



ALPHA METERING

PTY (LTD) • UTILITY MANAGEMENT

User Manual of Landis&Gyr Electricity Prepaid meter

Residential

E460 1ph DIN Rail PLC

Technical Specification



The E460 single phase DIN-Rail is part of the E460 family of smart prepayment meters and is an advanced single-phase, multi-function, keypad-based, smart prepayment meter in a DIN-Rail housing. The E460 solution incorporates powerful e-metering functionality combined with STS prepayment and uses open standard OFDM G3-PLC communications between the meter, the P160 customer interface unit and a PLC Data Concentrator.

The E460 solution is one of the world's first truly open standard smart STS prepayment meters, making use of OFDM G3-PLC, dlms/COSEM, IDIS and STS prepayment standards to ensure future proof open communications standards for the electricity utility for years to come.

Overview

The E460 single phase DIN-Rail split prepayment meter is based on Landis+Gyr's existing and already proven smart meter solutions and incorporates powerful smart metering functionality combined with STS prepayment.

The E460 solution is based on open and interoperable standards, using G3-PLC OFDM communications between the meter, P160 Customer Interface Unit and the Data Concentrator.

The E460 meter may be utilised in an off-line mode as a stand-alone split prepayment meter, or in an on-line mode as part of an end to end two way AMI smart metering solution.

Features

- Single-phase, 2 wire DIN-Rail smart prepayment PLC meter which works with a P160 PLC Customer Interface Unit
- Integrated OFDM G3-PLC transceiver for two way communications between the E460 meter, the P160 Customer Interface Unit and the DC450 Data Concentrator
- Data Concentrator communications via WAN to the Head-end System (HES)
- Open standards for interoperability
 - Open STS prepayment (IEC62055-41/51)
 - Interoperable IDIS specification
 - dlms/COSEM
 - Open International standard for PLC communications - OFDM G3-PLC
- Housing format suitable for mounting on a 35mm DIN rail or alternative hanging bracket and flush mounting facilities
- IP 54 degree of protection
- Bottom connect terminals for ease of retrofit and efficient wiring layouts in pole-top enclosures or street kiosks
- Long and short terminal cover options
- Zero power tamper sensing when meter is not powered
- Event trigger and fraud logs with date and time stamps in the on-line mode
- Voltage threshold settings with events logged when thresholds are exceeded
- Various configurable load switch disconnect options as well as remote disconnect and reconnect in the on-line mode
- Extensive e-metering load switch control functions including demand and fuse supervision and power-limit capabilities
- Four quadrant measurement with separate import and export registers
- Changeable metering modes by means of manufacturer specific STS tokens

- Modes supported: kWh transfer STS Prepayment, Smart Prepayment TOU with STS Currency token transfer TOU and Post-payment
- Emergency credit
- Real Time Clock – synchronised by the Data Concentrator in the on-line configuration mode
- Time of Use, with STS currency token transfer option in the prepayment mode
- LCD display on the P160 with 8 digits for register values, 6 digit index field, prepayment credit wedge, battery indicator for the P160, currency or kWh indicator, phase and energy direction, alarm and configurable arrow indicators and load switch status
- Various options on the P160 Customer Interface Unit for scrolling operating display list or standard display list that may be stepped through with a scroll key-press on the P160

Split Metering Functionality

The split metering solution consists of two parts, the E460 meter and the P160 customer interface unit.

Communication between the meter and the customer interface unit is by means of G3-PLC Power Line Carrier, using existing household wiring; no additional communication wires are required.

The P160 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. An easily replaceable battery is provided for communicating in the absence of AC mains power e.g. when the meter is out of credit.

The E460 meter contains all critical metering, token decryption, load control and smart meter functionality. It operates independently and is immune to any form of tampering on the Customer Interface Unit.

The E460 1ph DIN-Rail meter is typically installed in a pole-top enclosure or secure street kiosk and its small size enables a smaller street kiosk to be used. When used in conjunction with the DC450 G3-PLC Data Concentrator, the meter is able to operate in an on-line mode.

P160 Customer Interface Unit (CIU)

The P160 CIU is plugged into an existing mains outlet in the household. Under normal conditions when the load switch of the meter is closed and there is power in the house, the Customer Interface Unit operates directly from mains voltage. However in the event that the meter load switch opens (e.g. could be due to prepayment credit expiring), the

Customer Interface Unit, which is fitted with a battery, will enter a sleep mode to save battery energy. By pressing and holding the "Enter/Power key" on the keypad, the customer is able to power up the P160 Customer Interface Unit using the battery and enable a new prepayment credit token to be entered. If there is no power in the household and the customer interface unit is woken up using the battery, the display will flash on and off, showing the user the last known status of the meter, for example prepayment credit expired.

