1. Description

The multicube modular electricity metering System simultaneously monitors up to 20 three-phase loads or up to 60 single-phase loads (or a combination of both load types). The system integrates load measurement I/O functions logging and communications in a single, flexible unit which can be tailored to suit a variety of energy management installations.

A multicube system is built up from a combination of the following modular components:

- 1 Master Display Unit
- 1-10 Option Modules
  - Sub-Metering Modules (e.g. SM352*)
  - I/O Modules (eg Pulse Output Module(s) PM12)
- 1 Communications Module (e.g. Modbus RS485)
- * At least 1 sub metering module must be fitted.

1.1. Master Display Unit

The Master Display Unit provides a user interface and local display of metered parameters on a graphic LCD and can optionally log up to 200 days of energy readings from the Sub-Metering Modules. The Master Display Unit also acts as a power supply and voltage measurement input for all the Sub-Metering Modules, which may be attached to it. This single voltage input point makes wiring much simpler and safer by removing the need for distributed voltage connections.

1.2. Dual Sub-Metering Module – SM352

The Electricity Metering Module SM352 contains two complete 3-phase electricity meters, each of which may be optionally configured to monitor 3 single-phase loads. Each electricity meter accurately measures a wide range of power and energy parameters using a range of current input devices selected to suit loads with nominal inputs from 5 to 800 Amps. These specially designed transducers each have a nominal output of 0.33V, are safety-isolated and internally protected against high open-circuit voltages at the output. Split core current input devices can be fitted to existing power cables where it is inconvenient to remove one end of the cable for connection. Miniature ring type devices are also available for lower currents (up to 60A) providing a lower cost solution, with improved accuracy, where it is possible to slide these over one end of a power cable. Dual Sub-Metering Modules are configured using the Master Display Unit LCD/keypad interface or via the external communications network.

1.3. Communications Module

The Communications Module provides a connection point to external systems such as building energy management, billing data collection, SCADA etc. A specific Communications Module may be selected, such as the Modbus RTU - RS485 Module (RTU485), to suit a range of external systems. The Communications Module provides external access to:

- Master Display Unit Configuration
- Master Display Unit Logged Data (Optional)
- Sub-Metering Module Instantaneous Meter Readings and Energy Registers
- Sub-Metering Module Configuration
- Additional Module Data and Configuration

1.3.1. Further Information

Separate detailed guides are available for each type of communications module in the multicube range.

-
2. **Safety**

This instruction manual gives details of safe installation and operation of the multicube electricity metering system. Safety may be impaired if the instructions are not followed or the system is used in a manner not specified by the manufacturer. Labels give details of equipment ratings for safe operation. Take time to examine all labels before commencing installation. Safety symbols on the meter have specific meanings.

**WARNING**

Contains no user serviceable parts. Field wiring and commissioning should only be carried out by qualified personnel in compliance with applicable national regulations.

This product has been tested to the requirements of EN61010-1, 2nd Edition - including Amendment 1.

2.1. **Maintenance**

The equipment should be maintained in good working order. Damaged equipment must be returned to the manufacturer (or his authorised agent) for repair. The meter may be cleaned by wiping lightly with a soft cloth. No solvents or cleaning agents should be used. All inputs and supplies must be isolated before cleaning any part of the equipment.
3. **Multicube Systems Assembly**

3.1. **Building a New Multicube System**

**WARNING**
Risk of Electric Shock!
Ensure all voltages are fully isolated before carrying out any installation work on the **multicube** system.

The following diagram shows how a standard **multicube system** is constructed on a length of 35mm Symmetrical DIN Rail. The order of assembly from left to right is always:

**LEFT HAND**  
Communications Module  
Master Display Unit  
0-9 Standard Modules (*SM352* or other)

**RIGHT HAND**  
End Dual Sub-Meter Module (*SM352-E*)

To Assemble a New **multicube** System:

- Place the communications module on the left hand end of the DIN rail.
- While pushing the Locking Mechanism attach the Master Display unit.
- Release the Locking Mechanism.
- Align the each module on the DIN Rail at the right hand end*.
- While pushing the Locking Mechanism slide the module to mate with the assembly.
- Release the Locking Mechanism.
- Add the right hand End Module as above.
- Check the Module is firmly attached by gently pulling apart.

* The last module fitted must be an End Module Type (eg SM352-E)

**WARNING**
Risk of Electric Shock!
Check the assembly carefully before applying power to the **multicube** System. Ensure all Modules are securely clipped together, check all wiring and tidy up.
3.2. Making Changes to an Existing Multicube System

WARNING
Risk of Electric Shock!
Ensure all voltages are fully isolated before carrying out any installation work on the multicube system.

3.2.1. Adding Modules
It is possible to upgrade a multicube system that has been previously configured (ref section 6) by adding new modules.

To Add a Module:
- Isolate all voltages to the system.
- Push the locking mechanism on the module to the right of the new module position.
- Pull the modules apart.
- Add the new module in the gap as described above.
- While pushing the Locking Mechanism add the remaining.
- Release the Locking Mechanism.
- Test that the modules are all fully engaged by attempting to pull apart.
- Check the installation and Power up the system.
- Configure the system to include the new module as described in Section 6.3.

NOTE: Reconfiguring the system clears all data from the data logger including accumulated tariff register totals. This process can be delayed until after the logged data is downloaded as described in Section 6.3.

3.2.2. Removing Modules
It is possible to upgrade a multicube system that has been previously configured (ref section 6) by removing existing modules.

To Remove a Module:
- Isolate all voltages to the system.
- Push the locking mechanism on the module to the right of the module being removed.
- Pull the modules apart.
- Push the locking mechanism on the module being removed.
- Slide the module to the right and remove from the DIN Rail.
- While pushing the Locking Mechanism push the remaining modules together.
- Release the Locking Mechanism.
- Test that the modules are all fully engaged by attempting to pull apart.
- Check the installation and Power up the system.
- Configure the system to include the new module as described in Section 6.3.

NOTE: Reconfiguring the system clears all data from the data logger including accumulated tariff register totals. This process can be delayed until after the logged data is downloaded as described in Section 6.3.
3.2.3. Replacing a Module

It is possible to replace a module in a multicube system with a new module of the same type. The system will recognise the change and provide the user with an option to automatically configure the new module to replace the original one while retaining the module settings, logged data and accumulated tariffs.

To Replace a Module:
- Remove the old module as described above (Removing Modules).
- Add the new Module as described above (Adding Modules)
- Pull the modules apart
- Check the installation and Power up the system.
- Configure the system to remove the old module as described in Section 6.3.
4. Installation

4.1. Intended Use

The multicube System simultaneously monitors up to 20 three-phase loads or up to 60 single-phase loads or a combination of both load types. The system is designed for connection to the following power networks:

- 3-Phase 3 or 4 Wire: Nominal 230V Phase to Neutral (400V Phase to Phase)
- Single Phase 2 Wire: Nominal 230V Phase to Neutral.
- Two Phase 3-Wire: Nominal 120V Phase to Neutral (240V Phase to Phase)

The multicube should be mounted close to the power system distribution point to minimise the length of voltage and current input connections. Ensure that the voltage cable clamps are securely tightened and all terminal covers are securely fitted before powering up the system.

4.2. Mounting

The multicube is designed to be mounted on a 35mm symmetrical (“Top-Hat”) DIN rail. The minimum length of DIN Rail required depends on the number of standard modules fitted as follows:

<table>
<thead>
<tr>
<th>Comms Module</th>
<th>Master Display Unit</th>
<th>Standard Modules</th>
<th>Right Hand End Module</th>
<th>Overall Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>29mm</td>
<td>100mm</td>
<td>0 = 0mm</td>
<td>29mm</td>
<td>158mm</td>
</tr>
<tr>
<td>29mm</td>
<td>100mm</td>
<td>1 = 29mm</td>
<td>29mm</td>
<td>187mm</td>
</tr>
<tr>
<td>29mm</td>
<td>100mm</td>
<td>2 = 58mm</td>
<td>29mm</td>
<td>216mm</td>
</tr>
<tr>
<td>29mm</td>
<td>100mm</td>
<td>3 = 87mm</td>
<td>29mm</td>
<td>245mm</td>
</tr>
<tr>
<td>29mm</td>
<td>100mm</td>
<td>4 = 116mm</td>
<td>29mm</td>
<td>274mm</td>
</tr>
<tr>
<td>29mm</td>
<td>100mm</td>
<td>5 = 145mm</td>
<td>29mm</td>
<td>303mm</td>
</tr>
<tr>
<td>29mm</td>
<td>100mm</td>
<td>6 = 174mm</td>
<td>29mm</td>
<td>332mm</td>
</tr>
<tr>
<td>29mm</td>
<td>100mm</td>
<td>7 = 203mm</td>
<td>29mm</td>
<td>361mm</td>
</tr>
<tr>
<td>29mm</td>
<td>100mm</td>
<td>8 = 232mm</td>
<td>29mm</td>
<td>390mm</td>
</tr>
<tr>
<td>29mm</td>
<td>100mm</td>
<td>9 = 261mm</td>
<td>29mm</td>
<td>419mm</td>
</tr>
</tbody>
</table>

To clip the multicube on the DIN rail first hook onto the top of the rail then push the bottom of the unit till all the sprung clips click into place. For wall mounting the DIN rail should be first secured to the wall and the multicube system clipped on afterwards.
4.2.1. Access to Master Display Unit

The auxiliary mains supply and voltage input terminals are protected by a sliding terminal cover on the Master Display unit. To gain access to these terminals:

1. Insert a flat screwdriver into the slot at the front of the terminal cover.

2. Slide the terminal cover forward to its full extent.
3. Hinge the cover down in front of the display.

NOTE: The screwdriver slot may be covered with a tamper evident label (20mm x 18mm) to detect unauthorized access.
4.2.2. Accessing Module Wiring Terminals

Module wiring terminals are protected by terminal covers as shown in the diagram below. The terminal covers are designed to slide towards the front of the module and are captive so they may not be removed and misplaced.

