

# OPERATING INSTRUCTIONS

## ECO 531

### CENTRAL DEVICE / GATEWAY INDUSTRIAL / IoT SENSOR - ACTOR

Patented plug-and-play hardware



<https://lnk.esera.de/lixwmnxo>



#### HIGHLIGHTS

##### IoT Ready in 3 minutes

Fully automatic  
PLUG and PLAY system  
for up to 30 sensors  
in 3 zones

Full embedded concept,  
without Linux

Web server and access point  
for configuration, debug and  
firmware updates

Data interface for  
Modbus/TCP, MQTT and ASCII

Auto-E-Connect Plug and Play  
Level I to III

Low-maintenance device in industrial  
quality

Robust industrial design

Extended temperature range  
-20°C to 50°C

Extensive protective circuits and  
good device protection


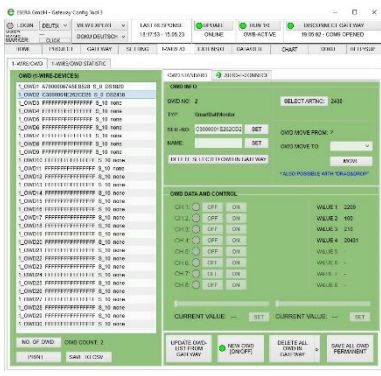

Simple assembly

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# 1 ADDITIONAL DOCUMENTS AND SOFTWARE

The ECO 531 operating instructions contain product-specific and cross-product documents. The cross-product documents apply to several devices. To obtain these and the corresponding software, please visit our website (<https://esera.de>).

<p style="text-align: center;"><b>Webserver Access Point INTERFACE DOCUMENTATION</b></p>	<p><b>INTERFACE MANUAL MODBUS, MQTT, LoRaWAN, NB-Smart Building</b> Manual for configuring the interface via web server and access point. he manual can be found in the ESERA download area at: <a href="https://lnk.esera.de/6UFQK8OR">https://lnk.esera.de/6UFQK8OR</a></p>  <p style="text-align: center;"><a href="https://lnk.esera.de/6ufqk8or">https://lnk.esera.de/6ufqk8or</a></p>
	<p><b>CONFIG TOOL 3 SOFTWARE</b> Comprehensive software for all ECO Gateways with 1-Wire I/O section You can find the software in the ESERA download area at: <a href="https://lnk.esera.de/R68Y1MKG">https://lnk.esera.de/R68Y1MKG</a></p>  <p style="text-align: center;"><a href="https://lnk.esera.de/r68y1mkg">https://lnk.esera.de/r68y1mkg</a></p>
<p style="text-align: center;"><b>Modbus/TCP Modbus/RTU INTERFACE DOCUMENTATION</b></p>	<p><b>MODBUS INTERFACE MANUAL V2, GATEWAY WITH WEB SERVER</b> Manual for configuring the Modbus/TCP and Modbus/RTU interface for ECO gateways with web server and access point  You can find the Modbus manual in the ESERA download area at: <a href="https://download.esera.de/download/technical/programmierhandbuch">https://download.esera.de/download/technical/programmierhandbuch</a></p>

	<p><b>PLANNING AID FOR 1-WIRE SYSTEMS</b></p> <p>Here we offer you a small Excel document for calculating your 1-Wire system</p> <p>You can find the Excel document in the ESERA download area at: <a href="https://lnk.esera.de/AJIRTGF4">https://lnk.esera.de/AJIRTGF4</a></p>
	
<p><a href="https://lnk.esera.de/ajirtgf4">https://lnk.esera.de/ajirtgf4</a></p>	

Please read the documents completely and follow the instructions in them. If you have difficulties finding the required documents or software, please do not hesitate to contact our customer support. We will be happy to help you with any questions or problems.



**Note**

Please read the operating instructions in full, especially the safety instructions section, before installing and operating the appliance.

If you have difficulties downloading additional documents or software, please contact our support team by e-mail: [support@esera.de](mailto:support@esera.de).

Our environmentally friendly approach extends to the use of paper and cardboard instead of plastic wherever possible. This paperless manual also contributes to our environmental commitment. We encourage you to consider the environment before printing this guide.

## 2 PRODUCT DESCRIPTION

### APPLICATIONS AND ADVANTAGES OF THE ECO CENTRAL UNIT / GATEWAYS FOR INDUSTRIAL AUTOMATION, IOT (IIoT) AND OT APPLICATIONS

#### APPLICATION

- Innovative sensor-actuator solution for the
  - Industry (OT),
  - IoT application
  - and IT/EDP monitoring
- State-of-the-art, universal Modbus/TCP and MQTT sensor interface for all modern machines, Systems and consumers
- Universal central device for all modern machines, systems and Energy optimization of consumers through many sensors
- Industrial systems, mechanical engineering, building management, silo monitoring, IIoT and M2M
- Can be used regardless of manufacturer
- Up to 30 sensors and actuators in up to 3 1-Wire zones via plug-and-play.

#### ADVANTAGE

- **IOT READY IN 3 MINUTES**
- Cost and time savings thanks to fast installation and commissioning
- Connect, switch on and you will immediately receive measured values
- Intuitive and simple operation via web server

The ESERA ECO central units (hereinafter also referred to as gateway) are the perfect solution for IoT, OT and IT platforms. They are the first multi-protocol central units that combine all 3 industrial worlds.

This is achieved through 4 standard industrial protocols, which can all work in parallel

- **Modbus/TCP for OT environments with PLC controllers**
- **MQTT for IoT application**
- **ASCII text protocol for universal IT applications**
- **Web server for extremely user-friendly configuration, maintenance and monitoring**

Thanks to our patented plug-and-play system from ESERA, integrating sensors and actuators with the ECO series central units is extremely quick and easy. Simply connect a sensor or actuator and in a few seconds you will receive the first measurement data, which you can seamlessly connect to your smart building software.

The ECO 531 central device is a modern system bus interface for the comprehensive monitoring and control of systems.

The central unit was specially developed for monitoring and controlling sensors, actuators and digital identity modules for machines, plants and systems. Equipped with an access point and an integrated web server, it enables convenient configuration and monitoring.

The ECO central units are low-maintenance industrial devices that have been the standard for 1-Wire bus systems for over 10 years, offer stability and meet a high "security by design" standard.

The simple installation of complex installations is facilitated by the integrated 1-Wire Zone feature. ESERA offers a wide range of sensors and actuators for the gateway. User-friendliness is reflected in the simple configuration, software updates and provision of data via the web server, accessible via LAN or the access point that can be activated at the touch of a button.

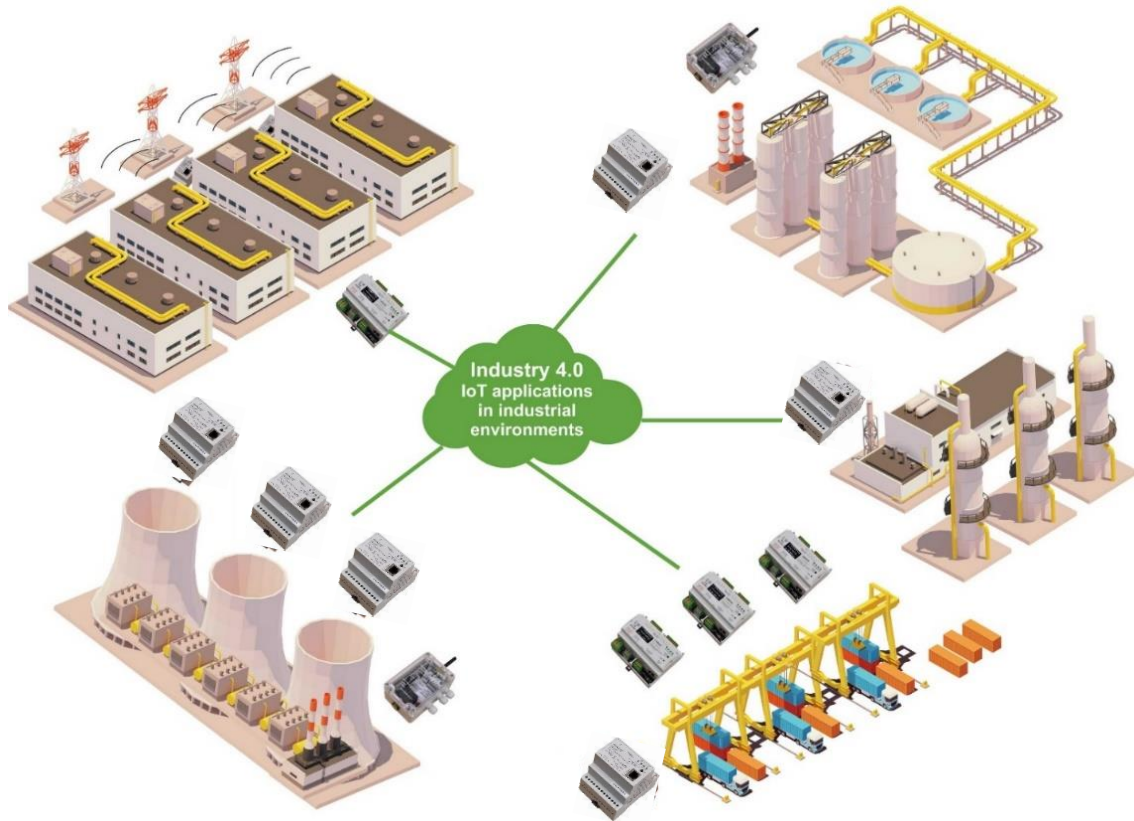
## For us, this means: IoT READY IN 3 MINUTES.

It's never been so easy!

