Ausgrid

ES3

PART B: Metering Equipment Technical Description for Type 5 & Type 6 Metering Installations

Jul 2017

Scope

This publication provides additional technical information to assist with connection to Ausgrid's network, and should be read in conjunction with Ausgrid's ES3 Part A publication.

Warning

It is the responsibility of the user of this document to ensure that only the current version is being used.

Ausgrid may amend this document at any time.

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Document and Amendment History

Issue No.	Date	Approved by	Summary of Changes
1	June 2009	M – Practice & Procedures – DO&R	This document supersedes the previous version of ES3 and CIAs 1321, 1324, 1330
2	May 2014		Replaced EEM with EEL, EDX/EDY/EDZ with EET, added ROM relay (New), added AMZ to AMX section, Removed Iskra ME372 and MT372 sections. Removed references to P1 meter. Expanded description of L&G's EM1210 to include the AMJ. Added AMS & AMT 'Basic' meters.
3	February 2015	Manager – Network & Customer Technology	Introduced the LGC meter as an E3 meter. This meter was previously used as part of the SGSC trial and remaining stock is being introduced as Business-as-Usual meters Update of CT section with notes on application. Editorial updates
4	May 2016	Network & Customer Technology Manager	Correspondence reference transferred to Asset Management Introduction of ECP as an E3c meter Editorial updates
5	September 2016	Network & Customer Technology Manager	Introduction of ECA as an E1c meter and ECJ as an E2c meter Editorial updates
6	October 2016	Network & Customer Technology Manager	Introduction of HLA as B1 and HLE as B3 meter Editorial updates
7	November 2016	Network & Customer Technology Manager	Modify ECJ instruction for operation of boost for load control relay test and sealing of boost button
8	July 2017	Manager Innovation and Productivity	Introduce TRT (smart time switch) that conforms with ES7

CONTENTS

1 Summary of Available Equipment

1.1 Meters

Prefix	Program	19	60	21	61	20	62	63	23	64	65	66	67	25	26	27	29
		Import Only		Import Export (NET)		Element 1 Import Only Element 2 OPHW			Element 1 Import Export Element 2 Controlled Load			OPHW Element 2		Gross Generation Meter Programs			
	Category					OP1 OP2	OP1	OP2	OP1 OP2	OP1	OP2	OP1	OP2				
AMS	B1	FLAT RATE SINGLE PHASE															
HLA																	
AMT	B3	FLAT RATE THREE PHASE															
HLE																	
AMG	E1	✓															
PRS		✓		✓													
EEL		✓		✓										✓			
ECA	E1c		✓		✓												
PRT	E2					✓			✓								
AMJ						✓			✓						✓	✓	✓
ECJ	E2c						✓	✓		✓	✓	✓	✓				
EET	E3	✓		✓										✓			
PRW		✓		✓													
AMX		✓		✓										✓			
LGC		✓		✓										✓			
ECP	E3c		✓		✓												

1.2 Low Voltage Current Transformers

Prefix	Description	Maximum Demand
CTS	200/5 LV Current Transformer	80 - 200A
CTT	800/5 LV Current Transformer	201 – 800A
CTW	1500/5 LV Current Transformer	801 – 1500A
CTU	2000/5 LV Current Transformer	1501 – 2000A

1.3 Load Control Units

Prefix	Description	Application
ERB	Ripple Load Control Unit	OP1 & OP2 in 750Hz and 1050Hz Decabit areas
ROM	Ripple Load Control Unit	OP1 & OP2 in 750Hz and 1050Hz Decabit areas
TFB	Time Switch Load Control Unit	OP1 & OP2 in all areas
TRT	Smart Time Switch Load Control Unit	OP1 & OP2 in all areas

2 B1- Single Phase Accumulation (Flat Rate) Meters

2.1 AMS (L+G EM500) B1 Meter

The **AMS** is a single phase single element accumulation meter. The meter is manufactured by Landis+Gyr. The meter is rated for up to 100A and Class 1kWh accuracy. The AMS has a pulsing LED on the front of the meter that flashes at 1000 pulses per kWh.

The meter is not programmable (and the optical port is disabled) and the meter is configured to display a single accumulation register representing the total kWh consumed by the customer

Figure 2.1-1: AMPY 1000 Electronic Meter

2.1.1 Application

The AMS is an accumulation meter suitable for Flat Rate (Type 5 BASIC) installations in the Ausgrid network area. It can be used for residential as well as small commercial and industrial installation metering.
The data is face read by Meter Reader then forwarded to the Meter Data Provider (MDP) for billing purposes.
Note: There is no real time clock in the meter.

2.1.2 Meter Dimensions

Figure 2.1-2 shows mounting dimensions for the AMS meter with a standard terminal cover.

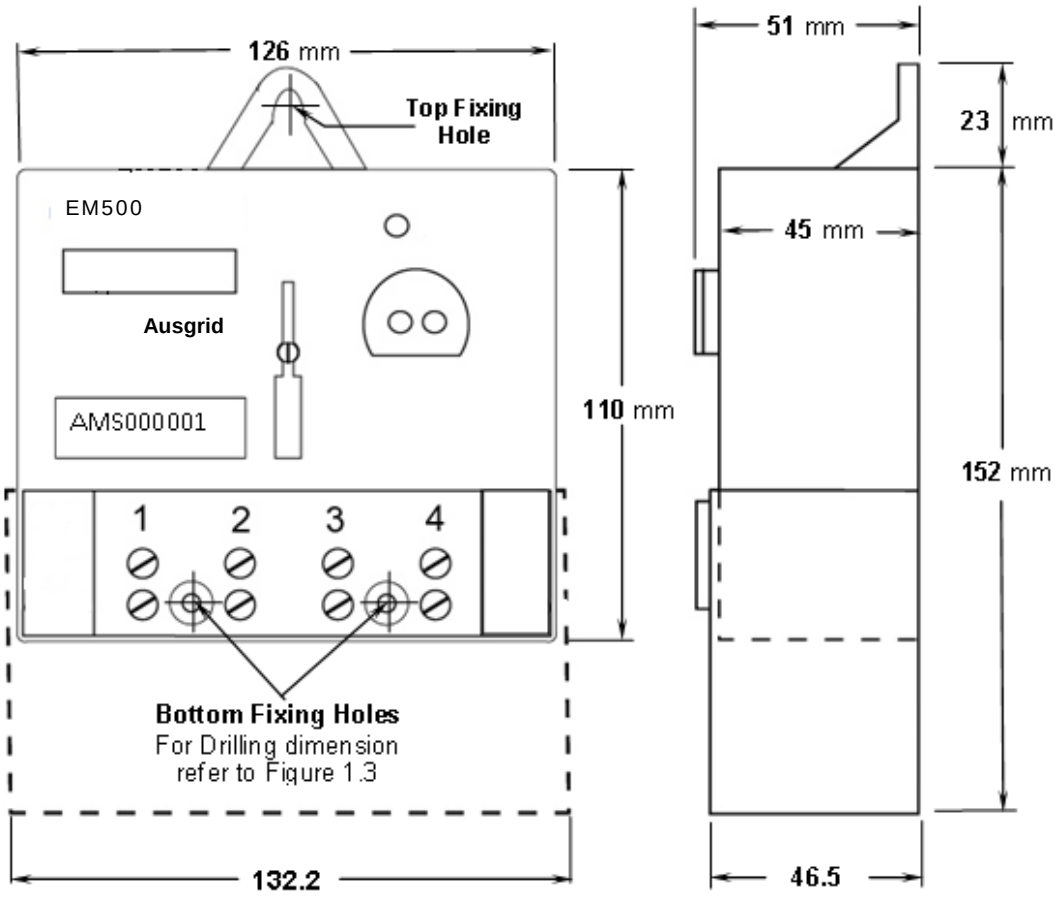


Figure 2.1-2: EM500 meter dimensions and mounting diagram

The dimensions of the meter are 132(W) x 152(H) x 51(D) (mm).
The meter is designed to be mounted using three screws. Threaded section of the screws should have diameter between 4 and 5mm with a screw head not smaller than 8mm.
A drilling template (drawn to scale) for the EM500 meter is included at the end of this section (the dotted line is the meter outline).

2.1.3 Meter Appearance

Main parts visible on the front of the meter include:

- Metrology Seal
- LCD display
- Pulsing LED to indicate consumption
- Meter property number
- ANSI optical port (disabled)

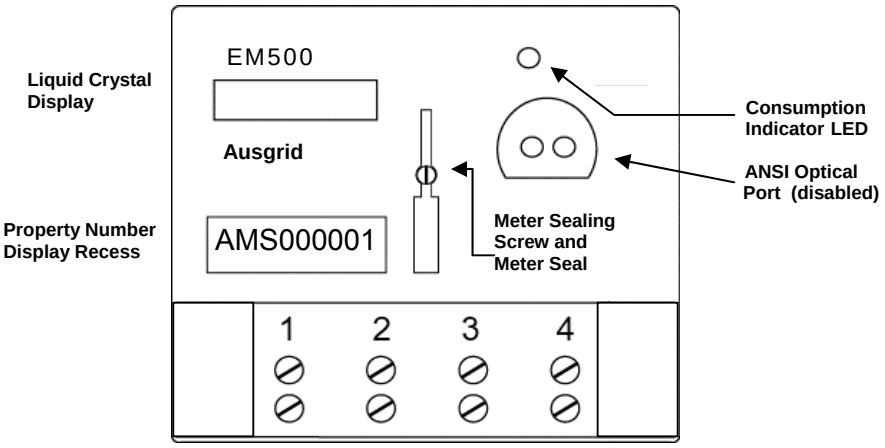


Figure 2.1-3: EM500 Meter Main Parts

2.1.4 Terminal Arrangement

The terminal cover is attached with one sealable screw which has a 2mm diameter hole to accommodate sealing wire. The terminals are rated for 100A

- Terminal 1 is the Active Line connection
- Terminal 2 is a Neutral connection. *However, Terminal 3 is the preferred neutral connection.*
- Terminal 3 is the preferred Neutral connection
- Terminal 4 is the Load connection

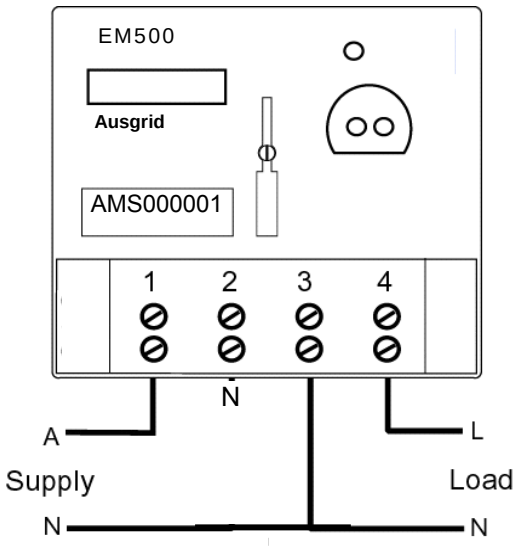


Figure 2.1-4 EM500 meter wiring schematic

2.1.5 Display

The display will show meter firmware version on power up and then the accumulated energy reading in kWh.

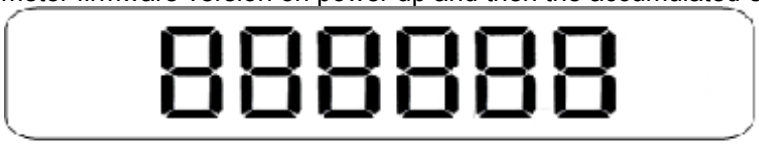


Figure 2.1-5 EM500 meter display

2.1.6 LED Indicators

One LED is located on a front panel of a meter labelled “1Wh/imp” and will flash at a rate of one pulse per watt-hour measured. The LED will not flash if reverse energy is applied. This is a pulse approximately every 1 minute with a 100W load.

2.1.7 Alarms

The meter does not support alarm functions.

2.1.8 Meter Seals

The EM500 meter is sealed by the manufacturer at the factory. The location of the seal is shown in figure 3. The seal ensures that the meter has not been tampered or interfered with by unauthorised parties. Please ensure that the meter seal is in place and intact. According to the National Measurements Act, it is a criminal offence to remove or tamper with the meter seal. DO NOT install a meter without a seal or if the seal has been tampered with. In addition, seal the meter terminal cover at the completion of the installation process.

2.1.9 Commissioning

The following points should be employed to ensure correct installation of the meter:

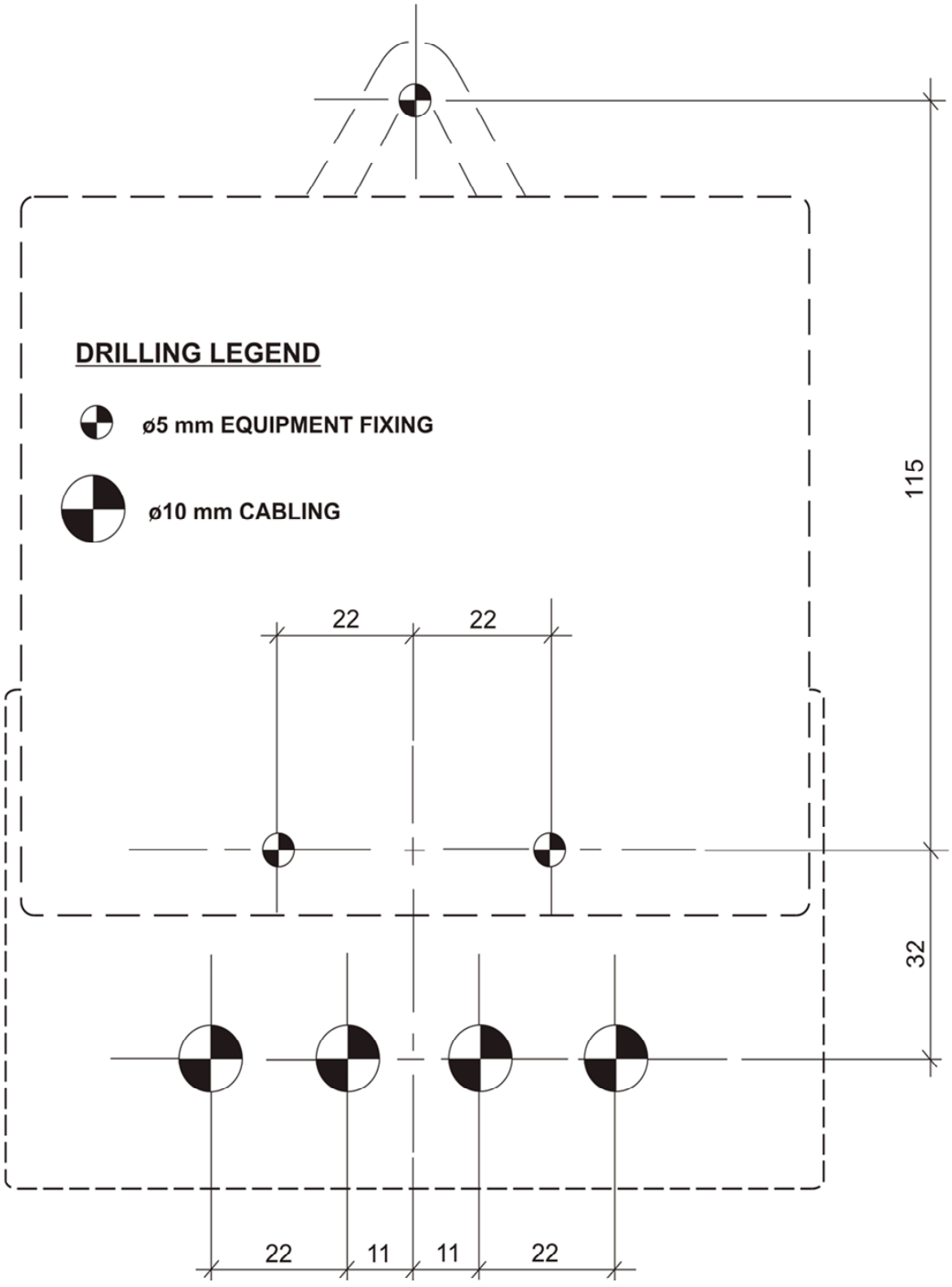
- Once the meter is energised the display will become active.
- The LED on the front of the meter should be pulsing to indicate energy consumption.
- Meter seals must not be broken.
- Scoop (terminal cover) must be sealed following the installation.

The meter is not designed to be serviced in a field and has no user replaceable parts. There are no internal fuses. In the event of failure of the meter, contact Ausgrid Metering Engineering support for assistance.

2.1.10 Drilling Template

EM500 (AMS) Drilling Template

NOTE: Scale must be checked before use.



2.2 HLA Holley (Formway) DDS-28B B1 METER

The **HLA** is a single phase single element accumulation meter. The meter is manufactured by Holley and distributed by Formway in Australia. The meter is 100A rated, Class 1 kWh accuracy and has a metrology LED on the front that flashes at 1000 pulses per kWh

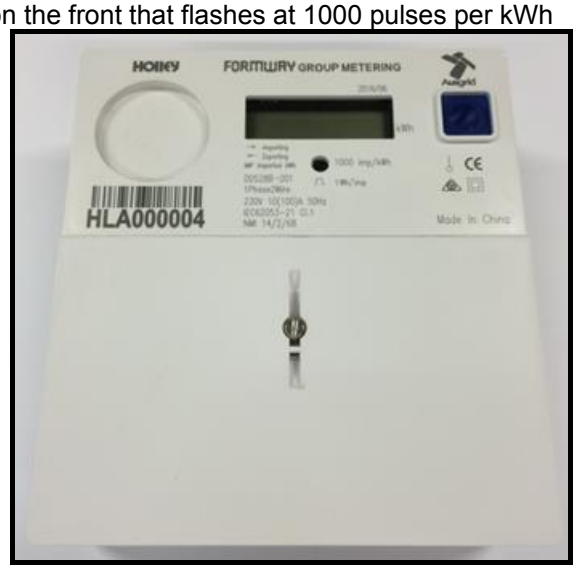


Figure 2.2-1: HLA Holley meter

2.2.1 Application

The HLA is suitable for Flat Rate (Type 6 BASIC) installations in the Ausgrid network area. It can be used for residential and non-residential installations. The meter is face read by the Meter Reader, who then forwards the meter readings to the Meter Data Provider (MDP) for billing purposes. There is no real time clock in the meter.

2.2.2 Meter Appearance

Main parts visible on the front of the meter include

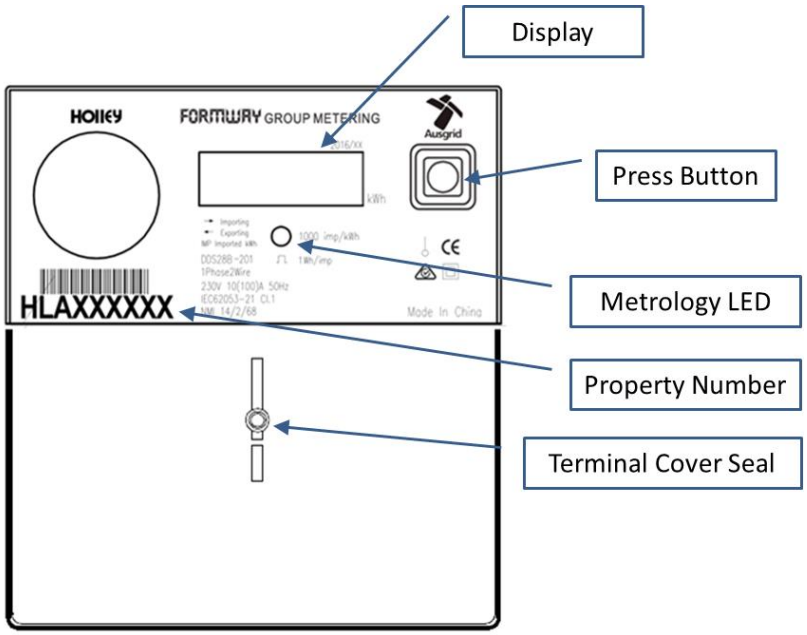


Figure 2.2-2: HLA Meter Appearance

2.2.3 Meter Dimensions

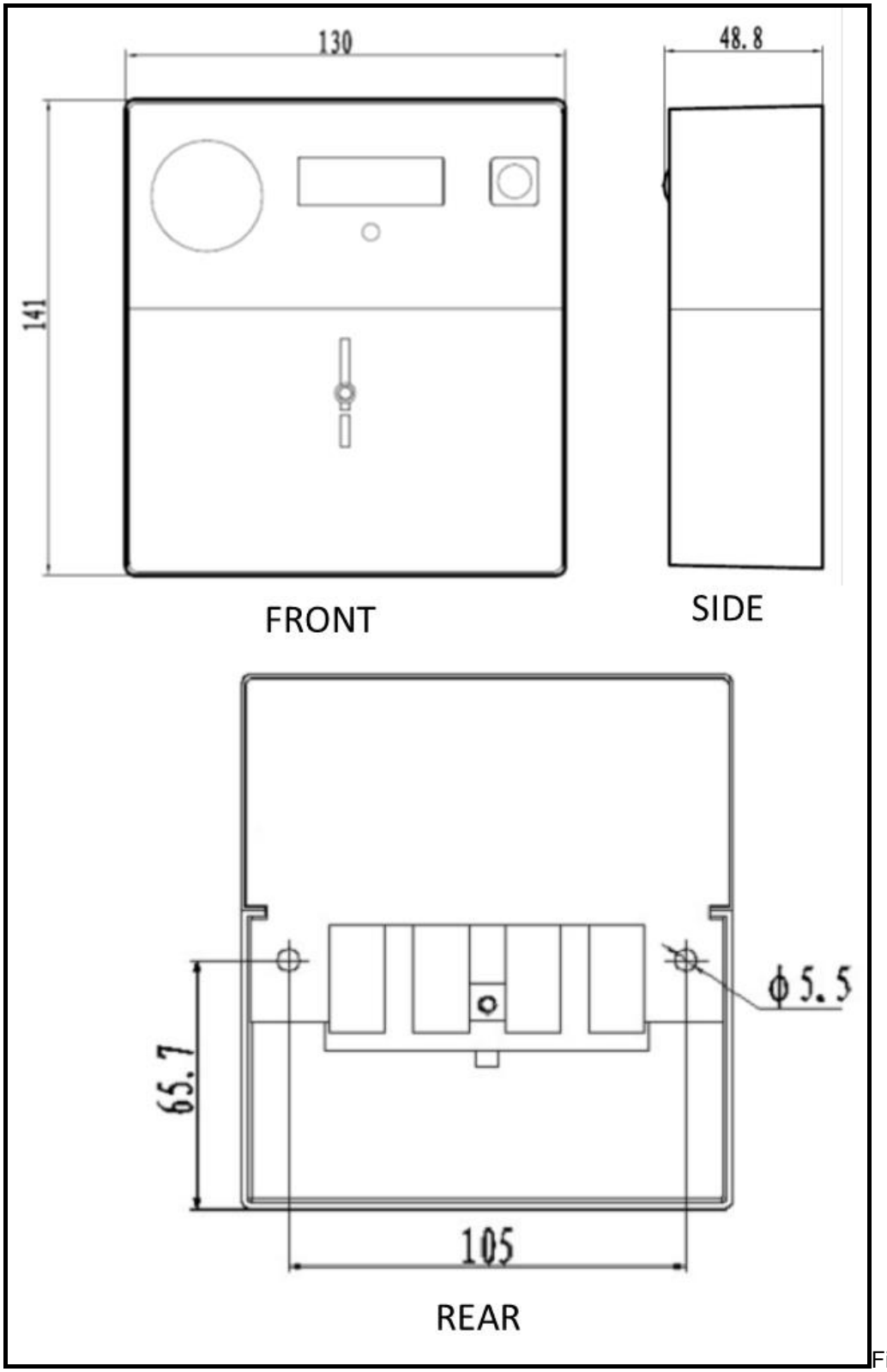


Figure 2.2-3: HLA Holley Mounting Dimension

The dimensions of the meter are 130(W) x 141(H) x 49(D) (mm). The meter is designed to be mounted using only two screws. Threaded section of the screws should have diameter between 4 and 5mm with a screw head not smaller than 8mm. A drilling template for the meter is included at the end of this Work Instruction. Check the scale before use.

2.2.4 Terminal Arrangement

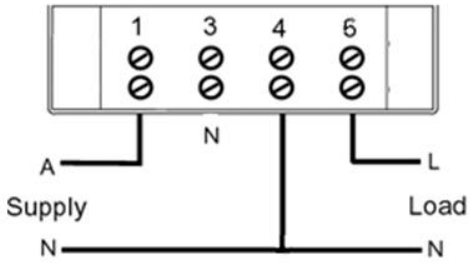


Figure 2.2-4: HLA Meter Terminals

The terminal cover is attached with one sealable screw which has a 2mm diameter hole to accommodate sealing wire. The terminals are rated for 100A

2.2.5 Display

The display will alternate between a test display (with all segments displayed) and then the accumulated energy reading in kWh. The press button will also wake the display when the meter is not powered.

Figure 2.2-5: HLA Display

IMP - is displayed to indicate the value on the display is the Import Energy Register. (**EXP** is not used)

⇄ The two arrows indicate the direction of energy flow. Flow should always be Import ➔

2.2.6 LED Indicators

One LED is located on a front panel of a meter labelled “1000 imp/ kWh” and will flash at a rate of one pulse per watt-hour measured. This is a Red pulse approximately every 1 minute with a 100W load. If reverse energy is applied, ⬅ will be displayed and the LED will flash Green. This indicates there is an error in the installation and must be corrected.

2.2.7 Alarms

The meter does not support alarm functions, however reverse energy is indicated by the ⬅ indication on the LCD display and the LED flashing Green.

2.2.8 Meter Seals

The HLA meter is permanently sealed by the manufacturer at the factory. DO NOT install a meter if the meter case appears to have been tempered. If main cover seal is satisfactory, then seal the meter terminal cover at the completion of the installation process.

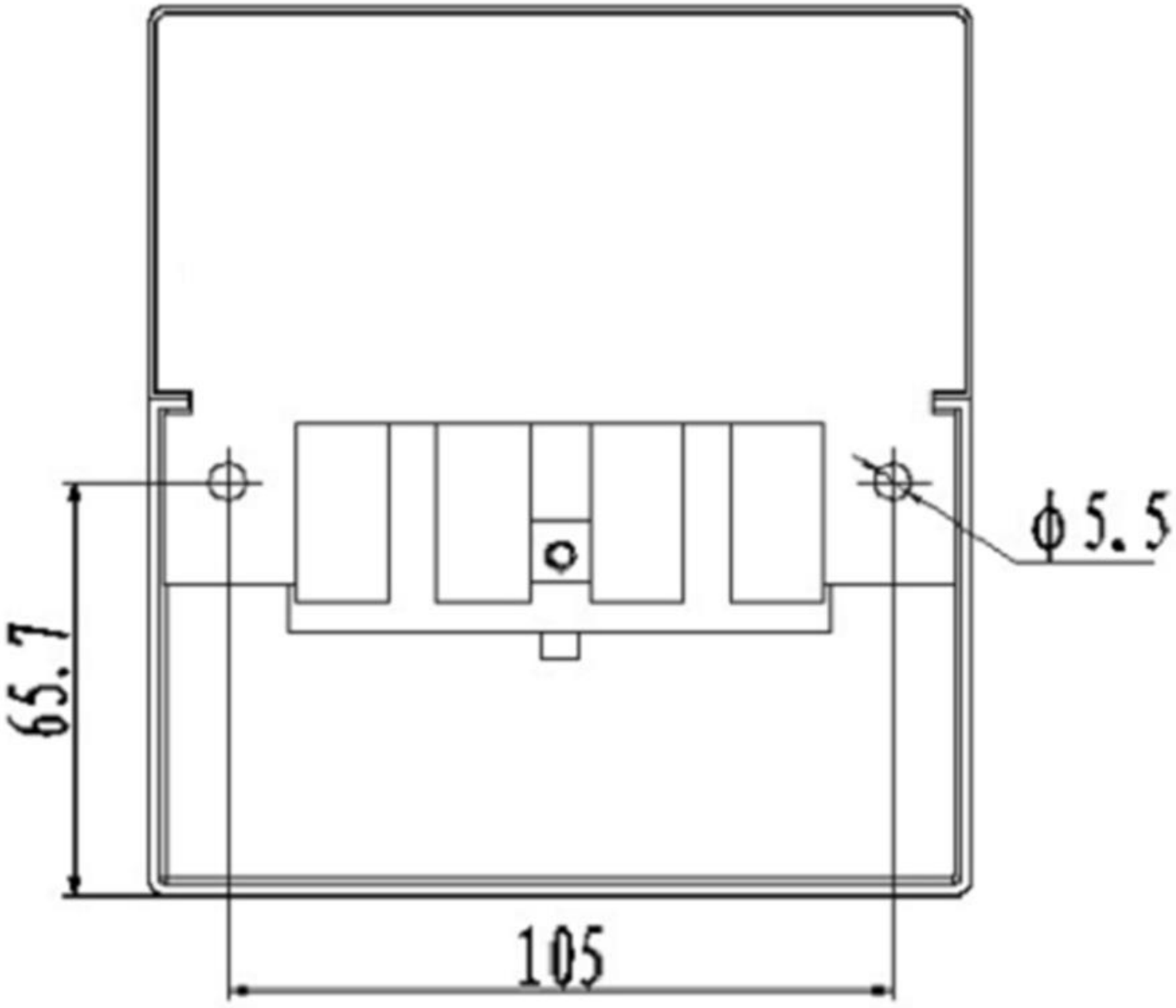
2.2.9 Commissioning

The following points should be employed to ensure correct installation of the meter:

- Once the meter is energised the display will become active.
- The metrology LED on the front of the meter should be pulsing RED to indicate energy consumption.
- Check for reverse energy - if detected correct wiring.
- The terminal cover must be sealed following the installation.

The meter is not designed to be serviced in a field and has no user replaceable parts. There are no internal fuses. In the event of failure of the meter, contact Ausgrid Metering Engineering support for assistance.

2.2.10 Drilling Template



3 B3 – Three Phase Accumulation (Flat Rate) Meters

3.1 AMT L&G EM3030 B3 Meter

The **AMT** is a polyphase single element accumulation meter. The meter is manufactured by Landis+Gyr. The meter is suitable for 100A and has Class 1 kWh accuracy and has a metrology LED on the front that flashes at 1000 pulses per kWh. The meter has an optical port but this is not utilised.

Figure 3.1-1 AMT Meter

3.1.1 Application

The AMT is suitable for Flat Rate (Type 6 BASIC) installations in the Ausgrid network. It can be used for residential installations. The meter is face read by the Meter Reader who then forward the meter readings to the Meter Data Provider (MDP) for billing purposes. There is no real time clock in the meter.

3.1.2 Meter Dimensions

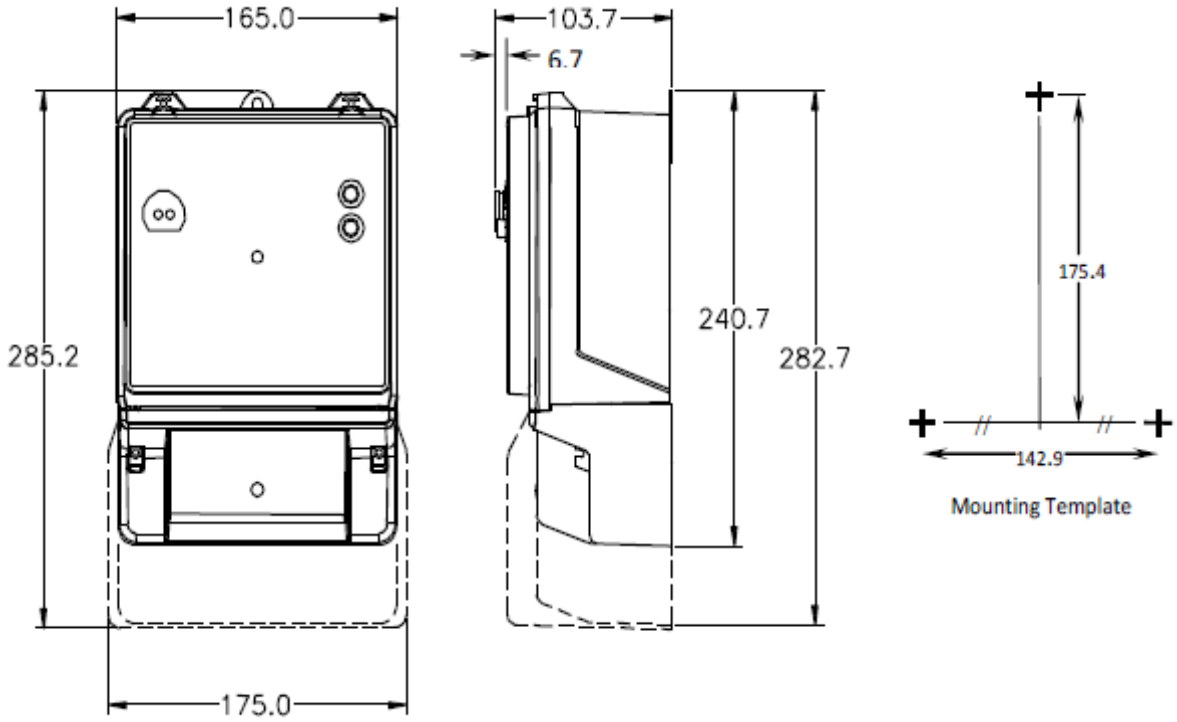


Figure 3.1-2 AMT Meter dimensions

The dimension of the meter is 241(H) x 165(W) x 104(D) (mm) with a standard terminal cover and 285(H) x 165(W) x 104(D) (mm) with an extended terminal cover. A drilling template for the AMT is included at the end of this document. Check the scale before use to ensure it has printed to the correct size. The meter is designed to be mounted using three screws. Threaded section of the screws should have diameter between 4mm and 5mm with a screw head not smaller than 8mm. The top mounting bracket can be used in 2 positions.

The top (exposed) position is the standard mounting position for the meter. An additional position is available (the concealed position) which allows for a hidden top screw. This has a top screw position set 25 mm below the standard position.

3.1.3 Meter Appearance

Main parts visible on the front of the meter include:

- Seals ensure meter integrity and must not be removed
- LCD display shows information in sequence
- Phase indication LEDs
- Pulsing LEDs to indicate kWh and kvarh consumption
- Meter property number
- ANSI port provides local optical connectivity for meter reprogramming and other service work

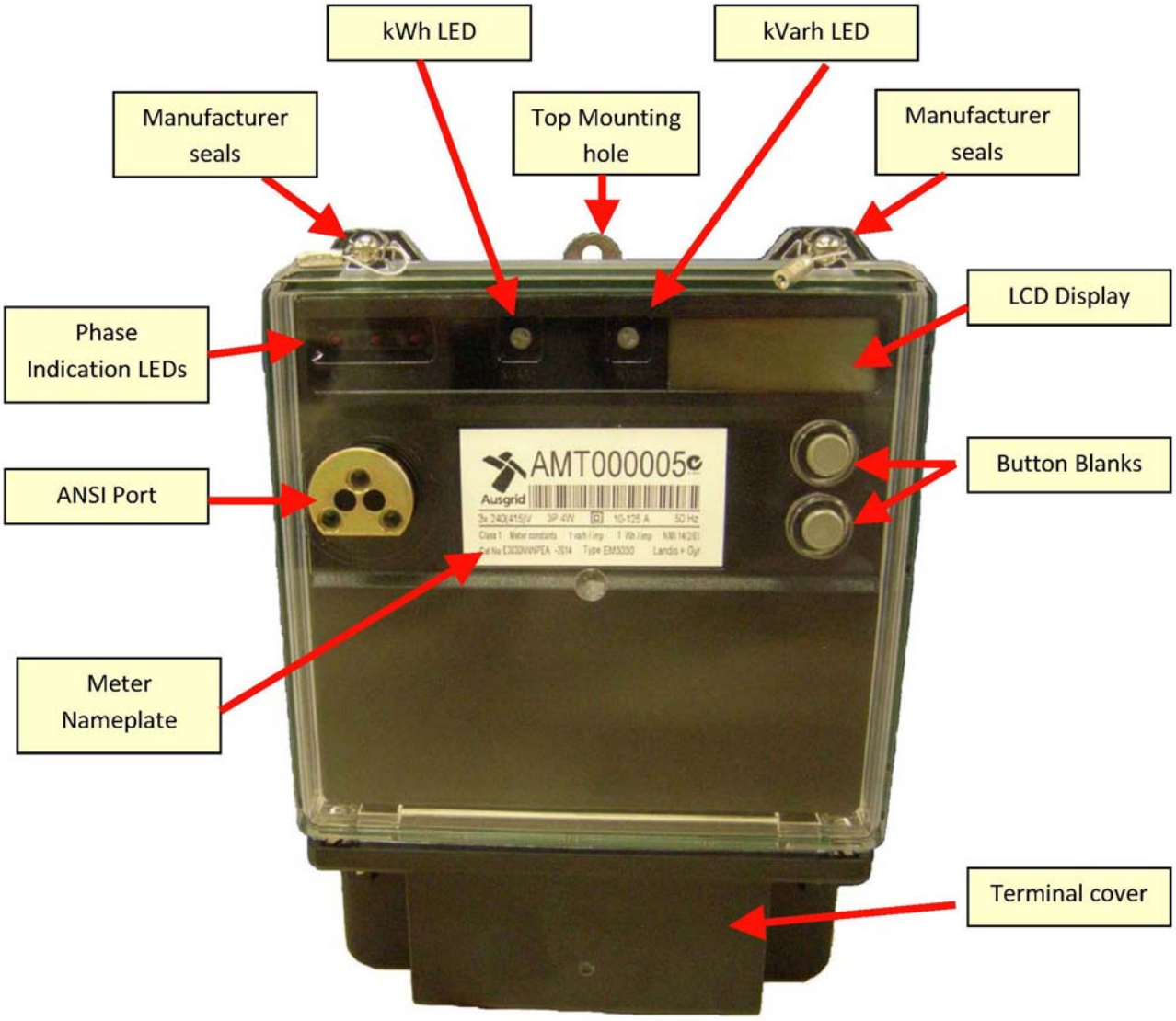


Figure 3.1-3 AMT Meter layout

3.1.4 Terminal Arrangement

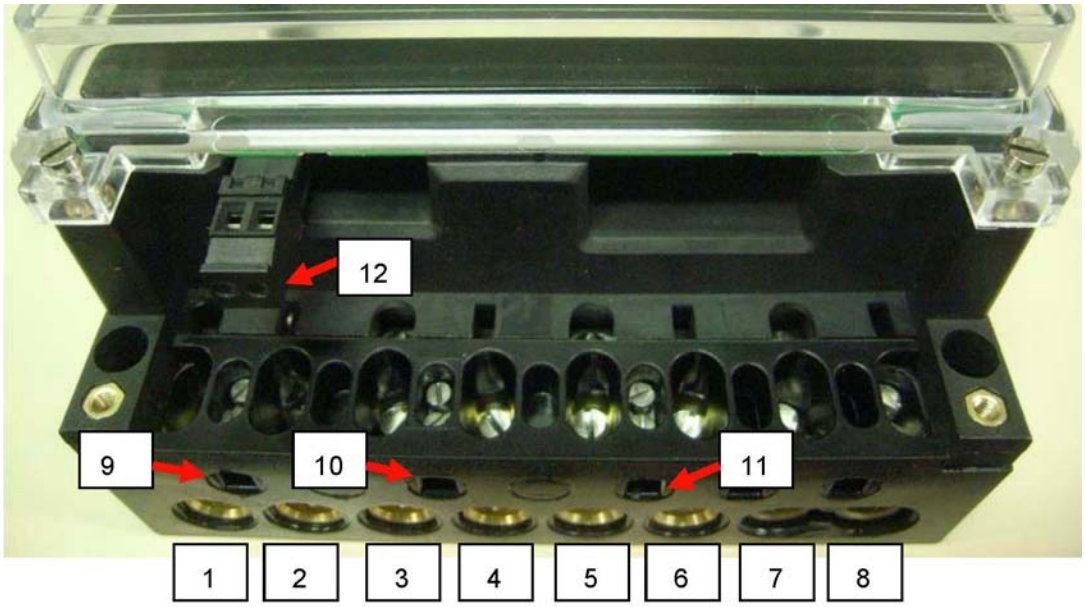


Figure 3.1-4 AMT meter wiring terminals

Terminal	Designation	Function
1	A	Active Line Connection (Phase A)
2	A	Load Connection (Phase A)
3	B	Active Line Connection (Phase B)
4	B	Load Connection (Phase B)
5	C	Active Line Connection (Phase C)
6	C	Load Connection (Phase C)
7	N	Neutral Connection (Line) - (Not to be used)
8	N	Neutral Connection (Load)
9	V_A	Phase A Supply Voltage
10	V_B	Phase B Supply Voltage
11	V_C	Phase C Supply Voltage
12	P	Pulse Output (Not to be used)

Table 3.1-1 AMT Terminal Arrangement

3.1.5 Meter Wiring

Connections for the AMT meter are as follow.

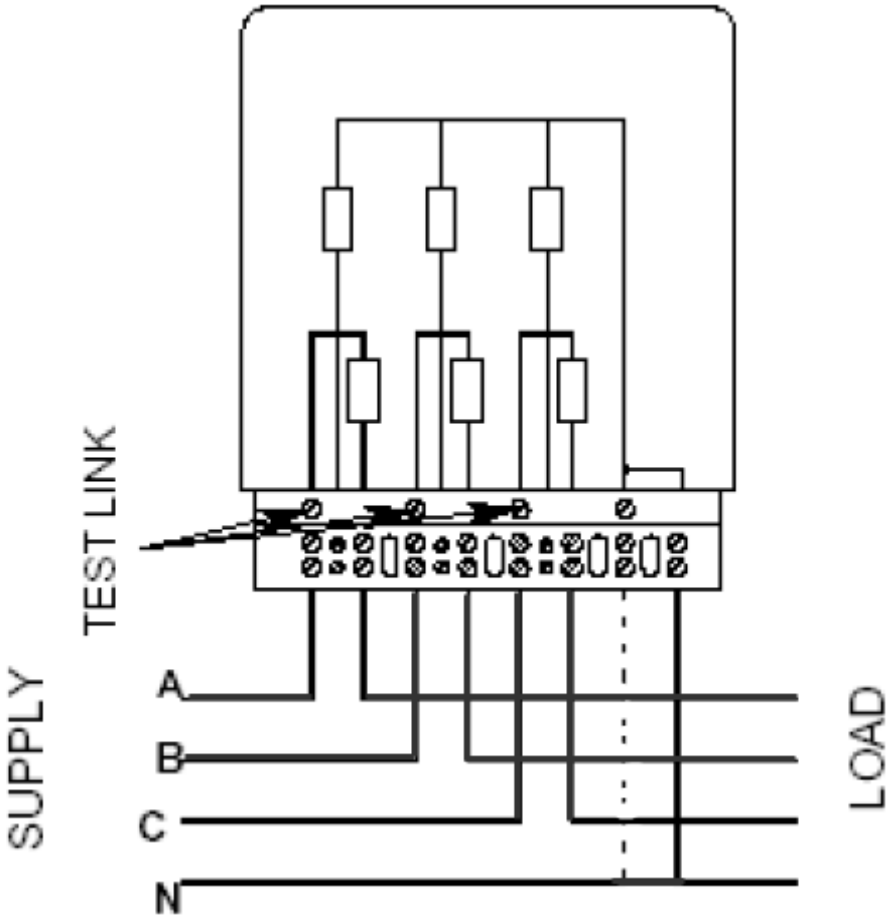


Figure 3.1-5 AMT meter wiring schematic

There is an Ausgrid specified limit of 100 Ampere maximum rating per phase.

3.1.6 Display

The display will show meter firmware version on power up and then accumulated energy reading.

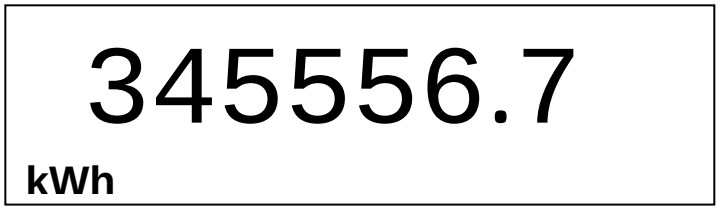


Figure 3.1-6 Meter Display

3.1.7 LED Indicators

Phase indicator LEDs are used to indicate that the meter elements are energised. The Phase A, B and C LEDs should be lit for 3 phase 4 wire circuits. The Consumption Indicators (Test LEDs) are two red Light Emitting Diodes (LEDs) pulsing at a rate proportional to the measured load. The meter constant is set at 1 watt-hour per pulse for the left side LED.

3.1.8 Alarms

The meter display will only show the exported energy warning code (F0000100) in the event the meter is incorrectly wired in reverse, or on a site with embedded generation. If the meter is incorrectly installed such that the alarm activates, the alarm cannot be cleared and the installer will be required to return the meter and obtain a replacement one before completing the job.

3.1.9 Meter Wiring Check and commissioning

The following points should be used to ensure correct installation of the meter:

- Once meter is energised the display will become active
- All 3 phase LEDs should be lit.
- Ensure the kWh LED (the one left of centre) on the front of the meter is pulsing to indicate energy consumption. It will flash at a rate of one pulse per watt-hour measured and should flash proportionally to the load connected via the Load Tester in the forward direction only.
- Meter seals must not be broken.
- The meter scoop (terminal cover) must be sealed following the installation.
- Ensure reverse energy warning code is cleared.

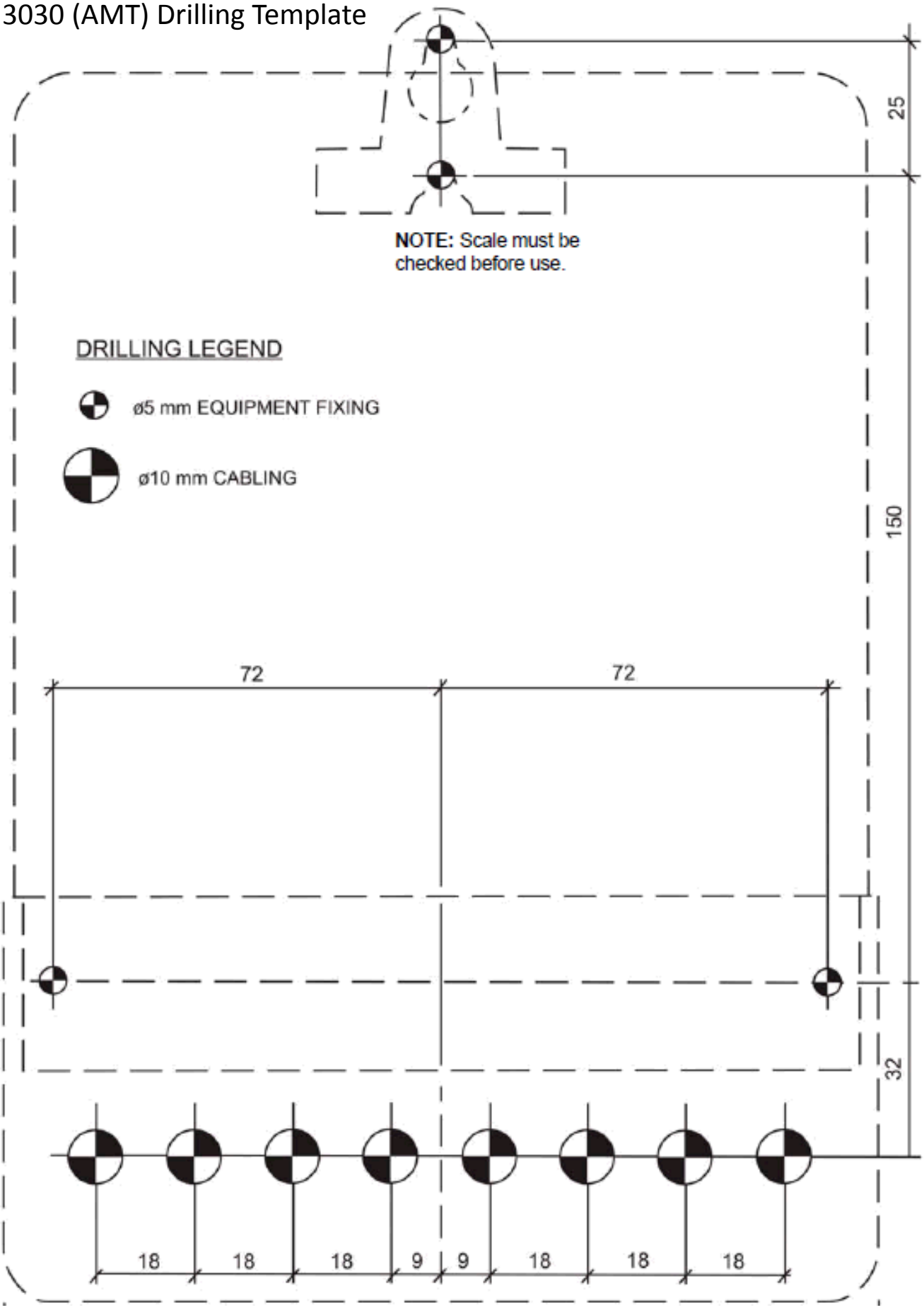
The meter is not designed to be serviced in a field and has no user replaceable parts. There are no internal fuses. In the event of failure of the meter, contact Ausgrid Metering Engineering support for assistance.

