

## Cashpower Prepayment Metering Cashpower Gem Lite User Guide



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Landis+Gyr (Pty) Ltd

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# 1 Abbreviations

LCD Liquid Crystal Display

LED Light Emitting Diode

STS Standard Transfer Specification (open prepayment standard)

CTN Credit Transfer Number

TN Transfer Number

KRN Key Revision Number

TI Tariff Index

## 2 Front Panel Layout

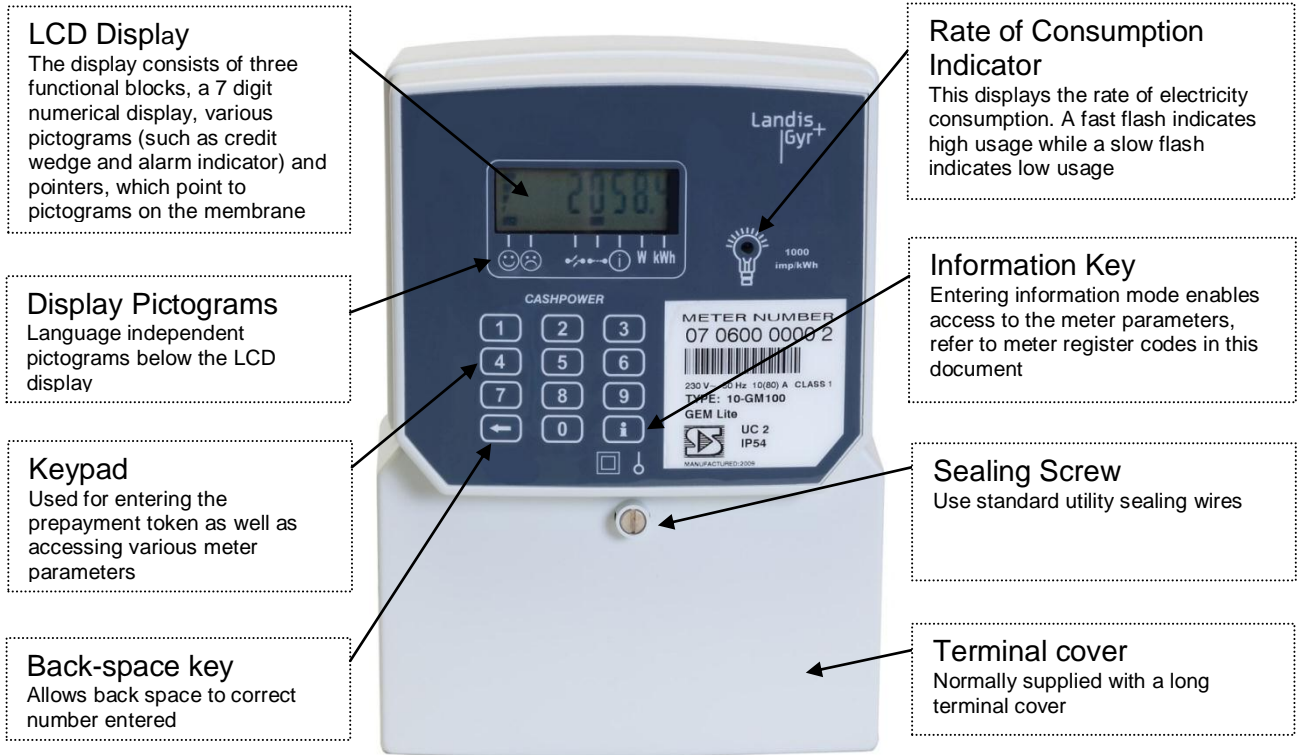


Figure 1: The Cashpower Gem Lite Prepayment Meter

### 2.1 Keypad

The 12-key keypad enables the entry of tokens and the accessing of various information functions. Key-presses are acknowledged with an audible beep.

### 2.2 Liquid Crystal Display (LCD)

The LCD normally displays remaining credit but also displays the scrolling in of keypad entries and viewing of various information functions.

### 2.3 Rate of Consumption Indicator (Rate LED)

A red rate of consumption LED provides a visual indication of instantaneous power consumption.



Its main function is to give a visible indication of energy usage i.e. a fast flash rate signifies high usage. The rate LED is also a reference output and can be used to verify the metrological accuracy.

## 3 Liquid Crystal Display (LCD)

### 3.1 General

The LCD is designed to give a clear and unambiguous visual indication of the important meter functions by means of language-independent pictograms. The LCD has three functional blocks: a numerical display for displaying various values such as remaining credit and power limit level, various pictograms such as the credit wedge, and pointers which point to pictograms on the membrane.

### 3.2 LCD Layout (what the icons mean)

The LCD is designed to give a clear and unambiguous visual indication of important meter functions by means of language-independent pictograms:

