

# PE Smart Mini Gateway *Neptune Generation* GWWG001 Series

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## Installation Manual

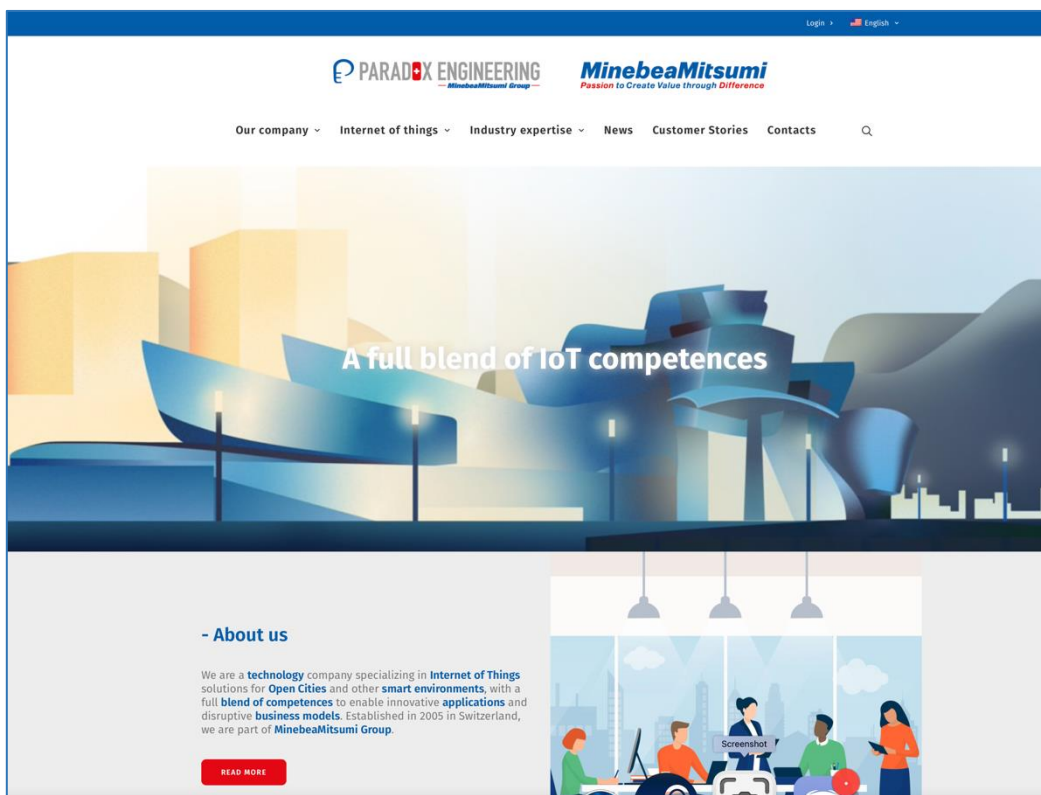




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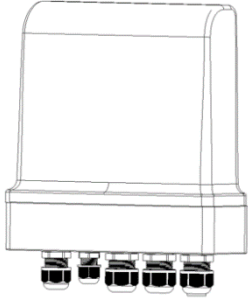


## 1. List of Acronyms

<b>Acronym</b>	<b>Description</b>
AES	Advanced Encryption Standard
CMS	Central Management System
eSIM	Embedded SIM
EUICC	Embedded Universal Integrated Circuit Card
GFSK	Gaussian Frequency Shift Key
GPS	Global Positioning System
HDLC	High-Level Data Link Control
IPv6/6LoWPAN	IPv6 over Low-Power Wireless Personal Area Networks
LED	Light Emitting Diode
LTE	Long Term Evolution
LWM2M	Lightweight Machine to Machine
MCU	Microcontroller Unit
NA	Not Applicable
NFC	Near Field Communication
OTA	Over-the-Air
PoE	Power Over Ethernet
RTC	Real Time Clock

# PE Smart Mini Gateway

## 2. Content List

Table 1 – Box Contents



Part Number	Description	Qty	Figure
GWWG001	PE Smart Mini Gateway	1	
Mounting brackets	Brackets used to mount the device on a wall or pole	1	
DOC-INS-0115	Installation Manual (this document)	1	



## 3. Warnings for Installers and Users

The following instructions provide important precautions to safely install, use and maintain the product. Please read and follow them carefully before operating the unit: failure to comply may compromise people safety and/or damage the device, with serious consequences depending on circumstances.



**Table 2 – Symbols Used in this Document**

Symbol	Description
	Warning: failure to follow these instructions properly may result in personal injury and/or product damage, which may be serious depending on the circumstances
	Important notice: be sure to follow the instructions

**Table 3 – Warnings**







**List of warnings**

The equipment is intended for installation, service and repair by trained and skilled personnel only (no operator access)	
Install the product in accordance with the instructions provided in this installation manual	
The manufacturer shall not be held liable for errors or damages due to wrong mounting operations	
The product is intended to be used even in countries having IT type electricity supply systems	
This equipment is intended to be used with elevations up to 2000 m	
The product and the various units comprising the installation must only be used for the purpose for which they are intended. Any other use is considered improper and dangerous	
Unpack the product and check possible damages before installing and operating it	
Electrical work and installation must be performed in accordance with relevant local and national regulations, following the instructions provided in this installation manual.	
Before connecting the product, make sure that product voltage ratings correspond to the mains power supply voltage	
Ensure that an appropriate disconnect device shall be incorporated in the electrical installation of the building.	
Cover all unused connectors with the provided plugs to safeguard product IP rating	

## PE Smart Mini Gateway

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Before cleaning or servicing the product, disconnect it from the mains power	
A power supply cord with a minimum conductor section 0.75 mm <sup>2</sup> (AWG-18) suitable for outdoor use and compliant with relevant local and national regulations shall be used	
In the final installation, an external 20 A (US market) or a 16 A (EU market) magneto-thermal switch must be installed as means of short-circuit backup protection. Consult local and national regulation for installation.	
Dispose of packaging or product must be in compliance with applicable local and national waste disposal regulation	
Keep this document for future use and reference	

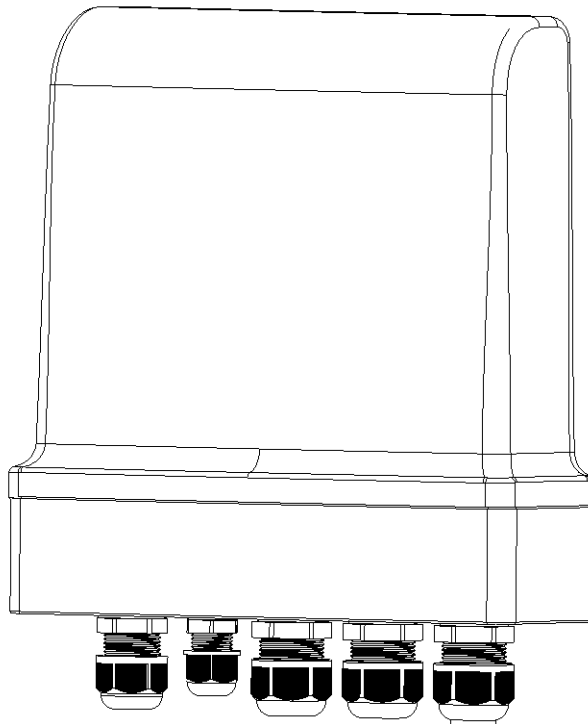


### 4. Product Description

The PE Smart Mini Gateway is a key hardware element of Paradox Engineering's PE Smart Urban Network platform for urban environments.

The PE Smart Mini Gateway natively manages Wireless and Wireless Highspeed integrated network technologies. It allows city managers to set up smart urban infrastructures supporting both wireless sensor-based applications (such as smart street lighting, smart parking, smart metering, smart environmental sensing, etc.) as well as data hungry applications such as traffic video surveillance, emergency-response systems, and various other use cases.

The PE Smart Mini Gateway operates as border router, connecting each physical object of PE Smart Urban Network to the Internet or Local Area Network with an addressing system to uniquely identify single devices and to adapt different communication layers. The PE Smart Mini Gateway is depicted in Figure 1, below.



*Figure 1: The PE Smart Mini Gateway*

The PE Smart Mini Gateway also acts as coordinator and data concentrator of the PE Smart Urban Network. It serves as central collecting point for data generated by PE Smart Nodes, leveraging 6LoWPAN protocol (with IPv6 addressing) for radio communications. It coordinates all PE Smart Nodes within the narrowband network, synchronizing them and routing data coming from field devices to PE Smart CMS (Central Management System). Furthermore, it forwards any commands generated by the PE Smart CMS to any and all PE Smart Nodes.

An example of network scheme is pictured in Figure 2.

# PE Smart Mini Gateway

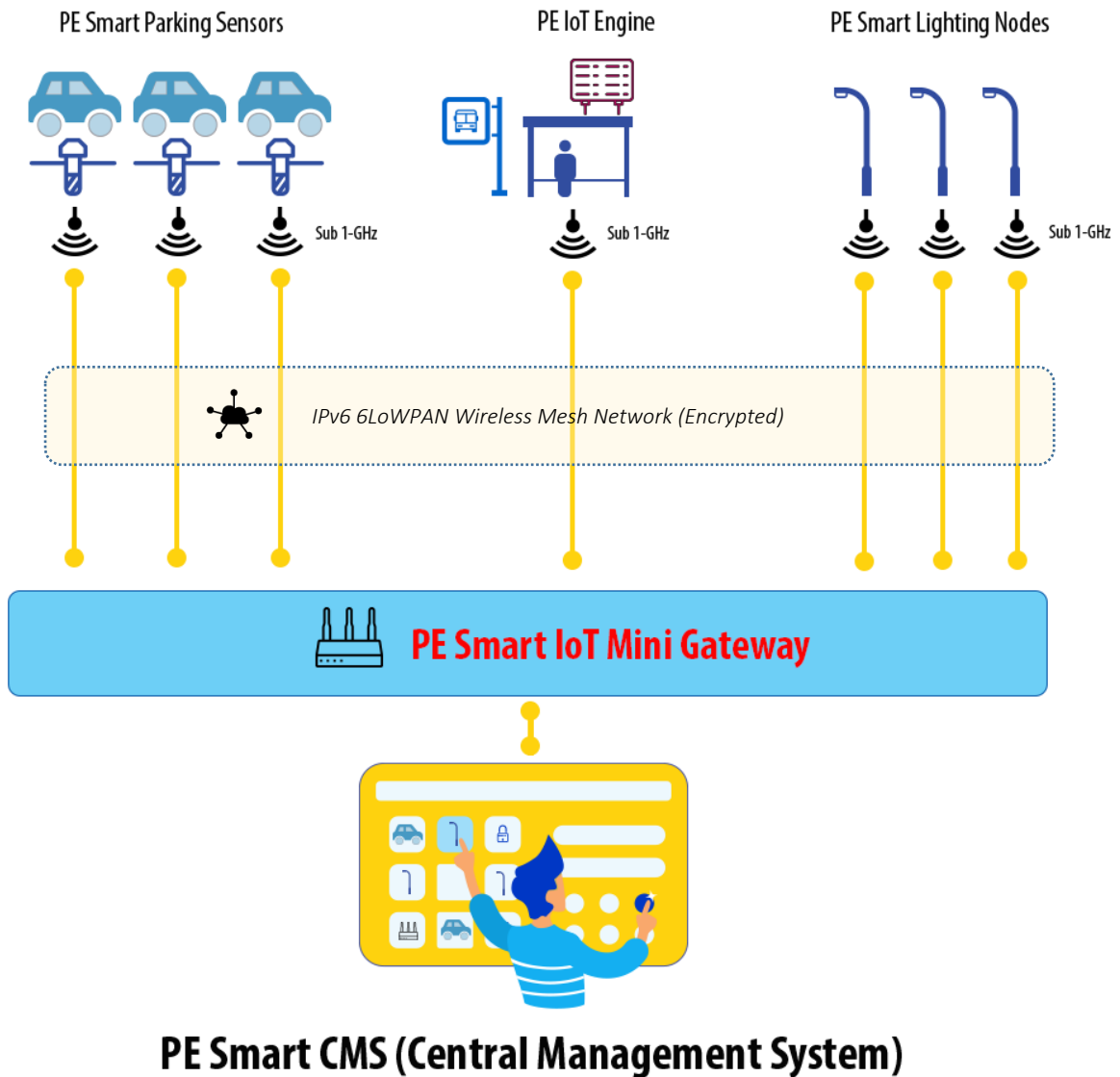
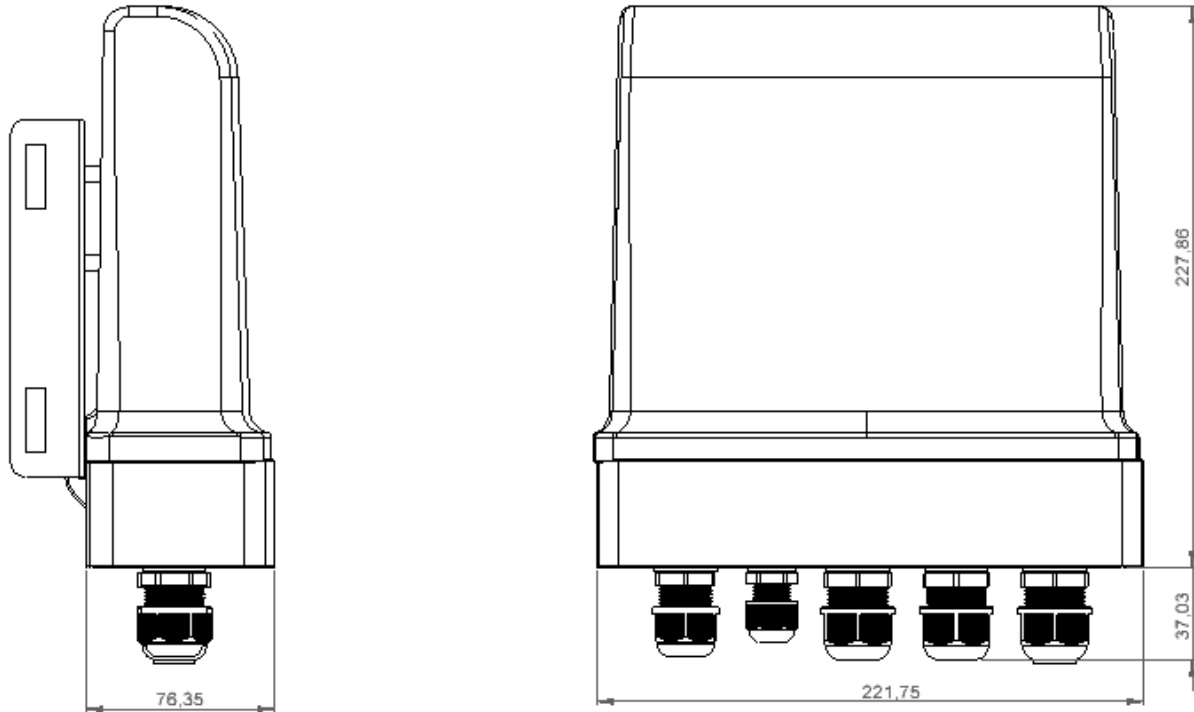


Figure 2: The PE Smart Mini Gateway and Other PE Technologies Operating in a Smart City Application

## 5. Installation Instructions

### 5.1 Dimensions

Mechanical dimensions of PE Smart Mini Gateway are pictured in Figure 3.