- **30 sensors and actuators in up to 3 zones**  
The central unit enables the connection of up to 30 sensors and actuators, which can be flexibly distributed to three separate zones/bus segments. The up to three bus segments work fully automatically with the proven technology of the Industrial 1-Wire bus.
- **Fast implementation:** The **plug-and-play functionality** of the gateways enables fast implementation without complicated configuration, saving time and resources.
- **Integration into smart home systems:** The gateways integrate seamlessly into the smart home infrastructure and offer advanced data analytics and intelligent automation capabilities.
- **Real-time monitoring:** Users receive real-time data and notifications about the performance and status of their safety and actuator components, enabling quick responses in critical situations.
- **Flexibility and customization:** The gateways can be adapted to specific requirements and environments in the smart home, allowing users to optimize their security solutions.
- **Centralized control:** Users can manage and monitor many sensors and actuators from a central location in the smart home, which improves efficiency and management.
- **Energy efficiency:** ESERA gateways are efficiently designed and optimize energy consumption in the smart home, which is particularly appreciated for environmentally conscious applications.
- **Reliability:** ESERA gateways are characterized by their reliability and robust design, which creates trust in the security infrastructure of the smart home.
- **Technical support:** Users receive technical support and expertise from ESERA to ensure smooth integration and operation of their security solutions in the smart home.

Overall, the ECO 531 central unit offers a robust and user-friendly solution for monitoring machines, plants and systems thanks to its extensive functions and the simple integration of sensors and actuators.

### 3 INDUSTRIAL ENVIRONMENT FOR THE ECO 531 SENSOR-ACTUATOR GATEWAY



### 4 1-WIRE ZONES

**The ECO 531 central unit has 3 1-wire zones / bus segments ex works. These zones are completely separated by a state-of-the-art switch technology. This makes complex 1-wire installations possible.**

Look forward to your ECO 531 sensor-actuator central unit!

In the standard version, 1-Wire zones 1 and 2 are already ready for use and promise an instant smart home experience. But that's not all - with our expandable technology, you can now unlock the full power of the 3rd zone!

Discover the limitless potential of your ECO 531 - where comfort and adaptability meet innovation.

## 5 ECO 531 GATEWAY FUNCTIONS

The ECO 531 gateway offers various functions and interfaces for data communication and management of 1-Wire networks. Here are some important features and information on the functions:

### DATA INTERFACE

Ethernet interface with 10/100 Mbit speed. Support for various data protocols such as TCP/IP and UDP. Up to 3 simultaneous data connections possible, e.g. for MQTT, text protocol and web server.

### MQTT PROTOCOL

For smart building and smart home applications.

Data connection via MQTT to a broker for sending and receiving data.

Transmission interval can be set via the web server.

Names can be added for 1-Wire sensors via Config Tool and are used in the transmission protocol. Default names are used if no specific names are specified.

Further details on the MQTT protocol can be found in the "Interface manual" document on the website.

### ASCII TEXT PROTOCOL

The 1-Wire sensor data is output by the ECO 531 gateway in a ready-to-use format.

For example, temperature sensors are output cyclically in °C. Scaling only requires division by 100.

Article numbers for ESERA modules can also be entered, whereby the calculation and output are adapted to the function of the module.

### SENSORS AND ACTUATORS

The ECO 531 Sensor Gateway supports up to 30 sensors.

Sensors are automatically connected to the Industrial 1-Wire bus via the Auto-E-Connect Plug and Play system.

Each sensor can deliver up to 5 measured values, i.e. a total of up to 150 sensor data to your control system or PLC.

### AUTONOMOUS MANAGEMENT

The Sensor Gateway enables autonomous management of a 1-Wire network.

No 1-Wire commands or formulas are required to evaluate the sensors and actuators.

The ECO 531 PRO gateway automatically scans the 1-Wire network for new 1-Wire devices, reads their Auto-E-Connect data and outputs the converted data in plain text.

### DESIGNED FOR ALL 1-WIRE NETWORKS

The 1-Wire interface of the ECO 531 PRO has been specially developed for large 1-Wire networks with long cable runs. 1-Wire devices can be operated mixed in parasitic or normal mode.

The interface offers maximum data security, even for complex network structures.

### POWER SUPPLY

The ECO 531 gateway can be operated with a voltage of 9-30 VDC.

Suitable for 12V and 24V power supply systems in stationary and mobile applications.

Suitable DIN rail or plug-in power supply units are available in the webshop.

### COMMISSIONING

If you require assistance with commissioning, please contact our technical support team at [support@esera.de](mailto:support@esera.de).

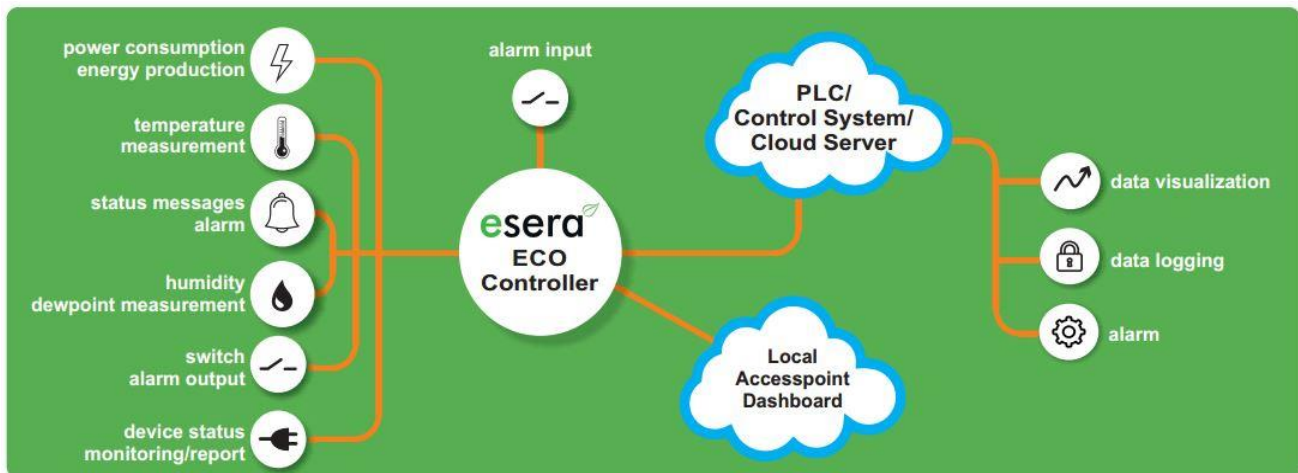
#### NOTE

Basics and tips on the 1-Wire bus system can be found in the ESERA Online Shop at 1-Wire basics or please refer to our eBook in the store under Training/Documentation



## 6 ECO GATEWAY SYSTEM

Many sensors, powerful interface and access point



## 7 THE ECO AUTOMATION SYSTEM

The ECO Gateway concept can be summarized in two concise points:

- **IoT Ready in 3 minutes**
- **Patented plug and play hardware**

## 8 PLUG AND PLAY SYSTEM, AUTO-E-CONNECT®

The Auto-E-Connect® 1-Wire Plug and Play system enables fully automatic configuration of 1-Wire sensors and actuators on the 1-Wire bus. It offers various added values and time savings for the customer. The system has been optimized over many years and is optimized for smart building, industrial applications and smart building.



The Auto-E-Connect system automatically recognizes sensors and actuators and starts suitable smart building libraries. The data is formatted and output. These functions run automatically in the background during the installation and commissioning of sensors and actuators.

The Auto-E-Connect system consists of three supplementary levels that extend the functionality. These functions can be used to implement fully automatic configurations of the 1-Wire sensors and actuators on the 1-Wire bus.

Please note that the Auto-E-Connect functionality will be available for the ESERA ECO Gateways and Station 200 Pro from 2021.

## 9 RANGE OF FUNCTIONS AUTO-E-CONNECT SYSTEM

The three levels of the Auto-E-Connect system offer advanced functions and automation for the installation and configuration of sensors and actuators in the 1-Wire bus.

The following three levels of the Auto-E-Connect system

### Level I

**OWD Detect** stands for "One-Wire Device Detect" and refers to the ECO Gateway's function of automatically detecting new sensors and actuators and starting customized BiblSmart building counters within the gateway. This saves time when connecting a new device to a 1-wire gateway.

When a new sensor or actuator is connected to the 1-Wire bus, the ECO Gateway automatically recognizes the new device. It then automatically starts the corresponding BiblSmart Buildingheken required for the recognized device.

This function makes it much easier to integrate new sensors and actuators, as there is no need for manual configuration. It saves time and simplifies the installation process, as the gateway automatically makes the necessary settings and adjustments.

OWD Detect therefore avoids the time-consuming manual configuration of new devices on the 1-Wire Gateway, which saves time overall when connecting new devices.

### Level II

The ECO Gateway offers the option of reading out and visualizing the Auto-E-Connect data and manufacturer data of sensors and actuators. Various information such as article number, date of manufacture, firmware version and hardware version can be displayed.

Reading this data gives you a detailed overview of the properties and specifications of the connected sensors and actuators. This can help you to manage and monitor your 1-Wire devices.

The data can be visualized in different ways, depending on the functions and possibilities of the ECO Gateway. For example, this can be done via a web-based user interface or special software provided by the manufacturer.

The visualization of the product data gives you a quick overview of the connected devices and their specific properties. This can be very useful for troubleshooting, maintenance and monitoring of the 1-Wire network.

### Level III

The extended plug-and-play system for the 1-Wire bus offers various functions that simplify the installation and configuration of sensors and actuators. Here are some of the functions in detail:

### PRE CONFIGURATION

You can write the desired OWD number (1-Wire Device Number) for the next installation directly into the sensor or actuator. This means that the device itself saves the information about its position in the gateway. This enables automatic assignment of the devices in the target gateway without the need for manual sorting.

### AUTOMATIC POSITIONING

The device automatically logs on to each ECO gateway with Auto-E-Connect III using the pre-configured OWD number. This automatic registration process works up to the maximum possible number of OWDs of the ECO gateway. No further configuration is required during commissioning.

