



UniSens-E

The small yet powerful telemetry sensor
measures and transmits
Voltage / current / capacity / power / energy
/Brushless rpm / height / Climb

Specifications and operating instructions

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Introduction

The UniSens-E is a pure telemetry sensor specifically designed for all electric models. It is so small and light, but at the same time so powerful that it can be suitable for almost any model.

In accordance with our philosophy to support many systems, the UniSens-E also speaks the language of

- Jeti Duplex (EX),
- Multiplex M-Link
- Graupner/SJ HoTT
- Robbe/Futaba FASSTest S.BUS2
- JR DMSS
- FrSky

The telemetry used in the UniSens-E must be specified, once only, in the settings. This is done either through our PC program "UniSens E-Tool" or the UniDisplay. On delivery HoTT GAM is selected.

Without additional sensors the UniSens-E can measure the entire drive, ie voltage, current, capacity and even the rpm. A special feature is that a brushless rpm sensor is already built-in. For measuring rpm you just need to make a single connection to one of the three motor phases with the included cable.

Since a high resolution barometric (air pressure) level sensor is integrated, in addition to the height measurement a Vario is also achieved with the UniSens-E.

Similarly extensive alarms are programmable, and can be reported by telemetry to the respective transmitter.

The UniSens-E is available with various connector systems, so normally nothing needs to be soldered. The current measurement range is symmetrical in both directions. Thus as regards the pin assignment, it does not matter if the battery positive pole is male or female. The measurement direction is just simply set in the Setup.

With our UniDisplay, all values measured on the UniSens-E can be viewed live directly and all settings and alarms can be programmed.

Whether sailplane, aerobatic, helicopter, HLG or slow flyer, the UniSens-E can, due to its low weight and compact size be used in almost every area. Of course, the UniSens-E is not only suitable for model aircraft. It can be installed in RC boats, RC cars, etc.

2 What the UniSens-E can do

- complete measurement of electric drives with current, voltage, power, capacity, rpm and altitude
- integrated brushless rpm sensor
- full telemetry support for Jeti Duplex (EX), Multiplex M-Link, Graupner HoTT, Futaba FASSTest S.BUS2, JR DMSS and FrSky.
- height measurement with automatic zeroing after switching on
- barometric vario
- current measurement range up to 140 A in both directions, voltage up to 60 V (the maximum current carrying capacity of the connectors used must not be exceeded!)
- connection for receiver signal for the remote control of certain functions
- direct connection to the GPS logger is possible to record data in a file
- measuring the receiver battery voltage
- powered from the receiver battery
- status is indicated by LED
- direct viewing of live readings with our UniDisplay
- parameter setting possible via a PC, UniDisplay or telemetry.
- PC software for settings and updates (SM UniSens-E Tool) is available online at www.smmodellbau.de in the menu Software & Updates
- free firmware updates possible via the PC with our USB interface (Order No. 2550), or with an existing USB connection cable such as from Jeti, Multiplex or Graupner.
- due to its compact size and low weight can be used virtually anywhere

3. **Technical Data**

Current range: 140 A in both directions, ie – 140A to + 140 A

Following durations are allowed:

- 100 A unlimited
- 120 A for 1 minute
- 140 A for 20 seconds

Depending on the plug-in system, but the limitations of the plug are much lower!

Reasonable values are as follows:

- | | |
|---------------------------------------|---------------------------------|
| - MPX green (double contact) and XT60 | Continuous: 50 A / 20 s: 70 A |
| - 4 mm gold plated plug | Continuous: 80 A / 20 s: 100 A |
| - 5.5 mm gold plug | Continuous: 120 A / 20 s: 150 A |
| - 6.0 mm LMT gold plug | Continuous: 120 A / 20 s: 150 A |

Voltage Range: 0 to 60 V

Altitude range: 0 to 8000 m above sea level, automatically zeroed at switch on

Receiver Voltage measurement: 3.8 V to 10 V

Data Rate: 10 Hz

Power supply: from receiver supply via the telemetry connection (from 3.8 V to maximum 10 V)

Power consumption: 25 mA from the receiver supply

External Connectors: 1 x connector for telemetry and power ("Link")
1 x phase connection for the brushless rpm measurement
1 x Servo signal input from the receiver
COM port for UniDisplay, GPS logger or PC

Dimensions: green MPX connector:	26 (38) x 29 x 9 mm
Yellow XT60 connector:	26 (50) x 29 x 9 mm
4mm gold connectors:	26 (55) x 22 x 9 mm
5.5 mm gold connectors:	26 (44) x 22 x 11 mm
6.0 mm LMT gold connectors:	26 (44) x 22 x 11 mm

Weight: 10 g - 14 g without cable (depending on connection), cable 4g

4 Readings

The following measured values can be capture by the UniSens -E. But depending on the telemetry used only parts of it may be available at the transmitter.

Description	Unit	Content
Drive current	A	Current in amperes consumed by the drive, at up to 2 decimal places depending on the telemetry.
Drive voltage	V	Voltage of the drive battery, at up to 2 decimal places depending on the telemetry.
Capacity	mAh	Battery capacity consumed by the drive, with a fully charged battery it will be incremented from 0 mAh.
Energy	Wmin	Drive energy consumed in watt minutes.
Power	W	Power consumed by the drive in watts.
Speed	rpm	Speed of the brushless motor in rpm, for this a connection to a motor phase is needed: can also be translated into propeller speed by input of a gear ratio
Altitude	m	Height above the starting point, the height is measured by a barometric sensor.
Climb rate	m/s	Vario value from the barometric sensor
Receiver voltage	V or VRx	Voltage at the Rx connection
Servo pulse	us	Servo pulse width at the single connection at "Link", may optionally be used to switch between Min/Live/Max values.
Air pressure	hPa	Air pressure measured by the barometric sensor.
Height gain	m	Height change in the last 10 seconds, recalculated every second and can be used to detect the trend when thermalling.

5 Variants

The UniSens-E is available with various connector systems. The basic module is identical, only the fixed soldered connector for connection of battery and controller are different.

Currently, the following versions are available:



MPX plug green, No. 3100



XT60 connector, No. 3101



4mm gold connectors, No. 3102



5.5 mm gold plug, No. 3103



6.0 mm LMT gold plug, No. 3104



4mm² Silicon cable No.3105

6 Operation of UniSens-E

6.1. Installation

Because of its light weight and compact design, the installation is straightforward. Since the UniSens-E will always be plugged directly between the battery and controller, it should not normally be specially secured.

6.2. Meanings of the LED

The UniSens-E has a red status LED

After switching on the power supply, a rapidly flashing LED shows the internal initialization.

In operation, there are the following signals

:

- LED lit waiting, timed measurement has not yet started
- LED flashes timed measurement was started by exceeding the current threshold

6.3. Basic Settings

The settings of the UniSens-E can be made with our software, "SM UniSens-E Tool" on the PC or Laptop, or alternatively with our UniDisplay or the Jeti and HoTT telemetry

The following settings are important so that the UniSens-E can measure correctly:

- **"Telemetrie Auswahl"** defines the telemetry used. From firmware v1.04 it must be specified here whether it will continue to automatically check for Jeti / HoTT / Multiplex, or if it is fixed and Futaba S.BUS2 or JR DMSS telemetry is specified.
- **"Strommessung"** chooses the direction of current flow, and so the positive current direction in which the power is measured.
When using the green MPX connector or the yellow XT60 connector choose "normal" so that positive currents are measured when discharging the Batteries.
For the gold connectors on drives with a socket on the positive terminal of the battery use "normal", if the positive terminal of the battery is a plug, then select "invers".
- **"Motorpole"** specifies the number of magnetic poles for the brushless speed measurement (typically inrunner 2 poles, outrunner 10 or 14 poles)
If in doubt, this value must be obtained from the manufacturer, or even the magnets are counted.
- **"Getrieb"** is the gear ratio for the rpm measurement.
With direct drive "1.00:1" must be set here. Otherwise the value of the gearbox specified.
- **"Vario Schwelle"** is the threshold for the vario signal via telemetry separated for rise and fall.
Only when the climb / descent is greater than the threshold is a Vario tone generated by telemetry.
- **"Vario Ton"** defines whether the vario for climb / descent or both is active.
Here the Vario tone can be turned off completely.
- **"Min/Max per Rx"** enables the selection of Live / Max / Min values in the telemetry display over a receiver channel on each individual orange cable

- **"Kapazität"** sets the mode for the capacity measurement: continued or always start at 0 mAh. See below.
- **"Stromoffset"** specifies whether when you connect the drive battery to the UniSens-E any existing current flow should always calibrate to 0. Thus, the quiescent current of the servo etc. are hidden.

