VPU IoT AC II

VPU IOT AC II 3+1 300/50 2735900000

Surge Protection Device

Operating instructions

Weidmüller

Content

Manufacturer

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1 About this documentation

1.1 Target group

These operating instructions are intended for the operator of the product and for all persons handling the product during its life cycle.

1.2 Symbols and notes

The warnings contained in the documentation are divided into hazard categories.

⚠ DANGER!

Notes with the signal word **"DANGER"** warn you of situations which will result in serious injury or death if you do not observe the specified instructions.

⚠ WARNING!

Notes with the signal word **"WARNING"** warn you of situations which may result in serious injury or death if you do not observe the specified instructions.

⚠ CAUTION!

Notes with the signal word **"CAUTION"** warn you of situations which may result in injury if you do not observe the specified instructions.

NOTICE!

Notes with the signal word "**NOTICE**" warn you of a danger which may result in material damage or malfunctions of the product if it is not avoided.

The situation-dependent warnings may contain the following warning symbols:

Symbol	Meaning
	Warning of dangerous electrical voltage
	Warning of electrostatically charged components
	Qualified electrician necessary
	Notes on the documentation

Additional formatting is used in the rest of the text which has the following meaning:

Sections of text next to this arrow contain information which is not related to safety, but which provides important information regarding correct and effective work.

► All instructions can be identified by the black triangle next to the text.
– Lists are indicated with dashes.

► Store the instructions such that they are available at all times. Do not store the instructions in the product enclosure.
The document is available to download from the Weidmüller website.
► Also refer to the inverter manufacturer's documentation.

2 Safety

⚠ DANGER!

Risk of electric shock!

Live parts carry high voltage during operation.

- ► The device has to be covered under the installation hood before pressing the operation button for commissioning.
- ► Only switch on and use the device when all conductors are connected and all arresters are mounted in the socket.
- ► Do not use the device near explosive gases, vapours or in a humid environment.
- ► Do not use damaged product.
- ► Do not insert any foreign objects into the contact sockets of the device.

NOTICE!

Risk of material damage!

- ► Only use the device for its intended purpose.
- ► The device must not be used if it is damaged or other defects have been identified.
- ► The device must not be opened, modified or converted.
- ► Use only the specified spare parts and accessories.
- ► Use only the supplied test leads.
- ► Use the test leads only together with the supplied test adapter.

2.1 Intended use

The VPU IoT AC II is a type II surge protection device (SPD). The device is used for protecting low-voltage consumer installations and electrical or electronic devices from the surge voltages which occur from atmospheric discharges (lightning) or from switching operations (transients).
The device detects overcurrent events as well as earthing faults in the plant. The device can be connected to a cloud via IoT.
The device must be mounted in an IP20 cabinet that is accessible by authorised personnel only.

2.2 Personnel

Only qualified electricians may carry out the installation, the initial commissioning, the reset and troubleshooting. Configuration can also be done by trained users

3 Transport and unpacking

- ► Transport the device to its destination in its original packaging.
- ► Observe the instructions regarding handling, moisture, shock, tilt and temperature indicators on the packaging.
- ► Observe the humidity specifications and the temperature range specified for transport.
- ► Protect the surfaces as necessary to prevent damage.
- ► When transporting the equipment or storing it temporarily, make sure that the surfaces are protected from the elements and any external influences, and that they are kept dry and clean.

3.1 Unpacking the product

- ► Unpack the product and the instruction sheet.
- ► Never install a damaged or otherwise defective surge protection device.

4 Device description

The VPU IoT AC II is a surge protection device (SPD) that detects overcurrent events as well as earthing faults in the plant. The device can be connected to a cloud enabling digital services. The current device status can be transferred and monitored via internet.