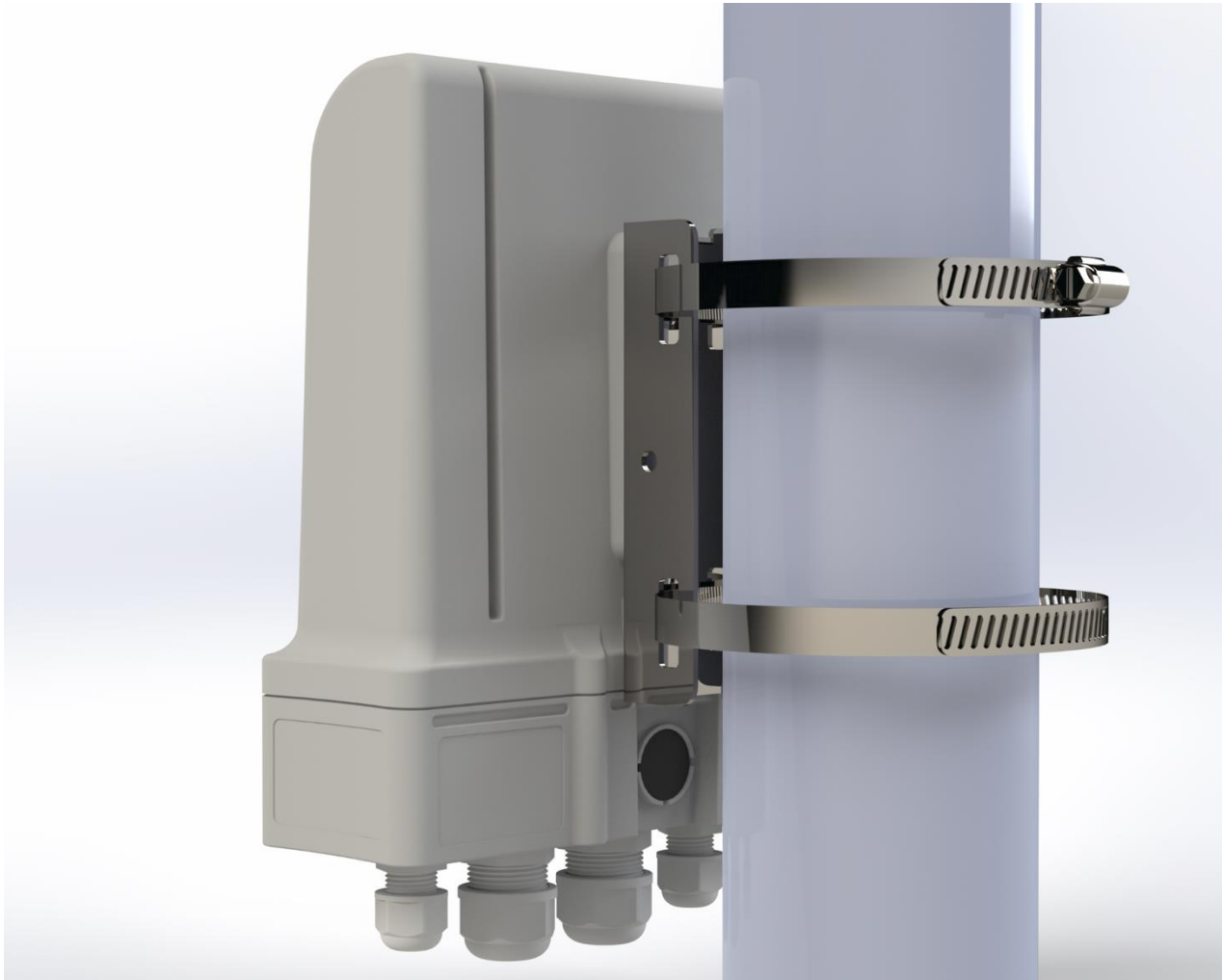
*Figure 3. Dimensions of the PE Smart Mini Gateway*

# PE Smart Mini Gateway

## 5.2 Mounting

### 5.2.1 Standard Mounting Brackets

The PE Smart Mini Gateway can be mounted on a flat surface or a pole (using the included mounting brackets). Figure 4 pictures a typical installation. Note that the device can be mounted on poles with different diameters.



*Figure 4. The PE Smart Mini Gateway Mounted on a Pole*

## PE Smart Mini Gateway

### 5.3 Wiring, Connectors, and SIM Slot

Remove the bottom cover of the device to reveal the power connector, Ethernet ports, USB port, and other connectors. See Figure 5 for a reference to all the connectors of the PE Smart Mini Gateway.

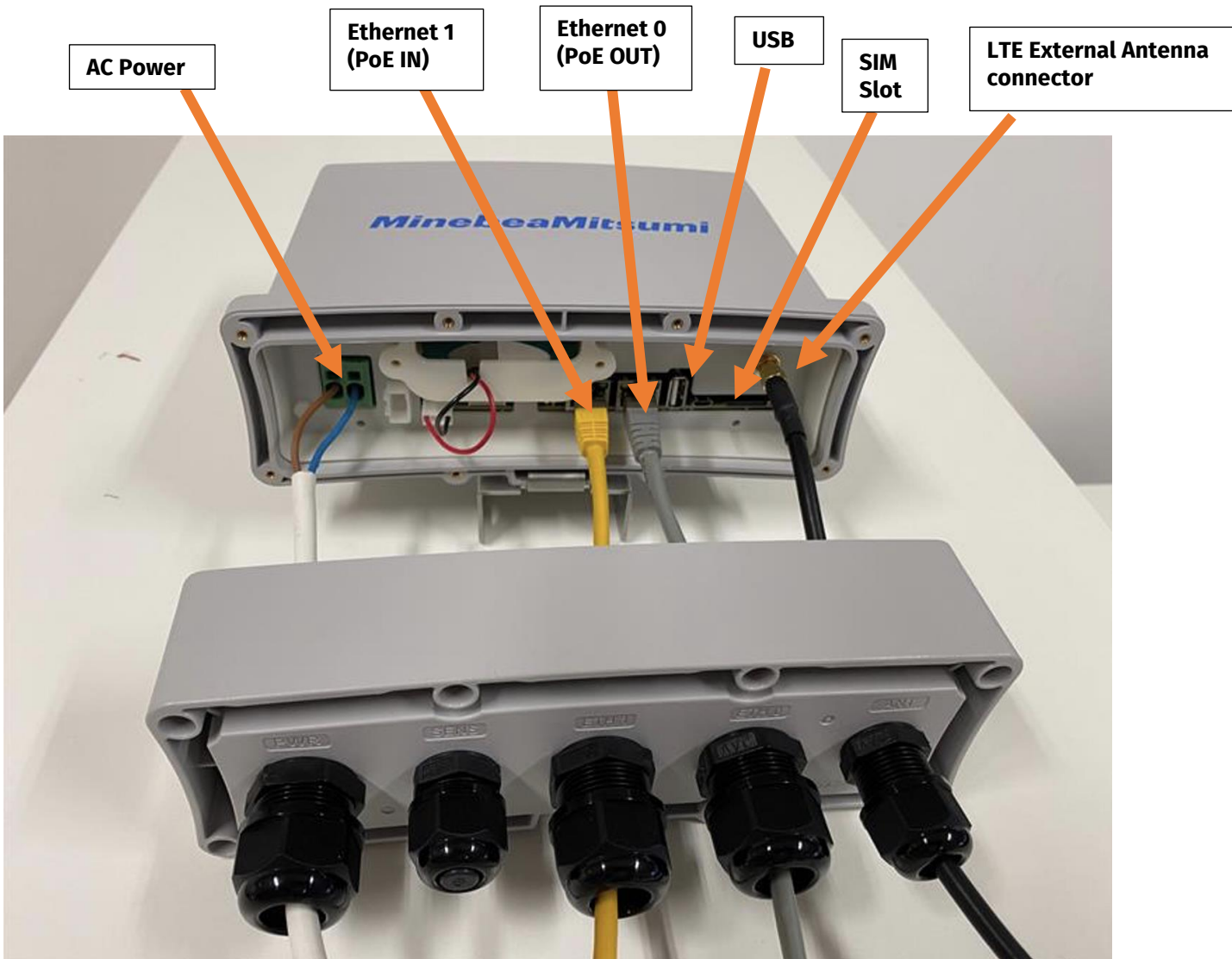


Figure 5. PE Smart Mini Gateway connectors

# PE Smart Mini Gateway

## 5.4 Connecting an Ethernet Cable – Step 1: Unscrew the Base and Disassemble the Connector

In order to connect an Ethernet cable to the PE Smart Mini Gateway, first disassemble the connector to reveal the three parts as shown in Figure 6 below. Part A is the exterior housing for the connector, while Parts B and C together form the interior. Please be sure to disassemble (and later to re-assemble) the parts carefully to ensure the IP66 weatherproofing for the Gateway.

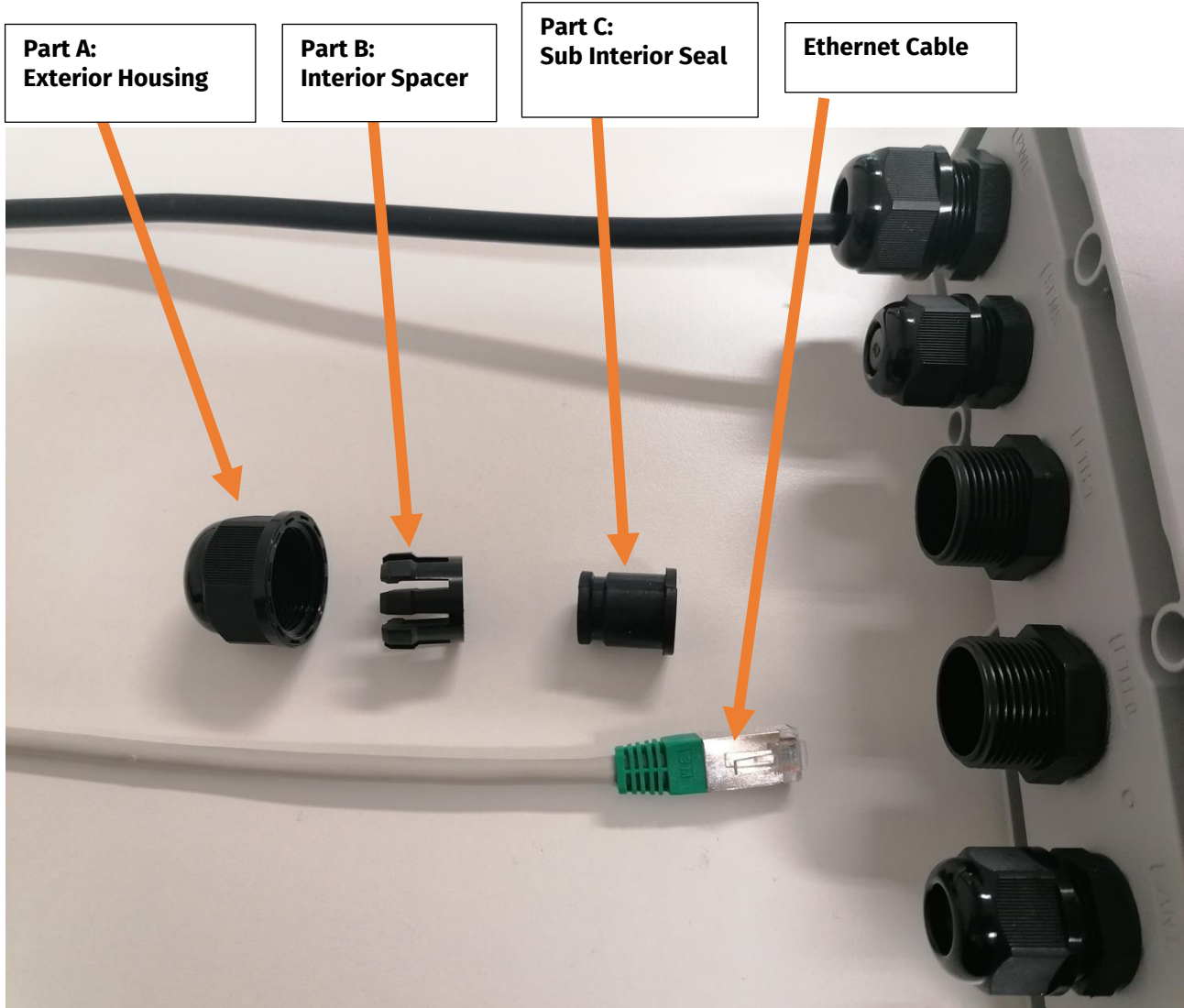
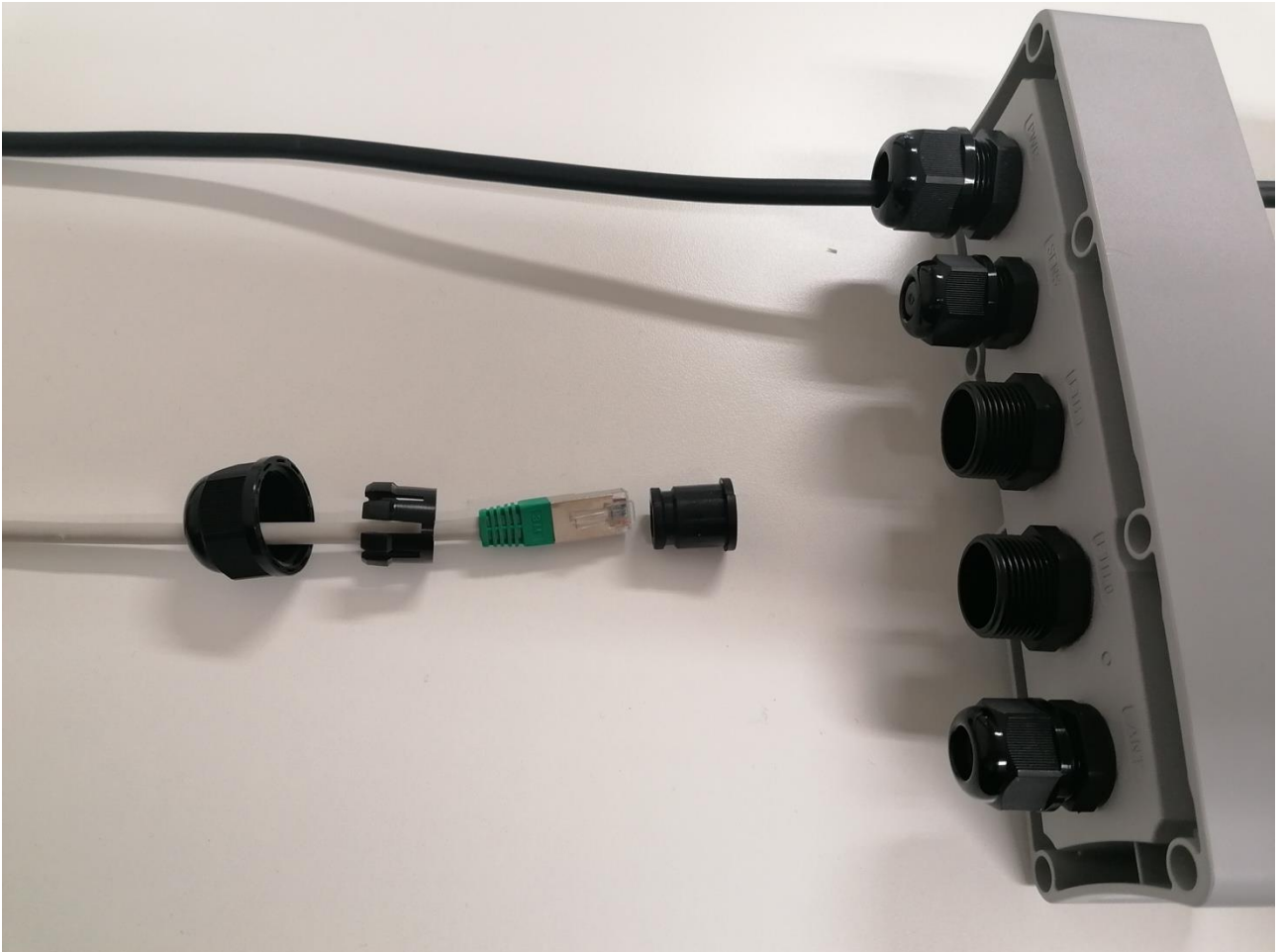


Figure 6. Connecting an Ethernet Cable to the PE Smart Mini Gateway

## PE Smart Mini Gateway

### 5.5 Connecting an Ethernet Cable – Step 2: Thread the Cable Through Parts A and B

Thread the Ethernet cable through Parts A and B, as shown in Figure 7, located below.



