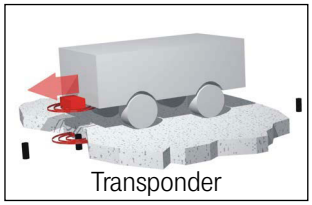
Device Description HG G-98760-C



Transponder Antenna

HG G-98760-C

1-dimensional, 128 kHz, CAN or Profibus®

English, Revision 08	Date: 25.09.2023	Dev. by: WM	Author(s): RAD / GW

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• Transponder antenna for rail-mounted cranes (AGV) • Encapsulated electronics • Indoor & outdoor, IP 67 • Frequency range 128 kHz • Reading distance depending on transponder 30 to max. 200 mm • Active area for positioning 280 x 110 mm	• Max. Crossing speed 3 m/s • Voltage supply 24 V ±10% • 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

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

Content

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 Letter Keys are indicated as such (for any programs of Götting KG small and capital letters are equally working).

2 Introduction

The described antenna is especially suited for vehicles in outdoor areas, as the electronic units are sealed within the antenna case. It is possible to adjust all important settings and values after manufacturingoftware as well as proceeding software updates via a serial interface.

The antenna supplies a structured output format in which additional system in-formation 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 device description applies to devices with the firmware 71895C2 beginning from version 1.16.

2.1 Variants of the Transponder Antenna

Table 2 *Available versions of HG G-98760-C*

HG G-98760-C				
Version	**Profibus®**	**CAN bus**	**RS 422**	**RS 232**
ZC		X	X	
YC	X			X
XC	X		X	
WC		X		X

2.2 Function

As the antenna passes over the transponder, it energizes the latter with an energy field of 128 kHz. So the transponder transmits his code at half of this frequency. The transponder position in relation to the antenna surface is measured by a coil with orientation in direction of travel. The interpreter which is integrated within the antenna decodes the transponder code.

Further, different characteristics of the antenna, like for example current consumption and supply voltage, can be measured and added to the output protocol.

The serial output signal is a non-isolated RS 232 or RS 422. The positioning pulse is also galvanically isolated +24 V (20 mA) switched output. Alternatively it is possible to use a CAN bus or a Profi Bus. The table above gives on overview of the available variants.

Optional a 16 bit parallel output for the code (24 Volt switched) can be effected. This interface is suited for mounting bar installation and should be installed in a place protected from any environmental influences (see section 6.6 on page 26).

2.3 Positioning

To trigger a positioning impulse the following conditions have to be fulfilled:

- ✓ signal S (see Table 19 on page 30) has to exceed the set threshold `Ngxgn" hqt"Rqukvkqpkpi` (see 7.2.2.2 on page 31)
- ✓ the transponder code has to be decoded correctly

- ✓ measurement voltage X has to switch its algebraic sign

Then an impulse is created which can be varied in duration.

3 Scope of Delivery

The scope of supply includes:

- one transponder antenna HG G-98760-C
- for Profibus® variants (s. Table 2 on page 7):
  Connector set CONSET00001 (s. Table 3 below)
- for CAN bus variants (s. Table 2 on page 7):
  Connector set CONSET00002 (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 chapter 6 on page 16 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: – 1 x M23 Power Connector – 2 x M23 Profibus Connector – 1 x M23 Termining resistor – 1 x Mounting Tool
HW CAB00064	Connector set, included in delivery of antenna variants with CAN bus. Connector Schaltbau M3 comprising: – casing – socket carrier – pins, gold-plated – cable support sleeve for cable diameter 10-13 + 13-16 mm – mounting instruction
HG Z-09870ZB	For variants with CAN bus: Connection cable, connector M3 on one side, other side open, specify length
HG Z-09878ZA	For variants with Profibus®: Connection cable POWER, connector M23 on one side, other side open, specify length

Table 3 *Required accessories (part 2 of 2)*

Order No.	Description
HG Z-09879ZA	for variants with Profibus®: Connection cable Profibus®, one side connector M23, other side open, specify length
HW DEV00095/ HW DEV00098	Disc Transponder Usually mounted on the roadway Reading distance: 30 – 80 mm 
HG G-70633ZB	Glass Transponder Usually mounted in the ground Reading distance: 50 – 150 mm 
HG G-70652ZC	Puck Transponder Usually mounted on the roadway Reading distance: 90 – 200 mm 
HG G-70653ZA	Puck Transponder Usually mounted on the roadway Reading distance: 90 – 200 mm 
HG G-71325XA	Rod Transponder Usually mounted in the ground Reading distance: 30 – 80 mm 

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 6.6 on page 26.
HG G-81840ZA	Transponder programming device for reading and programming of transponder codes i The transponders can also be programmed via the antenna, but this is more complicated when installed, as it usually requires driving the vehicle over the transponder to be programmed.

4 Mounting

Inside the casing are four drill holes for four M5 screws.

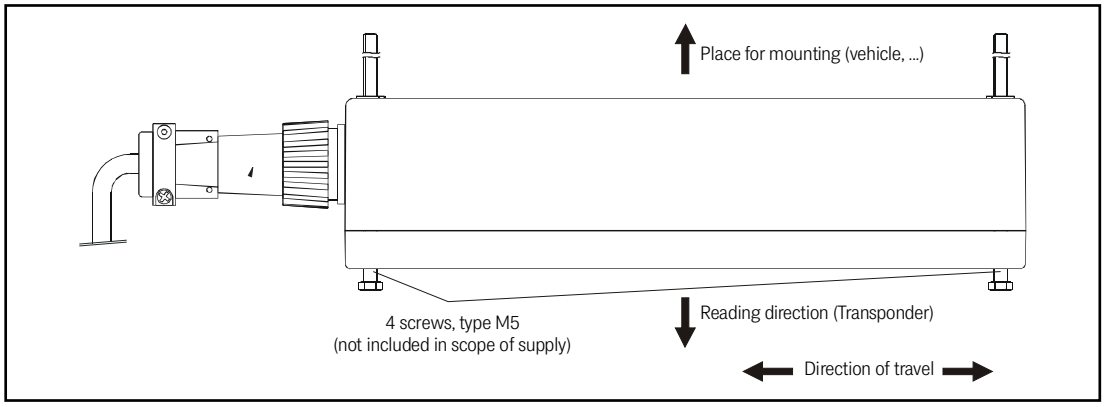
NOTICE

Reversing the sides

If the antenna is mounted the wrong way round, the system function is not given.

▶ Observe the orientation when mounting the antenna.

Figure 1 *Mounting the antenna*



In order to prevent any adverse effects on the system:

- ✓ The space above the antenna (at least 80 mm) should be kept free of any metal parts. If you need to mount the antenna directly on metal, it is important that you retune it or activate autotuning (see `Antenna Tuning` in section 7.2.2.3 on page 32)
- ✓ For the operation of the transponder system, it is important that there are no interfering signals in the frequency range of 64 ± 4 kHz (e.g. pulse engines etc.)!
- ✓ Make sure that the transponder track is located centered below the antenna (max. tolerance ±5 cm). Outside this area the signal strength decreases quickly and thus readings are unreliable.
- ✓ 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.

i

The heater has to be used if the antenna is operated at temperatures below 0° C! As the heating period lasts about an hour at -20° C it is recommended that the heating is connected to a standby system.

5 Installation / Commissioning

Check the operating voltage before connecting! Although the serial interface reacts largely insensitive to interferences, the cable should not lie directly beside power supply cables.

Establish all required connections, see sections 3.1 on page 9, 6.1.2 on page 17 and 6.2.2 on page 19. For the next commissioning steps connect a laptop with the serial interface of the antenna – for variants with RS 422 use a RS 422 to RS 232 interface (not in the scope of supply for further information see the introduction of chapter 7 on page 27). Then start the monitor program as described in section 7.2.1 on page 28.

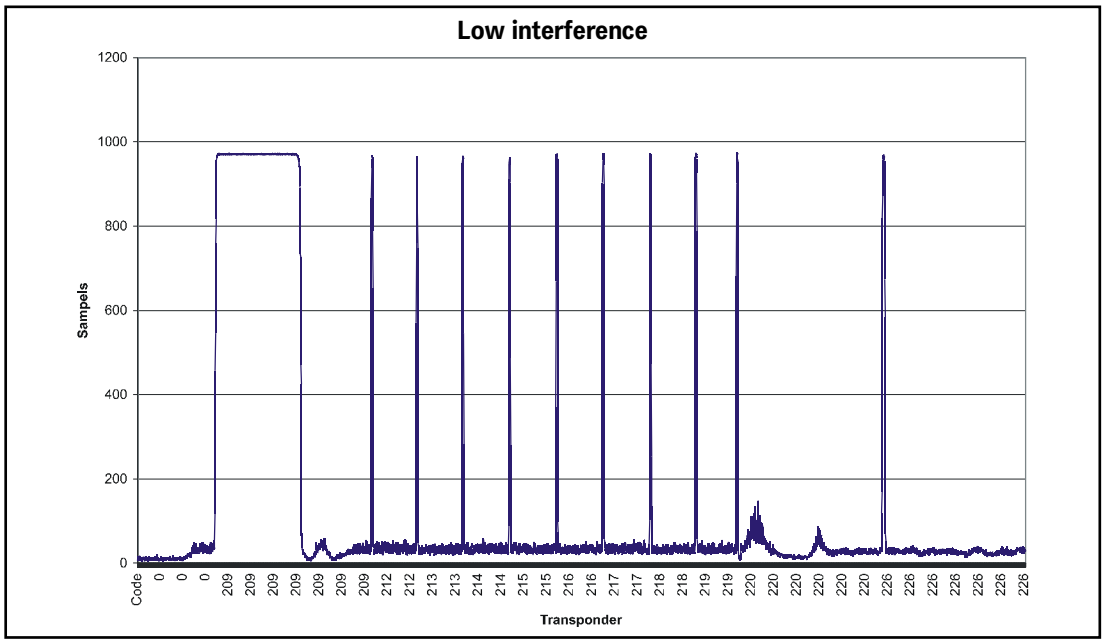
Default values: By default the system starts into the mode “Monitor only” at 9600 baud. Keep in mind that another person might have changed those settings!

