

**USER GUIDE  
MS 100 MULTISENSOR  
TEMPERATURE, HUMIDITY AND BRIGHTNESS  
FOR 1-WIRE BUS SYSTEM**

- High-quality Multisensor for temperature and rel. humidity with 12 Bit resolution
- Light sensor for detection of ambient brightness
- Voltage monitoring integrated
- Equipped with original DS2438 chip
- Mounting on flush-mounted boxes possible
- Universal surface mounting
- Shapely and high quality sensor housing with integrated ventilation slots
- Connection via screw terminals
- Simple power supply (5V)



**Application**

- Temperature sensor for individual room control
- Control sensor for ventilation system
- Monitoring of living spaces for mold risk

**Note**

Before you start assembling the device and put it into operation, read these operating instructions through to the end, especially the section on safety instructions.

## 1 PRODUCT DESCRIPTION

With the MS 100 1-Wire Multisensor you have purchased a professional Multisensor. Due to the most modern sensor elements, the accuracy of the MS 100 Multisensor of the rel. humidity measured values is on average 50% - 100% higher, compared to most sensors on the market. A Brightness sensor is used to measure the twilight and brightness values within living spaces. A special photodiode with a human-like detection light spectrum is used.

The MS 100 is installed in a shapely surface-mounted housing and fits harmoniously into modern furnished living and business rooms.

Thanks to the generous ventilation openings, the 1-Wire Multisensor detects the climate conditions in rooms very directly and quickly. For all types of radiator and heating controls, an accurate Temperature sensor such as the one installed in the Multisensor is an important component.

In combination with 1-Wire ESERA Switching modules / binary outputs, a very effective and energy-saving heating control (single room control) is possible.

The Multisensor is also optimal to warn of possible mold formation.

The MS 100 Multisensor is intended for use in normal living spaces. For outdoor use and in damp rooms, such as sauna or steam bath, a suitable sensor is available from the ESERA website.

Calibration of the internal sensors is not necessary. The device can be put into operation immediately without waiting time. The electrical connection to the 1-Wire Bus system of the MS 100 is done with screw terminals and can be operated in standard mode with 3 cables for ground, data and 5V.

Each MS 100 Multisensor has an individual serial number.

The Multisensor contains an original 1-Wire chip of the type DS2438..

### Note

Basics and Tips on the 1-Wire Bus system can be found in the ESERA Online Shop under 1-Wire Basics or please refer to our eBook in the Shop under Training/ Documentation

## 2 TECHNICAL DATA

design	Standard Multisensor for temperature, rel. humidity and brightness.
temperature measuring range, accuracy	-30°C to +60°C (sensor element: -55°C to +125°C) +/- 0,5° in the range from -10°C to + 85°C
Humidity sensor design, measuring range, accuracy	capacitive sensor, resolution 9 Bit 0-100% typical +/-3,5 % (10-85% rF), +/-6% (<10% and >85% rF)
Brightness sensor design, measuring range, accuracy	sensor, adapted to the sensitivity of the human eye approx. 2 - 7000 Lux +/-25% in the range up to approx. 200 Lux, +/-15% in the range up to 7000 Lux
Auto-E-Connect Support	No support of Auto-E-Connect
Operating voltage, current consumption	5VDC (+/-10%), approx.2mA
Data interface	1-Wire Bus (5V, data and ground), Original DS2438 Chip No parasitic operation possible due to reverse polarity and overvoltage protection
Protection circuits	High quality overvoltage protection of the 1-Wire data line up to permanent 28VDC voltage. Reverse polarity and overvoltage protection for power supply
connection	screw terminal for cable solid 0,2 to 2,5qmm or fine stranded 0,2 to 1,5qmm For connection we recommend slotted screwdriver size 2,5x75

**3 AMBIENT CONDITIONS**

Temperature, operation	-30°C to 60°C
Air humidity	10 - 92% (non condensing)
Dimensions	71 x 71 x 32mm (LxWxH)
Protection class	III
Protection system	IP20
Auto-E-Connect Support	No Auto-E-Connect Support

