Operating Manual

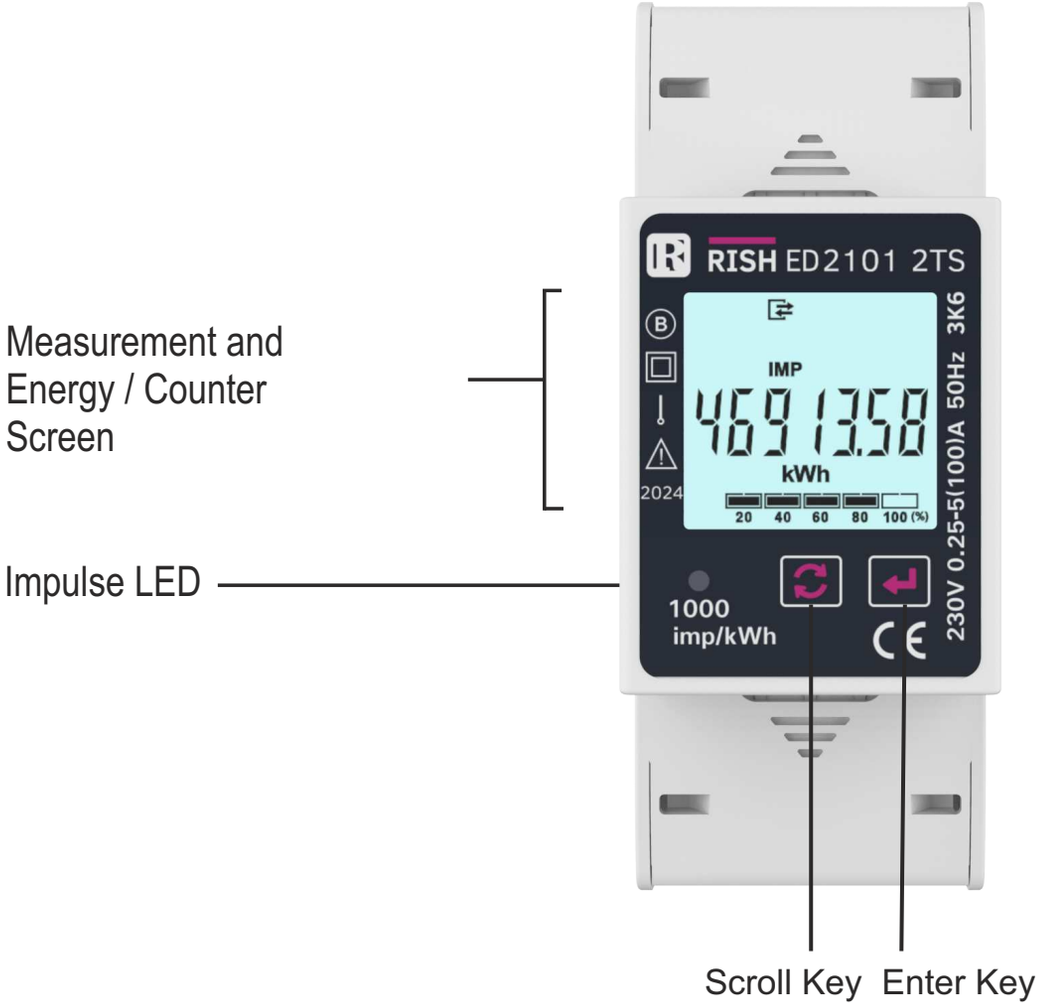
RISH ED21X1 / EC21X1 / ER21X1
Single Phase Energy Meters

DMAN-00IM-1073 Rev. E
Manual Subject to Change Without Notice

Index

1. INTRODUCTION

The Energy Meter is a DIN Rail mounted Digital Meter, primarily for bidirectional Active, Reactive and Apparent Energy measurement intended for use in industrial, commercial and residential electrical energy metering. It also accurately measures important electrical parameters like TRMS Voltage, TRMS Current, Frequency, Active / Reactive and Apparent Power, and Power Factor in Single Phase Networks. The meter is engineered using advanced microcontroller technology and is suitable for electrical parameter measurement and monitoring in 1 Phase 2 Wire Networks. It supports maximum 100 A current measurement on direct connected meter and 1A / 5A and 100 mA current measurement on CT connected meters. It displays parameters on bright intuitive LCD and also has Pulse Outputs and Impulse LED for energy monitoring. It supports Tariff Counters selectable via Digital Input or MODBUS / MBUS Communication. It has inbuilt industry standard MODBUS RTU and MBUS for remote monitoring.



2. LCD Display

2.1. Introduction

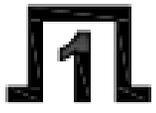
The meter displays more than 40 measurement parameters including Total Energies, Tariff, Partial and also other important electrical parameters like Max Demand, Voltage, Current, Frequency, Active, Power, Reactive Power, Apparent Power and Power Factor on individual screens. The user can easily scroll and See System Parameter By Pressing Scroll key and By Pressing and Holding Scroll key for 5 Seconds the user can see Tarrif & Demand Parameters on screen 2. again Pressing and Holding Scroll key for 5 Seconds it back to the Main Parameter Screen 1. Refer Table 1 & Table 2 for list all the Measurement Parameters available on Display and MODBUS and MBUS.

2.2. LCD Display Symbols and Indications

The LCD has bold seven segment digits with bright white backlit for display of measurement parameters. Special symbols, units and bar graph are provided for effective display and easy onsite configuration. Indications for current reversal, communication status, active tariff, digital inputs and pulse outputs status are continuously available on screen. Measurement screen can be set as automatic scrolling or manual scrolling.

2.2.1 SO Output Indication

The meter has two opto-isolated pulse outputs that can be configured for any one of the Active, Reactive and Apparent Energy parameter.



This symbol indicates that SO1 is energized.

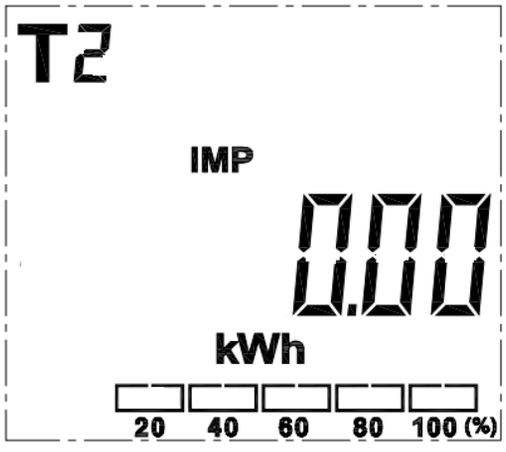
This symbol indicates that SO2 is energized.

2.2.2 Communication Indication

The meter provides communication based on MODBUS and MBUS protocol for remote data acquisition of measurement data and configuration. If meter is properly communicating with host then it is indicated by symbol as shown:

This symbol indicates that the meter is communicating.

2.2.3 Tariff Energies Indication



This Instrument comes with 2 tariff based on DI or MODBUS or MBUS. In the image given here, it indicates that the instrument is currently displaying the selected energy parameter (Import Active Energy) of Tariff 2.

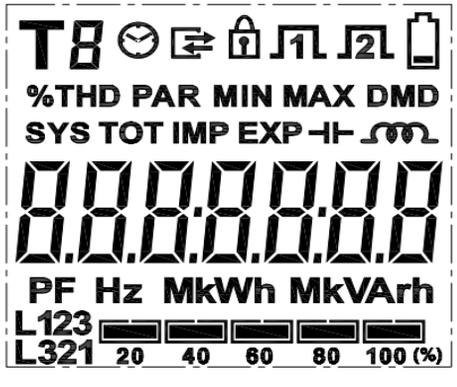
These Tariff energies and Demand parameters are available on display screen 2, For opening the Screen 2 Press and hold the Scroll Key for 5 Seconds

2.2.4 Bargraph Indication

Measured meter current in percentage of meter maximum current rating is displayed by bargraph symbols

Tariff Indication : Meter has tariff function and indicated by symbol **T**, The digit after this symbol indicates tariff number either 1 or 2.

Other Labels: DMD - Indicates demand parameter , PAR - Indicates partial energy parameter IMP - indicates Import parameter , EXP - indicates export parameter.



Display Check Screen

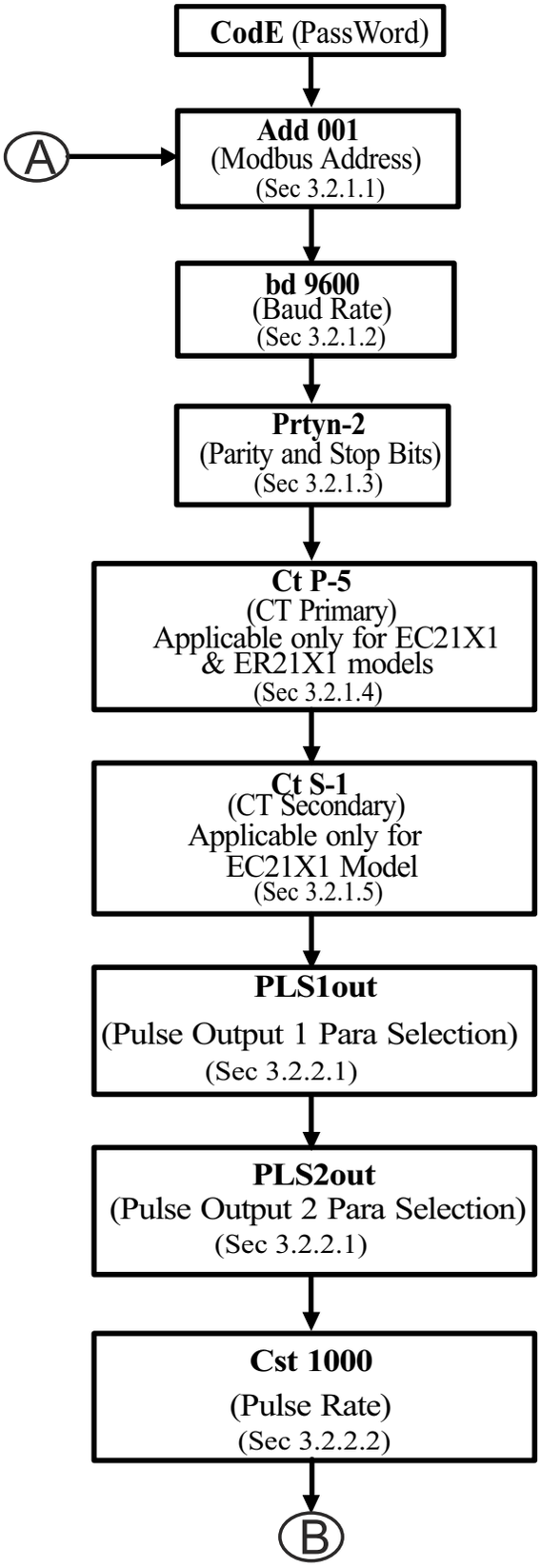
TABLE 1 : Measurement Parameters:
Screen 1