### SENSORFINDER FUNCTION

The ECO 531 PRO gateway can activate the status LED of a sensor in the 1-Wire sensor network. The status LED flashes for a certain time to facilitate the detection of a sensor within the network. This enables faster localization of sensors and saves time and costs.

### CLASSES ASSIGNMENT

ESERA 1-Wire Devices are assigned to OWD classes based on their article number. These classes map comparable properties, variable names and units. This class assignment enables fully automated software installation, visualization and data evaluation, both locally and in the cloud. The class parameters can be output via the data interface, e.g. using the MQTT protocol.

These extended functions of the plug-and-play system simplify the installation and configuration of sensors and actuators in the 1-Wire bus. It saves time and enables efficient management of the devices in your system.

**NOTE** The functions of the extended plug-and-play system mentioned above only apply to sensors and actuators that support the Auto-E-Connect functionality. We recommend the use of sensors and actuators from ESERA, as these already contain the Auto-E-Connect system. It is important to consult the respective operating instructions and technical specifications of the sensors and actuators to ensure that they are compatible with the Auto-E-Connect system.

The Auto-E-Connect function is specific to ESERA 1-Wire devices and offers additional advantages in the configuration and management of the devices. Please note that not all sensors and actuators on the market support this feature and it is important to check compatibility before purchasing.

The exact details of Auto-E-Connect support can be found in the respective operating instructions and technical documentation of the devices you wish to use.

## 10 PATENT AUTO-E-CONNECT® SYSTEM

Discover the revolutionary 1-Wire Plug and Play system Auto-E-Connect, which is protected by a European patent and thus officially seals its outstanding innovation and uniqueness.



This system exceeds all expectations with its impressive plug and play functionality extension and the modernization of the 1-Wire bus via Auto-E-Connect.

The invaluable benefits for our customers cannot be overlooked: a noticeable increase in convenience, significant cost and time savings - especially in the areas of commissioning, preparation, inventory, live time management and service and maintenance (predictive maintenance).

The Auto-E-Connect system brings the Industrial 1-Wire sensor and actuator bus up to date and is in direct competition with comparable industrial plug-and-play sensor systems such as IO-Link. Its applications are versatile and range from smart home and smart building to IoT, M2M and mechanical and plant engineering, even in aerospace.

This European patent underlines the uniqueness and innovative power of this system, which catapults the proven 1-wire bus standard, established since the 1980s, into the modern age. Experience the future of connectivity with Auto-E-Connect.

Illustration, patent certificate for the 1-Wire Bus Auto-E-Connect System



## 11 TECHNICAL DATA

<p><b>Special feature</b></p>	<ul style="list-style-type: none"> <li>• Up to 30 sensors and actuators in up to 3 zones*</li> <li>• 1-wire switch function for large projects</li> <li>• Web server for the configuration of data connections</li> <li>• Internal access point available for 30 minutes at the touch of a button</li> <li>• High-performance Ethernet interface</li> <li>• Internal WLAN antenna</li> <li>• Developed for use in extended temperature ranges</li> </ul>
<p><b>Data interfaces</b></p>	<ul style="list-style-type: none"> <li>• Ethernet (LAN): TCP/IP, UDP, 10/100MBit</li> <li>• Access point for web server can be switched on</li> <li>• Multi-protocol data interface, parallel communication with: <ul style="list-style-type: none"> <li>○ Modbus/TCP</li> <li>○ MQTT (text protocol according to ASCII standard)</li> <li>○ ASCII text protocol</li> <li>○ Web server</li> </ul> </li> </ul>
<p><b>Plug and play system, 1-Wire Bus</b></p> <p><b>Auto-E-Connect functions</b></p>	<p>Patented plug-and-play system for fully automatic sensor/actuator integration. Connect and you're ready to go.</p> <p>The plug-and-play system includes the following functions:</p> <ul style="list-style-type: none"> <li>• <b>Automatic Positioning:</b> Extended Plug And Play system for fully automatic positioning of the sensor/actuator in the ECO Gateway</li> <li>• <b>Automatic library assignment:</b> The appropriate library is assigned to the sensor fully automatically.</li> <li>• <b>Classes Assignment:</b> Output OWD sensor class via ECO Gateway.</li> <li>• <b>Electronic type plate:</b> Output of article number, year of manufacture, software version, software revision, hardware version, OWD position, sensor finder function</li> <li>• <b>Pre Configuration:</b> Programming the desired OWD for the next ECO Gateway, saving the OWD number</li> <li>• <b>Sensor finder function:</b> LED display for sensor detection. Allow the status LED on the sensor/actuator to flash for identification.</li> </ul>
<p><b>Data, firmware update and configuration</b></p>	<p>Web server and Config Tool 3</p>
<p><b>Software Support</b></p>	<p>Config Tool 3, ECO Dashboard 100</p>
<p><b>Supply voltage</b></p>	<p>Wide range 16-30VDC, typically 24VDC Supply</p>
<p><b>Power consumption</b></p>	<ul style="list-style-type: none"> <li>• Self-consumption max. 2.5W at 24VDC, without bus/output load</li> <li>• max. 35W at 24VDC with full bus/output load</li> </ul>
<p><b>RTC power supply</b></p>	<p>Goldcap, buffering of the internal clock (RTC) in the event of a power failure for approx. 2 days.</p> <p>The RTC must be reset in the event of a prolonged failure.</p> <p>The Goldcap is charged after approx. 2 hours.</p>
<p><b>1-Wire interface</b></p>	<ul style="list-style-type: none"> <li>• 3 independent zones/bus segments</li> <li>• Extended 1-Wire bus functions with Plug and Play function, Auto-E-Connect system</li> <li>• max. 30 1-Wire sensors or actuators</li> <li>• Data line with 5V level</li> <li>• Output per zone: 5V max. 500mA and 12V, max. 1.2A per zone,</li> <li>• Total output power: 5V max. 1.5A and 12V max. 2 A</li> </ul>

<b>Protective circuits</b>	<ul style="list-style-type: none"> <li>• ESD, overvoltage and reverse polarity protection</li> <li>• 1-Wire Protector for 1-Wire interface (overvoltage protection up to 28VDC) during operation of the ECO 531</li> </ul>
<b>Connection</b>	Screw terminals for stranded wires and cables up to 2.5qmm cross-section
<b>Insulation</b>	Galvanic isolation between Ethernet and 1-Wire interface
<b>Supported 1-Wire modules</b>	DS2401, DS1963, DS1990, DS1820, DS18S20, DS18B20, DS2413, DS2438, DS2450, DS2408, DS2405, DS2406 (only423, further chips on request. We are happy to support other modules as OEM products for you.
<b>Housing color</b>	Gray RAL7035
<b>Housing material</b>	ABS plastic

## 12 ENVIRONMENTAL CONDITIONS

<b>Operating temperature</b>	-20°C to +60°C, industry extended temperature range
<b>Storage temperature</b>	-25°C to +60°C
<b>Relative humidity</b>	10% to 92% (non-condensing)
<b>Room classification</b>	Only operate in dry rooms
<b>Protection class</b>	IP20
<b>Protection class</b>	III
<b>Dimensions</b>	2TE, 32 x 90 x 70mm (WxHxD) for DIN EN 50022 mounting