1. Move a transponder under the antenna.
   The voltage `S` should increase significantly in the status line. The code should be detected immediately and the number of readings have to be counted up continuously to 255. When moving the transponder in driving direction over the center axis of the antenna, a positioning pulse should be generated.
2. Remove the transponder.
   The voltage `S` should decrease to very small values if there is no transponder within the field. The code display and the number of readings will be preserved. If this is not the case, there are interferences in the frequency band of 64 kHz.
3. In case the antenna has been mounted directly on metal, it is necessary to re-tune it accordingly (see chapter 4 on page 11). For setting the positioning and decoding thresholds (refer to section 7.2.2.2 on page 31) it is useful, to record a complete test run along the transponder track (see below).
   Antenna HG G-98760ZC/WC makes this possible via the serial interface (see 7.2.2.8 on page 36) or the CAN Bus Message Object 4 (6.4.3.5 on page 24 or 7.2.2.5 on page 34).
   Antenna HG G-98760YC/XC offers for the same function via the serial interface (refer to section 7.2.2.8 on page 36) or the Profibus® interface (refer to section 6.4.4 on page 25 or 7.2.2.6 on page 35). When using the Profibus® interface, the necessary parameters from the 16 byte data block are `System Status`, `Code` and `U-Summe`.

If no errors have occurred, exit the monitor program. Don’t forget to save the altered values. If certain parameters have been changed, a system reset will be necessary (switch off and reactivate then the antenna) as mentioned in the corresponding section of the monitor program (section 7.2.2 on page 29). Now the system has been put into operation properly.

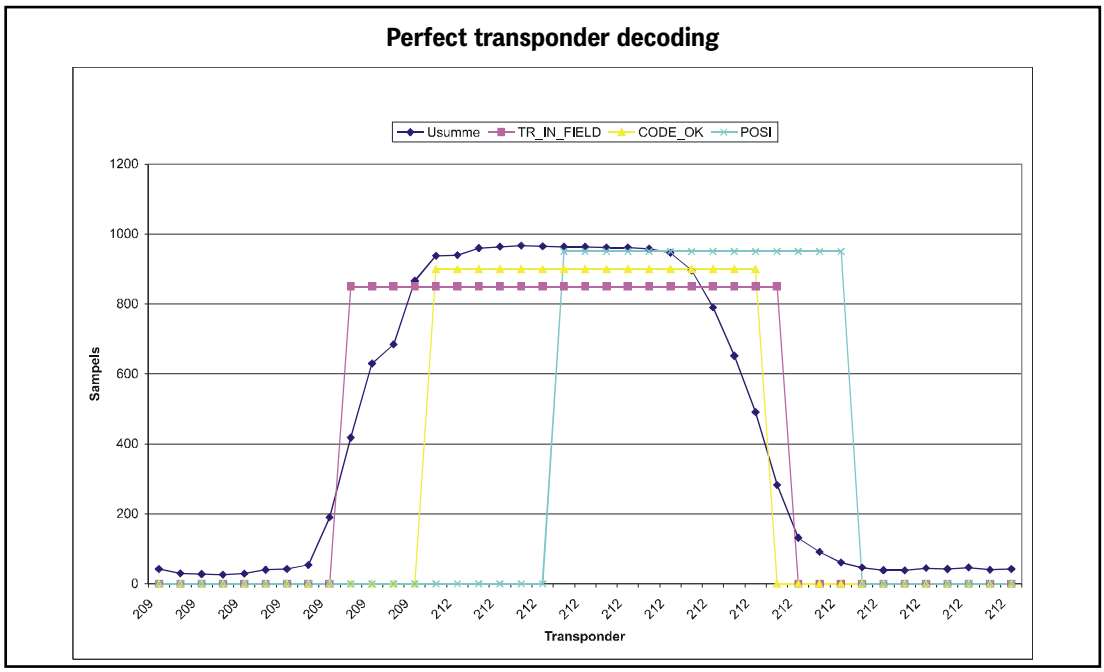
The following diagrams show examples for protocoled data:

Figure 2 *Diagram: commissioning protocol / low interference; sum voltage over the track*



In the diagram the sum voltage over the track is shown. Noise (inference) is located at 50 sampels, the signal at 950. The decoding of the transponder has no problems, as is shown in the next picture.

Figure 3 *Commissioning protocol / decoding of the transponder without any problems*

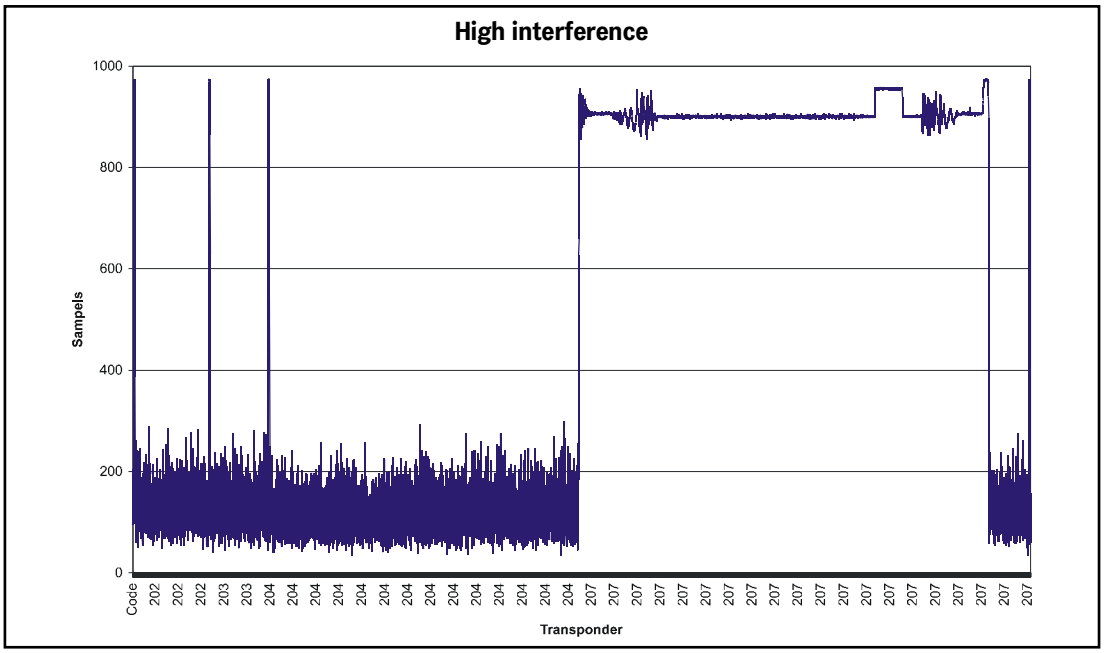


Whenever a transponder is crossed, initially the sum voltage will increase. Once the `Threshold for Decoding"`has been reached, the bit `TRANS_IN_FIELD"`is being set. It takes 4 x 8 ms (= 4 datapoints) for the transponder code to be decoded. The duration depends on the setting of `Number of Equal Codes"`in menu `Time & Code`. In the given example, the value is = 2, i. e. the received code is compared to two preceding codes.

When crossing the center of the antenna, the `POSI-Pulse` is generated. The duration of the `POSI-Pulse` is adjustable. The bits `TRANS_IN_FIELD` and `CODE_OK` are deleted as soon as the sum voltage falls below the set value for `Threshold for Decoding`. In the given example, there was an additional period of 6 x 8 ms for the generation of the `POSI-Pulse`. The transponder crossing speed was approx. 1,9 m/s (300 mm length of active antenna area / (20 x 8 ms)).

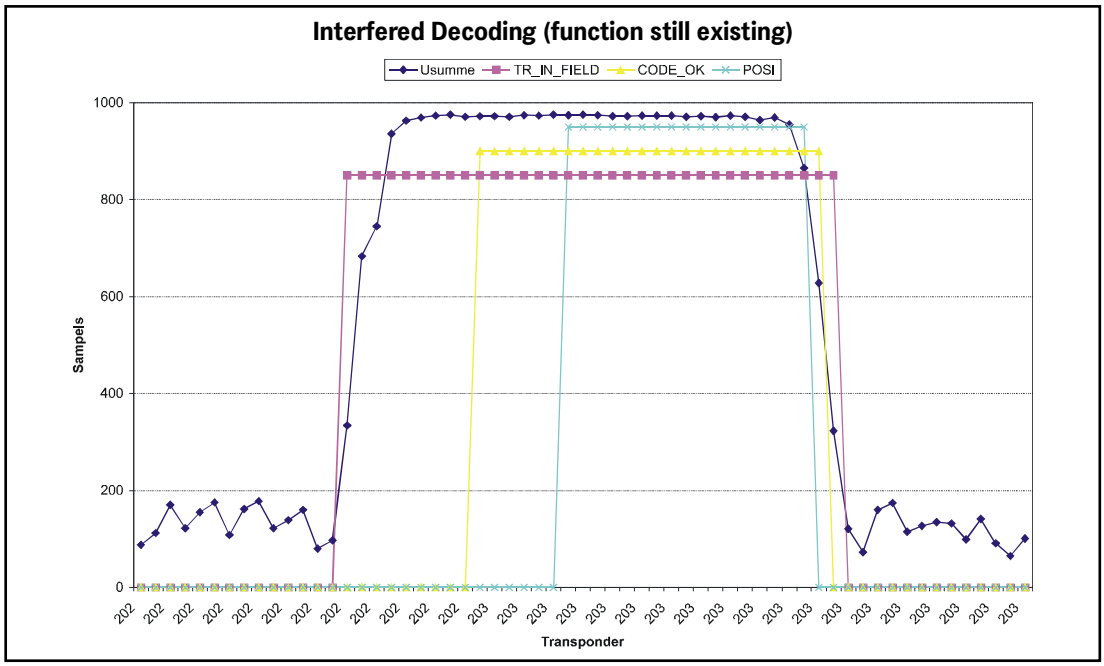
The following diagrams illustrate the effects of high interference levels.

