Residential

Cashpower Gemini PLC

Technical Specification

Cashpower Gemini PLC is an 80 Amp split prepayment meter that uses Power Line Carrier (PLC) technology. It is ideal for replacing conventional meters in existing apartment blocks and established dwellings/houses, where installing a dedicated communications cable is not practical. The use of standard household wiring for communication between the meter and customer interface unit makes this an extremely attractive and cost-effective technology.

Version:
Date: 14 April 2010
Issued by Product Management: Dave Tarr
Filename: Specification Sheet Cashpower Gemini PLC

Overview

The Cashpower Gemini PLC meter is a compact, single-phase, keypad-based, 80 Amp split prepayment meter in a BS 5685 standard housing. Communication between the meter and the customer interface unit is by means of Power Line Carrier (PLC) technology.

Features

- 80 Amp split PLC prepayment meter
- Compact prepayment meter design, with British Standard layout
- Power Line Carrier communication between meter and customer interface unit
- Power Line Carrier communication from concentrator in a kiosk or substation to the meter for remote access
- Optical port for alternative communication to kiosk concentrator
- Quick and easy to install using existing household wiring; no additional communication wires are required
- Proven Cashpower keypad technology
- Tamper detection
- Significant Reverse Energy (SRE) detection
- Programmable software power limit
- Commissioning feature
- Prepayment or credit metering modes of operation
- Language independent user interface
- LCD display on the meter for field technicians
- Diagnostic LED's on the meter
- Backlighting on customer interface display, audible and visual low credit alarm
- High surge withstand capability for areas prone to lightning or other line surges
- STS Compliant
- SABS 1524 and IEC 62052-11, IEC 62053-21 compliant

Split metering functionality

The split prepayment meter consists of two parts, the meter and the customer interface unit.

Communication between the meter and the customer interface unit is by means of Power Line Carrier (PLC) communication using existing household wiring. No additional communication wires are required.

The customer interface unit is compact with a user-friendly keypad and display. It may be installed in any convenient location in the consumer's home where there is an electrical socket outlet.

The prepayment meter contains all critical metering, number decryption and load control functionality. It operates independently and is immune to any form of tampering on the customer interface unit.

The meter is usually installed in a secure, locked enclosure, typically a pavement kiosk or pole-mounted equivalent. It is outside the consumer's home to facilitate easy inspection by the utility at any time and to reduce the opportunity of fraud by tampering.

Principle of operation

A key feature of the Cashpower Gemini PLC split prepayment meter is the ability to use standard household wiring for communication between the customer interface unit and the prepayment meter. This capability enhances retrofitting or replacement of conventional meters with prepayment meters in apartment blocks and housing estates.

The benefits include lower cost of installation as no new cabling needs to be laid, and speed of installation. The keypad or customer interface unit is simply plugged into any existing mains outlet and after a simple commissioning procedure, the unit communicates with the remote meter up to a distance of typically 200 metres.

The maximum communication distance is dependent upon network attenuation and interference.

Customer interface

The customer interface is connected by a power cord to an existing mains outlet in the household. Under normal conditions, when there is sufficient credit in the meter, the customer interface unit operates directly from mains voltage. However in the event that the meter credit expires and the meter disconnects power to the house, the customer interface unit is fitted with two standard AA Alkaline batteries to allow the customer to re-enter a new credit voucher.

The customer interface has a large backlit display with configurable functionality. The customer or field technician can access meter parameters by entering specific register information using the keypad.

In addition, the customer interface unit has audible low credit warning tones that can be silenced with a key press.

Meter status and diagnostic indicators

The meter includes a LED status indicator. This allows a technician to view the operational status of the meter without the need for specialised interrogation tools or having to gain access to the consumer's premises. Information such as tamper

status, power limiting, commissioned status and credit status are available.

LCD display on the meter

The Cashpower Gemini PLC meter model is fitted with a large clear display to enable field staff to read the meter parameters in a secure kiosk. This meter can be configured at the time of manufacture to show total kilowatt-hours consumed to date as a running total, while consumers are able to see the remaining kilowatt-hours or units of electricity remaining on the customer interface unit display in their house.

