GV - 700T TRANSMITTER

GV - 701R RECEIVER
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- System Overview and Antenna options
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- VIBE - PORT GVS ANT - DIR ANTENNA
- VIBE - PORT GV709A Antenna extension
- VIBE - PORT GV709B Antenna extension
- Installation of GV - 700T and GV - 701R
- Using Multiple Transmitters
- Operating Wireless System and LED Functionality
- GV - 721R - PC Portable Receiver
- GV - 700T and GV - 701R Trouble Shooting Guide
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DISCLAIMER
Whilst every effort has been taken to ensure the accuracy of this document, we accept no responsibility for damage, injury, loss or expense resulting from errors or omissions and reserve the right of amendment without notice.
GVS Reliability Products
The Wireless Vibration Monitoring system is designed to allow raw mV waveform vibration data from standard vibration sensors to be analysed in a remote location over a wireless link.

- It is ideal where access to vibration sensors is difficult due to Health & Safety or location issues. A typical installation diagram is shown below.

- Any standard Vibration Data Analyser may be used by simply connecting the input of the analyser to the front panel BNC vibration output connector.

- The Wireless Vibration Monitoring System comprises of one master Receiver Unit and a Transmitter Unit which can have up to 8 vibration sensors attached.

- Up to 8 Transmitter units may be linked to a single Receiver unit.

- The Receiver unit controls the system and provides the user with real time live vibration data together with the temperature reading of the vibration sensor if a dual output sensor is used.

- Sampling rate is 33kHz, which translates to a reading every 30 micro seconds.

- **See below for a system schematic overview:**
The GV-700 Vibe Port is designed to work out of the box without any user configuration.

The GV-700T and GV-701R Wireless Vibration Monitoring System comprises of one master Receiver Unit (GV-701R) and a Transmitter Unit (GV-700T) which can have up to 8 Vibration and Temperature sensors attached.

Any constant current with DC voltage output Accelerometer can be connected to the system.

The Receiver unit controls the system and provides the user with real time live vibration data together with the temperature reading of the dual output vibration and temperature sensor.

In addition the range of the system is up to 100m clear line of sight.

Sampling rate is 33kHz, which translates to a reading every 30 micro seconds.

The standard radio link uses 2.4GHz frequency band, other options e.g. 5.0 - 5.8GHz are available.

When ordering a GV-700 Vibe Port system a GV-700 VIBE PORT SURVEY FORM will be sent and after completion your GVS technician will select the appropriate Antenna and Antenna Extension, if required.

There are two Antenna options, as shown on pages 5-6

1. **GVS-ANT-OMNI** Omnidirectional antenna (standard)
2. **GVS-ANT-DIR** Directional antenna (optional)

There are two Antenna Extension options, if required due to mounting constraints with the transmitter/receiver enclosures, as shown on pages 7-8

1. **GV-709A** Omnidirectional Antenna Extension
2. **GV-709B** Directional Antenna Extension
FUNCTIONALITY

- 5dBi 2.4GHz Outdoor Antenna
- Robust Protective Cover
- IP66 Connection System
- Ideal for obtaining line of sight conditions

DESCRIPTION

- The GVS-ANT-OMNI is the standard antenna fitted to GV-700 Vibe-Port system.
- The rugged high gain 5dBi antenna has a black ASA UV resistant plastic radome with a heavy duty metal base.
- The antenna can be supplied as a remote antenna on either the transmitter or receiver enclosure.
- RMI-WHF-XX at 2400 MHz – Elevation

DIMENSIONS

<table>
<thead>
<tr>
<th>Length</th>
<th>76 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>350 g</td>
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<tr>
<td>Diameter</td>
<td>45 mm</td>
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ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Part Number</th>
<th>GVS-ANT—OMNI—(EXT—XX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable Length</td>
<td>XX is cable length in meters</td>
</tr>
<tr>
<td>Gain</td>
<td>5dBi</td>
</tr>
</tbody>
</table>

