

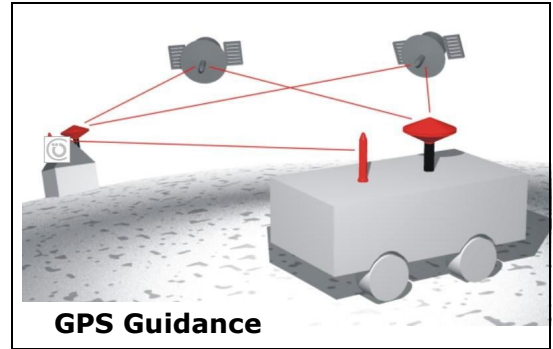
GPS Guidance Systems

Using the GPS Global Positioning System the vehicle receives timing signals from several GPS satellites. The vehicle calculates its distance to the individual satellites and then calculates its position using the distance information from several satellites. In the vehicle a GOETTING guidance controller combines the GPS information and odometric data from wheel encoders etc. to give direct commands to the vehicle's steering system.

The basic GPS system has only a precision of approximately ± 16 feet, which is insufficient for vehicle guidance. Goetting KG uses several measures to increase the performance of a GPS based guidance system to a **precision of ± 0.4 " (1 cm)**.

Some of the technologies include:

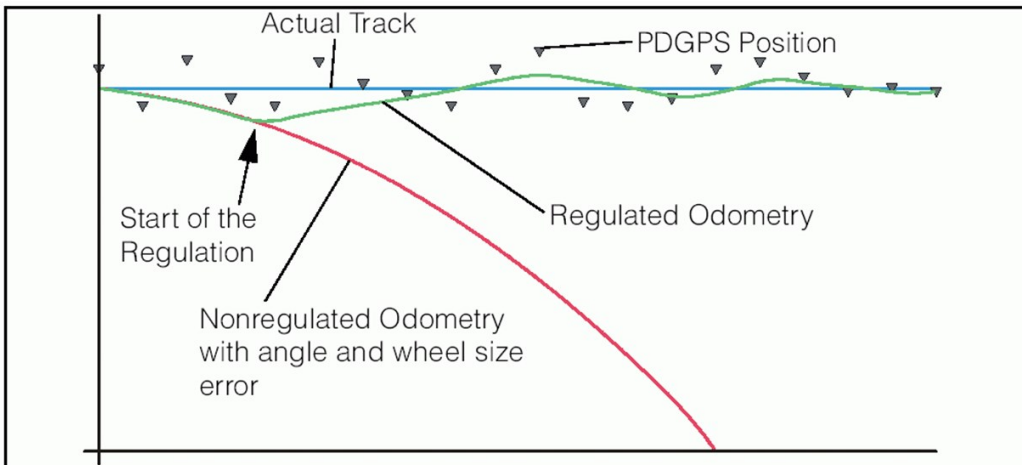
- **DGPS Differential GPS:** a fixed-location GPS receiver positioned on site evaluates the precision of the GPS signals and calculates correction signals, which are radioed to the vehicle system.
- **PDGPS Precision DGPS:** The vehicle receiver increases its precision using carrier phase evaluation algorithms.
- **Sensor Fusion:** GOETTING uses odometric information from the vehicle's wheel decoders to increase quality and to bridge brief interruptions and errors of the GPS signal.



GPS Guidance



GOETTING GPS guided outdoor AGV



GOETTING sensor fusion evaluates and combines positioning information from multiple sources

GPS Guidance System

Advantages and Challenges:

- No field installations (a DGPS reference station is needed, if no sufficient public reference signal is available). Changes of site or vehicle path are handled by self-learning" or changes to a virtual computer map.
- Performance of this guidance system is not affected by adverse light conditions including operation at night, under fog, airborne dust, lint, fluid spraying, bright daylight and welding or by objects on the path like debris, spills, snow, ice, standing water, fluids and ground irregularities etc. In most situations temporary interference of GPS data reception by sun activity is resolved by Goetting's sensor fusion technology.
- The precision of the guidance system ($\pm 0.4"$) is sufficient to stack and pick-up ISO shipping containers automatically, if the vehicle/crane offers precision controls. Customers reached an overall vehicle precision of up to $\pm 0.75"$.
- All GPS antennas need to be mounted with an unobstructed line of sight to the sky, opening angle 170° (5° elevation). Indoor operation is not possible, high buildings, container stacks and overhead cranes can pose challenges. CTS and Goetting offer site surveys to determine mounting positions of GPS antennas.
- The satellites as a part of the system are operated by the US government, which could decide to temporarily decline this service e.g. for reasons of national security.

Applications of GOETTING GPS guidance:

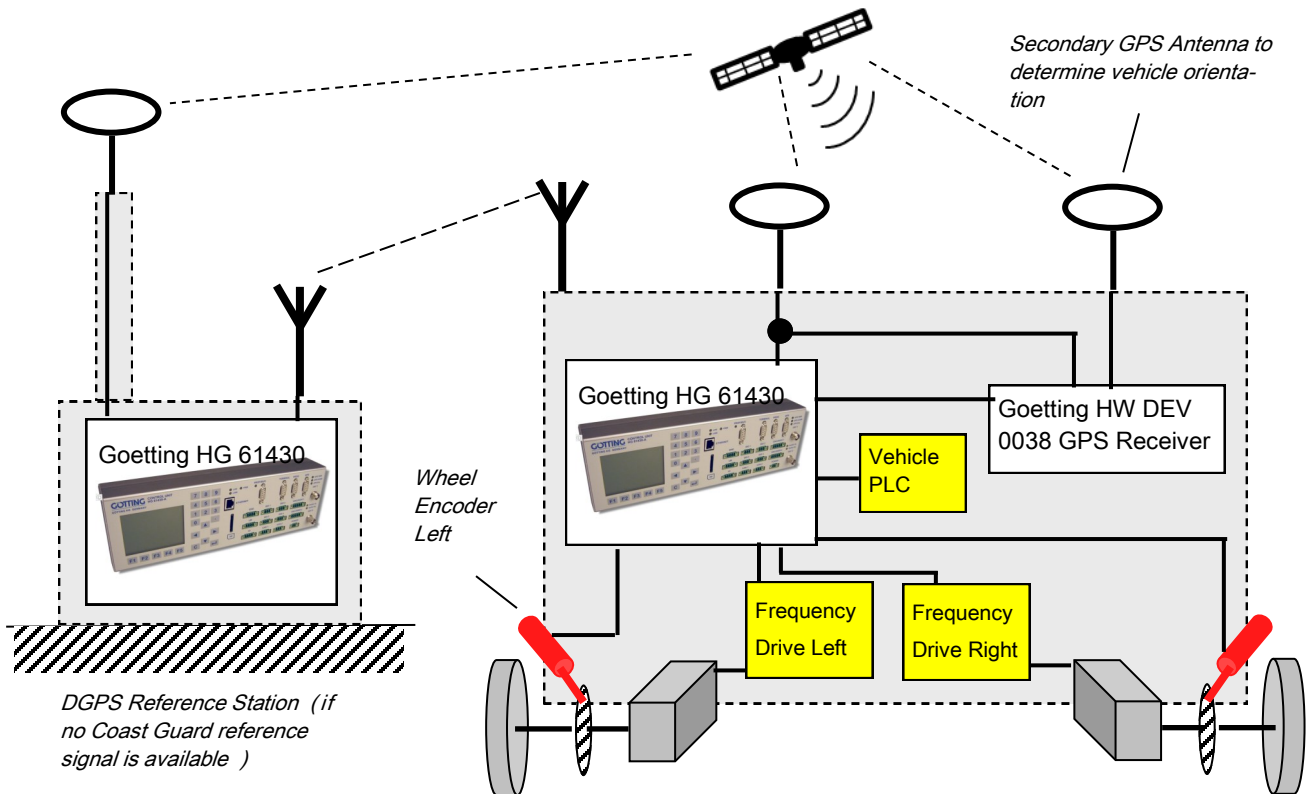
- Control of outdoor AGVs (Automated Guided Vehicles)
- Control of runner tired gantry cranes which then operate "as if on rails" easing operation and increasing operating speed in container terminals.
- Location of shipping containers in container terminals. GPS equipped container handling equipment (cranes etc.) sends messages, where it positions containers to the terminal operating system. This improves quality and allows detailed planning of terminal operation.
- Location and tracking of vehicles e. g, in container terminals, to allow detailed operations planning and collision avoidance



GPS Guidance System

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- Performance of this guidance system is not affected by adverse light conditions including operation at night, under fog, airborne dust, lint, fluid spraying, bright daylight and welding or by objects on the path like debris, spills, snow, ice, standing water, fluids and ground irregularities etc.
- All GPS antennas need to be mounted with an unobstructed free line of sight of the sky, opening angle 170°(5° elevation). Buildings, container stacks and overhead cranes can pose challenges.
- The vehicle has no internal information about its location along the guide-wire. Additional components, e.g. an inexpensive transponder-reader system are possible solutions to mark locations if needed.



Wire Guidance Example A:

GOETTING Interpreter for easy Automation

Wire guidance components for an indoor operated AGV (Automated Guided Vehicle).

A distance between loop and vehicle antenna of 60 mm [2.4"] and a frequency of 10 KHz are chosen in this example, so the customer can benefit from GOETTING's pre-calibrated components allowing accelerated commissioning and "drop-in-place" component replacement without adjustments. Components in this example would otherwise allow calibration on site for distances between 0.8" - 3.9" and frequencies of 3 kHz to 25 kHz.

The vehicle is driving in two directions (forward and backward) along the guide wire.

Using GOETTING's interpreter provides the outputs as a corrected linear relationship between output units and deviation (e.g. x output-units = constant * x inches), not dependent on antenna characteristics etc.

The interface to the vehicle controller/PLC is a computer interface (e.g. CAN open, PROFIBUS).



Alternative Components:

| Quantity | Part Number | Description |
|---------------|-------------|---|
| 1 per vehicle | HG 73350 ZA | Wire Guidance Interpreter, output CAN Open, weatherproof, mounted in vehicle |
| 2 per vehicle | HG 19200 ZC | Indoor Antenna for HG 73350, one installed at each end of vehicle |
| 1 | HG 57500 ZC | Frequency Generator, set to 10 kHz, dual channels, maximum 200 mA loop current, used to power loop in floor |
| 1 | HG 933110-A | Power Supply / Rack for Frequency Generator, for 2 units HG 57500 ZC . |

Use Guidance Interpreter HG 73351 ZA for PROFIBUS output

Use Indoor Antenna 19200 YC for different mounting position of antenna

Use Outdoor Antennas 19535 YC or 19535 ZC for outdoor application

Use Frequency generator HG 57420 for longer loop (max. 600 mA loop current)

**Wire Guidance — Example B:
AGV in large network**

This example shows wire guidance components for indoor operation of a bi-directional AGV within a large network. The vehicle is driving in two directions (forward and backward) along a guide wire.

