

Transponder Antenna HG G-98780-A

13.56 MHz, 1-dimensional

English, Revision 19

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<ul style="list-style-type: none">• Transponder antenna for rail-mounted cranes• Encapsulated electronics• Indoor & Outdoor, IP 67• Frequency range: 13.56 MHz (large frequency distance to interference sources)• Reading antenna <-> transponder 50 to 90 mm• Active area for positioning 280 x 90 mm	<ul style="list-style-type: none">• Max. crossing speed 8 m/s• Voltage supply 24 V \pm10• Bus interface: CAN or Profibus®, see table of variants• PosiPulse when crossing the center of the antenna in driving direction• Serial interface serves as service interface for configuration or data interface• Programming of transponders
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The Götting KG in D-31275 Lehrte has a certified quality management system according to ISO 9001.



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1

About this Document

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.

1.2 Symbols

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



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



Indicates one or more links to the Internet.

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



Indicates tips for easier operation of the product.

- ✓ The check mark lists a requirement.
- ▶ The arrow shows an action step.
The indentation shows the result of an action or an action sequence.
- ♦ Program texts and variables are indicated through the use of a `fixed width font`.
- ♦ Menu items and parameters are shown in *cursive characters*.
- ♦ Whenever the pressing of letter keys is required for program entries, the required `L`etter `K`eys are indicated as such (for any programs of Götting KG small and capital letters are equally working).

2

Introduction

The described antennas are especially suited for outdoor applications, as the electronic units are sealed within the antenna cases. All important settings, adjustable values and software updates can be effected via a serial interface.

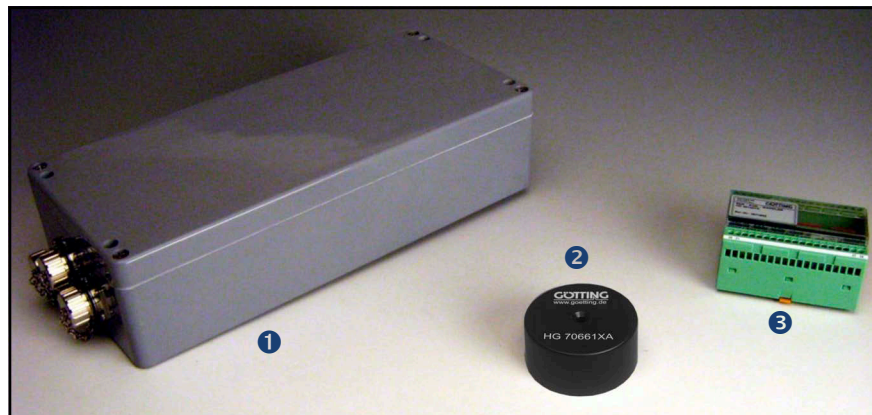
The Transponder Positioning Antenna HG G-98780-A is operating at 13.56 MHz. This ensures sufficient frequency separation to interference sources such as, e.g., drives, power converters and switching power supply.

Both systems supply a similarly structured output format in which additional system information can be configured by the user. This information can, for example, be saved in a visualization system and enables statements about the condition and availability/ accessibility of the transponders and antennas. This system description applies to devices with the firmware 98780B2 version 1.06 and higher.

2.1 Accessories

The following accessories are available for the one-dimensional Transponder Positioning Reader HG G-98780-A:

Figure 1 Components



1. Transponder reader with preamplifier and interpreter HG G-98780-A with different interfaces (see Table 2 on page 8)
2. Transponder HG 70661 (on the pavement)
3. Optional interface HG 06150-A serial/parallel converter
4. Optional desktop reading and programming unit HG G-81840YA (not shown in picture)

2.2 Functional Description

As the antenna passes over the transponder, it energizes the latter with an energy field of 13.56 MHz. The transponder returns its code through frequency modulation to the antenna. An additional coil generates the positioning pulse. The interpreter which is integrated within the antenna decodes the transponder code.

Furthermore several antenna parameters, e. g. current consumption and supply voltage, are measured and, if desired, added to the serial output protocol.

The serial signal is made available via potentially separated RS 422 or RS 232 interfaces. In addition, the positioning pulse is dc-insulated. Furthermore, CAN Bus or Profibus® interfaces are provided optionally. The following variants are available, they can be distinguished by the second to last character of the product number, e.g. HG G-98780ZA.

Table 2 Overview of HG G-98780-A variants

HG G-98780-A				
Variant	Profibus®	CAN Bus	RS 422	RS 232
ZA		X	X	
YA	X			X
XA	X		X	
WA		X		X
UA	X		X	
	Similar to variant XA but with cable tails, s. Table 3 on page 9			

As an option, the serial signal can be converted into a 16 bit parallel output signal (24 Volts switched) for the code within an external interface device. This interface device is suited for mounting rail (top-hat rail) installation and should be installed in a place protected from any environmental influences (see section 6.3 on page 27).

2.3 Positioning Pulse

For the generation of the positioning pulse, it is necessary that the following preconditions are met:

- ♦ The reception voltage S (refer to Table 22 on page 32) must exceed the set threshold for **Level for Positioning** (refer to section 7.2.2.2 on page 33).
- ♦ A transponder code must be decoded without error.
- ♦ The measured voltage X must fall below a certain threshold (refer to Table 22 on page 32).

If the above listed preconditions are met, a positioning pulse with changeable duration is generated. For the generation of a new positioning pulse it is essential that the reception voltage S has fallen below the threshold set for **Threshold for Decoding** (refer to section 7.2.2.2 on page 33) first.

Thus only one pulse per transponder crossing is possible. Therefore, if a vehicle/crane stops above the transponder after the positioning pulse was generated and then changes its direction of travel, no renewed positioning pulse is generated during the center crossing!

Positioning Accuracy

As the field compensation for the corresponding measuring coil is not infinitely sharp and is also depending on the reading height (refer to Appendix, Section 11.1 on page 46), the positioning pulse is generated at different but reproducible locations, depending on the direction of travel. Since the antenna is not aware of its direction of travel, but depends on the physical effect of the field strength, only the vehicle/crane control can carry out the direction-depending compensation. The appendix, section 11.2 on page 47 shows the locations of the positioning pulse related to the X and Y coordinates and the reading height.

3

Scope of Delivery

The scope of supply includes:

- ♦ one transponder antenna HG G-98780-A
- ♦ for Profibus® variants except HG G-98780UA (s. Table 2 on page 8):
Connector set CONSET00001 (s. Table 3 below)
- ♦ for CAN bus variants (s. Table 2 on page 8):
Connector set CONSET00002 (s. Table 3 below)
- ♦ for Profibus® Variant HG G-98780UA (s. Table 2 on page 8):
Connector set HG G-98780UA (s. Table 3 below)
- ♦ a device description

3.1 Required Accessories

The transponder antenna alone is not sufficient for position detection of vehicles with transponders. In order to operate a driverless transport system you also need:

- ♦ connection cables for connecting the antenna to the vehicle electronics,
- ♦ several transponders in the ground.



The connection cables can be assembled by the customer (see section 6.2 on page 15 for the pin allocations) or ordered from Götting (see below).

- ▶ Refer to Table 3 for the order numbers of the required accessories.

Table 3 Required accessories (part 1 of 2)

Order No.	Description
CONSET00001	Connector set, included in delivery of antenna variants with Profibus®. Includes: <ul style="list-style-type: none"> – 1 x M23 Power Connector – 2 x M23 Profibus Connector – 1 x M23 Terminating resistor – 1 x Mounting Tool
CONSET00002	Connector set, included in delivery of antenna variants with CAN bus. Connector Schaltbau M3 comprising: <ul style="list-style-type: none"> – casing – socket carrier – pins, gold-plated – cable support sleeve for cable diameter 10-13 + 13-16 mm – mounting instruction

Table 3 Required accessories (part 2 of 2)

Order No.	Description
HG G-98780UA	Connector set for the Profibus® variant UA with up to 3x cable tail 4 m: <ul style="list-style-type: none"> - 1 x Power/Serial - Additionally the following connector options can be ordered: <ul style="list-style-type: none"> - 1 x Profibus® cable & 1 x Profibus® Terminating Resistor permanently installed in the device If the antenna is to be the last device on the Profibus® - 2 x Profibus® cable If further devices follow on the Profibus®
HG Z-09878ZA	for variants with Profibus® except for UA: connection cable POWER, connector M23 on one side, other side open, specify length
HG Z-09879ZA	for variants with Profibus® except for UA: Connection cable Profibus®, one side connector M23, other side open, specify length
HG G-70661XA	Puck Transponder Usually mounted on the roadway



3.2 Optional Accessories

► Refer to Table 4 for the order numbers of the optional accessories.

Table 4 Optional accessories

Order No.	Description
HG G-06150-A	Serial/parallel Interface converts a serial RS232 or RS422 data stream into a parallel output, s. section 6.3 on page 27.
HG G-81840YA	Transponder programming device for reading and programming of transponder codes <div style="display: flex; align-items: flex-start; margin-top: 5px;"> <div style="background-color: #003366; color: white; padding: 2px 5px; margin-right: 5px; text-align: center; width: 20px; height: 20px; line-height: 20px;">i</div> <div> <p>The transponders can also be programmed via the antenna, but this is more complicated when installed, as it usually requires driving the vehicle over the transponder to be programmed.</p> </div> </div>

4

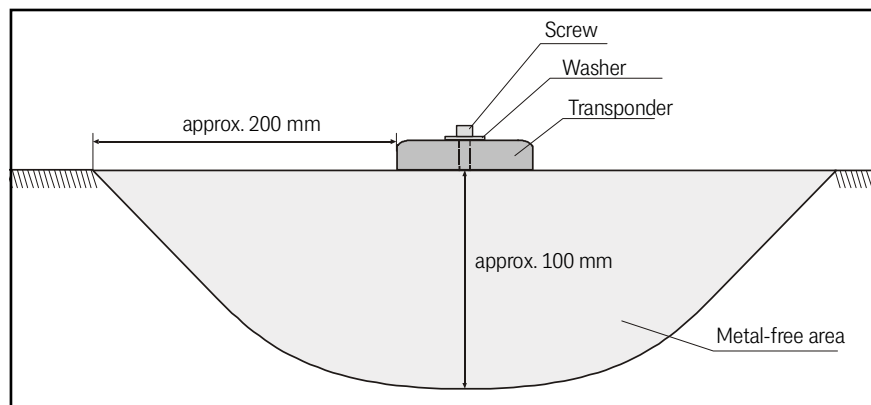
Mounting

4.1 Transponders

4.1.1 Dimensions and Specifications

The maximum reading distance for all transponders can only be achieved when the minimum distance to metal surfaces is maintained. It is recommended to maintain the minimum distances within the metal-free area (Figure 2). The impact on positioning accuracy and range also depends on the size and distance of metal parts.

Figure 2 Minimum iron-free area around Puck Transponder HG 70661



As rule of thumb it can be said that if the metal-free area behind the transponder has to be at least of the same range as the reading distance between transponder and antenna. The reception of the transponder signal will be largely unattenuated (also refer to Table 27 on page 50). It is essential, that the transponder **does not dip into the meshes/loops of steel reinforcement grids**. Single metal rods, on the other hand, hardly have any influence on the performance.

4.1.2 Mounting Instructions

There may only be a maximum of one transponder in the detection range at any time, so a minimum distance of 500 mm must be maintained between two transponders.

The Transponders may be mounted on even ground using a metal screw and a washer. The maximum fastening torque is not allowed to exceed 4 Nm. The diameter of the metal washer should not be max. 18 mm. For further information please refer to the transponder data-sheet HG G-70661.

4.2 Antenna HG 98780-A

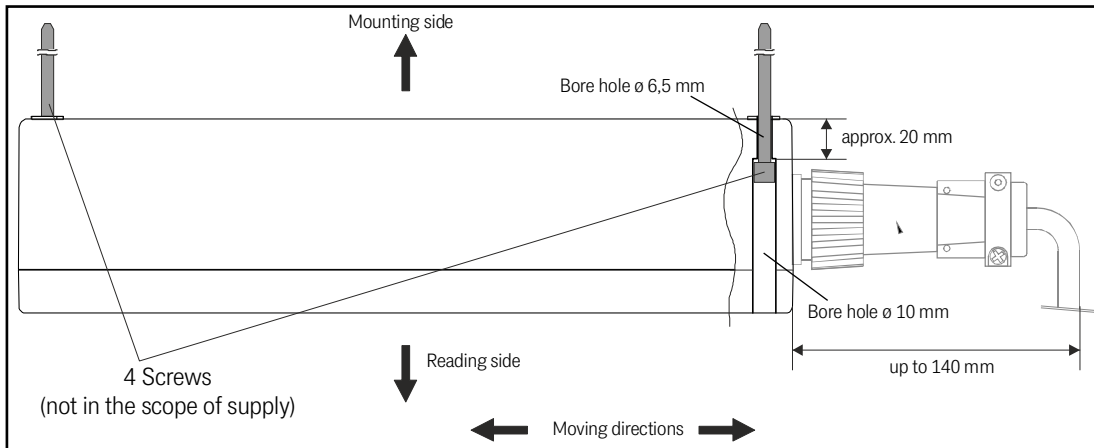
NOTICE

Incorrect mounting position

Unexpected position calculations.