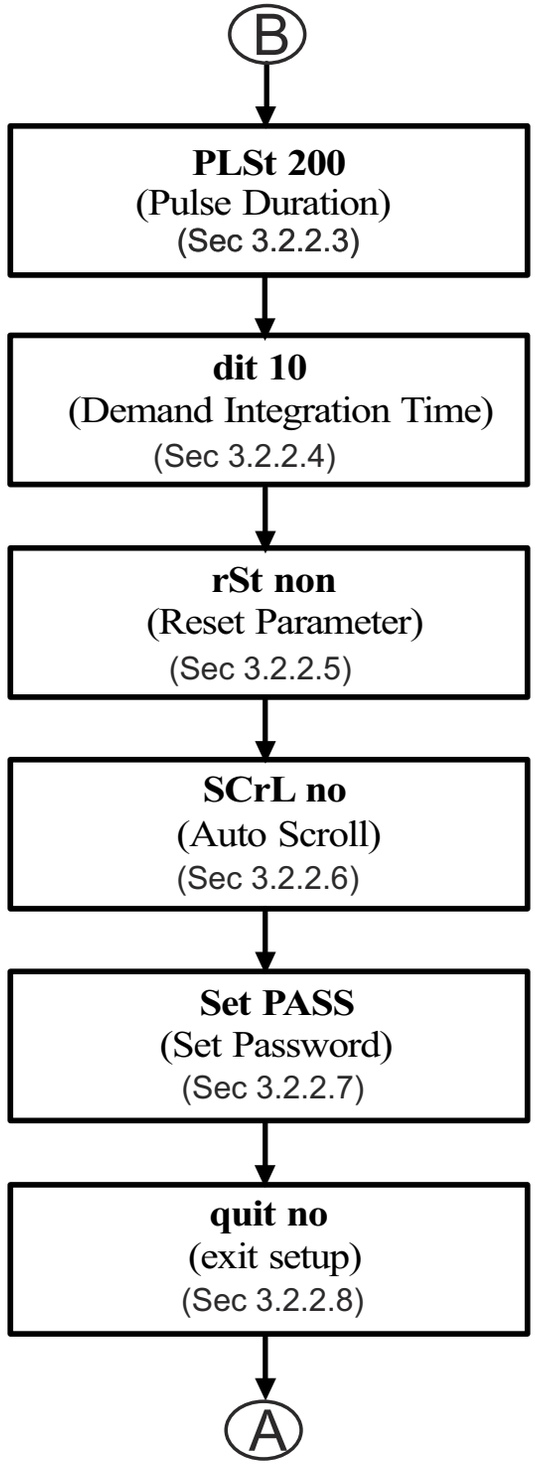
Parameter No.	Parameters	On Display	On Modbus
1	Import Active Energy	✓	✓
2	Export Active Energy	✓	✓
3	Total Active Energy	✓	✓
4	Import Reactive Energy	✓	✓
5	Export Reactive Energy	✓	✓
6	Total Reactive Energy	✓	✓
7	Total Apparent Energy	✓	✓
8	Partial Import Active Energy	✓	✓
9	Partial Export Active Energy	✓	✓
10	Partial Total Active Energy	✓	✓
11	Partial Import Reactive Energy	✓	✓
12	Partial Export Reactive Energy	✓	✓
13	Partial Total Reactive Energy	✓	✓
14	Partial Total Apparent Energy	✓	✓
15	Voltage	✓	✓
16	Current	✓	✓
17	Active Power	✓	✓
18	Reactive Power	✓	✓
19	Apparent Power	✓	✓
20	Power Factor	✓	✓
21	Frequency	✓	✓
22	Cst - xxxx	✓	✓
23	Add - xxx	✓	✓
24	bd - xxxx	✓	✓
25	Pd - Pd count of meter	✓	✓
26	Active tariff status	✓	✓
27	Serial Number	✓	✓
28	Display Test	✓	--

TABLE 1 : Measurement Parameters (contd.):
Screen 2

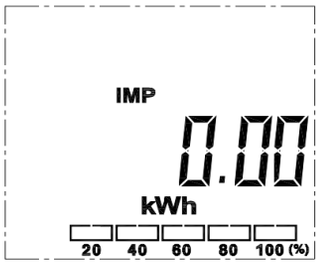
Parameter No.	Parameters	On Display	On Modbus
29	T1 Import Active Energy	✓	✓
30	T1 Export Active Energy	✓	✓
31	T1 Total Active Energy	✓	✓
32	T1 Import Reactive Energy	✓	✓
33	T1 Export Reactive Energy	✓	✓
34	T1 Total Reactive Energy	✓	✓
35	T1 Total Apparent Energy	✓	✓
36	T2 Import Active Energy	✓	✓
37	T2 Export Active Energy	✓	✓
38	T2 Total Active Energy	✓	✓
39	T2 Import Reactive Energy	✓	✓
40	T2 Export Reactive Energy	✓	✓
41	T2 Total Reactive Energy	✓	✓
42	T2 Total Apparent Energy	✓	✓
43	Import W Max Demand	✓	✓
44	Export W Max Demand	✓	✓
45	Import VAr Max Demand	✓	✓
46	Export VAr Max Demand	✓	✓
47	Import VA Max Demand	✓	✓
48	Export VA Max Demand	✓	✓
49	Current Max Demand	✓	✓