Figure 4 *Diagram: Commissioning protocol / high interference level; shown is the sum voltage over the distance traveled, indicated by different transponder codes*



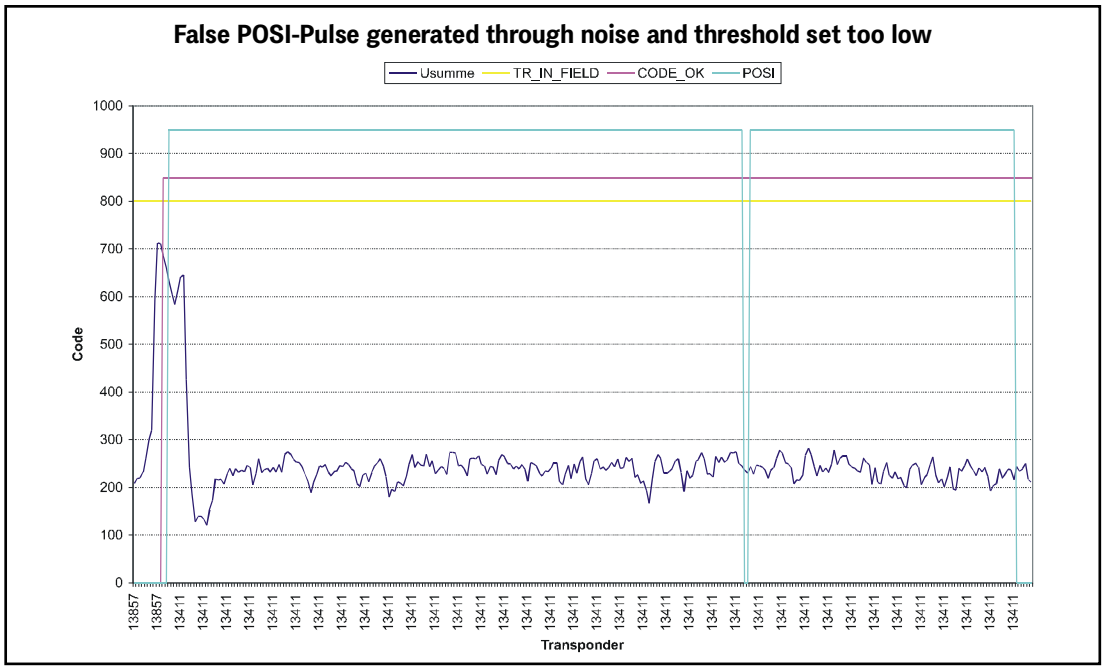
The interference level reaches up to 300 samples. At transponder 207, the noise reaches a level that even directly influences the transponder signal. As a result, it takes 9 x 8 ms until the transponder 203 has been decoded (refer to Figure 5 on page 15). For the slow crossing speed of 1.1 m/s (300 mm / (33 x 8 ms)) 9 x 8 ms is still sufficient for generating a `POSI Pulse`, but at a speed of 3 m/s it would no longer be possible to decode this transponder.

Figure 5 *Diagram: Commissioning protocol / interfered decoding (function still existing)*



The following diagram shows a case in which false `POSI-Pulses` may be generated through wrongly set parameters for `Threshold for Decoding` and/or `Threshold for Positioning`.

Figure 6 *Diagram: Commissioning protocol / false POSI-Pulse generated through noise and threshold set too low*



For this example, the thresholds are set to 100 samples. The bit `TRANS_IN_FIELD` is permanently set. Following a successful transponder decoding, initially a correct `POSI-Pulse` is generated. However, as the software does not realize that the transponder leaves the antenna field (the noise is higher than the set 100 samples for the thresholds), each zero crossing of the difference voltage (not shown in the diagram) will generate another `POSI-Pulse`.

6 Components and Operation

6.1 HG 98760ZC/WC (with CAN bus)

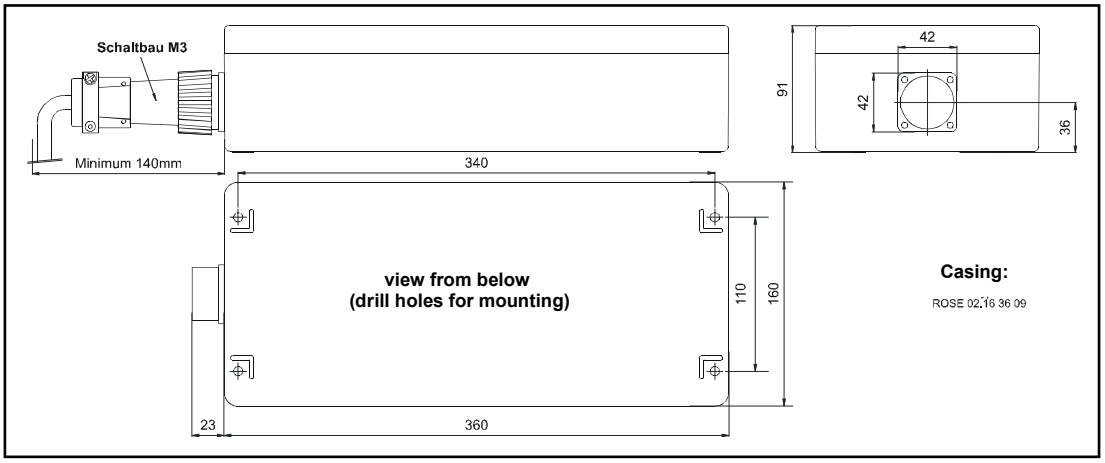
Figure 7 *Positioning antenna HG G-98760ZC/WC*

The antenna and interpreter electronics are housed in a 360 x 160 x 91 mm casing. The reading area is the upper side of the housing. The cover is located on top of the casing. A 12-pin screw-in socket point is mounted in direction of travel.

Inside the box the controller electronics are located. It also contains the heater. The device is connected by a 12-pin screw-in socket of the company *Schaltbau* (type M3) with gold-plated contacts.

6.1.1 Drawing

Figure 8 *Outline antenna HG G-98760ZC/WC*



6.1.2 Pin Allocations for 12-pin socket

The pin assignment of the plug-in system used is:

Table 5 *Pin allocation of 12-pin socket (CAN bus)*

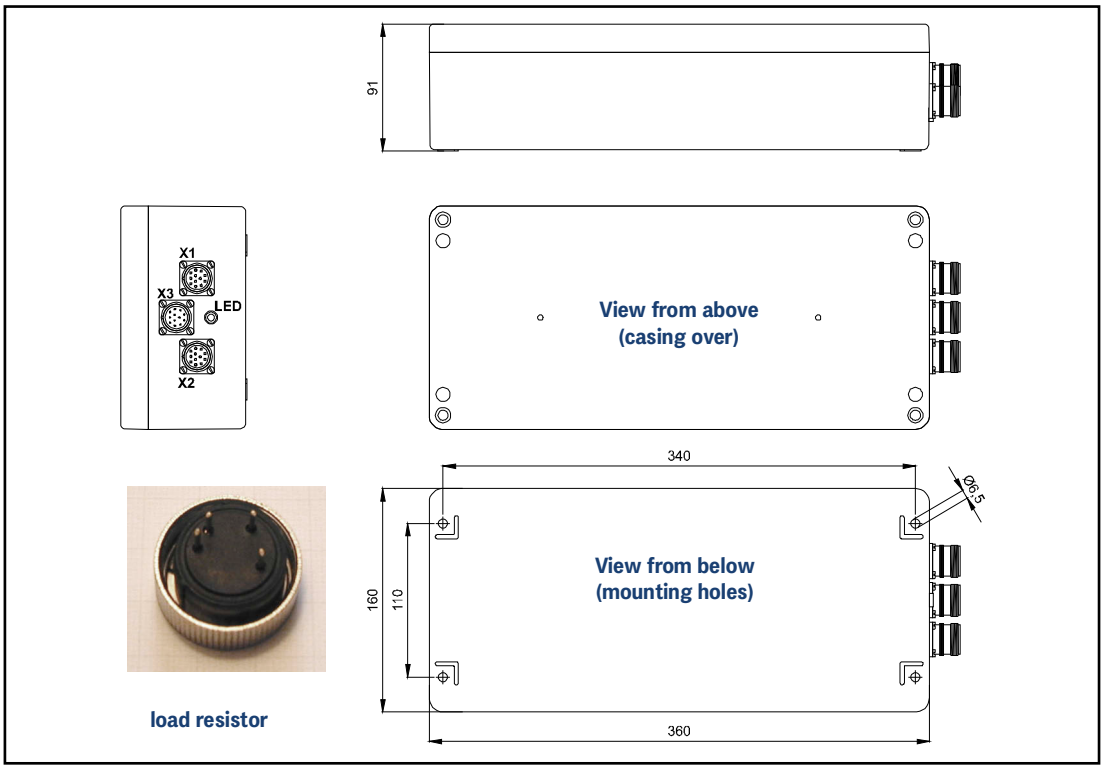
Contact	HG G-98760ZC	HG G-98760WC
1	+24 V (antenna)	
2	GND (antenna)	
3	+24 V (heater)	
4	GND (heater)	
5	+RX (RS 422)	RX (RS232)
6	-RX (RS 422)	not connected
7	+TX (RS 422)	Tx (RS232)
8	-TX (RS 422)	not connected
9	+ Posi Pulse	
10	- Posi Pulse	
11	CAN+	
12	CAN-	
PE	signal ground	

For further information regarding the PosiPulse and its connection possibilities see section 6.4.2 on page 23.

6.2 HG G-98760YC/XC (with Profibus®)

6.2.1 Drawing

Figure 9 *Drawing HG G-98760XC/YC (with dimensions and load 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. The three built-in 12 pin 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 houses the completely sealed antenna electronics and the heater. For connecting the antenna, the sockets X1 and X2 (Profibus®) or the connector X3 (Po-siPuls, RS232, power supply) are being used. The integrated LED indicates the Profi-bus status **Data exchange**.

For each antenna a connection set is part of the scope of supply, including 3 connectors, the terminating resistor and an inserter. **The particular cable diameters have to be indicated on order.**

The pin numbers are printed on the connectors. For Götting cables, the pin numbers are additionally attached to the strands.

6.2.2 Pin allocations

The Profibus® version has two 12-pin sockets for the bus and one 12-pin plug for supplying the antenna.

Table 6 *Allocation of 12-pin Profibus® connectors X1 and X2 (see Figure 9 on page 18)*

Contact	Description
1	signal ground
2	Line A
3	not connected
4	Line B
5	not connected
6	+5V signal
7	+24 V DC / 0.6 A (antenna)
8	GND (antenna)
9	shielding
10	not connected
11	not connected
12	RTS
casing	shielding

Table 7 *Allocation for 12-pin plug X3 for suppliance of the antenna (see Figure 9 on page 18), Profibus® version*

Contact	HG G-98769YC	HG G-98760XC
1	+24 V DC / 0.6 A (antenna)	
2	GND (antenna)	
3	+24 V DC / 2 A (heater)	
4	GND (heater)	
5	Rx (RS232)	+ RX (RS422)
6	not connected	- RX (RS422)
7	Tx (RS232)	+ TX (RS422)
8	not connected	- TX (RS422)
9	+ Posi Pulse	
10	- Posi Pulse	
11	not connected	
12	signal ground	
casing	shielding	

For further information regarding the PosiPulse and its connection possibilities see section 6.4.2 on page 23.

6.3 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 7.2.2.9 on page 36). A further 16 seconds are necessary, in case the automatic transmitter tuning function is activated (also refer to section 7.2.2.3 on page 32).

