Atlas Series Energy Meters

Mk10H

Hardware Reference Manual

Revison 1 (22/09/2015)
Design Australasia

1910-E-02

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1 INTRODUCTION

This reference manual is for the Mk10H Three Phase Energy Meter with DIN Rail mount.

It covers the hardware of the meter, including installation and connections.

On a simple level, the MK10H smart meter is an energy meter measuring the basic quantities of Wh, varh and VAh. The meter records consumption data in a load survey, and as time of use data. The meter can also measure a wide variety of instantaneous quantities. The configuration is extremely flexible.

For information on configuring the meter and using it with the EziView software, see the Atlas Software Reference Manual.

1.1 Conventions Used in this Manual

All dates are in DD/MM/YY format.

References to settings or controls are printed in *Italics*.

The path to a specific menu option is written as:

Menu Level 1→*Menu Level 2*→*Menu Level 3*

Information with special note (such as safety information) is marked with a  .

Additional noteworthy information is marked with a  .

"Clicking" on a button or field means using the left mouse button.

Note: Due to variations between computers and improvements in software, screenshots shown in this manual may vary slightly from the appearance on your system.

1.2 For more information

The best source of hardware information is this manual. If you are still having problems though, please email EDMI at support@edmi-meters.com

The online help of EziView also has a wealth of information, and contains more information on advanced functions of EziView such as the scheduler, script files, and reading files.

When emailing EDMI, we may ask you for the meter serial number and the version of EziView you are using. The meter serial number is printed on the meter label, and is also the serial number used in EziView to identify the meter. The EziView version is available under *Help*→*About* in EziView.

For software questions, it will also help to have details of your firmware version available. If you do not know your firmware version, you can find out from your EDMI Account Manager.

All this information will help us help you.

2 DIMENSIONS AND MOUNTING

Figure 1 shows the overall dimensions of the meter with a standard terminal cover. The depth of the meter is the meter at its deepest point and excludes the buttons.

Figure 1 - Mk10H Meter

Height = 105 mm, Depth = 71 mm, Width = 105 mm

Figure 2 shows measurements as viewed from the back of the meter.

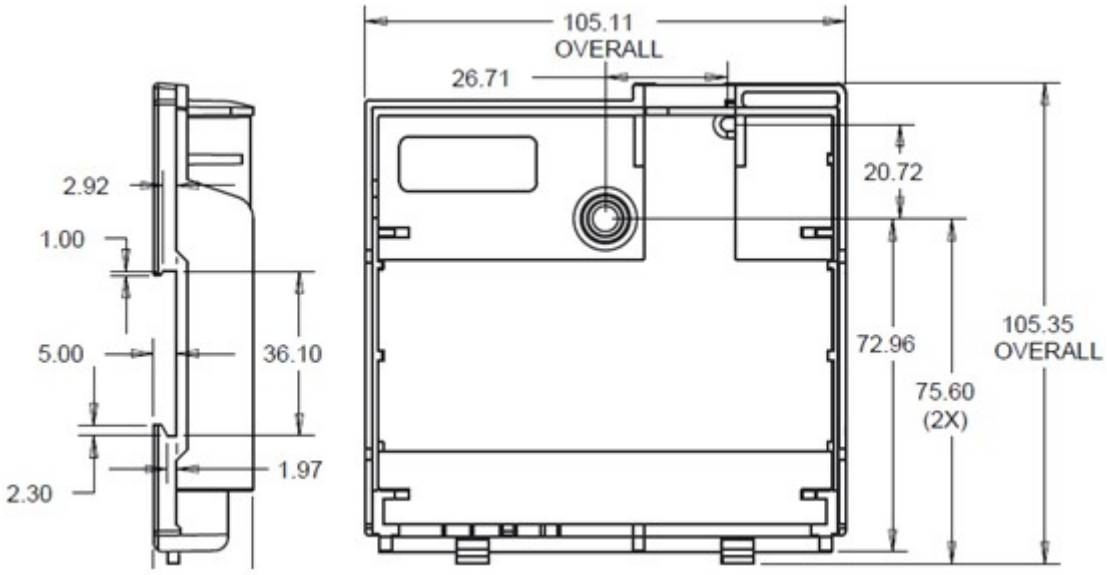


Figure 2 - Mk10H Mounting Dimensions

To mount the meter, Refer to and DIN terminal dimensions as mentioned in section Error: Reference source not found Error: Reference source not found Error: Reference source not found.

