

Mechanics

Dimensions	96 x 96 mm (LxW)
Depth (behind panel)	53 mm, 77.5 mm with option module(s)
Case protrusion (front of panel)	7 mm maximum
Sealing	IP52 (front panel), IP30 (case) (minimum)
Mounting	DIN 96 panel mounting

Approval, Certification, and Standards Compliance

RoHS compliant. (Although this class of product is presently excluded from the RoHS regulations, the unit has been designed and manufactured in compliance with the RoHS regulations.)

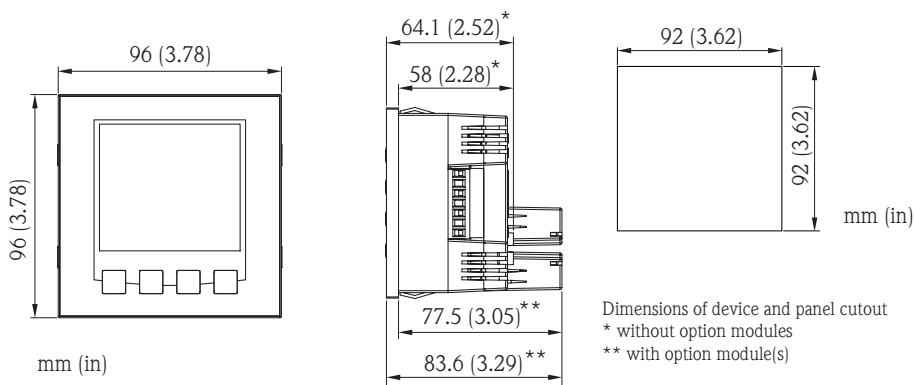
EMC Emissions	BS EN 61326, Class A (Industrial)
EMC Immunity	BS EN 61326, Class A (Industrial)
Safety	BS EN 61010-1:2001

Documentation

- Technical information TI01025K/09
- Operating instructions BA01040K/09

Documentation is available for download at:

www.endress.com/download



Dimensions of device and panel cutout
* without option modules
** with option module(s)

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Brief Operating Instructions

EngyVolt RV15

Multifunctional electrical energy meters

Introduction

The multifunction electrical energy meter is designed to record, display and transmit electrical measured values in low-voltage systems with a maximum nominal voltage of 500 V L-L (289 V L/N), current connected via low-voltage current converter x/5 A at a nominal frequency of 45 to 66 Hz. It is suitable for use in single-phase power systems, and in three-phase power systems with three or four wires.

Detailed information can be found in the corresponding Operating Instructions (BA01040K/09), which are available for download on www.endress.com/download.

Measurement

In measurement mode, the buttons control the displayed measurement as follows:

	Is used to display voltage and frequency. This is the "Back" function in the configuration mode.
	Is used to display the currents. This is the "Up" function in the configuration mode.
	Is used to display the power values and the power factor. This is the "Down" function in the configuration mode.
	Is used to display the energy values. This is the "Enter" function in the configuration mode.

Display shows the units of measurements in use for each range. Energy units can be set via set-up screens; other units are set automatically. A Demand Reset resets maximum demand readings to zero.

Setting up

To enter set-up mode, firmly press the and buttons simultaneously and hold for 5 seconds, until the password screen appears. Setting up is password-protected so you must enter the correct password (default '0000') before proceeding. If an incorrect password is entered, the display reverts to measurement mode.

To exit setting-up mode, press repeatedly until the measurement screen is restored or hold and buttons simultaneously for 5 seconds.

Setup Menu Structure

Change password

nnnn – 4-digit number, default '0000'.

Supply system

Single phase, 3-phase 3-wire or 4-wire.

CT

Set the value of the CT primary in use
nnnn – 4-digit number, 0001 to 9999.

dIT - Demand Integration Time

Selects demand time in minutes: Off, 5, 8, 10, 15, 20, 30 and 60 minutes.

RSET

Resets cumulative Energy and/or Demand measurements to zero.

COMS - Communication parameters for RS485 interface:

Modbus protocol,

Baud rate 2400/4800/9600/19200/38400

Parity none/odd/even

Stop bits 1 (1 or 2 if parity is None)

Network address nnn – 3-digit number, 1 to 247

Order: Norm/Rev – Indicates Modbus word order.

Johnson Controls (JC) N2 protocol

Network address nnn – 3-digit number, 1 to 255.

Rly - Relay pulse output (optional)

OP1 kWh/kVAh (Active/reactive – Import only)

Output module 1

OP2 kWh/kVAh (Active/reactive – Import only)

Output module 1

Rate 0.1/1/10/100/1k/10k kWh or kvarh per pulse

Pulse width 200/100/60 ms.

NRGy - Energy

kilo/Mega

Test

Display on: All elements on to check display

Display toggle: Each element is turned on and off

Phase sequence (V123 I123).

SOFT

Displays firmware version and build numbers.