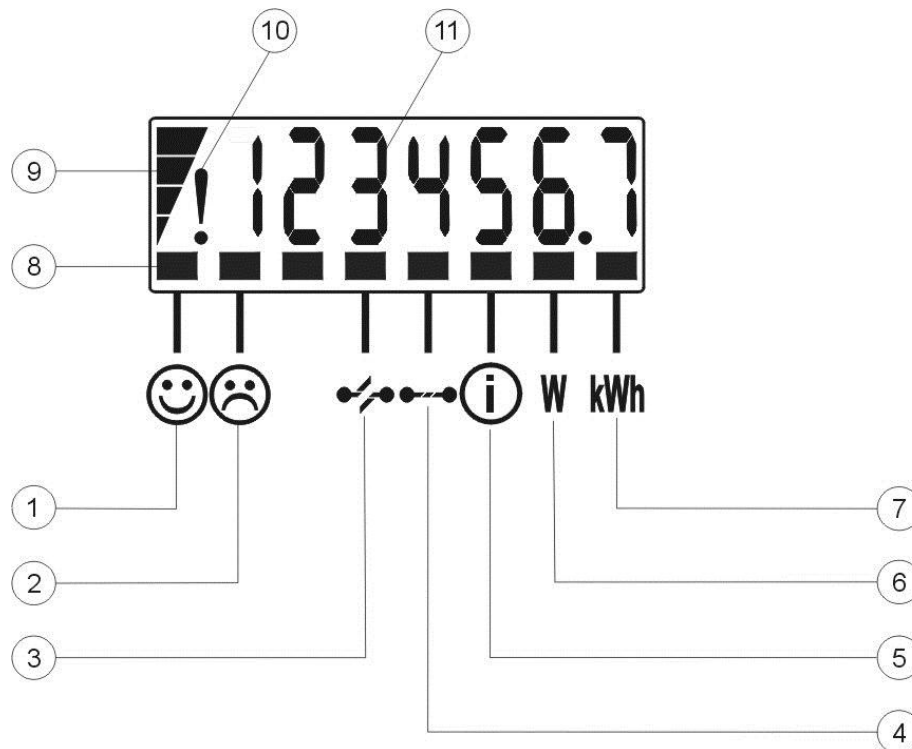


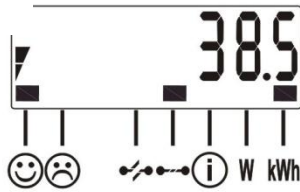
Figure 2: Display Icons

#### 3.2.1 Legend

- 1) Happy Face
- 2) Sad Face
- 3) Latching relay "OPEN" Indication
- 4) Latching relay "CLOSED" Indication
- 5) Information Mode Indicator
- 6) Power Indicator (W)
- 7) Power Indicator (kWh)
- 8) Icon Pointers
- 9) Remaining Credit Indicator (Credit Wedge)
- 10) Alarm Indicator
- 11) Numerical Display

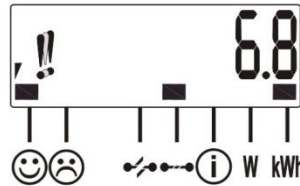
### 3.3 Typical Operational Displays

Normal Operation



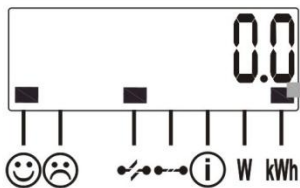
The display shows the remaining credit (kWh), displays (a portion of) the credit wedge, the happy face, latch closed and kWh icons.

Low Credit Warning



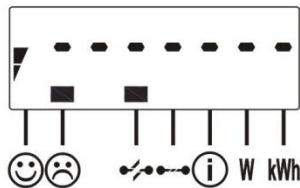
The credit is running low and more needs to be purchased to avoid disconnection of supply. Notice that only the smallest part of the credit wedge is displayed, in conjunction with the alarm icon which is flashing.

Zero Credit



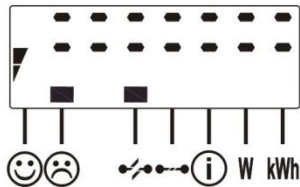
The supply is disconnected, whilst the happy face icon is displayed, indicating that the meter is functioning normally. The kWh icon flashes to indicate that no power is being supplied to the consumer.

Power Limit Lockout



The supply is disconnected. The sad face icon is displayed to indicate an error condition. The center row is displayed to indicate that the meter is in Power Limit Lockout mode.

Magnetic Trip Lockout



The supply is disconnected. The sad face icon is displayed to indicate an error condition. The two top rows are displayed to indicate that the meter is in the Magnetic Trip Lockout mode.

### 3.4 Happy and Sad Faces

These two icons are used in combination to give a quick visual indication of good and bad status. For example, if the meter were operating normally, the happy face would be on. However, if it were to be tampered, the sad face would come on. Similar responses would apply during token entry e.g. entering an invalid credit token would result in the sad face flashing for a short period of time.



Note that an out of credit condition is not considered to be a 'bad' status and the happy face will be on.



### 3.5 Latching Relay Status Indicators

Two icons are used to indicate the status of the internal latching relay.

Under normal operating conditions i.e. with the meter in credit, the latch will be 'closed' and power is supplied to the consumer. A second 'open' indicator is used to indicate that the latch is open, e.g. when credit expires.



Under normal operating conditions e.g. with the meter in credit, the latch will be closed. It will open when credit expires.

---

### 3.6 Information Mode Indicator

This icon turns on in response to pressing the i-key on the keypad. It indicates that the meter is in information mode and the contents of various registers can be viewed.



Note that the information mode automatically times out after a period of 1 minute in the absence of any further interrogation.

---

### 3.7 Power Indicator (kWh)

This function is used whenever the displayed units represent power (kWh). It applies to both normal meter operation, and when viewing registers via the information mode.

The icon will be ON when the latch is closed and the load exceeds the minimum creep load (typically 40mA) and the icon will be flashing when the latch is open and there is no load in excess of the creep limit.



The power (kWh) icon will flash on and off if no measurable energy is being consumed.