## 13 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, Radiated interference  
RoHS

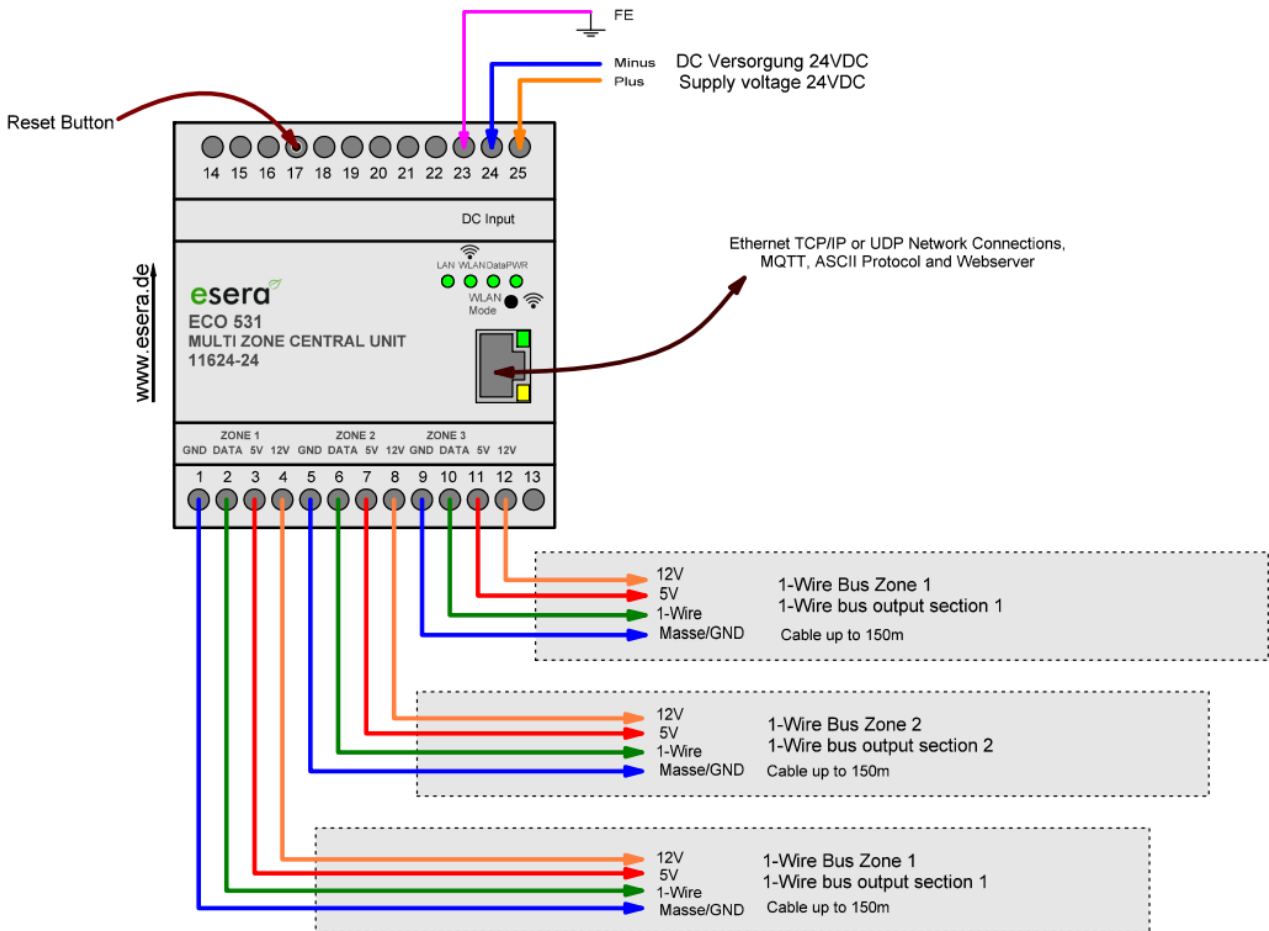
## 14 DISPLAY LED

The module has various display LEDs. The function of the displays is shown below

ADVERTISEMENT	DESCRIPTION	FUNCTION
Green LED	PWR	Display for supply voltage
Green LED	DATA	<ul style="list-style-type: none"> <li>• After switching on the device, the LED flashes 3 times</li> <li>• Flashes with 1-wire activity</li> <li>• Flashes when data is sent via the data interface</li> <li>• Flashes very quickly if "KAL Receive" has been activated and the "KAL messages" from the control system are missing.</li> </ul>
Green LED	LAN	LAN - Network status LED Lights up when LAN network connection is established Flashes when the interface is not activated
Green LED	WLAN	WLAN - Network status LED Lights up when WLAN network connection is established Flashes when the WLAN access point is activated and a direct connection is possible

## 15 CONNECTION PLAN

The connection diagram is available as a separate document on our website/product download area



### IMPORTANT

It is essential that the module is operated exclusively in accordance with the specified voltages and ambient conditions.

The device can be operated in any position, i.e. it can be operated in any orientation.

The installation and commissioning of the module may only be carried out by a qualified electrician. A qualified electrician has the necessary knowledge and skills to ensure that the installation complies with the relevant safety standards.

It is also important to carry out all connection work on the module when it is de-energized. Before starting any connection work, all power sources should be switched off and appropriate safety precautions taken to avoid injury or damage.

For more detailed information on the specific operating conditions, I recommend that you read the enclosed instructions. There you should find all the information you need to operate the module safely and properly.

## 16 CONNECTION TERMINAL ASSIGNMENT

Connection terminal no.	Function	Zone / bus segment
1	Ground / GND 1-wire bus, The GND connection is connected to the minus voltage supply	1-Wire Bus Interface, Zone 1
2	1-Wire Data, 5V level Note: 1-Wire devices with 5.0V level only are supported	
3	5V output for 1-Wire bus for sensors	
4	12V output for actuators and DIN rail 1-Wire devices	
5	Ground / GND 1-wire bus, The GND connection is connected to the minus voltage supply	1-Wire Bus Interface, Zone 2
6	1-Wire Data, 5V level Note: 1-Wire devices with 5.0V level only are supported	
7	5V output for 1-Wire bus for sensors	
8	12V output for actuators and DIN rail 1-Wire devices	
9	Ground / GND 1-wire bus, The GND connection is connected to the minus voltage supply	1-Wire Bus Interface, Zone 3
10	1-Wire Data, 5V level Note: 1-Wire devices with 5.0V level only are supported	
11	5V output for 1-Wire bus for sensors	
12	12V output for actuators and DIN rail 1-Wire devices	
13 -16	Not occupied, no function, do not insert any foreign objects!	
17	Reset button for 1-wire function. No reset for the data interface	
18 - 22	Not occupied, no function, do not insert any foreign objects!	
23	FE Functional earthing of the device Connect this terminal to the central earthing/protective earth conductor	
24	Minus/GND of the DC supply voltage	
25	Plus 24V of the DC supply voltage	



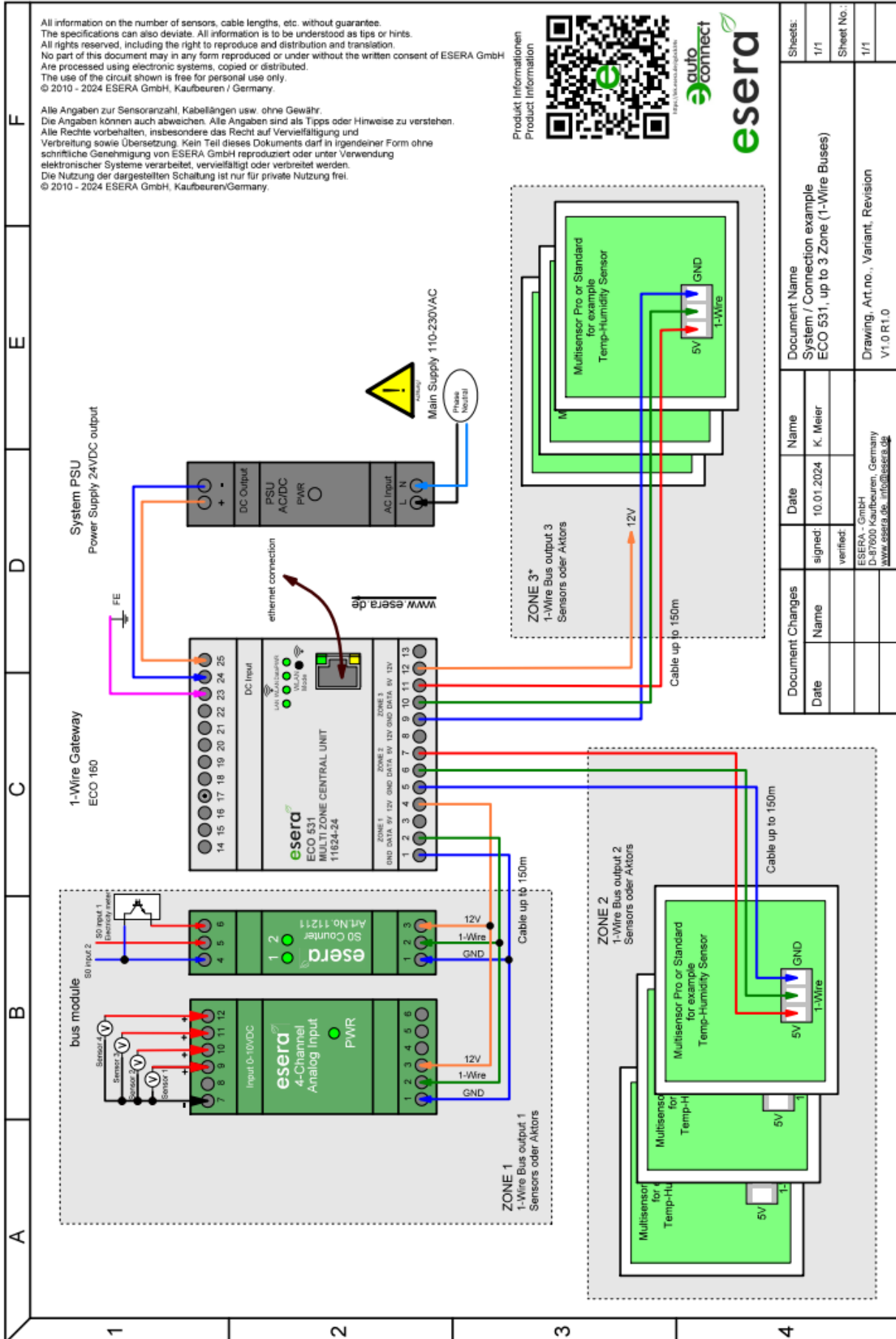
**NOTE**

The FE connection (functional earthing) of the ECO 531 should be connected to the earth potential (PE) in order to establish functional earthing. This is important to ensure reliable operation of the module.

By connecting the FE connection to earth potential, an earth connection is established which helps to minimize interference and electrical problems. Proper functional earthing protects the assembly from electrostatic discharges, overvoltages and other potential interference.