GVS - ANT - OMNI TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Type</th>
<th>Co-linear Dipole Array</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>1700 – 6000 MHz</td>
</tr>
<tr>
<td>Impedance</td>
<td>50 Ω Nominal</td>
</tr>
<tr>
<td>Gain</td>
<td>5 dBi (+/- 0.5 dBi)</td>
</tr>
<tr>
<td>Max Power</td>
<td>10 Watts (CW) at 50ºC</td>
</tr>
<tr>
<td>Ingress Protection</td>
<td>IP67</td>
</tr>
<tr>
<td>Polarization</td>
<td>Linear Vertical</td>
</tr>
<tr>
<td>VSWR</td>
<td>2:1 max</td>
</tr>
<tr>
<td>Connector</td>
<td>IP67 connection system</td>
</tr>
<tr>
<td>Operating Temp</td>
<td>-40 to +85 deg C</td>
</tr>
</tbody>
</table>
**FUNCTIONALITY**

- 12dBi 2.4GHz Outdoor Antenna
- Robust Protective Cover
- IP66 Connection System
- Ideal for obtaining line of sight conditions

**DESCRIPTION**

- The GVS-ANT-DIR is the optional directional antenna fitted to GV-700 Vibe-Port system.
- The rugged high gain 12dBi antenna is supplied within a robust polyester UV resistant IP66 housing.
- The antenna can be supplied as a remote antennas on the receiver enclosure

**DIMENSIONS**

<table>
<thead>
<tr>
<th>Length</th>
<th>110 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>350 g</td>
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<tr>
<td>Diameter</td>
<td>110 mm</td>
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</table>

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>GVS-ANT—DIR—(EXT—XX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable Length</td>
<td>XX is cable length in meters</td>
</tr>
<tr>
<td>Gain</td>
<td>12dBi</td>
</tr>
</tbody>
</table>

**GVS -ANT - DIR TECHNICAL SPECIFICATION**

<table>
<thead>
<tr>
<th>Type</th>
<th>Enclosed Yagi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>2400 – 2500 MHz</td>
</tr>
<tr>
<td>Impedance</td>
<td>50 Ω Nominal</td>
</tr>
<tr>
<td>Gain</td>
<td>12 dBi (+/- 0.5 dBi)</td>
</tr>
<tr>
<td>Max Power</td>
<td>10 Watts (CW) at 50ºC</td>
</tr>
<tr>
<td>Ingress Protection</td>
<td>IP67</td>
</tr>
<tr>
<td>Polarization</td>
<td>Linear Vertical</td>
</tr>
<tr>
<td>VSWR</td>
<td>1.5:1 max</td>
</tr>
<tr>
<td>Connector</td>
<td>IP67 connection system</td>
</tr>
<tr>
<td>Operating Temp</td>
<td>-40 to +85 deg C</td>
</tr>
</tbody>
</table>
**FUNCTIONALITY**

- 5dBi 2.4GHz Outdoor Antenna
- Robust Protective Cover
- IP66 Connection System
- Ideal for obtaining line of sight conditions
- Various cable lengths between 1 - 10 meter e.g. GV-709A-10m

**DESCRIPTION**

- The GV-709A Antenna Extension provides an easy and robust method of obtaining line of sight communications for a GV-700 Vibe-Port system. It can be used when a GV-701R receiver cannot be installed in a location that reaches the GV-700T Transmitter.
- The high gain 5dBi antenna allows users to transmit and receive all available signals in real world obstructed environments where other antennas fail to connect.
- It has a nominal 50 ohm impedance and a VSWR rating of 1:1 to 1.2:1
- For a full listing of devices available or technical assistance in choosing other suitable antenna please contact our sales department.

**DIMENSIONS**

- Length: 130mm
- Weight: 350 g
- Diameter: 100mm

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>GVS-709A-XX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable Length</td>
<td>05m or 10m of low loss cable</td>
</tr>
<tr>
<td>Gain</td>
<td>6dBi</td>
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</table>