To access the terminals:
1. Push up the release clip using a tool.
2. Slide the terminal cover back to its full extent
3. Flip the terminal cover to lay in front of the module while accessing the wiring terminals.

NOTE: The release clip may be covered with a tamper evident label (20mm x 18mm) to detect unauthorized access.
5. Schematics

Each ½ of an SM352 Metering Module acts as an independent meter and can be configured during commissioning to monitor a three-phase load or three single-phase loads.

5.1. Voltage Inputs

Voltage measurement connections are common for all the slave meters and are made at the Master Display Unit. The voltage inputs are attenuated before being passed on to all metering modules. The voltage inputs and auxiliary mains supply to the system should be supplied from a suitably located and easily reached fused switch or circuit breaker included as part of the installation. This fused switch/circuit breaker must be marked as the disconnecting device for the equipment and must comply with the relevant requirements of IEC 60947-1 and IEC 60947-3.

The voltage input and auxiliary supply circuits must meet or exceed the following specification:

**Cable**: UL-1015; 600Vac; 105°C. 30-12AWG

**Fuses (US/Canada)**

<table>
<thead>
<tr>
<th>Rated Voltage</th>
<th>Type</th>
<th>Rupture In (A)</th>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥500Vac</td>
<td>Time-Delay</td>
<td>1.0A</td>
<td>UL 248 (US)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>C22.2 No. 248 (CAN)</td>
</tr>
</tbody>
</table>

**Fuses (Other Countries)**

<table>
<thead>
<tr>
<th>Rated Voltage</th>
<th>Type</th>
<th>Rupture In (A)</th>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥500Vac</td>
<td>Time-Delay</td>
<td>1.0A</td>
<td>IEC 60269-2</td>
</tr>
</tbody>
</table>

The auxiliary mains supply may be connected to any one of the measurement phases and system neutral as shown below (Phase 1 and Neutral shown).

---

**Figure 5-1 Auxiliary Mains and Measurement Voltage Inputs**
5.2. **Current Inputs SM352**

Each phase current input of the SM352 Sub-Metering Module is associated with one of three phase voltage inputs, which are supplied by the Master Display Unit. It is essential that current transducers are mounted on the correct associated voltage phase for accurate measurement.

To ensure safe operation, the Sub Metering Module SM352 must only be used with Current Transducers supplied by the manufacturer. These provide an isolated 0.33Vac signal to the current inputs when measuring a nominal primary current. Current transducers must meet/exceed the following specification:

- Case Isolation: 600Vac
- Internal Isolation: 2.11kV
- Operating Temperature Range: 0 to 60°C
- Cable: 105°C, 600Vac.

**Diagram of Various CTs with type Numbers**

*Figure 5-2 Current Transducer Types*
5.3. **Measuring 3 Phase Loads**

![Diagram of 3-Phase Isolator and CT Connections](image)

*Figure 5-3 Measuring 2 x 3-Phase 3 or 4 Wire Loads on a SM352*

5.4. **Measuring Single Phase Loads**

![Diagram of Single Phase Circuit Connections](image)

*Figure 5-4 Measuring 3 x Single Phase Loads Using ½ SM352*
6. Power Up/Configuration

6.1. Powering up a multicube System

Before supplying power to the multicube system check all wiring, ensure the unit is securely mounted to a stable surface and clean up all debris, scraps of wire etc.

When power is applied to a multicube a system hardware check is carried out to determine which modules are connected and how these are configured. The power up screen displays the progress of this system configuration check.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>Module Position Empty</td>
</tr>
<tr>
<td>☐☐☐☐☐☐</td>
<td>Module not recognised by the system</td>
</tr>
<tr>
<td>☐☐☐☐☐☐</td>
<td>Recognised Module</td>
</tr>
</tbody>
</table>

Other information on the Power up screen, such as software version, may be required when contacting the manufacturer for technical support.

The Error LED may also illuminate for a short period during power up.
6.2. Configuring a New Multicube System

All new multicube systems are factory configured and calibrated with at least the following components:

1. A Master Display unit
2. At least 1 Metering Module (eg SM352 dual meter).

Default settings are provided which can be user configured during commissioning to suit the site to be monitored and host communication requirements. Default settings are as follows:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Default Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>System - Name</td>
<td>“ND Multicube”</td>
</tr>
<tr>
<td>System – Volts Demand Period</td>
<td>30 minutes</td>
</tr>
<tr>
<td>System – Amps Demand Period</td>
<td>30 minutes</td>
</tr>
<tr>
<td>System – Power Demand Period</td>
<td>30 minutes</td>
</tr>
<tr>
<td>System – Logging (optional)</td>
<td>Disabled</td>
</tr>
<tr>
<td>System – RS485 (optional)</td>
<td>Modbus ID = 1</td>
</tr>
<tr>
<td></td>
<td>Baud = 9600</td>
</tr>
<tr>
<td></td>
<td>Parity = None</td>
</tr>
<tr>
<td>Meters – Load Name</td>
<td>“&lt; Meter N &gt;”</td>
</tr>
<tr>
<td>Meters – Communications</td>
<td>Load Modbus IDs = 2,3,4</td>
</tr>
<tr>
<td></td>
<td>From left to right, top to bottom</td>
</tr>
<tr>
<td>Meters – CT Type</td>
<td>Split CT 150A-0.33V</td>
</tr>
<tr>
<td>Meters – Load Type</td>
<td>3-Phase</td>
</tr>
<tr>
<td>Meters-Autorotate</td>
<td>Enabled</td>
</tr>
</tbody>
</table>

On power up, multicube systems recognise and accept their factory configured modules. Changes to the system hardware configuration may be made in the field such as adding/removing modules providing the original minimum component hardware configuration (above) is maintained.
6.3. Configuring a Modified Multicube System

Hardware changes made to a multicube system such as adding/removing modules are detected during the power up and may require action by the user to confirm these changes before the system accepts the new configuration.

6.3.1. After Adding New Modules

If one or more new modules are detected during power up checks, the following screen is displayed:

![Configuration Changed Screen]

The detected modules are recognised and shown in their position and the user is requested to accept these changes.

Use the keys to select YES or NO and the key to confirm the selection.

NOTE: The “Configuration Changed” screen times out after approximately 20 seconds.

6.3.1.1. Selecting NO (default)

If NO is selected (or the screen is allowed to timeout with YES or NO selected):

- The system continues to operate unchanged with previously configured and accepted modules.
- New modules are skipped when selecting loads in normal operation.
- Existing communications IDs (e.g. Modbus) remain unchanged regardless of physical position in the multicube system.
- New modules are not available on the communications (e.g. Modbus) system.

6.3.1.2. Selecting YES

If YES is selected.

- New modules are added to the multicube system and made available for display.
- Existing communications IDs (e.g. Modbus) remain unchanged regardless of physical position in the multicube system.
- New modules are available on the communications (e.g. Modbus) system with consecutive IDs that start at the previous largest ID+1.

NOTE: In order for the data logger (optional) to record data from new module(s), the user must STOP the current LOGGING SESSION and start a new one.
6.3.2. After Removing Modules

If power up checks determine that one or more modules have been removed, the following screen is displayed:

![Configuration Changed Screen]

NOTE: The “Configuration Changed” screen times out after approximately 20 seconds.

Press key to remove the message or wait for the screen to timeout.

- The system continues to operate with the configuration of the remaining modules unchanged.
- Communications IDs (e.g. Modbus) of the remaining modules are unchanged regardless of their physical position in the multicube system.
- Removed modules may return invalid data on the communications (e.g. Modbus) system.
- Logged data for removed modules is not available.

If a module is removed permanently it is advised that the system is reconfigured using the “Renumber Slaves” the option in the Setup - Advanced menu. This removes all trace of the modules and renumbers the other modules to fill the gap.
6.3.3. After Replacing Modules

If a module is replaced by an unconfigured module of the same type (for example when replacing a faulty module) the user is given the choice of configuring the replacement module with the same user settings as the module being removed.

The detected module(s) are recognised and shown in their position and the user is requested to accept the changes.

Use the < or > keys to select YES or NO and the key to confirm the selection.

NOTE: The “Configuration Changed” screen times out after approximately 20 seconds.

6.3.3.1. Selecting NO (default)

If NO is selected (or the screen is allowed to timeout with YES or NO selected):

- The system continues to operate unchanged with previously configured and accepted modules.
- Replacement modules are skipped when selecting loads in normal operation.
- Existing communications IDs (e.g. Modbus) remain unchanged regardless of physical position in the multicube system.
- New modules are not available on the communications (e.g. Modbus) system.
- Removed modules are not available on the communications (e.g. Modbus) system.
- Logged data for removed modules is not available.

6.3.3.2. Selecting YES

If YES is selected.