6.4 Interfaces

6.4.1 Serial (RS 232 or RS422)

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 either “transparent” or “3964 R” (see also sections 11.2 on page 44 and 11.3 on page 45). 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 antennas 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 pulse per crossing.

6.4.1.1 List of System Data that may be Output

A telegram of the serial output consists of max. 21 bytes. The minimum update rate at 9,6 KB is then calculated as follows:

Figure 10 *Formula: Minimum update rate*

$$21\frac{\text{Byte}}{\text{Telegram}} \times 11\frac{\text{Bit}}{\text{Byte}} \;/\; 9600\frac{\text{Bit}}{\text{s}} = 24,1\frac{\text{ms}}{\text{Telegram}}$$

As the transmission is binary, it is possible – when using the 3964R procedure – to add further (DLE) characters by this procedure. All multiple byte variables are put out either with the highest byte or the lowest byte first (adjustable)!

The 8 bit check sum is only output when using the transparent protocol. It then includes the start character. The start character, as well as the check sum (transparent protocol) cannot be removed from the data block. The protocol is adjustable, irrespective of whether telegrams are output permanently by an adjustable update rate or whether one transponder is located within the field.

Table listing the data words of a telegram of 21 byte length:

Table 8 *Data words in a telegramm of 21 byte length*

Byte #	Length	Valency	Type	Description
1	1 Byte	0x0000.0001	unsigned char	Start character ASCII-061: „=“
2,3	2 Byte	0x0000.0002	signed int	constant 0, Dummy entry
4,5	2 Byte	0x0000.0004	unsigned int	the upper 16 bits of the transponder code (or depending on the configuration the lower 16 Bit, see Figure 17 on page 33).
6,7	2 Byte	0x0000.0008	unsigned int	the lower 16 bits of the transponder code (or the upper 16 Bit, explanation see above)
8,9	2 Byte	0x0000.0008	unsigned int	Voltage generated by the transponder within the frame antenna in samples
10,11	2 Byte	0x0000.0010	signed int	Voltage generated by the transponder within the difference antenna in samples
12	1 Byte	0x0000.0020	unsigned char	applied operating voltage on the antenna [x 100 mV]
13	1 Byte	0x0000.0080	unsigned int	current consumption [x 10 mA]
14	1 Byte	0x0000.0100	signed char	measured temperature in the antenna [^{0}C]
15	1 Byte	0x0000.0200	unsigned char	number of code readings during the last transponder crossing
16,17	2 Byte	0x0000.0400	unsigned int	frequency of the receptor [x 10 Hz]
18,19	2 Byte	0x0000.0800	unsigned int	frequency of the transmitter [x 10 Hz]
20,21	2 Byte	0x0000.1000	unsigned int	system status in binary code, see Table 9 below
(22)	1 Byte		unsigned char	check sum (XOR of all signs, **only** for transparent protocol)

The following table shows a list of the binary codes used to describe the system status:

Table 9 *Possible system status / error messages (part 1 of 2)*

Valency	Name	Description
0x0001	DEC_HW_ERROR	Code decoder hardware error
0x0002	CODE_CRC_ERR	Reception of transponder code with CRC error
0x0004	CODE_PAR_ERR	Reception of transponder code with parity error
0x0008	CODE_NIB_ERR	Reception of RW transponder code with wrong high-nibble
0x0010	EEPROM_ERROR	Parameter E^2Prom not addressable
0x0020	PARAM_CRC_ER	Parameter block no longer safe
0x0040	FRQ_RX_ERROR	Reception oscillator not on set frequency
0x0080	FRQ_TX_ERROR	Transmission oscillator not on set frequency
0x0100	REF_TRANS_ON	Info: Reference transponder is on
0x0200	TRANS_IN_FIELD	Transponder is detected within the antenna field *)
0x0400	CODE_OK	Decoded code correct
0x0800	SEGMENT-	A transponder is located under the connector / cable side of the antenna
0x1000	POSIPULS	transponder crossed center of the antenna **)
0x2000		

Table 9 *Possible system status / error messages (part 2 of 2)*

Valency	Name	Description
0x4000		
0x8000		
*) As soon as the transponder leaves the antenna field these bits are deleted **) This bit is deleted when the transponder leaves the antenna field or after a chosen time (refer to 7.2.2.2 on page 31)		

Errors `0x0002` and `0x0004` 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 correspond-ing switch-off command has been forgotten (in this case, it is no longer possible to read runway transponders correctly).

6.4.1.2 List of System Commands

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

There are three commands:

Table 10 *List of system commands*

No.	Meaning	Procedure		Start sign	command byte	parameter	Check sum
1	Switch to monitor mode (described in 7.2 on page 28)	3964R	HEX		$4D_{16}49_{16}$	$4E_{16}49_{16}$	
			ASCII		MO	NI	
		transparent	HEX	$3D_{16}$	$4D_{16}4F_{16}$	$4E_{16}49_{16}$	38_{16}
			ASCII	=	MO	NI	8
2	deactivate 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	activate 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	;

Further information concerning number:

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` (only valid for systems that include a reference transponder). 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 signaled by the deletion of the `0x0100` bit from the system status.

6.4.1.3 System Monitor

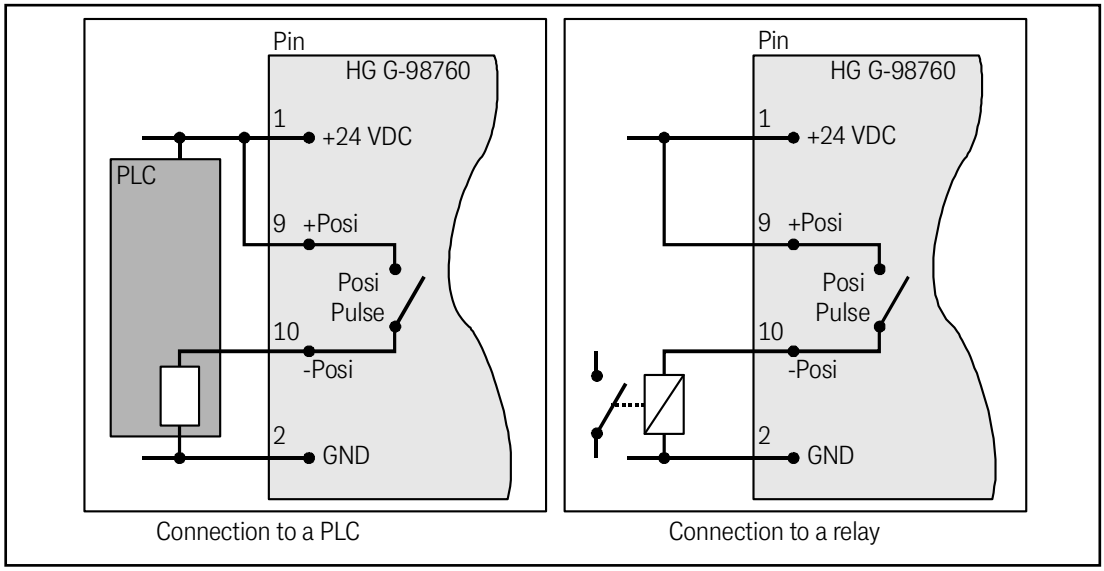
In monitor mode the system is configurable via a menu. Please refer to section 7.2 on page 28.

6.4.2 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 in monitor mode (see section 7.2.2.2 on page 31). In addition it can be limited to one pulse per crossing.

Both connecters for positioning are not internally connected with +24V or GND as in some systems a strict isolation of potentials has to be kept. Due to security requirements the current in these outputs is limited to 20mA. If e.g. a 24 V output is needed, contact number 9 has to be connected with +24V and contact number 10 has to be connected with GND using a resistor of 1 KOhm.

Figure 11 *Connection possibilities positioning pulse PosiPulse*



6.4.3 CAN

6.4.3.1 Description

Either Basic- or Full-CAN mode is configurable. The system monitor is used for setting the CAN parameters (also refer to section 7.2.2.5 on page 34). 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 four different CAN Message Objects and receive one. It is configurable whether telegrams are output permanently according to the set update rate or 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.

6.4.3.2 CAN Message Object 1 (transmission object, compatible to former firmware versions)

Table 11 *Structure of the CAN message object 1*

Byte #	Length	Type	Meaning
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	1 Byte	unsigned char	Number of code readings of the last transponder crossing

6.4.3.3 CAN Message Object 2 (A identifier; transmission object)

Table 12 *Structure of CAN message object 2*

Byte #	Length	Type	Meaning
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	signed int	Dummy entry

6.4.3.4 CAN Message Object 3 (B identifier, transmission object)

Table 13 *Structure of CAN Message Object 3*

Byte #	Length	Type	Meaning
1,2	2 Byte	unsigned int	sum voltage
3,4	2 Byte	signed int	difference voltage
5	1 Byte	unsigned char	number of code readings the last transponder crossing
6	1 Byte	unsigned char	operating voltage
7	1 Byte	unsigned char	operating current
8	1 Byte	signed char	temperature

To interpret these values refer also to Table 8 on page 21. This object serves the surveillances of the parameters.

6.4.3.5 CAN Message Object 4 (D identifier, transmission object)

Table 14 *Structure of CAN Message Object 4*

Byte #	Length	Type	Meaning
1,2	2 Byte	unsigned int	System status according to Table 9 on page 21
3,4	2 Byte	unsigned int	16 Bit transponder code
5,6	2 Byte	unsigned int	sum voltage
7	1 Byte	unsigned char	number of code readings
8	1 Byte	unsigned char	number of reading errors

To interprete these values also refer to Table 8 on page 21. This object serves the commissioning or service.

6.4.3.6 CAN Message Object 5 (reference transponder, 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 2 bytes.

Table 15 *Structure of CAN Message Object 5*

Byte #	Length	Type	Meaning
1	1 Byte	unsigned char	= 01: reference transponder ON = 00: reference transponder OFF
2	1 Byte	unsigned char	not connected

6.4.4 Profibus®

6.4.4.1 Profibus® Input Bytes

Table 16 *Profibus® Input Bytes*

Number of Input Bytes	Byte #	Length	Type	Order of bytes *)	Meaning
6	1	2 Byte	unsigned int	HiByte (LoByte)	system status in binary code
	2			LoByte (HiByte)	
	3	4 Byte	unsigned long	HiByte (LoByte)	transponder code
	4				
	5				
	6			LoByte (HiByte)	
7	7	1 Byte	unsigned char		applied antenna voltage [x 100 mV]
8	8	1 Byte	unsigned char		current consumption [x 10 mA]
9	9	1 Byte	unsigned char		measured temperature within antenna [^{0} C]
12	10	2 Byte	signed int		Dummy entry
	11				
	12	1 Byte	unsigned char		number of code readings
14	13	2 Byte	signed int	HiByte (LoByte)	voltage the transponder induced in the difference coil in samples
	14			LoByte (HiByte)	
16	15	2 Byte	unsigned int	HiByte (LoByte)	voltage the transponder induced in the frame antenna in samples
	16			LoByte (HiByte)	
*) = Corresponding to `Order of Data Transfer` (see 7.2.2.6 on page 35)					

Depending on the configuration of the master using the GSD files (see Appendix, section 11.4 on page 46) the corresponding quantity of input bytes will be transmitted. Input bytes may have the values 6, 7, 8, 9, 11, 12, 14, 16.