As a cost effective solution some customers like to handle unadjusted antenna voltage outputs directly with the existing on-board PLC of their vehicles. The interface to the vehicle controller / PLC will be the sum voltage and differential voltage of the antenna coils.

The components are adaptable for different frequencies (e. g. for existing systems). The vehicle will drive on an extensive network with way-switches (turnouts), requiring different guide wire frequencies within the network. The antennas allow the selection of different frequencies during operation.



Goetting equipped wire guided AGV

| Quantity | Part Number | Description |
|---------------|-------------|--|
| 2 per vehicle | HG 19330 xA | Indoor Wire Guidance antenna, remotely switchable frequency, different frequencies available |
| 1 | HG 57500 xC | Frequency Generator, different frequency ranges possible, 2 channels, maximum 200 mA loop current, used to power loop in floor |
| 1 | HG 93310-A | Power Supply / Rack for Frequency Generator, for 2 units HG 57500 |

Alternative Components:

Use Frequency generator HG 57400 ZC for longer loop (max 600 mA loop current), 16 frequencies selectable via dipswitch

Use rack HG 93160 A to house and supply up to 5 units HG 57500

Wire Guidance — Example C

Outdoor Vehicles and Passenger Transport

Wire guidance components are selected for an outdoor specialty vehicle.

In this example customers prefer to handle unadjusted antenna outputs with the existing on-board PLC of their vehicle. The interface to the vehicle controller /PLC will be the sum voltage and differential voltage of the antenna coils. See Example A if GOETTING's interpreter shall be used to provide a linear relationship between output units and vehicle deviation.

Several antennas, which operate on parallel guide wires at different frequencies could be installed to achieve a fail-safe solution.

For switches (turnouts) multi-frequency operation is possible.

Specialty Vehicles operating with GOETTING KG wire guidance technology include Rubber Tired Container Cranes (RTG), large component transporters zoo and amusement park rides.



GOETTING equipped wire guided specialty vehicle transporting airplane wing at Airbus Industries



GOETTING equipped wire guided service and emergency evacuation vehicles operating with passengers at the Channel tunnel connecting England with France. Top speed 55 mph, tunnel length 31.4 miles.

| Quantity | Part Number | Description |
|-----------|-------------|--|
| minimum 2 | HG 19534 | Outdoor Wire Guidance antenna, remote switchable frequency, different frequencies available |
| 1 | cables | Connecting components within vehicle |
| 1 | HG 57400 ZC | Frequency generator, frequency selectable via dipswitch |
| 1 | HG 93160-A | Power Supply / Rack for Frequency Generator, Input 230 VAC (other voltages possible), for 2 units HG 57400 |

Alternative Components:

For a passenger application HG50810-B, a complete cabinet including 2 frequency generators including battery backup for several hours of operation could be used.

Wire Guidance — Example D: Dual-Wire Loops

Wire Guidance components for an AGV with dual - wire loop network (indoor or outdoor).

In most applications the vehicle follows a single guide wire, which is returned to the frequency generator outside of the vehicle's path (forming a wire loop in that way). In a dual-wire application, the "out" and "back" wires of the loop are installed in parallel grooves with a distance of 3" - 6". The vehicle follows a path in the middle between these two wires. Dual-wire loops may be used in the following applications:

- It is not possible to install the "return part" of the wire loop at a sufficient distance from the "active part" of the guide-wire due to space restrictions. With dual guide-wires both grooves can be cut adjacent to each other.
- The electromagnetic field created by the dual-wire loop is generally more stable in an environment, where the floor contains metal (e. g. rebar of a concrete floor). The dual wire installation can help to reduce interference caused by the metal. CTS and GOETTING offer site evaluation services to determine the best solution for each particular environment and application.

The same antennas as in single-wire application are used for dual-wire loops. These are the HG 19200, HG 19330, 19534 and 19535 as shown in the previous example applications.



Goetting equipped wire guided AGV by AFT

Wire Guidance — Example E:

Guidance along an Inductive Power Supply System

Wire Guidance Components for an AGV that operates in a network with an existing inductive power supply system (indoor or outdoor). These systems are used to recharge the AGV batteries during operation, minimizing or eliminating the time and travel needed to change or charge batteries. Such power supply systems use a dual-wire loop configuration as described in Example D.

The GOETTING antennas in such a vehicle are only used for vehicle guidance, not to pick up high currents as part of a power supply.

Antennas are offered either with a direct, unadjusted output of antenna voltages or with an integrated interpreter, that offers a corrected linear relationship between output units and deviation.



Goetting equipped wire guided AGV by Dürr Automotion

| Quantity | Part Number | Description |
|---------------|---------------------------|--|
| 2 per vehicle | HG 19331 xA to HG19335 xA | Outdoor Wire Guidance antenna, for dual wires, offered for a range of wire distances and output interfaces |

For the guide wire the current supplied by the existing dual-wire power supply generator is used as a guidance signal.

