



## Installation and Operating Instructions Single Load

### Digital Energy Meter for a Single Load in an Electrical System.

#### Warnings Caution: Risk of Electric Shock

- During normal operation, voltages hazardous to life may be present at some of the terminals of this unit.
- At voltages below that specified in the Range of Use the meter may shut down. However, voltages hazardous to life may still 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 energized current transformer.
- If this equipment is used in a manner not specified by the manufacturer, protection provided by the equipment may be impaired.

#### 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 (electromagnetic 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 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 supply for a period of greater than 10 seconds to restore correct operation.
- 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

#### Introduction

The SL1-01 solution enables single load measurement with plug and play RJ12 CT's. This manual will provide all the necessary instructions to install and operate the instrument.

#### Single Load Configuration

The Integra SL1 is a digital metering system which provides measurement, isolation and conversion of all main electrical parameters from a three-phase load, in a single meter. It can be used in single (1ph 2wire) and three-phase four-wire (3p 4 Wire) unbalanced electrical systems.

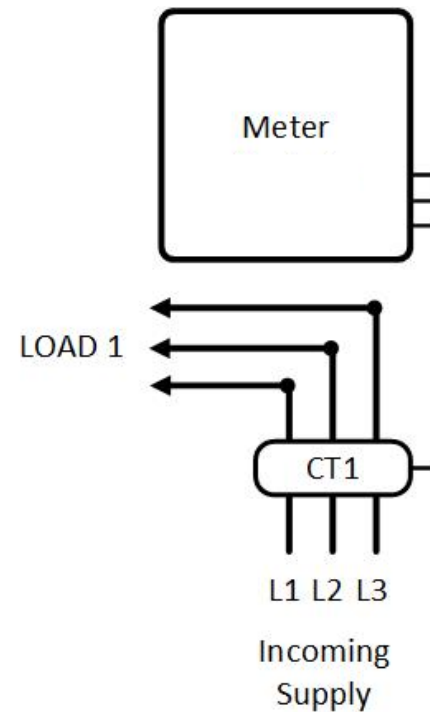


Fig.1

#### Number Entry Procedure

When setting up the unit, some screens require the entry of a number. In particular, to enter the setting up section a password must be entered. Digits are set individually, from left to right. The procedure is as follows:

1. The current digit to be set flashes and is set using the and keys.
2. Press to confirm each digit setting. The word SET will be displayed once the last digit has been set.
3. After setting the last digit, press to exit the number setting routine.

#### Setup

- Press and hold the two outermost buttons and simultaneously for five seconds until the password screen is displayed.
- Press four times to enter the default password of "0000".
- The system setup screen will be displayed.
- Use the and buttons to navigate up and down the first level menu until the desired menu is reached. Selection does not roll over from bottom to top of list or vice versa.
- Press the button to select the desired parameter and enter the second level menu structure.
- If an item flashes then it can be adjusted by the and keys. If not, there may be a further layer, e.g. Comms - Baud rate, before adjustment is possible. Press to select the lower layer.
- Having selected an option from the current menu layer, press to confirm your selection. The SET indicator will appear.
- Next, press to return to the previous menu. The word SET will disappear and one can then use the and keys for further menu selection.
- On completion of setting-up, press repeatedly until the measurement screen is restored.

#### Menu Option Selection

1. Press and hold the two outermost buttons and simultaneously for five seconds until the password screen is displayed.
2. After entering the correct password, use and buttons to navigate up and down the first level until the desired parameter is reached. Selection does not roll over from bottom to top of list or vice versa.
3. Press the button to select the desired parameter and enter the second level menu structure.
4. If an item flashes then it can be adjusted by the and keys. If not, there may be a further layer, e.g. Comms - Baud rate, before adjustment is possible. Press to select the lower layer.
5. Having selected an option from the current menu layer, press to confirm your selection. The SET indicator will appear.
6. Once all the necessary selections have been made and the required settings entered, press to return to the first level menu structure. The word SET will go off and one can then use the and keys for further menu selection
7. On completion of all setting-up, press repeatedly until the measurement screen is restored.