3 EXTERNAL FEATURES

Figure 3 shows a view of the front of the meter (the specifics of your label will vary).

Figure 3 - Front View of the Meter.

The major parts visible in Figure 3 include:

- The LCD display.
- A *Select* button for cycling the display (right push button).
- A *Billing Reset* button to initiate a manual billing reset (left push button).
- Two pulsing LEDs for energy indication (Pulse1 and Pulse2).
- A FLAG port for local connection.

There is one sealable screw on the top of meter, just above the RS232 port. The sealable screw has a 2.15mm diameter hole to accommodate standard sealing wire.

4 CONNECTIONS IN DETAIL

4.1 Current and Voltage

The mains power terminals are located at the lower side of the meter. The minimal clearance between CT terminals is 7.62mm and VT terminals is 9.52mm. Please refer to Figure 4 for CT and VT connections for 3 elements.

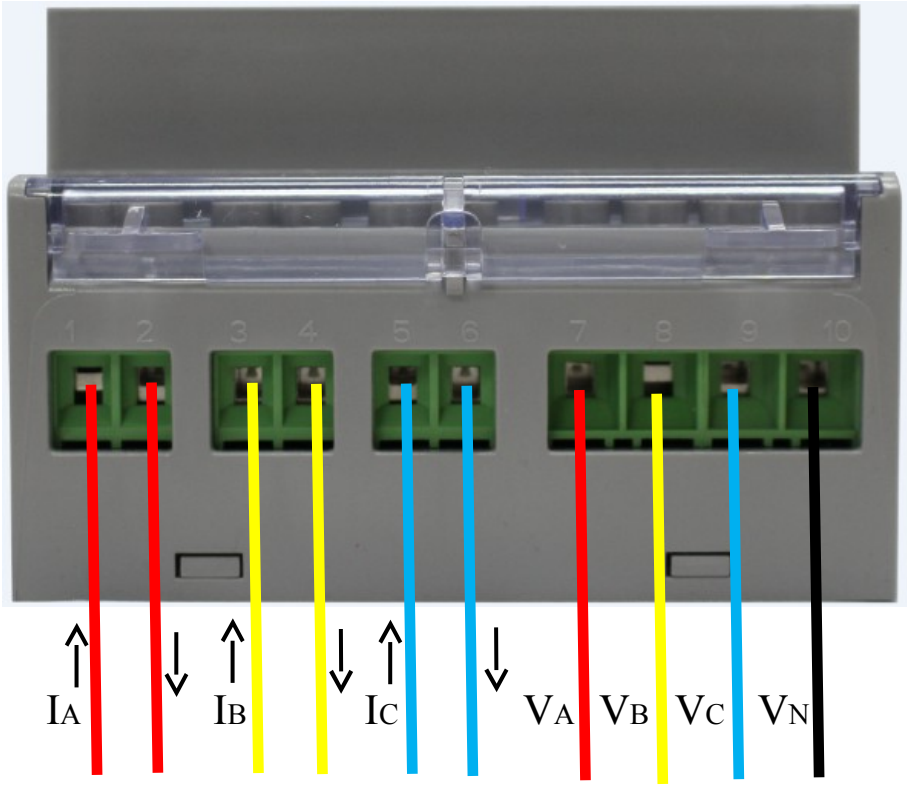


Figure 4 - Mk10H Mains Terminals

Figure 4 shows the connection methods in 3 element (4 wire) mode. The nominal voltage input range is 220 - 240 VAC (-20%, +15%). The current range depends on the current range of the meter, and should be limited to Imax.

The recommended maximum cable size is 8.5mm^2 and the recommended torque 0.6Nm.

In 3 element mode (4-wire) the maximum line to neutral voltage is 276V and the maximum line to line voltage is 477V. At any higher voltage the meter may not operate correctly and damage may occur

The neutral connection must be made otherwise the meter will not operate.