---

### 3.8 Power (W) Indicator

This function is used whenever the displayed units represent power (W), such as instantaneous power, or power limit setting. It applies to both normal meter operations, as well as when viewing registers via the information mode.

### 3.9 Remaining Credit Indicator

This 'wedge' provides a quick visual indication of the remaining credit in the meter.



The actual credit levels at which the individual bars in the 'wedge' icon toggle are personalised at the time of manufacture but can be changed at any time with a maintenance token.

---

The indicator functions as follows:

- All four credit wedge icons are displayed if the value in the current credit register is above the pre-set high credit level.
- The three smallest wedge icons are displayed if the value in the current credit register is somewhere between the pre-set low credit level and high credit level.
- The two smallest wedge icons are displayed if the value in the current credit register is somewhere between the pre-set low credit level and half of that level.
- The smallest wedge icon is displayed if the value in the current credit register is somewhere between zero and half of the pre-set low credit level.
- All the credit wedge icons will be off when the meter runs out of credit (zero or negative values).



When the remaining credit level reaches zero, the numeric display indicates 0.0 kWh. If, for any reason, the credit level is decremented below zero i.e. negative, the display indicates 0. kWh. (no zero after the decimal point)

---

This is the case if the meter has been personalised not to display negative credit

Although there is no negative value displayed, it gives a quick visual indication that a negative value is present (it is a requirement of some utilities to not show a negative credit value to consumers because in all likelihood it indicates tampering with the meter).

### **3.10 Alarm Indicator**

This is a 'low credit' warning indicator that turns on if the current credit register value is greater than zero, but less than half the low credit level. Under these conditions it is displayed in conjunction with the smallest credit wedge icon.

## 4 Meter Operation

### 4.1 General

In this section the features and functionality of the prepayment meter are described in detail.

### 4.2 LCD Indications during Normal Operation

During typical operation, the LCD provides the following displays:

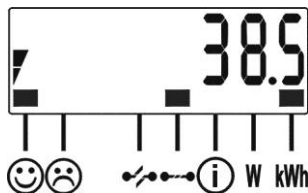


Figure 3: LCD Icons during the normal meter operation

- Displays the current credit register value to a resolution of 0.1 kWh.
- Displays any combination of the credit wedge icons (0 to 4 segments depending on the actual current credit level in the meter).
- Displays the happy face icon, irrespective of the credit register value.
- Displays the latching relay status icon in either the closed or open position, depending on whether the meter is in or out of credit.
- Flashes the 'kWh' icon if the meter is Creep mode (no power or very little power is consumed).

### 4.3 Entering Prepayment Tokens via the Keypad

Prepayment tokens are entered into the meter by keying in the numbers printed on the credit token via the keypad. The numbers entered are displayed on the LCD as they are being entered and scroll from right to left, with a space displayed at every fourth digit for ease of viewing.

Visual feedback is provided by flashing the happy face icon with each key press.

Audible feedback is provided by a 'beep' on each key press.



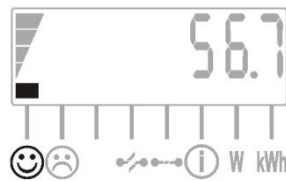
Incorrect entries can be corrected with the backspace key (left arrow key), which removes the rightmost digit on the LCD with each press. Two backspace key presses in quick succession will clear the entire entry.

Acceptance of a valid prepayment token is automatic. Once a complete token has been entered, the meter processes it and, depending on the result, displays one of the sequences described in paragraph [4.3.1](#).

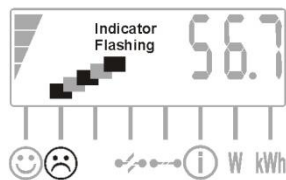
Depending on what sequence is invoked, the keypad could remain locked for a variable period of time i.e. it will not respond in any way to further key presses.

An incomplete token entry will be timed-out after 30 seconds, after which the LCD reverts to normal operation.

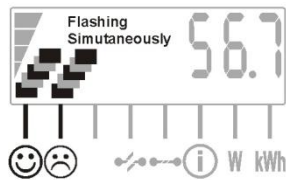
### 4.3.1 Happy & Sad face indications



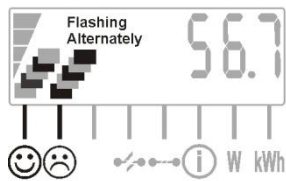
Normal Operation



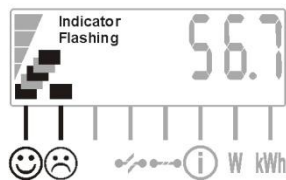
Wrong Number entered



Used Number entered



Expired Number entered



Meter already full

Figure 4: Typical Happy & Sad face combinations

## 4.4 Token Processing

Depending on the type of token entered into the meter, it will result in one of the display sequences described above.

### 4.4.1 Incomplete Token

A token entry is timed out if no key is pressed for more than 30 seconds. On time-out:

- The token number is cleared off the display.

#### 4.4.2 Complete Token

If a complete token is entered, the meter:

- Locks the keypad.
- Proceeds to process the token number.
- Once the token has been processed, the meter displays the remaining credit.

#### 4.4.3 Token Accepted

The running ladder pattern on the credit wedge is displayed.

#### 4.4.4 Token Accepted as a Valid Key Change Number



Two 20 digit tokens are required for a key change.

---

The scrolling credit wedge is displayed.

The key revision and key type, followed by the tariff index, is displayed during the above scrolling sequence.