6.4.4.2 Output Byte

Only the positive slope of the least significant bit of this byte is used for switching the reference transponder on. Its status is indicated correspondingly in the system status (refer to Table 9 on page 21).

6.5 Software update

If necessary, the antennas may be updated via the serial interface. Please refer to section 7.3 on page 37.

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

The interface is available in two variants for RS 232 or RS 422. The variant must be selected to match the antenna.

You can find more information on the Interface at the following address: https://www.goetting-agv.com/components/06150

Figure 12 *Photo serial/parallel interface HG G-06150-A*

The serial/parallel interface is housed within a case suitable for mounting bar installation. To output the serial data via the RS 232 or RS 422 interface, the serial output of the antenna has to be set to transparent protocol with the data content `EQFG` (lower 16 Bit), `DELTA_X` and system status as follows: Use 7 as length of the telegram and 100B as value for the Telegram Content Mask (as shown in Figure 18 on page 34) in the corresponding menu. The baud rate has to be set to 19200 Baud.

Table 17 *Output format serial/parallel interface*

Byte #	Length	Value	Type	Meaning
1	1 Byte	0x0000.0001	ASCII-061 : „=“	start sign
2,3	2 Byte	0x0000.0002	signed int	Dummy
4,5	2 Byte	0x0000.0008	unsigned int	the lower 16 Bit of the transponder code
6,7	2 Byte	0x0000.1000	unsigned int	system status
8	1 Byte		unsigned char	check sign

Out of this data stream the **transponder code** is converted into a 16 Bit parallel output. The code is then output 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 against `+Usps (24V)` and are not current limited. The outputs are not potentially separated.

7 Software

The system can be configured via software running in the antenna. In order to be able to communicate with the software, you connect the serial interface of a PC with the serial interface of the antenna. For antenna variants with RS 422 interface, an interface converter from RS 422 to RS 232 is required for this. Then start a terminal program on the PC.

The interface converter is not part of the systems scope of supply. However, it is available from several well-known distributors, as e.g. RS Components (see the following link). Please refer to the section “Industrial Interface Converters” in the RS Components catalogue.

http://www.rs-components.com/rs/

7.1 Terminal Program

In the following, we refer to the terminal program HyperTerminal®, which can be used in Windows®. You can download HyperTerminal from the following link:

http://www.hilgraeve.com/hyperterminal/

However, you can use any other terminal program that can handle the VT52 emulation.

If you use another terminal program:

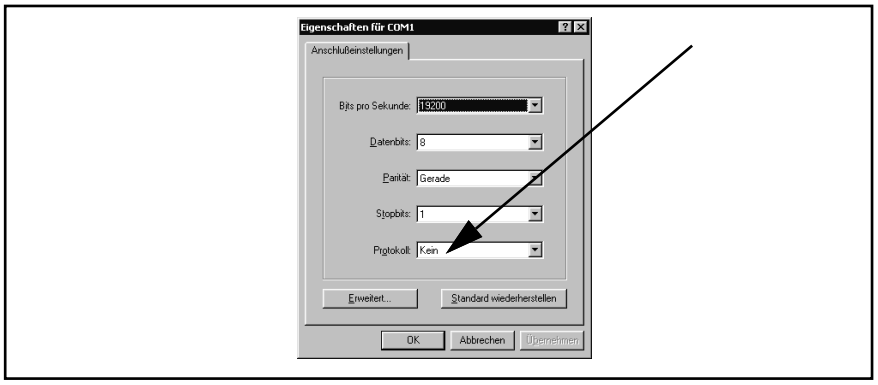
- ✓ Please refer to the documentation supplied with the terminal program.
- ✓ Set the values listed in Table 18 in the terminal program.

Table 18 *Terminal settings for the 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 PCs (see below)

If you want to use a different port than `COM1` with HyperTerminal, then adjust the port as follows:

1. Select Properties from the menu file (or click the Icon):



2. Choose the respective port via the connect to entry in the submenu. Confirm with OK. Save the altered values when you are asked for it when finishing HyperTerminal.

7.2 System Monitor

In the **monitor mode** the system can be configured with the help of a menu. To use the monitor mode you need to know which protocol is adjusted in your antenna.

7.2.1 How to start the Monitor Program

The way the monitor program ist started depends on the chosen procedure (see section 7.2.2.4 on page 33).

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 no files have to be transmitted and section 7.2.1.2 below may be ignored.

7.2.1.2 Procedures 3964R/transparent

The command to switch to monitor mode should be entered directly with a PC. To do so, start your terminal program. If you are using HyperTerminal (section 7.1), install the provided disk into your disk drive and display the contents. If HyperTerminal has been correctly installed, the terminal program can now be started directly by double clicking the respective *.ht file (`Monitor9600.ht` at 9600 Baud and `Monitor19200.ht` at 19200 Baud). If necessary, adapt the COM-port (see section). You can download pre-configured files from our server at the following address:

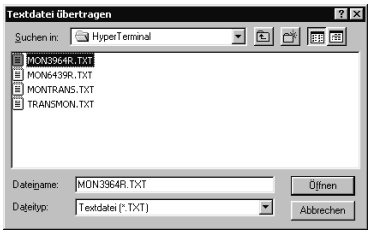
https://www.goetting-agv.com/components/transponderconf

Once the antenna is activated (takes 10 to 26 seconds after start-up) you can transfer the appropriate text file from the disk by using your terminal program. The following four files are available:

1. `Mon3964r.txt`
   Transfer if the system is adjusted to procedure **3964R** with „**HighByte first**“.
   The file contains the following characters in hexa-decimal notation:
   `02 4D 4F 4E 49 10 03 16`
2. `Mon6439r.txt`
   Transfer if the system is adjusted to procedure **3964R** with „**LowByte first**“.
   The file contains the following characters in hexa-decimal notation:
   `02 4F 4D 49 4E 10 03 16`
3. `Montrans.txt`
   Transfer if the system is adjusted to procedure **Transparent** with „**HighByte first**“. The file contains the following characters in hexa-decimal notation:
   `3D 4D 4F 4E 49 38`
4. `Transmon.txt`
   Transfer if the system is adjusted to procedure **Transparent** with „**LowByte first**“. The file contains the following characters in hexa-decimal notation:
   `3D 4F 4D 49 4E 38`

With HyperTerminal the file is transferred as follows:

1. Choose `Send Text file` in the menu `Transfer`. The following window will be opened:



2. Switch to your disk drive (in our example, the files are located on the hard disk) and select the respective *.txt file.
3. Click Öffnen (Open). The file will be transferred and (if you have chosen the right file) the monitor program will be started. The menus will then appear directly in the HyperTerminal window. At first, you will see the main menu from Figure 13 on page 30.

7.2.2 How to work with 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 starting the monitor program!

Once the transfer of the *txt.file (refer to 7.2.1) has been completed, the monitor program will start its main menu. If this is not the case, you have either based your settings on wrong system configuration, you are using a different terminal emulation, you did not adjust the character delay to 1 ms or you didn‘t wait for a minimum of 10 seconds after switching the antenna on.

7.2.2.1 Main Menu

Figure 13 *Main menu of the monitor program*

```
S:0055   X:+0007                  Code: 00000000  Read:   0:
Frx[/Hz]:66880  Ftx[/Hz]:127960
U[/mV]:24200  I[/mA]: 240  T[Grd.C]:+19     E: 0800 N:   0

    (P)assword

    (T)ime & Code
    (F)requency & Antenna tuning
    (S)erial Output
    C(A)N-Parameters
    P(r)ofibus-Parameters

    (L)oad Values to EEProm

    (W)rite Transponder
    (E)rror - Status
    Cs(v) (38,4 KB  Code,Sum,Tr,Co,+-,Pos,Read,Cnt<crlf>)
    (U)pdate Firmware
    Serv(i)ce


    Software Version  71895C21.14 / 19.MAR.2009    Serial Number: 9999999
```

Each of the screen menus contains important system variables in the first line (see also to Table 19), as they also appear in the output telegram (described in section 6.4.1.1 on page 20). The last line on the screen contains possible status messages, if e.g. predetermined value ranges have not been observed during input.

Table 19 *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 infobits of the transpondercode in hexadecimal notation. The code will be deleted, if the voltage decreases below the `Threshold for Decoding` (refer to 7.2.2.2 on page 31).
Read	Number of readings per transponder crossing. This value is preserved until another transponder is detected. It is also deleted through Noise.
Frx [Hz] and Ftx [Hz]	Display of important system frequencies for transmission and reception. Those frequencies are permanently controlled and output via the system status.
U [mV]	Supply voltage of the processor board with an accuracy of 100 mV. Due to several protection methods it is always a bit lower than the supply voltage of the antenna.
I [mA]	Current consumed by the positioning device, accuracy: 10 mA.
T [Grd.C]	Temperature measured within the device. The sensor is located close to a cooling sheet. Output in 5^0 steps.
E	State of system in hexadecimal notation. The meaning of each bit is explained in Table 9 on page 21.
N	Number of reading errors per transponder crossing. This value is stored until a new transponder has been detected.

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)assword. This prevents unintended alterations of values. With (L)oad Values to EEProm the values are saved after alteration and input of the password.

System status messages are explained in plain text upon pressing (E)rror - Status.