The customer or field technician can additionally view meter parameters by accessing specific register information via the P160 Customer Interface Unit keypad or by scrolling through the available pre-configured registers, by pressing the scroll up and down buttons on the P160 keypad.

Advanced Metering Infrastructure (AMI)

The E460 solution is capable of "upstream" PLC communication to a Data Concentrator typically installed at a street kiosk, low-voltage distribution transformer or mini sub-station and "downstream" PLC communications to the P160 Customer Interface Unit.

When the DC450 Data Concentrator and back-end (Head-end system) is in place, the E460 meter forms parts of an end-to-end Advanced Metering Infrastructure (AMI) system and powerful e-metering and prepayment capability is able to be supported.

When the E460 is used in conjunction with a Data Concentrator and head-end system and forms part of the AMI infrastructure, it supports extensive and powerful e-metering functionality, such as:

- two way communications
- real time clock synchronised by the system
- post-payment or prepayment modes
- standard kWh STS token transfer or smart prepayment with currency TOU STS prepayment token
- remote disconnect and reconnect
- Events and fraud notifications

Using supplier-specific 20-digit STS prepayment tokens which are unique to each meter, the E460 meter modes can be switched between post-payment and prepayment modes.

Powerful smart e-metering functions

The meter is able to be configured both locally via the IEC 62056-21 optical interface using Landis+Gyr's dotMAP meter configuration suite of software, and remotely via the Head-end System when in the on-line mode.

Real time clock (RTC) is adjustable locally via the optical interface using the Landis+Gyr dotMAP120

meter management tool or remotely synchronised by the Head-end System if the meter is used in conjunction with a Data Concentrator and system.

In the smart meter configuration, the meter supports a comprehensive set of Time of Use (TOU) configuration options including active season tables, weekly tables, daily tables and special days. This smart mode supports prepayment TOU with STS currency token transfer. Up to 6 Time of Use registers may also be configured.

The meter supports a wide range of configurable energy registers. Twelve total energy registers are available, with a further 24 energy registers which can be configured to store available values.

The meter further supports configurable demand registers with configurable integration periods.

Various fraud detection log trigger items may be selected for the fraud log, such as terminal cover sensing, strong DC magnetic field detected, measurement software changed, event log cleared and more.

A range of quality of supply features are also supported such as voltage supervision with configurable over and under voltage threshold limits and changeable parameters for long duration power failures and minimum power factor threshold. The E460 also has a comprehensive list of power quality event log trigger sources that can be selected as desired, for example under and over voltage, current without voltage and power factor threshold exceeded.

Features supporting the meter's load switch control include manual or automatic load switch disconnection and re-connection, remote or local (using dotMAP120 meter tool) meter load switch disconnection or re-connection, disconnect on configured threshold values being exceeded, disconnect when supervision monitor thresholds exceeded and if the disconnect event log has been inadvertently cleared.

Additional meter load switch Demand and Current Supervision features include configurable power threshold with settable over and under threshold durations limits.

Fuse supervision features include the ability to disconnect the meter's load switch at a pre-set amperage based on a specific control source monitored value with configurable minimum delays settings for over and under thresholds.

The P160 Customer Interface Unit display offers seven arrow icons which are individually configurable to indicate by selectable control sources. There are further options to display the

arrow icons as either steady state or blinking. In addition, a configurable operating display list that is able to cycle on the P160 display, or a standard display list that may be stepped through by pressing the scroll keys on the P160 keypad.

Meter Status and Diagnostic Indicators

The meter includes a LED status indicator which allows a utility technician to view the operational status of the meter without the need to gain access

to the consumer's premises. In addition, LED indicators are available to show the status of the meter's load switch and also PLC communications status.

Anti-tamper Features

The meter is mechanically sealed for life against tampering and features various tamper detection methods, including removal of the terminal cover whether the meter is powered or not.

