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Cashpower Power-Rail

Prepayment Electricity Meter
Residential



- **Compact meter design, with DIN rail-mount layout for high density stacking**
- **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**
- **Programmable operating mode – Energy Limiting Mode, Prepayment or Credit metering**
- **Programmable software power limit**
- **High surge withstand capability for areas prone to lightning or other line surges**
- **SABS 1524 and IEC 62052-11, IEC 62053-21 complaint**

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Overview

Cashpower Power-Rail is a single 60 A (80A optional) split meter in a DIN rail-mount housing. It 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. 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.

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 any convenient location inside the consumer's premises. Connection to the remotely installed 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 any form of 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 anytime, thus reducing the possibility of tampering.

Principle of Operation

The Cashpower Power-Rail meter in the Energy Limiting Mode, provides utilities with the utmost flexibility in terms of being able to adapt to a range of different consumer profiles. Three utility-programmable modes of operation are available and it is possible to switch between modes as required.

Energy Limiting Mode

This mode allows utilities to distribute a fixed, monthly allocation of energy to consumers. It encourages the rational use of energy without severely inconveniencing the consumer. Operation is as follows:

Assume that a monthly energy allowance of 150kWh has been allocated to a consumer. The meter allocates this energy in regular, equal portions, over the thirty-day period i.e. by

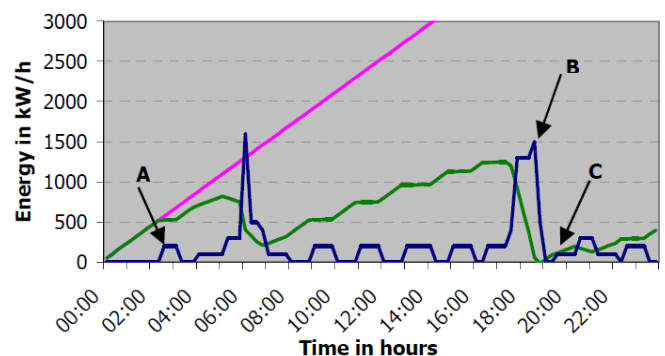
incrementing the kWh credit level with a value of 0.00087kWh every 15 seconds.

Assuming that the consumer draws no power at all, the credit level will continue to increase. However, as soon as energy starts to be used, the credit level is proportionately decremented. If the rate at which energy is being used is less than the rate at which it is being incremented, the credit level will slowly continue to increase. If the rate at which energy is being used is greater than the rate at which it is being incremented, the credit level will slowly decrease.

It is in the consumer's interest to ensure that electricity is not wasted and that unnecessary appliances are turned off. By conserving energy, it will be possible to use it at a high rate for periods when required.

In the event of the consumer exceeding the allocated allowance (credit level reduced to zero), the load is disconnected. However, the next allocation of credit will be available within a very short period of time (15 seconds) and the supply of electricity restored. Providing the consumer takes immediate steps to disconnect unnecessary appliances, it will be possible to have at least basic services available e.g. lighting. With a 150kWh monthly allocation of energy, it will be possible to maintain a continuous load of 200W whilst still maintaining a positive credit balance.

Graphical Representation of Typical Operation



- A) Consumer starts using energy
- B) Consumer depletes accumulated energy and load is disconnected
- C) Consumer starts using energy again after load is re-connected

Prepayment Mode

In Prepayment metering mode, it functions as a normal prepayment meter. Credit tokens are purchased and entered into the meter via the customer interface unit keypad. On expiry of credit, the load is disconnected and will only be re-connected when a valid credit token, purchased by the consumer, is entered.

Credit Mode

In Credit metering mode, it functions as a conventional credit meter. Power is continuously supplied to the consumer and total kWh used is continuously measured and recorded. The meter must be read by the utility at regular intervals and the consumer billed accordingly.

Automatic / Manual Supply Reconnection

A programmable function allows for either automatic or manual restoration of power to the load after it has been disconnected for a period due to expiry of credit or Power Limiting. Manual restoration is accomplished via the customer interface unit.