- New modules are added to the multicube system, in place of removed modules and are made available for display.
- New modules which replace removed modules are automatically configured with the settings of the removed modules.
- Existing communication IDs (e.g. Modbus) remain unchanged providing the number of modules in the multicube system is not changed.
- Logged data for replaced modules is not lost.
6.4. **Powering-Up a Configured Multicube System**

- Switch on the auxiliary supply to the unit

The power up screen details the software version for the Master Display Unit and a progress bar shows connection of each Sub Module as it is automatically identified. This screen is displayed for approximately 10 seconds.

- **Connected Loads List**

Use the ▼ ▲ keys to select a load from the list and press ▶ to show the default measurement page for the highlighted load.

The bottom line (Highlighted Text) gives details of the selected module:
- The Communications ID (eg Modbus ID).
- The selected channel (“Ph1”-“Ph3” or “3-Ph” for 3-Phase Loads)
- The Current Transducer nominal primary current.

Un-commissioned systems will display default names and all meters will be set to measure 3-Phase loads. It may be useful to refer back to this *Connected Loads List* after commissioning to check the system configuration.
6.4.1. System Information Pages

The system information page provides the user with details of the connected modules at any time during operation of the multicube system.

Select System Info
From the
CONNECTED LOADS

View the
System Information page

Select to View
Master/Module(s) Information

Return to Module List

✔ Module present and configured

✗ Module not present

❓ Module present but not yet configured

6.4.1.1. Master Information

User Name for the Master Display Unit
Serial Number for the Master Display Unit
Run time (since last power up)
Module status by position

6.4.1.2. Selected Slave Information (SM352)

Selected Module: Serial Number Firmware Version
Voltage: System, Nominal, Calibration Adjust
Current Transformer: Primary Secondary Phase Multiplier
Current Demand Periods (seconds/10)
Power Demand Periods (seconds/10)
Module Status – Selected Module Highlighted
Module Position (Type) Comms ID Meter Type
• Default Measurement Page

This page shows measured values from the selected meter/load. This data is meaningless for an unconfigured multicube system as the programmed Current Transducers may not match the physical devices fitted.

The bottom line (Highlighted Text) shows details of the selected load as:

- The Communications ID (eg Modbus ID).
- The selected channel (“Ph1”-“Ph3” or “3-Ph” for 3-Phase Loads)
- The programmed Load Name (Up to 14 Characters)

An LED is illuminated on the selected Module to indicate which phase is displayed on the LCD.

Display Current parameters for the selected load.

Display Voltage parameters for the selected load.  

Press/Release to show next page
Press/Hold for fast scroll

Display Power parameters for the selected load.

Display Energy parameters for the selected load.

Select a load to be displayed
(The LED associated with the selected load is illuminated)  

Press/Release to select next Load
Press/Hold to select from a Load List

Note: A different set of parameter display pages is available for single phase and 3-phase loads. For a list of available pages refer to Section 7.3.
• **Password Entry Screens**

Some programming features may be protected by a user password. Two levels of password are supported allowing more advanced features to be protected for use only by authorised users.

**Move to:**
- Next / Previous Digit
- ESC / OK

**Increment / Decrement Digit**

**Confirm:**
- OK – Issue the Password
- ESC – Return to Prev Screen

**NOTE:** If a password of 0000 is set, the password entry screen is not shown and immediate access is granted.
   If an incorrect password is entered the user is returned to the previous screen.
   The factory Set Default Passwords are:

   **Level 1:** 0 0 0 0
   **Level 2:** 1 1 1 1

To change the user passwords refer to Section XXXX
6.5. **System Name**

Each multicube system can be given a user defined ‘Name’ so it may be individually identified. Names are up to 14 Alpha-Numeric characters and are entered in the Setup Main page as follows:

1. **Enter Setup Mode**
   - Hold Setup Keys for 5 Seconds

2. **Select System Name from the SETUP MAIN Menu**
3. **View/Edit the System Name**
   - Switch between Character Entry Mode and Function Key Mode

**Function Key Mode**
- `< -` Previous Character
- `> -` Next Character
- `a/A` Lower/Upper Case
- `OK` Accept New Name
- `ESC` Abandon Changes

**Character Entry Mode**
- Select Character
- Enter Selected Character in Current position.
6.6. **Setup Each Electricity Meter Module (SM352)**

Each Electricity Metering Module **SM352** contains two complete 3-phase electricity meters, each of which may be optionally configured to monitor 3 single-phase loads.

**To configure a Meter Module:**
- Select the Current Transducer Type matching those connected. Suitable CTs are supplied by the manufacturer and are labelled with the type.
- Configure the meter to measure a 3-phase load or 3 individual single-phase loads.
- Set Autorotate Mode On/Off.
- Give each load a useful name, to be displayed on the LCD and available via Comms.

**NOTE:** The 3 inputs of each 1/2 SM352 must be connected using the same type of CT.

### 6.6.1. **Select a Current Transducer Type**

<table>
<thead>
<tr>
<th>Enter Setup Mode</th>
<th><img src="image" alt="Hold Setup Keys for 5 Seconds" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Meters</td>
<td><img src="image" alt="Select Meters from the Main Menu" /></td>
</tr>
<tr>
<td>View/Edit the Meter Setup</td>
<td><img src="image" alt="View/Edit the Meter Setup" /></td>
</tr>
<tr>
<td>Select a Meter Module</td>
<td><img src="image" alt="Select a Meter Module" /></td>
</tr>
<tr>
<td>Show CT List</td>
<td><img src="image" alt="Show CT List" /></td>
</tr>
<tr>
<td>Match the CTs Connected to this Meter to a type in the List</td>
<td><img src="image" alt="Match the CTs" /></td>
</tr>
<tr>
<td>Accept the CT Selection</td>
<td><img src="image" alt="Accept the CT Selection" /></td>
</tr>
</tbody>
</table>
6.6.1.1. **If User Spec CT is Selected**

It is possible to enter a user CT Specification for each Meter in place of selecting standard devices from the list. This is an advanced option, which is only required in exceptional circumstances and should not be used without technical support. A **Level 2 Password** is required when selecting a **User Spec CT**. This can be entered as described above.

**NOTE:** The SM352 is designed to compensate for small phase errors produced by each standard current transducer on the list. When a **User Spec CT** is used with the SM352 this phase error should match the specification of the device used or potential measurement errors will occur at low power factors. Current Transducers/Transformers not approved for use with the SM352 may permanently damage the Meter inputs.

6.6.1.2. **Enter a User Defined CT Specification**

- **Select User Spec CT**
  - From the **CT PRIMARY** list
- **View/Edit the User Spec CT**
- **Select The User Primary**
- **Edit the Primary Current**
- **Move to:**
  - **Next / Previous Digit**
  - **ESC / OK**
- **Increment / Decrement Digit**
- **Confirm:**
  - **OK – Issue the Password**
  - **ESC – Return to Prev Screen**


### 6.6.2. Custom CT Selection

A single Custom Current Transducer Specification may be defined, by an authorised user, and will then be available for selection from the Standard CT list.

A Custom Current Transducer Specification is defined by setting its CT Primary, and Phase Offset.

**NOTE:** Current Transducers/Transformers not approved for use with the SM352 may permanently damage the Meter inputs.

**NOTE:** The Custom CT specification is entered in the Advanced Settings Menu, which requires a Level 2 Password as, described above.
### 6.6.3. Set the Meter Module to Measure a 3-Phase or 3 Single Phase Loads

Select 1Phase/3Phase
The current mode is shown: 3-Ph or 1-Ph

Toggle Meter Types
3-Ph – 3 Phase Load
1-Ph – 3 x Single Phase

### 6.6.4. Set Autorotate Mode ON/OFF

When the Autorotate function is ON (default) the orientation of each current transducer on its associated conductor is irrelevant. If a CT is placed the wrong way round then the Autorotate system will automatically compensate for this.

If measurement of Export power/energy is required to then it is necessary to switch Autorotate OFF and ensure the CTs are mounted the correct way round on the conductors.

Select Autorotate
The current mode is shown: ON or OFF

Toggle Autorotate
ON - Normal Operation
OFF – Import/Export Power
6.6.5. Set a Name For Each Meter

An alphanumeric name may be associated with each load so that it may be identified on the LCD and over the Modbus or other communications link. Each measured load requires a name, so a meter measuring a single 3-phase load requires a single name while a 3 x Single Phase meter requires three names.

Select Load Names

View/Edit the Load Name(s)

Select The Meter to Edit

Note:
3-Phase Meters Require 1 Name.
1-Phase Meters Require 3 Names

Select a Load Name

Edit the Load Name

3-Phase Load (Single Name)

3 x Single Phase Loads (3 Names)
Switch Between:
Character Entry Mode and Function Key Mode

Function Key Mode
- < - Previous Character
- > Next Character
- a/A Lower/Upper Case
- OK Accept New Name
- ESC Abandon Changes

Character Entry Mode
- Select Character
- Enter Selected Character in Current position.

6.6.6. Repeat Meter Setup for All Meter Modules
Repeat the programming sequence for all attached loads as described above.

Select Back when Meter Programming is complete
Return to SETUP Menu
6.7. **Test Mode**
A series of load tests may be quickly performed to check the installation and validate connections.
To test a load:
- Ensure the load to be tested is ON and in a normal operating mode.
- For import/export meter types ensure the load is importing current
- Step through the load tests
- Isolate the system and correct installation errors where required.