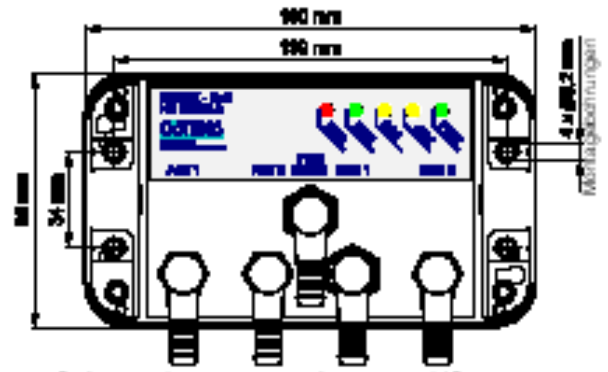


HG 7335x ZA Wire Guidance Interpreter - Outdoor

This unit controls up to 2 wire guidance antennas and provides information of the vehicle's deviation from the guide wire as a corrected linear relationship between output units and deviation.

Technical Features:

- Weatherproof IP64 (equivalent NEMA 4)
- Provides power for antennas
- Service Interface (serial) RS 232 for configuration
- The frequency can be adjusted during operation via CAN / PROFIBUS command (used for switching paths)



General Technical Data:

| | |
|---------------------------------|---------------------------------------|
| Supply Voltage: | 18 V - 30V DC |
| Supply Current: | 180mA at 24V without cameras |
| Update Rate: | 10 ms |
| Loop Frequency: | 3 kHz to 25 kHz |
| Dimensions (Housing with plug): | 6.3" x 3.6" x 3.0" (160 x 90 x 76 mm) |

Versions:

| | |
|-------------|---|
| HG 73350 ZA | Data Interface: CAN-Open Configuration Interface : RS 232 or CAN Open SDO object |
| HG 73351 ZA | Data Interface: PROFIBUS Configuration Interface : RS 232 |

Accessories:

| | |
|-------------|---|
| HG 19200 YC | Indoor Wire Guidance Antenna, 3 - 25 kHz, preset 10kHz, 60mm operating heights (30 - 100mm possible) |
| HG 19200 ZC | Same as 19200 YC, but different mounting position |
| HG 19535 YC | Outdoor Wire Guidance Antenna, 3 - 25 kHz, preset 10kHz, 60mm operating heights (30 - 100mm possible) |
| HG 19535 ZC | Same as 19535 YC, but different mounting position |

HG 19200 xC Wire Guidance Antenna for HG 7335x Interpreter, indoor model

These wire guidance antennas were especially designed to operate together with the HG 73350 Interpreter. They are pre-calibrated to 2.36" [60mm] reading heights, 10kHz, 100 mA, 1 V peak output voltage.

Technical Features :

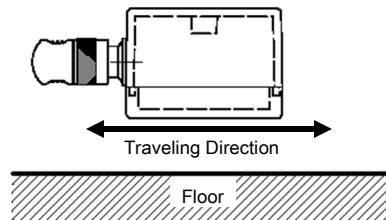
- Weatherproof IP65 (similar NEMA 4)
- Drop in replacement, pre calibrated for HG 7335x Interpreter
- Used mostly for indoor AGV
- Peak value of sum-voltage and differential voltage adjustable via potentiometer

General Technical Data:

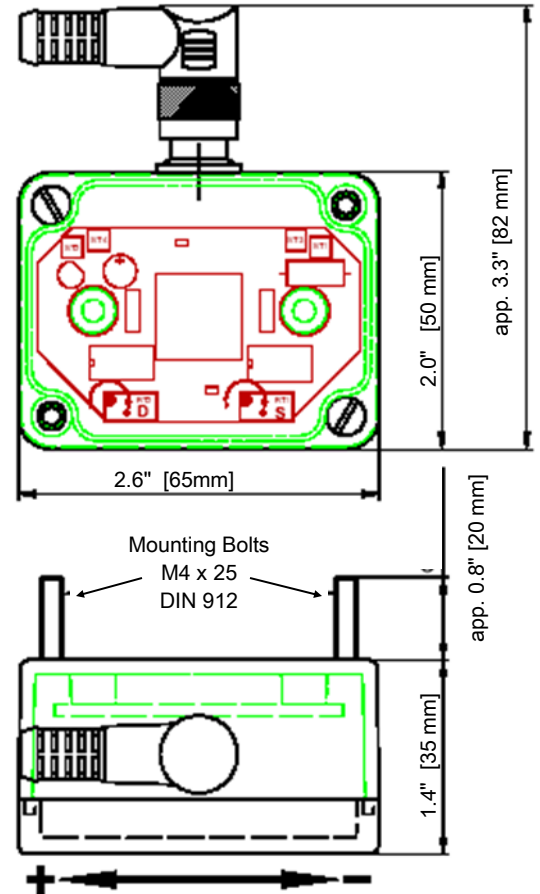
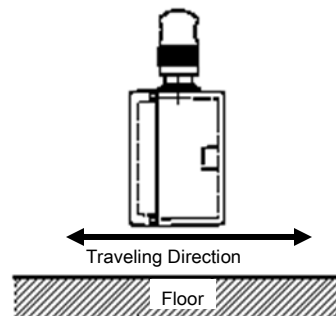
| | |
|---------------------------------|--------------------------------------|
| Reading Heights: | 1.18" to 3.93" [30 to 100 mm] |
| Guide Wire Current: | 50mA to 200 mA |
| Supply Power: | 18 V to 30 V DC |
| Frequency: | 3 kHz to 25 kHz |
| Dimensions (Housing with plug): | 2.6" x 3.3" x 1.4" [65 x 82 x 35 mm] |

