Positioning and Identification Antenna

– 13.56 MHz, one-dimensional –

HG G-98780-A

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1 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.

Unlike Transponder Positioning System S_I13933 (128 kHz operating frequency), 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.

1.1 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 98780-A with different interfaces (see Table 1 on page 6)
2. Transponder HG 70661 (on the pavement)
3. Optional interface HG 06150-A serial/parallel converter
4. Optional desktop reading and programming unit HG 81830VA (not shown in picture)

1.2 Function

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-98780***Z***A.

<table>
<tr><th colspan="5">HG G-98780?A</th></tr>
<tr><th>Variant</th><th>Profibus</th><th>CAN Bus</th><th>RS 422</th><th>RS 232</th></tr>
<tr><td>ZA</td><td></td><td>X</td><td>X</td><td></td></tr>
<tr><td>YA</td><td>X</td><td></td><td></td><td>X</td></tr>
<tr><td>XA</td><td>X</td><td></td><td>X</td><td></td></tr>
<tr><td>WA</td><td></td><td>X</td><td></td><td>X</td></tr>
<tr><td rowspan="2">UA</td><td>X</td><td></td><td>X</td><td></td></tr>
<tr><td colspan="4">Similar to variant XA but with 4 m cable tails:
- 1 x Power/Serial
- Additionally the following connector options can be ordered
  - 1 x Profibus & 1 x Profibus Terminating Resistor
    If the antenna is to be the last device on the Profibus
  - 2 x Profibus
    If further devices follow on the Profibus</td></tr>
</table>

Table 1 Overview of HG G-98780-A variants

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 4.3 on page 27).

1.3 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 20 on page 31) must exceed the set threshold for `Level for Positioning` (refer to section 5.2.2.2 on page 33).
- A transponder code must be decoded without error.

- The measured voltage X must fall below a certain threshold (refer to Table 20 on page 31).

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 5.2.2.2 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 A on page 48), 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 B on page 51 shows the locations of the positioning pulse related to the X and Y coordinates and the reading height.

2 Mounting

2.1 Transponders

2.1.1 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.

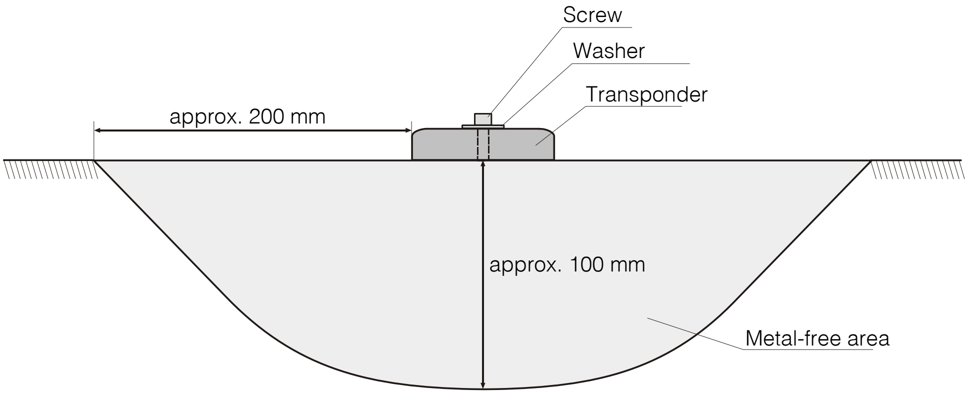


Figure 2 Minimum iron-free area around Puck Transponder HG 70661

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 26 on page 53). It is essential, that the transponder **does not dip into the meshs/loops of steel reinforcement grids**. Single metal rods, on the other hand, hardly have any influence on the performance.

2.1.2 Mounting Instructions

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.

2.2 Antenna HG 98780-A

ATTENTION! Make sure the antenna is mounted correctly with regards to its reading side!

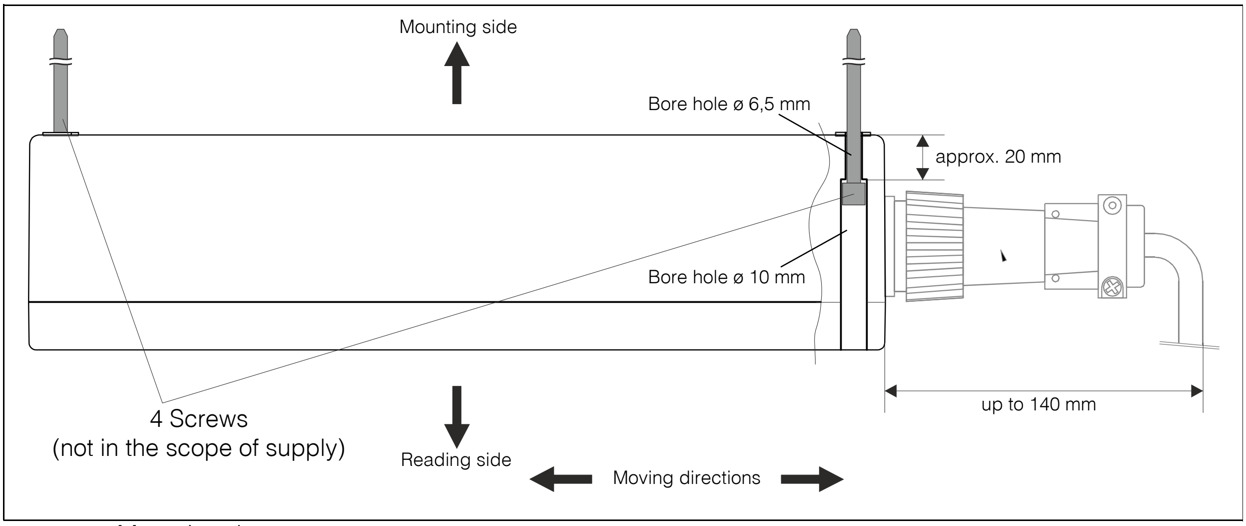


Figure 3 Mounting the antenna

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).

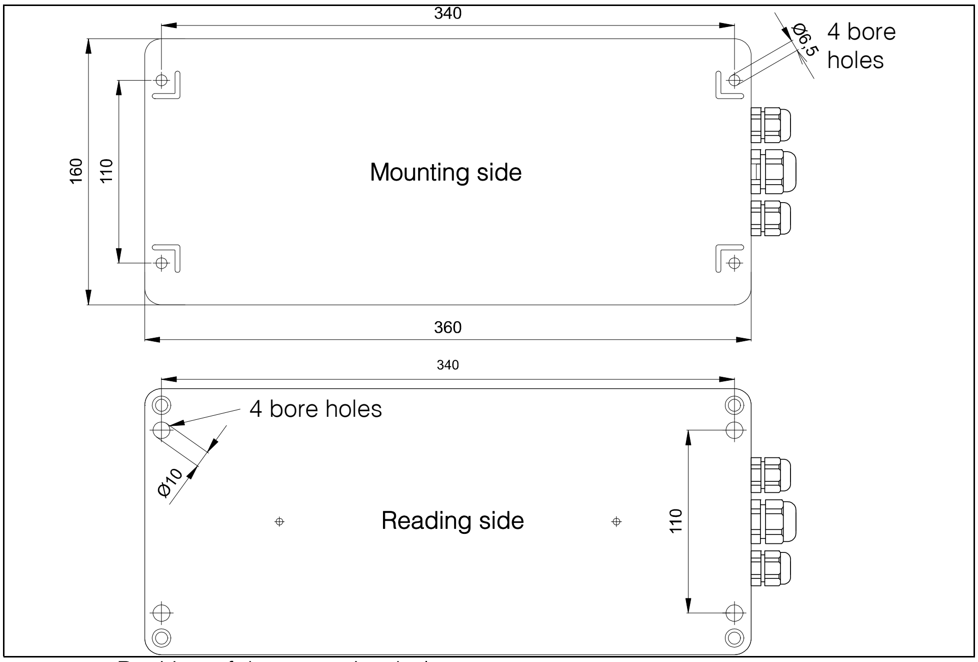


Figure 4 Position of the mounting holes

In order to prevent any adverse effects on the system:

- The space above and around the antenna should be metal-free.
- 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.

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

2.3 Interface HG 06150ZA/XA (optional)

The optional interface has to be mounted in a climated enclosure on a mounting bar with the following connections:

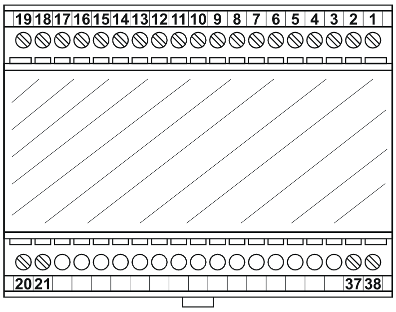


Figure 5 Outline of the interface mounting bar case

Interface connection plan					
1	Code Bit 1 (lowest Bit)	15	Code Bit 15	
2	Code Bit 2	16	Code Bit 16 (highest Bit)	
3	Code Bit 3	17	Data Ready	
4	Code Bit 4	18	Data Valid	
5	Code Bit 5			
6	Code Bit 6			
7	Code Bit 7			
8	Code Bit 8			
9	Code Bit 9			
10	Code Bit 10		**Version ZA**	**Version XA**
11	Code Bit 11	20	Rx+ (RS 422 input)	RxD (RS232 Input)
12	Code Bit 12	21	Rx- (RS 422 input)	not connected
13	Code Bit 13	37	+24 V operating voltage	
14	Code Bit 14	38	GND ground	

Table 2 Interface connection plan

3 Installation / Commissioning

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

Connect all necessary cables. 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 5 on page 28. Then start the monitor program as described in section 5.2 on page 29.

Default values In default the system uses the values of the file 1 (`Mon3964r.txt`; as listed in part 5.2.1 on page 29) with 9,600 Baud. Please keep in mind that another user could have changed these values.