3.1.10 Sealing of the Meter

The meter is sealed by the manufacturer at the factory. The seals are located on the top case bolts. The seal ensures that the meter has not been tampered or interfered with by unauthorised parties.
According to the National Measurements Act, it is a criminal offence to remove or tamper with the meter seal. DO NOT install a meter without a seal or if the seal has been tampered with.
Fit a seal to the terminal cover (meter scoop) through the cover screw at the completion of the installation process.

3.1.11 AMT Meter Drilling Template

EM3030 (AMT) Drilling Template



3.2 HLE Holley (Formway) DTS541 B3 Meter

The **HLE** is a polyphase single element accumulation meter. The meter is manufactured by Holley. The The meter is suitable for up to 100A and has Class 1 kWh accuracy and has a metrology LED on the front that flashes at 1000 pulses per kWh. The meter has an optical port but this is not utilised.

Figure 3.2-1 HLE Meter

3.2.1 Application

The **HLE** is suitable for Flat Rate (Type 6 BASIC) installations in the Ausgrid network. It can be used for residential installations. The meter is face read by the Meter Reader who then forward the meter readings to the Meter Data Provider (MDP) for billing purposes. There is no real time clock in the meter.

3.2.2 Meter Dimensions

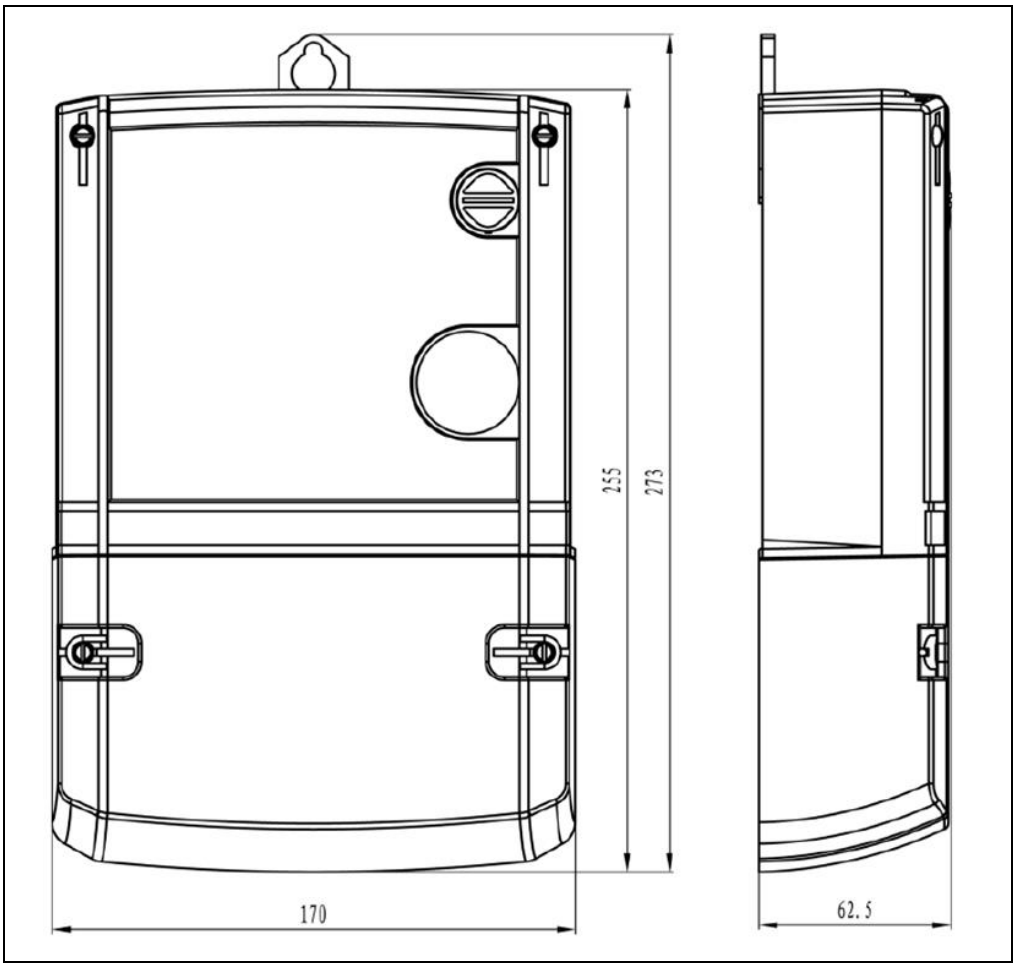


Figure 3.2-2 HLE Meter dimensions

The dimension of the meter is 255(H) x 170(W) x 63(D) (mm) and 273(H) x 170(W) x 63(D) (mm) with an optional external hook.

3.2.3 Meter Appearance

Main parts visible on the front of the meter include:

- Seals. These ensure meter integrity and must not be removed
- Display
- Metrology LED to indicate kWh consumption
- Meter property number
- Optical port (Disabled)

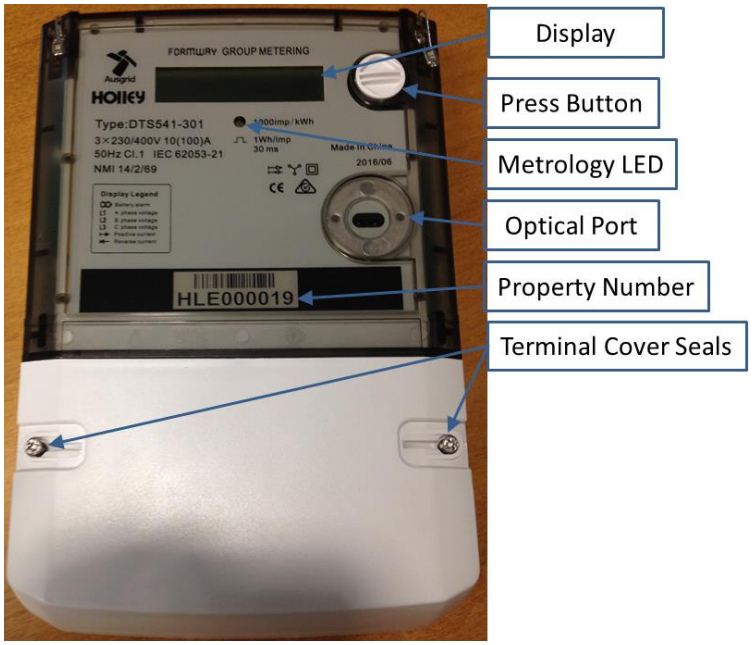


Figure 3.2-3 HLE Meter layout

3.2.4 Terminal Arrangement

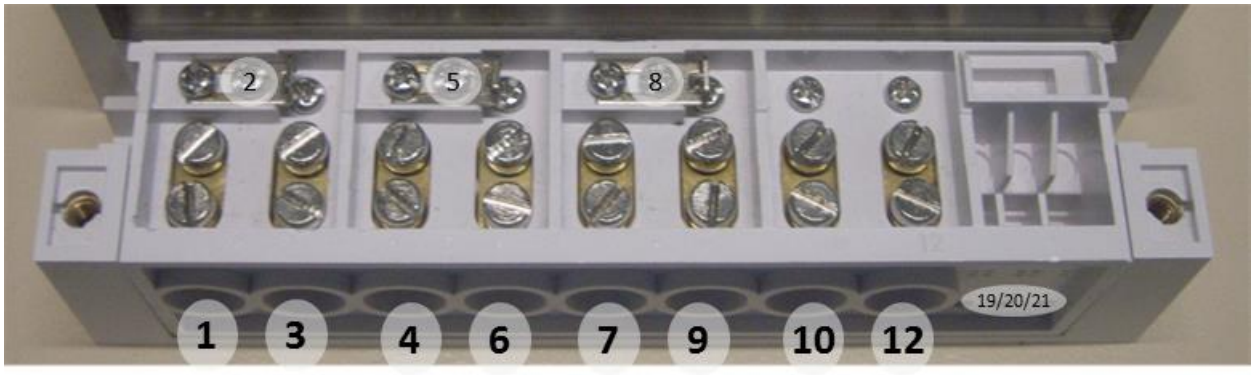


Table 3.2-1 HLE Terminal Arrangement

Terminal	Function
1	**A Phase Line**
3	**A Phase Load**
4	**B Phase Line**
6	**B Phase Load**
7	**C Phase Line**
9	**B Phase Load**
12	**Neutral**
10	Neutral (Not preferred)
2,5,8	Voltage link terminals(not to be used)
19, 20, 21	Pulsing Output terminals (not to be used)

3.2.5 Meter Wiring

Connections for the HLE meter are as follow.

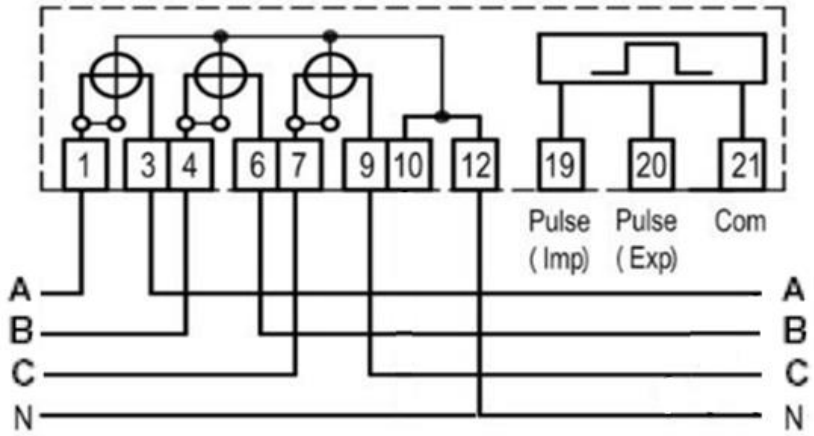


Figure 3.2-4 HLE meter wiring schematic

3.2.6 Display

The display will show a test display with all segments displayed when powered up, and will then switch to displaying the accumulated energy. It does not cycle between the test display and accumulated energy in normal use.

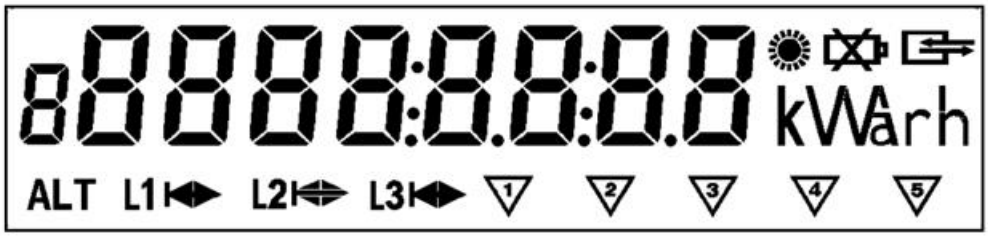
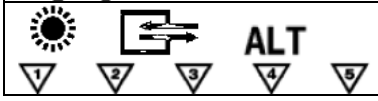


Figure 3.2-5 HLE Meter Display

	Display of energy data
L1, **L2**, **L3**	Phase Voltage Indicators Indicators will be steady **on** for normal operating conditions Indicators will flash for input voltages less than 184V Indicators will be off for input voltages less than 120V
	Forward Energy flow for that phase
	Reverse Energy flow for that phase
	Low Battery Warning
	Unused indicators – Daylight Savings, Communications, Alt Display Mode, Status Indicators. None of these are used in this meter.

3.2.7 LED Indicators

One LED is located on a front panel of a meter labelled “1000 imp/ kWh” and will flash Red at a rate of one pulse per watt-hour measured. If reverse energy is applied, the LED will flash Green. This may indicate that there is an error in the installation and must be corrected.

3.2.8 Alarms

The meter does not support alarm functions, however reverse energy on any phase is indicated by the  indication next to the phase indicators (L1, L2, L3) on the LCD display. If total energy flow is in reverse, the LED will be flashing Green. This is non latching and indicates there is an error in the installation and must be corrected.

3.2.9 Meter Wiring Check and commissioning

The following points should be used to ensure correct installation of the meter:

- Meter seals must not be broken.
- Once meter is energised the display will become active
- Ensure the metrology LED on the front of the meter is pulsing to indicate energy consumption.
- Ensure reverse energy indicators are not showing.
- The terminal cover (meter scoop) must be sealed following the installation.

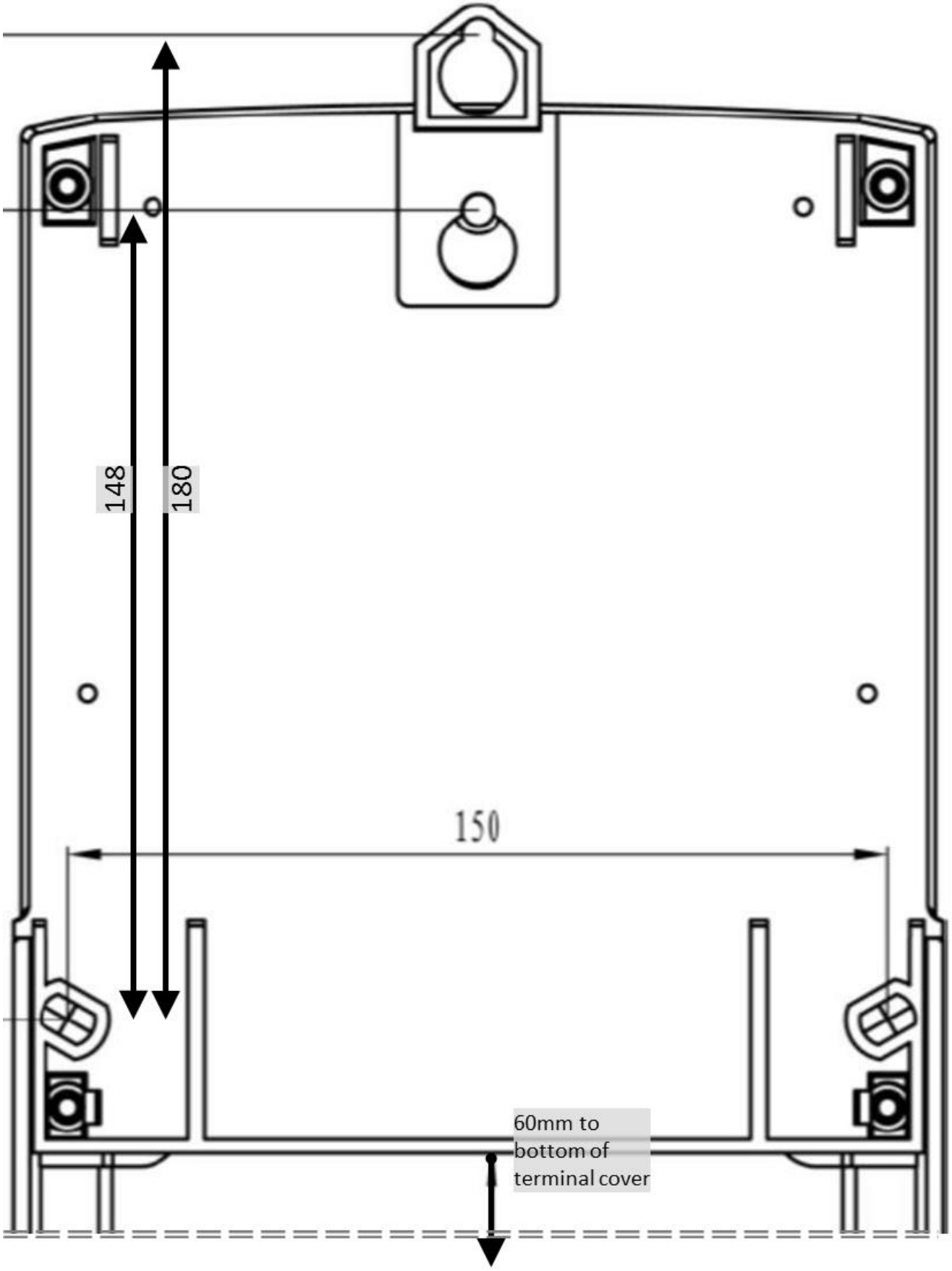
The meter is not designed to be serviced in a field and has no user replaceable parts. There are no internal fuses. In the event of failure of the meter contact Ausgrid Metering Engineering support for assistance.

3.2.10 Sealing of the Meter

The meter is sealed by the manufacturer at the factory. The seals are located on the top case bolts. The seals ensures that the meter has not been tampered or interfered with by unauthorised parties. According to the National Measurements Act, it is a criminal offence to remove or tamper with the meter seal. DO NOT install a meter without a seal or if the seal has been tampered with.

There are two terminal cover screws. Fit seals to both at the completion of the installation process.

3.2.11 HLE Meter Drilling Template



4 E1 - Single Phase Interval (Time of Use) Meters

The type/brand may be liable to change in the future as Ausgrid may enter alternative future supply contracts for meters.

4.1 L&G AMG EM1000 Electronic Meter

The EMAIL EM1000 electronic meter is an E1 Type 5 Rule compliant meter. The meter property number prefix for the **EM1000** is **AMG**.

Features of the EM1000 electronic meter include:

- Electronic single phase, single element, whole current meter
- 100 Amperes maximum current rating
- Bottom connected terminal arrangement
- Optical and RS-232 ports for communication
- Class 1 accuracy
- Load profile recording.

This meter is not suitable for registering buy back energy

Figure 4.1-1 AMPY EM1000 Electronic Meter

The dimensions of the meter are 130(W) x 125(H) x 50(D) (mm).

An internal battery ensures that the EM1000 meter will maintain time and date settings for at least 15 years with no power.

The EM1000 meter has a pulsing LED output located on the front fascia. The LED flashes at a rate of 1000 pulses per kilowatt-hour (kWh).

4.1.1 Application

The EM1000 meter is a type 5 rule compliant meter for half hour interval metering and Time of Use tariffs with load profile recording for use by retailers in contestable markets. This load profile data will be downloaded by meter readers with hand held probes that connect to the optical port. The data is then forwarded to the Meter Data Agency (MDA) for billing and statistical purposes.

The EM1000 display has auto-scroll enabled. This allows display to cycle continuously through the meter registers one-by-one through **Display Test**, **Date**, **Time**, **Total kWh.** The meter's SCROLL button (**Red** Button on front fascia) allows the reader to move forward through the cycle at a faster rate with each press moving one item forward.

See Figure 4.1-2 for the position of the SCROLL button.

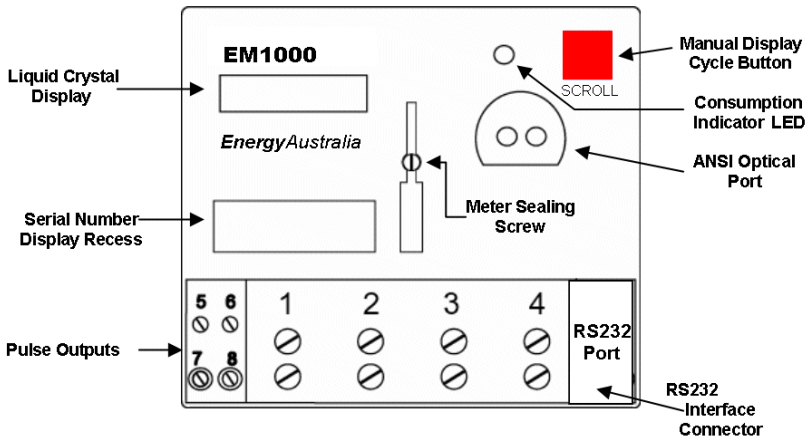


Figure 4.1-2 E1000 meter connections

Please note that the meter will always operate on Australian Eastern Standard Time (AEST). There will be no change to the displayed time due to Daylight Saving Time.

4.1.2 Meter Dimensions

The EM1000 meter dimensions and mounting diagram are shown in Figure 4.1-3.

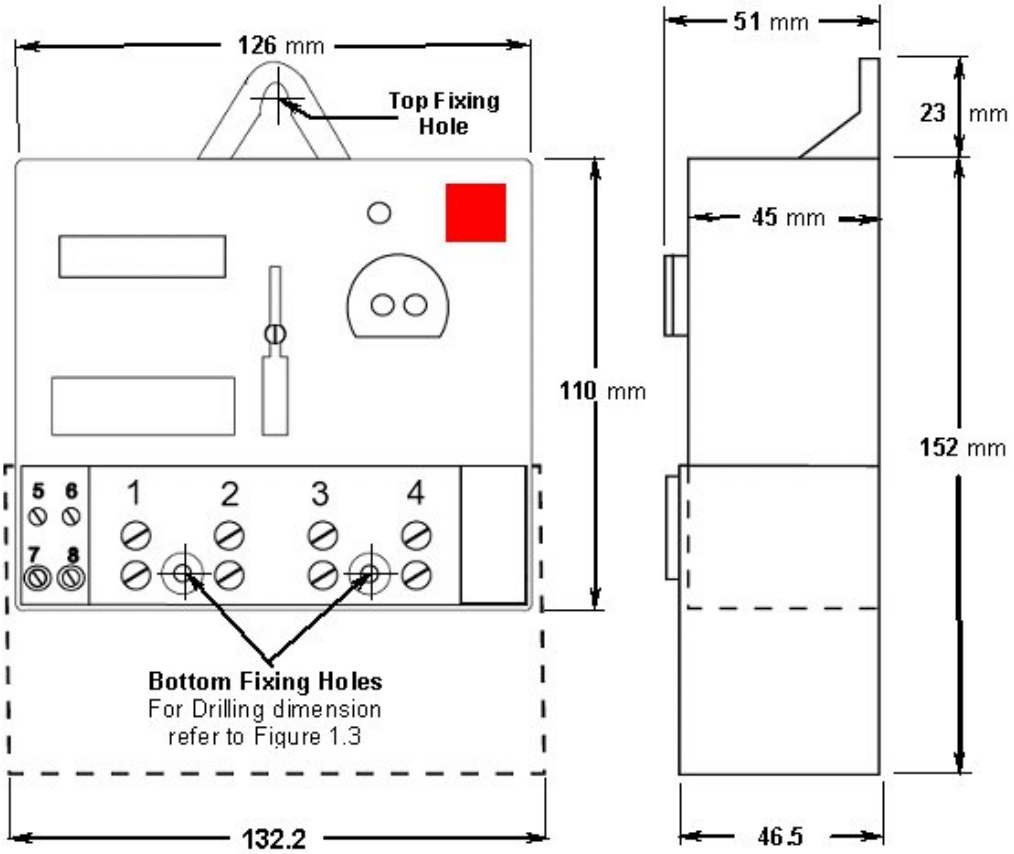


Figure 4.1-3 EM1000 meter dimensions and mounting diagram

A drilling template (scale must be checked before use) for the EM1000 meter is included at the end of this section (the dotted line is the meter outline). The EM1000 meter has the same mounting holes as the Email single phase “Ferraris Disc” meter.

4.1.3 Terminal Arrangement

Figure 4.1-4 shows the wiring schematic for the EM1000 electronic meter.

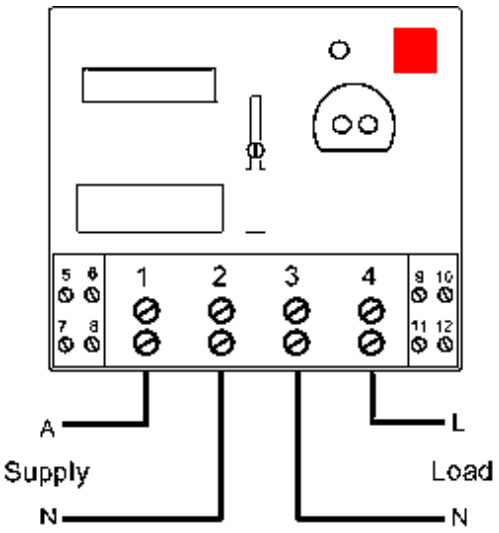


Figure 4.1-4 E1000 meter wiring schematic

- Terminal 1 is the Active Line connection.
- Terminal 2 is a Neutral connection. However, it is preferred that Terminal 3 be used for the Neutral connection for the purposes of standardization.
- Terminal 3 is the preferred Neutral connection.
- Terminal 4 is the Load connection.
- Terminals 5 6, 7 and 8 are optically isolated pulsing output.

This wiring schematic for the EM1000 meter can also be found on the inside of the meter's terminal cover.

4.1.4 Display

The meter display for the EM1000 electronic meter is shown in Figure 4.1-5.

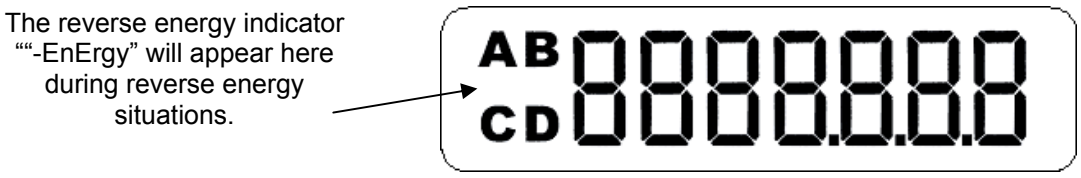


Figure 4.1-5 EM1000 meter display

None of the letters (EM1000) on the left-hand side of the display should be lit except during the test display as shown in Figure 1.5.

The EM1000 meter is programmed with a program structure called Structure 19. The meter has been programmed to scroll through the registers. The registers has been programmed to display are shown in Table 4.1-1.

Reg	Display (For AMG meters)	Dials	Dec
8	Display Test (8888888)	7	0
1	Date (ddmmyy)	6	0
2	Time (hhmm)	4	0
3	Total cumulative kWh	5	1

Table 4.1-1 Standard (Structure 19) Register Display

4.1.5 Optical port

The optical port enables reading the meter via a suitable optical probe.

To set up the communication link, place the optical probe against the optical port. The D shape of the ANSI standard port correctly aligns the probe and a magnet within the probe holds the probe in contact with the steel face of the optical port.

4.1.6 Communication Port

The RS232 interface provides a serial communication link with the meter and allows direct attachment of a communications device via the RJ45 socket. Please contact Ausgrid for further information.

4.1.7 Pulsing Outputs / Inputs

There are a number of auxiliary connections located besides main terminals under the terminal cover which are used to interface with external devices. Please contact Ausgrid for further information.

4.1.8 Meter Seals

The EM1000 meter is sealed by the manufacturer at the factory. The location of the seal is shown in Figure 4.1-6.

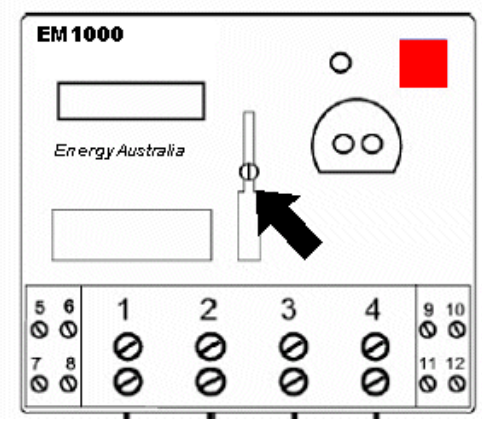


Figure 4.1-6 EM1000 meter seal location

The seal ensures that the meter has not been tampered or interfered with by unauthorised parties. Please ensure that the meter seal is in place and intact. According to the National Measurements Act, it is a criminal offence to remove or tamper with the meter seal. **DO NOT** install a meter without a seal or if the seal has been tampered with.

4.1.9 Meter Wiring Check

It is important that the installer checks the wiring of the EM1000 meter once it is installed.

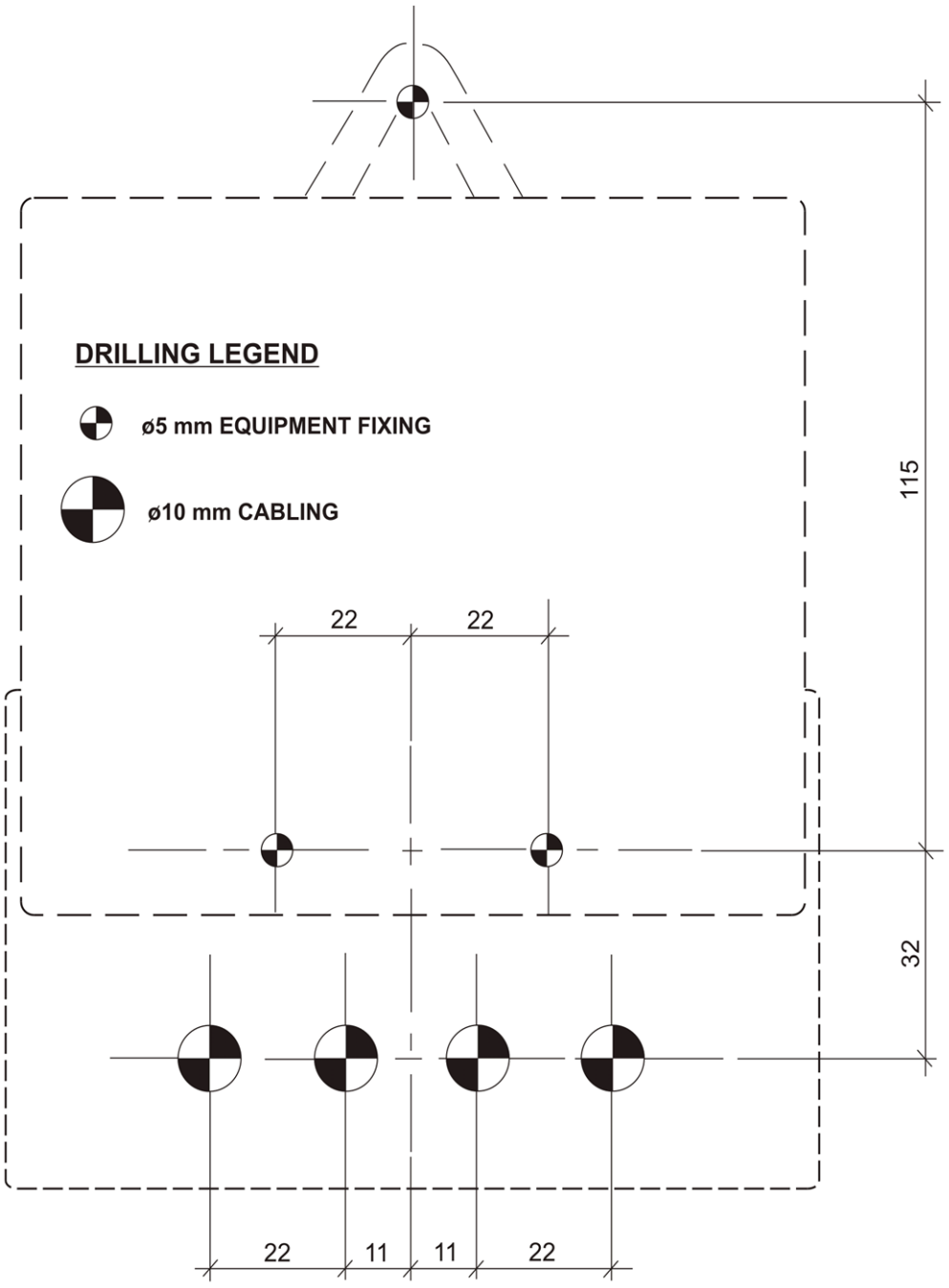
To check the wiring:

- Visually inspect the connections to ensure the correct wire is connected to the correct terminal of the meter.
- When a voltage is applied, the EM1000 meter will turn on and the display can be read.
- Attach a suitable load to the meter (household load or a 100W load lamp).
- Check the pulsing LED output on the front of the meter. The consumption indicator LED (see Figure B3) will flash at a rate of one pulse per watt-hour measured. This is a pulse approximately every 1 minute with a 100W load.
- Check for “Reverse Energy”. This is where the Active and Load Lines have been swapped on the meter.
- For the EM1000. When more than 100 Wh energy (approx 0.5Amps) flows backward through the meter, warning message “-EnErgy” gets added into the display list after the last programmed entry and the consumption indicator LED will not flash.
- The warning message is retained until the reverse energy ceases to flow and the status of the meter is reset using the EMPwin software. The consumption indicator LED will not flash if there is no load on the meter, therefore, it is important to test the load through the meter. If the meter is connected properly, the meter’s consumption indicator LED will start to flash when forward flowing current is connected to the meter. If this situation does occur, please ensure that the error is rectified.

4.1.10 Drilling Template

AMPY EMAIL EM1000 SINGLE PHASE KWH METER

NOTE: Scale must be checked before use.



4.2 PRS PRI I – Credit 400 Electronic Meter

The **PRS** i-Credit 400 is a single phase single element type 5 code compliant electronic meter.

Features of the **i-Credit 400** electronic meter are as follows:

- Electronic, single phase, single element, whole current meter
- 100 Amperes Element 1
- Bottom connected
- ANSI Optical and RS-232 ports for communication
- Class 1 accuracy
- Load profile recording
- Ability to record buy back energy. To enable this function the meter must be specifically requested and programmed prior to delivery.

Figure 4.2-1 i-Credit 400 electronic meter

4.2.1 Application

The PRS i-Credit 400 is a Type 5 code compliant meter for half hour interval metering and Time of Use tariffs with load profile recording for use by retailers in contestable markets. It can be used for residential as well as small commercial and industrial installation metering.

The load profile of the customer's energy usage will be recorded in 30 minute interval periods and stored in non-volatile memory in the meter. This data will be downloaded by meter readers with hand held probes that connect to the optical port. The data is then forwarded to the Meter Data Agency (MDA) for billing and statistical purposes.

Please note that the meter will operate on Australian Eastern Standard Time (AEST). There will be no change in time due to daylight savings.

4.2.2 Meter Dimensions

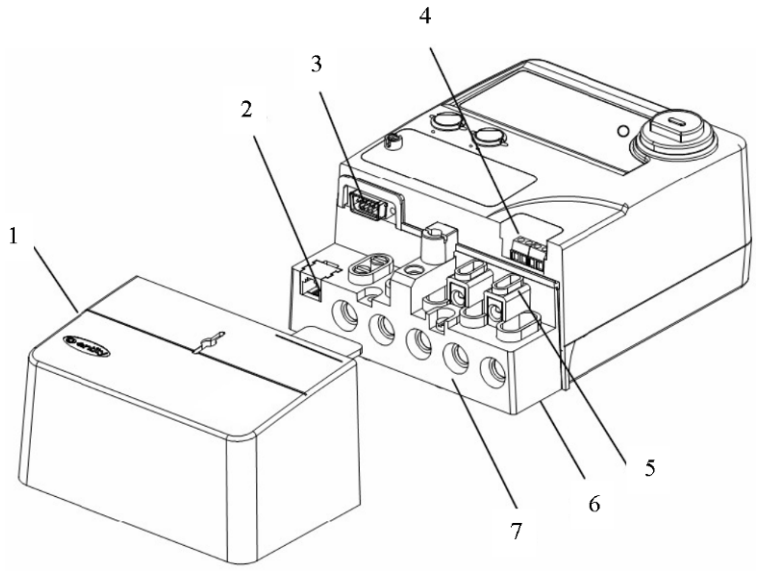


Figure 4.2-2 shows the parts of the meter

1	Terminal Cover
2	RJ11 Peripheral Socket
3	RS232 Port
4	Pulse Outputs
5	Not Used
6	Terminal Block
7	Mains Terminals

The approx. dimensions of the meter are 144(W) x 242(H) x 88(D) (mm).

Meter dimensions are shown in Figure 4.2-3.

A drilling template for the i-Credit 400 can be found at the end of this document.

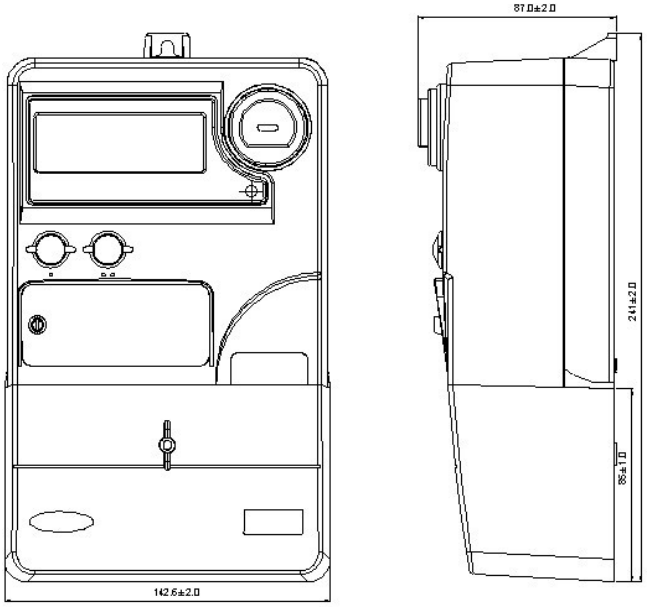


Figure 4.2-3 Meter Dimensions

4.2.3 Terminal Arrangement

A wiring schematic for the PRS meter is shown in Figure 4.2-4.

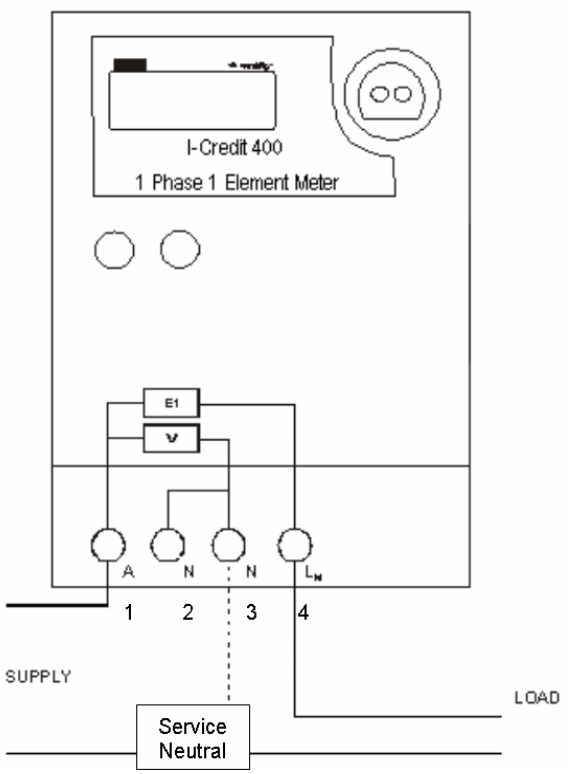


Figure 4.2-4 i-Credit 400 meter wiring schematic

- V is the voltage sensor
- E1 is the sensor for Element 1
- Terminal 1 is the Active Line connection
- Terminal 2 is the Neutral connection (use Terminal 3 for neutral)
- Terminal 3 is the preferred neutral connection
- Terminal 4 is the load terminal (100A max.)

4.2.4 Meter Wiring

Wiring the meter is performed in the standard manner, however in some circumstances, communication equipment may be connected to the serial port. See Figure 4.2-5 below.

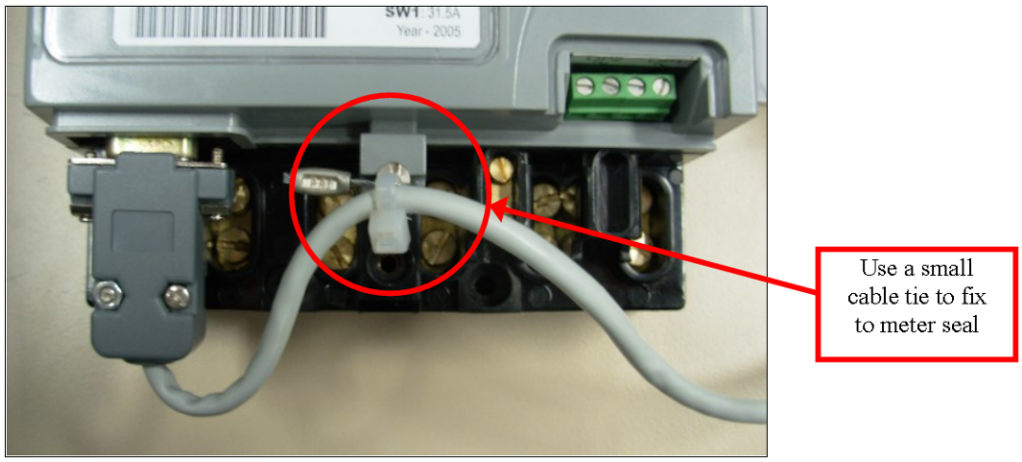


Figure 4.2-5 RS232 connection

4.2.5 Available Programs

The i-Credit 400 is programmed with a program structure 19 or structure 21. Structure 19 is for the standard scenario in which the customer uses energy. Structure 21 is for the scenario where the customer uses energy and also produces energy. Structure 21 therefore shows counters for the import of energy as well as export. The structure that the meter is programmed with is displayed on a sticker on the meter face.

4.2.6 Display

The electronic display for i-Credit 400 meter is shown in Figure 4.2-6.

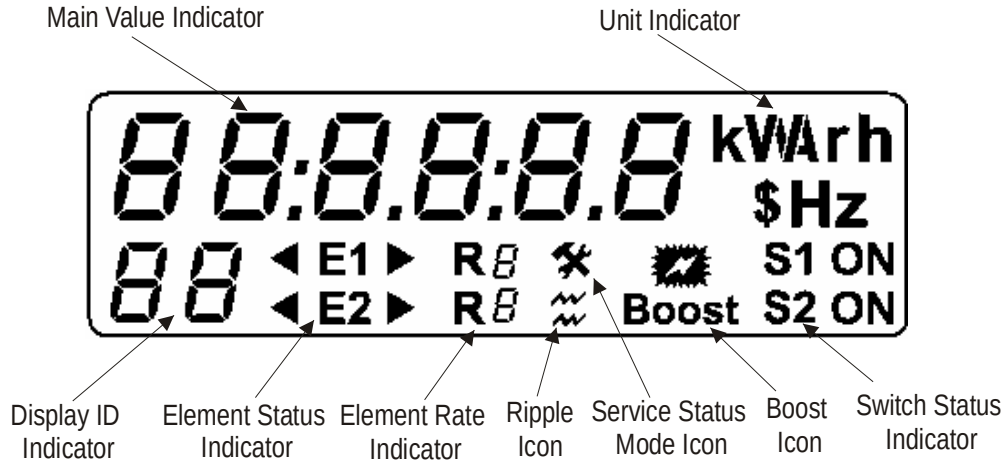


Figure 4.2-6 i-Credit 400 meter display

4.2.7 Main Display

The i-Credit 400 is programmed with a program structure 19 or structure 21. The registers it has been programmed to display are shown in Table 4.2-1 or Table 4.2-2.

Structure 19			
Reg	**Description**	**Dials**	**Dec**
88	Display Test (888888)	6	0
01	Date (dd:mm:yy)	n/a	n/a
02	Time (hh:mm:ss)	n/a	n/a
03	Total cumulative kWh	5	1

Table 4.2-1Standard (Structure 19) Register Display

Structure 21			
Reg	**Description**	**Dials**	**Dec**
88	Display Test (888888)	6	0
01	Date (dd:mm:yy)	n/a	n/a
02	Time (hh:mm:ss)	n/a	n/a
03	Total cumulative (Import) kWh	5	1
93	Total cumulative (Export) kWh	5	1

Table 4.2-2 Buy Back (Structure 21) Register Display

Please note, the Time of Use tariffs will be calculated from the load profile data that the MDA will download from the meter.

4.2.8 I-Credit 400 Self Diagnostic Features and Warnings

The following icon on the meter display provides indication of a problem in the meter:

Service Status Mode Icon  Illuminated when meter status is bad such as Real Time Clock failure etc. See example screen.

If the Service Status Mode Icon is showing the meter needs servicing. Contact Ausgrid.

The following warning messages should also be reported to Ausgrid.

Displayed when Battery is low.

The LED will only flash when a forward current is detected. The LED will not light up when a reverse current is detected. The easiest way to identify if a reverse current is occurring is to examine the LCD display of the meter. If the current is flowing correctly, an arrow to the right of the E1 will be flashing. If the meter is detecting reverse current, an arrow to the left of the E1 will be flashing. This is shown in Table 1.4

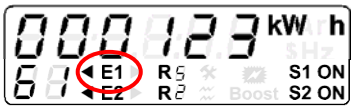
Reverse energy detected	
Correct energy detected	

Table 4.2-3 Forward and Reverse energy indicators

4.2.9 Button Operation

This section describes the functions of the button operation on i-Credit-400 Single Phase meters.

There are two buttons provided on the meter however the left button should be sealed and only used by Ausgrid personnel.

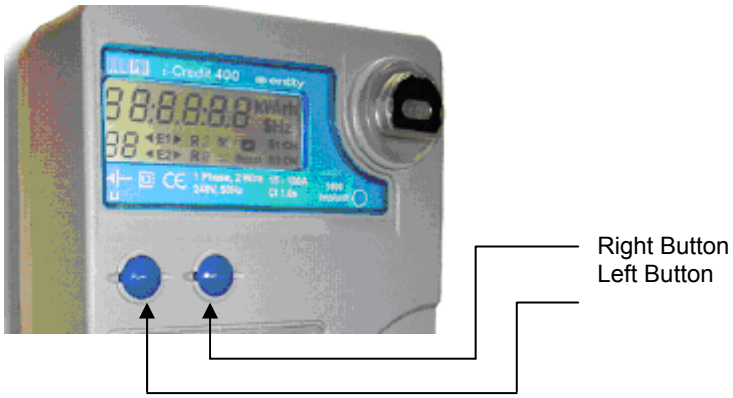


Figure 4.2-7 Meter Buttons

Normal mode

In normal mode standard and alternate display are available via the push buttons. Pushing the right button will advance to the next display item.

4.2.10 Meter Wiring Check and Commissioning

The following steps are to be followed for correct wiring and operation of the meter:

1.	Inspection	Visually inspect the connections to ensure the correct wire is connected to the correct terminal of the meter.
2.	Phase Check	When a voltage is applied, the meter will turn on and the display can be read.
3.	"Reverse Energy" check	Attach the Load Tester to the meter. Check for "Reverse Energy" prior to re-connection of the customer load. This is where the Active and Load lines have been swapped. Reverse energy is indicated by the"◄" symbol on the left side of the E1 indicator at the bottom of the display. If a "Reverse Energy" situation does occur, this error must be rectified immediately. After rechecking the wiring, the display should be checked to ensure the presence of the flashing "►" symbol.
4.	Operation check	Check the pulsing LED output on the front of the meter. The consumption indicator LED will flash at a rate of 1600 pulses per kilowatt-hour measured and should flash proportionally to the load connected via the Load Tester.
5.	Date/Time check	Check date and time and confirm. Note the format Day, Month, Year (DD:MM:YY)
6.	Initial check	Check the meter display. The meter should be in auto scroll mode.
7.	Connect load	Connect customer load. The symbol "►" should be displayed if there is consumption.
8.	Finish installation	Seal the terminal cover.

