Thank you very much for your investment in our unique data acquisition systems. These are top-quality instruments which are designed to provide you years of reliable service. This guide has been prepared to help you get the most from your investment, starting from the day you take it out of the box, and extending for years into the future.

www.dewesoft.com
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1 Notice

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

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**CAUTION**

Dewesoft GmbH shall not be liable for any errors contained in this document. Dewesoft makes no warranties of any kind with regard to this document, whether express or implied. Dewesoft specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. Dewesoft 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 Dewesoft product and replacement parts can be obtained from your local sales and service office.

To find a local dealer for your country, please visit this link: [http://www.dewesoft.com/support](http://www.dewesoft.com/support) and select Find dealers on the left navigation bar.

---

**Calibration**

Every instrument needs to be calibrated at regular intervals. The standard norm across nearly every industry is annual calibration. Before your Dewesoft data acquisition system is delivered, it is calibrated. Detailed calibration reports for your Dewesoft system can be requested. We retain them for at least one year, after system delivery.

---

**Support**

Dewesoft has a team of people ready to assist you if you have any questions or any technical difficulties regarding the system. For any support please contact your local distributor first or Dewesoft directly.

<table>
<thead>
<tr>
<th>Austria</th>
<th>Slovenia</th>
</tr>
</thead>
</table>
| Dewesoft GmbH  
Grazerstrasse 7  
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Web: [http://www.dewesoft.com](http://www.dewesoft.com)  
The telephone hotline is available Monday to Friday between 08:00 and 16:00 CET (GMT +1:00) |

---

**Service/repairs**

The team of Dewesoft also performs any kinds of repairs to your system to assure a safe and proper operation in the future. For information regarding service and repairs please contact your local distributor first or Dewesoft directly.
1.1 Safety instructions

Your safety is our primary concern! Please be safe!

Safety symbols in the manual

**WARNING**

Calls attention to a procedure, practice, or condition that could cause body injury or death.

**CAUTION**

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

General Safety Instructions

**WARNING**

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. Dewesoft GmbH 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.

Environmental Considerations

Information about the environmental impact of the product.

Product End-of-Life Handling

Observe the following guidelines when recycling a Dewesoft system:

System and Components Recycling

Production of these 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 information about recycling on the Dewesoft web site www.dewesoft.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. However we take care about our environment and the product is lead free.

General safety and hazard warnings for all Dewesoft systems

⚠️ Safety of the operator and the unit depend on following these rules
⚠️ Use this system under the terms of the specifications only to avoid any possible danger.
⚠️ Read your manual before operating the system.
⚠️ Observe local laws when using the instrument.
⚠️ DO NOT touch internal wiring!
⚠️ DO NOT use higher supply voltage than specified!
⚠️ Use only original plugs and cables for harnessing.
⚠️ You may not connect higher voltages than rated to any connectors.
⚠️ The power-cable and -connector serve as Power-Breaker. The cable must not exceed 3 meters, disconnect function must be possible without tools.
⚠️ Maintenance must be executed by qualified staff only.
⚠️ During the use of the system, it might be possible to access other parts of a more comprehensive system. Please read and follow the safety instructions provided in the manuals of all other components regarding warning and security advices for using the system.
⚠️ With this product, only use the power cable delivered or defined for the host country.
⚠️ DO NOT connect or disconnect sensors, probes or test leads, as these parts are connected to a voltage supply unit.
⚠️ 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.
⚠️ Please note the characteristics and indicators on the system to avoid fire or electric shocks. Before connecting the system, please read the corresponding specifications in the product manual carefully.
The inputs must not, unless otherwise noted (CATx identification), be connected to the main circuit of category II, III and IV.

The power cord separates the system from the power supply. Do not block the power cord, since it has to be accessible for the users.

DO NOT use the system if equipment covers or shields are removed.

If you assume the system is damaged, get it examined by authorised personnel only.

Adverse environmental conditions are:
- Moisture or high humidity
- Dust, flammable gases, fumes or dissolver
- Thunderstorm or thunderstorm conditions (except assembly PNA)
- Electrostatic fields, etcetera.

