masibus®

User's Manual

MULTI FUNCTION TRANSDUCER

Masibus Automation And Instrumentation Pvt. Ltd.
B/30, GIDC Electronics Estate,
Sector-25, Gandhinagar-382044, Gujarat, India
☎ +91 79 23287275-79 +91 79 23287281-82
Email: support@masibus.com
Web: www.masibus.com

CONTENTS

1. INTRODUCTION

Foreword

Thank you for purchasing Multi function transducer.
MFT (Multi Function Transducer)

This manual describes the basic functions and operation methods. Please read through this user's manual carefully before using the product.

Purpose of manual

How to read this manual?

Installer: Read Chapters 3, 4, 5, 6, 10, 11
System designer and new user: Read All Chapters
Expert user: Read Chapters 2, 4, 5, 6, 7, 8, 9

Regarding this user manual

- This manual should be provided to the end user. Keep an extra copy or copies of the manual in a safe place.
- Read this manual carefully to gain a thorough understanding of how to operate this product before starting operation.
- **MFT** is stands for MULTI FUNCTION TRANSDUCER throughout the document.
- Chapter 7 and 9 are for optional features. Read/use it if your device has LCD or Ethernet.

Notice

The contents of this manual are subject to change without notice as a result of continuous improvements to the instrument's performance and functions.

This manual describes the functions of this product. MASIBUS does not guarantee the application of these functions for any particular purpose.

Every effort has been made to ensure accuracy in the preparation of this manual. Should any errors or omissions come to your attention, however, please inform MASIBUS Sales office or sales representative. Under no circumstances may the contents of this manual, in part or in whole, be transcribed or copied without our permission.

Trademarks

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Checking the Contents of the Package

Unpack the box and check the contents before using the product. If the product is different from which you have ordered, if any parts or accessories are missing, or if the product appears to be damaged, contact your sales representative.

Product overview

The MFT is a solid state TRANSDUCER Which accurately measures all quantities of the supply including all types of energies and gives corresponding Analog output 4-20mA or 0-10V w.r.t. electrical parameter measured except energies. it also have fully programmable Digital output for all energies. The MFT is based on Microcontroller, with a high degree of programmability.

The MFT meets the Accuracy requirements of IEC 60688.

The MFT has been programmed to operate as an intelligent front end measuring and storing device and to communicate continuously to a Master, all the data relevant for the purpose of SCADA, through isolated RS-485 port using MODBUS-RTU protocol.

The MFT is normally supplied readily pre-programmed for operation and can be directly installed in the usual manner. The MFT can be read manually or through a Master using MODBUS-RTU Protocol.

Features

- Four Analog & Two Digital Outputs [Isolated to each other]
- Up to 30 parameter can be mapped to Analog Output
- Fully Programmable
- Analog o/p accuracy as per IEC60688
- Accuracy class 0.5s / 0.2s as per IS14697/ IEC 62053-22 for Energy
- Compact, Light weight, Rugged, Reliable & Safe for User
- Aux powered & uses Switch mode power supply
- LCD with back-lit to display various parameters (optional)
- Auto Scrolling feature for easy readability for all parameters on LCD(optional)
- Ethernet communication(optional)
- ABS enclosure an insulator so safe for user
- Front panel LED output for calibration & measurement of selected type of energy
- Store energy register efficiently during power failure.
- Four Quadrant measurement for Power factor, Power & Energy (Active & Reactive)
- 1-Ph, 3Ph3W, 3Ph4W configurations
- Fast response time (<350mS).
- Easy configuration of different parameter through front fascia key. (optional)
- GUI based site configuration software for MFT..
- Microcontroller based TRUE RMS Measurement of electrical parameters.

Product Ordering Code

Ordering Code

Model	Accuracy		Analog Output: Output Type		Analog Output: No. of Output		Digital Output		Display (LCD)		Ethernet	
MFT	X		X		X		X		X			
	1	Class 0.5	1	0-5V	1	One	N	None	N	None	N	None
	2	Class 0.2	2	1-5V	2	Two	Y	Two	Y	Required	1	Yes
			3	0-10V	3	Three						
			4	4-20mA	4	Four						
			5	0-20mA								
			6	Special*	* Consult Factory							

The unit has a nameplate affixed to the one side of the enclosure. Check the model and suffix codes inscribed on the nameplate to confirm that the product received is that which was ordered.

List of Accessories

The product is provided with the following accessories according to the model and suffix codes (see the table below). Check that none of them are missing or damaged.

Sr. No.	Description of accessory	Quantity
1	User manual	1
2	Anexture-1 (When Ordering code is with Ethernet)	1
3	Configuration software CD	1

Safety Precautions

The product and the instruction manual describe important information to prevent possible harm to users and damage to the property and to use the product safely.

Understand the following description (signs and symbols), read the text and observe descriptions.

⚠ WARNING	*This indicates a danger that may result in death or serious injury if not avoided.*
	This indicates a danger that may result in minor or moderate injury or only a physical damage if not avoided.

2. SPECIFICATIONS

System type

3Ph4W/ 3Ph3W (Site selectable)

Input

Voltage

Direct Voltage **(**AC RMS)	20V to 350V (L-N) or 34V to 620V (L-L) @ 240V Nominal
PT Secondary (Nominal Voltage)	63.5V L-N, 110V L-N, 120V L-N & 240V L-N (Site selectable) Configurable for 3Ph3W or 3Ph4W system
Measurement Method	True RMS
Burden	<0.2VA per phase
PT Ratio	1 to 9999.999 Programmable (Site selectable)
Overload	1.5 x Nominal Voltage (Continuous)
Accuracy Range	10% - Vn - 120%

Current

Direct Current (AC RMS)	0.01 to 8A
CT Secondary Current	1 or 5A (Site selectable)
Measurement Method	True RMS
Burden	<0.2VA per phase
CT Ratio	1 to 9999.999 Programmable
Overload	For 5A CT: 8A Continuous/ 20A for 1Sec For 1A CT: 2A Continuous/ 20A for 1Sec
Accuracy Range	1% - In - 120%

Starting current	0.1% of Nominal Current
Frequency	45 to 65Hz
Display	16x2 Backlight LCD

Measured Parameters

Voltage	L1-L2, L2-L3, L1-L3 and Average (3Ph3W & 3Ph4W)
	L1-N, L2-N, L3-N & average (1Ph & 3Ph4W)
Current	All phase currents & their average
Frequency	System Frequency
Power Factor	Phase wise PF & Average PF
Power (Phase wise & Total)	Active Power (W, KW & MW) Reactive Power(VAR, KVAR & MVAR) Apparent Power (VA, KVA & MVA)
Energy (Phase wise & Total)	Active Energy for Import & Export (Separate) (WH, KWh, MWh & GWh)
	Reactive Energy for lagging & leading (Separately) (VARh, KVARh, MVARh & GVARh)
	Apparent Energy (VAh, KVAh, MVAh & GVAh)

