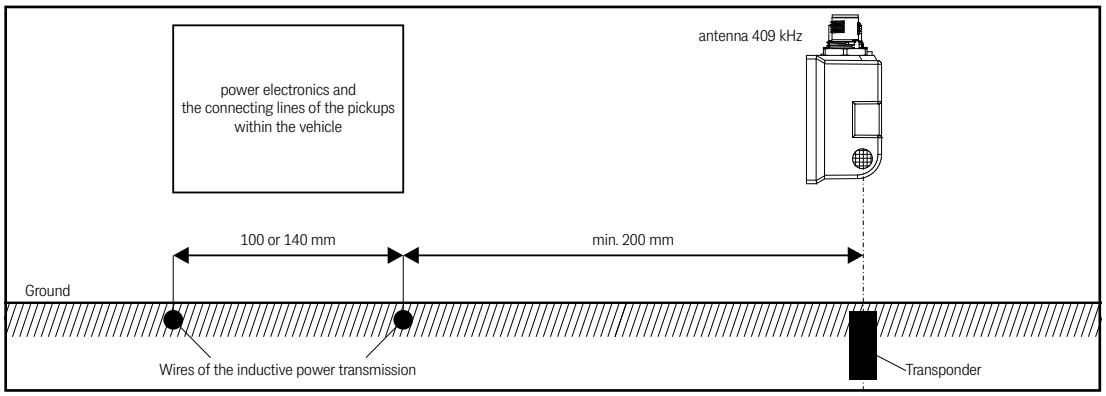
Under certain circumstances, the metal-free space can be reduced by decreasing the reading distance. For each application it must be checked individually when a transponder entering the reading area triggers the data and CD signal. The distance between triggering of the data and CD signal must still be more than 2 cm.

For some antenna variants, individual antennas can be temporarily deactivated via the data interface. You can see which variants support the deactivation in Table 2 on page 8.

4.3.2 Variants with 409 kHz in connection with Energy Tracks

409 kHz variants of the antenna (all ZA variants, s. section 2.1 on page 8) can be used in facilities with energy tracks (inductive tracks with energy transmission). In those cases the following minimum distances have to be observed.

Figure 13 *Minimum distances in facilities with inductive energy transmission systems*



4.3.3 Connection Cables

Connection cables are not included in the scope of supply. For some antenna variants, cables or Bus terminating resistors are available as accessories from the Götting KG. These can be found in Table 3 on page 9. Due to the consistent use of standard M12 connectors, suitable cables and adapters are available in specialized trade. See chapter 3 on page 15 to find out which connectors your antenna variant uses. If there is a high interference level, shielded cables should be used.

NOTICE

Risk of damage to the device or to other devices on the CAN Bus

The connectors ST1 (Power) and ST3 (CAN) of the antenna HG G-71453 with CAN Bus connection are mechanically identical. Thus there is the danger of mixing up the corresponding connectors.

- Pay particular attention to the correct placement of the ST1 and ST3 connectors on this antenna.

4.4 Interface HG 06150XA (optional for HG G-71450)

The optional serial/parallel interface must be installed on a mounting bar. The function is described in section 5.6 on page 30. Further information on the connections and mounting can be found in the data sheet for HG G-06150-A, which can be downloaded at:

https://www.goetting-agv.com/components/06150

4.5 Commissioning

After the installation including the connection via the connection cable, the transponder antenna is ready for operation. The interfaces and the configuration of deviating interface parameters are described in the following chapters.

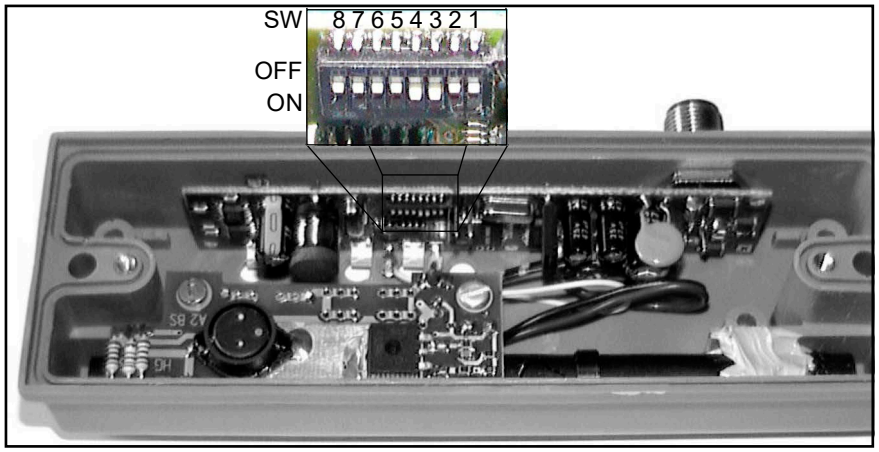
5 Interfaces: RS 232/serial (HG G-71450)

The transponder antenna HG G-71450 transmits the code of a transponder within the detection area via the serial interface. The output occurs according to the selected settings of the interface parameters (see below). If there is no transponder in the field, no protocols are sent. In addition, the serial interface can be used for configuration via the internal monitor program (see chapter 9 on page 48).

5.1 Interface Parameter RS 232

The parameters of the serial data transmission depend on the positions of the DIP-Switches on the antenna board (see Figure 14). To change them, the housing of the antenna must be opened.

Figure 14 *HG G-71450: Position of the DIP-Switches SW1 to SW8 on the antenna board*



The following table shows which settings of the RS 232 interface can be made via the DIP-Switches SW1 to SW8.

Table 17 *HG G-71450: Conf. options via the DIP-Switches of the antenna board*

SW	ON	OFF
SW1: Parity	ODD	**EVEN *)**
SW2: Baud rate	see Table 18 on page 28	
SW3: Baud rate		
SW4: Code output (see below)	**2 Codes *)**	CONT
SW5: Serial output	ASCII-coded (see 5.2 on page 28)	**Binary coded *)** (see 5.3 on page 29)
SW6	**Do not change!**	
SW7		
SW8		
***)** = Factory Setting		

With SW4 the type of telegram output is adjusted:

SW4 Position ON: When the transponder enters the antenna field of the reading antenna two identical data sets are output. Between both data sets there will be a pause of approx. 20 ms. As the vertical component of the magnetic field shows a zero point centrically under the reading antenna the transponder will be activated twice when passing the reading antenna. This means that in all 4 data sets are output.

SW4 Position OFF: The code will be output permanently as long as the transponder is located in the antenna field. Here the data stream will be interrupted as well, while the transponder is located centrically under the antenna.

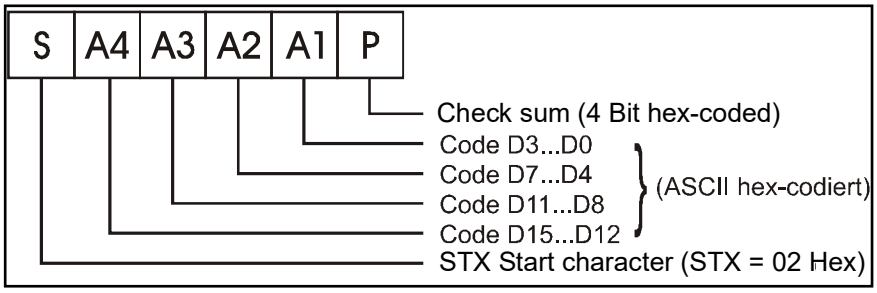
Table 18 *HG G-71450: Baud rate adjustment via SW2 and SW3*

Baud Rate	SW2	SW3
38400	OFF	OFF
9600 *)	**OFF**	**ON**
19200	ON	OFF
4800	ON	ON
***)** = Factory Setting		

5.2 Telegram Setup ASCII Coding (SW5 = ON)

Example:

Figure 15 *HG G-71450: Example for a ASCII telegram setup*



Adding the values of A1 to A4 and P results in 0 (A1 + A2 + A3 + A4 + P = 0).

Example:

Bit sequence: `0001 1001 0000 0000` (Transponder code 16 bit) 1900_{hex} in the transponder.

The following bytes will be output:

Table 19 *HG G-71450: Example telegram ASCII-coded*

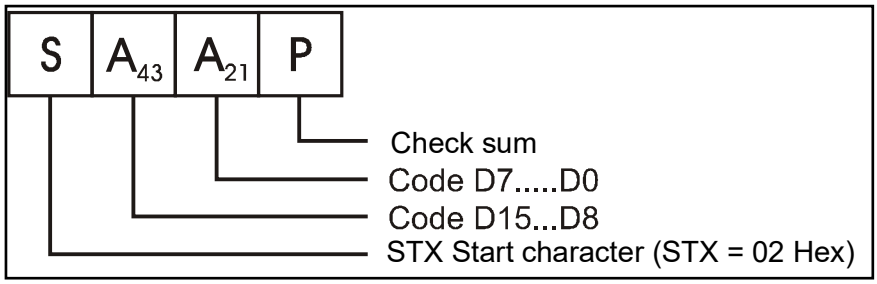
Character	Hex-Value	ASCII-Interpretation
STX	02	STX
A4	31	„1“
A3	39	„9“
A2	30	„0“
A1	30	„0“
P	36	„6“

Sum of „1“, „9“, „0“, „0“ and „6“ results in „0“.

5.3 Telegram Setup of Binary Coding (SW5 = OFF)

Example:

Figure 16 *HG G-71450: Example for a binary telegram setup*



Sum of A_{43}, A_{21} and P results in 0 (Mod256).

Example:

Bit sequence: `0000 0111 0000 1011` (Transponder code 16 bit) $070B_{hex}$ in the transponder.

