

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 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 1ph DIN-Rail meter solution is available in two variants, the E460P and the E460S. The E460P offers only prepayment mode functionality while the E460S offers additional smart functionality such as remote disconnection and reconnection and switching to post-payment mode.

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)
 - 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
- Remote disconnect and reconnect supported by the E460S variant in the on-line mode
- Demand supervision and power-limit capabilities
- Four quadrant measurement with separate import and export registers
- Changeable metering modes by means of dlms special command set
- 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, arrow indicators and load switch status indicator
- 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 CIU

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 supported by the E460S variant
- standard kWh STS token transfer or smart prepayment with currency TOU STS prepayment token
- remote disconnect and reconnect supported by the E460S variant
- Event and fraud notifications

Using a special set of dlms commands, the E460S 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 remotely synchronised by the Head-end System if the meter is used in conjunction with a Data Concentrator and system.

When used in an on-line 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 meter also supports prepayment TOU with STS currency token transfer. Up to 4 Time of Use rates are supported.

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 period.

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

A range of power quality 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 E460S meter’s load switch control include remote disconnection and re-connection and local (using dotMAP110 meter service tool). The E460 meter also supports Demand Supervision functionality that disconnects the load switch in the event that the pre-set limiter threshold is exceeded.

The P160 Customer Interface Unit display offers seven arrow icons that are typically configured to show the current rate in use, the status of the meter terminal cover, the detection of a strong magnetic field and in the case of the E460S, the validity of the meter RTC, which is synchronised by the DC.

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 options, including sensing the removal of the terminal cover with or without mains power present.

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

$30 \times I_{max}$ (≤ 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 / kVAh¹

Measurement Accuracy

Active energy, according to IEC62052-11/62053-21
Class 1

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 $-10^{\circ}C$ to $+55^{\circ}C$
Storage $-40^{\circ}C$ to $+70^{\circ}C$

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

¹ In kVAh mode

With external arrester	
Withstand rating	30 kA, 8/20 μ s
Without external arrester	
Withstand rating	10 kA, 8/20 μ s

Calendar Clock

Normal operation	
Accuracy (at +23°C)	\pm 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 hours ²
<i>(RTC Synchronised by Data Concentrator)</i>	

Outputs

Optical Test output (Active or reactive)	
Type	Visible Red LED
Meter constant ³	1000 pulses/kWh
	1000 pulses/kVAh

Meter Faceplate Indications

Meter Status Indication	
Type	Visible Yellow LED

Meter Load Switch Indication	
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-section ⁴	25mm ²
Type of screw	slotted (flat screw driver)

Communication Interfaces

Optical Communications Port	
	According to IEC 62056-21

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)

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

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 & Approvals

IEC 62053-21, IEC 62053-23, IEC62055-41(STS) and IEC62055-51 (STS)

² IEC requirements for operational reserve

³ Configurable for kVarh

⁴ Aluminum wires must be used with ferrules

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 packaging⁵ 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 / Certification

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

⁵ Also includes battery and power cord and plug

E460 Type Designation

M	C	A	1	10	C	R	G3	D1.2	00	S	S1
Network Type											
C	1 Phase, 2 wire (C connected)										
Product Family											
A	E460 smart prepayment, Keypad STS										
Connection Type											
1	Direct Connect, 1 phase										
Accuracy Class											
10	IEC Class 1										
20	IEC Class 2										
Measured Quantities											
A	Active Energy only										
C	Combination – Active and Reactive Energy										
Meter Housing Construction											
R	1ph DIN-Rail, bottom connect										
System Communications											
G3	Narrowband, G3 Power Line Carrier (PLC)										
Disconnecter Options											
D1.2	1 pole UC2 rating disconnecter										
D1.3	1 pole UC3 rating disconnecter										
Inputs & Outputs											
00	0 Inputs, 0 outputs										
Meter Mode											
P	Prepayment kWh token Mode ONLY										
S	Smart Prepayment Mode (configurable)										
Series Design											
S1	1 –First generation hardware platform										