The measured data and detected events are transmitted and permanently stored in the cloud. The current device status is visualised and enables predictive maintenance activities like replacement in time. The device status can be:

– SPD fully functional
– SPD still functional
– SPD replacement recommended
– SPD defective, replacement necessary

The detection of transient overvoltages is very sensitive, so that even the smallest events can be detected. Conclusions about the power quality in a TN-S or TT system can be drawn from the number and frequency of events.

For the internet connection a Wi-Fi network is required with reliable connection quality during the whole life cycle of the device. The Wi-Fi network must provide internet access for the device to deploy a public cloud endpoint.

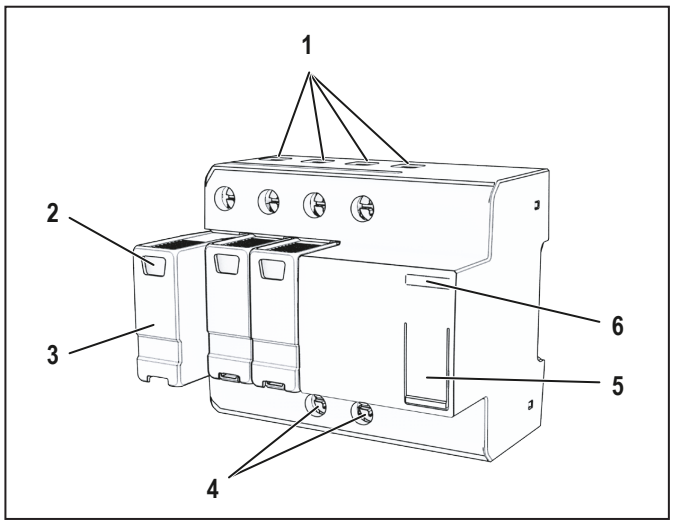


Figure 4.1 Device description

1 Clamping points for L1, L2, L3 and neutral
2 Status window
3 Arrester
4 PE clamping points
5 Operation button
6 LED

4.1 Operating modes

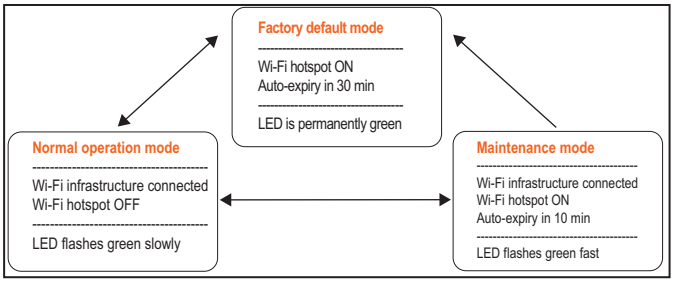


Figure 4.2 Operating modes

LED indicators

Priority	Type	Duration	LED status		
			Factory default	Normal operation	Temporary hotspot
0	Search	Instant	Green, fast flashing		
1	SPD fault	Long	Red, permanent		
2	Leakage	Long	Red, permanent		
3	Earth fault[1]	Long	x	Red, permanent	
4	TOV	Long	x	Green, fast flashing	
5	Phase loss[2]	Long	Red, permanent		
6	Wi-Fi loss	Long	x	Red, fast flashing	

1 Manually triggered
2 See Chapter 7.1

Factory default

– LED flashes green fast for 3 seconds. If the Wi-Fi hotspot is on, the LED lights permanently green
– change of the default values via user interface

Normal operation

– LED flashes green slowly

Temporary hotspot (Maintenance)

– LED flashes green fast
– for the initial device setup
– for the change of essential configuration
– the current IP can be read out via user interface with DHCP

