



Automotive
Energy & Power Analysis
Aerospace & Defense
Transportation
General Test & Measurement

DEWE-VGPS-HS

Technical reference manual



ISO9001

Re-inventing Data Acquisition



Copyright © DEWETRON elektronische Messgeraete Ges.m.b.H.

This document contains information which is protected by copyright. All rights are reserved. Reproduction, adaptation, or translation without prior written permission is prohibited, except as allowed under the copyright laws.

All trademarks and registered trademarks are acknowledged to be the property of their owners.

Table of content

Content

General Information, Safety Instructions	5
Warranty Information	5
Support	5
Printing History	5
Safety symbols in the manual	6
Safety instructions for all DEWETRON systems	7
Environmental Considerations	8
DEWE-VGPS-HS	9
Specifications	9
Device overview	10
Functionality of the LED	11
Mounting the aerial	11
Warm-Up time	11
Scope of supply	12
Connection	12
Options	16
Installation of the DEWESoft measurement software	18
Measurement setup	21
CE-Certificate of conformity	C1

Table of content

The information contained in this document is subject to change without notice.

DEWETRON elektronische Messgeraete Ges.m.b.H. (DEWETRON) shall not be liable for any errors contained in this document. DEWETRON MAKES NO WARRANTIES OF ANY KIND WITH REGARD TO THIS DOCUMENT, WHETHER EXPRESS OR IMPLIED. DEWETRON SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. DEWETRON shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory, in connection with the furnishing of this document or the use of the information in this document.

Warranty Information

A copy of the specific warranty terms applicable to your DEWETRON product and replacement parts can be obtained from your local sales and service office.

Support

For any support please contact your local distributor first or DEWETRON directly.

For Asia and Europe, please contact:

DEWETRON Ges.m.b.H.
Parking 4
A-8074 Graz-Grambach
AUSTRIA
Tel.: +43 316 3070
Fax: +43 316 307090
Email: support@dewetron.com
Web: <http://www.dewetron.com>

The telephone hotline is available
Monday to Friday between
08:00 and 17:00 CET (GMT +1:00)

For the Americas, please contact:

DEWETRON, Inc.
10 High Street, Suite K
Wakefield, RI 02879
U.S.A.
Tel.: +1 401 284 3750
Toll-free: +1 877 431 5166
Fax: +1 401 284 3755
Email: support@dewamerica.com
Web: <http://www.dewamerica.com>

The telephone hotline is available
Monday to Friday between
08:00 and 17:00 GST (GMT -5:00)

Restricted Rights Legend

Use austrian law for duplication or disclosure.

DEWETRON GesmbH
Parking 4
A-8074 Graz-Grambach / Austria

Printing History

Please refer to the page bottom for printing version.

Copyright © DEWETRON elektronische Messgeraete Ges.m.b.H.

This document contains information which is protected by copyright. All rights are reserved. Reproduction, adaptation, or translation without prior written permission is prohibited, except as allowed under the copyright laws.

All trademarks and registered trademarks are acknowledged to be the property of their owners.

Safety instructions

Safety symbols in the manual



Indicates hazardous voltages.

WARNING *Calls attention to a procedure, practice, or condition that could cause bodily injury or death.*

CAUTION *Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.*

WARNINGS

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. DEWETRON Elektronische Messgeraete Ges.m.b.H. assumes no liability for the customer's failure to comply with these requirements.

All accessories shown in this document are available as option and will not be shipped as standard parts.

Safety instructions for all DEWETRON systems

- The DEWETRON data acquisition systems may only be installed by experts.
- Read your manual before operating the system.
- Observe local laws when using the instrument.
- Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), a non interruptible safety earth ground must be provided from the mains power source to the product input wiring terminals or supplied power cable.
- DO NOT operate the product in an explosive atmosphere or in the presence of flammable gases or fumes.
- DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to a DEWETRON sales and service office for service and repair to ensure that safety features are maintained.
- Keep away from live circuits: Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers or shields are for use by service-trained personnel only. Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, DO NOT perform procedures involving cover or shield removal unless you are qualified to do so.
- No modifications are allowed at the instrument. The fuse in the power module has to be replaced by the same type. For continued protection against fire, replace the line fuse(s) only with fuse(s) of the same voltage and current rating and type. DO NOT use repaired fuses or short-circuited fuse holder labels and print on the power module may not be removed.
- DO NOT service or adjust alone. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.
- DO NOT substitute parts or modify equipment: Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to a DEWETRON sales and service office for service and repair to ensure that safety features are maintained.
- Before opening the instrument (experts only) or exchanging the fuse in the power module disconnect power!
- Don't touch internal wiring!
- Don't use higher supply voltage than specified!
- Use only original plugs and cables for harnessing.
- Install filler-panels in unused slots.
- The power-cable and -connector serve as Power-Breaker. The cable must not exceed 10 feet, disconnect function must be possible without tools.
- Safety of the operator and the unit depend on following these rules.

General System Information

Environmental Considerations

Information about the environmental impact of the product.

Product End-of-Life Handling

Observe the following guidelines when recycling a DEWETRON system:

System and Components Recycling

Production of this components required the extraction and use of natural resources. The substances contained in the system could be harmful to your health and to the environment if the system is improperly handled at it's end of life! Please recycle this product in an appropriate way to avoid an unnecessary pollution of the environment and to keep natural resources.