4.2 Serial Port Configurations

The Mk10H meter may have one or two RS-232 ports: a Modem and/or a SCADA port. These ports can be arranged in a number of configurations with an RS485 port. Table 1 lists the possible options, which line up with the order code options.

Type	Modem Communications
0	None
5	Modem: RS232 (RJ45 TB1, with DTR)
7	Modem: RS232 (RJ45 TB1); SCADA: RS232 (RJ45 TB1, pins 7 & 8)
S	Modem: RS232 (RJ45 TB1); SCADA: RS485 2-wire (Screw Terminal PL6)
W	SCADA: RS485 2-wire (Screw Terminals PL6)

Table 1 - Serial Port Options

There is only one RJ45 fitted and it is TB1. The 2 wire RS485 is fitted at PL6 location and cannot be fitted when S0 output is required.

4.2.1 RS-232

The RS-232 port on the meter uses an RJ45 connector, which complies with the RS-232D standard. To connect to a modem, use a modem with an RJ45 connector, or use an RJ45 to DB9 connector adapter. RTS/CTS hardware handshaking is not supported.

See Table 2 for connection details of TB1. Pin 1 of the RJ45 is on the right hand side.

RS232D RJ45 From Meter	RS232C DB9 To Modem	RS232C DB9 To PC (Null)	Description	Full Name
TB1-1 *	(9)	(9)	+14V	+14V 3.6W output
TB1-2			NC	Not Connected
TB1-3	4	1	DTR	Data Terminal Ready (from meter)
TB1-4	5	5	GND	Ground
TB1-5	2	3	RX	Receive Data (to meter)
TB1-6	3	2	TX	Transmit Data (from meter)
TB1-7			RX2	Receive Data–SCADA port
TB1-8			TX2	Transmit Data-SCADA port

Table 2 - RS-232 Connections

* TB1-1 is connected to a +14V power source from the meter, which is designed to power an external GSM modem. Other options are also available, contact EDMI for more details.

- See Figure 5 for the location of the RJ45 connector. It is designated as TB1.
- RX2 and TX2 are only present if the port is a dual RS232 port.
- When the SCADA port is on TB1, the connections are as per Table 2

4.2.2 RS-485

The RS-485 port on the meter has the factory option of a three-way terminal block and it is a 2-wire connection. Table 3 lists the connections.

	Terminal Block	Description	Full Name
PL6-1	1	(A+)	Transmit +/Receive+
PL6-2	2	(B-)	Transmit -/Receive-
PL6-3	3	GND	Ground

Table 3 - RS-485 Connections

See Figure 5 for the location of the connector.

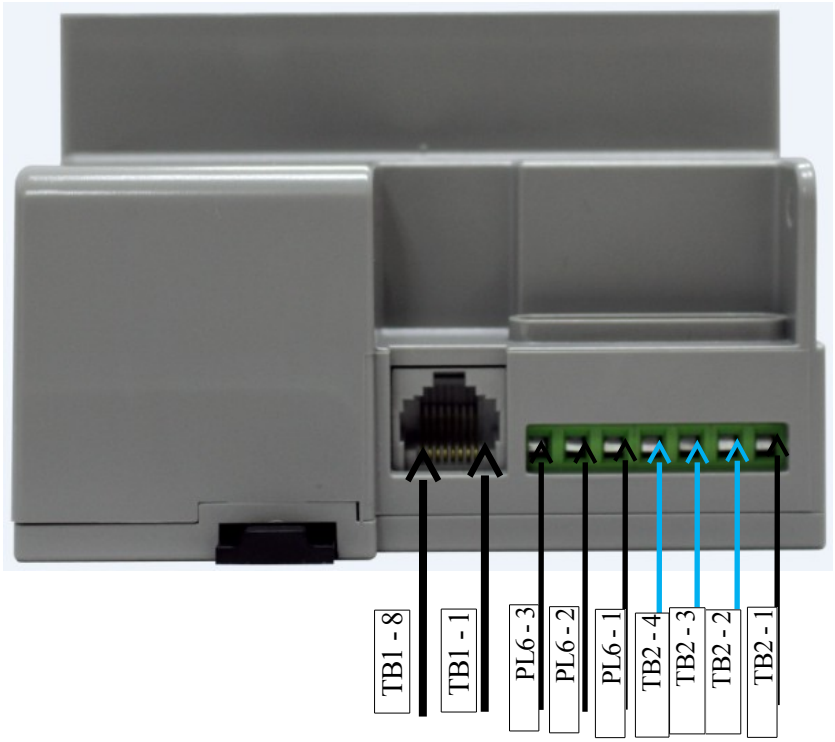


Figure 5 - Location of Mk10H Connectors.