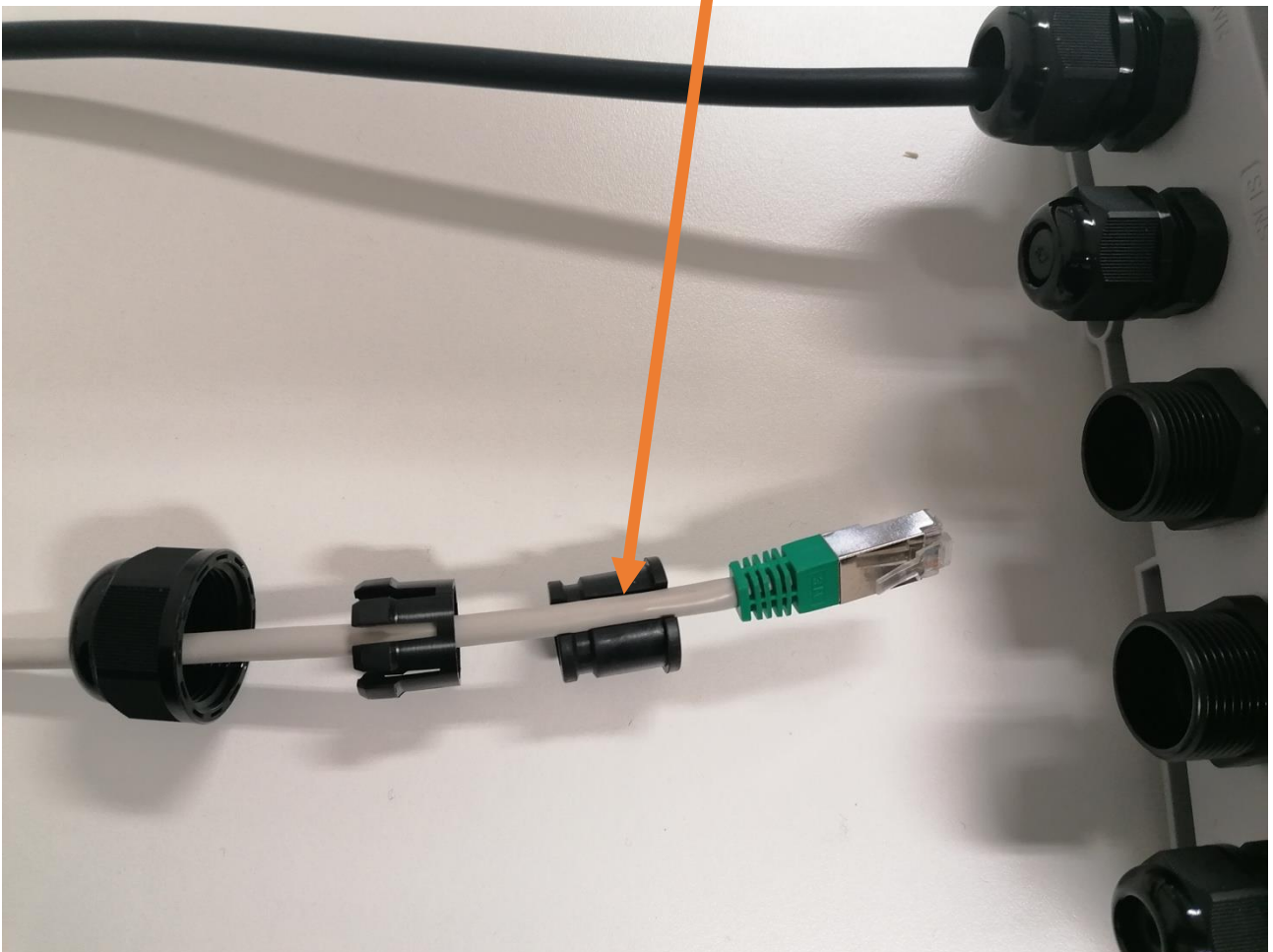
*Figure 7. Connecting an Ethernet Cable to the PE Smart Mini Gateway*

## PE Smart Mini Gateway

### 5.6 Connecting an Ethernet Cable – Step 3: Squeeze the Cable Through Part C

After you have threaded the Ethernet cable through Parts A and B, push the cable through the top of Part C to insert the cable. Part C will separate and re-close as shown in Figures 8 and 9.

**Press the cable on the top of Part C to squeeze the cable inside**



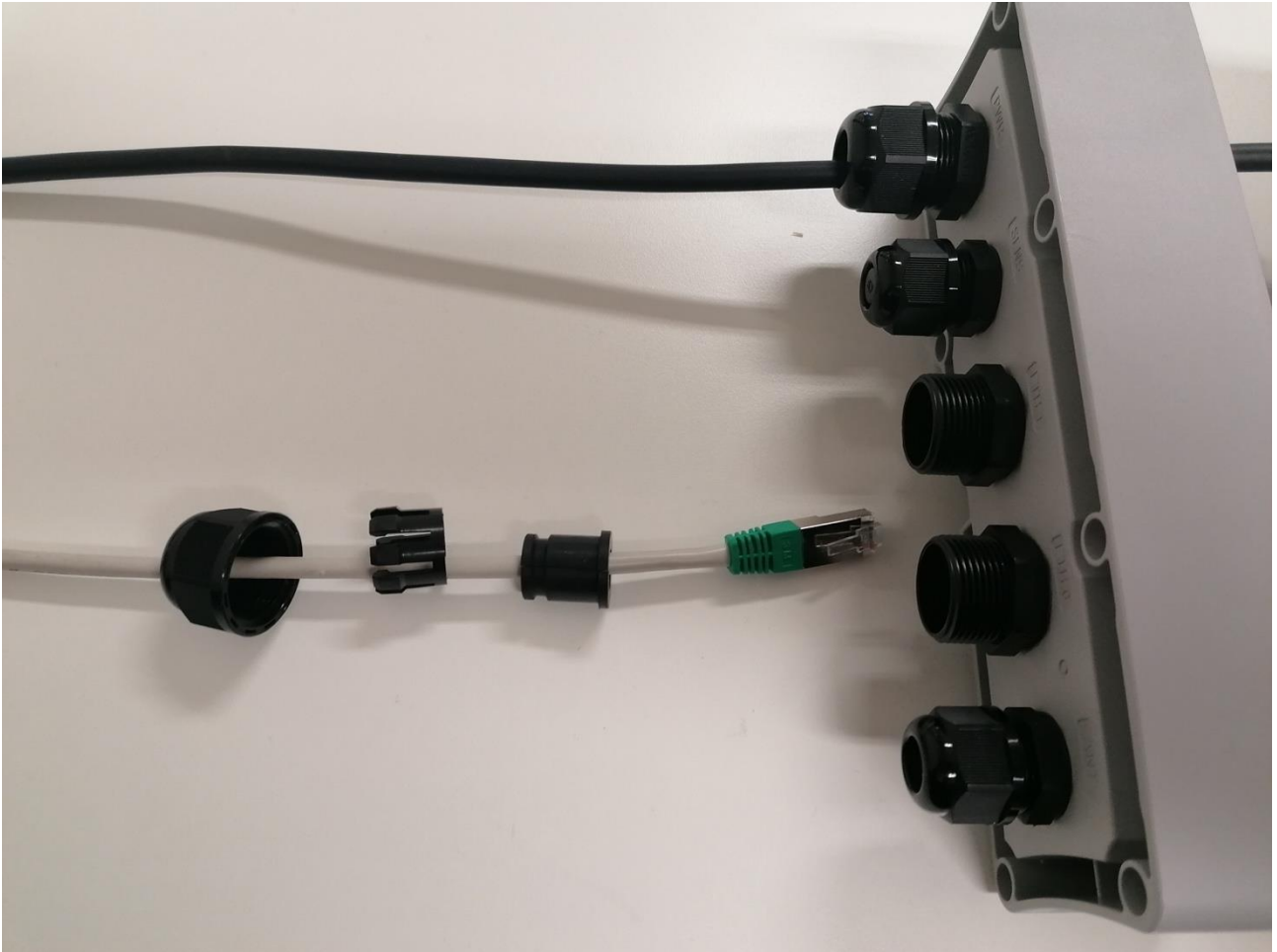
*Figure 8. Connecting an Ethernet Cable to the PE Smart Mini Gateway*



## PE Smart Mini Gateway

### 5.7 Connecting an Ethernet Cable – Step 4: Align the Cable to the Connector

After you have inserted the cable into Parts A, B, and C, align the cable to the connector, as shown in Figure 9.

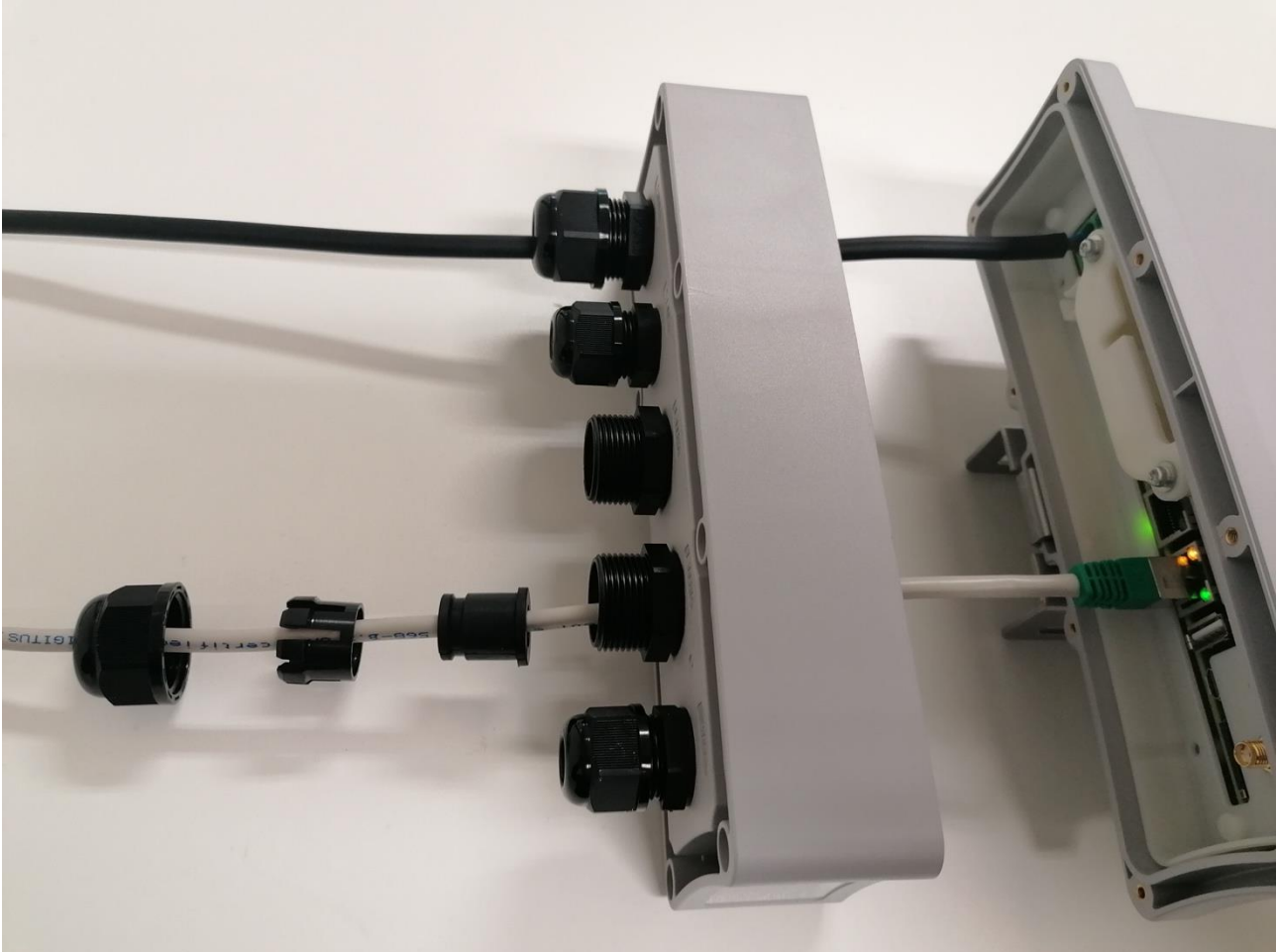


*Figure 9. Connecting an Ethernet Cable to the PE Smart Mini Gateway*

## PE Smart Mini Gateway

### 5.8 Connecting an Ethernet Cable – Step 5: Insert the Cable into the Ethernet Jack

Insert the cable in the Ethernet jack, as shown in Figure 10, below.