The following bytes will be output:

Table 20 *HG G-71450: Example telegram binary coded*

Character	Hex-Value
STX	02
A43	07
A21	0B
P	EE

The hexadecimal sum over 07, 0B, EE results in $(1)00_{hex}$.

5.4 Resetting the Antenna

The Reset of the antenna is triggered as soon as it receives the sign DC2 (012h) with the right parity. Then the antenna confirms the reception of this command by sending an answer telegram. After that the program resets all internal variables. Any other signs or transmission errors are ignored.

The answer telegram is formed as follows (binary coding):

1. Start identifier `StartofHeader` = 01h
2. data byte with the bits 15...8 (Bit 8 = LSB of the byte) of the last read code
3. data byte with the bits 7...0 (Bit 0 = LSB of the byte) of the last read code
4. check byte: the sum of the telegram identification, the data bytes and this check byte equals 0.

If the ASCII coded output is activated, the code will be displayed as shown in Table 19 on page 28. If no transponder has been read until the card is resetted, the value `0000h` will be put out.

5.5 Transponder Programming

Transponders can be programmed via the serial interface. This is described in section 10.3.1 on page 61.

5.6 Serial/Parallel Interface HG G-06150XA (optional)

Figure 17 *HG G-71450: Optional interface HG G-06150Y for mounting bar installation*

The serial/parallel interface comes within a case suitable for top hat rail installation, see 4.4 on page 25. The serial data stream of RS 232 is supplied. Therefore the serial output of the antenna has to be set to `CONT`. The baud rate has to be 19200bd with the parity EVEN. The serial output has to be ASCII coded. Correspondingly the DIP switches 1 to 5 (see Figure 14 on page 27) have to be set to the following values:

Table 21 *HG G-71450: Setting DIP switches 1 to 5 for using. serial/parallel interfaces*

SW	Setting
1	OFF
2	ON
3	OFF
4	OFF
5	ON

Function of the interface can be controlled via a LED that can be seen through the transparent cover. It flashes while serial telegrams are being decoded. These telegrams are only created if a transponder is situated in the field.

From the data stream the code will be converted into a 16 bit parallel output. The code is transmitted until a new code is received. Furthermore, 50 ms after the transmission of the codebits a *Data_Ready-Impuls* (duration: 100ms) is created. A new *Data_Ready-Impuls* will only be created at a code change.

Whether the transponder is located under the antenna or not is shown through the signal *Data_Valid*. If there is no transponder in the field, 0V is output. Otherwise the parallel outputs *Data_Ready* and *Data_Valid* switch to *+Usps (24V)*. They are neither short-circuit-proof nor are they electrically insulated.

6 Interfaces: PROFIBUS® (HG G-71451)

The code supplied by the transponder has a sequence of 24 bits in which 16 bits are coded. The data and a status byte are output via the PROFIBUS®. The programming of transponders can also be carried out via the PROFIBUS®. The additionally available serial interface can be used for logging and for the configuration via the internal monitor program (see chapter 9 on page 48).

6.1 PROFIBUS® Address (Hex Rotary Switch)

2 Hex-rotary switches under 2 closing plugs are available for the adjustment of the PROFIBUS® address (see Figure 8 on page 17). Set the address with a screwdriver between 0 to 7E and re-seal the plugs afterwards. For the readjusted address to be used the antenna has to be turned off and on again.

6.2 PROFIBUS® Configurations

By means of the GSD files HG71451A3.GSD (see section 6.5 on page 33) it is possible to project three different configurations:

1. Simple reading of the antenna with 3 input bytes according to the following table:

Table 22 *HG G-71451: Structure of the three PROFIBUS® input bytes*

Byte #	Length	Type	Sequence	Meaning
1	2 Byte	unsigned int	Lo Byte	read transponder code
2			Hi Byte	
3	1 Byte	unsigned char		Status (according to Table 25 below)

2. Reading of the antenna with 3 input bytes (Table 22) and send delete statement with 1 output byte (Table 23)

The output byte has to be used according to the following table:

Table 23 *HG G-71451: Structure of the PROFIBUS® output bytes*

Byte #	Length	Type	Sequence	Meaning
1	1 Byte	unsigned char		Command bit (according to Table 26 below)

If – e.g. after a change in the direction of travel – a new positioning pulse should be generated at the transponder just read the delete statement has to be send. The delete statement is initiated by a rising edge of the CLR bit; i. e. first the status byte should be transfered with a deleted CLR bit. The current status will be indicated in the status byte (see Table 25 on page 32).

3. Reading of the antenna with 3 input bytes (Table 22) and transponder programming with 3 output bytes (Table 24)

The output bytes have to be used according to the following table:

Table 24 *HG G-71451: Structure of the 3 PROFIBUS® output bytes*

Byte #	Length	Type	Sequence	Meaning
1	2 Byte	unsigned int	Lo Byte	Transponder code that is to be programmed
2			Hi Byte	
3	1 Byte	unsigned char		Command bit (according to Table 26 below)

6.3 Status and Command Bits

Table 25 *HG G-71451: Meaning of the status bits*

Priority	Name	Meaning	Comments
0x01		Currently not used	By means of status bit DATA and CD it is possible to determine, whether a transponder is located below the antenna. If both bits are set, transponder data is received at a sufficient level. The bits are not set within the data-free area. At an unprogrammed transponder or if interferences occur the CD bit will be set only.
0x02	CLR	Reflects the status of the CLR-instructions (see also Table 26 on page 32)	
0x04 0x08 0x10		Currently not used	
0x20	DATA	Set according to the Data LED	
0x40	CD	Set according to the CD LED	
0x80	POS	Set according to the Pos LED	

Table 26 *HG G-71451: Meaning of the command bits*

Priority	Name	Meaning
0x01	PROG	Transponder programming (see section 10.3.2 on page 63)
0x02	CLR	Internal deletion of the last transponder code *)
0x04 0x08 0x10 0x20 0x40 0x80		Currently not used
*) The last stored transponder code is „deleted“. Then, after a change of direction, a transponder with the same code can trigger a positioning pulse again.		

6.4 Transponder Programming

The sequence of a transponder programming via the PROFIBUS® interface is described in section 10.3.2 on page 63.

6.5 GSD File

You can download the latest version of the GSD file from our Internet server.

http://www.goetting-agv.com/components/7145x

7 Interfaces: CANopen® (HG G-71453)

The code supplied by the transponder has a sequence of 24 bits in which 16 bits are coded. The data and a status byte are output via the CAN-Bus. Transponders can also be programmed via the CAN-Bus. The serial interface, that is also available, can be used for logging and for configuration via the internal monitor program (see chapter 9 on page 48).

The Node-ID (see section 7.2 on page 36) and the CAN transmission rate (see section 9.4.3.3 on page 55) must be set.

The measured values of the system (transponder code and status) are transmitted via a so-called TPDO. Commands such as switching off the transmitter and deleting the last transponder code are transmitted via an RPDO. SDOs or the monitor program (see section 9.4.3 on page 54) are used for setting the communication parameters. The CAN identifiers are derived from the node address (1..127).

7.1 Definitions CAN and CANopen®

The CAN or CANopen® configuration is structured according to ISO 11898 or EN 50325-4. Important terms and abbreviations are explained in this section as small assistance. For further information, you can consult the standards or go to

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

and download the technical specifications of the CANopen® standards after a free registration. For devices that support CANopen®, EDS (Electronic Data Sheet) files can be downloaded from the Götting website (see section 7.11 on page 45). The complete configuration is stored in these files. CANopen® Magic from PEAK System is an example of a program that can be used to access EDS files:

http://www.canopenmagic.com

Table 27 *CAN: 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. Götting devices normally support operating modes 1 to 240 and 255.

Table 28 *CAN: PDO operating modes*

Operating mode	Explanation
Cyclic	Every nth Sync telegram will transmit data
Acyclic	Sends if an event has occurred since the last Sync telegram
Synchronous	Data are transmitted after receipt of a Sync telegram
Asynchronous	Data is transmitted event-controlled
RTR	Only on request by a remote frame
Inhibit Time	Minimum time span that must elapse before the next transmission of the same PDO
Event Time	Triggers an event at expiration. Restarted after each event.

Table 29 *Definitions CAN/CANopen®*

Name	Abbreviations	Meaning
Process data objects	PDO	Maximum 8 bytes of process data
Transmit-PDO	TPDO	Process data sent from a device
Receive-PDO	RPDO	Process data received from a device
Service data objects	SDO	Used for reading and writing device parameters. No size limitation
Synchronization telegram	Sync	Bus-wide telegram sent by the CANopen® Master
CAN-Identifier	–	The address at which a PDO,SDO is sent
Node ID	–	For CANopen®, the address of the device that is added to the CAN-Identifier

Table 30 *CAN: Bit and byte sequences*

Name	Meaning
Low Byte First	Little-Endian format, Intel format The byte with the smallest value of a multibyte value is sent first
High Byte First	Big-Endian format, Motorola format The most significant byte of a multibyte value is sent first
Left-justified	Sequence of bits in a byte from left (most significant) to the right (smallest)

Table 31 *CANopen® operating mode*

Name	Significance
Stopped	Only network management services executable
Pre-Operational	Full configuration possible, no transmission of PDOs
Operational	Full configuration possible, set PDOs are transmitted

Note that a CAN identifier or for CANopen® the combination CAN identifier and node identifier must always be unique.

7.2 Node ID

2 Hex rotary switches protected by closing plugs in the housing of the transponder antenna can be used to adjust the CANopen® Node ID (see also Figure 9 on page 19). Use a screwdriver to set the address in the range of 01 bis 7F and then close the plugs tightly again. For the readjusted address to be used the antenna has to be turned off and on again.

7.3 Default Values

The CANopen® interface is set to the following values in the delivery state.