4.3 FLAG Port

The meter has a Flag Port. Use a standard FLAG (IEC1107 physical standard) read head to connect the meter to a PC.

Some FLAG heads need to be rotated 180 degrees for them to work. If you have problems, try this.

4.4 Inputs

4.4.1 Active Inputs

Active inputs use power from the serial port, and are therefore not isolated from the serial port. In this case simply shorting between the input terminals will cause the input to trigger. The maximum external impedance is 500 Ω. The inputs will continue to work when power is cycled to the modem. Table 4 lists the connections.

Pin Number of TB2	Pin Name	Full Name
TB2-1	Common	Isolated Common Ground

Pin Number of TB2	Pin Name	Full Name
TB2-2	Ain1	Active Input Channel 1
TB2-3	Ain2	Active Input Channel 2
TB2-4	Ain3	Active Input Channel 3

Table 4 - Active Input Connections

4.5 Outputs

There is only one type of output available at PL6. It is electrically isolated from all other circuits, including other I/O. It is not available when RS485 is fitted. The SØ output designed to switch up to 24VDC and 24mA. Table 5 lists the connections.

Pin Number of PL6	Pin Name	Full Name
PL6-1	A	SØ output
PL6-2	B	Isolated Common Ground

Table 5 - SØ Output Connections

4.6 Battery

The battery runs the clock during a power outage. It also allows the LCD to be activated while mains power is not available.

The battery is a 3.6V, 950mAh Lithium battery.

A low battery indicator is displayed on the LCD if the battery is not present or is depleted – the level this occurs at can be configured. The battery usage life is longer than 10 years on continuous backup at 25°C. In normal operation the battery should last for more than 10 years.

5 LCD DISPLAY

5.1 LCD

The main function of the LCD is the display of information from the meter's registers for meter readers. It is also useful during installation and configuration, and for diagnosing problems. It has seven digits (each of seven segments) to display values and five digits (each of fourteen segments) to display a description (Figure 6). It has arrows to indicate import and export for active and reactive energies; indicators for phase voltage; indicators for display sets A, B and C; a battery indicator; a connection type indicator for connection through local or remote port; and units and multipliers.

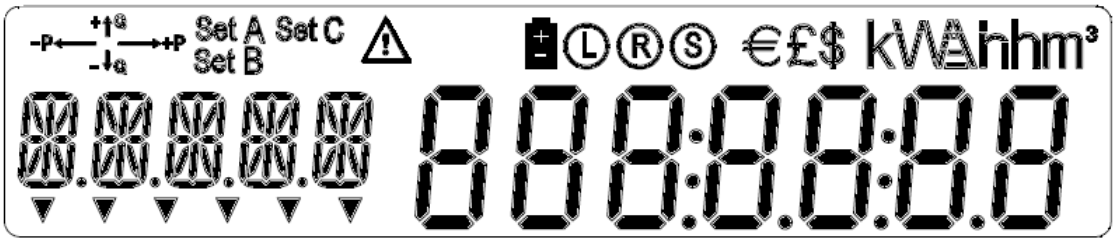


Figure 6 - LCD with all Segments ON

The LCD can come with or without a backlight. The backlight may be set to only activate while the LCD is in use. EDMI recommends this configuration to reduce power consumption. The turn on time of the backlight can be configured using EziView.

5.1.1 Default Display

If there is no LCD screen setup in the meter, the meter will show the time as a default page. The example display of Figure 7 shows Import active energy, which is a page in Display Set A.