**4 CONFORMITY**

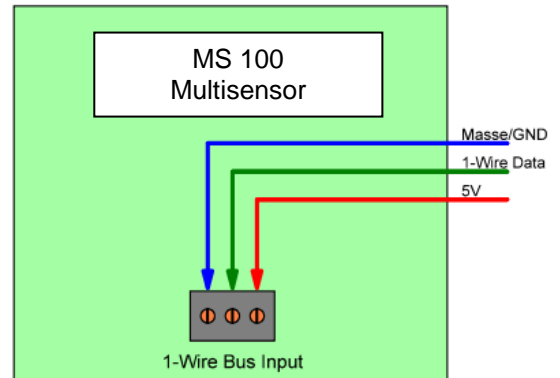
- EN 50090-2-2
- EN 61000-4-2, ESD
- EN 61000-4-3, HF
- EN 61000-4-4, Burst
- EN 61000-4-5, Surge
- EN 61000-6-1, Interference immunity
- EN 61000-6-3, Interference radiation
- RoHS

**5 CONNECTION DIAGRAM**

The connection diagram is available in the store as a separate document.  
 The Temperature and Humidity Sensor is connected by screw terminals.  
 The pin assignment of the screw terminals is printed on the printed circuit board.

**Assignment**

The Multisensor has to be supplied with three cables (ground, 1-Wire Data and 5V). The parasitic mode is not supported.



**Note**

The module may only be operated at the voltages and under the ambient conditions specified for it. The modules may only be commissioned by a qualified electrician.

Please observe the specified operating position of the device.

For further information on the operating conditions, see the following instructions under "Operating conditions".

Due to the high quality reverse polarity and overvoltage protection no parasitic operation is possible.

**Note on brightness measurement**

Please note that due to the positioning of light sources in relation to the angle of incidence of the Multisensor, there may be considerable deviations in the measured brightness values of hand-held brightness meters.

In the case of lighting with fluorescent or LED lamps, the value may also fluctuate. A living room brightness control is usually impaired by strongly changing light conditions, e.g. by shadows of people in the room and the resulting fluctuations of the sensor light values, and a well-functioning control function is often difficult to implement. The reason for this is largely the unfavorable placement in the light switch area for the brightness measurement of the Multisensor.

**6 SOFTWARE / CONTROL**

The Living room Sensor is read out via 1-Wire commands for DS2438 devices and supported by many systems, such as ESERA 1-Wire Controller, ESERA 1-Wire Gateway, Loxone PLC, WAGO PLC (via OWOS), OWFS, FHEM (Linux), IP-Symcon or microcontroller applications.

**7 CONTROL VIA 1-WIRE CONTROLLER / ECO 1-WIRE CONTROLLER**

The control and data output of the MS 100 Multisensor via the 1-Wire Controller / 1-Wire Gateway is very simplified. The current sensor data is output continuously. No query of the data is necessary and available. If you have assigned the article number (11134) to the OWD number of this sensor via the ESERA Config Tool 3, you will receive data records adapted to the sensor from now on. Thus no further formulas are necessary.

**7.1 Data output 1-Wire Controller / ECO 1-Wire Controller**

The following data formats are output for the ESERA modules. If you divide the value by 100, you get the data with two decimal places.

**Data output**

1_OWD1_1 2008	=> Controller No._module No._data set temperature (°C) example: 20,08 °C
1_OWD1_2 100	=> Controller No._module No._data set  Power Good for the operating voltage 100 = operating voltage ok, 0 = operating voltage too low
1_OWD1_3 850	=> Controller No._module No._data set air humidity (rF) example 85,0%
1_OWD1_4 1200	=> Controller No._module No._data set dew point (°C) example: 12,00 °C
1_OWD1_5 80000	=> Controller Nr._ module No._data set brightness (Lux) example: 800,00 Lux

For further information on the options and commands, please refer to the current Programming Manual of the 1-Wire Controller / 1-Wire Gateway, which can be found within Config Tool 3.