This symbol indicates that this system complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). Please find further informations about recycling on the DEWETRON web site www.dewetron.com



Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment, and is outside the scope of the 2002/95/EC RoHS Directive. This product is known to contain lead.

GPS based system for speed and displacement measurement

Features:

- **Real 100 Hz GPS engine:**
 - Portable and rugged construction
 - Insensitivity to road surface (can be used on mud off-road, water, snow, ice, ...)
 - No calibration required
 - Easy-to-install, easy-to-use
 - Supports differential GPS (SBAS) as standard function
- **RS232 interface:**
 - Lowest latency using unique PPS sync over RS232
 - Optional bright display to show results



Specifications

DEWE-VGPS-HS GPS based system for speed and displacement measurement			
Measurement specifications			
Speed		Absolute position	valid for RS-232, USB
Accuracy	0.1 km/h $\pm 0.05\%$ of range ¹⁾	Accuracy	< 40 cm CEP ³⁾
Min to Max	0.1 km/h to 500 km/h	Refresh rate	5 to 50 Hz
Resolution	0.01 km/h	Resolution	< 10 cm
Refresh rate	5 to 100 Hz	Latency time	< 2 ms using DEWESoft
Displacement			
Accuracy	< 20 cm/km ²⁾		
Refresh rate	5 to 100 Hz		
System specifications			
Input	SMA connector for GPS antenna, Lemo for event input and power supply		
Output	DSUB-9 for RS-232, USB (ext. converter), Lemo for VGPS display		
Power Supply	6 to 36 V _{DC} , 2 W		
Dimensions	115 x 93 x 35 mm (4.5 x 3.6 x 1.4 in.)	Display:	131 x 64 x 27 mm (5.2 x 2.5 x 1.1 in.)
Weight	740 g (1.63 lbs)	Display:	265 g (0.58 lbs)
Operating temperature	0 °C to 60 °C (standard)	(1) Acquiring more than 6 satellites, averaged over 3 values (2) Acquiring more than 6 satellites, driving at constant speed (3) Circular Error Probable • 40 cm differential operation using local base station • 90 cm differential operation using BEACON • 1.8 m differential operation using SBAS • 3 m autonomous operation	
Storage temperature	-20 °C to +70 °C		
Humidity (operating)	10 % to 80 %, non condensing 5 % to 95 %, rel. humidity		
Vibration	MIL-STD 810F 514.5 procedure I operating test procedure frequency range: 5 to 200 to 5 Hz; 5 x 12 min each direction displacement amplitude ± 3.5 mm (5 to 8.45 Hz) acceleration amplitude 1 g (8.45 to 92 Hz) displacement amplitude 92 to 113 Hz: ± 0.029 mm acceleration amplitude 1.5 g (113 to 200 Hz)		
Shock	MIL-STD 810F 516.5 procedure I non operating test procedure $\frac{1}{2}$ sinus 11 ms 10 g, 3 shocks positive, 3 shocks negative		

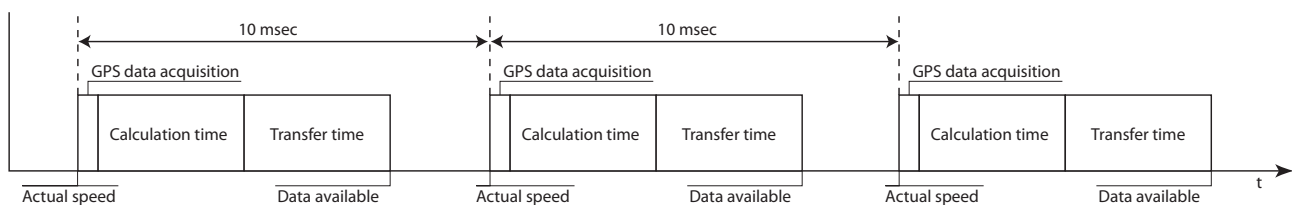
DEWE-VGPS-HS

Device overview

With the DEWE-VGPS-1000 DEWETRON offers latest 100 Hz technology of GPS based speed and displacement sensors. The result of this highest dynamic GPS receiver is the most easy to use speed/distance sensor with that bandwidth. In addition to this no calibration drives for different road conditions (ice, water, snow, off road) are needed.

Using the unique PPS sync technology of DEWETRON the latency time of the digital interface (RS-232) is corrected online.

Beside the filter characteristic of the internal algorithm, the latency time on the serial interface is related to the basic structure of any GPS-based sensor. After acquiring the GPS raw data, the time consuming calculation to get the position and speed and the data transfer time will delay the data from the DEWE-VGPS-HS.



Inside the data stream also the time information is included. By comparing the latency free PPS pulse on the RS232 interface with the time information inside the data stream, the latency time is completely eliminated.

Functionality of the LED

Mark input

The Mark input LED indicates if a brake trigger switch sensor is connected to the VGPS-HS.

Mounting the aerial

The aerial supplied with the VGPS is designed to be mounted magnetically on top of the vehicle in a horizontal plane. If the surface is not metallic, the aerial may be fixed by placing a piece of strong tape over the top of the aerial. The positioning of the aerial is critical to the correct operation of the VGPS.

Note: For correct working, the aerial requires a metallic subsurface with a minimal diameter of 15 cm. This surface doesn't have to be ferromagnetic.