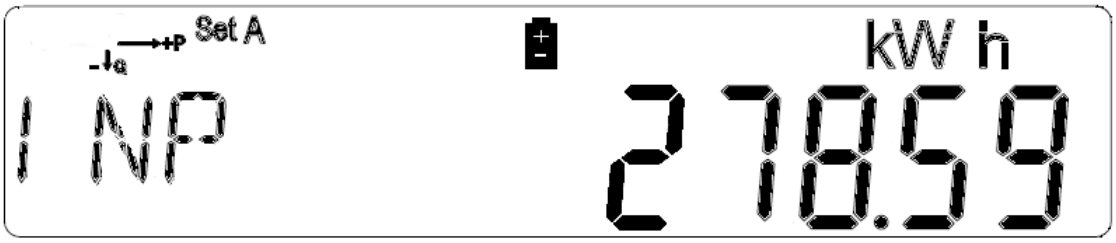


Figure 7 - Example of First Page of Set A LCD Display

If there is an LCD setup, the LCD will display the first display page in display set A when the meter is powered up.

5.2 Display Organisation

In general, the organisation of the display from the top left is as follows (Table 6):

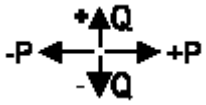
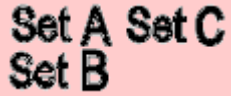
Section	Description
	The four arrows with characters and plus / minus sign at the top left display the direction of Watts and vars respectively. A plus sign indicates positive / export / delivered energy, while a minus sign indicates negative / import / received energy.
	Display set as explained in the Section LCD/Select Button.
	Indicates an EFA
	Low Battery indicator. Please refer to the section on the battery earlier this chapter.
	L shows local communication or login on the local port. R shows remote communication or login on the modem port. The R will flash if the meter is connected to the GPRS network in persistent mode but no one is logged in. S shows local communication or login on the SCADA port
	Currency indicator.
	k is the multiplier for kilo.
	These segments allow for display of units. The units are W, var, VA, Wh, varh, VAh, V and A.
	Label in 14-segment characters. There are 5 characters to describe the value shown in the value digits on the right side of the LCD. The size of each character is 3.53 mm x 6.15 mm.
	7 characters of seven-segment displays register contents as setup in LCD setup. The size of each seven-segment character is 4.35 mm x 9.30 mm.
	The enunciators allow various meter states to be displayed, and may be paired with a customised label.

Table 6 - Sections of the LCD

The energy direction arrows, battery, communication status, and phase presence indicators are not related to the register being shown; they are a display of the meter's state.

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.

5.3 LCD / Select Button

When using the LCD, press the meter's *Select* button to progress to the next page. The display may also be setup to automatically cycle the display through the pages, pausing if the *Select* button is pressed.

5.3.1 LCD/Select Button Usage

5.3.1.1 Pages/Screens

The meter displays data on the LCD as a series of pages or screens. Each screen of data shows a single quantity from the meter.

On the left, the segmented characters show a description, while the segmented characters on the right show a value. At the top right, an optional character may show the units.

5.3.1.2 Long Values

If the value is longer than the number of characters available on the screen, the display will scroll one character each second to show the entire value. The meter will display an underscore (_) to mark the start of the value.

5.3.1.3 Long Descriptions

Unlike values, the meter will not display long descriptions. You should limit the length of descriptions to the number of available characters.

5.3.1.4 Select Button

Press the *Select* button to move to the next screen of information. If the meter is set to cycle between screens, you can press the *Select* button to pause that cycle. If you hold down the *Select* button for one second, the meter will switch between screen sets. The *Select* button may also affect the operation of the LCD backlight or control meter wakeup.

5.3.1.5 LCD Backlight

Some meters may have a backlight. In most cases, the backlight will be set to activate only when the LCD is in use so as to save power. Meter backlight will not operate while the meter is relying on the UPS battery.

5.3.1.6 Meter Wakeup

If the meter is off (no voltage applied), you can wake the meter up by pressing and holding the **Select** button (there may be a short delay). The meter will then run on its internal battery. This means that it is possible to read the meter manually even if power is lost. All screens and sets are available, and the meter will turn itself off after a configurable period.

The meter does not measure in the “wakeup” state, nor will the communications ports operate. The time that the meter is in this state still counts as “off time” for the purposes of time statistics.

5.3.1.7 Display Sets

In order to make it easier to find a certain page, and to allow for different users and uses of the LCD, it is possible to assign each screen to a display set.

When you press the **Select** button, the LCD will scroll through only those screens that are in the current set. To switch between sets, you need to press and hold the **Select** button for one second.