**8 INTEGRATION IN IP-SYMCON**

For the integration of the 1-Wire Controllers a suitable ESERA module for all sensors and controllers is available in the IP-Symcon module store. This can be found via the backend of the 1-Wire software (from V5.0).

Alternatively, the ESERA IP-Symcon software module for easy integration of the sensor into IP-Symcon and 1-Wire controllers is available via our website. No scripts are necessary anymore.

Details can be found on the ESERA website under "Compatible controllers / control units/IP-Symcon integration".

<https://www.esera.de/service-support/kompatible-steuerungen-zentralen/ip-symcon-integration/>

For the conventional connection via 1-Wire Bus Coupler you can find a script in the article download area.

## **9 INTEGRATION IN LOXONE**

Via the shop we provide a sample project for reading in temperature, humidity values, dew point, brightness and operating voltage via 1-Wire Controller / 1-Wire Gateway.

Details see here:

<https://www.esera.de/service-support/kompatible-steuerungen-zentralen/loxone-integration/>

## **10 INTEGRATION IN FHEM**

Integration into the open source automation software FHEM is now very easy via 1-Wire controller. Since 2020, ESERA 1-Wire controllers, sensors and actuators are supported by FHEM by default. Details can be found on the FHEM website under the keyword "ESERA" or the following link:

[https://fhem.de/commandref\\_DE.html#EseraOneWire](https://fhem.de/commandref_DE.html#EseraOneWire)

This means that evaluation scripts are no longer necessary.

Details can be found on the ESERA website under "Compatible controllers / control units/FHEM integration"

<https://www.esera.de/service-support/kompatible-steuerungen-zentralen/fhem-integration/>

## 11 MANUAL CALCULATION OF THE SENSOR VALUES

The following formula can be used to evaluate the humidity sensor.

VDD = operating voltage (5V), VAD = humidity sensor, analog value of the DS2438, Xsense = light sensor, analog value of the DS2438.

### Humidity calculation

Offset = 0.847847 (Zero Offset V), slope = 29.404604 (Slope: mV/ %RH)

Srh = (VAD\_new - offset) / (slope / 1000)

rFH = (SrH + 2) / ((1.0305 + (0.000044 \* Temperature) - (0.0000011 \* Temperature x 10<sup>2</sup>))))

for Loxone control:

I1 = VAD-Value, I3 = Temperature

$$\left(\frac{5/I2 \cdot I1 - 0,847847}{29,404604/1000}\right) + 2 / \left(\frac{1,0305 + (0,000044 \cdot I3) - (0,0000011 \cdot I3^2)}{1000}\right)$$

### Brightness calculation

Xsense in Volt, factor = 25600

correction for operating voltage fluctuations: Xsense = (5 / VDD) \* Xsense

brightness (LUX) = (0,223V - Xsense) \* factor

#### Note on brightness measurement

It should be noted that due to the placement of light sources in relation to the angle of incidence of the Multisensor, there may be considerable deviations in the measured brightness values compared to hand-held brightness meters. This is not a fault of the Multisensor.

In the case of lighting with fluorescent or LED lamps, the value may also fluctuate. A living room brightness control is usually affected by strongly changing light conditions, e.g. by shadows of people in the room and the resulting fluctuations of the sensor light values, and a well-functioning control function is often difficult to implement. The reason for this is largely the unfavorable placement in the light switch area for the brightness measurement of the Multisensor.

## 12 1-WIRE NETWORK, CABLING

The special feature of the 1-Wire system is the "BUS technology". All devices (sensors and actuators) are operated in parallel on a three-wire line, which is used for both power supply and data communication. The 1-Wire Bus system joins the list of other successful bus systems such as CAN or Modbus RTU. All of the installation principles recommended for these are also applicable and appropriate to 1-Wire.