Output

Pulse output

No. of Outputs	2 digital outputs
Output Type	Open Collector [External Excitation Required]
Ratings	24VDC,20mA
Type	WH/VARH/VAH
Pulse rate	Programmable from 1 to 65000 pulses per KWh[I] / KWh[E] / KVARh[I] / KVARh[E] / KVAh / MWh[I] / MWh[E] / MVARh[I] / MVARh[E] / MVAh of total.
Pulse Duration	40 mSec ± 10%

Analog output - Optional	
No. of Outputs	4
Output type (factory set) [Current/ Voltage]	0/4-20mA, 0/1-5V, 0-10V DC
Response time	<350mS (except frequency)
Maximum No. of parameters mapped to o/p	31 Electrical Parameters
O/P Impedance	<750 Ω for 4-20mA O/P >2 KΩ for 0-10V O/P
Communication Output	
1) Serial Communication	
Interface	RS485
Baud rate	9600, 19200, 38400 (Selectable)
Start bit	1
Stop bit	1
Parity	None
Protocol	Modbus-RTU
2) Ethernet Communication – optional	
Interface	RJ-45
Baud rate	10/100 Mbps
Protocol	MODNET

Auxiliary Power Supply

Power Supply	85-265VAC, 50/60Hz or 100-300VDC
Burden	10 VA approx. (basic model)

Accuracy

	Class 0.2 Optional	**Class 0.5 (Standard)**
Analog Output	±0.2% as per IEC60688	± 0.5% as per IEC60688
Instantaneous Parameters on Communication and Display	± 0.2% or better	± 0.5% or better
Active Energy	Class 0.2s as per IS14697/ IEC 62053-22	Class 0.5s as per IS14697/ IEC 62053-22
Reactive Energy	Class 0.2s as per IS14697	Class 0.5s as per IS14697
Apparent Energy	Class 0.2s	Class 0.5s

(Applicable PF Range = 0.5Lag - 1.0 - 0.8Lead, for Power & Energy Parameters)

Safety

Impulse voltage tests: 5 kV, 1.2/50 uS as per IEC60688

Isolation (Withstanding voltage)

- Between primary terminals* and secondary terminals** and Earth:

At least 2500 V AC for 1 minute

- Between primary terminals*:

At least 2500 V AC for 1 minute

- Between secondary terminals**:

At least 2500 V AC for 1 minute

- Between secondary terminals Pulse o/p***:

At least 1500 V AC for 1 minute

* Primary terminals indicate Aux power terminals, Voltage i/p terminals and CT terminals.

** Secondary terminals indicate Analog o/p A1, Analog o/p A2, Analog o/p A3, Analog o/p A4, pulse o/p [D1 & D2] and Communication o/p.

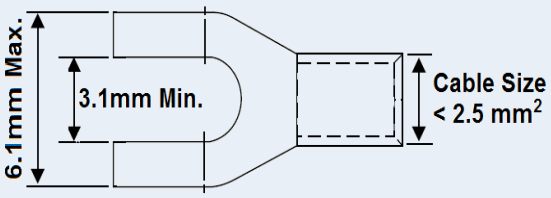
*** Between secondary terminals Pulse o/p: Pulse o/p D1 & Pulse o/p D2

Insulation resistance: 20MΩ or more at 500 V DC between power terminals and grounding Terminal.

Environmental

Operating temperature	0…15…30…45…55ºC
Storage temperature	-10 to 70ºC
Usage Group	II as per IEC60688
Relative humidity	30-95% non-condensing
Warm up time	10 minutes
Installation Category	CATIII (Refer to measuring and auxiliary inputs ≤ 300VAC versus earth
Protection Class	II
Pollution Degree	2

Physical

Protection Class	IP20
Mounting Type	DIN Rail
Dimension	100 x 78 x 110 mm
Material	ABS
Weight	0.5 Kg
Terminal [I/P and Aux] Cable Size	Barrier Type Terminal <2.5mm^2 
Terminal [O/P and Earth] Cable Size	MKDS 2.5mm^2

Configuration and View Software for programming the transducer at Site:
Windows based software; it is possible to configure the transducer on site through RS-485(MODBUS) interface or Ethernet interface (MODNET).