# 17 CONNECTION EXAMPLE 1

Connection example of the ECO 531 Sensor Gateway with many sensors and actuators



All information on the number of sensors, cable lengths, etc. without guarantee.  
 The specifications can also deviate. All information is to be understood as tips or hints.  
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 Are processed using electronic systems, copied or distributed.  
 The use of the circuit shown is free for personal use only.  
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 Die Angaben können auch abweichen. Alle Angaben sind als Tipps oder Hinweise zu verstehen.  
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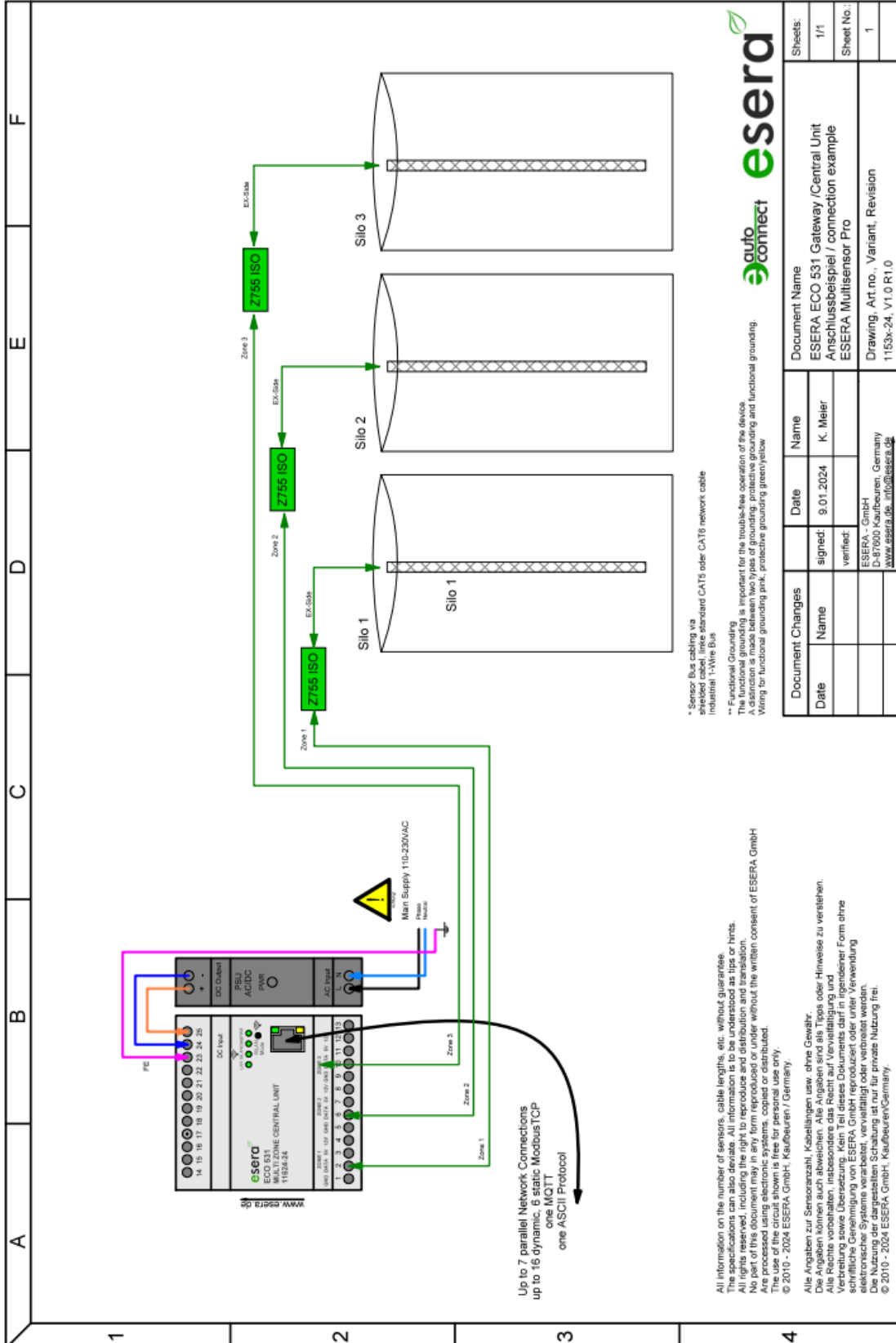
Produkt Informationen  
 Product Information



Sheets:		1/1	
Document Name		System / Connection example	
Date		10.01.2024	
Name		K. Meier	
Document Changes		signed: verified:	
Date		ESERA - GmbH D-87700 Kaufbeuren, Germany www.esera.de info@esera.de	
Drawing, Art. no., Variant, Revision		ECO 531, up to 3 Zone (1-Wire Buses)	
		V1.0 R1.0	

18 CONNECTION EXAMPLE 2

Connection example of the ECO 531 central unit for silo monitoring



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## 19 ACTIVATE ACCESS POINT



Push button to activate the Access Point

### What is an access point?

Via an integrated access point (wireless LAN AP mode), it is possible to connect mobile devices such as laptops, tablets and smartphones directly to the gateway.

This means that no separate wireless LAN access point is required.

By activating AP mode on the ECO gateway, you can establish a wireless connection and access the gateway directly. This makes it easier to configure, monitor and control the gateway via your mobile device. You can access the gateway to adjust settings, retrieve data or use other desired functions.

The ECO gateway with Maxi interface has a switchable WiFi (WLAN) access point. This allows you to access the gateway directly with a mobile device such as a smartphone, tablet or laptop without the need for additional devices such as a separate access point (e.g. a Fritzbox).

By activating the WiFi access point on the ECO gateway, you can establish a wireless connection and access the functions and settings of the gateway. This allows you, for example, to configure network settings, monitor sensor data or control connected devices.

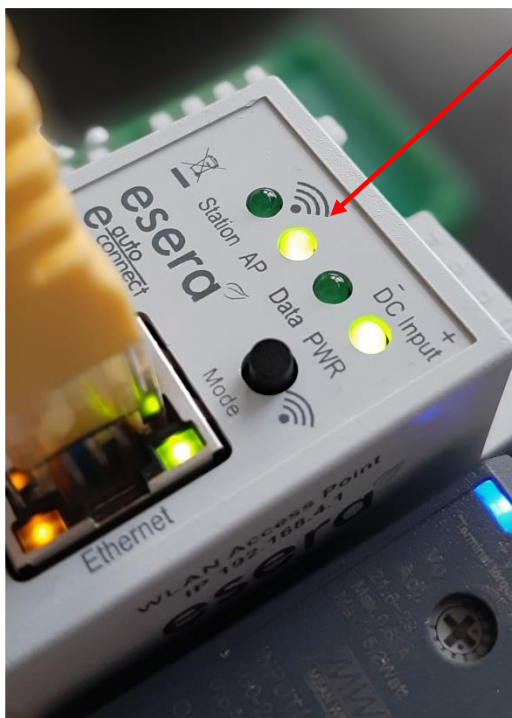
To access the gateway via WiFi, make sure that your mobile device is connected to the WiFi access point of the gateway. You can then access the gateway via a web browser or special application software and use the desired functions. Please note that you may need to follow the manufacturer's instructions for activating and configuring the WiFi access point on the ECO gateway. These instructions should help you to successfully set up and use access via WiFi.

### NOTE

You activate the access point by pressing the button on the top (for 5 seconds).

The access point is active for approx. 30 minutes. It then deactivates automatically for security reasons.

You can switch the access point off again by pressing it again for at least 5 seconds.



Access point is activated

If access point mode is activated on the WLAN interface of the ECO gateway, this means that the gateway is acting as an access point to enable wireless connections. This is indicated by the illuminated "AP" LED, while the "Station" LED is switched off.

If you no longer need the access point and want to deactivate the wireless connection, you can do this by pressing the button again for at least 5 seconds. This deactivates the access point mode and the gateway no longer establishes a wireless connection.

(See illustration, "AP" LED lights up, "Station" LED is off)

### NOTE

To access the ECO gateway's web server, use the Ethernet interface and the IP address of the device. You can retrieve the exact IP address from the "Ethernet Interface Settings" website.

### The following steps can help you to determine the IP address of the ECO gateway:

- Make sure that the ECO gateway is connected to your network and switched on.
- Open a web browser on a device that is connected to the same network.
- In the address bar of the browser, enter the IP address that you normally use to access the configuration interface of a router. This could be "192.168.0.1" or "192.168.1.1", for example.

- On the displayed web page, search for the "Ethernet Interface Settings" section or similar options that contain information on the IP address of the ECO gateway.
- Make a note of the specified IP address of the ECO gateway.

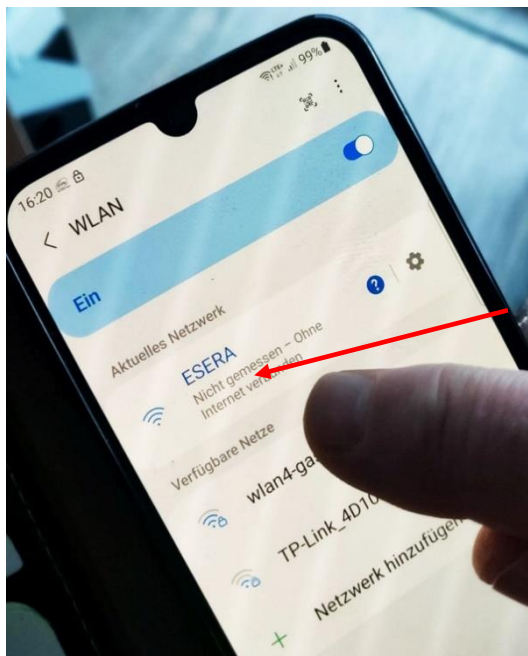
As soon as you have the IP address of the ECO gateway, you can enter it in the address bar of your browser and access the gateway's web server. This gives you access to the configuration settings and other functions of the ECO gateway via the web user interface.

Please note that the exact steps and the user interface may vary depending on the model and firmware version of the ECO gateway.

## 20 SELECT ACCESS POINT

The ECO Gateway with Maxi interface registers as a WLAN access point with the identifier "ESERA". On delivery, the Ethernet interface is set to "DHCP".

The access point is open, without an access password.



### NOTE

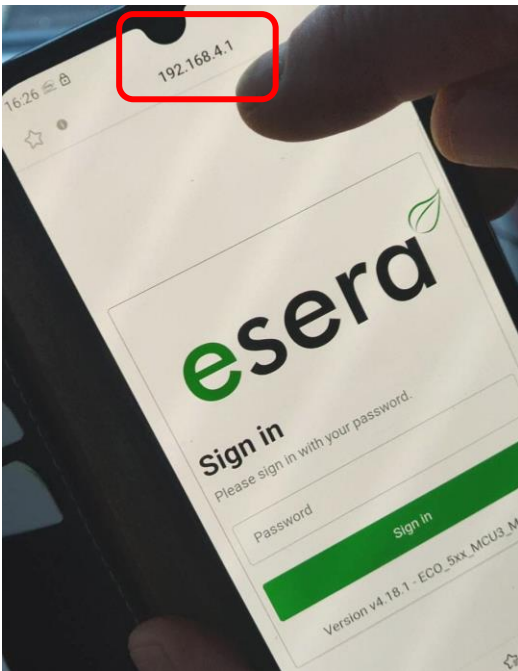
The ECO WLAN access point can be found as a WLAN network with the identifier "ESERA".