Interrogation port

More detailed information and programming is achieved via the standard interrogation port at the rear of the meter. This is an optional model at request.

Optical interface

The Gemini PLC meter has an IEC 62056-21 compliant optical communications port. This allows the utility to access a variety of information stored inside the meter using an optical pick-up.

Tamper detection

The split configuration of Gemini PLC meters significantly reduces the risk of tampering, especially considering that the meter is installed in a remote, secure location. The meter is also mechanically sealed against tampering through the use of a factory-sealed screw plugs on the rear of the meter, 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 is attempted.

In addition, the meter is equipped with a tamper sensor that will automatically disconnect the power to the load in the event of tampering.

The meter also has a feature allowing detection of Significant Reverse Energy. If the line and load wires are swapped during installation, the meter will continue to operate and decrement credit but can be factory programmed to tamper and disconnect the load should Significant Reverse Energy be detected.

Another anti-tamper feature comprises an interlocking mechanical design whereby two halves of the meter cannot be opened until the terminal cover of the meter has been removed. To do so, a utility seal has to be broken.

Remote Access

The meter is capable of “upstream” communication to a concentrator at a kiosk, low-voltage distribution transformer or mini sub-station.

This feature enables the Gemini PLC2 meter to be remotely accessed by the utility to check the remaining kilowatt-hours, or whether the meter has been tampered with, the total kilowatt-hours used to date, or maximum power limit, as well as other useful parameters stored by the prepayment meter.

Communications capability can be implemented in two ways. A concentrator, supplied either by Landis+Gyr or a third party, can be fitted into the secure enclosure to provide connectivity via wireless technology to a power utility’s back office. As with all Cashpower split prepayment meters, the Gemini PLC has an optical communications port and each meter in the enclosure is connected to the concentrator via an optical port reading device.

By means of the concentrator and the optical communication port, bi-directional communication is possible. A message can be sent to each meter to request information and prepayment vouchers (purchased by a specific consumer or generated for maintenance purposes) could be sent in a virtual payment process.

Prepayment/Credit feature

Using supplier-specific 20-digit STS prepayment vouchers which are unique to each meter, the Cashpower Gemini PLC prepayment meter can be converted into a standard credit meter, while retaining some of the useful features of a prepayment meter.

These include the anti-tamper facility, maximum power limit and remote customer interface unit for customer convenience. The meter can be switched between credit mode and prepayment mode when necessary, using a 20-digit STS prepayment voucher generated by Landis+Gyr’s Suprima prepayment system.

Surge protection

The meter incorporates comprehensive, 30kA lightning surge protection.

Cashpower Gemini Technical specifications

General information

Meter Format
Single phase, 2-wire, direct connected prepayment meter

Compatible network(s)
Single phase, 2-wire, earthed neutral[1]

Operation

General
Prepayment and Credit modes

Credit entry mechanism
Keypad; encrypted numbers

Encryption algorithms
STS Compliant[2]

Applicable specifications
NRS009-1; NRS009-6-6; NRS009-6-7;[3]

Electrical Ratings

Nominal Voltage (U_n) - Rated Voltage
230 Volts AC rms (other voltages available on request)

Nominal frequency
50 Hz (60Hz option available)

Operating voltage range
80% to 120% of U_n (184V – 276V)

Maximum continuous current (I_{max})
80 Amps (factory and field programmable to lower power limits)

Burden

Voltage circuit	<1.4W / <9VA @ 230V
Current circuit	<2.5 VA @ Base Reference Current (I_b)

Protective class (according to IEC 62052-11)
Class II (double insulated)

[1] May be compatible with other network types as well – Consult Landis+Gyr
[2] STS = Standard Transfer Specification (Industry Standard)
[3] NRS = National Rationalised Specification (South Africa)

Metrological Performance

Measurement direction
Forward and reverse power detection and metering[4] (Credit is decremented in both directions)

Meter constant (LED flash rate)
1000 impulses / kWh

Basic reference current (Ib)
10A [5]

Accurate metering range
0.05 I_b to 1.2 I_{max} [6]

Starting current
≤ 0.005 I_b (For Class 2)