**GV - 709A TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Type</th>
<th>Co-linear Dipole Array</th>
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</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>2300 – 2500 MHz</td>
</tr>
<tr>
<td>Impedance</td>
<td>50 Ω Nominal</td>
</tr>
<tr>
<td>Gain</td>
<td>5 dBi (+/- 0.5 dBi)</td>
</tr>
<tr>
<td>Max Power</td>
<td>50 Watts (CW) at 50°C</td>
</tr>
<tr>
<td>Ingress Protection</td>
<td>IP66</td>
</tr>
<tr>
<td>Polarization</td>
<td>Linear Vertical</td>
</tr>
<tr>
<td>VSWR</td>
<td>1.2:1 max</td>
</tr>
<tr>
<td>Connector</td>
<td>IP68 connection system</td>
</tr>
<tr>
<td>Operating Temp</td>
<td>-40 to +85 deg C</td>
</tr>
</tbody>
</table>
**FUNCTIONALITY**

- 12dBi 2.4GHz Outdoor Antenna
- Robust Protective Cover
- IP66 Connection System
- Ideal for obtaining line of sight conditions
- Various cable lengths between 1 - 10 meter e.g. GV-709B-10m

**DESCRIPTION**

- The GVS-ANT-DIR is the optional directional antenna fitted to GV-700 Vibe-Port system.
- The rugged high gain 12dBi antenna is supplied within a robust polyester UV resistant IP66 housing.
- The antenna can be supplied as a remote antennas on the receiver enclosure
- Specify the –EXT option and cable length required if it is to be used as a remote antenna.

**DIMENSIONS**

<table>
<thead>
<tr>
<th>Part</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>110 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>350 g</td>
</tr>
<tr>
<td>Diameter</td>
<td>110 mm</td>
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</tbody>
</table>

**GVS-ANT-DIR TECHNICAL SPECIFICATION**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Enclosed Yagi</td>
</tr>
<tr>
<td>Frequency Range</td>
<td>2400 – 2500 MHz</td>
</tr>
<tr>
<td>Impedance</td>
<td>50 Ω Nominal</td>
</tr>
<tr>
<td>Gain</td>
<td>12 dBi (+/- 0.5 dBi)</td>
</tr>
<tr>
<td>Max Power</td>
<td>10 Watts (CW) at 50ºC</td>
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<tr>
<td>Ingress Protection</td>
<td>IP67</td>
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<tr>
<td>Polarization</td>
<td>Linear Vertical</td>
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<td>VSWR</td>
<td>1.5:1 max</td>
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<td>Connector</td>
<td>IP67 connection system</td>
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<tr>
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<thead>
<tr>
<th>Part</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part Number</td>
<td>GVS-ANT—DIR—(EXT—XX)</td>
</tr>
<tr>
<td>Cable Length</td>
<td>XX is cable length in meters</td>
</tr>
<tr>
<td>Gain</td>
<td>12dBi</td>
</tr>
</tbody>
</table>
Terminal Block Wiring HS150T and 150ST

- The Transmitter Unit (GV-700T) should have up to 8 accelerometers connected into the 8 quad deck terminals with the connections as shown for each accelerometer from top to bottom.
- The following table provides details of the standard HS-150T and HS-150ST sensor wiring.

<table>
<thead>
<tr>
<th>Input</th>
<th>Wire Colour</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>White</td>
<td>Sensor Signal</td>
</tr>
<tr>
<td>2</td>
<td>Black</td>
<td>Sensor Ground</td>
</tr>
<tr>
<td>3</td>
<td>Red/Brown</td>
<td>Sensor Temperature</td>
</tr>
<tr>
<td>Screen</td>
<td>Screen</td>
<td>Screen</td>
</tr>
</tbody>
</table>

- Connect the Power Source (12V Battery or mains power adaptor) to the 2 way connector.
- Once power is applied the Blue LED on the front of the unit will light when that Transmitter is turned on by a connected Receiver.
The Receiver Unit (GV-701R)

- Connect the Power Source (12V Battery or mains power adaptor) to the 2 way connector.
- Connect the Vibration Analyser to the ‘Vibration’ BNC connector on the front panel.
- Connect the Temperature monitor to the ‘Temperature’ BNC connector on the front panel.
- See below for power connection diagram.

Installation recommendations:

It is important when the system is installed to ensure that the transmitter and receiver enclosures are mounted in the best possible locations to ensure the optimum performance of the system.