1. 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.
2. For setting the decoding thresholds (refer to section 5.2.2.2 „(T)ime & Code“ on page 33) it is useful, to record a complete test run along the transponder track. Antennas **HG 98780ZA** and **HG 98780WA** offer for this function the use of the serial interface (section 5.2.2.6 „CS(V)“ on page 38) or the CAN Bus Message Object 3 (section 4.2.6.4.4 on page 24 or 5.2.2.4 „C(A)N Parameters“ on page 36).
   Antennas **HG 98780YA** and **HG 98780XA** offer for the same function the serial interface (refer to section 5.2.2.6 on page 38) or the Profibus interface (refer to section 5.2.2.5 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 5.2). This procedure ensures that the system is commissioned correctly.

4 Components and Operation

4.1 Operation Conditions

Reference marks are the Puck Transponders HG 70661. The transponder data is configurated 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 C on page 53 in the appendix.
- Metal structures around the antenna.
- For influences of snow, ice and water refer to section D on page 54 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 E on page 55 in the appendix.

4.2 Positioning Antenna on the Vehicle / Crane

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

Figure 6 Positioning antenna HG 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 connecter is a 12-pin screw-in socket (Schaltbau, type M3) with gold plated pins.

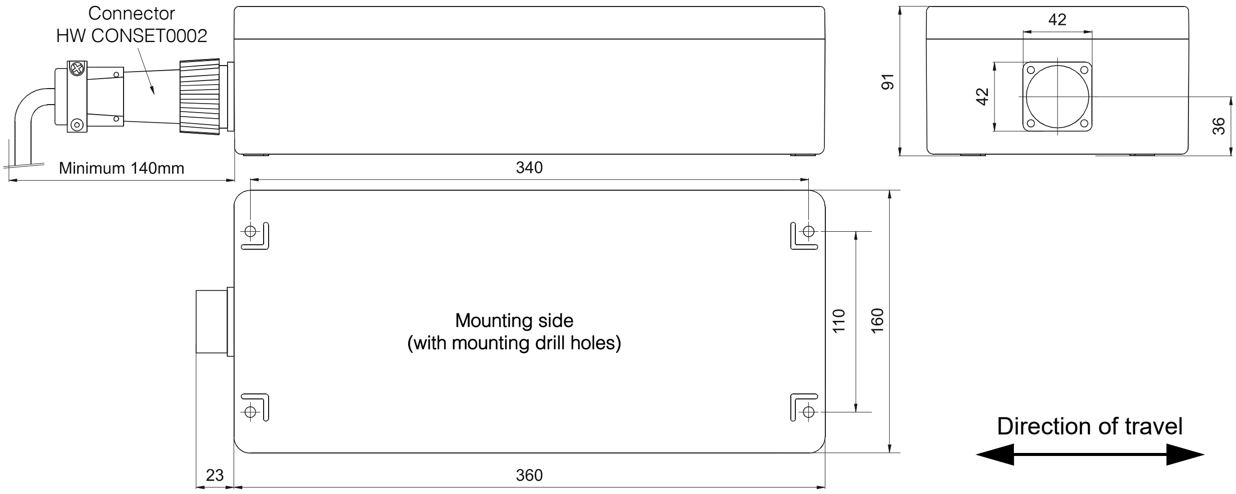


Figure 7 Outline antenna HG 98780ZA/WA (with casing dimensions)

For each antenna of this variant a connector HW CONSET00002 will be supplied (see Figure 7 above).

4.2.1.1 Connection plan of the 12-pin socket

The allocation of contacts is as follows:

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 4.2.4 on page 18)	
10	- Posi Pulse (see section 4.2.4 on page 18)	
11	CAN+	
12	CAN-	
PE	signal ground	

Table 3 Variant ZA/WA: Connection plan of the 12-pin antenna socket (CAN bus)

4.2.2 HG 98780YA/XA (with Profibus and RS232/RS422)

4.2.2.1 Dimensions

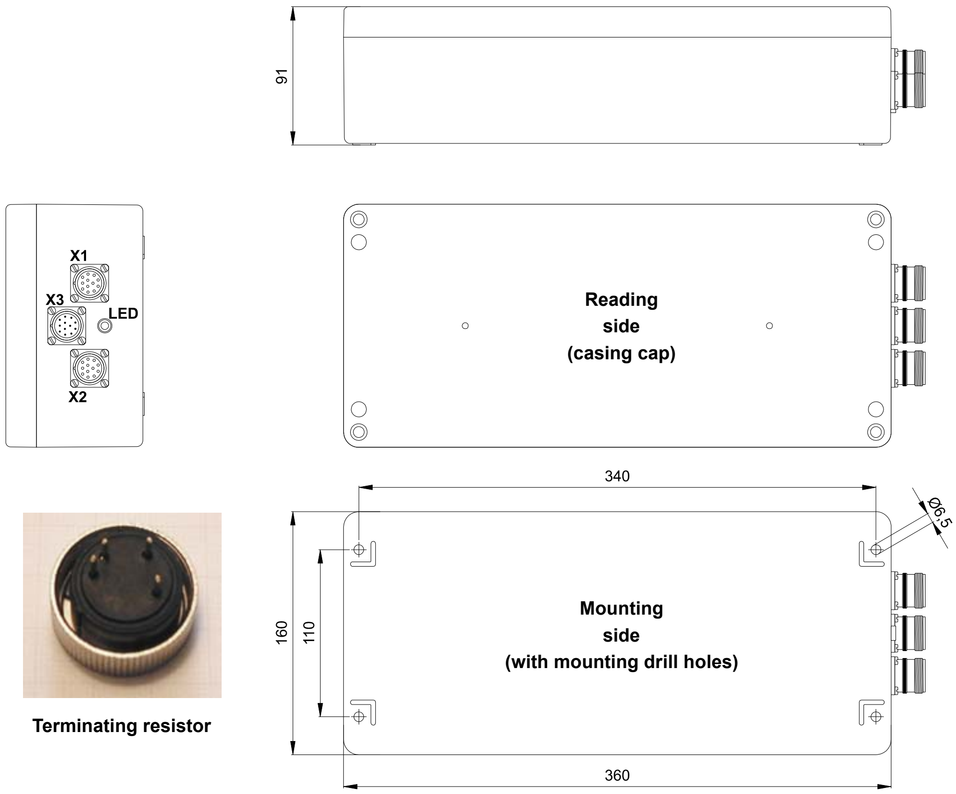


Figure 8 Outline of antenna HG 98780YA/XA (including housing dimensions and picture of the terminating resistor / Terminator)

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 sockets (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 sockets X1 and X2 (Profibus) or the connecter 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 mm^2. If the actual cable diameters do not match the pre-configured values the actual cable diameters have to be indicated on order.**

4.2.2.2 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 connecter for the power supply.

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 4 Variant XA/YA: Pin allocation of the 12 pin Profibus connectors X1 / X2

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 4.2.4 on page 18)	
10	- Posi Pulse (see section 4.2.4 on page 18)	
11	n. c.	
12	signal ground	
housing	shield	

Table 5 Variant XA/YA: Pin allocation of the 12 pin connector X3 for the antenna power supply/serial

4.2.3 HG 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 connector options can be ordered
  - 1 x Profibus X1 & 1 x Profibus Terminating Resistor
    If the antenna is to be the last device on the Profibus
  - 2 x Profibus X1/X2
    If further devices follow on the Profibus

4.2.3.1 Dimensions

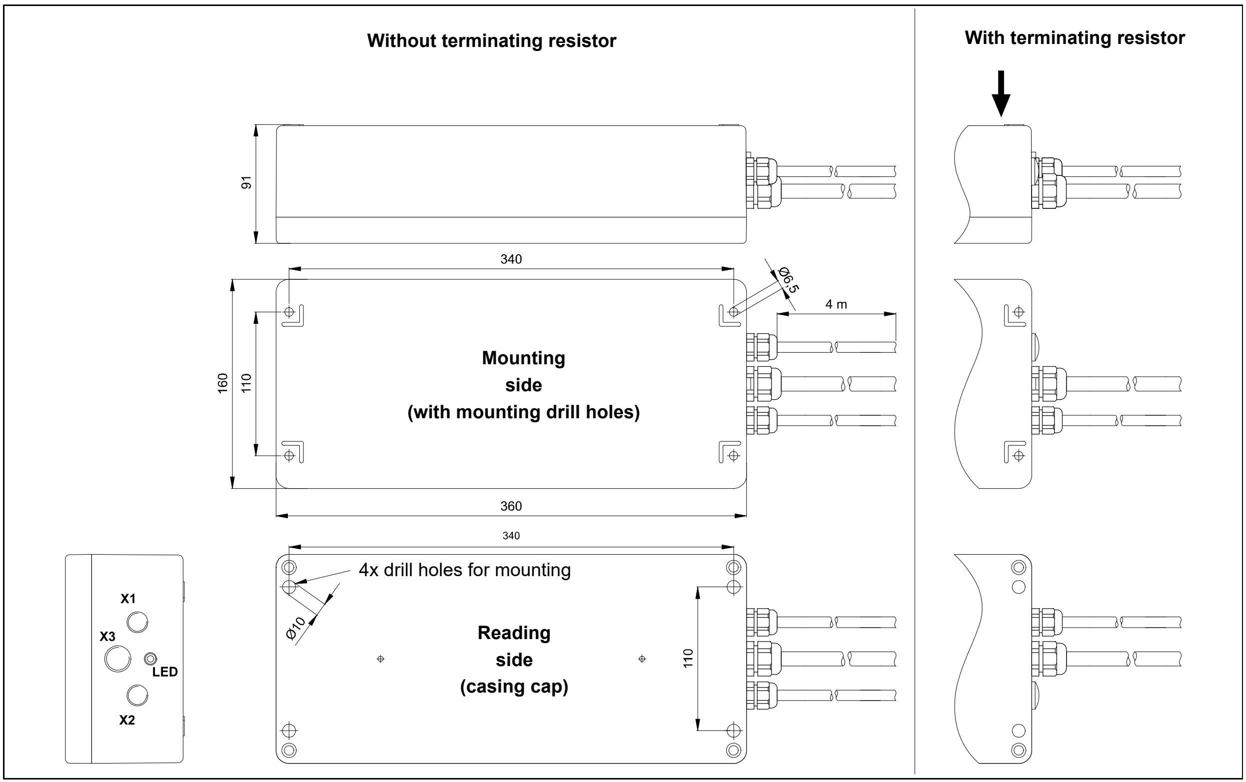


Figure 9 Outline of antenna HG 98780UA with/without terminating resistor

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**.