4.2 Technical data

	VPU IoT AC II	
	N-PE	L-N
Type	**305 V**	**300 V**
Grid (U_n) @ 50...60 Hz	230 V N-PE spark gap	230/400 V TN, TT
Voltage regulation	±10 %	±10 %
U_n	0 V	240 V
I_n / I_{max} (8/20 µs)	40/65 kA	20/50 kA
I_{PE}	1 µA	0.33 mA
II_{fi}	–	100 Arms
I_{SCCR}	–	25/50 kA
U_p @ I_n	≤ 1500 V	≤ 1500 V
U_c	305 V	300 V
Wire cross-section min.	2.5 mm² (AWG14) 2.5 mm² (AWG14) 2.5 mm² (AWG14) l = 18 mm / 2...3 Nm	
Wire cross-section max.	2.5 mm² (AWG2) 2.5 mm² (AWG2) l = 18 mm / 2...3 Nm	
Ambient temperature	-40...+85 °C	
Storage temperature	-40...+85 °C	
Relative humidity (non-condensation)	5...95 %	
Altitude	4000 m	
Degree of protection	IP20, built-in	
Height x Width x Depth	90 x 108 x 68 mm (one port SPD)	
Approvals / applied standards / directives	CE, IEC/EN 61643-11	

Communication settings		
Maintenance interface	IEEE 802.11 b/g/n Access Point	
	Frequency band	2.4 GHz
	Encryption	WPA/WPA2
	SSID	VPU_AC_IOT_ xxxxxxxxxxx (full MAC address)
	Password	Detmold01
	Temporary access (default 10 min)	
	Limited to a single STA	
Wi-Fi interface	IEEE 802.11 b/g/n STA	
	Frequency band	2.4 GHz
	Encryption	WPA/WPA2
Operating systems supported	Windows 10 Android 8 or later iOS 13 or later	

5 Mounting and electrical installation

5.1 Mounting

See instruction sheet in the packaging box.

5.2 Electrical installation

The installation must be carried out by a qualified electrician in accordance with the information in the instruction sheet and the local conditions and standards.
If the product is damaged, do not install and use the product.

► Carry out the wiring according to the intended application (see instruction sheet).

If the product has already been installed elsewhere and is now being reused, follow the instructions to restore the device to its factory defaults, see Chapter 6.3.
The LED indicator on the device lights permanently green if installed correctly.

6 Setup

6.1 Startup

Prerequisites:
– The power supply must be switched on. The LED lights permanently green.
– For the setup you need a Wi-Fi capable device and a supported browser, see Chapter 4.2.

The startup procedure includes the following steps:
– initial commissioning
– configuration

6.2 Initial commissioning

The commissioning must be carried out by a qualified electrician.

► Create a temporary hotspot by pressing the operation button 5 times briefly.
The LED flashes green for 3 seconds.
The temporary hotspot mode is now activated for a period of 10 minutes. After this time the hotspot mode is automatically switched off.

► Connect to the hotspot of the device via a Wi-Fi capable device, e.g. tablet.

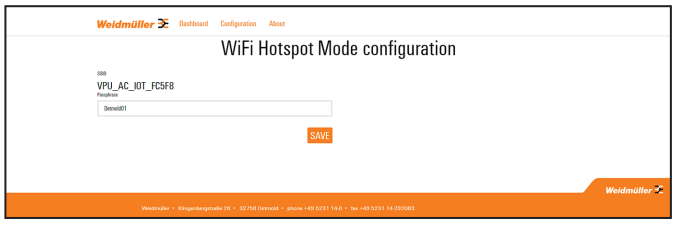


Figure 6.1 Using a Wi-Fi hotspot

The unit's SSID is displayed as VPU_AC_IOT_ xxxxxxxxxxxx (x = full MAC address). The default password is **Detmold01**.

If the SSID of the unit is not visible, the temporary hotspot mode has expired.
► Reactivate the temporary hotspot mode as described above.

► Check the voltage level, the leakage current and the status of the arresters.

6.3 Configuration

The configuration is done via user interface. A change of Wi-Fi and connection settings is only possible in temporary hotspot mode. By clicking **Configuration** the following settings can be edited:
– Wi-Fi
– Modbus connection
– cloud connection (Cloud)
– device description (Description)
– user password (Change Password)
– factory reset
Changes have to be confirmed by clicking the **SAVE** button.

Configuring the Wi-Fi

Prerequisite:
You must be able to access the device via IP address in his wireless network.