The measurement category can be adjusted depending on module configuration.

Any other use than described above may damage your system and is attended with dangers like short-circuit, fire or electric shocks.

The whole system must not be changed, rebuilt or opened

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 Dewesoft sales and service office for service and repair to ensure that safety features are maintained.

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.

If you assume a more risk less use is not provided any more, the system has to be rendered inoperative and should be protected against inadvertent operation. It is assumed that a more risk less operation is not possible any more, if
- the system is damaged obviously or causes strange noises.
- the system does not work any more.
- the system has been exposed to long storage in adverse environmental.
- the system has been exposed to heavy shipment strain.

DO NOT touch any exposed connectors or components if they are live wired. The use of metal bare wires is not allowed. There is a risk of short cut and fire hazard!

Warranty void if damages caused by disregarding this manual. For consequential damages NO liability will be assumed!

Warranty void if damages to property or persons caused by improper use or disregarding the safety instructions.

Unauthorized changing or rebuilding the system is prohibited due to safety and permission reasons (CE).

Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.

The product heats during operation. Make sure there is adequate ventilation. Ventilation slots must not be covered!

Only fuses of the specified type and nominal current may be used. The use of patched fuses is prohibited.

Prevent using metal bare wires! Risk of short circuit and fire hazard!

DO NOT use the system before, during or shortly after a thunderstorm (risk of lightning and high energy over-voltage). An advanced range of application under certain conditions is allowed with therefore designed products only. For details please refer to the specifications.

Make sure that your hands, shoes, clothes, the floor, the system or measuring leads, integrated circuits and so on, are dry.

DO NOT use the system in rooms with flammable gases, fumes or dust or in adverse environmental conditions.

Avoid operation in the immediate vicinity of:
- high magnetic or electromagnetic fields
- transmitting antennas or high-frequency generators
Notice

for exact values please refer to enclosed specifications.

Use measurement leads or measurement accessories aligned to the specification of the system only. Fire hazard in case of overload!

Do not switch on the system after transporting it from a cold into a warm room and vice versa. The thereby created condensation may damage your system. Acclimatise the system unpowered to room temperature.

Do not disassemble the system! There is a high risk of getting a perilous electric shock. Capacitors still might be charged, even if the system has been removed from the power supply.

The electrical installations and equipments in industrial facilities must be observed by the security regulations and insurance institutions.

The use of the measuring system in schools and other training facilities must be observed by skilled personnel.

The measuring systems are not designed for use at humans and animals.

Please contact a professional if you have doubts about the method of operation, safety or the connection of the system.

Please be careful with the product. Shocks, hits and dropping it from already lower level may damage your system.

Please also consider the detailed technical reference manual as well as the security advices of the connected systems.

This product has left the factory in safety-related flawless and in proper condition. In order to maintain this condition and guarantee safety use, the user has to consider the security advices and warnings in this manual.

EN 61326-3-1:2008

IEC 61326-1 applies to this part of IEC 61326 but is limited to systems and equipment for industrial applications intended to perform safety functions as defined in IEC 61508 with SIL 1-3.

The electromagnetic environments encompassed by this product family standard are industrial, both indoor and outdoor, as described for industrial locations in IEC 61000-6-2 or defined in 3.7 of IEC 61326-1. Equipment and systems intended for use in other electromagnetic environments, for example, in the process industry or in environments with potentially explosive atmospheres, are excluded from the scope of this product family standard, IEC 61326-3-1.

Devices and systems according to IEC 61508 or IEC 61511 which are considered as “operationally well-tried”, are excluded from the scope of IEC 61326-3-1.

Fire-alarm and safety-alarm systems, intended for protection of buildings, are excluded from the scope of IEC 61326-3-1.
2   About this document

This is the Technical Reference Manual for DS-VGPS-HSC Version 1.0.0.