The sections mentioned below describe the remaining menus one after the other:

- (T)ime & Code (section 7.2.2.2 on page 31)
- (F)requency and Antenna tuning (section 7.2.2.3 on page 32)
- (S)erial Output (section 7.2.2.4 on page 33)
- C(A)N-Parameter (section 7.2.2.5 on page 34)
- P(R)ofibus parameter (section 7.2.2.6 on page 35)
- (W)rite Transponder (section 7.2.2.7 on page 36)
- CS(V)-Out (section 7.2.2.8 on page 36)
- (U)pdate firmware (section 7.2.2.9 on page 36)
- (Q)uit monitor: by pressing Q the monitor program is left, if serial procedures `3964R` or `transparent` are active. When procedure `Monitor only` is active the monitor program cannot be left

7.2.2.2 (T)ime & Code

This menu enables the setting of timing values for the transponder decoding, the position calculation and the positioning pulse. The first three values are determined by the selected code transfer proceeding and **cannot be altered**:

Figure 14 *Menu: (T)ime & Code*

```
S:0008   X:+0006    Code: 00000000  Read:   0:
Frx[/Hz]:66800  Ftx[/Hz]:127980
U[/mV]:22400  I[/mA]: 290  T[Grd.C]:+24     E: 0000 N:   0



    (S)elect Code Channel                                S
    (H)igh-Nibble of RW-Code            [0..F,>F]:      10
    (N)umber of equal Codes               [0..15]:       1
    (L)evel for Positioning             [10.1023]:     256
    PosiPulse (a)fter Decoding                           1
    (T)hreshold Decoding                [10.1023]:     256
    (1) switch Reference Transponder:                    0
    (P)osi-Pulse Time                     [n*1ms]:     100
    (O)ne Positioning Pulse per Crossing                 0
    (X) Timed Positioning Pulse                          1
    (Q)uit Menue
```

With (S) one of the two reception channels can be chosen. Normally it is set to sum channel S. In order to reduce interferences, it is possible to switch to the difference channel.

> If the difference channel is used a code will be left out in the middle (at zero, see Figure 25 on page 44)!

Since the code transfer of trovan™ transponders is only secured by a simple parity check, two additional safety strategies have been implemented in order to achieve a higher data protection:

1. When using RW transponders, the free high bits are searched for a preset value (0-F). This value may be preset under H and has to be programmed into the transponders together with the desired code. If a value > F (e.g. 10) is entered, the monitoring is switched off.
2. For RO- and RW- transponders, the number of codes to be compared can be chosen within a range of 0 to 15 under N. If the number of codes is set to 0, any code is output immediately after detection; 1 effects that the received code is compared to precisely the one detected before, etc. Please note that the maximum crossing speed decreases, as the necessary transmission duration increases (n+1) x 8 ms.

L determines at which voltage `S` the positioning pulse is released to avoid wrong outputs generated by antenna side lopes.

A enables the output of a positioning pulse only when a transponder is decoded. Thus it is possible to avoid wrong positioning pulses in areas with parasitic frequencies.

With T it is able to decide from which voltage `S` on the code decoding begins in order to avoid decodings during a too weak signal.

1 turns the reference transponder on (`1`). Afterwards the first line of the monitor output has to show rising voltages, the corresponding code and a rising number of reads. Once you leave the monitor the reference transponder will be automatically deactivated (`0`).

By pressing P it is possible to adjust the duration of the positioning pulse within a 1 ms grid. O is used to determine whether each crossing of the center axis of the antenna shall result in a positioning pulse (`0`; e.g. when driving forward and backward directly above a transponder), or if only one pulse per crossing is output (`1`). In this case, the voltage `S` has to drop below the `Threshold for Decoding` for renewed enabling.

With X it can be chosen whether the Posipulse and the corresponding bit in the system status are turned off after the preset time (set with P) or after sinking of the voltage `S` below the threshold set with L.

7.2.2.3 (F)requency And Antenna Tuning

Figure 15 *Menu: (F)requency And Antenna Tuning*

```
S:0006   X:+0007    Code: 00000000  Read:   0:
Frx[/Hz]:66800  Ftx[/Hz]:127970
U[/mV]:22500  I[/mA]: 290  T[Grd.C]:+28     E: 0000 N:   0



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

    A(u)to-Tune                        0
    (A)ntenna-Tuning [0..15,+,-]:      7
    switch (T)ransmitter:              1

    (Q)uit Menue
```

The **receiving frequency** to set "(R)x" is calculated by using F_{ZF} = 455 kHz and the bandwidth B = 5,5 kHz according to the following equation:

Figure 16 *Equation: Calculating the receiving frequency*

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

As there is a single sideband 155300 Hz are to be set for the upper sideband, 157500 Hz for the lower one.

With U the automatic tuning can be activated. After each turn-on the transmitter tuning is checked. This procedure takes about 16 seconds. After that the adjustment is checked each 10 seconds (if there is no transponder in the field), if necessary another tuning is made.

With A, + or - the sending antenna can be tuned by setting its current consumption to the maximum (so the largest range is reached). By using T the transmitter can be activated (`1`) or deactivated (`0`) for checking the system. When leaving the menu it is automatically set to `1`.

7.2.2.4 (S)erial Output

Changes within this menu become effective by resetting the system (turn the antenna off and then on). Depending 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 28).

Figure 17 *Menu: (S)erial Output*

```
S:0021   X:+0004                  Code: 00000000  Read:   0:
Frx[/Hz]:66920  Ftx[/Hz]:127950
U[/mV]:24200  I[/mA]: 240  T[Grd.C]:+28     E: 0000 N:   0



    (B)audrate:                                   9600
    (P)rocedure                                  3964R
    (O)rder of Data Transfer (0= HiByte first):      0
    (T)elegram Content Mask [0..1FFF]:            1fff
    (D)isplay Telegram Content
    (C)har-Delaytime            [1..220ms]:       220

    (A)ck-Delaytime (3964R)     [1.1680ms]:      1680
    Co(n)tinous Telegrams                           1
    (S)erial Data Period        [1..1000ms]:        8



    (Q)uit Menue
```

Input of B enables switching between 9600 and 19200 Baud. 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`).

With P you choose the desired procedure – 3964R, transparent or Monitor only. In case Monitor only is chosen you can set the baud rate and procedure. This is useful whenever the serial output is only used for parametrizing and CAN or Profibus® are used for data output. For the procedure 3964R you have to set the Ack-Delaytime.

T influences the composition of the output telegram.

Based on the values given in Table 8 on page 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 comply with the sequence in the table!

Example You only want to display the code.
Add up the values 0000.0004 for the upper 16 bits and 0x0000.0008 for the lower code bits as well as the 0x0000.0001 for STX. Therefore input `D`.

Using (D)isplay Telegram Content it is possible to check the generated telegram (seeFigure 18). In this example the mask has the value 0x0000 and the telegram length is 14. Press any key to return to the menu `Serial Output`.

Figure 18 *Output „(D)isplay Telegram Content“*

```
S:0021   X:+0006                  Code: 00000000  Read:   0:
Frx[/Hz]:66880  Ftx[/Hz]:127960
U[/mV]:24200  I[/mA]: 240  T[Grd.C]:+28     E: 0800 N:   0


    STX         1 Bytes from Position: 1
    Dummy       2 Bytes from Position: 2
    CODE_H(L)   2 Bytes from Position: 4
    CODE_L(H)   2 Bytes from Position: 6
    SUM_1       2 Bytes from Position: 8
    DIF_X       2 Bytes from Position: 10
    Vcc         1 Bytes from Position: 12
    Current     1 Bytes from Position: 13
    Temp.       1 Bytes from Position: 14
    CodesRd     1 Bytes from Position: 15
    Rx-Freq.    2 Bytes from Position: 16
    Tx-Freq.    2 Bytes from Position: 18
    STATUS      2 Bytes from Position: 20



    (Q)uit Menue
```

The parameter (C)har Delaytime is the so-called character delay for the procedure 3964R (refer to appendix, section 11.2 on page 44) and the timeout period for incoming characters for the transparent procedure (refer to appendix, section 11.3 on page 45).

N either activates the permanent output according to the (S)erial Data Period (`1`), or generates the output solely when a transponder is decoded within the reading range of the antenna (`0`).

7.2.2.5 C(A)N-Parameters

This menu allows setting CAN Bus parameters. Before being able to use the CAN bus it has to be enabled with C.

Figure 19 *Menu: C(A)N-Parameters*

```
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
    (B)-Identifier:  TX  [0..2047]:              0
    (D)-Identifier:  TX  [0..2047]:              7

    CAN-Ba(u)drate[20,50,125,250,500,1000 kB]:1000
        or
        B(R)P Baudrate Prescaler [0..63]:        0
        (S)JW Sync Jump Width     [0..3]:        0
        Tseg(1)                  [2..15]:        6
        Tseg(2)                   [1..7]:        1



    Co(n)tinous Telegrams                        1
    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 Identifier (CAN address) as 11 bit value (0-2047) or as 29 bit value (0-536870911).

The identifier adjustable with I is refered to the sent frames for Message Object 1 or to the received frames for Message Object 5 for the reference transponder. The identifier set with A refers to Message Object 2, B and D accordingly to Message Objects 3 and 4. By entering 0 the corresponding Message Object is deactivated.

With U one out of six standard baud rates can be chosen.

The components of the `Bit Timing` register can be modified individually.

N enables activating (`1`) a permanent output according to the chosen `Clock for Sampling` (menu Time&Code, section 7.2.2.2 on page 31). Alternatively the output is only generated if a transponder is decoded within the field (`0`).

By using M the remote mode is activated. Telegrams are not generated automatically anymore, even if `Continuos Telegrams` is activated. Only remote frames are answered with the corresponding address.

With P the output rate of the CAN telegrams can be chosen.

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

7.2.2.6 P(r)ofibus Parameters

In this menu the Profibus® parameters can be altered.

NOTICE

Unexpected antenna resets

If the bus is activated, a reset of the antenna occurs in case of transmission errors. Even a non-existent bus can then be detected as a transmission error.

- ▶ If the Profibus® is not connected or it is an antenna without Profibus® -> deactivate Profibus® in the antenna.

Figure 20 *Menu: Profibus® parameters*

```
Byte #  Master-Input            Profibus-Status:  PB_OFFLINE
  0         00
  1         00
  2         00
  3         00
  4         00
  5         00
  6         e7
  7         18
  8         00          (P)rofibus active                              YES
  9         00          (A)ddress:   [0..125]:                           2
  10        00          (O)rder of Data Transfer (0= HiByte first):      0
  11        00
  12        00          (Q)uit Menue
  13        00
  14        00
  15        00

