

Technical description and user manual



UV-Radiometer KUV 2.4 WR MD Version 1.2

UV radiometer KUV 2.4 WR MD

Description

The UV measuring device KUV2.4 WR MD is used in conjunction with UV sensors of various types as a mobile handheld device for checking ballast water UV systems. The display range of this device has been extended upwards for strong medium pressure lamps.

By comparing the measured values between the system sensor and the UV sensor of the device, it can be determined whether the system sensor needs to be recalibrated or replaced. In addition, with this device, digital system sensors can be programmed on site and recalibrated in the range of $\pm 30\%$.

A robust metal housing with degree of protection IP65 protects the device from external influences. It is powered by rechargeable batteries, has an LCD display with backlight, automatic measuring range switching and is easy to operate using three buttons. It is possible to supply / charge via a plug-in power supply and to connect a data logger or a computer. The delivery takes place in the transport case.



Operators

System designers and manufacturers
Technicians / operators of ballast water systems
Test laboratories

Technical data

housing	handheld aluminum housing, colored matt black
size L x H x D	110/85 x 230 x 35 mm
weight	790 g incl. sensor and rechargeable battery
power supply	internal: 2 x 1.2 V / 2 Ah, size AA (Mignon), operating time fully charged approx. 8-10 h, plug-in power supply 100-240 V AC / 50-60 Hz with EU adapter (US, UK adapter on request) charging time max. 5 h, during charging the control LED in the connection compartment is lit
display	LCD, 2 x 16 characters with backlight function
measurement range	1-20000 W/m ² , measurement ranges with end values 2, 20, 200, 20000 W/m ² - automatic switching
memory	storage of the last measuring value and the maximal value
reference sensors	reference sensors are equipped with 1.3 m cable and M12 socket, the connection is made via M12 plug on the upper right, only registered sensors in the device are detected (maximum 8 possible), the serial numbers of the registered sensors can be found on the sticker on the back
plant sensors	plant sensors are connected via the M12 socket on the upper left, digital or digital / analogue sensors (options Z4, Z4Y1, Z4Y2) can be programmed and calibrated, the necessary connection cable is included in the delivery
analogue output	voltage output: 0.1 to 4.1 V for each measuring range (0.1V=0W/m ² , 4.1V=2/20/200/2000W/m ²) Ri = 10 kΩ, jack socket 2.5 mm in the connection compartment at the bottom of the device
serial interface	RS232 output: 9600 baud, no parity, 1 stop bit, 8 data bits, GND/TxD/RxD connection via jack socket 3.5 mm in the connection compartment at the bottom of the device
degree of protection	IP 65 with sensor connected and battery / connection compartment closed
temperature range	ambient temperature 0 to 30° C
recalibration	recommended after a service life of approx. 100 hours

Commissioning

The device must be charged before commissioning. To do this, the round plug of the power supply unit must be inserted into the appropriately labelled hollow socket in the battery/connection compartment at the bottom of the device. The flap of the connection compartment can be easily opened by pushing against the hinge from behind. A green LED next to the plug lights up during charging. The device can be charged and operated at the same time.

Before switching on the KUV2.4WR MD, the sensors must be connected to the top connectors of the device. The reference sensor is connected to the right M12 connector, the digital sensor to be calibrated (option Z4) is connected to the left M12 socket using the supplied extension cable. It must be ensured that sensors of the same type are always compared/calibrated (e.g. DVG40°). The device must be switched off each time the sensor is changed. It is switched on by briefly pressing the red button. Pressing this button for a longer time switches the device off again.

After switching on, the software version number appears on the display. The device then automatically recognizes the connected reference sensor, takes its calibration values from its memory and carries out an automatic zero-point adjustment. If no sensor, a defective sensor (cable break) or a sensor not registered in the device is connected to the device, the error message **invalid sensor** is issued. The serial numbers of the sensors registered in the device can be found on the back of the device. During the automatic zero-point adjustment the display shows **zero check wait...** The reference sensor must not be exposed to UV radiation during this time! Ambient light does not affect the adjustment since the UV sensors are blind to daylight. After the zero-point adjustment, the type of the connected reference sensor is displayed, e.g. **reference sensor DVGW W294 40/160°**. The device then scans the digital system sensor connected to the left socket while **scan bus...** is displayed. If no sensor is connected, the message **no sensor <return>** appears, which must be acknowledged with the red button. After the start routine has ended, the device automatically switches to measuring mode.