Versions:

HG 19200 YC Reading direction:



HG 19200 ZC Reading Direction:

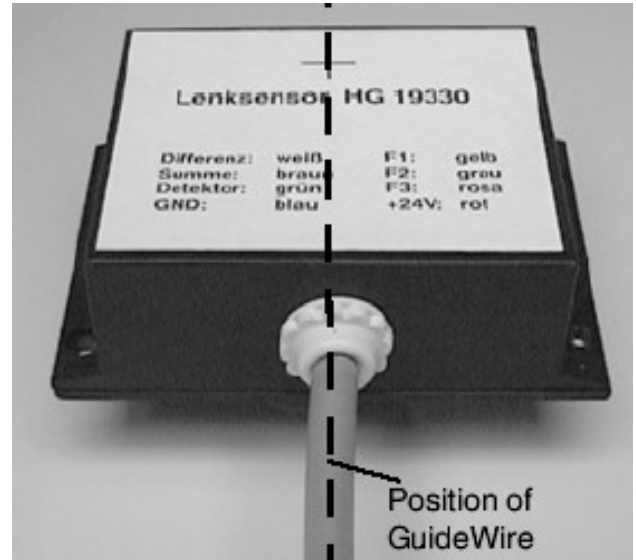


HG 19330 xA Standard Wire Guidance Antenna Indoor Operation, Multi Frequency

These wire guidance antennas are used for AGVs in indoor applications. A wide range of models with various frequencies, and pre-calibrated wire currents and installation heights are available.

Technical Features :

- Allows selection of 8 frequencies during operation via digital inputs
- Cost effective unit
- Sum Voltage detector detects presence of a guide wire
- Sensitivity and offsets of sum-voltage and differential voltage, as well as switch point of loop detection adjustable via potentiometers



General Technical Data:

Output Antenna Voltage: - 10V to + 10 V
 Dimensions: 3.9" x 2.5" x 1.3" [98 x 62 x 31 mm]
 Supply Power: 24 V DC, app. 100 mA

Versions:

| Type | Frequencies [kHz] | | | | | | | | Calibrated Wire Current | Calibrated Installation Heights |
|-----------------|-------------------|------|------|------|------|------|------|------|-------------------------|---------------------------------|
| 19330 ZA | 5.1 | 5.7 | 6.3 | 7.0 | 7.8 | 9.0 | 10.0 | 12.0 | 35 mA | 2.36", 60mm |
| 19330 YA | 1.5 | 2.0 | 2.7 | 3.5 | 4.7 | 6.3 | 6.3 | 6.3 | 450 mA | 2.76", 70mm |
| 19330 XA | 5.1 | 5.7 | 6.3 | 7.0 | 7.8 | 9.0 | 10.0 | 12.0 | 150 mA | 5.9", 150mm |
| 19330 WA | 5.1 | 5.7 | 6.3 | 7.0 | 7.8 | 9.0 | 10.0 | 12.0 | 35 mA | 2.36", 60mm |
| 19330 VA | 6.0 | 8.0 | 9.0 | 10.0 | 12.0 | 14.0 | 16.0 | 26.0 | 100 mA | 2.76", 70mm |
| 19330 UA | 4.0 | 6.0 | 8.0 | 10.0 | 16.0 | 4.7 | 5.1 | 5.7 | 100 mA | 2.76", 70mm |
| 19330 TA | 5.5 | 7.0 | 8.4 | 10.1 | 12.2 | 15.2 | 18.1 | 26.7 | 100 mA | 2.76", 70mm |
| 19330 SA | 4.0 | 6.0 | 8.0 | 9.0 | 10.0 | 12.0 | 14.0 | 16.0 | 100 mA | 2.76", 70mm |
| 19330 RA | 5.1 | 5.7 | 6.3 | 7.0 | 7.8 | 9.0 | 10.0 | 8.55 | 100 mA | 2.36", 60mm |
| 19330 QA | 8.1 | 10.7 | 13.5 | 7.0 | 7.8 | 9.0 | 10.0 | 12.0 | 100 mA | 3.94", 100m |

HG 19331 to HG 19335 Wire Guidance Antennas for Inductive Power Supply Installations

These wire guidance antennas are used for AGVs which operate on a inductive power supply dual guidewire. The antennas are for guidance purposes only, they may not be used to power an AGV.

Technical Features :

- Several units include an interpreter, that provides the deviation from the vehicle's path as measurements in mm.
- Sum Voltage detector detects presence of a guide wire
- Units have 3 antenna coils mounted in one housing allowing the vehicle to operate through path switches (turnouts).
- RS 232 serial maintenance interface for adjustments via laptop (exception HG 19331).