4.2.3.2 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.

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

Table 6 Variant UA: Pin allocation of the Profibus cable tails X1/X2

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

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 4.2.4 on page 18)
10	- Posi Pulse (see section 4.2.4 on page 18)
11	n. c.
Green-yellow	signal ground
Shield	

Table 7 Variant UA: Allocation of the cable tail X3 antenna power supply/RS 422

4.2.4 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.

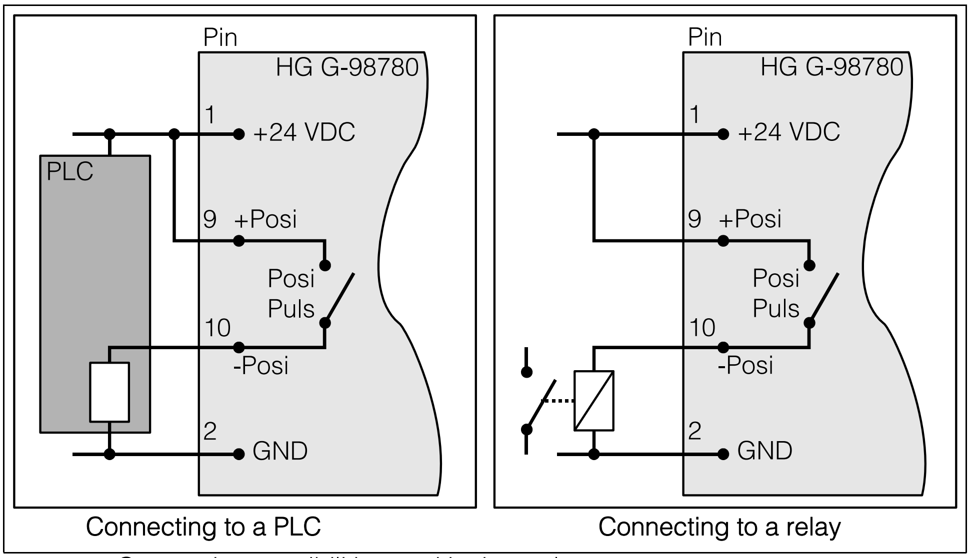


Figure 10 Connection possibilities positioning pulse

4.2.5 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 4.2.7 on page 26).

4.2.6 Interfaces

4.2.6.1 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.

4.2.6.1.1 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

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

Figure 11 Formula: minimum update rate

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:

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 [^{o} 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!

Table 8 Data words in a telegram of 15 (14) byte length

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

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		

Table 9 Possible system status messages

***)** 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).

4.2.6.1.2 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 G on page 57) 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:

No.	Description	Procedure		Start Char.	Command Byte	Parameter	Check Sum
1	Switching into monitor mode (described in section 5.2 „System monitor“ on page 29)	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 $tt_{16}tt_{16}$ For code „1234“ e. g. $12_{16}34_{16}$	
			ASCII		PL		
		transparent	HEX	$3D_{16}$	$50_{16}4C_{16}$		07_{16}
			ASCII	=	PL		
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 $tt_{16}tt_{16}$ For code „1234“ e. g. $12_{16}34_{16}$	
			ASCII		PH		
		transparent	HEX	$3D_{16}$	$50_{16}48_{16}$		03_{16}
			ASCII	=	PH		

Table 10 List of System Commands

Further information regarding command no. ...

1. 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.
2. 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.
3. The successful deactivation of the reference transponder is described by deleting the “0x0100“ bit from the system status.

4.2.6.2 System Monitor

In monitor mode, the system is configurable via a menu. Please refer to section 5.2 „System monitor“ on page 29.

4.2.6.3 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.

4.2.6.4 CAN Bus

4.2.6.4.1 Description

Either Basic- or Full-CAN mode are configurable. The system monitor is used for setting the CAN parameters (also refer to section 5.2.2.4 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 5.2.2.4 on page 36).

4.2.6.4.2 CAN Message Object 1 (Transmission Object)

Byte #	Length	Type	Description
1,2	2 Byte	Unsigned int	System status according to Table 9 on page 21
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

Table 11 Structure of the CAN Message Object 1

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

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

Table 12 Structure of the CAN Message Object 2

For interpreting the values of Message Objects 2 also refer to Table 8 on page 20. This Message Object is used for controlling parameters.

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

Byte #	Length	Type	Description
1,2	2 Byte	Unsigned int	System status according to Table 9 on page 21
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

Table 13 Structure of the CAN Message Object 3

For interpreting the values of Message Object 3 also refer to Table 8 on page 20. This Message Object is used for commissioning, service and troubleshooting.

4.2.6.4.5 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.

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

Table 14 Structure of the CAN Message Object 4

4.2.6.5 Profibus

4.2.6.5.1 Profibus Input Bytes

Number 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 [^{o} 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)	
*) = for correspondingly set `Order of Data Transfer` (refer to section 5.2.2.5 on page 37).					

Table 15 Profibus Input Bytes

The description of these values is also included in Table 8 on page 20. Depending on the configuration of the master using the GSD files (refer to appendix, section H on page 57) 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 15).

4.2.6.5.2 Output Bytes

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

Number 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	

Table 16 Profibus Output Bytes

Depending on the configuration of the master using the suitable GSD file (refer to Appendix, section H on page 57) the corresponding number of output bytes is transmitted. Values 1 and 5 are the options for the number of output bytes (refer to Table 16).

The instruction byte is defined as follows:

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

Table 17 Significance of the instruction bit

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 wit 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.

4.2.7 Software download

If necessary, the antennas may be updated via the serial interface. Please refer to chapter 5.3 „Software Update (Antenna Software)“ on page 39.

4.3 Accessories (optional)

4.3.1 Serial/parallel Converter HG 06150ZA/XA

Figure 12 Converter HG 06150XA 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 (XA) 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 5.2.2.3 on page 34). The Baud rate must be set to 19200 Baud.

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

Table 18 Output format when using the serial/parallel interface

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.

5 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.

NOTE! 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.

5.1 Terminal program

This section refers to the program **HyperTerminal®** (`Hypertrm.exe`), which is part of the scope of supply of Microsoft® Windows®. We usually use this program because many of our customers are already familiar with it and, due to the configuration files supplied by us, it is very easy to use.

Nevertheless, any other terminal program, that is capable of VT52 emulation, may be used. If you should use a different program, please read its manual and adjust it to the values described in section 5.1.1 below.

5.1.1 Parameter presettings

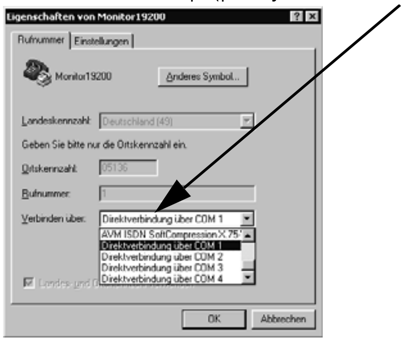
Dependent on whether you want to run the monitor program or the software update, different parameters are necessary. If you are using HyperTerminal, you do not need to enter these parameters and can move on to section 5.2 on page 29.

Terminal settings monitor program (see section 5.2)	
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.)

Table 19 Terminal settings monitor program

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):



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

5.2 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.

5.2.1 How to start the monitor program

Depending on the currently active procedure, the monitor program is started differently (refer to section 5.2.2.3 on page 34).

5.2.1.1 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 5.2.1.2 may be ignored.

5.2.1.2 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 at 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 5.1.1).

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`

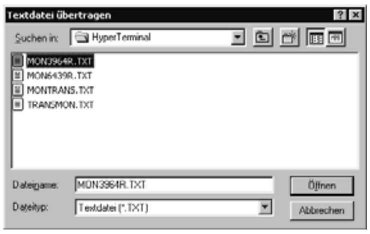
2. `Mon6439r.txt`
   Transfer if the system is preset to procedure **3964R** with „**LowByte first**“. The file contains in hexadecimal notation the following characters:
   `0x02 0x4F 0x4D 0x49 0x4E 0x10 0x03 0x16`

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:

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



2. Switch to disk drive (in our example, the files are located on the hard disk) and select the respective *.txt file.

3. 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 13).

5.2.2 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 5.2.1) 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.

5.2.2.1 Main menu

```
S:0568   X:+0000   Code: 00000000  Read:      0
U[/mV]:24000  I[/mA]: 150  T[Grd.C]:+28     E: 0200 N:      0
Ftx[/Hz]:105960    Prog_Code: 00000000



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

    (P)assword
    (L)oad Values to EEProm
    (E)rror ?
    Cs(v) (38,4 KB  Code(5d),Sum(4d),Tr(1),Co(1),+-(1),Po(1),Cnt(1d)<crlf>)
    (B)oot Load
    Serv(i)ce Menu
    (Q)uit Monitor

    Software Version  98780A11.00 / 31.OCT.2005    Serial Number: 9999999
```

Figure 13 Main menu of the monitor program

Each of the screen menus contains important system variables in the first three lines (refer also to Table 20), as they also appear in the output telegram (described in section 4.2.6.1.1 on page 19). The last line on the screen contains possible status messages, if e. g. predetermined value ranges have not been observed during input.

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^{o} C steps. The sensor is located near a cooling sheet.