Continued capacity measurement:

With the UniSens-E, a battery can be flown to empty in a series of flights. The UniSens-E remembers the consumed capacity (and energy) and starts again with this value unless a battery is connected at full voltage.

Manual reset of the capacity counter:

Start the UniSens-E and then turn off again during the rapid blinking (flickering) of the red LED

→ the counter goes back to 0 on the next boot

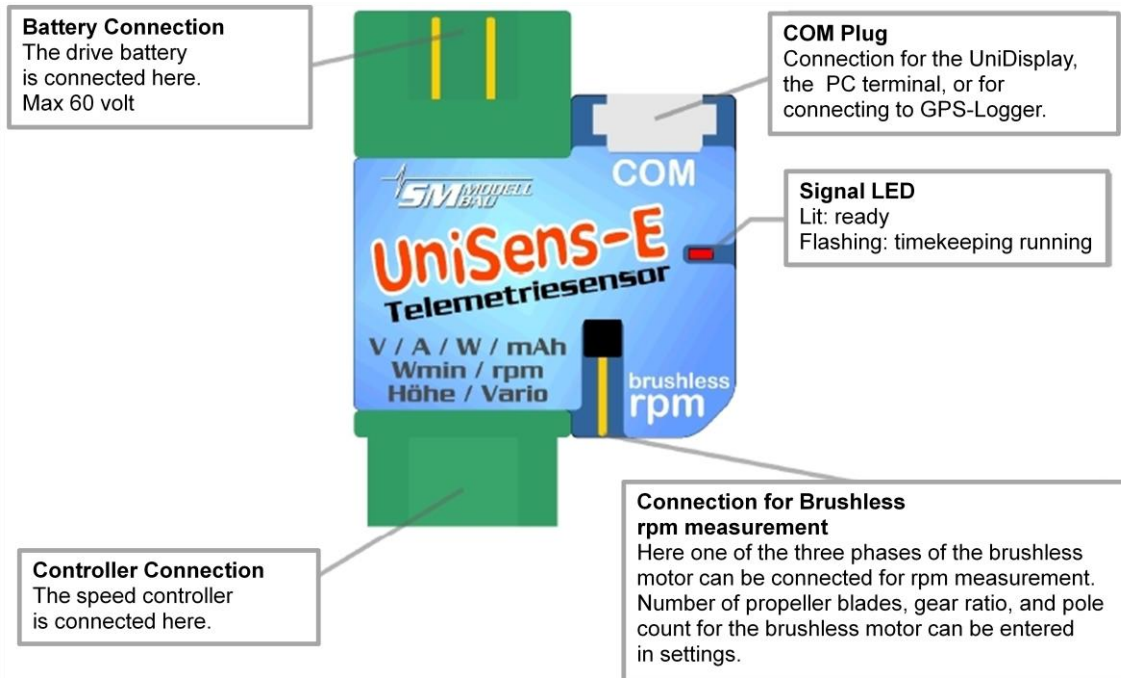
6.4. Telemetry alarms

These alarms are output at the transmitter via the attached telemetry. Depending on the system a beep will sound and/or a warning by voice output. Please read the notes in the individual telemetry system's sections.

Once the model has landed, the acoustic output stops automatically, so until you turn off the model no disturbing messages will be heard.

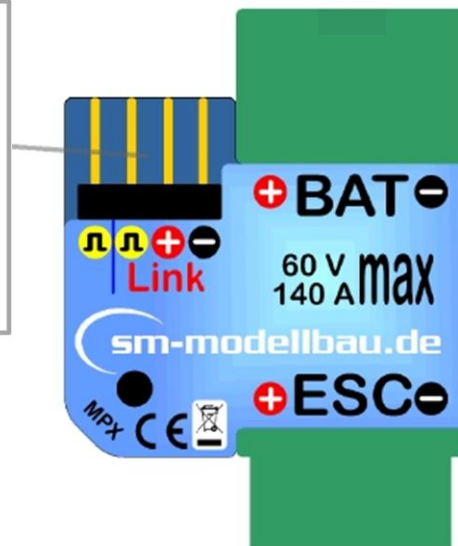
- **"Strom"** (Current)
The alarm is active when the set current threshold is exceeded.
- **"startspannung"** (Start voltage)
This alarm is a warning before starting with a dead battery. As an example if 12.4 V is set for a 3s LiPo, the alarm is only active if an already flown empty battery is connected accidentally. A full 3s has approximately 12.6 V, which is significantly above the threshold.
- **"voltage"**
The alarm is active when the set voltage threshold is exceeded.
- **" Kapazität"** (Capacity)
The alarm is activated when the consumed capacity exceeds the preset value. The capacity Alarm is cleared after 10 seconds, but then comes permanently once an additional 5% of the set capacity is consumed.
This is the main alarm to protect the LiPos. An input of max. 80% of rated capacity should be set.
- **"Höhe"** (Altitude)
The alarm is active when the set level is exceeded. Well suited for a tow plane to fly to a certain height.
- **"Rx Spannung"** (Rx voltage)
For monitoring the receiver supply. The alarm is active when the voltage falls below the set voltage threshold.

7. Connections of UniSens-E



Telemetry Connector "Link"
Using the supplied patch cable a direct connection to the telemetry ports of the receivers is made here. The cable and connection is identical for Jeti Duplex, Multiplex M-Link, and Graupner HoTT. The UniSens-E is also supplied here with 3.8v to 10v.

With the single signal line, the Unisens E can be connected to a free channel of the receiver.
Over this channel from the transmitter you can switch the display of measured data between live, min and max values.



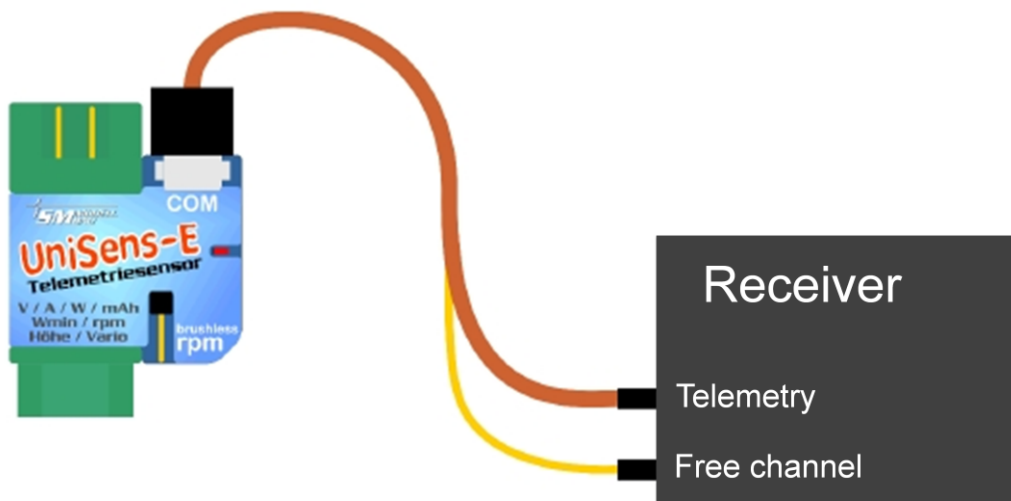
8. Connection Examples

Basically the UniSens-E is only powered over the telemetry connection "Link"

8.1. Only altimeter / vario e.g. in F3B/F3J sailplanes or HLG

For a pure altimeter and vario function via telemetry only the UniSens-E with the supplied connecting cable to receiver is necessary. The altitude sensor with vario thus weighs only 10g plus cable.

On the UniSens-E, the cable is connected at "Link" and connected directly to the telemetry port. on the receiver.