The maximum size of a 1-Wire Network is determined by various factors. These are mainly:

- Total cable length and cable type
- Number of 1-Wire devices
- Type of cable installation (topology)
- Number and design of cable connectors (unnecessary connection transitions should be avoided)

All factors in total are summarised and designated as 1-Wire Bus load. Each increase in a factor increases the total 1-Wire Bus load for the 1-Wire Controller and thus reduces the maximum network size.

According to our many years of experience and a lot of feedback from customers, the following conservative recommendation can be made:

- Maximum cable length 50 -120m
- Number of 1-Wire devices no more than 20 -22 pieces
- As linear a topology as possible without T-junctions

The topology in particular plays a major role. If possible, it should be installed in a linear topology. The linear topology can be compared like pearls on a pearl necklace. The data line should be laid from one device to the next without T-joints.

Furthermore, the type of cable used can also be mentioned here. We recommend for the cabling CAT5 or CAT6 network cable. It is also possible to use J-Y(St)Y telephone cables and KNX cables. Longer cable runs are possible with CAT5 versus CAT7 cables.

With twisted pair cables, a longer connection length can be achieved in an undisturbed environment, as the capacitive Bus load is lower. A total length of 50 m and more can be easily achieved without additional measures.

In disturbed, commercial and industrial environments, the cable should always be shielded in order to increase the "robustness" or interference sensitivity of the system.

**Note**

The above statements on 1-Wire are hints and tips and do not describe any product property or represent any guaranteed product property of the product and the 1-Wire Controllers. Information on the basics and tips on the 1-Wire Bus system can also be found in the ESERA Online Shop under <https://www.esera.de/1-wire-grundlagen/>

**13 OPERATING CONDITIONS**

The module may only be operated at the voltages and under the ambient conditions specified for it. The operating position of the device is arbitrary. The device is intended for use in dry and dust-free rooms. If condensation forms, wait for an acclimatization period of at least 2 hours. Do not operate the module in an environment where flammable gases, vapors or dusts are or may be present.

**14 ASSEMBLY**

The Multisensor is to be mounted upright, with the ventilation openings at the top and bottom. It is intended for measuring the temperature and humidity of air and gases in indoor areas such as living rooms, offices, factory halls or public facilities. The measured values specified under technical data are limit data for the entire 1-Wire Multisensor and must not be exceeded or fallen short of, otherwise the Multisensor may be damaged.

**15 DISPOSAL**

Electronic devices must not be disposed of with household waste. According to the directive on waste electrical and electronic equipment, electronic devices must be disposed of at designated local collection points for electronic waste. These collection points are specialized facilities that ensure electronic devices are properly recycled and reused to minimize potential environmental impacts and recover valuable resources.



Please note that the specific collection points and procedures for disposing of electronic devices may vary depending on the region. Therefore, consult local authorities, recycling centers, or waste disposal companies to learn the correct procedure for disposing of electronic devices in your area. By properly disposing of electronic devices, you contribute to environmental protection and the sustainable use of resources.

**16 SAFETY INSTRUCTIONS**

When dealing with products that come into contact with electrical voltage, it is very important to observe the applicable VDE regulations. The VDE regulations are standards set by the Association for Electrical, Electronic & Information Technologies (VDE) and are designed to ensure safety when working with electrical systems and devices.

Here are some of the relevant VDE regulations to consider when handling electrical voltage:

**VDE 0100**

This standard defines the general provisions for low-voltage electrical installations, including planning, installation, commissioning, maintenance, and testing.

**VDE 0550/0551**

These standards address the safety of electrical household appliances and similar purposes. They cover requirements for household devices such as hairdryers, irons, coffee machines, etc.

**VDE 0700**

This standard focuses on the safety of electrical devices in commercial, industrial, and similar environments. It includes requirements for electrical machines, tools, and other devices used in these settings.

**VDE 0711**

This standard specifies requirements for the electrical safety of medical devices. It applies to medical equipment used for diagnosing, treating, and monitoring patients.