Power threshold
6.5W (approx 28mA @ 230V and cos(Φ) = 1)[7]

Accuracy class index
Class 1 and Class 2 meters available

Maximum error
Class 1
< ± 1% over range 0.1 I_b to I_{max}; 0.5 ≤ cos(Φ) ≤ 1.0 (lead or lag)[8]

Class 2
< ± 2% over range 0.1 I_b to I_{max}; 0.5 ≤ cos(Φ) ≤ 1.0 (lead or lag)

Disconnection Device

Type

Single Pole latching contactor	100A

[4] Will accurately meter energy if Line and Load connections are reversed. Can also be configured to tamper on reverse energy detection.
[5] Other Base Currents available on request.
[6] The metering is accurate within the limits specified by IEC62053-21. Should a meter momentarily be operated outside its specified maximum current rating it will meter accurately up to 1.2 I_{max}.
[7] The Power Threshold represents the minimum load power that the meter will register. This value is programmable, with the recommended level for a base 10A meter shown.
[8] IEC 62053-21: 0.8 ≤ cos(Φ) ≤ 1.0 Leading, 0.5 ≤ cos(Φ) ≤ 1.0 Lagging

Insulation, Overvoltage and Surge Protection

Insulation System Classification
Protective Class ll (according to IEC 62052-11)

Insulation Level
4kV rms for 1 minute

Overvoltage withstand
440VAC for 48 hours[9]
600VDC for 1 minute[10]

Surge Immunity – Voltage impulse withstand
Differential
In excess of 6kV, 1.2/50µs, with 2Ω source impedance

Surge Immunity – Current impulse withstand
Service rating
5 kA 8/20µs
Withstand rating
30 kA, 4/10µs
Specification compliance
SABS 1524-1, IEC 62052-11

Electromagnetic compatibility (EMC)
Electrostatic discharge 15 kV air discharge
Immunity to HF fields
80 MHz to 2 GHz @ 10V/m with load, 80MHz to 2GHz @ 30V/m no load
Immunity to fast transient bursts 4 kV
Radio interference
Complies with requirements for CISPR 22
Specification compliance
IEC 61000-4-2; IEC 61000-4-3; IEC 61000-4-4; IEC 61000-4-6 CISPR 22

Communication Circuitry

Type
Power Line Carrier

Carrier frequency
66kHz (FSK)

Protocol
Device Language Message Specification (DLMS). High-level data link control (HDLC)

Specification compliance
IEC61334-4-41, ISO/IEC13239 and EN 50065

Communication range
Typically > 200 m (network dependant)

Main Enclosure

Type
Layout according to BS5685

Mounting
Two mounting screws bottom (spacing according to BS5685). Top mounting bracket available as an option

Rating
IP54 (IEC60529)[11]

Material
UV Stable Polycarbonate/ABS blend with flame-retardant

Resistance to heat and fire
Complies with 960°C[12] glow-wire (IEC 60695-2-1)

Resistance to spread of fire
UL94-V0 rated @1.5mm.
No toxic gases emitted: 'Green Material'[13]

Dimensions
127.6mm(H) x 122mm(W) x 68mm(D) with short terminal cover[14]

Mass
510 g

Terminals

Layout
According to BS5685

Mains terminals
Type Double screw (M6), moving-cage terminal

Material Mild steel, yellow passivated

Maximum Cable Size 25mm^2

[9] This higher specification (440V as opposed to 400V) has not yet formed part of the official specification
[10] This higher end test is not a requirement of IEC 62052
[11] Only IP51 rating is required by IEC 62052-11 for indoor meters
[12] Only 650°C called for by standard industry specification
[13] No V-rating or 'Green' material called for by industry specifications
[14] See diagram

Terminal block material

UV Stable Polycarbonate with flame-retardant

Resistance to heat and fire

Complies with 960°C[15] glow-wire (IEC 60695-2-1)

Resistance to spread of fire

UL94-V0 rated @1.5mm.

