

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

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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 a Remote Access Terminal in a kiosk or mini-substation to the meter for remote access
- Quick and easy to install using existing household wiring; no additional communication wires are required
- 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
- High surge withstand capability for areas prone to lightning or other line surges

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 unit is connected by an integrated 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 supply. However in the event of credit in the meter expiring and consequently disconnecting power to the house, the customer interface unit is fitted with a standard 9V(6LR61) type alkaline battery, to allow the consumer to enter a new credit voucher.

The customer interface unit has a large LCD display. The customer or field technician can access meter parameters by entering specific register information using the keypad.

In addition, the customer interface unit has an audible low credit warning tone 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.

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 interface.

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 Remote Access Terminal 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.

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 PLC: Technical specifications

General information

Meter Format

Single phase, 2-wire, direct connected prepayment meter

Compatible network(s)

Single phase, 2-wire, earthed neutral¹

Operation

General

Prepayment and Credit modes

Credit entry mechanism

Keypad; encrypted numbers

Encryption algorithms

STS Compliant²

¹ May be compatible with other network types as well – Consult Landis+Gyr

² STS = Standard Transfer Specification (Industry Standard)

Applicable specifications

IEC62055-41 and IEC62055-51

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 range80% 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)

Metrological Performance**Measurement direction**Forward and reverse power detection and metering³
(Credit is decremented in both directions)**Meter constant (LED flash rate)**

1000 impulses / kWh

Basic reference current (I_b)10A⁴**Accurate metering range**0.05 I_b to 1.2 I_{max} ⁵**Starting current** $\leq 0.004 I_b$ (For Class 1)**Power threshold**6.5W (approx 28mA @ 230V and $\cos(\Phi) = 1$)⁶**Accuracy class index**

Class 1

Maximum error

Class 1

< $\pm 1\%$ over range 0.1 I_b to I_{max} ; $0.5 \leq \cos(\Phi) \leq 1.0$
(lead or lag)⁷**Disconnection Device****Type**

Single Pole latching contactor 100A

Insulation, Overvoltage and Surge Protection**Insulation System Classification**

Protective Class II (according to IEC 62052-11)

Insulation Level

4kV rms for 1 minute

Overvoltage withstand440VAC for 48 hours⁸600VDC for 1 minute⁹**Surge Immunity – Voltage impulse withstand**

Differential

In excess of 6kV, 1.2/50 μ s, with 2 Ω source impedance**Surge Immunity – Current impulse withstand**

Service rating

5 kA 8/20 μ s

Withstand rating

30 kA, 4/10 μ s

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

³ Will accurately meter energy if Line and Load connections are reversed. Can also be configured to tamper on reverse energy detection.⁴ Other Base Currents available on request.⁵ 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} .⁶ 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.⁷ IEC 62053-21: $0.8 \leq \cos(\Phi) \leq 1.0$ Leading, $0.5 \leq \cos(\Phi) \leq 1.0$ Lagging⁸ This higher specification (440V as opposed to 400V) has not yet formed part of the official specification⁹ This higher end test is not a requirement of IEC 62052

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)¹⁰

Material
UV Stable Polycarbonate/ABS blend with flame-retardant

Resistance to heat and fire
Complies with 960°C¹¹ glow-wire (IEC 60695-2-1)

Resistance to spread of fire
UL94-V0 rated @ 1.5mm.
No toxic gases emitted: 'Green Material'¹²

Dimensions
127.6mm(H) x 122mm(W) x 68mm(D) with short terminal cover¹³

Mass
Approximately 510 g

Terminals

Layout
According to BS5685

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

Material Mild steel, yellow passivated

Maximum Cable Size 25mm²

Terminal block material
UV Stable Polycarbonate with flame-retardant

Resistance to heat and fire
Complies with 960°C¹⁴ glow-wire (IEC 60695-2-1)

Resistance to spread of fire
UL94-V0 rated @ 1.5mm.
No toxic gases emitted: 'Green Material'¹⁵

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%

¹⁰ Only IP51 rating is required by IEC 62052-11 for indoor meters

¹¹ Only 650°C called for by standard industry specification

¹² No V-rating or 'Green' material called for by industry specifications

¹³ See diagram

¹⁴ Only 650°C called for by standard industry specification

¹⁵ No V-rating or 'Green' material called for by industry specifications

Man-Machine Interface

Rate of consumption indicator

Visible LED, 1000 pulses/kWh

Liquid Crystal Display (LCD)