The following points should be noted when siting the units:

1. Both boxes must be mounted in the same orientation to ensure that both antennas have the same polarization.
2. Ideally both enclosures will be mounted vertically.
3. Ideally the units will be mounted with clear line of sight between them, it is important to reduce obstacles to a minimum, especially metallic obstacles.
4. The units should be mounted at as near the same height as possible.
5. The enclosures should be mounted away from any metal infrastructure where possible.
Up to eight transmitters may be connected to a single receiver, the receiver part code changes to state how many transmitters are connected, e.g. GV-701R, GV-702R, GV-703R up to GV-708R. This enables a receiver to link to up to 64 vibration sensors as each transmitter has eight input channels.

Usually the system is factory configured such that each transmitter is labelled with a ‘Transmitter Number’ which is simply selected using an eight way switch on the receiver front panel. All receiver units are programmed to accept up to eight transmitters but the selector switch is only included in the build if multiple transmitters have been ordered.

If a system has been ordered with 4 transmitter units and then four more transmitter units are added afterwards, the new transmitters can be supplied already configured as Transmitter Numbers five to eight and will link to the receiver when the appropriate channel number is selected.

In detail each Receiver unit is programmed with a unique fixed IP address and the eight transmitters will be allocated the next 8 IP addresses following on from that. So that if a receiver had an IP address of 192.168.1.30 Transmitter number one would have an IP address of 192.168.1.31, transmitter number two would be 192.168.1.32 and so on. This means that it is easy to add new transmitters to an existing system if required.
There are two red LED’s on the daughterboard within both the transmitter and receiver units.

The operation is as follows:

**RECEIVER UNIT**

- **Top position – Red LED**
  - This LED will be solid ON when the receiver has successfully booted up and is ready to connect to a transmitter

- **Bottom position – Red LED**
  - This will flash when the unit is first switched on and will then go off when the system has booted up.

**TRANSMITTER UNIT**

- **Top position – Red LED**
  - Will flash when the transmitter is powered on and will be solid ON when the transmitter has linked to the receiver unit

- **Bottom position – Red LED**
  - This will flash when the unit is first switched on and will then go off when the system has booted up.
1. When using multiple transmitters the GV-721R-PC portable receiver is ideal.

2. In a light weight industrial pelican enclosure the GV-721R-PC can connect up to 8 x GV-700T transmitters.

3. Another advantage of the GV-721R-PC is when a transmitter is on a moving asset and where there are challenges getting good line of site connection. With the portable receiver the technician can choose the ideal location to collect the data.
Please ensure all wiring is correct as per installation instructions before use.

**Unable to create a wireless link**

1. Check Power Supply or Battery is providing correct operational voltage, and if battery powered, ensure that the battery is sufficiently charged.

2. Is the Receiver Power ON/OFF switch in the depressed ON position?

3. Has 90 seconds elapsed since switching the system ON to allow the radio link to be established?  
   **No – Wait for 90 seconds after switch on.**

4. When the Power ON/OFF switch was pushed, did both the Power ON/OFF and Collect Data switches light up blue for 2 seconds to indicate that the system is beginning its’ start up procedures?  
   **No – Check power supply is correct or battery is sufficiently charged.**

5. Check power supply/battery is connected correctly.

6. Has the correct Channel number been selected on the Channel Select switch?

7. Has the Collect Data switch light stopped flashing?  
   **No - Press Collect Data switch and check that the Power ON/OFF switch lights up blue for 2 seconds, at which point the Collect Data switch will then light up blue if a data connection has been established.**

8. Has the Collect Data switch light turned on?  
   **Yes – The unit is now receiving data.**  
   **No - No data link was established.**  
   Try changing the channel number.  
   If no link is made again, check that the area between the receiver and the transmitter is still a clear line of sight, and that nothing is now blocking this area.

9. If there is still no link, try a system restart. Switch the Power ON/OFF switch off and wait for 90 seconds to allow time for all remote transmitters to switch themselves into low power mode.

10. After the 90 seconds, switch the receiver on again and wait for 90 seconds to allow the radio link to be established.

11. If the link is still failing, the problem may be due to the power supply or battery in the remote transmitter. Check the blue LED on the front cover is lit. If not check that the transmitter supply voltage is as required.