No toxic gases emitted: 'Green Material'[16]

Sealing

Type

Meter enclosure

Factory sealed with screw-sealing plugs

Terminal cover

Utility sealed with wire and crimped ferrule

Operating Environment

Area of application

Indoor meter (according to IEC62052-11)

Operating temperature range

-10°C (+14°F) to +55°C (+131°F)

Storage temperature range

-25°C (-13°F) to +70°C (+158°F)

Relative humidity

Maximum ≤95%; Annual mean 75%

Man-Machine Interface (Basic Option)

Rate of consumption indicator

Visible LED, 1000 pulses/kWh

Status Indication

Visible LED

Man-Machine Interface (LCD Option)

Rate of consumption indicator

Visible LED, 1000 pulses/kWh

Liquid Crystal Display (LCD)

Size 9cm^2 (45mm (W) x 20mm (H)), 8 digits + 11 icons

Icon information

Happy face, Sad face, Alert, Breaker status, Info, kWh, 4-segment credit wedge

Numeric information

Optional default display of either Total kWh Consumed or Remaining Credit

External Interfaces

Standard Interrogation Port

8-pin interface according to ESKOM DISSCAAA9

Optical Communications Port

According to IEC 62056-21

Proprietary Interrogation Port

Data interface for Cashpower Powerscope

Specifications Compliance & Approvals

IEC

IEC 62052-11; IEC 62053-21
IEC 62056-21 First Edition: 2002

SABS

SABS 1524-1 Edition 3

ESKOM – Prepayment meters

ESKOM DISSCAAA9

BS

BS 5685: 1979

[15] Only 650°C called for by standard industry specification
[16] No V-rating or 'Green' material called for by industry specifications

Cashpower Gemini PLC Customer Interface Unit

Electrical Ratings

Nominal Supply Voltage
230V AC (other voltages available on request)

Operating Voltage Range
184V – 276V

Nominal Supply Frequency
50Hz (60Hz option available on request)

Burden
<1.2W / <5VA @ 230V

Protective Class
Double insulated – SELV

Supply Connection
Detachable socket inlet

Batteries
2 x 1.5 Volt AA batteries (typical operating life - 2 years)

Communications Circuitry

Type
Power line carrier

Carrier frequency
66kHz (FSK)

Protocol
Device Language Message Specification (DLMS). High-level data link control (HDLC)

Specification compliance
IEC61334-4-41, ISO/IEC13239 and EN 50065

Operating Environment

Operating Temperature Range
-10°C (+14°F) to +55°C (+131°F)

Storage Temperature Range
-25°C (+12°F) to +70°C (+158°F)

Relative Humidity (IEC 6 1036)
Maximum ≤95%; Annual mean 75%

Enclosure

Type
Wall mounted with plug-in AC power cord socket inlet and hinged battery compartment

Rating
IP 51

Material
UV Stable Polycarbonate/ABS blend with flame-retardant

Resistance to heat and fire
Complies with 960°C[17] glow-wire (IEC 60695-2-1)

Resistance to spread of fire
UL94-V0 rated @1.5mm.
No toxic gases emitted: 'Green Material'[18]

Dimensions
147mm(H) x 123mm(W) x 65mm(D)

Weight
500 g

Sealing

Battery Compartment
Hinged door for battery replacement

Electronics Enclosure
Factory sealed - no user serviceable parts

Man-Machine Interface

Type
Language-independent

Components
Pictographic/Numeric LCD display, keypad, LED rate of consumption indicator, audio feedback

[17] Only 650°C called for by standard industry specification
[18] No V-rating or 'Green' material called for by industry specifications

Liquid Crystal Display (LCD)

Size

$9cm^2$ (45mm (W) x 20mm (H)), 8 digits + 11 icons

Icon information

Happy face, Sad face, Alert, Breaker status, Info, kWh, 4-segment credit wedge

Numeric information

Display of various meter information such as credit levels, number entry, etc.