2.3 Setup Parameters Screens Navigation Map

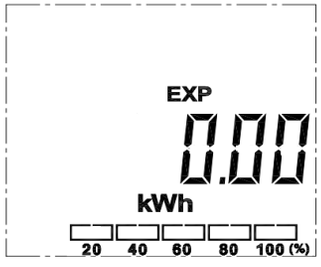




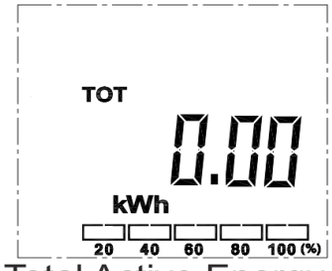
2.4 Measurement Parameters Screens



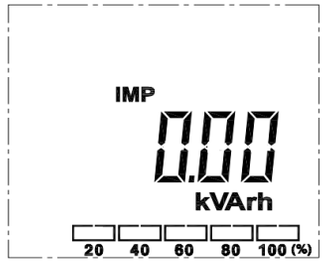
Import Active Energy



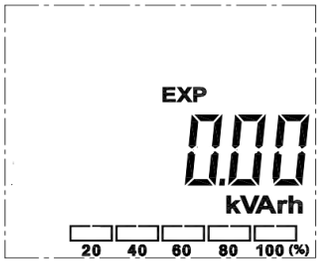
Export Active Energy



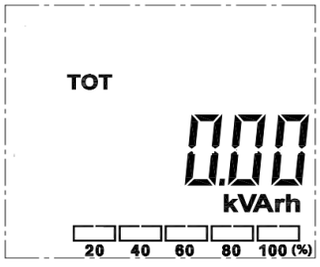
Total Active Energy



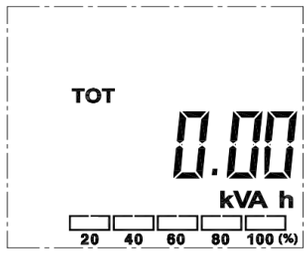
Import Reactive Energy



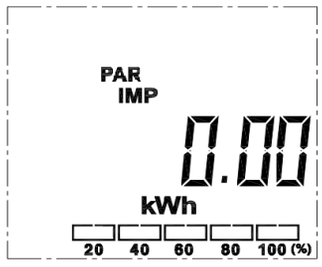
Export Reactive Energy



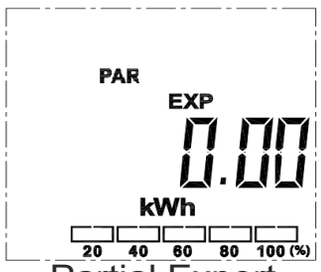
Total Reactive Energy



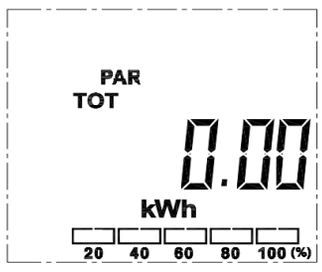
Total Apparent Energy



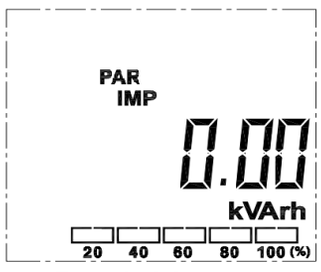
Partial Import Active Energy



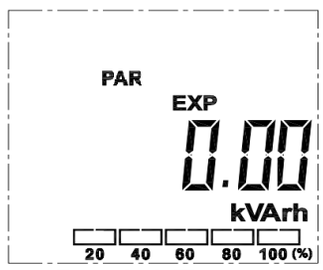
Partial Export Active Energy



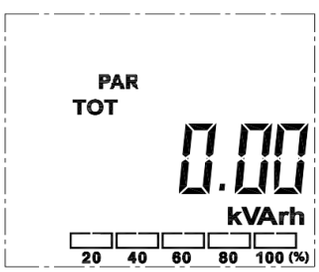
Partial Total Active Energy



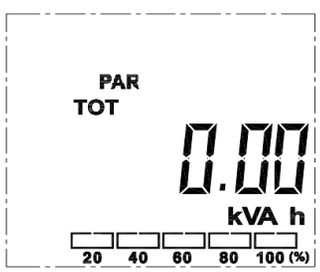
Partial Import Reactive Energy



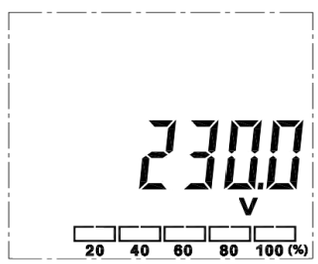
Partial Export Reactive Energy



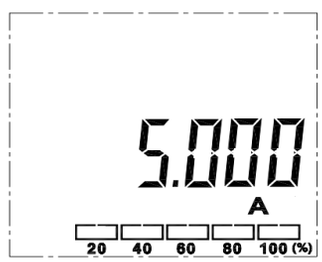
Partial Total Reactive Energy



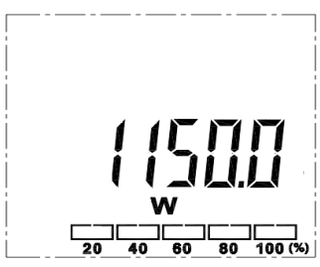
Partial Total Apparent Energy



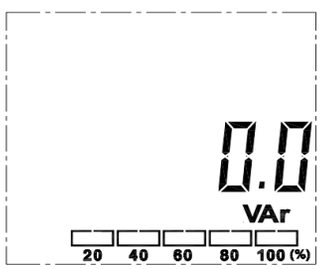
Voltage



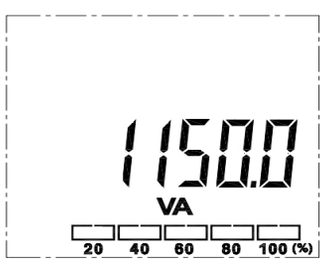
Current



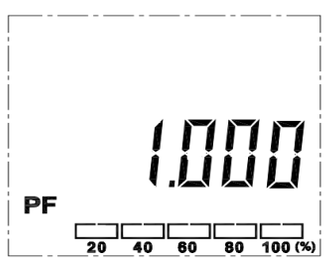
Active Power



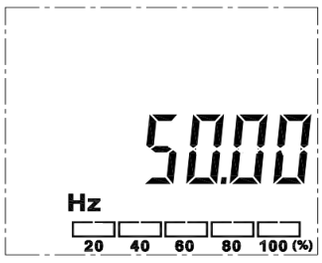
Reactive Power



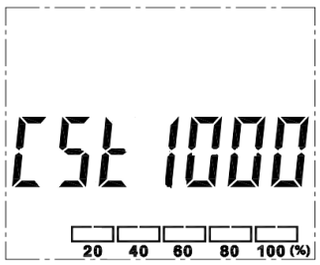
Apparent Power



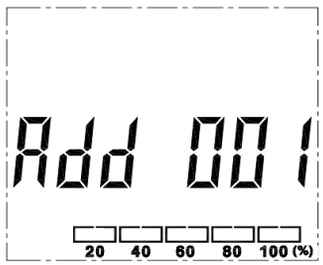
Power Factor



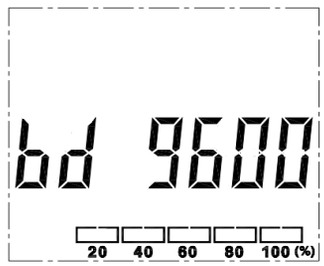
Frequency



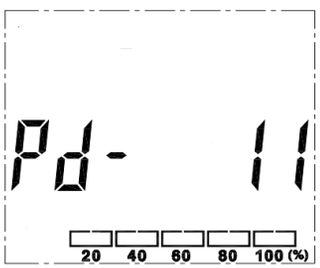
Pulse Constant



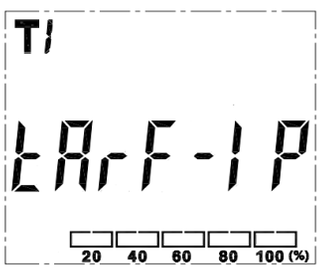
Modbus Device Address



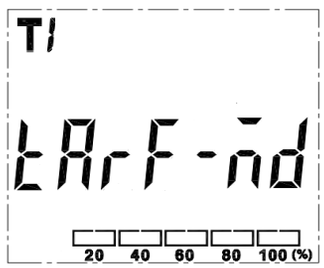
Baud Rate



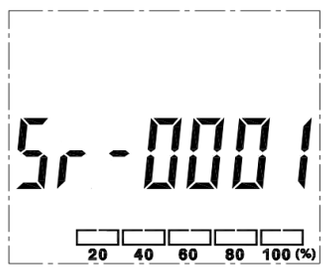
Power Drop



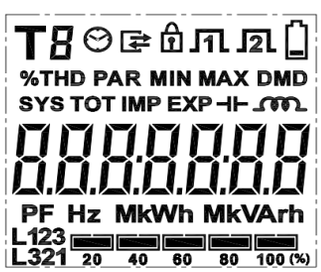
Tarrif Status-
Input Based



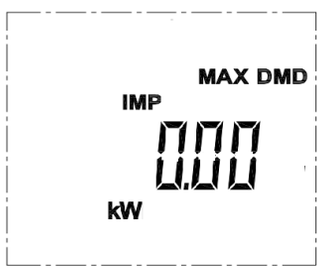
Tarrif Status-
Modbus Based



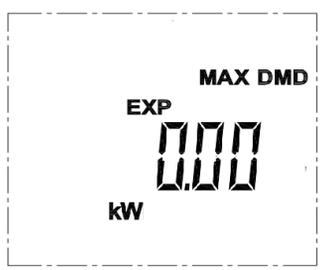
Serial Number



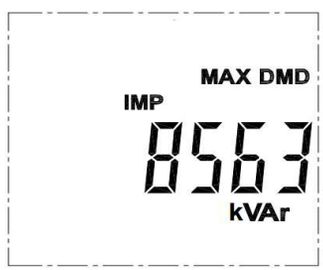
Display Check



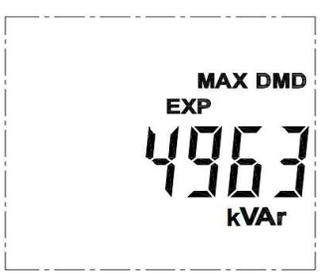
Import Active Power
Max Demand



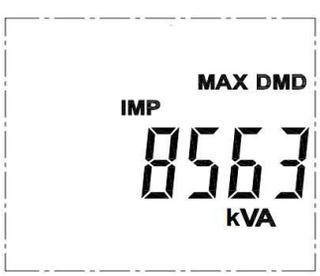
Export Active Power
Max Demand



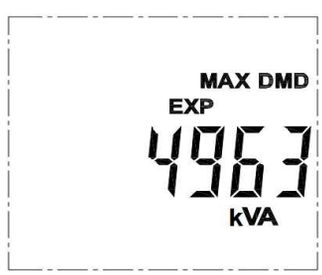
Import Reactive Power
Max Demand



Export Reactive Power
Max Demand



Import Apparent Power
Max Demand



Export Apparent Power
Max Demand

Current
Max Demand

3. PROGRAMMING

The following sections comprise step by step procedures for configuring the Energy Meter according to individual user requirements. To access the set-up screens press and hold
" ↵ " enter key for 5 seconds. This will take the User into the Password Protection Entry Stage (Section 3.1).

3.1 Password Protection

Password protection can be enabled to prevent unauthorized access to set-up screens, when default password protection is not enabled. Password protection is enabled by selecting a four digit number other than 0000, setting a password of 0000 disables the password protection.

Enter Password, prompt for first digit. Press the " ⟳ " scroll key to scroll the value of first digit from 0 through to 9, Press the " ↵ " enter key to advance to next digit.

Enter Password, first digit entered, prompt for second digit..
Press the " ⟳ " scroll key to scroll the value of first digit from 0 through to 9
Press the " ↵ " enter key to advance to next digit.

Enter Password, second digit entered, prompt for third digit.
Press the " ⟳ " key to scroll the value of first digit from 0 through to 9.
Press the " ↵ " enter key to advance to next digit.

Enter Password, third digit entered, prompt for fourth digit. .
Press the " ⟳ " scroll key to scroll the value of first digit from 0 through to 9.
Press the " ↵ " key to advance to verification of the password.

password confirmed and Pressing " ↵ " enter key advances to the "Setup Menu" entry stage. (See Section 3.2).

Password Incorrect.

When this Screen appears and first digit is blinking means the unit has not accepted the Password entered. it gives one more chance to enter the password and after this meter will quit setup menu.

3.2 Setup Menu selection

3.2.1 Communication Parameter Selection

3.2.1.1 Address Setting

This screen applies to the RS 485/ MBUS output. This screen allows the user to set address for the meter. The allowable range of addresses for MODBUS is 1 to 247 and for MBUS the range is 1 to 250.
Press "↵" enter key to set the address of meter.
pressing the "⟳" scroll key to advance to the "Baud Rate" setup screen.

Press enter key to enter into edit mode, prompt for first digit.
Press the scroll keys to scroll the value of the first digit. Press the enter key to advance to next digit.
Similarly, enter second and third digits of address. After entering third digit, pressing enter key confirms the selection and shows "Done" screen.
The default setting is '*001*'.

3.2.1.2 Baud Rate

This screen allows the user to set Baud Rate of RS 485 - MODBUS/ MBUS port. The values displayed on screen are in bits per second.
Pressing "⟳" scroll key accepts the present value and advance to the "Parity and Stop Bit Selection" screen (see Section 3.2.2.3).
Pressing the "↵" enter key advances to the "Baud Rate Edit" mode and pressing the scroll key scrolls the value through *4800, 9600, 19200 and 38400* baud for MODBUS and *300, 600, 1200, 2400, 4800 and 9600* baud for MBUS.
Pressing the enter key sets the value and shows the " Baud Rate" screen (see Section 3.2.1.2).
NOTE: For MODBUS Default value is set as '*9600*'.
NOTE: For MBUS Default value is set as '*2400*'.

3.2.1.3 Parity and Stop Bit

This screen allows the user to set Parity & number of stop bits of RS 485/ MBUS port. Pressing "⟳" scroll key accepts the present value and advances to "CT Primary Parameters" screen (see section 3.2.1.4)

Pressing the " ↵ " enter key advances to the "Parity & Stop bit Edit" mode & pressing the " ⟳ "scroll keys scrolls the value through: *nonE1*: no parity with one stop bit, *nonE2*: no parity with two stop bit, *EVEn*: even parity with one stop bit, *odd*: odd parity with one stop bit for MODBUS. For MBUS only *EVEn1*: even parity is settable.
Pressing enter key sets the value and advances to "CT Primary" setup screen.
Default value for MODBUS is set as '*nonE1*'.

3.2.1.4 CT Primary(only applicable for EC21X1 & ER21X1 Models)

This screen allows the user to set CT Primary value for the meter. The valid range of value is 1 - 9999.
Press " ↵ " enter key to set the CT Primary value .
Pressing the " ⟳ " scroll key to advance to the "CT Secondary" setup screen.
Press enter key to enter into edit mode, prompt for first digit.Press the scroll keys to scroll the value of the first digit. Press the enter key to advance to next digit.
Similarly, enter second and third digits CT Primary value. After entering third digit, Pressing enter key confirms the selection and shows "Done" screen.
The default setting is '5'.
NOTE : The parameter can be set in first 15 minutes of installation and get locked for lifetime.

3.2.1.5 CT Secondary (only applicable for EC21X1 Model)

This screen allows the user to set CT Secondary value for the meter. The values of CT Secondary are 1 Ampere or 5 Ampere.
Press " ↵ " enter key to set the CT Secondary value .
Pressing the " ⟳ " key scrolls the value through 1A or 5A.
Press enter key to enter into edit mode. Pressing enter key confirms the selection and shows "Done" screen.
Pressing enter key sets the value and advances to "output parameter Selection" screen (see Section 3.2.2.).
The default setting is '5'.
NOTE : The parameter can be set in first 15 minutes of installation and get locked for lifetime.

3.2.2 Output Parameter Selection

3.2.2.1. Pulse Output

This screen is used to set the pulse1 ie SO1 output parameter.
Pressing "↻"scroll key accept the current values and advances to "pulse output 2 Parameter Selection" menu.
Pressing the " ↵ " enter key advances to the " pulse output 1 Parameter edit " mode & pressing the scroll keys scrolls the value through: *IMP KWH, EXP KWH, IMP KVArh, EXP KVArh, IND KVArh, CAP KVArh, TOT KWH, TOT KVArh.* (see Table 3)
Pressing enter key sets the value and advances to "pulse output 2 parameter Selection" screen.
Default value is IMP KWH - *import kwh*

This screen is used to set the pulse2 ie SO2 output parameter.
Pressing "↻ "scroll key accept the current values and advances to "Pulse Rate selection" menu (see Section 3.2.2.2).
Pressing the " ↵ " enter key advances to the " pulse output 2 Parameter edit " mode & pressing the scroll keys scrolls the value through: *IMP KWH, EXP KWH, IMP KVArh, EXP KVArh, IND KVArh, CAP KVArh*, *TOT KWH, TOT KVArh.*. (see Table 3)
Pressing enter key sets the value and advances to "Pulse Rate" screen (see Section 3.2.2.2)

3.2.2.2. Pulse Rate

This screen applies to the Pulse Output option only. The screen allows user to set the following pulse rates: 1 pulse per 1 (1kWh) / 10 (1kWh) / 100 (1kWh) / 1000 (1kWh).
Pressing "↻" scroll key accepts the present selection and takes to the "Pulse Duration Selection" menu (See section 3.2.2.3).
Pressing the "↵ " enter key advances to "Pulse Rate Edit" mode & pressing Scroll key will scrolls the value through the values 1, 10, 100 and 1000.
Pressing the enter key set the value and advances to "Pulse Duration" screen (see Section 3.2.2.3).
The default setting is '1000'.