► Open the browser and enter the DNS-name **wmvpu.net** or enter the IP address **172.22.87.77**.
► Click **Configuration**.
► Click **Connectivity**, **WiFi**.
► Enter the user name and the password.

The default user name is **admin** and the default password is **SmartSPD**.

The password must be changed upon first login.

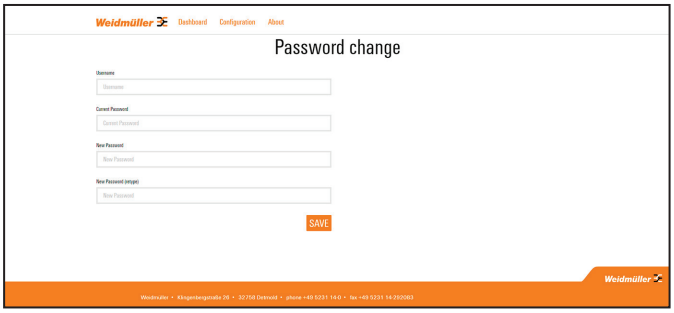


Figure 6.2 Changing the password

► Connect to the access point of the user's wireless network.
► Click **Enabled**.
► Click **CHECK CONNECTIVITY**.

A Wi-Fi test is performed.

Figure 6.3 Connecting to the Wi-Fi

After the Wi-Fi test you can proceed with further configuration. It is also possible to set a static IP address.

Services list applicable to Wi-Fi interface

Service	Protocol	Port	Traffic
DHCP	UDP	67	Outbound
DHCP	UDP	68	Inbound
DNS	UDP	53	Outbound
DNS	TCP	53	Outbound
HTTP	TCP	80	Inbound
HTTPS	TCP	443	Outbound
MODBUS TCP	TCP	502	Inbound
NTP	UDP	123	Outbound
PING	ICMP	N/A	Inbound

Configuring the connection via Modbus

► Load the website of the device.
► Select the **Modbus** interface.

Configuring the cloud

► Create a cloud account (WM Cloud or third party cloud).
► Add the device.

The cloud generates communication parameters.

Connecting to the cloud

Prerequisite:
– You have created a cloud account.

► Load the website of the device.
► Click **Connectivity**, **Cloud**.
► Select the **Azure IoT** interface.

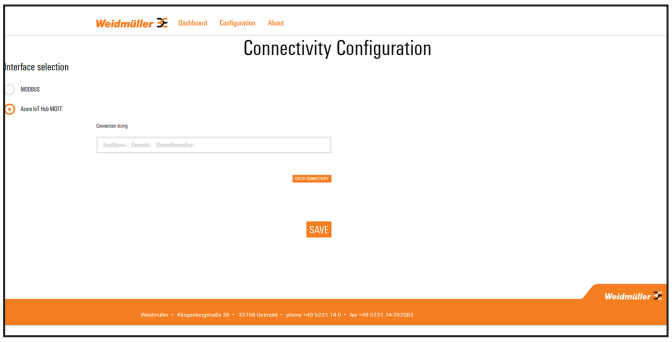


Figure 6.4 Connecting to the cloud

► Enter the connection string.

The device will confirm the communication with the cloud.

Configuring the device description

► Click **Description**.

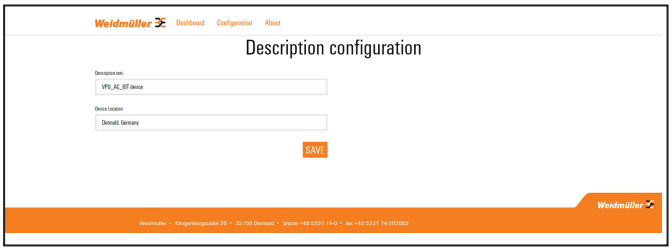


Figure 6.5 Description configuration

► Enter a text as a device description.
► Enter the device location.

