

User Manual



Flow indicator

EASYFUEL-multi

date: 19.04.2005

document: easyfuel_multi_hb_e.doc

Technical changes reserved!

holthausen elektronik GmbH is certified pursuant to DIN EN ISO 9001.



Contents:

1. Generally basical safety-indications	page 4
2. Packing and the transport	page 4
3. Function	page 4
4. Principle	page 5
5. Function overview	page 5
6. Operation in normal mode	page 6
6.1 Function selection	page 6
6.2 Setting the tank content after filling	page 6
7. Additional functions	page 7
7.1 Display brightness control	page 7
7.2 Warning functions	page 7
7.3 Preconfigured values	page 7
8. Setting and adjusting the tank gauge	page 8
8.1 Fuel tank settings	page 8
8.2 One or two engine mode, fuel sensor constants.....	page 8
8.3 Water tank settings	page 9
8.4 Switching between °C or °F, setting a limit temperature	page 9
9. Accuracy	page 10
9.1 Calibrating consumption values.....	page 10
10. Accessories.....	page 12
11. Installation instructions.....	page 13
11.1 Installation.....	page 13
11.2 Electrical connection	page 13
Technical data.....	appendix

Important Information

Before commissioning the device, please read this manual thoroughly and observe the information contained therein. No claims for liability can be made vis-à-vis the manufacturer in the event of non-observance or non-compliance.

Intervention in the device with the exception of that intervention described in the manual shall render the warranty void and result in exemption from liability.

The device is intended solely for the purpose described below. We wish to draw your attention at this point to the fact that the device is not authorised for use in professional maritime applications.

holthausen elektronik GmbH provides no guarantee of suitability for a specific purpose.

Should any questions be outstanding, please contact us via telephone or in writing so that we can provide further assistance.

holthausen elektronik GmbH

Wevelinghoven 38, D-41334 Nettetal

Phone: +49 (0) 21 53 - 40 08, Fax: +49 (0) 21 53 - 8 99 94

Mail: info@holthausen-elektronik.de

1. Generally basical safety-indications

Don't use this device as the only invigilator, if a malfunctioning of the decice could lead to damages on goods or Persons.

To obtain the desired result be sure, that the device with its technical data fits to the bulk of the object you want to supervise.

The electrical hook up is to be done by instructed persons. A mistake by the connection can entail to faulty functions, outfall or ruination of the electronics.

Powerful noise sources for instance inverters, in direct closeness of the electronics or cabling, can result in faulty behaving of the apparatus.

Potential differences and balance currents in the mass guidance can result in faulty behaving too.

2. Packing and the transport

Note:

- Keep the electronic in a dry place.
- In case of a downfall or heckling or squeezing, could the casing or the operation elements or the board get defects.

With adequate warning-labels and through a qualified packaging and storage, you can protect the electronics at carriage against influences from outside.

3. Function

The tank gauge is used to obtain a precise display of the content of the water and fuel tanks of sport motorboats with one or two carburettor engines without reverse stroke, or a single fuel-injection engine with reverse stroke, for example. This is not possible in the case of tank gauges commonly used that operate on the basis of the float principle. Furthermore, the tank gauge is capable of displaying the momentary and average fuel consumption, as well as providing a warning (flashing display) if the actual tank content drops below a set minimum tank volume.

The engine coolant temperature can also be displayed. In the event that a set temperature is exceeded, a warning is also output by means of the display flashing. An alarm output is also activated, to which a display lamp can be connected, for example.