3.2.2.3 Pulse Duration

This screen applies only to the Pulse Output. This screen allows the user to set pulse Output energization time in milliseconds.
Pressing "↻" scroll key accepts the present value and advance to "Demand integration time" screen (see section 3.2.2.4).
Pressing the "↵ " enter key advances to "Pulse Duration Edit" mode and pressing the scroll keys scroll the value through 60, 100 and 200 miliseconds.

Pressing the enter key selects the value and advances to “Demand integration time” menu (see Section 3.2.2.4).

Default value is set to ‘*200*’ ms.

Note - For more than 75 A current setting use 60 ms as value of pulse duration

3.2.2.4 Demand Integration Time

This screen is used to set the period over which current and power readings are to be integrated. The Unit of displayed value is minutes.

Pressing “ ” scroll key accepts the present value and advance to “Reset Parameter” screen.

Pressing the“ ” enter key advances to “Demand integration time Edit” mode and pressing the scroll keys scroll the value through *5,10,15,30 minutes*.

Pressing the enter key selects the value and advances to “Reset Parameter” menu (see Section 3.2.2.5).

Default value is set to ‘*15’minute*.

3.2.2.5 Reset Parameter Selection

This screen is used to reset different parameters.

Pressing “ ” scroll key accepts the present value and advance to “Auto Scroll” screen.

Pressing the “ ” enter key advances to “Reset Parameter Edit” mode and pressing the scroll keys scroll through *none,* partial energy, demand, power down counter and all .

Pressing the enter key selects the value and advances to “Auto scroll” menu (see Section 3.2.2.6).

3.2.2.6 Auto Scrolling

This screen allows user to enable auto screen scrolling.

Pressing “ ” scroll key accepts the present status and advance to the “Change Password ”screen (see Section 3.2.2.7).

Pressing the “ ” enter key advances to “Auto scroll Edit” mode and pressing the scroll keys scroll through no,*10, 20, 30 sec.*

No - Auto scroll is disabled

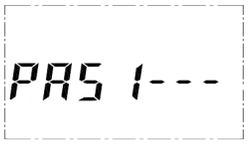
10,20,30 - Autoscroll activated and number here displays Time in seconds between two screens in autoscroll

Pressing the enter key selects the value and advances to “Set Password” menu (see Section 3.2.2.7).

3.2.2.7 New / Change Password

This screen allows user to set password screen scrolling.

Pressing “ ” scroll key accepts the present status and advance to the “quit screen” screen (see Section 3.2.2.8).



Pressing the “ ↵ ”enter key advances to “Set password Edit” mode and
pressing the “ ⟳ ”scroll keys scroll the value of first digit from 0 through to 9.

Pressing the “ ↵ ” enter key selects the value and advances to set second digit.
pressing the “ ⟳ ”scroll keys scroll the value of second digit from 0 through to 9.

Pressing the “ ↵ ” enter key selects the value and advances to set third digit.
pressing the “ ⟳ ”scroll keys scroll the value of third digit from 0 through to 9.

Pressing the “ ↵ ” enter key selects the value and advances to set forth digit.
pressing the “ ⟳ ”scroll keys scroll the value of fourth digit from 0 through to 9.

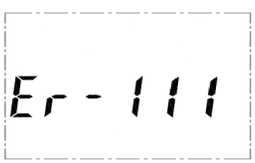
Pressing the “ ↵ ” enter key selects the value and advances to Password conformation.

3.2.2.8 Quit Setup Menu

This screen allows user to Exit from Setup Menu.
Pressing the “↵” enter key advances to “quit setup” edit mode
pressing the “⟳ ” scroll key scroll the options yes or no.
Pressing the “↵ ” enter key will conforms the selection.
if YES selected then meter will quit from setup, selecting the NO option it will advanced to address setup screen (see Section 3.2.1.1).

4. Trobleshooting

4.1 Error Screen



The Error Screen is designed to display error codes in the format "Er-XXX". Each digit in the error code represents a specific type of error. The first digit indicates a program flash CRC mismatch error, the second digit signifies an EEPROM full or error, and the third digit represents a calibration error. If any of these errors occur, the corresponding digit changes from 0 to 1. For instance, if a program flash CRC mismatch error occurs, the error code displayed will be "Er-100" or if a program EEPROM gets full or malfunction, the error code displayed will be "Er-010". Conversely, if no errors are detected, the screen will display "Er-000". This clear and concise error indication system ensures efficient troubleshooting and maintenance of the energy meter.

NOTE: If any of the above errors occurs, please contact technical support

5. Digital Input :

The meter is provided with 1 Digital Inputs for selection of active tariff respectively for energy metering.

5.1 Digital Input and Tariff Selection:

TABLE 2 : Relationship between Digital Input and Tariff

Digital Input 1	Tariff number
LOW	Tariff 1
HIGH	Tariff 2

6. SO Output :

The Meter is provided with two opto-isolated pulse outputs that can be configured for any one of the Active, Reactive and Apparent Energy parameters. Refer TABLE 3 for parameters for pulse output. The pulse width and rate of pulse out is onsite programmable .

6.1 Pulse Output :

Pulse Output is opto-coupler based SO which can be used to drive an external mechanical counter for energy measurement. The Pulse Output can be configured to the parameters mentioned in TABLE 3 through setup parameter screen.

TABLE 3 : Parameters for Pulse Output

Parameter Number	Parameter	1P 2W
1	Import Active Energy	✓
2	Export Active Energy	✓
3	Import Reactive Energy	✓
4	Export Reactive Energy	✓
5	Inductive Reactive Energy	✓
6	Capacitive Reactive Energy	✓
7	Total Active Energy	✓
8	Total Reactive Energy	✓

7. RS 485 (ModBus) Output :

The Energy Meter supports MODBUS (RS485) RTU protocol (2-wire) .

Connection should be made using twisted pair shielded cable. All "A" and "B" connections are daisy chained together. The screens should also be connected to the “Gnd” terminal. To avoid the possibility of loop currents, an Earth connection should be made at one point on the network. Loop (ring) topology does not require any termination load. Line topology may or may not require terminating loads depending on the type and length of cable used. The impedance of the termination load should match the impedance of the cable and be at both ends of the line. The cable should be terminated at each end with a 120 ohm (1/4 Watt min.) resistor.

RS 485 network supports maximum length of 1.2km. Including the Master, a maximum of 32 instruments can be connected in RS485 network. The permissible address range for The Meter is between 1 and 247 for 32 instruments. Broadcast Mode (address 0) is not allowed.

After sending any query through software (of the Master), it must allow 300ms of time to elapse before assuming that the Meter is not going to respond. If slave does not respond within 300 ms, Master can ignore the previous query and can issue fresh query to the slave.

Each byte in RTU mode has following format:

	8-bit binary, hexadecimal 0-9, A-F 2 hexadecimal characters contained in each 8-bit field of the message
Format of Data Bytes	4 bytes (32 bits) per parameter. Floating point format (to IEEE 754) Most significant byte first (Alternative least significant byte first)
Error Checking Bytes	2 byte Cyclical Redundancy Check (CRC)
Byte format	1 start bit, 8 data bits, least significant bit sent first 1 bit for even/odd parity 1 stop bit if parity is used; 1 or 2 bits if no parity

Communication Baud Rate is user selectable from the front panel between 2400,4800,9600,19200,38400 bps.

Function code :

03	Read Holding Registers	Read content of read /write location (4X)
04	Read input Registers	Read content of read only location (3X)
16	Presets Multiple Registers	Set the content of read / write locations (4X)

Exception Cases : An exception code will be generated when Meter receives ModBus query with valid parity & error check but which contains some other error (e.g. Attempt to set floating point variable to an invalid value) The response generated will be “Function Code” ORed with HEX (80H). The exception codes are listed below

01	Illegal function	The function code is not supported by Meter
02	Illegal Data Address	Attempt to access an invalid address or an attempt to read or write part of a floating point value
03	Illegal DataValue	Attempt to set a floating point variable to an invalid value

7.1 Accessing 3X and 4X register for reading measured values:

Two consecutive 16 bit registers represent one parameter. Refer **TABLE** 4 for the addresses of 3X and 4X registers used for parameters measured by the instrument. Each parameter is held in the 3X as well as 4X registers. Modbus Code 03 and 04 are used to access all parameters in 3X and 4X registers respectively.

Example :
To read parameter,
Voltage from 3X: Start address= 00 00 Number of registers = 02
Current from 4X: Start address= 00 06 Number of registers = 02

Note : Number of registers = Number of parameters x 2

Each query for reading the data must be restricted to 40 parameters or less. Exceeding the 40 parameter limit will cause a ModBus exception code to be returned.

Query for 3X read:

01 (Hex)	03 (Hex)	00 (Hex)	00(Hex)	00 (Hex)	02(Hex)	C4 (Hex)	0B (Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Lo	CRC Low	CRC High

3X Response: Voltage (230V)

01 (Hex)	03 (Hex)	04 (Hex)	43 (Hex)	66 (Hex)	00 (Hex)	00 (Hex)	0F (Hex)	A8 (Hex)
Device Address	Function Code	Byte Count	Data Register1 High Byte	Data Register1 Low Byte	Data Register2 High Byte	Data Register2 Low Byte	CRC Low	CRC High

Byte Count : Total number of data bytes received.

Query for 4X read:

01 (Hex)	04 (Hex)	00 (Hex)	06(Hex)	00 (Hex)	02(Hex)	91 (Hex)	CA (Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Lo	CRC Low	CRC High

4X Response: Current (5 A)

01 (Hex)	04 (Hex)	04 (Hex)	40 (Hex)	A0 (Hex)	00 (Hex)	00 (Hex)	EE (Hex)	66 (Hex)
Device Address	Function Code	Byte Count	Data Register1 High Byte	Data Register1 Low Byte	Data Register2 High Byte	Data Register2 Low Byte	CRC Low	CRC High

Byte count : No. of Bytes Demanded by user in query.
Start Address High : Most significant 8 bits of starting address of the parameter requested.
Start Address low : Least significant 8 bits of starting address of the parameter requested.
Number of register Hi : Most significant 8 bits of Number of registers requested.
Number of register Lo : Least significant 8 bits of Number of registers requested.
Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.
Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.
Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.
Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.
(Note : Two consecutive 16 bit register represent one parameter.)