User-friendly Customer Interface

The meter is controlled via the CIU in exactly the same way as other meters in the Cashpower meter range.

User interaction with the meter and access to meter information e.g. rate of energy consumption, low credit warning and load contactor status is available using the customer interface's keypad and large 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.

Meter Status and Diagnostic Indicators

The meter includes an 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 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.

Interrogation Port

As a customer option, more detailed information and programming is achieved via the standard interrogation port on the side of the meter.

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 to upload it to a hand-held unit.

Tamper Detection

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. Utility-sealed wire seals can be field-fitted to secure the main power cable terminations. The use of these mechanical seals ensures that there will be visible signs of tampering if unauthorised entry to the system is attempted.

The meter also has a feature allowing detection of Significant reverse Energy (SRE). If the line and load wires are swapped during installation, the meter will continue to operate and decrement credit. The unit may be factory programmed to tamper and disconnect the consumer's load should SRE be detected.

Disconnect on Power Fail

The meter includes a feature to cater for a condition where the neutral link to the device is removed. The meter can be personalised to 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 meter has been designed to have a surge voltage withstand that significantly exceeds the requirements of both SABS 1524 and IEC 62052-11.

Depending on the installation's electrical environment, the customer has the option of fitting an additional surge arrester with a current surge rating in excess of 30kA.

Installation Features

The meter is suited for connection to most metering and reticulation systems. The communication wires for the customer interface are non-polarised and safety-isolated. This simplifies the installation process and also ensures safety within the consumer's premises.

The communication wires can be included 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 specification

General Information

Meter Format

Single phase, 2-wire, direct connected prepayment meter

Compatible network(s)

Single phase, 2-wire, earthed neutral (1)

Operation

General

Credit store with decrement-on-usage

Credit entry mechanism

Keypad; encrypted numbers (prepayment mode) or automatically incremented monthly allocation (UP2 mode)

Encryption algorithms

STS Complaint (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

60 Hz

Operating voltage range

80% to 120% of U_n (184V – 276V)

Maximum continuous current (I_{max})

60 or 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)

Protective class (according to IEC 62052-11)

Class II (double insulated)

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 (I_b)

10A (5)

Accurate metering range

0.05 I_b to I_{max} (6)

(1) May be compatible with other network types as well – Consult PPI Pazifik Power, Inc.

(2) STS = Standard Transfer Specification (Industry Standard)

(3) NRS = National Rationalized Specification

(4) Accurately meters energy if line and load connections are reversed. Can also be configured to tamper on reverse energy detection (SRE).

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

Starting current

≤ 0.005 I_b (For Class 2)

Power threshold

6.5W for base 10A (approx 28mA @ 230V and cos (Φ) = 1) (7)

Accuracy class index

Class 2 (Class 1 optional)

Maximum error – Class 2

< 2% over range 0.1 I_b to I_{max}; (with 0.5 ≤ cos (Φ) ≤ 1.0 lagging and 0.8 ≤ cos (Φ) ≤ 1.0 leading) (8)

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 48hours (9)
600VDC for 1 minute (10)

Surge Immunity – Voltage impulse withstand

Differential

In excess of 6kV, 1.2/50μs, with 2Ω source impedance (according to SABS 1524-1)

Surge Immunity – Current impulse withstand

Service rating
5 kA 8/20μs (with optional surge arrestor populated) (11)

Withstand rating

30 kA, 4/10μs (with optional surge arrestor populated)

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, 80 MHz to 2GHz @ 30 V/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

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

Rated Impulse Voltage

Peak Voltage 6kV (1,2/50μs) 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 40Ω

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 fire

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

- (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
- (9) This higher specification (440V as opposed to 4000V) has not yet formed part of the official specification
- (10) This higher end test is not a requirement of IEC 62052
- (11) Surge arrestor externally fitted between Live In and Neutral

Dimensions

127mm (H) x 47.5 (W) x 87mm (D) (12)