Table 32 *HG G-71453: CAN factory settings*

Function	Default value
Posi filter	0ms
CAN baud rate	125kB
TPDO Event time	100ms
TPDO Inhibit time	3ms
Heartbeat time	1000ms
Autostart	1
Lowbyte first	0

7.4 Description of the Transmission Process Data Objects (TPDO)

Fixed places are allocated for the measured values in the PDO. Dynamic mapping is not possible. TPDO_1 is transmitted as a combination of the identifier 0x180 and the node address. It is either sent cyclically (event time > 10ms) or only when the measured values have changed (inhibit time > 3ms). In order to avoid excessive bus usage, it is possible to set the so-called Inhibit time in the CAN menu of the serial monitor or with an SDO.

TPDO_1 contains exactly 3 bytes consisting of 16 bit transponder code and the status. The latter is equal to the status as shown in the monitor program. The meaning of the data is defined in Table 33 on page 36.

It is also possible to permanently deactivate a TPDO by selecting the asynchronous mode (255) with inhibit time = 0 and event time = 0, then store the parameters. In addition, it is possible to temporarily deactivate/activate the TPDO by setting/deleting the highest ranking bit within the corresponding PDO COB identifier [1800,01].

Table 33 *HG G-71453: Structure CAN transmitting object TPDO_1*

Name	No. format	Value range (Hex)	Description
Code	Unsigned 16	0..0xffff	Code bits 0..15
Status	Unsigned 8	./.	Status bits (see below)

The status bits have the following meaning:

Table 34 *HG G-71453: CAN transmitting object TPDO_1 – description of the status bits*

Bit no.	Value	Description
7	0x80	Positioning pulse active (equivalent to the LED *POS*)
6	0x40	Transponder modulation detected (equivalent to the LED *CD*)
5	0x20	Transponder codes are decoded (equivalent to the LED *DATA*)
4	0x10	If = 1 the transmitting part of the transponder antenna is switched off
3	0x08	Not used
2	0x04	Not used
1	0x02	Not used
0	0x01	The check sum of the EEProm parameters is wrong.

7.5 Description of the Receiving Process Data Objects (RPDO)

The command byte is assigned to a fixed place in the RPDO, dynamic mapping is not possible. RPDO_1 is received with the identifier 0x200 and node address.

The RPDO can be temporarily deactivated/activated by setting/deleting the highest ranking bit in the corresponding PDO-COB identifier [1400,01]. It contains 3 bytes.

Table 35 *HG G-71453: Structure CAN receiving object RPDO_1*

Name	No. format	Value range (Hex)	Description
Code	Unsigned 16	0..0xffff	Code bits 0..15
Status	Unsigned 8	./.	Command bits (see below)

The command bits have the following meaning:

Table 36 *HG G-71453: CAN receiving object RPDO_1 – description of the command bits (part 1 of 2)*

Bit no.	Value	Description
7	0x80	TxOFF: if = 1, the transmitter is switched off
5	0x40	Not used
5	0x20	Not used
4	0x10	Not used
3	0x08	Not used

Table 36 *HG G-71453: CAN receiving object RPDO_1 – description of the command bits (part 2 of 2)*

Bit no.	Value	Description
2	0x04	Not used
1	0x02	PROG_CODE: The transition 0->1 of this bit generates a programming command. The data of the RPDO-Bytes *Code* are programmed into the transponder.
0	0x01	CLR_CODE: The transition 0->1 of this bit generates a delete command (see Table 55 on page 43)

7.6 Heartbeat

The device supports the heartbeat mode. When a heartbeat time > 0 is set in the CAN menu, the device status is transmitted under identifier (0x700 + node address) every time the heartbeat timer has expired.

Table 37 *HG G-71453: CAN coding of the device status*

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

7.7 Description of the Service Data Objects (SDOs)

The service data object is used to access the object index. An SDO is always transmitted with a confirmation, i. e. each reception of the message is acknowledged. The identifiers for read and write access are:

Read access: 0x600 + node address,

Write access: 0x580 + node address.

The SDO telegrams are described in the CiA® standard DS-301. The error codes in case of faulty communication are listed in the following table:

Table 38 *HG G-71453: SDO telegram error codes*

Name	Number	Description
SDO_ABORT_UNSUPPORTED	0x06010000	non-supported access to an object
SDO_ABORT_NOT_EXISTS	0x06020000	object is not implemented
SDO_ABORT_READONLY	0x06010002	write access to a read-only object
SDO_ABORT_SIGNATURE	0x08000020	The signature *load* or *save* was not used for loading or saving parameters. On the deletion of the transponder code the signature c was not used

7.8 Object Directory

All objects relevant for the device are included in the CANopen® Object Directory. Each entry is indicated by a 16 bit index. Sub-components are indicated by a 8 bit sub index. RO indicates read only entries. The object index is subdivided into the following areas:

Overview of the object directory:

Table 39 *HG G-71453: Communication specific entries in the range from 0x1000 to 0x1FFF*

Index	Subindex	Access	Description	EEProm
0x1000	0	RO	Device Typ	
0x1001	0	RO	Error Register	
0x1008	0	RO	Device Name	
0x1009	0	RO	Hardware Version	
0x100A	0	RO	Software Version	
0x1010	0	RO	Number of entries of Save Parameter	
	1	RW	Store all	
0x1011	0	RO	Number of entries of Restore Default Parameter	
	1	RW	Restore Default all	
0x1017	0	RW	Producer Heartbeat Time	X
0x1018	0	RO	Number of entries of Identity Object	
	1	RO	Vendor ID	
	2	RO	Product Code	
	3	RO	Revision	
0x1400	0	RO	Number of entries of Receive PDO_1	
	1	RW	COB-ID	
	2	RO	Transmission Type	
0x1600	0	RO	Number of Objects mapped to Receive PDO_1	
	1	RO	Specification of Appl. Object 1	
	2	RO	Specification of Appl. Object 2	
0x1800	0	RO	Number of entries of Transmit PDO_1	
	1	RW	COB-ID	
	2	RO	Transmission Type	
	3	RW	Inhibit Time	X
	5	RW	Event Time	X
0x1A00	0	RO	Number of Objects mapped to Transmit PDO_1	
	1	RO	Specification of Appl. Object 1	
	2	RO	Specification of Appl. Object 2	

Table 40 *HG G-71453: Manufacturer specific entries at 0x2000*

Index	Subindex	Access	Description
0x2000	0	RO	Number of Manufacture Parameter
	1	RW	Program transponder with 16 Bit Code
	2	WO	Delete last transponder code (in order to make Posi Pulse fire again for the same code)
0x2001	0	RO	Number of Parameter
	1	RW	Node Baud rate
	2	RW	Node ID
	3	RW	Node Config

Table 41 *HG G-71453: Standardised device profile area in the range from 0x6000 to 0x6400*

Index	Subindex	Access	Description
0x6000	0	RO	Number of 8 Bit Inputs
	1	RO	Status bits (s. Table 34 on page 37)
0x6100	0	RO	Number of 16 Bit Inputs
	1	RO	Transponder code bits 0..15
0x6200	0	RO	Number of 8 Bit Outputs
	1	RO	Command bits 0..7
0x6300	0	RO	Number of 16 Bit Outputs
	1	WO	Transponder code bits 0..15

Explanation of the entries:

Table 42 *HG G-71453: Device Type*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
1000	00	Device Type	Unsigned 32	RO	No	0x00010191	Digital Inputs - DS 401

Table 43 *HG G-71453: Error Register*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
1001	00	Error Register	Unsigned 8	RO	No	0x00	Error Register

Table 44 *HG G-71453: Manufacturer Device Name*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
1008	00	Manufacturer Device Name	Visible String	RO	No	„7145“	Device name

Table 45 *HG G-71453: CANopen® Directory: Hardware Version*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
0x1009	00	Hardware Version	Visible_ String	RO	No	„3-A1“	Hardware version no.

Table 46 *HG G-71453: CANopen® Directory: Software Version*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
0x100A	00	Software Version	Visible String	RO	No	„1.13“	Software version no.

Table 47 *HG G-71453: Save Parameter*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
1010	00	Save Parameter	Unsigned 8	RO	No	0x01	No. of sub indices
	01	Save All	Unsigned 32	RW	No	0x00000001	Save All is possible

By writing the signature `save` in ASCII-Code (hex-Code: 0x65766173) onto subindex 1, the currently set parameters are permanently saved. A successful saving process is acknowledged after about 120 ms by a TxSDO (1st byte = 0x60). The saving process is performed after that acknowledgment. During the saving process CAN telegrams can not be received or transmitted.

The signature can also be transmitted reverse as `evas`.

Table 48 *HG G-71453: Restore Default Parameter*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
1011	00	Restore Parameter	Unsigned 8	RO	No	0x04	No. sub indices
	01	Restore All	Unsigned 32	RW	No	0x00000001	Restore All is possible

By writing the signature `load` in ASCII-Code (hex-Code: 0x64616F6C) onto subindex 1, the corresponding default parameters are loaded. A reset should be carried out to make the antenna use them.

The signature can also be transmitted reverse as `daol`.

Table 49 *HG G-71453: Producer Heartbeat Time*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
1017	00	Producer Heartbeat Time	Unsigned 16	RW	No	1000	Heartbeat time in ms (approx.)

If 0 is entered for the time, this function is switched off.