#### 4.4.5 Incorrect Token

If the token is rejected, the following will be displayed:

- The happy face icon is turned off.
- The sad face icon is flashed for the reject time.

#### 4.4.6 Duplicate Token

If the token is rejected because it has previously been entered i.e. a duplicate token:



Both the happy face and sad face icons are flashed simultaneously for 5 seconds.

---

#### 4.4.7 Expired Token

If the token is rejected because it is older than the oldest token in the meter log i.e. 'expired':

Both the happy face and sad face icons are alternately flashed for a period of 5 seconds.

#### 4.4.8 Token Overflow Rejection

This occurs if the token is valid, but rejected because the current credit register would overflow. The following is displayed:

- The happy face icon is flashed.
- The sad face icon is turned on for 10 seconds.



The token can be re-used at a later stage.

---

## 4.5 Token Decryption and Processing

The meter accepts information transferred as specified in the Standard Transfer Specification

STS tokens comprise of 20-digit numbers.

The following STS token types will be recognised and accepted:

- Electricity credit (meter-specific token)
- Set 1st dispenser key (meter-specific token)
- Set 2nd dispenser key (meter-specific token)
- Clear tamper (meter-specific token)
- Set maximum power load or power limit level (meter-specific token)
- Set current credit levels (meter-specific, proprietary token)
- Clear credit (meter-specific token)
- Initiate dispenser test (non meter-specific token)
- Commissioning token (non meter-specific, proprietary token)
- Commissioning token (meter-specific, proprietary token)
- Decommissioning token (meter-specific, proprietary token).
- Set Options Register (meter-specific, proprietary token).

### 4.5.1 Electricity Credit Token

The electricity credit token transfers a variable quantity of credit to the meter.

### 4.5.2 Set 1st Dispenser Key Token

Key changes are occasionally carried out to maintain the security of a pre-payment system. Unless the prepayment vending system and meter are both operating on the same key, tokens vended from that system will not be accepted by the meter.

To effect a key change, two tokens (set 1st dispenser key and set 2nd dispenser key) need to be issued and entered into the meter within a 5-minute period of each other.



Set 1st dispenser key and set 2nd dispenser key tokens may be entered in any sequence i.e. the 2nd dispenser key token may be entered first.

---

Note: Various ancillary functions e.g. clearing the meter log may be embedded into the key-change process (refer to the STS specification).

### 4.5.3 Set 2nd Dispenser Key Token

Refer to paragraph [4.5.2](#) above.

### 4.5.4 Clear Tamper Token

If a meter has been tampered, normal operation can only be restored by entering a tamper reset token.



A tamper reset token also reset the power-fail counter.

---

### 4.5.5 Set Power Limit Token

This token sets the power limit level for the meter.

### 4.5.6 Set Credit Alarm Levels Token (Proprietary Token)

On accepting a credit alarm level number, the meter sets the appropriate high and low credit levels. These are the levels at which the segments in the 'wedge' of the LCD credit indicator toggle

Note: If any of the credit levels transferred via the token is zero, the token is accepted, but the respective credit level is not updated.



The set credit levels token is not defined in the STS specification. It is a Cashpower specific feature, and it uses one of the proprietary dispenser specific management token subclasses.

#### 4.5.7 Clear Credit Token

On accepting a clear credit token, the meter clears any remaining credit to zero and opens the latching relay, thus interrupting the electricity supply to the customer.

#### 4.5.8 Initiate Dispenser Test Token (Meter Non-Specific Token)

There are a number of non meter-specific tokens that can be used to test various functions on the meter. On accepting an initiate dispenser test token, the meter executes all the tests that are embedded in that particular token. The following tests are supported:

Function	Token Number
Open the latching relay	0000 0000 0001 5099 7584
HMI test - turns on all the LED's, displays all segments on the LCD, and activates the buzzer	0000 0000 0001 6777 4880
Display the total units counter	0000 0000 0002 0132 8896
Display the key revision number and key type	1844 6744 0738 4377 2416
Display the tariff index	3689 3488 1475 5332 2496
Display the power limit level	0000 0000 0012 0797 4400
Display the tamper state	0000 0000 0022 8172 8512
Display the instantaneous power	0000 0000 0044 2920 8064
Display the software version number	0000 0000 0087 2419 5840
Test all the above functions (tests run sequentially)	5649 3153 7254 5031 3471

In a test sequence (test all), each test has a duration of 2.5 seconds, and is performed in the above order. For a single test per token, the test duration is 5 seconds.

On completion of the test sequence, the meter returns to its normal mode of operation.

#### 4.5.9 Commissioning Token (Non Meter-Specific, Proprietary Token)



This is a proprietary STS token i.e. it can only be used on a Landis+Gyr STS meter: **1268 2136 5508 1001 3746**. This is a non meter specific number.

It is typically used to assist meter installation personnel by ensuring that the load remains disconnected and the tamper detect sensing switch function disabled (meter decommissioned).

Once the installation is complete and the number entered:

- The latching relay closes
- The tamper detect sensing switch function is enabled.

#### 4.5.10 Commissioning Token (Meter-Specific, Proprietary Token)

This is a meter-specific token but in all other aspects its operation is the same as described in the paragraph above.

Note: An already commissioned meter rejects a commissioning token.

#### 4.5.11 Decommissioning Token (Meter-Specific, Proprietary Token)

On accepting a decommissioning token, the meter opens the latching relay (load disconnected) and disables the tamper detect sensing switch function.