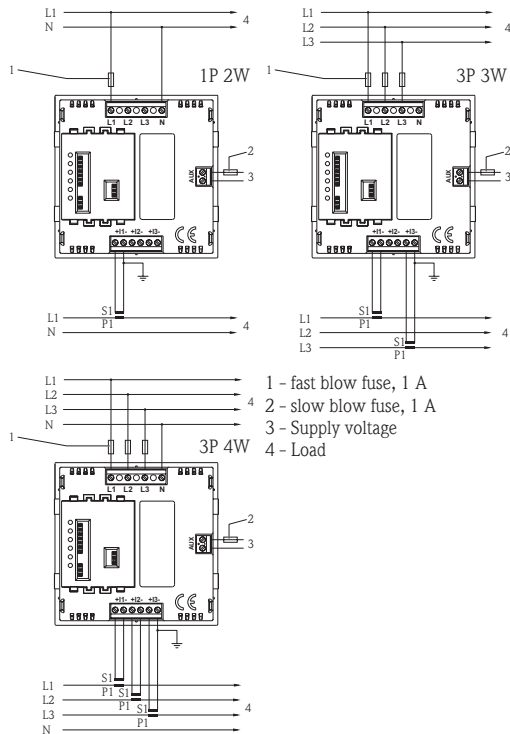
Operating the menu

Use the 'Up' and 'Down' buttons to select a menu item. Use the 'Enter' button to open the menu item. When the text in the display flashes, the entry can be changed using the 'Up' and 'Down' buttons. If the entry does not flash, there may be a further menu level which can be opened with the 'Enter' button, e.g. Coms - Baud rate, before setting is possible.

Use the 'Enter' button to confirm the selection. 'SET' is displayed and after pressing the 'Back' button the 'Up' or 'Down' button can be used to select another menu item.

Number entry procedure

Digits are set individually, from left to right. When the digit to be set flashes it can be changed using the 'Up' and 'Down' buttons. Confirm the setting with the 'Enter' button. The next digit flashes. After setting the last digit, press the 'Back' button to exit the number setting and return to the previous menu item. 'SET' is displayed.



Dimensions

The unit may be mounted in a panel of any thickness up to a maximum of 6mm (0.25in). Leave enough space behind the instrument to allow for bends in the connection cables. As the front of panel enclosure conforms to IP52, it is protected from dripping water. The unit is intended for use in a reasonably stable ambient temperature within the range -10 to +55°C. Do not mount the unit where there is excessive vibration or in excessive direct sunlight.

Safety

The unit is designed in accordance with BS EN 61010-1:2001 (IEC 61010-1:2001) – Permanently connected use, Normal condition. Installation category III, pollution degree 2, basic insulation for rated voltage. Measurement Category III.

EMC Installation Requirements

Whilst this unit complies with all relevant EU EMC (electro-magnetic compatibility) regulations, any additional precautions necessary to provide proper operation of this and adjacent equipment will be installation dependent and so the following can only be general guidance:

- Avoid routing wiring to this unit alongside cables and products that are, or could be, a source of interference.
- The auxiliary supply to the unit should not be subject to excessive interference. In some cases, a supply line filter may be required.
- To protect the product against incorrect operation or permanent damage, surge transients must be controlled. It is good EMC practice to suppress transients and surges at the source. The unit has been designed to automatically recover from typical transients; however in extreme circumstances it may be necessary to temporarily disconnect the auxiliary supply for a period of greater than 5 seconds to restore correct operation.

Safety instructions



Warning: Risk of Electric Shock

- During normal operation, voltages hazardous to life may be present at some of the terminals of this unit. Installation and servicing should be performed only by qualified, properly trained personnel abiding by local regulations. Ensure all supplies are de-energised before attempting connection or other procedures.
- Terminals should not be user accessible after installation and external installation provisions must be sufficient to prevent hazards under fault conditions.
- This unit is not intended to function as part of a system providing the sole means of fault protection – good engineering practice dictates that any critical function be protected by at least two independent and diverse means.
- The unit does not have internal fuses therefore external fuses must be used for protection and safety under fault conditions.
- Never open-circuit the secondary winding of an energised current transformer.
- This product should only be operated with the CT secondary connections earthed.
- If this equipment is used in a manner not specified by the manufacturer, protection provided by the equipment may be impaired.
- Auxiliary circuits (communication & relay outputs) are separated from metering inputs and 110–400V auxiliary circuits by at least basic insulation. Such auxiliary circuit terminals are only suitable for connection to equipment which has no user accessible live parts. The insulation for such auxiliary circuits must be rated for the highest voltage connected to the instrument and suitable for single fault condition. The connection at the remote end of such auxiliary circuits should not be accessible in normal use. Depending on application, equipment connected to auxiliary circuits may vary widely. The choice of connected equipment or combination of equipment should not diminish the level of user protection specified.

- Screened communication leads are recommended and may be required. These and other connecting leads may require the fitting of RF suppression components, such as ferrite absorbers, line filters etc., if RF fields cause problems.
- It is good practice to install sensitive electronic instruments that are performing critical functions in EMC enclosures that protect against electrical interference causing a disturbance in function.