Table 50 *HG G-71453: Identity Object*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
1018	00	Identity Object	Unsigned 8	RO	No	0x03	No. sub indices
	01	Vendor ID	Unsigned 32	RO	No	0x00000202	Manufacture no. as specified by the CiA®
	02	Product Code	Unsigned 32	RO	No	0x00071453	HG no. 71453
	03	Revision	Unsigned 32	RO	No	0x00000001	Version 1.00

Table 51 *HG G-71453: RPDO_1 Parameter*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
1400	00	TPDO_1 Parameter	Unsigned 8	RO	No	0x02	No. sub indices
	01	COB ID	Unsigned 32	RW	No	0x200 + Node-ID	PDO_1 valid, ID = 0x200 + node-ID
	02	Transmission Type	Unsigned 8	RO	No	255	Asynchronous, event-driven

Table 52 *HG G-71453: Mapping RPDO_1*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
1600	00	number of mapped objects	Unsigned 8	RO	No	0x02	No. sub indices
	01	1st mapped object	Unsigned 32	RO	No	0x63000110	Mapped to Index 0x6300,01 with a length of 16 Bit (Transponder code to be programmed)
	02	2nd mapped object	Unsigned 32	RO	No	0x62000108	Mapped to index 0x6200,01 with a length of 8 Bit (Command bits)

Table 53 *HG G-71453: Transmit PDO_1 Parameter*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
1800	00	TPDO_1 Parameter	Unsigned 8	RO	No	0x05	No. sub indices
	01	COB ID	Unsigned 32	RW	No	0x180 + Node-ID	PDO_1 valid, ID = 0x180 + node-ID
	02	Transmission Type	Unsigned 8	RO	No	255	Asynchronous, event-driven
	03	Inhibit Time	Unsigned 16	RW	No	100	Shortest period between transmis-sions in µs
	05	Event Time	Unsigned 16	RW	No	10	Cycle time in ms

Table 54 *HG G-71453: Mapping TPDO_1*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
1A00	00	number of mapped objects	Unsigned 8	RO	No	0x02	No. sub indices
	01	1st mapped object	Unsigned 32	RO	No	0x61000110	Mapped to index 0x6100,01 with a length of 16 bit (Code 0..15)
	02	2nd mapped object	Unsigned 32	RO	No	0x60000108	Mapped to index 0x6000,01 with a length of 8 bit (status)

Table 55 *HG G-71453: Manufacture Parameter*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
2000	00	number of manufacture parameter	Unsigned 8	RO	No	0x02	No. sub indices
	01	Prog_ transponder	Unsigned 16	RW	No	0	Transponder code that is to be programmed *)
	02	Clear code	Unsigned 8	WO	No	./.	Delete last transponder code **)

*) By setting sub index 1 to a 16 bit code this code will be programmed into a transponder within the reception range. This programming option is only available as long as it isn't deactivated in the CAN menu (see section 9.4.3.3 on page 55).
**) By writing the signature "c" in ASCII code (hex-Code: 0x63) to sub index 2 the last stored transponder code is „deleted". Afterwards a transponder with the same code can again generate a positioning pulse.

7.9 Manufacture Parameters - Node parameters

Table 56 *HG G-71453: CAN: Manufacture Parameters - Node Parameters*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
0x2001	00	Number of Parameter	Unsigned 8	RO	No	0x03	No. sub indices
	01	Node baud rate	Unsigned 8	RW	No	0x04	125Kbaud *)
	02	Node ID	Unsigned 8	RO	No	./.	Node address as set with the hex switches
	03	Node Config	Unsigned 8	RW	No	0x01	Start in state „operational“ Highbyte first **)

*)

Table 57 *HG G-71453: CAN: Coding of the Node baud rate*

Input/output value	Baud rate / kBaud
7	20
6	50
4 (Default)	125
3	250
2	500
1	800
0	1000

Table 58 *HG G-71453: CAN: Coding of the Node Config Bytes*

**)

Value	Description
xxxx.xxx0	Start in „pre-operational“ state
xxxx.xxx1	Start in „operational“ state
xxxx.xx0x	High byte first
xxxx.xx1x	Low byte first

Table 59 *HG G-71453: 8 Bit Digital Inputs (transmitted in TPDO 1)*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
6000	00	number of 8 bit inputs	Unsigned 8	RO	No	0x01	No. of 8 bit inputs
	01	8 bit digital input	Unsigned 8	RO	Yes	./.	Status

Table 60 *HG G-71453: 16 Bit Digital Inputs Transponder code*

Index	Sub Index	Name	Typ	Attr.	Map	Default	Bedeutung
6100	00	number of 16 bit digital inputs	Unsigned 8	RO	No	0x01	number of 16 bit digital input
	01	16 bit digital input	Unsigned 16	RO	Yes	./.	16 Bit received Transponder code

Table 61 *HG G-71453: 8 Bit Digital Outputs Command Code*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
6200	00	number of 8 bit digital outputs	Unsigned 8	RO	No	0x01	No. of digital 8 bit outputs
	01	8 bit digital output	Unsigned 8	WO	Yes	./.	8 bit Command Code according to Table 36 on page 37

Table 62 *HG G-71453: 16 Bit Digital Outputs Transponder Code*

Index	Sub Index	Name	Type	Attr.	Map	Default	Description
6300	00	number of 16 bit digital outputs	Unsigned 8	RO	No	0x01	No. of 16 bit digital outputs
	01	16 bit digital output	Unsigned 16	WO	Yes	0x00	16 Bit Transponder code to be programmed

7.10 Transponder Programming

Transponders can be programmed via the CAN interface. This is described in section 10.3.3 on page 63.

7.11 EDS File

You can download the latest version of the EDS file from our Internet server.

http://www.goetting-agv.com/components/7145x

8 Interfaces: PROFINET® (HG G-71455)

The transponder antenna has an internal PROFINET® switch.

The code transmitted by the transponder consists of a sequence of 24 bits in which 16 bits are coded. The data and a status byte are output via PROFINET®. Transponders can also be programmed via PROFINET®. The additionally available USB interface can be used for logging and configuration via the internal monitor program (see chapter 9 on page 48).

The PROFINET® interface is configured using the GSDML file (see section 8.6 on page 47). There are 5 input bytes and 3 output bytes available.

8.1 Input Bytes

Table 63 *HG G-71455: Structure of the PROFINET® input bytes*

Byte #	Length	Type	Sequence	Description
1	2 Byte	unsigned int	Hi Byte	Transponder code
2			Lo Byte	
3	2 Byte	unsigned int	Hi Byte	Level
4			Lo Byte	
5	1 Byte	unsigned char		Status (according to Table 65 below)

8.2 Output Bytes

Table 64 *HG G-71455: Structure of the PROFINET® output bytes*

Byte #	Length	Type	Sequence	Description
1	2 Byte	unsigned int	Hi Byte	Transponder code to be programmed
2			Lo Byte	
3	1 Byte	unsigned int		Command byte (according to Table 66 below)

8.3 Status Bits

Table 65 *HG G-71455: Description of the PROFINET® status bits*

Value	Name	Description	Explanation
0x01			*) The status bit Code can be used to determine whether there is a transponder in the field whose code is being read.
0x02	CLR	Mirroring of the command bit	
0x04 0x08 0x10			
0x20	CODE	is set according to the Code LED *)	
0x40			
0x80	POSI	is set according to the Pos LED	

8.4 Command Bits

Table 66 *HG G-71455: Description of the PROFINET® command bits*

Value	Name	Description	Explanation
0x01	PROG	Transponder programming see 10.3.4 on page 64	*) If, for example, after a change of direction a new PosiPulse is to be triggered at the transponder just read, the delete command (CLR) must be sent, which sets the number of the last transponder read to 0. The deletion process is initiated by a rising edge of the CLR bit, i. e. the status byte with the deleted CLR bit should first be sent. The current state is displayed in the status byte.
0x02	CLR	Deleting the last transponder ode *)	
0x04			
0x08			
0x10			
0x20			
0x40			
0x80			

8.5 Transponder Programming

Transponders can be programmed via the PROFINET® interface. This is described in section 10.3.4 on page 64.

8.6 GSDML File

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

http://www.goetting-agv.com/components/7145x

9 Software / Configuration

A monitor program runs in the antenna, to which a connection can be established with a PC. Depending on the antenna variant, this is done via the serial or USB interface. In both cases, the monitor program can then be called up via a terminal program on the PC. The monitor program can be used

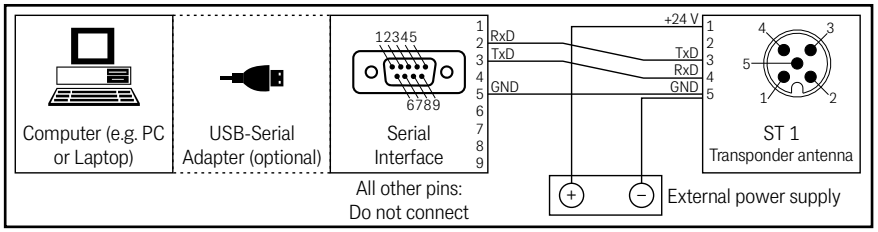
- to check the version of the antenna firmware,
- to program a transponder and
- to carry out a firmware update for some variants.

9.1 Connection to a PC

9.1.1 Via the serial interface (HG G-71450 / HG G-71451 / HG G-71453)

The 5-pin ST 1 connector (see e. g. 3.2.2.1 on page 16) can be used for the variant of the transponder antenna with serial RS 232 interface to establish a connection to a PC. A PC with a serial RS232 interface is required. For PCs that do not have a serial interface, it is recommended to use a USB to RS232 adapter, which is available in specialized stores.

Figure 18 *Connection example RS 232: Connection with the serial interface of a PC*



Depending on the variant, the serial interface of the transponder antenna is operated with the following standard transmission parameters. These must be set, for example, in the terminal program on the PC (see below).

Please note that the transponder antenna may have been changed to different interface parameters after delivery. In this case, the terminal program must correspondingly be started with changed parameters.

