KNOW WHAT'S GOING ON

THE 'GPS-V' SENSOR FROM POWERBOX SYSTEMS

Powerbox Systems has had the GPS sensor in its range for some time. However, the version with the addition 'V' (variometer) is new. Gerd Giese has taken a closer look at the latest development and reports in detail.

With the newly integrated variometer, the GPS sensor is a really interesting combination, as it provides GPS satellite data and barometric data in a single housing via telemetry. Another versatile feature is that the new GPS sensor is compatible with the telemetry protocols of Powerbox Systems 'P²-BUS', Futaba 'S.BUS2', Multiplex 'M-Link', Jeti 'EX-BUS' and Graupner 'HoTT'. There is no need for complicated pre-settings, as they are recognised automatically! The sensor is therefore ready for immediate use in designing the telemetry data on the transmitter.

I am an enthusiastic user of Powerbox Systems products and am familiar with both the 'GPS-II/-III' sensor and the company's variometer. I am very impressed with these sensors because their reliability and accuracy have won me over. The variometer in particular stands out thanks to its sensitive and almost instantaneous response to altitude differences. But its long-term and temperature stability for detecting altitude values are also in a class of their own. However, until now, two sensors were always needed to use the GPS and variometer data! The new 'GPS-V' sensor changes that.

The sensor is delivered in a high-quality hard box. The included accessories consist of a patch cable and a V-cable, an adhesive pad and the operating instructions. Of course, I was curious, so I first started up the 'GPS-V' sensor on the Powerbox Systems terminal. The setting options here are limited to Futaba 'S.BUS2' (slot channels), 'HoTT' (2D or 3D) and 'M-Link/HoTT' (distance limits). There are no other setting options for the 'GPS-V' sensor, even on the "Core" or 'Atom' transmitter. The sensor parameters are factory-optimised and do not need to be changed.
However, up to 15 values are available for telemetry data (GPS and variometer): GPS altitude, speed, distance in 2D and 3D, distance travelled, flight direction, number of satellites, accuracy, climb rate, altitude in metres or centimetres, temperature, GPS coordinates and sensor status. Powerbox Systems places the highest demands on the 'GPS-V'. I would like to

The accessories consist of a connection cable, V-cable, adhesive pad and instructions. The V-cable can be used to connect additional sensors to the receiver's telemetry BUS.

FACTS

The 'GPS-V' sensor from Powerbox-Systems
A useful aid

Operating voltage: . . . . . .4-9 V
Current consumption: . max. 60 mA
Horizontal speed: . . max. 1,200 km/h
Vertical speed: . . . . .max. 360 km/h
Dimensions: . . . . . 60 x 18 x 15 mm
Weight: . . . . . 14 g
Price: . . . . . .129 euros

Available from specialist retailers and from Powerbox Systems, phone: +49-906/99999200, www.powerbox-systems.com.

highlight the versatile support for different protocols.

The GPS technology is equipped with a high-precision MEMS altitude sensor that reliably detects even the smallest differences in altitude. Another highlight of the 'GPS-V' is the latest 'µBlox Max10' receiver. Among other things, this chip is optimised for fast GPS login, even under difficult installation conditions. The GPS processes data five times per second. Additional filter technology makes the 'GPS-V' insensitive to external interference and ensures stable reception. To optimise reception, Powerbox Systems uses a helical radial antenna, which ensures reliable and stable GPS reception in all flight positions (horizontal and vertical). By linking the data from the GPS and variometer, any inaccuracies that occur can be compensated for. It is only with this combination that you can enjoy a much more precise altitude determination. This enables real altitude resolution with minimal noise of only ten centimetres. The climb rate (variometer) is output in real time and transmitted to the transmitter via telemetry. This is particularly noticeable with the variometer signal! However, this also applies to all 15 values of the Powerbox Systems telemetry transmission.

After switching on, the 'GPS-V' sensor uses its status LED in different colours and flashing signals to indicate the current status of the sensor. The LED is bright enough to be easily identifiable even out in the open. The most important signal is the blue steady light. This sets in approximately 45 seconds after the first switch-on. If the 'GPS-V' is not installed in a visible location, the status can also be determined on the transmitter, provided that the status widget has been set up ('3D' indicates that everything is OK!). My GPS sensor was placed at the front of the model's fuselage nose. The fuselage

The fifteen telemetry options are spread over three screenpages, here only the first.

nose is 2.4 GHz-friendly and consists only of GRP/aramid fabric. The status LED signals with a blue light that there are enough satellites for 2D and 3D measurements. My recommendation: always wait for the blue status light or the '3D' message before starting the model! This avoids erroneous data in the telemetry. The 'GPS-V' sensor uses around 15 satellites to evaluate the 2D and 3D data. For me, this is a minimum of 12 and a maximum of 18. The location accuracy is not limited by this sensor, but by the deliberately added 'interference signal' in the civil use of GPS satellites! However, this is completely irrelevant for our model flying.