8.2 Minimum and Maximum values switched via a Receiver channel

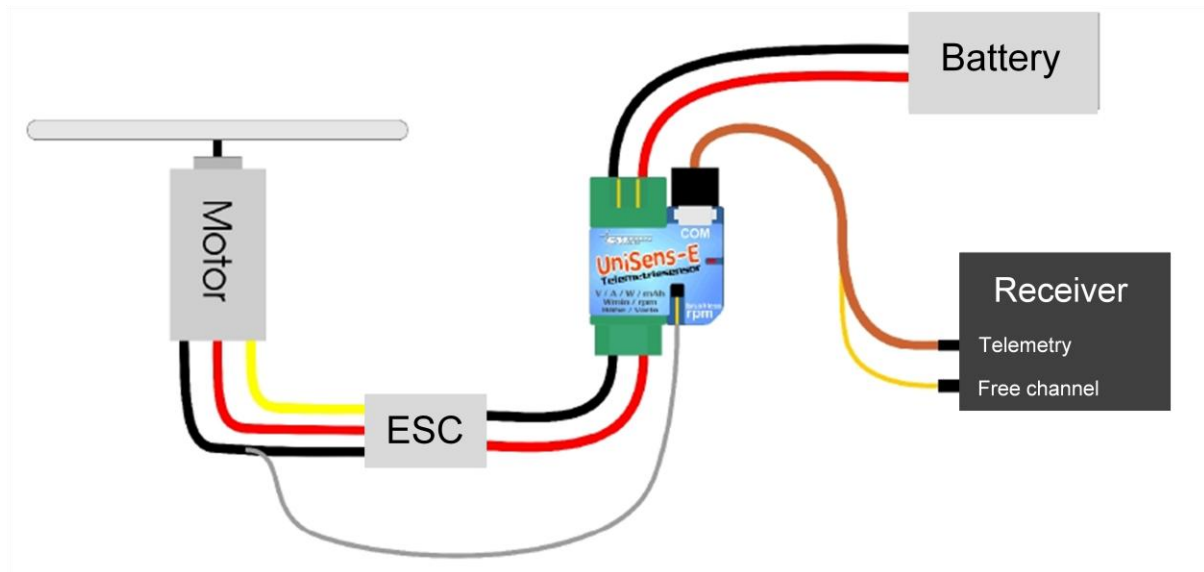
Optionally with a free receiver channel the Live, Maximum, and Minimum values can be switched between. To do this a second connecting cable is necessary between the desired receiver channel and the single pin on the UniSens-E telemetry connector.

On the transmitter a 3 position switch should be programmed for the selected channel, and the channel should change between the following values:

-100%	for Minimum values (change point 1.3 ms)
0%	for Live values
+100%	for maximum values (change point 1.7ms)

In addition the option "Min/Max per Rx" must be activated in the UniSens-E settings. If this option is not used the single receiver pin of the UniSens-E can just remain empty.

8.3. Electric power measurement



The UniSens-E is placed directly between the battery and controller. Since the UniSens-E is available with various connector systems, normally no soldering is required.

With the version with 4 mm or 5.5 mm and 6mm gold plated plug, and also the version with the silicon cable, only the positive terminal of battery and controller are connect directly to the UniSens-E. For the negative pole there is a short silicone cable. This separate negative pole only needs to be connected to the negative pole of the battery when the speed controller is equipped with an opto-coupler. Then the UniSens-E is missing the ground reference needed for measurement. With BEC regulators, the cable should be insulated with shrink tubing and just remain free.

The UniSens-E with a 5.5 mm or 6mm gold plated plug, and also the version with the silicon cable, does not have a plug on the single negative cable. Here a small connector should be attached with which the connection is made to the negative terminals of the battery. Well proven here is a 2 mm gold plated plug.

With the symmetrical current range of UniSens-E it does not matter how the connector on the battery is made. It is only necessary to set the correct current direction in the settings: When using the green MPX connector and yellow XT60 connector choose "normal" so that when the battery discharges positive currents are measured.

When using the bullet connectors for drives with the socket on the positive terminal of the battery choose "normal", with a plug on the positive pole of the battery select "invers".

When connecting the drive battery to the UniSens-E, depending on the settings for "Stromoffset" the current zero point is also calibrated. The current flowing then is set as 0 value.

8.4. Connecting the brushless rpm sensor

The brushless rpm sensor is built into the UniSens-E. To measure the rpm only a connection between one of the three motor phases and the single connection pin on the UniSens-E needs to be made.

This is a white single-pole cable.

This cable is easily cut to the required length, stripped to about 10 mm and plugged in one of the connections between Controller

and motor. Of course, the cable can also be soldered to a phase connection.



In the setup of UniSens-E for rpm measurement, the correct number of poles must be specified. A classic in-runner such as a Lehner or Hacker motor has 2 poles. An out-runner has 10 or 14 poles.

In addition the gear ratio can also be specified, ie. if the rpm of an in-runner with gearbox is measured with the brushless speed sensor, a mounted gearbox can be include in the count. This gives the actual propeller speed.

8.5. Use of different plug systems

With the UniSense-E part No. 3105 you have the possibility to use any plug. This variant is supplied with 4mm² cables.



Example of cabling for Part No. 3105 with Deans Ultra plug

The minus pole here is also only a thin single wire as only the positive pole goes through the UniSens-E. This negative lead must only be connected to the minus of the plug when the controller is equipped with an optocoupler. Then the UniSens-E lacks the ground reference point for the measurement. In BEC regulators, the cable should simply be insulated with shrink tubing and remain free.

If the connectors are soldered so that the battery is connected to the end of the UniSens-E where the "COM" and "link" are plugged in (as in the photo), then the current direction "normal" is chosen.

8.6. Connection to the GPS-logger

With the connection cables No. 2720 or 2721 the UniSens-E can be connected to, and communicate directly with, our Gps-Logger

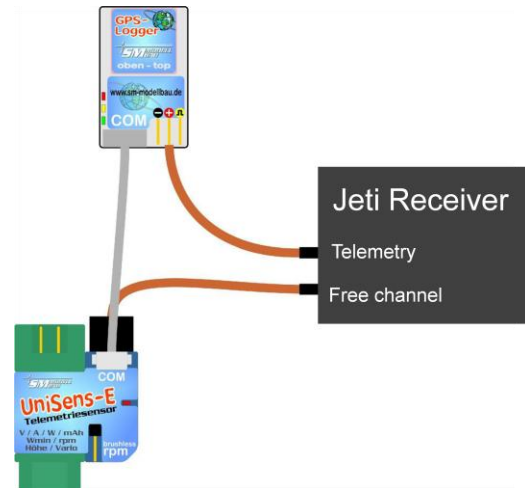
The GPS logger thus automatically records the data of the UniSens-E on its memory card. In This way GPS data and measurements of the UniSens-E are synchronised and can be evaluated together.

The connection to UniLog 1/2 or UniSens-E does not work during FASSTest, JR DMSS and FrSky operation of the GPS logger. The COM port cannot be used here.

The recording on the GPS logger is done with the storage rate of the GPS logger, ie a maximum of 10 Hz.

Note: Only the three wire connection cables order no.2720 and 2721 must be used!
With the 4-pin cable Order 2401, the two internal voltages of UniSens-E and Gps-Logger are connected, which can lead to failures.

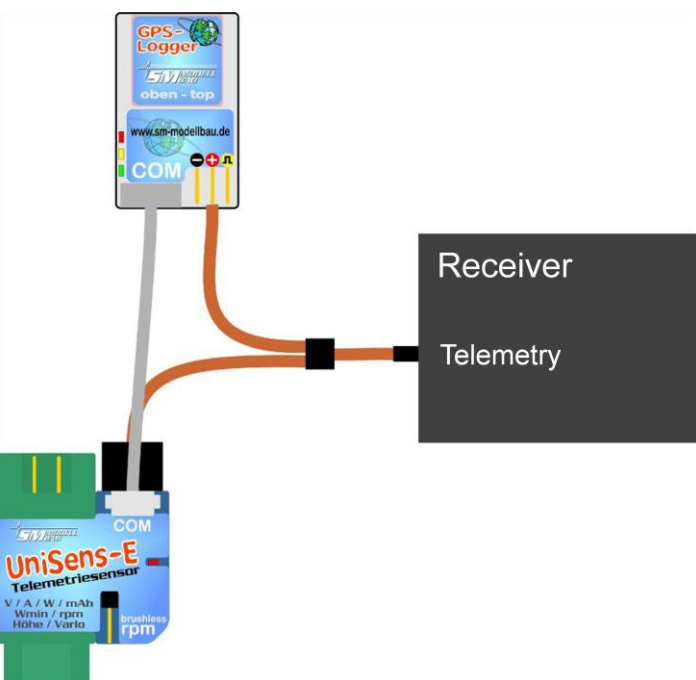
Depending on the telemetry, there are different connection options:



In Jeti Duplex (not EX!) The telemetry data from the UniSens-E is passed from the GPS logger to the receiver. That allows you to save the otherwise necessary Jeti E4 expander.