Keypad

12-key, international standard layout including “Information” and “Backspace” keys

Buzzer

Audio feedback on key press, encrypted number Accept and Reject melodies, Low-credit alarms as a factory-programmable option

Rate of Consumption Indicator (Rate LED)

Rate of consumption indicator (Pulse rate proportional to current rate of consumption)

Alarm Indicator

Visible warning of critically low credit status

LCD Backlighting

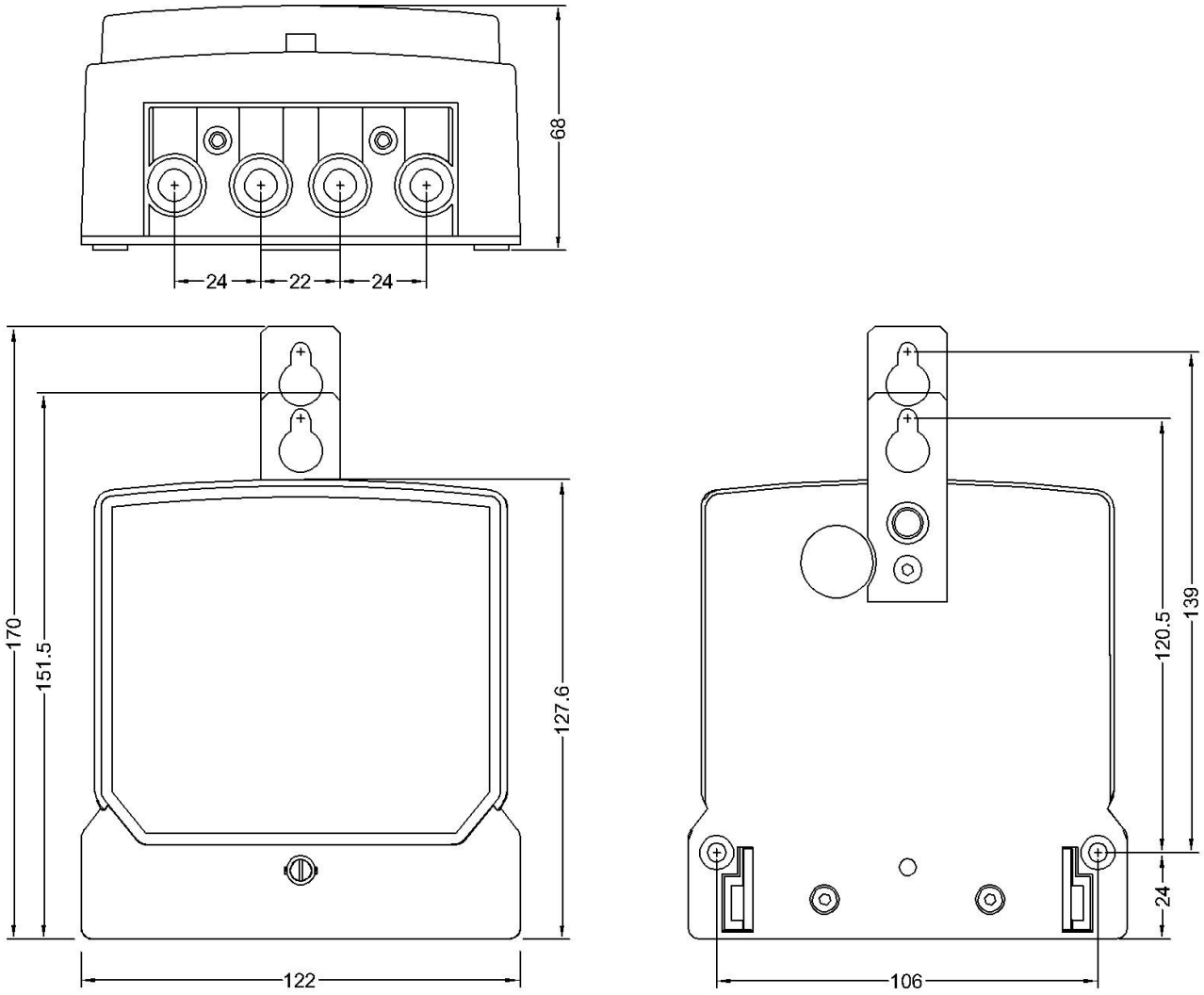
Settable – On or Off

