



Smart Metering Infrastructure

MQTT Gateway Devices

Field Technician Installation Manual

Covers:

- MQTT Wi-Fi Gateway
- MQTT Ethernet Gateway
- MQTT LTE Gateway
- Universal Node

Document Version 1.0

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1. Introduction

This manual is intended for field technicians responsible for the physical installation and initial configuration of PSP MQTT gateway devices and nodes. It covers all three gateway variants — MQTT Wi-Fi Gateway, MQTT Ethernet Gateway, and MQTT LTE Gateway — as well as the universal node.

For information on configuring the MQTT broker to which gateways connect, refer to the separate PSP MQTT Broker Configuration Manual.

1.1 About PSP Gateway Devices

PSP (Pty) Ltd manufactures a range of gateway devices, nodes, and communication modules for use in smart metering infrastructure. The hardware is designed to be broker-agnostic: any standard MQTT broker can be used, whether cloud-hosted or on a local network.

The gateway devices form the top tier of a three-tier IoT metering ecosystem:

Tier	Description
Top Tier — Gateway Node	Connects to the MQTT broker via the Internet (Wi-Fi, Ethernet, or LTE) and communicates with nodes via the EMOG radio mesh protocol.
Middle Tier — Node	Communicates with other nodes and gateway nodes via the EMOG radio mesh. Forms a self-healing radio mesh network.
Bottom Tier — Communications Module	Communicates with smart meters using the meter's native protocol (e.g. DLMS or DL/T 645) and communicates with nodes via EMOG radio.

1.2 EMOG Protocol

All radio communication between gateways, nodes, and communications modules uses the EMOG protocol (Encrypted, Mesh, Own Generation) — a proprietary protocol developed by PSP for smart metering radio mesh networks. Full protocol documentation is available at:

www.psp.co.za/documents/emog.pdf

1.3 Communications Modules

Communications modules are plug-and-play devices that require no configuration. They are detected automatically by nodes. The following communications modules are available:

- Kamstrup electricity meters

- Veryco electricity meters
- Kamstrup water meters (via WMBUS modem — see Section 2.3)

Communications modules for additional meter types will be added in future.

1.4 What the Field Technician Needs from the Network Administrator

Before configuring any gateway on site, the field technician must obtain the following information from the network administrator or client:

Parameter	Description
Broker Address	The URL or IP address of the MQTT broker (e.g. xxxxxxx1.ala.eu-central-1.emqxsl.com or 192.168.0.35)
Broker Port	The TCP port number for the MQTT broker connection
Username	The MQTT broker username
Password	The MQTT broker password
CA Certificate (if required)	A PEM file for secure (TLS) broker connections

2. Device Overview

2.1 Hardware

PSP produces four distinct printed circuit board (PCB) assemblies. All four share the same base board dimensions:

Specification	Detail
Base Board Size	90 mm × 40 mm
Mounting Holes	Two holes, 82 mm apart
Power Supply	5 V DC, minimum 2 A
Power Connection	Two screw terminals on the base board
LED Indicator	One LED per board indicating EMOG radio mesh activity
Enclosure	Not supplied — suitable for installation in a 4-way electrical distribution box

Recommended Enclosure

The board dimensions are designed to fit neatly inside a standard 4-way electrical distribution box (plug box) with IP67 rating. These enclosures can be ordered with 82 mm spaced mounting holes to accept 6 × 3.5 mm self-tapping screws, and are available with conduit pipe connectors on all four sides.

2.2 Device Types

Device	Description
Universal Node	Node only — no gateway. Communicates with other nodes and comms modules via EMOG radio.
MQTT Wi-Fi Gateway	Node + Wi-Fi gateway. Connects to an MQTT broker via a local Wi-Fi access point.
MQTT Ethernet Gateway	Node + Ethernet gateway. Connects to an MQTT broker via a wired LAN.
MQTT LTE Gateway	Node + LTE (NB-IoT) gateway. Connects to an MQTT broker via a mobile network using a SIM card.

2.3 Nodes and WMBUS Modems

Nodes can be ordered with or without an integrated WMBUS modem. A node equipped with a WMBUS modem will automatically detect and read WMBUS-compatible water meters (e.g. Kamstrup water meters) within radio range, without requiring a separate communications module.

