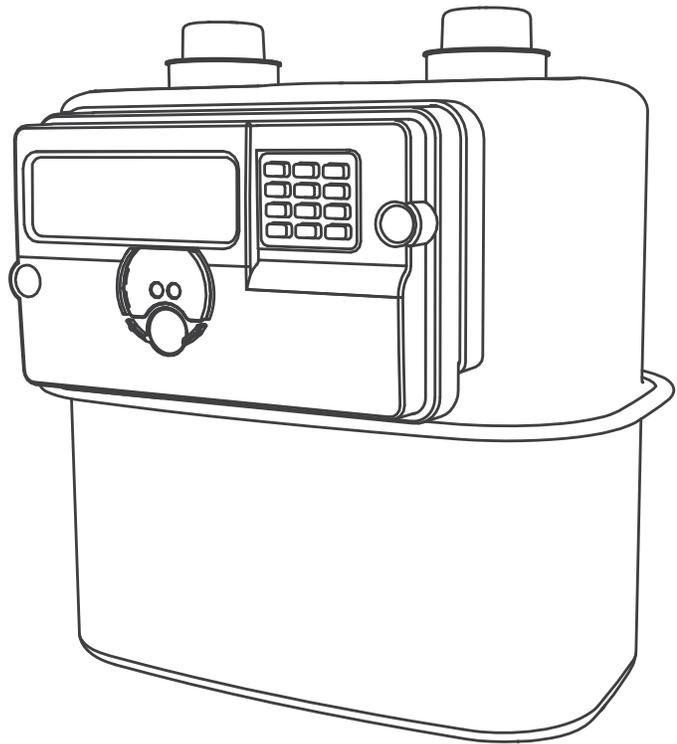# Liberty EG4v12 (G1.6) gas meter

User cum maintenance guide

The gas meter is compliant with the following:

Standard(s):

    BS EN 1359

Directives:

- Weight & Measure, Legal Metrology, Govt. of India
- WPC
- MID Directive (2014/32/EU)
- ATEX Directive(2014/34/EU)
- ROHS Directive (2011/65/EU)

Table of Contents

1   Introduction

1.1   Target audience

This document is intended for technical users, utilities and fully qualified, registered installers of Liberty EG4v12 meters.

1.2   About this manual

The manual describes functions and features of the Liberty EG4v12 meter and provides necessary information needed to use the meter.

1.3   Important safety information

Attention is drawn as follows in the individual chapters of this user manual with classified word symbols and pictographs to the relevant danger level, i.e. the severity and probability of any danger:

Danger

Definition of danger

This symbol is used to indicate a possibly dangerous situation which could result in severe physical injury or a fatality.

Attention

Definition of warning

This symbol is used to indicate a possibly dangerous situation which could result in minor physical injury or material damage.

The meter should only be installed by trained personnel safely and securely in accordance with local best practices.

1.4   Installation, maintenance and environment

- The product should be installed in line with PNGRB guidelines. Install in a location where it is protected from impact and friction.

- A visual inspection should be performed before installing the meter. The following should be checked, as a minimum:

  o   No evidence of external damage or missing parts
- The product conforms to ATEX zone 2 requirements. ATEX code is

  II 3 G Ex ic nA IIA T6

- There is no maintenance, repair or adjustment intended for this meter. There are no interchangeable or serviceable parts (except primary battery which can be exchanged in service by authorised personnel only), without breaking metrology seal.

- The primary battery in the meter can be replaced by authorised personnel, when in service. However, this battery must only be supplied by Secure Meters Ltd.

- You may contact the sales team representative at Secure Meters Limited for further information.

- When replacing the gas meter battery, ensure that you follow appropriate Electrostatic discharge (ESD) procedures before you open the meter cover. This will eliminate risk or possible damage to the meter circuit. A few methods are mentioned below:
    - Wear or use well-grounded ESD protective gear such as a wrist strap or pad during the operation.
    - Wear anti-static 'Finger cots' before you touch the meter cover.
    - Touch the Inlet/Outlet port of the Gas meter or any earthed metallic surface to discharge static electricity before you touch the meter cover.

    Observe local safety norms when disposing of the product and any batteries that it contains, at the end of their life, to ensure that they do not enter the household waste stream.

    The meters will be sent to an approved dealer for secure disposal.

- The product surfaces can be cleaned/wiped only with a damp or anti-static cloth.

2 Product overview and operating principle

Liberty EG4v12 supports Prepayment mode of operation. The meter is based on a positive displacement principle. It has a well-defined measurement compartment that alternately fill and empty when gas is consumed. By knowing the volume displaced in each cycle and by applying proper gear ratio, the meter will read the gas consumption in cubic meters.

Figure 1: Operating scenario

The meter has a Bluetooth interface (BLE 4.2) for communication with the mobile app and a user interface comprising of a custom LCD and 12-key keypad. The user interface provides a means of manually entering prepayment Unique Transaction Reference Numbers (UTRNs). UTRNs can also be entered via mobile app over Bluetooth.

Commands or configuration changes can be delivered to the meter in the form of UTRNs (recharge tokens). UTRNs are encrypted codes and are valid only for the meter for which they are generated.

The whole communication (token entry and data reading) between the mobile app and meter over the Bluetooth takes between one to three minutes depending on location. The data read from the meter is transferred to the meter data server of Secure at the backend whenever data (internet) connection is available in the mobile. **For sending data to the backend, the mobile app should be open in view mode.**

The meter has an integral shut-off valve (SOV) that enables or prevents the flow of gas. The integral shut-off valve is NOT a safety valve.

The electronic unit (EU) is powered by a long-life non-rechargeable lithium battery which also powers the unit's internal clock.

Note:

Communication with the meter over BLE is restricted from 10* pm to 7* am.

* This information is subjected to change

3   Product description

3.1   Liberty EG4v12 main features

Figure 2: Liberty EG4v12 meter

The integrity of the meter seals should be checked periodically.

LCD information window (Display)

Liberty EG4v12 has a backlit, monochrome LCD for displaying metering data, alerts and other relevant information. The meter is battery-powered, and therefore the display is enabled only on demand (key press). The meter display will return to 'sleep mode' if there is no user interaction after approximately 30 seconds.