12. Check that the transmitter supply voltage is as required.

**Conserving Battery Power**

1. The system uses a lot of power while transmitting the vibration data across the link, and it is very important that after the data has been analysed the Power ON/OFF switch should be put into the OFF position. This will reduce the receiver power drain to a minimum, and in addition within 90 seconds all the transmitters will switch into a very low power drain mode to ensure that the battery will remain charged for as long as possible.

2. If GV-700T and GV-701R are using battery power battery life is designed to last for 12 months when data is taken once per month. It is advised to have a spare battery and charger kit on standby for a 12 monthly change out.
The process of collecting data begins with the operator selecting a channel number after a link has been established and then pressing the ‘Collect Data’ switch. The Receiver unit wakes up the transmitter by sending a wireless message with the address of the transmitter involved. This message also contains the channel number of the vibration sensor to be monitored.

The transmitter unit selects that channel by using a multiplexor on the input stage as shown above. The signal from the vibration sensor then passes through a multi-stage amplification and filtering stage to a high speed data acquisition module.

This module reads the value of the waveform every 30uS and sends the data to the wireless module. The wireless module encodes this data in a unique way before sending it across the wireless link to the receiver.

The transmitter also takes a single temperature reading if a dual output sensor is being used and transmits that value across the wireless link.

The transmitter unit continues sending data until it receives either a different channel number request from the receiver, or is remotely turned off by the receiver.
The data is received by the wireless module and is read by the system controller microprocessor. This interprets the data level and sends the level out to the high speed DAC converter. This outputs the appropriate voltage level which is then fed through a multi-stage filter and gain circuit before being available on the BNC connector as a nearly perfect copy of the original input signal. The temperature reading is decoded and the corresponding voltage level outputted to the Temperature BNC connector.

When the operator has collected all the data required the system must be switched off using the ON/OFF switch on the Receiver unit.

Sampling rate is 33kHz, which translates to a reading every 30 micro seconds.
Warranty

- All goods are guaranteed against defects in materials and workmanship subject to specific exclusions, for a period of 36 months from date of delivery to the end user.

- The warranty is void if unauthorised persons or agents attempt repair or, if the product has been used for purpose for which it was not intended and/or subject to abuse or wilful neglect.

- No liability can be accepted for loss of items and/or component parts. It is expected that the user will take sufficient precautions to safeguard all guaranteed items.
DATA COLLECTOR SETUP

- Typically vibration sensors for routine condition monitoring are powered by a portable vibration analyser.
- The Industrial Interface Wireless unit sensors are powered separately.
- In this note we describe the cables required and how to setup the software to ensure no power is provided to the wireless unit.
- Other analysers can be used to collect data from the wireless unit just ensure in the software setup the power is turned to off and a volts input to the analyser is used.

**CSI 2130 Vibration Analyser**
- Accel / Volts Adapter 625 or
- Dual Volts Adapter A06290V
- BNC to BNC cable
- Sensor power box unchecked.

**CSI 2140 Vibration Analyser**
- Volts Cable D25479 into Volts/Tach connector
- Option - Volts input and standard BNC cable
- Sensor power box unchecked.

**Wireless Vibration Tests**
- A variable speed motor with an unbalanced mass was used to generate the vibration to be measured.
- HS100 series accelerometer glue mounted to the motor base and connected to the wireless system.
- Database created in Emerson's MHM software to collect the data during the tests.
- Vibration velocity mm/sec RMS was selected as the primary measurement unit for the readings.
- CSI 2130 & CSI 2140 Analysers used to collect the data with a Volts input and power off in the software.
- Wireless vibration readings were collected and direct readings from the accelerometer were also collected as a comparison for all of the tests.
- Tests 1 & 2 showed comparable levels with the trial wireless unit at 100Hz and 1000 Hz range.
HS - 150ST SERIES VIBRATION AND TEMPERATURE SENSOR

HS-150ST Series Vibration Sensor
3 Pin MS Connector, Low Profile 100mV/g Industrial Accelerometer with Temperature Sensor

Typical Applications
- Proven use in vibration monitoring for offline applications using commercially available data collectors and online monitoring systems in the mining of iron ore, copper, precious metals and coal etc.
- Protecting...
  Mining applications such as crushers, vibrating screens, shearers, feeders, motors, gearboxes, fans, pumps and conveyors.