**NOTE:** Very low Power Factor measurements (<0.55) are used to indicate installation errors. If the load measured actually produces such a low PF then test results may be invalid.
**NOTE:** If more than one error occurs simultaneously the first error in the list below will be shown until the error has been corrected.

### 6.7.1. **Installation Errors**:

#### ✓ No Error Detected
- The Current Transformer appears to be on the correct phase (Power Factor > 0.55).
- Sufficient load current is flowing for a valid test.
- The phase voltage is healthy.

#### V0 Insufficient Phase Voltage to carry out a Valid Test
- Check that the voltage wiring and ensure circuit breakers are ok.

#### I0 Insufficient Load Current to carry out a Valid Test
- Check that the load is running before carrying out the test.

#### ↓↑ Current Transformer Mounted on the Wrong Phase Cable
- This results in low power factor and kW measurements.
- Check the wiring and move the CTs to the correct phase.

#### aR Current Transformer Reversed on its Cable (Auto CT reverse activated)
- This occurs when the CT is reversed on its cable and indicates that the meter is automatically correcting for this error.
- There is no need to rotate the CT in this case this symbol is shown purely for information.

#### ⊢ Current Transformer Reversed on its Cable (Import/export meter)
- This result is only valid for import/export meter types.
- This results in negative kW measurements.
- Check the wiring and rotate the CT on its phase cable.
Enter Setup Mode

Hold Setup Keys for 5 Seconds

Select Test Mode from the Main Menu

Enter Test Mode

Select Connection Test

Enter Connection Test Mode

Connection Test - Power Factor

Select Meter to Test

Next / Previous Test

Exit Connection Test Mode

Connection Test – Amps

Select Meter to Test

Next / Previous Test

Exit Test Mode
<table>
<thead>
<tr>
<th>Connection Test – Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Load to Test</td>
</tr>
<tr>
<td>Next / Previous Test</td>
</tr>
<tr>
<td>Exit Test Mode</td>
</tr>
</tbody>
</table>

![VOLTAGE INPUT TEST](image)

<table>
<thead>
<tr>
<th>Connection Test – CT Rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Load to Test</td>
</tr>
<tr>
<td>Next / Previous Test</td>
</tr>
<tr>
<td>Exit Test Mode</td>
</tr>
</tbody>
</table>

![CT ROTATION TEST](image)
6.8. **Reset Saved Data**

Various stored parameters may be reset to zero using the programming menus.

- **“All Loads”** – Reset all meter modules simultaneously
- **“All Demands”** – Reset Volts, Amps and Power Demands simultaneously
- **“All Energy”** – Reset all energy registers simultaneously

---

**Enter Setup Mode**  
**Hold Setup Keys for 5 Seconds**

**Select Reset from the SETUP MAIN Menu**

**Enter the Reset Menu** *

**Select a single load or All Loads to reset.**

**Select One or More Parameters to Reset**

**Toggle Between:**  
- ✔️ Reset Stored Value  
- ✗ Don’t Reset Stored Value

**Select Next from the RESET Menu**

**Proceed With Reset** **

**WARNING MESSAGE**

**CONFIRM**: Perform Resets  
**CANCEL**: Exit Without Reset

---

* If passwords are enabled enter your password as described above.  
** Exit to main menu if no parameters are selected
6.9. Setup Modbus Communications (Optional)

Each multicube fitted with the Modbus communications option is assigned a range of unique IDs. Further information on this is available in the Multicube System - Communications Manual.

- The user assigns a unique ID for each multicube in the Modbus network leaving gaps for the Master Display Unit to automatically assign a further set of consecutive IDs (2 for each module).
- The user selects a baud rate to suit the Modbus system setting.
- The user set the Parity to suit the Modbus system setting.

Note: Parity is set to NONE for the majority of Modbus systems.

Enter The SETUP MAIN Menu

Hold Setup Keys for 5 Seconds

Select Communication from the SETUP MAIN menu

Enter the Communication Setup Menu

Set The Modbus ID

Select Modbus ID from the menu

Enter to change the value

Select a Digit, ESC or OK

Change the Digit Value.

OK – Accept new value
ESC- Reject new value

If the Modbus ID of the multicube Display Unit is changed the ID of each attached Slave unit is automatically updated starting from left to right (top to bottom) with the new ID +1, 2 etc.
**Set The Baud Rate**

Select *Baud Rate* from the *Communication Menu*

Enter to Change the Value

Select the desired baud rate

Enter to accept the selection

**Set The Parity**

Select *Parity* from the menu.

Enter to Change the Value

**Return To the SETUP MAIN Menu**

Select *Back* from the menu

Exit to SETUP MAIN menu
6.10. Test Modbus Communications (Optional)

The multicube system provides a facility for testing the RS485 communications network connection if the Modbus option is fitted. This allows communications problems to be identified and remedied during commissioning.

Enter Setup Mode

Hold Setup Keys for 5 Seconds

Select Test Mode
from the SETUP MAIN menu

Enter Test Mode

Select Modbus Test

Enter Modbus Test Mode

Modbus Test Mode

Select:
RESET or EXIT Button

RESET – Reset Test Results
EXIT – Leave Modbus Test

Pkts:
Total Number of RTU Framed Modbus Packets detected on the RS485 Bus. These may be complete or incomplete packets. The structure/content of these packets is not examined in detail unless they are addressed to ME.

Me:
Total Number of RTU Framed Modbus Packets starting with Any ID in My Range including that of the Display Unit and all connected Modules. These may be complete or incomplete packets. The structure/content of these packets is examined in detail for errors.
Errs:
This is a count of the Errors seen in RTU Framed Packets starting with Any ID in My Range including that of the Display Unit and all connected Modules. Exception errors are not counted here. The following errors are identified:

- Short Packet Length
- Long Packet Length
- Invalid Checksum
- Invalid Function Type

Exc:
This is a count of the Exception Errors seen in RTU Framed Packets with Any ID in My Range including that of the Master Display Unit and all connected Modules.

Last:
This provides details of the last error to occur including Exception Errors

STATUS LINE:
The bottom line of the LCD (Highlighted) shows the current configuration of the Modbus Port.

- ID 1-13  The Range of IDs used by the system including the Display and Slave Modules
- 9600  The baud rate of the Master Display Unit.
- NONE  Parity (NONE=No Parity, EVEN = Even Parity, ODD = Odd Parity)
6.11. **Setup Logging (Optional)**

The multicube system can be supplied with a built in data logger (Ref Section 8) which can store historical profiles of energy registers in flash memory that will be retained when power is removed from the system.

---

**Enter Setup Mode**

Hold Setup Keys for 5 Seconds

**Select Logging**
from the SETUP MAIN menu

**Enter the Logging Menu**

*NOTE:* New meters are supplied with logging STOPPED. Only when the logger is STOPPED can a new session be setup or major changes made to the logger configuration. This prevents corruption of the data format in during an ongoing log session.
6.11.1. Make Minor Real Time Clock Adjustments (Logger is Running)

It is possible to make minor adjustments to the real time clock while a log is in progress without stopping the logger. This may affect indexing of stored data on the day that the time is changed.

**ADJUST TIME – WHILE LOGGER IS RUNNING**

Select Adjust Time

Change the time

Select CONFIRM or CANCEL

CONFIRM – Continue
CANCEL – Return To Menu

Select HOUR : MIN : SEC OK or ESC

Change the Time Digits

OK – Set New Time
ESC – Escape / No Change

**NOTE:** Small time changes in the middle of a logging period will have least affect.
6.11.2. **Setup a New Log Session (Logger Must be Stopped First)**

- The user stops any ongoing data logging. Logged data will be lost when a new log is started so it is recommended that stored data be downloaded first.
- The user sets up a new logging session
- The user starts the new logging session
- Logging continues with the oldest data being replaced by the newest data when the logger is full (above).
- Stop The Logger

### Stop Logging

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Stop Logging</td>
<td><strong>LOGGING</strong> Stop Logging Adjust Time 11:02:12 Back</td>
</tr>
<tr>
<td>Enter to STOP LOGGING!</td>
<td>30 min Log in Progress</td>
</tr>
</tbody>
</table>

### Set A New Logging Period

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select <em>Period</em> from the menu</td>
<td><strong>LOGGING</strong> Period 20 mins Logged Loads Time 11:06:00 Date 15/07/2010</td>
</tr>
<tr>
<td>Change the Period</td>
<td>Logging Stopped</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select New Logging Period</td>
<td><strong>LOGGING PERIOD</strong> 15 mins 20 mins 30 mins 60 mins Logging Stopped</td>
</tr>
<tr>
<td>Accept New Period</td>
<td></td>
</tr>
</tbody>
</table>
Select Loads to Add to The Data Logger

Select *Logged Loads* from the menu

Change the Period

Highlight a Load

Toggle Between:
- ✓ Add Load to Logger
- ✗ Remove Load from Logger

When all Loads are selected
*Go to Back (Last Item).*

Exit to *LOGGING* menu.
6.11.3. Setting Up The Real Time Clock/Calendar

A fully functional real time clock (RTC) is provided with the data logging option on the multicube system. The RTC is battery backed and will keep time in the event of power failure to the system. Setup of the RTC is only allowed when the Logger is STOPPED. Features of the RTC are described in detail in Section 8.

Set the Daylight Savings Period

With logging Stopped –
Select Date & Time

LOGGING SETUP LCD PAGE

Change the Time

Select Daylight Savings from the
SET DATE & TIME Menu

Change the Daylight Savings Settings

Select from:
DST Enabled, Start/End Date, Back

Edit the selection.