Changing the password

► Click **Change Password**.
► Enter the current password.
► Enter the new password and retype it.

Resetting to factory defaults

In case of changing the application it may be necessary to reset a device.

For security reasons it is recommended to reset a device before it is replaced.

The reset to factory defaults must be carried out by a qualified electrician.

Resetting via software

► Load the website of the device.
► Open **Reset configuration to factory defaults**.
► Enter the user name and the password.
► Click the **RESET** button.

Figure 6.6 Resetting to factory defaults

Resetting via button on the device

► Press the **RESET** button on the device for 10 seconds.

6.4 Performing a firmware update

► Check the Weidmüller website for recent updates.
► Download the current firmware, including the README file.
► Perform the actions described in the README file.

6.5 Network and security configuration settings

The following settings are recommendations according to IEC 62443-4-2.

Item	Section	Configuration settings	Recommendation	Event	Comment
1	Operator account	Operator password	Strong password	No event	Use a strong password with letters, digits and symbols. The password should consist of at least 8 characters.
2	Wi-Fi STA / Infrastructure	SSID			With a button the connection can be validated.
3		Password			With a button the connection can be validated.
4		Enable DHCP	Enabled	Not enabled	Most Wi-Fi networks use DHCP for IP assignment and other network configuration parameters. It is recommended to use DHCP if available.
5		IP address	Unique IP address inside the Wi-Fi network subnet	Invalid IP address such as for broadcast, reservered for localhost, subnet address, public address (derive from gateway) or equal to the gateway IP address	Please use a unique IP address inside the Wi-Fi subnetwork. Note: Should be disabled in case DHCP is used.
6		Netmask Default value: 255.255.255.0	Valid netmask	Mask pattern begins not with 8 - 30 "1"s and is followed by "0"s.	The netmask is not recommended. Most private IP networks use netmasks, e.g. 255.255.255.0. Note: Should be disabled in case DHCP is used.
7		Gateway	Valid IP address		Please use a Gateway IP address inside the Wi-Fi subnetwork. Typically the gateway has the first valid IP address of the subnetwork, e.g. with a netmask of 255.255.255.0 it could be 192.168.1.1. Note: Should be disabled in case DHCP is used.
8		Enable automatic DNS server			It is recommended to obtain the DNS server IP addresses automatically via DHCP Note: Should be deactivated in case DHCP is not used.
9		DNS server 1	On-premise IP address of different subnetwork	IP address in subnetwork or always	Typically the DNS IP address is a IP address which is not in the same subnetwork but still on-premise. Note: Should be disabled in case automatic DNS is used (Pos. 8)
10		DNS Server 2	On-premise IP address of different subnetwork	IP address in subnetwork or always	Typically the DNS IP address is a IP address which is not in the same subnetwork but still on-premise. Note: Should be disabled in case automatic DNS is used (Pos. 8).
11		NTP server (IP/ domain)	On-premise IP address of different subnetwork	IP address in subnetwork or always	Typically the NTP IP address is a IP address which is not in the same subnetwork but still on-premise.
12	Cloud connection	is enabled			
13		Connection string		No	Please do not store the connection string permanently somewhere else in order to reduce the chance of misuse.
13	Modbus TCP	is enabled			See MODBUS registers map