Byte #  Master-Output
  0         00
```

Left, the bytes transmitted bytes to the master or the byte sent by the master are shown. For further informations refer to Table 19 on page 30.

In the first line the Profibus® status is shown. It can have the following values:

Table 20 *Possible Profibus® Status Messages*

Profibus® Status Messages	
NO_ERROR	Profibus® active, no error
DPS2_INI_ERROR	Those messages indicate that the Profibus® hardware is missing or defunct
SPC_HW_ERROR	
USER_IO_DATA_LEN	
BUF_LEN_ERROR	Buffer length in master are wrong. Use the official GSD file to fix this (see section 11.4 on page 46)
PB_OFFLINE	No contact with master

P allows to turn the Profibus® on or off. When switched on it is initialized with the Slave address as specified with A.

With O you can choose whether the highest byte is output first or last (see Table 16 on page 25).

Leave this menu with Q to return to the main menu. Remember to save changed parameters.

7.2.2.7 (W)rite Transponder

After opening this mode, enter an up to 5-digit Hex code. Locate an RW transponder in the rated distance of the antenna field and activate the programming process with Shift. Alternatively you can use the Götting Transponder Programming device, see Table 4 on page 10.

7.2.2.8 CS(V)

For means of diagnosis the values `Code`, `Us` as well as the status messages `Transponder within field`, `Code OK` (see Table 9 on page 21) and a telegram counter can be output in **CSV Format** (Comma Separated Values; a text file especially formatted to be imported into spreadsheet applications). This output is continuous at 38.400 baud, 8 bit and even parity, until it is interrupted by hitting the A key. This keystroke also generates a reset of the antenna, which restarts with 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 27). Use the function `Record Text ...` of menu `Transfer` and insert an appropriate file name (should bear the file ending `.csv` in order to ensure that the spreadsheet application will automatically recognize this file). Once the file is recorded, stored and closed in HyperTerminal®, it may be imported into a spreadsheet application (e. g. Microsoft® Excel®).

When opening the file, various options will be prompted by the spreadsheet 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 (U)pdate firmware

This menu offers the possibility to perform a software update without disconnecting the power supply of the device. First the update program has to be installed as explained in chapter 7.3.1 on page 37.

Press B in the main menu. Then perform the following steps.

▶ Open the update program (HEX Flasher).

- Select the COM port by which the antenna is connected to the PC.
- Select the HEX file, which is up to be programmed.
- Go back to Hyperterm and press any key.
- Close the COM port in Hyperterm within the next 20 seconds, then change to the HEX flasher and run the programming.

After the programming is complete switch to Hyperterm, wait 10 seconds und connect to the antenna's COM port again. Then start the monitor mode again.

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.

i 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 sent to you. Please address your requests to the email, 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:

- Open Windows Explorer and navigate to the place where you stored the update program. e.g. inside the Windows Program path.
- When using Windows-Versions prior to Windows XP, make sure that the two setting files are writeable. To do so, navigate to the newly created directory and mark the files `ST10-Flasher.ini` and `Command.log`. Open the file properties within the context menu of the Explorer and deactivate `Writing Protected` (if set).

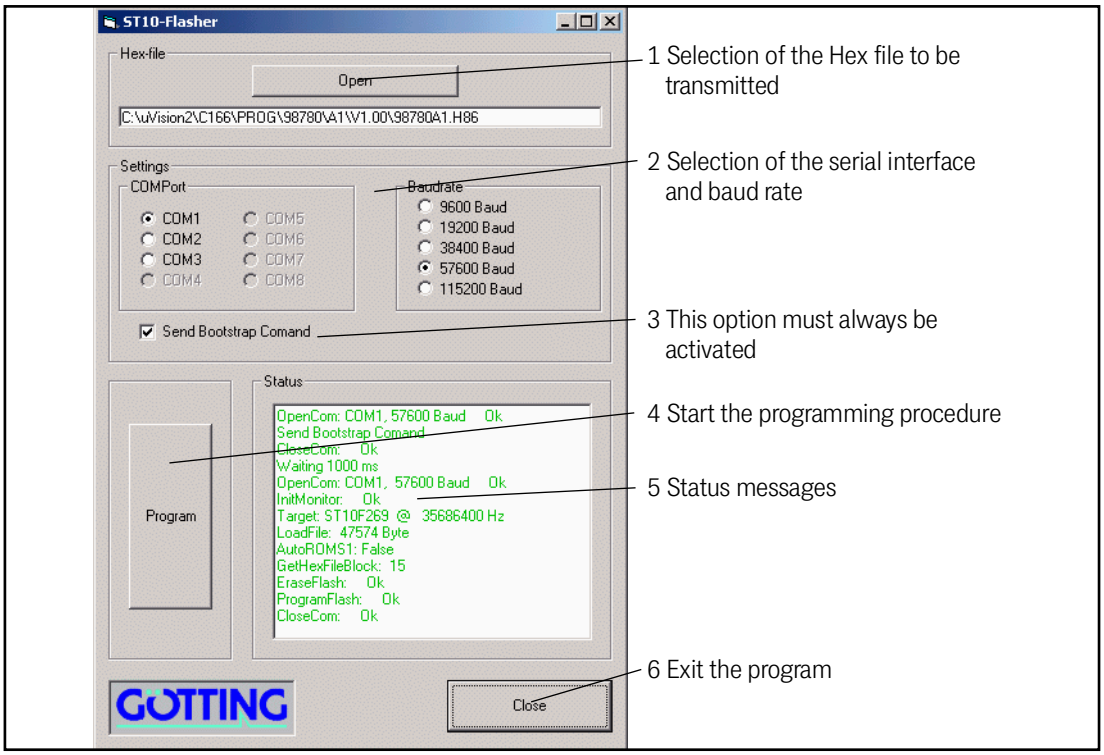
7.3.2 Proceeding the Software Update

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 27).

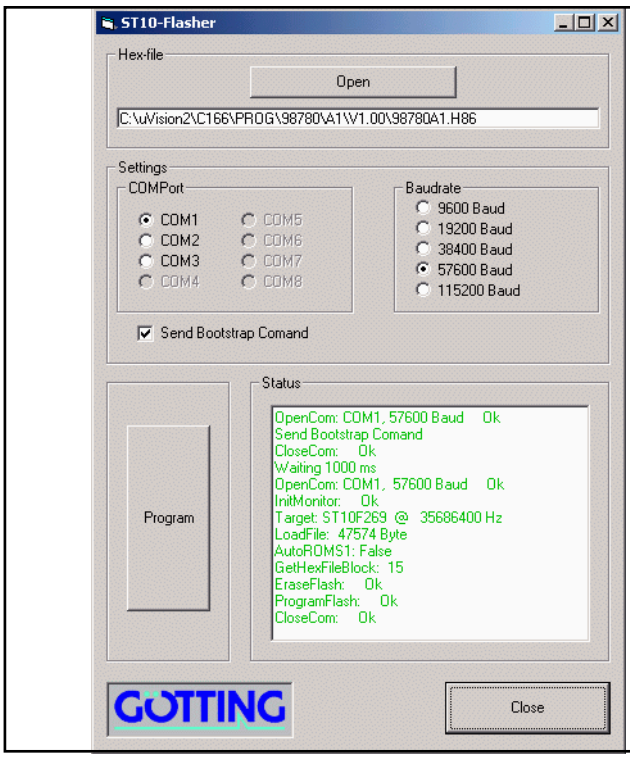
- In order to start the program, double click the file `ST10-Flasher.exe` in the path mentioned above.

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: Programming Procedure*



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`

Once the programing 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 antenna (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 (see section 7.3 on page 37). Date and version of the current antenna software can be obtained from the main menu.

9 Trouble Shooting

The following list 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 how to locate and possibly correct the error.

If you should not be able to correct an error occurred, please use the table how 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 21 *Trouble shooting*

Error	Possible Cause(s)	DIAGNOSIS / CORRECTION
No system function no serial output even though a transponder is located within reception range	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.	1. RS 422 T+(R+) and RS 422 T-(R-) exchanged accidentally 2. Ground not connected, potential difference too high between antenna and receptor 3. Incorrect setting of transfer parameters 4. Incorrect transfer procedure selected	1. Check the corresponding connections 2. Connect signal shielding 3. Select only 9600 or 19200 Baud, 8 Bit, even parity 4. Select the correct procedure, etc. with the PC and the system monitor program
Inaccurate values at low temperatures	1. System only works accurate as when heating period is over 2. Heating not sufficient, cabling loose	1. Wait until the system is heated up (about 60 minutes at -20° C). 2. Measure voltage of 24V on the corresponding clamp (+24V Heating).