2.4 Radio Mesh — Node Level

All nodes (including gateway nodes) participate in a self-healing EMOG radio mesh. The position of each node in the mesh hierarchy is indicated by its Node Level:

Node Level	Meaning
Level 0	Gateway node — directly connected to the MQTT broker
Level 1	One radio hop from the gateway (communicates directly with a Level-0 node)
Level 2	Two radio hops from the gateway
Level 3	Three radio hops from the gateway
Level 4	Four radio hops from the gateway
Level 5	Five radio hops from the gateway (maximum allowed)

Node level is assigned automatically based on received signal strength (RSSI) between nodes. No manual configuration is required.

TIP

When selecting a mounting location for a node, check the Node Level displayed on its configuration portal ([main.html](#)). Choose a location where:

- The Node Level is as low as possible (fewer hops to the gateway means better reliability).
- The RSSI to the parent node is strong (less negative value = stronger signal).
- The node has a clear radio line-of-sight to the meters inside the kiosk it services.

Nodes are typically installed on the outside of a meter kiosk enclosure — this allows the node to communicate both with the meters inside the kiosk and with other nodes in the mesh.

3. Installation Order

There is no mandatory sequence in which devices must be installed. Two common approaches are used:

Approach	Sequence
Top-Down	Configure the gateway first, then install and configure nodes, then install communications modules.
Bottom-Up	Install communications modules first, then configure nodes, then configure the gateway.

Regardless of the approach used, the node configuration procedure (Section 4) must be completed for every node, including the node that is built into each gateway device.

NOTE

The node built into a gateway device must be configured before the gateway itself is configured. The gateway's local IP address (required to access the gateway configuration portal) is only visible on the node's configuration page after the node has connected to the local network.

4. Node Configuration

Every device — whether a universal node or a gateway node — has a built-in web server accessible via a Wi-Fi Soft Access Point (Soft AP). The node is configured through this portal before the gateway (if present) is configured.

4.1 Connecting to the Node Soft AP

1. Power on the device.
2. On your smartphone or tablet, open the Wi-Fi settings and scan for available networks.
3. Locate the SSID consisting of 12 hexadecimal characters (e.g. A1B2C3D4E5F6). This is the MAC address of the node and serves as its default SSID and Node ID.
4. Connect to this network using the Wi-Fi password: 123456789
5. Open a browser and navigate to: `http://192.168.4.1`

TIP

Once a node has been given a name, its Soft AP SSID changes from the 12-character MAC address to the assigned node name. A newly installed node that has not yet been named will always advertise its MAC address as the SSID.

4.2 The Node Configuration Portal

The node configuration portal has two pages:

Page	Purpose
main.html (default)	Node name, node details, communication log, gateway information (if applicable), and Wi-Fi credentials (Wi-Fi gateway nodes only).
meters.html	Configure and manage the list of electricity meters serviced by this node.

4.2.1 Main Page (main.html)

The main page displays the following information:

- Node Name — the assigned name of the node (editable)
- Node Details — including Node ID (MAC address), Node Level, Parent Node ID, and Parent Node RSSI
- Communication Log — a scrolling log of recent EMOG mesh activity
- Gateway Information — displayed only if this node is the local node of a gateway (shows the gateway's assigned LAN IP address)

Setting the Node Name

6. Type the desired node name into the name input box on the main page.
7. Press the Update Name button.
8. The SSID advertised by the node's Soft AP will change to the new name after the update.

TIP

Choose a node name that clearly identifies the physical location of the node (e.g. the kiosk or building it is installed on). This makes it easier to identify nodes in the mesh.

Wi-Fi Credentials (Wi-Fi Gateway Nodes Only)

If the node is part of an MQTT Wi-Fi Gateway, the Wi-Fi network credentials must also be entered on the main page:

9. Press the down arrow next to the access point drop-down list to display available Wi-Fi networks.
10. If the list does not appear, wait 10 seconds and press the down arrow again.
11. Select the correct Wi-Fi network (SSID) from the list.
12. Enter the Wi-Fi password in the password field.
13. Press the Update button to save the credentials.