Wiring

Input connections are made to screw clamp terminals. Choice of cable should meet local regulations for the operating voltage and current.

The current inputs of these products are designed for connection into systems via current transformers only.

All negative current inputs are commoned inside the unit and grounding should be at one point only. To minimise measurement errors, the CTs should be grounded as shown in the wiring diagram.

CT secondaries must be grounded in accordance with local regulations. It is desirable to make provision for shorting links to be made across CTs to permit easy replacement of a unit should this ever be necessary.

Additional considerations for three wire systems

The neutral terminal (terminal N) is indirectly connected to the voltage input terminals (terminals L1, L2, L3). When connected to a three wire system the neutral terminal will adopt a potential somewhere between the remaining lines.

If external wiring is connected to the neutral terminal it must be connected to either the neutral line or earth (ground) to avoid the possibility of electric shock from the neutral terminal.

Fusing

This unit must be fitted with external fuses in voltage and auxiliary supply lines. Voltage input lines must be fused with a quick blow fuse 1A maximum. Auxiliary supply lines must be fused with a slow blow fuse rated 1A maximum. Choose fuses of a type and with a breaking capacity appropriate to the supply and in accordance with local regulations.

A suitable switch or circuit breaker should be included in the installation. It should be positioned so as to be easy to operate, in close proximity to the equipment, and clearly identified as the disconnecting device.

Earth/Ground Connections

For safety reasons, current transformer secondary connections should be grounded in accordance with local regulations. Under no circumstances should this product be operated without this earth connection.

Specification

Measurement Inputs

Imported energies are recorded.

Three current inputs (six physical terminals) with 2.5mm² stranded wire capacity for connection of external CTs. Voltage inputs through 4-way fixed connector with 2.5mm² stranded wire capacity.

3-Phase 3- and 4-wire and Single-phase 2-wire unbalanced. Line frequency measured from L1 voltage or L3 voltage.

Direct measurement of 173 to 500 V AC L-L (100 to 289 VAC L-N).

Range of Use

Values of measured quantities, components of measured quantities, and quantities which affect measurement errors to some degree, for which the product gives meaningful readings:

Voltage	5 to 120% of Range Maximum (below 5% of range maximum voltage, current indication may only be approximate)
Current	1 to 120% of nominal
Active power	1 to 144% of nominal, 3600 MW maximum
Apparent power	1 to 144% of nominal, 3600 MVA maximum

Power is only registered when voltage and current are within their respective range of use.

Accuracy

Voltage	0.5% of range maximum
Current	0.5% of nominal (4% for I2 in 3-wire mode)
Neutral current (calculated)	4% of range maximum
Frequency	0.11 Hz
Power factor	1% of unity (0.01)
Active power (W)	±1% of range maximum
Reactive power (var)	±1% of range maximum
Apparent power (VA)	±1% of range maximum
Active energy (Wh)	Class 1 IEC 62053-21 section 4.6
Reactive energy (varh)	±1% of range maximum
THD	1% up to 31st harmonic
Response time to step input	1s, typical, to >99% of final value.

Auxiliary Supply

Operating range

110 to 400V AC nominal ±10% (99–440V AC absolute limits)

120 to 350V DC nominal ±20% (96–420V DC absolute limits)

Frequency Range	45 to 66 Hz
Burden	5VA nominal

Option Modules

Pulsed output relays	1 per module* (maximum 2 modules fitted per meter)
Contact rating	50mA max at 250V AC for general switching applications
Type	Solid state relay
RS485 output module	1 channel per module (maximum 1 module fitted per meter)
Type	2-wire half duplex
Baud rate	2400, 4800, 9600, 19200, 38400

Reference Conditions of Influence Quantities

Influence Quantities are variables that affect measurement errors to a minor degree. Accuracy is verified under nominal value (within the specified tolerance) of these conditions.

Ambient temperature	23 °C ±1 °C (73.4 °F ±1.8 °F)
Input waveform	50 or 60 Hz ±2%
Input waveform	Sinusoidal (distortion factor <0.005)
Auxiliary supply voltage	Nominal ±1%
Auxiliary supply frequency	Nominal ±1%
Auxiliary supply waveform (if AC)	Sinusoidal (distortion factor <0.05)
Magnetic field of external origin	Terrestrial flux

Environment

Operating temperature	-10 to 55 °C (14 to 131 °F)*
Storage temperature	-20 to 70 °C (-4 to 158 °F)*
Relative humidity	0 to 90%, non-condensing
Altitude	Up to 2000m
Warm up time	1 minute
Vibration	10 to 50 Hz, IEC 60068-2-6, 2g
Shock	30g in 3 planes
Dielectric voltage withstand test	2.2kV rms 50Hz for 1 minute between Measuring Voltage Inputs to RS485 and Relay, and between Auxiliary to RS485 and Relay.

*Maximum operating and storage temperatures are in the context of typical daily and seasonal variation.