Table 20 Description of the system variables (monitor program) (Abschnitt 1 von 2)

Description of the system variables	
E	System status expression in hexadecimal notation. The single bits are explained in Table 9 „Possible system status messages“ on page 21.
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.

Table 20 Description of the system variables (monitor program) (Abschnitt 2 von 2)

Other menus are activated by pressing the (characters in brackets). Before altered values are transferred into the permanent memory, the pass word **815** has to be entered by pressing P. This prevents unintended alterations of values. With L the values are saved after their alteration and input of the password.

System status are explained in plain text upon pressing E. Typing C deletes the error display. Quit the menu by pressing Q.

The following sections describe one by one the menus

- (T)ime & Code (section 5.2.2.2 on page 33)
- (S)erial Output (section 5.2.2.3 on page 34)
- C(A)N Parameters (section 5.2.2.4 on page 36)
- P(R)ofibus-Parameters (section 5.2.2.5 on page 37)
- CS(V) (section 5.2.2.6 on page 38)
- (B)oot Load (section 5.2.2.7 on page 38).
- (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.

5.2.2.2 (T)ime & Code

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

```
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 Menue
```

Figure 14 Menu: (T)ime & Code

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].

5.2.2.3 (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 5.2.1 on page 29).

```
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)tinous Telegrams                          0
    (S)erial Data Period        [1..1000ms]:       8




    (Q)uit Menue
```

Figure 15 Menu: (S)erial Output

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 8 „Data words in a telegram of 15 (14) byte length" on page 20, 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 16 on page 35). In this example the mask has the value 0xff. Press any key to return to the menu `Serial Output`.

```
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
```

Figure 16 Output „(D)isplay Telegram Content“

The parameter “(C)har Delaytime“ is the so-called character delay for procedure 3964R (refer to appendix, section F „Procedure 3964R“ on page 55) and the time out period for incoming characters for the transparent procedure (refer to appendix, section G „Procedure „transparent““ on page 57).

N either activates the permanent output, according to the `Clock for Sampling` set in Time&Code (`1`; refer to 5.2.2.2 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.

5.2.2.4 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.

ATTENTION! In case the CAN bus is not connected, it is essential to deactivate this function, as transmission errors will lead to antenna reset while the CAN bus it activated!

```
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)tinous Telegrams                         0
    CAN on Re(m)ote Request                       0
    Data (P)eriod            [1..1000ms]:         8
    (Q)uit Menue
```

Figure 17 Menu: C(A)N-Parameter

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 Identifier (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 11 on page 23) and to received frames for Message Object 4 for the reference transponder (Table 14 on page 25), respectively. The Identifier adjustable via A refers to Message Object 2 (Table 12 on page 24), D, accordingly, refers to Message Objects 3 (Table 13 on page 24). 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 5.2.2.2 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.

5.2.2.5 P(r)ofibus-Parameters

This menu enables setting the Profibus parameters.

ATTENTION! In case the Profibus is not connected and if the antenna in question is a version HG 98780ZA/WA (in contrast to versions YA/XA), the Profibus must (!) be deactivated. If the Profibus is not deactivated, transmission errors will lead to an antenna reset!

```
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
```

Figure 18 Menu: P(r)ofibus-Parameters

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 15 on page 25.

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

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 H on page 57, or download this file from our website
PB_OFFLINE	No contact to the master

Table 21 Possible Profibus Status Messages

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 15 on page 25).

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

5.2.2.6 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 5.1 on page 28). 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.

5.2.2.7 (B)oot Load

The `Boot Load` 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 5.3 on page 39.

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

1. `Open HEX- Flasher` (Open the flash program)
2. select the COM-Port which is currently used for the connection between the PC and the antenna
3. `prepare file input` (Select the HEX file that is to be programmed)
4. `then press any key` (Return to Hyperterm and hit any key)
5. `close within 20 sec COM port 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 5.2.1 on page 29).

5.3 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.

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

5.3.1 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:

1. Insert the CD into the CD drive of the PC
2. Open Windows Explorer and navigate to the CD
3. Copy the directory ST-Flash including all sub-directories and files onto your hard disk, e.g. into the director 'programs'
4. 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-Flas-`

`her.ini` and `Command.log`. Open the function features ('Eigenschaften') within the file menu of the Explorer and deactivate the parameter `Writing Protected`.

5. In order to start the program now, carry out the file `ST10-Flasher.exe`.

5.3.2 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 page 28). Start the update program on your PC as described in section 5.3.1 on page 39.

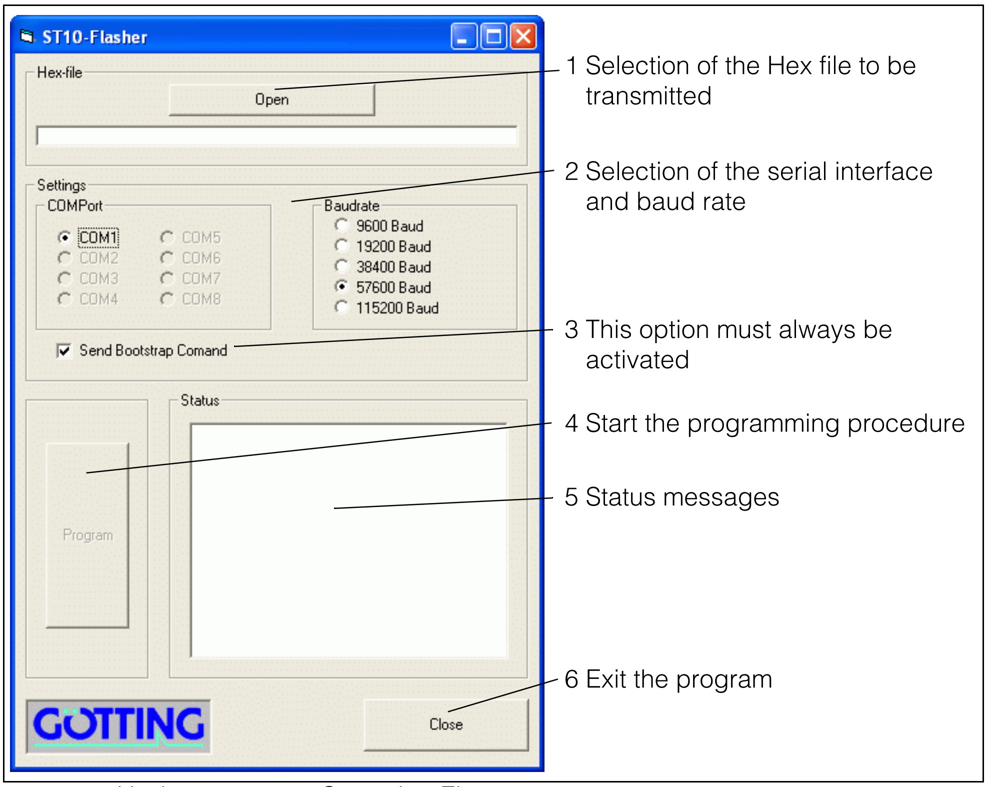
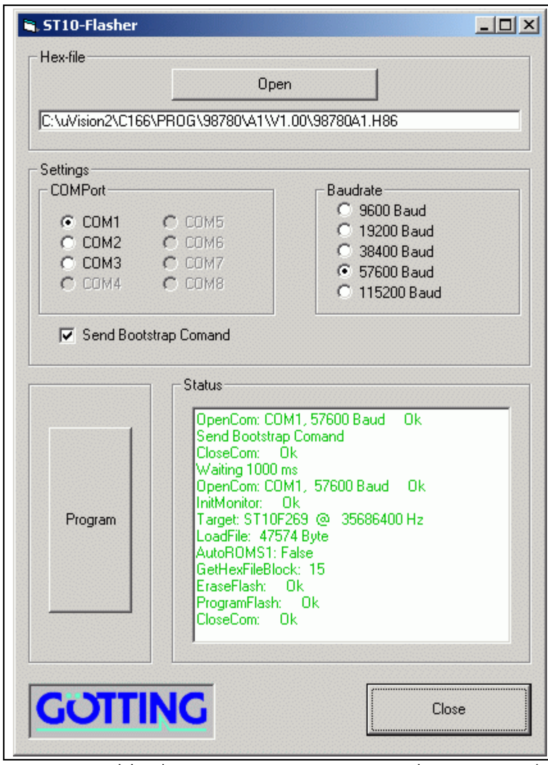


Figure 19 Update program: Operating Elements

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.



Should an error occur during the transmission, red coloured status messages are output. As long as green coloured messages are output, the software update is correct.

The last 2 messages of a normal update procedure are: `ProgramFlash: Ok` and `CloseCom: Ok`

Figure 20 Update program: programing procedure

Once the programing process is completed, the program can be closed (`close`). From now on, the interpreter uses the new program.

6 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 5.3 on page 39). Date and version of the current antenna software can be obtained from the main menu.

7 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.