#### Setup Menu Structure

##### Change password

nnnn - 4-digit number – default '0000'

##### Label

Choose the label used on the display. Available options: Label 1 (System) or Label 2 (Load 1)

#### Cable Entry

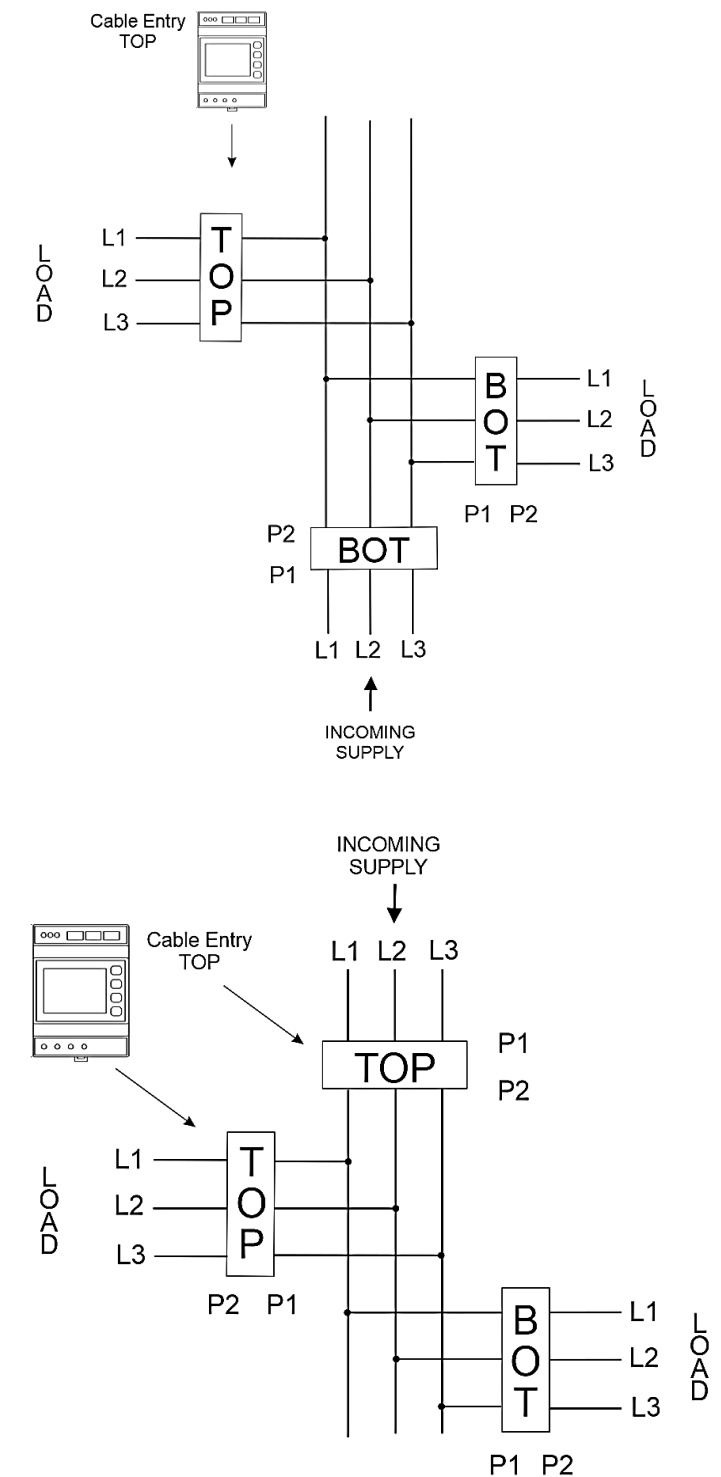
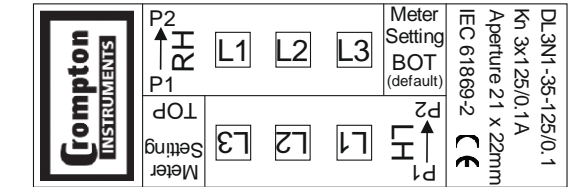
The meter has two cable entry options relating to the Position of the incomer, relative to the distribution board.

**Bot** for bottom entry - default

**Top** for top entry

Select either BOT or TOP on each meter according to the orientation of the line phases – see diagram example. Selecting BOT or TOP will automatically switch L1 to L3 (TOP) or L3 to L1 (BOT) in line with RJ CT label shown below.