GOETTING HG 19334 JA guidance antenna for dual wire inductive power supply installation

Versions:

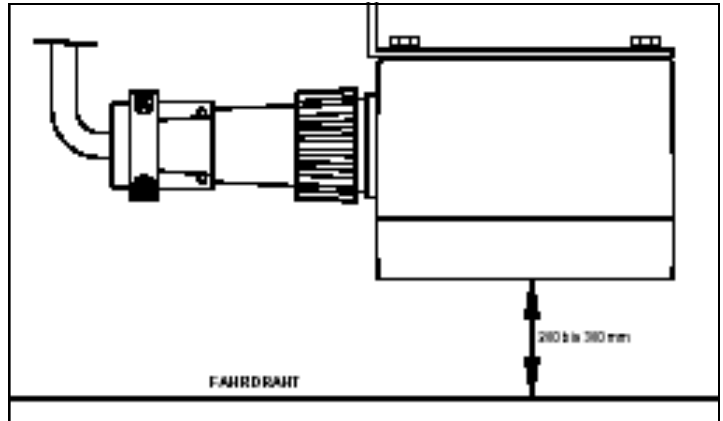
| Type | Distance between Guide Wires | Interface |
|-------------|------------------------------|---|
| HG 19331 -A | 100 mm | Individual analogue antenna sum and differential voltages from 3 antennas |
| HG 19333 OA | 100 mm | <ul style="list-style-type: none"> • Pre-calibrated for 35 mm distance to loop, • Output units proportional to antenna voltages, additional output of vehicle deviation in [mm] for deviations up to $\pm 1.5''$ • Data Output Interface: PROFIBUS and Serial RS 232 |
| HG 19333 TA | 140 mm | <ul style="list-style-type: none"> • Pre-calibrated for 35 mm distance to loop, • Output units proportional to antenna voltages, additional output of vehicle deviation in [mm] • Data Output Interface: PROFIBUS and Serial RS 232 |
| HG 19333 XA | 140 mm | <ul style="list-style-type: none"> • Pre-calibrated for 35 mm distance to loop, • Output units proportional to antenna voltages • Data Output Interface: PROFIBUS and Serial RS 232 |
| HG19334 JA | 80 mm | <ul style="list-style-type: none"> • Pre- calibrated for 30 mm distance to loop • output units proportional to antenna voltages , additional output of vehicle deviation in [mm] for deviations up to $\pm 1.5''$ • Data Output Interface: CAN-Open and Serial RS 232 |
| HG 19335 | ? | <ul style="list-style-type: none"> • Data Output Interface: CAN-Open and Serial RS 232 • Service Interface: serial RS232 |

HG 19534 Standard Wire Guidance Antenna Outdoor Operation, Multi Frequency

These wire guidance antennas are used for Outdoor vehicles, cranes etc. Several models with different frequencies and pre-calibrated wire currents and installation heights are available.

Technical Features :

- Allows 8 different frequencies to be selected during operation via digital inputs
- Outdoor Unit, protection IP 67 (similar NE-MA 4),
- Increased mounting heights for added clearance
- Sum Voltage detector detects presence of a guide wire
- Sensitivity and offsets of sum-voltage and differential voltage, as well as switch point of loop detection adjustable via potentiometers



General Technical Data:

Output Antenna Voltage: - 20V to + 20 V
 Dimensions (including plug): 4.8" x 9.6" x 1.3" [120 x 242 x 91 mm]
 Supply Power: 21.6 to 26.4 V DC, app. 100 mA

| | Frequencies [kHz] | | | | | | | | Calibrated Wire Current | Calibrated Installation Heights |
|--------------|-------------------|-----|-----|-----|-----|-----|------|------|-------------------------|---------------------------------|
| 19534 | 5.1 | 5.7 | 6.3 | 7.0 | 7.8 | 9.0 | 10.0 | 12.0 | 35 mA | 11.8", 300mm |

Other frequency groups similar to HG 19330 are available upon request.

HG 19535 xC Wire Guidance Antenna for HG 7335x Interpreter, outdoor model

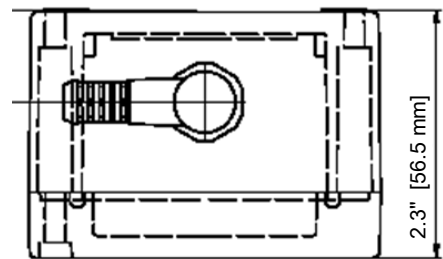
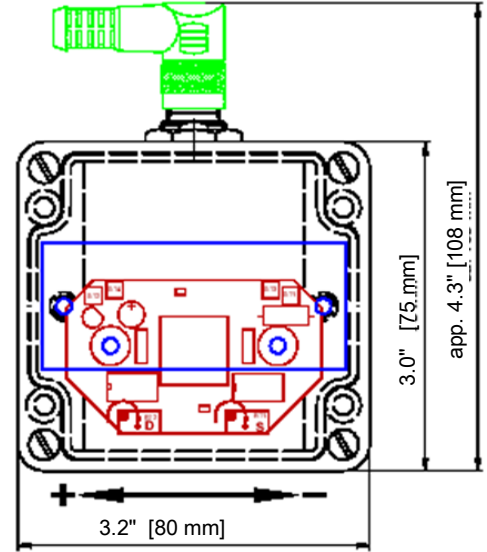
These wire guidance antennas were especially designed to operate together with the HG 73350 Interpreter. They are pre-calibrated to 2.36" [60mm] reading heights, 10kHz, 100 mA, 1 V peak output voltage.