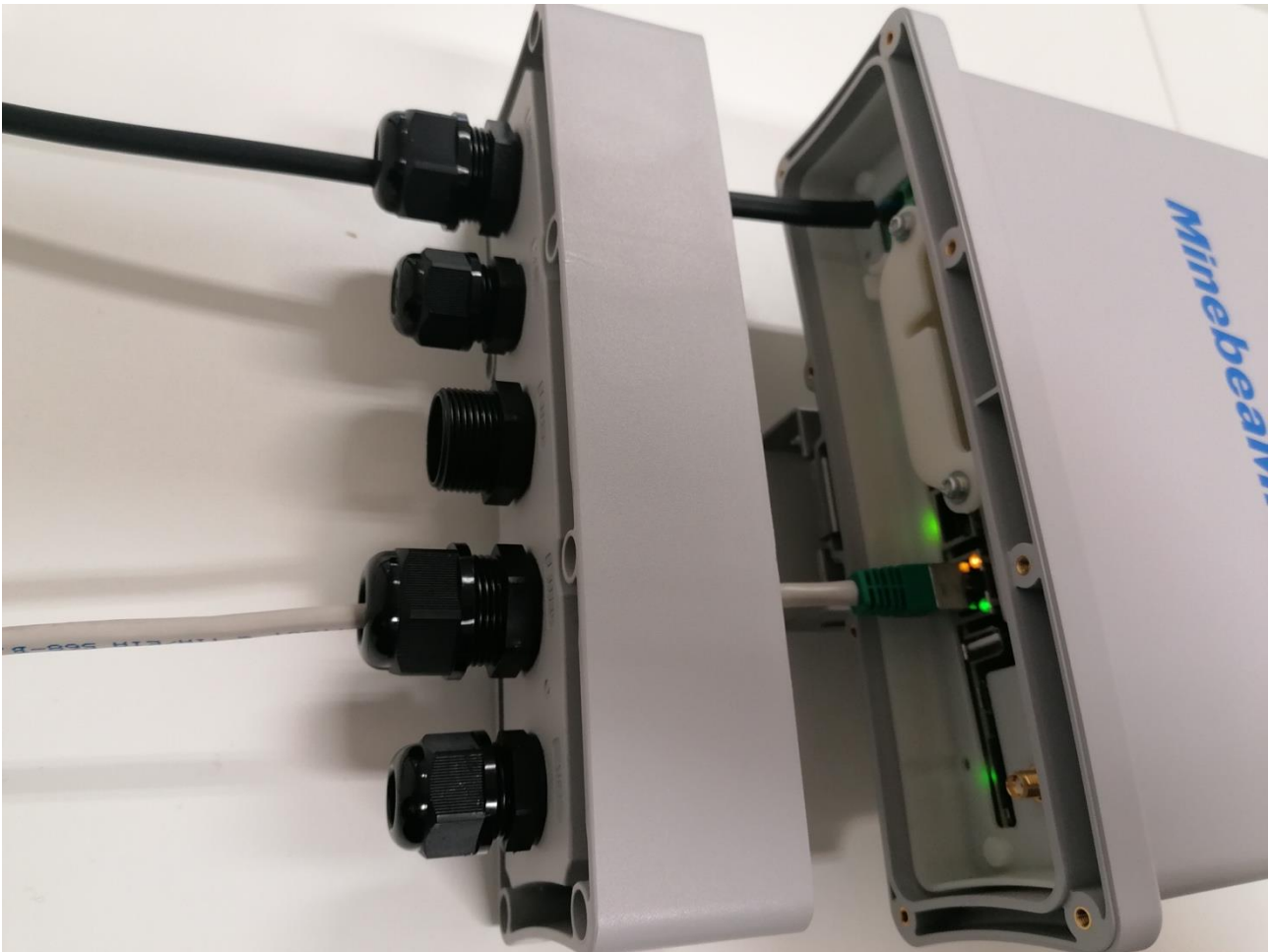


*Figure 10. Connecting an Ethernet Cable to the PE Smart Mini Gateway*

## PE Smart Mini Gateway

### 5.9 Connecting an Ethernet Cable – Step 6: Re-assemble Parts C, B, and A

Re-assemble Parts C, B, and A to their original state, as shown in Figure 11, below.



*Figure 11. Connecting an Ethernet Cable to the PE Smart Mini Gateway*

### 6. Connecting the Mini Gateway to the Internet

After mounting and providing power to the PE Smart Mini Gateway, you must provide the Gateway a connection to the Internet in order for it to communicate with the PE Smart CMS. The Mini Gateway can be configured to access the Internet through one of the 3 options below:

- 4G LTE network connection
- PoE Ethernet connection
- Wi-Fi b/g connection

The sections that follow provide details on how to utilize each option.

## PE Smart Mini Gateway

### 6.1 Option 1: Connecting to the Internet with the 4G LTE Network Connection

In order for the Mini Gateway to use a 4G LTE network connection to the Internet, ensure that **Dip Switch 2 is DOWN**, and a valid SIM card has been inserted in the SIM slot.

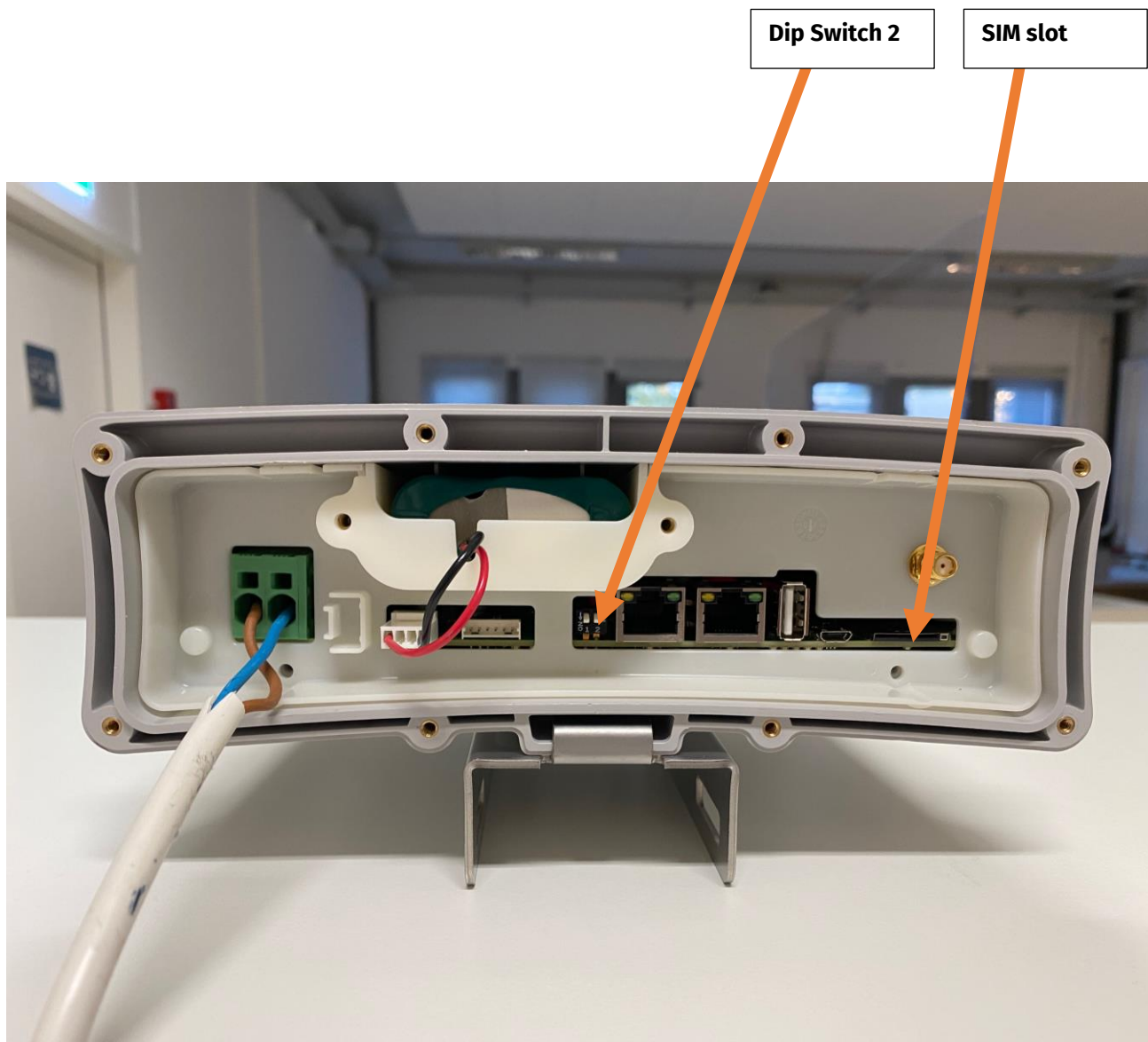


Figure 12. Connecting to the Internet via the 4G Connection

## PE Smart Mini Gateway

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After executing those steps, you need to use your laptop to connect to the internal webserver of the Mini Gateway. This can be accomplished by either joining the internal Wi-Fi access point of the Mini Gateway or using an Ethernet cable to connect directly to the Ethernet 0 port. Refer to Figure 5 (above) to see the location of Ethernet 0.

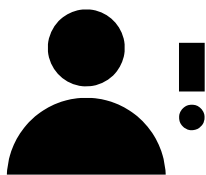


**NOTE:** If you join the Wi-Fi access point of the Mini Gateway, the SSID is “**PE-hotspot**” and the password is “**h0tst0PE**”.

If, however, you connect an Ethernet cable to Ethernet 0, then you need to modify your network settings to ensure that you have a fixed/static IP address. The address needs to be **192.168.1.100** netmask **255.255.255.0** and gateway **192.168.1.10**.

You now are able to login to the internal website of the Mini Gateway. To login, use your web browser to navigate to the following URL:

**hp://192.168.1.10**



**NOTE:** The default login is “admin” and the password is “pwd\_gwadmin\_demo”.

# PE Smart Mini Gateway

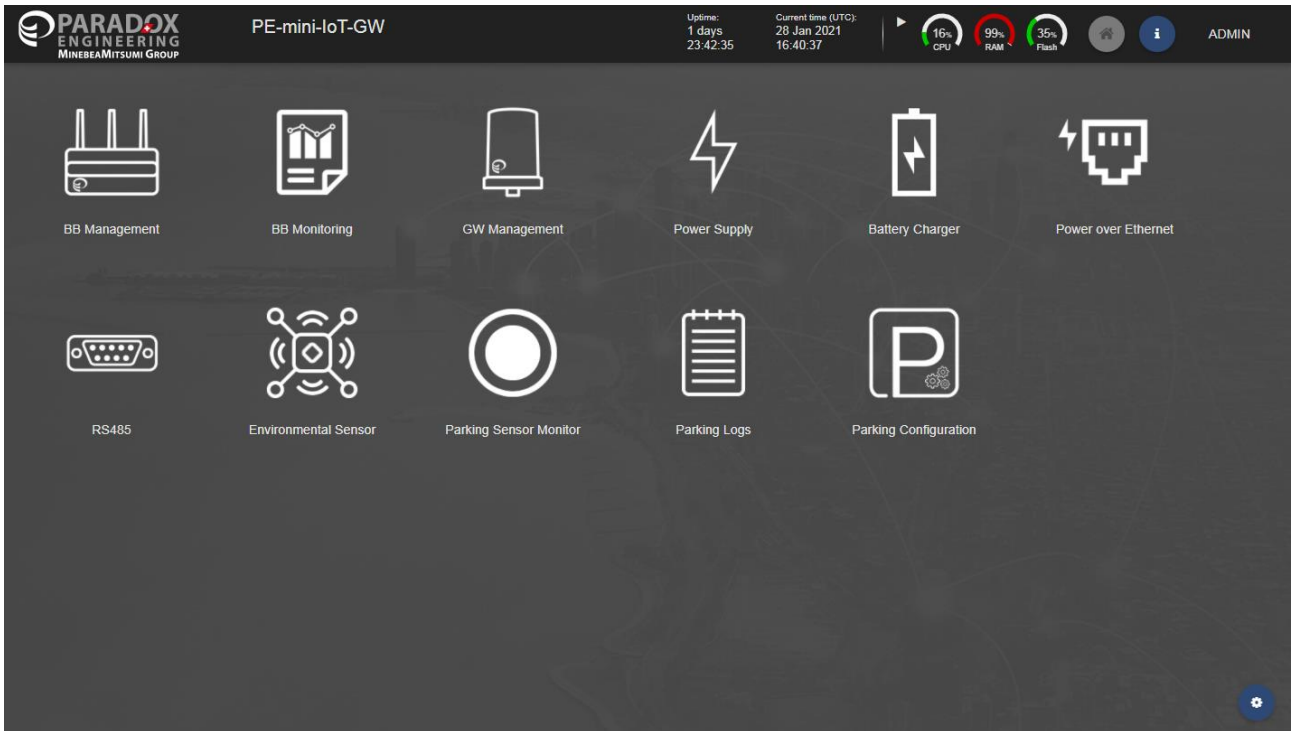


Figure 13. The Default Home Page for the Gateway

After logging in, navigate to the “**BB Management > Modem 4G**” page to specify the SIM PIN (if necessary), as well as the APN as shown in Figure 14 below.

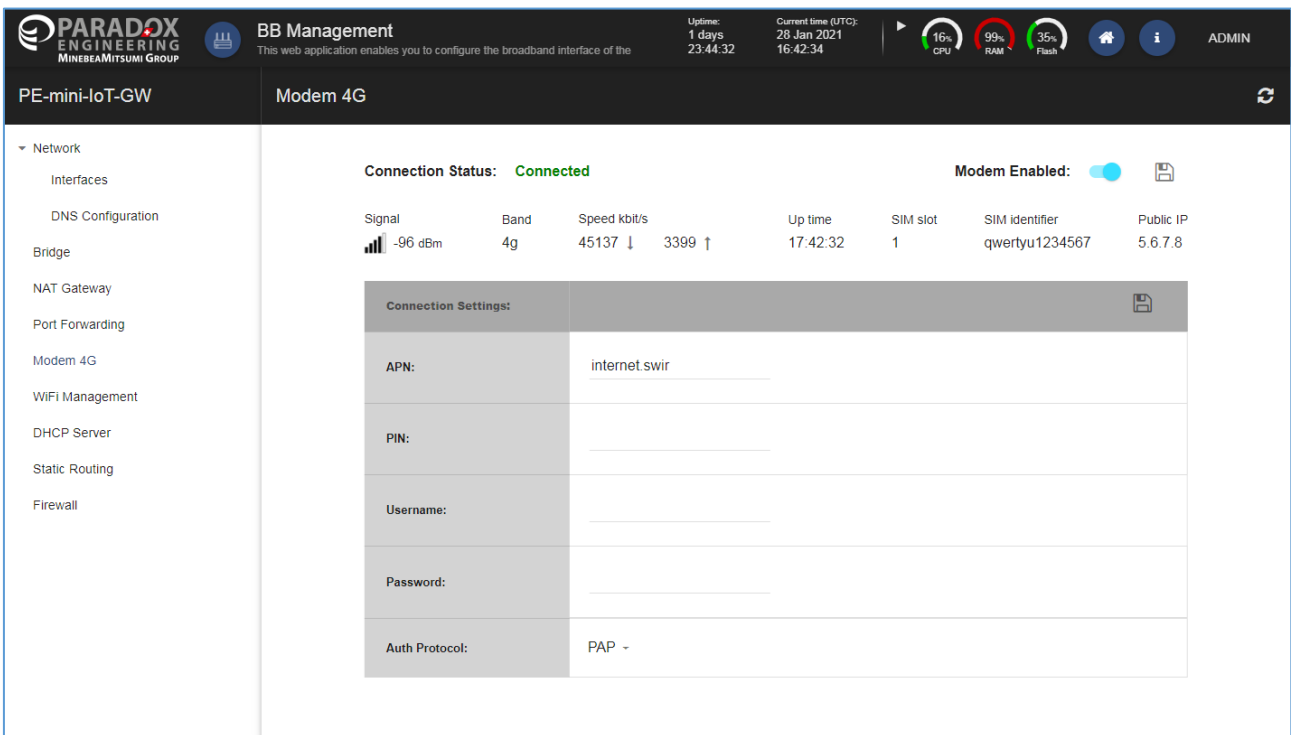


Figure 14. BB Management Page



## PE Smart Mini Gateway

### 6.2 Option 2: Connecting to the Internet with the PoE Network Connection

If the Mini Gateway is within reach of a network switch, then the Gateway can be configured to use the PoE Ethernet port to have a connection to the Internet. In order to enable this configuration, connect an Ethernet cable from the network switch to Ethernet 1.