The UniSens-E is here powered via the "Link" connection to a free receiver slot while GPS logger is connected to the telemetry port of the receiver.

In the new version Jeti Duplex EX, however, when connecting the UniSens-E and GPS-Logger the Jeti E4 EX expander is necessary. The direct connection can still be used to save the data of the UniSens-E on the Gps-Logger.



With HoTT, M-Link, Robbe/Futaba S.BUS2, JR DMSS and FrSky the UniSens-E and Gps-Logger are connected in parallel to the telemetry port with a simple V cable. Even more sensors can be connected by a V cable.

9 Using the UniDisplay

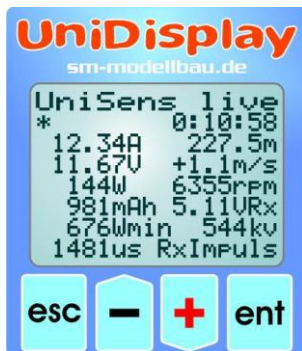
To connect the UniSens-E the firmware used in the UniDisplay must be at least v1.26. An update to the UniDisplay can be downloaded free from our website (www.sm-modellbau.de).

UniDisplay and UniSens-E are connected with the cable supplied with the display. The port used on the UniSens-E is marked with "COM". The connection cable can be connected either way, which end is the screen is irrelevant. The display is powered by the UniSens-E and automatically turns on when the UniSens-E is on. The display may be connected to the UniSens-E at any time.



Menu:

After switching on first the menu is activated. The menu options can be selected with the "plus" and "Minus" buttons, and the appropriate item selected with "Enter".



Live data display screen 1:

Here all current measured values are displayed.

Most values are self-explanatory.

- "Plus" starts and stops the recording.
- "Minus" alternates between live / MIN / MAX values.
- "Enter" toggles between the live screens 1, 2 and 3
- "Esc" will return to the menu.

Top right is the elapsed time.

The last line shows the measured servo pulse on the Rx port



Live display screen 2:

Here is the air pressure measured by the barometric pressure sensor, and the internal temperature of the UniSens-E.

Because of self-heating, this temperature always slightly higher than the ambient temperature.



Setup:

Here the menu appears for all of the settings UniSens-E.

The second line is the firmware version of UniSens-E and the Serial number.

The menu options can be selected with the "plus" and "Minus" buttons, and the appropriate item selected with "Enter".

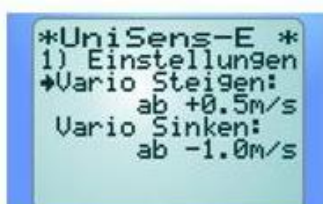
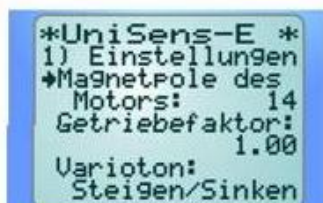
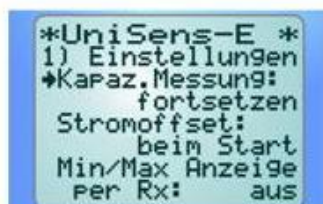


Settings screens 1 - 4:

The settings of the UniSens-E are summarized here.

The menu options can be selected with the “plus” and “Minus” buttons, and the appropriate item selected with “Enter”. The arrow then becomes a Dot and the selected value can be changed with “Plus” and “Minus”. A press on “Esc” or “Enter” stores the change.

- **Telemetrie:** default setting for the telemetry used.
- **HoTT Modus:** desired mode in HoTT.
- **Stromrichtung:** selects the measuring direction (sign) of the current sensor.
 - **Kapaz.Messung:** enables or disables the continuous capacity measurement.
 - **Stromoffset:** automatic zero point calibration of the current at power on or off.
 - **Min/Max Anzeige per Rx:** allows you to switch between live/max /min values on the Telemetry display via a channel on the Rx.
 - **Magnetpole des Motors:** specifies the number of poles for brushless rpm measurement
 - **Getriebefaktor:** is the gear ratio for the rpm measurement
 - **Varioton:** defines whether the Vario is active during climb / descent.
 - **Vario Steigen:** is the positive threshold for the Vario signal.
 - **Vario Sinken:** is the negative threshold for the Vario signal.



Alarms:

Alarms can be set here for all telemetry versions. Depending on the telemetry alarms can also be specified directly on the transmitter. Please refer to the notes on the individual telemetry systems..

When the arrow is in the left column and the appropriate menu option activated with “Enter”, the value of the alarm can be set. After the arrow is moved right and the menu option activated with “Enter” the alarm can be activated (“+”) or deactivated (“-”) with “Plus” or “Minus”.



M-Link addresses:

For transfer of UniSens-E measured values by M-Link, addresses can be assigned here for the display on Multiplex transmitter. Each address may only be assigned once to any attached M-Link sensor, including the M-Link receiver. The Bus system ceases to function with multiple assignments.

If a value is not to be transmitted chose the address “—”. This value becomes the highest permissible Address 15.



10 Telemetry operation

From UniSens-E telemetry via Jeti Duplex (EX), Multiplex M-Link, Graupner HoTT, Futaba FASSTest S.BUS2, JR Propo DMSS and FrSky is supported.

The telemetry operation is similar for all supported systems, live data is displayed on the transmitter or on external display, and with Jeti Duplex and HoTT the UniSens-E can also be operated from the transmitter.

If the system output is a spoken voice, then this is also supported by UniSens-E. The alarm output depends on the telemetry. In some systems, the UniSens-E generates the alarm, in others the thresholds are set directly on the transmitter. Please note the information on this below.

10.1. Telemetry operation with Jeti Duplex

The UniSens-E is a complete telemetry sensor for Jeti Duplex 2.4 GHz systems. The Jeti Expandere E4 for the connection of up to 4 sensors is supported.

Connection direct to the Jeti Duplex receiver is made with the patch cable supplied between “Link” on the UniSens-E and “ext” on the Jeti Duplex receiver.

10.1.1. Ex Telemetry with the Jeti transmitter and the JetiBox Profi

The UniSens-E transfers the data using the Jeti EX telemetry to the DC-16/DS-16 transmitter or the JetiBox Profi.

The UniSens-E is treated the same as a Jeti snsor. It transmits the available sensor values to the transmitter. There, from these values, the display content, unit version, and any alarms can be specified. With the built in emulation of the JetoBox the UniSens-E can be controlled and settings changed as described below.

If a UniSens-E is replaced by another, the telemetry values must be re-read in the DC-16/DS-16 or ProfiBox. Each UniSens-E has its own serial number and the Jeti EX distinguishes between the various devices on it.

The following measured values are shown in Jeti EX operation

- Spannung *Voltage*
- Strom *Current*
- Kapazität *Capacity*
- RxSpannung *Rx Volts*
- Höhe *Height*
- Steigen *Climb rate*
- Drehzahl *rpm*
- Energie *Energy*
- Leistung *Power*
- Luftdruck *Air pressure*
- Impuls ein *Pulse in (servo)*
- Temperatur intern *Internal temperature*
- Höhengewinn *Height gain*

10.1.2. Operation of the UniSens-E with the JetiBox

< - Mx
v

After the start of transmission the JetiBox is changed to Mx for the attached sensors..

Firmware v1.06
SM UniSens-E

A press the on the ▼ key changes to the UniSens-E initialisation screen then the measured data is displayed.

A 23.28 V 221.8 m
36.04 A 1377 mAh

As soon as the first screen with measured data appears, the different data screens can be selected with presses of ◀ and ▶ keys. A pressure on the key ▲ starts the recording of data, which is indicated by an acoustic signal. A further pressure on ▲ terminates the recording.

A simultaneous long pressure on the keys ◀ and ▶ changes between the display of Live / MAX / MIN values.

In the top left of the screen there is an indicator of the current active data screen and/or the status of the UniSens-E:

:

A first data screen, following screens have B, C, etc

* recording running

> maximum values are indicated

< minimum values are indicated

< Strom Alarm >
(Aus) 50A

A press of key ▼ changes to the settings. Again with the keys ◀ and ▶ the different screens and the desired point are selected.

< Strom Alarm >
(Ein) < 49A >

After a further press of key ▼ the selected value can then be changed (keys ◀ and ▶). With a simultaneous pressure on ▲ and ▼ the alarm is switched on/off (Ein/Aus).