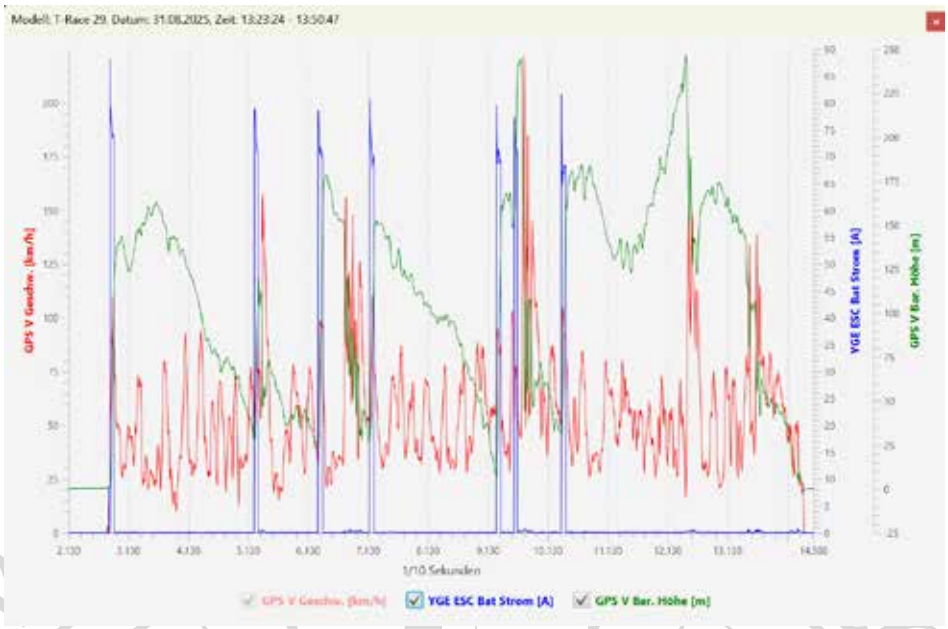
The flight test took place in the 'T-Race 29' electric glider model from Aer-O-Tec. Even the first flight showed me the class of the sensor: the variometer demonstrated to my ear how sensitive and direct it responds without seeming nervous. For me, the filter tuning is very well done. I am always impressed by how directly the variometer tones respond, with almost no delay! The usual 'memorial second' is not present. The test quickly led to the permanent integration of the 'GPS-V' in the 'T-Race 29'. How well a sensor compensates is also evident after a longer flight. After landing, the telemetry altitude reading shows zero metres, provided the air pressure has not changed.

As already mentioned, the sensor provides 15 telemetry values. For practical reasons, I use the variometer with the climb rates, altitude values and speed. On the second telemetry page, I also recommend the GPS coordinates. This should always be done for safety reasons. This is not necessary with the 'Core' transmitter – more on that later.

The 'GPS-V' also provides GPS data, which I evaluated using 'DataExplorer 3.98'. Among other things, this allows the horizontal and vertical speeds in the air to be reliably evaluated. After a 200-metre descent, the 'T-Race 29' reached a maximum ground speed of 224 kilometres per hour. The average speed of the 'T-Race 29' settled at around 45 kilometres per hour. By exporting the 3D flight data to Google Earth, you can review the flight in the landscape from both a ground and a bird's-eye perspective. The 'Powerbox Systems Terminal' programme is not (yet) suitable for this.

The distance covered by my model in dynamic flight after fifteen minutes is also interesting. In my case, it was 13 kilometres. So there is a lot to discover according to your own preferences. Just one example: if

Installation of the 'GPS-V' in the model with Velcro tape on the servo board.



A selection of telemetry data. I like to evaluate this data in 'DataExplorer'. Shown here are the flight altitude, speed and motor current from the 'iESC-65.8' controller. You can see that from the 11th minute onwards, slight thermals could be used.

you like, you can evaluate the 2D data and find out how far (not high!) the model flew at its maximum.

Powerbox Systems has also integrated a model finder: if the model crashes and the receiver fails, you have the last coordinates for locating the model on the transmitter. These are displayed in the transmitter's widget. These coordinates are used to determine the location and must be entered into the mobile phone. The only thing more convenient is the 'Core' transmitter. Here, the GPS coordinates of the model are displayed numerically and graphically on the display in its own GPS menu. The model is shown as a red dot. Direction and distance are now available as live data. In the event of an accident, all you have to do is walk towards the red dot until the model is in the centre circle. The model will then be just a few metres away from you.

My conclusion: Powerbox Systems has a well-designed and very practical sensor in its range, because the 'GPS-V' fulfils three important functions: a high-resolution variometer that is a real pleasure to use thanks to its successful calibration. In addition, it provides complete GPS data with distances, speeds, movement in the area (2D) and in space (3D). And the model finder, which is usually only available as an optional extra, but which is extremely important in an emergency! In my opinion, the 'GPS-V' sensor is an asset to our hobby and, based on my experience, I can recommend it without reservation. ■

Gerd Giese

GLOSSARY

u-blox MAX-M10

This special chip is optimised for high sensitivity and the fastest possible detection of GPS signals. It improves position accuracy by up to 25 per cent compared to standard systems.

Micro-Electro-Mechanical Systems

These are tiny sensors. They can detect mechanical, magnetic or even chemical changes and convert them into electrical information. Among other things, they optimally detect the slightest changes in air pressure for altitude measurement.

Helix antennas

They have higher reception strength and are less dependent on position and direction than rod antennas. This means that even in the most difficult reception situations, very weak reception signals can be reliably processed to obtain accurate GPS data, as is the case here! The disadvantage is the more complex and bulky design.

Noise

Interference signals generated by all components in the electronics! These small voltage peaks rage across a wide frequency spectrum. The technical trick here is to clearly distinguish a small useful signal from the noise so as not to distort the real data. In technical terms, this means that at some point the useful signal is lost in the noise.

The preferred variometer settings. These settings are also ideal for Bluetooth headphones.

The GPS data shown for locating the model. The red dot shows the location of the model. The exact coordinates and distance are also displayed.