There are five sets in total:

- **Set A**
  Set A is the standard set. It is the first display page displayed when the meter powers up and any set reset or revert will take you back to Set A. While in Set A, the meter will display the *Set A* LCD label.
- **Set B**
  Move from Set A to Set B by pressing and holding the *Select* button for one second. While in Set B, the meter will display the *Set B* LCD label.
- **Set C**
  Press and hold the *Select* button for one second to move from Set B to Set C. While in Set C, the meter will display the *Set C* LCD label. Press and hold the *Select* button for one second while in Set C to return to Set A.

5.4 Billing Reset Button

EziView can configure what operations are permitted using the button. EziView can also be used to configure the button as a billing reset button. Go to Security Setup and un-check the *Billing Reset Button Disabled* checkbox.

6 SERVICING

The meter is not designed for field servicing and has no user-serviceable parts. The meter has no internal fuses. For meter re-calibration or refurbishment, contact EDMI or your local agent.

7 SYSTEM SPECIFICATIONS

This chapter covers the basic specifications of EDMI Mk10H Meter.

7.1 Measured Quantities and Methods

The meter can measure the quantities listed in Table 7.

Quantity	Units	Description
Watt hours	Wh	The total Wh.
var hours	Varh	The fundamental varh.
VA hours	VAh	The total VAh, calculated from Vrms x Irms.
Watts	W	The total W.
vars	Var	The fundamental vars.
VA	VA	The total VA, calculated from Vrms x Irms.
Voltage	V	True RMS voltage.
Current	A	True RMS current.
Frequency	Hz	Fundamental system frequency.
Phase Angle	Degrees	Angle between Fundamental Voltage and Fundamental Current.
Phase to Phase Angle	Degrees	Angle between Fundamental Voltages.
Power Factor	Ratio	Watts divided by VA. Lead or lag determines the sign.
Volume	m^3	Volume.

Table 7 - Measurements

The sign of VAh is based on the sign of the Wh, as VA itself has no sign.

7.2 Operating Conditions

Table 8 below lists some of the operating conditions of the meter.

Quantity	Conditions
Standards	The meter complies with the following standards
IEC	IEC 62052-11 (2003), IEC 62053-21 (2003), IEC 62053-23 (2003)
Australian / New Zealand	AS 62052-11 (2005), AS 62053-21 (2005), AS62053-23 (2006), AS 1284.7 (1994), NMI M6 Pattern Approval, Electricity Industry Participation Code 2010(EIPC)
Voltage	
Nominal (Un)	220VAC to 240VAC
Operating Range	0.8 Un to 1.15 Un
Limit Range	0 Un to 1.2 Un (IEC is 1.15 Un)
Start up	Time for meter to be fully functional after Un applied is <3s
Overcurrent	20 Imax for 0.5 seconds
Frequency	45Hz to 65Hz +/- 6%
Temperature	
Operating	-25°C to +60°C
Limit Range	-40°C to +70°C

Quantity	Conditions
	Operation at extremes should be limited to <6h
Limit Range for Storage and Transport	-40°C to +80°C Storage and transport at extremes should be limited to <6h
Dry Heat test	+80°C (IEC is 70°C)
Damp Heat Cyclic Test	+60°C (IEC is 40°C)
Location	Indoor, Australian Outdoor
Relative Humidity	Non-condensing: Annual mean <75%, 30 days 95% (in a natural spread), occasionally 85%
EMC Environment	Electromagnetic Environment E2, per the 2004/22/EC directive
Insulation	Protective class II
Surge Test	5kV (IEC is 4kV)
Impulse Test	12kV (IEC is 6kV)
Mechanical	Mechanical Environment M1, per the 2004/22/EC directive (Vibrations and shocks of low significance)
Spring Hammer Test	0.5 J (IEC is 0.2 J)
Shock Test	400 m/s2 (IEC is 300)
Vibration test	0.15mm f<60Hz, 2.2g f>60 (IEC 0.075mm f<60Hz, 1g 1>60Hz)
Torque Test	3 Nm current terminal screws, 0.6 Nm voltage terminal screws
Water and Dust	IP53 without suction (as per Australian Outdoor)
Solar Radiation	IEC 62052-11
Rain Test	UL50 (3R)
Salt Spray	IEC 60068-2-11
Weather Simulation	DIN 53 387 (ANSI C12.16)
Thermal Shock	IEC 60068-2-14

Table 8 - Operating Conditions

7.3 Energy Conventions

The convention for energy directions is as shown in Figure 8 below.