Diagnostic Information

Additional meter parameters accessible via the “Information” key

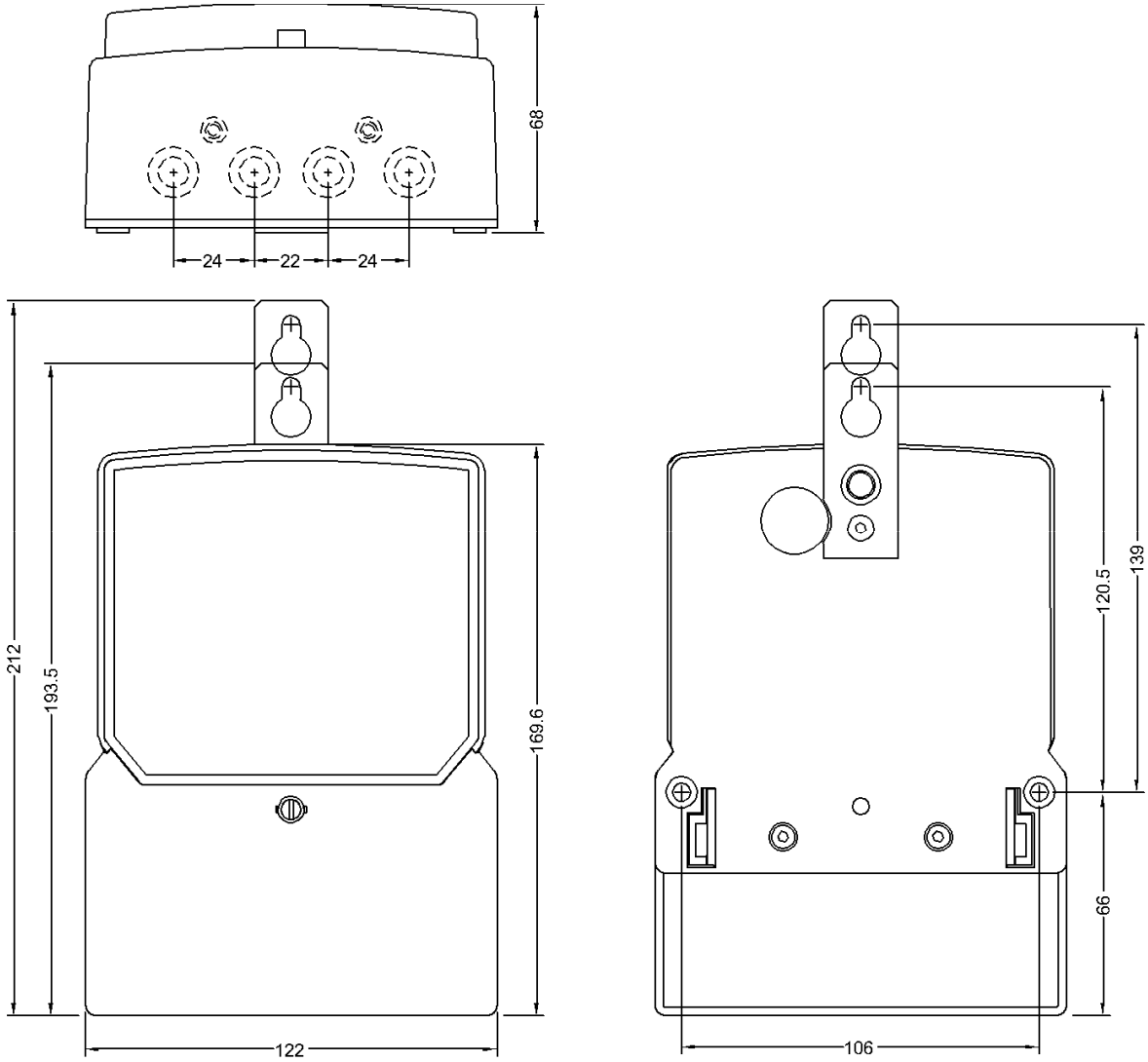
Cashpower Gemini PLC Dimensions

Meter Dimensions - Short Terminal Cover



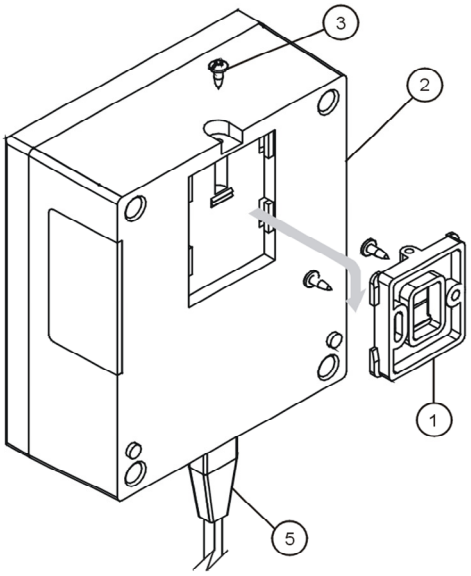
Cashpower Gemini PLC Dimensions

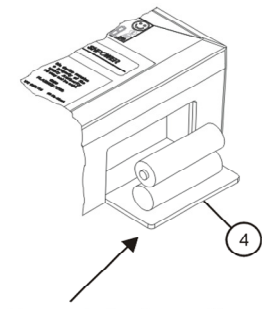
Meter Dimensions – Long Cover



Cashpower Gemini PLC Dimensions

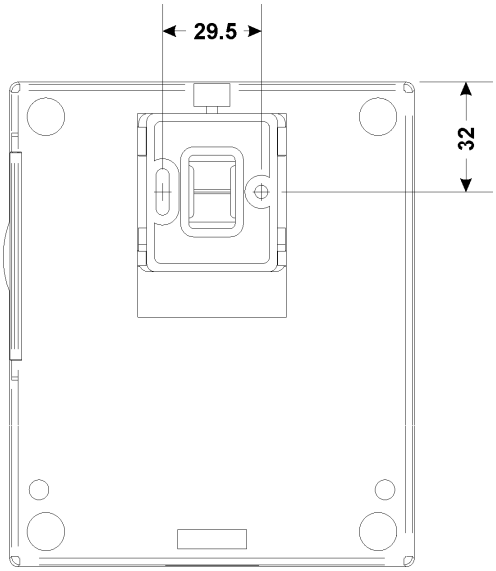
Customer Interface Unit – Parts

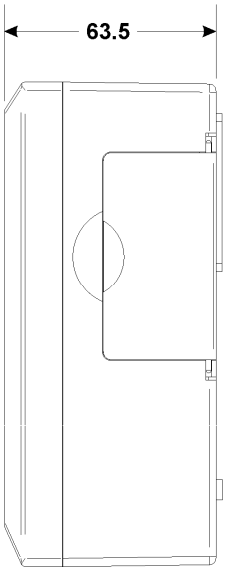