4. Principle

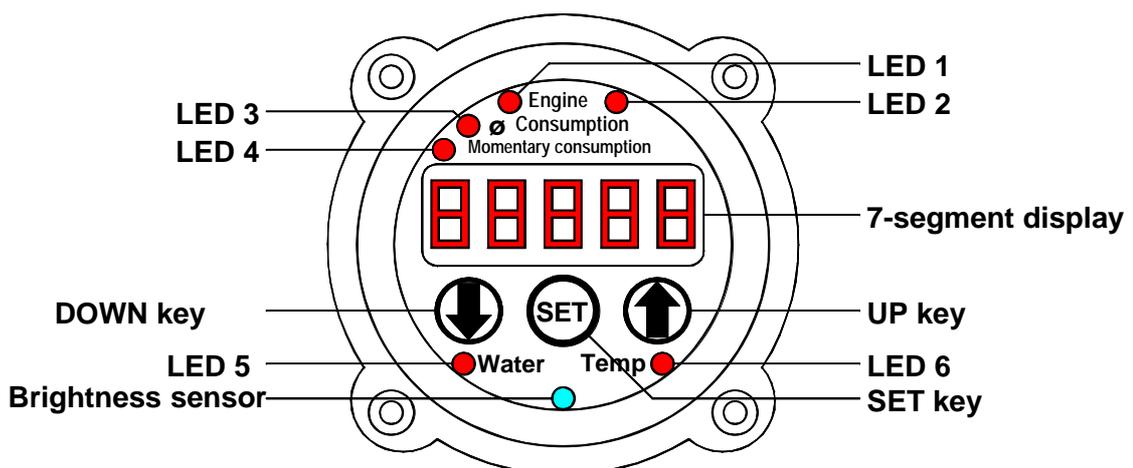
The flow rate sensors installed in the fuel line from the tank to the engine and in the reverse stroke line, if available, convert the fluid volume flowing through the line into electrical impulses. Following signal processing, the results of the impulse sequence are computed by a microcontroller for the currently selected function and displayed on the extra bright 7-segment display.

The temperature is measured according to the principle of changes in resistance of a Pt1000 platinum temperature sensor resistor. The current passing through this resistor is converted with an AD converter into a digital parameter that the microcontroller uses to compute the temperature.

All relevant data can be configured individually and remain reliably stored in an EEPROM for years, even without operating voltage.

5. Function overview

Fuel tank content (for Engine 1)	(unit: litre)	LED 1
Fuel tank content (for Engine 2)	(unit: litre)	LED 2
Fuel tank content (for Engines 1 and 2)	(unit: litre)	LED 1 + LED 2
Average fuel consumption (Engine 1)	(unit: litre / hour)	LED 1 + LED 3
Average fuel consumption (Engine 2)	(unit: litre / hour)	LED 2 + LED 3
Momentary fuel consumption (Engine 1)	(unit: litre / hour)	LED 1 + LED 4
Momentary fuel consumption (Engine 2)	(unit: litre / hour)	LED 2 + LED 4
Water tank content	(unit: litre)	LED 5
Coolant temperature (Engine 1)	(unit: °C or °F)	LED 1 + LED 6
Coolant temperature (Engine 2)	(unit: °C or °F)	LED 2 + LED 6



The first digit displays the setting level in configuration mode (display flashes).

6. Operation in normal mode



Front view

6.1 Function selection

The currently selected operating mode is displayed via one or two of 6 light emitting diodes (see function overview on page 5). Press the arrow keys to select the above-mentioned functions. The corresponding value is shown on the display after a short computation time.

If the tank gauge is in 2-engine mode, you can switch between the display values for Engine 1 and Engine 2 by briefly pressing the SET key.

6.2 Setting the tank content after filling

To reset the fuel tank content, e.g. after refuelling, select the content of that tank which has been refilled and press the SET key for 5 seconds without interruption. The tank content specified during the previous refuelling now flashes in the display, prefixed with a 1. You can now increase or decrease the tank content by briefly pressing the corresponding arrow key. If you press the arrow keys longer, the tank content increases or decreases faster. Briefly pressing the SET key returns you to the normal state (display no longer flashes).

This action simultaneously resets the average consumption of the selected tank.

7. Additional functions

7.1 Display brightness control

A phototransistor is located beneath the front film. This ensures that the brightness of the display adapts in two stages to the ambient brightness.

7.2 Warning functions

If the tank content drops below the set value, the corresponding tank content flashes on the display automatically.