TABLE 4 : 3 X and 4 X register addresses for measured parameters

Address (3X)	Address (4X)	Parameter Number	Parameter	Hex Address	
				High Byte	Low Byte
30001	40001	0	Voltage	00	00
30003	40003	1	-	00	02
30005	40005	2	-	00	04
30007	40007	3	Current	00	06
30009	40009	4	-	00	08
30011	40011	5	-	00	0A
30013	40013	6	Active Power	00	0C
30015	40015	7	-	00	0E
30017	40017	8	-	00	10
30019	40019	9	Apparent Power	00	12
30021	40021	10	-	00	14
30023	40023	11	-	00	16
30025	40025	12	Reactive Power	00	18
30027	40027	13	-	00	1A

TABLE 4 : Continued

Address (3X)	Address (4X)	Parameter Number	Parameter	Hex Address	
				High Byte	Low Byte
30029	40029	14	-	00	1C
30031	40031	15	Power Factor	00	1E
30033	40033	16	-	00	20
30035	40035	17	-	00	22
30037	40037	18	Angle	00	24
30071	40071	35	Freqency	00	46
30073	40073	36	kW Import Demand	00	48
30075	40075	37	kW Import Max Demand	00	4A
30077	40077	38	kWr Export Demand	00	4C
30079	40079	39	kW Exp. Max Demand	00	4E
30081	40081	40	kvar Imp. Demand	00	50
30083	40083	41	kvar Imp. Max Demand	00	52
30085	40085	42	kvar Exp. Max Demand	00	54
30087	40087	43	kvar Exp. Max Demand	00	56
30089	40089	44	kva Imp. Demand	00	58
30091	40091	45	kva Imp. Max Demand	00	5A
30093	40093	46	kva Exp. Demand	00	5C
30095	40095	47	kva Exp. Max Demand	00	5E
30097	40097	48	Current Imp. Demand	00	60
30099	40099	49	Current Imp Max. Demand	00	62
30101	40101	50	Current Exp. Demand	00	64
30103	40103	51	Current Exp. Max Demand	00	66
30105	40105	52	Watt R Fundamental	00	68
30107	40107	53	Active Import Energy Overflow Count	00	6A
30109	40109	54	Active Import Energy	00	6C
30111	40111	55	Active Export Energy Overflow Count	00	6E
30113	40113	56	Active Export Energy	00	70
30115	40115	57	Reactive Import Energy Overflow Count	00	72
30117	40117	58	Reactive Import Energy	00	74
30119	40119	59	Reactive Export Energy Overflow Count	00	76
30121	40121	60	Reactive Export Energy	00	78
30123	40123	61	Apparent Import Energy Overflow Count	00	7A
30125	40125	62	Apparent Import Energy	00	7C
30127	40127	63	Apparent Export Energy Overflow Count	00	7E
30129	40129	64	Apparent Export Energy	00	80

TABLE 4 : Continued

Address (3X)	Address (4X)	Parameter Number	Parameter	Hex Address	
				High Byte	Low Byte
30131	40131	65	Active Energy Overflow Count	00	82
30133	40133	66	Active Energy	00	84
30135	40135	67	Reactive Energy Overflow Count	00	86
30137	40137	68	Reactive Energy	00	88
30139	40139	69	Apparent Energy Overflow Count	00	8A
30141	40141	70	Apparent Energy	00	8C
30143	40143	71	T1 Active Import Energy Overflow Count	00	8E
30145	40145	72	T1 Active Import Energy	00	90
30147	40147	73	T1 Active Export Energy Overflow Count	00	92
30149	40149	74	T1 Active Export Energy	00	94
30151	40151	75	T1 Reactive Import Energy Overflow Count	00	96
30153	40153	76	T1 Reactive Import Energy	00	98
30155	40155	77	T1 Reactive Export Energy Overflow Count	00	9A
30157	40157	78	T1 Reactive Export Energy	00	9C
30159	40159	79	T1 Apparent Import Energy Overflow Count	00	9E
30161	40161	80	T1 Apparent Import Energy	00	A0
30163	40163	81	T1 Apparent Export Energy Overflow Count	00	A2
30165	40165	82	T1 Apparent Export Energy	00	A4
30167	40167	83	T1 Active Energy Overflow Count	00	A6
30169	40169	84	T1 Active Energy	00	A8
30171	40171	85	T1 Reactive Energy Overflow Count	00	AA
30173	40173	86	T1 Reactive Energy	00	AC
30175	40175	87	T1 Apparent Energy Overflow Count	00	AE
30177	40177	88	T1 Apparent Energy	00	B0
30179	40179	89	T2 Active Import Energy Overflow Count	00	B2
30181	40181	90	T2 Active Import Energy	00	B4
30183	40183	91	T2 Active Export Energy Overflow Count	00	B6
30185	40185	92	T2 Active Export Energy	00	B8
30187	40187	93	T2 Reactive Import Energy Overflow Count	00	BA
30189	40189	94	T2 Reactive Import Energy	00	BC
30191	40191	95	T2 Reactive Export Energy Overflow Count	00	BE
30193	40193	96	T2 Reactive Export Energy	00	C0
30195	40195	97	T2 Apparent Import Energy Overflow Count	00	C2
30197	40197	98	T2 Apparent Import Energy	00	C4
30199	40199	99	T2 Apparent Export Energy Overflow Count	00	C6

TABLE 4 : Continued

Address (3X)	Address (4X)	Parameter Number	Parameter	Hex Address	
				High Byte	Low Byte
30201	40201	100	T2 Apparent Export Energy	00	C8
30203	40203	101	T2 Active Energy Overflow Count	00	CA
30205	40205	102	T2 Active Energy	00	CC
30207	40207	103	T2 Reactive Energy Overflow Count	00	CE
30209	40209	104	T2 Reactive Energy	00	D0
30211	40211	105	T2 Apparent Energy Overflow Count	00	D2
30213	40213	106	T2 Apparent Energy	00	D4
30215	40215	107	PartialActive Import Energy Overflow Count	00	D6
30217	40217	108	Partial Active Import Energy	00	D8
30219	40219	109	Partial Active Export Energy Overflow Count	00	DA
30221	40221	110	Partial Active Export Energy	00	DC
30223	40223	111	Partial Reactive Import Energy Overflow Count	00	DE
30225	40225	112	Partial Reactive Import Energy	00	E0
30227	40227	113	partial Reactive Export Energy Overflow Count	00	E2
30229	40229	114	Partial Reactive Export Energy	00	E4
30231	40231	115	Partial Apparent Import Energy Overflow Count	00	E6
30233	40233	116	Partial Apparent Import Energy	00	E8
30235	40235	117	Partial Apparent Export Energy Overflow Count	00	EA
30237	40237	118	Partial Apparent Export Energy	00	EC
30239	40239	119	Partial Active Energy Overflow Count	00	EE
30241	40241	120	Partial Active Energy	00	F0
30243	40243	121	Partial Reactive Energy Overflow Count	00	F2
30245	40245	122	Partial Reactive Energy	00	F4
30247	40247	123	Partial Apparent Energy Overflow Count	00	F6
30249	40249	124	Partial Apparent Energy	00	F8
30251	40251	125	Run Hour	00	FA
30253	40253	126	On Hour	00	FC
30255	40255	127	No of Interrupts	00	FE
30257	40257	128	Impulse Rate	01	00
30259	40259	129	Power Fail Status	01	02
30261	40261	130	Tarrif Status	01	04
30263	40263	131	Current Direction	01	06

TABLE 5 : 3 X long register addresses for measured parameters

Address (3X)	Parameter Number	Parameter	Hex Address	
			High Byte	Low Byte
30513	1	Wh Import Overflow Count	02	00
30515	2	Wh Import	02	02
30517	3	Wh Export Overflow Count	02	04
30519	4	Wh Export	02	06
30521	5	Varh Import Overflow Count	02	08
30523	6	Varh Import	02	0A
30525	7	Varh Export Overflow Count	02	0C
30527	8	Varh Export	02	0E
30529	9	Vah Import Overflow Count	02	10
30531	10	Vah Import	02	12
30533	11	Vah Export Overflow Count	02	14
30535	12	Vah Export	02	16
30537	13	Active Energy Overflow Count	02	18
30539	14	Active Energy	02	1A
30541	15	Reactive Energy Overflow Count	02	1C
30543	16	Reactive Energy	02	1E
30545	17	Apparent Energy Overflow Count	02	20
30547	18	Apparent Energy	02	22
30549	19	T1 Wh Import Overflow Count	02	24
30551	20	T1 Wh Import	02	26
30553	21	T1 Wh Export Overflow Count	02	28
30555	22	T1 Wh Export	02	2A
30557	23	T1 Varh Import Overflow Count	02	2C
30559	24	T1 Varh Import	02	2E
30561	25	T1 Varh Export Overflow Count	02	30
30563	26	T1 Varh Export	02	32
30565	27	T1 Vah Import Overflow Count	02	34
30567	28	T1 Vah Import	02	36
30569	29	T1 Vah Export Overflow Count	02	38
30571	30	T1 Vah Export	02	3A
30573	31	T1 Active Energy Overflow Count	02	3C
30575	32	T1 Active Energy	02	3E
30577	33	T1 Reactive Energy Overflow Count	02	40
30579	34	T1 Reactive Energy	02	42
30581	35	T1 Apparent Energy Overflow Count	02	44
30583	36	T1 Apparent Energy	02	46

TABLE 5 : Continued

Address (3X)	Parameter Number	Parameter	Hex Address	
			High Byte	Low Byte
30585	37	T2 Wh Import Overflow Count	02	48
30587	38	T2 Wh Import	02	4A
30589	39	T2 Wh Export Overflow Count	02	4C
30591	40	T2 Wh Export	02	4E
30593	41	T2 Varh Import Overflow Count	02	50
30595	42	T2 Varh Import	02	52
30597	43	T2 Varh Export Overflow Count	02	54
30599	44	T2 Varh Export	02	56
30601	45	T2 Vah Import Overflow Count	02	58
30603	46	T2 Vah Import	02	5A
30605	47	T2 Vah Export Overflow Count	02	5C
30607	48	T2 Vah Export	02	5E
30609	49	T2 Active Energy Overflow Count	02	60
30611	50	T2 Active Energy	02	62
30613	51	T2 Reactive Energy Overflow Count	02	64
30615	52	T2 Reactive Energy	02	66
30617	53	T2 Apparent Energy Overflow Count	02	68
30619	54	T2 Apparent Energy	02	6A
30621	55	Par Wh Import Overflow Count	02	6C
30623	56	Par Wh Import	02	6E
30625	57	Par Wh Export Overflow Count	02	70
30627	58	Par Wh Export	02	72
30629	59	Par Varh Import Overflow Count	02	74
30631	60	Par Varh Import	02	76
30633	61	Par Varh Export Overflow Count	02	78
30635	62	Par Varh Export	02	7A
30637	63	Par Vah Import Overflow Count	02	7C
30639	64	Par Vah Import	02	7E
30641	65	Par Vah Export Overflow Count	02	80
30643	66	Par Vah Export	02	82
30645	67	Par Active Energy Overflow Count	02	84
30647	68	Par Active Energy	02	86
30649	69	Par Reactive Energy Overflow Count	02	88
30651	70	Par Reactive Energy	02	8A
30653	71	Par Apparent Energy Overflow Count	02	8C
30655	72	Par Apparent Energy	02	8E

NOTE: Energy Overflow count Increments when energy count exceeds 99999.999.

Overflow	Display Energy
< 1	99999.99
< 10	999999.9
> =10	9999999

7.2 Accessing 3 X register for Reading & Writing Settings:

Each setting is held in the 4X registers. ModBus code 04 is used to read the parameters. Refer **TABLE 5** for 4X Register addresses.

Example: Reading Measurement Mode

Start address = 1776 (Hex)
Number of registers = 02
Note: Number of registers = Number of Parameters x 2

Query :

Device Address	01 (Hex)
Function Code	04 (Hex)
Start Address High	17 (Hex)
Start Address Low	76 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
CRC Low	95 (Hex)
CRC High	A5 (Hex)

Start Address High : Most significant 8 bits of starting address of the parameter requested.
Start Address Low : Least significant 8 bits of starting address of the parameter requested.
Number of register High : Most significant 8 bits of Number of registers requested.
Number of register Low : Least significant 8 bits of Number of registers requested.
(Note : Two consecutive 16 bit register represent one parameter.)

