

## Technical description and user manual



# Reference radiometer

# MUV 2.4 WR

Version 1.0

## Reference radiometer MUV 2.4 WR with DVGW and/or ÖNORM sensor

### Description

The UV measuring device MUV2.4WR in connection with UV sensors is designed as a reference measuring unit according to DVGW/ÖNORM. It is set for the check-up of UV systems which are used for drinking water disinfection. Based on comparison measurements between field sensor and reference sensor, it is possible to figure out, whether the field sensor must be re-calibrated or exchanged.

A closed sturdy metal housing protects the unit against external hazard and ensures the IP65 degree of protection. The device is run by rechargeable batteries, equipped with a LCD display with backlight, automatic measuring range changer and can be controlled easily by only 3 buttons. Battery recharge and power supply can be done by a wall power supply and it is possible to connect a printer or computer. The measuring device comes in a transport case.



### Operators

System designer and system builder  
Technicians in water plants  
Health offices  
Laboratories

### Technical data

<b>housing</b>	handheld aluminum housing, colored matt black
<b>size L x H x D</b>	105 x 230 x 35 mm
<b>weight</b>	790 g incl. sensor and rechargeable battery
<b>power supply internal accumulator</b>	2 x 1.2 V / 2 Ah, size AA (Mignon), recharge time approx. 4 h at 0.5 A, operating time 10 h (during battery recharge the control LED in the connection box is lighting)
<b>mains adaptor</b>	110 - 230 V AC/ 9 - 12 V DC 5 W, mains plug EU (Art.-No.: 321 11000 0000) On request with additional adaptors for US or UK (Art.-No.: 321 11005 0000)
<b>display</b>	LCD, 2 x 16 characters with backlight function
<b>measuring range</b>	four measuring ranges with end value of 2, 20, 200, 2000 W/m <sup>2</sup> , automatic shifting
<b>accuracy</b>	≤ ± 5 % of the measuring range related to the standard of PTB Braunschweig
<b>memory</b>	the last measured value is stored
<b>analogue output</b>	0.1 to 4.1 V, R <sub>i</sub> = 10 kΩ, jack 2.5 mm, signal inside
<b>serial interface</b>	9600 Baud, no parity, 1 stop bit, 8 data bits, GND/TxD/RxD connection via 3.5 mm jack bush
<b>degree of protection</b>	IP 65 with battery / connection box closed
<b>temperature range</b>	ambient temperature 0 to 30° C
<b>recalibration</b>	Latest after 12 month, according to DVGW W294 rule
<b>Accuracy</b>	Uncertainty to working standard: ≤ ± 1% for low pressure, ≤ ± 3% for medium pressure lamps Uncertainty to internal reference: ≤ ± 1% Uncertainty to primary standard DVGW/ÖNORM: ≤ ± 6.5% Total uncertainty: ≤ ± 8.5% for low pressure, ≤ ± 10.5% for medium pressure lamps Calibration protocol included in scope of delivery.

### Commissioning

After having connected the sensor at the upper bushing of the unit, switch on the device by shortly pushing the red button. Pushing the red button for a longer while will switch off the device. After having switched on the MUV, the device does automatically check the connected sensor and read out its calibration value. If there is no sensor, a broken sensor (cable break) or a sensor connected that does not belong to the device, the error message "invalid sensor" is shown. For a sensor exchange, the device shall be switched off (3 seconds red button). When switched on, the number of the software version occurs in the display. From version 1.0, an automated offset-adjustment follows. During this procedure, "zero check" is shown in the display. Do not expose the sensor to UV radiation during this process! Daylight does not influence the adjustment, since the sensors do not detect it.

## Measurement

As soon as the starting routine is finished, the device goes into the measuring mode. The first line shows the sensor that is connected, e.g. "DVGW 40", "ÖNORM M5873-1" or similar. The second line indicates the actually measured UV irradiation value. In the whole measurement range from 0.05 to 2000 W/m<sup>2</sup> an automatic switching to the optimum measurement range is being made. A hysteresis function with time delay avoids a permanent switching between the measurement ranges if irradiation values are around the threshold values. The indicated value relates to the underlying DVGW/ÖNORM protocols. From software version 0.3 onwards, the changeover from "low pressure" (standard after switch-on) to "medium pressure" calibration is possible via the menu lamp type. Thereby, the calibration value for low pressure lamps at 253.7 nm or the value of the medium pressure calibration will be read out of the integral memory. If MP mode has been chosen, an „md“ is shown in the second line in front of the measurement value indication. If required, the unit can be changed in the menu between W/m<sup>2</sup>, mW/cm<sup>2</sup> and μW/cm<sup>2</sup>. The conversion of the measured value is done by the MUV2.4WR.