Size 9cm² (45mm (W) x 20mm (H))
8 digits + 11 icons
Digit Height: 9.3mm

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

Specifications Compliance & Approvals

IEC

IEC62055-41 and IEC62055-51

SABS

SABS 1524-1

ESKOM – Prepayment meters

DSP34-1635

PLC Customer Interface Unit Mk3: Technical Specifications

Electrical Ratings

Supply Voltage

220-240 VAC

Supply Frequency

50Hz

Burden

<0.82 W / < 17 VA @ 230VAC, 50Hz

Maximum Rated Current

0.09A @ 230VAC, 50Hz

Protective Class

Double insulated – Protective Class 2

Supply Connection

Integrated power cord. Variants are available with a range of power plug types

Batteries

1 x 9 Volt (6LR61 type) battery (typical battery life is 2 years)

Communications Circuitry

Type

Power Line Carrier (PLC)

Carrier Frequency

66kHz FSK – CENELEC A Band for utilities

Protocol

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

Specification compliance

IEC 61334-4-41, IEC 61334-5-2, and EN 50065-1

Operating Environment

Operating Temperature Range

-10°C to +55°C (+14°F to +131°F)

Storage Temperature Range

-25°C to +70°C (+12°F to +158°F)

Relative Humidity (IEC 62052-11)

Maximum ≤95%; Annual mean <75%

Enclosure Design

Type

Wall mounted with integrated AC power cord and sliding battery compartment

Degree of Protection (IP Rating)

IP 51

Material

UV Stable Polycarbonate/ABS blend with flame-retardant

Resistance to heat and fire

Complies with 960°C¹⁶ glow-wire (IEC 60695-2-1)

Resistance to spread of fire

UL94-V0 rated @1.5mm. No toxic gases emitted:
'Green Material'¹⁷

Dimensions

144mm(H) x 120mm(W) x 40.8mm(D)

Weight

Approximately 350 g (including battery, power cord and power plug)

Sealing & Access Control**Battery Compartment**

Sliding battery compartment for battery replacement

Electronics Compartment

Factory sealed with screw sealing plug- no user serviceable parts

Man-Machine Interface**Type**

Language-independent

Components

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

Liquid Crystal Display (LCD)

Size 9cm² (45mm (W) x 20mm (H)),
8 digits + 11 icons
Digit height: 9.3mm

Icon information

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

Numeric information

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

Compliance / Certification

SANS / IEC60950

Keypad

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

Buzzer

Audio feedback on key press, encrypted number accept and reject melodies and low-credit alarm

Rate of Consumption Indicator (Rate LED)

Rate of consumption indicator (Pulse rate proportional to current rate of consumption). Note that this is not a reference output for accuracy verification

Alarm Indicator

Visible warning of critically low credit status

Diagnostic Information

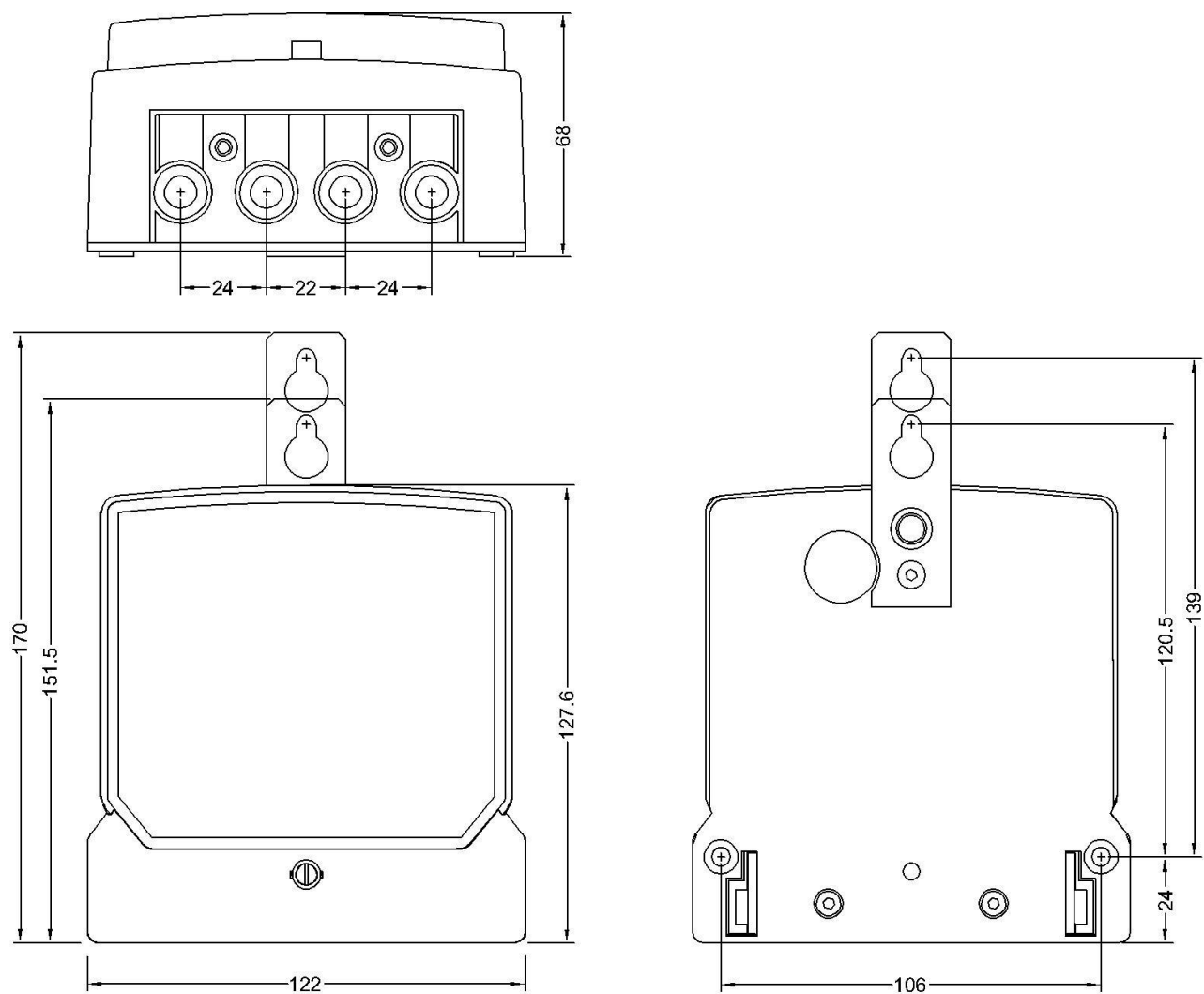
Additional meter parameters accessible via the "Information" key