The manual is divided into several chapters. You will find:

- A description of the system and the main combination and expansion options
- The description of the connection variants and the pin assignments on the inputs and outputs
- A comprehensive introduction to the configuration of the modules using DEWESoft™
- Technical data

The software that has been used must be:

- DEWESoft™ Version X7.1-b108 or higher
- Firmware of the VGPS-HSC system/s must be: version 4.12.6.16. or higher

2.1   Legend

The following symbols and formats will be used throughout the document.

| IMPORTANT | Gives you an important information about a subject. Please read carefully! |
| HINT      | Gives you a hint or provides additional information about a subject. |
| EXAMPLE   | Gives you an example to a specific subject. |

<table>
<thead>
<tr>
<th>Example</th>
<th>Meaning</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cancel</strong></td>
<td>Clickable GUI element</td>
<td>e.g. a button, a menu item, a radio button, etc.</td>
</tr>
<tr>
<td><strong>Times New Roman</strong></td>
<td>GUI element</td>
<td>an GUI element: e.g. a Text-Label</td>
</tr>
<tr>
<td>C:\Program Files\OpenOffice.org 3\readme.txt</td>
<td>File Path and Name</td>
<td>a file name or path</td>
</tr>
<tr>
<td><strong>Windows Key</strong></td>
<td>A term</td>
<td>any kind of term (maybe also compound)</td>
</tr>
<tr>
<td><strong>SNR: 85dB</strong></td>
<td>Preliminary info</td>
<td>Preliminary information: e.g. specifications that are not confirmed yet</td>
</tr>
<tr>
<td><strong>Highlight</strong></td>
<td>Highlighted Text</td>
<td>To highlight parts of the text: e.g. special features</td>
</tr>
<tr>
<td><strong>Isolated</strong></td>
<td>Galvanic Isolation</td>
<td>To emphasis items that are galvanically isolated</td>
</tr>
</tbody>
</table>

Table 1: Layout formats used in the documentation
2.2 Online versions

2.2.1 DS-VGPS-HSC technical reference manual

The most recent version of this manual can be downloaded from our homepage:

http://www.dewesoft.com/download

In the HW Manuals section click the download link for the DS-VGPS-HSC users manual.

2.2.2 DEWESoft™ tutorials

The DEWESoft™ tutorials document, provides basics and additional information and examples for working with DEWESoft™ and certain parts of the program.

The latest version of the DEWESoft™ tutorials can be found here:

http://www.dewesoft.com/download

In the SW Manuals section click the download link of the DEWESoft 7 tutorials entry.
3 GPS based system for position, speed and displacement measurement

3.1 Features

- Synchronized data acquisition combined with real time speed measurement
- Portable and rugged construction
- Insensitivity to road surface (can be used on mud off-road, water, snow, ice,..)
- Mark input for brake trigger switch

3.1.1 Speed sensor

- 100 Hz update rate for speed and distance output
- Supports USB and CAN interface
- Supports differential GPS (SBAS) as standard function
- Online signal quality monitoring for standalone applications
- No calibration required

3.1.2 Clock output

- Output clock rate of up to 10 MHz
- One independent output frequency
- Synchronization of DEW-E-ORION-1624 systems
- PPS accuracy of 100 ns
- Continuous synchronization to absolute GPS time
- Absolute long time stable
## Measurement Specifications

<table>
<thead>
<tr>
<th>Speed</th>
<th>Absolute position (valid for USB, CAN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>0.1 km/h ±0.05 % of range ¹</td>
</tr>
<tr>
<td>Min to Max</td>
<td>0.1 km/h to 500 km/h</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.01 km/h</td>
</tr>
<tr>
<td>Analog output</td>
<td>25 mV/km/h ² (0 to 5 V)</td>
</tr>
</tbody>
</table>