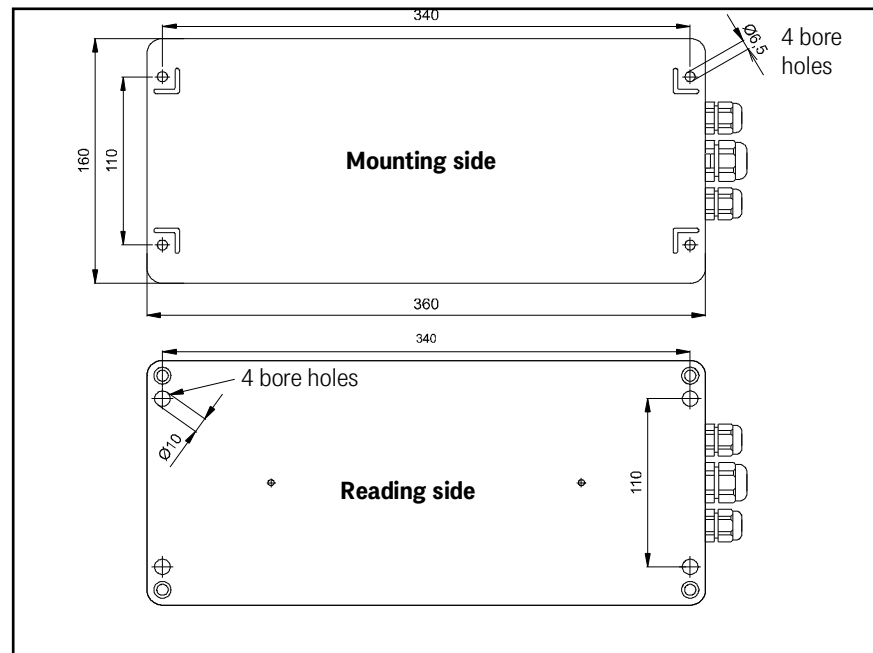
- Observe the correct positioning and orientation of the antenna when mounting it. The following image shows the correct positioning.

Figure 3 Mounting the antenna



The casing of the antenna has bore holes for 4 screws (also refer to Figure 4 below). We recommend the usage of M6 hexagon socket screws. The length of the screws depends on where the antenna is to be mounted. Please make sure that in the direction of travel there is enough free space for the connections. Depending on the variant up to 140 mm are needed (the picture above shows the ZA/WA variants).

Figure 4 Position of the mounting holes



In order to prevent any adverse effects on the system:

- ✓ The space above and around the antenna should be metal-free. You can find more information in the sections 11.3 on page 50, 11.4 on page 51 and 11.5 on page 52.
- ✓ Do not operate the reading antenna while the reading side is located directly above a metal surface, as this would mistune the antenna severely in such a way that the power consumption of the output stage would increase considerably.
- ✓ Perfect transponder readings are only guaranteed if the transponders are placed within max. ± 4 cm tolerance from the center line of the antenna! Outside these limits, the transponder readings become less reliable due to decreasing signal levels.



Whenever the antenna is operated at temperatures below 0°C , it is necessary to use the integrated heater! As the warm-up time with heater at -20°C surrounding temperature is approx. 1 hour, the heater should be connected to a stand-by power supply.

4.3 Interface HG 06150-A (optional)

The mounting of the optional interface is explained in the data sheet that you can download from:



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

5

Installation / Commissioning



Check the operating voltage before connecting! The cable should not lie directly beside power supply cables.

Connect all necessary cables. For this purpose, either use the connection cables available from Götting (see Table 3 on page 9) or assemble the connection cables yourself. The pin assignments for the different antenna variants can be found in section 6.2 on page 15.

For the next commissioning steps, connect a laptop with the serial interface of the antenna. Antenna variants with RS422 interface (HG 98780ZA/XA) require an appropriate interface converter. This interface converter is not included in the scope of supply of this system. For further information, please refer to the introduction in chapter 7 on page 29. Then start the monitor program as described in section 7.2 on page 30.

Default values: In default the system uses the values of the file 1 (Mon3964r.txt; as listed in part 7.2.1 on page 30) with 9,600 Baud. Please keep in mind that another user could have changed these values.

- ▶ Move a transponder into reception range.
The voltage S should increase significantly. The code should be detected immediately and the number of readings has to be continuously counted up to 65535. When moving the transponder in driving direction over the center axis of the antenna, a positioning pulse should be generated.
- ▶ For setting the decoding thresholds (refer to section 7.2.2.2 „(W)rite Transponder Code“ auf Seite 33) it is useful, to record a complete test run along the transponder track.
Antennas **HG G-98780ZA** and **HG G-98780WA** offer for this function the use of the serial interface (section 7.2.2.8 „CS(V)“ auf Seite 39) or the CAN Bus Message Object 3 (section 6.2.5.3.4 on page 25 or 7.2.2.5 „C(A)N Parameters“ auf Seite 36).
Antennas **HG G-98780YA** and **HG G-98780XA** offer for the same function the serial interface (refer to section 7.2.2.8 on page 39) or the Profibus® interface (refer to section 7.2.2.6 on page 37). When using the Profibus® interface, the necessary parameters from the 16 byte data block are System Status, Code and U-Summe.

Provided that the test run did not reveal any problems, changed parameters may be saved and the monitor program may be terminated. Changing certain parameters requires a complete system reset (switching the antenna off and on again), as described in the corresponding section for the monitor program (section 7.2). This procedure ensures that the system is commissioned correctly.

6

Components and Operation

6.1 Transponders in the Ground

Reference marks are the Puck Transponders HG 70661. The transponder data is configured to 32 Bit (Read/Write). Range and positioning accuracy of the system are influenced by:

- ♦ Steel reinforcements located around or behind the Transponder, refer to section 11.3 on page 50 in the appendix.
- ♦ Metal structures around the antenna.
- ♦ For influences of snow, ice and water refer to section 11.4 on page 51 in the appendix.

The following environmental conditions have no effect on the system:

- ♦ Oil, tar, earth, dirt, etc.
- ♦ Massive metal structures on one side of the Transponder or antenna, e.g. rails. Refer to section 11.5 on page 52 in the appendix.

6.2 Transponder Antenna on the Vehicle / Crane

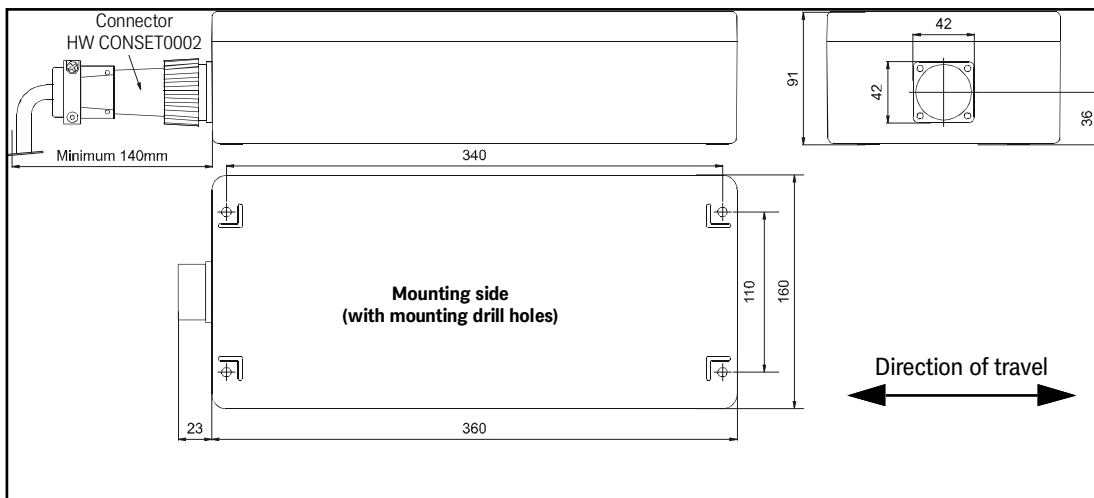
6.2.1 HG G-98780ZA/WA (with CAN-Bus and RS422 / RS232 interfaces)

Figure 5 Positioning antenna HG G-98780ZA/WA



The antenna and the interpreter electronics are housed in a 360 x 160 x 91 mm casing. The reading area is the upper side of the casing. The cover is located on top of the casing, the 12-pin socket (Schaltbau M3) points in the vehicle's direction of travel.

The interpreter is mounted in a completely sealed unit, along with the heating. The connector is a 12-pin screw-in socket (Schaltbau, type M3) with gold plated pins.

Figure 6 Outline antenna HG 98780ZA/WA (with casing dimensions)

For each antenna of this variant a connector HW CONSET00002 will be supplied (see Figure 6 above).

6.2.1.1 Connection plan of the 12-pin socket

The allocation of contacts is as follows:

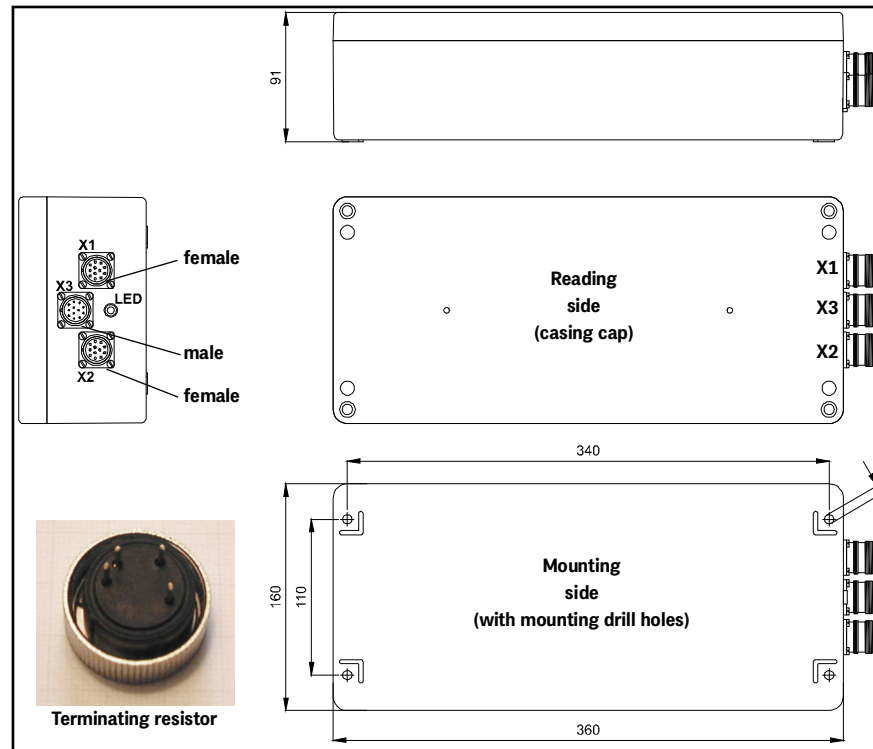
Table 5 Variant ZA/WA: Connection plan of the 12-pin antenna socket (CAN bus)

Contact	Description	
	HG 98780ZA	HG 98780WA
1	+24 V (antenna)	
2	GND (antenna)	
3	+24 V (heating)	
4	GND (heating)	
5	+RX (RS 422)	Rx (RS232)
6	-RX (RS 422)	n.c.
7	+TX (RS 422)	Tx (RS232)
8	-TX (RS 422)	n.c.
9	+ Posi Pulse (see section 6.2.5.2 on page 24)	
10	- Posi Pulse (see section 6.2.5.2 on page 24)	
11	CAN+	
12	CAN-	
PE	signal ground	

6.2.2 HG G-98780YA/XA (with Profibus® and RS232/RS422)

6.2.2.1 Dimensions

Figure 7 Outline of antenna HG G-98780YA/XA (including housing dimensions and picture of the terminating resistor / Terminator)



Antenna and interpreting electronics are housed in a 360 x 160 x 91 mm casing. The reading side of the antenna is the top of the casing with the casing cover. The three 12 pin built-in connectors (M23; gold-plated contacts) are facing in the direction of travel. For each antenna, a correspondingly suitable line termination resistance is included in the scope of supply.

Inside the casing are the completely sealed antenna electronics and the heater. For connecting the antenna, the female connectors X1 and X2 (Profibus®) or the male connector X3 (PosiPuls, RS232, power supply) are being used. The integrated LED is lit for the Profibus® status **Data exchange**.

For each antenna of this variant a connection set HW CONSET00001 will be supplied, including 3 connectors, the terminating resistor and an inserter tool. **Those sets are pre-configured for cable diameters of 7 – 12 mm². If the actual cable diameters do not match the pre-configured values the actual cable diameters have to be indicated on order.**

6.2.2.2 Pin Allocations X1/X2/X3

The Profibus® version of the antenna offers two identical 12 pin sockets for the bus function as well as one 12 pin connector for the power supply.

Table 6 Variant XA/YA: Pin allocation of the 12 pin Profibus® connectors X1 / X2 (female)

Contact	Allocation
1	signal ground
2	line A
3	n. c.
4	line B
5	n. c.
6	+5 V Signal
7	+24 V DC (antenna)
8	GND (antenna)
9	shield
10	n. c.
11	n. c.
12	RTS
housing	shield

Table 7 Variant XA/YA: Pin allocation of the 12 pin connector X3 for the antenna power supply/serial (male)

Contact	Allocation	
	HG 98780YA	HG 98780XA
1	+24 V DC (antenna)	
2	GND (antenna)	
3	+24 V DC / 2 A (heater)	
4	GND (heater)	
5	Rx (RS232)	+RX (RS 422)
6	n. c.	-RX (RS 422)
7	Tx (RS232)	+TX (RS 422)
8	n. c.	-TX (RS 422)
9	+ Posi Pulse (see section 6.2.5.2 on page 24)	
10	- Posi Pulse (see section 6.2.5.2 on page 24)	
11	n. c.	
12	signal ground	
housing	shield	

