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Prepayment Electricity Meters

Residential

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Residential

Cashpower Power-Rail

Version 14 Meter Firmware

Technical Specification



Cashpower Power-Rail is a single-phase split meter in a DIN rail-mount housing. The meter is ideal for new reticulation where housing is informal with the prepayment meters mounted in a pole-top enclosure with respective customer interface units conveniently mounted in the dwellings below. Fitted with the shroud, the Power-Rail offers features that further enhance the utility's revenue protection capability.

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Overview

Cashpower Power-Rail is a single-phase split prepayment meter in a DIN rail-mount housing, is ideal for new reticulation where housing is informal. The prepayment meters are mounted in a pole-top enclosure with respective customer interface units conveniently mounted in the dwellings below. Due to the small size and DIN rail housing, multiple Power-Rail meters can be mounted in a small enclosure thereby making installation cost-effective.

Features

- Compact meter design, with DIN rail-mount layout for high density stacking
- Optional shroud can be fitted for additional terminal protection and tamper detection feature
- Customer Interface Unit provides valuable information to help consumers effectively manage their electricity consumption
- Galvanically isolated communication link to customer interface unit for consumer safety
- Plug-in communications connector on the meter for easier utility access and maintenance
- Programmable operating mode - Prepayment or Credit metering modes
- Programmable software power limit
- Commissioning and de-commissioning feature
- Meter state indication LED and communication diagnostic LED at the meter
- Display of last 25 credit tokens entered
- Meter is able to store GPS coordinates as per Eskom's DSP34-1635 specification
- Supports micro generation, by means of a dedicated reverse energy register and various modes of operation
- Credit, total and reverse energy registers all support self-adjusting decimal point (10Wh or 100Wh resolution)
- Average consumption register over a 30 day period
- Number of days credit remaining (based on average consumption)

Split Metering Functionality

The Cashpower Power-Rail consists of two parts: the Customer Interface Unit and the meter.

The Customer Interface Unit is a compact unit with user-friendly display and keypad that can be installed in a convenient location inside the consumer's premises. Connection to the meter is via a pair of communications wires. The connection of these wires at the meter is achieved by means of

a plug-in connector, facilitating easy installation and maintenance.

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

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

Prepayment and Credit Mode Operation

The Cashpower Power-Rail meter is configurable and can operate both in the prepayment or credit mode, with the ability to switch between modes as required by using a meter specific 20 digit token.

User-friendly Customer Interface

User interaction with the meter and access to meter information e.g. rate of energy consumption, low credit warning and load switch status is available using the Customer Interface Unit's keypad and LCD. The customer Interface Unit makes use of clear, language-independent icons.

The user interface is further enhanced by the use of audible tones. These are sounded under different conditions e.g. Low Credit Alarm and Token Accept and Reject.

Meter Status and Diagnostic Indicators

The meter includes a LED status indicator. This allows a technician to view the state 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/decommissioned status and remaining credit status are available.

The meter also features a dedicated diagnostic LED for the Customer Interface. It can indicate the presence of "Open" or "Short" circuited communication lines. This is a valuable visual aid that assists the technician to validate the installation and determine probable fault types.

Micro-generation Support Features

In the event that the customer has either solar or wind generation and is intending to either generate energy for own use or possibly place net energy back into the grid, the meter provides a reverse energy register and various modes of operation to support the customer's micro-generation needs.

In one of the modes, known as the "Reverse Energy Neutral" mode, the meter will permit reverse energy flow, will meter it, and will record it in the Total Reverse Energy register, but will neither increment nor decrement the meter's Remaining Credit register.

The meter also features a Cumulative Total Reverse Energy register which accumulates all measured reverse energy irrespective of mode and as with the conventional Total Consumption register, this register is never cleared and will continue to accumulate all measured reverse energy for the lifetime of the meter. This register is accessible via the optical port, VTC ports (type A & type B) and via Cashpower information registers.

Tamper Detection & Prevention

The split configuration of the meter significantly reduces the risk of tampering. The meter is installed in a remote, secure location and is mechanically sealed against tampering through the use of mechanical clips and inaccessible assembly screws.

A shroud can also be fitted to the meter, which not only protects and limits access to the meter terminals, but also offers an innovative tamper detection facility. Using the optical interface of the meter, the removal of the anti-tamper shroud can be detected by the meter, resulting in the meter entering a tamper condition and opening the load switch. The tamper condition can only be reset by an authorised, meter specific STS token.