3. FRONT PANEL PICTURE

3.1 Front Panel Picture

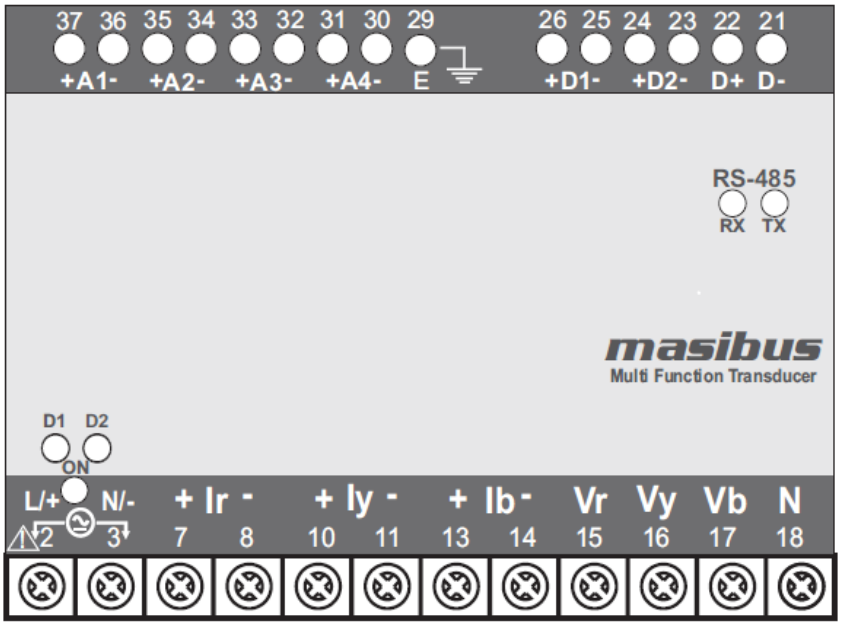


Fig-3.1 Detail of front panel - Basic model

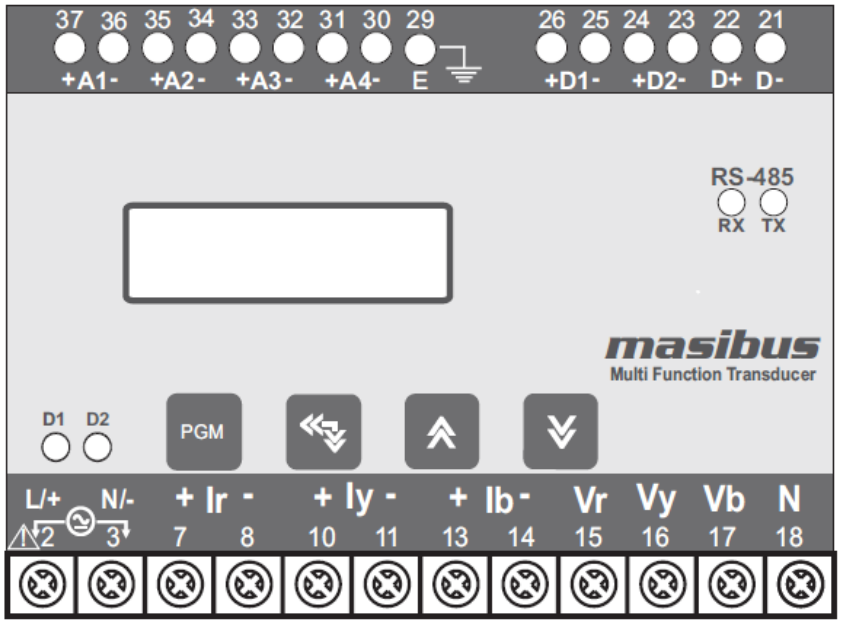


Fig-3.2 Detail of front panel - Basic model + LCD and Keypad

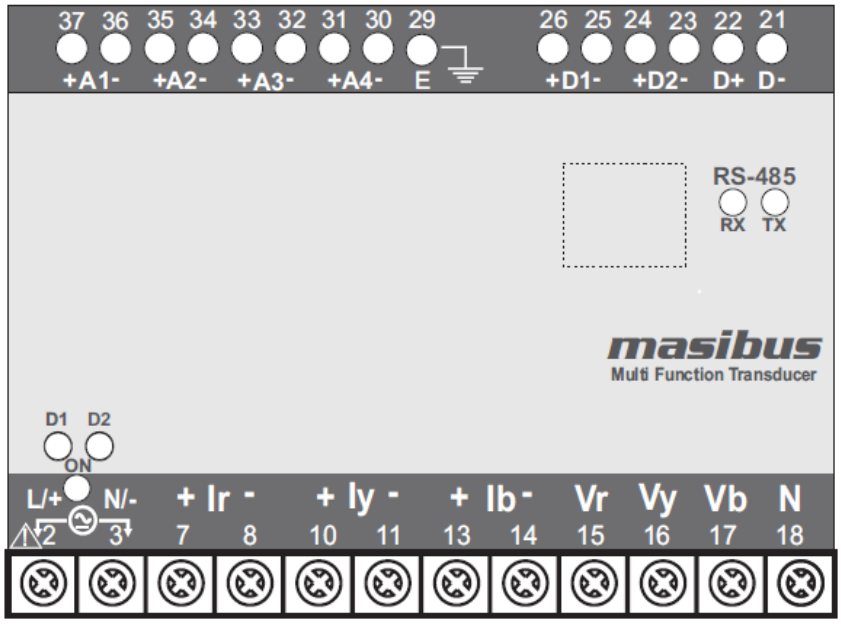


Fig-3.3 Detail of front panel - Basic model + Ethernet

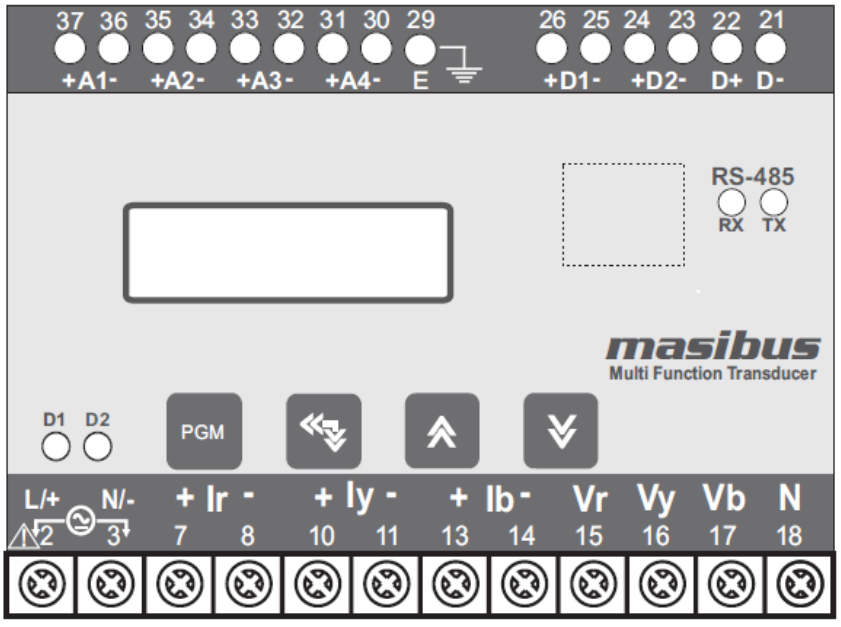
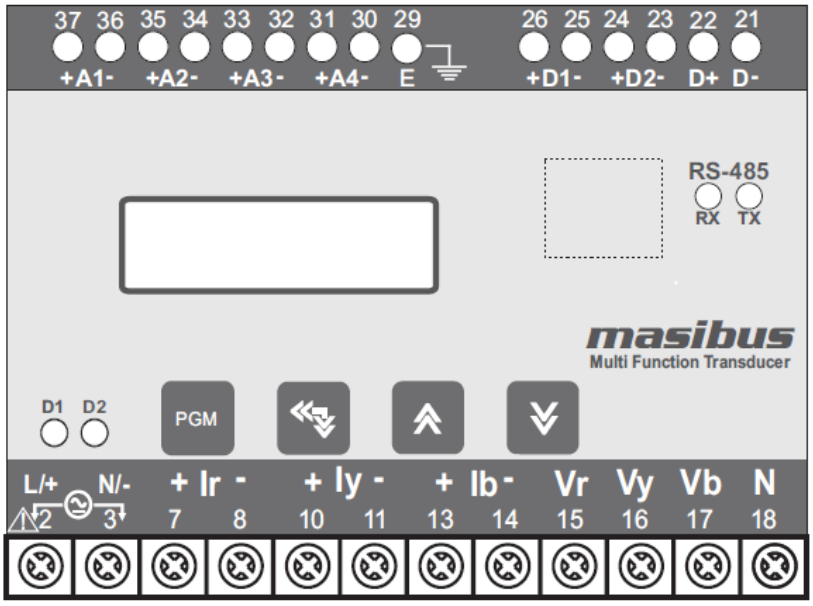