The aerial picks up the signals from up to 12 satellites which are all in different places in the sky. These satellites are not necessarily directly overhead, and can often be close to the horizon. Therefore it is best to mount the aerial in a way, that the least amount of metal obscures the view of the sky. On a domed roof, place the aerial on the top of the dome. On an open car with a roll-over bar, place the aerial horizontally on the highest point of the roll-over hoop and tape the wire securely to the frame. Although the VGPS can work with at least three satellites, its precision increases the more satellites it finds. If one satellite disappears over the horizon, or behind an object, there are other satellites still in view.

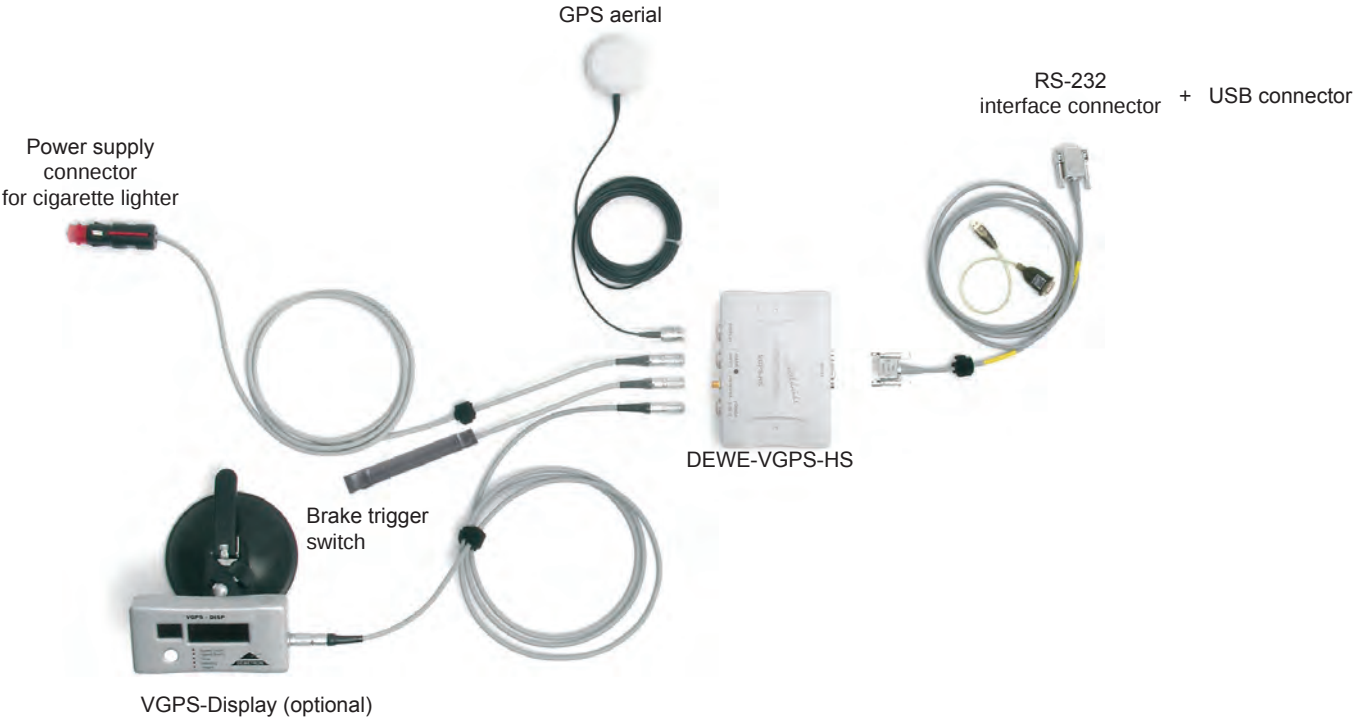


Warm-Up time

When the VGPS is used for the first time, has been moved more than 200 km or not used for 10 hours (since last usage), it is recommended to perform a 'cold start'. To get the best performance from your VGPS in the future, perform this cold start in an open place with a good all round view to the sky. Allow the VGPS to map the satellites for at least 20 to 30 minutes. The VGPS builds up the 'Ephemeris' data on each satellite which is stored in a non-volatile memory, and means future satellite tracking is swift and stable. Once the VGPS has carried out a successful cold start, future satellite lock from power up will take between 15 seconds and 1 minute. Before going to test in a shady environment with tall objects or near to trees, allow the VGPS to settle in an open space for 5 to 10 minutes.