4.2.11 Sealing of Meter

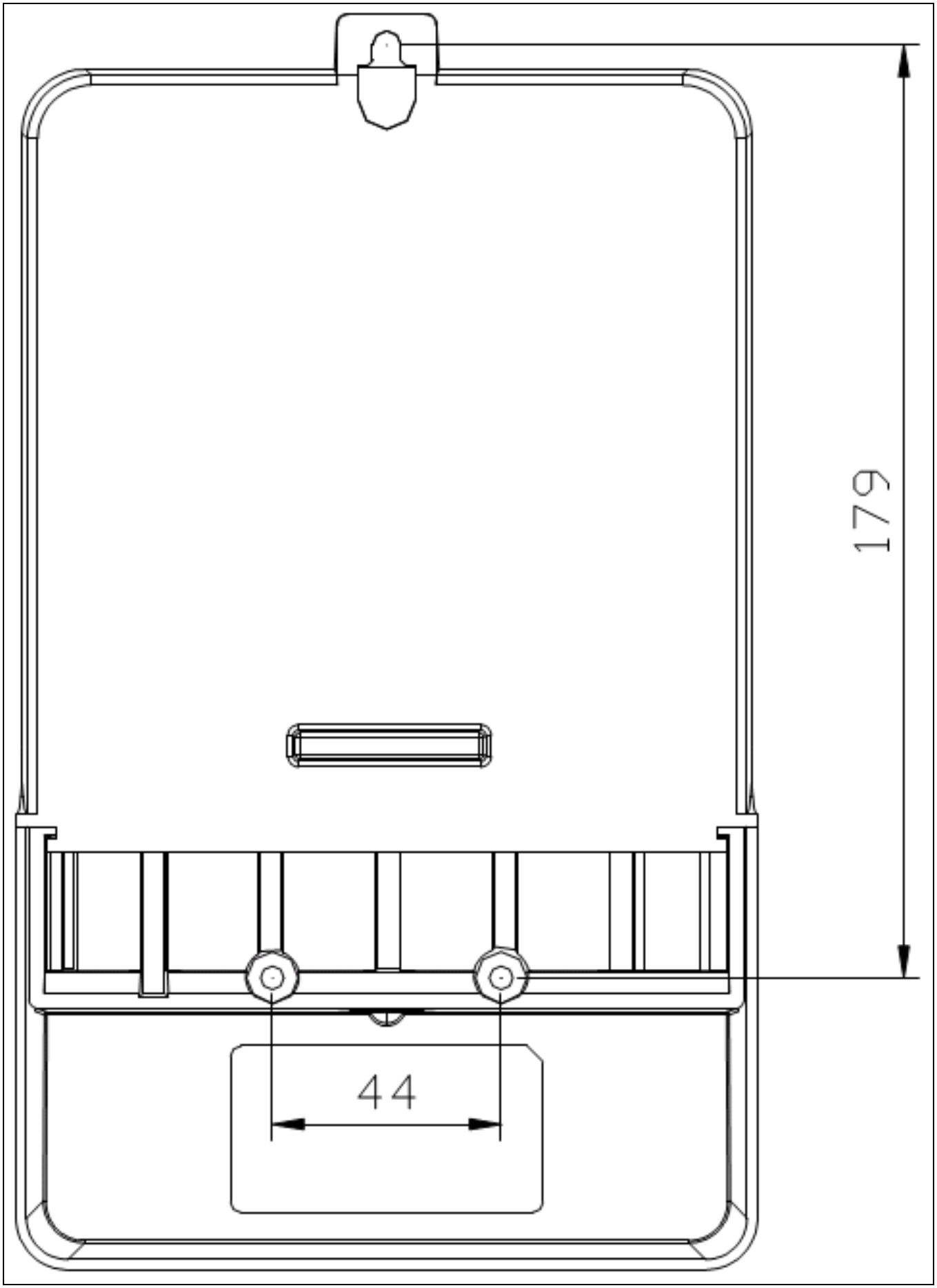
The i-Credit 400 Meter is supplied with 4 seals.

- To prevent opening the meter enclosure situated under the terminal cover.
- To prevent opening the terminal cover situated on the terminal cover.
- To prevent opening of the slot for the optional external battery and the Ausgrid label.
- To prevent using the Left button.

The meter enclosure seal should never be broken. Other seals, if broken, must be re-sealed, preferably with two turns of nylon seal as shown in Figure 4.2-8

Figure 4.2-8 Sealing the Left button

4.2.12 Drilling Template PRS



4.3 EEL EDMI Mk7C E1 METER

The EEL meter is an electronic, multifunctional, programmable, single phase, Whole Current (10-100 A) 230V meter.

Figure 4.3-1: EEL meter front view

- Single Phase, single element whole current meter
- Type 4, 5 and 6 compliant (NER V38)
- Class 1 Wh accuracy
- Class 2 VArh accuracy
- Enhanced processor
- Four Quadrant energy measurement (suitable for bi-directional embedded generation applications)
- Advanced Power Quality measurements
- Nominal current 10A, Max current 100A
- Operating voltage 230V
- Bottom connected
- ANSI optical port
- Active Dual RS-232 Port (Single RJ45)
- Load profile recording
- Internal battery
- 2 LED
- 3 Active inputs (12V)
- 1 Output

4.3.1 Application

The meter has a property number prefix beginning with EEL. This meter is a further development of the EDMI Mk7C family and is positioned to replace the EEM meter where similar functionality is required.

The EEL meter meets NER V38 accuracy requirements for type 4, 5 and 6 installations, and can be used in domestic, commercial and small industrial metering application that require an E1 configuration. Table 4.3-2 provides details on available meter programs. Load profiles are stored in non-volatile memory within the meter and downloaded by the Meter Data Agency (MDA) for billing and statistical purposes.

Please note that the meter will operate on Australian Eastern Standard Time (AEST) – there will be no change in time due to daylight savings.

4.3.2 Meter Dimensions

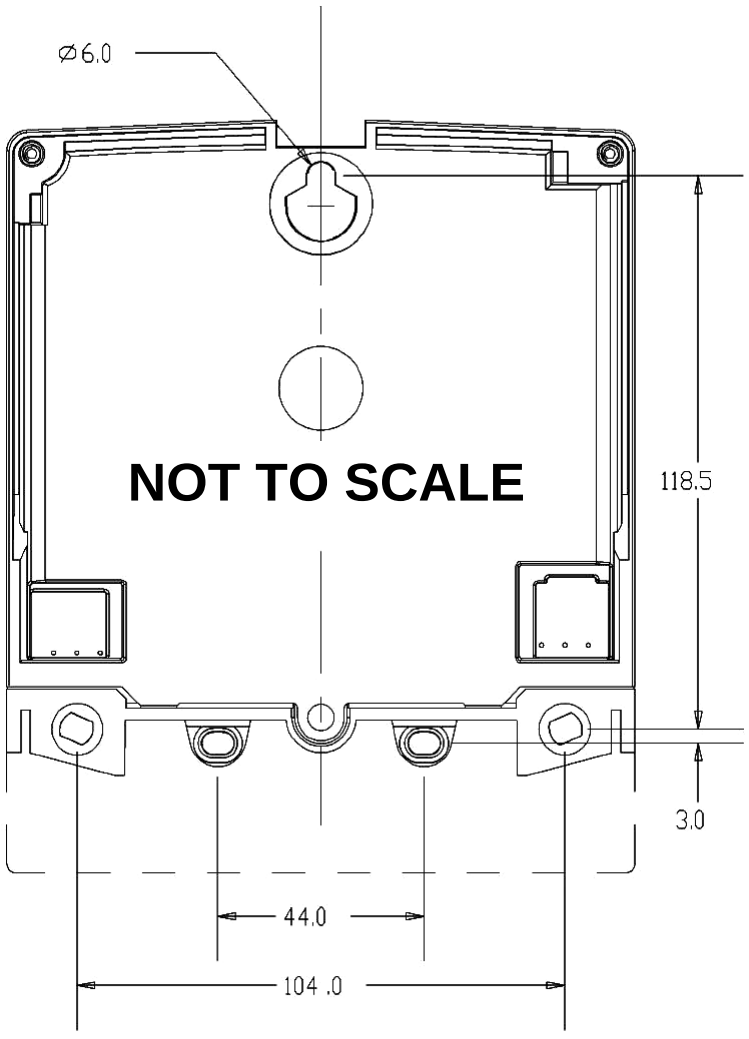


Figure 4.3-2: EEL Mounting Diagram

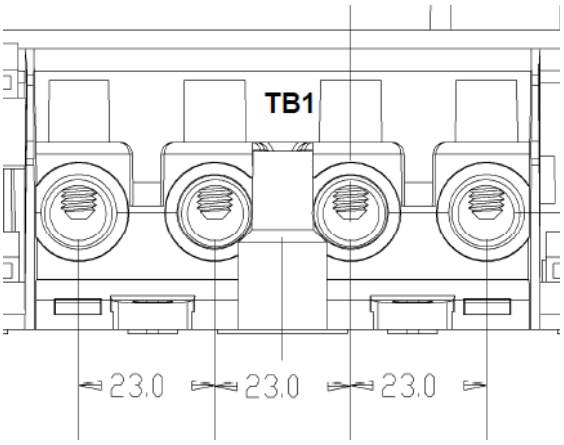


Figure 4.3-3: EEL Main Terminal Spacing

The dimensions of the meter:

Height with standard terminal cover: 164mm, Width: 134mm, Depth: 59mm. An extended cover is available for use with an underscoop modem.

The dimensions for mounting are shown in Figure 4.3-2.

4.3.3 Meter Appearance

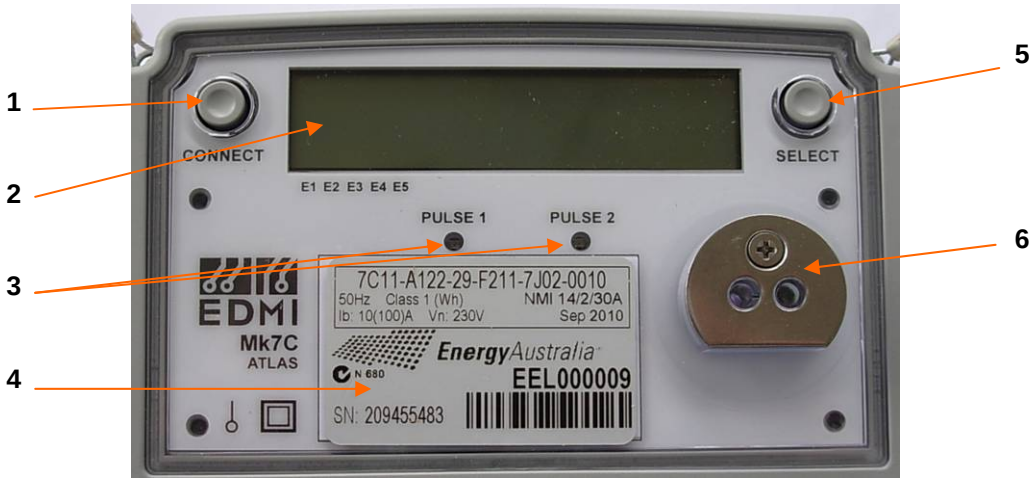


Figure 4.3-4: EEL Appearance

Main parts visible on the front EEL meter include:

1. Connect button disabled.
2. LCD display shows information in sequence.
3. Two pulsing LEDs. See Table 4.3-5 for information on the meaning of these LEDs.
4. Meter label provides meter specific information including the meter serial number.
5. Select button moves display to next register.
6. ANSI port provides local optical connectivity for meter reprogramming and other service work.

4.3.4 Terminal arrangement

Figure 4.3-5 EEL meter terminals

Under the terminal cover are the terminals for voltage and current, connectors for auxiliary contacts and an optional communication interface socket. The terminal cover is attached with a sealable screw which have 2mm diameter hole to accommodate sealing wire.

Cable connections to the meter are made under the terminal cover. Figure 4.3-5 shows the terminals available in EEL meter and their location.

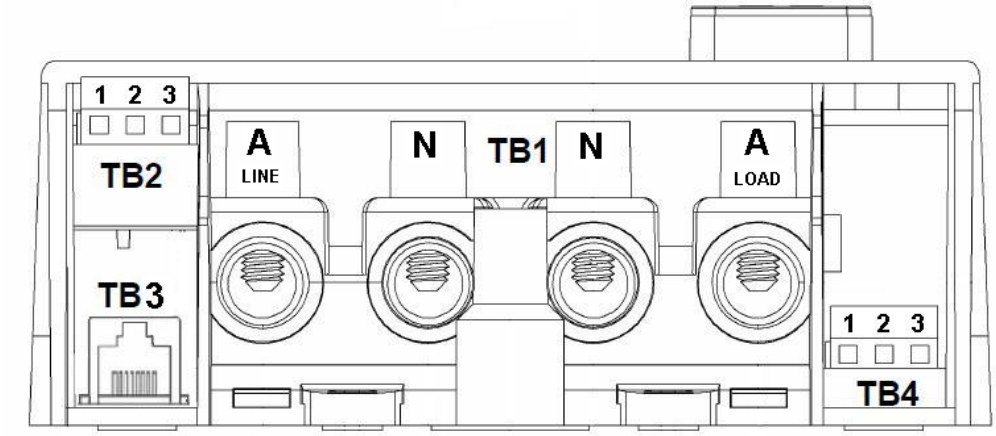


Figure 4.3-6: EEL terminal block diagram

Terminal	Description
TB1	Main terminals. **A**ctive. **N**eutral.
TB2	Auxiliary contacts. Refer to Ausgrid for information
TB3	Communication port. Refer to Ausgrid for information
TB4	Auxiliary contacts. Refer to Ausgrid for information

Table 4.3-1: Terminal description

ES3 Part1 and NSW Service and Installation Rules provide information on metering structure selection and corresponding wiring arrangements for Main Terminals in a particular application.

Note that although two neutral terminals are provided on the meter, the preferred practice is to connect to only the right hand Neutral terminal.

4.3.5 Available programs

Programs	Interval	Structure	Application
9019	30	19	MRIM, PQ
9619	30	19	MRIM, 2G COMMS, PQ
1821	30	21	Net Solar Buy Back, PQ
2321	30	21	Net Solar Buy Back, 2G COMMS, PQ
1425	30	25	Gross Solar Buy Back, PQ
2325	30	25	Gross Solar Buy Back, COMMS, PQ

Table 4.3-2: Available programs for EEL meter

Screws for mounting can be up to 5mm in diameter with screw head at least 8mm. The top mounting hole can be extended using the optional clip which allows a screw to be inserted after the meter is placed on the wall.

4.3.6 Finger Guard

A finger guard is fitted over the top of main terminals to protect from accidental contact with live terminals. The Finger guard must be removed to gain access to the main terminal screws by pressing inwards on to the clip in the centre of the guard as shown in Figure 4.3-7. *Make sure the finger guard is reinstated after the connections are made.*

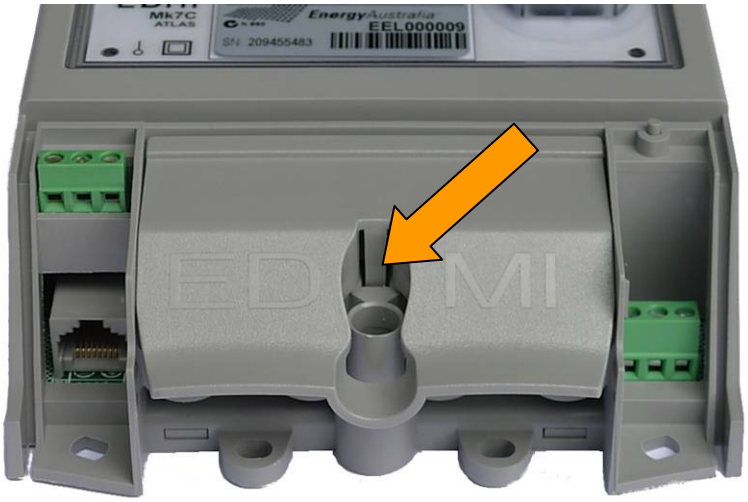


Figure 4.3-7: Finger guard fitted

4.3.7 Display

The display shows information from the meter and can be useful during installation and troubleshooting. Meter is programmed to cycle through main set of displays including test display which used to verify that all elements of the display are operating correctly (Figure 6.1-9).

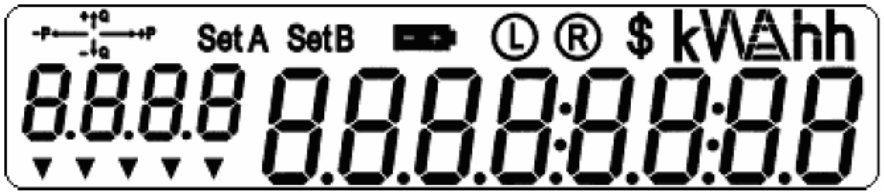


Figure 4.3-8: EEL display

As the LCD is a numeric type, alphabetic characters are difficult to display. The meter will attempt to display them as best as possible, but readability will vary depending on the letter. If the information to display is longer than 8 characters the information will scroll to show the entire line with underscore "_" showing the start of the line.

The Meter display has following main areas:

8.8.8.8:8.8:8.8 - 8 seven segment digits on the right to display values.

8.8.8.8 - 4 seven segment digits on the left to display description and register ID of values shown in the 8 segment section.

- Indicates direction of energy flow for Watts (P) and Vars (Q). A plus sign indicates positive flow (energy consumed by a customer), while a minus sign indicates negative flow (energy generated by a customer).

- Low battery indicator.

Ⓛ® - Shows active Local or Remote communication session.

kWAhh - Displays the units and multiplier for values where applicable.

SetA SetB - Indicates current active set of displays.

▼ ▼ ▼ ▼ - Enunciators represent various meter conditions. Refer to Alarms section for details.

$ - Not Used

The energy direction, battery and communication status indicators appear independently of what data is being displayed.

4.3.8 Buttons and Scrolling

The data is displayed as a series of pages with each page displaying an individual value record from the meter on the main seven segment display along with an associated display identifier on the small seven segment display. The meter is programmed to scroll through the displays automatically. The scroll button will force progress to the next page each time the button is pressed. The display then will remain on the selected page for an extended period of time before reverting back to regular cycling.

There are two display sets in the meter: Set A and Set B. Only pages from the currently selected display set are shown in the cycle. To change between sets, press and hold the Select button for 2 seconds. Set A shows the structure information currently in the meter, see Table 4.3-3 for details.

Set B has additional information on the meter status, see Table 4.3-4 for details. The display will be automatically reverted back to Set A after 2 minutes.

The Connect button has no function assigned.

4.3.9 Meter Display Scroll

Meter Register Structure 19 (9019 & 9619)				
Reg	**Display**	**Description**	**Dials**	**Dec**
	8888	Display Test		
01	01	Date (DD.MM.YYYY)		
02	02	Time (HH:MM:SS)		
03	03	Total cumulative kWh consumed	6	1

Meter Register Structure 21 (1821 & 2321)				
Reg	**Display**	**Description**	**Dials**	**Dec**
	8888	Display Test		
01	01	Date (DD.MM.YYYY)		
02	02	Time (HH:MM:SS)		
03	03	Total cumulative kWh consumed	6	1
93	93	Total cumulative kWh generated	6	1

Meter Register Structure 25 (1425, 2325)				
Reg	**Display**	**Description**	**Dials**	**Dec**
	8888	Display Test		
01	01	Date (DD.MM.YYYY)		
02	02	Time (HH:MM:SS)		
73	73	Total cumulative kWh generated	6	1
83	83	Total cumulative kWh consumed	6	1

Table 4.3-3: Set A Display Descriptions

Default Set B Display	
Display	**Description**
Str	Electronic program ID
EAId	Plant number (Meter ID)
SEr	Serial Number
vEr	Firmware version
SIGn	Modem Signal strength (0-31)
voL	Voltage (V)
Cur	Current (A)
AnG	Phase Angle
C AL	Current Alarms
L AL	Latched Alarms
P on	Last Power ON Time/Date
PoFF	Last Power Loss Time/Date
IΠP or RVRS	Total cumulative kWh generated (9019, 9619, 5611)

Table 4.3-4: Set B Display Descriptions

4.3.10 LED Indicators

There are two LEDs located on a front panel of the meter, labelled “Pulse 1” and “Pulse 2”. They are programmed to pulse with a 10ms active time. Table 4.3-5 shows the LED outputs assignment.

Program (9019, 9619, 1821, 2321)		
Output	**Function**	**Rate**
Pulse 1	Wh consumed	1 Pulse/Wh
Pulse 2	Wh generated	1 Pulse/Wh

Program (1425,2325,4722)		
Output	**Function**	**Rate**
Pulse 1	Absolute Wh	1 Pulse/Wh
Pulse 2	Absolute varh	1 Pulse/varh

Program (5611)		
Output	**Function**	**Rate**
Pulse 1	Wh consumed	1 Pulse/Wh
Pulse 2	Absolute varh	1 Pulse/varh

Table 4.3-5: LED Assignments

4.3.11 Alarms

During operation the meter monitors a number of parameters. If an event occurs that is outside preset value an individual alarm is raised to indicate the status of the meter. The presence of an alarm is indicated by a downward pointing arrow (▼) indication on the bottom of the display.

Alarm Indication	Description
E1	Modem power supply active (5611, 9619, 2321 only)
E2	Active alarm present
E3	Alarm event is recorded but not currently present
E4	Not Used
E5	Not Used

Table 4.3-6: EEL Enunciator description

E2 and E3 enunciators will appear on the display independently or simultaneous in the event of active or latched alarms respectively.

User can navigate to the Set B display on the meter and read dedicated register values as described in the Display section. When reading the alarm state from the display a string format is used. The alarm status is displayed as a string of characters, with each character representing an individual alarm. The register value when all alarms are present looks like “ESVFRTCMLHXYZNDU”. A full stop appears in each position when an alarm is not active. Letters always appear in the same location in the string with a full stop appearing in place of inactive alarms. For example, the display with only the reverse power alarm active will look like “…....M……..”. Table 6.1-7 below provides description of alarm conditions that can appear on the screen.

Note that an overcurrent event triggers an alarm indicator (▼) on the main display but will not have a dedicated letter displayed in an alarms register of SetB displays. Consequently, where an alarms register display does not show any letters for an alarm but alarm enunciators appear on the display, this indicates an overcurrent event. Overcurrent alarm will trigger if the current value exceeds 110A over a 2 minutes period. The meter is not designed to operate at such current values and corrective actions should be taken if the customer site operates at these load levels.

Letter	Alarm Name	Description
E	Analog Reference Failure	Meter measurement reference drift is above 50%, normally indicating an internal fault.
S		Not Used
V	Voltage Tolerance Error	The voltage level is outside 202V ÷ 276V limits where meter can not provide accurate measurements.
F	VT Failure	The supply voltage is below minimum level of 70V.
R		Not Used
T	Lid Tamper	Temper switch is released. Terminal cover is not in place or dislocated.
C	Clock Failure	The clock information is lost during a power off event. Normally caused by flat battery.
M	Reverse Power	Energy flow is negative indicating incorrect connection. (*disabled for Structure 21 and 25*)
L	Calibration Data Lost	Calibration data is lost or corrupted. Commonly caused by memory failure. Meter must be replaced.
H	Modem Failure	Meter has not got a response from the modem for some time (*where modem is installed*)
X	RAM or LCD Failure	Test is continuously performed on meter memory and LCD controller integrity. Alarm is generated when test fails.
Y	Program Memory Failure	Checksum of the program flash memory is continuously tested and any errors will trigger this alarm.
Z	Data Memory Failure	Memory read/write operation is failed.
N	Pulsing Output Overflow	The amount of energy pulses are greater then pulsing output can perform on time.
D	Battery Failure	Battery voltage is below required limit.
U		Not Used
O		Not Used

Table 4.3-7: Description of Alarms

4.3.12 Optical port

The optical port enables reading the meter via a suitable optical probe.

To set up the communication link, place the optical probe against the optical port. The D shape of the ANSI standard port correctly aligns the probe and a magnet within the probe holds the probe in contact with the steel face of the optical port.

4.3.13 Communication Port

The RS232 interface provides a serial communication link with the meter and allows direct attachment of a communications device via the RJ45 socket. Refer to Ausgrid for further information.

4.3.14 Pulsing Outputs / Inputs

There are a number of auxiliary connections located besides main terminals under the terminal cover which are used to interface with external devices. Refer to Ausgrid for further information.

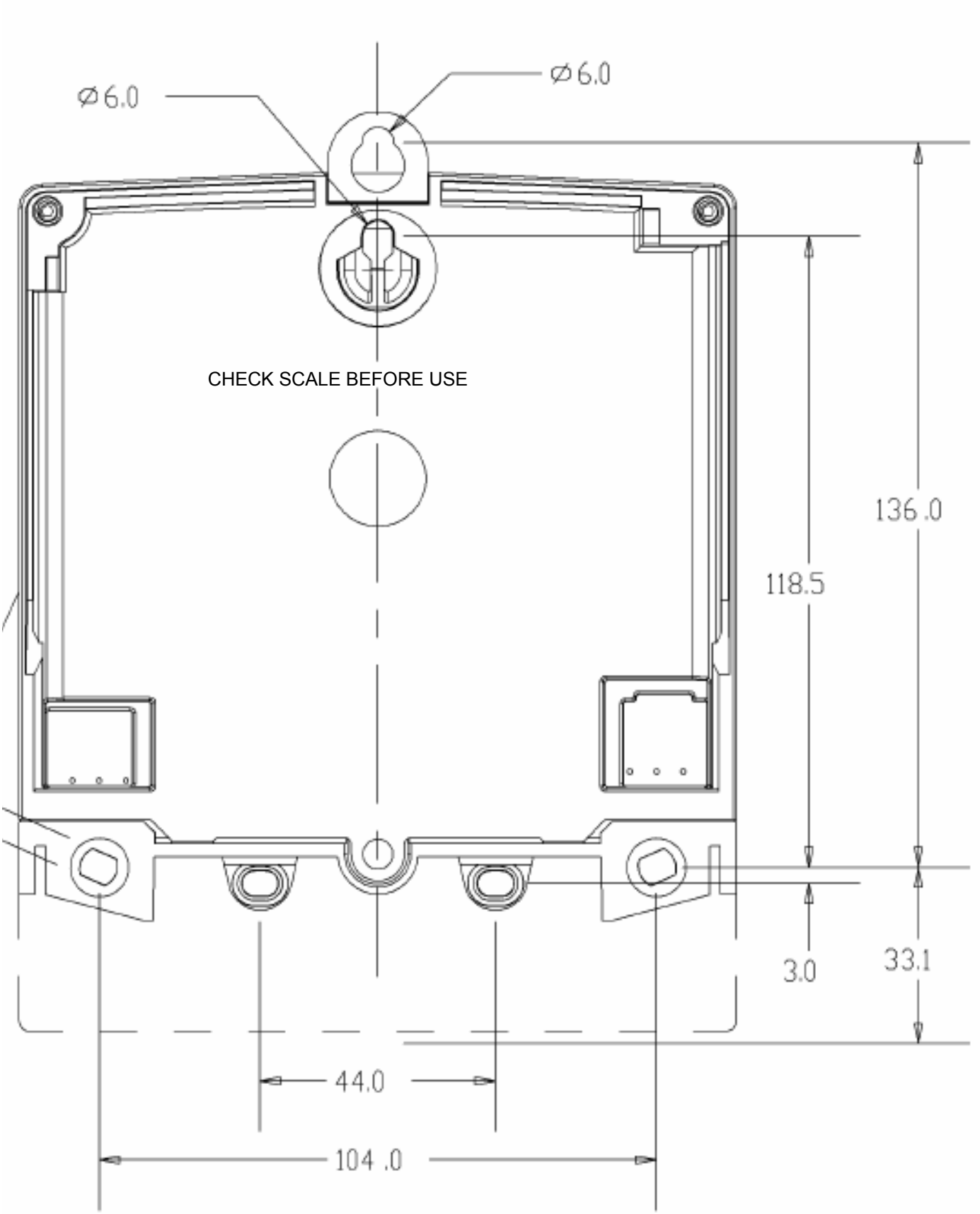
4.3.15 Meter Seals

The meter is sealed by the manufacturer at the factory. The seals are located on each top corner of the main meter body. The seal ensures that the meter has not been tampered or interfered with by unauthorized parties. Please ensure that the meter seal is in place and intact. According to the National Measurements Act, it is a criminal offence to remove or tamper with the meter seal. DO NOT install a meter without a seal or if the seal has been tampered with.

Fit a seal to the terminal cover (meter scoop) through the central screw at the completion of the installation.

The meter is not designed to be serviced in a field and has no user replaceable parts. There are no internal fuses. In the event of failure of the meter contact Ausgrid for assistance.

4.3.16 Meter Dimensions and mounting diagram:



4.4 ECA EDMI Mk7C E1c METER

The ECA meter is an electronic, multifunctional, programmable, single phase, Whole Current (10-100 A) 240V communications-capable meter with internal 100A disconnect relay.

Figure 4.4-1: ECA meter front view

- Class 1 Wh accuracy / Class 2 varh accuracy
- Four Quadrant energy measurement (suitable for bi-directional embedded generation applications)
- Advanced Power Quality measurements
- Base current 10A, Max current 100A
- Front connected
- Load Profiling
- Pulsing outputs

4.4.1 Application

The Property Number prefix is ECA. This meter is functionally similar to EEL prefix meters except for the inclusion of the 100A disconnect relay and changes to pulsing outputs. These functions are not utilised when the meter is installed at a Type 5 installation.

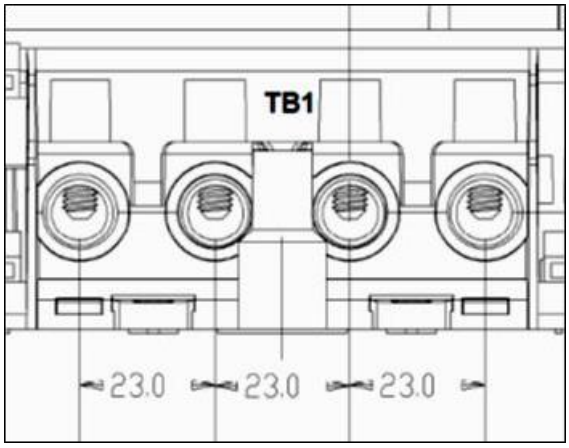
The meter can be used in domestic and non-domestic metering applications that require the E1 configuration.

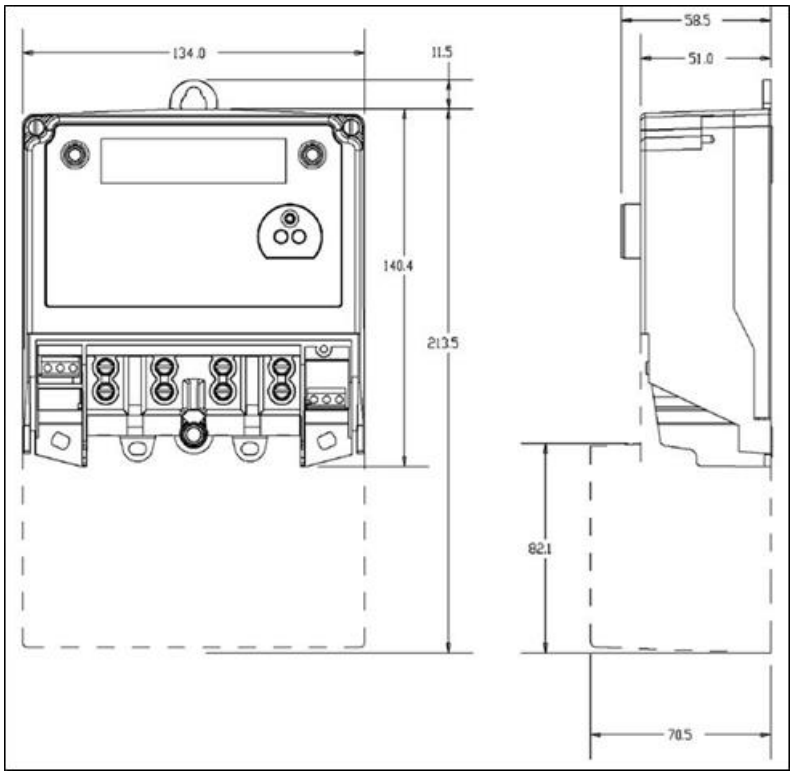
The meter is supplied with an extended terminal cover to accommodate the future installation of communications equipment.

4.4.2 Available Programs for ECA Meters

Programs	Interval	Structure	Application
0160	30	60 (Equivalent Str 19)	Consumption Only (MRIM)
0161	30	61 (Equivalent Str 21)	Embedded Generation (MRIM)

4.4.1 Mounting Dimensions



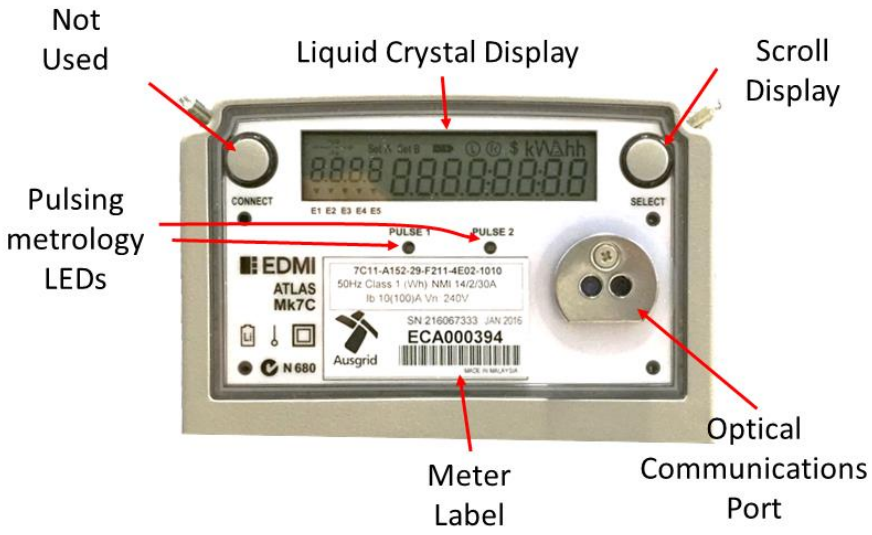


Overall height is 214mm, width 134mm and depth 70mm

Fasteners may be up to 5mm in diameter but require a head diameter minimum of 8mm. The top, blind mounting hook can be extended using the optional clip which extends hook above top of meter.

Refer to the drilling template of the EEL in the previous section (identical templates).

4.4.2 Meter Appearance



4.4.3 Terminal Arrangement

Terminal	Description
TB1	**Main terminals: Line / Neutral / Neutral / Load**
TB2	TB2-1 S0 Output (+) [Positive] TB2-2 S0 Output (+) [Positive] TB2-3 Common (-) [Negative]
TB3	Dual active RS-232 port with RJ45 connector
TB4	TB4-1 S0 Output (+) [Positive] TB4-2 S0 Output (+) [Positive] TB4-3 Common (-) [Negative]

The terminal cover is attached with a sealable screw which has a 2mm diameter hole to accommodate the seal.

Although two neutral terminals are provided on the meter, the convention is to connet only the right-hand-side neutral terminal.

For Type 5 metering installations, only TB1 is generally used.

A finger guard is fitted over the top of main terminals to protect from accidental contact with hazardous voltages terminals. The finger guard must be removed to gain access to the main terminal screws.

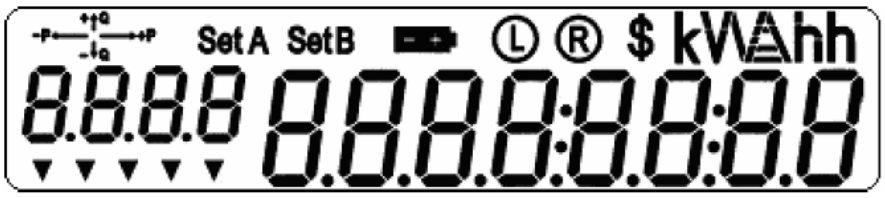
The finger guard must be reinstated after conductors are securely terminated

The meter is equipped with terminal cover tamper detection. Removing the terminal cover will release a switch located at the top right corner under the terminal cover, which generates an internal meter alarm.

If the tamper alarm remains active with the terminal cover closed, ensure the terminal cover is positioned correctly and fully secured in place.

4.4.4 Display

The display shows information from the meter and can be useful during installation and troubleshooting. The meter is programmed to cycle through main set of displays including test display which used to verify that all elements of the display are operating correctly.

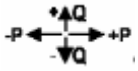


As the LCD is a numeric type, alphabetic characters are difficult to display. The meter will attempt to display them as best as possible, but readability will vary depending on the letter. If the information to display is longer than 8 characters the information will scroll to show the entire line with underscore "_" showing the start of the line.

The Meter display has following main areas:

 - 8 seven segment digits on the right to display values.

 - 4 seven segment digits on the left to display description and register ID of values shown in the 8 segment section.



- Indicates direction of energy flow for Watts (P) and vars (Q). A plus sign indicates positive flow (energy consumed by a customer), while a minus sign indicates negative flow (energy generated by a customer).

 - Low battery indicator.

 - Shows active Local or Remote communication session.

kWΔhh - Displays the units and multiplier for values where applicable.

SetA SetB - Indicates current active set of displays.

 - Enunciators represent various meter conditions. Refer to Alarms section for details.

Note: The E4 enunciator is used to represent the main load contactor closed state. It should normally be on

$ - Not Used

The energy direction, battery and communication status indicators appear independently of what data is being displayed.

4.4.1 Buttons and Scrolling

The data is displayed as a series of pages with each page displaying an individual value record from the meter on the main seven segment display along with an associated display identifier on the small seven segment display. The meter is programmed to scroll through the displays automatically. The scroll button will force progress to the next page each time the button is pressed. The display then will remain on the selected page for an extended period of time before reverting back to regular cycling.

There are two display sets in the meter: Set A and Set B. Only pages from the currently selected display set are shown in the cycle. To change between sets, press and hold the Select button for 2 seconds. Set A shows the structure information currently in the meter. Set B has additional information on the meter status. The display will be automatically reverted back to Set A after 2 minutes.

4.4.2 Structure Cards

Structure 60 (0160)				
Reg	**Display**	**Description**	**Dials**	**Dec**
	8888	Display Test		
01	01	Date (DD.MM.YYYY)		
02	02	Time (HH:MM:SS)		
03	03	Total cumulative kWh consumed	6	1

Structure 61 (0161)				
Reg	**Display**	**Description**	**Dials**	**Dec**
	8888	Display Test		
01	01	Date (DD.MM.YYYY)		
02	02	Time (HH:MM:SS)		
03	03	Total cumulative kWh consumed	6	1
93	93	Total cumulative kWh generated	6	1

Default Set B Display	
Display	**Description**
I∩P	Total cumulative kWh generated
Cur	Current (A)
voL	Voltage (V)
AnG	Phase Angle
C AL	Current Alarms
L AL	Latched Alarms
ProG	Miscellaneous String
Id	Customer Plant number (Meter ID)
Sn	Serial Number
SoFt	Software version number
boot	Boot Loader Revision Number
bAtt	Battery Voltage
Lon	Last Power ON Time/Date
LoFF	Last Power Loss Time/Date
P on	Total run time Ever
PoFF	Total OFF time Ever
FrEq	Frequency
tot	Active Power Total
tot	Reactive Power Total

4.4.1 LED Indicators

There are two LEDs located on a front panel of the meter, labelled “Pulse 1” and “Pulse 2”. They are programmed to pulse with a 35ms active time and no less than 35ms inactive time. Table 7 shows the LED outputs assignment.

Program (All programs)		
Output	**Function**	**Rate**
Pulse 1	Absolute Wh	1 Pulse/Wh
Pulse 2	Absolute varh	1 Pulse/varh

Pulse ON time	**Pulse OFF time (min)**	**LED constant (where appropriate)**	**Electrical o/p Pulse constant**
35 ms	35 ms	1 Wh / pulse 1 varh / pulse	1 Wh / pulse 1 varh / pulse

4.4.1 Alarms

During operation the meter monitors a number of parameters. If an event occurs that is outside pre-set value an individual alarm is raised to indicate the status of the meter. The presence of an alarm is indicated by a downward pointing arrow (▼) indication on the bottom of the display.

Alarm Indication	Description
E1	Modem power supply active
E2	EFA Active alarm present
E3	EFA Latched Alarm
E4	Main Relay state (Solid ON when Main Contactor is closed)
E5	Not used

E2 and E3 enunciators will appear on the display independently or simultaneous in the event of active or latched alarms respectively.

Note: The E4 enunciator is used to represent the main load contactor closed state. It should normally be on

A user can navigate to the Set B display on the meter and read dedicated register values as described in the Display section. When reading the alarm state from the display a string format is used. The alarm status is displayed as a string of characters, with each character representing an individual alarm. The register value when all alarms are present looks like “ESVFRTCMLHXYZNDU”. A full stop appears in each position when an alarm is not active. Letters always appear in the same location in the string with a full stop appearing in place of inactive alarms. For example, the display with only the reverse power alarm active will look like “…....M……..”. Table 11 below provides description of alarm conditions that can appear on the screen.

Letter	Alarm Name	Description
E	Analog Reference Failure	Meter measurement reference drift is above 50%, normally indicating an internal fault.
S	Neutral current mismatch	Not Used
V	Voltage Tolerance Error	The voltage level is outside 216V - 273.6V limits where meter cannot provide accurate measurements.
F	VT Failure	The supply voltage is below minimum level of 72V.
T	Lid Tamper	Temper switch is released. Terminal cover is not in place or dislocated.
C	Clock Failure	The clock information is lost during a power off event. Normally caused by flat battery.
M	Reverse Power	Energy flow is negative indicating incorrect connection. (*disabled for Structure 22 and 61*)
L	Calibration Data Lost	Calibration data is lost or corrupted. Commonly caused by memory failure. Meter must be replaced.
H	Modem Failure	Not Used
X	RAM or LCD Failure	Test is continuously performed on meter memory and LCD controller integrity. Alarm is generated when test fails.
Y	Program Memory Failure	Checksum of the program flash memory is continuously tested and any errors will trigger this alarm.
Z	Data Memory Failure	Memory read/write operation is failed.
N	Pulsing Output Overflow	The amount of energy pulses is greater than pulsing output can perform on time.
D	Battery Failure	Battery voltage is below required limit.
U	Magnetic Tamper	Not Used
O	Overcurrent	100A Current for greater than 60 sec

4.4.1 Meter Seals

The meter is sealed by the manufacturer at the factory. The seals are located on each top corner of the main meter body. The seal ensures that the meter has not been tampered or interfered with by unauthorised parties. Please ensure that the meter seal is in place and intact. According to the National Measurements Act, it is a criminal offence to remove or tamper with the meter seal. DO NOT install a meter if the seals are not intact.

Fit a seal to the terminal cover (meter scoop) through the central screw at the completion of the installation process.

4.4.2 Commissioning

The following steps are to be followed for correct wiring and operation of the meter:

1. Inspection	Visually inspect the connection to ensure the correct wire is connected to the correct terminals of the meter. Ensure the Meter main seal is not broken.
2. Power check	When a voltage is applied, the meter will turn on and the display can be read.
3. "Energy Direction" check	Attach the Load Tester to the meter Check for "Energy Direction" prior to re-connection of the customer load. With a test load connected, the display should be checked to ensure the presence of the "⟶ "symbol. If the Active and Load line have been swapped, reverse energy is indicated by the"⟵ " symbol at the top left of the display. For the non-bi-directional structures, there will also be a warning code **M** is displayed on the LCD in the Set B display against 'CUR ALA" alternately **If a "Reverse Energy" situation does occur, this error must be rectified immediately.** After correcting the wiring, the display should be checked to ensure the presence of the "⟶ "symbol.
4. Operation check	Check the pulsing LED output on the front of the meter. The consumption indicator LED (Pulse 1) will flash at a rate of one pulse per 1 Wh measured and should flash proportionally to the load connected via the Load Tester.
5. Date/Time check	Check date and time and confirm.
6. Initial check	Check the meter display. The meter should be in auto scroll mode.
7. Connect load	Connect customer load. Pulse LED should flash if there is consumption. *Note Net or Gross Metering may see reverse energy flow if the site generator is operating.*
8. Clear meter alarms	Check for and clear meter alarm enunciators
9. Finish installation	Seal the meter scoop.

The meter is not designed to be serviced in a field and has no user replaceable parts. There are no internal fuses. In the event of failure of the meter contact Ausgrid for assistance.

5 E2 - Single Phase Interval (Time of Use) Meters with Controlled Load

The type/brand of electronic (E2) meter may be liable to change in the future as Ausgrid may enter alternative future supply contracts for meters.

5.1 PRT PRI I-credit 400 Electronic Meter

The **PRT** I-Credit 400 is a single phase dual element electronic meter (type 5 code compliant). The meter has the prefix PRT, and the default structure is 2620. A buyback structure is also available, as shown in the table below:

Meter Applications	Meter Prefix	Meter Programs	Description
Types 4,5	PRT	2620	Standard structure
Types 4,5	PRT	0123	Buyback

Features of the **i-Credit 400** electronic meter are:

- Electronic, single phase, dual element, whole current meter
- 100 Amperes Element 1
- 25 Amperes Element 2 Controlled
- 100 Amperes Element 2 Uncontrolled. 100 Amperes maximum rating for the whole meter (Elements 1 and 2 combined)
- Bottom connected
- ANSI Optical and RS-232 ports for communication
- Class 1 accuracy
- Load profile recording
- Programmable (by Ausgrid) for off-peak load control (ripple or time switch operation)
- Ability to record buy back energy. To enable this function the meter must be specifically requested and programmed prior to delivery.

5.1.1 Application

The I-Credit 400 is a type 5 code compliant meter for half hour interval metering and Time of Use tariffs with load profile recorded in 30 minute interval periods and stored in non-volatile memory in the meter.

It can be installed at installations that receive an off-peak controlled load tariff such as off-peak hot water.

The meter will be set to operate on Australian Eastern Standard Time (AEST). There will be no change in time due to daylight savings.

5.1.2 Layout of the Meter

Terminal Arrangement

A wiring schematic for i-Credit 400 meter is shown in Figure 5.1-1

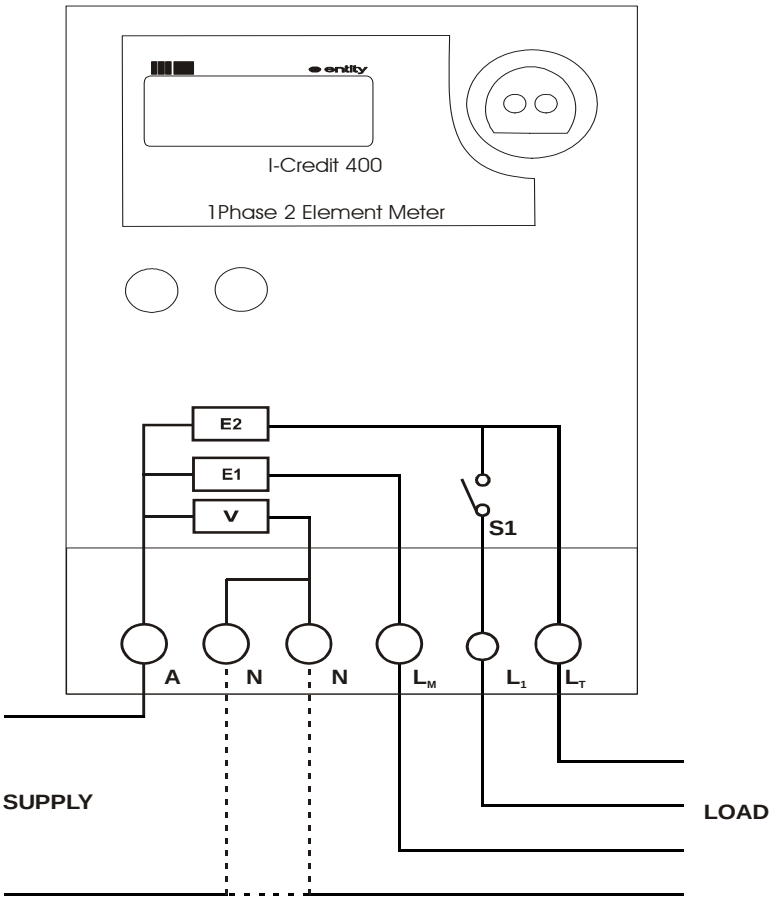


Figure 5.1-1 i-Credit 400 meter wiring schematic (configuration 210)

- Terminal 3 (N) is the preferred Neutral connection.
- Terminal Lm is for Element 1 Domestic loads (100A max.)
- Terminal Lt is for Element 2 off peak uncontrolled loads (100A max.)
- Terminal L1 (located between and just above terminals 3(N) and Lm is for Element 2 off-peak controlled loads (25A max.)