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 labelled clamps in the clamping case.
No contact is possible, only unintelligible characters are sent.	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.	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.	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^{o} C). Measure the voltage 24 V at the corresponding clamps (+ 24 V heating).
No positioning pulse.	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

Table 22 Troubleshooting

8 Technical Data

8.1 Antenna

Antenna HG 98780-A		
Casing		Refer to Figure 7 on page 14
Effective antenna area		refer to appendix, Section A on page 48
Power supply		24 V ±10 %, approx. 600 mA, approx. 2 A heating
Protection		- Power 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 9
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 ±40 mm crosswise to the center of the antenna: 50 to 90 mm
	Nominal reading distance	75 mm
	Nominal writing distance	75 mm
	Position accuracy	refer to Section B on page 51
	Max. pass-over speed	8 m/s

Table 23 Technical Data Antenna HG 98780-A (Part 1 of 2)

Antenna HG 98780-A	
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.
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 23 Technical Data Antenna HG 98780-A (Part 2 of 2)

Electromagnetic Compatibility (EMC) of Antenna HG 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[a]
		Quick transients	EN 61000-4-4
	DC connections		
		High frequency asymmetrical	EN 61000-4-6 [a.]
		Impulse voltages	EN 61000-4-5

Table 24 EMC-Testing

a. Possible application for cable diameter 12 mm (e. g. Würth STARTEC 74271222)

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

8.2 Parallel converter (optional)

Parallel converter HG 06150ZA/XA (optional)	
Casing	28-pin mounting bar 75 x 75 x 47,5 mm L x W x H
Supply	24 V ±10 %, approx. 50 mA
Operating temperature	0 to +50° C
Mechanical stability	5 g 11 ms / 2g 10 to 55 Hz
Protection	IP 55
Connector	screw terminal
Data input	RS 422 (ZA), RS232 (XA)
Data output	16+2, 24 V, 20 mA, not potentially separated

Table 25 Technical Data Parallel converter HG 06150ZA/XA (optional)

9 Appendix

A 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 20 on page 31). As long as this voltage is > 200, transponder codes are correctly received.

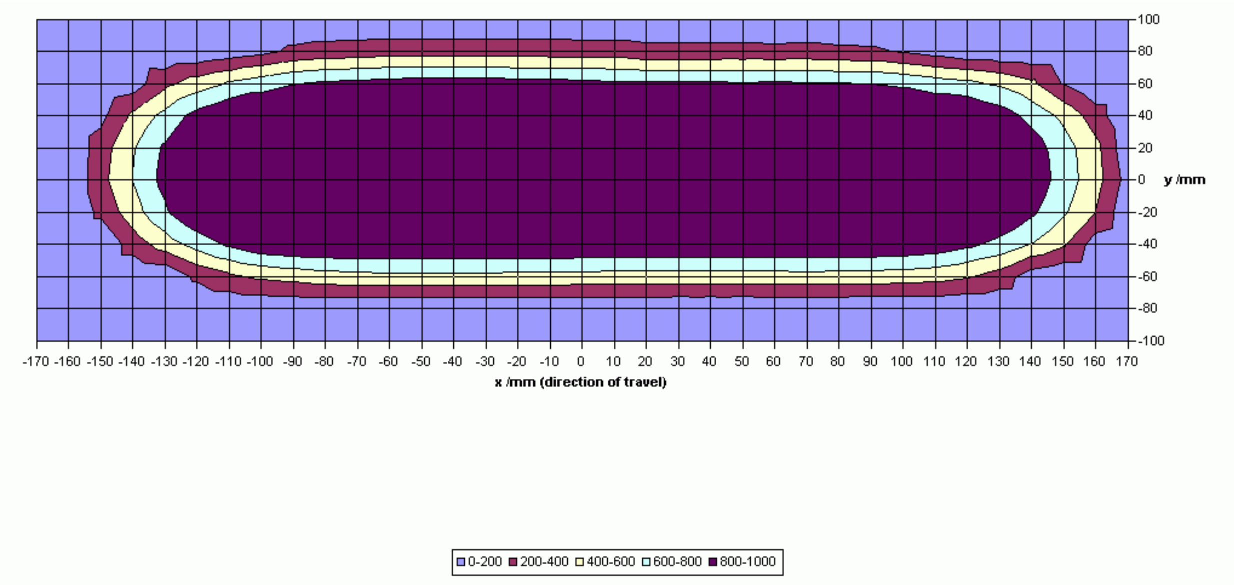


Figure 21 Diagram 1, Reception voltage S within the antenna area at a reading distance of 40 mm

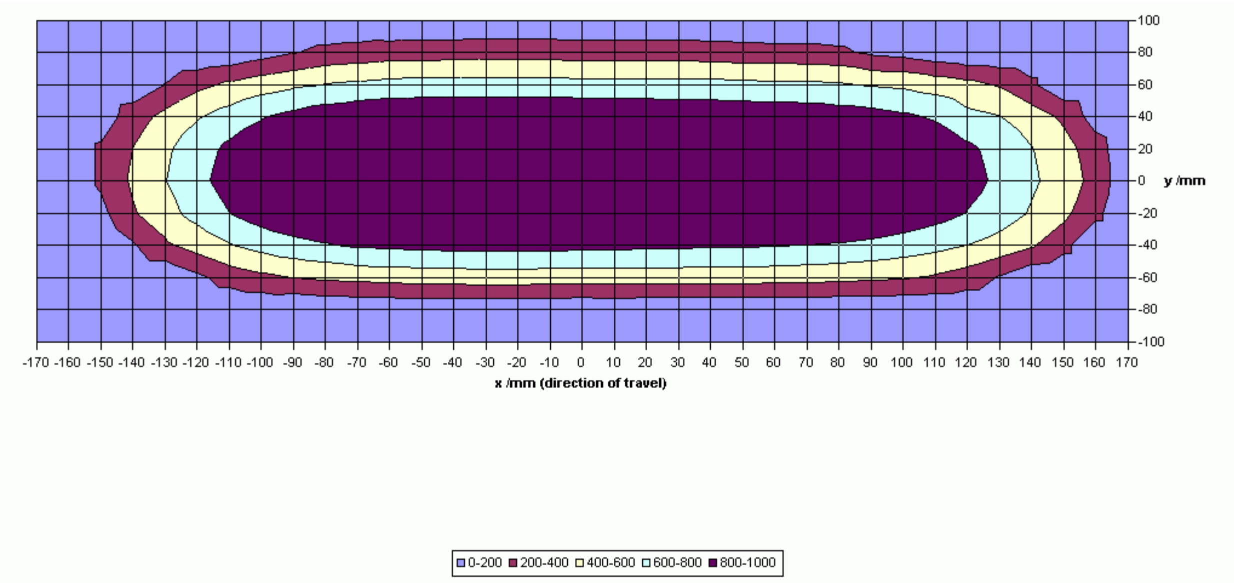


Figure 22 Diagram 2, Reception voltage S within the antenna area at reading distance 60 mm

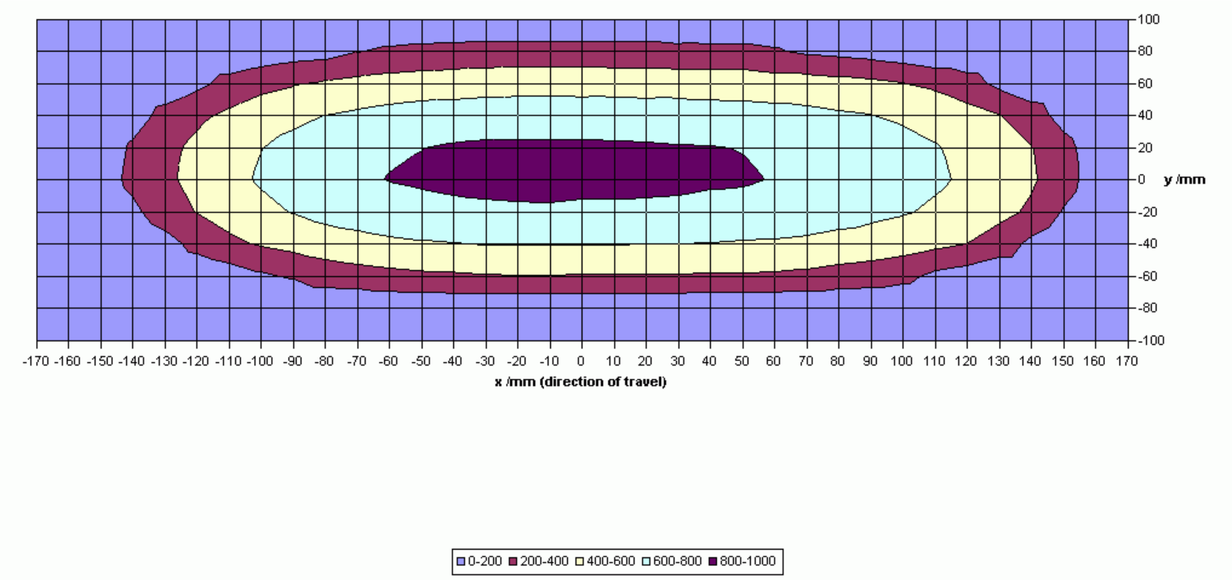


Figure 23 Diagram 3, Reception voltage S within the antenna area at reading distance 80 mm

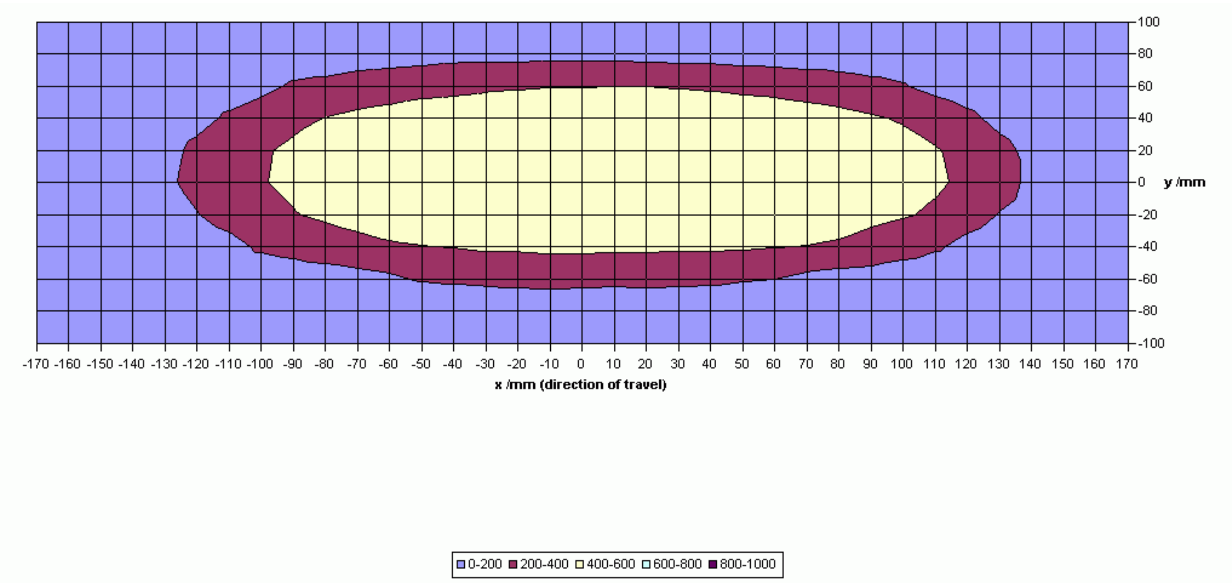


Figure 24 Diagram 4, Reception voltage S within the antenna area at reading distance 100 mm

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 20 on page 31).