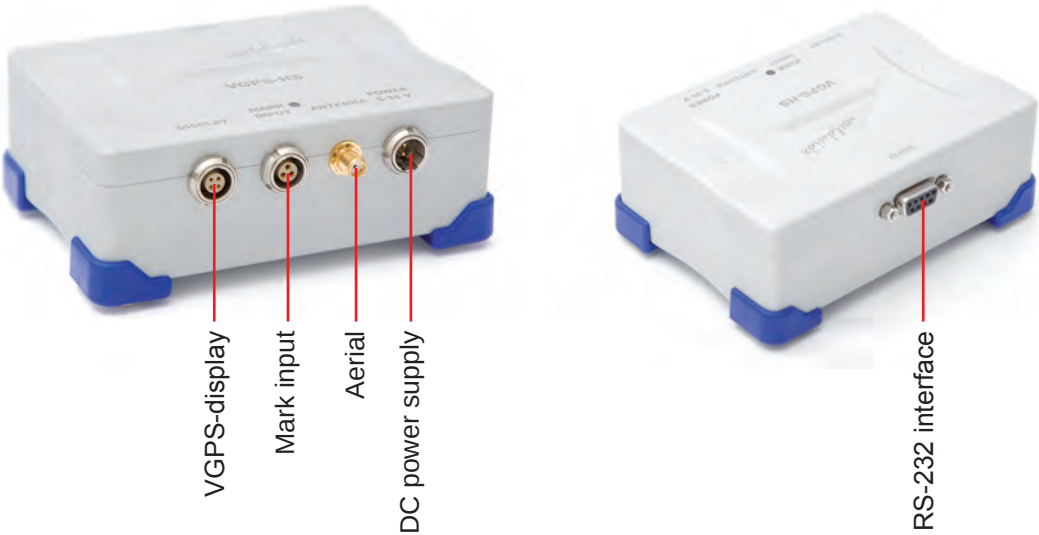
DEWE-VGPS-HS

Scope of supply



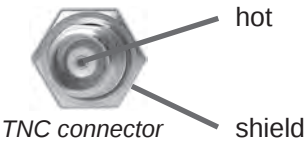
Connection

Connector overview:



Aerial connector

Connect the GPS aerial to the TNC connector.

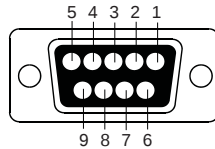


RS-232 interface / CAN connector

The RS-232 interface connector (female) is configured as standard RS-232 interface. Standard 9-pin RS-232 cable is allowed to connect, if CAN is not used.



9-pin SUB-D
connector (female)



Schematic

Pin assignment

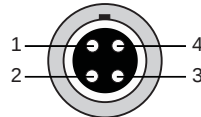
- 1: Free run operation
- 2: TXD (Transmitted Data)
- 3: RXD (Received Data)
- 4: Not connected
- 5: GND (Ground)
- 6: PPS (pulse per second)
- 7: Not connected
- 8: n.c.
- 9: n.c.

VGPS-Display connector

To connect the external display to the DEWE-VGPS-HS system.



4-pin Lemo
connector (female)
EGG.1B.304.CLL



Schematic

Pin assignment

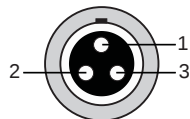
- 1: +5 V_{DC}
- 2: GND
- 3: TXD
- 4: RXD

Mark input connector

Connects an external trigger source to the DEWE-VGPS-HS system.



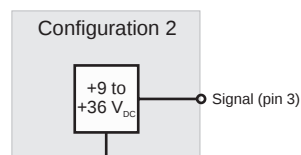
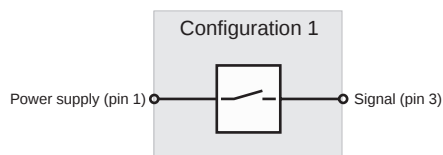
3-pin Lemo
connector (female)
EGG.1B.303.CLL



Schematic

Pin assignment

- 1: +9 to +36 V_{DC} power supply
- 2: GND power supply
- 3: Signal

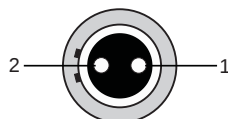


Power supply connector

Connects the DEWE-VGPS-HS system to an external DC power supply.



2-pin Lemo
connector (male)
EGJ.1B.302.CLA



Schematic

Pin assignment

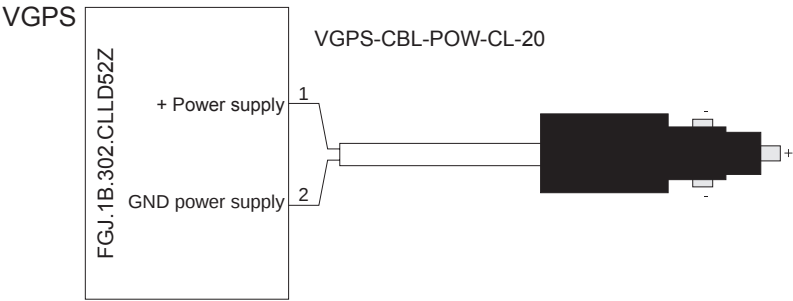
- 1: +9 to 36 V_{DC} power supply
- 2: GND power supply

DEWE-VGPS-HS

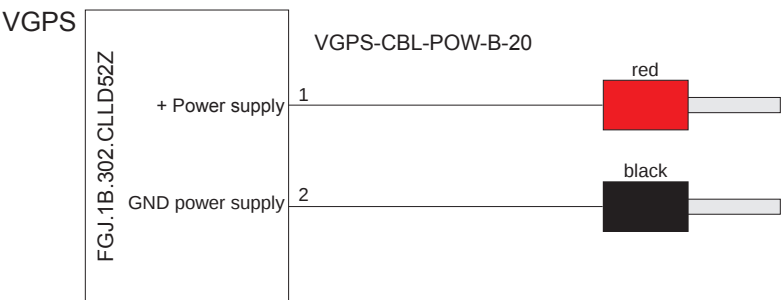
Cable for external power supply

Type of cable: LIYY 2x0.75, length: 2 m

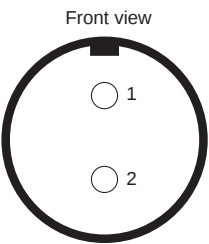
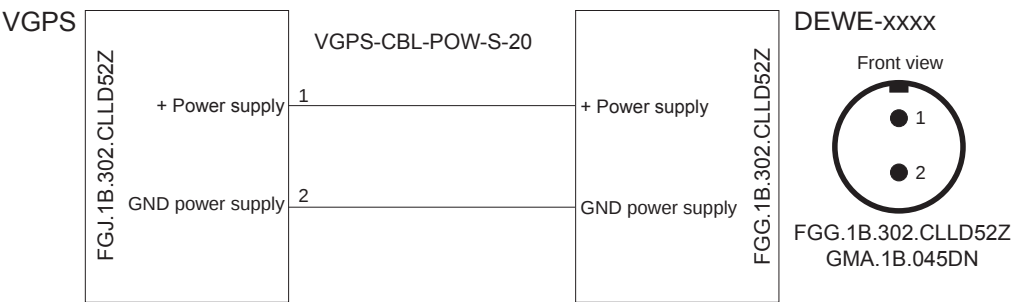
Standard:
(included)