Keypad

The keypad has ten 0-9 numeric keys and two special keys marked 'A' (blue) and 'B' (red). Key '5' has a raised dot to help visually impaired users to navigate.

The EU front cover

The EU front cover has a transparent window to view the display and a flange to protect it from dust and moisture ingress. The cover is secured to the meter base with two sealable M4 machine screws, on either

side, at the front. Provision is also made for front/battery cover 'open' detection. Removal of the cover and access to the battery compartment requires breaking the plastic seals and undoing the screws.

3.1.1 Electronic unit (EU)

The electronic unit (EU) is fitted on the front of the mechanical gas meter using mounting studs. The enclosure has an ingress rating of IP-54. The EU houses the processor and battery.

Figure 3: Electronic unit with the cover removed

Functions of the EU

- Computes the volume of gas passed through the gas meter, processes and stores the information in its memory and communicates the information to mobile app over Bluetooth (on request).
- Carries out all accounting and billing activities for gas consumption
- Detects and records flags of tamper events/faults
- Monitors battery voltage for detection of low battery condition
  The EU generates a 'low battery' alert when the battery voltage is continuously below 3.3 volts for 48 hours. In the case of battery failure, the EU will close the gas meter valve, stop metrology and all communications as well as take backups of all registers.

3.1.2 Battery

A 3.6 V D-Cell battery provides power to the EU. The battery is fitted in a small compartment inside the EU and has an independent cover with cover removal detection and a tamper-evident sealing arrangement. Under normal operating conditions, the battery is expected to last for approx ten years. The hardware and firmware in the EU is designed to work with low power consumption to conserve battery life.

3.1.3 Integral shut-off valve

The meter has an integrated supply shut-off valve mounted inside the metal meter enclosure. The EU can be factory configured to close the valve when it detects any of the following events:

a) Battery cover open detection
b) Magnet tamper detection
c) Tilt detection

3.1.4 Tamper detection

The meter has anti-tamper features including tilt sensor, magnetic tamper sensor and battery cover open sensor.

3.2 Using the display

The figure below shows the illuminated segments during display test when key 0 is pressed:

Figure 4: Meter display in 'Test Mode'

Note:

Only a few icons as described in section 3.2.1 are applicable for Liberty EG4v12 gas meter.

The meter is programmed to display information on manually pressing any numeric key on the meter keypad. Sets of information relating to a function are grouped on each numeric key. Repeated pressing of the same key manually jumps the display through the configured display list. Pressing key 'B' manually allows the displays to go backwards.

3.2.1   Display icons

The following table lists the icons displayed on the meter LCD and their significance:

Display icon	Significance
	Displays alpha-numeric data such as gas consumption or a UTRN token number during token entry or an alert message.
m³	Indicates the volume of gas
	Indicates the supply status – ON, READY, OFF

Table 1: Interpretation of LCD icons

3.2.2   Keypad functions

Balance, Volume and Days left

Number keys (0-9) functions:
➢ Used to display meter data
➢ Used to input tokens.

Emergency credit value and status

Friendly credit status

Key 'A' functions:
➢ Initiates token entry;
➢ Used as backspace during token entry;
➢ Used to enable Emergency Credit when made available;
➢ Initiates supply reconnection from ARM state.

Key '0' functions:
➢ Initiates Commissioning process if applicable.
➢ Displays test mode, time and date (after successful commissioning)

Key 'B' functions:
➢ Used to scroll back through a display sequence;
➢ Initiates token authentication process;
➢ Used to confirm supply reconnection from ARM state.

3.2.3   Financial display

All financial information will be displayed in Rupees and Paisa. Most numerical displays use the decimal points predefined in the display graphics, as shown below:

3.2.4   Display timing

Display timings are preconfigured for each data item in a display sequence with each item being preceded by a relevant title. A title is displayed for two (2) seconds, followed by the data for four (4) seconds followed by the next set of information.

4 Meter specifications

4.1 General specification

Specification		Description
Mechanical	Weight (in kg)	Approx. 2.5 kg
	Case work	Pressed steel
	Finish	Powder coating
	Diaphragms	Synthetic
	Shut off valve	Internal electrically operated, operational life 2000 cycles (2000 On and 2000 Off operations)
	Sealing provisions	Two sealable battery cover screws
	Index	English
	Max index reading	99999.999 m^3
	Gas connections	3/4" BS 746
	Keypad	Silicon material
	Display	LCD with backlight, ten starburst character (7mm high) with icons. Viewing angle 18^0 to 20^0 at 12 o'clock and 6 o'clock 25^0 at 3 o'clock and 9 o'clock from normal to window
Compliance	Metrology	BS EN 1359
	Fire resistant	EN1359 (pressed steel version)
Metrology	Cyclic volume	1.2dm^3(Liberty EG4v12)
	Flow range — Qmax	2.5 m^3/hr
	Flow range — Qmin	0.016 m^3/hr
	Starting flow rate	3.0 dm^3/hr
	Maximum working pressure (Pmax)	0.5 bar
	Gas type	Natural
Environmental	Operating temperature (Tmin to Tmax)	- 10 °C to + 55 °C
	Storage temperature	- 25°C to + 60 °C
	Ingress protection	IP54 (EN60529)

4.2   Handling, storage and operating conditions

Liberty EG4v12 meter is an electro-magnetic device containing delicate components and should be handled carefully during transit, storage and installation to ensure accuracy and endurance. The meter should be stored upright with inlet and outlet boss dust caps in place and protected from physical vibration and shocks. Wherever possible the meter should be kept in its original packaging on a shelf or pallet until it is installed at the customer's site.

Proper installation and removal procedures should be followed to prevent damage or injury. Physical damage to the meter's case could indicate damage to internal components. Under no circumstances should an attempt be made to install a damaged meter.

Ideally, the meter should be stored and operated in a dry, well ventilated, climate-controlled building. Rapid changes in temperature and humidity should be avoided.