Fig-3.4 Detail of front panel - Basic model + LCD and Keypad + Ethernet

4. TERMINAL CONNECTIONS

4.1 Front Panel Terminal Connections

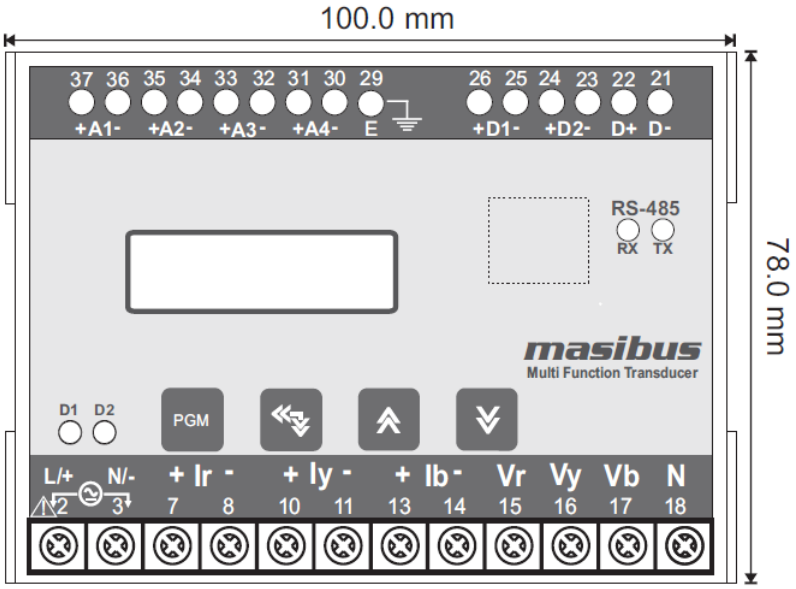


Terminal No.	Description	
2	L/+ (Line)	Aux. Power Supply Input
3	N/-(Neutral)	
29	E(Earth)	
7	IR+ [Current In R-Phase]	Three Phase Current Inputs
8	IR- [Current Out R-Phase]	
10	IY+ [Current In Y-Phase]	
11	IY- [Current Out Y-Phase]	
13	IB+ [Current In B-Phase]	
14	IB- [Current Out B-Phase]	
15	Vr [Voltage R-Phase]	Three Phase Voltage Inputs
16	Vy [Voltage Y-Phase]	
17	Vb[Voltage B-Phase]	
18	N [Neutral for Voltage input]	
21	RS-485 [D-]	RS-485 Connection
22	RS-485 [D+]	
23	Digital O/P2-	Pulse Output D2 Connection
24	Digital O/P2+	
25	Digital O/P1-	Pulse Output D1 Connection
26	Digital O/P1+	
30	Analogue O/P4-	Analogue Output A4 Connection
31	Analogue O/P4+	
32	Analogue O/P3-	Analogue Output A3 Connection
33	Analogue O/P3+	

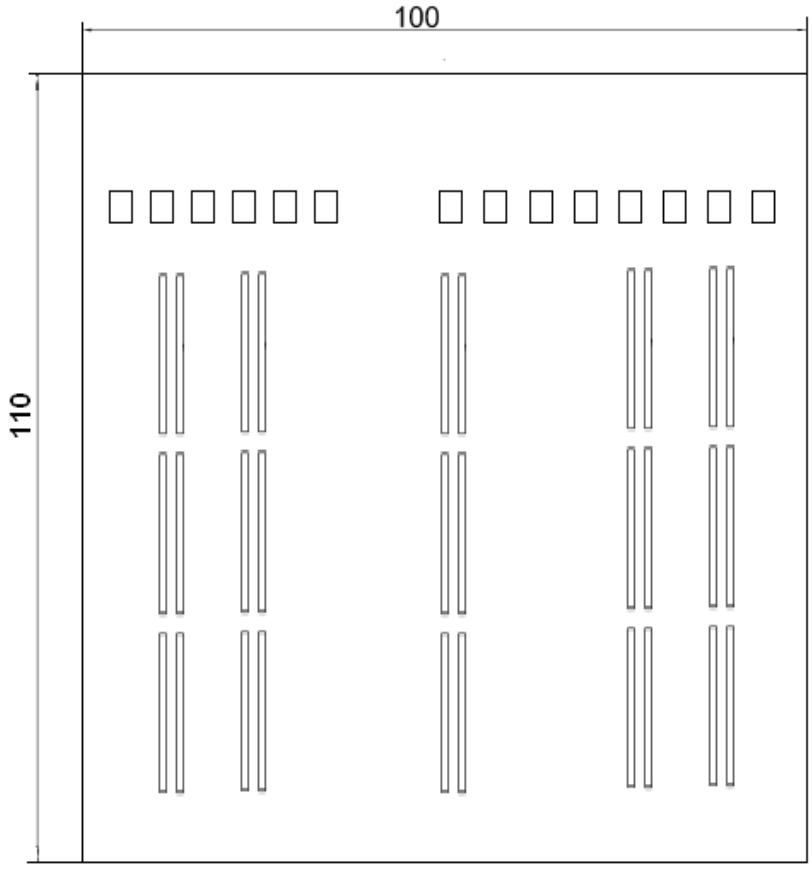
34	Analogue O/P2-	Analogue Output A2	Connection
35	Analogue O/P2+		
36	Analogue O/P1-	Analogue Output A1	Connection
37	Analogue O/P1+		

5. MECHANICAL GUIDELINE

5.1 Front View



5.2 Side View



6. INSTALLATION GUIDELINE

6.1 Safety/Warning Precautions

Safety Precautions

Dangerous voltages capable of causing death are sometimes present in this instrument. Before installation or beginning of any troubleshooting procedures the power to all equipment must be switched off and isolated. Units suspected of being faulty must be disconnected and removed first and brought to a properly equipped workshop for testing and repair. Component replacement and interval adjustments must be made by a company person only.

Warning Precautions

Read the instructions in this manual before performing installation and take note of the following precautions:

- *All wiring must confirm to appropriate standards of good practice and local codes and regulations. Wiring must be suitable for voltage, current, and temperature rating of the system.*
- *Ensure that all incoming AC power and other power sources are turned OFF before performing any work on the instrument. Protect the measurement AC Inputs voltage (V1, V2, V3) with 2A external over current protection device and the power supply source inputs with 5A external over current protection device, located close to the equipment.*
- *Before connecting the instrument to the power source, check the labels on the instrument to ensure that your instrument is equipped with the appropriate power supply voltage, input voltages and currents. Failure to do so may result in serious or even fatal injury and/or equipment damage.*
- *Under no circumstances don't connect instrument a power source if it is damaged.*
- *To prevent potential fire or shock hazard, do not expose the instrument to rain or moisture.*
- *The secondary of an external current transformer must never be allowed to be open circuit when the primary is energized. An open circuit can cause high voltages, possibly resulting in equipment damage, fire and even serious or fatal injury. Ensure that the current transformer wiring is secured using an external strain relief to reduce mechanical strain on the screw terminals, if necessary.*
- *Only qualified personnel familiar with the instrument and its associated electrical equipment must perform setup procedures.*
- *Beware not to over-tighten the terminal screws.*
- *Read this manual thoroughly before connecting the device to the current carrying circuits. During operation of the device, hazardous voltages are present on input terminals. Failure to observe precautions can result in serious or even fatal injury or damage to equipment.*
- *Upon receipt of the shipment remove the unit from the carton and inspect the unit for shipping damage. If any damage due to transit, report and claim with the carrier. Write down the model*