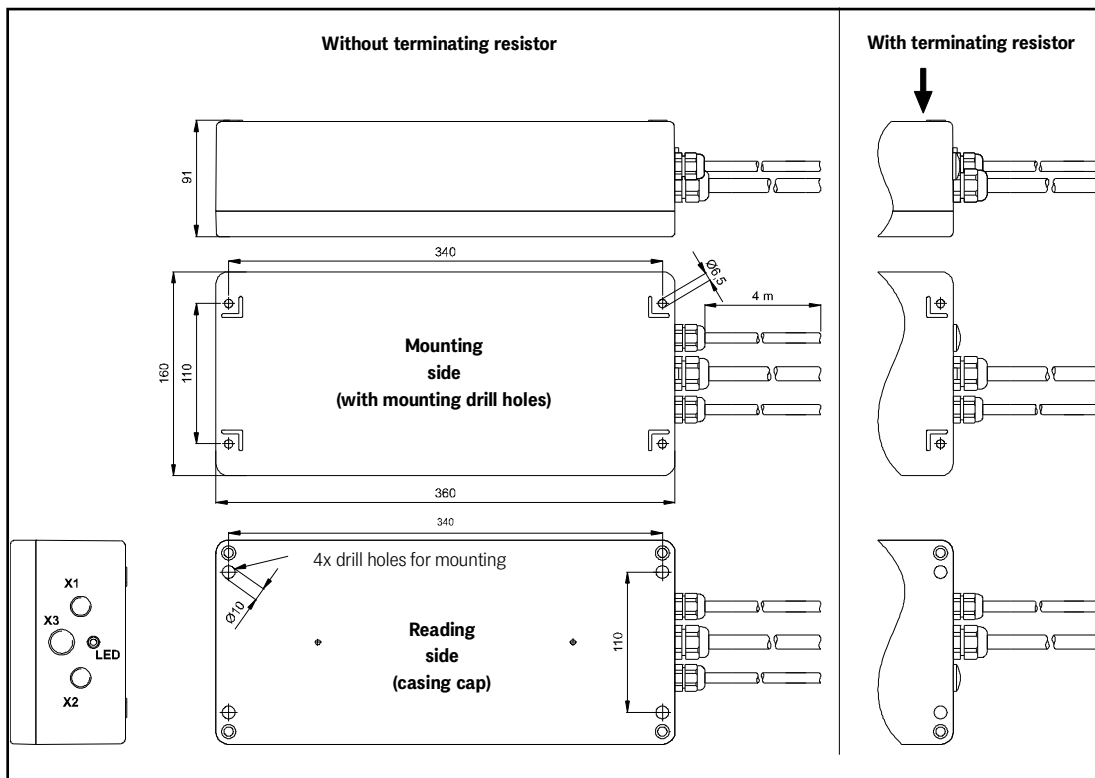
6.2.3 HG G-98780UA (with Profibus®, RS422 and Cable Tails)

This antenna variant comes with pre-configured cable tails for the connections:

- ♦ 1 x Power/Serial X3
- ♦ Additionally the following options can be ordered
 - 1 x Profibus® X1 & 1 x Profibus® Terminating Resistor permanently installed if the antenna is to be the last device on the Profibus® or
 - 2 x Profibus® X1/X2 if further devices follow on the Profibus®

6.2.3.1 Dimensions

Figure 8 Outline of antenna HG G-98780UA with/without terminating resistor



Antenna and interpreting electronics are housed in a 360 x 160 x 91 mm casing. The reading side of the antenna is the top of the casing with the casing cover. Up to three connections X1, X2 (Profibus®) and X3 (power/serial) are facing in the direction of travel. If a terminating resistor is included connection X2 is replaced with a dummy plug.

Inside the casing are the completely sealed antenna electronics and the heater. For connecting the antenna, the cable tails X1 and X2 (Profibus®) and X3 (PosiPuls, RS422, power supply) are being used. The integrated LED is lit for the Profibus® status **Data exchange**.

6.2.3.2 Pin Allocations X1/X2/X3

This Profibus® variant of the antenna offers up to two identical cable tails X1/X2 for Profibus® connections depending on whether a terminating resistor is included.

Table 8 Variant UA: Pin allocation of the Profibus® cable tails X1/X2

Color	Allocation
Shield	Signal Ground
Green	Line A
Red	Line B
Shield	

In addition there is a cable tail X3 for the power connection and the serial interface.

Table 9 Variant UA: Allocation of the cable tail X3 antenna power supply/RS 422

Numeric Print	Allocation
1	+24 V DC (antenna)
2	GND (antenna)
3	+24 V DC (heater)
4	GND (heater)
5	+RX (RS 422)
6	-RX (RS 422)
7	+TX (RS 422)
8	-TX (RS 422)
9	+ Posi Pulse (see section 6.2.5.2 on page 24)
10	- Posi Pulse (see section 6.2.5.2 on page 24)
11	n. c.
Green-yellow	signal ground
Shield	

6.2.4 Switch-on Characteristics

Once the supply voltage has been applied, the antenna requires 10 s until it reacts to data input, or outputs data protocols. During these 10 s, a software download may be started (also refer to section 6.2.6 on page 27).

6.2.5 Interfaces

6.2.5.1 Serial (RS 422 / RS 232)

The serial output may be configured in several ways. The transmission rate is adjustable between 9600 and 19200 Baud, the output protocol may be chosen as “transparent” or “3964R”. Apart from that, the content of the telegrams is configurable, as the user may choose from a list of parameters.

Serial commands are used for activating a system monitor. The crossing of the antenna’s center axis in direction of travel, is shown by the digital positioning output. Its transmission time is adjustable in blocks of milliseconds. In addition, it may be reduced to one impulse per crossing.

6.2.5.1.1 List of system data to be output

A telegram consists of max. 15 bytes. The minimum update rate at 9600 Baud is then calculated as follows

Figure 9 Formula: minimum update rate

$$15 \frac{\text{Byte}}{\text{Telegram}} \times 11 \frac{\text{Bit}}{\text{Byte}} / 9600 \frac{\text{Bit}}{\text{s}} = 17,2 \frac{\text{ms}}{\text{Telegram}}$$

As the transmission is binary, it is possible - when using the 3964R procedure - that further (DLE) characters are added by this procedure. All multiple-byte variables are output either with the highest byte or the lowest byte first (adjustable)!

The 8 bit check character is only output when using the transparent protocol. It then includes the start character. The check character (transparent protocol), cannot be removed from the data block. It is a matter of configuration, whether data telegrams are output permanently according to the set update rate or only during the period, when a transponder is within the field.

Table listing the data words of a telegram of 15 byte length:

Table 10 Data words in a telegram of 15 (14) byte length

Byte #	Length	Priority	Type	Description
1	1 Byte	0x01	Unsigned char	Start character ASCII-061: „=“
2,3,4,5	4 Byte	0x02	Unsigned long	32 Bit of the Transponder code
6,7	2 Byte	0x04	Unsigned int	Voltage induced by the Transponder within the frame antenna in Samples
8	1 Byte	0x08	Unsigned char	Supply voltage for the antenna [x 100 mV]
9	1 Byte	0x10	Unsigned char	Power consumption [x 10 mA]
10	1 Byte	0x20	Signed char	Temperature within the antenna [° C]
11,12	2 Byte	0x40	Unsigned int	Number of readings during the latest transponder crossing
13,14	2 Byte	0x80	Unsigned int	System status in binary encoding
(15)	1 Byte		Unsigned char	Check character (EXOR function over all characters), only for transparent protocol!

The following table shows a list of the binary codes used to describe the system status (for bytes # 13 and 14 from Table 3):

Table 11 Possible system status messages

Priority	Name	Description
0x0001	HW_ERROR	Hardware error
0x0002	CODE_CRC_ERR	Reception of transponder code with CRC error
0x0004		
0x0008		
0x0010		
0x0020	PARAM_CRC_ER	Parameter block no longer save
0x0040		
0x0080	F_ERROR	Transmission oscillator not operating at set frequency
0x0100	REF_TRANS_ON	Note: reference transponder is activated.
0x0200	TRANS_IN_FIELD	Transponder within antenna field *)
0x0400	CODE_OK	Decoded code correct *)
0x0800		
0x1000	POSIPULS	Transponder has crossed the center of the antenna *)
0x2000		
0x4000		
0x8000		
*) These bits are deleted as soon as the transponder has left the antenna field.		

Example: Status 0x0600 stands for TRANS_IN_FIELD and CODE_OK

The status 0x0002 may also arise during ordinary transponder crossings, if the code transmission is aborted due to decreasing power output level. The message 0x0100 (REF_TRANS_ON) enables checking whether transmission of the corresponding switch-off command has been forgotten (in this case, it is no longer possible to read runway transponders correctly).

6.2.5.1.2 List of commands

One command telegram always consists of four bytes, including the actual command and the parameters. When using the procedure 'transparent' (also refer to Appendix, section 11.7 on page 53) it is, in addition, necessary to transfer one start character and a check sum (XOR operation of all bytes including the start character).

5 commands are defined:

Table 12 List of System Commands

No.	Description	Procedure	Start Char.	Command Byte	Parameter	Check Sum	
1	Switching into monitor mode *) (described in section 7.2 „System monitor“ auf Seite 30)	3964R	HEX		4D ₁₆ 4F ₁₆	4E ₁₆ 49 ₁₆	
			ASCII		MO	NI	
		transparent	HEX	3D ₁₆	4D ₁₆ 4F ₁₆	4E ₁₆ 49 ₁₆	38 ₁₆
			ASCII	=	MO	NI	8
2	Switch off reference transponder **)	3964R	HEX		52 ₁₆ 54 ₁₆	30 ₁₆ 30 ₁₆	
			ASCII		RT	00	
		transparent	HEX	3D ₁₆	52 ₁₆ 54 ₁₆	30 ₁₆ 30 ₁₆	3B ₁₆
			ASCII	=	RT	00	;
3	Switch on reference transponder ***)	3964R	HEX		52 ₁₆ 54 ₁₆	31 ₁₆ 31 ₁₆	
			ASCII		RT	11	
		transparent	HEX	3D ₁₆	52 ₁₆ 54 ₁₆	31 ₁₆ 31 ₁₆	3B ₁₆
			ASCII	=	RT	11	;
4	Supply of the 16 programmable lower bits of the transponder code	3964R	HEX		50 ₁₆ 4C ₁₆	Code in the format tt ₁₆ tt ₁₆	
			ASCII		PL	For code „1234“ e. g. 12 ₁₆ 34 ₁₆	
		transparent	HEX	3D ₁₆	50 ₁₆ 4C ₁₆	Code in the format tt ₁₆ tt ₁₆	07 ₁₆
			ASCII	=	PL	For code „1234“ e. g. 12 ₁₆ 34 ₁₆	
5	Supply of the 16 programmable higher bits of the transponder code and start of the programming procedure	3964R	HEX		50 ₁₆ 48 ₁₆	Code in the format tt ₁₆ tt ₁₆	
			ASCII		PH	For code „1234“ e. g. 12 ₁₆ 34 ₁₆	
		transparent	HEX	3D ₁₆	50 ₁₆ 48 ₁₆	Code in the format tt ₁₆ tt ₁₆	03 ₁₆
			ASCII	=	PH	For code „1234“ e. g. 12 ₁₆ 34 ₁₆	
*) The monitor mode should not be used during normal operation (e. g. from an PLC), as the following output is not according to a transparent or 3964R protocol but only suitable for display on a VT52-terminal and used for the alteration of parameters.							
**) The successful deactivation of the reference transponder is described by deleting the “0x0100“ bit from the system status.							
***) An activated reference transponder is described by setting the corresponding bit in the system status “0x0100“.							
Please note that while the reference transponder is activated, the runway transponders cannot be processed unambiguously, i.e. they are either oppressed or their position is inaccurate.							

6.2.5.1.3 System Monitor

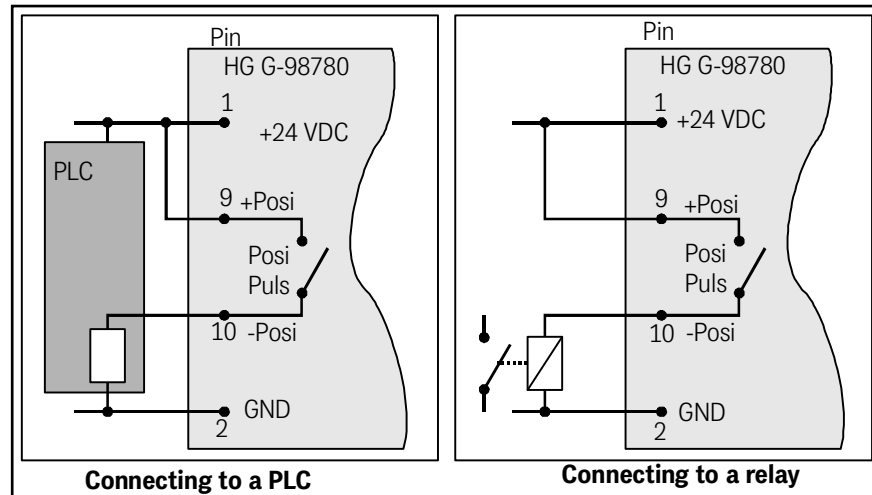
In monitor mode, the system is configurable via a menu. Please refer to section 7.2 „System monitor“ auf Seite 30.

6.2.5.2 Positioning Pulse

The digital positioning output indicates the crossing of the center line of the antenna in direction of travel (x direction). Its duration is adjustable within a millisecond pattern.

Both positioning connections are separately and not internally connected to +24 V or GND, as a strict voltaic separation is essential for some of the systems. For safety reasons, a 20 mA current limitation has been implemented in the antenna for these outputs. In case a 24 V output is required, contact No. 9 may be connected to +24 V and contact No. 10 may be connected to GND via a 1 KOhm resistor.

Figure 10 Connection possibilities positioning pulse



6.2.5.3 CAN Bus

6.2.5.3.1 Description

Either Basic- or Full-CAN mode are configurable. The system monitor is used for setting the CAN parameters (also refer to section 7.2.2.5 on page 36). The internal CAN module is based on the CAN specifications V2.0 part B. It is possible to transmit either standard or extended frames (adjustable). The system monitor is used for setting the bit timing as well as the identifier.

It is possible to output 3 different CAN Message Objects and receive 1. Depending on the configuration, it is possible to distinguish between permanently output telegrams according to the set update rate or telegrams output only while a transponder is within the field. In addition, remote operation is selectable.

The objects are activated in the CAN menu by input of an address different from 0 (also refer to section 7.2.2.5 on page 36).

6.2.5.3.2 CAN Message Object 1 (Transmission Object)

Table 13 Structure of the CAN Message Object 1

Byte #	Length	Type	Description
1,2	2 Byte	Unsigned int	System status according to Table 11 on page 22
3,4,5,6	4 Byte	Unsigned long	32 Bit transponder code
7,8	2 Byte	Unsigned int	Number of code readings of the last transponder crossings

6.2.5.3.3 CAN Message Object 2 (A Identifier; Transmission Object)

Table 14 Structure of the CAN Message Object 2

Byte #	Length	Type	Description
1,2	2 Byte	Unsigned int	Sum voltage
3,4	2 Byte	Unsigned int	Number of code readings of the last transponder crossing
5	1 Byte	Unsigned char	Supply voltage
6	1 Byte	Unsigned char	Supply current
7	1 Byte	Signed char	Temperature

For interpreting the values of Message Objects 2 also refer to Table 10 on page 21. This Message Object is used for controlling parameters.