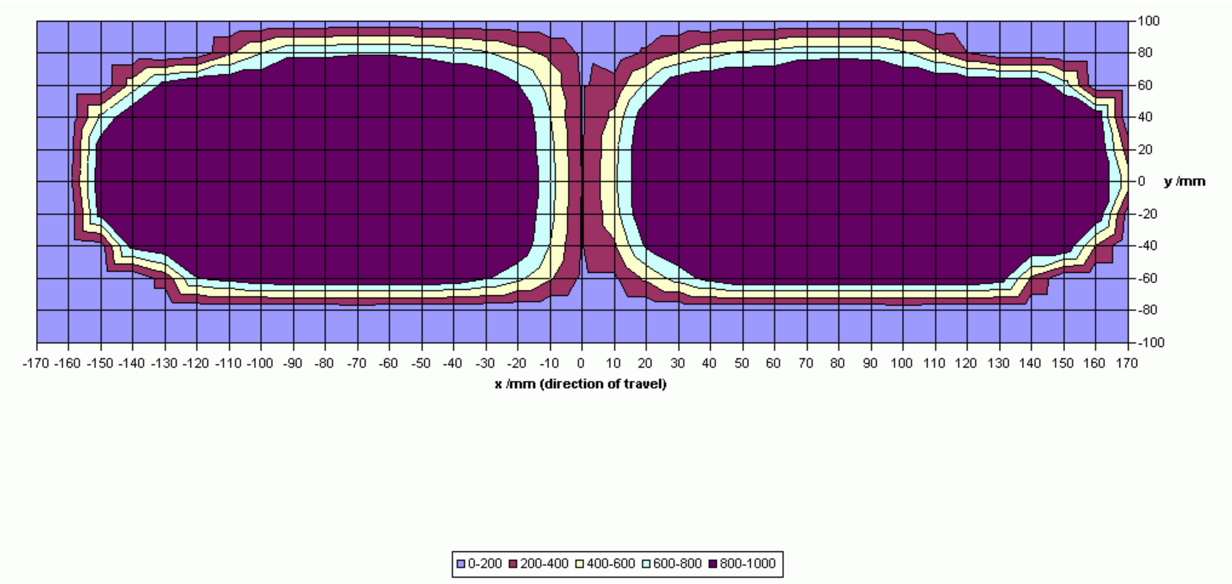


Figure 25 Diagram 5, Reception voltage X within the antenna area at reading distance 40 mm

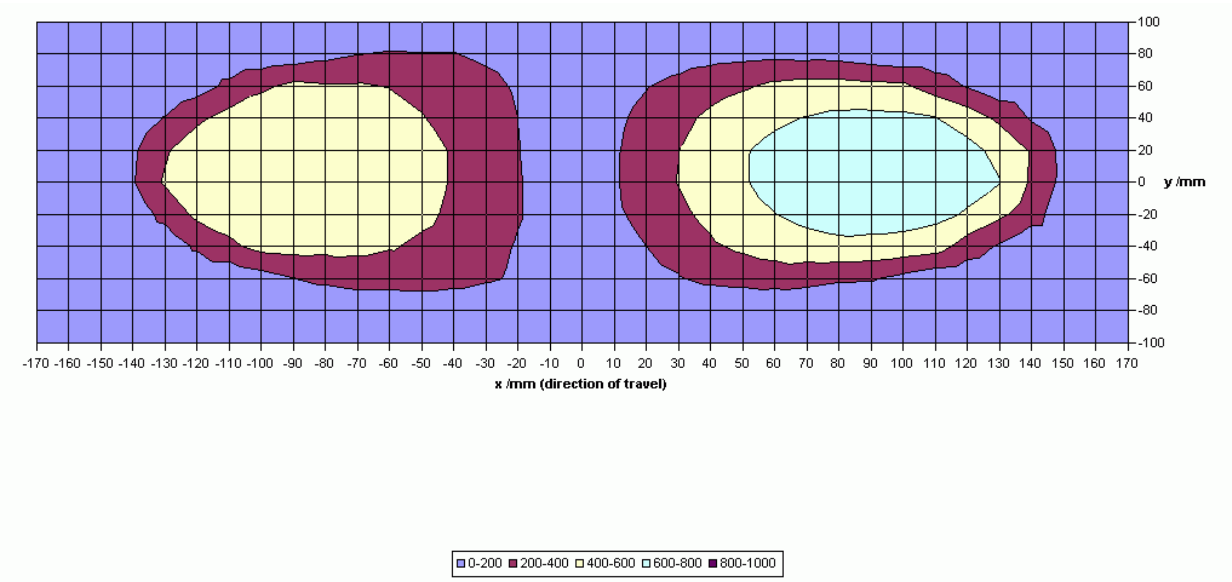


Figure 26 Diagram 6, Reception voltage X within the antenna area at reading distance 100 mm

B 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.

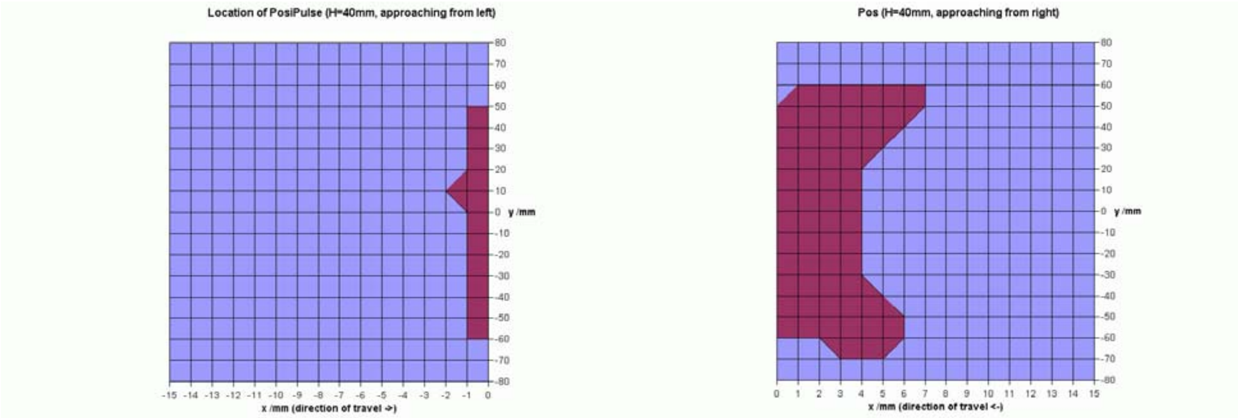


Figure 27 Diagram 1, Location of the generation of the Posipulse at reading distance 40 mm

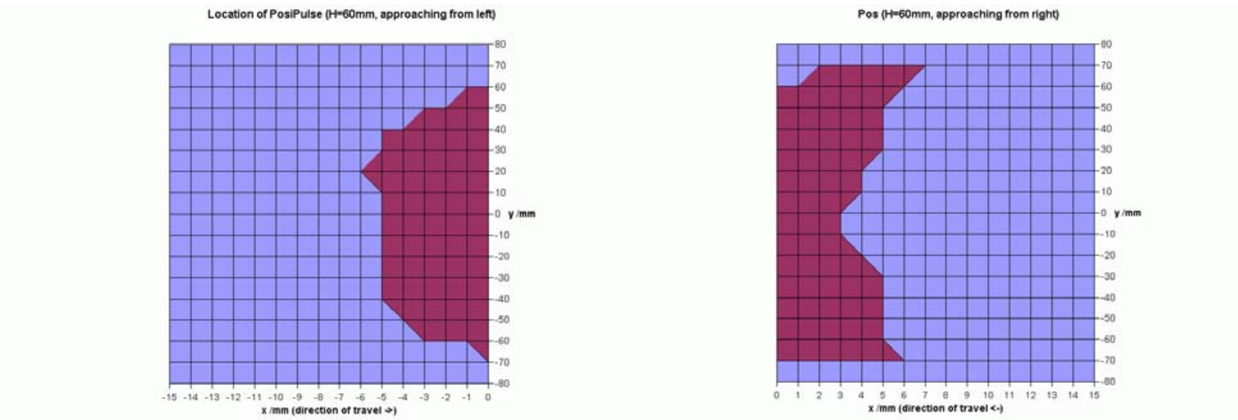


Figure 28 Diagram 2, Location of the generation of the Posipulse at reading distance 60 mm