Changed settings are only stored with the move back to the selection level with ▲.

10.1.3. Display of measured values on the JetiBox

A	23.28 V	221.8 m
	36.04 A	1377 mAh

Top: Drive voltage, barometric altitude from start point

Bottom: Drive current, capacity used

B	1750.1 Wmin
2481 rpm	839 W

Top: energy used

Bottom: rpm, drive power

C	5.01 VRx	221.8 m
>>>>> _		+12.1 m / s

Top: receiver voltage, barometric altitude compared to start point

Bottom: Graphical display of the Vario, Vario as numerical value

D	971.43 hPa
internal	28.1 °C

Top: Current air pressure

Bottom: internal temperature of UniSens-E. As a result of self-heating this temperature is always somewhat higher than the ambient temperature.

E	00:14:34
----------	----------

Top: measured time

10.1.4. Alarms

When operating on the Jeti transmitter modules with the display of data on the simple JetiBox all alarms and Vario sounds are generated directly from UniSens-E. All relevant settings are therefore made on the UniSens-E.

The JetiBox Profi and the Jeti transmitters in Jeti EX mode can actually generate the alerts and sounds. These are then set in the Box or in the transmitter. Alarms that are set in UniSens-E are additionally issued.

10.2. Multiplex M-Link

The UniSens-E is also a full telemetry sensor for the Multiplex M-Link 2.4 GHz system. The Measured values can be transmitted live to the ground and displayed directly on Multiplex ROYAL pro or COCKPIT SX transmitters or the external telemetry screen displays.

In order to display the correct rpm, the Royal Pro transmitter must have at least firmware v3.46 and the external display at least v1.09.

The connection to the M-Link receiver is made with the Patch cable provided between the connection location “Link” on the UniSens-E and “Sensor” on the M-Link receiver.



The settings for telemetry can be made either with the UniDisplay (also see chapter 9) or with our “SM Uniens-E tool” software on a PC.

The addresses for display on the Multiplex remote control (the line that the respective value is indicated in) can also be freely selected.

10.2.1. Alarms

With M-Link all alarms are generated directly from the UniSens-E. All relevant settings are therefore made at the UniSens-E

There is a peculiarity with the Vario settings:

Since the Multiplex transmitter itself produces the Vario tone, the UniSens-E suppresses climb values which are smaller than “Vario threshold”. Thus this range is hidden from the transmitter tone.

Example: –“Vario threshold climbing” is set to 0,5 m/s

–“Vario sinking threshold set to -1.0 m/s

–“Vario tone” is set to “on”

→ if the model rises faster than 0.5 m/s, the value is sent and the transmitters beeps

→ if the model rises or sinks more slowly, the value 0 sent and the transmitter remains silent

If the change is always required, “Vario threshold” must be adjusted to 0,1 m/s and “Vario tone” set to “up/down”.

10.3. Graupner HoTT

The UniSens-E is also a full telemetry sensor for the Graupner HoTT 2.4 GHz system. The measured values can be transmitted live to the ground and displayed directly on either the Smart Box at the HoTT transmitter or directly in the display of the HoTT transmitter. The connection to the HoTT receiver is made with the Patch cable provided, between the connection “Link” on the UniSens-E and “T” on the HoTT receiver.

As of firmware v1.07 the UniSens-E can be operated with HoTT either as a "General Module (GAM)", "Electric Air Module (EAM) "or" controller (ESC) ". The desired type is specified in the settings of UniSens-E. On delivery GAM is the default. This allows, for example, several UniSens-E to be operated together.

10.3.1. Alarms

The UniSens-E supports both the text mode and digital mode of the HoTT system. In both modes of operation all the adjustable alarms of the UnSens-E are indicated on the transmitter by beeping or voice output.

There is a peculiarity with the Vario settings:

Since the HoTT transmitter itself produces the Vario tone, the UniSens-E suppresses climb values which are smaller than “Vario threshold”. Thus this range is hidden from the transmitter tone.

Example: - “

- “Vario climbing threshold” is set to 0.5 m/s, “sinking threshold” is set to -1.0 m/s
- “Vario tone” is set to “on”

→ if the model rises faster than 0.5 m/s, the value is sent and the transmitters beeps (for transmitters without built in speaker the vario sound will only be heard with headphones.

→ if the model rises or sinks more slowly, the value 0 sent and the transmitter remains silent
If the vario change is always required, “Vario threshold” must be adjusted to 0.1 m/s and “Vario tone” set to “up/down”.

10.3.2. Text Mode

To enter text mode, use the Telemetry menu and select "Settings view". With the left keypad of the transmitter using "On" and "Off", for UniSens-E call up the "General module".

With one click to the right, you leave the receiver data and display the text from UniSens-E.



Operation is done with the right touchpad on the transmitter. Structure and content are identical to the screens of the UniDisplay, see also Chapter 9. Here you can also set all the alarms, the beep from the transmitter or the voice output.

Operation in text mode seems to be rather slow because the data is not updated as often via telemetry.

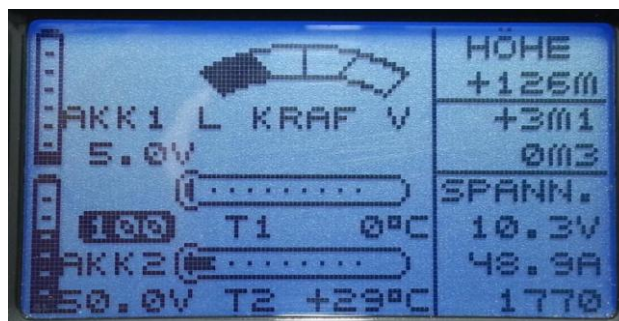
10.3.3. Digital mode

From the default display of the sender with the "left" and "right" of the left of the touchpad activate digital mode. Use the "On" and "Off" keys of left panel of the transmitter to call the correct HoTT mode, in accordance with the mode selected in the UniSens-E. With the "Left" and "Right" keys of the left touch pad you can now change between each screen. Depending on the mode there are additional screens available with a large display of measurements.

Display as GAM (General Air Module)

These values from the UniSens-E are allocated differently:

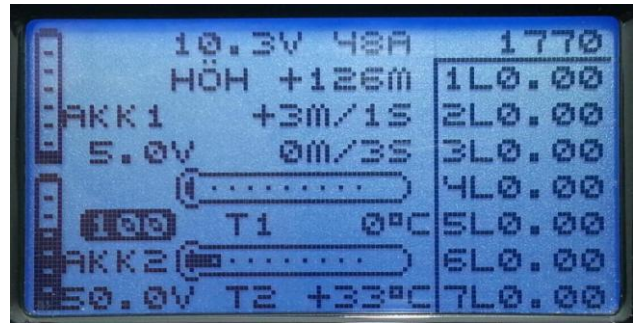
- Fuel scale: shows the remaining capacity of the battery according to the capacity set under "Alerts".
- Temperature 2: the internal temperature
- Battery 1: the receiver battery voltage.
- Battery 2: shows whether Min or Max values are selected by Rx Control: .
 - 0.0V minimum values
 - 50.0V live values are displayed
 - 99.9V maximum values
- **m3** shows the height gain in the last 10 seconds



Display as EAM (Electric Air Module)

These values from the UniSens-E are allocated differently:

- Temperature 2: the internal temperature
- Battery 1: the receiver battery voltage.
- Battery 2: shows whether Min or Max values are selected by Rx Control: .
 - 0.0V minimum values
 - 50.0V live values are displayed
 - 99.9V maximum values
- **m3** shows the height gain in the last 10 seconds

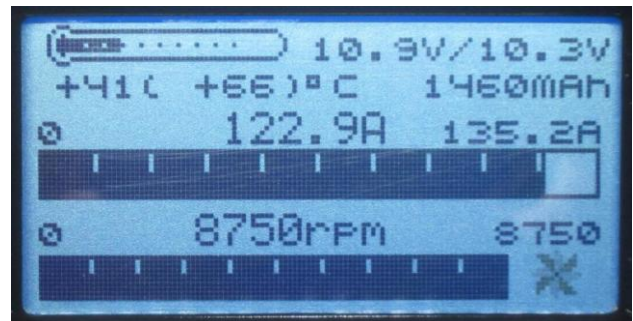


Display as an ESC (controller)

These values from the UniSens-E are allocated differently:

- Temperature : the internal temperature

In this mode Height and Vario cannot be displayed.