6.2.5.3.4 CAN Message Object 3 (D Identifier; Transmission Object)

Table 15 Structure of the CAN Message Object 3

Byte #	Length	Type	Description
1,2	2 Byte	Unsigned int	System status according to Table 11 on page 22
3,4	2 Byte	Unsigned int	Lower 16 bit of the transponder code
5,6	2 Byte	Unsigned int	Sum voltage
7,8	2 Byte	Unsigned int	Number of code readings

For interpreting the values of Message Object 3 also refer to Table 10 on page 21. This Message Object is used for commissioning, service and troubleshooting.

6.2.5.3.5 CAN Message Object 4 (Reference Transponder, transponder programming; Reception Object)

It is possible to activate and deactivate the reference transponder via the CAN bus. For this it is necessary to send a Message Object with the same address as Message Object 1 and a length of 5 bytes. The reference transponder may be de-/activated via byte #5.

The programming of a transponder is initiated by setting byte #5 to the value 02. This byte should be reset after 8 to 100 ms.

The programming of a transponder takes 100 to max. 200 ms. Afterwards the new code is read and may be checked via Message Object 1. In case the programming wasn't successful repeat the procedure.

Table 16 Structure of the CAN Message Object 4

Byte #	Length	Type	Description
1,2,3,4	4 Byte	Unsigned long	Transponder code to be programmed (32 Bit)
5	1 Byte	Unsigned char	= 00: Reference transponder OFF = 01: Reference transponder ON = 02: Program Transponder

6.2.5.4 Profibus®

6.2.5.4.1 Profibus® Input Bytes

Table 17 Profibus® Input Bytes

Number of Input Bytes	Byte #	Length	Type	Byte Sequence *)	Description
6	1	2 Byte	Unsigned int	HiByte (LoByte)	System status in binary coding
	2			LoByte (HiByte)	
	3	4 byte	Unsigned long	HiByte (LoByte)	Transponder code
	4				
	5				
	6			LoByte (HiByte)	
7	7	1 Byte	Unsigned char		Supply voltage connected to the antenna [x 100 mV]
8	8	1 Byte	Unsigned char		Current consumption [x 10 mA]
9	9	1 Byte	Unsigned char		Temperature measured within the antenna [° C]
11	10	2 Byte	Unsigned int	HiByte (LoByte)	Number of code readings
	11			LoByte (HiByte)	
13	12	2 Byte	Unsigned int	HiByte (LoByte)	Voltage induced by the transponder within the frame antenna in samples
	13			LoByte (HiByte)	

*) = when Order of Data Transfer is set correspondingly (refer to section 7.2.2.6 on page 37).

The description of these values is also included in Table 10 on page 21. Depending on the configuration of the master using the GSD files (refer to appendix, section 11.8 on page 54) the corresponding quantity of input bytes will be transmitted. Input bytes may have the values 6, 7, 8, 9, 11, 13 (also refer to Table 17).

6.2.5.4.2 Output Bytes

Output bytes are to be used according to the following table:

Table 18 Profibus® Output Bytes

Number of Input Bytes	Byte #	Length	Type	Byte Sequence *)	Description
1	1	1 Byte	Unsigned char		Instruction byte
5	2	4 Byte	Unsigned long	HiByte	Transponder code to be programmed
	3				
	4				
	5			LoByte	

*) = when Order of Data Transfer is set correspondingly (refer to section 7.2.2.6 on page 37).

Depending on the configuration of the master using the suitable GSD file (refer to Appendix, section 11.8 on page 54) the corresponding number of output bytes is transmitted. Values 1 and 5 are the options for the number of output bytes (refer to Table 18).

The instruction byte is defined as follows:

Table 19 Significance of the instruction bit

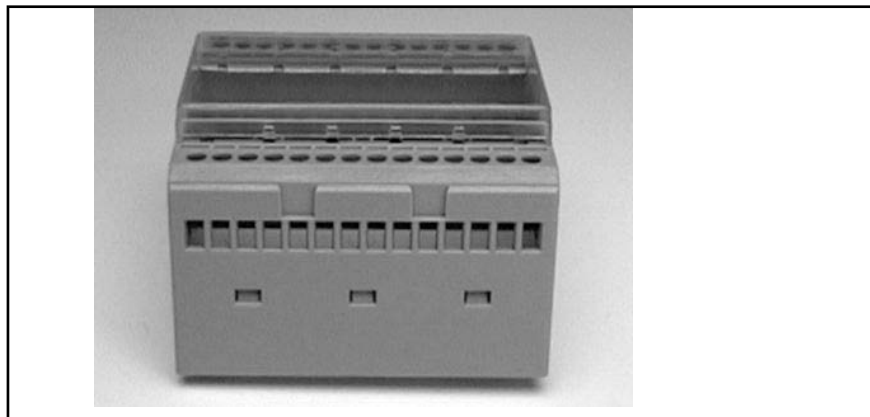
Priority	Name	Significance
0x01	SETREF	Switching the Reference Transponder ON/OFF
0x02	PROG	Transponder programming
0x04 0x08 0x10 0x20 0x40 0x80		Currently not allocated

Programming will be initiated by a rising edge of the PROG bit; i.e. first the transponder code which has to be programmed with PROG=0 should be transferred, subsequently the same transponder code with PROG=2. Thus the released programming process lasts approx. 100 ms. Afterwards the new code will be read directly and is available for the input bytes.

6.2.6 Software download

If necessary, the antennas may be updated via the serial interface. Please refer to section 7.3 on page 40.

6.3 Accessories: Optional serial/parallel Interface HG G-06150-A

Figure 11 Converter HG 06150-A for mounting bar installation

The serial/parallel converter has a casing which is suitable for mounting bar installation. To output the serial data via the RS 422 interface (ZA) or via RS232 (YA) the serial output of the antenna has to be set to transparent protocol with the data contents CODE and system status as follows: Enter the value 83 within the corresponding submenu for Telegram Content Mask (refer to section 7.2.2.4 on page 35). The Baud rate must be set to 19200 Baud.

Table 20 Output format when using the serial/parallel interface

Byte #	Length	Significance	Type	Description
1	1 Byte	0x01	ASCII-061 : „=“	Start pulse
2,3,4,5	4 Byte	0x02	Unsigned long	Transponder code
6,7	2 Byte	0x80	Unsigned int	System status
8	1 Byte		Unsigned char	Check character

Out of this data stream the **code** is converted into a 16 Bit parallel output. The code then contacts the outlets until the next code is received. In addition, 10 ms after the code bits are applied a data ready pulse of 100 ms is generated as the antenna passes over a transponder, i. e. the same transponder generates a new data ready pulse as it enters the field again (e. g. when switching tracks).

The validity of the voltage, i. e. if a transponder is actually within reception range, is displayed by the signal `Data_Valid`. If there is no transponder within the range, 0 V is output. The parallel outputs, `Data_Ready` and `Data_Valid` are switched contra `+Usps` (24V) and are not current limited. In addition they are not potentially separated.

7

Software

The system can be configured via the antenna software. To enter the program, you have to connect the serial interface of an ordinary PC via an interface converter with the serial interface of the antenna. For antenna variants with RS422 interface (i.e. HG 98780ZA/XA) an appropriate interface converter is required. Then start a terminal program on the PC.



The interface converter is not part of the system's scope of supply! However, it is available from several well-known distributors, as e. g. RS Components (<http://www.rs-components.com/rs/>). Please refer to the section „Industrial Interface Converters“ in the RS Components catalogue.

7.1 Terminal program

In the following we refer to the program **HyperTerminal**[®] (Hypertrm.exe), which is part of the scope of supply of Microsoft[®] Windows[®] 95/98/NT[®]. We use this program on one hand because many users dispose of it, and on the other hand because it is very easy to use thanks to the configuration files we deliver.



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

Nevertheless, any other terminal program can be utilized, provided that it contains VT52 emulation. If you should use a different program, please read the documentation and adjust it to the values shown in section 7.1.1 below.

7.1.1 Parameter presets

Depending on whether you want to run the monitor program or the software update, different parameters are necessary. If you are using HyperTerminal, you do not need to enter these parameters and can move on to section 7.2 on page 30.

Table 21 Terminal settings monitor program

Terminal settings monitor program (see section 7.2)	
Baud rate	9600 or 19200 Baud depending on the system configuration
Terminal emulation	VT52
Parity	Even
Data bits	8
Stop bits	1
Character delay	1 ms
Line delay	0 ms
PC-Interface (Port)	COM1 may alter depending on the PC (see below.)

If you are using a different port than COM1 with HyperTerminal, then alter the port setting as follows:


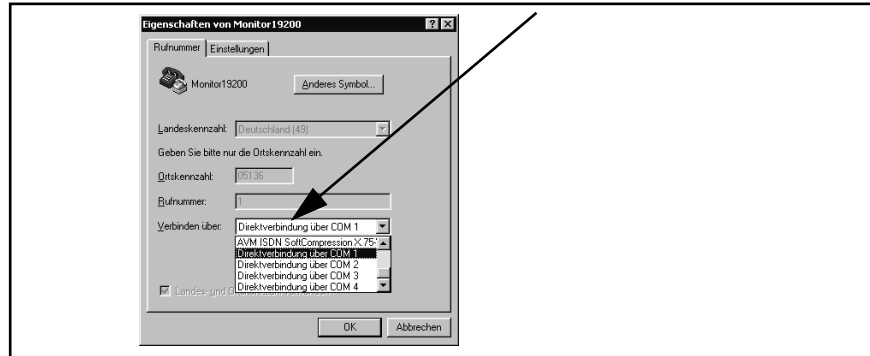
1. Select **Properties** from the **File** menu (or click the icon ). The following window shows up (partly German version):

Figure 12 COM port selection in the terminal program



2. Choose the respective port via the **Direkt** to connection in the submenu. Confirm with **OK**. Save the altered values if you are asked for it when closing HyperTerminal.

7.2 System monitor

In **monitor mode** it is possible to configure the system via a menu. To use the monitor mode you need to know which protocol is preset in your antenna.

7.2.1 How to start the monitor program

Depending on the currently active procedure, the monitor program is started differently (refer to section 7.2.2.4 on page 35).

7.2.1.1 Procedure Monitor only

If the antenna is set to the procedure „Monitor only“, the monitor mode is started 10 s after switch on. In this case not files have to be transmitted and section 7.2.1.2 may be ignored.

7.2.1.2 Procedures 3964R/transparent

The command to switch to monitor mode should be entered directly via a PC. To do so, start your terminal program. For the startup, a set of configuration files is necessary (small text files and HyperTerminal configuration files). These files are accessible for download in the latest version from our internet server:



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

If HyperTerminal has been correctly installed, the terminal program can now be started directly by double clicking the respective *.ht file (*Monitor9600.ht* for 9600 Baud and *Monitor19200.ht* for 19200 Baud). If necessary, adapt the COM-port (refer to section 7.1.1).

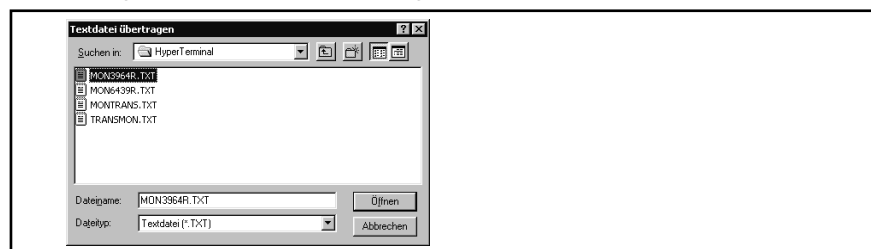
In order to start the monitor mode, first of all you have to switch the antenna off and on again. After 10 s (resp. 26 s) you can transfer the appropriate *.txt file from the disk with your terminal program. The following four files are on the disk:

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

Transferring a file with HyperTerminal is done as follows:

- ▶ Choose **Send Text File** from the menu **Transfer**. The following window will opened up (partly German version):

Figure 13 *Transferring a file with the terminal program*



- ▶ Switch to disk drive (in our example, the files are located on the hard disk) and select the respective *.txt file.
- ▶ Click 'open'. The file will be transferred and (if the correct file has been selected) the monitor program will be started. The menus will then appear directly within the HyperTerminal Window. First, the main menu is displayed (Figure 14).

7.2.2 Operating the monitor program

Any change to the interface parameters will be activated after a system reset (switch the antenna off and on again). Afterwards it may be necessary to use a different file from the four given *.txt documents for the monitor call!

Once the transfer of the *.txt file (refer to section 7.2.1) has been completed, the monitor program will start with the main menu. If this is not the case, you have either based your settings on a wrong system configuration, or you are using a different terminal emulation, or you did not adjust the character delay to 1 ms, or you did not wait at least 10 s after activating the antenna.

7.2.2.1 Main menu

Figure 14 Main menu of the monitor program

```

S:0568 X:+0175 Code: 00000aaa Read: 9
U[/mV]:24000 I[/mA]: 150 T[Grd.C]:+28 E: 0200 N: 0
Ftx[/Hz]:105960 Prog_Code: 00000aaa

(W)rite Transponder Code
(T)ime & Code
(S)erial Output
C(A)N-Parameters
P(r)ofibus-Parameters

(P)assword
(L)oad User Parameters to EEPROM
Load (D)efault User Parameters

(1) Import User Parameters from Host to Antenna
(2) Export User Parameters from Antenna to Host
(E) Show Status Bits
Cs(v) (38,4 KB Code,Sum,Dif,Tr,Co,Po,N_read,N_err,Cnt,<crLf>)
(F)irmware Update
Serv(i)ce Menu
(Q)uit Monitor

Software Version 98780A51.11 / 17.FEB.2016 Serial Number: 9999999

```

Each of the screen menus contains important system variables in the first three lines (refer also to Table 22), as they also appear in the output telegram (described in section 6.2.5.1.1 on page 21). The last line on the screen contains possible status messages, if e. g. predetermined value ranges have not been observed during input.