5.1.3 LED indicators

The meter uses a **Red LED Pulse indicator,** which flashes at a rate of 1600 pulses/kWh, proportional to the energy consumption.

5.1.4 LCD display

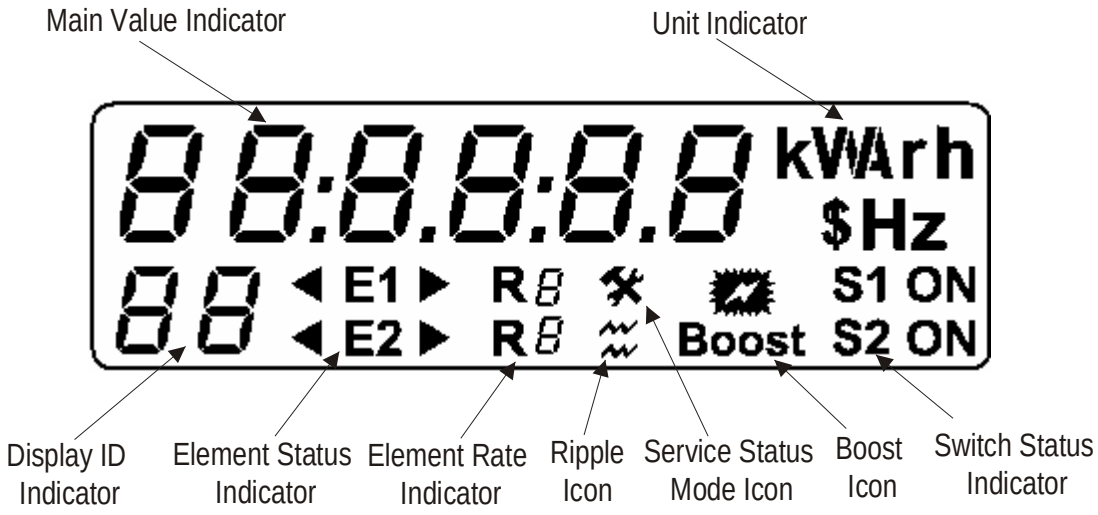


Figure 5.1-2 i-Credit 400 meter display (Note the Boost feature is not used by Ausgrid)

5.1.5 Screen Displays

The I Credit 400 is programmed with a program structure called “Structure 20”. The meter can be programmed for off-peak 1 or off-peak 2. The registers it has been programmed to display are as shown.

Structure 20 - Standard Display				
Reg	**Display**	**Dials**	**Dec**	
88	Display Test (888888)	6	0	
01	Date (ddmmyy)	6	0	
02	Time (hhmmss)	6	0	
03	Total cumulative kWh	5	1	
07	Total cumulative Off-peak 1 or Off-peak 2 kWh	5	1	
13	Time switch ON time (hhmm)	n/a	n/a	Time switch meters only
13	Time switch OFF time (hhmm)	n/a	n/a	Time switch meters only
17	Ripple master channel Id (000)	n/a	n/a	Ripple meters only
17	Ripple control channel Id (0 or 00)	n/a	n/a	Ripple meters only
20	Ripple frequency (0000)	n/a	n/a	Ripple meters only

Table 5.1-1 Standard (Structure 20) Display

The i–credit 400 meters that are programmed for time switch load control will have the programmed ON and OFF times for the switching indicated in register 13.

Note – When register 17 is displayed, the top left corner of the display indicates the function code “20”.

For Energy Buyback schemes in E2 installations, the I Credit 400 may be programmed with configuration 0123 (With this configuration, the main metering element records import and export energy, while the second element records just the Export energy taken by the Hot Water Service).

The meter can be programmed for Off-peak 1 or Off-peak 2.

The parameters shown in the display are given in the Table 2.2 below:

Structure 23 - Buy Back Meter Display				
Reg	**Display (For PRT meters with Off-peak 1 or Off-peak 2)**	**Dials**	**Dec**	
88	Display Test (888888)	6	0	
01	Date (ddmmyy)	6	0	
02	Time (hhmmss)	6	0	
03	Import Total cumulative kWh	5	1	
93	Export Total cumulative kWh	5	1	
07	Total cumulative Off-peak 1 or Off-peak 2 kWh	5	1	
13 (1)	Time switch ON time (hhmm)	n/a	n/a	Time switch meters only
	Time switch OFF time (hhmm)	n/a	n/a	Time switch meters only
17 (2)	Ripple master channel Id (000)	n/a	n/a	Ripple meters only
	Ripple control channel Id (0 or 00)	n/a	n/a	Ripple meters only
20	Ripple frequency (0000)	n/a	n/a	Ripple meters only

Table 5.1-2 Buy Back (Structure 23) Register Display

Notes: (1) Register 13 has two displays – "**ON**" time followed by "**OFF**" time.

(2) Register 17 has two displays – **Ripple master channel Id** followed by **Ripple control channel Id**. When register 17 is displayed, the top left corner of the display indicates the function code "20".

5.1.6 Alternate display and Scroll buttons

Button Operation

Figure 5.1-3 Meter buttons

5.1.7 Sealing of the Meter

The i-Credit 400 Meter is supplied with 4 seals.

- To prevent opening the meter enclosure situated under the terminal cover.
- To prevent opening the terminal cover situated on the terminal cover.
- To prevent opening of the slot for the optional external battery and the Ausgrid label.
- To prevent using the Left button.

The meter enclosure seal should never be broken. Other seals, if broken, must be re-sealed, preferably with two turns of nylon seal.

5.1.8 I-Credit 400 Self Diagnostic Features and Warnings

The following icon will appear on the display if the meter has an internal problem:

Service Status Mode Icon		Illuminated when meter status is bad such as Real Time Clock failure etc.

5.1.9 Energisation Checks

It is important that the installer checks the wiring of the meter once it is installed.

To check the wiring:

- Visually inspect the connections to ensure the correct wire is connected to the correct terminal of the meter
- When a voltage is applied, the i-Credit 400 meter will turn on and the display can be read
- Attach a suitable load to the meter. (e.g. household load or a 100W load lamp) and ensure the red LED pulse indicator on the right side of the meter display flashes at a rate proportional to the load connected. Note the flash rate of the led is 1600 pulses per kilowatt-hour.
- Also check for “Reverse Energy”. This is where the Active and Load Lines have been swapped on the meter. If this situation exists the red LED pulse indicator will not illuminate or flash while the meter has load connected.

5.1.10 Meter Dimensions and mounting diagram:

The approximate dimensions of the meter are 144(W) x 242(H) x 88(D) (mm). A drilling template (not to scale) for i-Credit 400 can be found in §4.1.11.

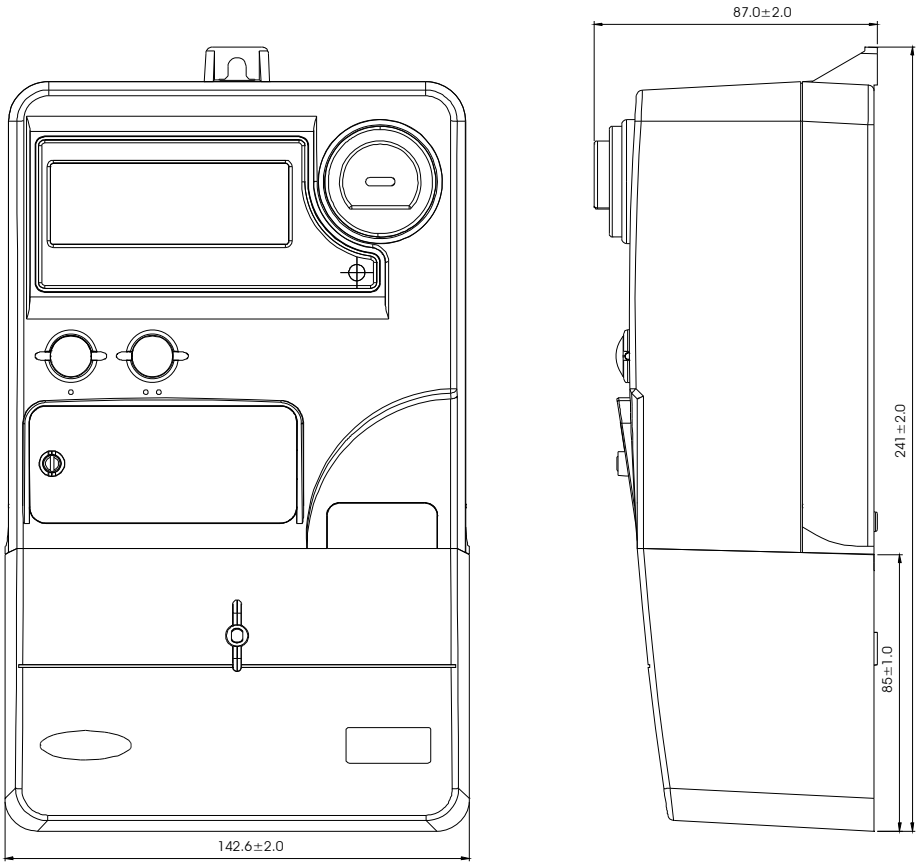
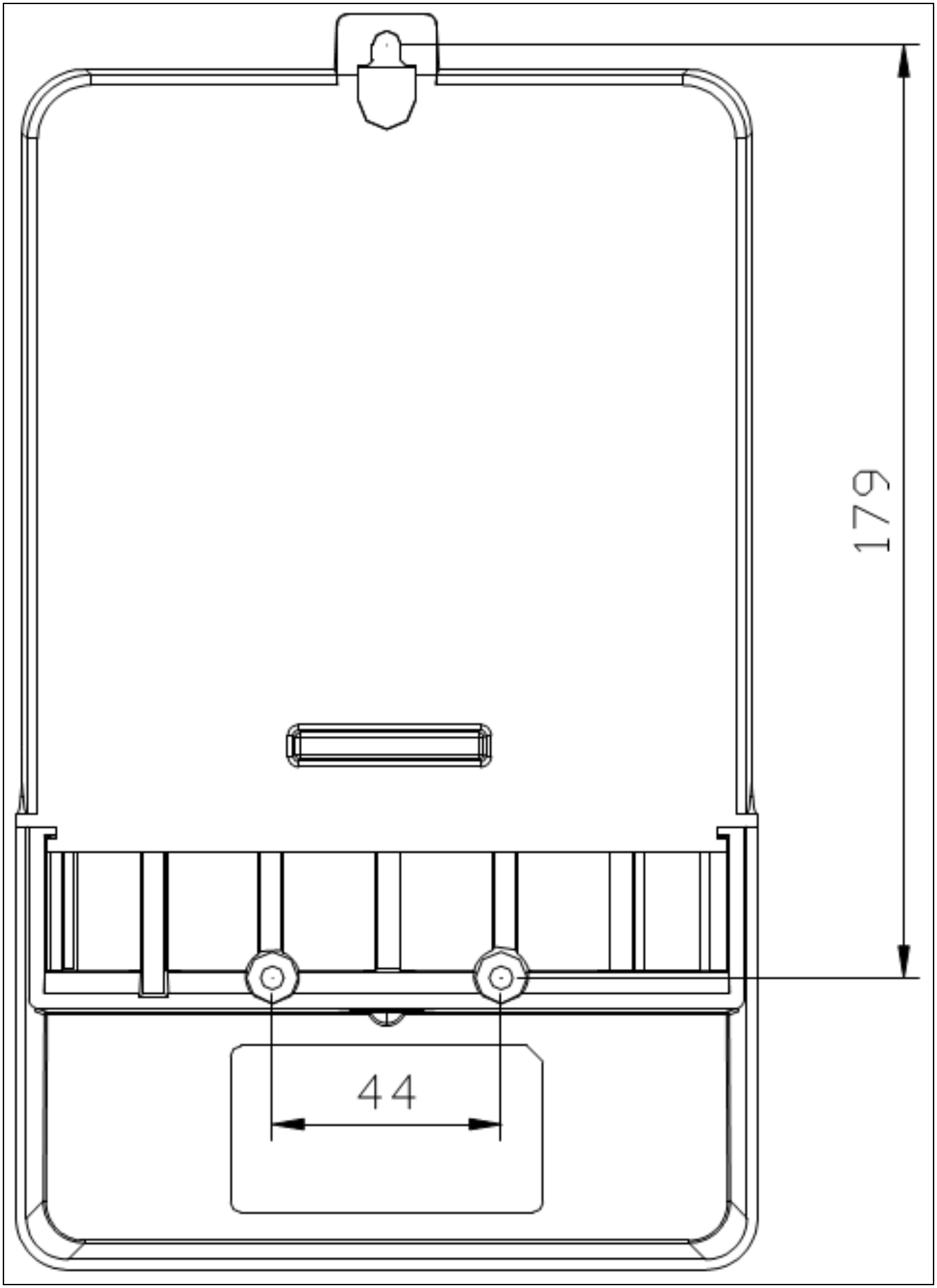


Figure 5.1-4 Meter dimensions and mounting diagram

5.1.11 Drilling Template PRT



5.2 AMJ (L+G) EM1210 E2 Meter

The AMG is an electronic, multifunctional, programmable single phase Whole Current (10-100A) 240V 2 Element interval meter

- Electronic, single phase, dual element, whole current meter
- Element 1 is rated at 100A
- Element 2 Controlled is rated at 40A
- Element 2 Uncontrolled is rated at 100A
- The whole meter (Elements 1 and 2 combined) is rated at 100A
- Bottom connected
- Optical and RS-232 ports for communication
- Class 1 accuracy
- Load profile recording
- Programmable (by Ausgrid) off-peak load control facility, selectable between ripple frequency relay or time switch control.

Figure 5.2-1: AMJ Meter

5.2.1 Application

The AMJ is a type 5 code compliant meter and can be used for residential as well as small commercial and industrial installation metering.
The load profile of the customer's energy usage will be recorded in 30 minute interval periods and stored in non-volatile memory in the meter.
The AMJ can be issued for and installed at installations that receive an off-peak controlled load tariff such as off-peak hot water.
The AMJ meter can also be issued and used for installations that are equipped with embedded generation capability.
Please note that the meter will operate on Australian Eastern Standard Time (AEST). There will be no change in meter time due to daylight savings. Please note that the boost button is sealed.

5.2.2 Available Programs

Meter Program	Meter Application	Note
2720	Type 5,6	Ripple or random Time Switch
0226	Type 5,6	Gross metering (Space saver)
0227	Type 5,6	Gross metering with OP, Ripple or random Time Switch
0223	Type 5,6	Net metering with OP, Ripple or random Time Switch
0129	Type 5,6	Type 5 Site with net and gross embedded generators

Table 5.2-1: Available EM1210 Programs

5.2.3 Mounting Dimensions

Figure 5.2-2 shows mounting dimensions for the AMJ meter with a standard terminal cover.
The dimensions of the bottom connected meters are 140(W) x 227(H) x 74(D) (mm)

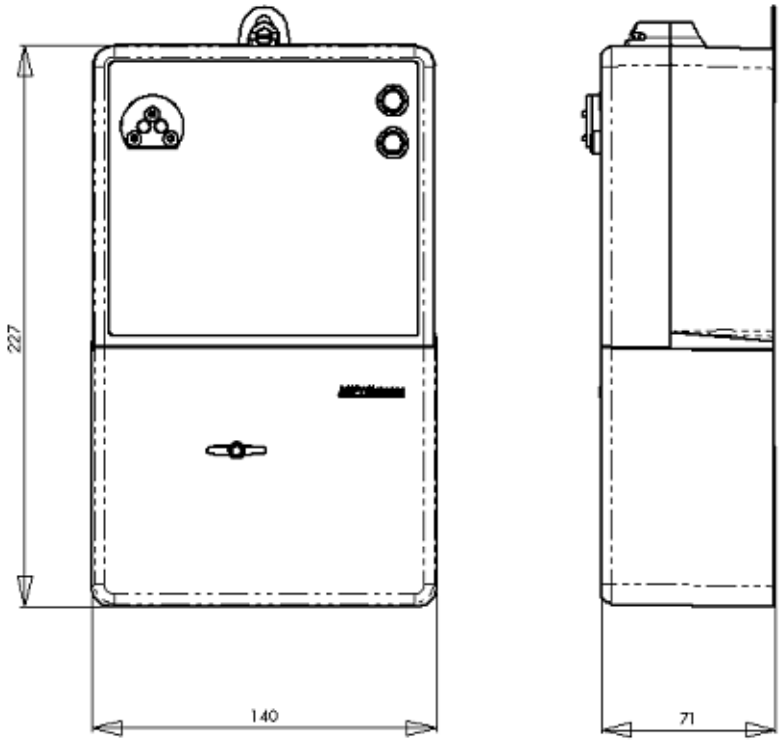


Figure 5.2-2 (AMJ) meter dimensions.

A drilling layout (scale must be checked before use.) for the AMJ can be found at the end of this section. (The dotted line is the meter outline.)
The meter is designed to be mounted using three screws. Threaded section of the screws should have diameter between 3 and 5mm with a screw head not smaller than 8mm.
The top mounting bracket can be used in 2 positions.
The top (exposed) position is the standard mounting position for the meter. An additional position is available (the concealed position) which allows for a hidden top screw. This has a top screw position set 24 mm below the standard position.

5.2.4 Terminal Arrangement

Figure 5.2-3 Wiring terminals of AMJ

Under the terminal cover are the terminals for voltage and current, connectors for auxiliary contacts and an RS-232 communication interface socket. The terminal

cover is attached with one sealable screw which has a 2mm diameter hole to accommodate sealing wire.
A photo of the wiring terminals of the AMJ meter is shown in Figure 5.2-3.

- Terminal 1 (A) is the Active Line connection (100A max.)
- Terminal 2 (N) is a Neutral connection. However it is preferred that Terminal 3 is used for the Neutral connection for the purposes of standardisation.
- Terminal 3 (N) is the preferred Neutral connection.
- Terminal 4 (L_M) is for Element 1 Domestic loads (100A max.)
- Terminal 5 (L_T) is for Element 2 off peak uncontrolled loads (100A max.)
- Terminal 6 (L_1) (located between and just above terminals 4 and 5 is for Element 2 off-peak controlled loads (25A max.)

There is a 100 Ampere maximum rating for the whole meter (Elements 1 and 2 combined).
Ensure that Domestic loads are NOT connected to the fifth main terminal (Off-peak uncontrolled loads terminal).
In the following figures, V is the voltage sensor, I_M is the sensor for Element 1, I_S is the sensor for Element 2.

5.2.5 Wiring -Standard Configurations

Structure 20 for AMJ

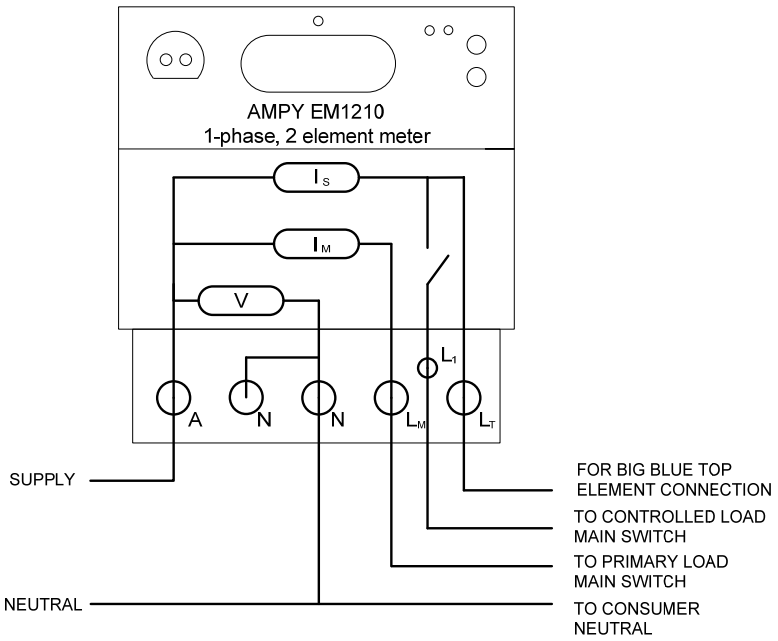


Figure 5.2-4 Wiring Schematic for Standard Configuration - Structure 20

Wiring - Net and OP Metering – Structure 23 for AMJ

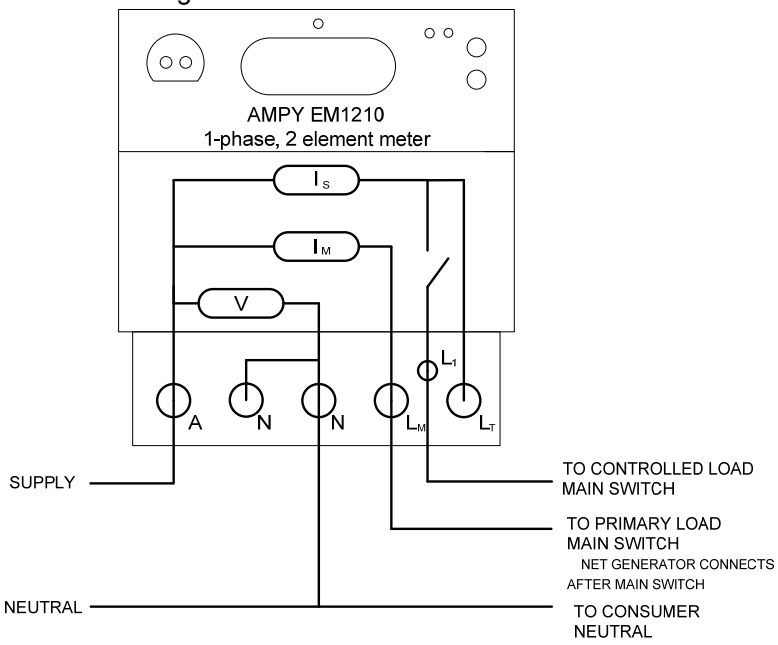


Figure 5.2-5 Wiring Schematic for Net and OP Metering – Structure 23

Note: The figures above reflect the order of terminals as they appear on the meter. In the schematic diagram on the front panel of the meter, L1 and LT appear in reversed order.

Wiring -Gross Metering –Structure 26 (Space Saver) for AMJ

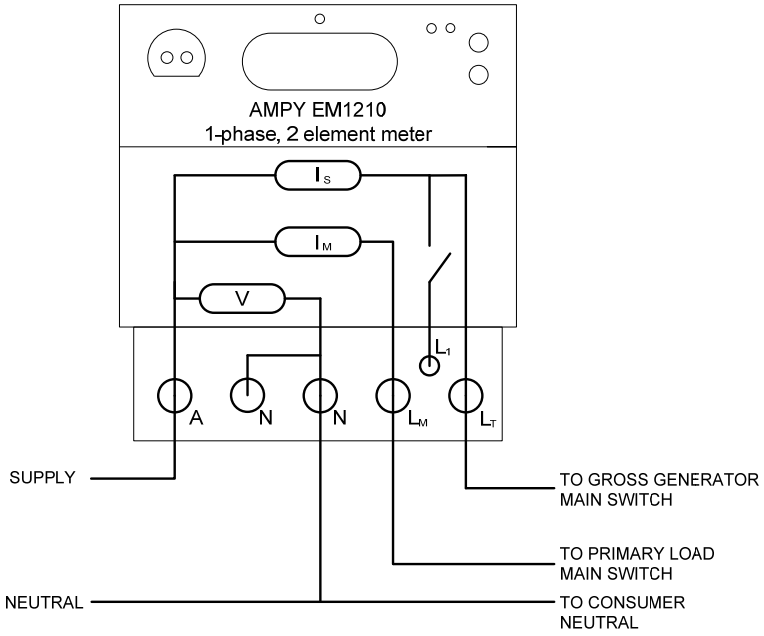


Figure 5.2-6 Wiring Schematic for Gross Metering – Structure 26

Wiring - Gross Metering – Structure 27 for AMJ

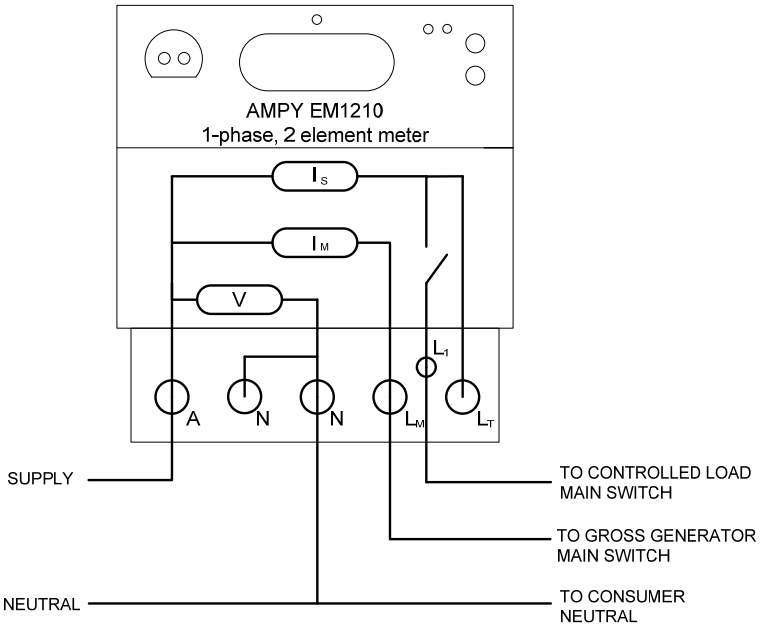


Figure 5.2-7 Wiring Schematic for Gross Metering – Structure 27

Note: above reflects the order of terminals as they appear on the meter. In the schematic diagram on the front panel of the meter, L1 and LT appear in reversed order.

Wiring - Net and Gross Metering – Structure 29 for AMJ

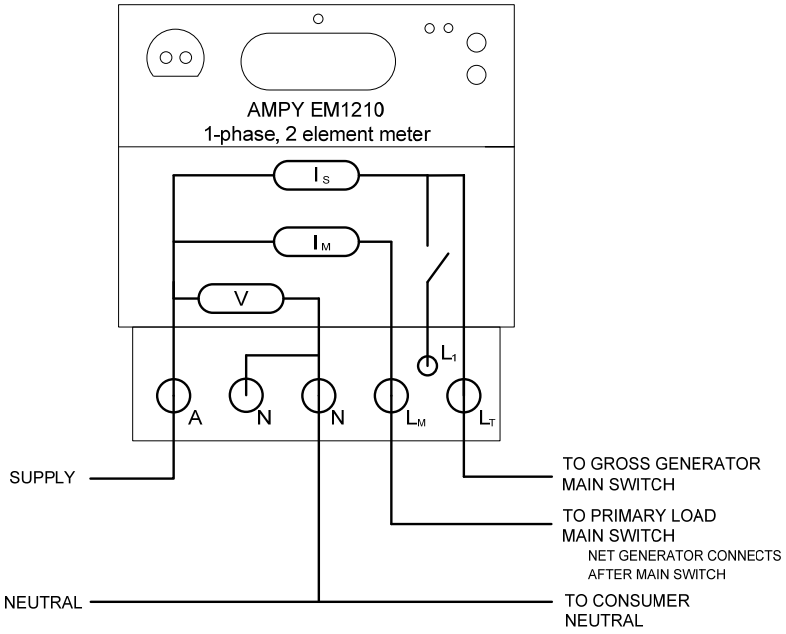


Figure 5.2-8 Wiring Schematic for Gross + Net Spacesaver – Structure 29

5.2.6 Display

The display shows information from the meter and can be useful during installation and troubleshooting. The test display containing all possible elements is shown in Figure 5.2-9. The meter is programmed to cycle through a sequence of displays including the test display which used to verify that all elements of the display are operating.
Please note that the meter will always operate on Australian Eastern Standard Time (AEST). There will be no change to the displayed time due to daylight savings.

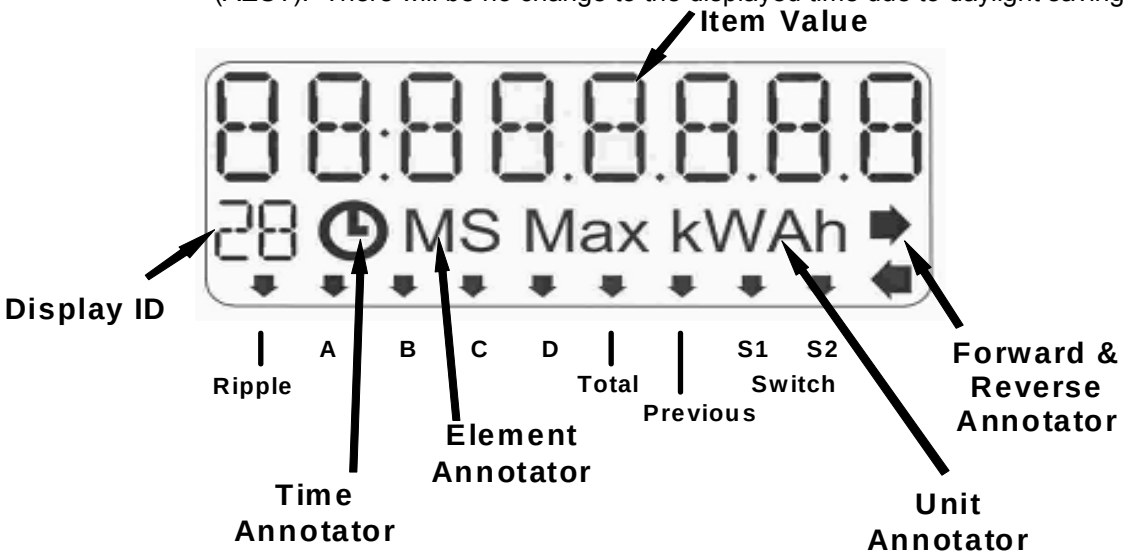


Figure 5.2-9 EM1210 AMJ meter display

The LCD screen contains a number of Enunciators and Indicators that help identify display options (metering and configuration information).

- **Display ID:** A two-digit number that identifies the display option (specified during programming).
- **Item Value:** The value of the display option, such as date, time, voltage, current, and the number of energy consumed. This section is also used to display extra information such as the power factor value, error and warning code.
- **Time Annotator:** This indicator is used when the meter is running a time switch load control program.
- **Element Annotator:** This indicator is used to indicate the displayed value related to the Main or Secondary element.
- **Unit Annotator:** This describes the value being displayed, such as the unit of the energy, current, and voltage.
- **Forward / Reverse indicator:** This indicates direction of energy flow in the main element of the meter.

The AMJ meter's stored data, which is located in the meter's registers, can be displayed on the LCD. These data are organised in two display groups. The buttons on the front of the meter are used to display this information.

5.2.7 ALT Display Button

The ALT Display button is not used and has been sealed.

5.2.8 Meter Display Scroll

The SCROLL button can be used for Scrolling the LCD items.
The AMJ display has auto-scroll enabled. This allows the display to scroll automatically through the display items for the Standard Display. The meters SCROLL button also allows the reader to manually move forward through the display item at a faster rate with each press moving one item forward.

The details of the display sets are given below in Table **5.2-2**. The scroll order is top through to the bottom then looping back to the top.

METER REGISTER IDENTIFIER STRUCTURE 3119				
Reg	**Structure 19 (For existing meters running single element only)**	**Dials**	**Dec**	
88	Display Test (888888)	6	0	
1	Date (ddmmyy)	6	0	
2	Time (hhmmss)	6	0	
3	Import Total cumulative kWh (Imp E1)	5	1	Ch1

METER REGISTER IDENTIFIER STRUCTURE 1820 and 2720				
Reg	**Structure 20 (Standard Metering with Off-peak 1 or Off-peak 2 – 30 min LP)**	**Dials**	**Dec**	
88	Display Test (888888)	6	0	
01	Date (ddmmyy)	6	0	
02	Time (hhmmss)	6	0	
03	Total cumulative kWh E1	5	1	Ch1
07	Total cumulative kWh OP1 or OP2 E2	5	1	Ch2
13	Time switch times (hhmm)	n/a	n/a	Time switch meters only
17	Ripple channel Id (rld 00000)	n/a	n/a	Ripple meters only
20	Ripple frequency (rF 0000.0)	n/a	n/a	Ripple meters only

METER REGISTER IDENTIFIER STRUCTURE 0223				
Reg	**Structure 23 (import /export with OP metering – 30 min LP)**	**Dials**	**Dec**	
88	Display Test (888888)	6	0	
01	Date (ddmmyy)	6	0	
02	Time (hhmmss)	6	0	
03	Total cumulative kWh import E1	5	1	Ch1
93	Total cumulative kWh export B1	5	1	Ch2
07	Total cumulative kWh OP1 or OP2 E2	5	1	Ch3
13	Time switch times (hhmm)	n/a	n/a	Time switch meters only
17	Ripple channel Id (rld 00000)	n/a	n/a	Ripple meters only
20	Ripple frequency (rF 0000.0)	n/a	n/a	Ripple meters only

METER REGISTER IDENTIFIER STRUCTURE 0226				
Reg	**Structure 26 (For AMJ meters with Gross Metering – Space saver)**	**Dials**	**Dec**	
88	Display Test (888888)	6	0	
01	Date (ddmmyy)	6	0	
02	Time (hhmmss)	6	0	
03	Total cumulative kWh (Imp E1)	5	1	Ch1
73	Gross kWh Export (Exp B2)	5	1	Ch2
83	Gross kWh Import (Imp E2)	5	1	Ch3

METER REGISTER IDENTIFIER STRUCTURE 0227				
Reg	**Structure 27 (For AMJ meters with Gross Metering and off-peak**	**Dials**	**Dec**	
88	Display Test (888888)	6	0	
01	Date (ddmmyy)	6	0	
02	Time (hhmmss)	6	0	
73	Gross kWh Export (Exp B1)	5	1	Ch1
83	Gross kWh Import (Imp E1)	5	1	Ch2
07	Total cumulative Off-peak 1 or Off-peak 2 kWh (Imp E2)	5	1	Ch3
13	Time switch ON time (hhmm)	n/a	n/a	Time switch meters only
13	Time switch OFF time (hhmm)	n/a	n/a	Time switch meters only
17	Ripple master channel Id (000)	n/a	n/a	Ripple meters only
17	Ripple control channel Id (0 or 00)	n/a	n/a	Ripple meters only
20	Ripple frequency (0000)	n/a	n/a	Ripple meters only

METER REGISTER IDENTIFIER STRUCTURE 0129				
Reg	**Structure 29 (For AMJ meters with Net Metering and Gross Metering – Space Saver)**	**Dials**	**Dec**	
88	Display Test (888888)	6	0	
01	Date (ddmmyy)	6	0	
02	Time (hhmmss)	6	0	
03	Total cumulative kWh Import E1	5	1	Ch1
93	Total cumulative kWh Export B1	5	1	Ch2
73	Gross kWh Export (B2)	5	1	Ch3
83	Gross kWh Import (E2)	5	1	Ch4

Table 5.2-2: AMJ Standard Display Information

Note: If the meter is programmed for ripple load control, register 13 will not get displayed.
Note: Meters that are programmed for time switch load control will have a clock symbol indicated in the display and Register 13 will indicate the programmed ON and OFF times for the switching. The ON time is indicated by the presence of a small arrow in the display above the "Switch S1" marking. Register 17 and 20 will not be displayed in this case.

5.2.9 Switching Time Configuration

The following table shows the various off peak configurations used with the different programs

Struc-ture	Program ID	Comments	Switching Details
20	2720_011	Ripple 2.4V	Ripple programs also require additional ripple frequency and channel for the meter for that area to be installed.
	2720_021	Off-Peak 1 for Sydney & Central Coast	23:30-06:00 (Set for Random switching ON/OFF within the next hour)
	2720_031	Off-Peak 1 for Hunter	23:00-06:00 (Set for Random switching ON/OFF within the next hour)
	2720_041	OP2 All Areas	21:30-16:00 (Set for Random switching ON/OFF within the next hour)
23	0223_010	Ripple	As above
	0223_020	Off-Peak 1 for Sydney & Central Coast	As above
	0223_030	Off-Peak 1 for Hunter	As above
	0223_040	OP2 All Areas	As above
26	0226_000	Gross Solar Spacesaver	N/A – No Switching
27	0227_010	Ripple	As above
	0227_020	Off-Peak 1 for Sydney & Central Coast	As above
	0227_030	Off-Peak 1 for Hunter	As above
	0227_040	OP2 All Areas	As above
29	0129_000	Net and Gross Solar	N/A – No Switching

Table 5.2-3: AMJ Off Peak Program Details Current Programs

Note the Time Switch programs with random programming will turn on at a randomly calculated time within the hour following the nominated start time. So for a start time of 2300, the meter will turn on any time between 2300 and 0000. If on a particular day, the meter turned on at 2342, it would turn off at 0600+42 minutes, or 0642. The randomisation offset is recalculated for each period.

5.2.10 LED Indicators

The meter uses three LEDs to show status information:

- **Relay Status LEDs:** Two relay status LEDs are provided on the meter being S1 and S2.
    - **S1:** The S1 LED is lit when the controlled load relay is active.
    - **S2:** The S2 LED is not used and should never be lit.
- **Energy Pulse indicator:** pulses at a rate proportional to the energy consumption. The LED indicator flashes at the rates of 1.0 Wh / pulse, and is labelled “1 Wh/imp”.

5.2.11 Meter Seals

The AMJ meter is sealed by the manufacturer at the factory. The locations of the seals are at the top of the meter and on the left hand side of the main meter body under the scoop. The seal ensures that the meter has not been tampered or interfered with by unauthorised parties. Please ensure that the meter seals are in place and intact. According to the National Measurements Act, it is a criminal offence to remove or tamper with the meter seal. **DO NOT** install a meter without seals or if either of the seals has been tampered with.
A third seal must be present on the “ALT DISPLAY” button. Fit a seal to the meter scoop cover at the completion of the installation process.

5.2.12 Commissioning

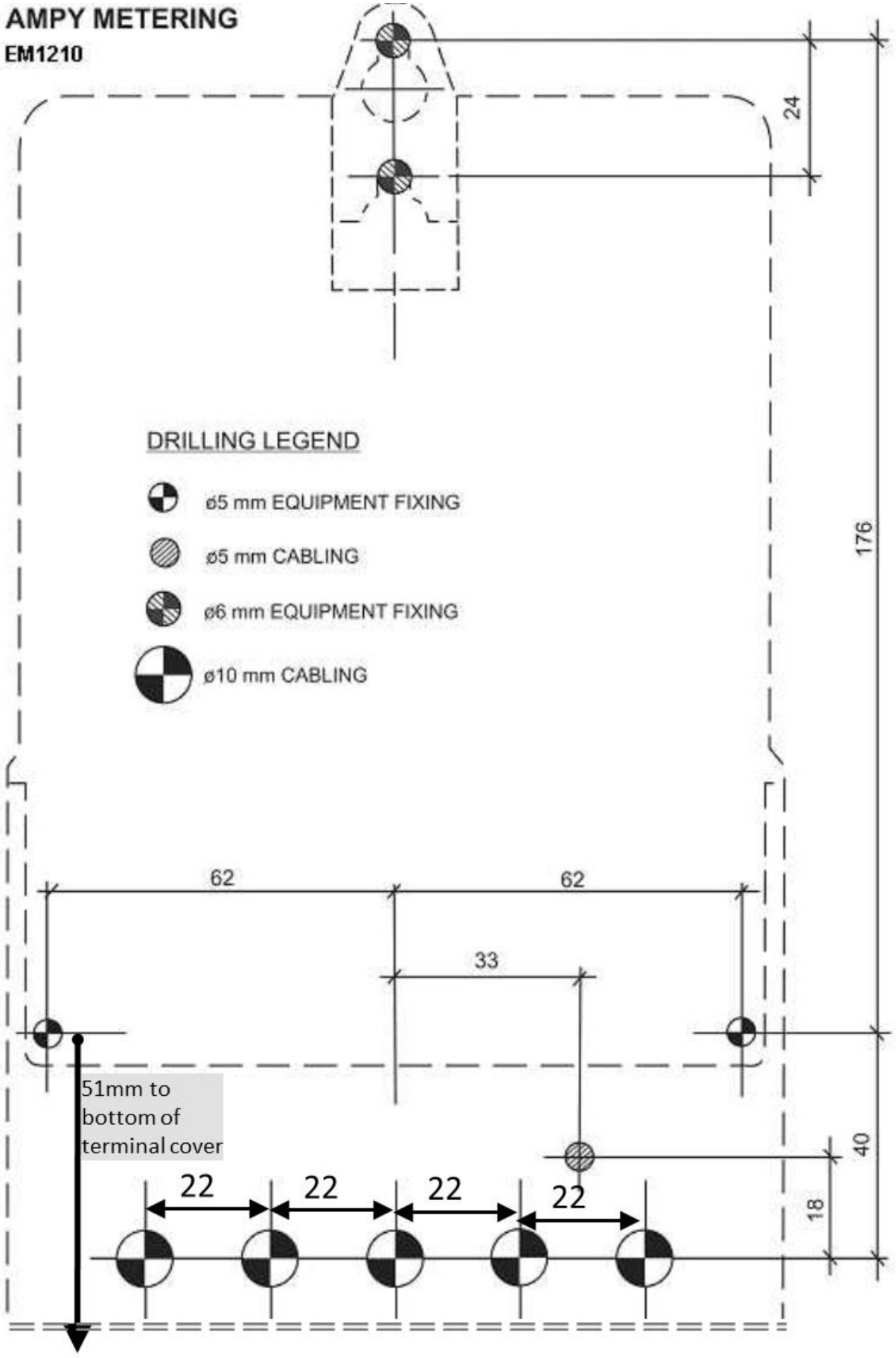
The following steps are to be followed for correct wiring and operation of the meter:

1. Inspection	Visually inspect the connection to ensure the correct wire is connected to the correct terminals of the meter. Ensure the Meter main seal is not broken.
2. Voltage check	When a voltage is applied, the meter will turn on and the display can be read.
3. Operation check	Attach the Load Tester to the meter Check the pulsing LED output on the front of the meter. The consumption indicator LED will flash at a rate of one pulse per 1 Wh measured and should flash proportionally to the load connected via the Load Tester. This is a pulse approximately every 30-60 seconds with a 100W load.
4. Reverse Energy Check	For structure 19 and 20 programs, check for “Reverse Energy”. If the Active and Load Lines have been swapped, the red LED pulse indicator above the display will not illuminate or flash while the meter has load connected. If this situation does occur, please ensure that the error is rectified.
5. Off Peak Load Check – For meters with off peak connections (Structures 20 or 27)	For AMB / AME / AMJ – Check the operation of the controlled Element 2 load by using the relay test function of the Alt Display button. Attach a suitable load to terminal 6 (located between and just above terminals 4 and 5) and ensure that the LAMP goes ON. Press the Alt Display button for the second time to turn the controlled load off. For AMP – Check the operation of the controlled Element 2 load by using button and confirm the operation of the relay from audible click and watching LED S1.
6. Date/Time check	Check date and time and confirm. Note the format Day, Month, Year (DD.MM.YY)
7. Initial check	Check the meter display. The meter should be in auto scroll mode.
8. Finish installation	Seal the meter scoop.

Table 5.2-4: Commissioning Steps

The meter is not designed to be serviced in a field and has no user replaceable parts. There are no internal fuses. In the event of failure of the meter contact Ausgrid for assistance.

5.2.13 Drilling Template AMJ



5.3 ECJ EDMI Mk7A E2c METER

The ECJ meter is an electronic, multifunctional, programmable, single phase, dual element, Whole Current (10-100 A) 240V communications-enabled meter with internal 100A disconnect relay.

Figure 5.3-1: ECJ meter front view

- Single Phase, dual element whole current meter
- Programmable (by Ausgrid) off-peak load control facility
- Element 1 is rated at 100A
- Element 2 Controlled 25A / Uncontrolled 40A Rating
- Combined (Element 1 + Element 2) rated at 100A
- Class 1 Wh accuracy / Class 2 varh accuracy
- Four Quadrant energy measurement (suitable for bi-directional embedded generation applications)
- Advanced Power Quality measurements
- Base current 10A, Max current 100A
- Front connected
- Load Profiling
- Pulsing outputs

5.3.1 Application

The ECJ meter can be used in domestic and non-domestic applications that require an E2 configuration for consumption and embedded generation. Table 1 provides details on available meter programs. The meter has an internal 100A main disconnect to allow remote connection/disconnection or armed operation. These functions are not utilised when the meter is installed at a Type 5 installation.

The meter also has a 25A Load Control Relay on Element 2, for use in conjunction with a Load Control tariff (OP1 or OP2). This can be utilised conventionally as a two-element meter or in single-element configuration where Element 1 is disabled for tariff purposes

The meter is supplied with an extended terminal cover to accommodate the future installation of communications equipment.

Please note that the meter will operate on Australian Eastern Standard Time (AEST). There will be no change in meter time due to daylight savings.

5.3.2 Available Programs for ECJ Meters

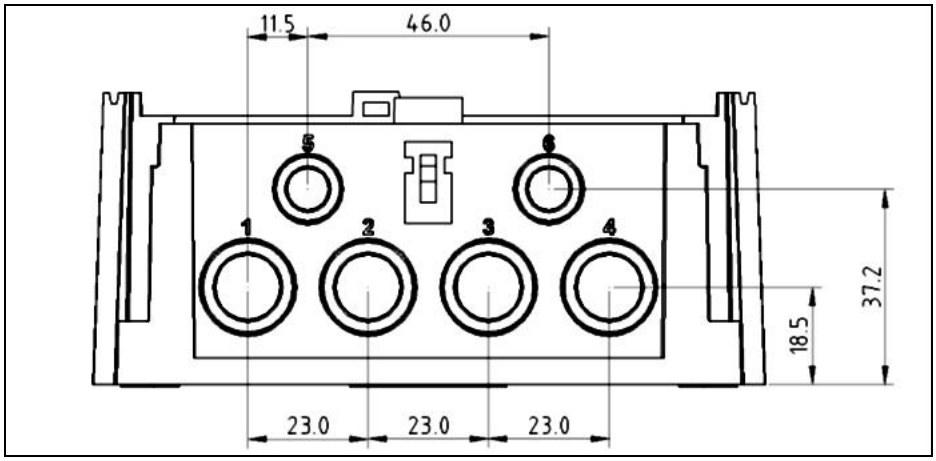
Programs	Interval	Structure	Application
0162	30	62 (Equivalent Str 20)	Element 1: Consumption Only (MRIM) Element 2: OP1 (Time Switch)
0163	30	63 (Equivalent Str 20)	Element 1: Consumption Only (MRIM) Element 2: OP2 (Time Switch)
0164	30	64 (Equivalent Str 23)	Element 1: Net Generation (MRIM) Element 2: OP1 (Time Switch)
0165	30	65 (Equivalent Str 23)	Element 1: Net Generation (MRIM) Element 2: OP2 (Time Switch)
0166	30	66	Element 1: Disabled Element 2: OP1 (Time Switch)
0167	30	67	Element 1: Disabled Element 2: OP2 (Time Switch)

5.3.3 Mounting Dimensions

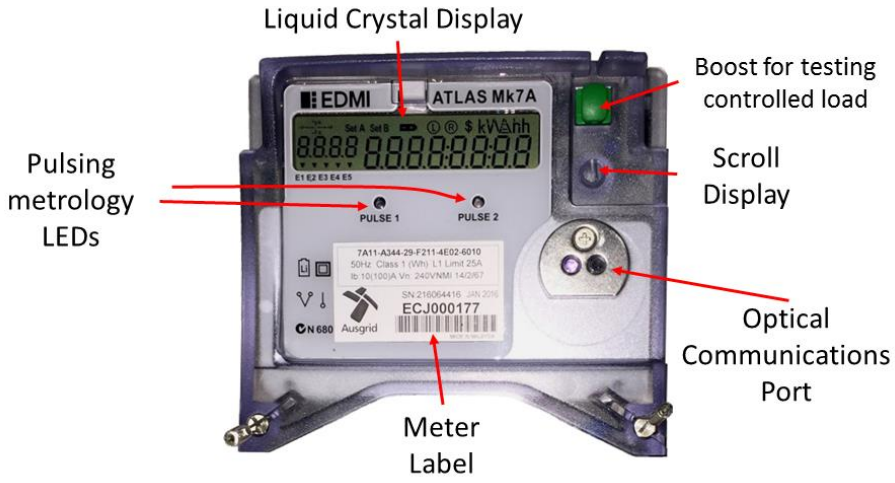
Overall height is 212mm, width 128mm and depth 111mm

Fasteners may be up to 5mm in diameter but require a head diameter minimum of 8mm. The top, blind mounting hook can be extended using the optional clip which extends hook above top of meter.