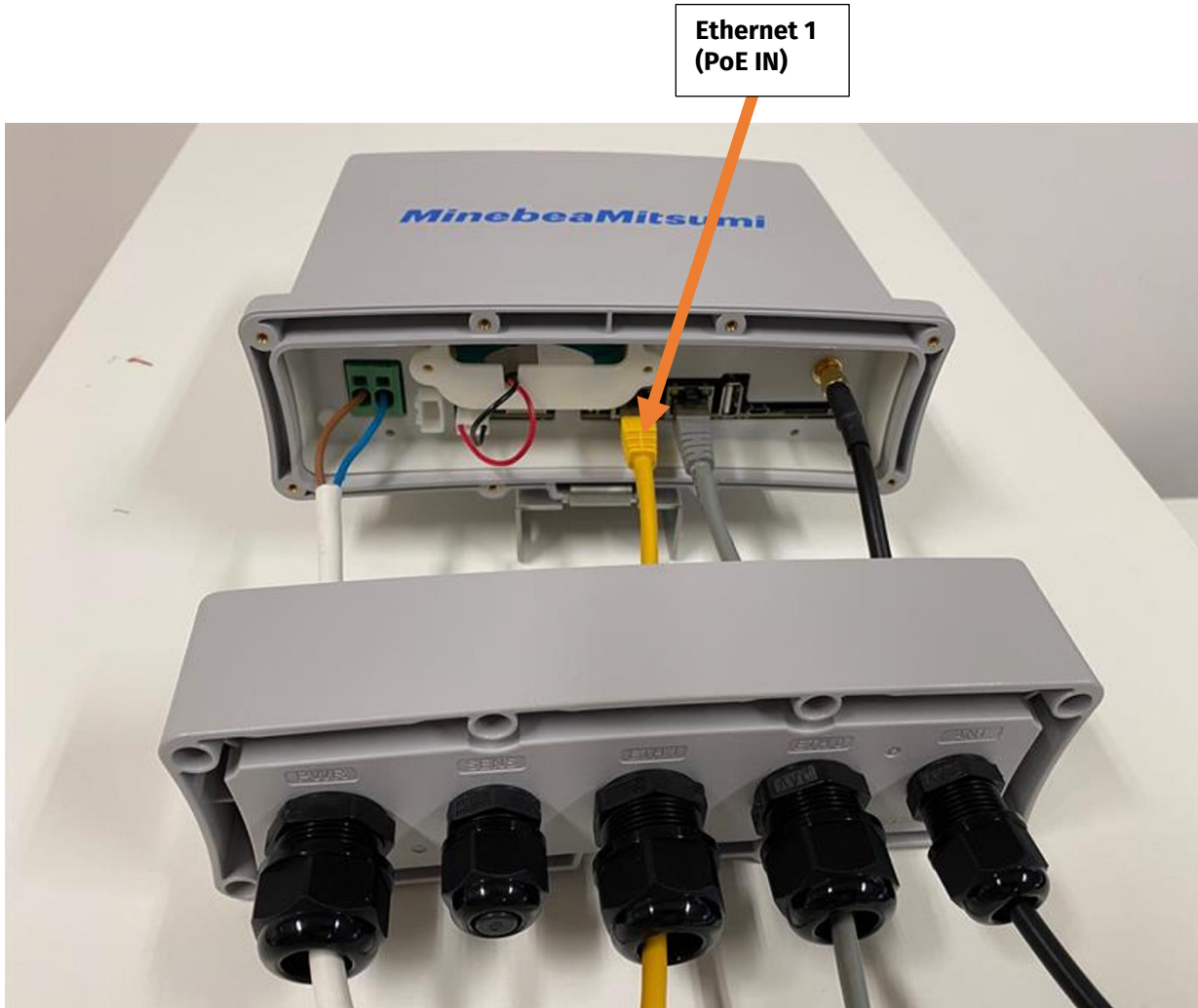


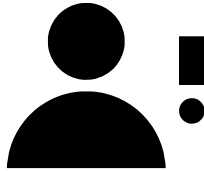
Figure 15. Location of Ethernet 1



## PE Smart Mini Gateway

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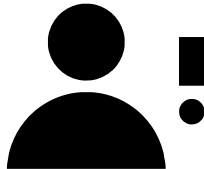
After executing those steps, you need to use your laptop to connect to the internal webserver of the Mini Gateway. This can be accomplished by either joining the internal Wi-Fi access point of the Mini Gateway or using an Ethernet cable to connect directly to the Ethernet 0 port. Refer to Figure 5, above to see the location of Ethernet 0.



**NOTE:** In order to use this option, you need a laptop computer to join the Wi-Fi access point of the Mini Gateway, the SSID is "PE-hotspot" and the password is "hotst0PE".

You now are able to login to the internal website of the Mini Gateway. To login, use your web browser to navigate to the following URL:

hp://192.168.1.10



**NOTE:** The default login is "admin" and the password is "pwd\_gwadmin\_demo".

# PE Smart Mini Gateway

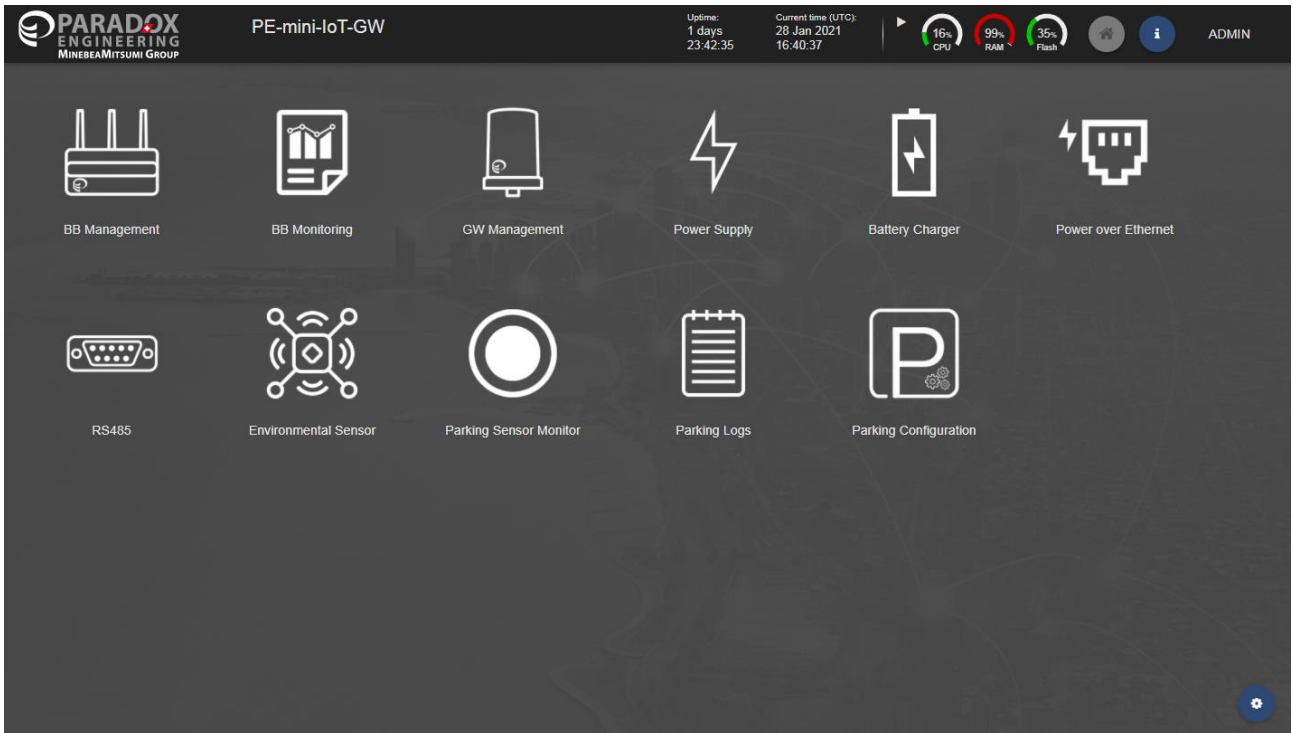


Figure 16. The Default Home Page for the Gateway

After logging in, navigate to the **“BB Management > DHCP Server”** to enable the Gateway to function as a DHCP client, as shown in Figure 17 below.

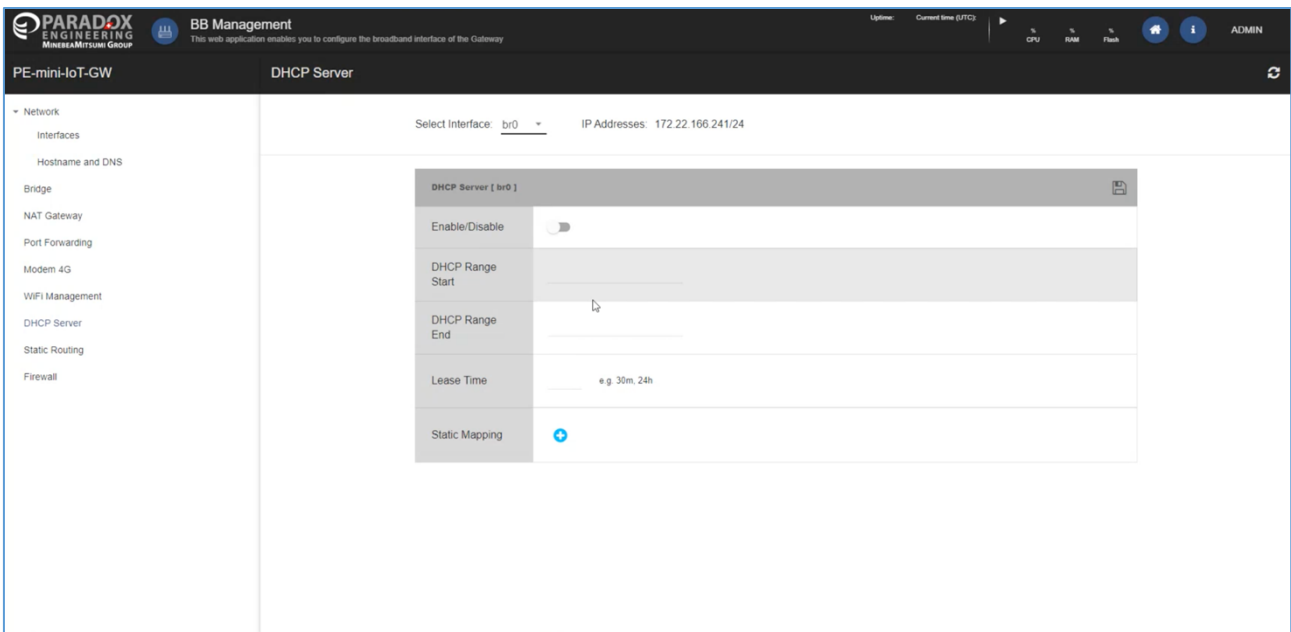


Figure 17. BB Management Page



## PE Smart Mini Gateway

### 6.3 Option 3: Connecting to the Internet Using Wi-Fi

If the Mini Gateway is in range of a known and trusted Wi-Fi access point, then the Gateway can be configured to be a Wi-Fi client (just like a laptop or mobile phone) to have a connection to the Internet. In order to enable this configuration, connect an Ethernet cable to Ethernet 0.

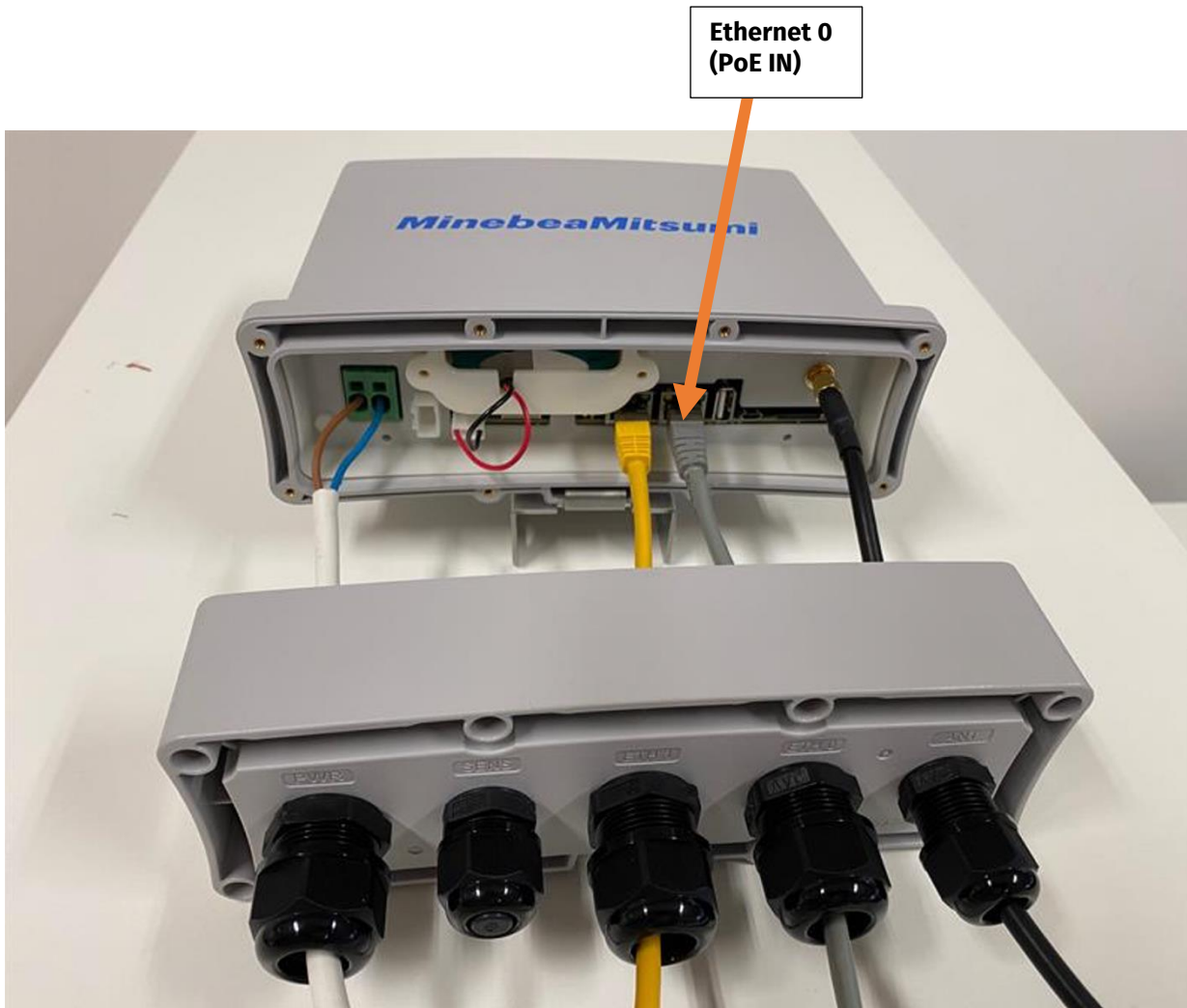


Figure 18. Location of Ethernet 0

## PE Smart Mini Gateway

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**NOTE:** After you have connected an Ethernet cable to Ethernet 0, then you need to modify your network settings on your laptop to ensure that you have a fixed/static IP address. The address needs to be **192.168.1.100** netmask **255.255.255.0** and gateway **192.168.1.10**.