4.3   Liberty EG4v12 dimensions

The following diagram shows the outer dimensions of the Liberty EG4v12. All dimensions are in millimetres (mm):
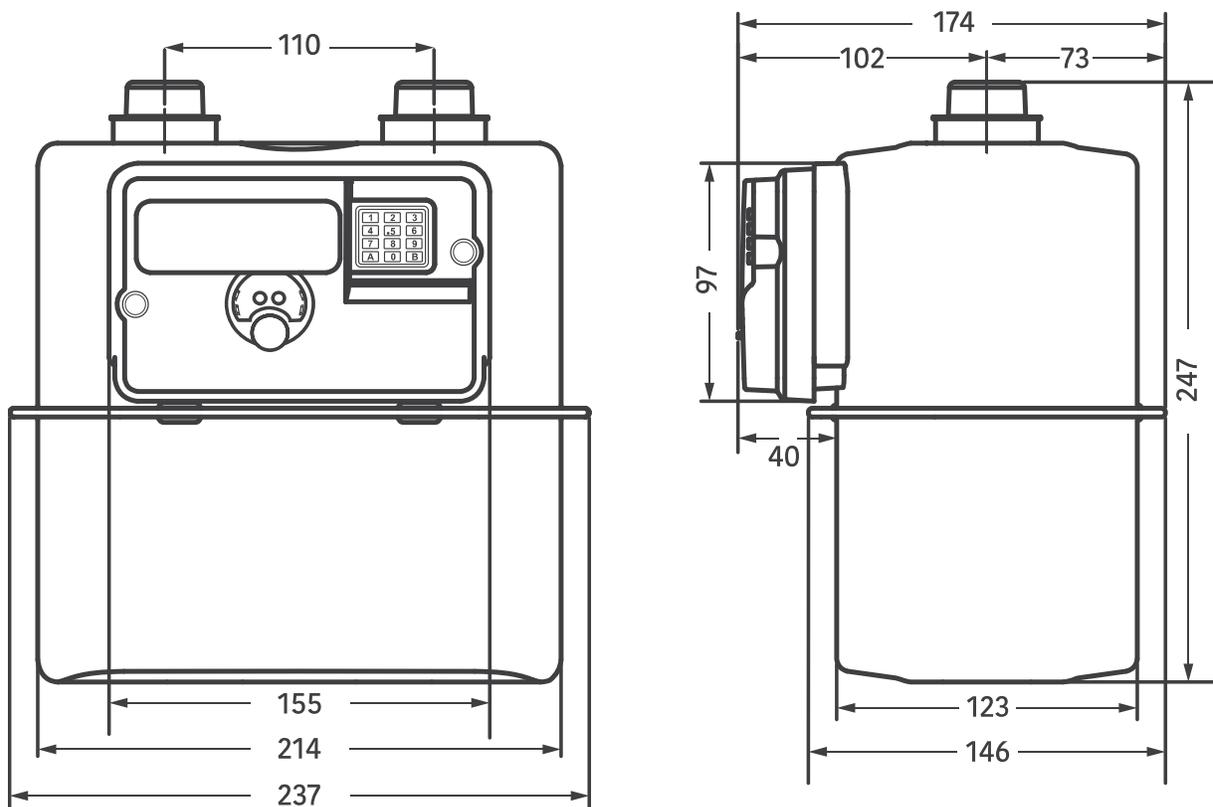
Figure 5: Liberty EG4v12 front and side views

5 Functional specification

The following functional features of Liberty EG4v12 are described in this section:

1. Meter operating modes
2. Registers and snapshots
3. Time keeping
4. Accounting
5. UTRN Transaction
6. Meter configuration and functionality
7. Meter valve state
8. Detecting and logging events
9. Communication channels
10. Meter reading data
11. Engineering Codes

5.1 Meter operating modes

Liberty EG4v12 meter operates in pre-payment mode. Also, there is a commissioning mode for commissioning of the meter.

5.1.1 Prepayment mode

In Prepayment mode, the meter will perform billing actions as detailed in 'Device information

Device information consists of the meter serial number, meter program name, commodity type and the meter type.

Billing snapshot' in Section 5.2.2.1. Prepayment mode supports four different accounting zones as detailed in Section 5.4.2 'Accounting zones in prepayment mode' and generates account-specific visual alerts. Also, this mode supports the following features:

- Adding an absolute value to the meter's account through meter keypad or mobile app
- Displaying account-specific messages
- Emergency Credit and Friendly Credit support
- Meter valve operation based on the account state, Friendly Credit and Emergency Credit configurations.
- Retain credit

The meter activates the following functionality when operating in this mode:

- Slab or Block tariff
- Events and tamper detection
- Prepayment features:
  o Sending visual alerts on display when meter credit becomes low
  o Updating, activating and repaying of Emergency Credit
  o Disconnecting and reconnecting supply

5.1.2 Commissioning mode

After physically installing the meter, the commissioning process is carried out. This process is initiated by the gas meter when it is put into commissioning mode (by pressing key '0'). If carried out correctly, the

entire commissioning process, including the gas test but excluding gas meter installation, should take less than ten (10) minutes.

Note: Once the commissioning is carried out successfully, standing charge deduction becomes applicable.

5.2   Registers and snapshots

5.2.1   Registers

The gas meter EU records the volume of gas consumed in m^3.

Measurement and recording of the gas flow

The gas meter EU is designed to receive pulses from its gas meter. Each pulse indicates the quantity of gas flow.

5.2.2   Snapshot logging

The gas meter EU logs the following three types of data which will be sent to the mobile app on the receipt of a snapshot request:

a) Device information
b) Billing snapshot
c) Current snapshot

The snapshot data consists of the following details as per configuration:

● Cumulative volume (resolution is 1 litre)
● Prepayment information consisting of currency code, meter account balance, cost of consumption and standing charges deducted.

Note:
Cumulative volume and standing charges are not shown on the mobile app.

5.2.2.1   Device information

Device information consists of the meter serial number, meter program name, commodity type and the meter type.

5.2.2.2   Billing snapshot

Meter will log the billing data of cumulative volume consumed during billing period, cost of consumption, deducted standing charges and billing flags.