Optional:



Optional:



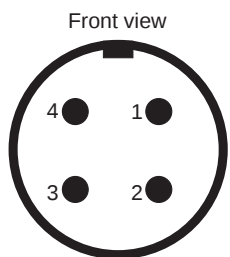
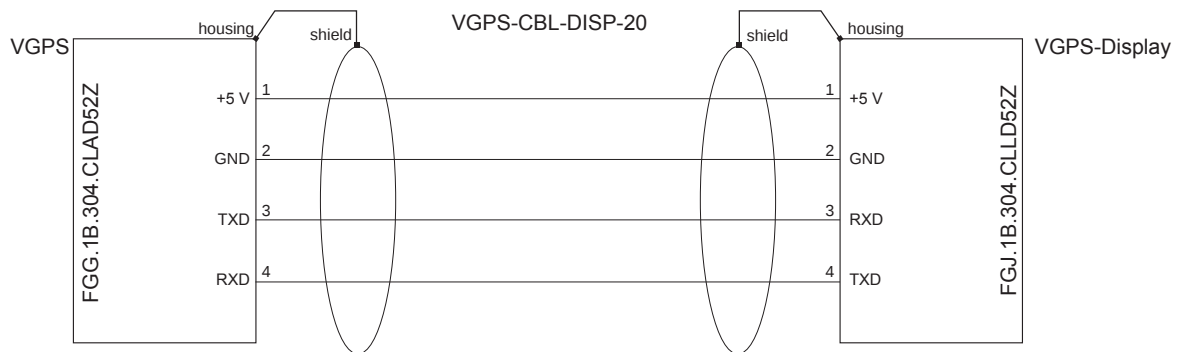
FGJ.1B.302.CLLD52Z
GMA.1B.045DN

Optional:

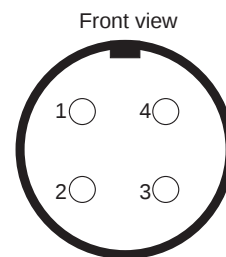


Cable for connecting VGPS to VGPS-Display (optional)

Type of cable: LIYCY 4x0.25 shielded, length: 2 m



FGG.1B.304.CLAD52Z
GMA.1B.045DN



FGJ.1B.304.CLLD52Z
GMA.1B.045DN

DEWE-VGPS-HS

Options

Brake trigger switch

(Available to purchase as an option)

The brake trigger is designed to be mounted on the brake pedal or the accelerator pedal, and gives an indication when the pedal is pressed. The normal method of fixing is via rubber bands. The brake trigger can be used during a brake stop to determine the speed at which the brake pedal was pressed, and the braking distance from this point can be viewed. This switch can be connected directly to an input of the data acquisition system or to the DEWE-VGPS-HS. The DEWE-VGPS-HS will recognize the exact time of the switching point. A serial command with this time information will be transmitted to the data acquisition unit. DEWESoft displays this event as a separate channel. This channel can be used during post processing to calculate the brake distance.



Brake trigger switch

Digital display operation

The LED display is used to monitor various GPS parameters.



Display description:

Blinking middle dashes on all digits - the display is unable to communicate with the VGPS. Pressing and releasing the push-button on the front of the VGPS-Display switches the display to different mode. After pressing the push-button, the LED beside mode changed to appropriate display mode.



Mode 01:

Number of satellites and velocity in mph.



Mode 02:

Number of satellites and velocity in kilometers per hour



Mode 03:

GPS UTC time reported by the satellites goes up in increments of 0.05 seconds. The format is: hh.mm.ss. The base for the time is Universal Time co-ordinated, derived from the atomic clocks on board the satellite and hence is extremely accurate.



Mode 04:

Heading in degrees

Number of satellites and heading of the vehicle relative to true North.

Resolution: 0.1 degree



Mode 05:

Number of satellites and height of the vehicle relative to the Datum WGS84 (approx. 50 meters below UK sea level)