Select "ESERA" Access Point

## 21 ACCESS WEB SERVER VIA WIFI

If you have connected to the "ESERA" WLAN network, the web browser starts directly on many smartphones.

If this is not the case, switch to your web browser (e.g. Firefox, Chrome, etc.) and enter the IP address of the ECO Gateway.



The ECO Gateway web server should now be visible, similar to the following image.

The device can currently only be configured via the ECO Gateway web server.

**NOTE**

The IP address of the ECO Gateway per access point is: **192.168.4.1**

The IP address of the access point is printed on the right-hand side of the gateway housing.

**Important:**

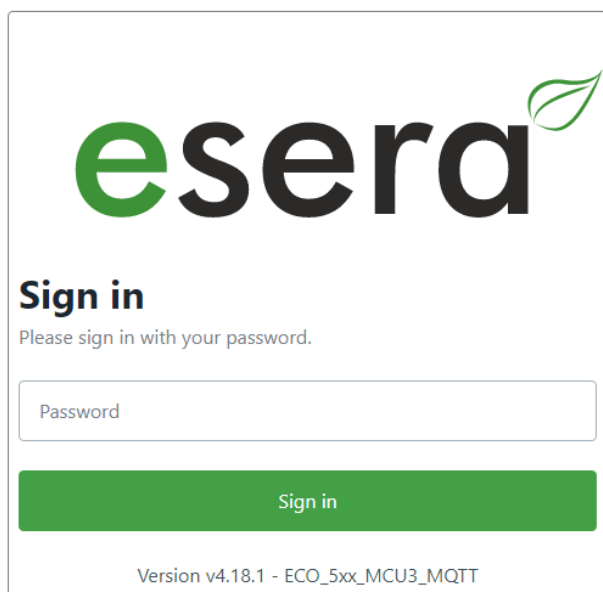
Enter the IP address without "https://".

## 22 CALL WEB SERVER VIA LAN

You can also access the ECO Gateway web server at any time via the LAN interface using the set IP address.

The IP address of the ECO Gateway is shown on the device display (if the device has a display). If the device does not have a display, you can also read out the current IP address (not the IP address of the access point) via your router/DHCP server.

## 23 WEBSERVER, LOG IN



### Password, Log In

To log in to the ECO Gateway web server for the first time, use the

**Start/default password: eserapwd**

For security reasons, the password is not displayed in plain text but with dots.

After entering your password, click on the "Login" button to open the main menu (hereinafter referred to as the main menu).

Please change the password after logging in for the first time, otherwise unauthorized persons can also make settings on the ECO Gateway.

Please enter a new and secure password via the main menu/"Change Password".

You can find information on assigning secure passwords on the Internet.

### Software version Ethernet interface/log out

Displays the software version of the Ethernet interface installed on the device. You can view the version of the 1-Wire firmware via the Config Tool 3.

Click on the "Log Out" button to exit the web interface.

#### NOTE

**The start/default password for the login is: eserapwd**

#### IMPORTANT

**Please change the password after the first login.**

It is good security practice to change your password after logging in for the first time to ensure the security of the system. After you have successfully logged in, you should change the default password and set a new, strong password.

This minimizes the risk of unauthorized access to the system. Make sure that the new password is sufficiently complex and contains letters, numbers and special characters. Avoid using easy-to-guess passwords and use a combination of different characters instead.

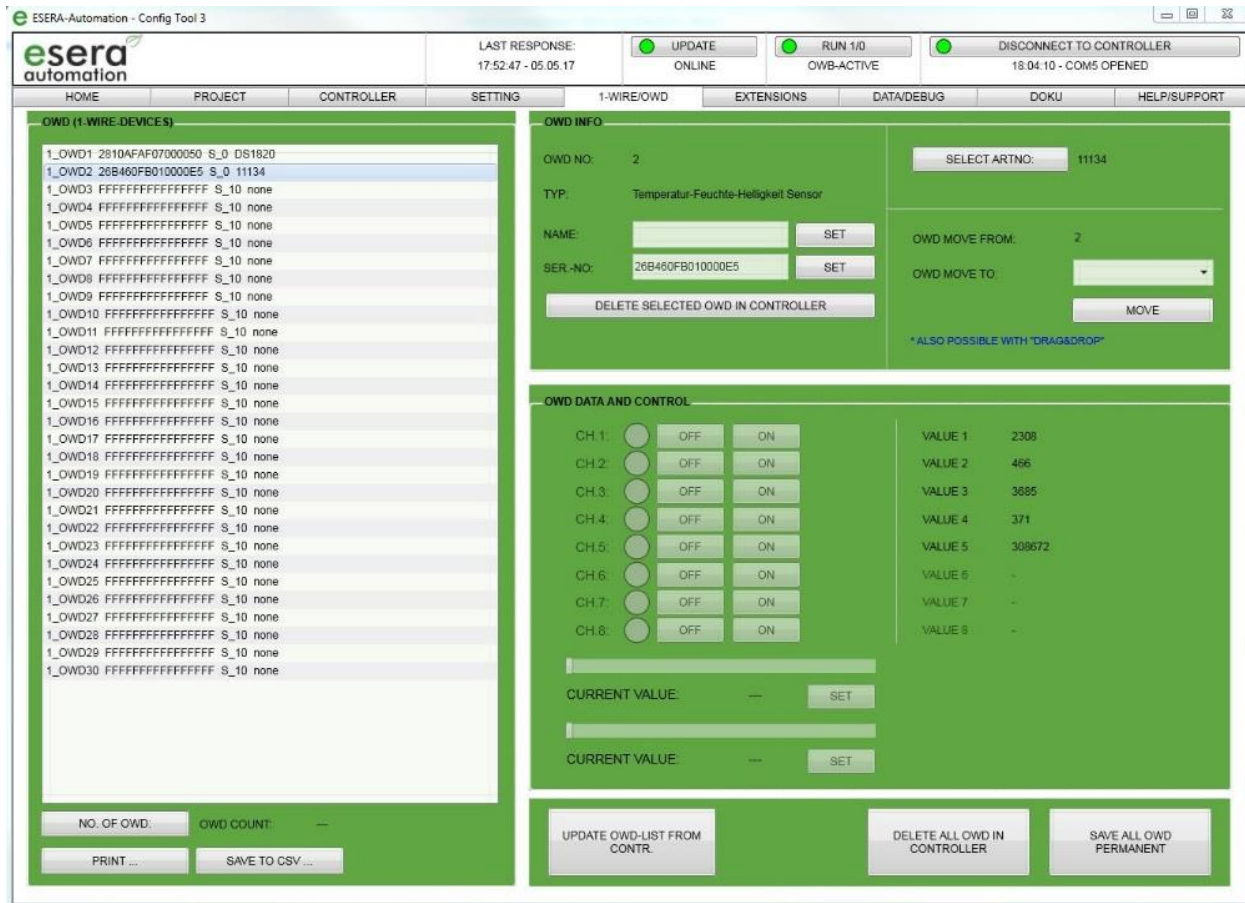
For further details on the functions of the ECO gateway web server, we recommend that you consult the "Interface manual" document. You can find this document on the website [www.esera.de](http://www.esera.de) in the download area/technical downloads.

The "Interface manual" should contain detailed information about the various functions and options of the ECO gateway's web server. It can help you to optimally configure and use the gateway to meet your requirements.

Please note that the exact procedure for navigating the website and downloading the manual may depend on the specific website structure and layout. If you have difficulty finding the manual, I recommend that you use the website's search function or contact esera's technical support directly for further assistance.

## 24 DATA INTERFACE, ASCII PROTOCOL

You can configure the Ethernet interface using the Windows ESERA program Config Tool 3, which can be found in the download area of the ESERA online store Tool 3 software.



## 25 ESERA ASCII TEXT PROTOCOL

The ASCII text protocol is a communication protocol that is used to transfer data between different devices via serial interfaces.

The abbreviation "ASCII" stands for "American Standard Code for Information Interchange" and refers to the standard code used to represent characters, numbers and symbols in digital form.

In the ASCII text protocol, data is transmitted in the form of character strings, whereby each character is coded in its ASCII representation. A character string can represent different types of data, such as measured values, control commands or status messages.

The ASCII text protocol is comparatively simple and easy to implement as it uses the standardized ASCII character set. Data is transmitted in plain text, which makes it easier to read and understand the transmitted data.

The ASCII text protocol is used in many applications that require simple and reliable communication. For example, it is used in industrial automation, building automation, measurement technology and control technology.

The ESERA ASCII text protocol, which was specially developed for the ECO 531 Gateway, is based on the ASCII protocol and provides a specific structure and commands for configuring and analyzing the gateway. Further details on the configuration and use of the ESERA ASCII text protocol can be found in the corresponding documentation and manuals provided for the ECO 531 Gateway.

The ESERA ASCII text protocol has the following properties:

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**Standard protocol**

The ESERA ASCII protocol is a common protocol for transferring data via serial interfaces between a computer and other devices such as the ECO gateway and a controller.

**ASCII character strings**

Data is transmitted in the ESERA ASCII protocol as ASCII character strings. These character strings consist of letters, numbers, punctuation marks and control characters.

**Division into fields or segments**

The transmitted data in the ESERA ASCII protocol is normally divided into specific fields or segments. This allows different types of data such as measured values, status messages or commands to be represented.

**Simplicity and ease of implementation**

The ESERA ASCII protocol is based on standardized ASCII characters and enables the transmission of data in plain text. It is relatively simple and easy to implement.