Technical Performance
- Mounted Base Resonance: 22 kHz (nominal)
- Sensitivity: 100 mV/g ±10% Nominal 80 Hz at 22 °C
- Frequency Response: 1.5 Hz to 10 kHz ±5 %
- 0.5 Hz to 12 kHz ±10%
- 0.2 Hz to 15 kHz ±3 dB
- Isolation: Base isolated
- Measurement Range: ±80 g
- Temperature: 10 mV/°C STANDARD 100°C. Option 140°C
- Transverse Sensitivity: Less than 5%

Electrical
- Electrical Noise: 0.1 mg max
- Current Range: 0.5 mA to 8 mA
- Bias Voltage: 10 - 12 Volts DC
- Settling Time: 1 second
- Output Impedance: 200 Ohms max.
- Case Isolation: >10⁸ Ohms at 500 Volts

Environmental
- Operating Temperature Range: -55 to 130 °C
- Sealing: IP68
- Maximum Shock: 5000 g
- Emissions: EN61000-6-4:2007
- Immunity: EN61000-6-2:2005

Mechanical
- Case Material: Stainless Steel
- Sensing Element/Construction: PZT/Shear
- Mounting Torque: 8Nm
- Mounting Bolt provided: Hex M8 x 35 mm long, ¼-28 UNF x 35 mm long or M8 x 35 mm long
- Weight: 170 gms (nom)
- Maximum Cable length: 1000 metres
- Mating Connector: HS-AA005
- Mounting Threads: See ‘How to order’ table
- Options: Mounting cable assemblies, integral cable and other sensitivities

Hansford Sensors
Excellence in Vibration Monitoring
Tel: +44(0) 845 680 1957
Fax: +44(0) 845 680 1958
Email: sales@hansfordsensors.com
Web: www.hansfordsensors.com
HS-150ST Series Vibration Sensor

Dimensions

Frequency Response

Mounting of sensor to achieve good repeatable readings. Vibration sensor should be firmly fixed to a flat surface (spot face surface may be needed to be produced and cable anchored to sensor body.)

How to order

Hansford Sensors
Excellence in Vibration Monitoring

Tel: +44(0) 845 680 1957
Fax: +44(0) 845 680 1958
Email: sales@hansfordsensors.com
Web: www.hansfordsensors.com

Guaranteed for Life
Environment Specification of Cable Assembly
Maximum operating temperature of 150°C with high levels of resistance to chemical attack.

Cross Sectional View of Cable

Technical Data of Cable

<table>
<thead>
<tr>
<th>Description</th>
<th>Values at 20°C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductor resistance</td>
<td>Max: 0.24</td>
<td>Ω/km</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>&gt;1500</td>
<td>MΩ/km</td>
</tr>
<tr>
<td>Test voltage</td>
<td>3</td>
<td>KV DC</td>
</tr>
<tr>
<td>Voltage rating</td>
<td>600</td>
<td>V AC</td>
</tr>
<tr>
<td>Capacitance</td>
<td>Core-core: 178 ± 18</td>
<td>nF/km</td>
</tr>
<tr>
<td></td>
<td>Core-screen: 335 ± 33</td>
<td>nF/km</td>
</tr>
<tr>
<td>Impedance</td>
<td>Core-core: 20.6 ± 26</td>
<td>Ω</td>
</tr>
<tr>
<td></td>
<td>Core-screen: 15.3 ± 2</td>
<td>Ω</td>
</tr>
<tr>
<td>Weight</td>
<td>46</td>
<td>g/m</td>
</tr>
<tr>
<td>Temperature rating</td>
<td>-50 / +150</td>
<td>°C</td>
</tr>
</tbody>
</table>
Sealed Lead-Acid Battery
Deep Cycle

727-0405(12V20Ah)