Table 67 *Transmission parameters of the serial RS232 interface*

Setting	
Baud rates	– 38400 Baud (fixed for HG G-71451 and HG G-71453) – 19200 Baud – 9600 Baud (Standard for HG G-71450, Change via the DIP switches, see 5.1 on page 27) – 4800 Baud
Data bits	8
Parity	Even
Stop bits	1
Flow control	XON/XOFF
Terminal emulation	ANSI

9.1.2 Via the USB interface (HG G-71455)

For the variants of the transponder antenna with USB interface, the 5-pin connector ST 1 can be used to establish a connection to a PC. A PC with USB interface is required.

NOTICE

Damage to the transponder antenna, computer or other devices connected via USB

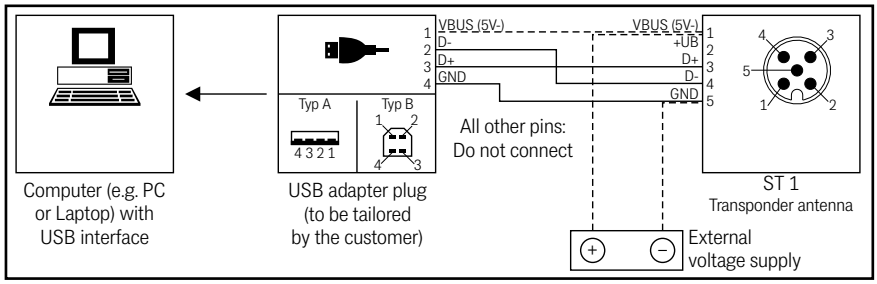
If an external voltage supply and the VBUS voltage supply are connected at the same time, +Ub is switched to the USB interface of the computer, which can damage the interface.

- Only connect either the VBUS (5V-) voltage supply or the external voltage supply.
- If you use the external voltage supply, leave pin 1 unconnected.

The USB interface does not have a leading ground contact. If you plug in or unplug USB connectors while an external power supply is connected to the inductive guidance sensor, voltage spikes can occur that will damage the devices connected via USB.

- When using an external voltage supply, always disconnect the antenna from the voltage supply before plugging or unplugging USB connectors. When all connections are made, turn on the external voltage supply to use the USB connection.

Figure 19 *Connection example USB: Connection with the USB interface of a PC*



Optionally the *connection box M12-5-8-USB* HG G-20960 can be inserted between antenna and PC (see also Table 3 on page 9). This allows the antenna to be connected via standard M12 cables and enables to supply the antenna with energy while it is connected to a PC.

For further information about the connection box see
http://goetting-agv.com/components/20960

The USB module in the antenna is addressed as a virtual serial interface (virtual COM port). This means that variants with a USB interface can also be configured with the same terminal program (see below), which is also used for connections via RS 232. Usually, the corresponding virtual COM port driver is installed automatically under current versions of Microsoft® Windows®.

If the transponder antenna is not automatically recognized as a virtual COM port after establishing the USB connection, the STM32 virtual COM port driver (STSW-STM32102) must be installed manually. The driver can be downloaded from the Internet at the following address:

http://www.st.com/en/development-tools/stsw-stm32102.html

9.2 Terminal Program

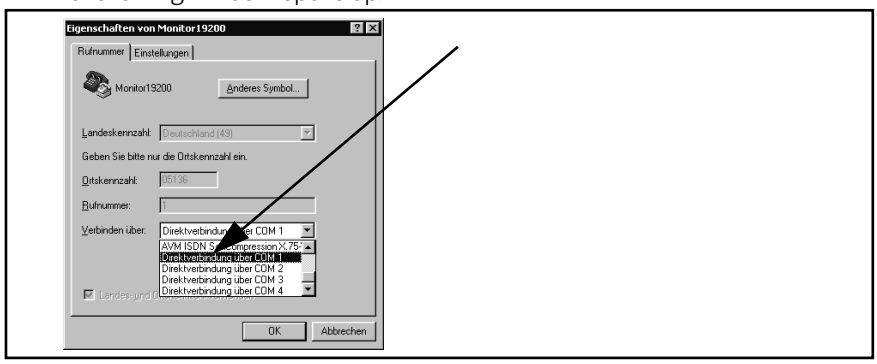
Any compatible terminal program can be used, examples are HyperTerminal® or Tera Term®. HyperTerminal® was included in earlier versions of Microsoft® Windows®. It can also be downloaded for all Windows® versions from the Internet at the following address:

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

Start the terminal program on the PC and connect the transponder antenna to the PC (depending on the variant via RS 232 or USB). If the connection has been established successfully, the basic menu appears in the output of the terminal program in accordance with section 9.4.

Usually the port COM1 is used for the connection. However, this may vary depending on the configuration of the PC interfaces. If you are using a port other than `COM1` and apply HyperTerminal, change the port as follows:

1. From the menu *File,* select the sub item *properties* (or click on the icon).
   The following window opens up:



2. From the drop down `connect via` select the direct connection the corresponding port and confirm with OK. Save the changed values when HyperTerminal asks during program exit.

9.3 Logging (CSV Output)

Table 68 *Variants of the transponder antenna with logging function*

Logging (CSV output)	transponder antenna			
	HG G-71450	HG G-71451	HG G-71453	HG G-71455
Logging function		✓	✓	✓
Logging function after starting the antenna		✓	✓	CSV must be called up in the main menu

For transponder antennas supporting the logging (see table above), data is permanently output in CSV Format (Comma Separated Values) after the connection is established in the terminal program. For the PROFINET® variant HG G-71455 the main menu is output instead, in which there is a separate menu item for starting CSV logging.

The CSV data can be stored in a text file via the terminal program. Each line consists of a data set in which the individual values are divided by commas. The data are put out as ASCII characters. The data lines are terminated by <CR LF>. The following values are put out depending on the antenna:

- HG G-71451:
  `CD,DATA,POS,Code<CR LF>`
- HG G-71453:
  `TXOFF,CD,DATA,POS,Code<CR LF>`
- HG G-71455:
  `Code,Pegel,DATA,POS Counter<CR LF>`

Table 69 *Description of the values output via CSV (part 1 of 2)*

Value	Value range	Description
CD	0/1	1 = Transponder in the field
DATA	0/1	1 = Data is decoded
POS	0/1	1 = PosiPulse triggered

Table 69 *Description of the values output via CSV (part 2 of 2)*

Value	Value range	Description
Code	0 – 65535	Transponder code
TXOFF	0/1	1 = Transmitter part of the transponder antenna is switched off
Level	0 – 2048	Received signal strength of the transponder
POS Counter	Number	Increased by 1 for each PosiPuls

This data corresponds to the data that is also transmitted via the other interfaces of the transponder antenna variants. If you assign the file extension .CSV to a recorded text file, you can usually import it into an installed spreadsheet application such as Microsoft® Excel® or OpenOffice® Calc® by double-clicking and use the data there. To switch from logging to the monitor program (see below), press the key P during data output in CSV format (upper or lower case / any key for HG G-71455).

9.4 Monitor Program (Service)

After the connection has been established (see above), enter a P (upper or lower case) in the terminal program. The main menu appears. It is structured differently depending on the variant. The following applies to all variants:

- The programming of a transponder is described in chapter 10 on page 60.
- The firmware Update is described in section 9.5 on page 57.
- The monitor mode is terminated with Quit or by switching the transponder antenna off and on. Depending on the antenna, the logging starts automatically or the main menu of the monitor program is displayed (see section 9.3 above).

9.4.1 Main Menu Monitor Program HG G-71450

Figure 20 *HG G-71450: Main menu of the monitor program*

```
HG71450 Monitor        409kHz / BIN    / 2*Code /  9600 Baud / EvnPar


Current Transponder Code  [hex/dez]:         9ABC / 39612

(H)ex Input Transponder Code    [0..FFFF]:      9ABC
(D)ez Input Transponder Code   [0..65535]:     39612
(W)rite Transponder
(V)ersion



(U)pdate Firmware
(Q)uit
```

The top line shows the settings selected via the DIP switches for control purposes (see section 5.1 on page 27). If it is a version of the antenna that supports KATE transponders the word KATE is also shown.

9.4.2 Main Menu Monitor Program HG G-71451

Figure 21 *HG G-71451: Main menu of the monitor program*

```
HG71451 Monitor System    409kHz

Profibus address:   1
Current Transponder Code  [hex/dez]:         9ABC / 39612

(H)ex Input Transponder Code    [0..FFFF]:      9ABC
(D)ez Input Transponder Code   [0..65535]:     39612
(W)rite Transponder
(V)ersion



(U)pdate Firmware
(Q)uit
```

The Profibus address set via the hex rotary switches is displayed (0 to 127; see 6.1 on page 31).

9.4.3 Monitor Program HG G-71453

9.4.3.1 Main Menu

Figure 22 *HG G-71453ZA (409kHz): Main menu of the monitor program*

```
                          HG 71453 Monitor

System: 409 kHz   / Code [hex-dez]: 1111 -  4369    / Status: 60
Node ID [hex]: 02 / CAN offline   :                 / int.Status: 8801


     (H)ex Input Transponder Code    [0..FFFF]:      0000
     (D)ez Input Transponder Code   [0..65535]:      0000
     (W)rite Transponder
     (P)osi Filter                [0..255 ms]:         0

     (C)AN Menu
     (L)oad Values to EEProm
     (V)ersion

     (U)pdate Firmware
     Default Values to (E)EProm

     (Q)uit
```

The antenna variant with 125kHz has an additional menu entry, (S)peed Mode.