Table 22 Description of the system variables (monitor program)

Description of the system variables	
S	Measured voltage of the sum coil within the cover of the casing in samples (max. 1023).
X	Measured voltage of the difference coil within the cover of the casing in samples (max. 1023).
Code	The 32 bits of the decoded transponder code.
Read	Number of readings per transponder crossing. This value is preserved until another transponder is detected. It is also deleted through Noise.
U [mV]	Supply voltage of the processor circuit board, measured exactly to 100 mV. Due to various protective measures, it is always slightly lower than the applied supply voltage.
I [mA]	Current consumed by the positioning unit, measured to 10 mA accurately.
T [Grd.C]	Approximate temperature inside the unit, measured in 5° C steps. The sensor is located near a cooling sheet.
E	System status expression in hexadecimal notation. The single bits are explained in Table 11 „Possible system status messages“ auf Seite 22.
N	Number of reading errors per transponder crossing. This value is stored until a new transponder has been detected.
Ftx	Display of the transmission frequency divided by 128. This frequency is permanently monitored and considered for the system status word.
Prog_Code	Code to be programmed into the Transponder.

Other menus are activated by pressing the (characters in brackets). The following 5 menu items are explained only on this page:

- ♦ (P)assword: Before altered values are transferred into the permanent memory, the password **815** has to be entered. This prevents unintended alterations of values.
- ♦ (L)oad User Parameters to EEPROM: Used to permanently save changed values after password input.
- ♦ Load (D)efault User Parameters: Loads default values into the antenna. To save these permanently in the antenna, (L) must be used again.
- ♦ (E) Show Status Bits: Explains the system status in plain text. With (C) the status messages can be reset.
- ♦ Serv(i)ce Menu: This menu is only used internally by Götting for commissioning the antenna. It has no function for customers and is protected by its own password.

In the sections below, the following menu items are described:

- ♦ (W)rite Transponder Code (section 7.2.2.2 on page 33)
- ♦ (T)ime & Code (section 7.2.2.3 on page 34)
- ♦ (S)erial Output (section 7.2.2.4 on page 35)
- ♦ C(A)N Parameters (section 7.2.2.5 on page 36)
- ♦ P(R)ofibus-Parameters (section 7.2.2.6 on page 37)
- ♦ (I) Import User Parameters / (2) Export User Parameters (section 7.2.2.7 on page 38)
- ♦ CS(V) (section 7.2.2.8 on page 39)
- ♦ (F)irmware Update (section 7.2.2.9 on page 39)
- ♦ (Q)uit Monitor. With (Q) the monitor program is left, whenever the serial procedures 3964R or transparent are active. In procedure 'Monitor only' it is impossible to leave the monitor program.

7.2.2.2 (W)rite Transponder Code

Allows to program a read/write transponder of the type HG G-70661 located in the antenna field with a new code.

Figure 15 Menu: (W)rite Transponder Code

```

S:0568 X:+0175 Code: 00000aaa Read: 9
U[/mV]:24000 I[/mA]: 150 I[Grd.C]:+28 E: 0200 N: 0
Ftx[/Hz]:105960 Prog_Code: 00000aaa

(W)rite Transponder Code
(T)ime & Code
(S)erial Output
C(A)N-Parameters
P(r)ofibus-Parameters

(P)assword
(L)oad User Parameters to EEPROM
Load (D)efault User Parameters

(1) Import User Parameters from Host to Antenna
(2) Export User Parameters from Antenna to Host
(E) Show Status Bits
Cs(v) (38,4 KB Code,Sum,Dif,Tr,Co,Po,N_read,N_err,Cnt,<crLf>)
(F)irmware Update
Serv(i)ce Menu
(Q)uit Monitor

Software Version 98780A51.11 / 17.FEB.2016 Serial Number: 9999999
Enter 32 Bit Data ->

```

To program a transponder:

- ▶ Call up this menu.
- ▶ At the bottom enter the code to be programmed as a hex code up to 8 bits long.
- ▶ Make sure that there is a suitable transponder within the antenna field.
- ▶ Start the programming by pressing the Enter key.

As soon as the transponder is programmed, the new code is output in the status line at the top of the menu.

7.2.2.3 (T)ime & Code

This menu enables the setting of timing values for the transponder decoding, the position calculation and the positioning pulse.

Figure 16 Menu: (T)ime & Code

```

S:0544 X:+0000 Code: 00000000 Read: 0
U[/mV]:24000 I[/mA]: 150 T[Grd.C]:+28 E: 0200 N: 0
Ftx[/Hz]:105970 Prog_Code: 00000000

(L)evel for Positioning [10.1023]: 256
(T)hreshold Decoding [10.1023]: 256
(1) switch Reference Transponder: 0
(P)osi-Pulse Time [n*1ms]: 100

(Q)uit Menuue

```

With **L** the voltage threshold S for the release of the output of the positioning pulse is set in order to eliminate wrong outputs.

With **T** the voltage threshold S for the start of the code decoding is set in order to prevent decoding tries during a weak signal period.

With **1** it is possible to switch on the reference transponder for testing.

The duration of the positioning pulses can be set in a millisecond pattern by pressing **P**.

7.2.2.4 (S)erial Output

Alterations within this menu need to be made effective by resetting the system (turn the antenna off and then on). Dependent upon the alterations made, it may be necessary to use a different baud rate / text document to call up the monitor (section 7.2.1 on page 30).

Figure 17 Menu: (S)erial Output

```

S:0843 X:+0748 Code: 12345678 Read: 65535
U[/mV]:20200 I[/mA]: 200 T[Grd.C]:+28 E: 0600 N: 2
Ftx[/Hz]:105960 Prog_Code: 00000000

(B)audrate: 9600
(P)rocedure 3964R
(O)rder of Data Transfer (0= HiByte first): 0
(T)elegram Content Mask [0..FF]: ff
(D)isplay Telegram Content
(C)har-Delaytime [1..220ms]: 220
(A)ck-Delaytime (3964R) [1..1680ms]: 1680
Co(n)tinuous Telegrams 0
(S)erial Data Period [1..1000ms]: 8

(Q)uit Menue

```

Input of **B** enables switching between 9600 and 19200 baud.

Select the desired procedure – 3964R or transparent – by pressing **P**. For procedure 3964R, in addition, the acknowledgement delay time (**A**) is adjustable. If procedure 'Monitor only' is active, only baud rate and procedure can be selected. This is useful whenever the serial output is solely required for parameter setting and the data output is done via CAN or Profibus®.

Via **O** it is possible to select whether the highest byte is to be output first or last. When connecting this equipment with a Siemens PLC, this parameter has to be 0 (High Byte first).

T influences the composition of the output telegram.

Based on the values given in Table 10 „Data words in a telegram of 15 (14) byte length“ auf Seite 21, you can define the desired elements of your telegram **T** by hexadecimal addition. The sequence of the parameters cannot be influenced. It will always conform to the sequence in the table!

Example: You only want to display the code and the status.

Add up the values 0x02 for the 32 code bits, 0x01 for STX as well as the value 0x80 for status. Enter 0B with **T**.

Using „**D**isplay Telegram Content“ it is possible to check the generated telegram (refer to Figure 18 on page 36). In this example the mask has the value 0xff. Press any key to return to the menu Serial Output.

Figure 18 Output „(D)isplay Telegram Content“

```

S:0547 X:+0000 Code: 00000000 Read: 0
U[/mV]:24200 I[/mA]: 140 T[Grd.C]:+28 E: 0200 N: 0
Ftx[/Hz]:105960 Prog_Code: 00000000

STX      1 Bytes from Position: 1
CODE     4 Bytes from Position: 2
SUM_1    2 Bytes from Position: 6
Vcc      1 Bytes from Position: 8
Current  1 Bytes from Position: 9
Temp.    1 Bytes from Position: 10
CodesRd  2 Bytes from Position: 11
Status   2 Bytes from Position: 13

(Q)uit Menue

```

The parameter “(C)har Delaytime“ is the so-called character delay for procedure 3964R (refer to appendix, section 11.6 „Procedure 3964R“ auf Seite 52) and the time out period for incoming characters for the transparent procedure (refer to appendix, section 11.7 „Procedure „transparent““ auf Seite 53).

(N) either activates the permanent output, according to the Clock for Sampling set in Time&Code (1; refer to 7.2.2.2 on page 33), or generates the output solely when a transponder is decoded within the reading range of the antenna (0).

With (S) the repetition rate of the serial output is set.

7.2.2.5 C(A)N Parameters

This menu enables setting the various CAN-Bus parameters. Before being able to use the CAN bus, it is necessary to activate this function by pressing (C).

NOTICE

Unexpected antenna resets

In case of transmission errors on the CAN bus, the antenna performs a reset. Also the case that no device is connected when the CAN bus is activated can be interpreted as a transmission error.

- If the CAN bus is not used: deactivate the CAN bus.

Figure 19 Menu: C(A)N-Parameter

```

SR = 00:      NO ERROR / / / /

(C)AN active          NO
E(X)tended CAN       STANDARD
(I)dentifier: TX/RX [0..2047]: 10
(A)-Identifier: TX [0..2047]: 0
(D)-Identifier: TX [0..2047]: 0
B(T)-Register [hex 0.7FFF]: 1e01
or
B(R)P Baudrate Prescaler [0..63]: 1
(S)JW Sync Jump Width [0..3]: 0
Tseg(1) [2..15]: 14
Tseg(2) [1..7]: 1
(3) set Values for Baudrate = 50kB
(4) set Values for Baudrate = 125kB
(5) set Values for Baudrate = 250kB
(6) set Values for Baudrate = 500kB
(7) set Values for Baudrate = 1MB
Co(n)tinuous Telegrams 0
CAN on Re(m)ote Request 0
Data (P)eriod [1..1000ms]: 8
(Q)uit Menue

```

Entering **X** enables generation of telegrams either as standard frames according to CAN2.0A or as extended frames according to CAN2.0B. Correspondingly it is possible to either set the **I**dentifier (CAN address) as 11 bit value (0-2047) or as 29 bit value (0-536870911).

The identifier, that is adjustable via **I**, refers to transmitted frames for Message Object 1 (Table 13 on page 24) and to received frames for Message Object 4 for the reference transponder (Table 16 on page 25), respectively. The Identifier adjustable via **A** refers to Message Object 2 (Table 14 on page 25), **D**, accordingly, refers to Message Objects 3 (Table 15 on page 25). Entering 0 deactivates the corresponding Message Object.

T enables alteration of the so-called **Bit Timing Register** for different baud rates and sample points. It is possible to directly fill it with a 4 digit HEX value in the range between 0 to 7fff (according to the Siemens Processor Manual S. 23-10 – Ordering No. B158-H6651-G1-X-7600).

It is possible to alternatively alter each of the registers parameters separately; in addition, without knowledge of the exact meaning of the single timing parameters, one out of five possible baud rates can be selected

N either activates the permanent output, according to the **Clock for Sampling** set in **Time&Code** (1; refer to 7.2.2.2 on page 33), or generates the output solely when a transponder is decoded within the reading range of the antenna (0).

M activates remote operation. In this mode (independent of the settings of **Continuous Telegrams**), telegrams are no longer generated, but only to remote frames answered with the corresponding address.

With **P** the repetition rate of the data output can be selected.

The content of the CAN value status is shown in the upper line of the menu. These values are used for simple diagnosis. They are explained in above mentioned Processor Manual on page 23-7.

7.2.2.6 P(ro)fibus-Parameters

This menu enables setting the Profibus® parameters.

NOTICE

Unexpected antenna resets

In case of transmission errors on the Profibus®, antennas of the types HG 98780ZA/WA (in contrast to the variants YA/XA) perform a reset. Even the case that no device is connected when the Profibus® is activated can be interpreted as a transmission error.

- ▶ If the Profibus® is not used: deactivate the Profibus®.

Figure 20 Menu: P(ro)fibus-Parameters

Byte #	Master-Input	Profibus-Status:	NO_ERROR
0	02		
1	00		
2	00		
3	00		
4	00		
5	00		
6	f0		
7	0f		
8	1c	(P)rofibus active	YES
9	00	(A)ddress: [0..125]:	2
10	00	(O)rder of Data Transfer (0= HiByte first):	0
11	02		
12	0b	(Q)uit Menue	

Byte #	Master-Output
0	00
1	00
2	00
3	00
4	00

On the left hand side of the screen, the bytes transmitted to the master as well as the bytes transmitted by the master are displayed. The description of these bytes is included in Table 17 on page 26.

The header shows the current Profibus® status. The following messages are possible:

Table 23 Possible Profibus® Status Messages

Profibus® Status Messages	
NO_ERROR	Profibus® not active / without error
DPS2_INI_ERROR	These messages indicate that the Profibus® hardware is either not equipped or faulty
SPC_HW_ERROR	
USER_IO_DATA_LEN	
BUF_LEN_ERROR	Inadmissible buffer lengths were specified in the master. Use the GSD file that is included in the appendix, section 11.8 on page 54, or download this file from our website
PB_OFFLINE	No contact to the master

P activates and deactivates the Profibus®. It will then be initialized with the slave address given under **A**.

O selects whether the respective highest byte will be output first or last (refer to Table 17 on page 26).

Q exits this menu and returns to the main menu. In case parameters were changed, it is necessary to save them at this point.

7.2.2.7 (1) Import / (2) Export User Parameter

All values changed by the user can be saved and restored from a host PC. The XMODEM protocol is used for file transfer:

To import a data set from the host to the antenna:

- ▶ Press the key **F1**.

Within 50 seconds, you must start the XMODEM transfer of the file on the host as follows:

- ▶ Choose *Transfer > Send file> XMODEM > Select file* from the menu.
After a successful transmission the message *Success* is output. The antenna has checked the file and loaded it into the parameter RAM.



To save the values permanently in the antenna, you have to use **(L)**oad values to EEPROM and enter the password.

To export a data set from the antenna to the host:

- ▶ Press the key **(2)**.
The XMODEM-file transfer starts.

Alternatively, you can export the data using the HyperTerminal monitor program as follows:

- ▶ Choose *Transfer > Receive file> XMODEM > Select folder* from the menu and enter a file name.
After a successful transfer, the message *Success* is output.

7.2.2.8 CS(V)

For means of diagnosis generating output of several values in **CSV Format** (Comma Separated Values; a text file especially formatted to be read by spreadsheet analysis programs) is possible. This output is continuous at 38.400 baud, 8 bit and even parity, until it is interrupted by hitting any key. This keystroke generates a reset of the antenna to the basic settings (not monitor mode) including the stored parameters.