The meter will take a snapshot of its energy registers for billing purpose due to any of the following actions:

● Scheduled billing date
● The occurrence of an abnormal event, for example, corruption of energy register or rollover of consumption amount

The meter stores a total of 3 billing snapshot. Billing snapshot data is updated on a FIFO basis.

5.2.2.3   Current snapshot

The meter will send the present value of its gas volume, meter balance, emergency credit limit, bill amount since the last billing, average cost/day, days left, cost of the previous day, cost of last seven days' consumption and diagnostic flags.

5.3 Timekeeping

The gas meter clock maintains time in hour, minutes, and seconds format.

All data logging (e.g. events data and snapshots) and scheduled task activation (e.g. rate register switching, Friendly Credit timing, minimum charge deduction, etc.) takes place using the country's standard time.

When the time is invalid for any reasons, an RTC failure flag is logged. The date and time on the meter display will appear as '--------'

5.4 Accounting

This section describes the accounting features in the Liberty EG4v12 meter.

5.4.1 Standing charge deduction

Liberty EG4v12 meter can be configured at the factory end to deduct a specified amount of standing charge from its current account and Emergency Credit account (if applicable); this deduction takes place in one of the following two ways:

1. Daily

2. At the end of the billing period (monthly/bimonthly/quarterly)

5.4.1.1 Daily

When configured as 'daily', the standing charges are deducted every day at midnight.

Example 1,

> Consumption = Rs10
>
> Standing charge = Rs6
>
> Deduction at midnight = Rs6 besides the consumption

Example 2,

> Consumption = Rs0
>
> Standing charge = Rs6
>
> Total deduction at midnight = Rs6

5.4.1.2 At the end of the billing period

When configured as 'at the end of billing period', the standing charges are deducted at bill end (monthly/bimonthly/quarterly). The following cases are possible:

If the consumption amount within the billing period is more than the standing charge for that billing period, no amount is deducted besides the consumption.

For example,

> Consumption = Rs150
>
> Standing charge = Rs100
>
> No amount is deducted at the end of the billing period in addition to the consumption.

If the consumption amount within the billing period is less than the standing charge for that billing period, the difference amount is deducted besides the consumption.

For example,

> Consumption = Rs20

> Standing charge = Rs100

> Rs100- Rs20 = Rs80 will be deducted at the end of billing period in addition to the consumption.

Notes:

- It is possible for the account balance to go in negative after deduction of standing charges.
- The deduction takes place irrespective of the volume of gas consumed or the meter's account status.
- To stop the deduction of standing charges in the meter, a Retain credit transaction needs to be performed.

5.4.2   Accounting zones in prepayment mode

Liberty EG4v12 meters operating in Prepayment mode will have the following four accounting zones:

- Credit zone
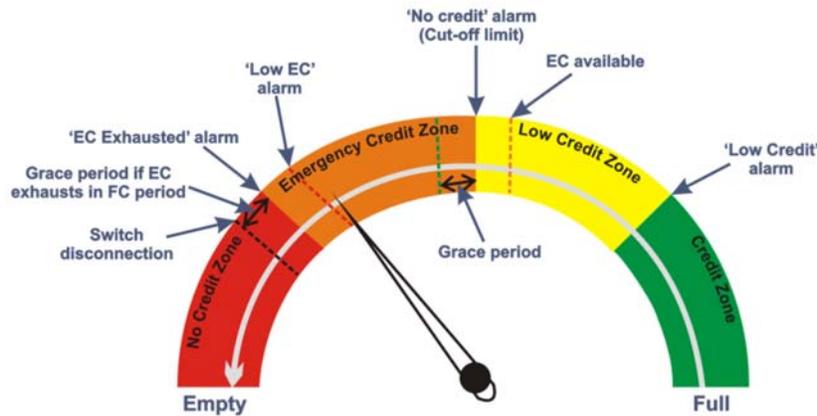- Low credit zone
- Emergency credit zone
- No credit zone

Figure 6: Liberty EG4v12 accounting zones in prepayment mode

In Prepayment mode, the meter maintains two internal accounts: the main account and the emergency credit account. Minimum charges are deducted at billing date.

Each time the meter account passes through a credit zone threshold, it generates a visual alert.

'Low credit' threshold and 'Low emergency credit' threshold values can be configured during manufacturing.

In Prepayment mode the meter will provide the following information on Emergency Credit:

a) When emergency credit is available for selection
b) When emergency credit is in use
c) When emergency credit has been fully used

5.4.2.1 Credit zone

In the credit zone, the value of the meters' account, after a reduction, is checked against the meter's Low Credit threshold. No action is taken if the value is above the threshold. When the value goes below the threshold, the meter generates an alert.

5.4.2.2 Low credit zone

In the low credit zone, the value of the meter account, after a reduction, is checked against the meter's cut-off threshold. No action is taken if the value is above the cut-off threshold. In this zone, emergency credit is made available to the user before the value reaches the cut-off threshold. A visual indicator on the meter's display indicates that emergency credit is available. **While the meter is operating in this zone, if emergency credit (Refer section 5.4.3 for details)is made available, the user can enable it by pressing key 'A' on the meter's keypad to prevent supply disconnection when the meter reaches the cut-off threshold.**

5.4.2.3 Emergency credit zone

In the emergency credit zone, the value of the meter account, after a reduction, is checked against the meter's low emergency credit threshold. No action is taken if the value is above the threshold. A visual indicator on the meter display will indicate when emergency credit is in use. Also, the meter provides information on the emergency Credit amount remaining.

If the entire emergency credit allowance is used up, but the meter is operating in friendly credit (Refer section 5.4.4 for details) period, the supply will remain 'On' till friendly credit ends. The user must add sufficient credit to put the meter's account into positive balance before supply restoration is permitted.

5.4.2.4 No credit zone

In the no credit zone, there is no emergency credit left to be used by the user. Therefore, the supply will remain disconnected until the user tops up the meter's account sufficiently to the amount which is shown as –ve balance on the meter.

5.4.3 Emergency credit (EC)

Liberty EG4v12 operating in Prepayment mode supports Emergency Credit functionality which if enabled will prevent immediate supply disconnection when the meter account becomes zero or negative. Emergency Credit is made available to users when their meter account passes the Low Credit threshold. A visual indication on the meter's display will indicate the availability of Emergency Credit. It can be enabled by pressing key 'A' on the meter keypad. If Emergency Credit is available but ignored by the user previously, then it can again be availed by pressing **key 7** on the meter keypad.