#### Current Transformer Label



## CT Ratio

The primary CT ratio can be set within the allowable range of 1 to 9999A.

**CT1** *nnnn* - 4-digit number

**Reset** Resets cumulative energy measurements to zero

**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)

**RS485 network address** *nnn* – 3-digit number 1 to 247

**Order** Norm/Rev indicates if the Modbus™ word order is normal or reversed.

**Energy** Watts (x1) or KiloWatts (Kilo).

**There is a selectable 1% Power Limit which, when invoked, prevents energy accumulation at powers below 1% of range maximum. This can prevent spurious kWh readings at low loads.**

## Test

**Display on** all elements on to check display

**Display toggle** Each element is turned on and off

**Phase sequence**

**SOFT** Displays firmware version numbers

## Measurement

The Single Load buttons operate as follows:

	This button has no function during measurement mode. In setup mode, this acts as the 'back' button.
	This button has no function during measurement mode. In setup mode, this acts as the 'up' button.
	This button has no function during measurement mode. In setup mode, this acts as the 'down' button.
	In measurement mode, this button displays the System parameters V, I, kW, kWh, Hz, PF. In setup Mode, this acts as the 'enter' and 'save' button.

## Specification

### Measurement Inputs

Imported energies are recorded.

Three current inputs (one physical terminal) with RJ12 connection for use with the supplied external CT.

Voltage inputs and outputs through 4-way connectors with 2.5mm<sup>2</sup> stranded wire capacity. 3-Phase 4-wire unbalanced. Line frequency measured from L1 voltage or L3 voltage.

Direct measurement of 173 to 400V AC L-L (100 to 230Vac 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 31 ... 120% of Range Maximum

Current 1 ... 120% of nominal

Active power 1 ... 144% of nominal

Apparent power 1 ... 144% of nominal

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

Primary current can be set to 1 – 9999 A.

## Accuracy

Voltage (V)	0.5% of range maximum
Current (A)	0.5% of range maximum
Neutral current calculated (A)	4% of range maximum
Frequency (Hz)	0.2%
Power factor (PF)	1% of unity
Active power (W)	± 1% of range maximum
Reactive power (VAr)	± 1% of range maximum
Apparent power (VA)	± 1% of range maximum
Active energy (kWh)	Class 1 (IEC 62053-21) section 4.6 <sup>1</sup>
Reactive energy (kVArh)	Class 2 IEC 62053-23 <sup>2</sup>
THD	1% up to 31 <sup>st</sup> harmonic
Response time to step input	1s typical to >99% of final value

<sup>1</sup>**There is a selectable 1% Power Limit which, when invoked, prevents energy accumulation at powers below 1% of range maximum.**

<sup>2</sup>**Error in energy readings is expressed as a percentage of the energy count that would result from applying Range Maximum voltage and nominal current for the same measurement period.**

### RS485 output

Type	2-wire half duplex
Baud rates	2400, 4800, 9600, 19200, 38400

\*Ensure any external circuits connected to RS-485 output modules are provided with double/reinforced insulation.

### 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
Input waveform	50 or 60Hz ±2%
Input waveform	Sinusoidal (distortion factor <0.005)
Magnetic field of external origin	Terrestrial flux

### Environment

Operating temperature	-10°C to +55°C*
Storage temperature	-20°C to +70°C*
*Maximum operating and storage temperatures are in the context of typical daily and seasonal variation.	
Relative humidity	0 to 90%, non-condensing
Altitude	Up to 2000m
Warm up time	1 minute
Vibration	10Hz to 50Hz, 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.