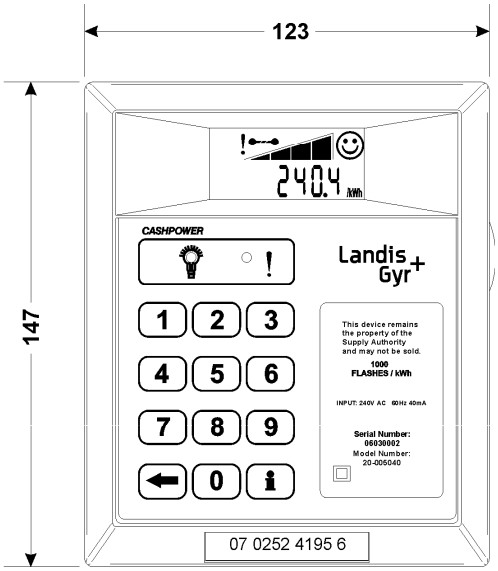


Use only leak proof alkaline, 1.5V AA batteries.

1. Fix mounting clip to wall with suitable size screws (not supplied)
2. Slide unit onto clip as shown
3. Secure into place with locking screw
4. Insert batteries with polarity as shown
5. Fit power cord and plug into an AC outlet







Landis+Gyr (Pty) Ltd
2 Slate Avenue, N1 Business Park
Old Johannesburg Road, Kosmosdal Ext. 7
Gauteng, South Africa
Tel: +12 645 3100
www.landisgyr.com/za

Landis+Gyr
manage energy better