'Not now', 'Selected', 'In use' or 'Used up' display will appear on the meter as per the current EC status.

Users can also enable Emergency Credit (if not already exhausted) after supply disconnection by pressing Key 7. If the meter is running in EC, the mobile app will show account status as follows:
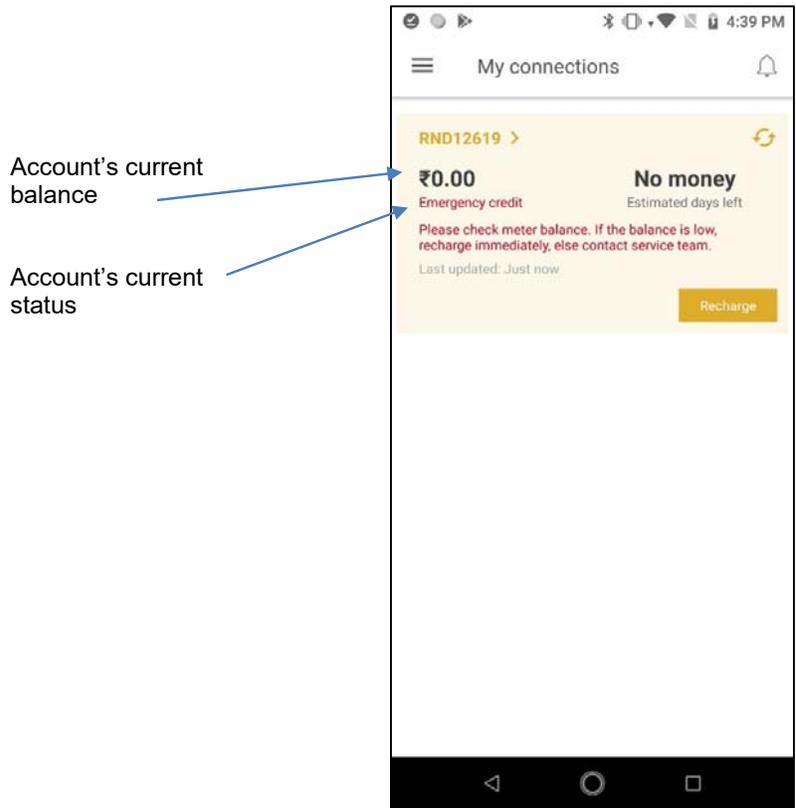
Account's current balance

Account's current status

Figure 7: Account status on mobile app

IF EC is not availed, the mobile app will show 'low money'.

5.4.4   Friendly credit(FC)

Friendly Credit is a factory configurable non-disconnection period which prevents account-related supply disconnection at certain times of the day, days of the week or on defined dates in the year such as public holidays.

In a Friendly Credit period if the meter's account balance becomes zero and Emergency Credit is not enabled or is used up then the supply will not disconnect because a grace period of x minutes is configured at the end of Friendly Credit period which interrupts supply disconnection.

Pressing **key 8** on the meter keypad displays the current status of FC and the time at which it ends or starts depending upon its current state.

5.5   UTRN transaction

A Unique Transaction Reference Number is an encrypted code used for adding money to the meter's account. UTRNs can be uploaded to the meter from a mobile app or entered using the meter's keypad.

The meter will reject UTRNs if they fail authentication (for example, UTRN is not for this meter, duplicate, etc.) and are invalid. Each time a UTRN is rejected, the meter displays a failure message along with a failure reason.

When entering a UTRN via the meter's keypad, there is a timeout period of 20 seconds after which time, if no key has been pressed the meter will begin automatic authentication of the UTRN.

The meter allows five (5) successive incorrect UTRN entries (via keypad) after which it locks key 'A' (key 'A' is used for initiating UTRN entry) for 30 seconds with a 'Keypad Locked' message on its display. After that, the lock period doubles with each incorrect UTRN until the 10th attempt is reached when the lock period is 16 minutes. Acceptance of a correct UTRN resets the incorrect UTRN counter and the lock period to zero and takes necessary action based on the UTRN type.

In case, the tokens are sent from the mobile app:

If seven transactions are already performed in the last 30 minutes, the app blocks the user for the next 15 minutes.

5.6 Retain credit

This transaction is performed to stop the deduction of standing charges in the meter when you are not consuming the gas for a longer duration.

A retain credit token of less than or equal to ten rupees is generated from the vending station. This token is entered into the meter and a refund code is generated for the remaining balance. This token stops the deduction of standing charges in the meter. Once a new recharge token is entered, the meter starts deducting the standing charges normally.

5.7 Meter configuration and functionality

The EU verifies and authenticates the commands it receives before executing them. If authentication fails, the meter will reject the command.

The following parameters are configurable in field Liberty EG4v12 meters via authenticated UTRNs ('Vend + tariff' type):

- Tariff rates and slabs
- Standing charge
- Credit addition (recharge through vend)

5.8 Account-based prepay alerts

Liberty EG4v12 meters operating in prepayment mode displays visual alerts (see Figure 6) under the following circumstances based on the state of its account:

- 'Low credit' alert if the credit level in the meter's account reaches or passes below the configured low credit threshold.
- 'Emergency credit available' alert if the credit level in the meter's account reaches or passes below the configured emergency credit threshold, thereby making the users aware of the availability of Emergency Credit.
- 'No credit' alert if the credit level in the meter's account reaches or passes below zero credit threshold.

- 'Low emergency credit' alert if an emergency credit level in the meter reaches or passes below the configured low emergency credit threshold.
- 'Emergency credit exhausted' alert if there is no emergency credit left in the meter

5.9 Meter valve state

The supply valve has three states –

1. **On:** Valve will be in the opened state, and there will be continuity of supply
2. **Off:** Valve will be in a closed state, and there will be no supply
3. **READY**: For safety reasons, a 'READY' state is introduced between the supply OFF and ON states. This gives the user the control to reconnect their supply from the meter when it is safe to do so (e.g. appliances are off). When the gas valve is in 'READY' state, the 'READY' icon will illuminate on the LCD, and an appropriate message will be displayed indicating that the meter is ready to reconnect supply and is waiting for the user to press the correct key sequence on the meter's keypad.