Figure 23 *HG G-71453YA (125kHz): Main menu of the monitor program*

```
                          HG 71453 Monitor

System: 125 kHz   / Code [hex-dez]: 1111 -  4369    / Status: 60
Node ID [hex]: 02 / CAN offline   :                 / int.Status: 8801


     (H)ex Input Transponder Code    [0..FFFF]:      0000
     (D)ez Input Transponder Code   [0..65535]:      0000
     (W)rite Transponder
     (P)osi Filter                [0..255 ms]:         0
     (S)peed Mode                                     SLOW [compatible]
     (C)AN Menu
     (L)oad Values to EEProm
     (V)ersion

     (U)pdate Firmware
     Default Values to (E)EProm

     (Q)uit
```

The top line shows the operating frequency (variant -Z: 409 kHz, variant -Y: 125 kHz), the code of the last received transponder in hex or decimal and the status. For the coding of the status bits see Table 34 on page 37.

The CAN bus status is displayed in the line below. CAN online changes to CAN offline if e. g.

- the CAN bus connector is unplugged.
- the CAN controller enters the BUSOFF state due to a missing terminating resistor (a suitable terminating resistor is available as an accessory, see Table 3 on page 9)

In addition, the CANopen® node state is displayed (stopped, preoperational oder operational).

The internal status should normally always be `0000`.

P: Setting of a filter that can prevent the premature triggering of a positioning pulse in very slow vehicles, see section 9.4.3.2 on page 55.

S (only available with variant HG G-71453YA / 125khz): In the SLOW setting, the transponder data format is compatible with existing equipment. In the FAST setting, the code transmission is accelerated. Only transponders programmed with the FAST setting can then be read.

C: CAN configuration, see section 9.4.3.3 on page 55.

By entering L changed parameters are stored in the EEProm. With E default values are stored in the EEProm. By entering Q the monitor mode is exited.

9.4.3.2 (P)osi Filter

The PosiPulse filter defines a time period in ms for which the DATA signal must be omitted at least before the positioning pulse is triggered. With the help of this filter, problems caused by positioning pulses triggered too early when entering the transponder field can be solved at very slow travel speeds.

At high driving speeds it can then happen that the PosiPulse is not triggered in the signal gap but only when leaving the detection area. Please also note that this will shift the location of the positioning by the distance covered within the set time.

9.4.3.3 CAN Menu

The CAN menu is opened by entering C in the main menu.

Figure 24 *HG G-71453: CAN menu*

```
                          HG 71453 Monitor

System: 409 kHz   / Code [hex-dez]: 0000 -  0000    / Status: 00
Node ID [hex]: 02 / CAN offline   :                 / int.Status: 8801


     CAN-(B)audrate[20,50,125,250,500,800,1000 kB]:     125
     TPDO (E)vent time            [0,10..65535 ms]:     100
     TPDO (I)nhibit time          [0, 3..65535 ms]:     3
     (H)eartbeat time             [0,10..65535 ms]:     1000
     (A)utostart                                        1
     (L)owbyte first                                    0
     (D)isable tag programming via object 0x2000,01     0
     Appl(y)

     (Q)uit
```

The CAN default values are listed in Table 32 on page 36.

B Selection of one of the listed baud rates (the autobaud function is not implemented).

E Selection of the cycle time of the TPDO transmission.

I Entering of the inhibit time of the TPDO. The inhibit time is the shortest possible time span between two successive transmissions. If both E and I are both set to `0`, the PDO is not transmitted.

H Changing of the so-called heartbeat time. A control message is sent at the selected interval of this cycle time. If H is set to `0`, the output of this message is suppressed.

A (De)activation of the Autostart function.

- If Autostart is deactivated, only the heartbeat message (if activated) is sent after turning the device on; the device is in the *preoperational* state.
- If Autostart is activated, the PDO and the heartbeat message (if activated) are sent immediately after turning the device on; the device is in *operational* state.

L Inversion of the byte sequence of the 16 bit code in the TPDO.

D In order to prevent the CANopen® master from triggering a programming at startup by parameterizing all SDOs, this function can be deactivated here. A transponder can then still be written via the RPDO.

Y Transfer of changed parameters, which are then applied. Note that this generates a node reset (see note below).

Node Reset: A connected host might reload the values stored in the EEProm and thereby undo the changes.

Node Reset: In the above case, do not apply the changes with Y, but first save the values in the main menu (see Figure 22 on page 54) to the EEprom. After saving in the main menu, a node reset is also generated. The host then reads in the saved configuration after the reset.

9.4.4 Main Menu Monitor Program HG G-71455

Figure 25 *HG G-71455: Main menu of the monitor program*

```
HG 71455 ZA V1.01


 System:     409.6 kHz
 Level:      375
 Code:       ABCD / 43981
 Code Valid: 1



 1: Calibration config
 2: CSV
 3: Program Transponder

 C: Clear
 U: Firmware update
```

The read transponder code is displayed (hexadecimal / decimal)

In addition, it is shown whether the transponder is currently in the reception area (code valid). This output corresponds to the Code LED. A firmware update can be carried out via the USB interface with U, see section 9.5.2 on page 58.

Table 70 *Default values PROFINET® interface HG G-71455*

Parameter	Factory setting
Decode Threshold	130
Posi Threshold	300
DC-Offset	10

9.5 Update of the Operating Software (Firmware)

9.5.1 Via the RS 232 Interface (HG G-71450 / HG G-71451 / HG G-71453)

Start the monitor program (see section 9.4 on page 52) and check the current firmware version first by entering V.

Figure 26 *Output of the firmware version (for example HG G-71450)*

```
----------------
  Transponder-
Reader  HG71450
 Version 1.10
(c) Goetting KG
----------------
  71450A11.10B
   30.01.03
----------------
Modul     Date
X39300W5  300103
I39300W5  060103
S39300W5  060103
T39300W5  060103
H39300W5  060103
GETEDIT   061095
MONITOR   300103
PROGNAGEL 220802
DOWNLOAD  050202
APT89C51  020701
LOADJUMP  050202
----------------

press any key to return
```

In the 7th and 8th line you can see the version and the corresponding date. By pressing any key you return to the main menu.

By pressing U you are asked to enter a password (supplied with a new firmware). After correct entry, the loader version is displayed. After entering P the old firmware is deleted. An R is displayed on the screen when this procedure is completed.

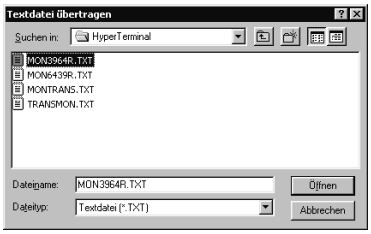
Figure 27 *Screen request for ASCII-Upload (for example HG G-71450)*

```
          (W)rite Transponder
          (V)ersion




          (U)pdate Firmware
          (Q)uit




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

--------------
Flash Loader
T89C51RD2
(c)GoettingKG
   19.08.02
--------------
    71450A1
--------------
PR
```

The new firmware can then be loaded via ASCII upload.

With HyperTerminal you transfer the file as follows:

- From the *Transmission* menu, select the sub item *send text file*. The following window opens:



- Change to the directory or data carrier in which the firmware file is located and select the corresponding firmware file (e. g. `71450A11.10H`).
- Click on Öffnen .

  The file is transferred.

The upload is indicated by a series of dots with a final „`O`“. Then press P to return to the main menu of the monitor program and press V to check the new firmware version. By pressing any key you return to the main menu.

If the programming was not successful, the firmware starts automatically in the flash loader program, outputs „`P`“ and „`R`“ and waits for a new ASCII upload.

9.5.2 Via the USB Interface (HG G-71455)

First start the monitor program (see section 9.4 on page 52).

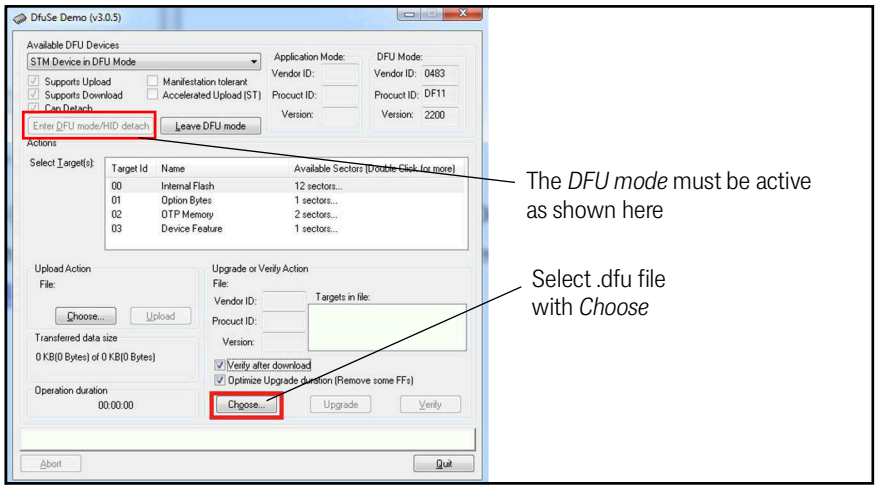
- Use the U key to switch the device to DFU mode (Device Firmware Upgrade).
- Close the connection via the COM port in the terminal program (hang up/ disconnect).