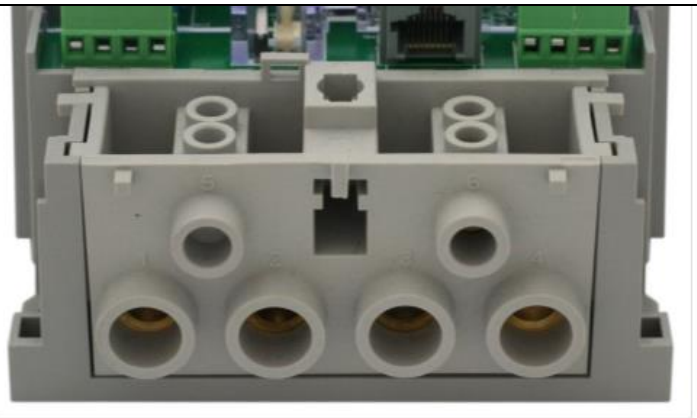
Refer to the drilling template at the end of this section.

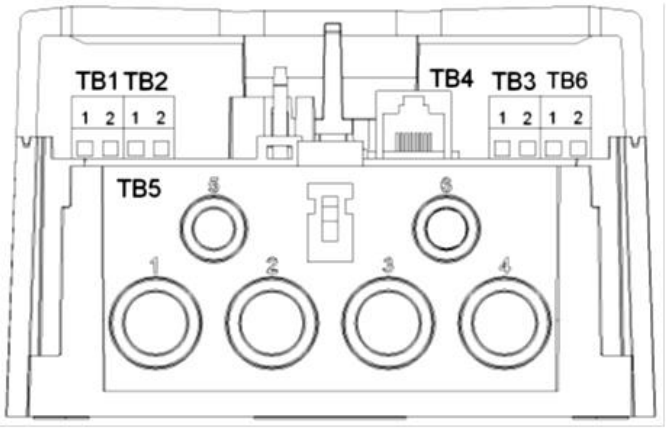


5.3.4 Meter Appearance



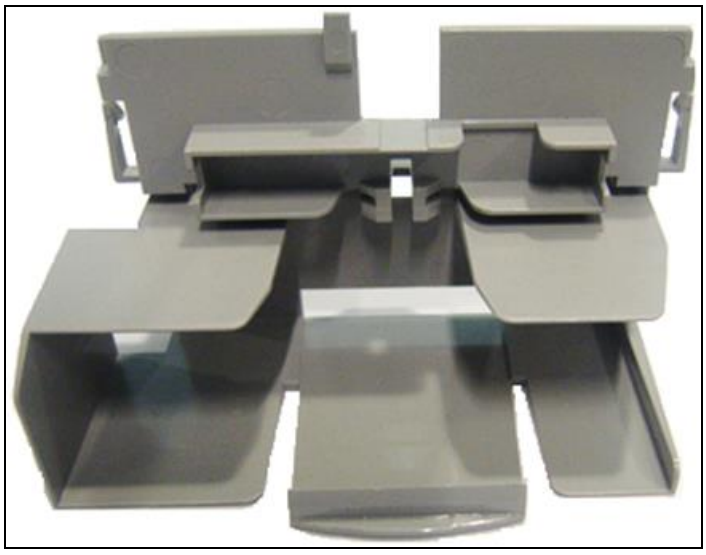
5.3.5 Terminal Arrangement





Terminal	Description
TB5	**Main terminals** **5:Uncontrolled (Element 2) | 6:Controlled (Element 2)** **1:Active | 2:Neutral | 3:Neutral | 4:Load (Element 1)**
TB1,2,3,6	S0 Pulsing Outputs
TB4	Dual active RS-232 port with RJ45 connector

A Finger guard with modem carrier is fitted over the top of main terminals to protect from accidental contact with live terminals. The Finger guard must be removed to gain access to the main terminal screws. Make sure the finger guard is reinstated after the connections are made.



The meter is equipped with terminal cover tamper detection. Removing the terminal cover will release a switch located at centre left above the meter terminals which generates an internal meter alarm.

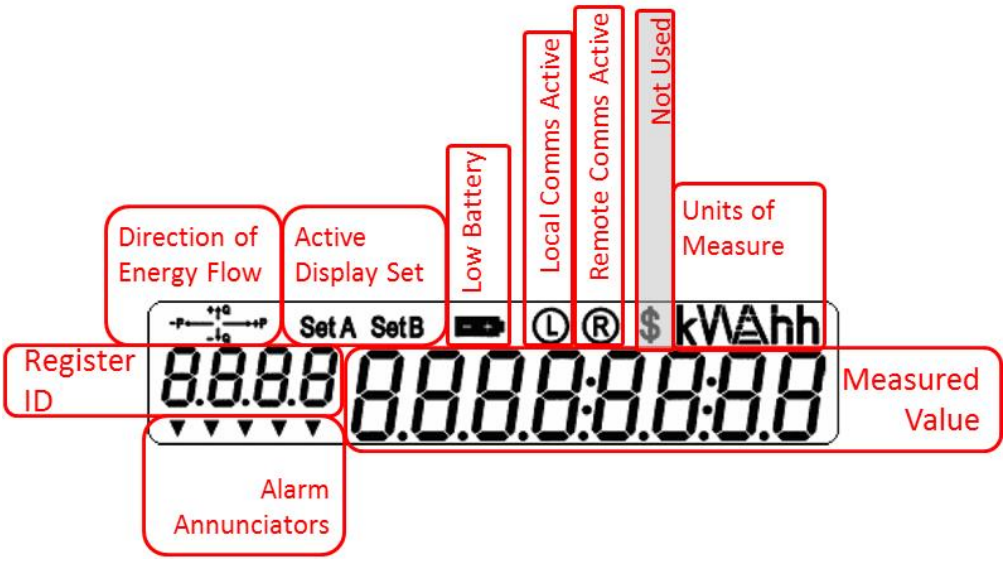
If the tamper alarm remains active with the terminal cover closed, ensure the terminal cover is positioned correctly and fully secured in place.

5.3.6 Display

The display shows information from the meter and can be useful during installation and troubleshooting. Meter is programmed to cycle through main set of displays including test display which used to verify that all elements of the display are operating correctly.

Alphabetic characters will be approximated by the 7-segment display. Display information longer than 8 characters will scroll to show the entire line with underscore "_" showing the start of the line.

The Meter display has following main areas:



The direction of energy flow has the convention of P for Watts and Q for vars. A *plus* sign indicates energy delivered to the customer while a *minus* sign indicates energy generated by the customer.

The energy direction, battery and communication status indicators appear independently of what data is being displayed.

5.3.7 Buttons and Scrolling

The data is displayed as a series of pages with each page displaying an individual value record from the meter on the main seven segment display along with an associated display identifier on the small seven segment display. The meter is programmed to scroll through the displays automatically. The scroll button will force progress to the next page each time the button is pressed. The display then will remain on the selected page for an extended period of time before reverting back to regular cycling.

There are two display sets in the meter: Set A and Set B. Only pages from the currently selected display set are shown in the cycle. To change between sets, press and hold the scroll display button for 2 seconds.

Set A shows the structure information currently in the meter, as per the Structure Cards. Set B has additional information on the meter status. The display will be automatically reverted back to Set A after 2 minutes.

To initiate a relay test to test operation of LC relay, hold the Green button for at least half a second. The LCD will display the message "Connect" and the Load control relay will connect. This can be verified by the enunciator E5 changing to solid ON.

There is a delay (up to 2 minutes) between button press and operation of the relay, as the meter relies on first charging a capacitor and its discharge operating the relay.

Note: This should only be used for checking the correct connections to the Load control terminal. **At the completion of the check, the button must be sealed to prevent unauthorised operation**.

5.3.8 Structure Cards

Structure 62, 63, (0162/0163)				
Reg	**Display**	**Description**	**Dials**	**Dec**
	8888	Display Test		
01	01	Date (DD.MM.YYYY)		
02	02	Time (HH:MM:SS)		
03	03	Total cumulative kWh consumed Main	6	1
07	07	Total cumulative kWh consumed Element 2	6	1
	On	On time as per meter program		
	Off	Off Time as per meter program		

Structure 64,65 (0164/0165)				
Reg	**Display**	**Description**	**Dials**	**Dec**
	8888	Display Test		
01	01	Date (DD.MM.YYYY)		
02	02	Time (HH:MM:SS)		
03	03	Total cumulative kWh consumed Main	6	1
93	93	Total cumulative kWh generated Element 1	6	1
07	07	Total cumulative kWh consumed Element 2	6	1
	On	On time as per meter program		
	Off	Off Time as per meter program		

Structure 66, 67(0166/0167)				
Reg	**Display**	**Description**	**Dials**	**Dec**
	8888	Display Test		
01	01	Date (DD.MM.YYYY)		
02	02	Time (HH:MM:SS)		
07	07	Total cumulative kWh consumed Element 1+ Element 2	6	1
	On	On time as per meter program		
	Off	Off Time as per meter program		

Default Set B Display	
Display	**Description**
I∩P	Total cumulative kWh generated
Curm	Current (A) Main
curL	Current (A) Load1
vol	Voltage (V)
Pham	Phase Angle Main (Note: Firmware Version 1.403 meters display phase angle sign opposite to normal Ausgrid convention)
Phal	Phase Angle Load1 (Note: Firmware Version 1.403 meters display phase angle sign opposite to normal Ausgrid convention)
C AL	Current Alarms
L AL	Latched Alarms
ProG	Miscellaneous string
Id	Customer Plant number (Meter ID)
Sn	Serial Number
SoFt	Software version number
Boot	Boot Loader Revision Number
bAtt	Battery Voltage
Lon	Last Power ON Time/Date
LoFF	Last Power Loss Time/Date
P on	Total run time Ever
PoFF	Total OFF time Ever
FrEq	Frequency
tot	Active Power Total (kW)
tot	Reactive Power total (kvar)

5.3.9 LED Indicators

There are two LEDs located on a front panel of the meter, labelled “Pulse 1” and “Pulse 2”. They are programmed to pulse with a 35ms active time and minimum 35ms inactive time. Table 7 shows the LED outputs assignment.

Program (All programs)		
Output	**Function**	**Rate**
Pulse 1	Absolute Wh	1 Pulse/Wh
Pulse 2	Absolute varh	1 Pulse/varh

Pulse ON time	**Pulse OFF time (min)**	**LED constant (where appropriate)**	**Electrical o/p Pulse constant**
35 ms	35 ms	1 Wh / pulse 1 varh / pulse	1 Wh / pulse 1 varh / pulse

5.3.10 Alarms

During operation the meter monitors a number of parameters. If an event occurs that is outside pre-set value an individual alarm is raised to indicate the status of the meter. The presence of an alarm is indicated by a downward pointing arrow (▼) indication on the bottom of the display.

Alarm Indication	Description
E1	Modem power supply active
E2	EFA Active alarm present
E3	EFA Latched Alarm
E4	Relay 1 state (Main), Solid ON when connected
E5	Relay 2 state (Load1), Solid ON when connected

E2 and E3 enunciators will appear on the display independently or simultaneous in the event of active or latched alarms respectively.

To identify the cause of an alarm, a user can navigate to the Set B display on the meter and read dedicated register values as described in the Display section. When reading the alarm state from the display a string format is used. The alarm status is displayed as a string of characters, with each character representing an individual alarm. The register value when all alarms are present looks like “*ESVFRTCMLHXYZNDU*”. A full stop appears in each position when an alarm is not active. Letters always appear in the same location in the string with a full stop appearing in place of inactive alarms. For example, the display with only the reverse power alarm active will look like “…….*M*……..”.

Letter	**Alarm Name**	**Description**
E	Analog Reference Failure	Meter measurement reference drift is above 50%, normally indicating an internal fault. It should never flag.
S	Neutral current mismatch	Not Used
V	Voltage Tolerance Error	The voltage level is outside 216V ~ 273.6V limits where meter cannot provide accurate measurements.
F	VT Failure	The supply voltage is below minimum level of 72V.
T	Lid Tamper	Temper switch is released. Terminal cover is not in place or dislocated. Not set for FEA alarm.
C	Clock Failure	The clock information is lost during a power off event. Normally caused by flat battery.

Letter	Alarm Name	Description
U	Magnetic Tamper	Not used
M	Reverse Power	Energy flow is negative indicating incorrect connection. (disabled for Structure 44, 45, 48, 64 & 65)
L	Calibration Data Lost	Calibration data is lost or corrupted. Commonly caused by memory failure. Meter must be replaced.
H	Modem Failure	Not Used
S	Neutral current mismatch	Not used
X	RAM or LCD Failure	Test is continuously performed on meter memory and LCD controller integrity. Alarm is generated when test fails.
Y	Program Memory Failure	Checksum of the program flash memory is continuously tested and any errors will trigger this alarm.
Z	Data Memory Failure	Memory read/write operation is failed.
N	Pulsing Output Overflow	The amount of energy pulses is greater than pulsing output can perform on time.
D	Battery Failure	Battery voltage is below required limit – i.e. below 2.7 V
U	Magnetic Tamper	Not Used
O	Overcurrent	Over current above 100A

5.3.11 Meter Seals

The meter is sealed by the manufacturer at the factory. The seals are located on each side of the middle of the main meter body. The seal ensures that the meter has not been tampered or interfered with by unauthorised parties. Please ensure that the meter seal is in place and intact. According to the National Measurements Act, it is a criminal offence to remove or tamper with the meter seal. DO NOT install a meter without a seal or if the seal has been tampered with.

Fit a seal to the terminal cover (meter scoop) through the central screw at the completion of the installation process.

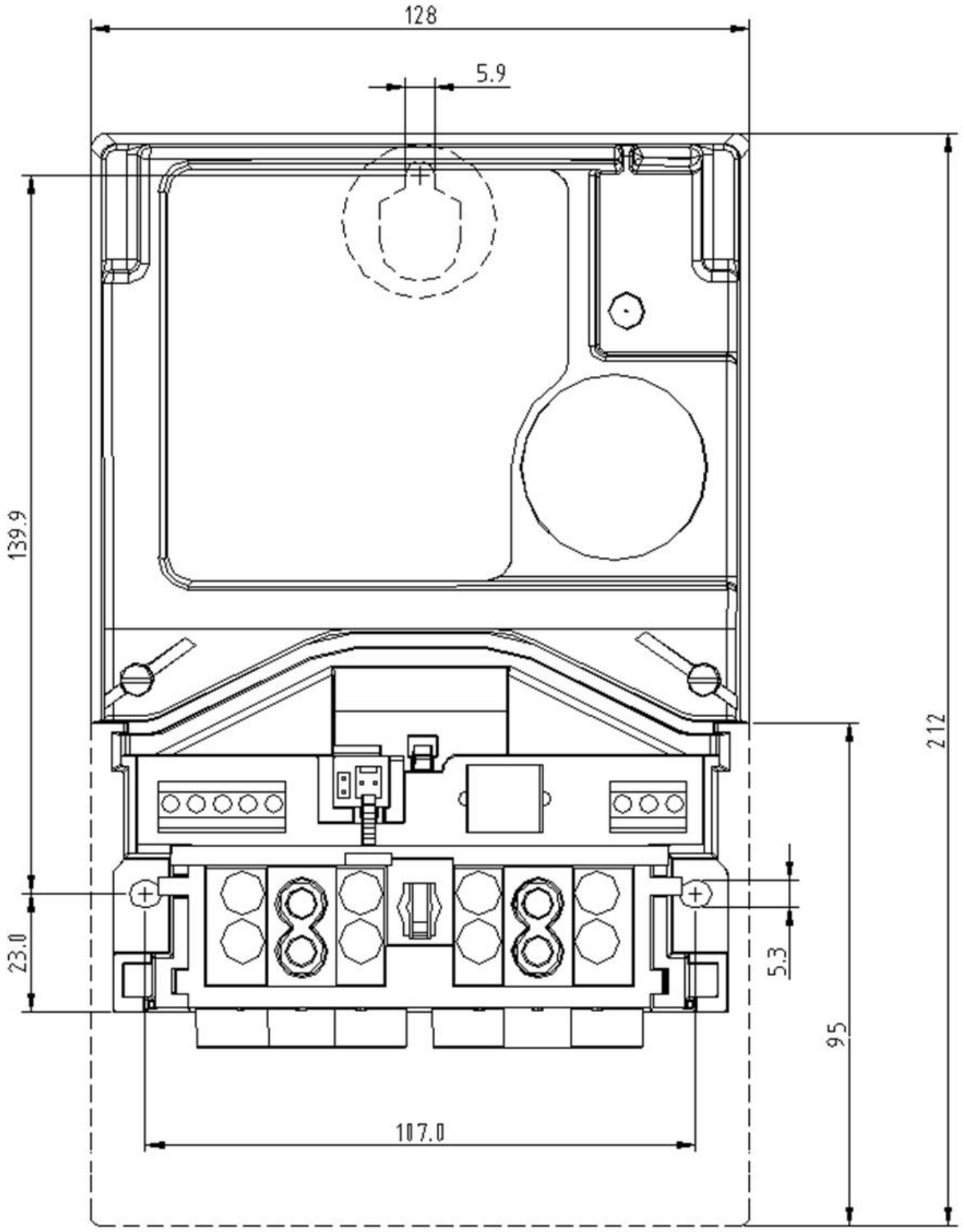
5.3.12 Commissioning

The following steps are to be followed for correct wiring and operation of the meter:

1. Inspection	Visually inspect the connection to ensure the correct wire is connected to the correct terminals of the meter. Ensure the Meter main seal is not broken.
2. Phase check	When a voltage is applied, the meter will turn on and the display can be read.
3. “Energy Direction” check	Attach the Load Tester to the meter Check for “Energy Direction” prior to re-connection of the customer load. With a test load connected, the display should be checked to ensure the presence of the “⟶ “symbol. If the Active and Load line have been swapped, reverse energy is indicated by the”⟵ ” symbol at the top left of the display. For the non-bi-directional structures, there will also be a warning code **M (looks like n)** displayed on the LCD in the Set B display against ‘C ALA”. **If a “Reverse Energy” situation does occur, this error must be rectified immediately.** After correcting the wiring, the display should be checked to ensure the presence of the “⟶ “symbol.

4. Operation check	Check the pulsing LED output on the front of the meter. The consumption indicator LED (Pulse 1) will flash at a rate of one pulse per 1 Wh measured and should flash proportionally to the load connected via the Load Tester.
5. Off Peak Load Check	Check the operation of the controlled Element 2 load by using the relay test function. Connect a suitable load to the switched terminal 6 (located RHS above the main terminals) and ensure that operating the Relay Test control turns the load ON. Load Control Relay can be tested by holding the Green button down for at least half a second. Subsequently, the message "Connect" will display and the Load control relay will connect. This can be verified by the enunciator E5 changing to solid ON. Note the delay (up to 2 minutes) between button press and operation of the relay – this is normal. Seal the green button to prevent unauthorised use
6. Date/Time check	Check date and time and confirm.
7. Initial check	Check the meter display. The meter should be in auto scroll mode.
8. Connect load	Connect customer load. Pulse LED should flash if there is consumption.
9. Clear meter alarms	Check for and clear any meter alarm
10. Finish installation	Seal the meter scoop.

The meter is not designed to be serviced in a field and has no user replaceable parts. There are no internal fuses. In the event of failure of the meter contact Ausgrid Metering Engineering support for assistance.



ECJ Drilling Template

6 E3 - Three Phase Interval (Time of Use) Meters

6.1 EET EDMI Mk10A E3 Meter

The EET meter is a Class 1 electronic, multifunctional, programmable, polyphase, 4-Wire Whole Current (10-100A) 230V meter suitable for 4 wire installations. The meter is equipped with an ANSI optical port for local communication and a dual RS232 powered port for remote connectivity through a suitable modem. Auxiliary connections include one active 5V input and three SØ outputs.

- Polyphase, three element Whole Current meter
- Type 4 and 5 compliant (NER V38)
- Class 1 Wh accuracy
- Class 2 Varh accuracy
- 3 Element (4 wire) mode
- Four Quadrant energy measurement (suitable for bi-directional embedded generation applications)
- Advanced Power Quality measurements
- Nominal current 10A, Max current 100A
- Operating voltage 180 - 290V
- Bottom connected
- ANSI optical port
- Active Dual RS-232 Port (Single RJ45)
- Load profile recording
- Internal battery
- Option of external 3.0V, 700mAh Lithium battery
- 2 LED's

Figure 6.1-1: EET meter front view

6.1.1 Application

The meter has a property number prefix beginning with EET. This meter is an addition to the EDMI Mk10 Atlas family.

The EET meter meets NER V38 accuracy requirements for type 4 and 5 installations, and can be used in domestic, commercial and industrial metering applications that require an E3 configuration. Table 4.3-2 provides details on available meter programs. Load profiles are stored in non-volatile memory within the meter and downloaded by the Meter Data Agency (MDA) for billing and statistical purposes.

Please note that the meter will operate on Australian Eastern Standard Time (AEST) – there will be no change in time due to daylight savings.

6.1.2 Available Programs

Programs	Interval	Structure	Type	Application
5511	15	11	4	Low Voltage, COMMS, PQ
9119	30	19	5	MRIM, PQ
9719	30	19	5	MRIM Chronic with COMMS, PQ
2421	30	21	5	MRIM, bi directional, PQ
2521	30	21	5	MRIM Chronic bi directional, COMMS, PQ
4422	15	22	4	Low Voltage bi directional, COMMS, PQ
2125	30	25	5	MRIM, Bi-directional, QS, Gross
2225	30	25	5	MRIM with COMMS, Bi-directional, QS, Gross

Table 6.1-1: Available programs for EET meter

ES3 Part1 and NSW Service and Installation Rules provide information on metering structure selection and corresponding wiring arrangements for Main Terminals in a particular application.

6.1.3 Meter Dimensions

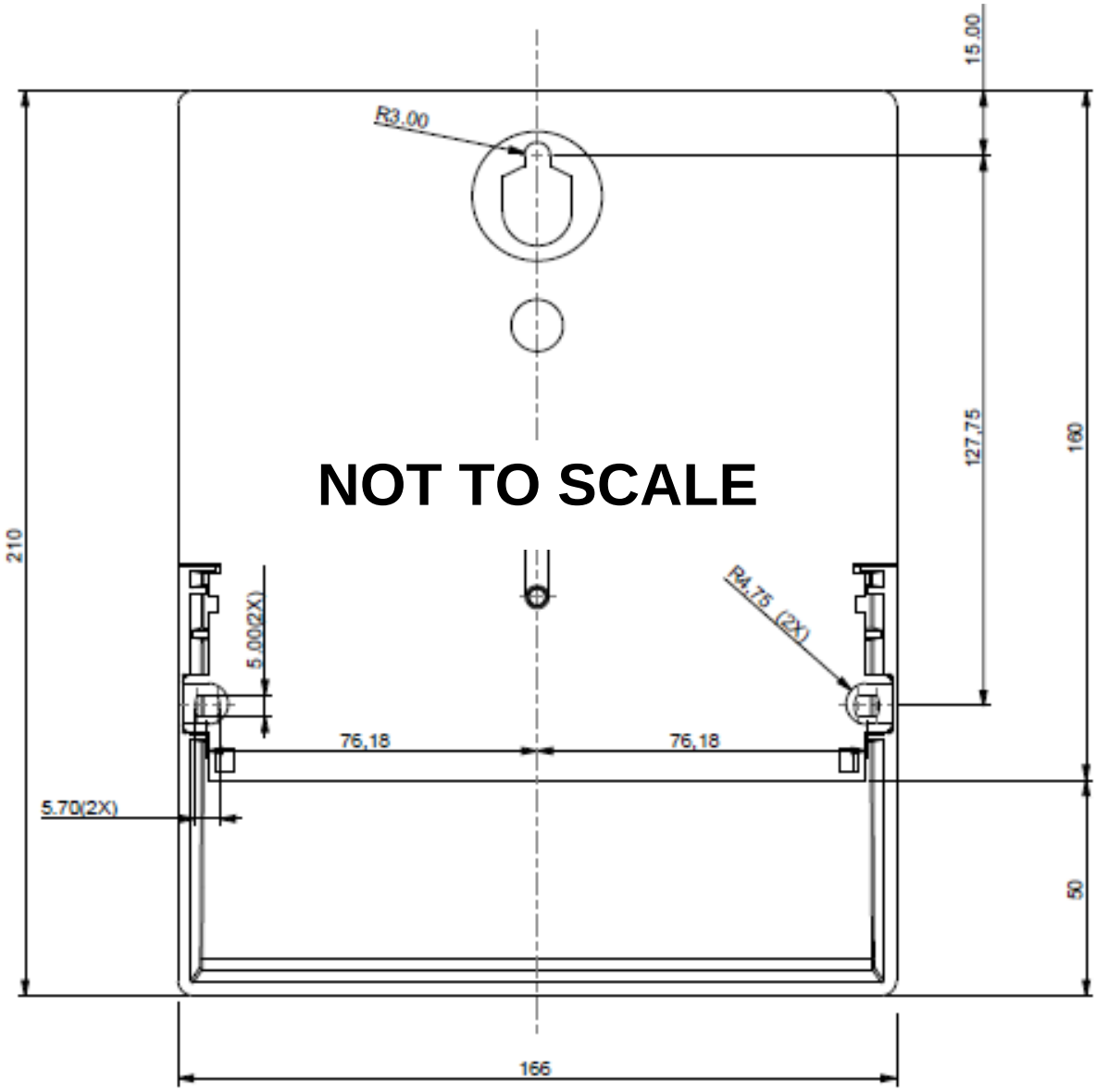


Figure 6.1-2: EET Meter Dimensions

The dimensions of the meter are shown in Figure 6.1-2. Height: 210mm (with standard terminal cover), 240mm (with extended terminal cover), Width: 166mm, Depth: 74mm.

When mounting the meter onto the switchboard, do not apply excessive force on the lower mounting points. These points should not be used to force the meter down onto the board. Ensure the supply cables are appropriately shaped or dressed and if necessary, slightly increase the size of the cable holes in the board.

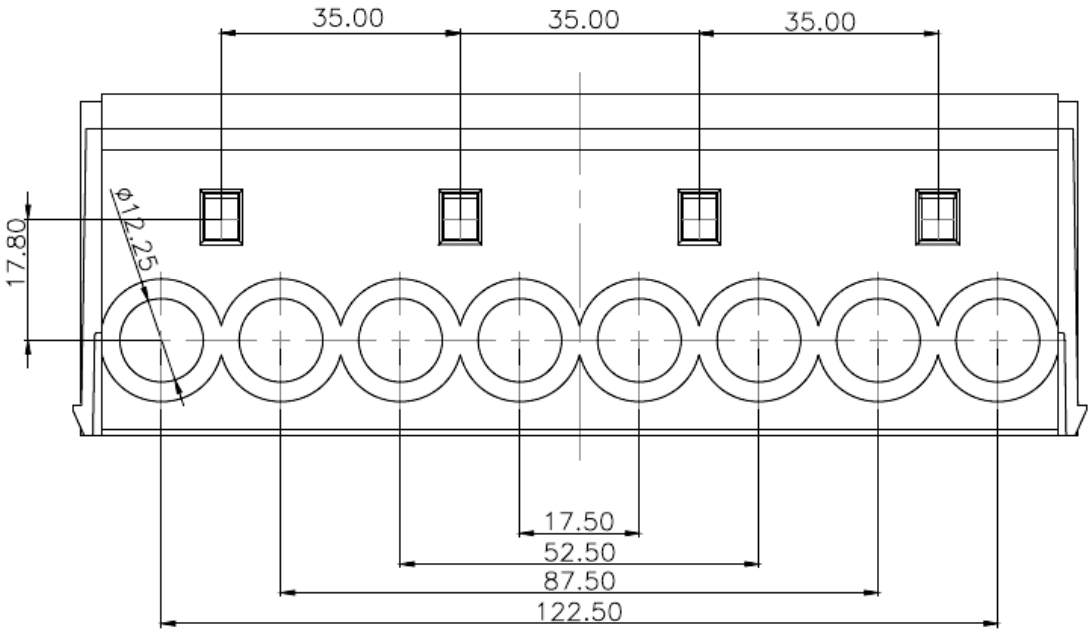


Figure 6.1-3: EET Main Terminal Spacing

6.1.4 Meter Appearance

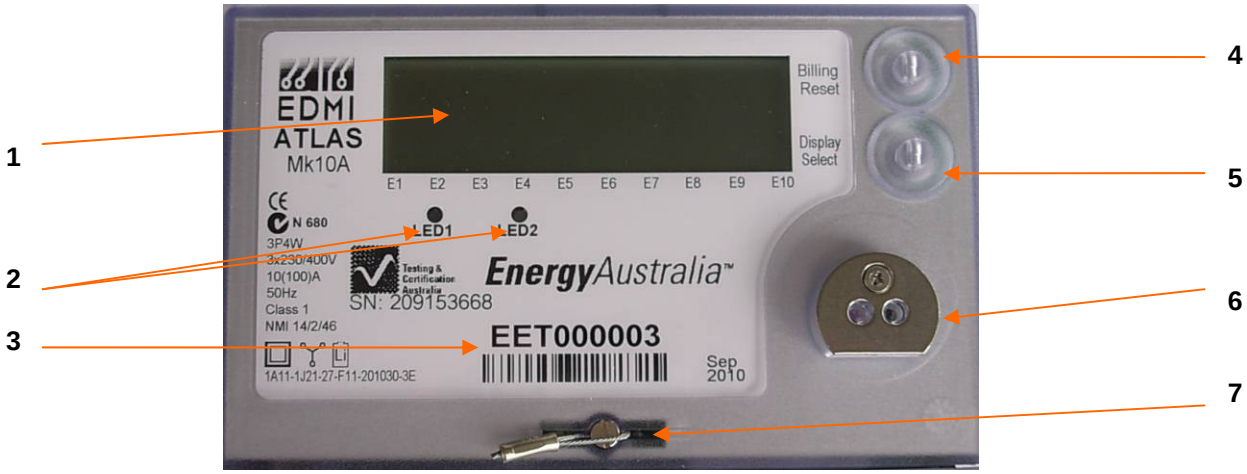


Figure 6.1-4: EET Appearance

Main parts visible on the front of the EET meter include:

1. LCD display shows information in sequence.
2. Two pulsing LEDs. See Table 4.3-5 for information on the configuration of these LEDs.
3. Meter label provides meter specific information including the meter serial number.
4. Billing Reset button disabled.
5. Display select button moves display to next register.
6. ANSI port provides local optical connectivity for meter reprogramming and other service work.
7. Meter seal ensure meter integrity.

6.1.5 Terminal Arrangement

Under the terminal cover are the terminals for voltage and current, connectors for auxiliary contacts and an optional communication interface socket. The terminal cover is attached with a sealable screw which has a 2mm diameter hole to accommodate sealing wire.

Cable connections to the meter are made under the terminal cover. Figure 4.3-5 shows the terminals available in EET meter and their location.

Figure 6.1-5: EET meter terminals

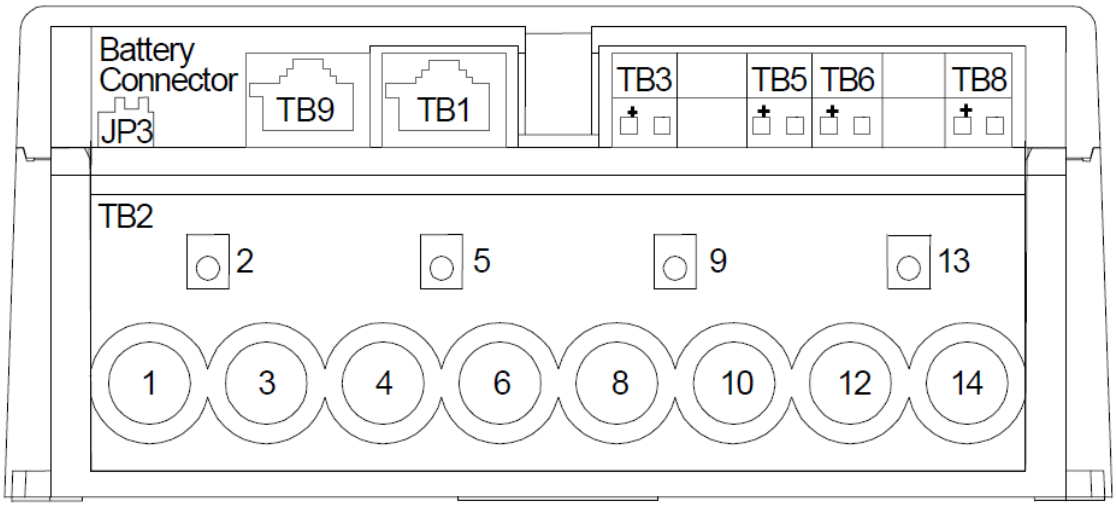


Figure 6.1-6: EET Terminal Block diagram

Terminal	Description
TB1	Dual active RS-232 port with RJ45 connector
TB2	Voltage and current inputs. (TB2-2, 2-5, 2-9, 2-12 and 2-13 not used)
TB3	Pulse Input 3 Active 12V
TB5	Pulse Output 4
TB6	Pulse Output 5
TB8	Pulse Output 6
TB9	Not Used
JP3	External battery connector

Table 6.1-2: Terminal description

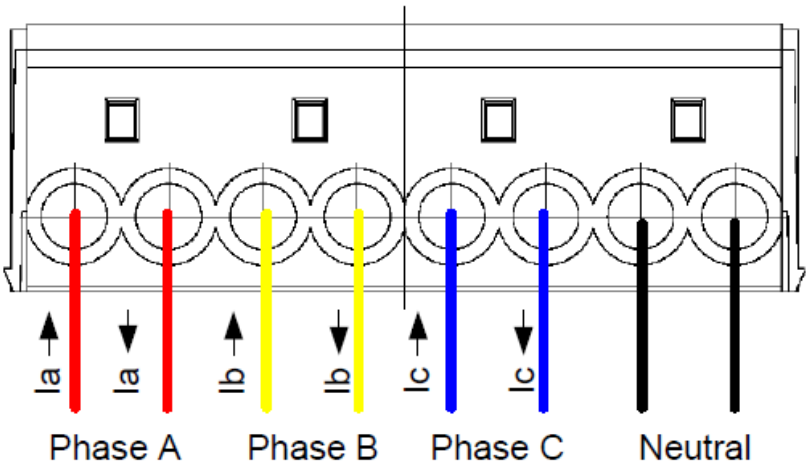


Figure 6.1-7: EET Mains Connection diagram

A finger guard is fitted over the top of main terminals to protect from accidental contact with live terminals. Make sure the finger guard is reinstated after the connections are made.

Figure 6.1-8: Finger Guard

6.1.6 Display

The display shows information from the meter and can be useful during installation and troubleshooting. Meter is programmed to cycle through main set of displays including test display which used to verify that all elements of the display are operating correctly (Figure 6.1-9).

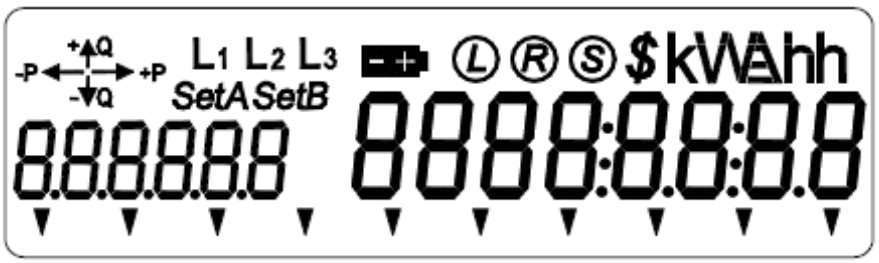


Figure 6.1-9: EET display

As the LCD is a numeric type, alphabetic characters are difficult to display. The meter will attempt to display them as best as possible, but readability will vary depending on the letter. If the information to display is longer than 8 characters the information will scroll to show the entire line with underscore "_" showing the start of the line.

The Meter display has following main areas:

 - 8 seven segment digits on the right to display values.

8.8.8.8.8.8 - 6 seven segment digits on the left to display description and register ID of values shown in the 8 segment section.

- Indicates direction of energy flow for Watts (P) and VARs (Q). A plus sign indicates positive flow (energy consumed by a customer), while a minus sign indicates negative flow (energy generated by a customer).

L1 L2 L3 - the three characters show presence of phase voltage on an individual phase.

 - Low battery indicator.

Ⓛ Ⓡ Ⓢ - Shows active Local or Remote communication session and SCADA port.

$ kWh - Displays the units and multiplier for values where applicable.

SetA SetB - Indicates current active set of displays.

▼ ▼ ▼ ▼ - Enunciators represent various meter conditions. Refer to Alarms section for details.

$ - Currency Symbol

The energy direction, battery and communication status indicators appear independently of what data is being displayed.

6.1.7 Buttons and Scrolling

The data is displayed as a series of pages with each page displaying an individual value record from the meter on the main seven segment display along with an associated display identifier on the small seven segment display. The meter is programmed to scroll through the displays automatically. The scroll button will force progress to the next page each time the button is pressed. The display then will remain on the selected page for an extended period of time before reverting back to regular cycling.

There are two display sets in the meter: Set A and Set B. Only pages from the currently selected display set are shown in the cycle. To change between sets, press and hold the Select button for 2 seconds. Set A shows the structure information currently in the meter, see Table 6.1-3 for details. Set B has additional information on the meter status, see Table 6.1-4 for details. The display will be automatically reverted back to Set A after 2 minutes.

If the meter is off (no voltage applied), pressing and holding the Select button will wake up the meter using its internal battery (it may take up to a second for the meter to wake up). All LCD screens may be viewed in this mode, including alternate display sets. This allows a manual meter reading even if power is lost. The display will automatically turn itself off after the No Power Timeout (15 secs).

6.1.8 Meter Registers

Meter Register Identifier Structure 11 (5511)			
Register	**Description**	**Dials**	**Dec**
	Display Test		
01	Date (DD.MM.YYYY)		
02	Time (HH:MM:SS)		
03	Total cumulative kWh consumed	6	1
14	Total cumulative kVarh lag	6	1
15	Total cumulative kVarh lead	6	1

Meter Register Identifier Structure 19 (9119, 9719)			
Register	**Description**	**Dials**	**Dec**
	Display Test		
01	Date (DD.MM.YYYY)		
02	Time (HH:MM:SS)		
03	Total cumulative kWh consumed	6	1

Meter Register Identifier Structure 21 (2421, 2521)			
Register	**Description**	**Dials**	**Dec**
	Display Test		
01	Date (DD.MM.YYYY)		
02	Time (HH:MM:SS)		
03	Total cumulative kWh consumed	6	1
93	Total cumulative kWh generated	6	1

Meter Register Identifier Structure 22 (4422)			
Register	**Description**	**Dials**	**Dec**
	Display Test		
01	Date (DD.MM.YYYY)		
02	Time (HH:MM:SS)		
03	Total cumulative kWh consumed	6	1
04	Total cumulative kVarh lag	6	1
93	Total cumulative kWh generated	6	1
94	Total cumulative kVarh lead	6	1

Meter Register Identifier Structure 25 (2125, 2225)			
Register	**Description**	**Dials**	**Dec**
	Display Test		
01	Date (DD.MM.YYYY)		
02	Time (HH:MM:SS)		
73	Total cumulative kWh generated	6	1
83	Total cumulative kWh consumed	6	1

Table 6.1-3: Set A Display Descriptions

All Programs	
Display	**Description**
SIGN	Modem Signal
PH A	Phase A Voltage
PH B	Phase B Voltage
PH C	Phase C Voltage
PH A	Phase A Current
PH B	Phase B Current
PH C	Phase C Current
PH A	Phase Angle A
PH B	Phase Angle B
PH C	Phase Angle C
C ALA	Current Alarms
L ALA	Latched Alarms
PROG	Meter Program ID
EAID	Meter ID
SN	Meter Serial Number
SOFT	Firmware version
P ON	Last Power Up Time
P OFF	Last Power Loss Time
InP or RVRS	Import kWh

Table 6.1-4: Set B Display Descriptions

6.1.9 LED Indicators

There are two LED's located on a front panel of the meter, labelled "Pulse 1" and "Pulse 2". They are programmed to pulse with a 50ms active time. Table 4.3-5 shows the LED outputs assignment.

All Programs		
Output	**Function**	**Rate**
Pulse 1	Absolute Wh Total	1 Pulse/Wh
Pulse 2	Absolute Varh Total	1 Pulse/Varh

Table 6.1-5: LED Assignments

6.1.10 Alarms

During operation the meter monitors a number of parameters. If an event occurs that is outside preset value an individual alarm is raised to indicate the status of the meter. The presence of an alarm is indicated by a downward pointing arrow (▼) indication on the bottom of the display.

Alarm Indication	Description
E1	Modem Power On (structures 5511, 9719, 2521, 4422)
E2	Active alarm present
E3	Latched Alarm event is recorded (not currently present)
E4	Not Used
E5	Not Used
E6	Not Used
E7	Not Used
E8	Not Used
E9	Not Used
E10	Not Used

Table 6.1-6: EET Enunciator description

E1 enunciator indicates modem power supply status and should stay solid on during normal operation while modem is connected.

E2 and E3 enunciators will appear on the display independently or simultaneous in the event of active or latched alarms respectively. The meter should not be commissioned with either E2 or E3 enunciator active.

The user can navigate to the Set B display on the meter and read dedicated register values as described in the Display section. When reading the alarm state from the display a string format is used. The alarm status is displayed as a string of characters, with each character representing an individual alarm. The register value when all alarms are present looks like “ESVFRTCMLHXYZNDU”. A full stop appears in each position when an alarm is not active. Letters always appear in the same location in the string with a full stop appearing in place of inactive alarms. For example, the display with only the reverse power alarm active will look like “…....M……..”. Table 6.1-7 below provides description of alarm conditions that can appear on the screen.

Letter	Alarm Name	Description
E	Analog Reference Failure	Meter measurement reference drift is above 50%, normally indicating an internal fault.
S	Asymmetric Power	Load unbalance between individual phases is above 100%.
V	Voltage Tolerance Error	The voltage level is outside allowed limits where meter can not provide accurate measurements.
F	VT Failure	The supply voltage is below 30% of nominal value.
R	Incorrect phase rotation	Disabled
T	Lid Tamper	Temper switch is released. Terminal cover is not in place or dislocated.
C	Clock Failure	The clock information is lost during a power off event. Normally caused by flat battery.
M	Reverse Power	Energy flow is negative indicating incorrect connection. (*disabled for Structure 22 and 21*)
L	Calibration Data Lost	Calibration data is lost or corrupted. Commonly caused by memory failure. Meter must be replaced.
H	Modem Failure	Meter has not got a response from the modem for some time
X	RAM or LCD Failure	Test is continuously performed on meter memory and LCD controller integrity. Alarm is generated when test fails.
Y	Program Flash Failure	Checksum of the program flash memory is continuously tested and any errors will trigger this alarm.
Z	Data Flash Failure	Memory read/write operation is failed.
N	Pulsing Output Overflow	The amount of energy pulses are greater then pulsing output can perform on time.
D	Battery Failure	Battery voltage is below required limit.
U	Magnetic Tamper	Not Used
O	Over Current	Over current (disabled)

Table 6.1-7: Description of Alarms

6.1.11 Pulsing Outputs / Inputs

There are a number of auxiliary connections located above the main terminals under the terminal cover which are used to interface with external devices. Please contact Ausgrid for further information.

6.1.12 Communication Port

The RS232 interface provides a serial communication link with the meter and allows direct attachment of a communications device via the RJ45 socket. Please contact Ausgrid for further information.

6.1.13 Meter Seals

The meter is sealed by the manufacturer at the factory. The seal is located on the main meter body on top of the terminal cover. The seal ensures that the meter has not been tampered or interfered with by unauthorised parties. Please ensure that the meter seal is in place and intact. According to the National Measurements Act, it is a criminal offence to remove or tamper with the meter seal. DO NOT install a meter without a seal or if the seal has been tampered with.

Fit a seal to the terminal cover (meter scoop) through the central screw at the completion of the installation process.

6.1.14 Commissioning

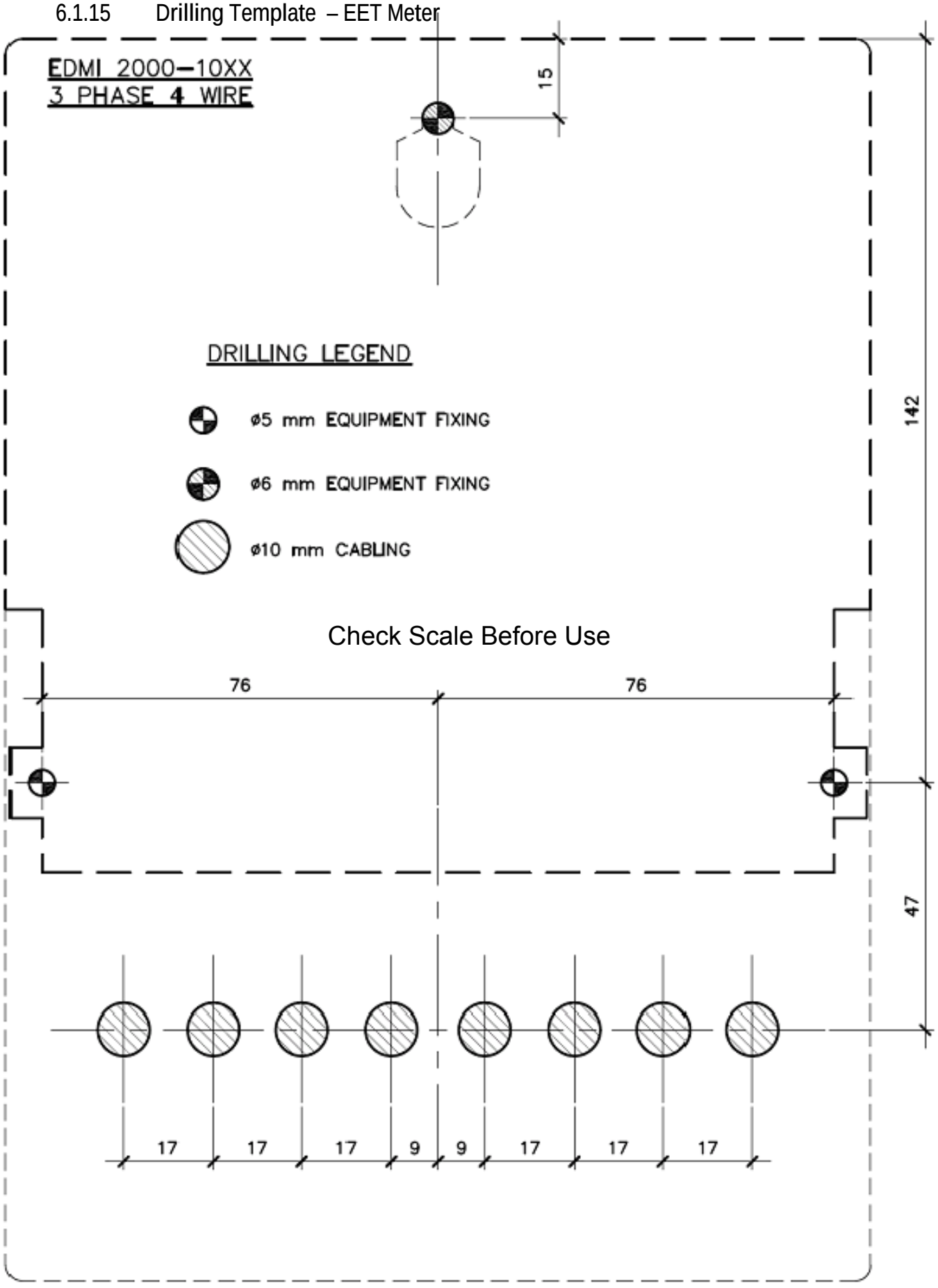
The following steps are to be followed for correct wiring and operation of the meter:

1. Inspection	Visually inspect the connection to ensure the correct wire is connected to the correct terminals of the meter. Ensure the Meter main seal is not broken.
2. Phase check	When a voltage is applied, the meter will turn on and the display can be read.
3. “Reverse Energy” check	Attach the Load Tester to the meter Check for “Reverse Energy” prior to re-connection of the customer load. This is where the Active and Load line may have been swapped. If this situation exist a warning code **M** is displayed on the LCD in the Set B display against IΠP or RVRS alternately Reverse energy is indicated by the ”**– P**⟵ ” symbol at the top left of the display. **If a “Reverse Energy” situation does occur, this error must be rectified immediately.** After correcting the wiring, the display should be checked to ensure the presence of the “⟶**+P** “symbol.
4. Operation check	Check the pulsing LED output on the front of the meter. The consumption indicator LED (Pulse 1) will flash at a rate of one pulse per 1 Wh measured and should flash proportionally to the load connected via the Load Tester. Note the LEDs are set for Absolute energy. (Refer to pulsing output section on page 15 for more details)
5. Date/Time check	Check date and time and confirm.
6. Initial check	Check the meter display. The meter should be in auto scroll mode.
7. Connect load	Connect customer load. Pulse LED should flash if there is consumption.
8. Clear meter alarms	Check for and clear meter alarms enunciators
9. Finish installation	Seal the meter scoop.