Select “Back” and Press to Return to SET DATE & TIME Menu

Note: Setting the dates for Daylight Savings does not affect the real time clock or the data logger operation. The daylight savings setting merely allows Day Data files, stored in the logger, to include a flag on days when daylight saving should be applied in external systems.

Set the Date Format

Select Date Format UK (US)

Toggle between UK and US Formats:
UK = DD/MM/YY
US = MM/DD/YY
Set the Current Time

Select Time hh:mm:ss

Change the Time

Select HOUR : MIN : SEC OK or ESC

Change the Clock Digits

OK – Accept new time
ESC - Reject new time

Set the Real Time Clock (Date)

Select Date

Change the Calendar Date

UK: Select DAY / MONTH / YEAR
US: Select MONTH / DAY / YEAR

Select OK or ESC

Change the Calendar Digits

OK – Accept new Date
ESC - Reject new Date

When the RTC Setup is complete:
Select Back

Return to LOGGING menu.
## 6.11.4. Setting Up Energy Tariffs

**multicube** systems fitted with the Data Logging option allow energy accumulated during preset tariff periods to accumulate in up to 8 sets of Energy Tariff Registers. A full description of the Tariff register system is described in detail in Section 8.

<table>
<thead>
<tr>
<th>Setup Energy Tariffs</th>
</tr>
</thead>
<tbody>
<tr>
<td>With logging Stopped – Select Tariffs</td>
</tr>
<tr>
<td>Setup new Tariffs</td>
</tr>
</tbody>
</table>

### Set the Tariff Costs

<table>
<thead>
<tr>
<th>Select Tariff Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change the Costs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Select Tariff N Menu Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Tariff 1 – Tariff 8 (Current settings are shown)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Select kWh Cost Menu Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change the kWh/kvarh Tariff N Cost</td>
</tr>
</tbody>
</table>
6.11.4.1. Setting Tariff Costs

Each of the 8 Tariffs has a cost associated with it which is stored in the logger and may be used by external systems for bill validation calculations. The values set have no effect on other values stored in the multicube system but merely allow the user to maintain a local record of historic costs.

Select a Digit  OK or ESC
OK – Accept new Tariff Cost
ESC - Reject new Tariff Cost

Change The Digit Value

Select Back to return To Tariff Menu

Return to Main Tariff Menu

TARIFF 1 kwh ENTRY PAGE

TARIFF COSTS
Tariff 1
kWh cost 0.34
kvarh cost 0.34
Back
6.11.4.2. Defining Tariff Day Structures

Up to 8 Tariff Day Types may be defined for the multicube system as described in Section 8. A Day Type is defined by setting up to 8 consecutive periods which make up the day each of which may be associated with a selected Tariff. The values set have no effect on other values stored in the multicube system but merely allow the user to maintain a record of historic Tariff periods.

For example a Day Type may define:

<table>
<thead>
<tr>
<th>Day Type 1</th>
<th>Period</th>
<th>Start Time</th>
<th>End Time</th>
<th>Tariff</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>00:00</td>
<td>07:30</td>
<td></td>
<td>T3</td>
</tr>
<tr>
<td>2</td>
<td>07:30</td>
<td>15:30</td>
<td></td>
<td>T1</td>
</tr>
<tr>
<td>3</td>
<td>15:30</td>
<td>18:00</td>
<td></td>
<td>T6</td>
</tr>
<tr>
<td>4</td>
<td>18:00</td>
<td>00:00</td>
<td></td>
<td>T1</td>
</tr>
</tbody>
</table>

Day Types are setup graphically as:

**Setting Up A Day Type (See Section 8)**

**Select Day Periods**

**Define/Change Day Periods**

**Select The Day Type 1-8 To Program**

**Select Day Type**

**EDIT DAY TYPE**

Day Type Number Selected

**Select Day Type 1 – Day Type 8**

(Current settings are shown)

**Define The Day Type Time Periods**

**Select The Time Period Graphic for the selected Day Type**

**Select A Time Period to Adjust (Selected period is highlighted)**

**EDIT DAY TYPE**

Period Graph Selected

**Adjust the Start/End Times for the Selected period**
6.11.4.3. Defining Tariff Week Structures

Up to 8 Tariff Week Types may be defined for the multicube system as described in Section 8. A Week Type is defined by selecting a Day Type for each day of the week allowing a comprehensive Tariff profile to be programmed for each week. The values set have no effect on other values stored in the multicube system but merely allow the user to maintain a record of historic Tariff periods.

For example a Week Type may define:

<table>
<thead>
<tr>
<th>Week Type 1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Day of Week</td>
<td>Selected Day Type</td>
</tr>
<tr>
<td>Monday</td>
<td>Day Type 1</td>
</tr>
<tr>
<td>Tuesday</td>
<td>Day Type 2</td>
</tr>
<tr>
<td>Wednesday</td>
<td>Day Type 2</td>
</tr>
<tr>
<td>Thursday</td>
<td>Day Type 2</td>
</tr>
<tr>
<td>Friday</td>
<td>Day Type 3</td>
</tr>
<tr>
<td>Saturday</td>
<td>Day Type 4</td>
</tr>
<tr>
<td>Sunday</td>
<td>Day Type 5</td>
</tr>
</tbody>
</table>
Week Types are setup graphically as:

**Setting Up A Week Type (See Section 8)**

- Select Week Types
- Define/Change Day Periods

**Select The Week Type 1-8 To Program**

- Select the Week Type Number
- Select the Week Type to Edit (Current Setting are Shown)

**Program The Week Type**

- Select The Week Type Graphic
- Select A Day of the week (Selected day is highlighted)
- Select a Day Type For each day of the week

**Return to Main Tariffs Menu**

- Select Back
- Return to Main Tariffs Menu
6.11.4.4. Defining Tariff Seasons

Up to 8 Seasons per year may be defined for the multicube system as described in Section 8. Each season is defined as being a calendar period with a constant Week Type. For example we may have tariffs configured as Week Type 1 during the winter and Week Type 2 consistent throughout the summer. The values set have no effect on other values stored in the multicube system but merely allow the user to maintain a record of historic Tariff periods.

Seasons are setup graphically as:

**Setting Up A Season (See Section 8)**

Select Seasons

Define/Change the Seasons

**Define the Seasons Start/End Dates**

Select the season Graphic. (Highlighted when selected))

Select a Season to change. (Highlighted period in graphic)

Edit the Start/End date. (Detailed below graphic)

**Define The Week Type For Each Season**

Select the Week Type Number (Highlighted when Selected)

Select a Season (Highlighted period in graphic)

Select a Week Type for the selected season.

**Return to Tariffs Menu**

Select Back

Return to Main Tariffs Menu
Return to Logger Menu

Select Back

Return to Logger Menu

Start the New Log Session

Select Start Logging

START Log Session

Select CONFIRM or CANCEL

CONFIRM – Start Logging
CANCEL - Don't Start Logging

Complete Logger Setup

Select Back

Return to main Menu
6.11.5. Setup Demand Periods

Various average demand parameters are available in the multicube system. These are time-averaged values derived from standard instantaneous readings. The time period over which each parameter is averaged can be programmed to suit end user applications. For example a 1-minute average Amps Demand measurement may be set to provide a current profile, which smoothes out small fluctuations caused by minor load switching.

Enter Setup Mode

Hold Setup Keys for 5 Seconds

Select Demand Periods from the SETUP MAIN menu

Enter the Demand Period Menu

Set a New Demand Period

Select the Demand Parameter to Change

Select The Load associated with the demand periods*

Set the Demand Period for the Selected Parameter.

Select the Demand Period

Change the Demand Period

Select another Demand Parameter to Change or

Select Back when all Periods are set on all loads

* A single Voltage Demand Period is set for the system as a whole and effects all loads.
6.11.6. Setup Passwords to Restrict Keyboard Access

Some programming features may require a user password. Two levels of access may be set, each of which has a unique password. Only a user with access to Level-2 can modify passwords. A Level-1 Password is required to access the Main Menu. Some Main Menu Items require the level-2 Password as detailed in the Table below.

If a password is set to 0000 then the associated password screens will not be shown. Default factory password settings are Level-1 = 0000 and Level-2 = 1111. With these settings only level-2 screens, shown below, will require password entry.

<table>
<thead>
<tr>
<th>Main Menu Item</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset</td>
<td>2</td>
</tr>
<tr>
<td>Logging</td>
<td>2</td>
</tr>
<tr>
<td>Passwords</td>
<td>2</td>
</tr>
<tr>
<td>Advanced</td>
<td>2</td>
</tr>
</tbody>
</table>

Default factory password settings are Level-1 = 0000 and Level-2 = 1111. With these settings only level-2 screens, shown below, will require password entry.

Enter Setup Mode
Hold Setup Keys for 5 Seconds

Select Passwords from the SETUP MAIN menu

Set New Password(s)

Enter Existing Level 2 Password

Move to:
Next / Previous Digit
ESC / OK

Increment / Decrement Digit

Confirm:
OK – Issue the Password
ESC – Return to Prev Screen
Set new Password(s)

Select the Password

Change the Password

Edit The Existing Password

Move to:
Next / Previous Digit
ESC / OK

Increment / Decrement Digit

Confirm:
OK – Accept New Password
ESC – Return to Prev Screen

Select Back to Return to Main Menu
6.11.7. Advanced Settings Menu

Advanced settings should only be used by authorised personnel with an in depth understanding of the multicube metering system and its application in its installed location.