Measurement

The first line now shows the value of the connected reference sensor, **R: 0,000 W/m²**. The second line shows the current measured value of the system sensor, **S: 0,000 W/m²**. If no system sensor is connected, the message **S: inval.sens.** In the entire measuring range from 1 to 20000 W/m², the system automatically switches to the optimal measuring range. A hysteresis function with time delay prevents constant range switching at irradiance levels near the switching points. The displayed value refers to the underlying standard of the connected reference sensor. The menu item *lamp type* can be used to choose between **low pressure** (standard after switching on) and **medium pressure**. Accordingly, either the calibration value for LP lamps at 253.7 nm or the value of the medium pressure calibration is loaded from the internal memory. The latter is indicated in measurement mode by **md** before the value of the irradiance. Via the menu item *uv irr. unit* can also be selected between **W/m²**, **mW/cm²** and **µW/cm²** if required. The device converts the display values.

Under unfavorable lighting conditions, the display lighting can be switched on and off if necessary, by pressing the blue button (LIGHT). To increase the operating time on battery power, the display lighting switches itself off after approx. 1 min. To protect the batteries, the device also has an economy circuit that switches the device off 10 minutes after the last key was pressed. This function can be deactivated via the menu for longer series of measurements. When the batteries are discharged, **low bat** flashes in the upper display line alternately with the sensor measured value. If the lighting is used frequently or long series of measurements, mains operation should be preferred. The enclosed plug-in power supply can be connected via the correspondingly marked hollow socket after opening the connection compartment flap. Attention: with the bottom flap open, the device no longer corresponds to IP65!

The last measured value can be saved using the yellow button (HOLD). A **hold** is then shown in the display alternating with the saved measured value. Pressing this button again returns to the current measurement. A maximum value function is also available. This is called up in measurement mode by long pressing the yellow key (HOLD). A **max** will then appear in the display alternating with the maximum value. The maximum value can also be reset via the menu. The same happens when switching off or when changing a sensor.

Measurement output

An analogue and digital interface are available for the measured value output. The analogue output is designed as a voltage output of 0.1 to 4.1 V for each measuring range. 0.1 V corresponds to 0 W/m²; 4.1 V corresponds to 2/20/200/20000 W/m², i.e. the end value of the automatically set measuring range. A special cable is available for connecting y-t recorders and other devices, which can be adapted to the respective device using standard adapters.

The digital output is designed as a bidirectional RS232 interface. Communication with a PC can be done with standard software, e.g. "Hyperlink" take place, which is part of the Microsoft operating systems. After sending the ASCII character "U", the KUV2.4WR MD replies with the character "U", followed by the numerical value of the current irradiance, space, unit of measure and a semicolon as a conclusion.

The digital output is designed as a bidirectional RS232 interface. Communication with a PC can be performed with standard software, e.g. "Hyperlink", which is part of the Microsoft operating systems. After sending the ASCII character "U", the KUV2.4WR MD responds with the character "U", followed by the numerical value of the current irradiation strength, space, unit of measure and a semicolon as a conclusion.

In addition to a special cable for the computer connection, the RV2 transmission software is optionally available for querying measured values and evaluating them. Details can be found in the associated documentation.

Calibration and maintenance

The radiometer is intended for checking the calibration of system sensors. It is possible to use several sensors alternately on one device. Please order the device with the desired sensors straight away. The device must be switched off when changing the sensors. After switching on again, the device automatically recognizes the connected sensor and assigns its calibration value internally.

For calibration, the device including all sensors must be sent to us. When calibration is necessary depends on the frequency of use and the irradiance levels to the sensor. We recommend recalibration after approx. 100 hours of operation.

No repairs can be carried out by the user on the device and the associated sensors. In the event of errors, the device and all associated sensors must be sent to us.

Calibration of the digital system sensor

The following sequence must be observed for calibrating digital or digital/analogue duty plant sensors:

1. Call Menu point *cal. sensor* (see menu)
2. Position the reference sensor in front of the UV lamp
3. Confirm the measured value with the red key (Enter)
4. Position the digital plant sensor in front of the UV spotlight
5. Confirm the measured value with the red key (Enter)
6. Darken the reference sensor (protect the sensor from UVC radiation, daylight allowed)
7. Confirm the measured value with the red key (Enter)
8. Darken the plant sensor (protect the sensor against UVC radiation, daylight allowed)
9. Confirm the measured value with the red key (Enter)

If the calibration is successful, **calibr. OK!** will be shown in the display. If an error occurs during the calibration or the calibration has been cancelled, the display shows **calibr. invalid!**