After completing the above steps, you now are able to login to the internal website of the Mini Gateway. To login, use your web browser to navigate to the following URL:

**hp://192.168.1.10**



**NOTE:** The default login is "**admin**" and the password is "**pwd\_gwadmin\_demo**".

# PE Smart Mini Gateway

After logging in, navigate to the “**BB Management > WiFi Management**” page to specify the Wi-Fi access point name (SSID) and the password as shown in Figures 19 and 20 below.

The screenshot shows the 'WiFi Management' interface. At the top, it indicates 'Connected to PE-GUEST'. Below this is a table listing various networks with their signal strengths. The 'PE-GUEST' network is highlighted as the current connection.

Network	Signal
PE-GUEST	-54.00 dBm
ConfigTool-AP	-59.00 dBm
GMCS-Guest-WiFi	-63.00 dBm
WLAN-INT	-76.00 dBm
WLAN-EOA	-77.00 dBm
WLC-INT	-77.00 dBm
WLC-EXT	-79.00 dBm

Figure 19. BB Management Page



# PE Smart Mini Gateway

The screenshot displays the 'BB Management' interface for a 'PE-mini-LoT-GW'. The top navigation bar includes the Paradox Engineering logo, the title 'BB Management', and system status indicators: Uptime (1 days 23:53:44), Current time (UTC: 28 Jan 2021 16:51:46), and resource usage (16% CPU, 99% RAM, 35% Flash). The left sidebar lists configuration options: Network, Interfaces, DNS Configuration, Bridge, NAT Gateway, Port Forwarding, Modem 4G, WiFi Management, DHCP Server, Static Routing, and Firewall. The main content area is titled 'WiFi Management' and features a 'Select Mode' dropdown set to 'Client'. A red error message states 'Not connected to any WiFi network'. Below this is a table of detected networks:

Network	Signal	Security	Details	Action
PE-GUEST	-54.00 dBm	WPA2	Password	CONNECT
ConfigTool-AP	-59.00 dBm			
GMCS-Guest-WiFi	-63.00 dBm			
WLAN-INT	-76.00 dBm			
WLAN-EOA	-77.00 dBm			
WLC-INT	-77.00 dBm			
WLC-EXT	-79.00 dBm			

Figure 20. BB Management Page



# PE Smart Mini Gateway

## 7. Product Configuration

The PE Smart Mini Gateway must be connected to the customer network via Ethernet port, configuring the IP address to match local addressing plan.

### 7.1 Configuring the IP address (narrowband and broadband)

PE Smart Mini Gateway is delivered with pre-configured addressing. Please refer to PE Smart Mini Gateway Configuration Sheet to find out the IP addressing set on your device.

To change the configuration, connect a PC directly to PE Smart Mini Gateway and configure a static IP address on the same product subnet.

Point your browser to PE Smart Mini Gateway Narrowband IPv4 address to reach the device management interface.

After login (credentials are available on PE Smart Mini Gateway Configuration Sheet), click on “IP management” and enter the desired network configuration, as provided by your network administrator. Click on “Save Item Configuration”. If available, please enter your DNS server IP address(es).

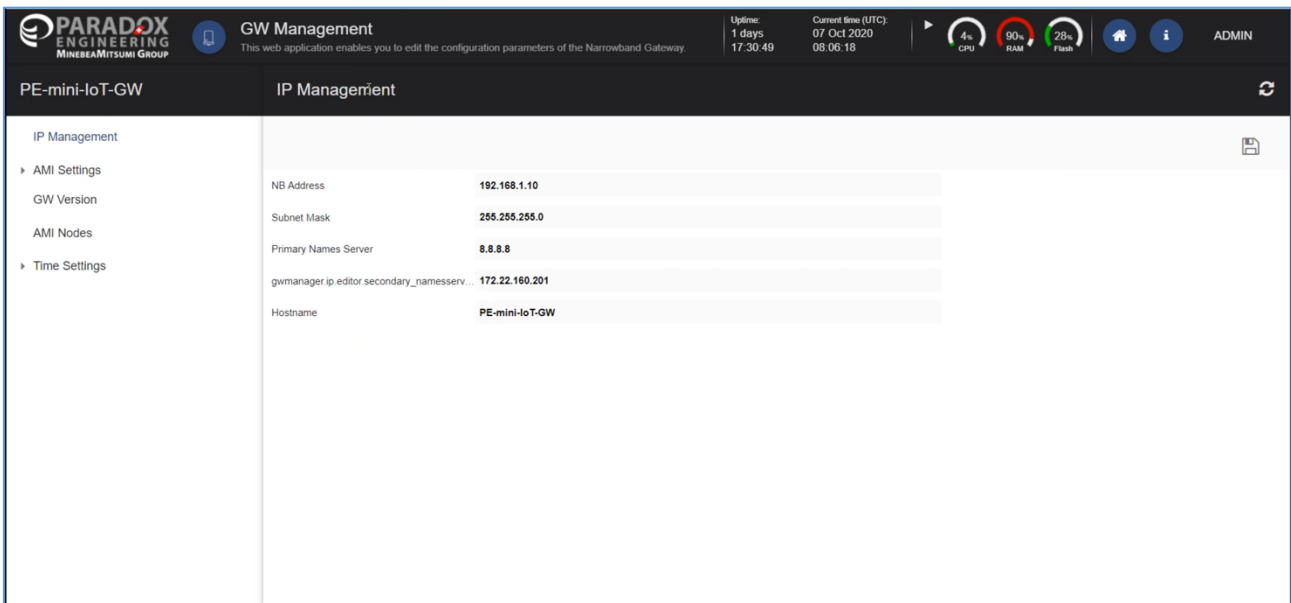


Figure 21. IP Management

The PE Smart Mini Gateway will apply the new configuration and try to redirect your browser to the new web interface address. Connect PE Smart Mini Gateway to the customer’s local network, reconfigure the client PC to its usual IP address and reload the page on your browser, or point the browser to PE Smart Mini Gateway assigned IP address.



# PE Smart Mini Gateway

## 7.2 Specifying the Connection Parameters from the Gateway to the CMS

The PE Smart Mini Gateway must be able to establish a TCP connection to the hosted instance of CMS Server on TCP port 55555 (if not differently mentioned). Please DO NOT modify it, unless receiving specific instruction by Paradox Engineering.

If the IP address of the CMS is different from default setting, please modify it accordingly in the AMI Settings section of GW Manager by changing the “ServerAddr” IP.

Please ensure to correctly configure your network firewall to allow bidirectional communication over the TCP port range.

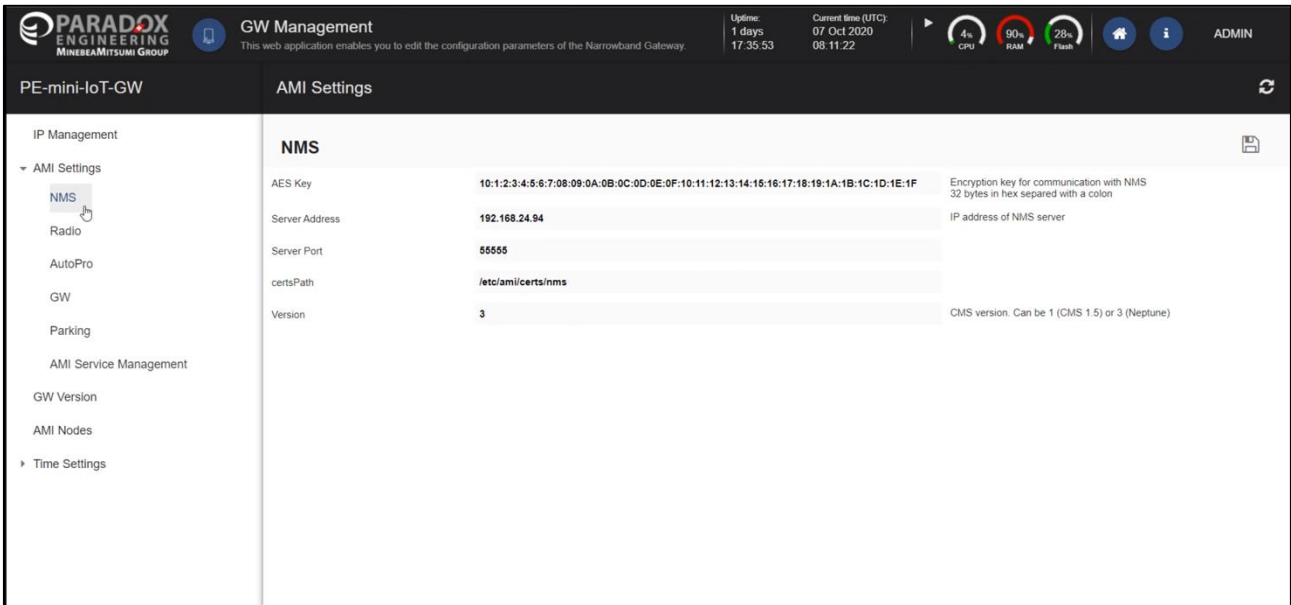


Figure 22. AMI Settings





# PE Smart Mini Gateway

## 7.3 VPN Configuration

The PE Smart Mini Gateway will attempt to establish a VPN link to Paradox Engineering network through TCP port 21194. This link will be used for remote support purposes only.

Opening this port in your network firewall is not mandatory, but it is recommended to open this port in order to have a prompt and efficient remote support experience from Paradox Engineering.

## 7.4 NTP Configuration

The PE Smart Mini Gateway should have time configured by an NTP server. The product is pre-configured to use public NTP servers.

If public NTP servers (UDP port 123) are filtered by your firewall, or if a DNS server is not available, other NTP servers can be configured under **AMI Settings > NTP**. Enter one or more IP addresses or names, separated by commas in the NTP/Servers textbox, then click on “Save Settings” and on “Restart AMI Service”.

If an NTP service is not available on your network, leave the **NTP > Servers** textbox blank, click on “Save Settings” and then on “Restart AMI Service”, and manually configure time under the “Timezone” page.

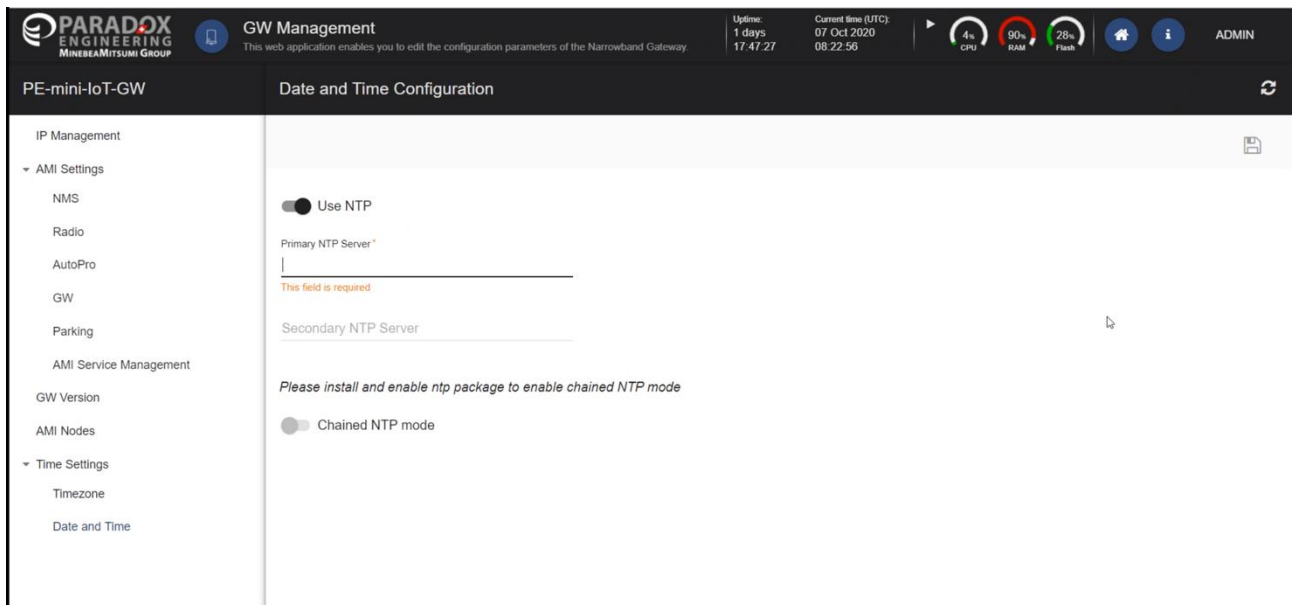


Figure 23. NTP Configuration



# PE Smart Mini Gateway

## 7.5 Timezone Configuration

To set the timezone, click on the **“Timezone”** menu item, and select the desired option from the drop-down menu and click on **“Continue”** to confirm.

Based on your selected timezone, further details may need to be specified. Please select accordingly and click on **“Continue”** to confirm and complete configuration.

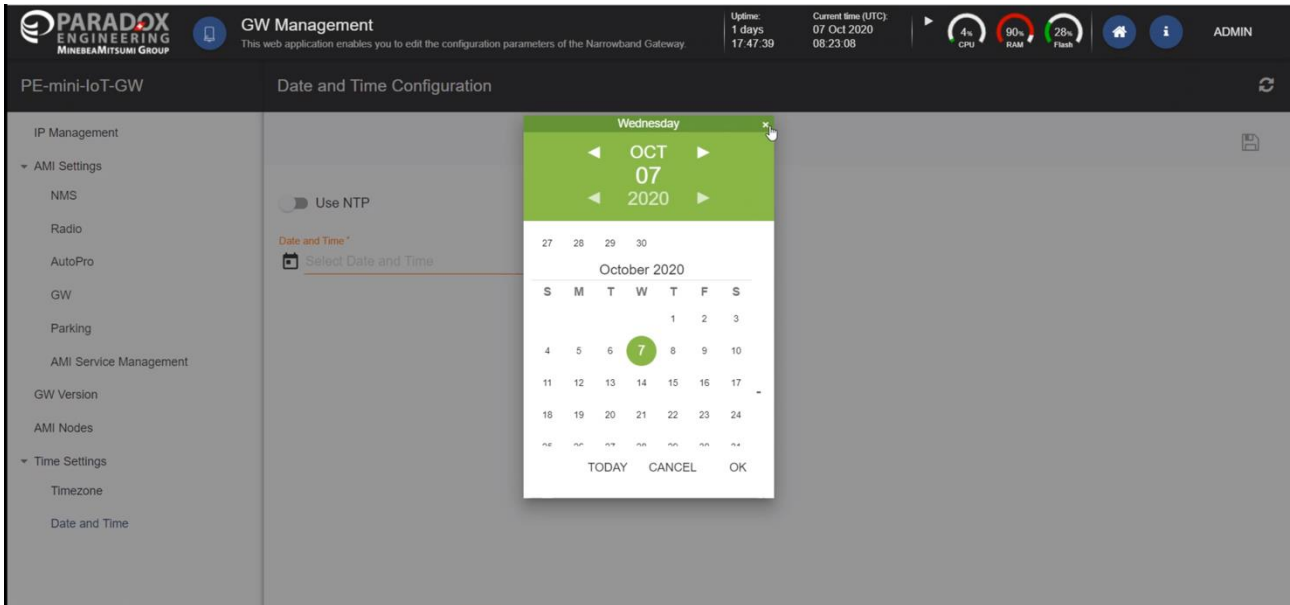


Figure 24. Timezone Configuration

## 7.6 Other Configurations

Please DO NOT modify any other setting, unless receiving specific instructions by Paradox Engineering.