6.11.7.1. Custom CT Primary

A user-defined Current Transducer can be configured which can then be selected from the list available for selection in Meter Setup. The Custom CT is defined by its Primary Current and a Phase Compensation values required to ensure accurate measurements at poor power factors.

**WARNING:** If incorrect parameters are set for the Custom CT this can lead to significant reading errors.

---

**Enter Setup Mode**

*Hold Setup Keys for 5 Seconds*

**Select Advanced from the SETUP MAIN menu**

**Enter the Advanced Settings Menu***

*A Level 2 Password may be required to gain access to the Advanced Menu. This is entered as described above.

**Enter The Custom CT Primary Current**

**Select Custom CT Primary**

**Change the Primary Current**

**Select:**

Digit or OK or ESC

**Change the Digit**

**OK – Accept new Value**

**ESC - Reject new Value**
**multicube**

**Modular Metering System - Configuration**

**Enter The Custom CT-Phase Offset**

- **Select Custom CT Phase**
  - ![Arrow Up](image)
  - ![Arrow Down](image)

- **Change the Phase Angle**
  - ![Arrow Left](image)

**Select:**
- Digit or OK or ESC

**Change the Digit**

**OK – Accept new Value**

**ESC - Reject new Value**

![Advanced Menu](image)

![Enter CT Phase Offset](image)
6.11.7.2. Advanced Settings Menu (Nominal Voltage)

The standard multicube voltage measurement inputs have a nominal rating:

- 230V (400V Line-Line) Nominal Hardware Inputs
- 100V-277V (173V - 480V Line-Line) Accurate Measurement Range

As standard the multicube is configured with a “Nominal Voltage” setting of:

- 230V (400V Line-Line) Default Nominal Voltage Setting

Changing the Nominal Voltage setting to suit the actual voltage range of the power system in which the multicube is installed optimises the display resolution of power parameters. For example:

Nominal Volts = 120V Optimal Setting for 120V / 208V System

Enter The Nominal System Voltage

Select Nominal Voltage From the Advanced Menu

Change Nominal Voltage

Select the Nominal Voltage From the list

Accept the Nominal Voltage

Return From Advanced Menu

Select another Advanced Setting to Change or

Select Exit to Return to Meter Display pages
7. **Meter Operation**

Different measured loads are shown on the graphics LCD using the keypad on the Master Display Unit. Different sets of display pages are available for 1-Phase and 3-Phase loads.

### 7.1. Display Scaling

#### 7.1.1. Voltage Scaling

The voltage display normally shows a 4 digit number scaled to 1 decimal place:

**Examples:** 230.0V, 400.0V

#### 7.1.2. Current Scaling

The display resolution for all current (amps) parameters is set to provide 4 digits of resolution at the nominal CT Primary input.

<table>
<thead>
<tr>
<th>CT Primary (Amps)</th>
<th>Current Display Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>5A to 8A</td>
<td>0.001 A</td>
</tr>
<tr>
<td>9A to 80A</td>
<td>0.01 A</td>
</tr>
<tr>
<td>81A to 800A</td>
<td>0.1A</td>
</tr>
<tr>
<td>801A to 8000A</td>
<td>1 A</td>
</tr>
<tr>
<td>&gt; 8000A</td>
<td>0.01 kA</td>
</tr>
</tbody>
</table>

#### 7.1.3. Power Scaling (Meters Configured for a Single 3-Phase Load)

<table>
<thead>
<tr>
<th>CT Primary (Amps)</th>
<th>3-Phase Power Display Resolution</th>
<th>Single Phase Power Display Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>5A – 35A</td>
<td>0.01kW</td>
<td>0.001kW</td>
</tr>
<tr>
<td>36A to 350A</td>
<td>0.1kW</td>
<td>0.01kW</td>
</tr>
<tr>
<td>351A to 3500A</td>
<td>1kW</td>
<td>0.1kW</td>
</tr>
<tr>
<td>&gt;3500A</td>
<td>0.01MW</td>
<td>1 kW</td>
</tr>
</tbody>
</table>

#### 7.1.4. Power Scaling (Meters Configured for a 3 x Single Phase Loads)

<table>
<thead>
<tr>
<th>CT Primary (Amps)</th>
<th>Single Phase Power Display Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>5A&lt;11A</td>
<td>0.001kWh</td>
</tr>
<tr>
<td>11A to 100A</td>
<td>0.01kWh</td>
</tr>
<tr>
<td>101A to 1000A</td>
<td>0.1kWh</td>
</tr>
<tr>
<td>1001A to 10,000A</td>
<td>1kWh</td>
</tr>
<tr>
<td>&gt;10,000A</td>
<td>0.01MWh</td>
</tr>
</tbody>
</table>

#### 7.1.5. Energy Scaling (Meters Configured for a Single 3-Phase Load)

<table>
<thead>
<tr>
<th>CT Primary (Amps)</th>
<th>3 Phase Energy Display Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5A</td>
<td>0.001kWh</td>
</tr>
<tr>
<td>5A – 35A</td>
<td>0.01kWh</td>
</tr>
<tr>
<td>36A to 350A</td>
<td>0.1kWh</td>
</tr>
<tr>
<td>351A to 3500A</td>
<td>1kWh</td>
</tr>
<tr>
<td>&gt;3500A</td>
<td>0.01MWh</td>
</tr>
</tbody>
</table>
7.1.6. Energy Scaling (Meters Configured for 3 x Single Phase Loads)

<table>
<thead>
<tr>
<th>CT Primary (Amps)</th>
<th>Single Phase Energy Display Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;11A</td>
<td>0.001kWh</td>
</tr>
<tr>
<td>11A to 100A</td>
<td>0.01kWh</td>
</tr>
<tr>
<td>101A to 1000A</td>
<td>0.1kWh</td>
</tr>
<tr>
<td>1001A to 10,000A</td>
<td>1kWh</td>
</tr>
<tr>
<td>&gt; 10,000A</td>
<td>0.01MWh</td>
</tr>
</tbody>
</table>

7.2. Sliding Window Demand

Average values of Volts, Amps kW, and kvar are calculated over a user programmable time period. The displays show the averages for the most recent time period ending at the time the display was last updated. The demand period is continuously updated as time progresses hence the term “Sliding Window Demand”.
7.3. **Load Display Menus**

Each metered load is represented in display menus which are accessed using the user keypad on the *Master Display Unit*.

7.3.1. **Capacitive and Inductive Loads**

Measured parameters such as kvar and Power Factor are displayed with a symbol indicating the type of load:

Inductive Loads:  
Capacitive Loads: 

7.3.2. **3-Phase Load Display Menus**

### 3-Phase Current Display Menu

<table>
<thead>
<tr>
<th>Select Current Pages</th>
<th>Select Load</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Select Current Pages" /></td>
<td><img src="image2" alt="Select Load" /></td>
</tr>
<tr>
<td><img src="image3" alt="Current Display" /></td>
<td><strong>Instantaneous Phase Currents</strong></td>
</tr>
<tr>
<td><img src="image4" alt="Peak Display" /></td>
<td></td>
</tr>
<tr>
<td><img src="image5" alt="Dmd Display" /></td>
<td><strong>Peak Hold Phase Currents</strong></td>
</tr>
<tr>
<td><img src="image6" alt="Min Display" /></td>
<td></td>
</tr>
<tr>
<td><img src="image7" alt="THD Display" /></td>
<td><strong>Current Demand (Sliding Window) Ref 7.2</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image8" alt="Peak Display" /></td>
<td><strong>Peak Current Demand (Sliding Window) Ref 7.1</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image9" alt="Min Display" /></td>
<td><strong>Min Current Demand (Sliding Window) Ref 7.1</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Current Total Harmonic Distortion (THD)</strong></td>
</tr>
</tbody>
</table>
3-Phase Voltage Display Menu

Select Voltage Pages

**Instantaneous Phase to Neutral Voltages**
- Phase 1 to neutral volts
- Phase 2 to neutral volts
- Phase 3 to neutral volts

**Instantaneous Line-Line Voltages**
- Line 1 – Line 2 volts
- Line 2 – Line 3 volts
- Line 3 – Line 1 volts

**Peak Hold Phase to Neutral Voltages**
- Peak Hold Phase 1 Volts
- Peak Hold Phase 2 Volts
- Peak Hold Phase 3 Volts

**Voltage Demand (Sliding Window) Ref 7.1**
- Voltage Demand Phase 1
- Voltage Demand Phase 2
- Voltage Demand Phase 3

**Peak Voltage Demand (Sliding Window) Ref 7.1**
- Peak Hold Voltage Demand Phase 1
- Peak Hold Voltage Demand Phase 2
- Peak Hold Voltage Demand Phase 3

**Min Voltage Demand (Sliding Window) Ref 7.1**
- Minimum Hold Voltage Demand Phase 1
- Minimum Hold Voltage Demand Phase 2
- Minimum Hold Voltage Demand Phase 3

**Voltage Total Harmonic**
- %THD Phase 1 Volts
- %THD Phase 2 Volts
- %THD Phase 3 Volts
### 3-Phase Power Display Menu

#### Select Power Pages

- **Instantaneous System Power**
  - System Real Power kW (P)
  - System Reactive kvar (Q)
  - System Power Factor (COSØ)

- **kW Demand (Sliding Window) Ref 7.1**
  - kW Demand
  - Peak Hold kW Demand
  - Minimum Hold kW Demand

- **System Frequency, Neutral Current, kVA (S)**
  - Frequency (Measured on Volts Ph1)
  - Neutral Current Ref Error! Reference source not found.
  - System Apparent Power kVA

- **Per Phase kW (P1-P3)**
  - Phase 1 Real Power (kW)
  - Phase 2 Real Power (kW)
  - Phase 3 Real Power (kW)

- **Per Phase Reactive Power (kvar)**
  - Phase 1 Reactive Power (Inductive shown)
  - Phase 2 Reactive Power (Inductive shown)
  - Phase 3 Reactive Power (Inductive shown)

- **Per Phase Power Factor (COS Ø )**
  - Phase 1 Power Factor (Capacitive shown)
  - Phase 2 Power Factor (Capacitive shown)
  - Phase 3 Power Factor (Capacitive shown)
### 3-Phase Energy Display Menu

<table>
<thead>
<tr>
<th>E</th>
<th>Select Energy Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Select Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total System Import Energy**

- Real Energy kWh
- Reactive Energy (kvarh)
- Apparent Energy (kVAh)
7.3.3. **Single-Phase Meter Display Menus**

**NOTE:** Each single-phase load is associated with a phase voltage determined by its position in a 3-Phase metering module. The phase voltages connected to the Master Display Unit are numbered Ph1 - Ph3 and this is indicated on the single-phase pages as “Ph1” - “Ph3”.