10.4. Futaba S.BUS2

As of firmware v1.09 the UniSens-E can be used with the Robbe / Futaba telemetry FASSTest as an S.BUS2 sensor.

The UniSens-E is thereby connected like any other sensor to the S.BUS2 slot of the receiver. Currently the UniSens-E is not yet registered in the transmitters, so it uses already existing sensor protocols. We tested the integration with the T14SG firmware v2.0, the FX-32 firmware v1.1 and the T18MZ Firmware v2.4.0 on the receivers and R7008SB R7003SB. Older firmware versions support the integration but possibly incomplete.

With S.BUS2 Servo data sensor values can be connected to the same data line. But since the servo data is far more important than the sensor values we strongly recommend that you make a strict separation. All servos go to the S.BUS1 connection of the receiver, all the sensors on the S.BUS2. Thus, in the event of an error, a sensor can never interfere with the data for the servos.

If nevertheless the UniSens-E is to be operated together with the servos on S.BUS2, is absolutely mandatory that a connection cable No. 9110 is used between UniSens-E and S.BUS2! Thus the sensor is decoupled from the bus so far that any influence on the servo data is impossible.

10.4.1. Registration on the Transmitter

Since firmware v1.11 the UniSens-E uses the Robbe F1678 current sensor for the representation and display of the data. If the UniSens-E was previously logged in, then the registration must be made again with v1.11.

To use the UniSens-E with the S.BUS2, it must like all S.BUS2 sensors be first registered on the transmitter. Use the "Link" connector on the UniSens-E on a V cable with the "SI / F" connector on the transmitter and a receiver battery connected for the power supply. The UniSens-E behaves like a Robbe / Futaba sensor and is thus closely integrated into the system. Please also refer to the transmitter instructions.

However, the UniSens-E currently uses three Robbe / Futaba sensor values to represent all measured values.

The example of the T18MZ here follows the steps of the application:

If the UniSens-E connected to the transmitter and is supplied with power, it is invoked in the sensor menu item "Login". In this way the sensor is registered in the transmitter and assigned free slots. The sensor and transmitter save this assignment.



To be able to represent all values the menu item "Login" on the transmitter must necessarily be called three times. The message "OK" will appear four times, at the fifth time the message is "sensor already exists".

When the application of all three sensors is complete, the sensor list looks like this:

Sensor			Test UniSens-E		
Zeitschlitz	Sensor	ID	Zeitschlitz	Sensor	ID
1	VARIO-F1712	14413	7	Funktion inaktiv	13
2	VARIO-F1712		8	Funktion inaktiv	14
3	CUR-F1678	14413	9	Funktion inaktiv	15
4	CUR-F1678		10	Funktion inaktiv	16
5	CUR-F1678		11	Funktion inaktiv	17
6	Drehzahl	14413	12	Funktion inaktiv	18

In T18MZ the sensors can then be renamed.

6 slots are occupied by the three UniSens-E sensors:

Sensor	Name	Slots	Original designation	In UniSens-E	Value examples
1	VARIO-1712	2	Height Vario	Hohe Vario	155 m 13.2 m/s
2	CUR-F1678	3	Current Voltage Capacity	Strom Spannung Kapazität	48.4 A 20.3 V 3612 mAh
3	SBS 01RM / O	1	U/min	Drehzahl	9284 rpm

Now connect the UniSens-E to the receiver and call up the transmitter telemetry display.

Telemetrie		Test UniSens-E	
Empfänger	Extern	3. CUR-F1678(Strom)	6. Drehzahl(Magnet.)
5.1V	0.0V	48.4A	9264rpm
1. VARIO-F1712(Höhe)	155m	3. CUR-F1678(Spannu...)	20.4V
1. VARIO-F1712(Vario)	13.2m/s	3. CUR-F1678(Kapazität)	3612mAh

Here again the T18MZ for example.

See the same values in the T14SG as follows (here the names cannot be changed):

TELEMETRIE		1/2	
Rx-BATT.	5.0V	1 HOHE	+155 m
EMPFÄNGR		VARIO-1712	
EXT-VOLT	0.0V	1 VARIO	+13.2m/s
EMPFÄNGR		VARIO-1712	

TELEMETRIE		2/2	
3 STROM	+48.4A	3 KAPAZIT.	+3.612mAh
CUR-1678		CUR-1678	
3 SPANNUNG	20.3V	6 U/min	9.264rpm
CUR-1678		SBS-01RM/O	

9.4. 2 Alarms

Since the UniSens-E uses existing sensors for the display, there are a few features in the setting of alarms. In principle with S.BUS2 the alarms are defined in the transmitter. The UniSens-E has no way to directly activate an alarm at the transmitter.

Required settings:

- Alarm for altitude and vario → set inside the transmitter on HEIGHT and VARIO
- Alarm for current → set inside the transmitter on CURRENT
- Alarm for voltage → set inside the transmitter on VOLTAGE
- Alarm for starting voltage → set inside the transmitter on VOLTAGE and additional alarm. Enable start voltage in UniSens-E and specify the desired value there → the UniSens-E then transmits in case of alarm a constant from 0 to 50 volts continuous voltage value at VOLTAGE and gives the alarm.
- Alarm for capacity → two options:
1. only set inside the transmitter on CAPACITY
 2. in the transmitter at CAPACITY set an alarm for decreasing values of less than 0 (alarm with down arrow) and enable an additional capacity alarm in the UniSens-E and specify the desired value there → the UniSens-E then transmits a negative current value to trigger an alarm and changes every two seconds with the actual value.
- Advantage: the UniSens-E can thus cause an alarm itself and deactivate automatically after 20 seconds and also at landing.

10.5. JR Propo DMSS

As from firmware v1.09 the UniSens-E can also be used with the JR Propo DMSS telemetry.

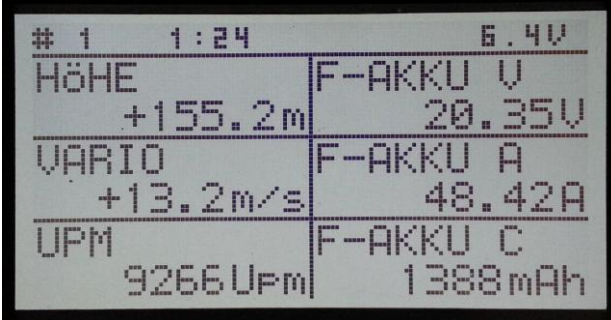
The UniSens-E is thereby connected like any other sensor to the sensor slot of the receiver and transfers the following data:

- Rpm (sensor address 0x02 "rotation")
- air pressure, altitude, vario (sensor address 0x03 "Pressure / Altitude")
- voltage, current, capacity, watts, (sensor address 0x08 "Power Pack")

No more sensors occupying the same addresses can be connected. For the free addresses, further sensors can easily be plugged into the receiver in parallel to UniSens-E with a Y cable.

We tested the connection with the XG8 transmitter firmware version 0001-0012 and the RG831B receiver.

10.5.1. Presentation on the Transmitter



# 1	1:24	6.4V
HÖHE	+155.2m	F-AKKU U 20.35V
VARIO	+13.2m/s	F-AKKU A 48.42A
UPM	9266 UPM	F-AKKU C 1388mAh

The values can be displayed directly and the sequence on the display is freely selectable.

Special feature: The transmitter converts the battery capacity into a residual capacity. The measured value of the UniSens-E 2 is therefore deducted from the default setting in the transmitter. In the example shown, there are still 1388 mAh in the battery.

10.5.2. Alarms

The alarms are defined in the transmitter in principle with JR DMSS. The UniSens-E has no way to directly trigger an alarm on the transmitter. All alarm thresholds, and also the production of the Vario tone, are specified in the transmitter.

Required settings:

Alarm for current → is not currently supported

Alarm for starting voltage → voltage alarm set in the transmitter and in addition a Start Voltage alarm enabled in the UniSens-E and the desired value specified there → the transmitter then displays in case of alarm a voltage value of 1:00 V and gives the alarm.

Alarm for capacity → Since the transmitter calculates the remaining battery capacity from the measured value of the UniSens-E, the actual battery size and the desired percent residual capacity is simply determined in the transmitter.

10.6. FrSky

As of firmware version v1.07 the UniSens-E can also be used with FrSky telemetry. Only receivers with the new “S.Port” connection are supported.