Note: An already decommissioned meter rejects a commissioning token.

### 4.5.12 Set Options Register (Meter-Specific, Proprietary Token)

On accepting this token, the “Changeable Options Register 0” is set according to the 8-bit value in the token.



Care must be taken when using this feature, as the operator would not know the settings in the meter, and various parameters could be set/reset.

---

The parameters are as follows:

- Enable/Disable Tamper Function
- Tamper / Do Not Tamper on Significant Reverse Energy
- Disconnect / Do Not Disconnect on Power-Fail
- Non Automatic / Automatic Latch Reconnect

Refer to paragraph [5.1.15](#) for more detail.

### 4.5.13 Commissioning and Decommissioning the Meter

The function of being able to set the meter into the decommissioned / commissioned mode offers several advantages to meter installation personnel. If power is applied to the meter during installation and the meter terminal cover not yet in place, the meter will detect this and enter into the tampered mode, thereby disconnecting the supply to the customer. A meter-specific tamper reset token then needs to be generated at the vending system to rectify the situation.

When setting the meter into the decommissioned mode, the following occurs:

- The tamper detect sensing switch function is disabled.
- The latching relay is set into the open state.

When setting the meter into the commissioned mode, the following occurs:

- The tamper detect sensing switch function may be either enabled or disabled.
- The latching relay operates as normal.



The meter’s commissioned / decommissioned status can be observed in the meter state register - refer to paragraph [5.1.13](#) for more information.

---

## 4.6 Power Limiting

The power-limiting feature allows utilities to set the maximum load that can be drawn by customers. The setting can be changed when necessary via a set power limit token from the prepayment vending system.

This algorithm is included in the meter’s software and is implemented as follows:

- If the preset power limit threshold is exceeded, the latching relay will open for a period of 30 seconds (power limit trip period), after which it will re-close (either automatically or manually - refer to paragraph [4.7](#)).
- If the power limit threshold continues to be exceeded, the above process is repeated.
- If, after 4 power-limit events within a 15-minute window, the limit is still being exceeded because of excessive energy consumption, the latching relay will be opened for a period of 30 minutes (the power limit lockout period).
- At the end of the lockout period, the latching relay will re-close (either automatically or via a manual operation on the keypad) and, unless the excessive loading has been removed, the process will be repeated. Note that tokens may be entered and the information modes accessed as normal during the power limit lockout period.
- If the power drawn by the customer is reduced in response to a power limit disconnect, the event will be ignored after 15 minutes has elapsed.



The LCD will display the following during the two conditions:

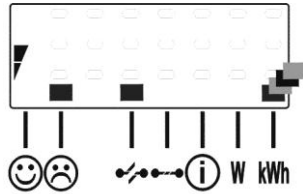


Figure 5: LCD Showing "Power Limit Trip" - Disconnection for a 30 second period

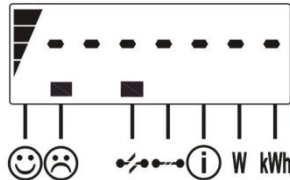


Figure 6: LCD Showing "Power Limit Lockout" - Disconnection for a 30 minute period



Power Limit is not a form of safety overload protection. It is designed to generally limit the overall usage of power in a particular area (possibly dictated by reticulation limitations or linked to a tariff allocation).

## 4.7 Automatic/Manual Load Reconnection

In some instances, local safety regulations require that the meter not automatically re-close the latching relay after, for example, a power limit trip. Under these conditions, the latching relay will remain in the open state until such time as a key is pressed on the keypad.

Using the example of a power limit trip, the latching relay will open and remain open for a period of 30 seconds. At the end of this 30-second period, the display will return to normal but, instead of the latching relay closing, the latching relay status icon on the LCD will start to flash, toggling between an open and closed state. This is a visual indication that the latching relay may now be manually closed, by pressing any key on the keypad.



When the latching relay open & closed status icons on the LCD start to flash alternately, this is a visual indication that the latching relay may be manually closed by pressing any key on the keypad.

In the event of the latching relay opening due to expiry of credit, it will only be able to close again on entry of a valid credit token.

The manual action of entering a credit token via the keypad, results in the latching relay closing when the last digit of the token is entered and accepted by the meter.

Automatic/manual load reconnection is a configurable option, set at the time of manufacture. It may also be changed at any stage with a suitable engineering token.

## 4.8 Disconnect on Power Failure

This option, configurable at the time of manufacture, forces the meter's latching relay to open whenever there is a power failure. The option can be invoked as a means of preventing the meter from being installed fraudulently with line and load connections reversed, in which case the meter will never power up once the latching relay is open.

## 4.9 Anti-tamper Features

### 4.9.1 General

The meter is mechanically sealed against tampering through the use of a factory sealed screw plug on the rear panels and a utility-sealed wire seal on the front of the meter.

The use of these mechanical seals ensures that there are visible signs of tampering if unauthorised entry to the system is attempted.

### 4.9.2 Anti-Tamper Switch

This tamper facility automatically detects if the terminal cover of the meter is removed. This condition will set the tamper condition thereby opening the latching relay. A meter specific tamper reset token will be required to reset this condition.

The Tamper Detection function may be enabled or disabled during production, or by means of a Set Options Register token – refer to paragraph [4.5.12](#)



To check if the tamper facility is enabled or disabled refer to register 035, refer to section [5.1.15](#).