### Displacement

<table>
<thead>
<tr>
<th>Speed</th>
<th>Accuracy</th>
<th>Digital output</th>
<th>Refresh rate</th>
<th>Latency time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>&lt; 20 cm/km ³</td>
<td>500 pls/m ² (TTL level)</td>
<td>100 Hz</td>
<td>&lt; 2 ms using DEWESoft</td>
</tr>
<tr>
<td>Trigger accuracy</td>
<td>100 ns</td>
<td>Clock acc. GPS locked</td>
<td>without drift</td>
<td>Clock acc. GPS unlocked</td>
</tr>
<tr>
<td>Clock/Trigger signal level</td>
<td>TTL (LVDS for ORION-1624)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### System specifications

<table>
<thead>
<tr>
<th>Input</th>
<th>SMA connector for GPS antenna, Lemo for event input and power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>Speed and displacement BNC, USB, CAN, Lemo for VGPS display, Lemo for timebase generator</td>
</tr>
</tbody>
</table>

| Power Supply | 9 to 36 V<sub>DC</sub> (3W) |
| Dimensions | 115 x 93 x 35 mm (4.5 x 3.6 x 1.4 in.) 740 g (1.63 lbs) |
| Display | 131 x 64 x 27 mm (5.2 x 2.5 x 1.1 in.) 265 g (0.58 lbs) |

### Vibration

- MIL-STD 810 F 514.5 procedure
- 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 810 F 516.5 procedure
- non operating test procedure
- ½ sinus 11 ms 10g, 3 shocks positive, 3 shocks negative

### Storage temperature

- -20°C to +70°C

### Operating temperature

- 0°C to 60°C (standard)

### Operating humidity

- 10 % to 80 % non condensing
- 5 % to 95 % rel. humidity

1) Acquiring more than 5 satellites, averaged over 3 values

2) Free programmable

3) Acquiring more than 6 satellites, driving at constant speed

4) Circular Error Probable
   - 2 cm RTK option
   - 1.8 m differential operation using SBAS
   - 3 m autonomous operation
3.3 Device overview

With the DS-VGPS-HSC DEWESoft offers a unique combination of a high dynamic GPS based speed sensor and a GPS synchronized time base generator. This combination allows completely synchronized data acquisition of multiple systems located inside and outside of moving vehicles.

The sensitivity of the analog speed and displacement output is free programmable. Due to the 100 Hz update rate the latency time is as low as 9 ms. Using the unique PPS sync technology of DEWESoft the latency time of the digital interfaces (USB or CAN) are corrected online.

The time synchronization is supported for the whole DEWE-ORION series and also for many 3rd party A/D-boards.

The base of any GPS receiver is precise time measurement. In addition to the position information a precise PPS (pulse per second) is generated by the GPS engine. This pulse is used to synchronize 80 MHz oscillator with software PLL (phase locked loop). The result is ultra stable 80 MHz clock source which is completely free of drift over time.

Out of this 80 MHz base clock, the programmable clock divider generates the clock frequency for the data acquisition system. Due to the over-clocking of delta sigma converters, a special output clock is required for synchronized sampling. This is available on a RJ45 connector for clocking the DEWE-ORION-1624.

The communication to the host is provided over CAN or standard USB interface.
3.4 Functionality of the LEDs

3.4.1 Power (green)
The power LED is solid green when the DS-VGPS-HSC is in normal operation.

3.4.2 Status (red)
The red status LED indicates current status of device:

- **At normal operation** - when DS-VGPS-HSC is locked to the selected time source - it shortly blinks once a second.

- **When the time source signal is missing** (neither GPS or IRIG time code signal), the device automatically goes to flying-wheel operation. This is indicated by inverted blinking.

### LED: Normal Operation
![LED: Normal Operation]

### LED: Missing Signal
![LED: Missing Signal]

3.5 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.

3.6 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.
4 Scope of supply
5 Connection

5.1 Connector overview

5.1.1 Aerial connector

Connect the GPS aerial to the SMA connector.

5.1.2 MULTI I/O connector

The 9-pin DSUB 9 (male) connector is configured as output connector for following signals.