Important!

The supply will get disconnected in case of the following conditions:

- No balance
- Excessive gas flow (Inrush flow)- During the valve opening process (When user manually presses 'A' followed by 'B') if gas flow exceeds the uncontrolled gas flow rate (30 litres/hour), it returns back to the 'READY' state.
- Tamper

Reconnection of the valve will always require manual intervention. Fix the reason for valve disconnection, then press Key A, followed by Key B.

5.9.1 Opening the valve from the 'READY 'state

When the valve is in 'READY' state, the 'READY' icon will illuminate on the meter's LCD followed by the messages 'PRESS A' and 'CONNECT'. Pressing key 'A' on the meter displays 'PRESS B' followed by 'CONFIRM'. Pressing key 'B' within 30 seconds of pressing key 'A' opens the valve and resumes the supply. Otherwise, it stays in the 'READY' state, and the meter's display reverts to 'PRESS A' followed by and 'CONNECT' display sequence.

5.9.2 Gas valve connection displays

1. READY state display cycle

When the meter's valve is in READY state, the following display sequence will be shown for the user to connect their supply.

    Followed by

Acknowledge the above message by pressing key 'A' within 10 seconds. Otherwise, the display goes into sleep mode and will return by pressing any key on the meter's keypad.

2. Confirmation display cycle

After pressing key 'A', the following confirmation display cycle will be shown for 30 seconds:

| PRESS B | Followed by | CONFIRM |

If the user confirms the action by pressing key 'B' within 30 seconds of pressing key 'A', the valve will open, and the default display of the current mode will resume otherwise the display will revert to the Ready state display cycle.

5.10 Detecting events

The meter events should be checked periodically. Liberty EG4v12 detects the following events and stores them in the form of flags for the last three billing periods and current billing period:

- Hardware events
- Tamper events
- Prepayment events
- Valve operation events

If a faulty position of the meter's valve persists for 180 seconds, then it will be logged as an event flag. Similarly, the presence of magnetic field for 10 seconds will be logged as a tamper event flag. The meter will retain event data after decommissioning.

The following events are logged throughout the billing cycle:

- Magnet
- Meter tilt
- Overload
- Front cover open
- Clock invalid

The following events are logged at the time of billing only:

- Battery status
- Account status
- Valve Status
- Valve Leak

Note: Alerts for event logging and acknowledgement is configured in tariff at the time of manufacturing.

5.10.1 Hardware events

The occurrence of hardware events in the meter, such as a low battery or battery failure or valve failure or RTC failure is logged as diagnostic flags.

5.10.2 Tamper events

Liberty EG4v12 can be configured to disconnect the supply when it detects a tamper event. The meter is programmed to record the following as tamper events:

- Removal or restoration of the meter battery cover
- Induction of a DC magnetic field

- Persistence and restoration of excessive flow of gas
- Tilt of 45 degrees and tilt restoration

If the valve is closed due to any of one of the above events, then the restoration of such event resets the tamper flag and drives the gas valve to its READY state from where a user can reconnect their supply by using the meter keypad to acknowledge the displayed message.

5.10.3 Prepayment events

The following events are recorded in the meter as diagnostic flags:

- Low credit condition or credit exhausted
- Emergency credit

5.10.4 Valve operation events

When meter is read, it will send the actual status of the valve. The same is also logged as diagnostic flags when billing data is stored in memory. Meter will maintain the data for the last three histories.

5.11 Communication channels

The EU supports the following two communication channels:

- IEC 1107 optical port – for manufacturing use only
- Bluetooth – For exchanging data with mobile app and for UTRN transactions

6 Maintenance

This section explains the various steps involved in replacing the battery in the gas meter and replacing the meter itself.
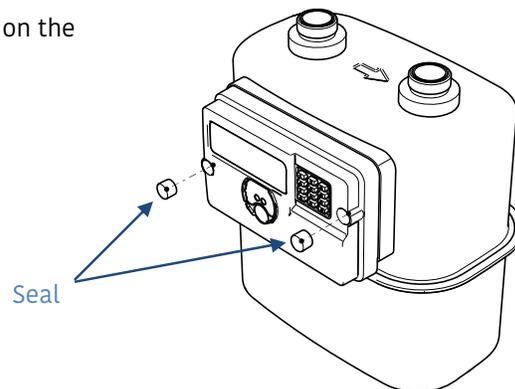
Important:

- The following procedure is to be performed by authorised personnel only.

- Appropriate electrostatic discharge (ESD) procedures must be followed before opening the meter cover.

- Under no circumstances should the battery be changed if gas leakage is observed.

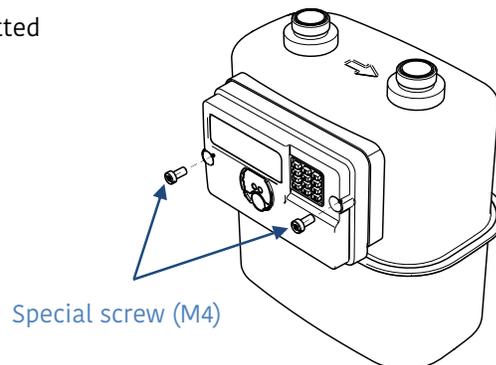## 6.1 Replacing the battery in the Liberty EG4v12 gas meter

The gas meter battery is designed to last for at least ten years under regular use and operating conditions. More frequent use of the gas meter's interface and excessive operation of the valve will cause a higher battery discharge and may result in a shorter lifespan. The procedure for changing the battery in the gas meter is as follows:

Step 1: For safety reasons, ensure all appliances are turned off, or the emergency control valve is in the OFF position.
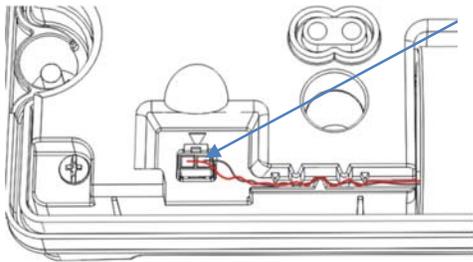
Step 2: Break both battery cover seals (white colour) on the front cover by using a suitable removal tool.
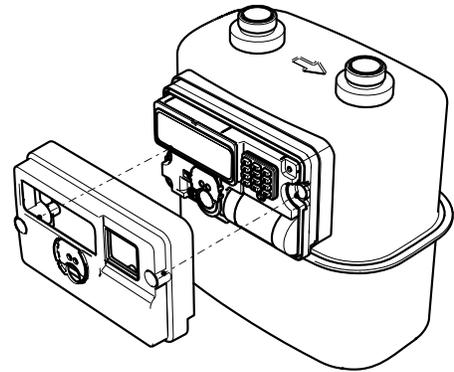
Seal

Step 3: Unscrew the special screws (M4) using a slotted screwdriver.

Special screw (M4)

Step 4: Remove the front cover and then disconnect the battery by unlocking the battery connector.
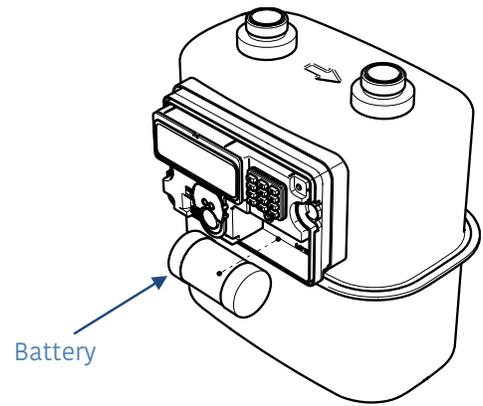
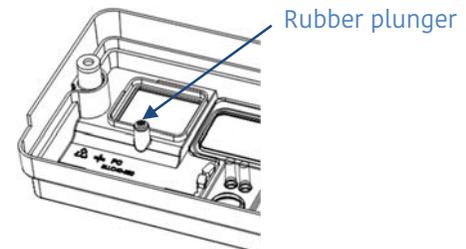Press clip to unlock the connector and pull it out

Step 5: Replace the old battery with the new battery and connect it by aligning the connector clip with the arrow on the meter body. During this process ensure that the special nuts, gaskets and rubber plunger are handled carefully, and they are back in their original position after assembly.

Note: If this operation is carried out at the installation site, then the new battery must be fitted within 10 minutes.

For test station use, where the meter has been disconnected and purged, the battery can be replaced any time after disconnection.

Battery

Rubber plunger

Step 6: Ensure that the battery connector is connected correctly and the rubber plunger is in place with the front cover. Put the front cover back on the unit and secure the M4 screws tightly at 1.2 Nm torque. To avoid any damage to the plastic parts, the new seals should be press-fitted to seal the battery compartment.

After changing the battery, the meter will log the status of 'cover open' and 'battery' in the form of flags.

The old battery must be disposed of in a suitable manner in accordance with local legislation.

Attention

The battery can only be replaced by a type and manufacturer approved and recommended by Secure Meters, fitting an unapproved battery will be in breach of the regulations set out by the ATEX directive and will invalidate the products warranty. The primary battery must only be of any one of the following types:

- EVE part number ER34615

- Vitzrocell part number SB-D02 CON

- Tadiran part number TL-4930

- Xeno part number XL-205F

Replacement batteries and seals can be ordered through Secure Meters Limited.

Secure part number	Description
BGX101-630	EVE or Vitzrocell battery
BGX101-542	Tadiran or Xeno battery
BGX201-190	Plastic battery cover seal (press-fitted seals, 2 per battery cover)
BFF131-019	M4 battery cover brass nut (optional) should not be needed unless they are lost or damaged during the exchange

6.2   Replacing Liberty EG4v12 gas meter

1. Before removing the gas meter, the installer must send the following information to the gas supplier (or meter operator) via mobile app:

    ● Device serial numbers of the gas meter

    ● Cumulative meter reading from the gas meter

2. Fit and connect the new gas meter. The gas supplier must contact the HES to initiate the gas meter replacement process. The HES requests the WSE to generate and send a UTRN to the installer's smartphone:

3. Enter the received UTRN at the gas meter to activate the commissioning mode.

4. Follow the gas meter commissioning steps for registering the new gas meter.

5. Link consumer's app with the new meter number.

7 Working with the mobile app

The Sahaj mobile app is available on Google Play store. The supported android and Bluetooth versions to run the app are:

Android version: 6.0 to 9.0

Bluetooth version: 4.2 to 5.0

Download the app from the store and follow the instructions to launch it.

7.1 Logging-in
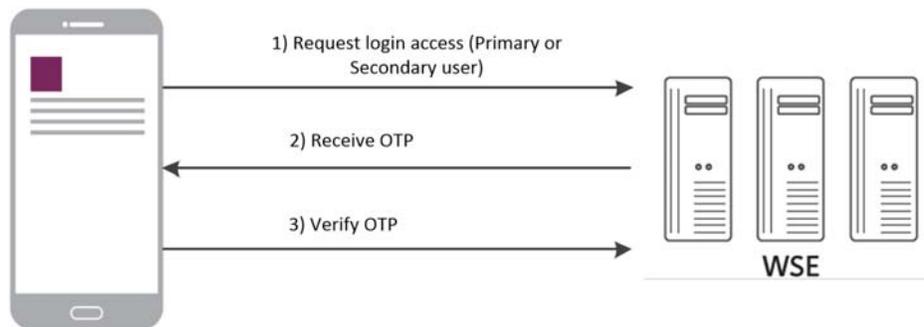
Following are the steps to log in to the mobile app:

Figure 8: Logging-in

1. Enter information such as the **Service point number** and the **Mobile no** and click **Login.**
2. Enter the OTP sent on your registered mobile no via SMS.
3. Resend request if you don't receive the OTP.
4. Click **Verify.** You will be directed to the **My Connection** page on successful verification.

Notes:

- If you are a secondary user, you need to click the **I am a secondary user** checkbox.