¹⁶ Only 650°C called for by standard industry specification

¹⁷ No V-rating or 'Green' material called for by industry specifications

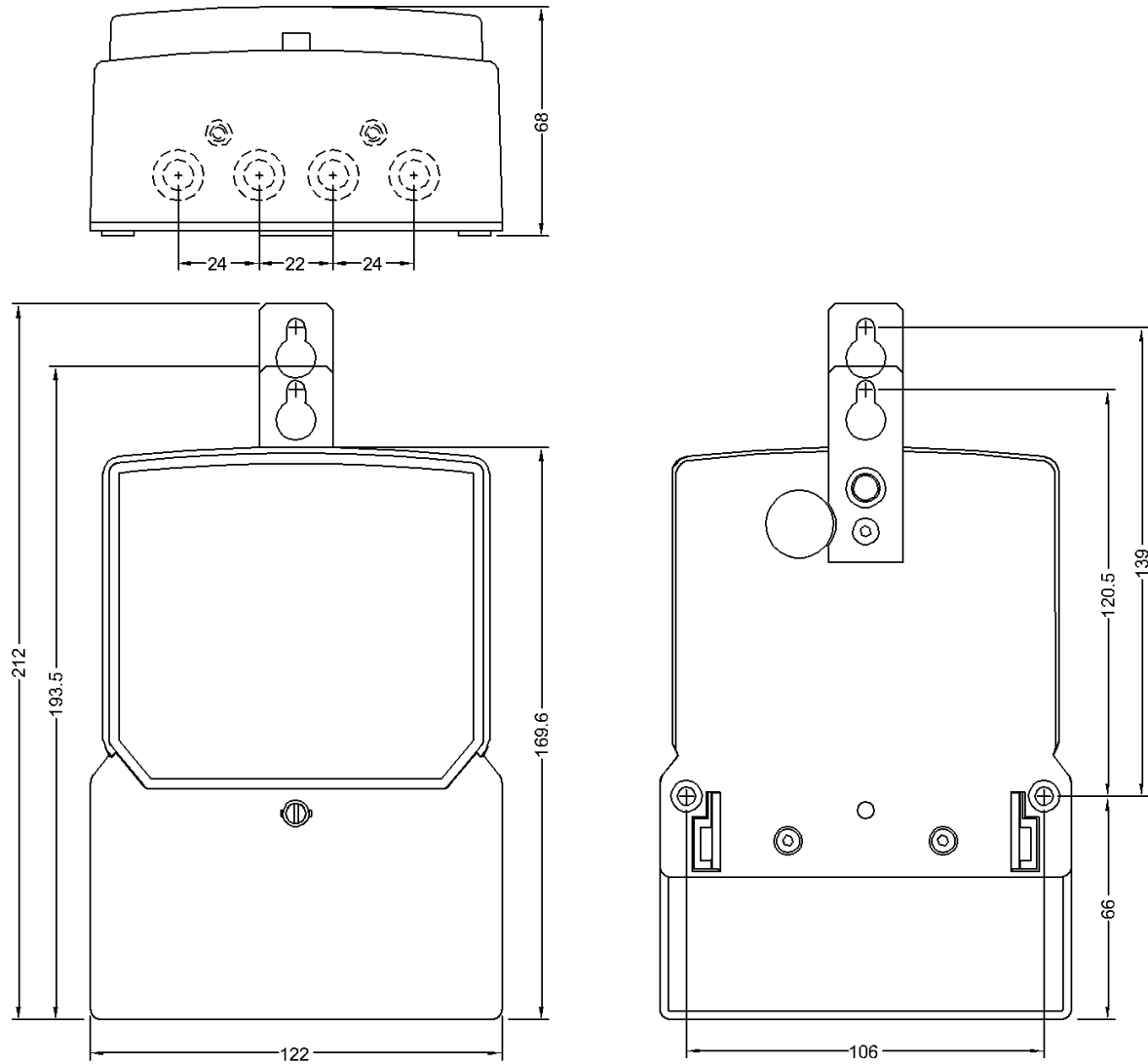
Cashpower Gemini PLC Dimensions

Meter Dimensions - Short Terminal Cover