Table 6.1-8: Commissioning Steps

The meter is not designed to be serviced in a field except for optional installation of an external battery. There are no internal fuses. In the event of failure of the meter contact Ausgrid for assistance

6.1.15 Drilling Template – EET Meter



6.2 PRI-Sprint Whole Current PRW Electronic Meter

The **Sprint** is a three phase electronic type 4 & 5 code compliant meter.

Sprint meter offers following features for revenue metering application:

- Electronic, polyphase, whole current meter
- Full four quadrant metering
- 100 Amperes max current rating
- Bottom connected
- ANSI Optical port and RS-232 ports for remote communication
- Class 1 accuracy
- Load profile recording
- Does not require hand held programmer or Laptop for programming
- Ability to record buy back energy. To enable this function the meter must be specifically requested and programmed prior to delivery.

Figure 6.2-1 PRI-Sprint Whole Current PRW Electronic E3 Meter

6.2.1 Application

The Sprint is a type 5 code compliant meter for half hour interval metering and Time of Use tariffs with load profile recording for use by retailers in contestable markets. It can be used for residential as well as small commercial and industrial installation metering.

The load profile of the customer's energy usage will be recorded in 30 minute interval periods and stored in non-volatile memory in the meter. This data will be downloaded by meter readers with hand held probes that connect to the optical port. The data is then forwarded to the Meter Data Agency (MDA) for billing and statistical purposes. MDA also can read data remotely via the GSM modem.

Please note that the meter will operate on Australian Eastern Standard Time (AEST). There will be no change in time due to daylight savings.

Figure 6.2-2 shows the parts of the meter.

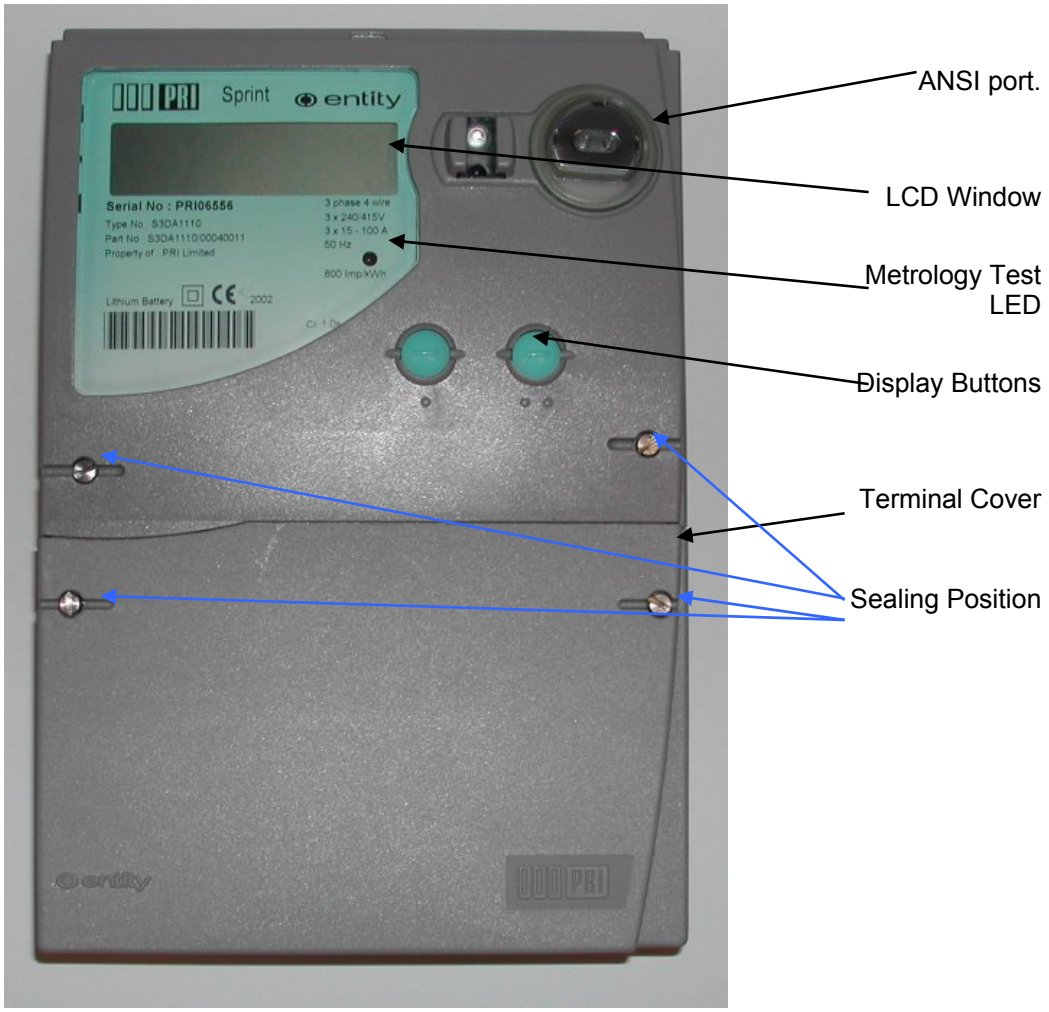


Figure 6.2-2 Parts Identification

6.2.2 Meter Dimensions

The approx. dimensions of the meter are 175(W) x 250(H) x 66.7(D) (mm). Figure 6.2-3shows the meter dimension. A drilling template (Not to scale) for Sprint Meter is also shown Figure 6.2-4.

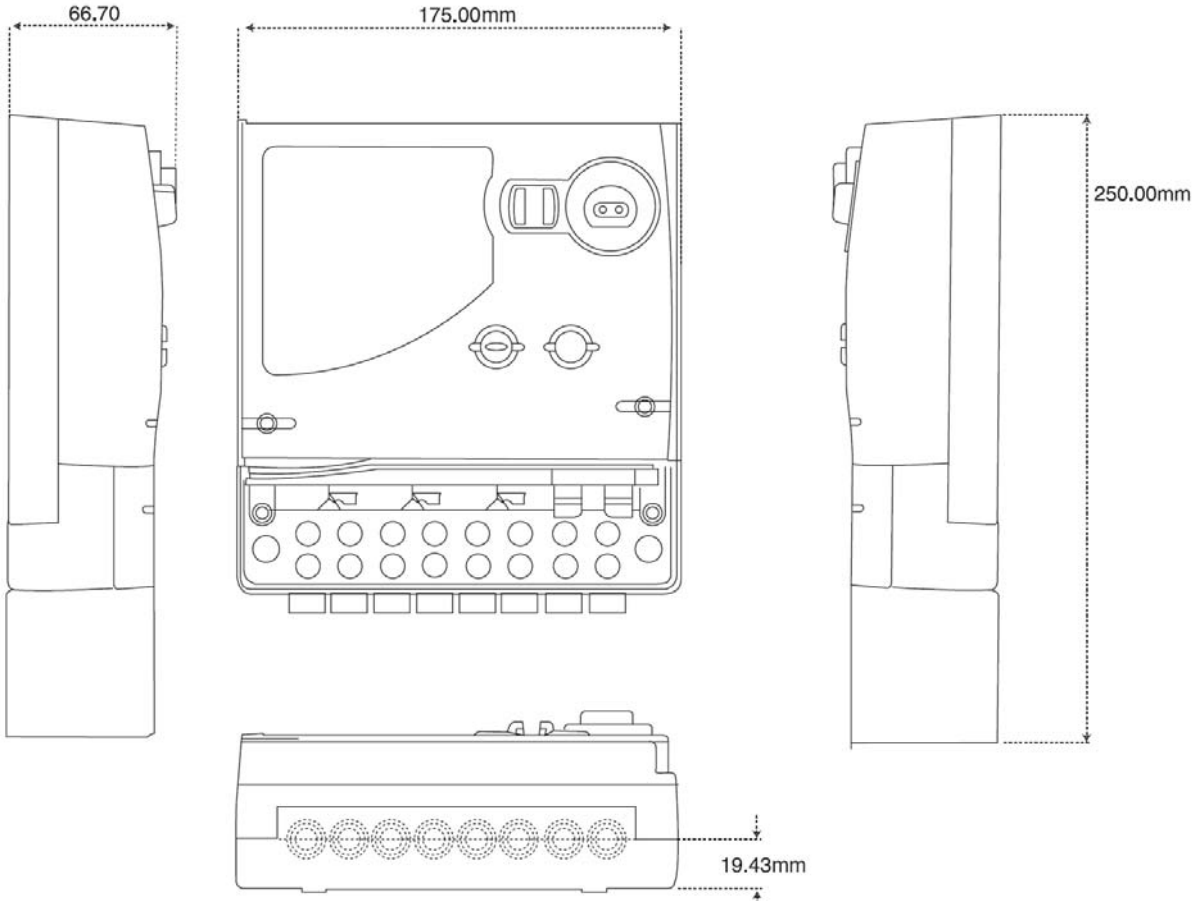


Figure 6.2-3The dimensions of Sprint meter

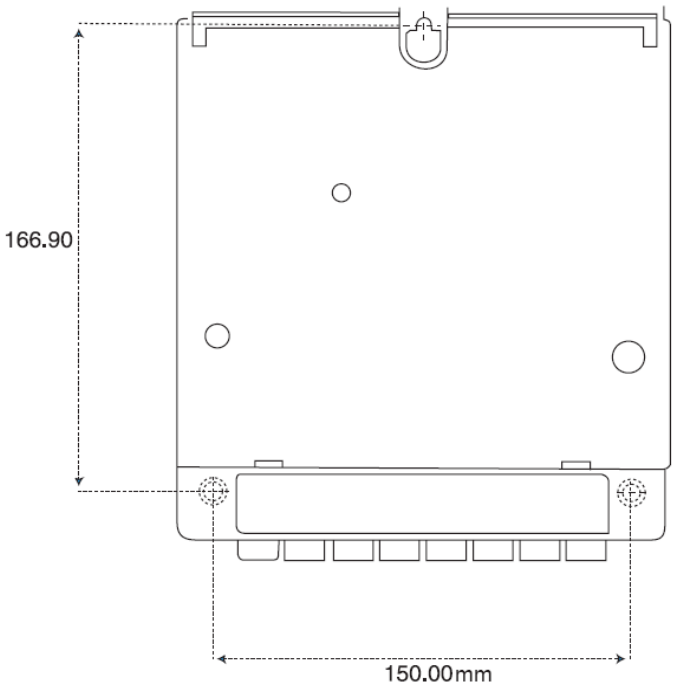


Figure 6.2-4 Drilling Positions

6.2.3 Terminal Arrangement

A terminal layout and wiring schematic for Sprint meter is shown in Figure 6.2-5.

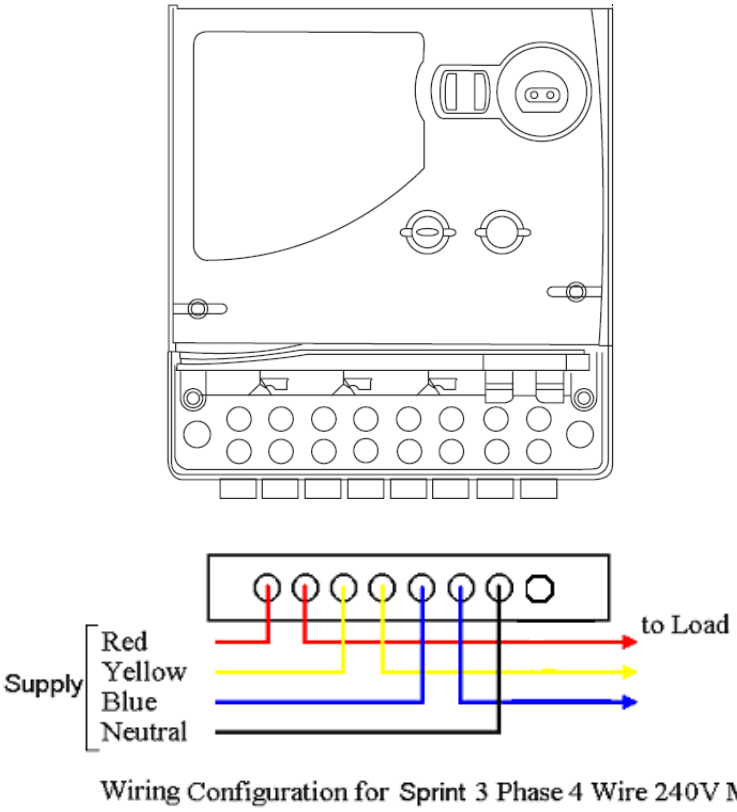


Figure 6.2-5 Meter Wiring Schematic

- Terminals 1S, 2S and 3S are the Supply Phases 1, 2, and 3
- Terminals 1L, 2L and 3L are the Load Phases 1, 2, and 3 (100A max.)
- Terminals NS, NL are the Neutral Supply and Load respectively

6.2.4 External RS232 Connected Interfaces

A modem can be connected to the RS232 port via an RJ11 connector as shown in Figure 6.2-6. Refer to Ausgrid for further information.

Figure 6.2-6 Terminals and RS232 connector

6.2.5 Display

The electronic display for the Sprint meter is shown in Figure 6.2-7

Figure 6.2-7 Meter Display

Section	Icon/ Digits	Details / Remark	Example
Main Value Indicator		Main section for display. Value of displayed parameter is shown here. Example screen showing value 123456.7	
Register ID Indicator		As the name indicates, this section shows the register number for the Rate, Demand or History Register. It is also used for showing Phase Number 1,2,3 for R,Y,B respectively	
Display ID Indicator		Used to indicate an id associated with a display. Used to distinguish between two similar displays.	
Unit Indicator		Indicates unit for parameter being displayed. Example screen shows value 12345.6 in KWh units.	
Direction Indicator		Forward & Backward signs indicate import and export condition of the meter, respectively. Similarly, the Capacitor and Inductor symbol indicate leading and lagging sign, respectively.	

Table 6.2-1 Meter Display Indicators

6.2.6 Display Set A – Main display

The Sprint is programmed with a default program structure called “Structure 19”. The registers it has been programmed to display are shown in Table 6.2-2.

Structure 19 Meter Register Display			
Reg	**Display**	**Dials**	**Dec**
88	Display Test (888888)	6	0
01	Date (ddmmyy)	6	0
02	Time (hhmmss)	6	0
03	Total cumulative kWh	6	1

Table 6.2-2 Standard (Structure 19) Register Display

When programmed for buy back consumption, the meter display is as described in Table 6.2-3.

Structure 21 Meter Register Display			
Reg	**Display**	**Dials**	**Dec**
88	Display Test (888888)	6	0
01	Date (ddmmyy)	6	0
02	Time (hhmmss)	6	0
03	Import Total cumulative kWh	6	1
93	Export Total cumulative kWh	6	1

Table 6.2-3 Buy Back (Structure 21) (Buy Back) Register Display

Please note, the Time of Use tariffs will be calculated from the load profile data that the MDA will download from the meter.

6.2.7 Display Set B – Power Quality Reporting

The information available in the Set B display is shown in Table 6.2-4.

Identifier	Displayed Information
01	Current phase 1
02	Current phase 2
03	Current phase 3
04	Voltage phase 1
05	Voltage phase 2
06	Voltage phase 3
07	Frequency
08	Power factor
09	Real power (kW)
10	Reactive Power (kVar)
11	Max. Voltage recorded on Phase 1
12	Time of Max. Voltage recorded on Phase 1
13	Date of Max. Voltage recorded on Phase 1
14	Max. Voltage recorded on Phase 2
15	Time of Max. Voltage recorded on Phase 2
16	Date of Max. Voltage recorded on Phase 2
17	Max. Voltage recorded on Phase 3
18	Time of Max. Voltage recorded on Phase 3
19	Date of Max. Voltage recorded on Phase 3
20	Min. Voltage recorded on Phase 1
21	Time of Min. Voltage recorded on Phase 1
22	Date of Min. Voltage recorded on Phase 1
23	Min. Voltage recorded on Phase 2
24	Time of Min. Voltage recorded on Phase 2
25	Date of Min. Voltage recorded on Phase 2
26	Min. Voltage recorded on Phase 3
27	Time of Min. Voltage recorded on Phase 3
28	Date of Min. Voltage recorded on Phase 3
29	Status
30	Tariff name eg 2711 00 (00 is the program version)

Table 6.2-4 Set B Display Information

To access Display Set B, push and hold the right button for 5 seconds. Pushing the right button after this allows you to manually scroll through the display items.

6.2.8 Meter Wiring Check

The following steps are to be followed for correct wiring and operation of the meter.

1. Inspection	Visually inspect the connections to ensure the correct wire is connected to the correct terminal of the meter.
2. Phase Check	When a voltage is applied, the meter will turn on and the display can be read.
3. "Reverse Energy" check	Attach the Load Tester to the meter. Check for "Reverse Energy" prior to re-connection of the customer load. This is where the Active and Load lines have been swapped. Reverse energy is indicated by the"◄" symbol at the bottom of the display. Go to display set B to check the direction of the current flow in each phase. If a "Reverse Energy" situation does occur, this error must be rectified immediately. After rechecking the wiring, the display should be checked to ensure the presence of the "►"symbol.
4. Operation check	Check the pulsing LED output on the front of the meter. The consumption indicator LED will flash at a rate of 800 pulses per kilowatt-hour measured and should flash proportionally to the load connected via the Load Tester.
5. Date/Time check	Check date and time and confirm. Note the format Day, Month, Year (DD:MM:YY)
6. Initial check	Check the meter display. The meter should be in auto scroll mode.
7. Connect load	Connect customer load. The symbol "►"should be displayed if there is consumption.

6.2.9 Sealing of Meter

The Sprint Meter is supplied with 5 seals (See Figure 6.2-2).

- Two to prevent opening the meter enclosure on front of the top cover.
- Two to prevent opening the terminal cover situated on the terminal cover.
- One on the left button to prevent using the Left button.

The meter enclosure seal and the seal on the left button should never be broken. Other seals, if broken, must be re-sealed.

6.2.10 Drilling Template

The cable hole drilling dimensions can be obtained from Figure 6.2-4.

6.3 AMX and AMZ L&G EM5100 Electronic Meter

The AMPY Email EM5100 meter (Figure 6.3-1) is a multifunctional, programmable, polyphase, 4-wire Whole Current (10-125 A) 240V, Type 5 code compliant meter.

The meter has a property number prefix beginning with **AMX** or **AMZ** and by default is programmed with structure **19.**

Other structures available include 11 and 21 bidirectional. If any of these structures is required, they must be specifically requested when meter is ordered.

The AMZ meter is based on the AMX design, but includes provision for an under scoop modem and has more memory.

6.3.1 Features

Features of the EM5100 electronic meter are as follows:

- 10-125A Whole Current Range
- Class 1.0
- Quality of Supply monitoring
- Flexible interval data recording
- Four fully programmable pulse relay outputs for energy management systems
- Backlit display for ease of reading
- Interval data recording – up to 12 channels in 2 separate groups
- RS232 port for remote communication. AMZ meters also have power feed for a modem device
- AMZ meters have under scoop modem capability
- Ability to record buy back energy.
- AMZ meters have additional interval memory compared to the AMX
- In-field replaceable battery

Figure 6.3-1 AMPY Email EM5100 (AMX) Meter. AMZ is similar.

6.3.2 Application

The EM5100 electronic meter is code compliant for types 4 & 5 installations for interval metering and Time-Of-Use tariffs with load profile recording. It can be used by retailers in contestable markets and for industrial and commercial metering that require an E3 configuration.

Structures **19** (default), 21 and 25 are programmed to record the customer's energy usage in 30 minute intervals and 15 minutes with structure 11, or structure 22. Each phase (average) voltage is also recorded but in 10 minute intervals. All load profiles are stored in non-volatile memory within the meter and can be downloaded for billing and statistical purposes.

Note: The meter operates on Australian Eastern Standard Time (AEST) at all times– there will be no change in time due to daylight savings

6.3.3 Layout of the Meter

The layout of the EM5100 meter is shown in Figure 6.3-2 below:

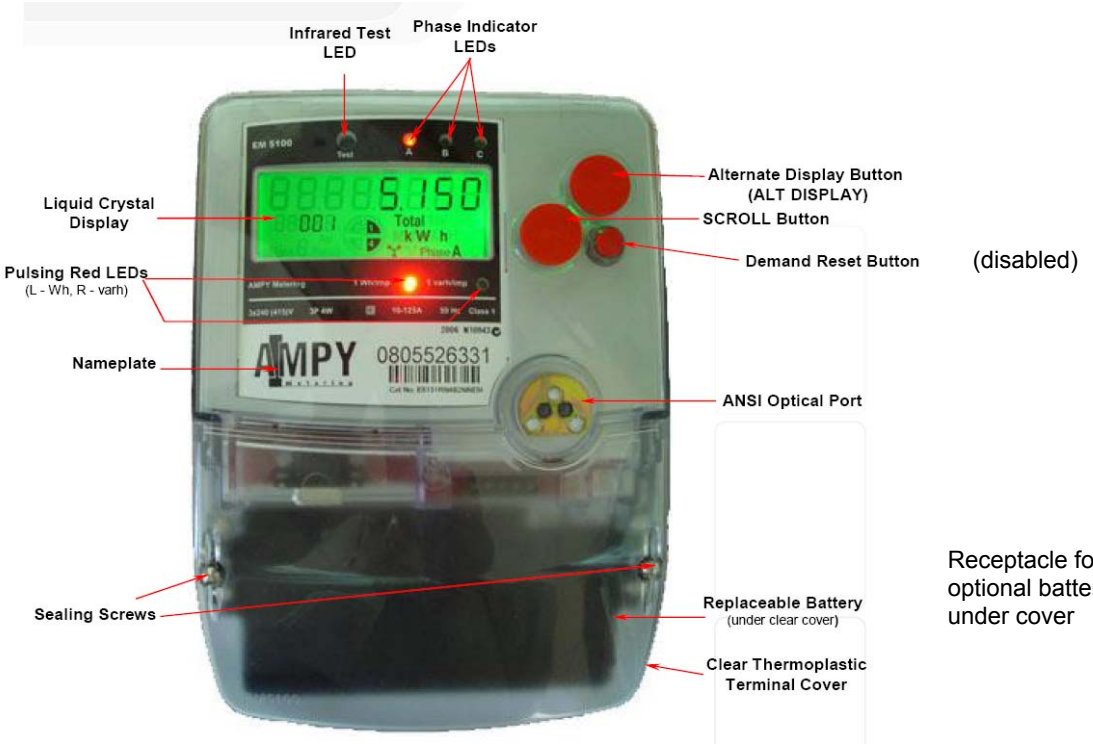


Figure 6.3-2 EM5100 Meter Appearance

6.3.4 Terminals and Connectors

Figure 6.3-3 below shows the terminals and connectors of the EM5100 (AMX).

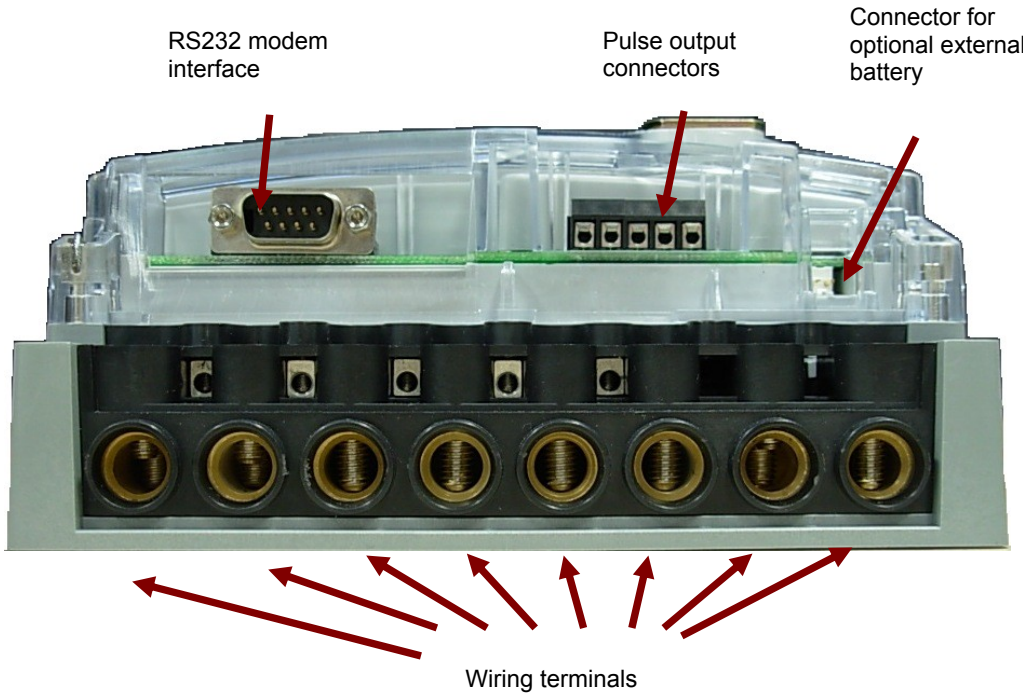


Figure 6.3-3 Meter terminal

The AMZ meter is similar, and differs only from Figure 6.2-4 in that the RS232 port is an RJ45 connector instead of the DB9 connector on the AMX meter.

6.3.5 Wiring Configuration

The EM5100 is configured as a 3 phase 4 wire Whole Current meter. Figure 6.3-4 below shows the wiring schematic.

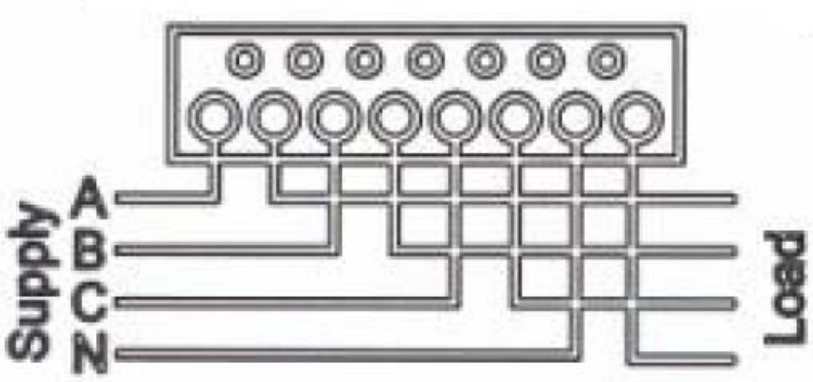


Figure 6.3-4 Meter wiring

This wiring schematic for the EM5100 meter can also be found on the inside of the meter's terminal cover.

Standard installation wiring is to use only a single neutral wire, and the preference is to wire this to terminal 8.

6.3.6 LCD display

The display, shown below, contains a number of Annunciators and Indicators which help identify display options (metering and configuration information). Display ID is programmable.

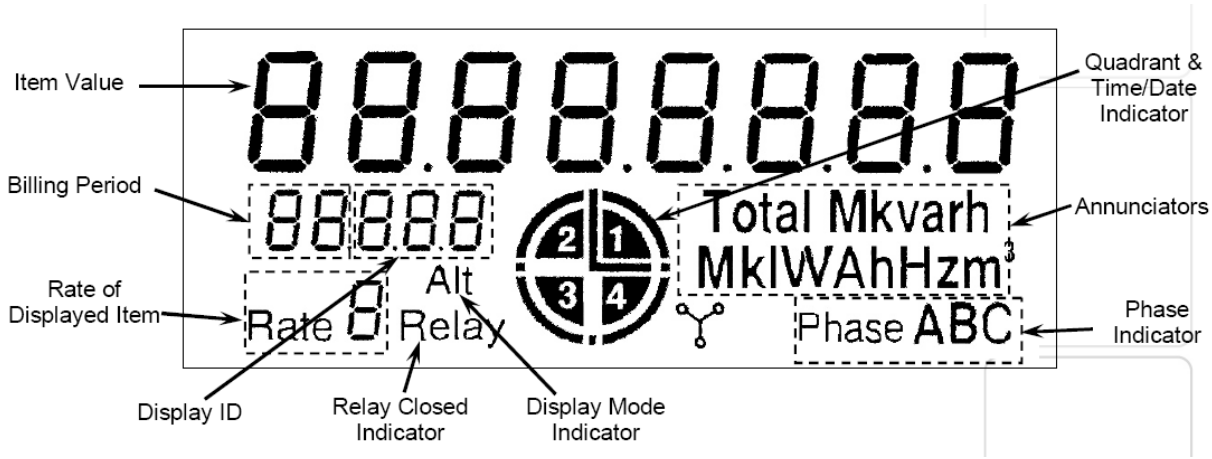


Figure 6.3-5 EM5100 meter display

Display ID: a three-digit number that identifies the display option.

Item Value: the value of the display option, i.e. date, time, voltage, current, energy consumed, power factor value, error and warning code.

Phase Indicators: shows the Phase or Phases metered.

Quadrant indicator: The quadrant annunciator is used to indicate imported and exported energy and the quadrant referred to by the power factor currently being displayed. These indicators are useful when analysing meter connections in new installations.

Figure 6.3-6 Quadrant indicator examples

Note: Import and export metering conventions are based on the customer perception.

More details can be viewed through the Display Lists as described in following sections

6.3.7 LED indicators

Test LED: Infrared LED - used for test purposes only.

Phase Indicator LEDs: Three red LEDs indicate the presence of the A, B and C phase voltages respectively.

Red LED Pulse indicators: Two Red LEDs below the main LCD screen. Flash at a rate proportional to the energy consumption.

- The left LED “1Wh/imp” flashes at the rate of 1 pulse per Wh.
- The right LED “1 varh/imp” flashes at the rate of 1 pulse per VArh.

6.3.8 Alternate Display and Scroll Buttons

The EM5100 meter displays data stored in the meter's registers on the LCD. The data to be displayed is programmed in three display groups, and scrolls automatically through the first of these display groups (Normal Display). The meter display backlight times out after approximately 80 seconds, and pressing either SCROLL or ALT DISPLAY buttons will restore it for a further 80 seconds.

The ALT DISPLAY button can be used to move quickly to the Alternate Display lists. The operation of the ALT Display button is best explained with reference to Figure 4.3-7 below. In this figure each arrow represents one press of the ALT DISPLAY button.

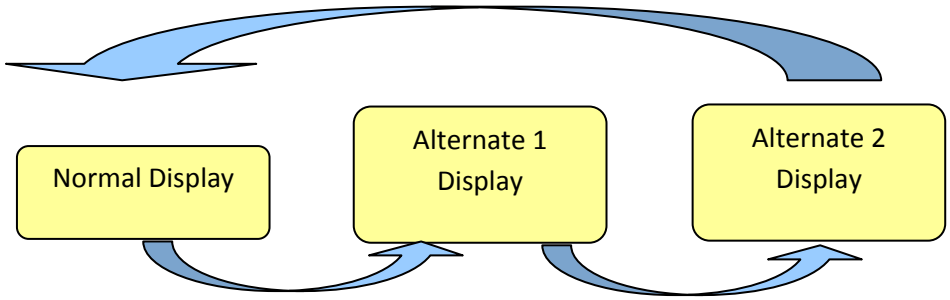


Figure 6.3-7 Sequence followed by pressing ALT DISPLAY button

Scrolling individual items is automatic, every 6 seconds, or manual by pressing the SCROLL button in any display which will move on one item in the list. Note that holding the SCROLL button down does not make the list scroll quickly. Scrolling past the end of the 3 display lists automatically returns to the start of Normal Display list.

6.3.9 AMX Meter Display Scroll

The Table 6.3-1show the order of information displayed on the AMX meter display for the various program structures. The scroll order is top through to the bottom then looping back to the top

Meter Register Identifier Structure 3211			
Reg	**Structure 11 (Standard Metering – 15 min lp)**	**Dials**	**Dec**
000	Display Test (88888888)	8	0
01	Date (dd.mm.yyyy)	8	0
02	Time (hh:mm)	4	0
03	kWh Imported	5	1
14	Import Varh total (E1)	5	1
15	Export Varh total (B1)	5	1

Meter Register Identifier Structure 6619			
Reg	**Structure 19 (Standard Metering – 30 min lp)**	**Dials**	**Dec**
000	Display Test (88888888)	8	0
01	Date (dd.mm.yyyy)	8	0
02	Time (hh:mm)	4	0
03	kWh Imported (E1)	5	1

Meter Register Identifier Structure 0921			
Reg	**Structure 21 (Net-Metering)**	**Dials**	**Dec**
000	Display Test (88888888)	8	0
01	Date (dd.mm.yyyy)	8	0
02	Time (hh:mm)	4	0
03	kWh Imported (E1)	5	1
93	Net kWh Exported (B1)	5	1

Meter Register Identifier Structure 3222			
Reg	**Structure 22 (Standard Metering)**	**Dials**	**Dec**
000	Display Test (88888888)	8	0
01	Date (dd.mm.yyyy)	8	0
02	Time (hh:mm)	4	0
03	kWh Imported (E1)	5	1
04	kVARh Quadrants 1 and 2	5	1
93	kWh Exported (B1)	5	1
94	kVARh Quadrants 3 and 4	5	1

Meter Register Identifier Structure 0425			
Reg	**Structure 25 (Gross-Metering)**	**Dials**	**Dec**
000	Display Test (88888888)	8	0
01	Date (dd.mm.yyyy)	8	0
02	Time (hh:mm)	4	0
73	Gross kWh Exported (B1)	5	1
83	Gross kWh Imported (E1)	5	1

Table 6.3-1 Normal Display Structure

6.3.10 AMZ Meter Display Scroll

The Table 6.3-2 show the order of information displayed on the AMZ meter display for the various program options. The scroll order is top through to the bottom then looping back to the top

Meter Register Identifier Structure 5111			
Reg	**Structure 11 (Standard Metering – 15 min lp)**	**Dials**	**Dec**
000	Display Test (88888888)	8	0
01	Date (dd.mm.yyyy)	8	0
02	Time (hh:mm)	4	0
03	kWh Imported	5	1
14	Import Varh total (E1)	5	1
15	Export Varh total (B1)	5	1

Meter Register Identifier Structure 8219			
Reg	**Structure 19 (Standard Metering – 30 min lp)**	**Dials**	**Dec**
000	Display Test (88888888)	8	0
01	Date (dd.mm.yyyy)	8	0
02	Time (hh:mm)	4	0
03	kWh Imported (E1)	5	1

Meter Register Identifier Structure 1521			
Reg	**Structure 21 (Net-Metering)**	**Dials**	**Dec**
000	Display Test (88888888)	8	0
01	Date (dd.mm.yyyy)	8	0
02	Time (hh:mm)	4	0
03	kWh Imported (E1)	5	1
93	Net kWh Exported (B1)	5	1

Meter Register Identifier Structure 3422			
Reg	**Structure 22 (Standard Metering)**	**Dials**	**Dec**
000	Display Test (88888888)	8	0
01	Date (dd.mm.yyyy)	8	0
02	Time (hh:mm)	4	0
03	kWh Imported (E1)	5	1
04	kVARh Quadrants 1 and 2	5	1
93	kWh Exported (B1)	5	1
94	kVARh Quadrants 3 and 4	5	1

Meter Register Identifier Structure 1225			
Reg	**Structure 25 (Gross-Metering)**	**Dials**	**Dec**
000	Display Test (88888888)	8	0
01	Date (dd.mm.yyyy)	8	0
02	Time (hh:mm)	4	0
73	Gross kWh Exported (B1)	5	1
83	Gross kWh Imported (E1)	5	1

Table 6.3-2 Normal Display Structure

6.3.11 Alternate Display For AMX and AMZ meters

Alternate 1 Display List	
Scroll Time [Secs] 6	
Display ID	**Description**
001	Amps Phase A
002	Amps Phase B
003	Amps Phase C
004	Voltage Phase A
005	Voltage Phase B
006	Voltage Phase C
007	Power Actual Total
008	Power Apparent Total
009	Power Factor Total
010	Frequency
011	kWh Exported
012	Number of Power Outages
013	Duration of all Outages
014	Start Time of Last Power Outage
015	Start Date of Last Power Outage
016	Error
017	Flagged Warnings
018	Program File Number

Table 6.3-3 Alternate 1 Display List

Alternate 2 Display List	
Scroll Time [Secs] 6	
Display ID	**Description (see Notes 1 & 2)**
001	Phase A Volts Phase A Amps Phase PF Phase B Volts Phase B Amps Phase PF Phase C Volts Phase C Amps Phase PF Phase angle between phase A & B Phase angle between phase A & C

Table 6.3-4 Alternate 2 Display List – To be used to check parameters at installation

Note 1: When the Alternate 2 display list is enabled, the meter will cycle through a sequence of checks of the meter voltage, current, and power factor for each of the 3 phases followed by the voltage angle for phase B and C (relative to A phase).

The cycling continues until the SCROLL button is pressed which will then move the display out of continuous cycle onto the next item in the list. In this case, it will return to the Normal Display sequence.

Note 2: All measurements are instantaneous values.

6.3.12 Pre – Commissioning Checklist

It is important that the installer checks the wiring of the EM5100 meter once it is installed.

The following steps are to be followed for correct wiring and operation of the meter:

1. Inspection	Visually inspect the connection to ensure the correct wire is connected to the correct terminals of the meter. Ensure the Meter main seal is not be broken. Ensure the three voltage links are in the closed/shorted position before installation.
2. Phase check	When a voltage is applied, the meter will turn on and the display can be read. The Phase LED indicators will be ON to indicate the presence of the phase voltages.
3. "Reverse Energy" check	Attach the Load Tester to the meter Check for "Reverse Energy" prior to re-connection of the customer load. This is where the Active and Load line may have been swapped. If this situation exists a warning code **F 000100** is displayed on the LCD in the Alt display. Or use the power factor display and look at the quadrant information to work out whether energy is flowing to or from the supply. The reverse energy alarm is only active in St 19 program.
4. Operation check with Load connected	Check the pulsing LED output on the front of the meter. The consumption indicator LED (the one on the left) will flash at a rate of one pulse per 1 Wh measured and should flash proportionally to the load connected via the Load Tester.
5. Date/Time check	Check date and time and confirm. Note the format Day, Month, Year (DD.MM.YYYY)
6. Initial check	Select the Alternate 2 display and confirm that all readings are consistent with the load connected to the meter.
7. Connect load	Connect customer load. Pulse LED should flash if there is consumption.
8. Finish installation	Seal the meter.

6.3.13 Error and Warning Codes

The meter can display errors that alert the user to various problems. If the problem cannot be identified or fixed on site, note the error code and return the meter to Ausgrid for investigation.

Error codes have the format 'Er 0xxxxxx' and will be displayed on the 'Normal' display.

Warning codes have the format 'F0xxxxxx' and will be displayed in the 'Alt 1' display. They indicate a 'less severe' fault.

6.3.14 Sealing of The Meter

The EM5100 meter is sealed by the manufacturer at the factory. The location of the seal is on the left hand side of the main meter body under the scoop. The seal ensures that the meter has not been tampered or interfered with by unauthorised parties. Please ensure that the meter seal is in place and intact. According to the National Measurements Act, it is a criminal offence to remove or tamper with the meter seal. **DO NOT** install a meter without a seal or if the seal has been tampered with.

Fit two seals to the meter scoop cover at the completion of the installation process

6.3.15 Meter Dimensions and Mounting Diagram:

The top mounting bracket can be used in 2 positions as shown in the figure 3.33.

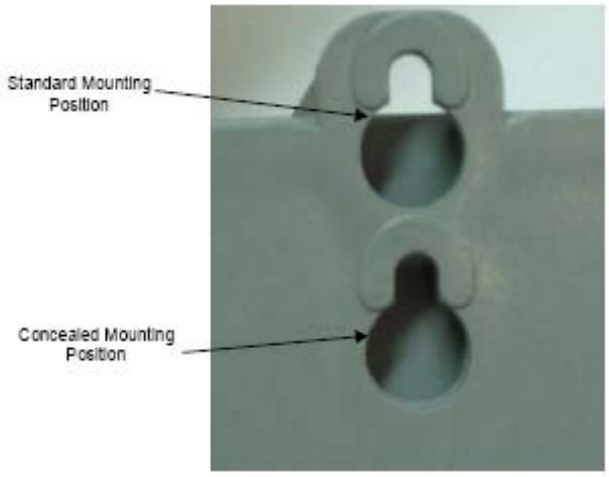


Figure 6.3-8 The 2 positions of the meter top mounting bracket

The top position is the standard mounting position for AMPY Email Metering polyphase meters.

An additional position is available (the concealed position in Figure 6.3-8 which allows for a hidden top screw. This has a top screw position set at 22 mm below the standard position (also shown in Figure 3.34).

The corresponding mounting dimensions are shown in Figure 6.3-9 together with the meter's overall dimensions and the drilling positions for meter wiring.

Drawing Not To Scale

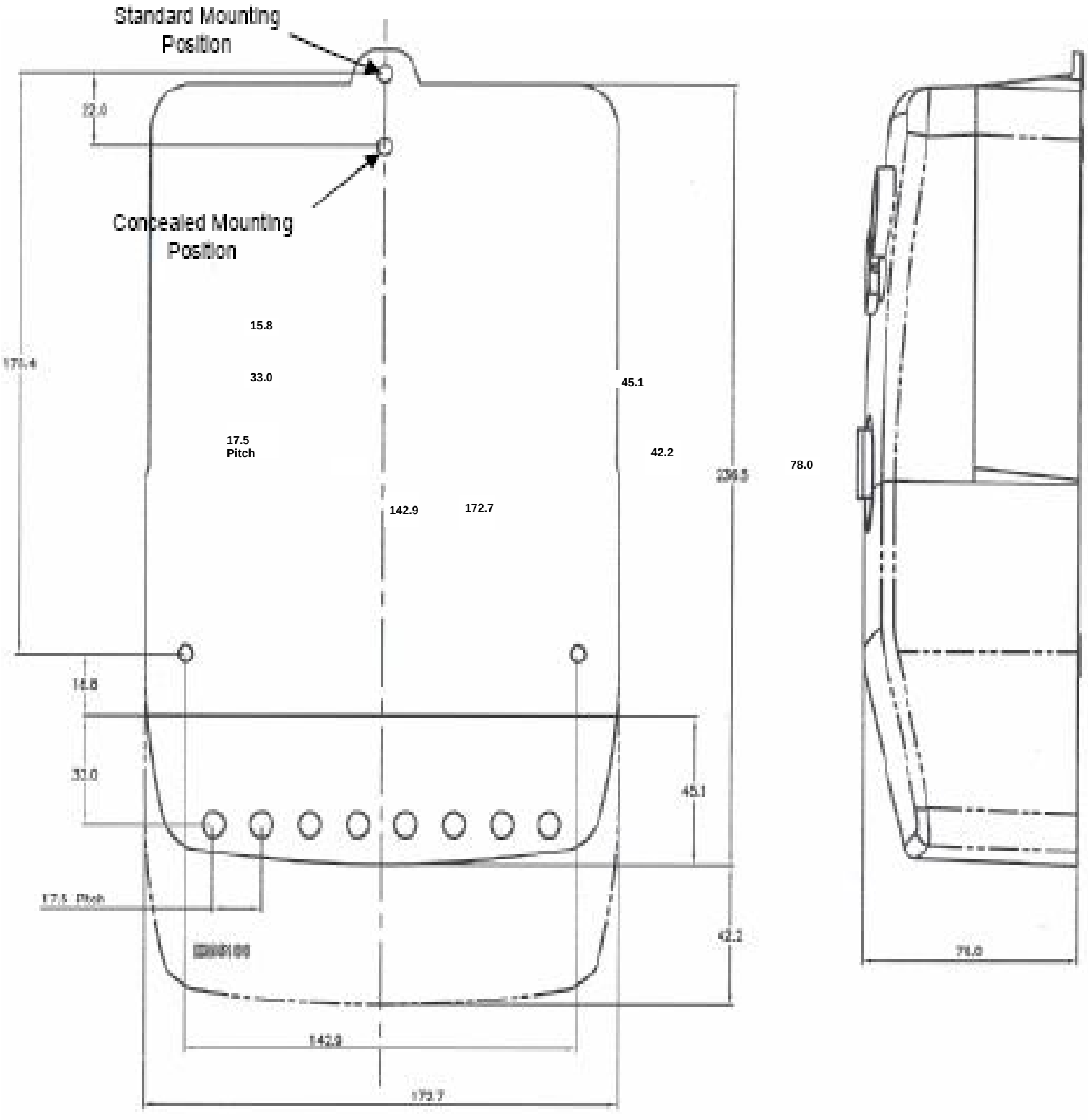


Figure 6.3-9 EM5100 meter dimensions and drilling positions (NOT TO SCALE)

6.4 LGC L&G U3300 E3 Wimax Meter

The LGC is a three-phase, single element load profiling meter suitable for type 5 installations. The meter is manufactured by Landis & Gyr and is from the U3300 Series WiMAX meter range. The meter was initially used as part of the Smart Grid Smart City WiMAX trial, however is now used as a standard meter without the communications module installed.

The LGC is an electronic, multifunction, programmable, three phase, four wire, single element, Whole Current (10-100A) 3X240(415)V Interval (Time-of-Use) meter.

Main Features of U3300:

- Electronic, three-phase whole current meter
- Import / Export kWh and kvarh measurement
- Wh Class 1 and Varh Class 2 Accuracy
- Supports Type 5
- 7 digit Liquid Crystal Display
- Four Quadrant measurement
- Up to 1182 Days of Load profiling Recording (Interval data)
- Enhanced QOS & Supply capacity control (not used)
- Plug - N - Play communication system (not used)
- Optical port for local communication
- HAN capable (not used)
- Lithium Battery with 5 years off power operation and 10 years shelf life

Figure 5.4-1: LGC Meter front view

6.4.1 Application

The LGC is a three-phase, single element, whole current Interval (Time-of-Use) meter. It records interval metering for Time-of-Use tariffs. The meter meets NER accuracy requirements and is suitable for type 5 domestic and commercial installations that required an E3 configuration.