Output values are not reproducible; lack of accuracy	Interferences	Check the value S in monitor mode. If it is over approx. 50, there could be interferences in the range 62kHz.
No positioning pulse.	1. Transponder defect 2. Loose cable connections 3. Interferences 4. Antenna defect	Check the transponder (e.g. with the hand-held reader, see Table 4 on page 10)

10 Technical Data

10.1 Antenna

Table 22 *Technical Data Antenna HG 98760-C*

Antenna HG 98760-C	
Casing	refer to Figure 8 on page 16
Weight	approx. 6 kg
Effective antenna area	280 x 110 mm (positioning range)
Voltage supply	24 V ±10 %
Current consumption	approx. 600 mA, during transponder programming max. 2A for 500 ms, about 2A heater
Necessary protection	– Supply (Pin 1) 1 A inert – Heating (Pin 3) 3 A inert
Temperature (storage and operation)	-25 to +70 °C with heater Heating period: about 60 minutes at -20° C Turn-on temperature heating: 0 to 5° C
Mechanical stability	5 g 11 ms / 2 g 10 to 55 Hz
Installation regulations	Refer to Figure 1 on page 11
Protection class	IP 67
Connectors – HG G-98760ZC/WC – HG G-98760YC/XC	 – 12 pin M3 socket – 3 x12 pin M23 sockets
Reading distance (distance between the transponder and the antenna's underside)	in traveling direction in a range of max. ±40mm crossing the center of the antenna: – See information on the transponders in Table 3 on page 9
Positioning accuracy	±3 mm on the center axis
Repeating accuracy	3 mm
Max. pass-over speed	3 m/s
Serial interface (RS422 or RS232)	output with 9600 or 19200 baud; Content of telgram adjustable; procedure 3964R or transparent can be chosen as protocol
CAN-Bus (Version HG G-98760ZC/WC)	According to ISO/DIS 11898 Identifier, Data rate, Basic/Extended CAN; configurable via serial interface
Profibus® (Version HG G-98760YC/XC)	According to DIN 19245 / EN 50170 automatic searching of baud rates; supported rates: 9.6 kBd, 19.2 kBd, 93.75 kBdm 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 power source, isolated

10.2 EMC

Table 23 *EMC-Testing*

Electromagnetic Compatibility (EMC) of Antenna HG 98760-C			
Checking of			**Preliminary Test Standards**
Interference transmission			
	Radiated interference		EN 55 022 Class A
Interference immunity			
	Casing		
		Electromagnetic 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)			

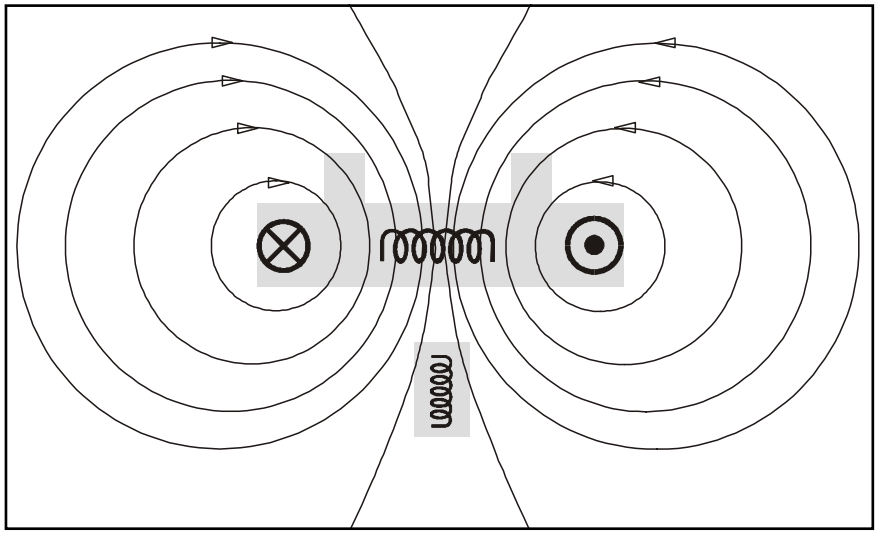
In environments with strong interferences a shielded connection cable should be applied!

11 Appendix

11.1 Physical Basics

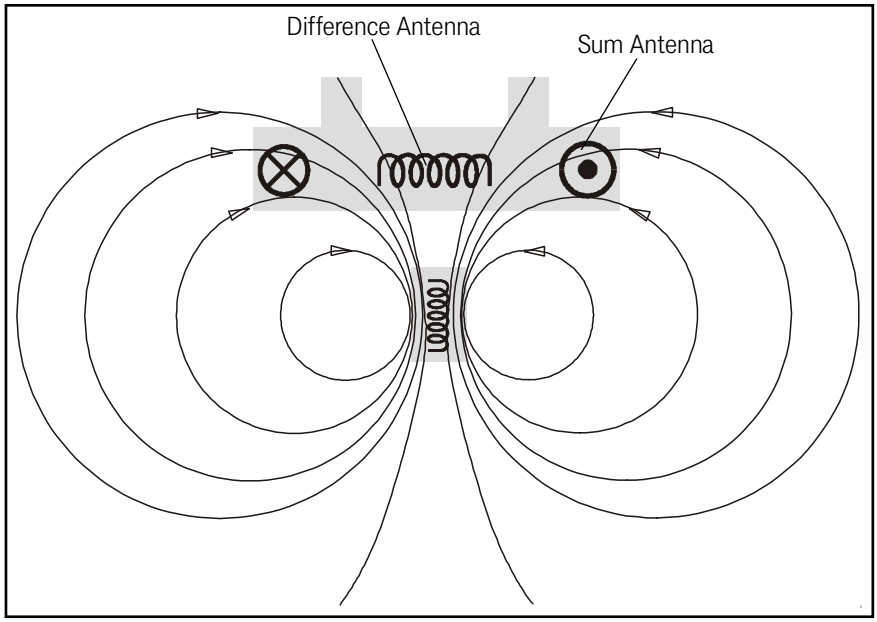
11.1.1 Field Arrangement of the Energy Field

Figure 23 *Field arrangement of the energy field f_c=128 kHz*



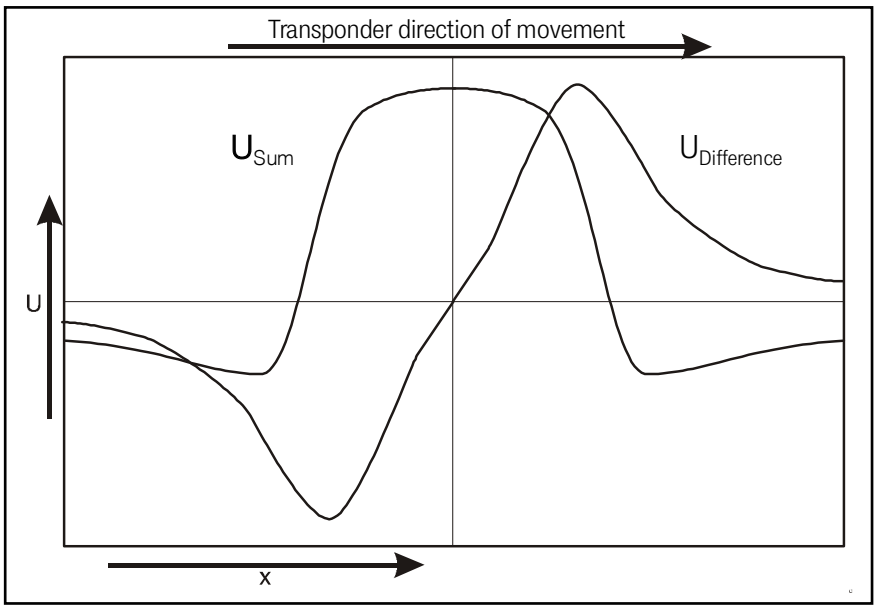
11.1.2 Field Arrangement of the Transponder's Reverse Signal

Figure 24 *Field arrangement of the transponder's reverse signal f_c=64 kHz*



11.1.3 Induced Voltages in Sum and Difference Antenna

Figure 25 *Induced voltages in sum- and difference antenna*



11.2 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.

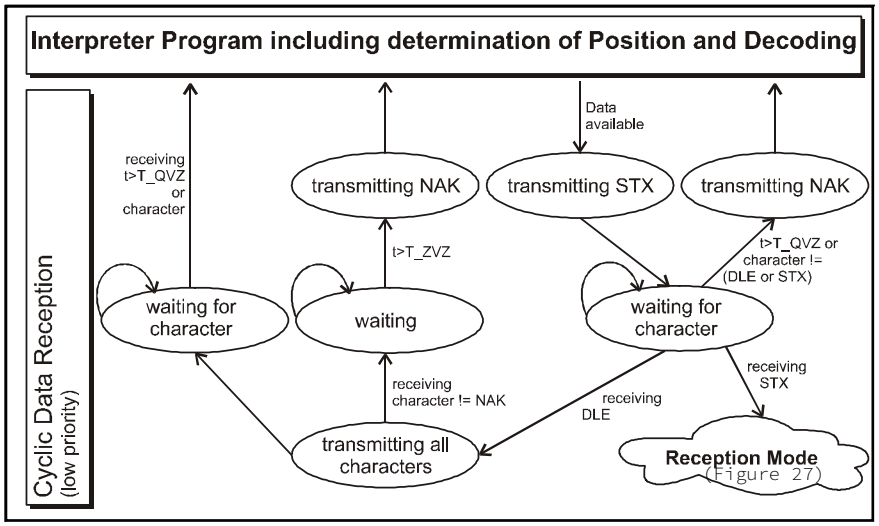
11.2.1 Data direction antenna -> PLC

In this direction the antenna data is transmitted cyclically. A set of data always starts with an "="-character (hex 0x3d). The cycle time is parameterizable 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.

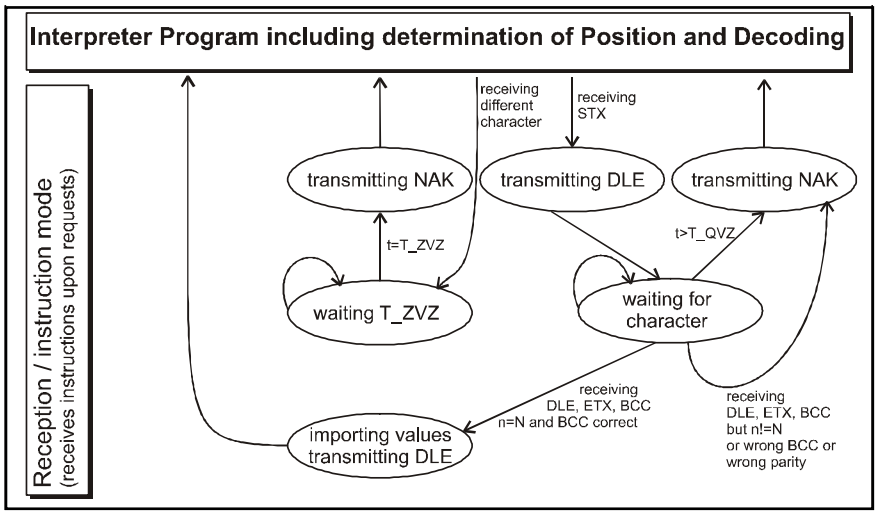
Figure 26 *Status diagram procedure 3964R; Antenna –> PLC*



11.2.2 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 26).

Figure 27 *Status diagram procedure 3964R; PLC –> Antenna*



11.3 Procedure „transparent“

For the interconnection antenna <–> PLC a transparent protocol can be used. The following settings have to be observed for the data transmission:

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

11.3.1 Data direction antenna -> PLC

In this direction, cyclical antenna data is transmitted. The duration is parameterizable, it should take an integral part or multiple of the transponder code transmission. The minimum cycle duration depends upon the telegram length, the Baud rate and the chosen telegram content.

The data sentence always starts with an „=“-character (hex 0x3d). Then the parameters chosen from the respective menu follow. The telegram is to be quit with an 8 bit check sum over all characters. This check character is the result of ex-oring all characters. The characters are transmitted without delay.

11.3.2 Data direction SPS -> antenna

Commands are transmitted into this direction if necessary. Each command must start with a „=“-character (hex 0x3d). The format of the commands is described in Table 10 „List of system commands“ auf Seite 22. The telegram is to be quit with a 8 bit check sum (XOR) over all characters. The characters are sent without delay. The characters must be received within the parameterizable character delay time. Otherwise the telegram will be chopped.

Additionally it is possible to set that the positioning pulse is only deallocated after a transponder has been decoded.

11.4 GSD File (Antenna HG 98760XC/YC with Profibus®)

The latest version of the GDS file can be downloaded from our website at the following address.

https://www.goetting-agv.com/components/98760

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15 Copyright and Terms of Liability

15.1 Copyright

15.2 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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