Response: Measurement mode 1

Device Address	01 (Hex)
Function Code	04 (Hex)
Byte Count	04 (Hex)
Data Register- 1 High Byte	3F(Hex)
Data Register- 1 Low Byte	80 (Hex)
Data Register- 2 High Byte	00 (Hex)
Data Register- 2 Low Byte	00 (Hex)
CRC Low	F6 (Hex)
CRC High	78 (Hex)

Byte Count : Total number of data bytes received.
Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.
Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.
Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.
Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.
(Note : Two consecutive 16 bit register represent one parameter.)

Example : Writing Measurement Mode Watt

Measurement mode : 2 Start address = 1776 (Hex)
Number of registers = 02
Note: Number of registers = Number of Parameters x 2

Query:

Device Address	01 (Hex)
Function Code	10 (Hex)
Starting Address High	17 (Hex)
Starting Address Low	76 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
Byte Count	04 (Hex)
Data Register- 1 High Byte	40 (Hex)
Data Register- 1 Low Byte	00 (Hex)
Data Register- 2 High Byte	00 (Hex)
Data Register- 2 Low Byte	00 (Hex)
CRC Low	8A (Hex)
CRC High	91 (Hex)

Byte Count : Total number of data bytes received.
Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.
Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.
Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.
Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.
(Note : Two consecutive 16 bit register represent one parameter)

Response:

Device Address	01 (Hex)
Function Code	10 (Hex)
Start Address High	17 (Hex)
Start Address Low	76 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
CRC Low	A5 (Hex)
CRC High	A6 (Hex)

Start Address High : Most significant 8 bits of starting address of the parameter requested.
Start Address Low : Least significant 8 bits of starting address of the parameter requested.
Number of register High : Most significant 8 bits of Number of registers requested.
Number of register Low : Least significant 8 bits of Number of registers requested.
(Note : Two consecutive 16 bit register represent one parameter)

7.3 Accessing 3 X register for Long Energy Reading :

For Reading Energy start count in long energy format following query format should be used

Query: (Query for Reading Active Energy Import Overflow)

Device Address	01 (Hex)
Function Code	03 (Hex)
Starting Address High	02 (Hex)
Starting Address Low	00 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
Byte Count	04 (Hex)
Data Register- 1 High Byte	40 (Hex)
Data Register- 1 Low Byte	80 (Hex)
Data Register- 2 High Byte	00 (Hex)
Data Register- 2 Low Byte	00 (Hex)
CRC Low	0F (Hex)
CRC High	7D (Hex)

Byte Count : Total number of data bytes transmitted.

Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.

Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.

Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.

Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.

(Note : Two consecutive 16 bit register represent one parameter.)

Response:

Device Address	01 (Hex)
Function Code	03 (Hex)
Start Address High	02 (Hex)
Start Address Low	00 (Hex)
Number of Registers High	00 (Hex)
Number of Registers Low	02 (Hex)
CRC Low	C5 (Hex)
CRC High	B3 (Hex)

Start Address High : Most significant 8 bits of starting address of the parameter requested.

Start Address Low : Least significant 8 bits of starting address of the parameter requested.

Number of register High : Most significant 8 bits of Number of registers requested.

Number of register Low : Least significant 8 bits of Number of registers requested.

TABLE 6 : 4 X register addresses

Parameter No.	Address Register	Parameters	Default Values
1	46001	-	-
2	46003	Demand Integration Time	15
3	46005	-	-
4	46007	Measurement Mode Watt	3
5	46009	Measurement mode VAR	1
6	46011	Nominal voltage	230
7	46013	Nominal Current	Rated Current
8	46015	Nominal Frequency	50
9	46017	Reset Parameters	4
10	46019	-	-
11	46021	-	-
12	46023	Tariff Configuration	2
13	46025	Modbus Address	1
14	46027	Comsetup Address	9
15	46029	-	-
16	46031	Autoscroll	0
17	46033	-	-
18	46035	Password	0000
19	46037	So1 Pulse Constant	1000
20	46039	So1 Pulse Parameters	1
21	46041	So1 Pulse Width	200
22	46043	So2 Pulse Constant	1000
23	46045	So2 Pulse Parameters	2
24	46047	So2 Pulse Width	200
25	46049	CT Primary(only applicable for EC21X1 and ER21X1 models)	5
26	46051	CT Secondary(applicable only for EC21X1 model)	5
27	46053	Version Number	XX.XX
28	46055	Serial Number Year Date	YYMM
29	46057	Serial Number Data	-

TABLE 7 : 4 X register addresses Description

Parameter No.	Address Register	Parameters	Description
1	46001	-	-
2	46003	Demand Integration Time	Demand Period represents demand time in minutes The Applicable values are ranging from 5 to 30.
3	46005	-	-
4	46007	Measurement Mode Watt	This address allow to setup total energy measurement modes. the valid values are 1: import, 2: export, 3: import+export.
5	46009	Measurement mode VAR	This address allow to setup reactive energy measurement Modes. the valid values are 1: import/export, 2: inductive/capacitive.
6	46011	Nominal voltage	In this address nominal Voltage is set 230V by default.
7	46013	Nominal Current	In this address Rated Current will be Shown.
8	46015	Nominal Frequency	In this address nominal Frequency is set 50Hz by default.
9	46017	Reset Parameters	This address allows the user to reset Parameter the valid values are 0: None, 1: Partial Energy, 2: Demand, 3: Power Drop, 4: all.
10	46019	-	-
11	46021	-	-
12	46023	Tariff Configuration	This address allows user to configure the tarrif input whether if it is setup from modbus or Digital input. The Valid Values are 0: no tarrif 1: DI Based 2: tarrif 1 3: tarrif 2.
13	46025	Modbus Address	This register address is used to set device address between 1 to 247.
14	46027	Comsetup Address	This register address is used to setup Rs485 communication parameters like buad rate , parity stop bit. the valid values are in between 0 to 19 (refer table no. for details of buad rate and parity stop bit.
15	46029	-	-
16	46031	Autoscroll	This address is used to setup autoscroll feature the valid values are 0 for No & 10,20,30 Seconds.
17	46033	-	-

TABLE 7 : Continued

Parameter No.	Address Register	Parameters	Description
18	46035	Password	This Address is used to set & Reset the Password Valid Range of Password can be set is 0000-9999. 1)if password lock is present & if this location is read it will return zero 2)if password lock is present & to disable this lock first send valid password to this location then write “0000” to this location 3)if password lock is present & to modify 4X parameter first send valid password to this to this location so that 4X parameter will be accessible for modification. 4) if for in any of the above case invalid password is send then meter will return exception error 2
19	46037	So1 Pulse Constant	This address is used to set desired pulse rate for 1 Kwh of SO1 output. The valid Values are 1,10,100,1000.
20	46039	So1 Pulse Parameters	This address is used to select parameter for S01 output the valid values in between 1 to 6. refer table 3 for parmeters
21	46041	So1 Pulse Width	This address allows the user to set the pulse duration of S01 output the valid values are 60, 100, 200 in ms.
22	46043	So2 Pulse Constant	this address is used to set desired pulse rate for 1 Kwh of SO2 output. The valid Values are 1,10,100,1000.
23	46045	So2 Pulse Parameters	This address is used to select parameter for S02 output the valid values in between 1 to 6. refer table 3 for parmeters.
24	46047	So2 Pulse Width	This address allows the user to set the pulse duration of S02 output the valid values are 60, 100, 200 in ms.
25	46049	CT Primary(applicable for EC21X1 and ER21X1 models)	This address allows the user to set the CT Primary Maximum stable value is 9999
26	46051	CT Secondary(applicable for EC21X1 model)	This address allows the user to set the CT Secondary Write one of the following value to this address 1 = 1 A CT Secondary 5 = 5 A CT Secondary
27	46053	Version Number	This address reads only firmware version of meter.
28	46055	Serial Number Year Date	This address shows the serial number of meter in Year and Month format
29	46057	Serial Number Data	-

TABLE 8 : RS 485 Setup Codes

Buad Rate	Parity	Stop Bit	Parameter No
2400	NONE	1	0
2400	NONE	2	1
2400	EVEN	1	2
2400	ODD	1	3
4800	NONE	1	4
4800	NONE	2	5
4800	EVEN	1	6
4800	ODD	1	7
9600	NONE	1	8
9600	NONE	2	9
9600	EVEN	1	10
9600	ODD	1	11
19200	NONE	1	12
19200	NONE	2	13
19200	EVEN	1	14
19200	ODD	1	15
38400	NONE	1	16
38400	NONE	2	17
38400	EVEN	1	18
38400	ODD	1	19

7.4 User Assignable Modbus Registers

The Multifunction Meter contains the 14 user assignable registers in the address range of (31025) to (31051) (**See Table 9**).

Any of the parameter addresses (3X register addresses Table 4) accessible in the instrument can be mapped to these 14 user assignable registers.

Parameters (3X registers addresses) that resides in different locations may be accessed by the single request by re-mapping them to adjacent address in the user assignable registers area.

Table 9 : User Assignable 3X & 4X Data Registers

Address (3X)	Address (4X)	Assignable Register	Modbus Start Address (Hex)	
			High Byte	Low Byte
31025	41025	Assignable Register 1	04	00
31027	41027	Assignable Register 2	04	02
31029	41029	Assignable Register 3	04	04
31031	41031	Assignable Register 4	04	06
31033	41033	Assignable Register 5	04	08
31035	41035	Assignable Register 6	04	0A
31037	41037	Assignable Register 7	04	0C
31039	41039	Assignable Register 8	04	0E
31041	41041	Assignable Register 9	04	10
31043	41043	Assignable Register 10	04	12
31045	41045	Assignable Register 11	04	14
31047	41047	Assignable Register 12	04	16
31049	41049	Assignable Register 13	04	18
31051	41051	Assignable Register 14	04	1A

Table 10 : User Assignable mapping register (4X registers)

Address (4X)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
49501	Map Address for Assignable Register 1	25	1C
49502	Map Address for Assignable Register 2	25	1D
49503	Map Address for Assignable Register 3	25	1E
49504	Map Address for Assignable Register 4	25	1F
49505	Map Address for Assignable Register 5	25	20
49506	Map Address for Assignable Register 6	25	21
49507	Map Address for Assignable Register 7	25	22
49508	Map Address for Assignable Register 8	25	23
49509	Map Address for Assignable Register 9	25	24
49510	Map Address for Assignable Register 10	25	25
49511	Map Address for Assignable Register 11	25	26
49512	Map Address for Assignable Register 12	25	27
49513	Map Address for Assignable Register 13	25	28
49514	Map Address for Assignable Register 14	25	29

Example : Assigning parameter to user assignable registers
To access the voltage (3X address (30001) 0000 & Current (3X address (30007) 0006 through user assignable register assign these addresses to 4x register (Table 10) 4C2C (49501) & 4C2D (49502) Respectively.
Assigning Query:

Device Address	01 (Hex)
Function Code	10 (Hex)
Starting Address Hi	00 (Hex)
Starting Address Lo	00 (Hex)
Number of Registers Hi	00 (Hex)*
Number of Registers Lo	02 (Hex)*
Byte Count	04 (Hex)

Data Register-1High Byte	4C (Hex)	Voltage (3X Address 30001)
Data Register-1 Low Byte	2C (Hex)	
Data Register-2 High Byte	4C (Hex)	Current (3X Address 30007)
Data Register-2 Low Byte	2D (Hex)	
CRC Low	D0 (Hex)	
CRC High	2B (Hex)	

* Note : Parameters should be assigned in Multiple of two i.e. 2,4,6,8.....14.