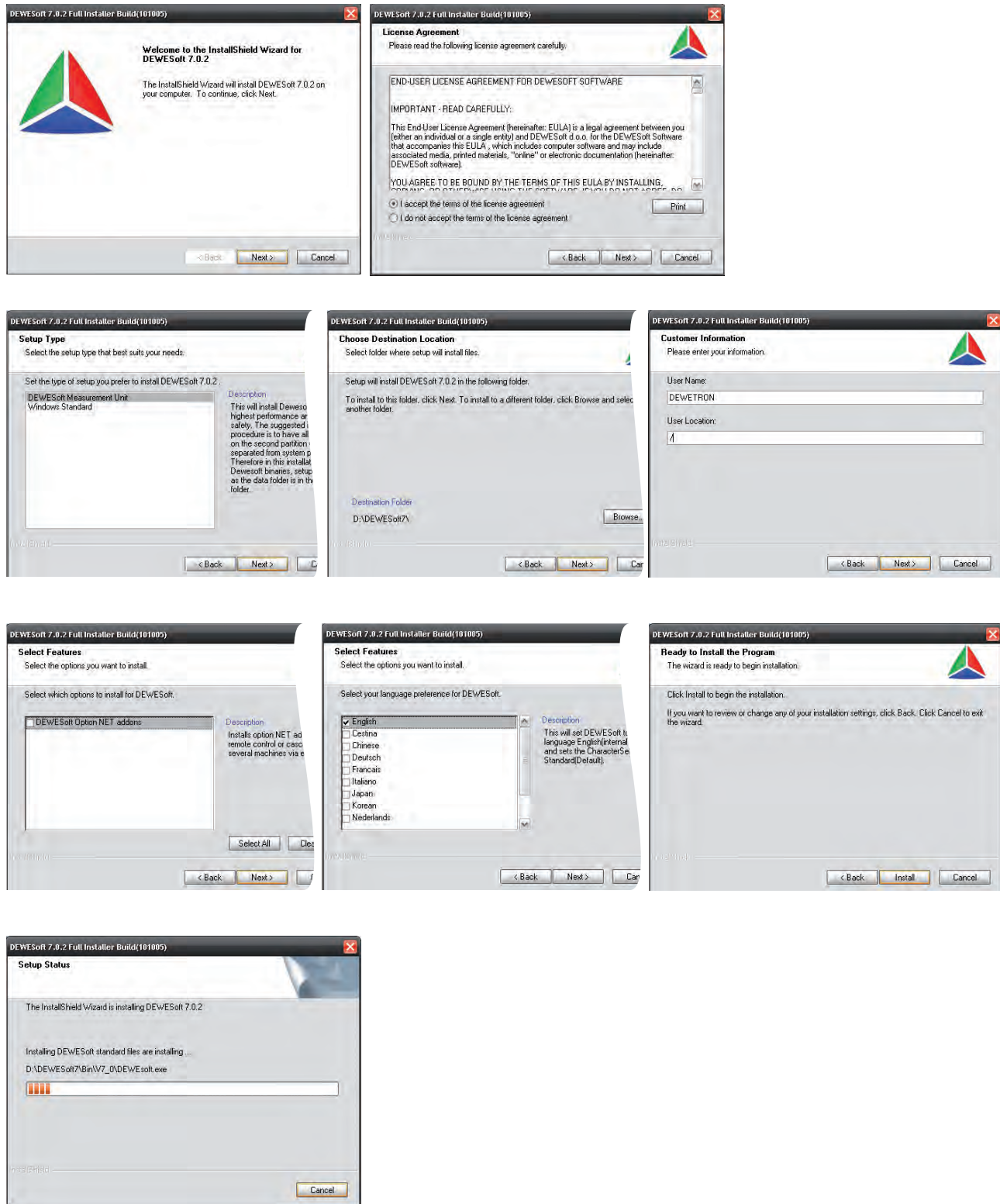
Resolution: 0.1 meters

DEWE-VGPS-HS

Installation of the DEWESoft measurement software

Start the installation software on the System DVD, shipped with the system.

Follow the instructions of the install program according to your license.



Now DEWESoft is installed on your computer. The software creates some directories on your harddisk.



You can start the software in the Windows start menu or use the icon created on your desktop. For more information about the DEWESoft installation please refer to the *DEWESoft Software Users Manual*.

Installation of the DEWE-VGPS-HS

After installing DEWESoft7, connect the RS-232 connector to the corresponding COM port of your system (COM1 or COM2).

Configuration of DEWESoft7 for the DEWE-VGPS-HS

- Start DEWESoft7
- To unlock the GPS functionality in DEWESoft7 the GPS has to be configured in the Hardware Setup screen (Settings → Hardware Setup):