If the coolant temperature exceeds the set value, this likewise flashes on the display and the operating voltage of the boat is switched to the alarm output. In order to guarantee a reliable warning of overheating, a visual / acoustic transducer must be connected to the alarm output.

The alarm output is resistant to overload, i.e. if the load exceeds 5 Watt, the alarm is deactivated. The switch checks the load every 2 seconds and reactivates the alarm if the load is in the permissible range.

7.3 Preconfigured values

The device automatically saves the last values you entered (EEPROM memory, functions automatically even without operating voltage). The following values are preconfigured values:

Min. tank content	50 litres for all water and fuel tanks
Max. tank content	1200 litres for all tanks
Tank content after refuelling	1000 litres for all tanks
Fuel sensor constant	1000 impulses / litre
Water sensor constant	1000 impulses / litre
Max. coolant temperature	255°C <u>Caution:</u> The temperature measuring range is only 0°C ... 117°C. The high value is set by default in the factory, to prevent an overheating warning being triggered without a sensor being connected.
2-engine mode	
Fuel sensor constant in impulses per litre	
Temperature display in °C	

8. Setting and adjusting the tank gauge

The following sections describe the options for setting the tank gauge. The tank gauge returns to normal operating mode from each setting once the SET key is pressed briefly. The setting level is indicated on the display by a prefixed digit.

Caution: If you enter values > 9999, you must note that the leading digit is not visible, as this is assigned to the setting level.

8.1 Fuel tank settings (for tanks one and two)

To reset the fuel tank content, e.g. after refuelling, select the fuel tank content display mode of the corresponding engine and press the SET key for 5 seconds without interruption.

The tank content specified during the previous refuelling now flashes in the display, prefixed with a 1. This can be increased (or decreased) by pressing the arrow key according to the volume filled.

If the SET key is now pressed for 10 seconds, the minimum fuel tank content flashes on the display. If the content drops below this value, a warning (flashing display) is triggered. (prefixed 2) ⇒ change with arrow keys

If the SET key is pressed again for another 10 seconds, the maximum fuel tank fill volume flashes on the display (prefixed 3) ⇒ change with arrow keys

8.2 One or two engine mode, fuel sensor constants

While the average fuel consumption is displayed in the display, pressing the SET key for 5 seconds calls up the 1st setting level (prefixed 1). The display now shows a flashing 1 for 1-engine mode (with or without two sensors), a flashing 2 for 2-engine mode with separate tank, or a flashing 3 for 2-engine mode with a common tank. One of these options can be selected by pressing the arrow keys.

Pressing the SET key again for 10 seconds results in a 2 being prefixed, allowing you to use the arrow keys to choose between 1 for the petrol sensor constants in impulses per litre, or 2 for impulses per 100ml. This setting also applies to petrol sensors 1 and 2.

The sensor constant of the currently selected engine is changed by pressing the SET key for 10 seconds, after which the sensor constant flashes (prefixed 3; unit: impulse / litre or impulse / 100ml). This value can be changed via the arrow keys. Keeping the corresponding arrow key pressed causes the sensor constant to be increased or decreased faster.

Caution: When operating an engine with forward and reverse stroke, the sensor constants must be set in 2-engine mode. The forward stroke sensor constant is entered under Engine 1, and the reverse stroke sensor constant is entered under Engine 2.

8.3 Water tank settings

The water tank content must be reset each time the water tank is filled. It must be possible to set the sensor constants in order to adjust the device to different sensors. To change the water tank content, the water tank content display mode is selected and the SET key pressed without interruption for 5 seconds. The previous water tank content then flashes on the display (prefixed 1). This can be increased (or decreased) by pressing the arrow key according to the volume added.

If the SET key is now pressed for 10 seconds, the minimum water tank content flashes on the display. If the content drops below this value, a warning (flashing display) is triggered. (prefixed 2) ⇒ change with arrow keys

If the SET key is pressed again for another 10 seconds, the maximum water tank fill volume flashes on the display (prefixed 3) ⇒ change with arrow keys

The sensor constants are changed by pressing the SET key for 10 seconds while the water fill volume is flashing. The sensor constant of the water flow rate sensor now flashes on the display (prefixed 4; unit: impulse / litre). ⇒ change with arrow keys

8.4 Switching between °C or °F, setting a limit temperature

If the temperature display is activated, pressing the SET key for 5 seconds accesses the setting mode (prefixed 1; temperature display flashes).