---

The tamper condition may be monitored by using the information functions



To check if a meter is tampered, refer to register 031, (section [5.1.13](#)), or use the non meter specific token (0000 0000 0022 8172 8512) to display the tamper state. A value of 1 displayed after the token has been accepted means that the meter is tampered.

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### 4.9.3 Reverse Energy Detection

The meter includes a Significant Reverse Energy (SRE) detection feature. If the line and load wires are swapped during installation, the meter will continue to operate and decrement credit, however, the meter can be factory-programmed to tamper and disconnect the load should SRE be detected.

The reverse energy condition may be monitored by using the information functions – refer to section [5.1.13](#) and [5.1.15](#)

### 4.9.4 Magnetic Tamper Detection

The meter incorporates a magnetic tamper detector. When the meter senses a magnetic field strength above a pre-programmed threshold level, it disconnects the supply to the consumer. As with the power limit trip condition, the magnetic tamper condition opens the internal latching relay for 30 seconds. Should magnetic interference be detected more than 5 times in a 15 minute window, the latching relay will open for 30 minutes.



The Magnetic Tamper state may be monitored by viewing the register 037, (press information button & then 037) refer to paragraph [5.1.17](#).

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### 4.9.5 Resetting a Tamper Condition

Before resetting a tamper condition, care must be taken to remove the cause of the condition, e.g. ensure that the tamper switch is closed. Failing to do this will cause an immediate tamper condition.

If a meter has been tampered, normal operation can only be restored by entering a clear tamper token.

## 4.10 Virtual Token Carrier (VTC) Interface

This port is available via a removable plug at the rear of the meter and should only be accessed when the meter is disconnected from power. It allows for meter data such as remaining credit to be extracted in the event of an electronics failure.



From a safety point of view, the meter must not be powered when accessing this port the field tool provides the necessary low-voltage supply to power the logic circuitry.

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## 5 Information Functions

Pressing the information key, invokes the meter's information mode (the information icon on the LCD turns on and all display rows, refer to Figure 7 below). The contents of various registers can now be viewed by entering the appropriate, 3-digit register code.

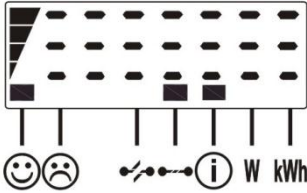


Figure 7: LCD showing the display in the information mode



Once in information mode, toggling between different registers may be done on an ongoing basis by entering the appropriate 3-digit code i.e. the information key does not have to be pressed again.

To exit the Information mode, press the information key or, in the absence of any other key presses, it will automatically return to the normal display after a period of 1 minute.

### 5.1 Information Register Functions

Information Register Functions	
Info Register Number	Function / Meter Parameter
000	11-Digit Electricity Dispenser Number
001	Instantaneous Power
002	Current Credit Register
003	Total Units Counter
005	Accumulated Credit Register
008	Current 30-day Consumption
009	Previous 30-day Consumption
012	Low Credit Level
013	High Credit Level
014	Power Limit Level
030	Meter State Register – Upper
031	Meter State Register – Lower
032	(Fixed) Option Register – Upper (Not used)
033	(Fixed) Option Register – Lower

Information Register Functions	
Info Register Number	Function / Meter Parameter
034	Changeable Option Register – Upper (Not used)
035	Changeable Option Register – Lower
036	Volatile Meter State Register – Upper
037	Volatile Meter State Register – Lower
048	Software Version Number
050	Power-fail Counter
054	Last Credit Token 20-Digit Transfer Number and ID in date/time format
055	Last Credit Token ID
056	Value of Credit for Last Credit Token entered
057	Key Revision and Key Type
058	Tariff Index
059	Current Credit Register (10 Wh resolution)
060	Supply Group Code Register
061	Total Units Counter (10 Wh resolution)
301	Last Token's 20-Digit Transfer Number and ID in Date/Time Format
302	2nd Last Token's 20-Digit Transfer Number and ID in Date/Time Format
...	...
350	50th Last Token's 20-Digit Transfer Number and ID in Date/Time Format
600	Enter Customer Information Mode (Refer to section <a href="#">5.1.29</a> )

### 5.1.1 Meter Number (Register 000)

The meter displays the unique identity number personalised at the time of manufacture. The serial number scrolls on the display from right to left. It must match the number printed on the meter's front panel label.

### 5.1.2 Instantaneous Power (Register 001)

The meter displays the power currently being consumed by the connected load (Display is in Watts). The Watts icon flashes.

### 5.1.3 Current Credit Register (Register 002)

This register stores the remaining credit in the meter. This register has a minimum value of (minus) 99'999.99 kWh, and a maximum value of 9'999'999.99 kWh.

Note: When more than seven digits are to be displayed (e.g. 1234567.8), the decimal digits are dropped.

Note: The remaining credit can be decremented past zero (0) into negative values if the load is not disconnected. This negative credit value will be subtracted from any new credit entered into the meter.

### 5.1.4 Total Units Counter (Register 003)

The meter displays the total kWh consumed since the meter was put into service. This register will have a value of between 0 kWh and 9'999'999.99 kWh.

### 5.1.5 Accumulated Credit Register (Register 005)

The meter displays the total kWh entered into the meter, via tokens. This register will have a value of between 0 kWh and 9'999'999.99 kWh.