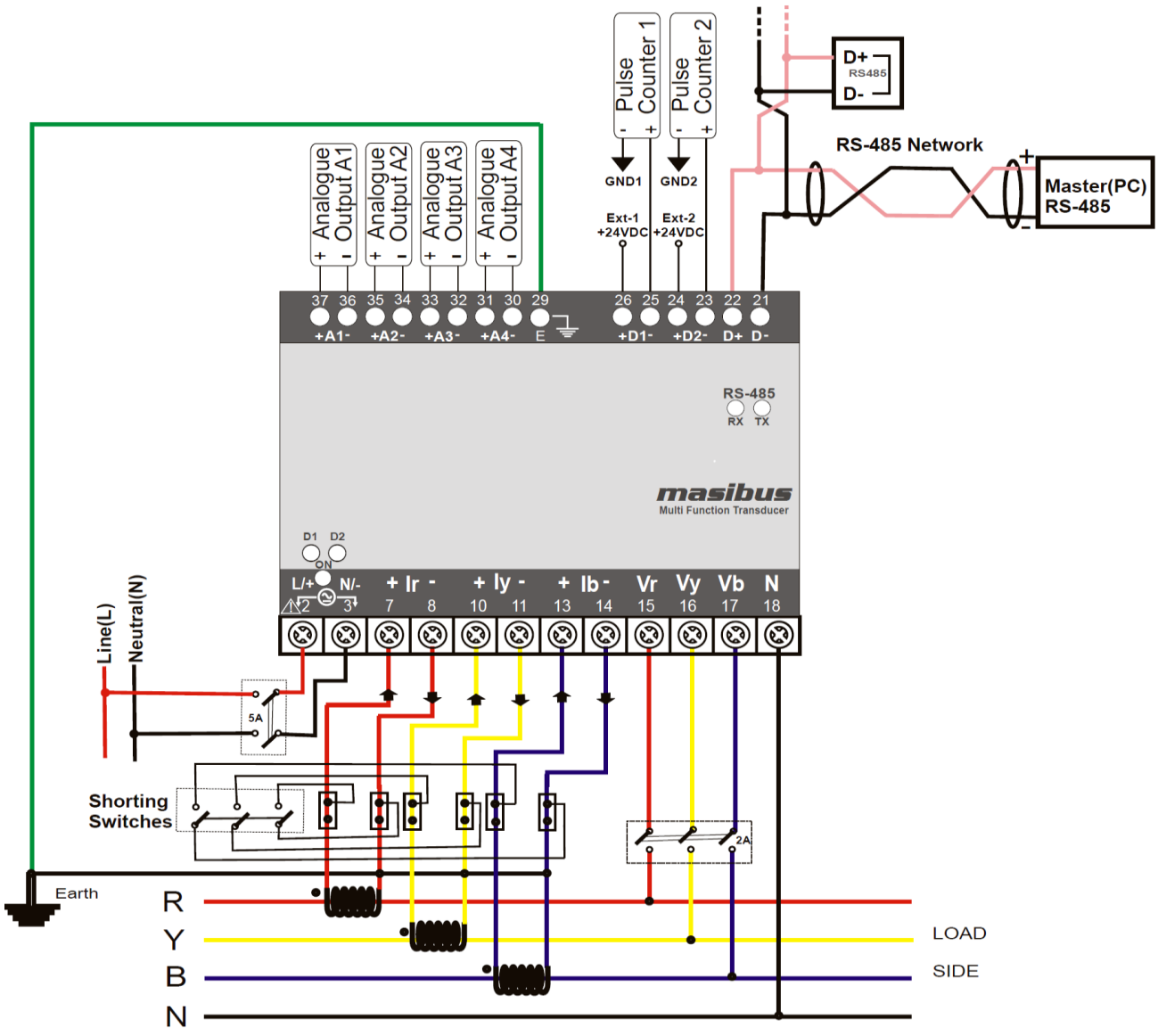
number and serial number for future reference when corresponding with our Customer Support Division.

- *Do not use this instrument in areas such as excessive shock, vibration, dirt, moisture, corrosive gases or rain. The ambient temperature of the areas should not exceed the maximum rating specified.*

6.2 Common Wiring with RS-485 Connections

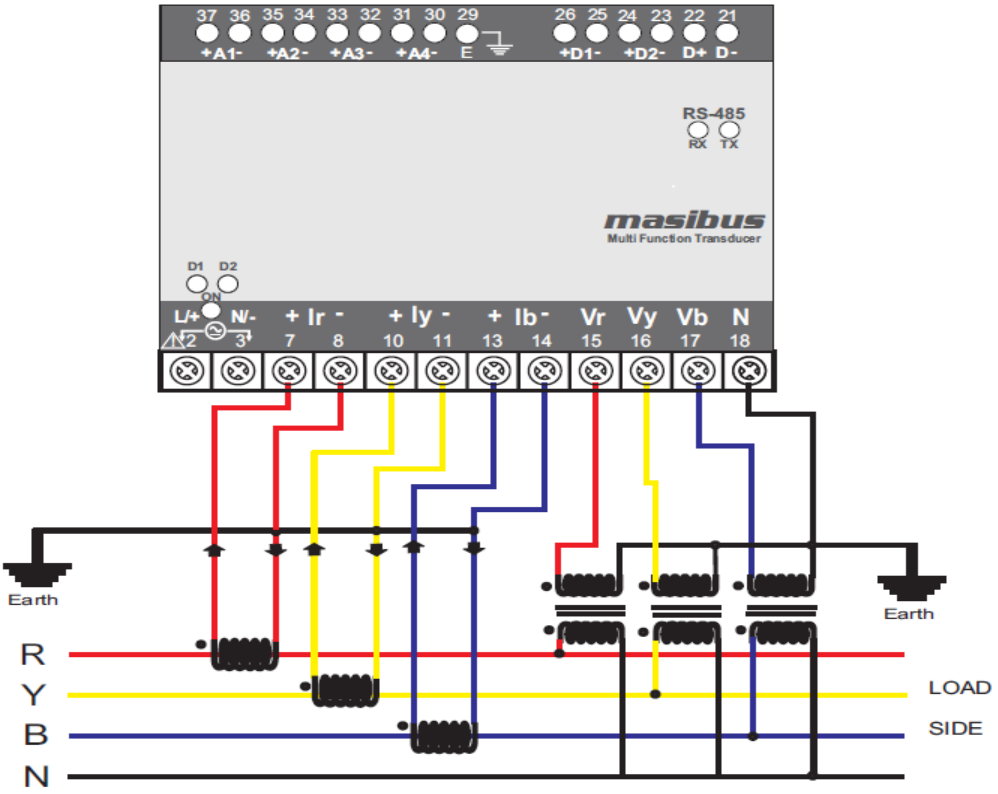
Recommended wiring for Aux Supply, Voltage input, Current Input & Analogue Output along with RS-485 Connections

Also note correct polarity for Current Input & Phase wise Voltage & Current Input combination is essential