Technical Features :

- Weatherproof IP65 (similar NEMA 4)
- Drop in replacement, pre calibrated for HG 7335x Interpreter
- Used mostly for outdoor vehicles
- Peak value of sum-voltage and differential voltage adjustable via potentiometer

General Technical Data:

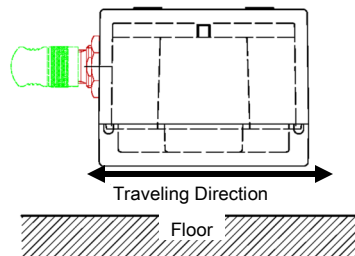
Reading Heights: 1.18" to 3.93" [30 to 100 mm]
 Guide Wire Current: 50mA to 200 mA
 Supply Power: 18 V to 30 V DC
 Frequency: 3 kHz to 25 kHz
 Dimensions (Housing with plug): 3.2" x 4.3" x 2.3" [80 x 108 x 56.5 mm]



Versions:

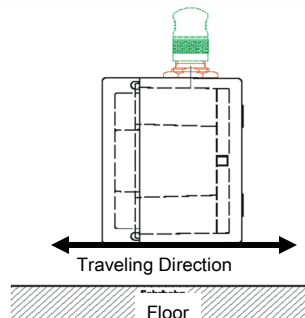
HG 19200 YC

Reading direction:



HG 19535 ZC

Reading Direction:



HG 574x0 Frequency Generator for Guide Wire Loop (higher current)

These generators provide an AC current of a single fixed frequency for an inductive guidance loop.

Features and Advantages

- High current for longer loops i. e. at outdoor installation
- Quarz stabilized oscillator and regulated current output
- Loop power and supply power galvanically isolated by transformer
- 24VDC power input, EURO-card "slide -in-cassette" design, see "Accessories" section for power racks (exception, HG 57441)



Versions:

| Model | Max Output Current | Frequency | Width [TE] | Comments |
|-------------|--------------------|---|--------------|---|
| HG 57400 ZC | 600 mA | Adjustable, additional frequencies possible | 20 TE = 4" | Frequency adjustable by dipswitch: 5.05 kHz - 5.1 kHz - 5.15 kHz - 5.2 kHz - 5.7 kHz - 6 kHz - 6.3 kHz - 6.5 kHz - 7 kHz - 7.5 kHz - 7.8 kHz - 8 kHz - 8.5 kHz - 9 kHz - 9.5 kHz - 10 kHz |
| HG 57420 | 600 mA | 10 kHz | 28 TE = 5.6" | |
| HG 57440 | 700 mA | 10 kHz | 20 TE = 4" | |
| HG 57441 | 700 mA | 10 kHz | 20 TE = 4" | Same as HG 57441 but with flange mount case |

Accessories:

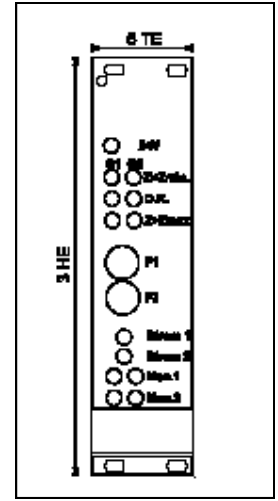
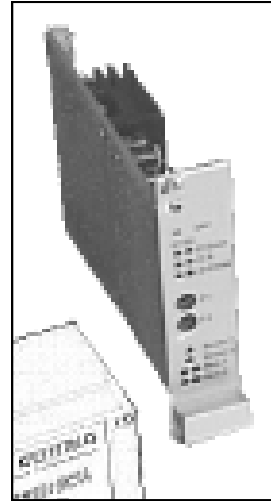
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| HG 93110-A | Power Supply and Rack for 1 generator HG574x0, input 230V AC 50 Hz |
| HG 93160-A | Power Supply and Rack for 1 or 2 generators HG574x0, input 230V AC 50 Hz |
| HG 93161-A | Power Supply and Rack for 1 or 2 generators HG574x0, input 24V DC |

HC 57500 xC Multi Frequency Dual Generator for Guide Wire Loops

These generators provide AC current for inductive guidance loops. They combine two generators in one housing. They are very cost effective and are mostly used for indoor AGV networks utilizing different loop frequencies for switches, wyes and intersections.

Technical Features:

- Each generator supplies 16 different frequencies, which are selected by HEX switch or remotely
- 2 independent quartz stabilized oscillators and regulated current output
- Synchronous operation is performed, if the same frequency is selected for both generators
- Loop power and supply power are galvanically isolated by individual transformers
- LED indicators for loop load impedance range: "impedance to low" e.g. by short circuit, "impedance to high" e.g. by broken wire
- 24VDC power input, EURO-card "slide -in-cassette" design width 6 TE = 1.2", (exception, HG 57441)



Versions:

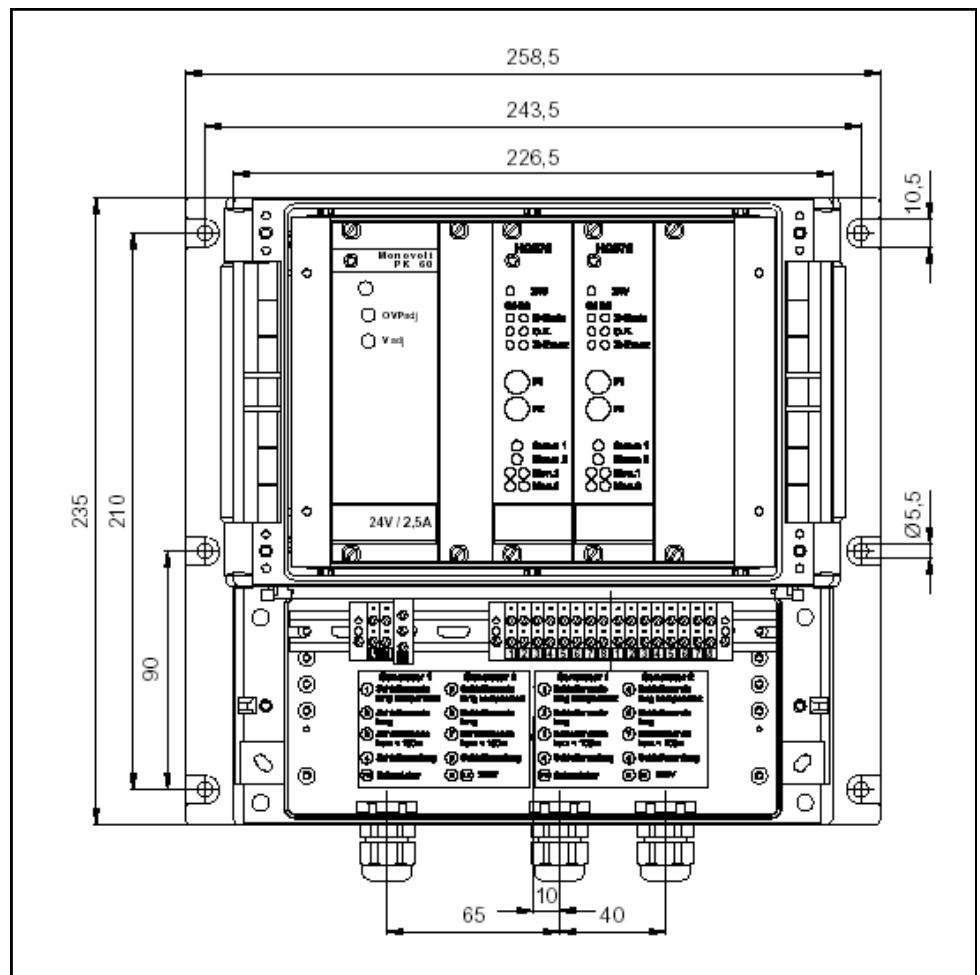
GOETTING offers 9 versions of the HG 57500 xC frequency generator. These vary mostly in the set of preprogrammed frequencies. Additional custom frequency sets in 1 Hz steps from 4 kHz to 26 kHz are available for these generators.

The HG 57500ZC is a widely used generator offering the following frequencies at a maximum current of 200 mA (short loop) or 100 mA (long loop): 1 Hz - 5kHz - 5.1 kHz - 5.2 kHz - 5.7 kHz - 6 kHz - 6.3 kHz - 6.5 kHz - 7 kHz - 7.5 kHz - 7.8 kHz - 8 kHz - 8.5 kHz - 9 kHz - 9.5 kHz - 10 kHz.

Accessories for HG 57500 see next page

HC 57500 xC Accessories

| | |
|-------------|---|
| HG 93110-A | Power Supply and Wall mounting Rack for 1 or 2 generators HG57500, input 230V AC 50 Hz or 24 VDC |
| HG 93110 XA | Power Supply and Wall mounting Rack for 1 to 3 generators HG57500, input 230V AC 50 Hz or 24 VDC |
| HG 93160-ZA | Power Supply and 19" Rack for 1 to 5 generators HG57500, input 230V AC or 110V AC |
| HG 93161-ZA | Power Supply and 19" Rack for 1 or 5 generators HG57500, input 24V DC |
| HG 05750-A | Fault Message Collector for up to 8 generators HG 57500 xC. The unit has a switched contact, that is activated, if one of the attached HG57500 xC shows too low or too high loop impedance. |



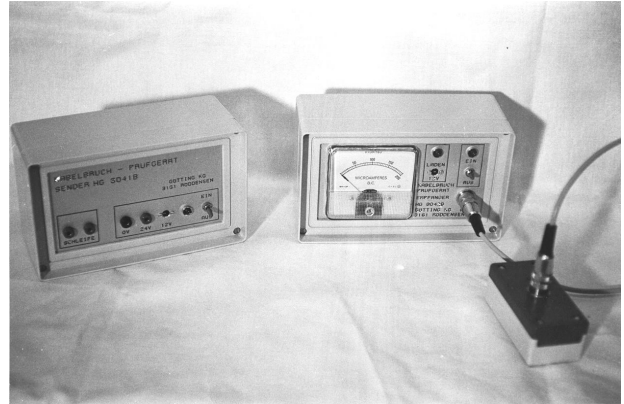
HG 93110-A wall mounting rack with two generators HG 57500

S 80400 B Wire Breakage Indicator Tool

The portable S80400 B wire breakage Indicator is used to locate the position of a cable break in a buried wire guidance cable loop.

The kit consists of three parts:

- A special frequency generator to power the loop
- A portable battery operated receiver unit with an indicator powered by a rechargeable battery
- An antenna, which could be installed on a handle (similar to a "mine sweeping device").



The defective loop is energized by the special generator. The operator carries the receiver on a shoulder strap and follows the guide wire with the antenna. Using the receiver's indicator, the operator is able to locate the break point. Maximum detection depth for concrete - buried guide wire is 4 inches.

S 81933-A Track - Finder Tool

This portable measuring tool is used to verify and check a guide wire installation after installation or repairs and to find a buried guide wire.

The HG 19330 antenna (not included) is attached to the tool. Indicators show the sum - voltage and differential - voltage of the antenna. The antenna is held directly over the guide wire at maximum sum voltage. An indicator verifies that the wire is powered with the correct frequency.

The track finder and antenna are powered by a rechargeable battery. Different frequencies of the HG19330 are conveniently chosen on the S 81933 using a selector switch.