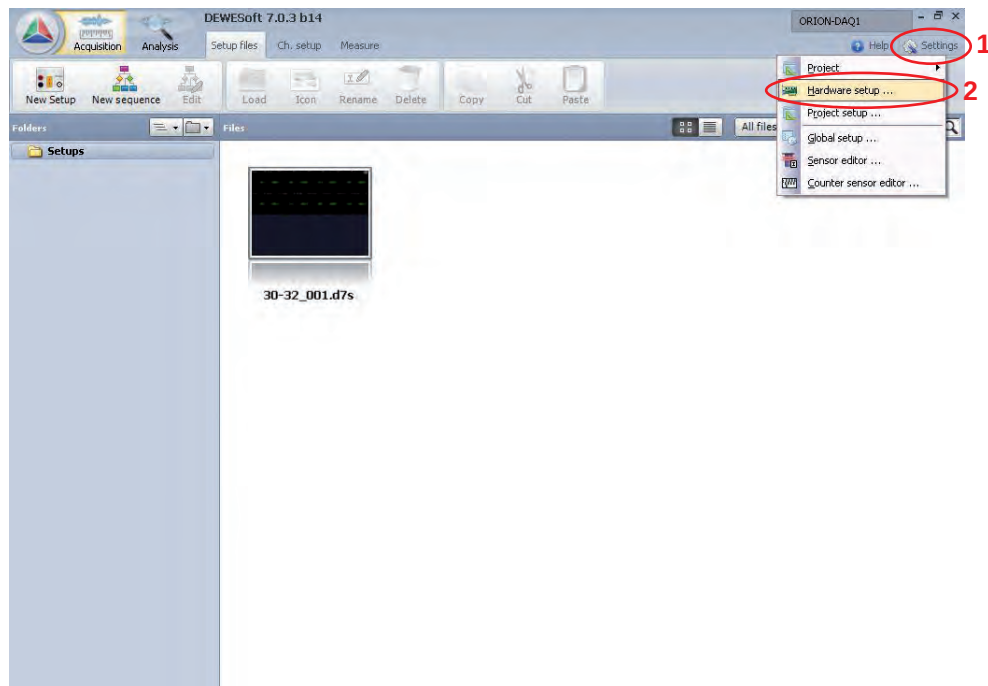
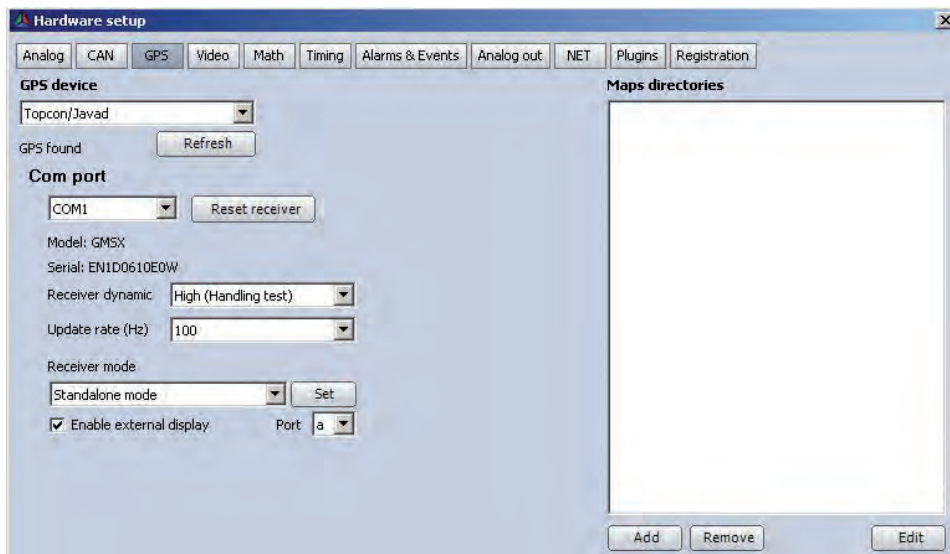


Figure 1: starting hardware setup in DEWESoft 7

DEWE-VGPS-HS

- In the hardware setup window select 'GPS' and follow the instructions below:



GPS device

A list of the supported GPS systems. Select the **TOPCON/JAVAD** GPS device.

Com port

Select the corresponding COM port in the dropdown menu. If the GPS can not be found select the port where the GPS is connected from the COM port dropdown menu and hit the 'Refresh' button (usually COM1 or COM2).

Model

Shows the hardware version of the VGPS system.

Serial number

Serial number of the connected GPS sensor. Serial number is recorded to reconstruct the measurement conditions.

Receiver dynamic settings

Depending on the application, the DEWE-VGPS-HS offers the possibility to set it into three different settings. These can be done in the pull down menu Receiver dynamic settings.

Highest (car performance for analog out): This setting should be used if the low latency time of 12 ms at the analog and speed output is needed.

High (handling test): Because of the PPS-Sync facility of the DEWE-VGPS-HS, this setting will not increase the latency time and the dynamic behavior using the serial interface for data acquisition. The delay time at the analog and displacement output may be up to 22 ms.

Normal (data logging): Select this mode for highest accuracy and lowest noise of the position and velocity signal.

Reset receiver

The "Reset receiver" button will reset the internally used receiver. This function has no influence on all settings below.

Update rate (Hz)

This setting will define the sample rate of the serial data storage. Please note at 100 Hz only effects velocity, distance and acceleration channel. At this update rate the position output is reduced to 20 Hz. Up to 50 Hz, all channels are stored with this rate.

Receiver mode

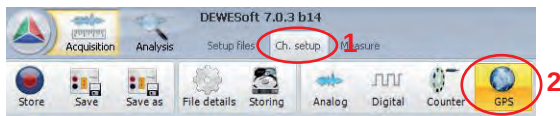
The receiver supports receiving correction (differential mode) signals like Waas (for USA) or Egnos (for Europe). It is recommended to enable differential mode to increase the accuracy of the absolute position.

External display

On receiver port 'a' the VGPS-HS supports the VGPS-Display.

Measurement setup

When you finished the hardware settings, click on the 'Ch. setup' button and select 'GPS'.



Channel Setup

The screenshot below shows the channel setup screen of the DEWE-VGPS-HS. In the column *ON/OFF* you can select the channels for storing during the measurement. The default channel names are displayed in the column *NAME*. You can change them with a double click on it. Beside the channel names the actual value is displayed.