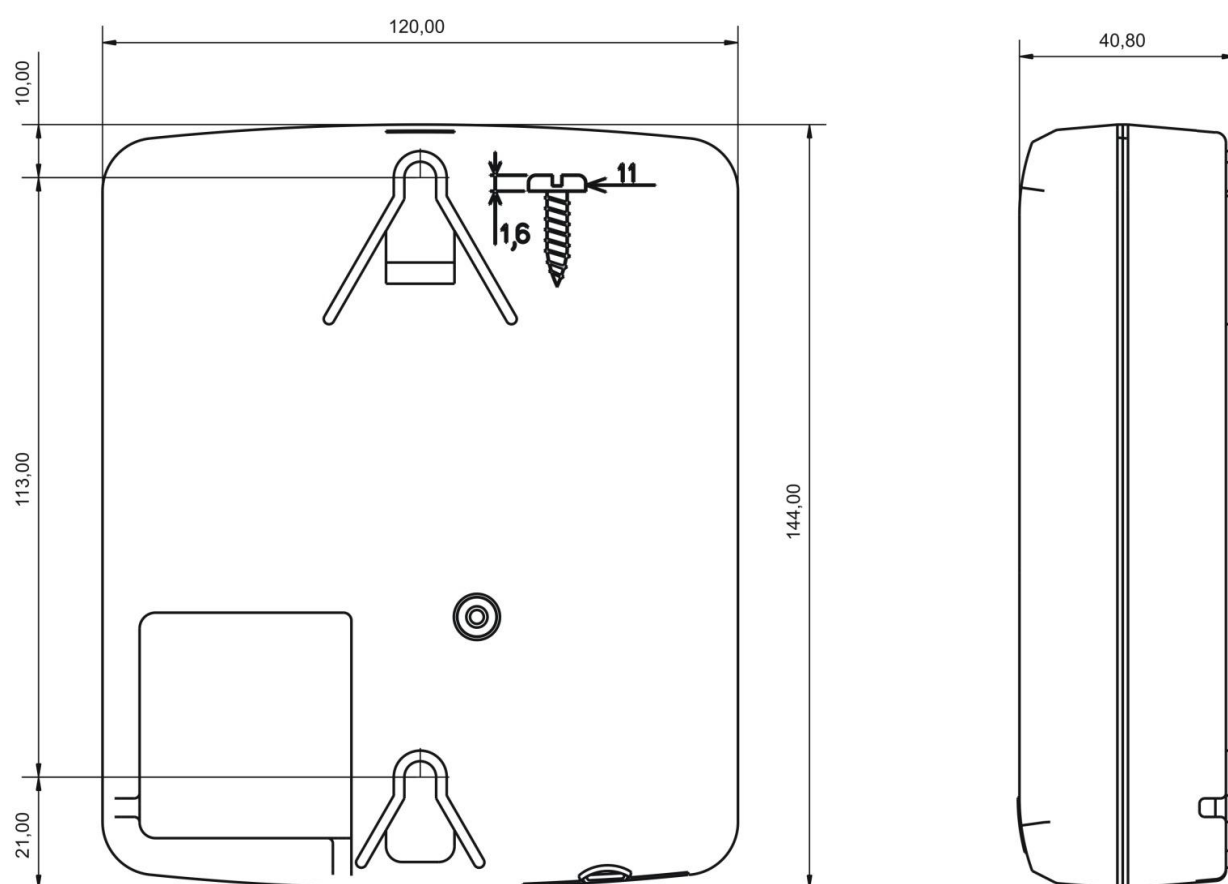


Cashpower Gemini PLC Dimensions

Meter Dimensions – Long Cover



Cashpower Customer Interface Unit: Dimensions



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