### 5.1.6 Current 30-Day Consumption (Register 008)

The meter displays the number of days into the current 30-day period, followed by the consumption in kWh. By pressing the information-key twice in quick succession, the day counter and consumption is reset to zero. The display is days (on left hand side) and consumption (on right hand side)

### 5.1.7 Previous 30-Day Consumption (Register 009)

The meter displays the previous 30-day period consumption.

### 5.1.8 Low Credit Level (Register 012)

The meter displays the level at which the lower two credit wedges on the LCD come into operation. The meter could have a value of between 6.4 kWh and 1 632 kWh, with a 6.4 kWh resolution.

### 5.1.9 High Credit Level (Register 013)

The meter displays the level at which the upper two credit wedges on the LCD come into operation. The meter could have a value of between 128 kWh and 32 640 kWh, with a 128 kWh resolution.

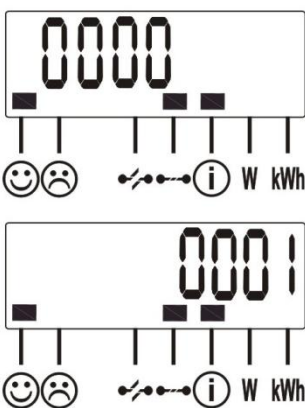
### 5.1.10 Power Limit Level (Register 014)

The meter displays the power level at which the latching relay will be opened, causing the supply to the consumer to be interrupted. The value of this register could be between 0 and 65'535 Watt.



To calculate the "Amps" of the Power Limit, divide the "Watt" reading by the rated supply voltage of the meter e.g.  $18400W / 230V = 80$  Amps

### 5.1.11 How to use the State & Options Registers



Example of Options Register displays:

Press Information key, then press 031, this enters the Upper Meter State Register, showing the most significant 8 bits of the State Register

The LCD display only has 7 digits, so it is necessary to toggle between the upper 4 and lower 4 bits by entering the register number 031 again

Check the bit information against the register table



Repeat the register number to toggle between the upper 4 bits and lower 4 bits

### 5.1.12 Meter State Register UPPER (Register 030)<sup>1</sup>

The meter displays the most significant eight bits of the meter state register. This register indicates the current state of the following meter functions:

Meter State Register – Upper	
Display	Function
1xxx - - - -	Not Used
x1xx - - - -	Not used
xx1x - - - -	Not used
xxx1 - - - -	Not used
Press '030' to toggle between UPPER set and LOWER sets of 4 numbers	
- - - - 1xxx	Not used
- - - - x1xx	Not used
- - - - xx1x	Not used
- - - - xxx1	Waiting for Key press (if non-auto latching relay reconnect enabled)

### 5.1.13 Meter State Register LOWER (Register 031)

The meter displays the least significant eight bits of the meter state register. This register indicates the current state of the following meter functions:

Meter State Register – Lower	
Display	Function (bracketed state applies for a bit set to 0)
1xxx - - - -	Latching relay Inhibit (Latching relay not inhibited)
x1xx - - - -	Significant reverse power metered (SRE not metered / detected)
xx1x - - - -	Not used
xxx1 - - - -	Meter decommissioned (Meter Commissioned)
Press '031' to toggle between UPPER set and LOWER sets of 4 numbers	
- - - 1xxx	Meter NOT initialised i.e. default key (Meter initialised)
- - - x1xx	Meter in power limit trip (Meter NOT in power limit trip)
- - - xx1x	Meter out of credit (Meter has sufficient credit)
- - - xxx1	Meter tampered (Meter NOT tampered)

<sup>1</sup> Because eight digits need to be displayed, but only 7 digits are available on the display, the number to be displayed is grouped into two sets of four numbers each. The upper set is displayed on the left hand side of the display, whilst the lower set is displayed on the right hand side. To toggle between the upper and lower sets, re-enter the three digit code for that register (without pressing the information-key).

### 5.1.14 Fixed Option Register (Register 033)<sup>2</sup>

The meter displays the least significant eight bits of the meter fixed option register. The contents of this register are determined at the time of manufacture and cannot be subsequently changed via a token:

Fixed Option Register – Lower	
Display	Function (bracketed state applies for a bit set to 0)
1xxx - - - -	Not used
x1xx - - - -	Not used
xx1x - - - -	Not used
xxx1 - - - -	Not used
Press '033' to toggle between UPPER set and LOWER sets of 4 numbers	
- - - - 1xxx	Not used
- - - - x1xx	Enable creep lock (disable creep lock)
- - - - xx1x	Display negative credit (Do NOT display negative credit)
- - - - xxx1	Reserved - must be set to 1

### 5.1.15 Changeable Option Register (Register 035)<sup>2</sup>

The meter displays the least significant eight bits of the meter changeable option register. The contents of this register are determined at the time of manufacture but can be subsequently changed via a token:

Changeable Option Register – Lower	
Display	Function (bracketed state applies for a bit set to 0)
1xxx - - - -	Not used
x1xx - - - -	Not used
xx1x - - - -	Tamper function enabled (Tamper facility disabled)
xxx1 - - - -	Tamper on significant reverse power (Do NOT tamper on SRE)
Press '035' to toggle between UPPER set and LOWER sets of 4 numbers	
- - - 1xxx	Disconnect on power fail (Do NOT disconnect on power fail)
- - - x1xx	Not used
- - - xx1x	Non-auto latch reconnect (Automatic latch re-connect)
- - - xxx1	Not used

<sup>2</sup> Because eight digits need to be displayed, but only 7 digits are available on the display, the number to be displayed is grouped into two sets of four numbers each. The upper set is displayed on the left hand side of the display, whilst the lower set is displayed on the right hand side. To toggle between the upper and lower sets, re-enter the three digit code for that register (without pressing the information-key).