6.4.2 Available Programs For LGC Meters

Programs	Interval	Structure	Type	Application
9519	30	19	5	Standard Electricity Consumption Only
2821	30	21	5	Bidirectional Net Metering
1925	30	25	5	Bidirectional Gross Mmetering

Table 5.4-1: Available LGC Programs

6.4.1 Mounting Dimensions

The dimensions of the bottom connected meters are 229(H) x 175(W) x 109(D) (mm).

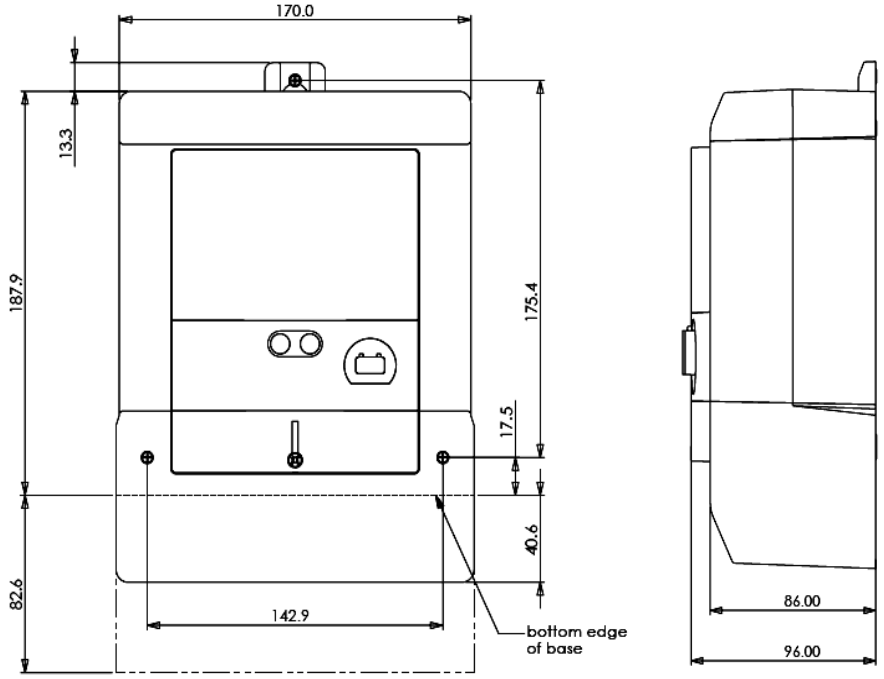


Figure 5.4-2: LGC meter dimensions.

A drilling template for the LGC can be found at the end of this document. (The dotted line is the meter outline.) Check the scale before use to ensure it has printed to the correct size.

The meter is designed to be mounted using three screws. Threaded section of the screws should have diameter between 3mm and 5mm with a screw head not smaller than 8mm.

The top mounting bracket can be used in 2 positions.

The top (exposed) position is the standard mounting position for the meter. An additional position is available (the concealed position) which allows for a hidden top screw. This has a top screw position set 25 mm below the standard position.

6.4.2 Meter Appearance

Figure 5.4-3: LGC Meter layout

Main parts visible on the front of the meter include:

- Seals ensure meter integrity and must not be removed
- LCD display shows information in sequence
- Phase indication LEDs
- Pulsing LEDs to indicate kWh and kvarh consumption
- Meter property number
- Optical communications port provides local connectivity for meter reading, meter reprogramming and other service work

6.4.3 Terminal arrangment

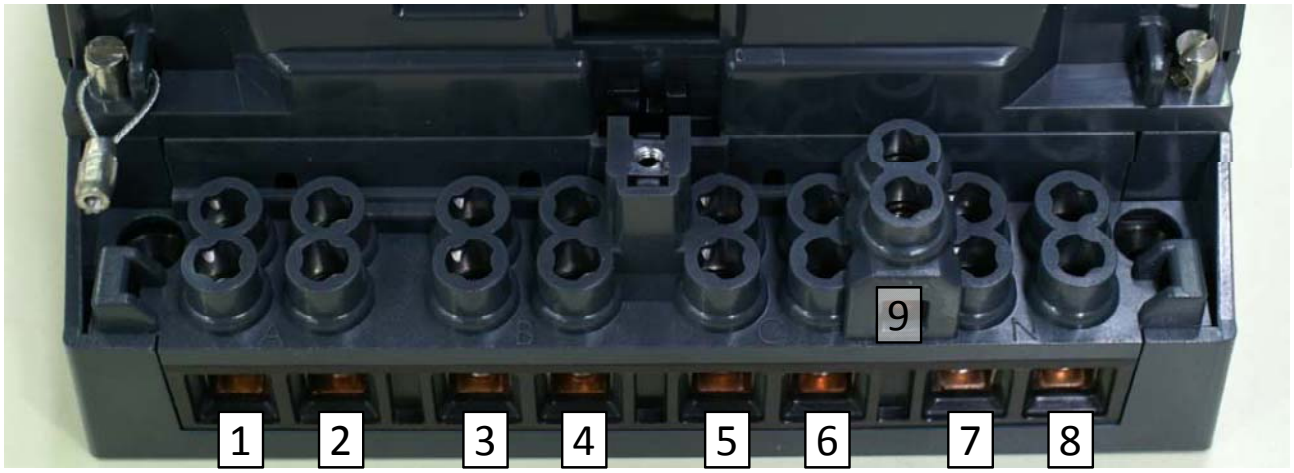


Figure 5.4-4: LGC meter wiring terminals

Terminal	Designation	Function
1	A	Active Line Connection (Phase A)
2		Load Connection (Phase A)
3	B	Active Line Connection (Phase B)
4		Load Connection (Phase B)
5	C	Active Line Connection (Phase C)
6		Load Connection (Phase C)
7	N	Neutral Connection (Line) - (Not to be used)
8		Neutral Connection (Load)
9	LI	Not Present

Table 5.4-2: LGC Terminal Arrangement

The terminal holes of the meter are only 19mm in length. Ensure when terminating cables, especially 25 mm sq and 35 mm sq cables that the cable ends are trimmed flush after bending to ensure the inner clamp screw is applying pressure to all the strands of the cable.

6.4.4 Wiring Configuration

Connections for the LGC meter are as follows:

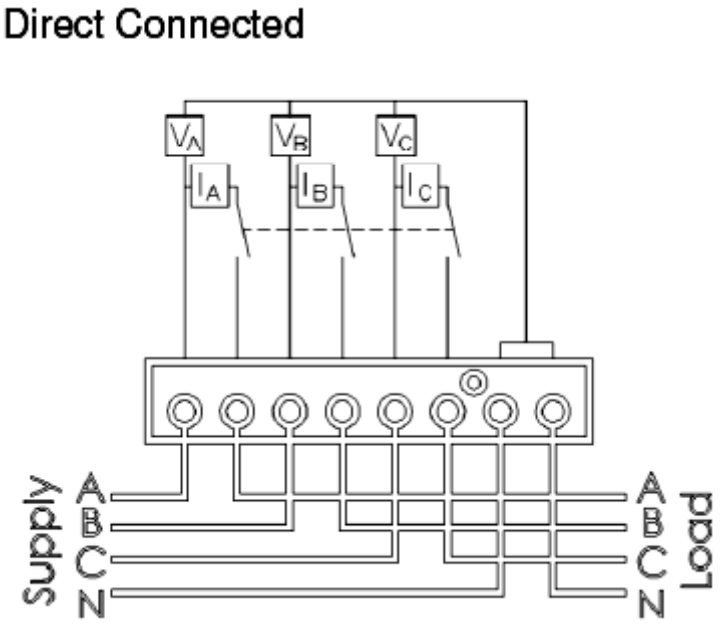


Figure 5.4-5: LGC meter wiring schematic

There is a 100 Ampere maximum rating per phase.
Also note that the Disconnect Contactor has been fixed in the CLOSED position

6.4.5 Display

The display shows information from the meter and can be useful during installation and troubleshooting. The test display containing all possible elements is shown in Figure . The meter is programmed to cycle through a sequence of displays including the test display which used to verify that all elements of the display are operating.

Please note that the meter will always operate on Australian Eastern Standard Time (AEST). There will be no change to the displayed time due to daylight savings.

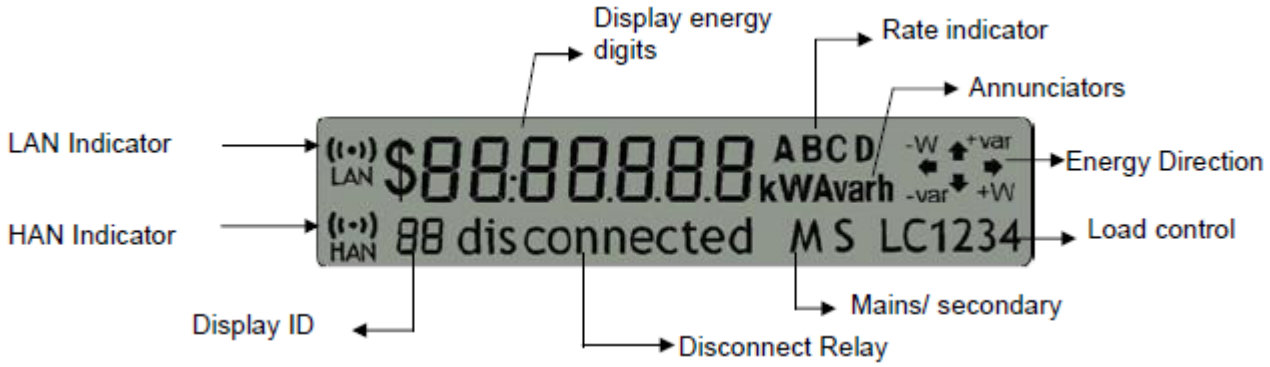


Figure 5.4-6: LGC meter display

The LCD screen contains a number of Enunciators and Indicators that help identify display options (metering and configuration information).

Display ID - A two-digit number identifies the display value.

Energy Digits Value - The value on the display, gives the energy values consumed during the current billing period and other information like date, time, program ID, Revision numbers, etc. Sections of the Value are sometimes used to convey extra information such “PF” used in front of the power factor value.

Annunciators - Various annunciators provide information about the quantity displayed with a unique identification number along with direction of energy with respect to each

value displayed to eliminate any possible confusion between similar items. Also information about the energy units like KWh, KVARh etc.

disconnected/ connected. This tells whether the disconnect relay is connected to the premises or not. When the Disconnect relay is closed the word “connected” and when its open the word “disconnected” is displayed.

LC - enunciates the status for the Load Control relay. (Not applicable)

A, B, C, D - current tariff rates by which the energy is calculated. (Not used)

MS - indicates Main or Secondary element values are being displayed.

Energy Direction Arrows

+W	Active energy import (Energy Received from the Utility).
-W	Active energy export (Energy Received from the Customer).
+var	Reactive energy (kvarh Imported by customer)
-var	Reactive energy (kvarh Exported by customer)

Figure 5.4-7: Energy Flow Designations

6.4.6 Buttons and Scrolling

There are two buttons on the meter front face. The left button is the **display select / scroll** button and the right button is the **boost** button. The buttons are not labelled.

6.4.7 Display Select / Scroll Button

Scrolling individual display items is automatic but scrolling can be manually sped up. Short pressing the scroll button in any display will advance one item in the list. Scrolling past the end of any display lists automatically returns to the start of the Normal Display list.

By pressing and holding scroll button, the Alternate displays can be selected. The operation of the Display Select / Scroll Button is explained below in Figure , where each arrow represents one extended press of the button.

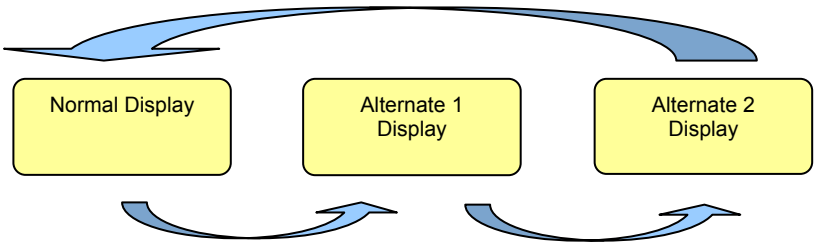


Figure 5.4-8: Sequence followed by pressing and holding Display Select button

6.4.8 Normal Display Mode

The following cards show the order of information displayed on the meter display for the various programs. The scroll order is top through to the bottom then looping back to the top

Structure 19 (9519)				
Register	**Description**	**Dials**	**Dec**	**LP**
88	Display Test (8888888)	7	0	
01	Date (dd.mm.yy)	6	0	
02	Time (hh:mm ss)	6	0	
03	kWh Imported total	6	1	Ch1

Table 5.4-3: Normal Display – 9519 Configuration

Structure 21 (2821)				
Register	**Description**	**Dials**	**Dec**	**LP**
88	Display Test (8888888)	7	0	
01	Date (dd.mm.yy)	6	0	
02	Time (hh:mm ss)	6	0	
03	kWh Imported total	6	1	Ch1
93	kWh Exported total	6	1	Ch2

Table 5.4-4: Normal Display – 2821 Net Configuration

Structure 25 (1925)				
Register	**Description**	**Dials**	**Dec**	**LP**
88	Display Test (8888888)	7	0	
01	Date (dd.mm.yy)	6	0	
02	Time (hh:mm ss)	6	0	
73	Gross kWh Exported total	6	1	Ch1
83	Gross kWh Imported total	6	1	Ch2

Table 5.4-5: Normal Display – 1925 Gross Configuration

Note: The meter will operate on Australian Eastern Standard Time (AEST). There will be no change in time due to daylight savings.

6.4.9 Alternate Display Mode

The following cards show the order of the alternate display information displayed on the meter display. The scroll order is top through to the bottom of the card with the display then reverting to the standard display sequence.

Alternate 1 does not automatically scroll to Alternate 2 except by an extended press of the scroll button.

Alternate 1 Display List	
Display ID	**Description**
40	Program File ID
41	Program File Version
42	Firmware Revision
43	Standard Meter Status
44	Manufacturer's Meter Status
45	Hardware Revision
46	Estimated % Battery Life Remaining
47	Power Active Total
48	Power Reactive Total
49	kWh Exported Total

Table 5.4-6: LGC Alternative 1 Display List

Alternate 2 Display List	
Display ID	**Description**
50	Comms Display
51	Voltage Phase A
52	Voltage Phase B
53	Voltage Phase C
54	Amps Phase A
55	Amps Phase B
56	Amps Phase C
57	Power Factor Phase A
58	Power Factor Phase B
59	Power Factor Phase C

Table 5.4-7: LGC Alternative 2 Display List

6.4.10 LED Indicators

Phase indicator LEDs are used to indicate that the meter elements are energised. The Phase A, B and C LEDs should be lit for 3 phase 4 wire circuits.

The Consumption Indicators (Test LEDs) are two red Light Emitting Diodes (LEDs) pulsing at a rate proportional to the measured load. The meter constant is set at 1 Wh per pulse (left) and 1 varh per pulse (right).

6.4.11 Alarms

The meter can display Status codes that alert the user to various problems. If the meter shows any of these codes, return the meter to Ausgrid MTG for investigation.

Code	Description
S1 0001	Cyclic Redundancy Check Sum (CRC)
S1 0040	Clock Error
S1 0100	Low Battery
S1 1000	Tamper Switch Activated
S1 2000	Reverse Energy Detected

Table 5.4-8: Standard Status codes

Code	Description
S2 0001	Flat Battery
S2 0002	Power Fail Counter Mismatch
S2 0004	Export Energy Detected on Phase A
S2 0008	Export Energy Detected on Phase B
S2 0010	Export Energy Detected on Phase C
S2 0040	Missing phase A
S2 0080	Missing phase B
S2 0100	Missing phase C

Table 5.4-9: Manufacturing Status codes

Note: It is possible to have more than one Status reported at one time as the codes are added together. Care must be taken when deciphering status codes as they are reported in hexadecimal (base 16).

Example: If the meter reported S1 0041. The meter would have a CRC Error and a Clock Error. If the meter reported S2 000C. The meter would have Export Energy Detected on Phase A and Export Energy Detected on Phase B.

Errors S1 *2000, S2 0004, S2 0008 and S2 0010 should be ignored for meters programmed with structure 21 and 25.*

6.4.12 The Optical Port

The optical port enables reading, reprogramming and testing the meter using a personal computer or hand-held unit fitted with a suitable optical probe.

6.4.13 Communications Module

The Smart Grid Smart City Trial is now completed and the WiMAX Communications infrastructure has been turned off. The Communications modules are no longer being fitted and the lid to the communications module area should remain sealed.

6.4.14 Meter Wiring Check and commissioning

The following steps are to be followed to ensure correct wiring and operation of the meter:

Inspection	Visually inspect the connections to ensure the correct wire is connected to the correct terminal of the meter.
Initial Check	When mains voltage is applied, the meter will turn on and the display can be read.
Meter program check	Confirm the meter program matches the structure required for the customer.
"Reverse Energy" check	Attach a load to the meter. For a normal supply, check for "Reverse Energy" prior to re-connection of the customer load. This is where the Active and Load lines have been swapped. Reverse energy is indicated by the "**– W**⟵ " symbol at the top left of the display. **If a "Reverse Energy" situation does occur, this error must be rectified immediately.** After correcting the wiring, the display should be checked to ensure the presence of the "⟶ **+W** "symbol. *Note the Solar Net or Gross Metering will expect to see reverse energy flow if the generator is operating.*
Meter Operation check	Check the pulsing LED output on the front of the meter. The consumption indicator LED (the one on the left) will flash at a rate of one pulse per watt-hours measured and should flash proportionally to the load connected via the Load Tester to the first element in the forward direction only.
Date/Time check	Check date and time. Note the date format **dd:mm.yy** and time **hh:mm ss**
Display check	Check the meter display. The meter should be in auto scroll mode.
Connect load	Connect customer load. The symbol "⟶ **+W** "should be displayed if there is consumption.
Finish installation	Seal the terminal cover. Ensure the communications cover is sealed with two seals.

The meter is not designed to be serviced in a field and has no user replaceable parts. There are no internal fuses. In the event of failure of the meter, contact Ausgrid for assistance.

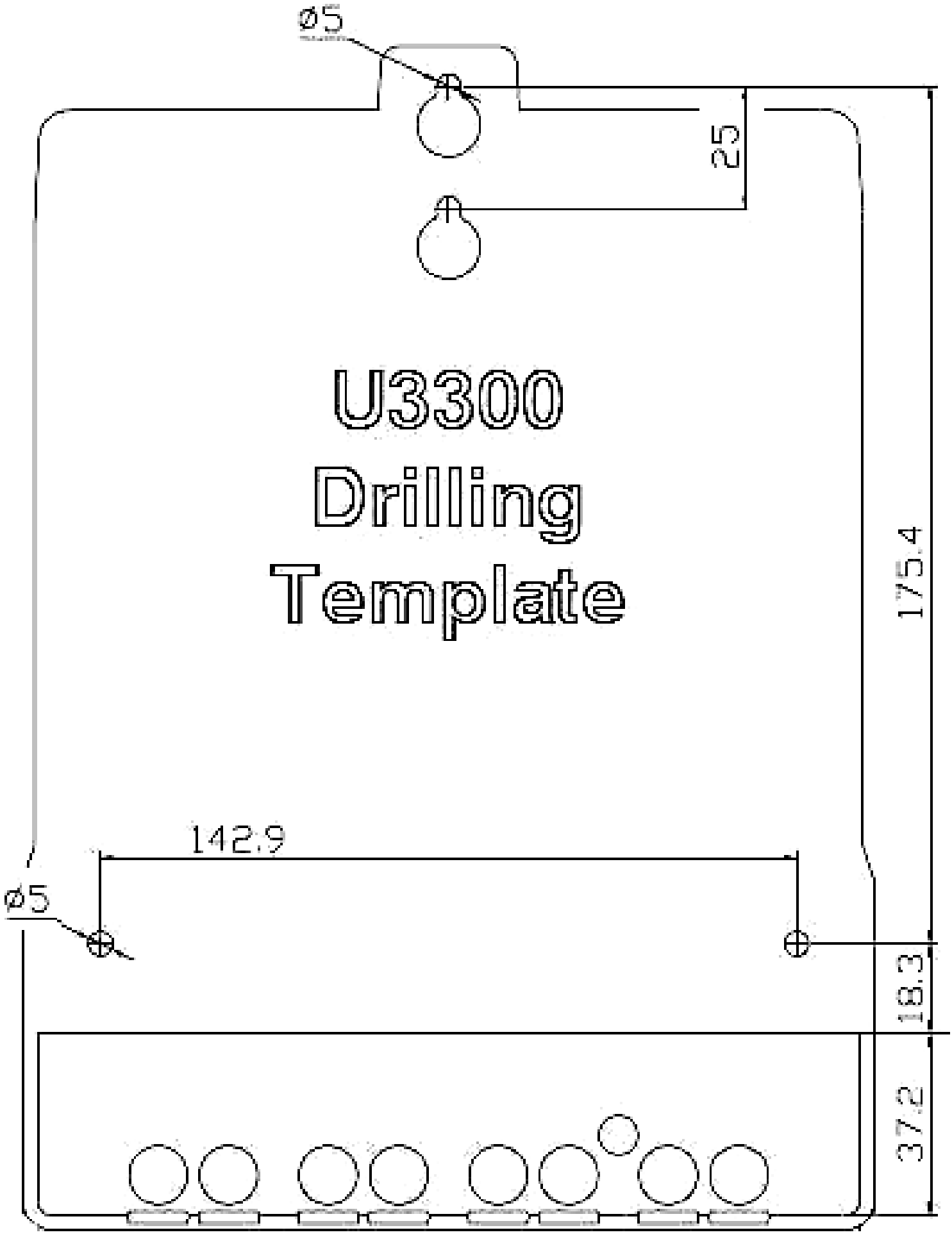
6.4.15 Sealing of the Meter

The meter is sealed by the manufacturer at the factory. The seal is located on the left hand case bolt under the terminal cover. The seal ensures that the meter has not been tampered or interfered with by unauthorised parties. According to the National Measurements Act, it is a criminal offence to remove or tamper with the meter seal. DO NOT install a meter without a seal or if the seal has been tampered with.

Fit a seal to the terminal cover (meter scoop) through the central screw at the completion of the installation process.

Fit two seals to the communications module (top) cover to secure the cover. The first seal is at the centre front and the second seal is at the rear edge on the right hand side.

6.4.16 Drilling Template – LGC Meter



6.5 ECP EDMI Mk10D E3c Meter

The ECP is a Three Phase Single Element Direct Connected Load Profiling Watt-hour Meter with disconnect contactor

Main features of Mk10D	
• Member of EDMI Mk10 Atlas family of meters • Main Disconnect Contactor • Class 1 Wh accuracy • Class 2 varh accuracy • 3 Element (4 wire) mode • Four Quadrant energy measurement (suitable for bi-directional embedded generation applications) • Advanced Power Quality measurements • Nominal current 10A, Max current 100A • Operating voltage 180 - 290V • Bottom connected • ANSI optical port • Active Dual RS-232 Port (Single RJ45) • Load profile recording • 16kB EEPROM + 2.1Mb SPI Flash • 950mAh internal battery • 2 LED's • 4 S0 pulsing outputs	

6.5.1 Application

The ECP meter can be used in domestic and commercial direct-connected three-phase applications requiring Time of Use (Interval) metering.

The contactor function is not used in this. This meter is treated as an E3 configuration.

6.5.2 Available Programs for ECP Meters

This meter has a special meter program allocation reflecting that its hardware includes a disconnect contactor. However the programs are interpreted as equivalent to Structures 19 and 20 respectively

Programs	Interval	Structure	Type	Application
0260	30	60 **(Equivalent to Str 19)**	5	Standard Electricity Consumption Only
0261	30	61 **(Equivalent to Str 21)**	5	Bidirectional Net Metering

Table 5.5-1: Available ECP Programs

6.5.3 Mounting Dimensions

The overall dimensions of the meter: height 292mm, depth 95, width 175 with an extended terminal cover. The meter is designed to be mounted using three screws. The threaded section of the screws shall not have diameter greater than 5mm with a screw head not smaller than 8mm.

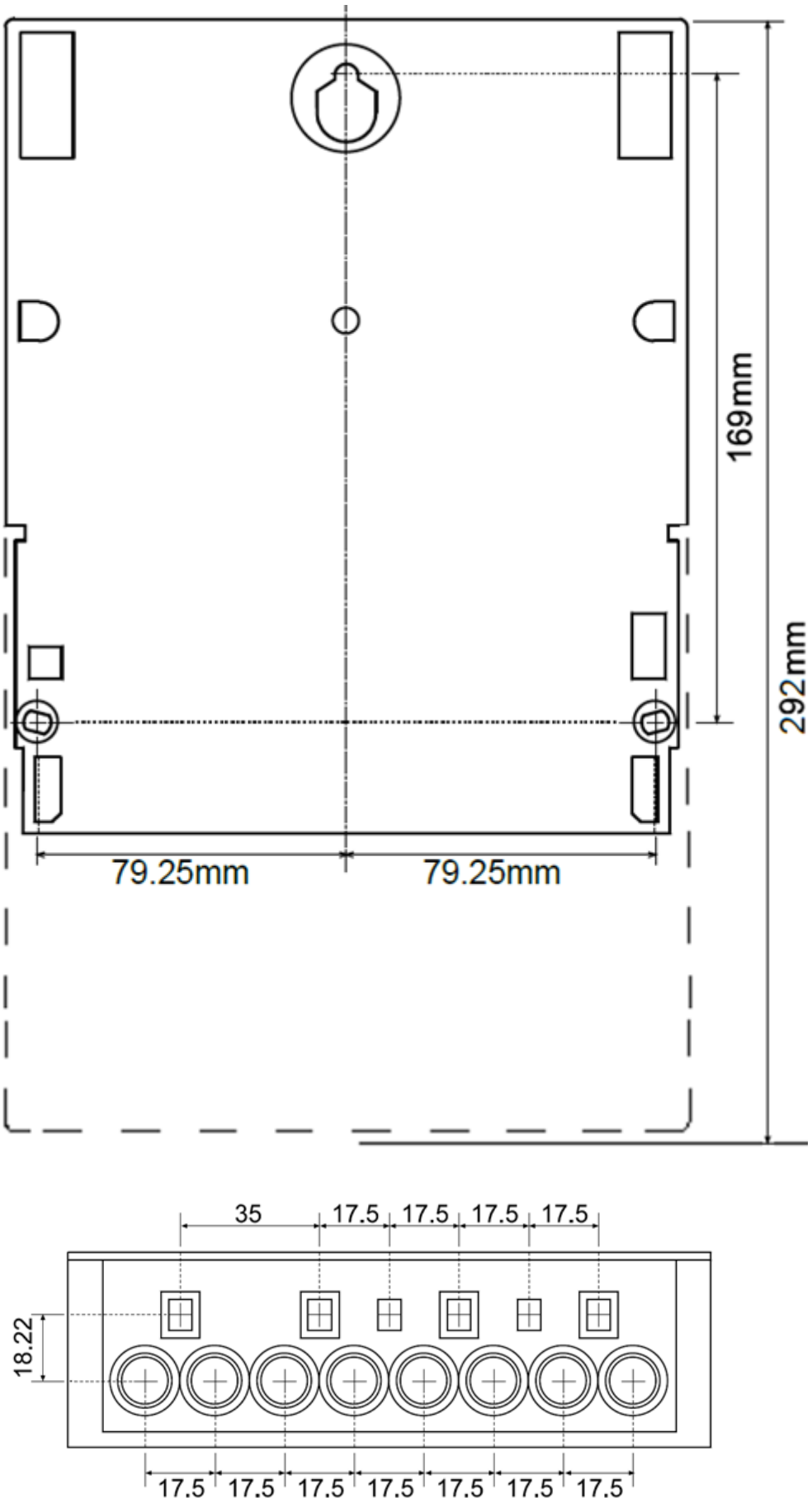


Figure 5.5-1: ECP meter dimensions (not to scale).

6.5.4 Meter Appearance

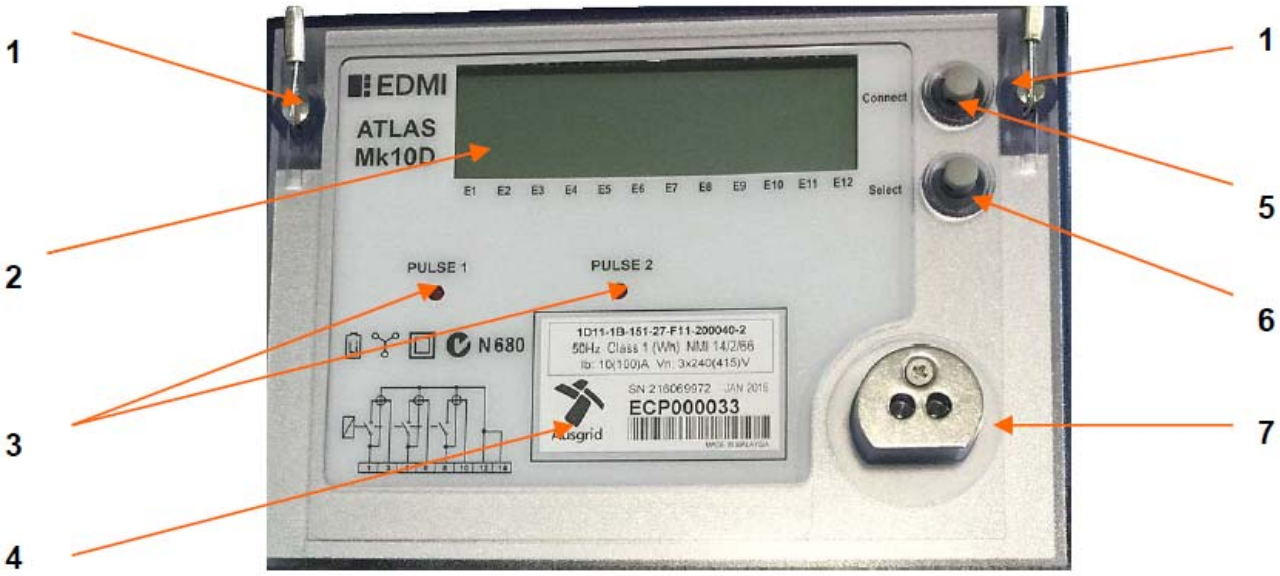


Figure 5.5-2: Front of ECP meter

Main parts visible on the front of Mk10D meter include:

[1] Seals ensure metrology integrity and must not be removed.

[2] LCD shows information in sequence.

[3] Two pulsing LEDs. See Table 5.5-6 for further information.

[4] Meter label information showing Property Number.

[5] Connect button (not used)

[6] Display Select button moves display to next register.

[7] Optical communications port for meter reading.

6.5.5 Terminal Arrangement

Under the terminal cover are the line and load terminals for connection to supply as well as auxiliary terminals and communication ports. The terminal cover is attached with two sealable screws which have 2mm diameter holes to accommodate sealing wire.

Figure 5.5-3: Terminals of ECP meter

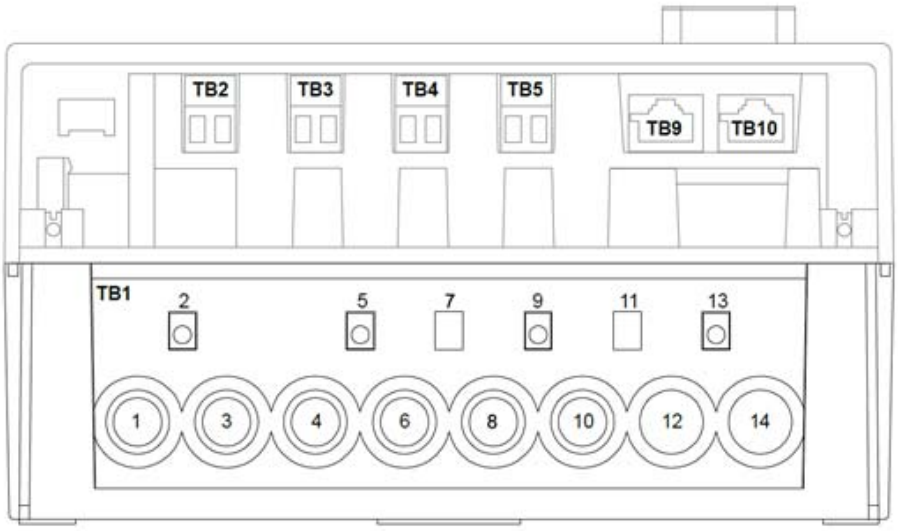


Figure 5.5-4: ECP Terminal Identification

Terminal	Description
TB1-1,4,8	Line terminals A/B/C Phase respectively
TB1-3,6,10	Load terminals A/B/C Phase respectively
TB1-12, 14	Neutral terminals
TB1-2, 5, 9, 13	(Not to be used) VT connections
TB1-7, 11	Blanks
TB2, TB3, TB4, TB5	(Not to be used)S0 Pulsing Outputs
TB9	Not fitted
TB10	(Not to be used) Dual RS232 port with modem power

Table 5.5-2: Available ECP Programs

A finger guard is fitted over the top of the main terminal to protect from accidental contact with live terminals. The finger guard shall be reinstated after the connections are made

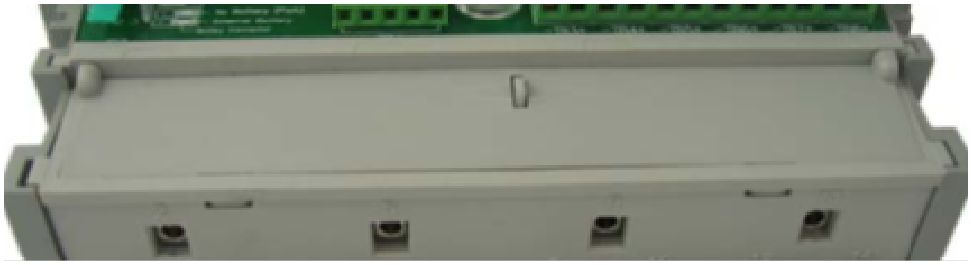


Figure 5.5-5: ECP Terminal Finger Guard

6.5.6 Display

The display shows information from the meter and can be useful during installation and troubleshooting. Test display containing all possible display segments. Meter is programmed to cycle through main set of displays including test display which used to verify that all elements of the display operating.

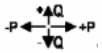
Figure 5.5-6: ECP Display – Test Pattern

As the LCD is a numeric type, alphabetic characters are difficult to display. The meter will attempt to display them as best it can, but readability will vary depending on the letter. If the value to display is longer than 8 characters the information will scroll to show the entire line with underscore "_" showing the start of the line.

Meter display has following main areas:

8.8.8.8:8.8:8.8 - 8 seven segment digits on the right to display values.

8.8.8.8.8 - 5 seven segment digits on the left to display description of values shown in the 8 segment section.

 - indicates direction of energy flow for Watts (P) and vars (Q). A plus sign indicates consumption by the customer and minus sign indicates generation by the customer.

L1 L2 L3 - shows presence of voltage on each phase respectively

- Low battery indicator.

Ⓛ® - shows active Local or Remote communication session

GMkWΔhh - Displays the units and multiplier for values where applicable.

SetA SetB - indicates active set of display.

▼ ▼ ▼ ▼ - Enunciators represent various meter conditions, refer to Alarms section.

Note: The E4 enunciator is used to represent the main load contactor closed state. It should normally be on

The energy direction, battery and communication status indicators appear independently of what data is being displayed.

6.5.7 Buttons and Scrolling

The data is displayed as a series of pages with each page displaying an individual value record from the meter on the main seven segment display along with an associated display identifier on the small seven segment display. The meter is programmed to scroll through the displays automatically. The scroll button will force progress to the next page each time the button is pressed. The display then will remain on the selected page for an extended period of time before reverting back to regular cycling.

There are two display sets in the meter: Set A and Set B. Only pages from the currently selected display set are shown in the cycle. To change between sets, press

and hold the Select button for 2 seconds. Set A shows the structure information currently in the meter, see ***Table 5.5-3*** and ***Table 5.5-4*** for details. Set B has additional information on the meter status, see ***Table 5.5-5*** for details. The display will be automatically reverted back to Set A after 2 minutes.

If the meter is disconnected from supply, the LCD screens can still be viewed by pressing and holding the Select button. All LCD screens may be viewed in this mode, including alternate display sets. This allows a manual meter reading even if supply disconnected. The display will automatically turn itself off after the No Power Timeout set at 15s.

6.5.8 Structure Cards

Structure 60 (0260)			
Register	**Description**	**Dials**	**Dec**
	Display Test		
01	Date (DD.MM.YYYY)		
02	Time (HH:MM:SS)		
03	Total cumulative kWh consumed	6	1

Table 5.5-3: Set A display items for Structure 60

Structure 61 (0261)			
Register	**Description**	**Dials**	**Dec**
	Display Test		
01	Date (DD.MM.YYYY)		
02	Time (HH:MM:SS)		
03	Total cumulative kWh consumed	6	1
93	Total cumulative kWh generated	6	1

Table 5.5-4: Set A display items for Structure 61

Display	**Description**
ImP or RVRS	Generated kWh
PH A	Phase A Current
PH B	Phase B Current
PH C	Phase C Current
PH A	Phase A Voltage
PH B	Phase B Voltage
PH C	Phase C Voltage
PH A	Phase Angle A
PH B	Phase Angle B
PH C	Phase Angle C
C ALA	Current Alarms
L ALA	Latched Alarms
PROG	Miscellaneous String
ID	Customer Plant number
SN	Meter Serial Number
SOFT	Software version number
boot	Bootloader revision

Display	Description
BATT	Battery Voltage
L ON	Last Power Up Time
L OFF	Last Power Loss Time
PON	Total run time ever
POFF	Total Off time ever
FREQ	Frequency
TOT	Total Active power
TOT	Total Reactive Power

Table 5.5-5: Set B Display Items

6.5.9 LED Indicators

Output	Function	Rate
Pulse 1	Absolute Wh Total	1 Wh per flash
Pulse 2	Absolute varh Total	1 varh per flash

Table 5.5-6: LED Indicators

6.5.10 Alarms

During operation the meter monitors a number of parameters. If an event occurs that is outside pre-set value an individual alarm is raised to indicate the status of the meter. The presence of an alarm is indicated by a downward pointing arrow (▼) indication on the bottom of the display.

Alarm Indication	Description
E1	Modem Power On
E2	EFA Active alarm present
E3	EFA Latched Alarm event is recorded (not currently present)
E4	Main Relay state
E5 – E12	Not Used

Table 5.5-7: Alarm Indicators

E1 enunciator indicates modem power supply status and should stay solid on during normal operation regardless of the modem is connected.

E2 and E3 enunciators will appear on the display independently or simultaneous in the event of active or latched alarms respectively. **The meter shall not be commissioned with either E2 or E3 enunciator active**.

Note: The E4 enunciator is used to represent the main load contactor closed state. It should normally be on. **The meter shall not be commissioned if E4 enunciator is not active**.

To identify the cause of an alarm, a user can navigate to the Set B display on the meter and read dedicated register values as described in the Display section. When reading the alarm state from the display a string format is used. The alarm status is displayed as a string of characters, with each character representing an individual alarm. The register value when all alarms are present looks like "ESVFRTCMLHXYZNDU". A full stop appears in each position when an alarm is not active. Letters always appear in the same location in the string with a full stop appearing in place of inactive alarms. For example, the display with only the reverse power alarm active will look like "…....M……..". Table 6.1-7 below provides description of alarm conditions that can appear on the screen.

Letter	Alarm Name	Description
E	Analog Reference Failure	Meter measurement reference drift is above 50%, normally indicating an internal fault.
S	Asymmetric Power	Load unbalance between individual phases is above 100%.
V	Voltage Tolerance Error	The voltage level is outside allowed limits 216 ~ 273.6V where meter cannot provide accurate measurements.
F	VT Failure	The supply voltage is below 30% of nominal value (168V).
R	Incorrect phase rotation	Disabled
T	Lid Tamper	Temper switch is released. Terminal cover is not in place or dislocated.
C	Clock Failure	The clock information is lost during a power off event. Normally caused by flat battery.
M	Reverse Power	Energy flow is negative indicating incorrect connection. (*disabled for Structure 22 and 61*)
L	Calibration Data Lost	Calibration data is lost or corrupted. Commonly caused by memory failure. Meter must be replaced.
H	Modem Failure	Not Used
X	RAM or LCD Failure	Test is continuously performed on meter memory and LCD controller integrity. Alarm is generated when test fails.
Y	Program Flash Failure	Checksum of the program flash memory is continuously tested and any errors will trigger this alarm.
Z	Data Flash Failure	Memory read/write operation is failed.
N	Pulsing Output Overflow	The amount of energy pulses are greater then pulsing output can perform on time.
D	Battery Failure	Battery voltage is below required limit(2.7V).
U	Magnetic Tamper	Not Used
O	Over Current	Over current (>100A on any phase for > 1 minute)

Table 5.5-8: Description of Alarm

6.5.11 Meter Seals

The meter is sealed by the manufacturer at the factory. Two seals are located on the main meter body at the top corners. The seals ensure that the metrology has not been tampered or interfered with by unauthorised parties. Please ensure that the meter seals are in place and intact. According to the National Measurements Act, it is a criminal offence to remove or tamper with the meter seal. **Do not install a meter without a seal or if a seal has evidence of tampering**.

Fit a seal to the terminal cover (meter scoop) through the screw at the completion of the installation process.

6.5.12 Commissioning

The following steps are to be followed for correct wiring and operation of the meter:

1. Inspection	Visually inspect the connection to ensure the correct wire is connected to the correct terminals of the meter. Ensure the Meter main seal is not broken.
2. Power check	When a voltage is applied, the meter will turn on and the display can be read.
3. "Energy Direction" check	Attach the Load Tester to the meter Check for "Energy Direction" prior to re-connection of the customer load. With a test load connected, the display should be checked to ensure the presence of the "⟶ "symbol. If Active and Load lines have been swapped, reverse energy is indicated by the"⟵ " symbol at the top left of the display. For the non bi-directional structures, there will also be a warning code **M** is displayed on the LCD in the Set B display against 'CUR ALA". **If a "Reverse Energy" situation does occur, this error must be rectified immediately.** After correcting the wiring, the display should be checked to ensure the presence of the "⟶ "symbol.
4. Operation check	Check the pulsing LED output on the front of the meter. The consumption indicator LED (Pulse 1) will flash at a rate of one pulse per 1 Wh measured and should flash proportionally to the load connected via the Load Tester. Note the LEDs are set for Absolute energy. (Refer to pulsing output section on page 15 for more details)
5. Date/Time check	Check date and time and confirm it is correct (Australian Eastern Standard Time).
6. Initial check	Check the meter display. The meter should be in auto scroll mode.
7. Connect load	Connect customer load. Pulse LED should flash if there is consumption.
8. Check alarms	Confirm relevant meter alarms are clear
9. Finish installation	Seal the meter scoop.

Table 5.5-9: Commissioning Checklist

7 Metering Current Transformers (CT's) - S, T, W and U Type

This section describes the Current Transformers (CTs) available for purchase from Ausgrid's local Customer Operations' offices (price on application) and are applicable to 230/400V installations.

These CT's fulfil Ausgrid's requirements as detailed in ES3 Part A

The range of CTs used by Ausgrid is as follows:

- S Type – 200/5A Class 0.5S (AS 60044.1-2007)
- T Type – 800/5A Class 0.5S (AS 60044.1-2007)
- W Type – 1500/5A Class 0.5S (AS 60044.1-2007)
- U Type – 2000/5A Class 0.5S (AS 60044.1-2007)

7.1.1 Application

The S, T, W and U type CT's must be installed in accordance with the Service and Installation Rules of NSW and ES3 Part A.

CTs are essential for metering 230/400V, 3-phase connections greater than 100A. However the application of CT's at the lower threshold of 80A is recommended to accommodate load growth for new and upgrade direct connected customer.

The current range of the CT's ensures full and comprehensive coverage of initial maximum demand range anywhere between 80A and 2000A.

Three Phase Maximum Demand	Applicable CT
80 - 200A	S Type
201 – 800A	T Type
801 – 1500A	W Type
1501 – 2000A	U Type
>2000A	Consult with Customer Operations

To avoid the requirement for unnecessary replacement of CT's during the life of an installation, each CT is designed with an extended range capability. This extended range is generally reserved for future load growth.

7.1.2 Labelling

CTs have labels on three visible sides to assist in identification. The asset identification numbers follow the convention of 3 alpha prefix and 6 digit suffix, as follows:

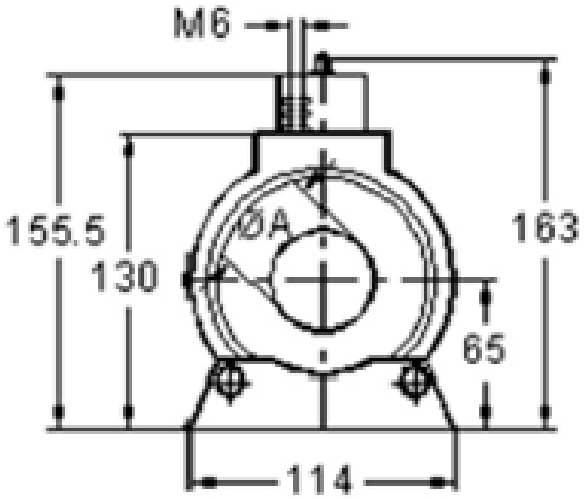
- S Type: CTS123456
- T Type: CTT123456
- W Type: CTW123456
- U Type: CTU123456.

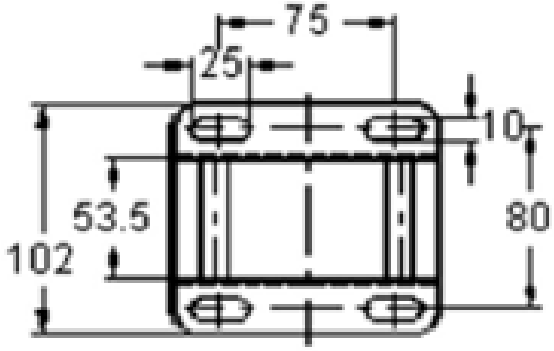
Primary is labelled with P1. A P2 label indicates primary current flow from P1 to P2. A polarity dot also marks the P1 side of the winding.