### Single-Phase Current Display Menu

**Select Current Pages**

- **Instantaneous Phase Current**
  - Phase Current
  - Peak Hold Phase Current
  - Bar Graph of Amps Scale = 0 - 120% CT Prim

**Select Load**

- **Current Demand (Sliding Window) Ref 7.1**
  - Phase Current Demand
  - Peak Hold Phase Current Demand
  - Minimum Hold Phase Voltage Demand

### Single-Phase Voltage Display Menu

**Select Voltage Pages**

- **Instantaneous Phase to Neutral Voltage**
  - Phase to Neutral Voltage
  - Peak Hold Phase Voltage
  - Bar Graph of Volts Scale = 0 - 120% Vnom

**Select Load**

- **Voltage Demand (Sliding Window) Ref 7.1**
  - Phase Voltage Demand
  - Peak Hold Phase Voltage Demand
  - Minimum Hold Phase Voltage Demand
Single-Phase Power Display Menu

Select Power Pages

Instantaneous Phase Powers
- Single Phase Real Power (P)
- Single Phase Reactive Power (Q)
- Single Phase Power Factor (COSΦ)

Power Demand (Sliding Window) Ref 7.1
- Single Phase kW Demand
- Single Phase Peak Hold kW Demand
- Frequency (From Phase 1 volts)

Single-Phase Energy Display Menu

Select Energy Pages

Single Phase Total Import Energy
- Single Phase Real Energy (kWh)
- Single Phase Reactive Energy (kvarh)
8. Data Logger/Tariffs (Optional)

8.1. Data Logger

The multicube system can be supplied with a richly featured energy data logger which stores historic kWh and kvarh profile data for up to 1000 days. The data logger also provides a store for up to 8 sets of accumulating kWh and kvarh Tariff Registers. Once configured by the user the logger runs continuously, automatically replacing the earliest data with the newest.

Storage is in conveniently structured data files which hold 15, 20 or 30 minutes period energy register totals for each single day. Each Day Data File also holds summary information for that day allowing user software to review a comprehensive history.

The data in the logger is made available via the communications system (e.g. Modbus) as described in the appropriate multicube System - Communications Manual.

8.1.1. Storage Capacity

The logger can store up to 1000 days of energy profile data depending on the total number of loads being monitored. Each Sub-Metering Module configured as a 3-phase meter stores 1 Load Profiles and each Sub-Metering Module configured as 3 x 1 Phase stores 3 Load Profiles. It is the total number of Load Profiles stored which determines the logger capacity in days as:

<table>
<thead>
<tr>
<th>Total Load Profiles</th>
<th>Logger Capacity Number of Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-7</td>
<td>1,000</td>
</tr>
<tr>
<td>8-15</td>
<td>500</td>
</tr>
<tr>
<td>16-23</td>
<td>333</td>
</tr>
<tr>
<td>24-31</td>
<td>250</td>
</tr>
<tr>
<td>32-39</td>
<td>200</td>
</tr>
<tr>
<td>40-47</td>
<td>166</td>
</tr>
<tr>
<td>48-55</td>
<td>142</td>
</tr>
<tr>
<td>56-60</td>
<td>125</td>
</tr>
</tbody>
</table>
**8.1.2. Daily Data Stored For Each Load**

<table>
<thead>
<tr>
<th>Data Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of days since the logger was first started.</td>
</tr>
<tr>
<td>Calendar Date as Day - Month – Year</td>
</tr>
<tr>
<td>Day Data File Index. Incremented every time a Day Data File is stored. This may be used to speed up data searching.</td>
</tr>
<tr>
<td>Daylight Saving Flag</td>
</tr>
<tr>
<td>Total kWh registered up to the start of the logged day</td>
</tr>
<tr>
<td>Total kvarh registered up to the start of the logged day</td>
</tr>
<tr>
<td>kWh recorded in each sub period (15, 20 or 30 minutes) for 24 hours.</td>
</tr>
<tr>
<td>kvarh recorded in each sub period (15, 20 or 30 minutes) for 24 hours.</td>
</tr>
<tr>
<td>Start/End times for up to 8 Tariffs T1-T8. Saved every day so historic tariff changes can be recorded.</td>
</tr>
<tr>
<td>Associated values for up to 8 Tariffs T1-T8. Saved every day so historic tariff changes can be recorded. These are user set numbers 0-65000 which are stored along side the energy data but have no affect on it.</td>
</tr>
<tr>
<td>Total kWh and kvarh registered up to the start of the logged day measured during all T1 Tariff periods.</td>
</tr>
<tr>
<td>Total kWh and kvarh registered up to the start of the logged day measured during all T2 Tariff periods.</td>
</tr>
<tr>
<td>Total kWh and kvarh registered up to the start of the logged day measured during all T3 Tariff periods.</td>
</tr>
<tr>
<td>Total kWh and kvarh registered up to the start of the logged day measured during all T4 Tariff periods.</td>
</tr>
<tr>
<td>Total kWh and kvarh registered up to the start of the logged day measured during all T5 Tariff periods.</td>
</tr>
<tr>
<td>Total kWh and kvarh registered up to the start of the logged day measured during all T6 Tariff periods.</td>
</tr>
<tr>
<td>Total kWh and kvarh registered up to the start of the logged day measured during all T7 Tariff periods.</td>
</tr>
<tr>
<td>Total kWh and kvarh registered up to the start of the logged day measured during all T8 Tariff periods.</td>
</tr>
</tbody>
</table>

**8.1.3. Logger Clock**

The Logger clock should **ALWAYS** be set to local time **WITHOUT DAYLIGHT SAVING APPLIED**. This ensures that no data is lost on the days when Daylight Saving starts and ends. For example in the UK always set the Logger Clock to Greenwich Mean Time (GMT). This approach is the standard method used for data logging electricity values.

The logger clock is accurate to within 30 seconds per month. It is recommended that it is adjusted (via the communications interface or the control panel) regularly to ensure it is synchronised to other clocks in the system.
8.1.4. Daylight Saving

Although the data in the Logger is internally time-stamped without daylight saving time applied the multicube allows the user to record a flag in days when Daylight Saving is applied locally throughout the year. Storing this Daylight Saving Flag does not affect the data in the logger but merely provides a method by which stored data may be adjusted when it is read from the logger at a later date. In order to facilitate this retrospective shift of the time stamp, 25 hours of data are stored every day from 23:00 on the previous day to 24:00 on the day of the log.

8.1.5. When is Data Stored/Available

New Day Data Files are opened at 00:00h each day and available for reading from 01:30 that day. The totalised energy registers accumulated up to each logged day are stored at 00:00h and account for all time since the meter was first commissioned (or the values were manually reset).

8.1.6. Logger Status Information

A table of logger status information is available for reading using the communication interface which allows the user to keep track of its progress. The status information available includes:

- Logger status (running or stopped)
- Number of loads being logged
- Maximum number of days which can be stored (dependant on number of loads)
- Memory status (full/overwriting or not full)
- Number of days since the logger was started
- Earliest day available for download
- Latest day available for download

8.1.7. Starting/Stopping the Logger

Once the logger is setup it is recommended to leave it running allowing the oldest stored data to be overwritten by the latest. Regular downloads of the logger data reduces the download times and ensures the data is backed up.