Response :

Device Address	01 (Hex)
Function Code	10 (Hex)
Start Address High	00 (Hex)
Start Address Low	00 (Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02 (Hex)
CRC Low	41 (Hex)
CRC High	C8 (Hex)

Reading parameter data through user assignable registers:
In assigning query voltage & Current parameters were assigned to 0000 & 0006 which will point to user assignable 3xregisters 4C2C and 4C2D (table10). So to read voltage and Current data reading query should be as below.

Query:

Device Address	01 (Hex)
Function Code	04 (Hex)
Start Address High	00 (Hex)
Start Address Low	00 (Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	04 (Hex)**
CRC Low	F1 (Hex)
CRC High	C9 (Hex)

Start address high : Most significant 8 bits of starting address of user assignable register.
Start address low :Least significant 8 bits of starting address of user assignable register.

Number of register Hi : Most significant 8 bits of number of registers requested.
Number of register Lo : Least significant 8 bits of number of registers requested.

****Note : Two consecutive 16 bit register represent one parameter.**
Since two parameters are requested four registers are required

Response : (Volt = 230 / Current = 5)

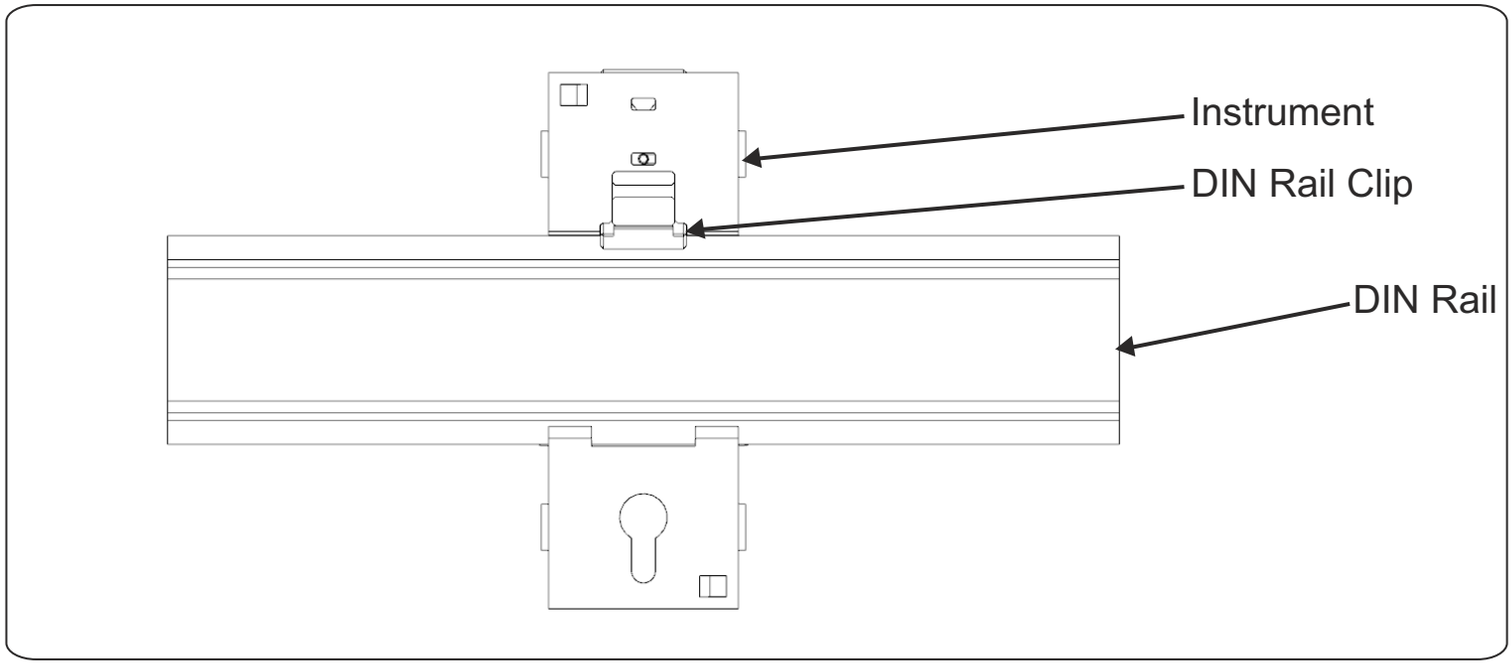
Device Address	01 (Hex)	
Function Code	04 (Hex)	
Byte count	08 (Hex)	
Data Register-1 High Byte	43 (Hex)	**Voltage Data**
Data Register-1 Low Byte	66 (Hex)	
Data Register-2 High Byte	00 (Hex)	
Data Register-2 Low Byte	00 (Hex)	
Data Register-3 High Byte	40 (Hex)	**Current Data**
Data Register-3 Low Byte	A0 (Hex)	
Data Register-4 High Byte	00 (Hex)	
Data Register-4 Low Byte	00 (Hex)	
CRC Low	79 (Hex)	
CRC High	3F (Hex)	

8. MBUS

For detailed information on the M-Bus communication Protocol, please refer to the M-Bus manual.

9. Installation

The Instrument should be mounted in a reasonably stable ambient temperature and where the operating temperature is within the range defined by the technical specification. Vibration should be kept to a minimum and the product should not be mounted where it will be subjected to excessive direct sunlight.



⚠ Caution

1. In the interest of safety and functionality this product must be installed by a qualified engineer, abiding by any local regulations.
2. Voltages dangerous to human life are present at some of the terminal connections of this unit. Ensure that all supplies are de-energised before attempting any connection or disconnection.
3. These products do not have internal fuses therefore external fuses must be used to ensure safety under fault conditions.
4. The intaller must select the approprite supply side protection overcurent device ensuring the rating and characteristics of that device.

⚠ Warning

1. Qualified personnel familiar with applicable codes and regulations must perform the installation.
2. Utilize insulated tools for device installation.
3. Install a fuse, thermal cut-off, or single-pole circuit breaker on the supply line, not on the neutral line.

8.1 EMC Installation Requirements

This product has been designed to meet the certification of the EU directives when installed to a good code of practice for EMC in industrial environments, e.g.

1. Screened output and low signal input leads or have provision for fitting RF suppression components,such as ferrite absorbers, line filters etc., in the event that RF fields cause problems.

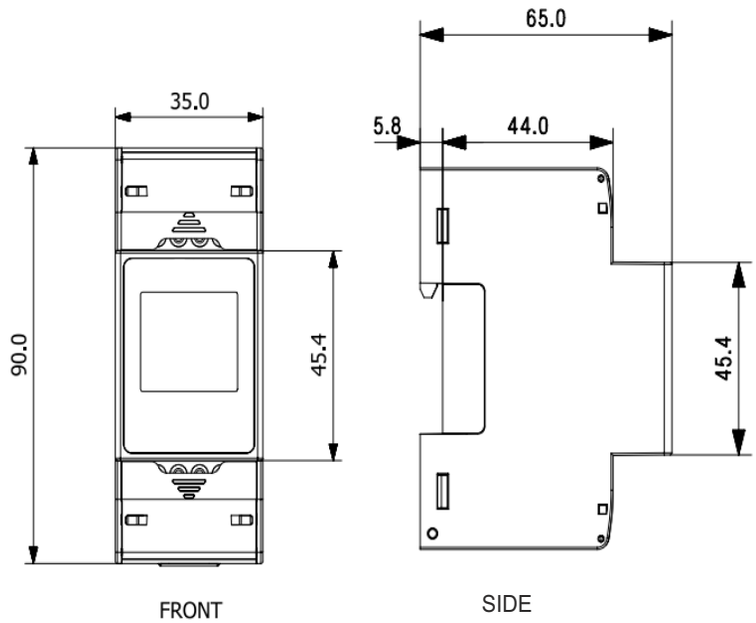
Note : It is good practice to install sensitive electronic instruments that are performing critical functions, in EMC enclosures that protect against electrical interference which could cause a disturbance in function.

2. Avoid routing leads alongside cables and products that are, or could be, a source of interference.

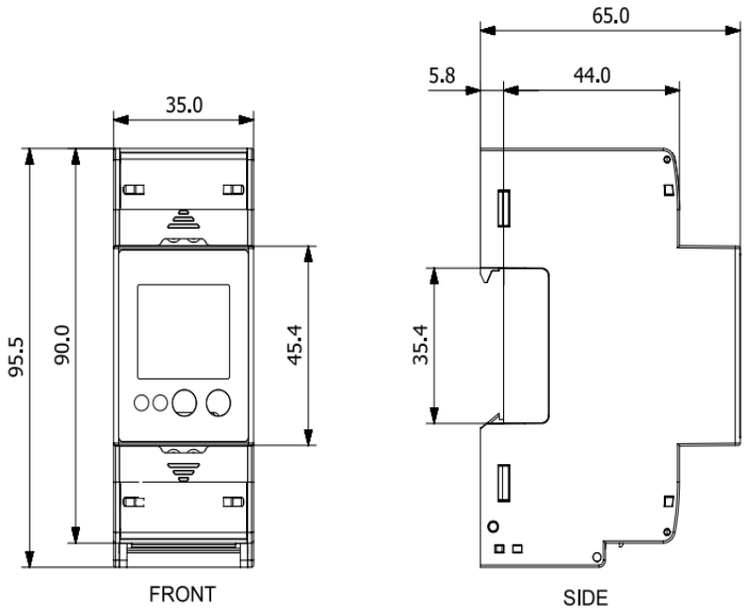
3. To protect the product against permanent damage, surge transients must be limited to 2kV pk. It is good EMC practice to suppress differential surges to 2kV at the source. Theunit has been designed to automatically recover in the event of a high level of transients. In extreme circumstances it may be necessary to temporarily disconnect the auxiliary supply for a period of greater than 5 seconds to restore correct operation.

4. ESD precautions must be taken at all times when handling this product.

9.2 Case Dimensions

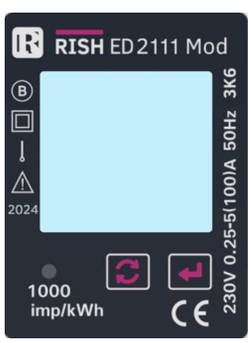


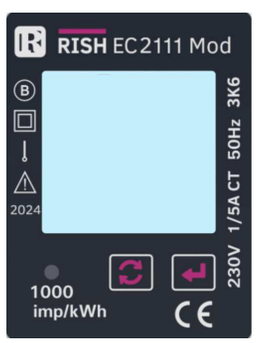
For ED21X1 / EC21X1

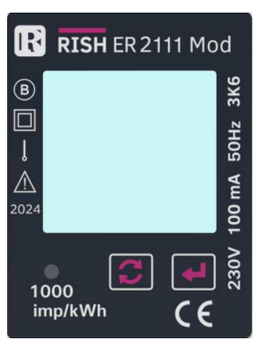


For ER21X1

9.3 Name Plate







9.4 Wiring

Input connections are made directly to screw-type terminals with indirect wire pressure. Numbering is clearly marked at the connector location. Choice of cable should meet local regulations.