**Readability and comprehensibility**

When developing the ESERA ASCII text protocol, particular emphasis was placed on good readability and comprehensibility. It uses "GET" and "SET" commands that are already familiar to many programmers.

**Disclosed and documented**

The ESERA text protocol is openly documented and the current protocol description can be found in the programming manual and in the ESERA Config Tool 3.

**Standard port**

By default, port 5000 is preset for communication via the ESERA ASCII protocol.

The ESERA ASCII text protocol offers a simple and comprehensible way of exchanging data between the ECO 531 PRO gateway and other devices. It is particularly suitable for applications in measurement and control technology or industrial automation where simple and reliable data transmission is required.

### NOTE

**Up to 3 permanent connections** can be established **per port of the ECO 531** via the Modbus TCP protocol. This means that you can establish a total of up to 3 simultaneous connections via the Modbus/TCP protocol.

Furthermore, the **IP address of the ECO 531 is set to DHCP mode by default.**

This means that the device is automatically assigned an IP address by a DHCP server in your network. This IP address enables communication with the ECO 531 via the Modbus/TCP protocol.

Please note that the exact steps for navigating the website and downloading the manual may depend on the specific structure and layout of the website.

If you have difficulty finding the manual, I recommend that you use the search function on the website or contact ESERA technical support directly for further assistance.

The Modbus protocol uses specific addressing to access different data points. In the ECO 531 PRO programming manual, which is available in the download area, you will find an addressing overview to help you identify the correct addresses for reading and writing data. You can also use the Config Tool 3 software, which also contains an addressing overview.

It is important to note that the exact use and configuration of the Modbus protocol and the ECO 531 PRO may depend on your specific requirements and the devices you wish to communicate with.

It is recommended that you consult the detailed instructions and information in the ECO 531 PRO programming manual and documentation to ensure that you can implement the protocol correctly and achieve the desired functions.

### Addressing overview

The complete Modbus addressing overview can be found in the programming manual in the download area of the ECO 501 PRO and within the Config Tool 3 software.

#### Extract from Modbus address description

Description	Reading address	Number of words (16bit)	Data type
Gateway no.	60000	1	Word
Article no.	60001	1	Word
Firmware version	61000	5	String
Hardware version	61010	3	String
Serial number	61020	9	String
Time	61030	4	String
Date	61035	4	String
...			

1-Wire bus sensors and actuators			
<b>OWD 1, 1-wire module</b>	40100	1	Integer
	40101,40102	2	Dword 1
	40103,40104	2	Dword 2
	40105,40106	2	Dword 3
	40107,40108	2	Dword 4
	40109,40110	2	Dword 5
	40111,40112	2	Dword 6
	40113,40114	2	Dword 7
	40115,40116	2	Dword 8
<b>OWD 2, 1-wire module</b>	40200	1	Integer
	40201,40202	2	Dword 1
	40203,40204	2	Dword 2
	...		

## 27 MQTT PROTOCOL

MQTT (Message Queuing Telemetry Transport) is a protocol developed for the transmission of messages between devices in a network. It is particularly suitable for environments with poor or intermittent network connectivity, such as NB-Smart Building\* (4G data radio), as it requires very little network bandwidth and resources.

The publish-subscribe architecture of MQTT enables devices to publish messages on specific topics and to be received by other devices that are interested in these topics. The hierarchy of topics enables an organized structuring of messages.

A broker acts as an intermediary between the devices and forwards the messages. When a device publishes a message, it sends it to the broker, who forwards it to all subscribers who are interested in this topic.

MQTT is characterized by its efficiency, as it requires minimal overhead communication. Maintaining the connection between the devices is ensured by regular "heartbeat" messages that are sent to the broker.

It is important to note that a broker is always required to operate the MQTT protocol. The broker is responsible for managing the transmission of messages and enables communication between the devices.

For more information on MQTT and its implementation, I recommend the sources mentioned, such as Wikipedia, as well as the documentation and resources of the MQTT-BibISmart building counters or platforms you use.

### NOTE

To find out about the specific configuration options for the MQTT protocol of the ECO501 PRO, we recommend that you consult the "Interface manual" document. You can find this document on the website [www.esera.de](http://www.esera.de) in the download area/technical downloads.

The "Interface manual" should contain detailed information about the configuration options and settings for the MQTT protocol of the ECO501. It will help you to configure the ECO501 according to your requirements and to use the desired functions.

Please note that the exact steps to navigate the website and download the manual may depend on the specific structure and layout of the website. If you have difficulty finding the manual, I recommend that you use the website's search function or contact esera's technical support directly for further assistance.

## In conjunction with the ECO 531 gateway, MQTT offers the following advantages

### Efficient smart building communication

The ECO 531 gateway supports MQTT as a communication protocol to exchange data between the gateway and other devices. MQTT is known for its efficiency and low overhead, making it ideal for use in smart building environments with limited bandwidth and resources.

### Connection to MQTT brokers:

The ECO 531 Gateway can act as an MQTT client and connect to an MQTT broker. The MQTT broker serves as an intermediary that forwards the messages between the devices. These brokers can be hosted locally or in the cloud, depending on the requirements of your smart building application.

### Publish-Subscribe pattern

MQTT is based on the publish-subscribe pattern, where devices publish messages on specific topics and other devices that are interested in these topics can subscribe to these messages. This allows you to send data specifically to those devices that need it, which improves the efficiency and scalability of communication.

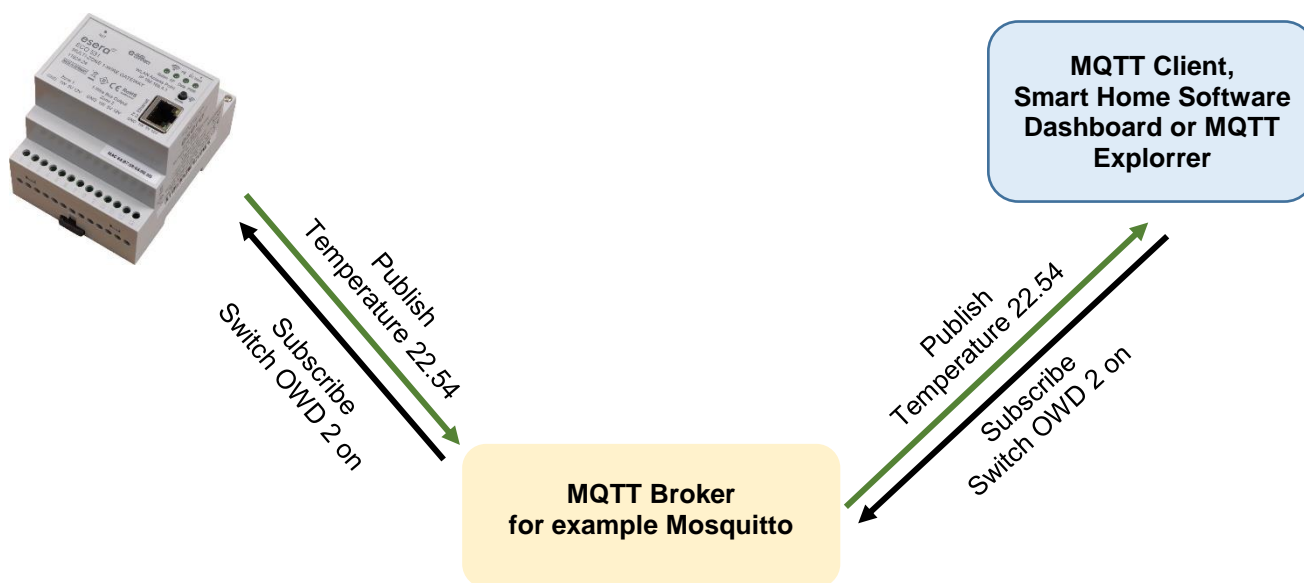
### Flexible configuration

The ECO 531 gateway enables the configuration of MQTT connections, including the setting of QoS (Quality of Service) levels, as mentioned above. You can customize the reliable delivery of messages, depending on the requirements of your application.

**Integration in smart home / smart building ecosystems**

MQTT is a widely used protocol in the smart building world and is supported by many smart building platforms and solutions. The ECO 531 gateway can be seamlessly integrated into existing smart building infrastructures and enables communication with other MQTT-enabled devices and platforms.

In summary, the ECO 531 Gateway in combination with MQTT offers an efficient, scalable and flexible way to transfer data in your smart building application. It enables seamless integration into existing smart building infrastructures and gives you the opportunity to benefit from the advantages of the MQTT protocol to connect your smart building devices and exchange data.



**28 YOUR PROTOCOL NOT INCLUDED?**

The ECO 531 PRO is extremely powerful thanks to the Maxi data interface used. We can also integrate other interface protocols on request. We would be happy to provide you with a quote for this. Contact us via the technical support, support@esera.de.

## 29 1-WIRE NETWORK

The special feature of the 1-Wire system is the "BUS technology". This means that all devices (sensors and actuators) are operated in parallel on a three-wire cable, 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 relevant for the 1-Wire bus.

The maximum size of a 1-wire network is determined by various factors.

All factors in total are summarized and designated as 1-wire bus load. Each increase in a factor increases the total bus load for the 1-wire gateway and thus reduces the maximum network size.

Based on our many years of experience and a lot of feedback from our customers, we would like to make the following conservative recommendation:

- Cable runs maximum 50 -120m
- Number of 1-Wire Devices no more than 20 -22 pieces
- Topology as linear as possible without T-junctions
- Number and design of cable connectors (avoid unnecessary connection transitions)
- Do not use "terminal blocks", as these contain too many connectors and are not suitable for the bus system. The distributor modules we offer are optimized for the bus

Topology plays a particularly important role. If possible, it should be installed in a linear topology. The linear topology can be compared to pearls on a string of pearls. The data line should be laid from one device to the next without T-junctions.

The type of cable used can also be specified here.