Product Dimensions

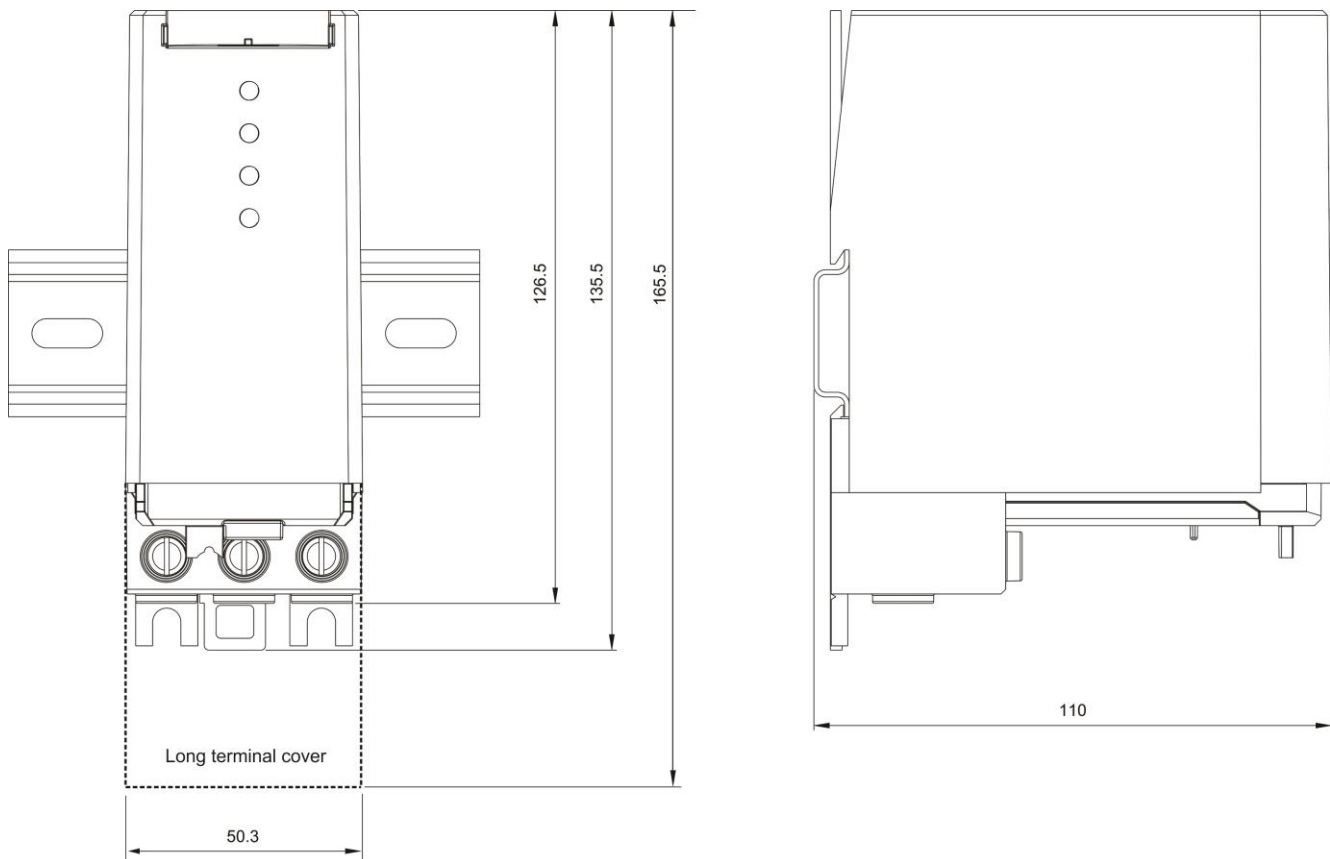


Figure 1: (Above) Dimensions of the E460 1ph DIN Rail G3-PLC meter

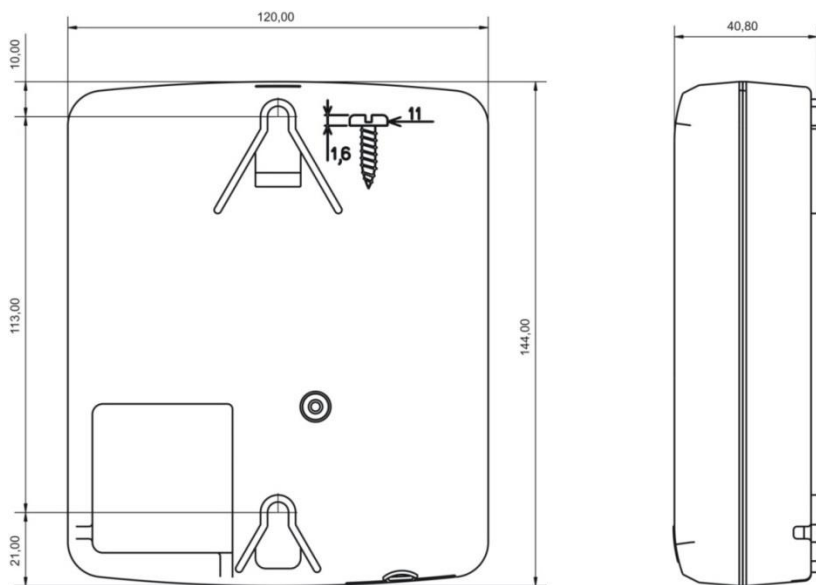


Figure 2 (Above) Dimensions of the P160 PLC Customer Interface Unit

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