- X absolute: Longitude component of position in degrees, minutes and fraction of minutes
- Y absolute: Latitude component of position in degrees, minutes and fraction of minutes
- Z: Altitude in meters above sea level
- Velocity: Speed over ground (vector of all 3 dimensions)
- Direction: True track over ground
- Distance: Integration of speed for getting the displacement. Only speed levels above 0.5 km/h are used to calculate the distance
- Used sat.: Numbers of satellites used for calculation of position and speed
- Current sec: This channel counts the seconds since midnight UTC
- Mark input: Indicates an event at the mark input by changing the level from 0 to 1
- Acc.: Based on the GPS velocity the acceleration calculated automatically

The circle at the right gives an overview of the satellites in view of the GPS receiver and which of them are used from the receiver. The color of the shown satellites indicates the signal strength of them. From grey to dark green which is the strongest density. Satellites shown in the centre of the circle are directly above the GPS-aerial. Satellites shown at the border of the circle are near the horizon.

The field <PPS sync> and <Standalone> change their color from grey to green depending if the appropriate feature is available at the moment (green means available).

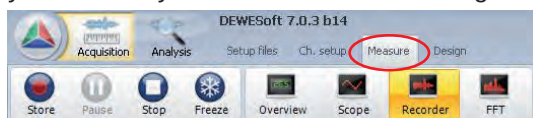
The PPS synchronisation is used for hardware synchronisation to analog channels. This will eliminate the time shift caused due to the calculation time of the GPS receiver and of the data transfer time of the RS-232 port.

DEWE-VGPS-HS

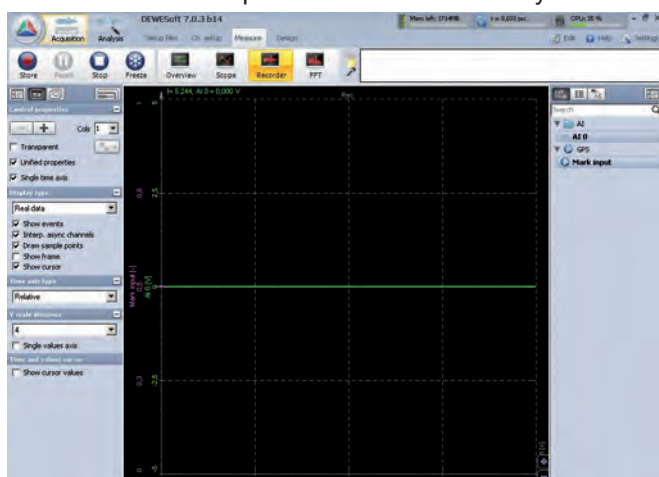
NMEA is a combined electrical and data specification for communication between marine electronic devices such as GPS receivers and many other types of instruments. It has been defined by, and is controlled by, the U.S.-based National Marine Electronics Association. The NMEA 0183 standard uses a simple ASCII, serial communications protocol that defines how data is transmitted in a 'sentence' from one 'talker' to multiple 'listeners' at a time. Through the use of intermediate expanders, a talker can have a unidirectional conversation with a nearly unlimited number of listeners, and using multiplexers, multiple sensors can talk to a single computer port.

Measurement

Now you are ready for measurement. Clicking the “Measure” button opens the measurement screen.

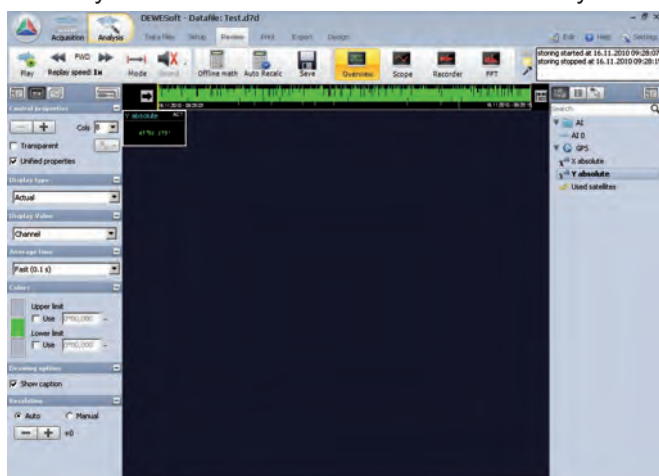


With the “Store” and “Stop” button in the recorder you can control the measurement manually.



Analyze

After measurement you can analyze and protocol the stored data. One click on the “Analysis” button gives you the possibility to choose a recorded data file and analyze it.



Use the cursor functions to zoom in, cut out, measure, and print out. With the “Export” function you can export data to other applications, like Excel, Word etc.

Find details about DEWESoft in the *DEWESoft Software Users Manual*.

CE-Certificate of conformity



Manufacturer:

DEWETRON Elektronische Messgeraete Ges.m.b.H.

Address:

**Parkring 4
A-8074 Graz-Grambach Austria**

Tel.: +43 316 3070 0

Fax: +43 316 3070 90

e-mail: sales@dewetron.com

<http://www.dewetron.com>

Name of product:

DEWE-VGPS-HS

Kind of product:

GPS system

The product meets the regulations of the following EC-directives:

73/23/EEC

"Directive on the approximation of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits amended by the directive 93/68/EEC"

89/336/EEC

"Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility amended by the directives 91/263/EEC, 92/31/EEC, 93/68/EEC and 93/97/EEC"

The accordance is proved by the observance of the following standards:

L V E M C	Safety	IEC/EN 61010-1:1992/93 IEC/EN 61010-2-031	IEC 61010-1:1992/300 V CATIII Pol. D. 2 IEC 1010-2-031
	Emissions	EN 61000-6-4	EN 55011 Class B
	Immunity	EN 61000-6-2	Group standard

Graz, October 14, 2008

Place / Date of the CE-marking

Dipl.-Ing. Roland Jeutter / Managing director

Notes