The UniSens-E is in this case connected like any other sensor to the sensor slot on the receiver and transmits the following data:

- Height (Höhe)
- Climb (Steigen) = VGes
- Current (Strom) = Strm (Vfas)
- Voltage (Spannung) = Vfas
- Capacity (Kapazität) = Fuel as a % of the capacity set in the UniSens-E (alarm)
- rpm (Drehzahl) = Umdr (2 blades must be selected in the transmitter)

The real capacity in mAh currently cannot be transferred because there is no suitable value available.

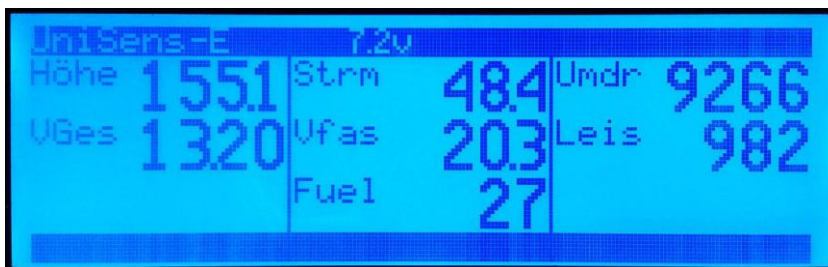
The transmitter, under VERB, itself calculates the capacity from the current.

The Power (Leis = Leistung - watts) is calculated when, for Current and Voltage, FAS is set in the transmitter as the data source.

The UniSens-E responds to the freely chosen sensor address 0x53. No more sensors can be connected occupying the same address. For the free addresses additional sensors can easily be connected to the receiver with a V cable in parallel with the UniSens-E.

We tested the connection with the Taranis transmitter firmware “opentx-r2940” and the X8R receiver.

10.6.1. Presentation on the Transmitter



The image shows a transmitter display with a blue background and white text. The display is titled "UniSens-E" and "720". It shows several sensor readings in a grid format:

Parameter	Value	Parameter	Value	Parameter	Value
Höhe	1551	Strm	484	Umdr	9266
VGes	1320	Vfas	203	Leis	982
		Fuel	27		

All values can be shown directly on the display, the order on the display is freely selectable.

10.6.2. Alarms

In principle with the Taranis the alarms are defined in the transmitter. The UniSens-E has no way to directly trigger an alarm on the transmitter. All alarms and the Vario tone are thus specified in the transmitter.

11 The software "SM UniSens-E Tool"

On our website you will find in [Software & Updates](#) the free software, "SM UniSens-E Tool" with the following functions:

- read and change the settings of the UniSens-E on (almost) any USB Interface
- live data display with a simulated UniDisplay over our USB interface (Order No. 2550)
- automatic online search for new firmware for the UniSens-E from our website
- update firmware on the UniSens-E

If you hover your mouse over the buttons, you will see a brief tip for operation.

11.1. Connecting the UniSens-E to a PC

Editing the settings and updating firmware on the UniSens-E is possible with almost any USB interface cable. Our own USB interface (No. 2550) with 4 wire connection is suitable as well as many update cables of current transmitters / receivers / controllers. These usually have a 3 core cable and a standard JR servo plug / socket.

Currently the following cables have been tested:

- | | | |
|--------------------------------------|------|--|
| SM-Modelbau-USB Interface No 2550 | ➔ | > is directly connected to the COM port of the UniSens-E.
> No further adapters needed.
> First plug in the cables then click "connect" in the software |
| Jeti Duplex "USBa" USB adapter | ➔ | > connected to the LINK port of UniSens-E.
> No further adapters needed.
> First click "connect" in the software then connect the Jeti cable to the UniSens-E |
| Multiplex "USB PC cable" # 85149 ... | ...➔ | > connected to the LINK port of UniSens-E.
> V cable with Rx battery for power required.
> First plug in the cables then click "connect" in the software and finally plug the battery into the V cable |
| Graupner "USB interface" No. 7168.6 | ➔ | > connected to the LINK port of UniSens-E.
> adapter cable 7168.S required.
> First click "connect" in the software then connect the 7168.S adaptor cable to the UniSens-E |

Third-party cables with servo plugs are connected directly to the UniSens-E at "Link".
When the USB cable has a servo socket, use the normal cable from UniSens-E as adapter.

With all cables that connect to the UniSens-E via "link", you must click on "Verbinden" (Connect) in the "SM UniSens-E Tool" prior to making the connection and activation of the power supply. Otherwise the UniSens-E starts up normally and can no longer be addressed by the PC

11.2. Settings

The software opens with the "Settings" tab. Here the settings of the UniSens-E are read and displayed. When a value is changed, the data must be written to the device with the button "geänderte Einstellungen übertragen" (transfer changed settings).

The screenshot shows the SM UniSens-E Tool 1.0.0 interface. At the top, the 'COM Port' is set to 'COM4 -> SM USB Serial Interface (COM4)'. Below this, the 'Status' bar shows 'Gerät: UniSens-E', 'Seriennummer: 9999', 'Firmware: 1.00', 'Hardware: 1.00', and 'Bootloader: 1.00'. A 'trennen' button is present, and a message 'Einstellungen erfolgreich gesetzt!' is displayed with a 100% progress indicator. The main area is divided into three sections: 'Allgemein', 'Telemetrie Alarme', and 'M-Link Adressen'. The 'Allgemein' section includes fields for 'Seriennummer' (9999), 'Firmware' (1.00), 'Strommessung' (normal), 'Motorpole' (2), 'Getriebefaktor' (1,00 : 1), 'Vario Schwelle +' (0,5 m/s), 'Vario Schwelle -' (1,0 m/s), 'Vario Ton' (aus), and 'Min/Max per Rx' (aus). The 'Telemetrie Alarme' section has checkboxes for 'Strom' (100 A), 'Startspann.' (12,4 V), 'Spannung' (10,0 V), 'Kapazität' (2000 mAh), 'Höhe' (200 m), and 'RxSpannung' (4,50 V). The 'M-Link Adressen' section has dropdown menus for 'Spannung' (2), 'Strom' (3), 'Drehzahl' (5), 'Kapazität' (4), 'Vario' (7), and 'Höhe' (6). At the bottom, there are three buttons: 'Standardeinstellungen laden', 'Einstellungen vom Gerät lesen', and 'geänderte Einstellungen übertragen'. Callouts on the right side of the image point to these elements with the following text:

- Selection of COM port to be used
- Make or break connection
- UniSens-E settings
- UniSens-E sensor addresses in M-Link system
- Telemetry alarms for all supported telemetry interfaces
- Load default settings
- Read settings from device
- Save changed settings

Illustration 1: Settings Tab

11.3. Firmware update for the UniSens-E

New firmware for the UniSens-E can be simply uploaded on (almost) any USB interface. When there are improvements to our Firmware a corresponding file with the update can be downloaded free through our “SM UniSens-E Tool” and loaded on to the UniSens-E.

When the PC software "SM UniSens-E Tool" is started, it automatically searches for a newer firmware on our server. If a newer file is found, if wished, it can be automatically uploaded to the UniSens-E. Thus the UniSens-E remains up to date:

- The UniSens-E must be connected to the "SM UniSens-E Tool".
- On the "Update" tab search for a new firmware.
- With the “**ausgewählte Firmware Datei übertragen**“ button, the update will start.
- Subsequently the UniSens-E reports back with with the new version number.