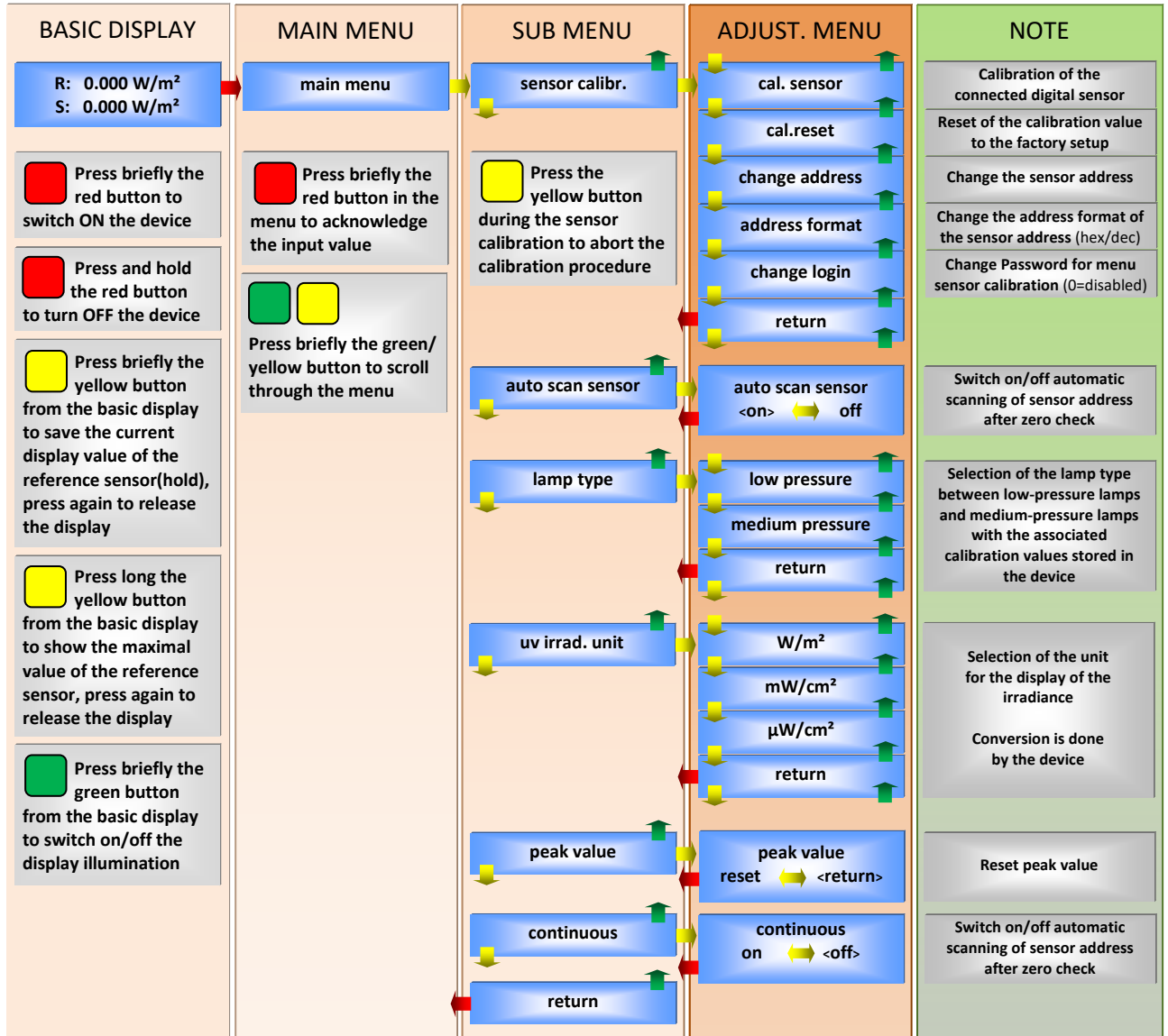
The calibration can be interrupted at any time with the yellow button (break).

Note: We assume no responsibility / liability for the customer calibration of system sensors.

Correction values greater than ± 25% compared to the factory calibration indicate damage to the sensor and require repair / recalibration in the factory.

Menu structure Version 1.2

After switching on, press the red button again briefly to enter the main menu. The navigation is simple and usually intuitive. The following overview shows the menu structure.



The colour of the arrows indicates which button must be pressed for navigation. With return and after selecting a setting, the jump back to the basic display always takes place. After 2 minutes without pushing a button, the device automatically returns to the basic display. When selecting medium-pressure lamps, an md in the first line before the measured value is displayed in the measuring mode, e.g. R: md 0.000 W/m². To increase the operating time in the battery operation, the backlight turns off after approx. one minute. Each button operation switches the backlight on again. In the case of poor light conditions, the display light can be switched on and off manually using the green button. The unit has a power cut-off which switches it off approximately 10 minutes after the last key operation. For longer measurements, the **continuous** function must be activated via the menu. When the battery is discharged, **low bat** alternates with the sensor information in the first display line.