NOTE

Wi-Fi credentials are only required for MQTT Wi-Fi Gateway nodes. Universal nodes, Ethernet gateway nodes, and LTE gateway nodes do not require Wi-Fi credentials.

4.2.2 Meters Page (meters.html)

The meters page manages the list of electricity meters and water meters serviced by this node.

How Meters Are Assigned to a Node

Communications modules attached to electricity meters select their parent node automatically. Each communications module compares the RSSI of signals received from nearby nodes and connects to the node with the strongest signal. If a node with a stronger signal appears, or if the current parent node becomes unresponsive, the communications module will switch to a different parent node.

This automatic switching can cause communication errors when a meter repeatedly switches between nodes. To prevent this, the node's meter list must be locked.

Locking the Meter List

When a node's meter list is locked, only meters already on the list will be polled by the node. Any communications module that is not on the list will be ignored, even if it sends signals to the node. This forces each meter to remain on its designated parent node.

NOTE

Water meters are not polled and cannot be locked. The lock function applies to electricity meters only.

Nodes should normally be installed on the outside of the meter kiosk they service. The locked meter list should include all — and only — the electricity meters inside that kiosk.

Using the Meters Page

The meters page displays two lists: electricity meters and water meters. It also provides the following controls:

Control	Function
Meter Input Box	Enter the serial number of a meter before using Add or Remove.
Add Meter button	Adds the meter serial number entered in the input box to the electricity meter list.
Remove Meter button	Removes the meter serial number entered in the input box from the electricity meter list.
Lock List button	Locks the current electricity meter list. No new meters will be added automatically.
Unlock List button	Unlocks the electricity meter list, allowing automatic meter assignment to resume.

The current locked/unlocked status of the list is displayed in the heading above the electricity meter list.

Procedure — Building and Locking a Meter List

14. Allow the node to run for a period so that nearby communications modules can connect and populate the meter list automatically.
15. Verify that the list shown on the meters page contains exactly the meters inside the kiosk served by this node.
16. To add a missing meter: enter its serial number in the meter input box and press Add Meter.
17. To remove an incorrect meter: enter its serial number in the meter input box and press Remove Meter.
18. Once the list is correct, press Lock List to lock it.
19. Confirm that the heading above the electricity meter list shows the Locked status.

5. MQTT Wi-Fi Gateway Configuration

The MQTT Wi-Fi Gateway consists of a node and a Wi-Fi gateway on a single PCB. It has two separate configuration portals: one for the node (via the Soft AP at 192.168.4.1) and one for the gateway (via the gateway's assigned LAN IP address).

5.1 Step 1 — Configure the Node

Follow the full node configuration procedure in Section 4, including:

- Setting the node name
- Entering the Wi-Fi network SSID and password (required for Wi-Fi gateway nodes)
- Configuring the meter list on the meters page if required

After saving the Wi-Fi credentials, the gateway will connect to the local Wi-Fi network. The IP address assigned to the gateway by the DHCP server will be displayed on the main page of the node portal.

NOTE

A DHCP server must be running on the local Wi-Fi network to assign an IP address to the gateway. It is not possible to set a static IP address on the gateway.

5.2 Step 2 — Access the Gateway Configuration Portal

20. Note the gateway's LAN IP address displayed on the node's main page (e.g. 192.168.1.45).
21. Connect your smartphone or tablet to the same local Wi-Fi network (not the Soft AP).
22. Open a browser and navigate to the gateway's IP address (e.g. <http://192.168.1.45>).

5.3 Step 3 — Configure the Gateway

The gateway configuration portal displays the current settings and broker connection status at the top of the page. Each parameter has its own input box and Update button. The following parameters are available:

Parameter	Description
Gateway Name	A descriptive name for this gateway (e.g. the complex or site name).
Complex Code	A unique site code used to identify this installation on the MQTT broker.
Broker Address	The URL or IP address of the MQTT broker (without protocol prefix, e.g. xxxxxxx1.ala.eu-central-1.emqxsl.com or 192.168.0.35).