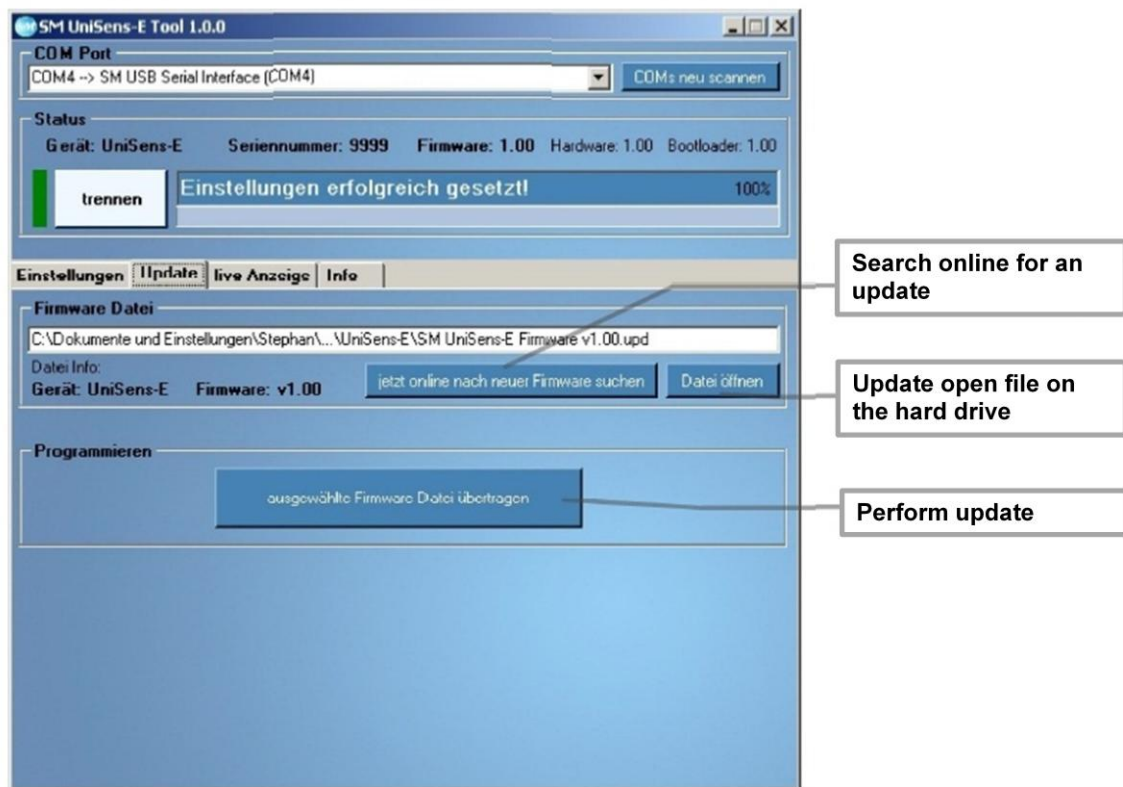


Illustration 2: Update Tab

11.4. Live Access to the UniSens-E

If the UniSens-E is connected to a PC with our USB interface, the UniSens-E can be directly accessed over the "live display" on our Software. The display is identical to the live operation of the UniDisplay. See also Chapter 9.

The USB interface is identical to the interface previously used with the UniLog or GPS-Logger or JLog2. It can be ordered separately under the part no. 2550.

The "live display" requires a separate power supply for the UniSens-E on the "Link" connection.
This feature is only possible with our USB interface 2550. Other USB cables are not suitable.

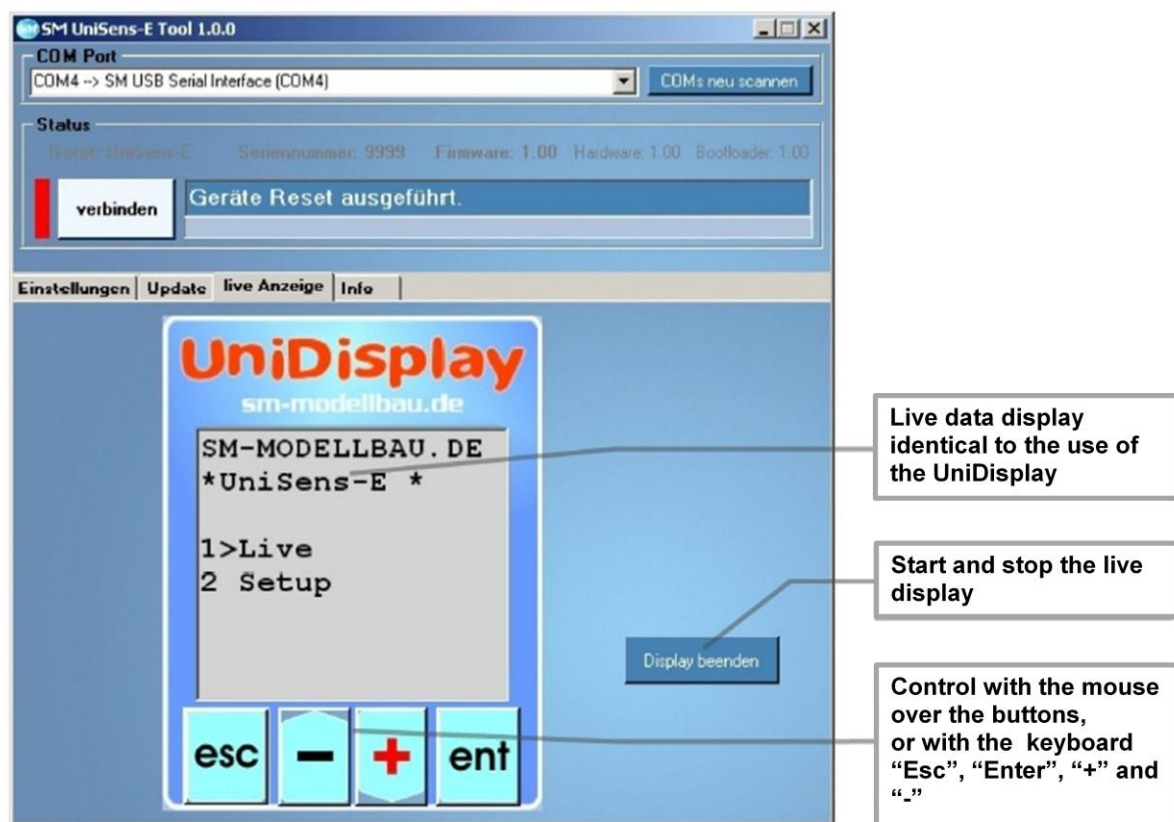


Illustration 3: Live Data Tab

12 Version History

Here you can find all firmware versions and the changes to the previous version.

You can read the firmware version of your UniSens-E with our software, "SM UniSens-E Tool" or the UniDisplay.

Version	Date	Comments
1.00	08.2012	First sold version.
1.01	10.2012	1/ Jeti Duplex: Vario tone did not work on all systems. 2/ HoTT: negative current, capacity, and voltage values caused nonsensical displays on the transmitter.
1.02	12,2012	1/ Current zero calibration had an error in the reverse current direction. 2/ HoTT: UniSens-E may optionally as GAM (General module), EAM (Electric Air Module) can configure or ESC (controller) è are thus more UniSens-E together be operated on HoTT 3/ Jeti EX: alarms have prevented further transmission 4/ M-Link: rpm is now sent with 10 rpm resolution
1.03	01.2013	1/ Jeti EX: Correction for Jeti DC-16 transmitter firmware v1.07
1.04	03.2013	1/ Futaba FASSTest S.BUS2 telemetry added. 2/ JR DMSS telemetry added 3/ Continuous capacity measurement can now be explicitly turned on and off. 4/ Recalibration of current zero point at switch on can now be switched off and be an option (current offset = never/always) 5/ New reading "Height gain": change in height of last 10 seconds recalculated every second > On Jeti EX and M-Link as a new value and on HoTT as m3. 6/ During the battery recognition, the rpm measurement is suspended otherwise incorrect values are measured because of the beeping of the ESC.
1.05	05.2013	1/ HoTT : protocol in ESC mode has been changed 2/ Jeti EX : sensor name changed to UniS-E. Text foits better in transmitter display. 3/ rpm suppression now only active during battery recognition. 4/ Height alarm now sounds for 20 seconds and only triggers again with a new crossing of the threshold.
1.06	08.2013	1/ FASSTest built in protocol for the current sensor 1678 → the UniSens-E now sends the data in this format with V, A and mAh. NOTE: The sensor must be deleted in the transmitter then re-registered. 2/ Undervoltage alarm now triggers only after 2 seconds.
1.07	01.2014	1. Telemetry: automatic scan for HoTT/MPX/Jeti has been removed because ther are always problems with modified protocols. →HoTT/MPX/Jeti are now as Futaba and JR a fixed selection →Default after update is HoTT according to the previous HoTT mode, if FASSTest or JR was not already selected. →Jeti and M-Link must select the telemetry after the update in any case. 2. FrSky telemetry added (only S.Port protocol). 3.Jeti EX: values can be selected individually for transmission.

		<ol style="list-style-type: none">4. FASSTest: capacity alarm has not cleared automatically after landing.5. HoTT: with new receivers with integrated sensors the data transfer is now faster.6. With the option "Vario bei motor: aus" (Vario with motor: off) the climb is not shown when the drive is running.
1.08	06.2014	<ol style="list-style-type: none">1. Sporadic measurement error in pressure sensor resolved.2. Telemetry current alarm now triggers somewhat slower.3. HoTT: alarms in ESC mode corrected.