Utility seals can be field-fitted to secure the shroud to the meter. The use of these mechanical seals ensures that there will be visible signs of tampering if unauthorised entry to the meter is attempted.

Optical Interface

As a standard feature, the meter has an IEC 62056-21 compliant optical communications port. This allows the utility to access a variety of information stored inside the meter and additionally enables two way communications with the meter using Landis+Gyr's RS485 FLAG Interface device.

Virtual Token Carrier (VTC) Type A port

Meter configuration and access to meter parameter data may be achieved via the industry standard VTC Type A port, access on the side of the meter once the VTC seal is broken.

Virtual Token Carrier (VTC) Type B port

When fitted with the shroud and the Eskom DSP34-1635 type B interface, the meter offers an Eskom standard communications interface for future remote access and two way communications.

Disconnect on Power Fail

The meter includes a feature to cater for a condition where the neutral connection to the device is removed. The meter will disconnect the load if a power failure is detected, as would be the case if the neutral wire were to be removed.

Surge protection

The utility has the option of fitting an external surge arrester with a current surge rating in excess of 30kA.

Installation Features

For ease of installation, the communication wires for the customer interface are non-polarised, safety-isolated and are connected to the meter by a convenient plug-on connector. This simplifies the installation process for the field technician.

The communication wires may be available as separate cores in a concentric reticulation cable and provide a very robust communications interface between the meter and the customer interface over a distance of at least 130 metres.

Cashpower Power-Rail: Technical specifications

General information	Credit entry mechanism
Meter Format	Keypad; encrypted numbers
Single phase, 2-wire, direct connected prepayment meter	Encryption algorithms
Compatible network(s)	STS Compliant ¹
Single phase, 2-wire, earthed neutral	Applicable STS specifications
Operation	IEC62055-41 and IEC62055-51
General	
Credit store with decrement-on-usage	

¹ STS = Standard Transfer Specification (Industry Standard for prepayment metering, according to IEC62055-41 / 51)

Electrical Ratings

Nominal Voltage (U_n) - Rated Voltage
230 Volts AC rms r variants available)

Nominal frequency
50 Hz

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 <1.8W / <10VA @ 230V
Current circuit <2.5 VA @ Base Reference Current (I_b)

Metrological Performance

Measurement direction
Forward and reverse power detection and metering²

Meter constant (LED flash rate)
1000 impulses / kWh

Basic reference current (I_b)
10A

Accurate metering range
0.05 I_b to I_{max} ³

Starting current
 $\leq 0.004 I_b$ (For Class 1)

Power threshold
6.5W for base 10A (approximately 28mA @ 230V and $\cos(\Phi) = 1$)⁴

Accuracy class index
Class 1

² Accurately meters energy if line and load connections are reversed. The meter also provides a reverse energy register and the meter can be configured in various modes to support the utility's micro-generation requirements.

³ 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} or 1.6 I_{max} (80A or 60A meters respectively).

⁴ 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.

Maximum error – Class 1

$< \pm 1\%$ over range 0.1 I_b to I_{max} ; (with $0.5 \leq \cos(\Phi) \leq 1.0$ lagging and $0.8 \leq \cos(\Phi) \leq 1.0$ leading)⁵

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 withstand
440VAC for 48 hours
600VDC for 1 minute

Surge Immunity – Voltage impulse withstand
Differential
In excess of 6kV, 1.2/50 μ s, with 2 Ω source impedance (according to SABS 1524-1)

Surge Immunity – Current impulse withstand
Service rating
5 kA 8/20 μ s (with optional surge arrester populated)⁶
Withstand rating
30 kA, 4/10 μ s (with optional surge arrester populated)

Specification compliance
SANS 1524-1

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

⁵ IEC 62053-21: $0.8 \leq \cos(\Phi) \leq 1.0$ Leading, $0.5 \leq \cos(\Phi) \leq 1.0$ Lagging

⁶ Surge arrester externally fitted between Live In and Neutral

Communication Circuitry

Type

Galvanically isolated, non-polarised, 2-wire, half-duplex. Meter function is independent of CIU function

Rated Impulse Voltage

Peak Voltage 6kV (1,2/50 μ S) waveform (according to IEC 62052-11 Protective Class II)