Broker Port	The TCP port for the MQTT connection.
Broker Username	The MQTT broker username.
Broker Password	The MQTT broker password (not displayed in the status view).
Secure Connection	Check this box to enable a TLS-secured connection to the broker.
Broker-as-HomeAssistant	Check this box if the broker is a Home Assistant MQTT broker.

Updating Parameters

23. Enter or modify the value in the parameter's input box.
24. Press the Update button next to that parameter.
25. A confirmation message will appear indicating which parameter was updated.
26. Repeat for each parameter that must be set.

NOTE

It is not necessary to reboot the gateway after updating parameters. The gateway continuously attempts to connect to the broker using the current credentials. The page may appear slow or unresponsive while the broker status shows NOT CONNECTED. This is normal behaviour during connection retries. The page should become responsive again within 30 seconds of a parameter change.

Loading a CA Certificate (Secure Connections)

27. Press the Load Certificate button on the gateway configuration page.
28. An upload page will open. Select the PEM certificate file provided by the network administrator.
29. The certificate will be uploaded and stored on the gateway.
30. Ensure that the Secure Connection checkbox is checked.

6. MQTT Ethernet Gateway Configuration

The MQTT Ethernet Gateway consists of a node and an Ethernet gateway on a single PCB. Like the Wi-Fi gateway, it has two separate configuration portals: one for the node (via Soft AP) and one for the gateway (via LAN IP).

6.1 Step 1 — Configure the Node

Follow the full node configuration procedure in Section 4. Note that no Wi-Fi credentials are required for an Ethernet gateway node — only the node name and meter list configuration (if applicable) need to be set.

Connect the gateway to the local LAN using an Ethernet cable. A DHCP server must be running on the LAN to assign an IP address to the gateway. The assigned IP address will be displayed on the main page of the node's Soft AP portal.

NOTE

A DHCP server must be running on the local LAN to assign an IP address to the Ethernet gateway. It is not possible to set a static IP address on the gateway.

6.2 Step 2 — Access the Gateway Configuration Portal

31. Note the gateway's LAN IP address displayed on the node's main page.
32. Connect your device to the same local LAN (via Wi-Fi or Ethernet — not the Soft AP).
33. Open a browser and navigate to the gateway's IP address (e.g. <http://192.168.1.50>).

6.3 Step 3 — Configure the Gateway

Follow the same gateway configuration procedure as described in Section 5.3 for the Wi-Fi gateway. All parameters, update procedures, and behaviour are identical.

7. MQTT LTE Gateway Configuration

The MQTT LTE Gateway is based on the Wavecom SIM7022 NB-IoT module and uses a commercial mobile network for connectivity. Unlike the Wi-Fi and Ethernet gateways, the LTE gateway has a single configuration portal (on the Soft AP at 192.168.4.1) where both the node settings and the gateway (broker) settings are configured on the same page.

7.1 SIM Card Requirements

The LTE gateway requires a micro SIM card on a commercial NB-IoT contract with a mobile network service provider.

NOTE

Before inserting the SIM card into the gateway, the SIM PIN must be set to the required PIN using another mobile phone. The gateway cannot change the SIM PIN — it can only use the PIN that has already been set on the SIM card.

SIM Card Preparation Procedure

34. Insert the SIM card into another mobile phone.
35. Navigate to the phone's SIM PIN settings (usually under Security or SIM Card Management).
36. Change or confirm the SIM PIN to the value that will be entered in the gateway configuration.
37. Remove the SIM card from the phone and insert it into the LTE gateway's SIM card slot.

7.2 Connecting to the LTE Gateway Soft AP

38. Power on the LTE gateway.
39. On your smartphone or tablet, scan for Wi-Fi networks.
40. Locate the SSID consisting of 12 hexadecimal characters (the node's MAC address). This is the default SSID until the gateway name has been set.
41. Connect using the Wi-Fi password: 123456789
42. Open a browser and navigate to: <http://192.168.4.1>

TIP

Once the gateway name has been set on the main page, the Soft AP SSID will change from the MAC address to the gateway name — the same behaviour as a universal node.

7.3 Configuring the LTE Gateway

The LTE gateway configuration portal (main.html) contains both node settings and gateway settings on a single page.