6.6 MODBUS registers map

Address	Item
0xA000	Last PE measurement timestamp (high part, uint16)
0xA001	Last PE measurement timestamp (low part, uint16)
0xA002	Last PE measurement result (0 or 1; 0=error)
0xA010	Last Surge event timestamp (high part, uint16)
0xA011	Last Surge event timestamp (low part, uint16)
0xA012	Surge events counter (uint16)
0xA013	Last Surge severity (0 or 1; 0=surge during PE error, 1=surge during proper PE)
0xA020	Last SPD status change event timestamp (high part, uint16)
0xA021	Last SPD status change event timestamp (low part, uint16)
0xA022	Latest SPD status (0 or 1; 0=error)
0xA030	Last Leakage measurement timestamp (high part, uint16)
0xA031	Last Leakage measurement timestamp (low part, uint16)
0xA032	Latest Leakage value (uint16; unit is 0.1mA -> value 45 represents 4.5 mA)
0xA033	Latest Leakage status (0 or 1; 0=error)
0xA040	Last Voltages measurement timestamp (high part, uint16)
0xA041	Last Voltages measurement timestamp (low part, uint16)
0xA042	Latest Phase 1 Voltage (uint16; unit is 0.1 V -> value 2405 represents 240.5 V)
0xA043	Latest Phase 2 Voltage (uint16; unit is 0.1 V -> value 2413 represents 241.3 V)
0xA044	Latest Phase 3 Voltage (uint16; unit is 0.1 V -> value 2405 represents 240.5 V)
0xA050	Last Phase 1 TOV event timestamp (high part, uint16)
0xA051	Last Phase 1 TOV event timestamp (low part, uint16)
0xA052	Phase 1 TOV events counter (uint16)
0xA053	Current Phase 1 TOV status (0 or 1; 0=ongoing TOV)
0xA054	Last Phase 2 TOV event timestamp (high part, uint16)
0xA055	Last Phase 2 TOV event timestamp (low part, uint16)
0xA056	Phase 2 TOV events counter (uint16)
0xA057	Current Phase 2 TOV status (0 or 1; 0=ongoing TOV)
0xA058	Last Phase 3 TOV event timestamp (high part, uint16)
0xA059	Last Phase 3 TOV event timestamp (low part, uint16)
0xA05A	Phase 3 TOV events counter (uint16)
0xA05B	Current Phase 3 TOV status (0 or 1; 0=ongoing TOV)

7 Operating the device

During normal operation, the device is sending periodic or triggered process data as well as connection information (RSSI, latency).

7.1 Dashboard

The dashboard is displayed every time the device is accessed via IP address. In the dashboard you can find a summary of the following monitored values:

– SPD Status
– Leakage
– Last Surge timestamp
– Grounding
– Phase 1 Voltage level or Phase loss
– Phase 1 Last TOV timestamp
– Phase 2 Voltage level or Phase loss
– Phase 2 Last TOV timestamp
– Phase 3 Voltage level or Phase loss
– Phase 3 Last TOV timestamp

Phase loss: Limit value of 190 V is reached
Phase loss alarm: 190 V for > 5 s

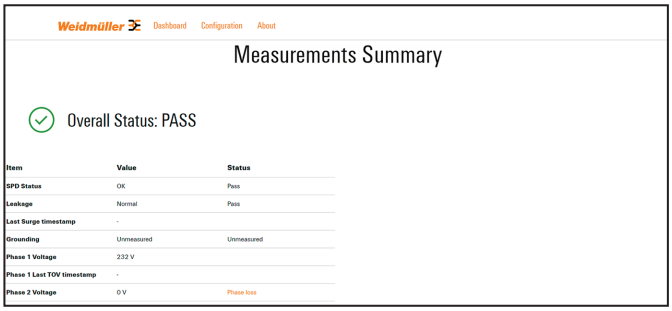
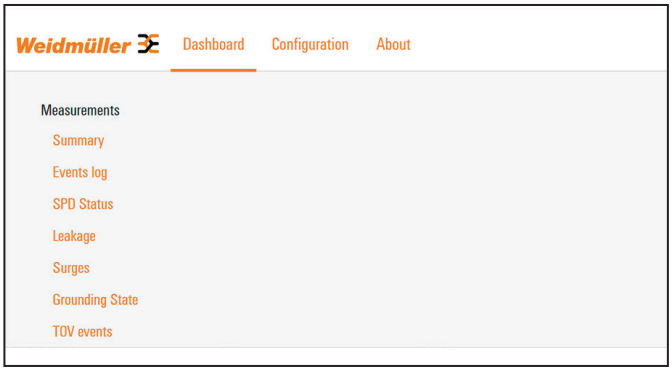


Figure 7.1 Measurements summary

► Click **Dashboard** and select the menu item you want to open:



Events log

In the **Events log** view, a table with the latest events, including a description and a timestamp, is displayed.