<table>
<thead>
<tr>
<th>Pin assignment</th>
<th>1: +5V 50mA supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>2: CAN-LOW</td>
<td></td>
</tr>
<tr>
<td>3: Scan clock out</td>
<td></td>
</tr>
<tr>
<td>4: Distance out</td>
<td></td>
</tr>
<tr>
<td>5: Analog speed output</td>
<td></td>
</tr>
<tr>
<td>6: PPS (pulse per second)</td>
<td></td>
</tr>
<tr>
<td>7: CAN-HIGH</td>
<td></td>
</tr>
<tr>
<td>8: DGND (Ground)</td>
<td></td>
</tr>
<tr>
<td>9: AGND (Analog speed ground)</td>
<td></td>
</tr>
</tbody>
</table>

5.1.3 USB connector

The Mini-USB interface connectors meets standard USB pin assignment.

<table>
<thead>
<tr>
<th>Pin assignment</th>
<th>1: +5V</th>
</tr>
</thead>
<tbody>
<tr>
<td>2: Data -</td>
<td></td>
</tr>
<tr>
<td>3: Data +</td>
<td></td>
</tr>
<tr>
<td>4: Host cable identification</td>
<td></td>
</tr>
<tr>
<td>5: GND</td>
<td></td>
</tr>
</tbody>
</table>
5.1.4 VGPS – Display connector

To connect the external display to the DS-VGPS-HSC system.

<table>
<thead>
<tr>
<th>Pin assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: +5 V</td>
</tr>
<tr>
<td>2: GND</td>
</tr>
<tr>
<td>3: TXD</td>
</tr>
<tr>
<td>4: RXD</td>
</tr>
</tbody>
</table>

5.1.5 Mark input connector

Connects an external trigger source to the DS-VGPS-HSC system.

<table>
<thead>
<tr>
<th>Pin assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: +9 to +36 V</td>
</tr>
<tr>
<td>2: GND</td>
</tr>
<tr>
<td>3: Signal</td>
</tr>
</tbody>
</table>

5.1.6 Power supply connector

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

<table>
<thead>
<tr>
<th>Pin assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: +9 to +36 V</td>
</tr>
<tr>
<td>2: GND</td>
</tr>
</tbody>
</table>
5.1.7 ORION-DSA-SYNC connector

This connector is used for synchronizing any ORION-DSA data acquisition card to the DS-CLOCK. For this purpose the DS-CLOCK is equipped with a RJ45 connector for connection to the DEWESoft™ data acquisition system. A standard CAT5e or CAT6 Ethernet cable with up to 30 m can be used for connection.

5.1.8 Cable for external power supply

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

Standard:
(included)

Optional:

Optional:

AC adapter

- different AC cable (depends on the country)
5.1.9 Cable for connecting VGPS to VGPS-Display (optional)

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

5.1.10 Cable for connecting VGPS to CAN

Type of cable: LIYCY 2x0.25 shielded, length: 2 m
5.1.11 Output cable velocity and distance

Type of cable: RG-174, length: 2 m

5.2 Options

5.2.1 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 DS-VGPS-HSC. The DS-VGPS-HSC 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.
5.2.2 Digital display

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 kph.

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 coordinate, 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 relative to the Datum WGS84 (approx. 50 meters below UK sea level). Resolution: 0.1 meters
Installation of the DEWESoft X measurement software

Start the installation software on the System USB stick, shipped with the system. Follow the instructions of the install program according to your license.
Now DEWESoft X is installed on your computer. The software creates some directories on your hard disk.

You can start the software in the Windows start menu or use the icon created on your desktop. For more information about the DEWESoft X installation please refer to the DEWESoft Software Users Manual.
6.1 Connecting the DS-VGPS-HSC to the DAQ-System

6.1.1 Synchronization to system with Clock and Trigger

To synchronize standard data acquisition systems a start trigger and the possibility of external clocking is required. This input needs to be connected to the output of the DS-CLOCK sync signals of the 9-pin DSUB female (signal Scan Clock Output and PPS).