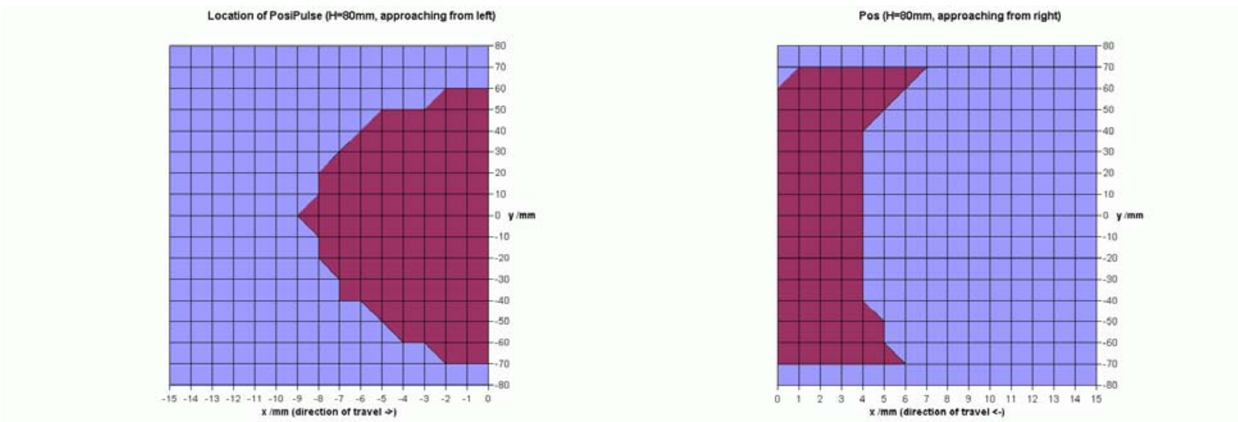


Figure 29 Diagram 3, Location of the generation of the Posipulse at reading distance 80 mm

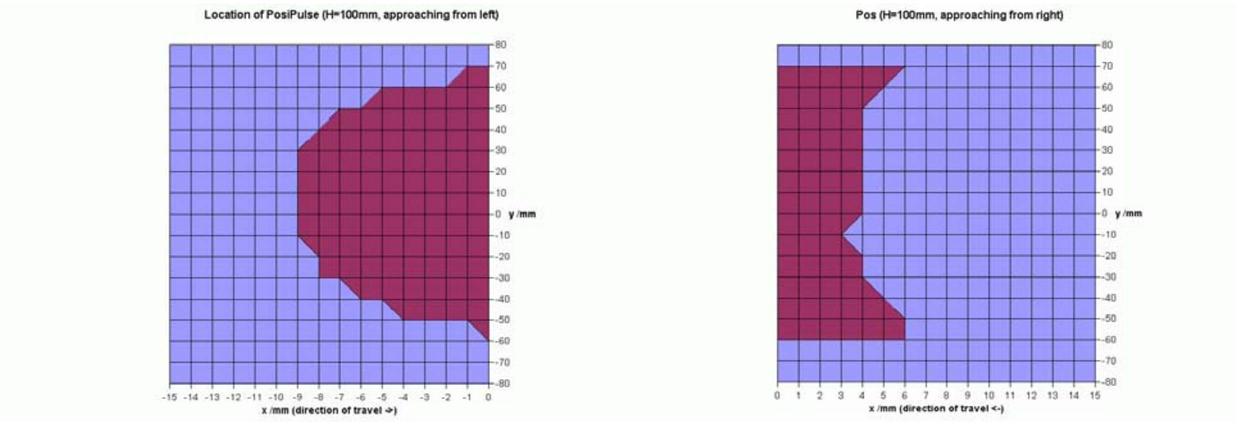


Figure 30 Diagram 4, Location of the generation of the Posipulse at reading distance 100 mm

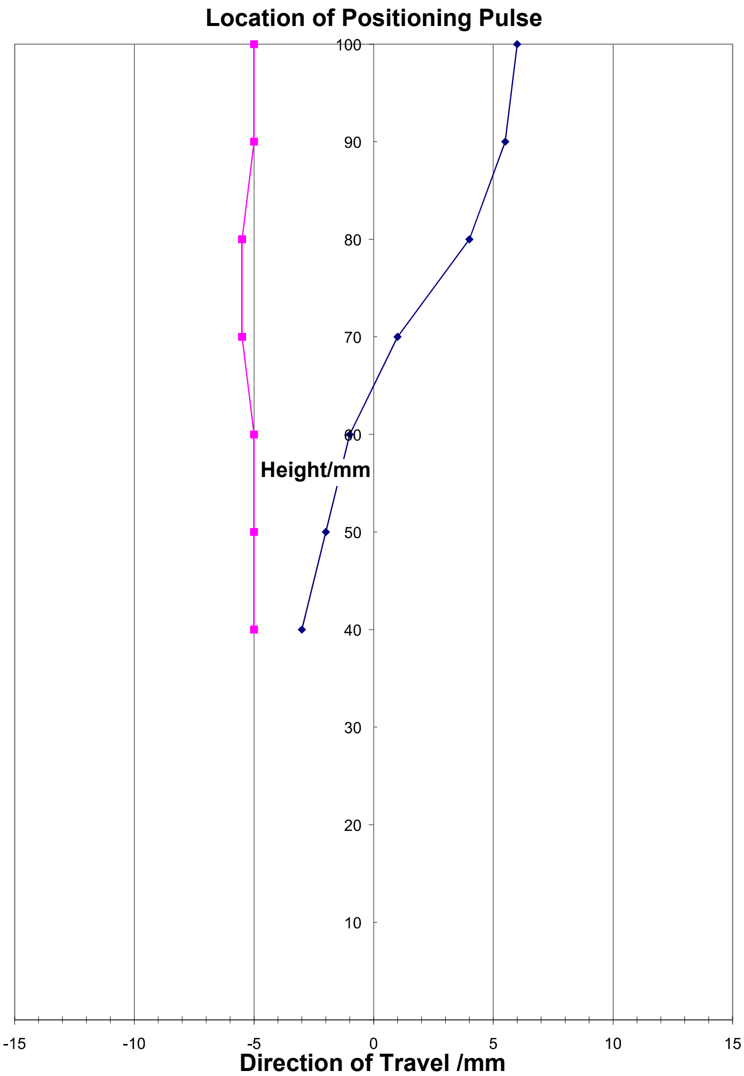


Figure 31 Diagram 5, Location of the generation of the Posipulse on the center axis at different reading distances

C Attenuation of the Reception Level caused by Metal

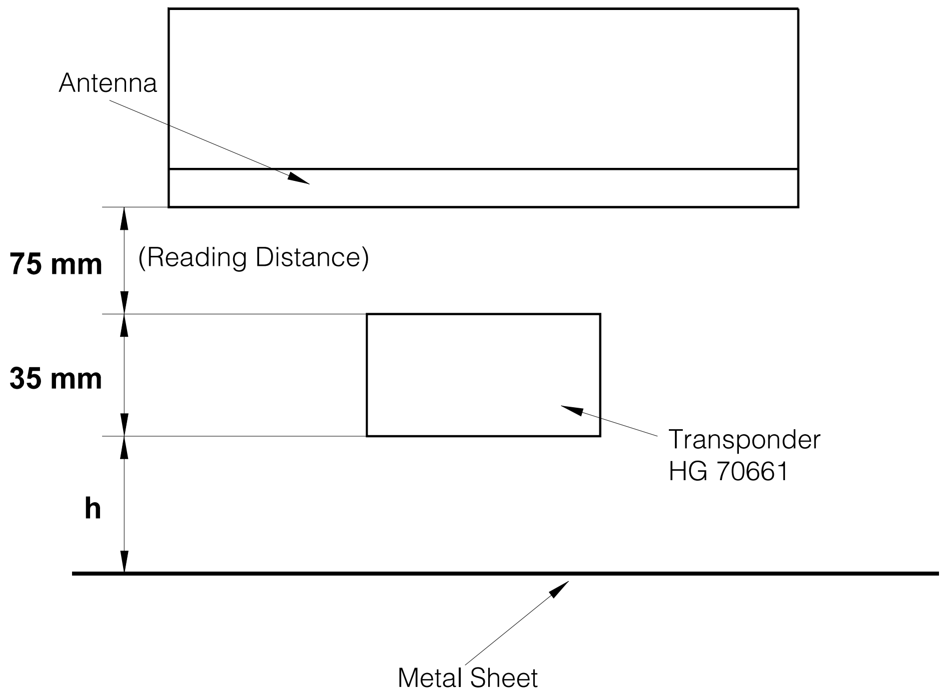


Figure 32 Attenuation of the reception level caused by metal

Height h [cm]	Signal [%]
0	34
1	56
2	70
3	78
4	83
5	88
6	94
7	93
8	96
9	97
10	99
↓	↓
∞	100

Table 26 Dependency of the signal strength on the distance between transponder and metal

D Influence of Water

Reading height was 80 mm [≅ 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.

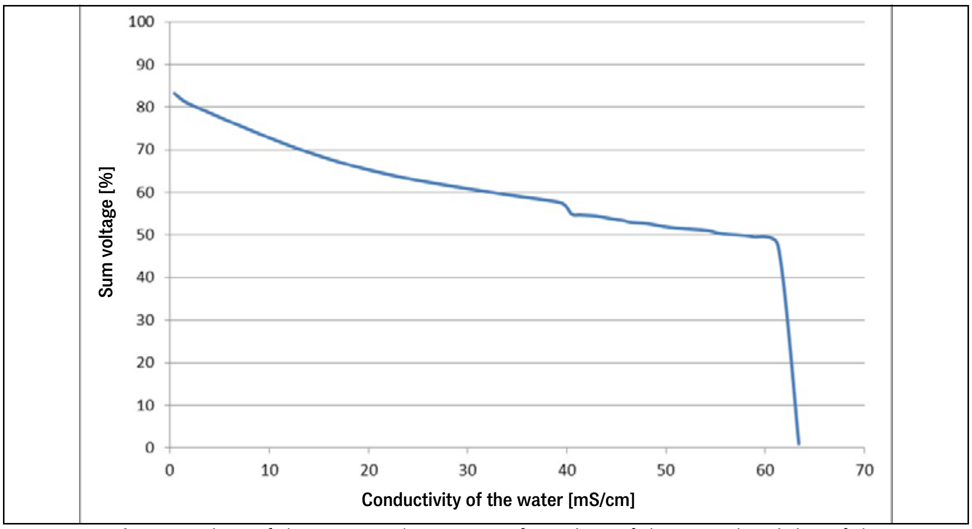


Figure 33 Attenuation of the sum voltage as a function of the conductivity of the water (30 mm water level)