Storing the CSV output is, e.g., possible using the program HyperTerminal® (also refer to section 7.1 on page 29). Use the function *Text aufzeichnen ...* of menu *Übertragung* and insert an appropriate file name (should bear the file ending *.csv* in order to ensure that the spreadsheet calculation program will automatically recognize this file). Once the file is recorded, stored and closed under HyperTerminal®, it may be uploaded into a spreadsheet calculation program (e. g. Microsoft® Excel®, Sun® StarCalc®, ...).


When opening the file various options will be prompted by the spreadsheet calculation program. Make sure to state that the file consists of Comma Separated Values. Then it is possible to process the data for the generation of diagrams or save it as native spreadsheet calculation file.


7.2.2.9 (F)irmware Update

Puts the antenna into *Boot Load* mode and thus offers the option of updating the software without interruption of the power supply. However, first the update program must be installed as described in section 7.3 on page 40.

Then hit the **(B)** key within the main menu and a display with the following commands will appear:

- ▶ *Open HEX-Flasher* (Open the flash program)
- ▶ select the COM-Port which is currently used for the connection between the PC and the antenna
- ▶ *prepare file input* (Select the HEX file that is to be programmed)

- ▶ then press any key (Return to Hyperterm and hit any key)
- ▶ close COM port within 20 sec and start HEX Flasher (Close the COM port in Hyperterm within 20 sec. via the icon , return to the HEX-Flasher and start programming.

Once the programming process is finished, return to Hyperterm, wait for 10 sec. and re-connect to the COM Port (e. g. via icon ). Following this procedure, re-start the monitor mode (also refer to 7.2.1 on page 30).

7.3 Software Update (Antenna Software)

It is possible to update the software of the integrated interpreters via the serial interface using a portable PC. Following switching-on, the integrated download unit will check for approx. 10 seconds whether a download is to be carried out. In case a download is not generated, the unit will return to the normal operating program.

Data received during this period of 10 seconds are examined for their validity.



Only the update program described below may be used for the software update!

7.3.1 Installation of the Program for Software Update

The program for the antenna software update is a 32-bit application for Microsoft® Windows®. Upon request, this program is available either on disc (described in the following paragraphs) or sent by e-mail. Please address your requests to the e-mail, phone, fax or mailing address given on the cover of this manual.

It is not necessary to install this program. It is sufficient to copy it onto the hard disc of your PC and execute it there. Follow these steps:

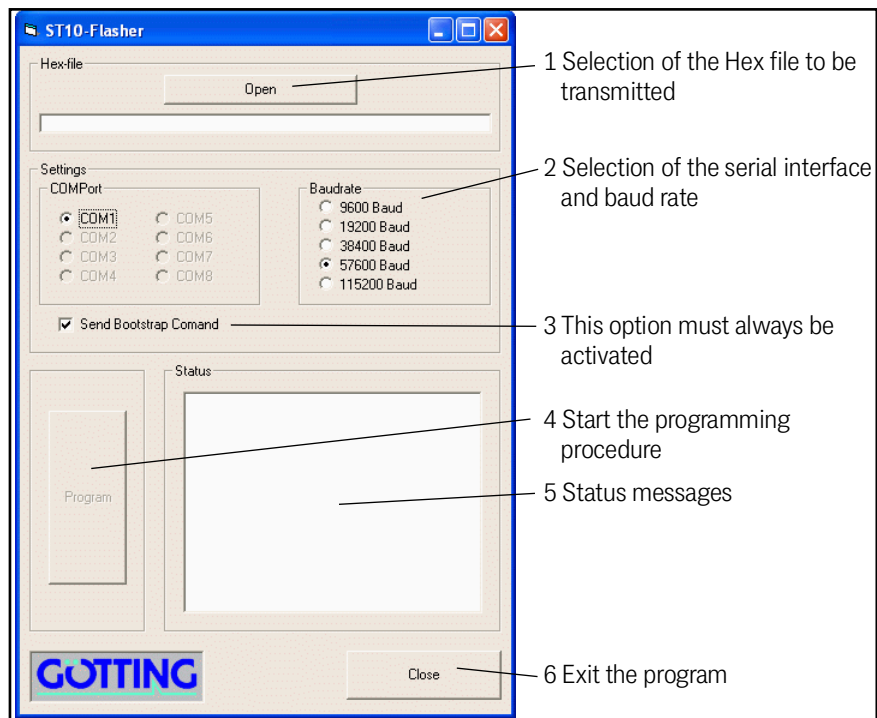
- ▶ Insert the CD into the CD drive of the PC
- ▶ Open Windows Explorer and navigate to the CD
- ▶ Copy the directory ST-Flash including all sub-directories and files onto your hard disk, e.g. into the director 'programs'
- ▶ When using Windows-Versions prior to Windows XP, it is now necessary to deactivate the writing protection for the two setting files. To do so, navigate to the newly created directory Programs\ST-Flash and mark the files ST10-Flasher.ini and Command.log. Open the function features ('Eigenschaften') within the file menu of the Explorer and deactivate the parameter Writing Protected.
- ▶ In order to start the program now, carry out the file ST10-Flasher.exe.

7.3.2 Software Update

While the software update is carried out, no other programs may occupy the used serial interface (COM-Port). Thus, terminate any such connections in your Terminal program (e. g. Hyperterm).

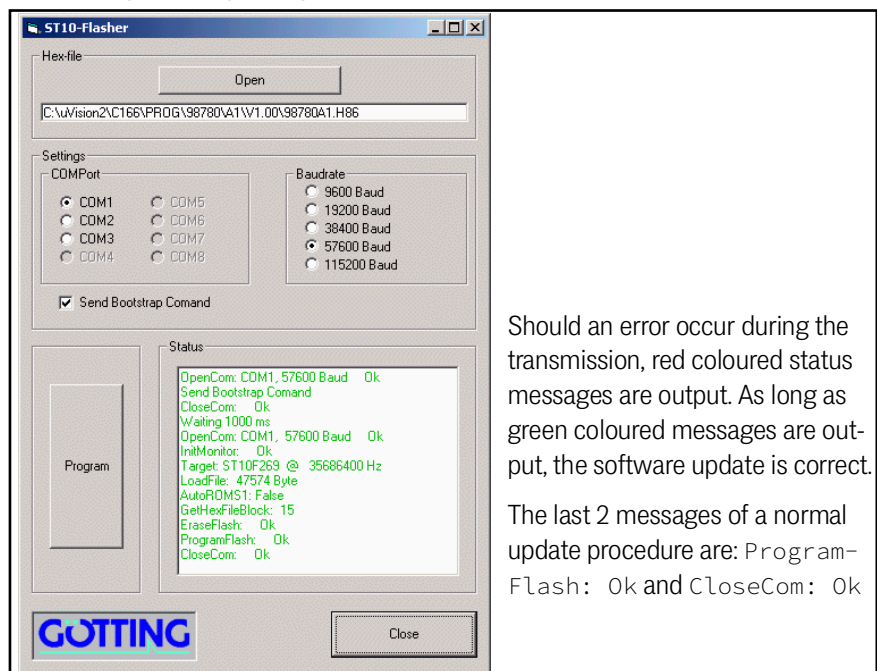
Connect the antenna with your PC. For antenna variants with RS422 interface (HG 98780ZA/XA) it is essential to use an appropriate interface converter (not included in the antenna scope of supply; refer to the note on the top of Seite 29). Start the update program on your PC as described in section 7.3.1 on page 40.

Figure 21 Update program: Operating Elements



Start the programming process by switching on the antenna and then click Program within a period of 10 seconds afterwards. A device reset follows and after a short period of time, the file is being transmitted.

Figure 22 Update program: programing procedure



Once the programming process is completed, the program can be closed (Close). From now on, the interpreter uses the new program.

8

Maintenance

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

- ♦ visual examination of the antennas (ensuring all screws, cables and plugs are correctly fastened)
- ♦ cleaning the ventilation openings if necessary.

Document regularly the power consumption and power supply of each antenna. These values can be obtained from any menu in the monitor program.

If necessary, update of the system software as described above (section 7.3 on page 40). Date and version of the current antenna software can be obtained from the main menu.

9

Troubleshooting

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

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

Table 24 *Troubleshooting*

Error	Possible cause	Diagnosis/ Correction
No system function Even though a transponder is located within reception range, there is not serial output	– Power supply is not sufficient	Measure the voltage at the respectively labeled clamps in the clamping case.
No contact is possible, only unintelligible characters are sent.	<ol style="list-style-type: none"> 1. RS 422 T+(R+) exchanged with RS 422 T- (R-) by mistake 2. Signal ground not connected, a too high potential difference between antenna and receiver. 3. Incorrect setting of transfer parameters. 4. Incorrect transfer procedure selected. 	<ol style="list-style-type: none"> 1. Check the connections 2. Connect signal ground 3. Select only 9600 or 19200 baud, 8 bit, even parity. 4. Select the correct procedure, etc. with the PC and the system monitor.
Inaccurate values at low temperature.	<ol style="list-style-type: none"> 1. System needs a certain warm-up time in order to operate at sufficient accuracy in low ambient temperature. 2. Insufficient heating performance, loose cable connections 	Wait until the system has warmed up (ca. 60 minutes at -20° C). Measure the voltage 24 V at the corresponding clamps (+ 24 V heating).
No positioning pulse.	<ol style="list-style-type: none"> 1. Transponder defective 2. Loose cable connections 3. Wrong reading distance 4. Transponders are located outside the reading area of the antenna during the antenna crossing 5. Antenna defective 	Check the transponder (e. g. with the hand-held reader) and its location

10

Technical Data

10.1 Antenna

Table 25 Technical Data Antenna HG G-98780-A (part 1 of 2)

Antenna HG G-98780-A	
Casing	Refer to Figure 6 on page 16
Weight	approx. 6 kg
Effective antenna area	refer to appendix, Section 11.1 on page 46
Voltage supply	24 V \pm 10 %
Current consumption	approx. 600 mA, during transponder programming max. 2A for 500 ms, about 2A heater
Protection	<ul style="list-style-type: none"> – Voltage supply (pin 1) 1 A slow-reacting – Heating (pin 3) 3 A slow-reacting
Operating temperature	-25 to +50° C Warm-up time: Approx. 60 minutes at -20° C surrounding temp. (provided heater is in operation) Automatic heater switch-on as soon as the temperatures are below 5° C
Mechanical stability	5 g 11 ms / 2 g 10 to 55 Hz
Weight	Approx. 6 kg
Installation regulations	refer to Figure 3 on page 12
Protection	IP 67
Connectors	
HG G-98780ZA/WA	12-pin M3 screw-in plug
HG G-98780YA/XA	3 12-pin M23 built-in sockets
HG G-98780UA	Up to 3 cable tails (4 m)
With Transponder HG 70661	
Reading distance (distance transponder – underside reading antenna)	In direction of travel a max. of \pm 40 mm crosswise to the center of the antenna: 50 to 90 mm
Position accuracy	refer to Section 11.2 on page 47
Max. pass-over speed	8 m/s
Output serial (RS422 resp. RS232)	The output requires 9.6 or 19.2 kbaud. The telegram content is configurable. 3964R or „transparent“ procedures are available.

Table 25 *Technical Data Antenna HG G-98780-A (part 2 of 2)*

Antenna HG G-98780-A	
Output CAN (HG 98780ZA/WA)	According to ISO/DIS 11898 identifier, Data rate, Basic/Extended CAN; configurable via ser. interf.
Profibus® (HG 98780YA/XA)	According to DIN 19245 / EN 50170 Autom. baud rate detection, supported baud rates: 9,6 kBd, 19,2 kBd, 93,75 kBd, 187,5 kBd, 500 kBd, 1,5 MBd, 3 MBd, 6 MBd, 12 MBd LED for Profibus® status 'data exchange'
Output positioning pulse	20 mA current source, potentially separated

Table 26 *EMC-Testing*

Electromagnetic Compatibility (EMC) of Antenna HG G-98780-A		
Checking of		Test Standards
Interference transmission		
	Radiated interference	EN 55 022 Class A
Interference immunity		
Casing		
	Electromagnetical HF-field, amplitude-modulated	EN 61000-4-3
	Static electric discharge	EN 61000-4-2
Signal connections		
	High frequency asymmetrical	EN 61000-4-6 *)
	Quick transients	EN 61000-4-4
DC connections		
	High frequency asymmetrical	EN 61000-4-6 *)
	Impulse voltages	EN 61000-4-5
*) Possible application for cable diameter 12 mm (e. g. Würth STARTEC 74271222)		



In surroundings with strong interferences a shielded connecting cable should be applied!

10.2 Parallel converter (optional)

You can find the technical data of the optional interface in the data sheet that you can download from:



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

11

Appendix

11.1 Effective Antenna Area

The following 4 diagrams show the intensity of the reception voltage over the area of the antenna reading side for different reading distances. The scaling of this voltage corresponds to the sum voltage S output by the antenna (refer to Table 22 on page 32). As long as this voltage is > 200 , transponder codes are correctly received.