Specification

- Cells Per Unit: 6
- Voltage Per Unit: 12
- Capacity: 20.0Ah@10hr-rate to 1.80V per cell @25°C
- Weight: Approx.9kg
- Max. Discharge Current: 300A (5 sec)
- Internal Resistance: Approx 15mΩ
- Operating Temp.Range: Discharge : -15 ~ 50°C (5 ~ 122°F)
  Charge : 0 ~ 40°C (32 ~ 104°F)
  Storage : -15 ~ 40°C (5 ~ 104°F)
- Nominal Operating Temp. Range: 25 ± 3°C (77 ± 5°F)
- Float charging Voltage: 13.5 to 13.8 VDC/unit Average at 25°C
- Recommended Maximum Charging Current Limit: 6A
- Equalization and Cycle Service: 14.4 to 15.0 VDC/unit Average at 25°C
- Self Discharge: The batteries can be stored for more than 6 months at 25°C. Self-discharge ratio less than 3% per month at 25°C. Please charge batteries before using.
- Terminal: T12
- Container Material: A.B.S. (UL94-HB), Flammability resistance of UL94-V0 can be available upon request.

Applications

- Electric tools
- Vehicle in place of walking
- Lawn mowers
- Golf trolleys and golf cart
- Portable apparatus, lights and instruments;
- Electric toys
- Illumination light
- Fire alarms
- Portable power
- Wheelchairs
- Medical equipments.

Dimensions

Unit: mm Dimension:181.5(L)×77(W)×167.5(H)

Constant Current Discharge Characteristics: A (25°C)

<table>
<thead>
<tr>
<th>F.V/Time</th>
<th>5min</th>
<th>10min</th>
<th>15min</th>
<th>20min</th>
<th>30min</th>
<th>45min</th>
<th>1h</th>
<th>2h</th>
<th>3h</th>
<th>4h</th>
<th>5h</th>
<th>6h</th>
<th>8h</th>
<th>10h</th>
<th>12h</th>
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</thead>
<tbody>
<tr>
<td>11.1V</td>
<td>38.0</td>
<td>29.3</td>
<td>24.6</td>
<td>21.5</td>
<td>15.5</td>
<td>12.3</td>
<td>9.99</td>
<td>6.20</td>
<td>4.84</td>
<td>3.92</td>
<td>3.18</td>
<td>2.78</td>
<td>2.27</td>
<td>1.89</td>
<td>1.06</td>
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<tr>
<td>10.8V</td>
<td>51.0</td>
<td>37.4</td>
<td>29.8</td>
<td>25.5</td>
<td>18.3</td>
<td>14.3</td>
<td>11.2</td>
<td>6.77</td>
<td>5.20</td>
<td>4.18</td>
<td>3.42</td>
<td>2.98</td>
<td>2.40</td>
<td>2.00</td>
<td>1.07</td>
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<td>57.5</td>
<td>41.1</td>
<td>32.5</td>
<td>27.4</td>
<td>19.0</td>
<td>14.9</td>
<td>11.7</td>
<td>7.02</td>
<td>5.30</td>
<td>4.28</td>
<td>3.51</td>
<td>3.06</td>
<td>2.45</td>
<td>2.02</td>
<td>1.08</td>
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<tr>
<td>10.2V</td>
<td>63.3</td>
<td>44.8</td>
<td>34.7</td>
<td>28.8</td>
<td>19.8</td>
<td>15.4</td>
<td>12.1</td>
<td>7.30</td>
<td>5.45</td>
<td>4.39</td>
<td>3.60</td>
<td>3.12</td>
<td>2.48</td>
<td>2.04</td>
<td>1.10</td>
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<tr>
<td>9.90V</td>
<td>69.8</td>
<td>48.4</td>
<td>36.9</td>
<td>30.6</td>
<td>20.8</td>
<td>15.8</td>
<td>12.5</td>
<td>7.50</td>
<td>5.68</td>
<td>4.54</td>
<td>3.70</td>
<td>3.19</td>
<td>2.52</td>
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<td>1.12</td>
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<tr>
<td>9.60V</td>
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<td>52.5</td>
<td>39.5</td>
<td>32.6</td>
<td>22.0</td>
<td>16.5</td>
<td>12.9</td>
<td>7.76</td>
<td>5.85</td>
<td>4.68</td>
<td>3.82</td>
<td>3.26</td>
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<td>1.12</td>
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Constant Power Discharge Characteristics: W (25°C)