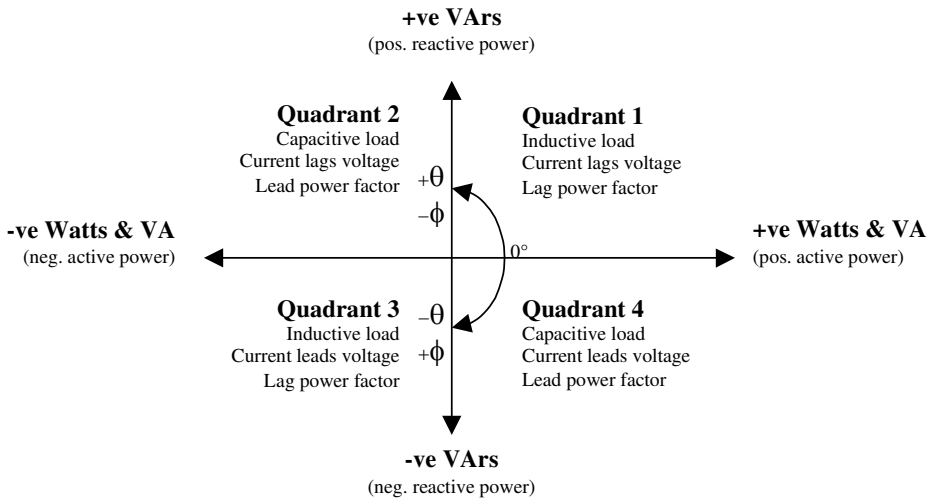


Figure 8 - Energy Directions

Export is exporting or delivering energy to the customer's load, import is importing or receiving energy from the customer. All conventions are from the point of view of the supply authority.

θ is the impedance angle of voltage with respect to current. ϕ is the admittance angle of current with respect to voltage. The meter measures the angle in terms of current with respect to voltage (ϕ, admittance).

Since conventions change around the world, there is a setting called *Naming Convention* in the EziView *Tools*→*Options*→*General* page (Figure 9). The colour used for each phase may also be edited here.

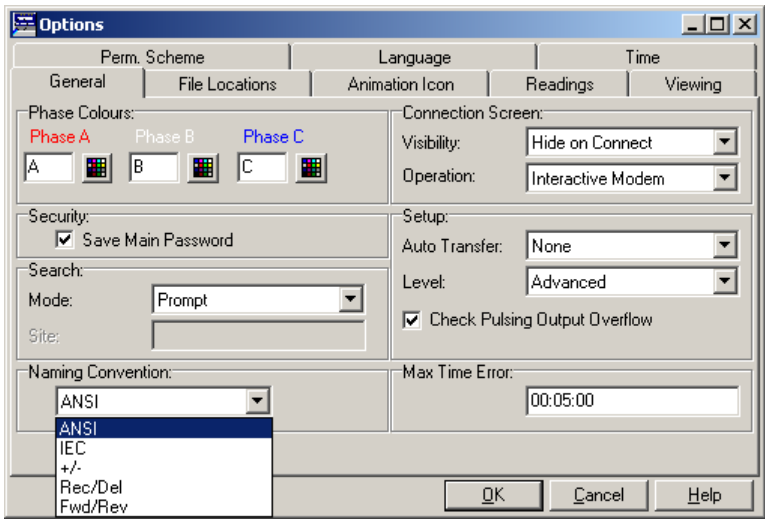


Figure 9 - Naming Convention Settings

The naming conventions are as in Table 9.

Standard	Positive Energy	Negative Energy	Abbreviated
ANSI	Export	Import	Exp/Imp
IEC	Import	Export	Imp/Exp
+/-	+	-	+/-
Rec/Del	Delivered	Received	Del/Rec
Fwd/Rev	Forward	Reverse	Fwd/Rev

Table 9 - Naming Conventions