7.1.3 S Type CT Description & Dimensions

S Type

- Current Ratio: (I_p/I_s) 200/5A (K=40)
- Burden: 5VA
- Normal range to 200A
- Extended range to 400A
- Suitable for 230/400V installations only



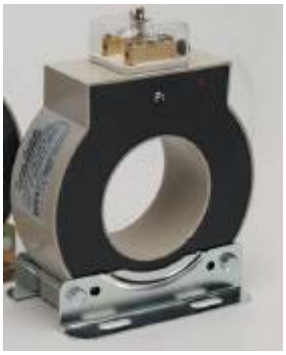


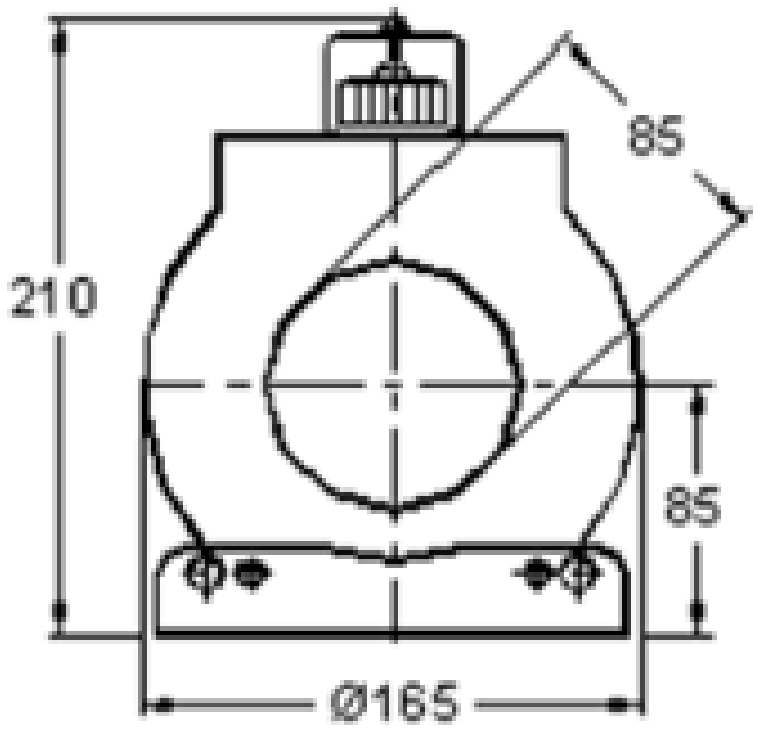
ØA.	Form	Dia.
	S32	32mm
	S45	45mm

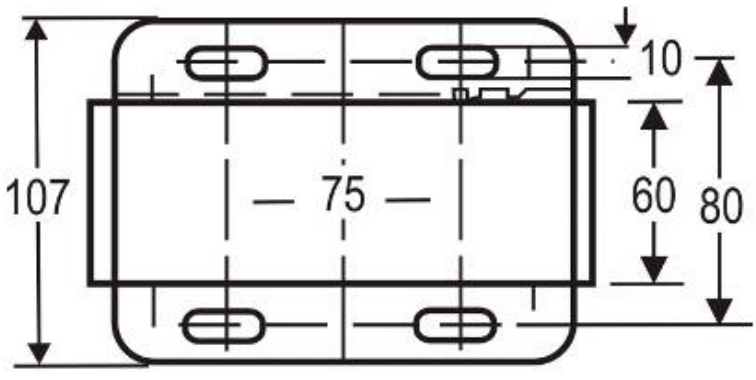
7.1.4 T Type CT Description & Dimensions

T Type

- Current Ratio: (Ip/Is) 800/5A (K=160)
- Burden: 15VA
- Normal range to 800A
- Extended range to 1600A
- Suitable for 230/400V installations only



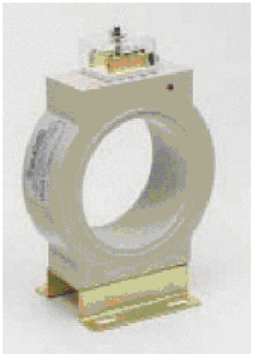


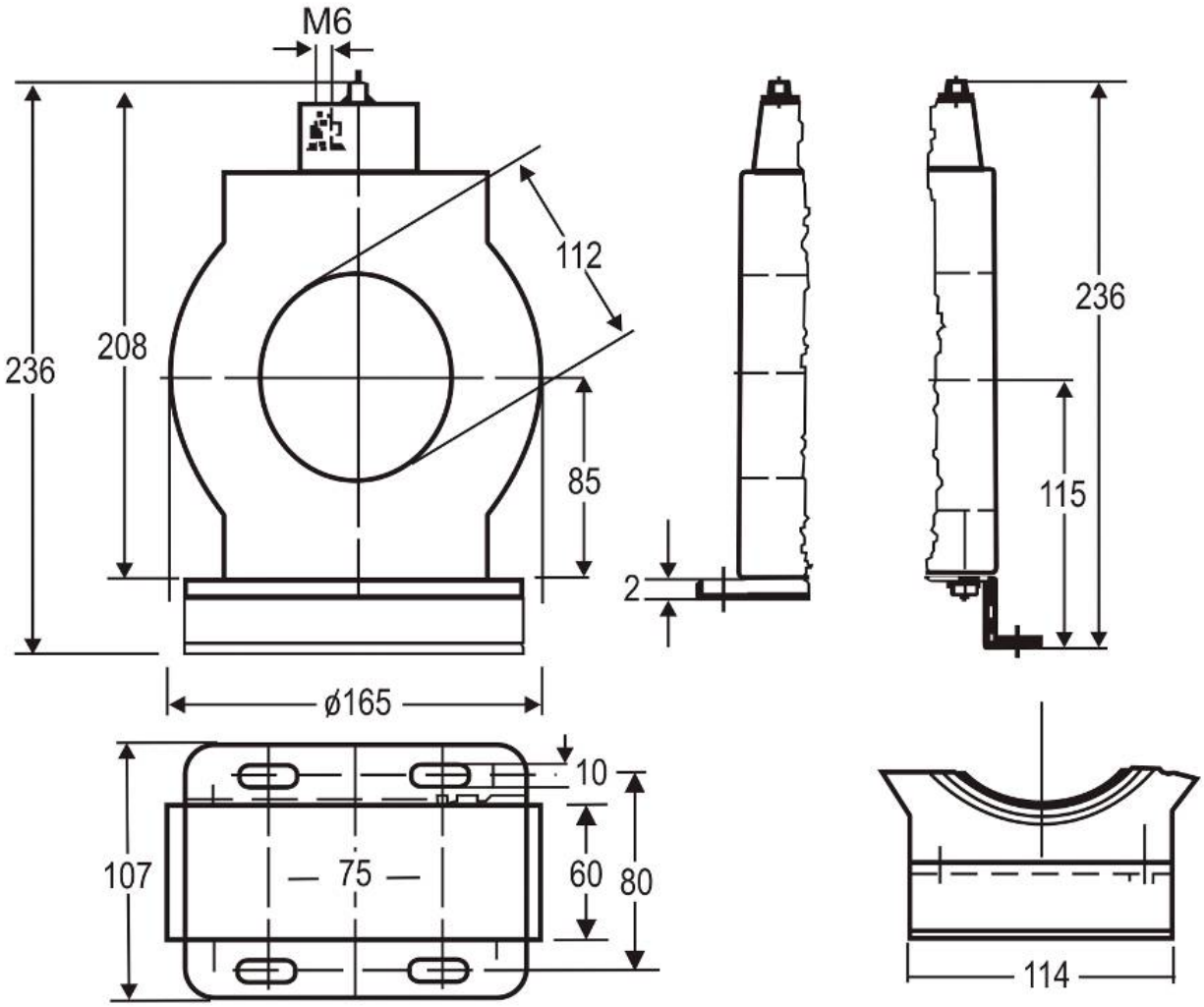


7.1.5 W Type CT Description & Dimensions

W Type

- Current Ratio: (Ip/Is) 1500/5 A (K=300)
- Burden: 15VA
- Normal range to 1500A
- Extended range to 3000A
- Suitable for 230/400V installations only

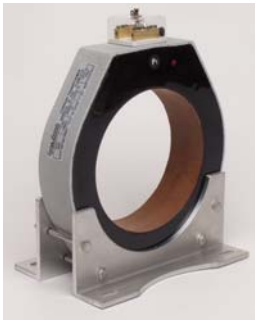


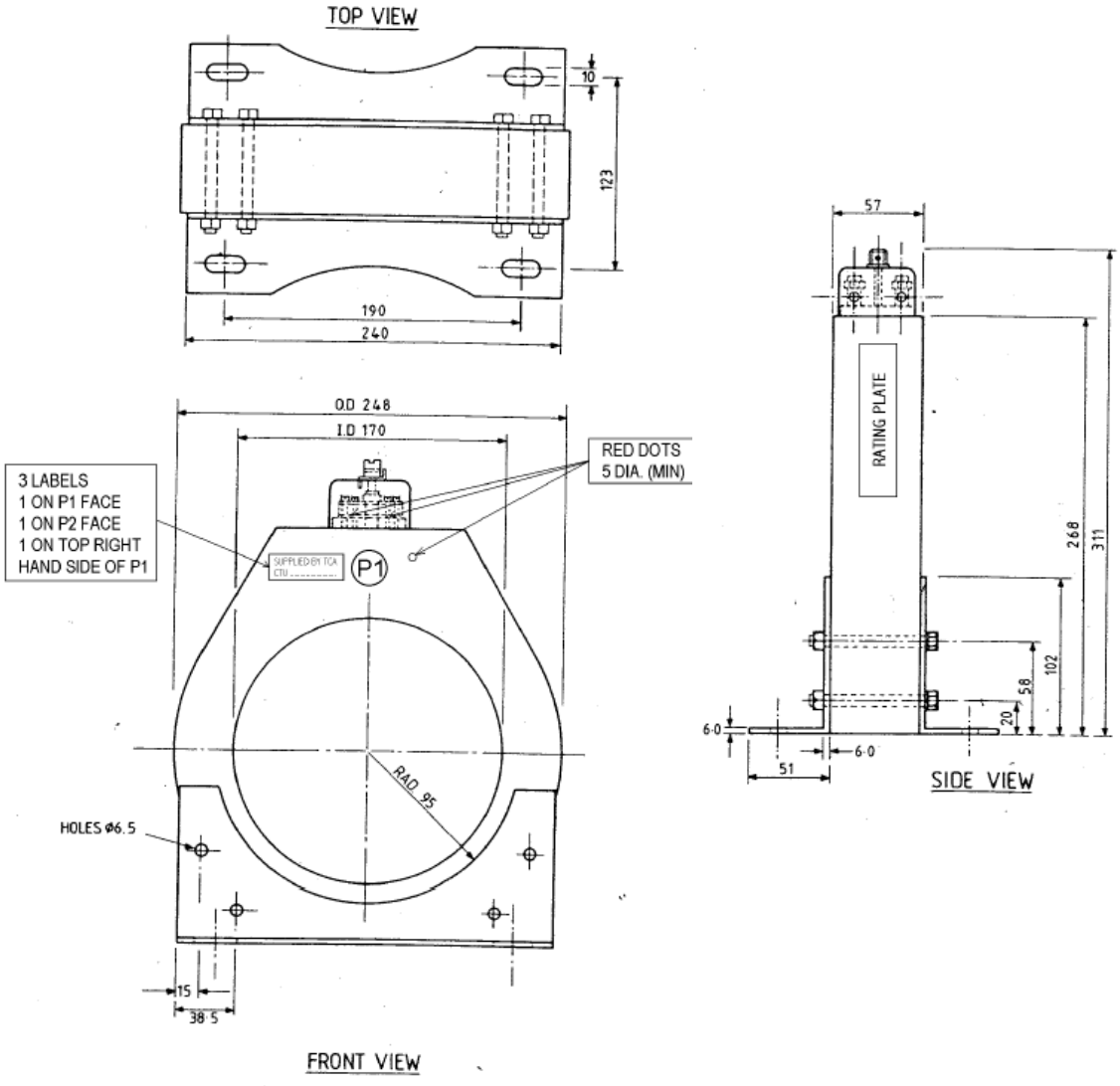


7.1.6 U Type CT Description & Dimensions

U Type

- Current Ratio: (Ip/Is) 2000/5 A (K=400)
- Burden: 15VA
- Normal range to 2000A
- Extended range to 4000A
- Suitable for 230/400V installations only





8 Load Control Devices

Ausgrid has introduced the use of load control relay as part of its standard metering configurations for certain applications. Below is the technical formation regarding these devices.

8.1 ERB Elster LCR-212 Relay

The Elster LCR-212RTC is an electronic ripple control load receiver. It has a property number prefix beginning with **ERB, ERC or ERD.**

8.1.1 Features

The LCR-212 is programmable for ripple frequency and time settings, with the stored ripple configuration labelled on the front panel; refer to Figure 8.1-1.

This unit can be configured as a time-switch rather than as a ripple receiver, however Ausgrid currently only use it as a ripple receiver.

These receivers can be configured as either 1, 2 or 3 pole versions, e.g. for switching of multiple loads or phases, and these exist in the network. Generally, 1-pole units have the prefix ERB, 2-pole ERC and 3-pole ERD. Note that some units may have been reconfigured to have extra relays installed, but the prefix would have remained the same.

A few multipole receivers are kept by TCA for maintenance purposes. However, Ausgrid now only purchase 1 pole ERB prefix receivers.

8.1.2 Application

Ausgrid stipulate the relay load capability is up to 25 A.

If the load is greater, use the relay to drive a contactor with a suitable current rating to suit the load.

For multiple phase loads or circuits, use a contactor driven by the ERB receiver.

8.1.3 Layout of the Receiver

The layout of the LCR-212 ripple receiver is shown in Figure 8.1-1below:

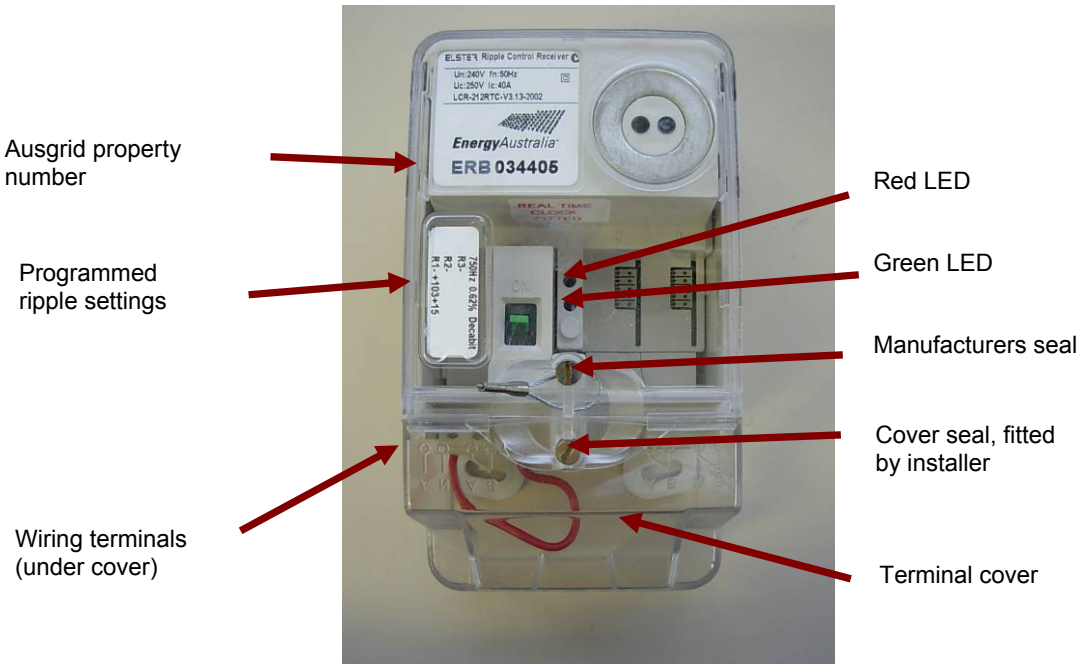
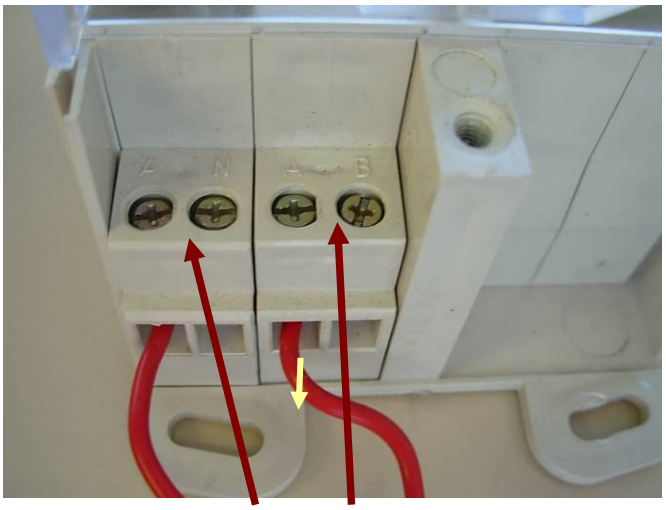


Figure 8.1-1 Receiver Layout

8.1.4 Terminals and Connectors



Wiring terminals: A N, A B

Figure 8.1-2 shows the terminals and connectors of the LCR-212 receiver.

8.1.5 Wiring Configuration

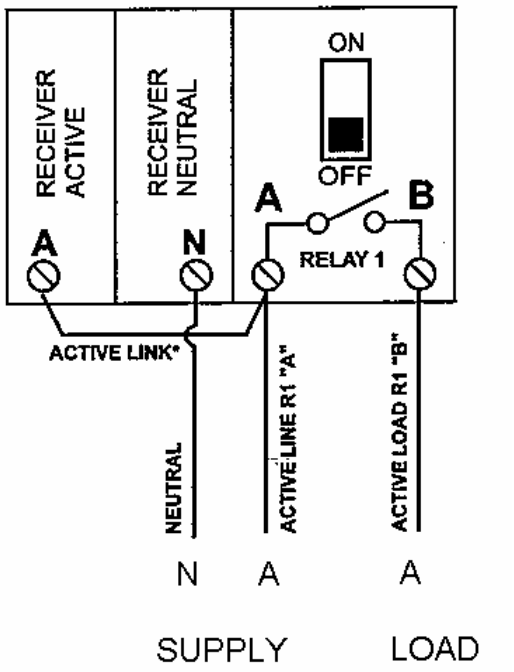


Figure 8.1-3 details the wiring schematic diagram for the relay.

8.1.6 Installation Instructions

Strip the insulation from the cable as per the gauge on the installation card.

A drilling template is given on an installation card with each receiver.

Mount the receiver in a vertical position out of direct sunlight

Fit the incoming active line into the relay “A” terminal as shown on the card and fit the neutral line into the “N” terminal.

Using the active link, bridge the active line to the receiver Active “A”.

Tighten all receiver terminals firmly to a torque of between 3.5 – 4.0 Nm. DO NOT overtighten the case top and terminal cover screws as this may result in the case cracking.

Check the wires are secured in the terminals by pulling the wires side to side and twisting them; this will ensure strands are correctly bedded in. Retighten the screws as in step 5.

Note: To achieve IP54 sealing, the receiver must be mounted vertically.If not mounted vertically, then the ERB can only be installed in a weatherproof enclosure.

8.1.7 Dimensions and Mounting Diagram

Figure 8.1-4 Mounting holes- 1 at top, 2 at bottom under cover

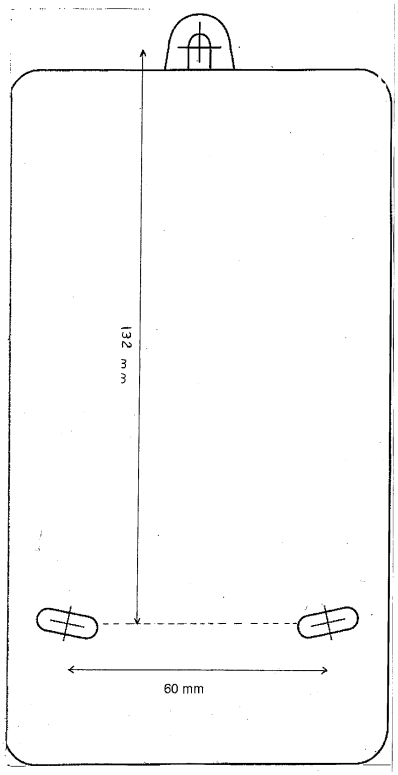


Figure 8.1-5 Drilling positions (not to scale)

Note: A drilling template card is provided with each receiver.

8.1.8 Energisation Check

The following steps are to be followed for correct wiring and operation of the meter:

1. Inspection	Visually inspect the connection to ensure the correct wire is connected to the correct terminals of the relay.
2. Operation check	On power-up, the green LED will light momentarily, and the red LED will either flash to indicate it is in idle mode or stay ON to indicate it is receiving a signal. There are no other operational checks that can be made on this unit by ASP's, except to confirm the wiring is correct and that the relay program label agrees with that region's ripple code/frequency/tariff.
3. Finish installation	Seal the relay cover. Note: The relay enclosure seal should never be broken.

8.2 ROM Enermet RO3 RIpple receiver

The Enermet RO3 is an electronic ripple control load receiver. It has a property number prefix beginning with **ROM**. It is a standards compliant receiver for detecting and decoding ripple control signals.

8.2.1 Features

The RO3 ripple receivers are single phase devices with options of up to three channels switching.

The ROM ripple receiver version is equipped with only one single channel relay (1x 40A On/Off contact) in bottom connected form however Ausgrid stipulate the relay load capability (according to ES3 rules) as 25 A.

If the load is greater, use the relay to drive a contactor with a suitable current rating to suit the load.

For multiple phase loads or circuits, use a contactor driven by the ROM receiver.

Figure 8.2-1 Ripple Receiver ROM

Figure 8.2-2 – Sample of Nameplate

8.2.2 Dimensions

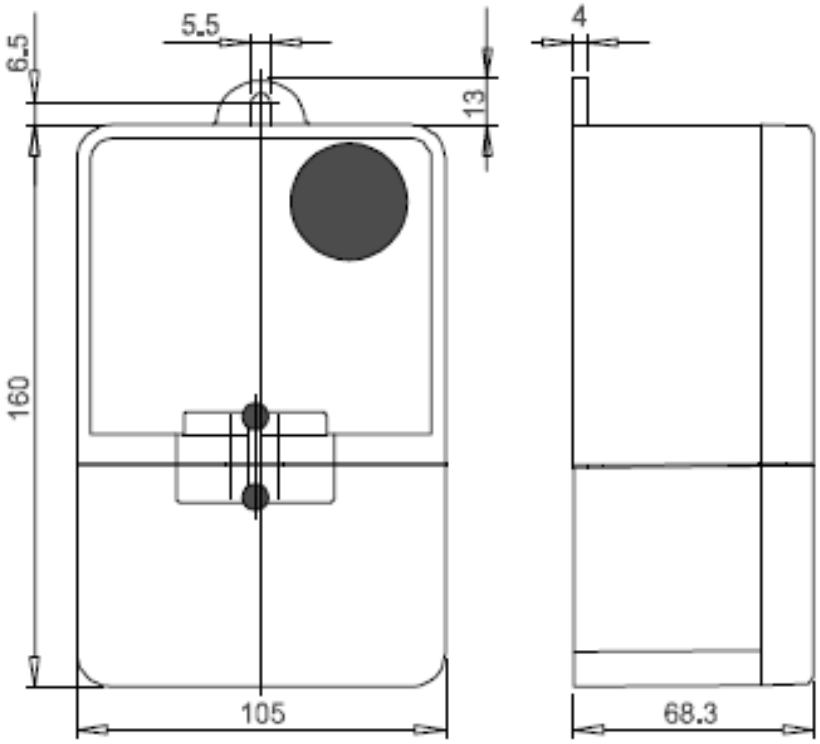


Figure 8.2-3 Ripple Receiver Dimensions

A mounting template is provided at the end of this section. Check scale for accuracy before use.

8.2.3 Available Ripple Programs

A variety of ripple programs are available to suit the requirements of the ripple control for the local area.

The programmed frequency of the receiver is indicated on the channel label. For example, the frequencies shown in **Error! Reference source not found.** is 744Hz (for use in 750Hz areas), and 1042Hz (for use in 1050Hz areas).

+100+04 and +103+17 are the programmed ripple channels. (Master / Single Channel).

2.4V is the minimum ripple signal level to operate the relay.

The receiver is only set for Decabit protocol.

Figure 8.2-4 ROM Channel Label

8.2.4 Terminal Arrangement

Error! Reference source not found. shows the terminal arrangement of the Ripple receiver.

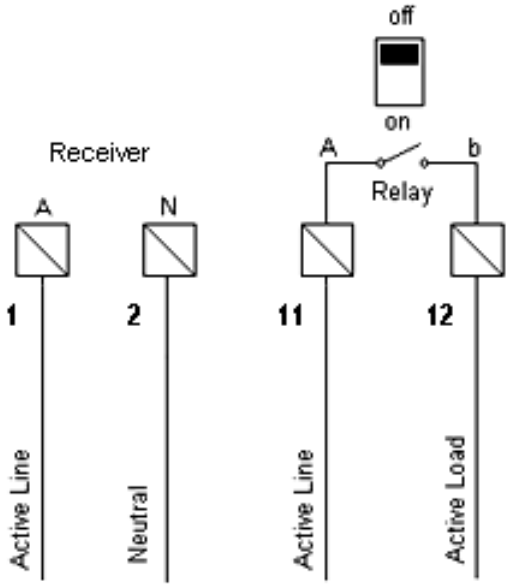
The active line should be connected to terminal 11.

The receiver active terminal should be bridged to the relay active terminal if required.

Do **not** connect the active only to terminal 1 and allow customers load current to run through a bridge wire.

Maximum cable size for the terminals is 10 mm^2. Cable strip length is 8 to 10 mm. Ensure the cable is installed underneath the busbar in the rising clamp terminals.

Terminal screws are combination flat / Posidriv. *Do **not** use Phillips head screwdriver bits.*



Terminal	Description
1	Receiver Active
2	Receiver Neutral (N)
11	Relay Active Line
12	Relay Active Load

Figure 8.2-5 Wiring Diagram

8.2.5 LED Indicator

The receiver is equipped with a flashing LED which indicates the operating status of the device.

Status	LED
Before the first transmission (after Power ON or programming)	Flashing rate 5.1 s
Passive, not receiving a signal	Flashing rate 1.3 s
Active, receiving a signal	Flashing rate 0.3 s
Error	Continuously ON

Table 8.2-1 LED States

The individual relay has a position indicator to show if it is on or off. The position indicator can also be manually switched (using appropriate PPE if working with power connected) to check customer's load connections.

8.2.6 Sealing

For proper sealing the screw of both the cover and terminal cover have to be equipped with a seal.

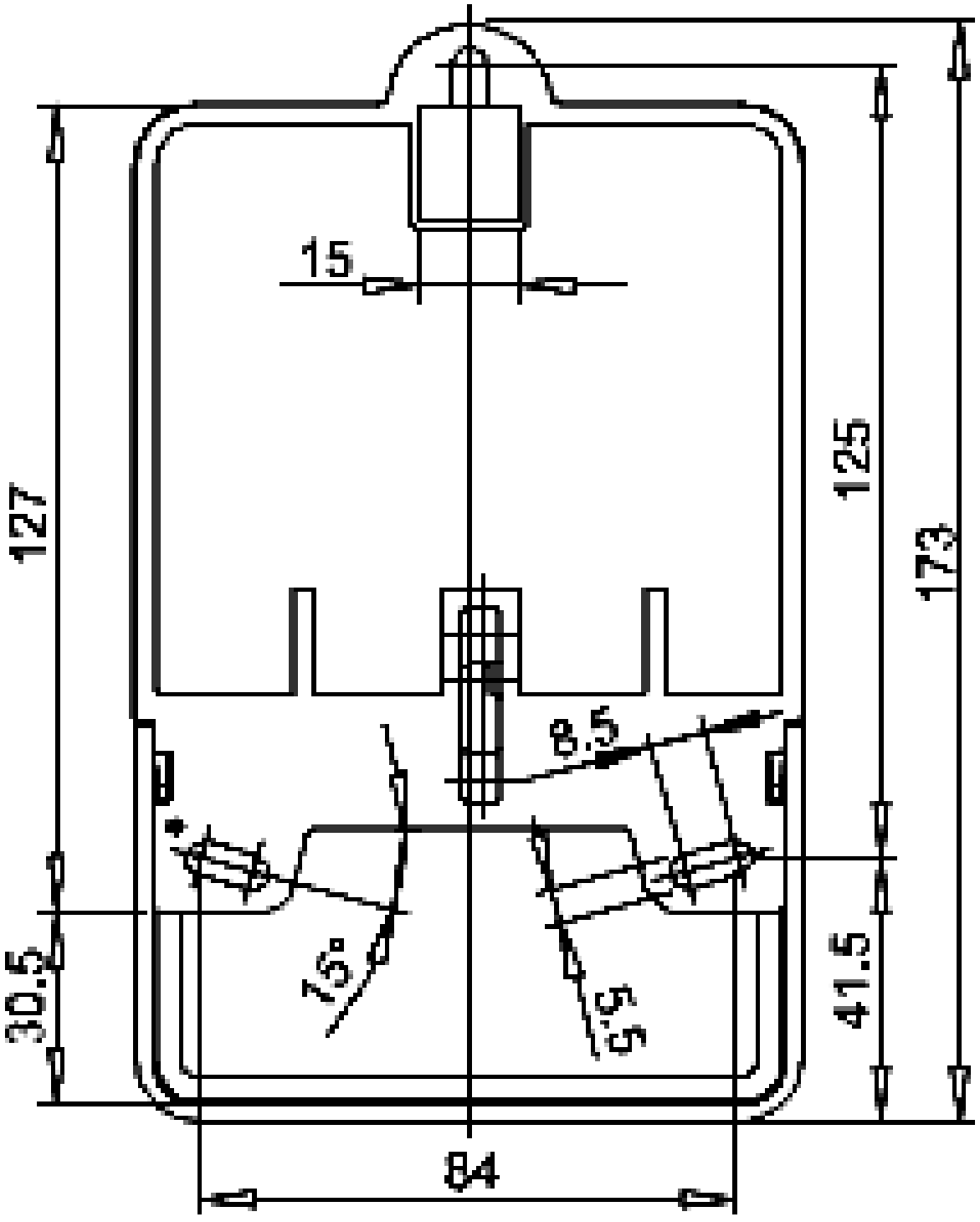
The main cover comes already equipped with a seal which should only be removed if it is necessary to manually switch the relay for test purposes. At the end of the installation, ensure seals are fitted to both the main cover and the terminal cover.

Sealing is performed using standard Ausgrid meter seals.

The device is not designed to be serviced in a field and has no user replaceable parts. There are no internal fuses. In the event of failure of the receiver contact Ausgrid assistance.

8.2.7 Mounting Template

Check scale before use.



8.3 Energy Controls WF 17-30 Time Switch

8.3.1 Description

This device can operate in one of two modes:

- 24 hour mode
- 7 day mode.

Twenty four hour mode treats each day as being the same. Seven day mode is not used at this stage.

This device has the capability of up to 6 ON/OFF switching cycles in twenty four hour mode.

In the event of a power failure, the device will store its time and program information for a maximum of 5 1/2 days. This is achieved with an on board super-capacitor. Once the capacitor is discharged the time and program information is lost and the device will need to be re-programmed. 5 1/2 days reserve is considered satisfactory.

The switching capability is 30 Amps assuming a resistive load (e.g. hot water heating).

Figure 8.3-1 Model WF 17-30 single channel time switch

8.3.2 Installation Requirements and Procedures

Ausgrid will only program the time switches in twenty four hour mode. These devices are available in bottom connect (4 terminal), see Figure 8.3-2.

The Property Number will consist of a prefix, followed by 6 digits ranging from 000000 to 999999 (e.g. TFB000001).

The prefixes are:

- **TFB** for bottom connect time switches
- **TFP** for the plug in time switches.

Note that the WF 17-30 does not have a battery, and relies on a super capacitor for temporary backup of settings. Therefore, before use this unit requires the Time Switch settings to be setup by using the front panel buttons. Follow the instructions provided under the terminal cover of new units for details on setting the times. As ummary of button operation follows:

The 'T' button is used with the D,H and M buttons to set the date and time.

The 'PROG' button is used for setting and changing the switching events.

The 'C' button is used to manually toggle the switch position once the device has been programmed. The toggling will be displayed on the screen, however the relay switch will only actually change position when powered with 240 Volt mains supply.

Ensure the cover is sealed after installation and programming.

8.3.3 Terminal Arrangement

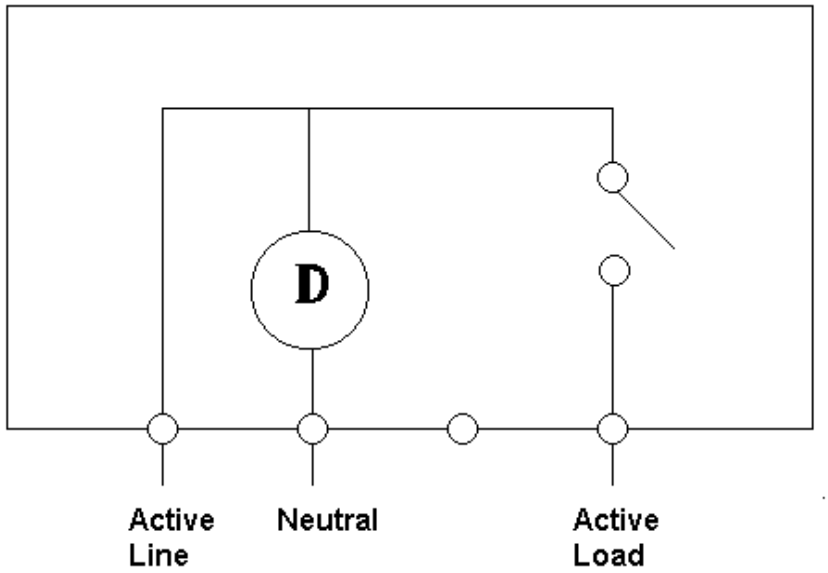


Figure 8.3-2 Bottom connect terminal arrangement

8.4 TRT Secure iC400 based Time Switch

8.4.1 Description

The TRT is a single phase Time Switch that has been developed from a re-purposed iC400 electricity meter.

The TRT is a 240V/50Hz rated, 25A relay, front connected device

The TRT is configured to support Ausgrid Controlled Load 1 (EA030) and Controlled Load 2 (EA040) as described in ES7 Network Price Guide, October 2016.

Figure 8.4-1 TRT Time Switch

8.4.2 Application

The TRT can be used for residential as well as small commercial and industrial installations where a stand-alone Load Control Unit is required.

The TRT can be utilised in ALL Ausgrid areas, including ripple areas.

The TRT comes in two programs varieties:

Programs	Program Application
OP1	Controlled Load 1 (EA030)
OP2	Controlled Load 2 (EA040)

The program can be identified by an adhesve label on the front of the meter entitled either OP1 or OP2:

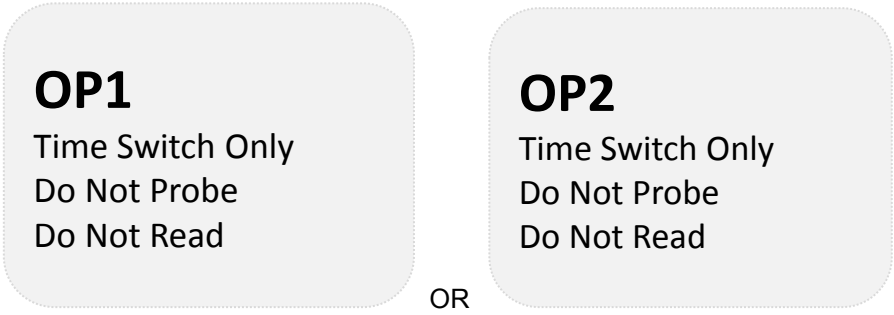


Figure 8.4-2 Example of Labels

8.4.3 Time Switch operation

The TRT is factory pre-configured with the following settings, in alignment with Ausgrid's ES7 Network Price Guide – Appendix B.

Program	Switching times
OP1	1st Sun Apr – 1st Sun Oct: Start Time 22:00, Finish Time 07:00 1st Sun Oct – 1st Sun Apr: Start Time 21:00, Finish Time 06:00 Randomised Delay Start 180min
OP2	1st Sun Apr – 1st Sun Oct: Start Time 20:00, Finish Time 17:00 1st Sun Oct – 1 Nov: Start Time 19:00, Finish Time 16:00 1 Nov – 1st Sun Apr: Start Time 19:00, Finish Time 14:00 Randomised Delay Start 180 min

Please note that the Time Switch and displayed clock operates on Australian Eastern Standard Time (AEST), thus does not change for daylight savings. The switching schedules also reflect this arrangement

8.4.4 Dimensions

The approx. dimensions of the Time Switch are 144(W) x 242(H) x 88(D) mm and are shown in Figure 2.

A drilling template for the TRT can be found at the end of this document. (Check the scale before use to ensure it has printed to the correct size.)

The Time Switch is designed to be mounted using three screws. Threaded section of the screws should have diameter between 3mm and 5mm with a screw head not smaller than 8mm.

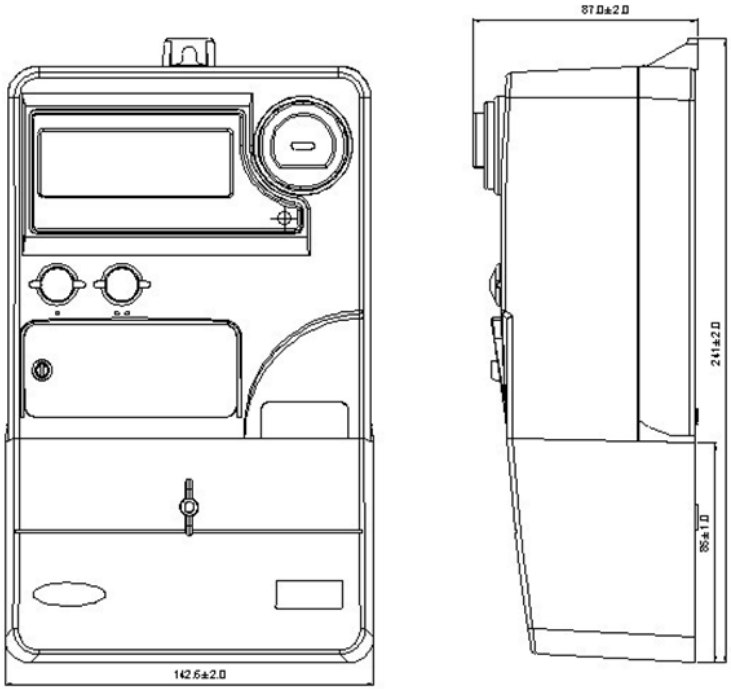


Figure 8.4-3 Dimensions

8.4.5 Terminal arrangement

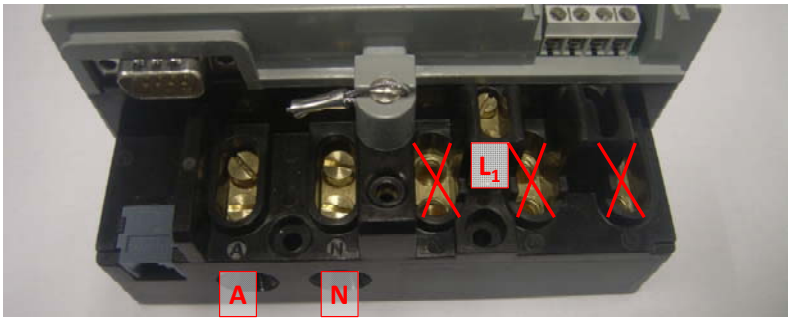


Figure 8.4-4 Photo of Terminals

The terminals are detailed from left to right

Terminal	Function
A	Active
N_1	Neutral
N_2	Not used
L_1	Controlled Load (25A max)
L_M	Not used
L_T	Not used

Unused terminals have had their fastening screws removed.

For controlled loads exceeding 25A, a separate contactor must be used as described in ES3 Part A

8.4.6 Terminal Schematic

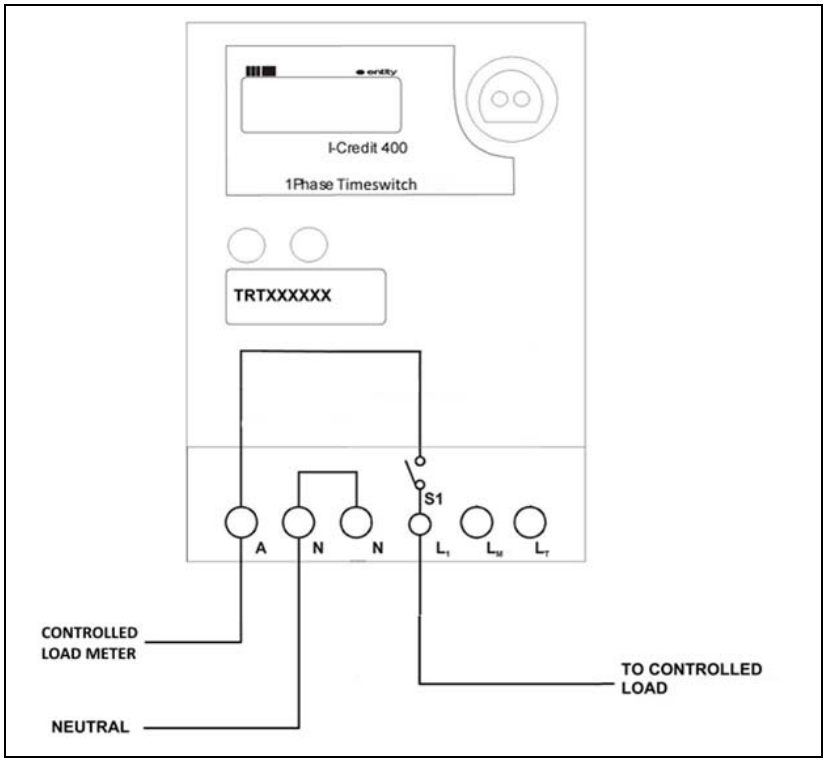


Figure 8.4-5 Wiring Schematic

8.4.7 Display

The configuration of the display and the relevant components are as follows, with the greyed out components not relevant for the operation of the Time Switch and can be ignored.

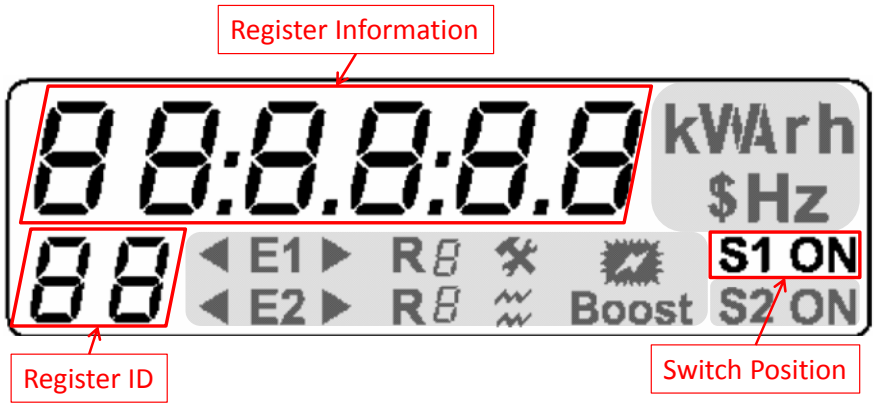


Figure 8.4-6 Register Display

The following registers cycle automatically

Register ID	Register Information
88	Display Test (888888)
01	Date (dd.mm.yy)
02	Time (hh:mm ss)
03	Program info (OP1 or OP2)

To advance the display manally, the right button of the meter can be pushed momentarily to force the displaty to the next register in sequence

The Switch Position displays whenever the load control relay is in the closed position

8.4.8 Load Control Relay Test

The Load Control Relay can be manually operated by pressing and holding the right button for a minimum of 5 seconds to engage Boost.

ACCEPt should appear on the Register Information part of the display and the relay will engage.

Check for current flow by inspecting the upstream electricity meter for spinning disk or flashing metrology LED.

The icon Boost will appear on the Display.

This mode will revert to the normal switching schedule after 10 minutes.

8.4.9 Sealing of the Time Switch

The Time Switch is sealed by the manufacturer at the factory. The seal is located on the case bolt under the terminal cover. Similarly, there are seals over the left hand button and the battery compartment The Time Switch MUST NOT be installed without these seals intact.

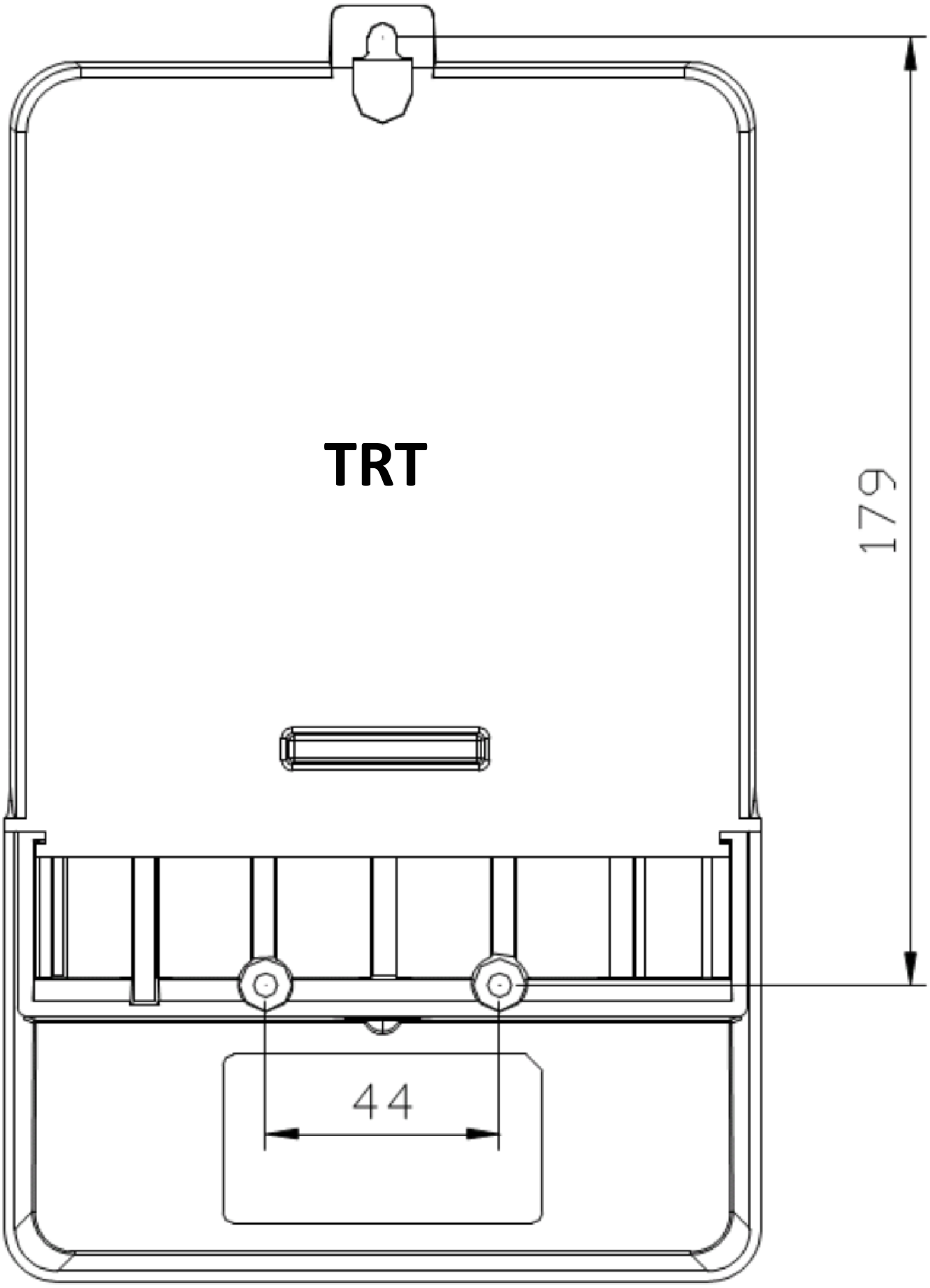
Figure 8.4-7 Seals that must remain intact

After fitting the terminal cover during the installation process, fit a seal through the central terminal cover screw.

Figure 8.4-8 Terminal Cover Seal after Installation

8.4.10 Installation Procedure

1. Inspection	Visually inspect the connections to ensure the correct wire is connected to the correct terminal of the Time Switch
2. Initial Check	When a voltage is applied, the Time Switch will turn on and the display can be read.
3. Display check	Check the Time Switch display. The Time Switch should be in auto scroll mode, starting with the display check.
4. Date/Time check	Check date and time and confirm Note the format Day, Month, Year (DD:MM:YY). Time format (HH:MM:SS) and that time is in Australian Eastern Standard Time (AEST)
5. Program check	Check for correct program, OP1 or OP2 on the display and on the sticker affixed to the front of the Time Switch.
6. Controlled Load check	Once the controlled load is connected, check the operation of the load control relay as per Load Control Relay Test section.
7. Operation check	Check the pulsing LED or spinning disk of the upstream electrcity meter
8. Finish installation	Seal the terminal cover.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