Under bad lighting conditions the display backlight can be switched on/off by pressing the blue button (LIGHT). To extend the duration of battery operation, the display illumination is automatically switched off after 1 minute. If the backlight is used frequently, it is recommend to use mains supply (Attention: no IP65!). To save the battery, the device provides a control option which cuts-off the unit after 10 minutes if no button has been pushed. For longer measuring procedures or other applications, this function may be deactivated. When the batteries are nearly empty, the display shows a flashing "low bat" message alternating with the sensor information.

After having opened the connection box flap, the wall power supply can be connected via the marked plug. The flap can be opened easily by slightly pressing against the hinge from the back. The last measured value is saved by pushing the yellow button (HOLD). The display then indicates a flashing "hold" alternating with the stored value information. By pushing the yellow button again the unit goes back into the measurement mode. In addition, a max. value memory was implemented from version 1.0. The max. value is shown by pushing the yellow button (HOLD) for a long time. The display then switches between "max" and the measured max. value. It is possible to reset this max. value via the menu. Reset is done as well in case of switching off the unit or changing the sensor.

## Output of measured values

For the output of the measured values both an analogue and a digital interface are provided. The analogue output is designed as voltage output 0.1 to 4.1 V per measuring range. 0.1 V belongs to 0 W/m<sup>2</sup>; 4.1 V belongs to 2/20/200/2000 W/m<sup>2</sup>, which are the end values of the automatically adjusted range. To connect y-t-printers or other devices a special adaptor cable is available, which can be connected to the suitable device by using standard adaptors. The digital output is designed as bi-directional RS232 interface. The communication with a PC is possible using a standard software, i.e. "Hyperlink", which is part of Microsoft operating systems. After having sent the ASCII-character "U" the measuring device responds with "U", followed by the actual UV intensity value, a space character, the measuring unit and a finalizing semicolon.

Aside from a special computer connecting cable, the transmission software RV2 is available as an option for transferring an analyzing the measurement readings. For details please refer to the related documentation.

## Calibration and certification

The radiometer is designed to check the calibration of UV field sensors according to DVGW W294 or ÖNORM M5873 protocols. It is possible to use one and the same device for differently calibrated sensors. Please do always order the MUV device together with the desired sensors. To change the sensors, the device should be switched off. After having switched on the device again, it will automatically identify the particular sensor which is connected and it allocates the correct calibration value. For calibration/recalibration a special software is available which permits adjustments without any additional tools. On request, this software will be provided free of charge to authorized calibration laboratories. The calibration of reference radiometers in accordance to DVWG W294 or ÖNORM M5873 protocols should be checked regularly but latest after 12 month. To do that, the device must be send to us including all sensors.

## Reference sensors

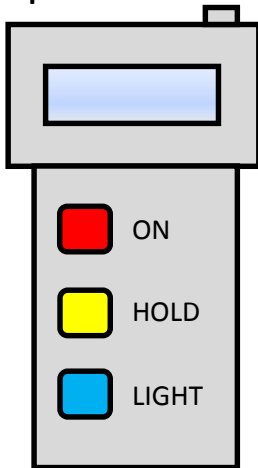
The device must be ordered will all required sensors. The following sensors are available:

- reference sensor acc. DVGW-norm W 294: SUV 20.2 Y1 R 40° LP/MP, Art.-No.: 321 11001 0000
- reference sensor acc. DVGW-norm W 294: SUV 20.2 A2 Y1 R 160°LP/MP, Art.-No.: 321 11002 0000
- reference sensor acc. ÖNORM M5873: SUV 20.1 A2 Y1 R 160° LP, Art.-No.: 321 11003 0000

The sensors are equipped with a 1.2 m connection cable and plug M12 (IP65). Every supplied sensor is registered in the device. The registered sensors are shown on the sticker at the back side of the MUV2.4WR.