### 5.1.16 Volatile Meter State – Upper (Register 036)

The meter displays the most significant eight bits of the volatile meter state register. This register indicates the current state of the following meter functions:

Volatile Meter State Register – Upper	
Display	Function (bracketed state applies for a bit set to 0)
1xxx - - - -	Not Used
x1xx - - - -	Not used
xx1x - - - -	Not used
xxx1 - - - -	Not used
Press '036' to toggle between UPPER set and LOWER sets of 4 numbers	
- - - - 1xxx	Not used for field staff
- - - - x1xx	Not used
- - - - xx1x	Reason for latch hold-back: Overload / Magnetic trip
- - - - xxx1	Not used for field staff

### 5.1.17 Volatile Meter State – Lower (Register 037)<sup>3</sup>

The meter displays the least significant eight bits of the volatile meter state register. This register indicates the current state of the following meter functions:

Meter State Register – lower	
Display	Function (bracketed state applies for a bit set to 0)
1xxx - - - -	Meter in Creep Lock (Out of Creep Lock)
x1xx - - - -	Not used
xx1x - - - -	Not used
xxx1 - - - -	Tamper switch not depressed (Tamper switch depressed)
Press '037' to toggle between UPPER set and LOWER sets of 4 numbers	
- - - - 1xxx	Not Used
- - - - x1xx	Not used
- - - - xx1x	DC Magnetic Field Detected (No DC Magnetic Field detected)
- - - - xxx1	DC Magnetic Field Trip State – tripped due to magnetic field detection

<sup>3</sup> Because eight digits need to be displayed, but only 7 digits are available on the display, the number to be displayed is grouped into two sets of four numbers each. The upper set is displayed on the left hand side of the display, whilst the lower set is displayed on the right hand side. To toggle between the upper and lower sets, re-enter the three digit code for that register (without pressing the information-key).

### 5.1.18 Software Version Number (Register 048)

The meter displays the software version number masked into the microprocessor.

### 5.1.19 Power-Fail Counter (Register 050)

The meter displays the number of power failures that have occurred since installation.



This register is cleared with the entry of a tamper reset token.

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### 5.1.20 TN and ID Number of Last CTN Entered (Register 054)

The meter displays scrolls the last 20 digit Credit Transfer Number (CTN) and the Token Identifier on the LCD in the date and time format.

### 5.1.21 ID Number of Last CTN Entered (Register 055)

The token identifier is displayed (0 – 16777215) i.e. number of minutes elapsed since 01:01:1993.



This value is not of use, unless the prepayment vending system prints this same token identifier on the receipt, in which case you can compare the token identifier on the receipt, with the token identifier in the meter to confirm that the token has been entered.

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### 5.1.22 Value of Last CTN Entered (Register 056)

The meter displays the value (l n kWh) of the last Credit Transfer Number entered.

### 5.1.23 Key Revision and Key Type (Register 057)

Displays the Key Revision Number (KRN) and key type, for more details, refer to the STS specification

### 5.1.24 Tariff Index (Register 058)

Displays the Tariff Index (TI) of the meter.



This is a very important register. If the TI of the meter does not match with the TI that is linked to the meter in the Prepayment Vending system, the meter will not accept the 20 digit token. In the case where a meter will not accept a token, compare the TI printed on the receipt against the TI in the meter.

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### 5.1.25 Current Credit Register - 10Wh Resolution (Register 059)

The meter displays the value of the credit register with a resolution of 0.01kWh. The most significant digit of the display (if in use) will be “pushed” off the display in this mode.

### 5.1.26 SGC Register (Register 060)

This register will contain the initial SGC value, personalised at the time of manufacture. Once a successful STS meter key-change has been performed, the information is no longer valid and is, therefore, cleared.



This option gives a quick indication of whether a key-change has been performed on the meter.

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### 5.1.27 Total Units Counter (10 Wh Resolution) (Register 061)

The meter displays the total kWh consumed, with a resolution of 0.01kWh, since the meter was put into service.

### 5.1.28 Last fifty 20 digit numbers entered into the meter

Meter stores the last fifty 20 digit STS numbers entered into the meter in fifty separate registers.



The meter displays the 20 digit STS number scrolling from right to left, followed by the date and time stamp which indicates when the token was created at the vending system (Date & time format is DDMMYYYY hhmm)

Register 301 Last 20 digit token entered

Register 302 2nd Last 20 digit token entered

Register 303 to Register 349 – 3rd last to 49th last token entered

Register 350 50th last token entered



A display of 0000 0000 0000 0000 0000 implies that the register does not contain a record of an STS token.

### 5.1.29 Customer Information Mode

The Customer Information Mode is entered via info-register 600.

On entering the Customer Information Mode, meter will display as follows:

- All lines on the display (typical information mode display)
- Information mode icon flashing

Now enter the register number in the table below

Code	Function
000	test all
001	open the disconnect-device
002	switch all LCD segments on and flash the rate LED
004	display total units counter
005	display key revision and key type
006	display tariff index
007	display power limit level
008	display the meter tamper status
009	display available credit
030	display the meter supply group code
050	instantaneous power
100	display the meter number
101	display the software version number
102	display the VTC mapping number
200	display value of last credit token
201	display id of last credit token