Figure 23 Diagram 1, Reception voltage S within the antenna area at a reading dist. of 40 mm

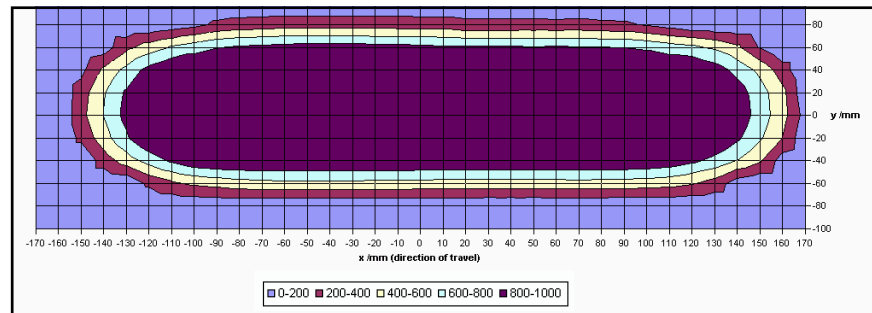


Figure 24 Diagram 2, Reception voltage S within the antenna area at reading dist. 60 mm

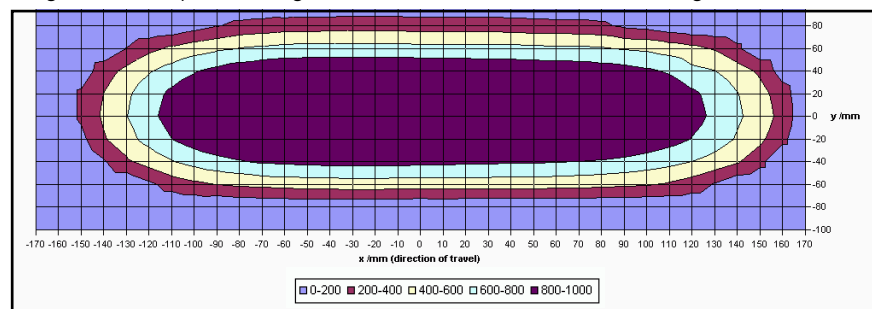


Figure 25 Diagram 3, Reception voltage S within the antenna area at reading dist. 80 mm

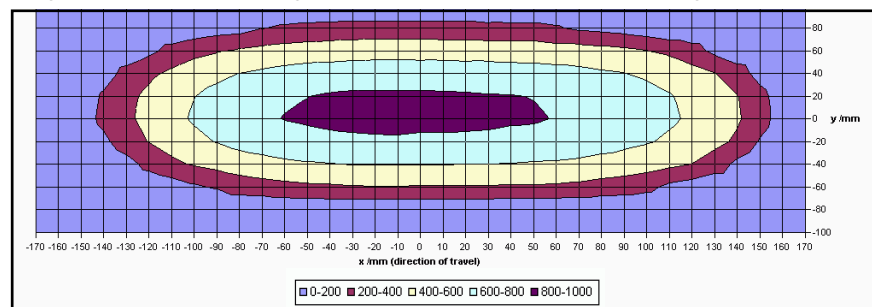
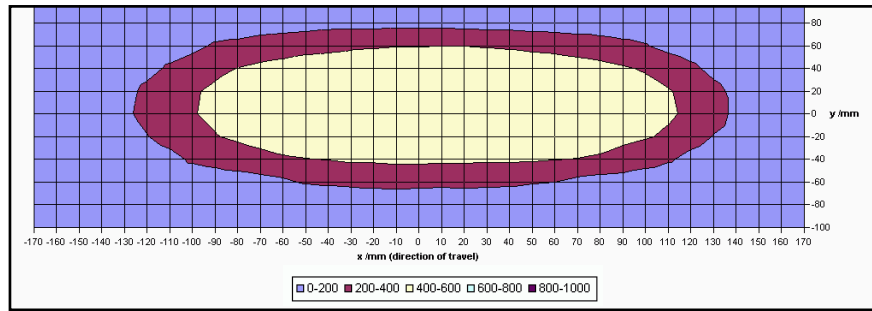


Figure 26 Diagram 4, Reception voltage S within the antenna area at reading dist. 100 mm



The following two diagrams show the intensity of the positioning coil voltage within the antenna area for different reading distances. The voltage scaling corresponds the antenna voltage X (refer to Table 22 on page 32).

Figure 27 Diagram 5, Reception voltage X within the antenna area at reading dist. 40 mm

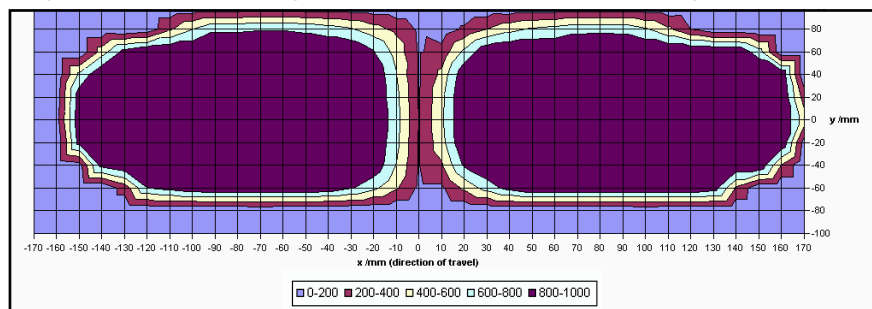
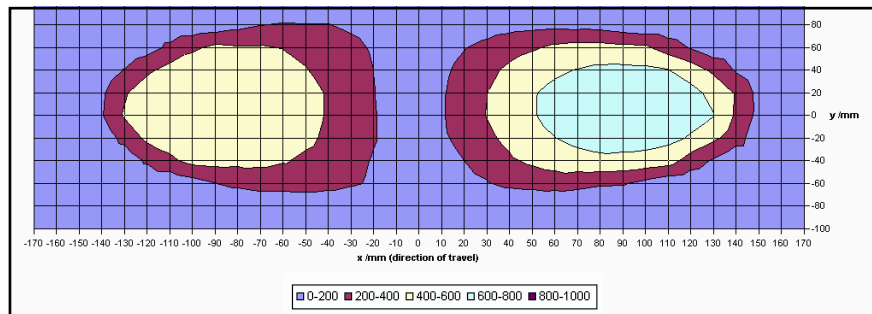


Figure 28 Diagram 6, Reception voltage X within the antenna area at reading dist. 100 mm



11.2 Positioning Accuracy

The following diagrams show the location of the generation of the Posipuls within the antenna area at different reading distances and approach from left and right.

Figure 29 Diagram 1, Location of the generation of the Posipulse at reading dist. 40 mm

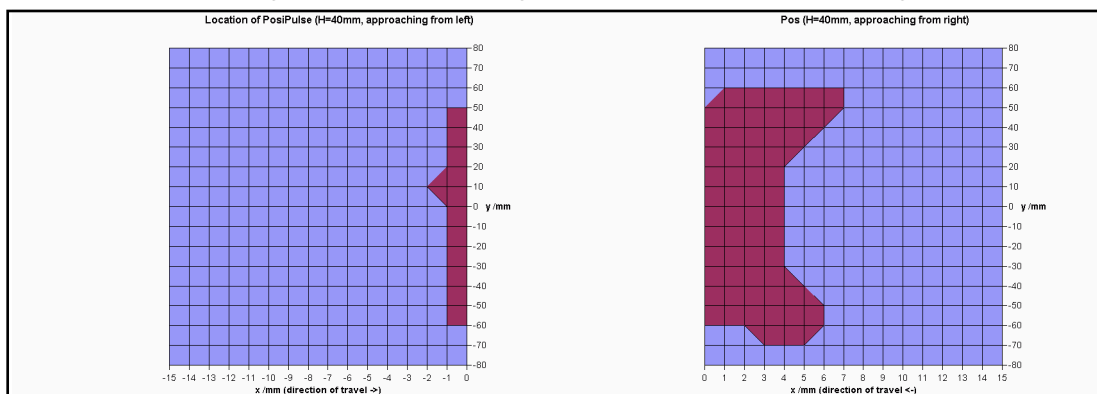


Figure 30 Diagram 2, Location of the generation of the Posipulse at reading dist. 60 mm

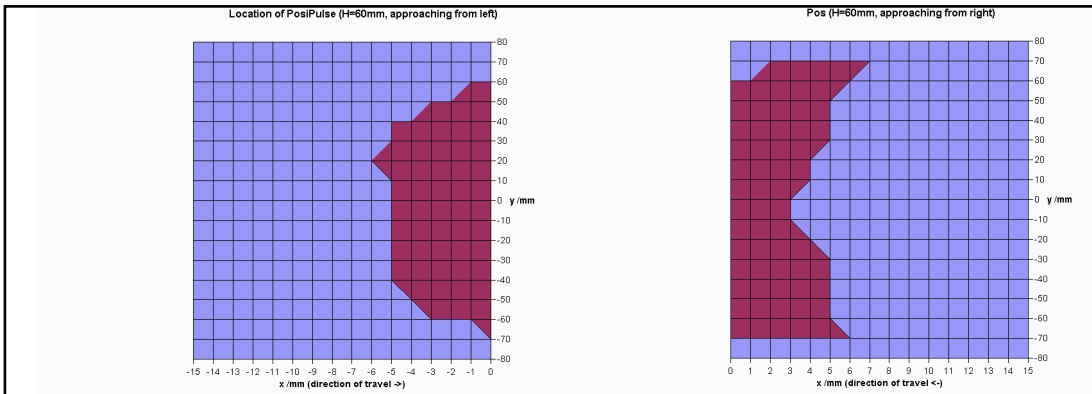


Figure 31 Diagram 3, Location of the generation of the Posipulse at reading dist. 80 mm

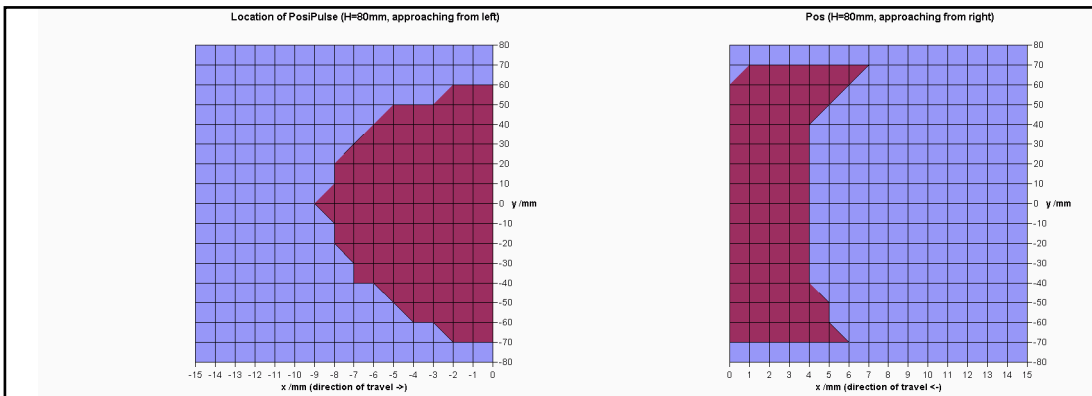


Figure 32 Diagram 4, Location of the generation of the Posipulse at reading dist. 100 mm

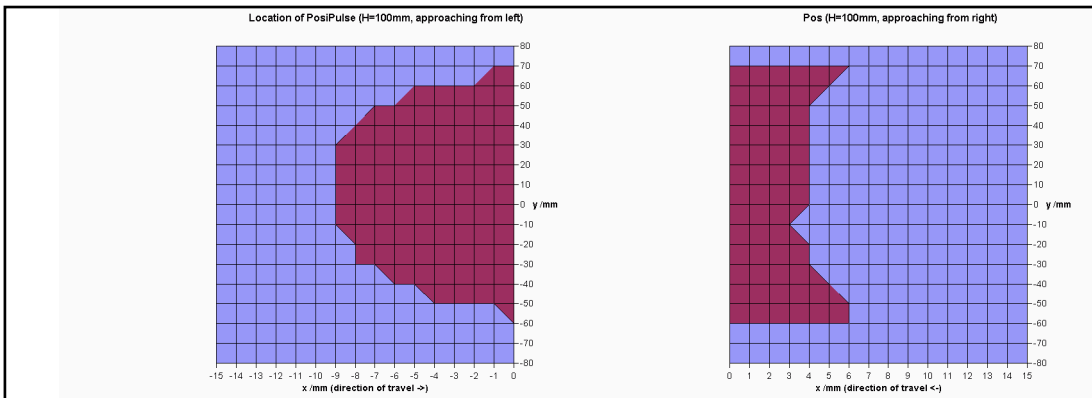
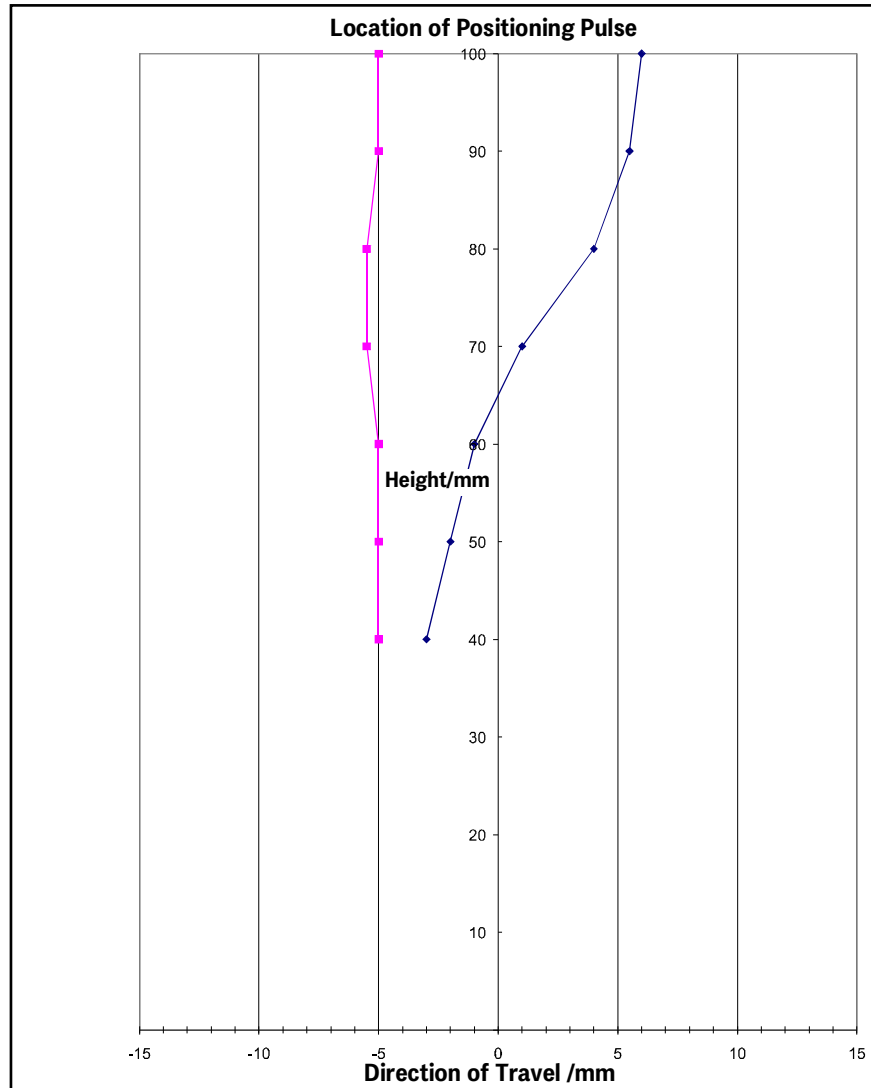