All changes to the limit temperature apply simultaneously to Temperature 1 and Temperature 2.

Use one of the arrow keys to switch between the display in °C (indicated on display by a 1) or in °F (indicated on display by a 2).

If the SET key is pressed again for 10 seconds while the temperature display is flashing, the limit temperature for the coolant is displayed. If this temperature is exceeded, a warning is triggered (prefixed 2). This temperature value can be increased or decreased via the arrow keys. The same limit temperature is used for Engine 1 and Engine 2.

9. Accuracy

Errors in the display unit amount to less than 1 litre in the tank content setting. To this is added the error of the flow rate sensors. If the reverse stroke is greater than the forward stroke in 1 engine mode with forward and reverse stroke sensor, a value of 0 is displayed as the momentary and average consumption. The tank content display stays at the last computed value in this case.

9.1 Calibrating consumption values

In order to minimise the effective error displayed as a result of the deviation between the nominal and the actual sensor constants, the sensor constants can be corrected in the Edit menu.

For devices **without a reverse stroke sensor**, you need only divide the calculated consumption (tank content minus displayed consumption) by the actual consumption, multiply this with the old sensor constant and enter the result as the new sensor constant.

Example for the calibration of equipment without reverse stroke sensor:

You fill the tank and set the tank content to 900 litres (see Operation in normal mode on page 6). Run the tank until a good volume of the content has been expended, e.g. until a momentary tank content of approx. 170 litres is displayed. Now refill the tank. Let us assume that you are able to fill 750 litres. Divide 730 litres (calculated consumption) by 750 litres (actual consumption). Now multiply the result of the division (0.973) with the configured sensor constant. If the old sensor constant was 1000, for example, this is changed to 973 in the Edit menu.

Devices **with a reverse stroke sensor** (Diesel with fuel injection) can be calibrated according to the following instructions:

Smallest sensor faults already affect very strongly the shown consumption in comparison with the real consumption. With the following calibrating method you should nevertheless reach precise consumption details in most cases:

You calculate and note down the values when tanking real consumption in liters and calculated consumption (tank content minus displayed consumption) in liters. Don't move the contents of the tank yet. By changing the sensor constant for the trace the value is adjusted so till the real and shown fuel consumption agree.

You must be more important changing the sensor constant cautiously. We recommend the sensor constant at the beginning not to change any more than 1%. If the calculated consumption is greater than the real consumption, then you must increase the trace, degrade in the reversed case the sensor constant. After the change of the sensor constant and storing by pressing the set button you have to switch the operating voltage of the EASYFUEL off and after a short break turn on again. You are checking the shown consumption now and you repeat the given method till the calculated and real consumption agree.

After a successful correction of the sensor constant you can move (reset) the contents of the tank.

Example for the calibration of equipment with reverse stroke sensor:

calculated consumption (tank content minus displayed consumption)	550 liters
real consumption	430 liters
sensor constant original	6900
sensor constant corrects:	6970
Turning power off	
consumption calculated now	450 liters
sensor constant, 2nd correction	6984
turning power off	
consumption calculated now	430 liters

10. Accessories

A front cover ring in black ABS plastic is available as a special accessory for the EASYFUEL-multi tank gauge. This is fitted simply over the front panel of the EASYFUEL-multi to conceal the mounting screws.



Cover, black ABS



EASYFUEL-multi, installed with cover

The AL mounting kit is also available as an accessory, comprising an aluminium bracket and two thumbscrews. This kit allows the EASYFUEL-multi to be securely mounted without having to screw it into the front of the instrument panel. When using the AL mounting kit, the EASYFUEL-multi is positioned in the opening from the front and the mounting bracket secured to the rear screws of the EASYFUEL-multi by means of the associated thumbscrews. The mounting kit is suitable for installation with material thicknesses of up to 8mm. In the event of greater material thicknesses, the sides of the aluminium bracket can be shortened accordingly.