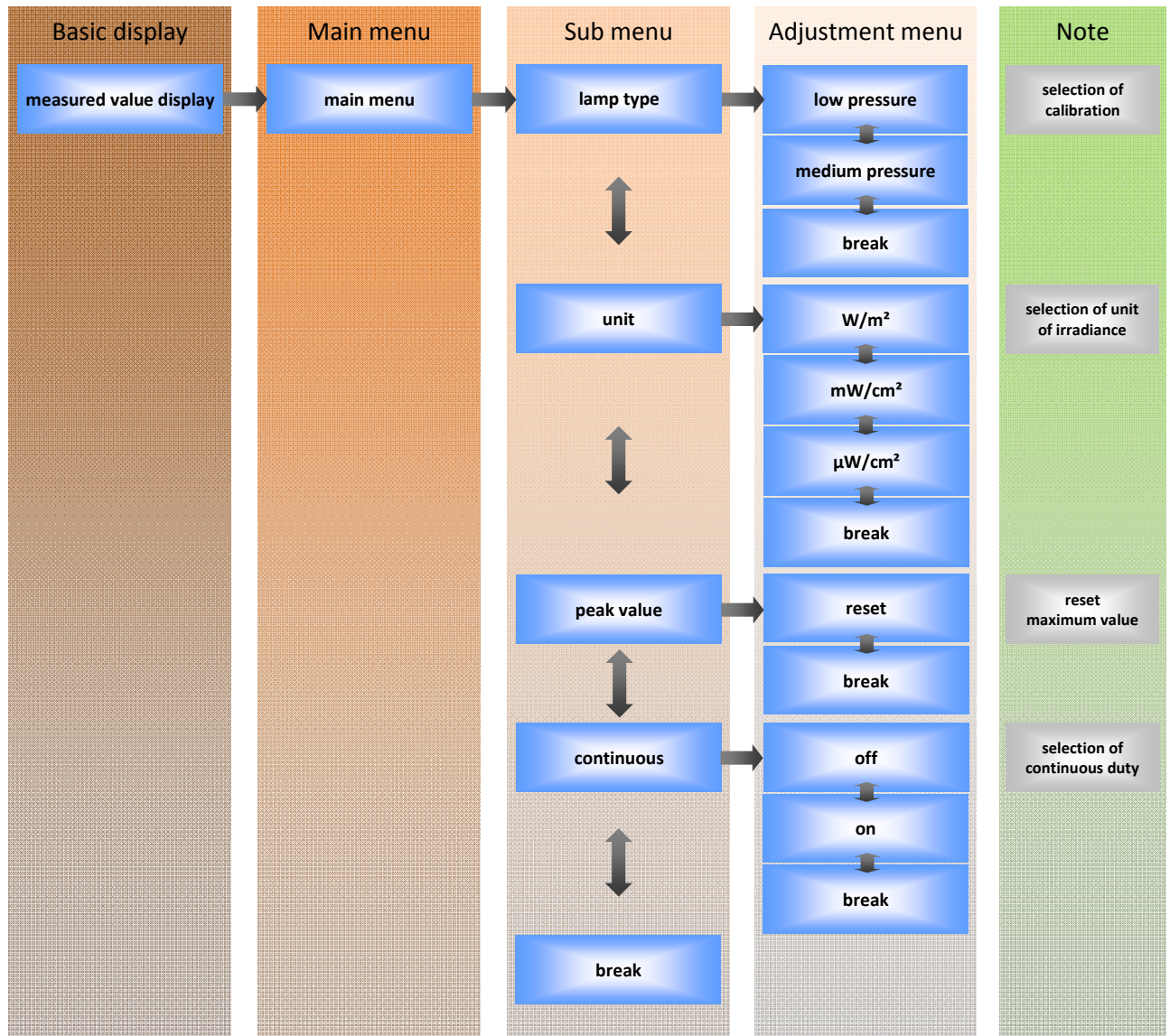


**Operation**



button	keystroke	while measurement	menu navigation
ON	short	switch on device call menu	selection/confirmation of adjustments
	long	switch off device	
HOLD	short	memorize measured value	navigation upwards
	long	show maximum value	
LIGHT	short	LCD light on/off	navigation downwards

**Menu structure from version 1.0**



Return to basic display will be carried out after break or selection of a setting.