E460 1ph DIN Rail PLC (MCA 1x0 x R xx) - Technical Specifications

General Overview	
Compatible network	Single phase, 2-wire
Enclosure format	Rail mount, with locking clip compatible with 35mm DIN standard rail or flush mounting using keyhole slot and bottom fixing screws. Long and short terminal covers supported
IEC Specific Data	
Rated voltage (U_n)	Wide-range: 110 to 240 Volts AC
Frequency	50Hz or 60Hz
Extended operating voltage range	80% to 120% U_n
Base current (I_b)	5 Amps
Maximum current (I_{max})	80 Amps
Short circuit current	30 x I_{max} (≤ 10 ms according to IEC 62053-21) 2.5kA r.m.s. (Utilisation Category UC2 according to IEC 62055-31)
Meter constant (LED flash rate)	1000 impulses / kWh 1000 impulses / kVAh ¹
Measurement Accuracy	Active energy, according to IEC62052-11/62053-21 Class 1

¹ In kVAh mode

Reactive energy, according to IEC62053-23
Class 2 for $I_b = 10A$, Class 3 for $I_b = 5A$

Measurement behaviour
Starting current $\leq 0.004 I_b$ for Class 1

General Data	
Operating Behaviour	
Power consumption in voltage circuit	
Active power at U_n (max)	<2W
Apparent power at U_n (max)	<12VA
Power consumption in current circuit	
Apparent power at I_b (max)	<7VA
Environmental Influences	
Area of application	Indoor meter (according to IEC62052-11)
Temperature range	
Operation meter	-10°C to +55°C
Storage	-40°C to +70°C
Relative humidity	
Maximum	$\leq 95\%$; Annual mean 75%
Degree of Protection (according to IEC60529)	
IP Rating	IP54
Product is for indoor use and must be installed in a suitable enclosure when used outdoors	
Electromagnetic Compatibility	
Electrostatic discharges (IEC61000-4-2)	
Air discharge	15 kV
Electromagnetic RF fields (IEC 61000-4-3)	
80 MHz to 2 GHz	10 V/m with load 30 V/m no load
Fast transient burst (IEC61000-4-4)	
Current / voltage under load (IEC 62053-21)	4 kV

Radio interference suppression (IEC / CISPR 22)
Complies with requirements for CISPR 22 and CENELEC EN 50065-1

Insulation Strength

Insulation System Classification
(According to IEC 62052-11) Protective Class II

Insulation Level
4 kV rms @ 50Hz for 1 minute

Overvoltage withstand

Overvoltage withstand
440 Vac for 48 hours, 600 VDC for 1 minute

Surge Immunity

Voltage impulse withstand (Differential)
Meets the requirements of IEC 62052-11

Current impulse withstand

According to: IEC 62052-11, SANS 61643-1
With external arrestor

Withstand rating 30 kA, 8/20µs

Without external arrestor

Withstand rating 10 kA, 8/20µs

Calendar Clock

Normal operation
Accuracy (at +23°C) ± 0.2 s/day

Reserve running
Accuracy (at +23°C) <1 s/day
(EN 62054-21 requirement for time switches: 1.0s)

Operational Reserve
With super-capacitor minimum 36 hours²
(RTC Synchronised by Data Concentrator)

Outputs

Optical Test output (Active or reactive)
Type Visible Red LED
Meter constant³ 1000 pulses/kWh
1000 pulses/kVAh

Meter Faceplate Indications

Meter Status Indication
Type Visible Yellow LED

Meter Load Switch Indication

² IEC requirements for operational reserve
³ Configurable for kWh

Weights & Dimensions

Dimensions
135.5mm(H) x 50.3mm(W) x 110mm(D) (Short cover)
165.5mm(H) x 50.3mm(W) x 110mm(D) (Long cover)
Please also refer to dimensional drawings

Type Visible Red LED

PLC Status Indication
Type Visible Green LED

Phase Connections

Format
Type Bottom connect (Line, Neutral, Load)

Terminal Details
Material Mild steel, yellow passivated
Type Single (M8) moving-cage terminal
Diameter 8.5 mm
Maximum conductor cross-section⁴ 25mm²
Type of screw slotted (flat screw driver)

Communication Interfaces

Optical Communications Port
According to IEC 62056-21

Eskom Interrogation Port (optional fitment)
According to Eskom DSP34-1635 specification⁵

PLC Interface
Type OFDM G3-PLC
Narrowband Orthogonal Frequency Division
Multiplexing (OFDM) for G3 networks in
accordance with recommendation ITU-T G.9903
and CENELEC-A band plan
Refer - IEC61334-4-41, ISO/IEC13239/ EN 50065
Range Typically >200m