<table>
<thead>
<tr>
<th>F.V/Time</th>
<th>5min</th>
<th>10min</th>
<th>15min</th>
<th>20min</th>
<th>30min</th>
<th>45min</th>
<th>1h</th>
<th>2h</th>
<th>3h</th>
<th>4h</th>
<th>5h</th>
<th>6h</th>
<th>8h</th>
<th>10h</th>
<th>12h</th>
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<tbody>
<tr>
<td>11.1V</td>
<td>420.8</td>
<td>327.8</td>
<td>278.7</td>
<td>246.2</td>
<td>175.6</td>
<td>142.8</td>
<td>116.3</td>
<td>72.5</td>
<td>56.7</td>
<td>46.0</td>
<td>37.5</td>
<td>32.9</td>
<td>26.9</td>
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<td>12.8</td>
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<tr>
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<td>413.3</td>
<td>331.7</td>
<td>286.6</td>
<td>208.2</td>
<td>164.8</td>
<td>129.5</td>
<td>78.7</td>
<td>60.7</td>
<td>48.9</td>
<td>40.2</td>
<td>35.2</td>
<td>28.5</td>
<td>23.8</td>
<td>12.9</td>
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<tr>
<td>10.5V</td>
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<td>448.5</td>
<td>358.9</td>
<td>305.7</td>
<td>215.1</td>
<td>170.2</td>
<td>135.0</td>
<td>81.4</td>
<td>61.7</td>
<td>49.9</td>
<td>41.1</td>
<td>36.1</td>
<td>29.0</td>
<td>24.0</td>
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<td>482.0</td>
<td>380.3</td>
<td>319.5</td>
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<td>138.9</td>
<td>84.4</td>
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<td>42.1</td>
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<tr>
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<td>401.8</td>
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<td>37.5</td>
<td>29.8</td>
<td>24.7</td>
<td>13.3</td>
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<tr>
<td>9.60V</td>
<td>784.8</td>
<td>551.2</td>
<td>424.6</td>
<td>356.2</td>
<td>244.8</td>
<td>186.1</td>
<td>147.0</td>
<td>88.9</td>
<td>67.4</td>
<td>54.2</td>
<td>44.4</td>
<td>38.3</td>
<td>30.0</td>
<td>24.9</td>
<td>13.4</td>
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CAPACITY, WEIGHT and SIZE

<table>
<thead>
<tr>
<th>BATTERY PACK:</th>
<th>BP2541</th>
<th>BP2544</th>
<th>BP2545</th>
<th>BP2546</th>
<th>BP2548</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>4Ah +/-5%</td>
<td>8Ah +/-5%</td>
<td>10Ah +/-5%</td>
<td>14Ah +/-5%</td>
<td>22Ah +/-5%</td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td>115 x 76 x 32</td>
<td>153 x 80 x 38</td>
<td>153 x 80 x 48</td>
<td>161 x 115 x 56</td>
<td>161 x 115 x 56</td>
</tr>
<tr>
<td>Weight (grams)</td>
<td>360</td>
<td>600</td>
<td>735</td>
<td>950</td>
<td>1250</td>
</tr>
</tbody>
</table>

OPERATING PARAMETERS

- Maximum Continuous Discharge Current: 10A
- Maximum Peak Current: 40A for 10mS
- Nominal Voltage: 12V
- Discharge Cut-off Voltage: 9V
- Charging Voltage: 12.6V
- Temperature Range (Charging): 0°C – 45°C
- Temperature Range (Discharging): -20°C - 60°C

DURABILITY

- Cycle Life: >300 Cycles
- This is based on charging at a standard rate with a discharge from full capacity to 9V at 5A. Rest time of 30 minutes between charge and discharge. Cycle life is classed as when discharge capacity is at 70% of original. Note that the battery still has a useful life after this.
- Self - Discharge: <0.5% per day

PROTECTION

- The battery pack is protected against over charge and discharge, there is also short circuit protection.

GUARANTEE

- The battery pack and charger are guaranteed against manufacturing defect for 12 months from the date of purchase
Licenced Distributor

GVS - Reliability Products

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