If the logger configuration requires changing, for example to add/remove loads or to change the logging period, the logger must be stopped so that it may be reformatted. This is necessary to ensure that all Day Data Files in the logger are formatted equally. The following rules apply:

- Stopping the logger prevents new data being added
- After the logger is stopped it is still possible to read the old logged data files
- The logger configuration can only be changed when the logger is stopped
- The logger date can only be set when the logger is stopped.
- Small adjustments to the logger clock are possible while the logger is running.
- Starting the logger always resets the file format using the latest configuration (even if it has not been changed) and old data is lost at this point.
8.1.8. Power Failures

If the power supply to the multicube is removed for a period of time the following applies:

- No measurement or logging can occur while the auxiliary power is removed.
- If power-up occurs in the same sub-period:
  Accumulation re-starts for that period on power-up resulting in a lower count at the end of this sub-period.
- If power-up occurs in a later sub-period during the same day:
  Energy accumulated in the part completed power fail period is stored to the logger
  Missing sub-periods are filled with energy values of zero
  Accumulation re-starts part way through the power-up sub-period.
- If power-up occurs on a later day:
  Energy accumulated in the part completed power fail period is stored to the logger.
  Energy accumulated in periods to the end of the power-fail day is logged as zero.
  Energy accumulated in periods on the power-up day before the power-up period is logged as zero.
  Accumulation re-starts part way through the power-up sub-period on the power-up day.
8.2. **Multiple Tariffs (Optional)**

The kWh and kvarh energy measured during preset tariff periods is accumulated in up to 8 sets of energy registers. For example: The Sum of all kWh energy measured by a 3-Phase Slave 1 Meter during all Tariff 1 periods throughout the year are accumulated in Slave 1 Tariff 1 kWh. The Tariff registers option is only available as an add-on option to the data logger.

**8.2.1. Tariff Values**

Up to 8 Tariffs may be programmed, each defined by its number (T1-T8) and an associated value (0-65000). Tariff values are set by the user and recorded along with the energy profile in the Day Data Files so that historic changes to values such as cost may be conveniently recorded for future reference. The Tariff Values have no effect on the accumulating Tariff Registers.

**8.2.2. Tariff Day Types**

Up to 8 Tariff Day Types may be user defined which are split into a maximum of 8 time periods to suit a local energy tariff structure. A single Tariff is assigned, using its number, to each tariff period in each Tariff Day Type.

*Example:* To set a weekday tariff saved to Day Type 1 with:

- A Day-time Tariff of T3 from 07:00h to 19:30h
- A Night-time Tariff of T6 from 19:30 to 07:00

<table>
<thead>
<tr>
<th><strong>Day Type 1</strong></th>
<th>00:00 – 07:00</th>
<th>07:00 – 19:30</th>
<th>19:30 – 24:00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day Period 1</td>
<td>Tariff = T6</td>
<td>Tariff = T3</td>
<td>Tariff = T6</td>
</tr>
</tbody>
</table>
8.2.3. **Tariff Week Types**

Up to 8 *Week Types* may be user defined each of which is made up of 7 *Day Types*.

**Example:** A summer week has different weekday and weekend tariffs as:

**Monday to Friday**
- Day time from 07:00 to 19:30 = T3
- Night time from 19:30 to 07:00 = T6

**Saturday and Sunday**
- From Friday at 19:30 to Monday at 07:00 = T2

<table>
<thead>
<tr>
<th>Monday Day Type 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day Period 1</td>
</tr>
<tr>
<td>Day Period 2</td>
</tr>
<tr>
<td>Day Period 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tuesday – Thursday Day Type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day Period 1</td>
</tr>
<tr>
<td>Day Period 2</td>
</tr>
<tr>
<td>Day Period 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Friday Day Type 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day Period 1</td>
</tr>
<tr>
<td>Day Period 2</td>
</tr>
<tr>
<td>Day Period 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Saturday – Sunday Day Type 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day Period 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Summer Season Week Type 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
</tr>
<tr>
<td>Tuesday</td>
</tr>
<tr>
<td>Wednesday</td>
</tr>
<tr>
<td>Thursday</td>
</tr>
<tr>
<td>Friday</td>
</tr>
<tr>
<td>Saturday</td>
</tr>
<tr>
<td>Sunday</td>
</tr>
</tbody>
</table>
8.2.4. **Tariff Seasons**

Up to 8 periods of each calendar year (seasons) may be defined by selecting start and end dates. A single *Tariff Week Type* is assigned to each season to define the tariff structure for the period.

**Example:** 2 Seasons (Winter and Summer) Using 2 Week Types

<table>
<thead>
<tr>
<th>Tariff Week Type 1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>30&lt;sup&gt;th&lt;/sup&gt; November - 22&lt;sup&gt;nd&lt;/sup&gt; March (Winter)</td>
<td>Tariff Week Type 1</td>
</tr>
<tr>
<td>23&lt;sup&gt;rd&lt;/sup&gt; March – 29&lt;sup&gt;th&lt;/sup&gt; November (Summer)</td>
<td>Tariff Week Type 2</td>
</tr>
</tbody>
</table>

This structured approach simplifies setting of Tariff periods for a year while maintaining flexibility to suit most tariff structures.

8.2.5. **Tariffs in the Data Logger**

In addition to displaying kWh and kvarh accumulated during Tariff periods T1-T8 the *multicube* system records T1-T8 time periods relevant to each day in the data logger. This data does not affect the logged energy but provides historic tariff information locally in the unit. This information can be downloaded with the energy profile to produce historic tariff weighted energy data. Each day the logger stores the Tariff Number for each period and the associated Tariff Value dependant on the tariff structure and calendar date.
## 9. Specification

### 9.1. Modular Metering System

<table>
<thead>
<tr>
<th>ENVIRONMENT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature</strong></td>
<td>Operating: -10°C to +55°C</td>
</tr>
<tr>
<td></td>
<td>Storage: -25°C to +70°C</td>
</tr>
<tr>
<td><strong>Humidity</strong></td>
<td>&lt; 75% non-condensing</td>
</tr>
<tr>
<td><strong>Environment</strong></td>
<td>IP54 standard</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MECHANICAL</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Enclosure</strong></td>
<td>Material: Black ABS UL 94-V0</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>Height: 164mm</td>
</tr>
<tr>
<td></td>
<td>Depth: (Off Wall) 96mm</td>
</tr>
<tr>
<td></td>
<td>Length: Master Display Unit: 100mm</td>
</tr>
<tr>
<td></td>
<td>Communication Module: 29mm</td>
</tr>
<tr>
<td></td>
<td>Dual Metering Slave: 29mm</td>
</tr>
<tr>
<td></td>
<td>Master Display Unit: TBA</td>
</tr>
<tr>
<td></td>
<td>Dual Metering Slave: TBA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SAFETY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conforms to</strong></td>
<td>EN 61010-1 Installation Category III</td>
</tr>
</tbody>
</table>
### 9.2. Master Display Module

<table>
<thead>
<tr>
<th><strong>GENERAL</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimensions</strong></td>
</tr>
<tr>
<td>Height : 164mm</td>
</tr>
<tr>
<td>Depth: (Off Wall) 96mm</td>
</tr>
<tr>
<td>Length: 100mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Phase 2 Wire Unbalanced Loads</td>
</tr>
<tr>
<td>3-Phase 3 or 4 Wire Unbalanced Loads</td>
</tr>
<tr>
<td>2 Phase 3 wire Unbalanced Loads</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Modules (Capacity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum = 10 Modules</td>
</tr>
<tr>
<td>e.g. 10x Metering Modules SM352</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Voltage Un</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal: 400V Phase to Phase</td>
</tr>
<tr>
<td>230V. Phase to Vn</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current In</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal: 0.333V from Externally Isolated Custom Current Transducers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measurement Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage 40% to 120% of Nominal</td>
</tr>
<tr>
<td>Current 0.2% to 120% of Nominal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundamental 45 to 65Hz</td>
</tr>
<tr>
<td>Harmonics Up to 30th harmonic at 50Hz</td>
</tr>
<tr>
<td>Individual to the 15th</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Burden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage &lt;0.1VA per phase</td>
</tr>
<tr>
<td>Current Not applicable (Burden fitted in transducer)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage x4 for 1 hour</td>
</tr>
<tr>
<td>Current x40 for 0.5 second max</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>DISPLAY</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Type LCD 128x64 Dot Graphic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>AUXILIARY SUPPLY</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Range 90-264Vac 50/60Hz</td>
</tr>
<tr>
<td>Load Master Only: TBA W max</td>
</tr>
<tr>
<td>Master + 10 SM352 Modules: TBA W max.</td>
</tr>
</tbody>
</table>
## 9.3. Dual Metering Module SM352

### GENERAL

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Height</th>
<th>164mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Depth: (Off Wall)</td>
<td>96mm</td>
</tr>
<tr>
<td></td>
<td>Length</td>
<td>29mm</td>
</tr>
</tbody>
</table>

Use only Northern Design Current Transducers with the following specification:
- Nominal CT Primary: 20A; 40A; 60A; 100A; 150A; 200A; 300A; 400A; 600A; 800A; 1000A or 1200A
- Nominal CT Secondary: 0.333Vac
- Insulation Class 600Vac

### Voltage Input

From Master Display Unit:
- maximum 0V - 3.3V ac Peak

### ACCURACY

All errors ± 1 digit:
- **kWh**: Better than Class 1 per EN 62053-21 & BS 8431
- **kvarh**: Better than Class 2 per EN 62053-23 & BS 8431
- **kW & kVA**: Better than Class 0.25 IEC 60688
- **kvar**: Better than Class 0.5 IEC 60688
- **Amps & Volts**: Class 0.1 IEC 60688 (0.01In – 1.2In or 0.1Un – 1.2Un)
- **PF**: ±0.2° (0.05In – 1.2In and 0.2Un – 1.2Un)
- **Neutral Current**: Class 0.5 IEC 60688 (0.05In – 1.2In)

### POWER SUPPLY

<table>
<thead>
<tr>
<th>DC Power From</th>
<th>DC Power Supply:</th>
<th>3.3V DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master Display</td>
<td>Maximum Load Per Module (2 Meters):</td>
<td>TBA W</td>
</tr>
</tbody>
</table>