Insulation Properties

4kVrms (1 minute) according to IEC 62052-11 Protective Class II

Communication Distance

Up to 130 metres, with a maximum total loop resistance of 40 Ω

Main Enclosure

Type

Rail mount, with locking clip compatible with 35mm DIN standard rail

Rating

Product is designed to be installed in a pole-top or street kiosk housing rated at IP51 or better

Material

Polycarbonate, flame-retardant, glass-filled grade

Resistance to heat and fire

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

Resistance to spread of fire

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

Dimensions

127mm(H) x 47.7mm(W) x 87.5mm(D)⁷

Mass

Approximately 280 g (excluding shroud)

Terminals

Layout

Top Live-in, Neutral-in cage terminals

Bottom Live-out cage terminal

Front

Communication connector

Live Terminals

Type Single screw (M8), moving-cage terminal

Material Mild steel, yellow passivated

Maximum Cable Size 25mm²

Neutral Terminal

Type Single screw (M6), moving-cage terminal

Material Mild steel, yellow passivated

Maximum Cable Size 16mm²

Customer Interface Connector

Type Plug-in, single screw cage terminal (with wire protector)

Maximum Cable Size 1.5mm²

Sealing

Type

Meter enclosure Factory sealed with screw-seal

Anti-tamper shroud Sealed with Utility seal

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 \leq 95%; Annual mean 75%

Man-Machine Interface

Rate of consumption indicator

Visible LED, 1000 pulses/kWh

Status Indication

Visible LED

CIU Operating Indication

Visible LED

⁷ Excludes shroud, please see diagram

External Interfaces

Virtual Token Carrier (VTC) Type A

Type A port with access when the VTC port plug on the side of the meter is removed

Optical Communications Port

According to IEC 62056-21

Virtual Token Carrier (VTC) Type B Interface

Applicable when the shroud is fitted onto the meter and the Eskom DSP34-1635 type B interface pcb is

fitted. Provides a standard Eskom interface according to the Eskom DSP34-1635 specification

Specifications Compliance & Approvals

SABS

SANS 1524-1

Eskom

Eskom DSP34-1635

STS

IEC62055-41 and IEC62055-51

Cashpower Power-Rail - Customer Interface Unit

Electrical

Type

Isolated, non-polarised, 2-wire, half-duplex, 12Vdc from meter

Operating Range (Communication)

Up to 130 metres, with a maximum total loop resistance of 40Ω

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

Slimline, wall mounted

Rating

IP 51

Material

ABS

Dimensions

77.5mm(H) x 132mm(W) x 29mm(D)

Weight

Approximately 100 g

Terminals

Type

Two-way screw terminal

Maximum cable size

2.5mm²

Sealing

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

Liquid Crystal Display (LCD)

Size

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

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

Light Emitting Diode (LED)