## 8. Maintenance Instructions



**NOTE:** The instructions provided in this section should **ONLY** be performed by authorized, skilled, and trained service professionals.

The fuse in on neutral (N), before any type maintenance is performed on the PE Smart Mini Gateway, the mains shall be disconnected to de-energize the phase conductors.

### 8.1 Identifying the Main Fuse, F4

The main fuse, F4, is a 16A 500V fuse and is capable of withstanding a surge of approximately 10kV. F4 is located on the circuit board of the PE Mini Gateway as shown in Figures 25 and 26 below.

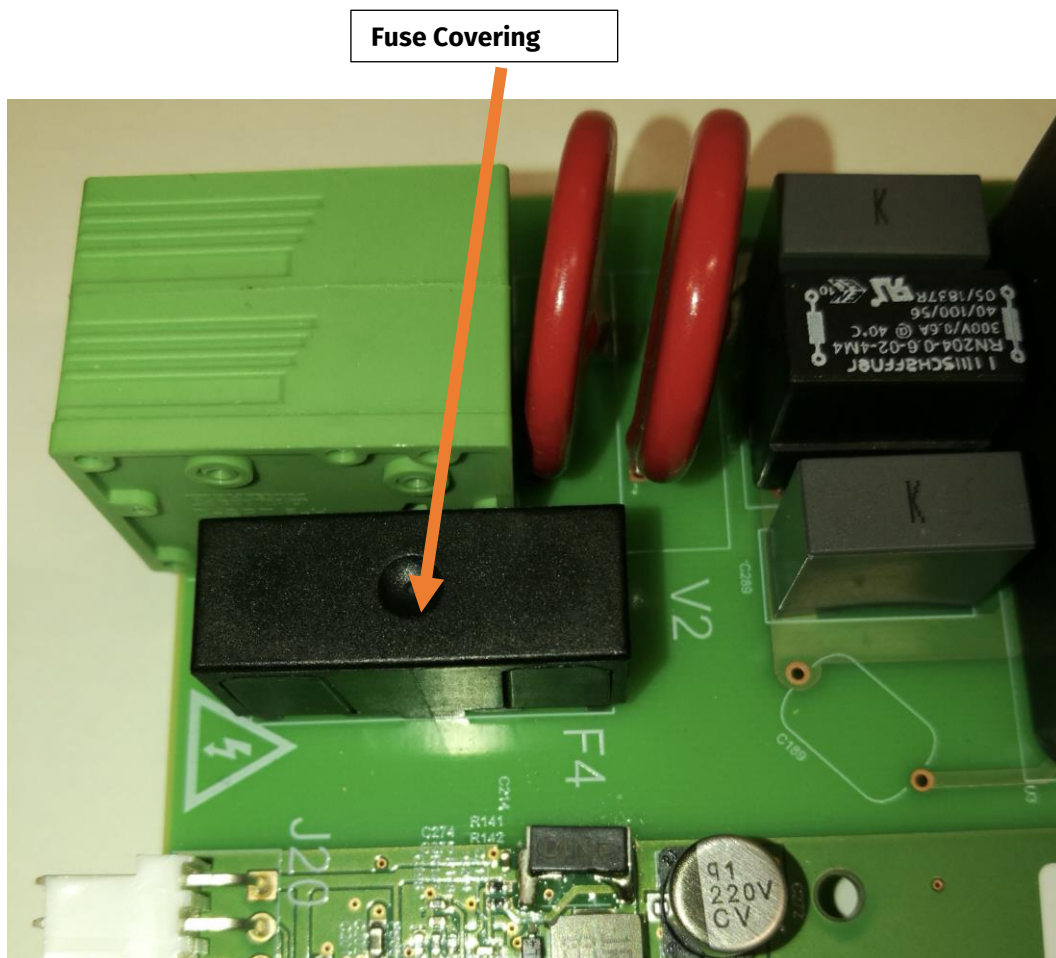


Figure 25. Fuse F4 Located Under the Fuse Covering

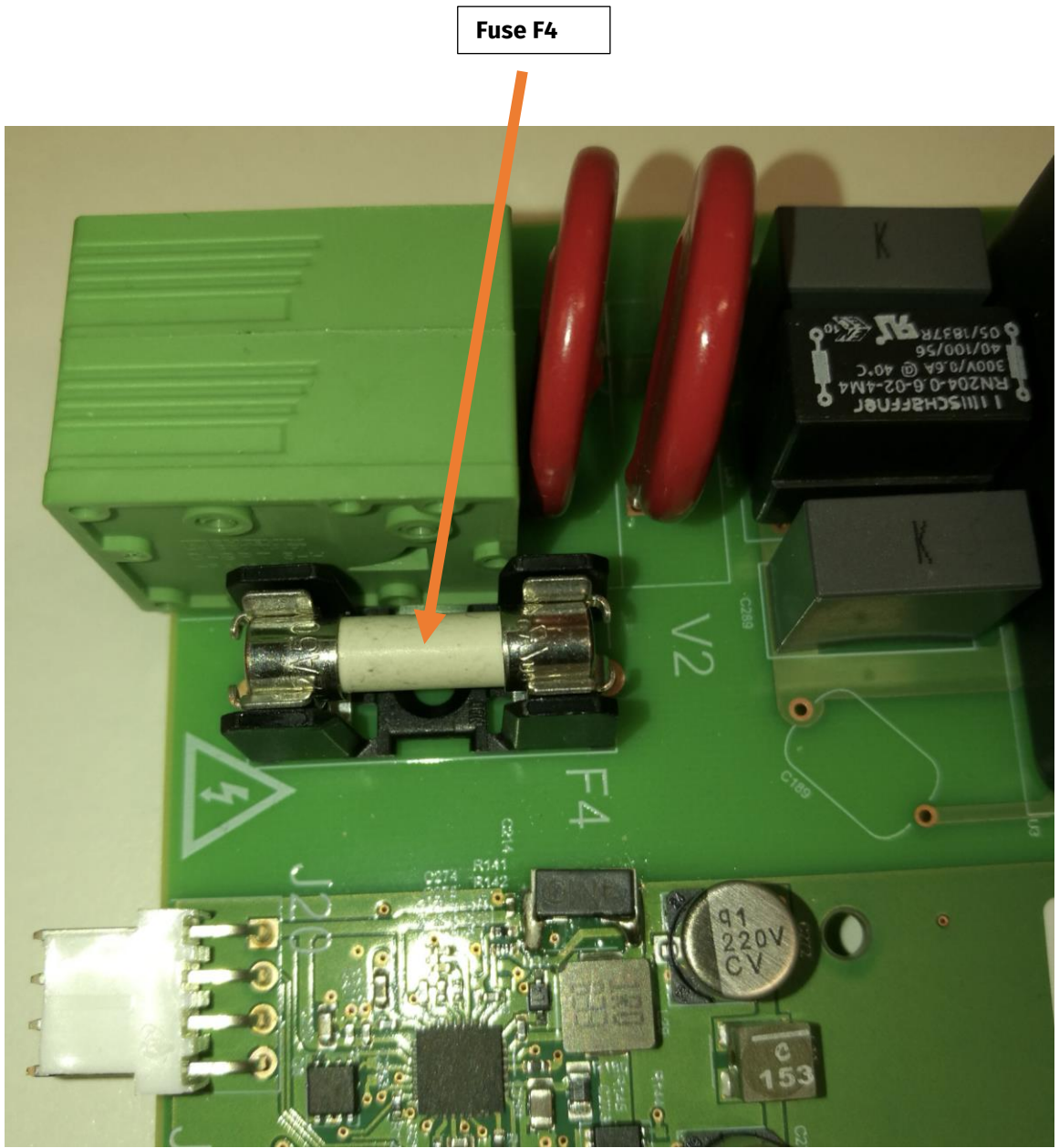


Figure 26. Fuse F4 with the Fuse Covering Removed



## 9. Packing

A representative packing scheme for PE Smart Mini Gateway is pictured in Figure 27.

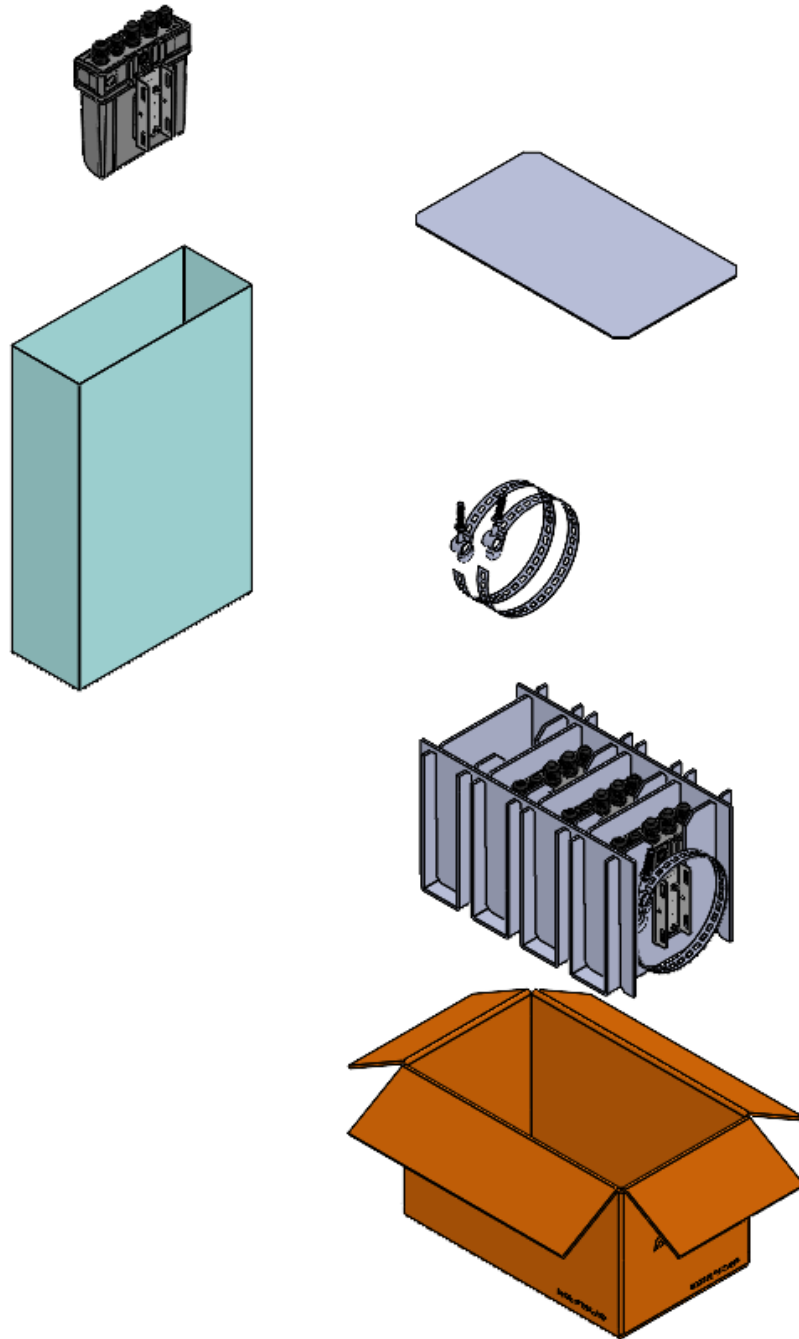


Figure 27. Packing scheme

# PE Smart Mini Gateway

## 10.Label

### 10.1 US – United States

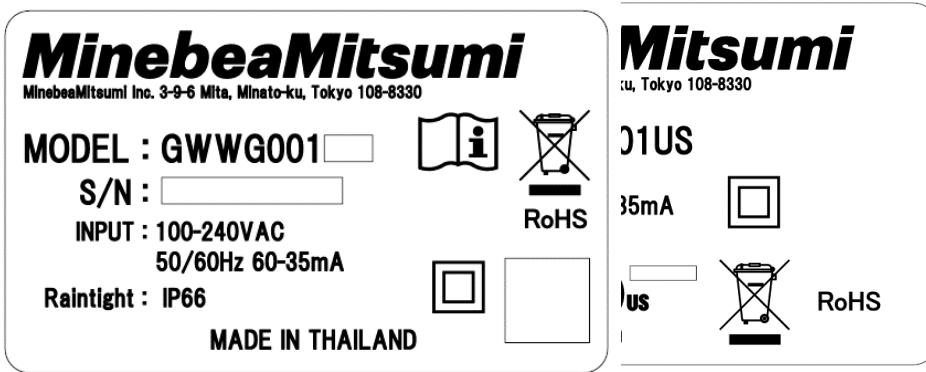


Figure 28. The PE Smart Mini Gateway – US Market

### 10.2 EU, CL, TH, KH – Europe, Chile, Thailand, Cambodia

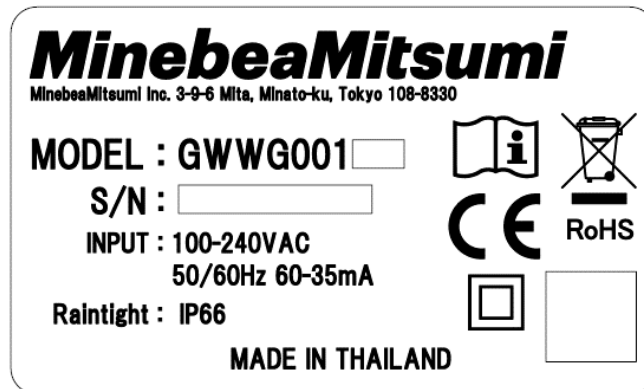


Figure 29. The PE Smart Mini Gateway – EU, CL, TH, KH Market

## PE Smart Mini Gateway

### 10.3 JP – Japan

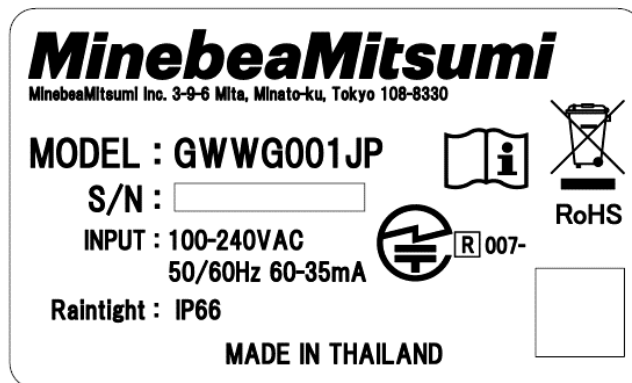


Figure 30: The PE Smart Mini Gateway – JP Market

## 11. Maximum Permissible Exposure (MPE) limits

PE Smart Mini Gateway is compliant to Maximum Permissible Exposure (MPE) limits.

### 11.1 US – United States

The following tables summarize the results of the calculations carried out assuming no co-location or operation in conjunction with any other antenna or transmitter. It is also indicated the minimum distance to keep between antennas and the public:

#### 6.1 RF Exposure Conditions

The device is intended for use in fixed position.

According to "FCC KDB publication 447498 D01 General RF Exposure Guidance v06" sections 7.1 and 7.2 have been applied.

Transmitters used in mobile device exposure conditions for simultaneous transmission operations.