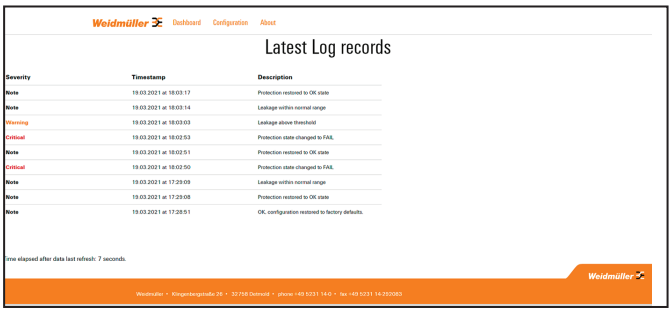


Figure 7.2 Latest log records

SPD status

In the **SPD Status** view, the operating status is displayed: Pass or Fail.

Figure 7.3 SPD status

Leakage current monitoring

The leakage current is an indicator of the ageing of the arresters. Lightning or overvoltages from the application will accelerate the ageing process.
In the **Leakage** view, the leakage current status is displayed:
Pass or Warning.

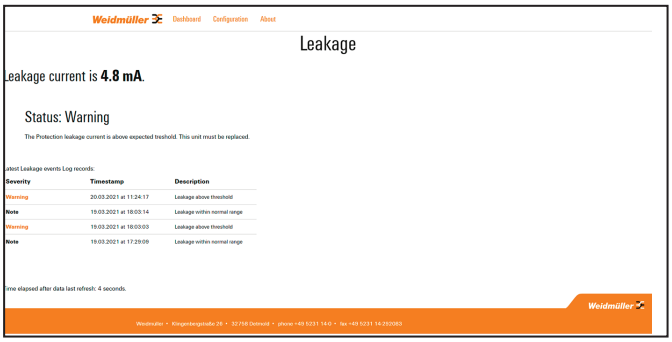


Figure 7.4 Leakage current monitoring

Surge history

In the **Surge** view, the number of surges with timestamp is displayed.

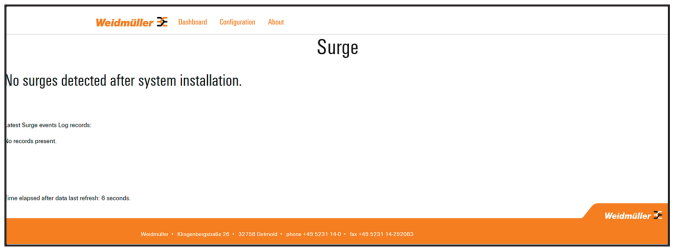


Figure 7.5 Surge history and monitoring

Grounding state

An SPD requires a proper earthing connection.
In case of an overvoltage, the device is discharged via the earth conductor.
In the **Grounding state** view, the earthing status is displayed.

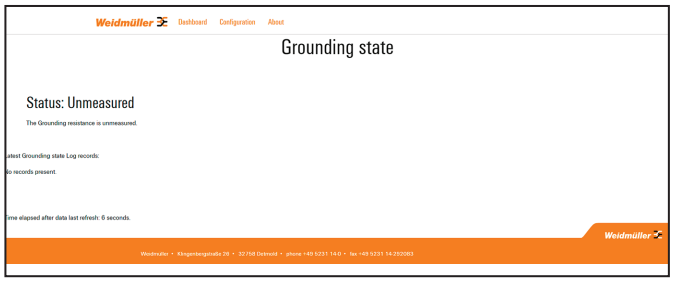


Figure 7.6 Grounding state monitoring

Earth loop impedance alarm

TT System limit value: 10 Ohm
TN-S System limit value: 1 Ohm
Earth loop impedance monitoring should be enabled only if the device is installed before a residual current device (RCD), since the function causes the RCD to trip.