Load Switch

Contact Data
According to IEC 62055-31 for Utilisation Category UC2

Meter Enclosure Material

Material (Housing)
Type: Polycarbonate, flame-retardant
Resistance to spread of fire
UL94-V0 rated @1.5mm. No toxic gases emitted:
"Green Material"

Material (Terminal block)
Type: Polycarbonate, flame-retardant, glass-filled

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

⁴ Aluminum wires must be used with ferrules
⁵ Eskom DSP 34-1635 Type B interface fitted onto the optical interface to provide Eskom port requirement

Weight

Including packaging (excl. MOV) approx.450 grams

Including packaging (Incl. MOV) approx.455 grams

Sealing

Type
Meter enclosure Factory sealed for life
Terminal Cover Utility sealing wires (1 point)
Long and short cover

Specifications Compliance & Approvals⁶

SANS 1524-1, Eskom DSP34-1635, IEC62055-31,
IEC 62053-23, IEC62055-41 and IEC62055-51,
IDIS

P160 PLC Customer Interface Unit

General Data

Supply Voltage

110-240 VAC wide ranging power supply

Supply Frequency

50Hz or 60Hz

Power consumption (Burden)

<1.5 W / <12 VA @ 230VAC, 50Hz

Maximum Rated Current

<120mA @ 230VAC, 50Hz

Protective Class

Double insulated – Protective Class 2

Supply Connection

Mains supply by means of integrated power cord. Variants are available with various international power plugs

Battery

1 x 9 Volt (6LR61 type) battery

Communications Circuitry

Type

Narrowband OFDM G3-PLC Power Line Carrier

Protocol

Device Language Message Specification (DLMS)

Specification compliance

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

Operating Environment

Temperature Range

Operating -10°C to +55°C
Storage -40°C to +70°C

Relative Humidity (IEC 62052-11)

Maximum ≤ 95%; Annual mean <75%

Enclosure

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°C glow-wire (IEC 60695-2-1)

Resistance to spread of fire

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

Dimensions

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

Weight

Including packaging⁷ approximately 350 g

Sealing & Access Control

Battery Compartment

Type Sliding compartment for battery replacement

Customer Interface Unit Enclosure

Factory sealed- no user serviceable parts

Man-Machine Interface

Type

Pictographic/Numeric LCD display, keypad, multi-colour rate of consumption indicator and alert LED's and audible feedback

Liquid Crystal Display (LCD)

Size 9cm² (50mm (W) x 26mm (H))
8 digits in value field, 6 digits in the index field
Digit size: 8mm (H) x 4mm (W)

Compliance / Certification⁸

Designed to conform to SANS / IEC60950

Keypad

16-key, including 12-key standard layout including "Information" and "Backspace" keys as well as separate additional smart user keys

Buzzer

Audible feedback on key press, token accept and reject melodies and alarms

Rate of Consumption Indicator (Rate LED)

Multi-colour rate LED (colour indicates current credit level). Not for accuracy verification

Alarm Indicator

Multi-colour LED indications for ease of use and additional audible warning of critically low credit status or other operational warnings

⁷ Also includes battery and power cord and plug

⁸ Certification pending

Product Dimensions



Figure 1: (Above) Dimensions of the E460 1ph DIN Rail G3-PLC meter

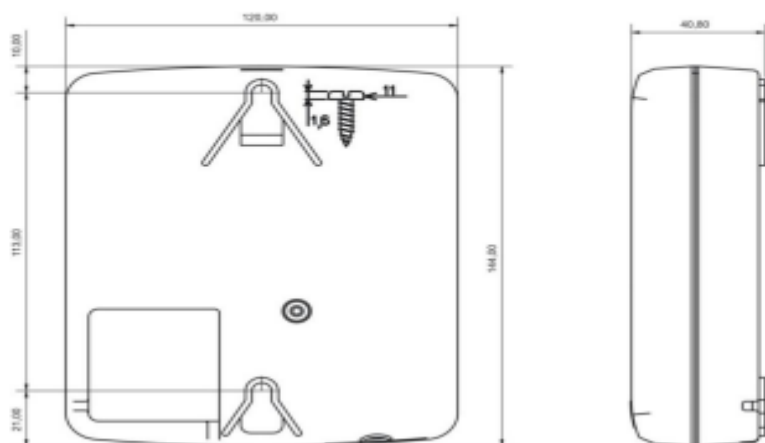


Figure 2 (Above) Dimensions of the P160 PLC Customer Interface Unit