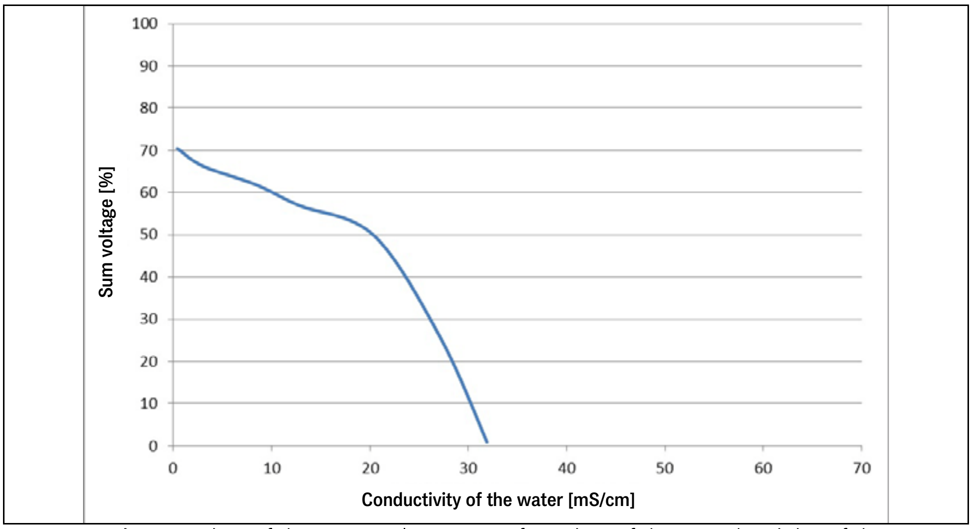


Figure 34 Attenuation of the sum voltage as a function of the conductivity of the water (75 mm water level)

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

E Mounting next to Massive Metal Structures

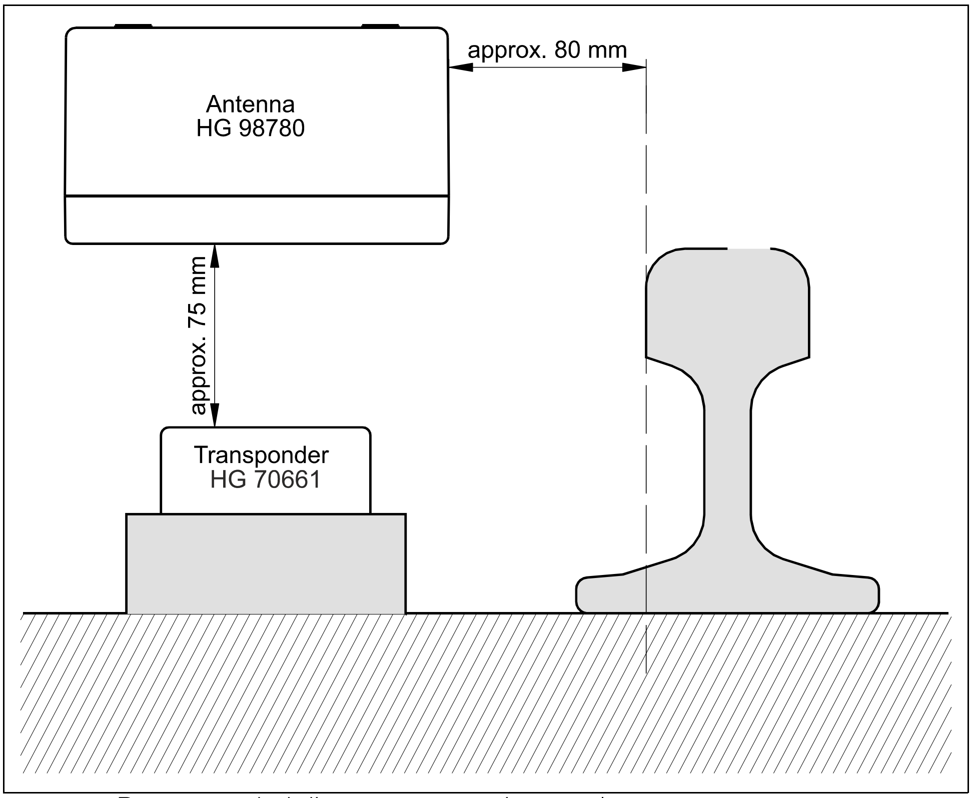


Figure 35 Recommended distances to massive metal structures

F 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.

F.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 acknowledgement delay.

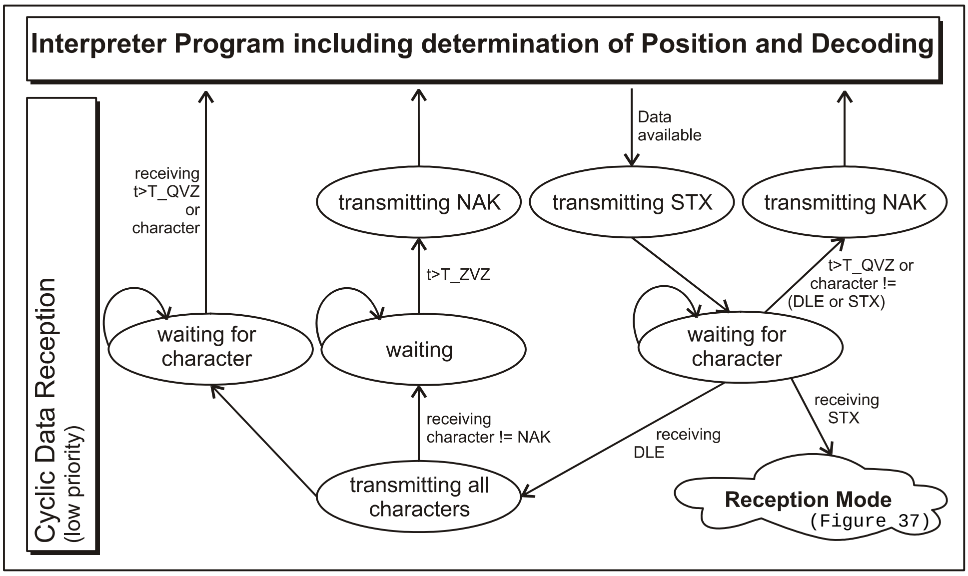


Figure 36 Status diagram procedure 3964R; Antenna –> PLC

F.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 36).

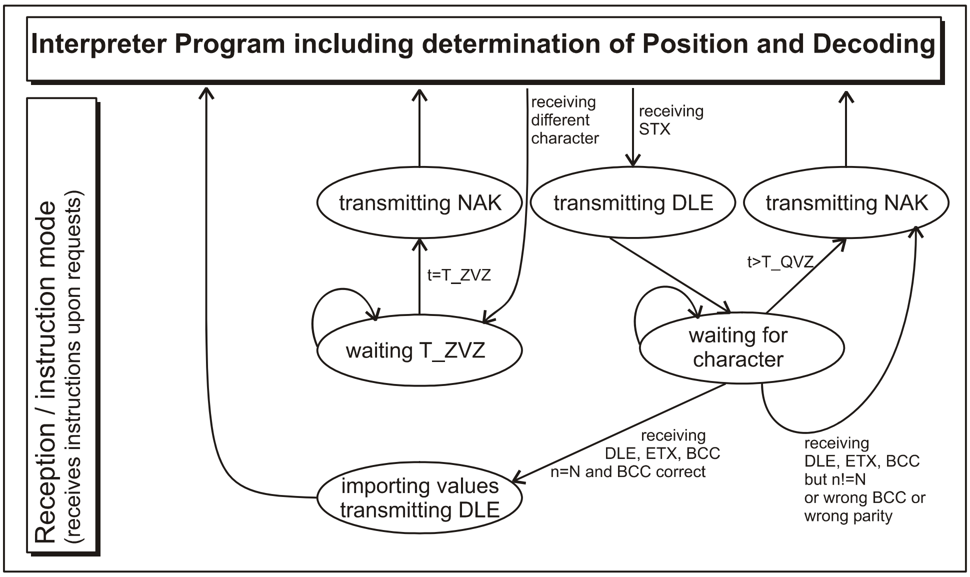


Figure 37 Status diagram procedure 3964R; PLC –> Antenna

G 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.

G.1 Data direction antenna -> PLC

In this direction, antenna data is transmitted cyclically. The duration is parameterizeable, 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.

G.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 10 „List of System Commands“ on page 22. 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.

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

The latest version of the GDS files can always be downloaded from our website at http://www.goetting-agv.com/components/98780.

10 Handbook Conventions

At the time this manual was printed, the following symbols and marks were used in all Götting KG documentations:

- For security advice, the following symbols stand for different degrees of danger and importance:

  NOTE!

  ATTENTION!

  WARNING!

- Further information or advice are indicated as follows:

  TIP!

- Program texts and variables are indicated through the use of the `Script Courier`.
- 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 valid).
- Sections, drawings and tables are subsequential numbers throughout the complete document. In addition, each documents includes a list of contents showing the page numbers following the front. If a document exceeds 10 pages, it also has a drawings list and a list of tables on the last few pages. If required, in case a document is correspondingly long and complex, a index is added in the back.
- Each document shows a small table including meta information, such as developer, author, revision and date of issue, on the front page. The information regarding revision and date of issue are also included in the bottom line on each page of the document. This way it is possible to clear identify the source document for each bit of information.
- Online version (PDF) and printed handbook are always generated from the same source. Due to the consequent use of Adobe FrameMaker for these documentations, it is possible to use the cross hints and content entries (including page numbers of the index) of the PDF file for automatic transfer to the corresponding content.

11 List of Figures

12 List of Tables

13 Index

14 Copyright and Terms of Liability

14.1 Copyright

14.2 Exclusion of Liability

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

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

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