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

Diagnostic Information

Additional meter parameters accessible via the "Information" key

Cashpower Power-Rail Dimensions

Meter Dimensions

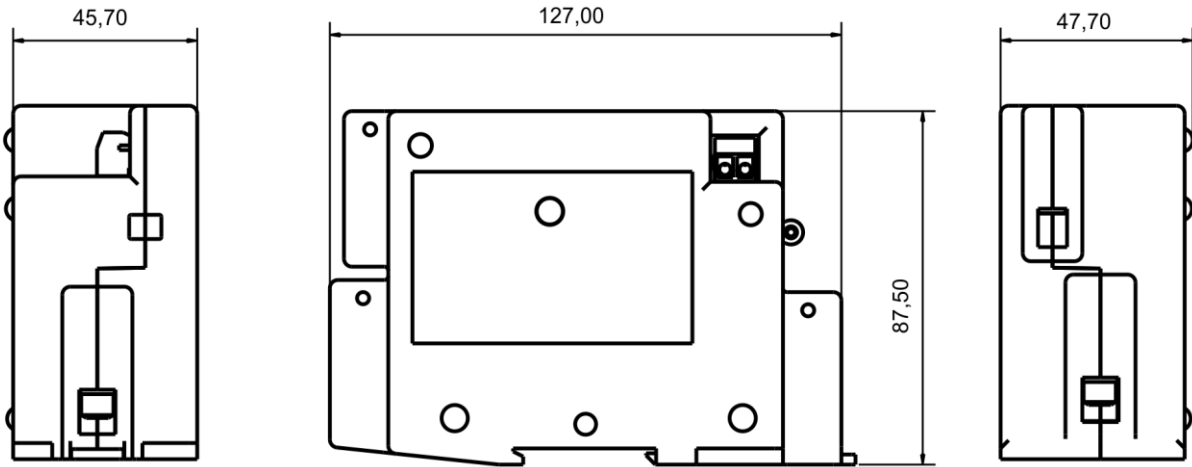


Figure 1: (Above) Dimensions of the Power-Rail meter without the shroud fitted

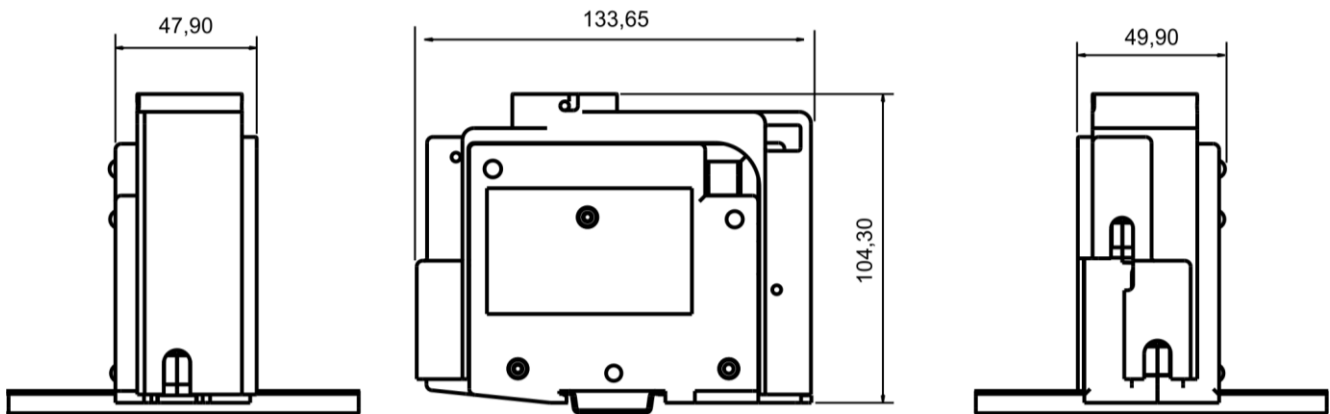
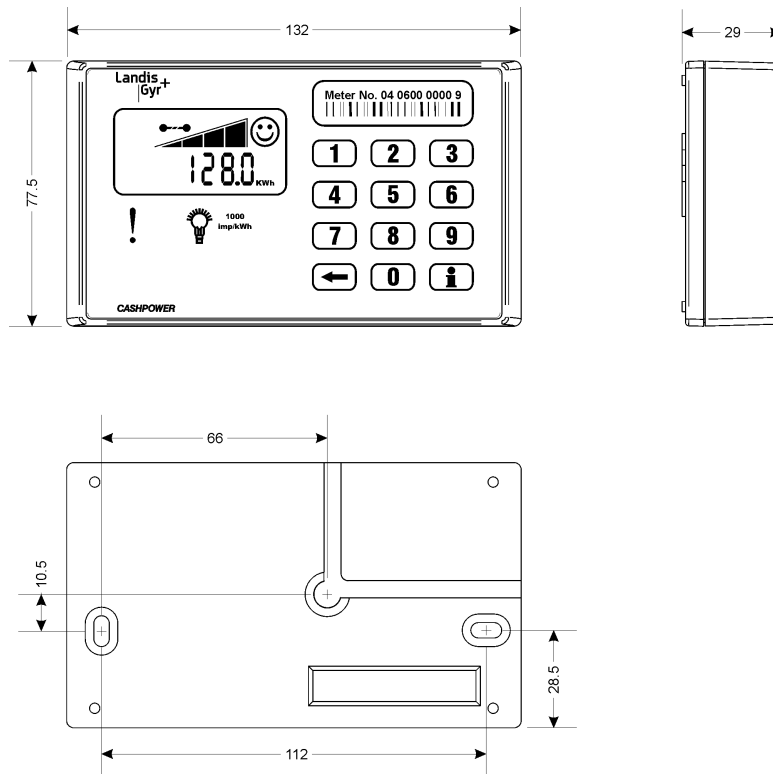


Figure 2: (Above) Dimensions of the Power-Rail meter with the shroud fitted

Customer Interface Unit Dimensions



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