EASYFUEL-multi AL mounting kit

Order designations:

EASYFUEL-multi cover, ABS, black
Item No.: 309.0001.01

EASYFUEL-multi AL mounting kit
Item No.: 309.0001.02

11. Installation instructions

These instructions only apply to the EASYFUEL-multi tank gauge. Please refer to the corresponding manufacturer's information for installing the flow rate sensors and temperature sensors and establishing the electrical connections. **Installation and electrical connections** may only be performed by **qualified specialists**.

11.1 Installation

A hole with a minimum diameter of 55mm and a maximum diameter of 57mm is drilled at a suitable position in the instrument panel and the gauge secured by means of the accompanying rust-proof screws. Ensure that sufficient space is available for the device and the lines (installation depth 83mm + 30mm for the connectors and connecting lines).

The installation space behind the device must be well ventilated to ensure that the heat generated during operation can be dissipated.

11.2 Electrical connection

The following electrical connections must be realised **professionally and without tensile loading**, to guarantee a long service life. For the supplied connector, flexible lines with a cross-section of 0.34mm² to 1mm² must be stripped over a length of 6mm to 8mm. To secure the line, a small screwdriver is used to depress the tongue in the rectangular hole of the connector, the bared wire is inserted into the round hole and the screwdriver removed.

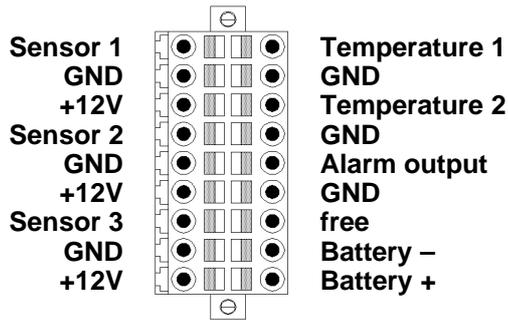
Once all lines have been connected, the connections are checked again to ensure that they are correctly poled. The connector is then attached to the EASYFUEL-multi and secured in place by means of the two small screws.

Please ensure that the long connection lines do not coil, as this could result in malfunctions arising from coupled interference.

View:

Connection side of the connector

EASYFUEL-multi pin assignment



When operating with two engines, the lines are connected as indicated above.

When operating with one engine, the terminals of Sensor 1 are used for the sensor in the fuel tank feed line from the tank to the engine. If a reverse stroke fuel line from the engine to the tank is installed, an additional flow rate sensor is fitted and connected to the terminal of Sensor 2.

Please refer to the data sheets of the sensor manufacturer for the pin assignment of the flow rate sensors.

If you only use one temperature sensor, if at all, the unused temperature measuring inputs can be connected to ground. This results in a temperature of 0°C being displayed; if the inputs are left open, the maximum temperature (117°C) is displayed.

Sensor 1:	Impulse output of fuel flow rate sensor 1 (forward stroke sensor)
GND:	Ground of fuel sensor 1
+ 12V:	12V for fuel sensor 1
Sensor 2:	Impulse output of fuel flow rate sensor 2 (reverse stroke sensor)
GND:	Ground of fuel sensor 2
+ 12V:	12V for fuel sensor 2
Sensor 3:	Impulse output of water flow rate sensor
GND:	Ground of water flow rate sensor
+ 12V:	12V for water flow rate sensor
<hr/>	
Temperature 1:	Connection for Pt1000 temperature sensor 1
GND:	Ground of temperature sensor 1
Temperature 2:	Connection for Pt1000 temperature sensor 2
GND:	Ground of temperature sensor 2
Alarm output:	Warning output for temperature monitoring, can be used with indicator lamp (max 5 Watt) or for relay to switch greater loads, for example.
GND:	Ground of alarm output
Free:	No function
Battery - :	Ground of onboard voltage
Battery + :	12V or 24V battery voltage (switched via master switch, all data remain stored without supply voltage)