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is  $\leq 1.0$

#### 6.2 EUT composition

- Wi-Fi module STERLING-LWB (FCC ID: TFB-1003) with 2.4GHz 5.05dBi Chip Antenna
- LTE module RC7611 (FCC ID: N7NRC76B) with 831.5MHz 3.8dBi Chip Antenna
- Paradox Engineering SA (FCC ID: 2AKPQGWWG001) with 920MHz 1.59dBi Chip antenna

#### 6.3 Calculation method, results and limits

FCC ID	Frequency	Power	Power	Antenna Gain	EIRP	EIRP	Distance	Power Density	Limit
	MHz	dBm	W	dBi	dBm	mW	cm	mW/cm <sup>2</sup>	mW/cm <sup>2</sup>
TFB-1003	2412	24.00	0.25	5.05	29.05	800	50	0.026	1,0
N7NRC76B	830	23.64	0.23	3.80	27.44	550	50	0.018	1,0
2AKPQGWWG001	915	24.39	0.27	1.59	25.98	400	50	0.013	0,6

TFB-1003 Power Density =  $EIRP / (4\pi r^2) = 800mW / (4\pi * 2500cm^2) = 0.026 mW/cm^2$

N7NRC76B Power Density =  $EIRP / (4\pi r^2) = 550mW / (4\pi * 2500cm^2) = 0.018 mW/cm^2$

2AKPQGWWG001 Power Density =  $EIRP / (4\pi r^2) = 400mW / (4\pi * 2500cm^2) = 0.013 mW/cm^2$

#### 6.4 Result

FCC ID	Power Density	Limit	PD/Limit
	mW/m <sup>2</sup>	mW/cm <sup>2</sup>	
TFB-1003	0.026	1,0	0.026
N7NRC76B	0.018	1,0	0.018
2AKPQGWWG001	0.013	0,6	0.022
		$\Sigma =$	0.066



## PE Smart Mini Gateway

### Notice

Changes or modifications made to this equipment not expressly approved by Paradox Engineering may void the user's authority to operate this equipment.

### Note

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense

### Radiofrequency radiation exposure information

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 50 cm between the radiator and your body.

This equipment must not be co-located or operating in conjunction with any other antenna or transmitter.

Product operation is subject to the following two conditions:

This device may not cause harmful interference, and  
This device must accept any interference received, including interference that may cause undesired operation.

The FCC ID label is pictured in Figure 31:

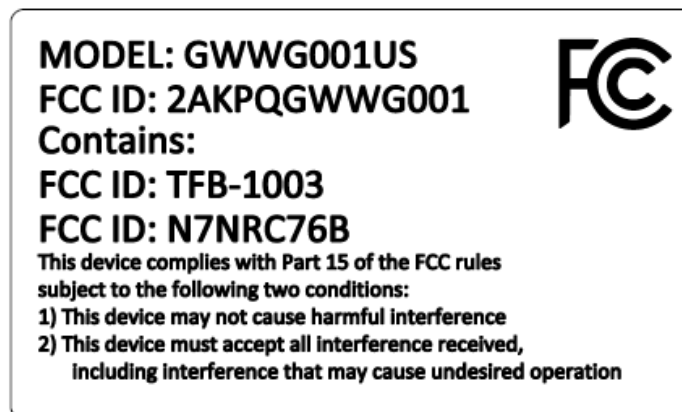


Figure 31. FCC ID label

## 11.2 EU – Europe

The calculation has been done using the value of power density fixed, according to table at page 13.  
The calculated distance has been compare with the distance limit according to table at page 11 (20cm)

RADIATED BY INTERNAL ANTENNA			
Band (from ETSI EN 300 220-2 V.3.1.1)	M		P
TX Frequency (MHz)	868.10	868.50	869.525
Measured Power (dBm)	13.80	13.30	26.50
Measured Power (mW)	23.99	21.38	446.68
MAXIMUM PERMISSIBLE EXPOSURE (MPE)			
Power density (W/m <sup>2</sup> )	4.3405	4.3425	4.3476
Evaluation Distance at power density (cm)	2.10	1.98	9.04
VERDICT			
The EUT Radiated Power density at evaluation distance, calculated with the follow expression:			
<u>868.10MHz Evaluation distance at power density</u> = $\sqrt{(EIRP/(4*\pi*S))} = \sqrt{(23.99mW / (4*\pi*4.3405W/m^2))} = 2.10$ cm			
<u>868.50MHz Evaluation distance at power density</u> = $\sqrt{(EIRP/(4*\pi*S))} = \sqrt{(21.38mW / (4*\pi*4.3425W/m^2))} = 1.98$ cm			
<u>869.525MHz Evaluation distance at power density</u> = $\sqrt{(EIRP/(4*\pi*S))} = \sqrt{(446.68mW / (4*\pi*4.3476W/m^2))} = 9.04$ cm is WHITIN THE LIMIT			
Expanded Uncertainty: ± 3,41 dB Level of confidence = 95% (k=2)			

Wi-Fi module radiated power by internal antenna - mode B -			
Channel	CH1	CH7	CH13
TX Frequency (MHz)	2412	2442	2472
Radiated Power (dBm)	10.9	10.8	11.4
Radiated Power (mW)	12.30	12.02	13.80
MAXIMUM PERMISSIBLE EXPOSURE (MPE)			
Power density (W/m <sup>2</sup> )	10	10	10
Evaluation Distance at power density (cm)	0.99	0.98	1.05
VERDICT			
The EUT Radiated Power density at evaluation distance, calculated with the follow expression:			
<u>CHANNEL 1: Evaluation distance at power density</u> = $\sqrt{(EIRP/(4*\pi*S))} = \sqrt{(12.30mW/4*\pi*10W/m^2)} = 0.99$ cm			
<u>CHANNEL 7: Evaluation distance at power density</u> = $\sqrt{(EIRP/(4*\pi*S))} = \sqrt{(12.02mW/4*\pi*10W/m^2)} = 0.98$ cm			
<u>CHANNEL 13: Evaluation distance at power density</u> = $\sqrt{(EIRP/(4*\pi*S))} = \sqrt{(13.80mW/4*\pi*10W/m^2)} = 1.05$ cm is WHITIN THE LIMIT			
Expanded Uncertainty: ± 3,41 dB Level of confidence = 95% (k=2)			

## PE Smart Mini Gateway

Wi-Fi module radiated power by internal antenna - mode G -			
Channel	CH1	CH7	CH13
TX Frequency (MHz)	2412	2442	2472
Radiated Power (dBm)	10.2	11.3	11.5
Radiated Power (mW)	10.47	13.49	14.13
MAXIMUM PERMISSIBLE EXPOSURE (MPE)			
Power density (W/m <sup>2</sup> )	10	10	10
Evaluation Distance at power density (cm)	0.91	1.04	1.06
VERDICT			
The EUT Radiated Power density at evaluation distance, calculated with the follow expression: <b>CHANNEL 1: Evaluation distance at power density</b> = $\sqrt{(EIRP/(4*\pi*S))} = \sqrt{(10.47mW/4*\pi*10W/m^2)} = 0.91$ cm <b>CHANNEL 7: Evaluation distance at power density</b> = $\sqrt{(EIRP/(4*\pi*S))} = \sqrt{(13.49mW/4*\pi*10W/m^2)} = 1.04$ cm <b>CHANNEL 13: Evaluation distance at power density</b> = $\sqrt{(EIRP/(4*\pi*S))} = \sqrt{(14.13mW/4*\pi*10W/m^2)} = 1.06$ cm <b>is WITHIN THE LIMIT</b>			
Expanded Uncertainty: ± 3,41 dB Level of confidence = 95% (k=2)			

UMTS module power	
Band	I
TX Frequency (MHz)	1917
<sup>1</sup> Radiated Power (dBm)	24
Radiated Power (mW)	251.19
MAXIMUM PERMISSIBLE EXPOSURE (MPE)	
Power density (W/m <sup>2</sup> )	9.585
Evaluation Distance at power density (cm)	4.57
VERDICT	
The EUT Radiated Power density at evaluation distance, calculated with the follow expression: <b>Band I: Evaluation distance at power density</b> = $\sqrt{(EIRP/(4*\pi*S))} = \sqrt{(251.19mW / (4*\pi*9.585W/m^2))} = 4.57$ cm <b>is WITHIN THE LIMIT</b>	
Expanded Uncertainty: ± 3,41 dB Level of confidence = 95% (k=2)	
Note: <sup>1</sup> Tx Output Power declared in EU-Type Examination Certificate ID: 57278RNB.008 issue by DEKRA Testing and Certification, S.A.U. in 07.07.2020.	

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LTE module power					
Band	I	III	VIII	XX	XXVIII
TX Frequency (MHz)	1940	1730	899	848	726
<sup>1</sup> Radiated Power (dBm)	23				
Radiated Power (mW)	199.53				
MAXIMUM PERMISSIBLE EXPOSURE (MPE)					
Power density (W/m <sup>2</sup> )	9.70	8.65	4.495	4.24	3.63
Evaluation Distance at power density (cm)	4.05	4.28	5.94	6.12	6.61
VERDICT					
<p>The EUT Radiated Power density at evaluation distance, calculated with the follow expression:</p> <p><b>Band I: Evaluation distance at power density</b> = <math>\sqrt{(EIRP/(4*\pi*S))} = \sqrt{(199.53mW / (4*\pi*9.70W/m^2))} = 4.05cm</math></p> <p><b>Band III: Evaluation distance at power density</b> = <math>\sqrt{(EIRP/(4*\pi*S))} = \sqrt{(199.53mW / (4*\pi*8.65W/m^2))} = 4.28cm</math></p> <p><b>Band VIII: Evaluation distance at power density</b> = <math>\sqrt{(EIRP/(4*\pi*S))} = \sqrt{(199.53mW / (4*\pi*4.495W/m^2))} = 5.94cm</math></p> <p><b>Band XX: Evaluation distance at power density</b> = <math>\sqrt{(EIRP/(4*\pi*S))} = \sqrt{(199.53mW / (4*\pi*4.24W/m^2))} = 6.12cm</math></p> <p><b>Band XXVIII: Evaluation distance at power density</b> = <math>\sqrt{(EIRP/(4*\pi*S))} = \sqrt{(199.53mW / (4*\pi*3.63W/m^2))} = 6.61cm</math></p> <p>is <b>WHITIN THE LIMIT</b></p>					
Expanded Uncertainty: ± 3,41 dB					
Level of confidence = 95% (k=2)					
Note: <sup>1</sup> Tx Output Power declared in EU-Type Examination Certificate ID: <b>57278RNB.008</b> issue by <b>DEKRA Testing and Certification, S.A.U.</b> in 07.07.2020.					

## PE Smart Mini Gateway

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### 11.2.1 EU Declaration of Conformity

Paradox Engineering declares that PE Smart Mini Gateway is compliant within the 2014/53/EU directive. The full Declaration of Conformity is available at the following link:  
[www.pdxeng.ch/certification/Gr57sjffl9.pdf](http://www.pdxeng.ch/certification/Gr57sjffl9.pdf)

### 11.2.2 Radio Restrictions

With reference to Article 10(10) of Directive 2014/53/EU and regulation 2017/1354, the use of this equipment is subject to restrictions in the following countries:

BE, BG, CZ, D, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT,  
LU, HU, MT, NL, AT, PL, PT, RO, SI, SK, FI, SE, UK, CH

The device will automatically comply with national regulations once it is correctly configured.

The country where PE Smart Mini Gateway will operate must therefore be configured for the wireless interface in order to respect the country regulations.

## 12. Certifications

### 12.1 US – United States

**Table 4 – Reference Standards of the United States**

Standard	Title
UL 62368-1	Audio/video, information and communication technology equipment - Part 1: Safety requirements (pending)
FCC 47 CFR part 15	FCC 47 CFR Part 15, Subpart C - Intentional Radiators (pending)

### 12.2 EU - Europe

**Table 5 – Directives of Europe**









Directive	Title
2014/53/EU	Directive on the harmonization of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC
2011/65/EU	Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment
2015/863/EU	Commission delegated directive amending Annex II to Directive 2011/65/EU of the European Parliament and of the Council as regards the list of restricted substances

**Table 6 – Reference Standards of Europe**





EN 55032: 2015  
EN 55024: 2010 + A1: 2015  
ETSI EN 301 489-1 V2.2.3  
ETSI EN 301 489-3 V2.1.1  
ETSI EN 301 489-17 V3.2.4  
ETSI EN 301 489-52 V1.1.0  
EN 62311:2008  
ETSI EN 300 328 V.2.1.1 clause 4.3.2.2, 4.3.2.9, 4.3.2.10  
ETSI EN 301 908-2 V.11.1.2 clause 4.2.2, 4.2.4, 4.2.10  
ETSI EN 301 908-13 V.11.1.2 clause 4.2.2, 4.2.4, 4.2.10  
ETSI EN 300 220-2 V.3.1.1  
ETSI EG 203 367 V1.1.1 (2016-06) Intermodulation of SRD 868MHz, Wi-Fi 2.4GHz and UMTS/LTE  
IEC EN 62368-1:2014/AC:2015/AC:2017/A11:2017 + IEC EN 60950-22:2006 + A11:2008

## 12.3 Symbols and Approval marks

### Approval marks

Approval	Issued by	Certificate No.
	 <i>MinebeaMitsumi</i> <small>Passion to Create Value through Difference</small>	Declaration of Conformity
		UL certificate: pending
		FCC ID: 2AKPQGWWG001
		ARIB certificate: pending

### Symbols

Approval	Description
	Read the product documentation to install and operate the equipment
	Class II equipment
	RoHS compliant, refer to [OD_1]
	WEEE Directive compliant, refer to [OD_1]

### 13. Ordering Codes

**Table 7 – Ordering Codes**

<b>Ordering code</b>	<b>Country / Region</b>
GWWG001US	United States
GWWG001EU	Europe
GWWG001JP	Japan
GWWG001KH	Cambodia
GWWG001TH	Thailand
GWWG001PH	Philippines
GWWG001CL	Chile



## 14. Related Documents

**Table 8 – Related Documents**

<b>Document Number</b>	<b>Document Title/Description</b>
DOC-INS-0019	PE SUN System Installation Manual
DOC-DAT-0026	PE Smart Mini Gateway Datasheet
DOC-INS-0111	PE Smart Mini Gateway User Manual
EM10507	MinebeaMitsumi Group Green Procurement Standard
178919 D01	FCC Permissive Change Policy

## 15. Revision History

Revision	Document No.	Created by Verified by Approved by	Date	Description
00	DOC-INS-0115-00	B. Hopkins R. Palmiero L. Grillo	22.04.2020	First emission of this document.
01	DOC-INS-0115-01	B. Hopkins R. Palmiero L. Grillo	30.10.2020	Updated to include new mounting brackets and configuration screens.
02	DOC-INS-0115-02	B. Hopkins R. Palmiero L. Grillo	13.11.2020	Added a section for port identification as well as new section for Maintenance and fuse F4
03	DOC-INS-0115-03	B. Hopkins R. Palmiero L. Grillo	24.11.2020	Created a new Section 7 for specifying the 3 types of the connections to the internet
04	DOC-INS-0115-04	C. Bernocco R. Palmiero L. Grillo	19.02.2021	Updated the default IP address used by the Mini Gateway as management interface Updated the name of the ethernet labels and LTE antenna connector. Added new instructions for inserting the Ethernet Cable Added new screens for configuration of 4G and DHCP connections
05	DOC-INS-0115-05	B. Hopkins R. Palmiero L. Grillo	31.05.2021	Updated the figure for the DHCP connection



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