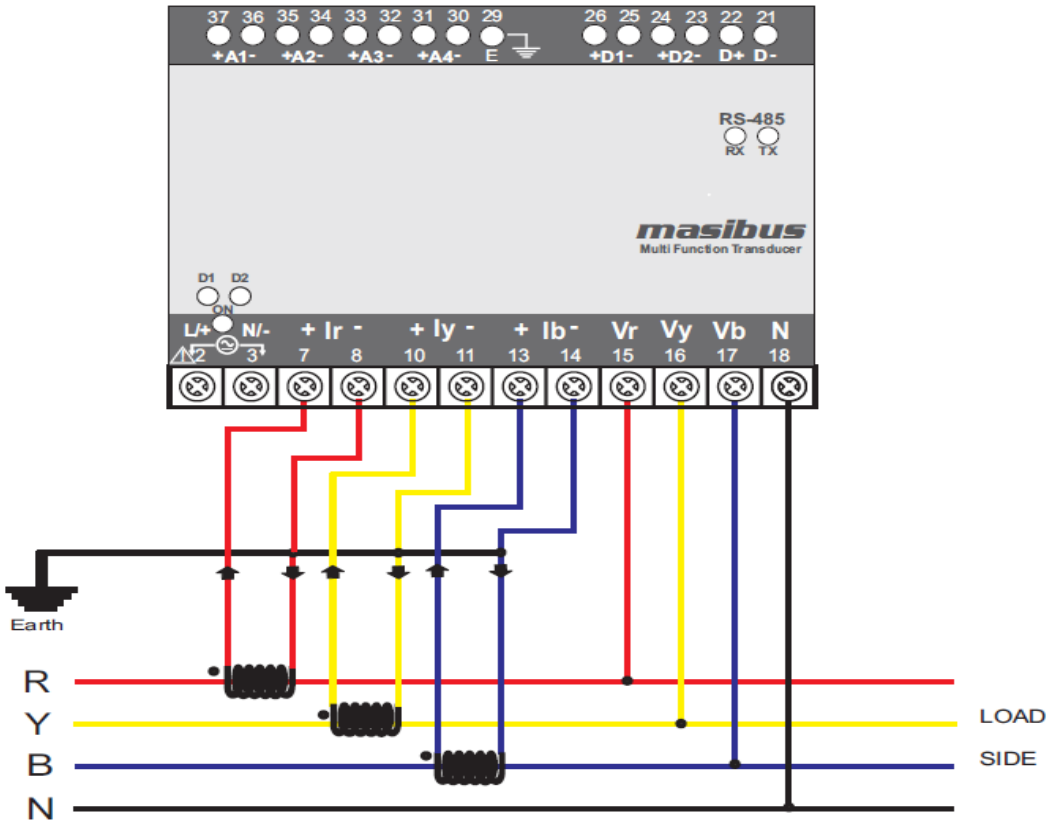


6.3.1 Three Phase Four Wire System

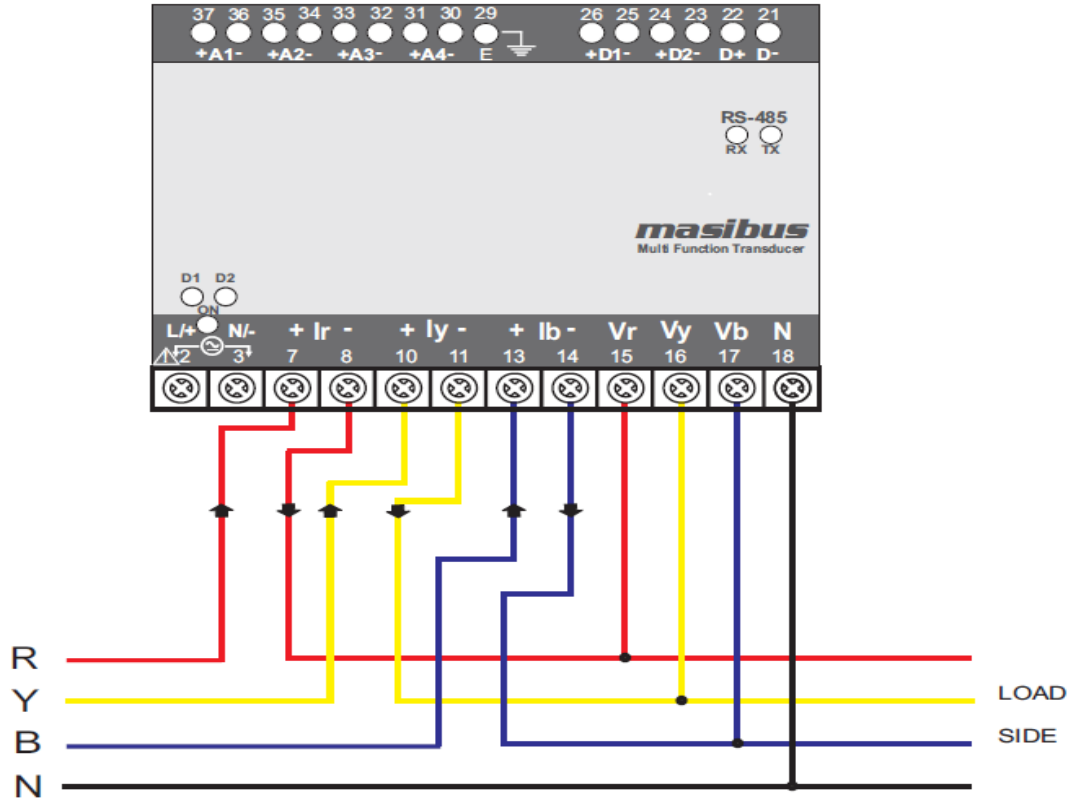
a) 4-Wire Wye-3 Element Connection Using 3PTs, 3CTs