We recommend using CAT5 or CAT6 network cables for the cabling.

It is also possible to use J-Y(St)Y telephone cables and KNX cables.

Longer cable runs are possible with CAT5 compared to CAT7 cables.

A longer connection length can be achieved with twisted-pair cable 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 EMC-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 notes and tips and do not describe a product feature or represent a guaranteed product feature of the ECO 160.

Information on the basics and tips on the 1-Wire bus system can also be found in the ESERA online store at <https://www.esera.de/1-wire-grundlagen/>

### 30 FIRMWARE UPDATE

The latest device software (firmware) can be found in the download area of the Config Tool 3.

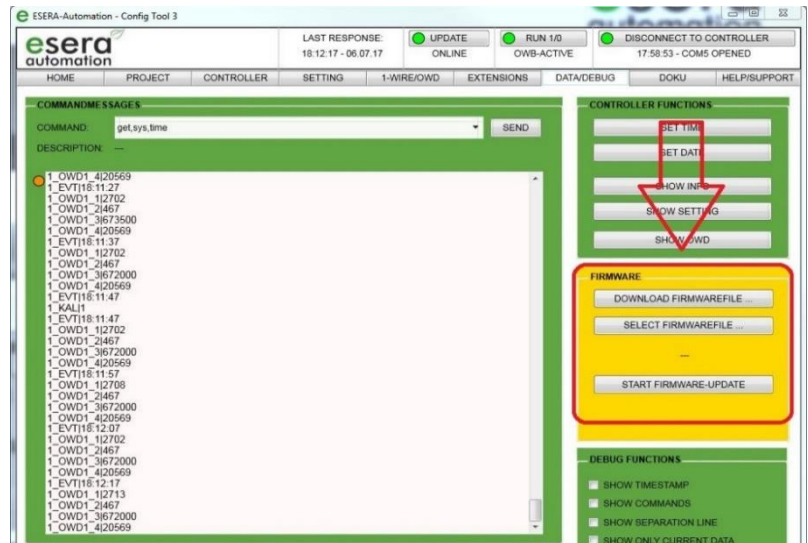
When commissioning the ECO 531 PRO, please check for a new firmware version. Please always use the latest version.

**You can update the firmware via the web server.**

**Alternatively, you can also carry out a firmware update using Config Tool 3. However, the update via web server is preferable.**

Please refer to the operating instructions for Config Tool 3, which can be found within Config Tool 3 under the "HELP/SUPPORT" tab.

You can find a video about the firmware update on our website under "Service and support, Support videos".



#### NOTE

Please also refer to the operating instructions for Config Tool 3, which can be found within Config Tool 3 under the "HELP/SUPPORT" tab.

You can also find a video about the firmware update on our website under "Service and support, Support videos".

### 31 RESTORE FUNCTION

If the update is faulty, e.g. due to a power failure during the update, you can use the restore function. To do this, press and hold the reset button (this is located under hole 5 on the top of the module), start the update in Config-Tool 3 and -release the reset button approx. 1 second after starting in ConfigTool -3. The update should now start.

If you have any problems with the installation, we will be happy to help you. Simply contact our support team by e-mail at support@esera.de

#### NOTE

After carrying out a firmware update, we recommend disconnecting the gateway from the power supply for approx. 30 seconds and restarting it.



### 32 RESET BUTTON

The restart, also known as RESET, is carried out using the RESET button on the system. The device is restarted by pressing the button. The permanently saved data is retained, but all connections are interrupted.

This button press does not correspond to an interruption (also known as a cold start) of the power supply.

### 33 OPERATING CONDITIONS

Only operate the device within the specified voltage limits and under the specified ambient conditions. Avoid operation outside these parameters, as this can lead to malfunctions or damage.

The appliance can be operated in any position, which means that it can be operated in various positions. However, make sure that the appliance is mounted in a stable position and that there is no risk of it falling or being damaged.

The device is intended for use in dry and dust-free rooms. Avoid operation in environments with high humidity or dust accumulation, as this can lead to damage or impaired functionality.

If condensation forms, wait at least 2 hours to give the device time to acclimatize before switching it on. Switching on the device in a damp environment can lead to short circuits or other electrical problems.

The assemblies should only be put into operation under the supervision of a qualified electrician. Qualified electricians are responsible for the correct installation and safe operation of electrical devices. Do not operate the module in an environment in which flammable gases, vapors or dusts are present or could be present. The presence of such substances can lead to potentially explosive situations.

These additional instructions are intended to ensure that the appliance is operated properly and safely and that potential risks and damage are avoided. Always follow the instructions and contact a qualified electrician if you have any questions or uncertainties.

### **34 ASSEMBLY**

The device can be installed in any position, which means that it can be installed in different positions depending on the requirements and conditions on site. In this case, there are no specific specifications or restrictions for the orientation or positioning of the device.

The installation location for the device must be protected from moisture and the device may only be used in dry indoor areas. It is specially designed as a stationary device for installation inside a switch cabinet. An enclosure offers additional protection against environmental influences such as moisture, dust or mechanical stress.

It is important to ensure that the enclosure provides the necessary protection and complies with the applicable regulations and standards. This includes, for example, the enclosure's degree of protection in accordance with the IP protection classes and compliance with the relevant electrical safety standards. The correct assembly and installation of the device within the control cabinet should be carried out in accordance with the applicable safety regulations and standards.

This ensures safe and reliable operation of the device and minimizes potential risks associated with moisture and other environmental influences.

### **35 DISPOSAL**

Electronic devices must not be disposed of with household waste. According to the WEEE Directive, electronic equipment must be disposed of via the designated local collection points for WEEE. The WEEE collection points are special facilities that ensure that electrical and electronic equipment is properly recycled and reused to minimize potential environmental impacts and recover valuable resources.



Please note that the exact collection points and procedures for disposing of electronic devices may vary from region to region.

Therefore, contact your local authorities, recycling centers or disposal companies to find out the correct procedure for disposing of electronic devices in your area. By disposing of electronic devices properly, you are contributing to environmental protection and the sustainable use of resources.

### **36 SAFETY INSTRUCTIONS**

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

Here are some of the relevant VDE regulations that should be observed when working with electrical voltage:

#### **VDE 0100**

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



**VDE 0550/0551**

These standards deal with the safety of electrical appliances for household and similar use. They include requirements for electrical household appliances such as hair dryers, irons, coffee machines, etc.

**VDE 0700**

This standard deals with the safety of electrical equipment in commercial, industrial and similar environments. It contains requirements for electrical machines, tools and other equipment used in such environments.

**VDE 0711**

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

**VDE 0860**

This standard deals with the safety of electronic devices for office applications, including computers, printers, monitors, etc.

It is important that professionals who work with electrical systems and devices know and follow the relevant VDE regulations in order to ensure the safety of people and property.

**Basic safety rules**

Observe the basic safety rules when working on electrical appliances.

- **All connection and wiring work may only be carried out when the system is de-energized.**  
It is a basic safety measure that all connection and wiring work on electrical systems and devices should only be carried out when the power is switched off.  
Never work on electrical appliances while they are live.
- Before starting work, check that the appliance is de-energized by pulling out the mains plug or switching off the power supply. - Never work on electrical appliances while they are live.
- Be particularly careful when handling high voltages and be aware of possible dangers.
- Before opening an appliance, always pull out the mains plug or ensure that the appliance is de-energized.
- Components, assemblies or devices may only be put into operation if they have been installed in an enclosure so that they are safe to touch. They must be de-energized during installation.
- Tools may only be used on devices, components or assemblies if it has been ensured that the devices are disconnected from the supply voltage and that electrical charges stored in the components in the device have been discharged beforehand.
- Live cables or lines to which the device, component or assembly is connected must always be checked for insulation faults or breaks.
- If a fault is detected in the supply line, the appliance must be taken out of operation immediately until the faulty line has been replaced.
- When using components or assemblies, strict compliance with the characteristic data for electrical variables specified in the associated description must always be ensured.
- If it is not clear to the non-commercial end user from an existing description which electrical characteristic values apply to a component or an assembly, how external wiring is to be carried out or which external components or additional devices may be connected and which connection values these external components may have, a qualified electrician must be consulted.
- Before commissioning a device, it must generally be checked whether this device or the module is fundamentally suitable for the application for which it is to be used.
- In case of doubt, it is essential to consult specialists, experts or the manufacturer of the assemblies used.
- We accept no liability for any damage resulting from operating and connection errors that are beyond our control.
- In the event of malfunction, kits should be returned without the housing with a precise description of the fault and the associated assembly instructions. Repair is not possible without a description of the fault. Time-consuming assembly or disassembly of housings will be charged additionally.
- The relevant VDE regulations must be observed during installation and when handling live parts.

- Devices that are operated at a voltage greater than 35 VDC/ 12 mA may only be connected and put into operation by qualified electricians.
- Commissioning may only be carried out if the circuit is installed in an enclosure so that it is safe to touch.
- If measurements with the housing open are unavoidable, a safety isolating transformer must be connected upstream for safety reasons or a suitable power supply unit must be used.
- After installation, the required inspection in accordance with DGUV regulation 3 must be carried out.
- After installing an electrical device, it is necessary to carry out a test in accordance with DGUV regulation 3 (formerly known as BGV A3). -

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

The test in accordance with DGUV regulation 3 includes checking the proper installation, functionality and safety of the electrical device.

The test should be carried out by a qualified electrician or an authorized testing service. The purpose of the test is to identify potential sources of danger, recognize defects and take appropriate measures to ensure electrical safety.

Testing in accordance with DGUV Regulation 3 should be repeated at regular intervals to ensure the continued safety of electrical systems and equipment.

Testing in accordance with DGUV Regulation 3 is required by law in many countries and serves to protect people and property from electrical hazards.

Also observe other national and local regulations and standards that may apply to your region.

### **37 WARRANTY**

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