Mass

275 g

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	25 mm ²

Neutral Terminal

Type	Single screw (M6), moving-cage terminal
Material	Mild steel, yellow passivated
Maximum Cable Size	16 mm ²

Customer Interface Connector

Type	Plug-in, single screw cage terminal (with wire protector)
Maximum Cable Size	1.5mm ²

Sealing

Type

Meter enclosure	Factory sealed with screw-seal
Terminal cover	Utility sealed with wire and crimped ferrule, and sealing plugs

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 ≤96%; Annual mean 75%

Man-Machine Interface

Rate of consumption indicator

Visible LED, 1000 pulses/kWh

Status Indication

Visible LED, 1000 pulses/kWh

CIU Operating Indication

Visible LED

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 II

Specifications Compliance & Approvals

SABS

SABS 1524-1

ESKOM – prepayment meters

ESKOM DISSCAAA9

(12) See diagram

Cashpower Power-Rail Customer Interface Unit

Electrical

Type

Isolated, non-polarised, 2-wire, half- duplex, 12 Vdc 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)

Enclosure

Type

Slimline, wall mounted

Rating

IP 51

Material

ABS

Dimensions

69mm (H) x 134mm (W) x 25mm (D)

Weight

100g

Terminals

Type

Two-way screw terminal

Maximum cable size

2.5 mm²

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

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)

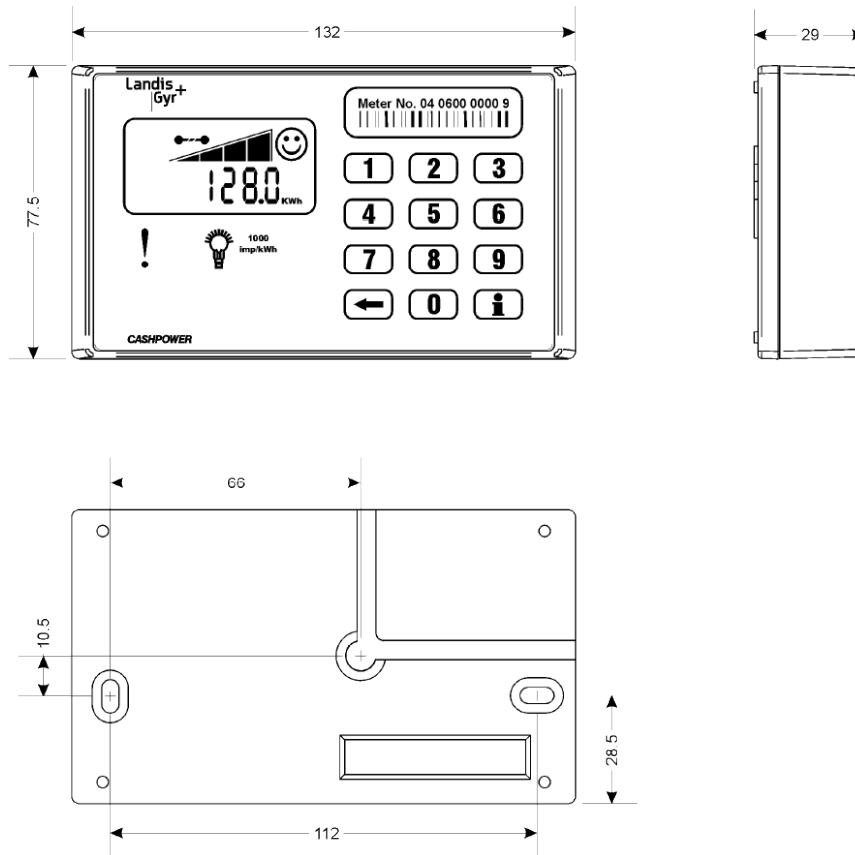
Rate of consumption indicator (pulse rate proportional to current rate of consumption)

Diagnostic Information

Additional meter parameters accessible via the "Information" key

Cashpower Power-Rail Dimensions

Meter Dimensions



Meter Dimensions