For the following steps the firmware as *.dfu* file and the software *DfuSe* from ST Microelectronics are required. The firmware file is available on request from Götting. The *DfuSE* software can be downloaded from the Internet at the following address:

http://www.st.com/en/development-tools/stsw-stm32080.html

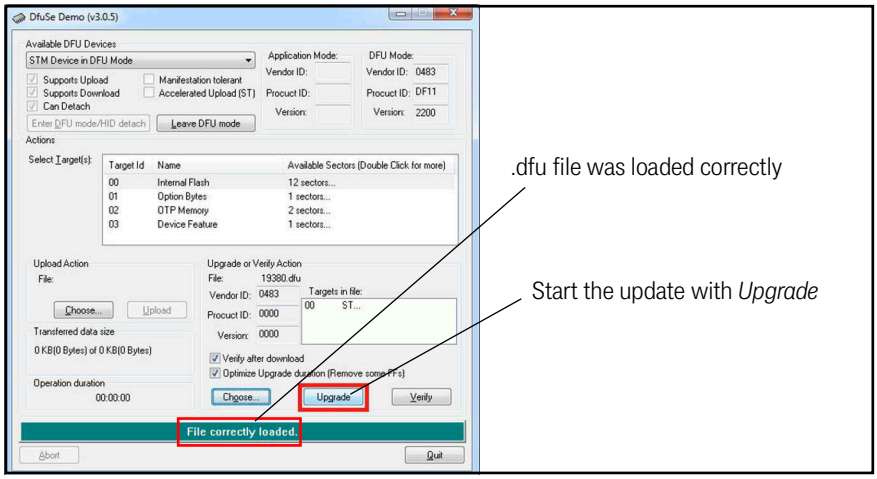
- Download *DfuSE* , install the programm and run it. It starts in demo GUI mode, which is sufficient for the firmware update.
- Select the *.dfu* firmware update file provided by Götting with *Choose*.

Figure 28 *HG G-71455: Firmware update – choose file*



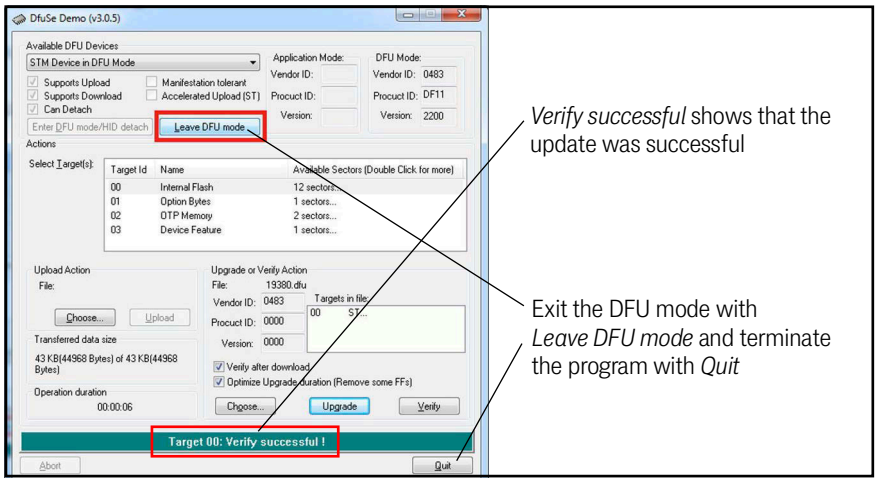
▶ If the file was loaded correctly (status: *File correctly loaded*), execute the firmware update via Upgrade.

Figure 29 *HG G-71455: Firmware update – start the update*



▶ After a successful update (status: *Verify successful*) the DFU mode can be left via *Leave DFU mode* and the program can be terminated.

Figure 30 *HG G-71455: Firmware update – Leave DFU mode*



The connection can then be re-established in the terminal program and the monitor program can be started again.

10 Transponder Programming

The transponder antenna can also be used to program compatible transponders (see Table 3 on page 9). This is a two-stage process:

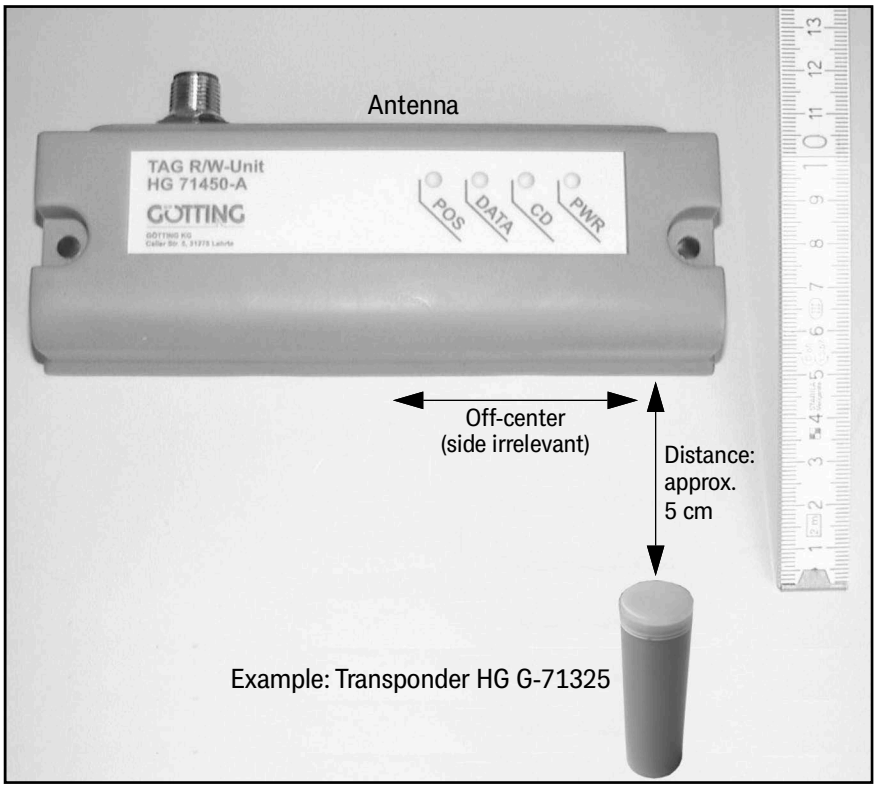
1. Move the transponder to the correct position underneath the antenna
2. Trigger the programming process in the transponder antenna (via interface telegrams or the monitor program)

For transponders that are yet unprogrammed no level is shown respectively the LED Data is not lit even when the transponder is in the antenna‘s reception area.

10.1 Positioning of the Transponders Using HG G-71325 as an Example

For best possible results when programming the transponder, hold the transponder approx. 5 cm below the antenna. While doing so the antenna must be supplied with power. Take care not to position the transponder centrally under the antenna, as there is a data-free area in the field in which programming is not possible (see also Figure 5 on page 14). The aim is for the transponder to be in detection area I (see Figure 2 on page 12).

Figure 31 *Notes for transponder programming*



The process from here on differs depending on the antenna variant. The telegrams of the integrated interface or the monitor program can be used alternatively for each variant.

10.2 Programming via the Monitor Program

For this type of programming, the antenna must be connected to a PC on which a terminal program runs (see chapter 9 on page 48).

- ▶ Hold a transponder under the antenna as shown in Figure 31 on page 60.
- ▶ Press P to call up the main menu, which appears automatically for the antenna HG G-71455. The next steps differ depending on the variant of the transponder antenna:
- ▶ For HG G-71450 / HG G-71451 / HG G-71453:
  - Enter the desired transponder code with H (hexadecimal) or with D (decimal) and confirm with Enter.
  - Press W to start the programming process.
- ▶ For HG G-71455:
  - Press 3 to start the programming process.
  - Enter the desired transponder code with 1 decimal or with 2 hexadecimal and confirm with Enter.

The new code appears in the display.

10.3 Programming via Interface Telegrams

This type of programming permits the use of the vehicle computer (e. g. PLC, from here on referred to as host). It differs depending on the antenna variant.

10.3.1 HG G-71450: Programming via Serial Telegrams

For this type of programming, ST 1 must be connected to supply voltage and a host. The position of the DIP switches in the antenna (see section 5.1 on page 27) influences the telegram transmission.

Transponders can be programmed via a serial command with the structure as in Table 71 on page 62 and Table 72 on page 62.

- If a transponder has been programmed, the new code is acknowledged in that it is output according to the specifications selected via the DIP switch SW4 (see Table 17 on page 27).
- If there is no transponder in the field or it has not been successfully programmed, a special response telegram is output once according to Table 73 on page 63 and Table 74 on page 63. The response telegram is output after approx. 2 seconds.
- Baud rate and parity of the characters correspond to the settings of the DIP switches SW1 to SW3 (see Table 17 on page 27).
- The checksums are formed according to the content of the telegrams sent by the antenna.

10.3.1.1 Structure of the Telegram (Host -> Antenna)

1. ASCII telegram with fixed start character, 4 bytes of data and a checksum.

Table 71 *HG G-71450: Content of the telegrams sent by the host (ASCII mode)*

#	Character	Description	Data type	Value range
1	DC1	Start character	Unsigned char	$0x11_h$
2	Code (Hi)	Transponder code to be programmed	Unsigned char	$0x30_h$ ... $0x39_h$, $0x41_h$ ... $0x46_h$, $0x61_h$ ... $0x66_h$ '0'...'9', 'A'...'F', 'a'...'f'
3	Code		Unsigned char	
4	Code		Unsigned char	
5	Code (Lo)		Unsigned char	
6	Checksum	The sum over the characters 2 to 6 results in $0x\cancel{1}0_h$	Unsigned char	

Example for valid ASCII programming telegrams:

- Code 1900: $0x11_h$,$0x31_h$,$0x39_h$,$0x30_h$,$0x30_h$,$0x36_h$
  ($1_h+9_h+0_h+0_h+6_h = \cancel{1}0_h$ *)
- Code AFFE: $0x11_h$,$0x\cancel{4}1_h$,$0x46_h$,$0x46_h$,$0x45_h$,$0x41_h$
  ($A_h+F_h+F_h+E_h+A_h = \cancel{4}0_h$ *)

*) Only 1 digit is output.