Figure 33 Diagram 5, Location of the generation of the Posipulse on the center axis at different reading distances



11.3 Attenuation of the Reception Level caused by Metal

Figure 34 Attenuation of the reception level caused by metal

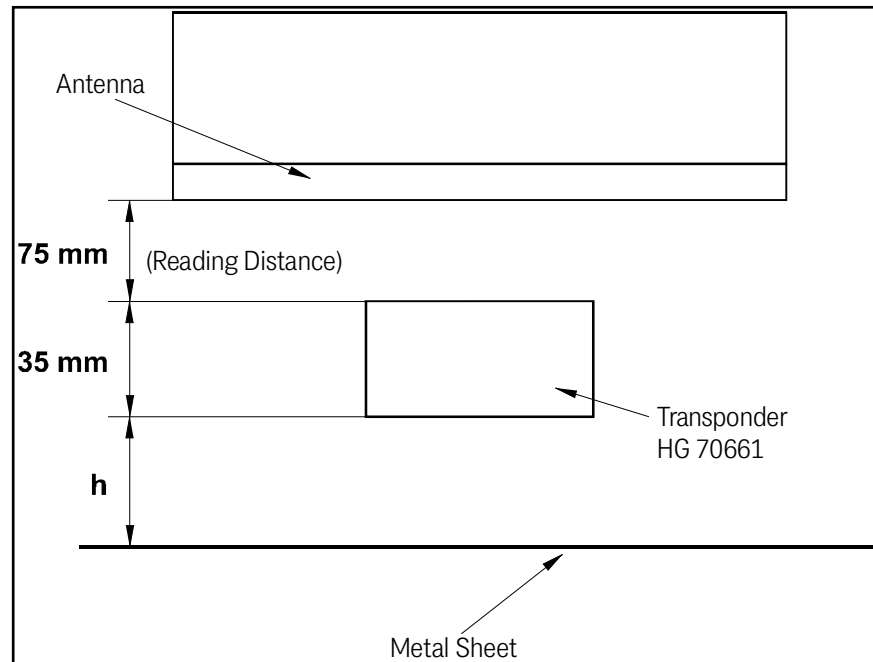


Table 27 Dependency of the signal strength on the distance between transponder and metal

Height h [cm]	Signal [%]
0	34
1	56
2	70
3	78
4	83
5	88
6	94
7	95
8	96
9	97
10	99
↓	↓
∞	100

11.4 Influence of Water

Reading height was 80 mm [\cong 3.15 in] in all cases. The signal strength level at this distance in air represents 100 % in the following measurements. The water level was measured from the bottom of the transponder. The transponder top was also moist during the measurement with 30 mm water level (splash water). A road salt/water mixture was used for emulating natural seawater. For comparison, seawater has a conductivity of about 42 to 55 mS/cm. Through evaporation a salt crust can form on the transponder top which then leads to punctual higher conductivity.

Figure 35 Attenuation of the sum voltage as a function of the conductivity of the water (30 mm water level)

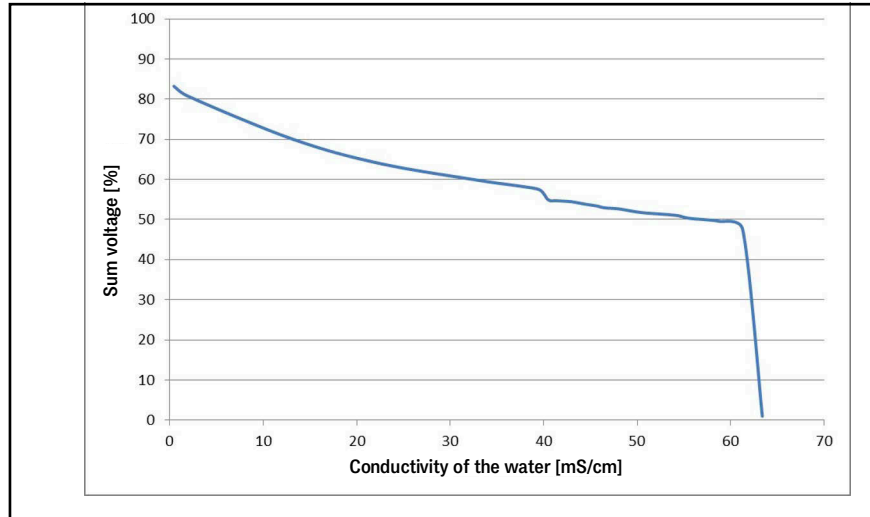
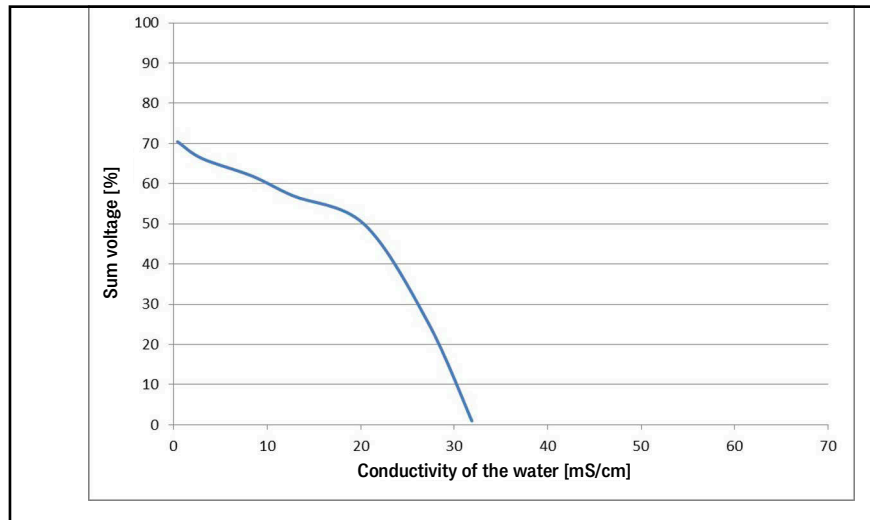


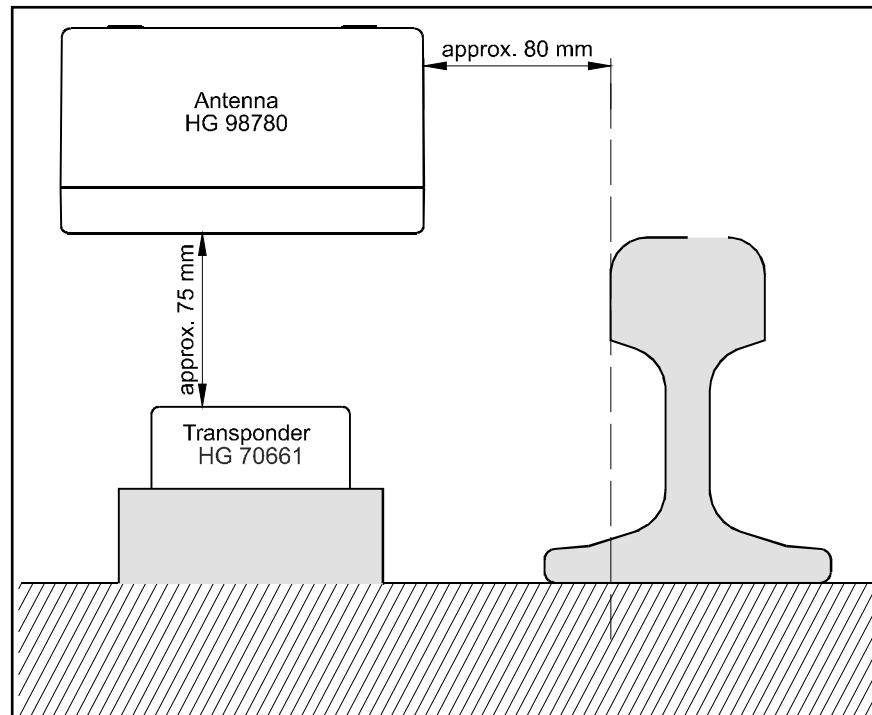
Figure 36 Attenuation of the sum voltage as a function of the conductivity of the water (75 mm water level)



Install the transponder slightly elevated, so that it will not be completely submerged under salt-saturated water.

11.5 Mounting next to Massive Metal Structures

Figure 37 Recommended distances to massive metal structures



11.6 Procedure 3964R

For the computer interconnection between antenna <=> PLC a 3964R-Protocol may be used. As the antenna outputs data cyclically, this results in some simplifications for the implementation of the 3964R. The following diagrams describe the procedure.

The following settings need to be observed:

- Transponder system has lower priority
- Data transfer is set to 1 start bit, 8 data bit, even parity, 1 stop bit, baud rate 9600 baud (default) or 19200 baud.

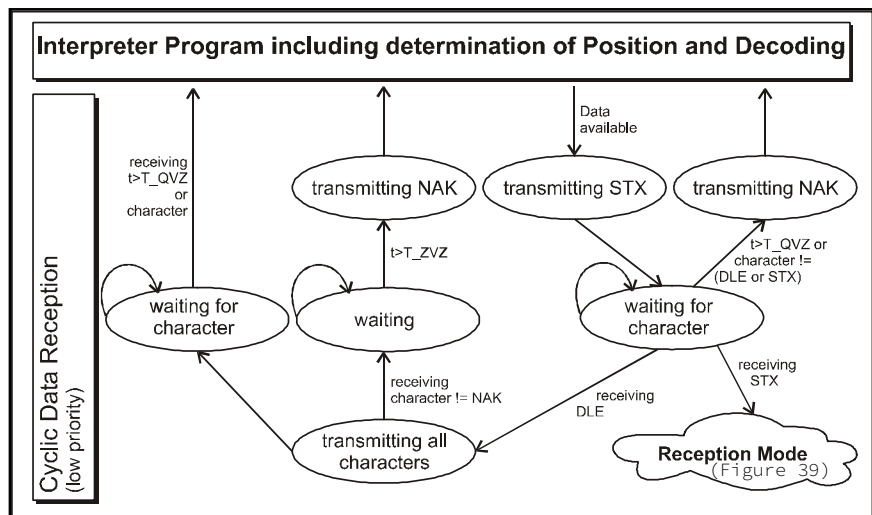
11.6.1 Data direction antenna -> PLC

In this direction the antenna data is transmitted cyclically. A set of data always starts with an "="-character (hex 0x3d). The cycle time is parameterizeable and should be an integer part, or a multiple thereof, of the transponder code's transmission time. For this system, the duration for the transponder code transmission is 8 ms. The minimum cycle duration depends upon the telegram length, therefore on the baud rate and the selected telegram content.

In the following status diagram

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

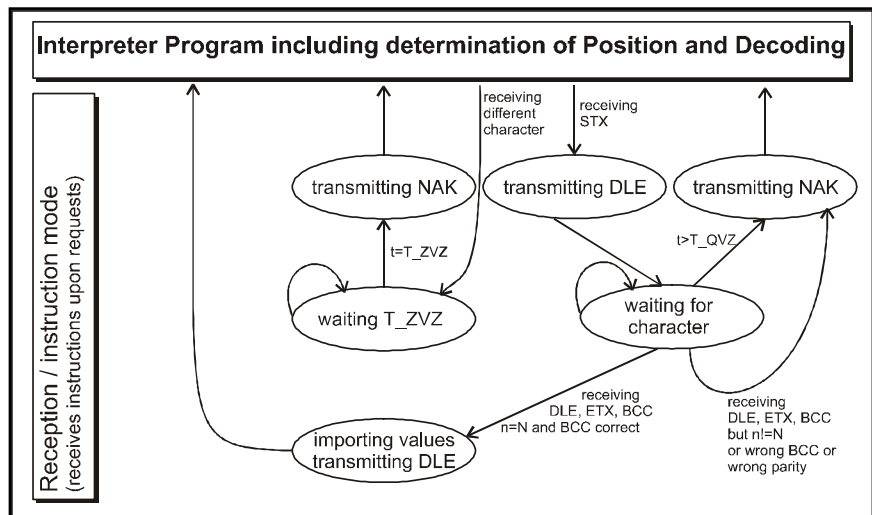
Figure 38 Status diagram procedure 3964R; Antenna → PLC



11.6.2 Data direction PLC → Antenna

In this direction, commands are transmitted only when required (e. g. when the reference transponder is activated). To overcome the frequent cyclical data output of the antenna, the 3964R of the antenna has a lower priority (see Figure 38).

Figure 39 Status diagram procedure 3964R; PLC → Antenna



11.7 Procedure „transparent“

For the interconnection antenna ↔ PLC a transparent protocol may be used. The following settings are necessary for the data transmission:

- ♦ 1 start bit, 8 data bit, even parity, 1 stop bit, baud rate 9600 Baud (default) or 19200 Baud.

11.7.1 Data direction antenna → PLC

In this direction, antenna data is transmitted cyclically. The duration is configurable, it should take an integer part, or multiple thereof, of the transponder code transmission time. The minimum cycle duration depends upon the telegram length, therefore on the baud rate and the selected telegram content.

A set of data always starts with an “=”-character (hex 0x3d), followed by the accordingly selected parameters from the menu. The telegram is terminated with an 8 bit check character (incl. start character). This check character is the result of ex-oring all characters. The characters are transmitted without delay.

11.7.2 Data direction PLC -> antenna

Commands are transmitted in this direction upon request. Each command has to start with an “=”-character (hex 0x3d). The format of the commands is described in Table 12 „List of System Commands“ auf Seite 23. The telegram is terminated with an 8 bit check character over all characters (incl. start character). The characters are transmitted without delay. The characters have to be received within the parameterizeable character delay time. Otherwise the telegram will be chopped.

11.8 GSD File (Antenna HG 98780XA/YA with Profibus)

The latest version of the GDS files can always be downloaded from our website.



<http://www.goetting-agv.com/components/98780>

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