b) 4-Wire Wye-3 Element Direct Connection Using 3CTs

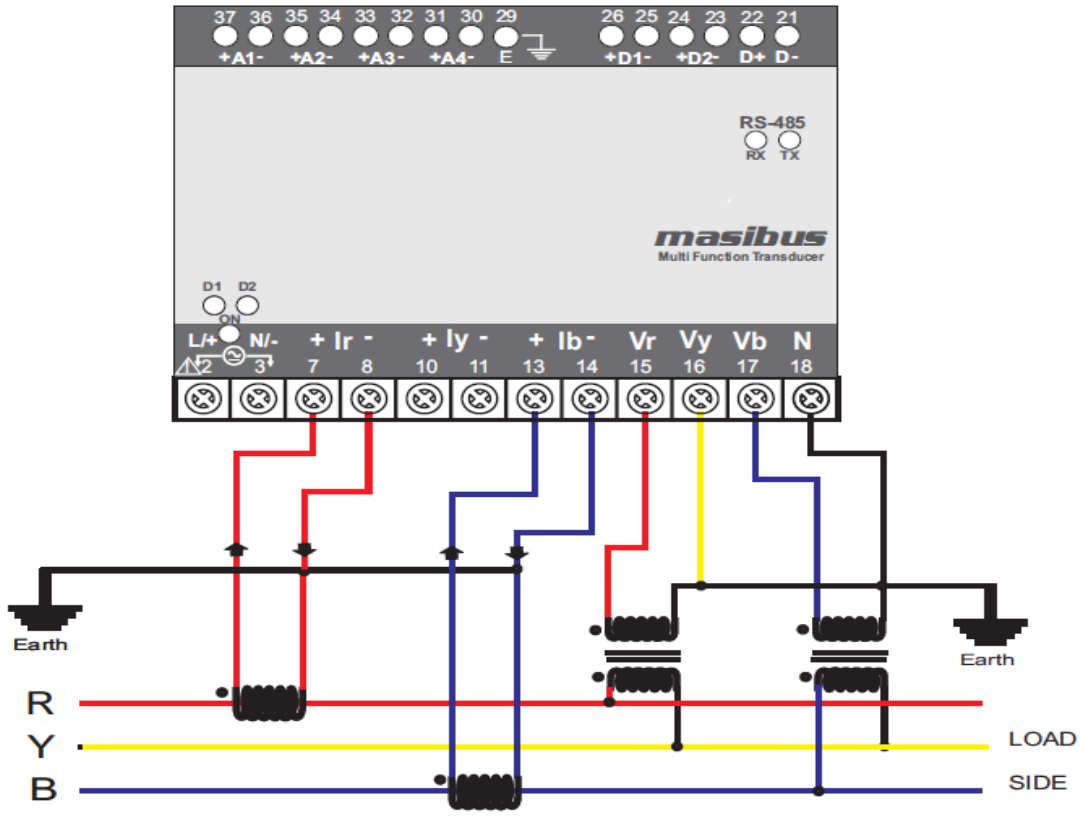


c) 4-Wire Direct Connection

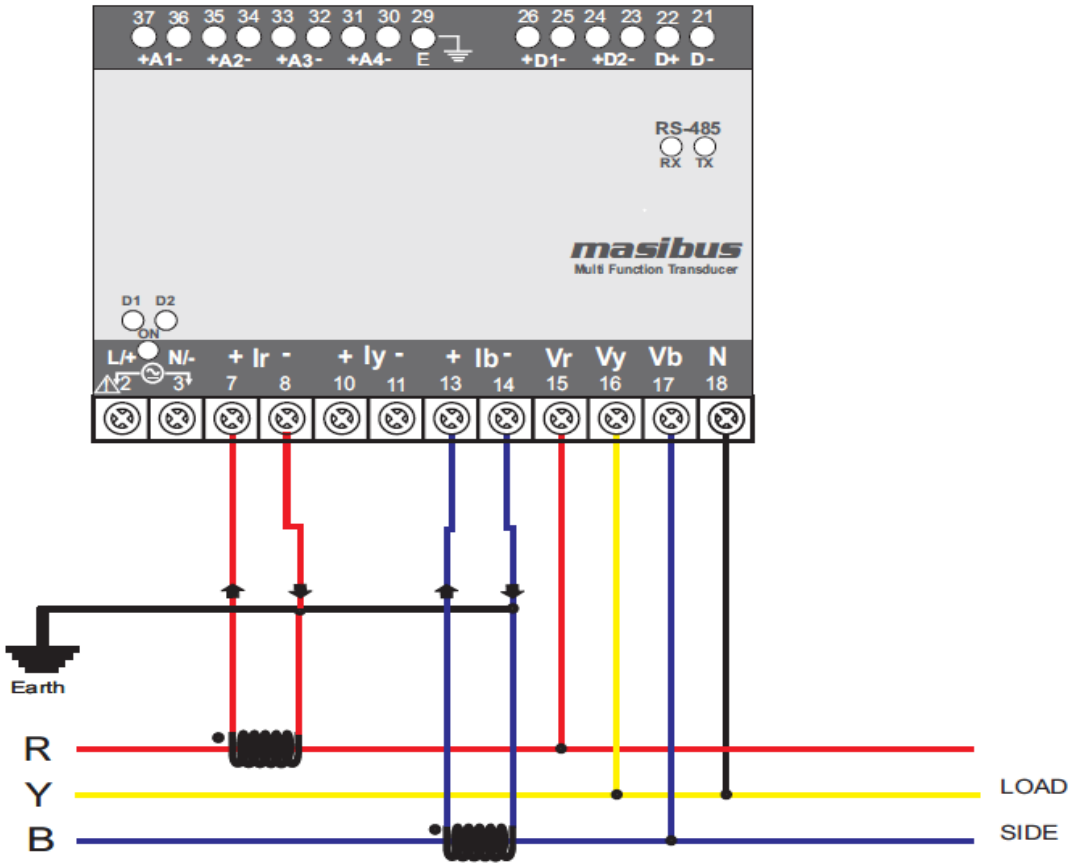


6.3.2 Three Phase Three Wire System

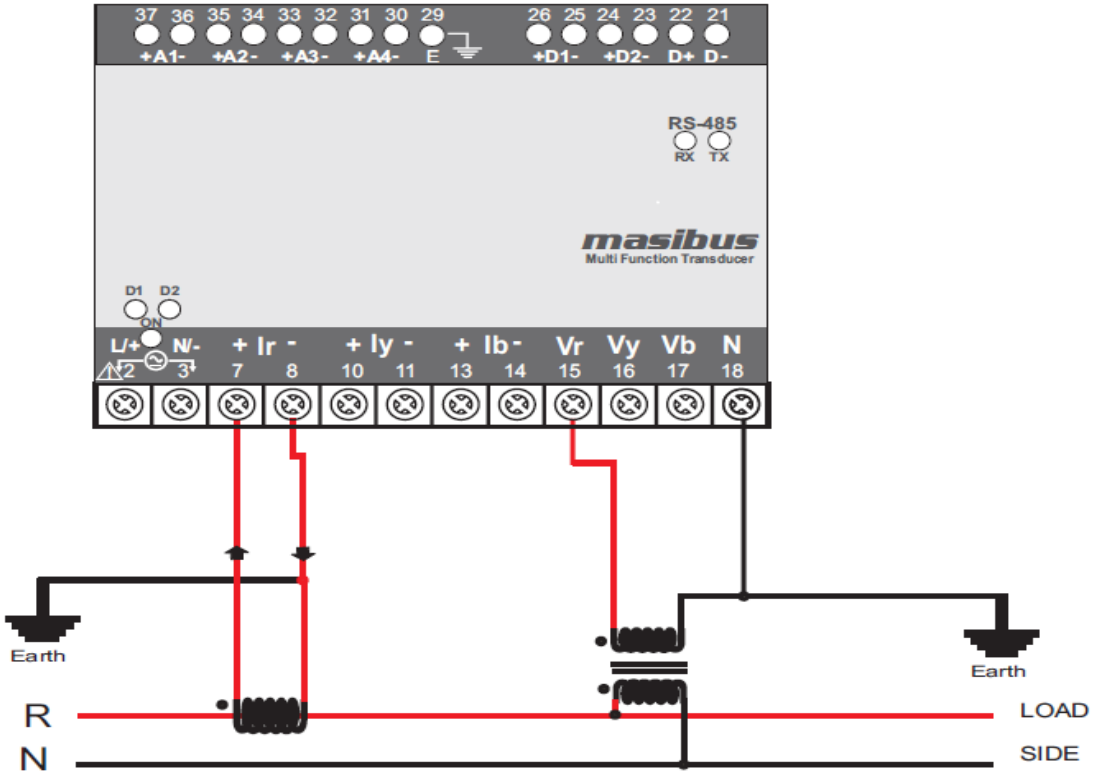
a) 3-Wire 2- Element Open Delta Connection Using 2PTs, 2CTs



b) 3-Wire 2- Element Direct Connection Using 2CTs



6.3.3 Single Phase Two Wire Configuration



Note: -*For Single Phase Two Wire, system should be 3P4W and Do not consider Average Voltage, Average Current & Average PF on the display or MODBUS.*

6.4 PTs and CTs

Large electrical installations have high voltages and currents, which may exceed the direct connection rating of the MFT. In this case, Potential Transformers (PTs) and Current Transformers (CTs) are used to precisely “step down” or reduce the voltage and current level to suit the Transducer rating. Potential Transformers usually have a full-scale output of 110V ac RMS line-line and Current Transformers, a full-scale output of 5A or sometimes 1A.