### **VDE 0860**

This standard covers the safety of electronic devices used in office applications, including computers, printers, monitors, etc.

It is important that professionals working with electrical systems and devices are familiar with and follow the relevant VDE regulations to ensure the safety of people and property.

### **Basic Safety Rules**

When working on electrical devices, always observe basic safety rules.

- **All connection or wiring work must be carried out in a de-energized state.**  
It is a fundamental safety measure that all connection and wiring work on electrical systems and devices should only be done when they are not live. Never work on electrical devices while they are powered.
- Before starting work, check that the device is disconnected by unplugging it or turning off the relevant power supply.
- Be especially cautious when handling high voltages and be aware of potential hazards.
- Always unplug the device or ensure it is de-energized before opening it.
- Components, assemblies, or devices must only be operated if they are safely enclosed. They must be de-energized during installation.
- Tools may only be used on devices, components, or assemblies when it has been ensured that they are disconnected from the power supply and any electrical charges stored in the device have been discharged.
- Power cables or lines connected to the device, component, or assembly must always be inspected for insulation faults or breaks.
- If a fault is found in the supply line, the device must be immediately removed from service until the faulty line is replaced.
- When using components or assemblies, always strictly adhere to the specified electrical values mentioned in the accompanying documentation.
- If it is unclear which electrical ratings apply to a component or assembly, how external wiring should be carried out, or which external components or accessories may be connected and their connection values, a qualified electrician must be consulted.
- Before commissioning a device, always verify that the device or assembly is suitable for the intended application.
- In case of doubt, always consult experts, professionals, or the manufacturer of the used assemblies.
- We assume no liability for damages resulting from operational or connection errors beyond our control.
- Kits that do not function properly should be returned without the housing and with a detailed description of the error and the corresponding assembly instructions. Repairs cannot be made without an error description. Time-consuming assembly or disassembly of housings will be additionally charged.
- When installing and handling parts that will later carry mains voltage, always observe the relevant VDE regulations.
- Devices operating at voltages greater than 35 VDC/12mA must only be connected and commissioned by qualified electricians.
- Commissioning should only take place if the circuit is installed in an enclosure that prevents accidental contact.
- If measurements must be taken with the housing open, a safety isolating transformer or suitable power supply must be used for safety reasons.
- After installation, a required inspection must be conducted in accordance with DGUV Regulation 3 (formerly known as BGV A3).

DGUV Regulation 3 is a safety regulation for electrical systems and equipment and defines the requirements for electrical safety.

The DGUV Regulation 3 inspection includes checking the proper installation, functionality, and safety of the electrical device.

The inspection should be carried out by a qualified electrician or an authorized inspection service.

The purpose of the inspection is to identify potential hazards, detect defects, and take appropriate measures to ensure electrical safety.

The DGUV Regulation 3 inspection should be repeated at regular intervals to ensure the continuous safety of electrical systems and equipment.

The DGUV Regulation 3 inspection is legally required in many countries and serves to protect people and property from electrical hazards.

Also, be aware of additional national and local regulations and standards that may apply in your region.

## 17 WARRANTY

ESERA GmbH warrants that the goods sold are free from material and manufacturing defects at the time of transfer of risk and have the contractually warranted characteristics. The statutory warranty period of two years from the date of invoice shall apply. The warranty does not extend to normal wear and tear. Claims of the customer for damages, e.g. due to non-performance, culpa in contrahendo, breach of secondary contractual obligations, consequential damages, damages in tort and other legal grounds are excluded. ESERA GmbH shall be liable in the absence of a warranted characteristic, in the event of intent or gross negligence. Claims arising from the Product Liability Act are not affected. Should defects occur for which ESERA GmbH is responsible, and if the replacement delivery is also defective in the event that the goods are exchanged, the purchaser shall be entitled to cancel the contract or reduce the purchase price. ESERA GmbH accepts no liability for the constant and uninterrupted availability of ESERA GmbH or for technical or electronic errors in the online offer.

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