6.1.2 Synchronization to DEWE-ORION-DSA series

One of the unique features of the DS-CLOCK is the possibility to synchronize also data acquisition systems using delta sigma ADC technology like DEWE-ORION-DSA. The main challenge is to produce the up to 256 times over sample clock used for these types of analogue to digital converters. For this purpose the DS-CLOCK is equipped with a RJ45 connector for connection to the Dewesoft data acquisition system. A standard CAT5e or CAT6 Ethernet cable with up to 30 m can be used for connection.

IMPORTANT

Please note that also the data acquisition has to be provided ORION-DSA-SYNC option for having access to the synch bus of the board.
6.2 Configuration of DEWESoft X for the DS-VGPS-HSC

- Start DEWESoft X
- To unlock the GPS functionality in DEWESoft X the GPS has to be configured in the Hardware Setup screen (Settings → Hardware Setup)
- In the hardware setup window select 'GPS' and follow the instructions below:

![Hardware Setup Window](image)

**GPS device**

A list of the supported GPS systems. Select the Dewesoft RS232 (Topcon/Javad/NVS) GPS device. If it don't find the Model of receiver press Refresh button or you have to switch COM port.

**Firmware version**

Shows the firmware version of the VGPS system.

**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.

**Reset receiver**

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

**Update rate (Hz)**

Only option is 100 Hz update rate.

**Velocity analog output**

The maximum value of the analog output coefficient can be set in this input field. The valid range is between 50 and 500 km/h.
Distance output

Here you can define the number of pulses per meter of the digital distance output. Measuring the frequency of this output gives also a high accuracy speed output. For example if this output is set to 500 pulses per meter a frequency of 1 kHz equals to 2 meters per second (or 7.2 km/h). Selectable ranges are from 10 to 1000 pulses per meter.

CAN output

By clicking on this screen, you enable CAN output. For CAN reading you can also use a .dbc file (DS-VGPS-HSC.dbc), which can be downloaded from our website.

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.
6.2.1 Timing settings

Hardware setup

In addition to a high precision speed sensor the DS-VGPS-HSC is also a high precision timing source for synchronized data acquisition. In this operation mode the DS-VGPS-HSC generates the clock for the data acquisition system. Besides of generating a clock from of up to 10 MHz for data acquisition systems a clock engine for synchronized acquisition using DEWE-ORION-1624 is included also.

This operation mode needs to be enabled in the Hardware setup of DEWESoft (Hardware Setup → Timing):

Select DEWESoft USB from the Timing device drop down menu.

Correction limit

For synchronizing the internal oscillator with the PPS signal at least 4 satellites are required. If the GPS signal is lost during acquisition the DS-VGPS-HSC continues sourcing the data acquisition system with a precision clock source. Without synchronizing to the GPS signal, the oscillator may drift. Therefore the absolute time synchronization can’t be guaranteed anymore. However, as soon the GPS signal is available again, the VGPS-HSC recognizes a possible drift and tries to correct this inaccuracy. If the drift during the free-run time is higher than 100ms, a new data file is automatically generated with exact time stamping.
As soon the timing device is selected DEWESoft automatically sets the data acquisition hardware to external clocking for receiving the sample frequency out of the DS-VGPS-HSC. In addition to this each measurement starts synchronized with the PPS signal. The time information of the data file is taken out of the GPS-time and not anymore from the local PC time.

The actual time form the DS-VGPS-HSC is shown at the right top corner. In addition to this an indicator gives you the information if the clock generator is locked to the GPS data (green dot) or if it is operating in FREE-RUN mode (red dot).
6.3 Channel setup

When you are finished in the hardware settings, click on the ‘Ch. setup’ button and select ‘GPS’.

The screenshot below shows the channel setup screen of the DS-VGPS-HSC. 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 satellites**: 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
- **Acceleration**: Based on the GPS velocity the acceleration is calculated automatically
- **GPS fix quality**: To recognize in which mode the receiver is (Standalone, DGPS, RTK)

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 gray to dark green which is the strongest density. Satellites shown in the center 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> change the color from gray to green depending if the appropriate feature is available at the moment.

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

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

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

After measurement you can analyze 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/out, cut out 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.
# 7 Documentation version history

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