- Contact the utility for the Service point number if you don't have it. This is a unique alphanumeric value to identify your supply service point.

- Ensure that you've entered the mobile number registered with the utility consumer database.

7.2 Connecting the device

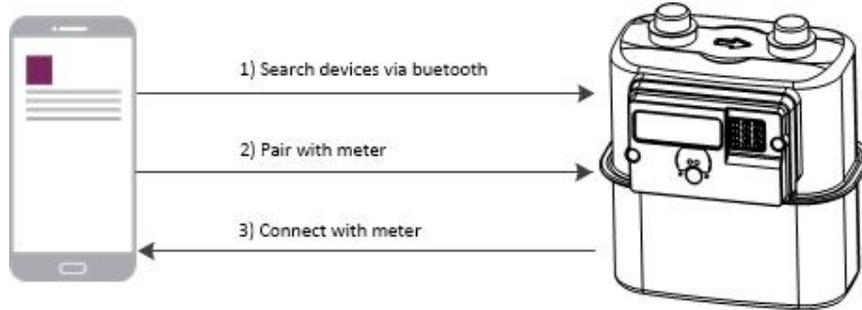Communication between the mobile app and meter will be done via Bluetooth.

Figure 9: Connecting device via Bluetooth

On the **My connection page,** click the **Connect** button. The app establishes a connection via Bluetooth with the metering device and acquires information like **balance amount, estimated days left** etc.

7.3 Recharge options

Recharge can be performed in both Offline and Online modes. A flow of the same is provided below:
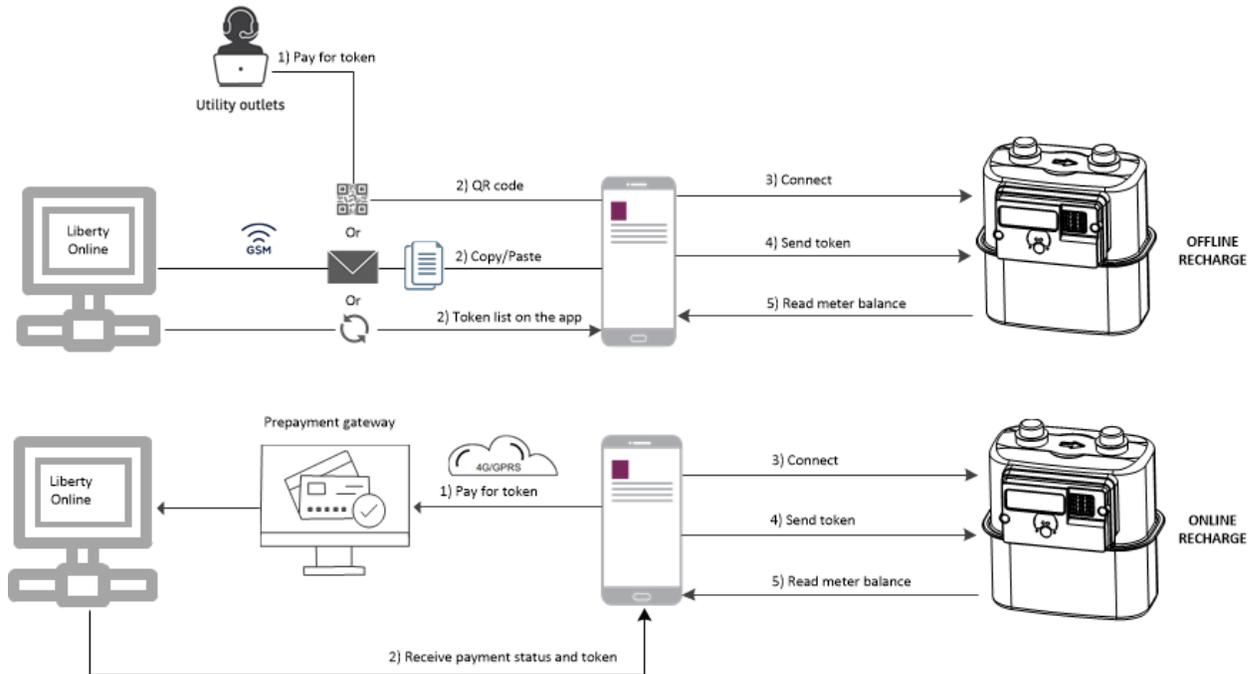

Figure 10: Recharging your account balance

7.3.1 Purchasing a token (Online)

1. On My Home/ My connections, click the **Recharge** tab/button.
2. Next, click the **Purchase** token option.

3. Enter the amount with which you want to recharge. Alternatively, you can use the **Quick recharge** option. In this case, a specific series of pre-defined amounts are already configured in the app to help you for quick payment.
4. Click the **Pay securely** button to continue.
5. Complete the process on the payment gateway.
6. After payment is successfully made, you receive the payment status details with the meter token. To send token to meter, click the **Send to meter** button. A confirmation message will appear.
7. If the token is accepted, you receive a notification, with details of the updated account balance.

7.3.2   Saving a purchased token

1. After purchasing a token online, you will be prompted through a confirmation message.
2. If you click **No** in the confirmation message, the token will be saved for future use. The process to apply a pending/saved token is described in the next section.

7.3.3   Applying a pending token

On **My Home/ My connections**, click the **Recharge** tab/button.

If pending, you will be able to view a list of purchased and pending tokens. Click the **Send to meter** button against the token you want to use for recharge.

List of Figures

8 Glossary

Cut-off threshold /limit	:	This is the state when the meter's account has no credit.
EC	:	Emergency Credit
EU	:	The electronic unit of the gas meter
FC	:	Friendly Credit
Grace period	:	Grace period is a minimal time given to users at the end of Friendly Credit period if their meter account balance has become zero or negative during the Friendly Credit period. This feature allows users to top-up their meter account or enable Emergency Credit in the meter to prevent sudden supply disconnection.
HES		Head End System
Liberty EG4v12	:	Smart gas meter with a display and a keypad.
Local disconnection	:	Self-disconnection of meter's supply switch due to load limit or no credit reasons.
Manual connection	:	Connecting supply using the meter keypad.
UTRN	:	Unique Transaction Reference Number

9   Notes