7.3.1 Node Settings

Configure the node name and meter list as described in Section 4. No Wi-Fi credentials are required for the LTE gateway.

7.3.2 Gateway Settings

In addition to the standard gateway parameters described in Section 5.3, the LTE gateway also requires:

Parameter	Description
SIM PIN	The PIN of the inserted SIM card (must match the PIN set on the SIM before insertion).
Broker Address	URL or IP address of the MQTT broker.
Broker Port	TCP port for the MQTT connection.
Broker Username	MQTT broker username.
Broker Password	MQTT broker password.
Secure Connection	Check to enable TLS-secured broker connection.
Broker-as-HomeAssistant	Check if the broker is a Home Assistant MQTT broker.

Follow the same update procedure as described in Section 5.3: enter each value in its input box and press the corresponding Update button.

For secure connections requiring a CA certificate, press the Load Certificate button and upload the PEM file as described in Section 5.3.

8. Troubleshooting

Problem	Suggested Action
Cannot find the Soft AP SSID	Ensure the device is powered on. If the node has previously been named, the SSID will be the node name, not the MAC address.
Cannot connect to Soft AP	Verify the Wi-Fi password is 123456789. Ensure you are within range of the device.
Wi-Fi access point list is empty	Wait 10 seconds and press the down arrow again to refresh the list.
Gateway's LAN IP address not shown on node page	Ensure a DHCP server is active on the local LAN/Wi-Fi network. Check Ethernet cable connection for Ethernet gateways.
Gateway configuration page is slow or unresponsive	This is normal while the broker status shows NOT CONNECTED. Wait up to 30 seconds after changing a parameter for the page to become responsive.
Node level is too high (Level 4 or 5)	Relocate the node to a position with better radio line-of-sight to a lower-level node. Check Parent Node RSSI on the main page.
Meter list is not populating	Ensure communications modules are powered and within radio range of the node. Allow sufficient time for the modules to select a parent node.
LTE gateway not connecting	Verify the SIM card is correctly inserted, the SIM PIN matches the one entered in the portal, and the mobile network provides NB-IoT coverage at the site.

9. Quick Reference

9.1 Default Soft AP Credentials

Parameter	Value
Soft AP IP Address	192.168.4.1
Default SSID	Node MAC address (12 hexadecimal characters) — changes to node/gateway name once configured
Wi-Fi Password	123456789
Node Portal — Main Page	http://192.168.4.1/main.html
Node Portal — Meters Page	http://192.168.4.1/meters.html

9.2 Gateway Portal Access

Gateway Type	How to Access Gateway Portal
MQTT Wi-Fi Gateway	Connect to local Wi-Fi LAN, then navigate to the IP address shown on the node's main page.
MQTT Ethernet Gateway	Connect to local LAN, then navigate to the IP address shown on the node's main page.
MQTT LTE Gateway	Gateway settings are on the same page as node settings — accessed via the Soft AP at 192.168.4.1.

9.3 Configuration Checklist

Use this checklist for each device installation:

Step	Task
☐ 1	Power on the device and locate its Soft AP SSID.
☐ 2	Connect to the Soft AP (password: 123456789) and open http://192.168.4.1 .
☐ 3	Set the node name on main.html.
☐ 4	(Wi-Fi gateway only) Select the Wi-Fi network and enter credentials on main.html.
☐ 5	(LTE gateway only) Insert prepared SIM card and enter SIM PIN on main.html.
☐ 6	Note the Node Level and Parent Node RSSI — confirm location is suitable.
☐ 7	Navigate to meters.html and verify/configure the electricity meter list.

☐ 8	Lock the meter list once correct.
☐ 9	(Wi-Fi/Ethernet gateway) Note gateway LAN IP from main.html, connect to LAN, open gateway portal.
☐ 10	Enter all broker parameters in the gateway portal and confirm broker connection.
☐ 11	(Secure connection) Upload the CA certificate PEM file via the Load Certificate button.

9.4 Further Documentation

EMOG Protocol Reference: www.psp.co.za/documents/emog.pdf

MQTT Broker Configuration Manual: Refer to the separate PSP MQTT Broker Configuration Manual.

PSP Website: www.psp.co.za