2. Binary telegrams with fixed start character, 2 bytes of data and a checksum.

Table 72 *HG G-71450: Content of the telegrams sent by the host (binary mode)*

#	Character	Description	Data type	Value range
1	DC1	Start character	Unsigned char	$0x11_h$
2	Code (Hi)	Transponder code to be programmed	Unsigned char	$0x00_h$ ... $0xFF_h$
3	Code (Lo		Unsigned char	
4	Checksum	The sum over the characters 2 to 4 results in $0x\cancel{1}00_h$	Unsigned char	

Example for valid binary programming telegrama:

- Code 1900: $0x11_h$,$0x19_h$,$0x00_h$,$0xE7_h$
  ($19_h+00_h+E7_h = \cancel{1}00_h$ *)
- Code AFFE: $0x11_h$,$0xAF_h$,$0xFE_h$,$0x53_h$
  ($AF_h+FE_h+53_h = \cancel{2}00_h$ *)

*) Only 2 digits are output.

10.3.1.2 Structure of the Telegram (Antenna -> Host / if Transponder is not programmed)

This telegram type is sent once if the transponder has not been programmed.

1. ASCII telegram with fixed start character, 4 bytes of data and a checksum.

Table 73 *HG G-71450: Contents of the telegrams sent by the antenna (ASCII mode)*

#	Character	Description	Data type	Value range
1	SOH	Start character	Unsigned char	$0x01_h$
2	Code (Hi)	Last read transponder code	Unsigned char	$0x30_h$ ... $0x39_h$, $0x41_h$ ... $0x46_h$, $0x61_h$ ... $0x66_h$ '0'...'9', 'A'...'F', 'a'...'f'
3	Code		Unsigned char	
4	Code		Unsigned char	
5	Code (Lo)		Unsigned char	
6	Checksum	The sum over the characters 2 to 6 results in $0x¥0_h$	Unsigned char	

2. Binary telegram with fixed start character, 2 bytes of data and a checksum.

Table 74 *HG G-71450: Content of the telegrams sent by the antenna (binary mode)*

#	Character	Description	Data type	Value range
1	SOH	Start character	Unsigned char	$0x01_h$
2	Code (Hi)	Last read transponder code	Unsigned char	$0x00_h$ ... $0xFF_h$
3	Code (Lo		Unsigned char	
4	Checksum	The sum over the characters 2 to 4 results in $0x¥00_h$	Unsigned char	

10.3.2 HG G-71451: Programming via PROFIBUS® Telegrams

For this type of programming, ST 1 must be connected to supply voltage and the PROFIBUS® interface to a host. The telegrams of the PROFIBUS® interface (see chapter 6 on page 31) can then be used to program a transponder positioned under the antenna (see Figure 31 on page 60).

The programming process is initiated by a rising edge of the PROG bit, i. e. the transponder code to be programmed should first be transmitted with PROG=0. Then the same transponder code with PROG=1. This triggers the programming process which takes approx. 100 ms. The new code is then read immediately and is available in the input bytes.

10.3.3 HG G-71453: Programming via CANopen® Telegrams

For this type of programming, ST 1 must be connected to supply voltage and the CANopen® interface to a host. The SDO telegrams of the CAN interface (see chapter 7 on page 34) can then be used to program a transponder positioned under the antenna (see Figure 31 on page 60).

Sub-index 1 of the object with index 0x2000 is used for this (see Table 55 on page 43). This function can be deactivated in the CANopen® menu (see section 9.4.3.3 on page 55) and is then no longer available.

i

It is always possible to program a transponder via the corresponding bit in the RPDO (see section 7.5 on page 37).

The programming process is initiated by a rising edge of the PROG instruction bit, i.e. the transponder code to be programmed should first be transmitted with PROG=0. Then the same transponder code with PROG=1. This triggers the programming process which takes approx. 100 ms. The new code is then read immediately and is available in the input bytes.

10.3.4 HG G-71455: Programming via PROFINET® Telegrams

For this type of programming ST1 must be connected to supply voltage and the PROFINET® interface to a host. The telegrams of the PROFINET® interface (see chapter 8 on page 46) can be used to program a transponder positioned under the antenna. The level for the transponder to be programmed should be between 200 and 500.

The output byte is used for this (Table 64 on page 46). The programming process is initiated by a rising edge of the PROG instruction bit (Table 66 on page 47), i.e. the transponder code to be programmed should first be transmitted with PROG=0. Then the same transponder code with PROG=1. This triggers the programming process which takes approx. 100 ms. The new code is then read immediately and is available in the input bytes.

11 Maintenance

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

- the visual inspection of the antennas.
- checking all screws, seal plugs, cables and plugs for proper fastening and tight fit.

If necessary, update the operating software according to the procedure described in section 9.5 on page 57. You can check the date and version of the current antenna software in the main menu.

12 Troubleshooting

Below you can find a list of possible errors in table form. A description of the symptoms that occur is given for each error. In the third column you can find instructions on how to narrow down the error and, ideally, how to correct it.

If you are unable to solve an error, please use the table to narrow it down as precisely as possible (type of malfunction, time of occurrence) before contacting us.

Table 75 *Troubleshooting (part 1 of 2)*

Error	Possible cause(s)	Possible Diagnosis/Remedy
No system function No serial output despite a transponder in the detection range	Operating voltage too low	Measure the voltage at the corresponding terminals
No contact possible; incomprehensible characters are sent	1. RxD and TxD or D+, D- lines reversed 2. Signal ground not connected 3. Incorrect transmission parameters set	1. Check the corresponding connections 2. Connect the signal ground 3. Select 38.400 baud (see note), 8 bit, parity even Note on the baud rate: – For the antenna HG G-71450 the baud rate depends on the position of the DIP switches, see Table 18 on page 28 – For the antenna HG G-71455 the baud rate is arbitrarily selectable, because it has a virtual port
No positioning pulse	– Transponder defect – Loose cable connection – Wrong reading distance – Transponders are outside the reading area of the antenna during crossing – Too high damping of the transponder signal due to unfavorably arranged metal in the floor / on the vehicle – Antenna defect	Check the transponder (e. g. with the programming device) and its position. Replace defective transponders/antennas.

Table 75 *Troubleshooting (part 2 of 2)*

Error	Possible cause(s)	Possible Diagnosis/Remedy
Too early positioning pulses at the beginning of the antenna field	– due to metal loops in the floor too small of a range 1-2 or 7-8 (see Figure 5 on page 14) – Faults due to clocked drives or power lines in the ground	– Separate metal loops – Eliminate malfunctions
Too late positioning pulses at the end of the antenna field	– Too high crossing speed – for 71453 time for *Posi Filter* set too high (Figure 22 on page 54) – Diagonal crossing of the transponder, thus area 2 is crossed only behind the field gap.	– decelerate – change settings – change lane or lay transponder on another position
Transponder cannot be programmed	– Transponder too close to antenna – Transponder too far away from the antenna – wrong procedure	– Increase distance slightly – Reduce distance slightly – Set the correct procedure: • 71450/serial: s. section 10.3.1 on page 61 • 71451/PROFIBUS®: s. section 6.2 on page 31 • 71543/CANopen®: s. section 9.4.3.3 on page 55 • 71545/PROFINET®: s. section 8.2 on page 46

13 Technical Data

Table 76 *Technical Data Transponder antenna (part 1 of 2)*

Transponder antenna		
Dimensions	156.5 mm x max. 70 mm*) x 31 mm (L x H x D incl. connectors) *) Height depending on the antenna variant, see section 3.2 on page 15	
Housing	Polycarbonate (PC)	
Weight	approx. 250 g	
Supply voltage range	HG G-71450 / HG G-71451 / HG G-71453	HG G-71455
	+Ub: +22 to +28 VDC (max. ripple 10 %)	+Ub: +18 VDC to +30 VDC (max. ripple 10 %)
Nominal voltage	+24 VDC	
Power consumption	130 mA @ +24 VDC	
Relative humidity	95% @ 25° C (without condensation)	
Temperature range	Operation: 0° C to +50° C / Storage: -20° C to +70° C	
Protection class	IP 64	
max. cable length	– supply incl. RS 232 or USB: 3 m – Bus cable max. length according to bus standards	
Connection	– M12 circular connectors – Connection cable available as accessory (s. Table 3 on page 9)	
Net code length	16 Bit	
Nominal reading distance S see Figure 2 on page 12	50 mm with transponders HG G-71325YA/ZA, HW DEV00033, HW DEV00034, HW DEV00131YA/WA	
Data free area D see Figure 2 on page 12	25 to 30 mm at nominal reading distance	
Field width B see Figure 3 on page 12	± 25 mm at nominal reading distance	
Field length L see Figure 3 on page 12	Housing length at nominal reading distance	
Offset Z see Figure 4 on page 13	max. ±30 mm (refers to the position of the ferrite rod in the antenna, see Figure 2 on page 12)	

Table 76 *Technical Data Transponder antenna (part 2 of 2)*

Transponder antenna		
max. crossing speed at nominal reading distance	**ZA (409 kHz)**	**YA (125 kHz)**
	HG G-71450 / HG G-71451 / HG G-71453: – only code output: 2 m/s – Code & PosiPulse: 1,5 m/s	HG G-71450 / HG G-71451 / HG G-71453: – only code output: 1,5 m/s – Code & PosiPulse: 1,0 m/s
	HG G-71455: 2 m/s	
Repeat accuracy	±2 mm at 0.5 m/s, interference-free environment and nominal reading distance	
PosiPulse	+Ub, 20 mA current source, current-limited, not electrically isolated	
Minimum distances	– 1500 mm between two active transponder antennas – 500 mm between two transponders	

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17 Copyright and Terms of Liability

17.1 Copyright

17.2 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.

17.3 Trade Marks and Company Names

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

Innovation through Guidance

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