Note : It is recommended to use **wire with** lug for **connection with meter.**

Wire: It is suggested to use wire with a temperature rating of at least 83 Deg. C

Guidelines:

1. To prevent the risk of electric shock, power supply to the equipment must be Kept OFF while doing the wiring Arrangement.
2. Wiring shall be done strictly according to the terminal layout. Confirm that all connections are correct.
3. Use lugged terminals.
4. To reduce electromagnetic interference use of wires with adequate ratings and twists of the same in equal size shall be made with shortest connections.
5. Layout of connecting cables shall be away from any internal EMI source.
6. Cable used for connection to power source, must have across section of 25mm^2 These wires shall have current carrying capacity of 100A.
7. Copper cable should be used (Stranded or Single core cable).
8. Before attempting work on device, ensure absence of voltages using appropriate voltage detection device.

	ISO 7000-0434B(2004-01)	CAUTION
	ISO 7000-1641	Operating Instructions

For Direct Connected(ED21X1) Model :

Connections	Cable Size (mm^2)	Torque (Nm)
L-In, L-Out, N	25 mm^2	3.5 Nm
B, A, G / M+, M-, SO1+, SO1-, SO2+, SO2-, DI+, DI-.	1 - 2.5 mm^2 Stranded with pin types lugs.	0.3-0.4 Nm

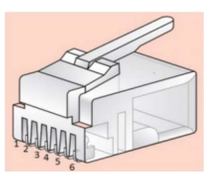
For CT Connected Meters (EC21X1):

Connections	Cable Size (mm^2)	Torque (Nm)
L, N, I-in, I-out	1- 1.25 mm^2	0.4 Nm
B, A, G / M+,M-,SO1+, SO1-, SO2+, SO2-, DI+, DI-.	1 - 2.5 mm^2 Standard with pin types lugs.	0.3-0.4 Nm

For RJ-12 CT Meters (ER21X1) :

Connections	Cable Size (mm^2)	Torque (Nm)
L,N	1- 1.25 mm^2	0.5-0.6 Nm
B, A, G / M+,M-,SO1+, SO1-, SO2+, SO2-, DI+, DI-.	1 - 2.5 mm^2 Standard with pin types lugs.	0.3-0.4 Nm

For current use standard RJ12 connector



PIN NUMBER	1, 3, 5	2, 4, 6
CT SIDE	S1	S2

***Note:**
1. Pin number 1, 3, 5 are shorted.
2. Pin number 2, 4, 6 are shorted.

9.5 Auxiliary Supply

Meter doesn't required external power source to operate, The power is derived from input signal source itself

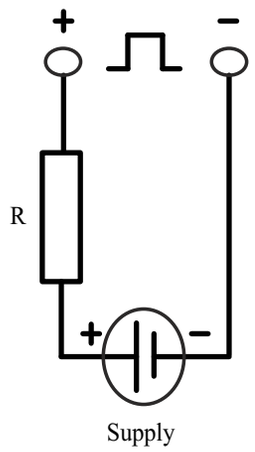
9.6 Fusing

It is recommended to choose fuse of a type and with breaking capacity appropriate to the supply and in accordance with local regulations.

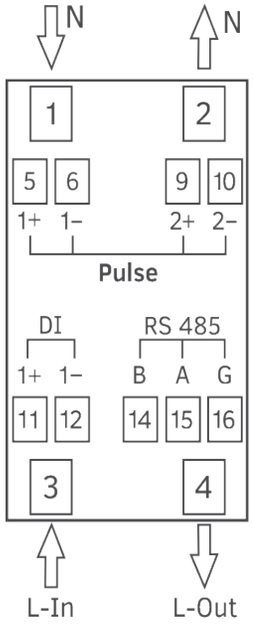
10. Connection Diagrams

Connection Terminals Detail:

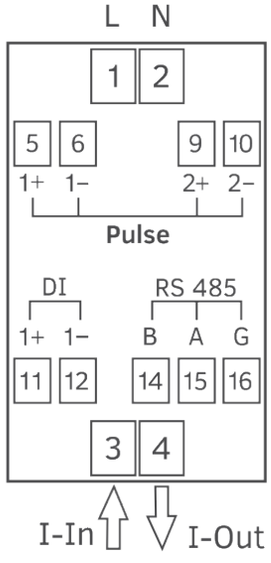
1, - Neutral In For ED21X1 AND Line For EC21X1 & ER21X1
2 - Neutral out For ED21X1 AND Neutral for EC21X1 & ER21X1
3 - Line In for ED21X1 AND Current in for EC21X1
4 - Line out for ED21X1 AND Current out for EC21X1
5,6 - SO1 Output
9,10 - SO2 Output
11,12 - DI / TARIFF SIGNAL
14,15,16 - RS 485 or MBUS Communication



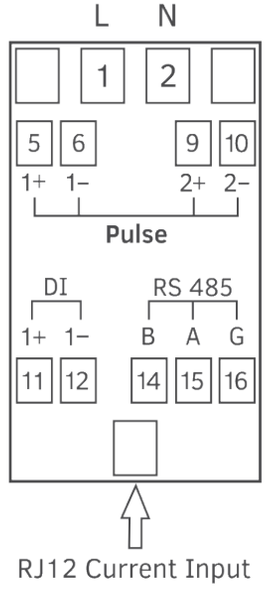
SO Connections



Connection Diagram for ED-2111 Mod Model



Connection Diagram for EC-2111 Mod Model



Connection Diagram for ER-2111 Mod Model

11. Specification

Input :

Connections:	1 Phase 2 Wire
Reference Voltage	230 VLN
Operating Voltage Range :	184 - 276 VLN
Power consumption in Voltage Circuit :	< 2 W (10 VA)
Power consumption in Current Circuit	< 1 VA
Short time Over-current	30*Imax for half-cycle at 50 Hz
Frequency	45-65 Hz

Direct Current(ED21X1) Model :

Starting Current	(Ist = 0.04*Itr) 20 mA
Minimum Current (Imin	(0.5*Itr) 250 mA
Transitional Current (Itr)	0.5 A
Reference Current (Iref)	(10*Itr) 5 A
Maximum Current (Imax)	> (50*Itr) 100 A or 63A (Model Specific)
Operating Current Range	0.25-5(100) A

1A/5A(EC21X1) Model :

Starting Current	(Ist = 0.04*Itr) 2 mA for 1 A / 10 mA for 5 A
Minimum Current (Imin)	(0.2*Itr) 10 mA for 1A / 50 mA for 5 A
Transitional Current (Itr)	50 mA for 1 A / 250 mA for 5 A
Reference Current (Iref)	(20*Itr) 1 A / 5 A
Maximum Current (Imax)	> (20*Itr) 1.2 A for 1 A / 6 A for 5 A
Operating Current Range	10 mA -1A (1.2A) / 50 mA - 5 A (6A)

RJ12(ER21X1) Model :

Starting Current	(Ist = 0.04*Itr) 0.2 mA
Minimum Current (Imin)	(0.2*Itr) 1 mA
Transitional Current (Itr)	5 mA
Reference Current (Iref)	(20*Itr) 100 mA
Maximum Current (Imax)	> (20*Itr) 120 mA
Operating Current Range	1 mA - 100 mA(120 mA)

Accuracy :

Active Energy (Import/Export)	Class B as per EN50470-3, Class 1 as per IEC 62053-21
Reactive Energy (Import/Export)	Class 2 as per IEC62053-23
Apparent Energy	± 1.0 %
Voltage	± 0.5% of of range max
Current	± 0.5% of Nominal value
Frequency	± 0.2% of Mid frequency
Active Power	± 1% of range max
Reactive Power	± 1% of range max
Apparent Power	± 1% of range max
Power Factor	±1% of unity

Pulse Outputs :

SO1 and SO2	Passive Opto-isolated
Contact Ranges	5 - 27V DC, 27 mA DC (max)
Pulse Duration	60 / 100 / 200 millisecond
Pulse Rate	1 / 10 / 100 / 1000 pulse per kWh
Impulse Rate	1000 pulse per kWh

Communication Interface :

MODBUS :

Protocol	RS485 MODBUS RTU
Baudrate	2.4 / 4.8 / 9.6 /19.2/38.4 kbit
Data Width	8
Parity	Stop Bits None -1 / None -2/ Even -1 / Odd -1
Device Address	1- 247
Response Time	< 30 millisecond (1000 millisecond for 2.4 & 4.8 Baudrate)

MBUS :

Protocol	EN13757-3 MBUS
Baudrate	0.3/ 0.6/ 1.2/ 2.4/ 4.8/ 9.6 kbps
Data Width	8
Parity - Stop Bits	Even -1
Response Time	
Address	1 250

Display Ranges :

Active Energy	0.01-99999.99 kWh
Reactive Energy	0.01-99999.99 kVARh
Apparent Energy	0.01-99999.99 kVAh

Active Power	0-99999 W
Reactive Power	0-99999 VAR
Apparent Power	0-99999 VA
Digital Input :	
Low	0 V
High	20... 300 VAC / 10... 60 VDC
Installation :	Indoor
Enclosure	Ip51 (IEC 60529: 1989)
Housing	2 Module DIN 43880
Dimensions	35 mm X 90 mm X 65 mm
Weight	250 gm
Mounting	35 mm DIN Rail
Safety :	
Installation Category	III
Protective Class	II (EN 50470-1) (MID) / (IEC61010) (IEC)
High Voltage Test	4 kV AC, 50Hz for 1 minute between all electrical circuits
Impulse Voltage Withstand	6.0 kV (1.2 microsecond waveform)
Pollution Degree	2
Housing Flame Resistance	Flammability Class V-0 acc. to UL 94, Self Extinguishing, Non Dripping, free of Halogen
Environmental Conditions :	
Mechanical Environment	M1
Electromagnetic Environment	E2
Operating Temperature	-25°C to +55°C
Storage/Transport Temperature	-40°C to +70°C
Relative Humidity	0... 90% (Non Condensing)
Shock	Half sine wave, peak acceleration $30g_n$ (300 m/s^2), pulse duration 18msec
Vibration	10...150Hz, f<60 Hz 0.075mm constant amplitude, f>60Hz $1g_n$ constant acceleration, 10 sweep cycles per axis
Altitude	<2000 m max

12. Saftey Instructions :

Warning :

This indicates potential danger that can lead to death, serious injury, or significant material damage if not followed. Ignoring these instructions can cause death, serious injury, or major material damage.

Caution :

This indicates electric shock risk, which can also result in death, serious injury, or significant material damage.Risk of electric shock. Not taking precautions can result in death, serious injury, or major material damage.

Qualified Personnel:

- Only qualified individuals should install and operate this device.
- Qualified personnel are those with authorization and knowledge of labeling and grounding electrical equipment according to local safety regulations.

Intended Use:

- Use the device only as specified in the catalog and user manual.
- Use only with devices and components.

Proper Handling:

- Ensure proper transport, storage, installation, connection, operation, and maintenance for reliable operation.
- Be aware that parts of the meter may carry dangerous voltages during use.

Safety Precautions:

1. Use insulated tools suitable for the meter's voltages.
2. Do not connect the meter while the circuit is powered.
3. Install the meter in a dry environment within a suitable IP-rated enclosure.
4. Follow local installation codes and regulations.
5. Avoid installing in explosive areas or places with dust, mildew, or insects.
6. Use wires suitable for the meter's maximum current and ensure correct AC wire connections before powering the meter.
7. Do not touch the meter's connection clamps with bare hands or conductive materials to avoid electric shock.
8. Replace protection covers after installation.
9. Maintenance and repairs should only be performed by qualified personnel.
10. Do not break any seals on the meter as it may affect functionality, accuracy, and void the warranty.
11. Handle the meter carefully to avoid damaging internal components.
12. Ensure all clamps are properly tightened and wires fit securely to avoid bad contact and potential sparks.

NOTE