► If you want to enable earth loop impedance monitoring, enter the following command in the address bar of your browser: **https://172.22.87.77/eli_trigger.html**

All messages are time-stamped and stored in the cloud.

TOV monitoring

Arresters must be able to withstand persistent voltage increases with mains frequency. These temporary overvoltages (TOVs) can occur by various error states inside and outside the low voltage consumer facility of a building.
In the **TOV events** view, the TOVs are displayed.
Temporary overvoltage alarm: 264 V for > 5 s

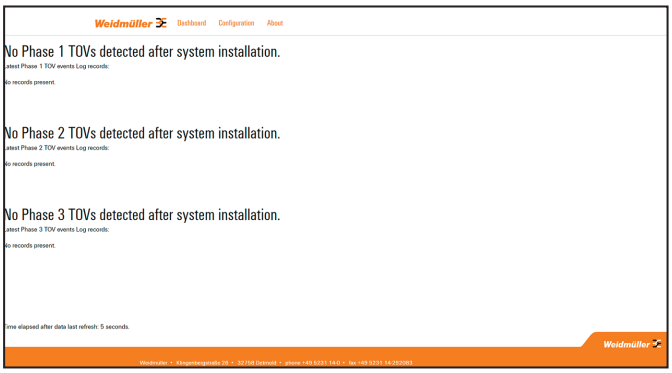


Figure 7.7 TOV monitoring

7.2 Getting information about the device

► On the starting page, click **About**.

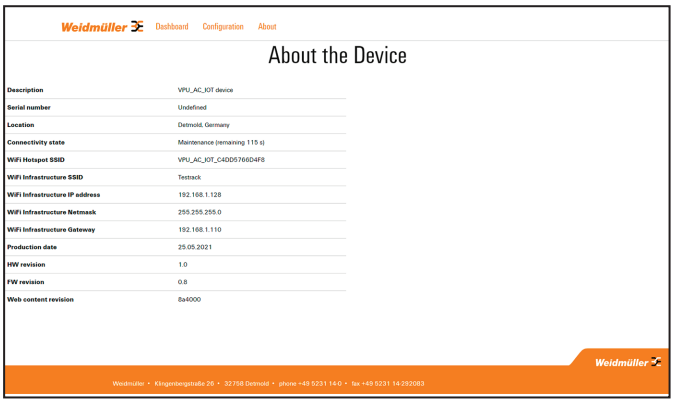


Figure 7.8 About the device

8 Troubleshooting and spare parts

8.1 Troubleshooting

Fault	Possible cause	Remedy	See chapter
An error message is sent via user interface. Device is shown as offline	No cloud connection	► Reconnect. The synchronisation of missed last data begins.	6.3
LED flashes red, signalisation also via captive portal	No Wi-Fi connection	► Reconnect. The synchronisation of missed last data begins. ► Switch off and on the device.	6.3
LED lights permanently red	The device is not properly installed.	► Check the installation.	5.2
	The arresters are not in order.	► Check the correct fit of the arresters and the locking mechanism.	5.2
Device is out of order	The device has no power supply or the device is broken.	► Check the power supply. ► Reset and replace the device.	
A leakage current warning is sent via user interface or the status window of the arrester is red.	The arrester is at the end of the operating lifetime.	► Replace the arrester, see instruction sheet.	

8.2 Spare parts

Product	Order No.
Arrester	2810460000
Screwdriver SDIK SLIM PH 1 X 80	2749650000

9 Disposal

Products marked with this symbol are subject to Directive 2012/19/EU: Collection and recycling of electrical and electronic equipment (WEEE). These products contain substances that may be harmful to the environment and human health. They also contain substances that can be reused through targeted recycling.

► Observe the notes for proper disposal of the product. You can find the notes here: www.weidmueller.com/disposal.