Front Face Only

## Mechanics

Dimensions	72 × 90 mm (W×H) to DIN 43880
Depth	62 mm maximum
Sealing	IP52 (front panel), IP30 (case) (minimum)
Mounting	DIN Rail (DIN 43880)

### Approval, Certification, and Standards Compliance

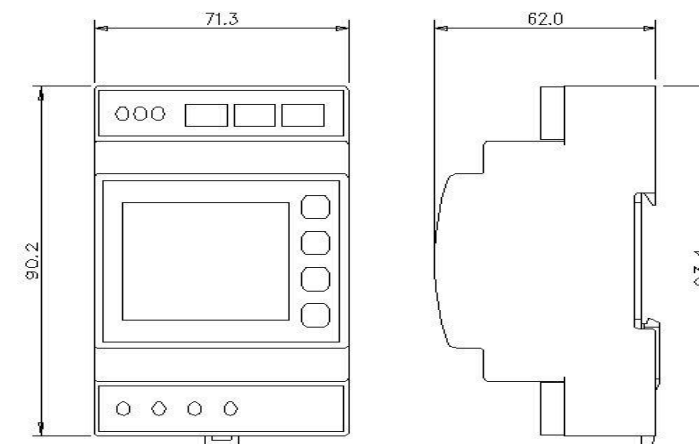
EMC, Emissions	BS EN 61326, Class A (Industrial)
EMC, Immunity	BS EN 61326, Class A (Industrial)
Safety	BS EN 61010-1:2001

### Specification Input

Nominal input voltage	100 to 230V AC L-N
Max. continuous input overload voltage	120% of nominal
Max. short duration input voltage	2 x range maximum (1 second application repeated 5 times at 5 minute intervals)
Nominal input voltage burden	5VA nominal L1-N, < 0.2VA all other phases
Nominal input current	100mA, 0.1VA
Max. short duration input current	10 x nominal (1 second application repeated 5 times at 5 minute intervals)
Frequency	45 to 66Hz

### Case Dimensions:

Width 71.3 mm, Depth 57.5 mm, Length 90.5 mm  
**Length including fixing tag 93.5 mm**



### Installation and Maintenance

In normal use, little maintenance is needed. As appropriate for service conditions, isolate from electrical power, inspect the unit, and remove any dust or other foreign material present. Periodically check all connections for freedom from corrosion and screw tightness, particularly if vibration is present.

The front of the case should be wiped with a dry cloth only. Use minimal pressure, especially over the viewing window area. If necessary wipe the rear case with a dry cloth. If a cleaning agent is necessary, isopropyl alcohol is the only recommended agent and should be used sparingly. Water should not be used. If the rear case exterior or terminals should be contaminated accidentally with water, the unit must be thoroughly dried before further service. Should it be suspected that water might have entered the unit, factory inspection and refurbishment is recommended.

### Wiring

Connections are made via two-part connectors with screw clamp terminals and two RJ12 CT connections. Choice of cable should meet local regulations for the operating voltage. **The current inputs of this product are designed for connection into CTs supplied with the product only.**

Connector plugs are suitable for copper wires only and will accept one stranded 0.5 – 2.5mm<sup>2</sup> (30 - 12AWG) stranded or solid core cables. This instrument can be panel mounted using an adaptor plate. Terminals must be enclosed within the panel. For mains terminals use wire rated at 600V, 60°C minimum temperature. Terminal screws are fully tightened for shipment and must be undone before wire insertion. Terminal screws should be tightened to 0.5 Nm (4.4 lbf in) only.

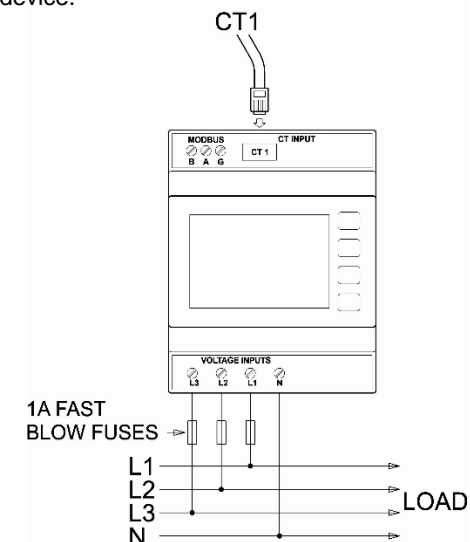
### Warning:

**It is essential that the primary current is isolated BEFORE connecting or disconnecting the secondary current connections**

### Fusing

This unit must be installed with external fuses in the voltage supply lines of type fast blow 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 conforming to the relevant parts of IEC 60947-1 and IEC 60947-3 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.



### Explanation of Symbols

	Refer to manual
	Danger of electric shock
	Do not discard



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