The PTs (Potential Transformers) and CTs (Current Transformers) must be planned, installed and tested by a qualified electrical contractor before wiring the transducer. The accuracy of the measurement also depends on the accuracy and phase – angle error of the PTs and CTs. Instrument Class 1 or better PTs and CTs are recommended. Do not use protection class CTs to feed the MFT; as they have poor accuracy and phase characteristics.

Ensure that the CT primary rating has been selected so that your normal load variation lies between 40% and 80% of its full scale. If your CT is over-rated, say if the load is always less than 10% of the CT primary rating, accuracy suffers.

6.4.1 PT, CT Wiring

The PTs and CTs must have adequate VA rating to support the burden (loading) on the secondary. You may want to support the auxiliary supply burden from one of the PTs. CTs wiring can impose additional burden (loading) on the CT. For example, if the CT has a 5A secondary and the wire resistance is 1.0 Ω, then the CT has to support an additional burden of 5VA. The wiring distance from the CT secondary to instrument should be such that, VA of wire path between MFT and CT along with VA of MFT should not exceed the VA rating of CT, otherwise the CT could get over-burdened and give large errors.

MFT should be conveniently located for easy connections of voltage (PT) and Current (CT) signals.

7. CONFIGURATION GUIDELINES

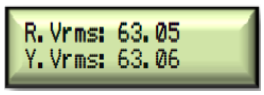
7.1 Modes of Operation

Power Indicator has four mode of operation:

- Run Mode
- PGM Mode (Edit Mode)
- AUTO/MANUAL SCROLL
- Reset Registers

7.2 Run Mode Detail

At power ON, the unit by default goes into RUN Mode. The following frame (if 3p4w) is displayed in AUTO SCROLL, just after flash of MASIBUS introduction frame.



In Manual Scroll it will display stored page, if it is programmed in PGM Mode.

AUTO SCROLL

To toggle the scroll mode i.e. Auto to manual or manual to Auto, press shift key for 5 seconds → 

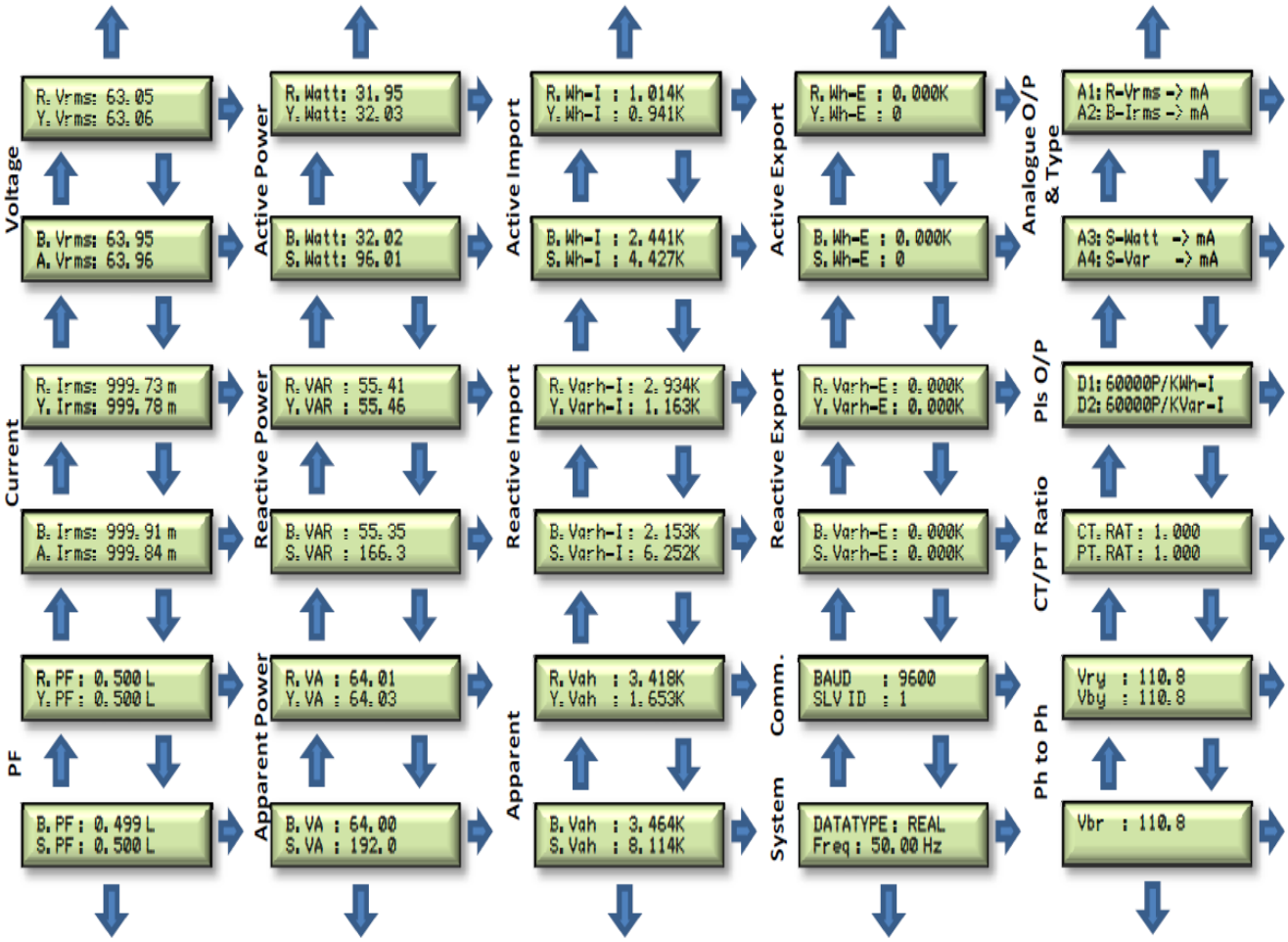
In Auto scroll mode, display screen will automatically scroll as per manual scroll menu & scroll time is 8 seconds.

MANUAL SCROLL

For horizontal movement of frame to frame, press  key and it will be in loop Similarly for Vertical movement of frames, use  or  key.

The sequence of frames, which can be observed in RUN Mode, is shown in below fig. There are two types of display menu: For 3P4W and for 3P3W.

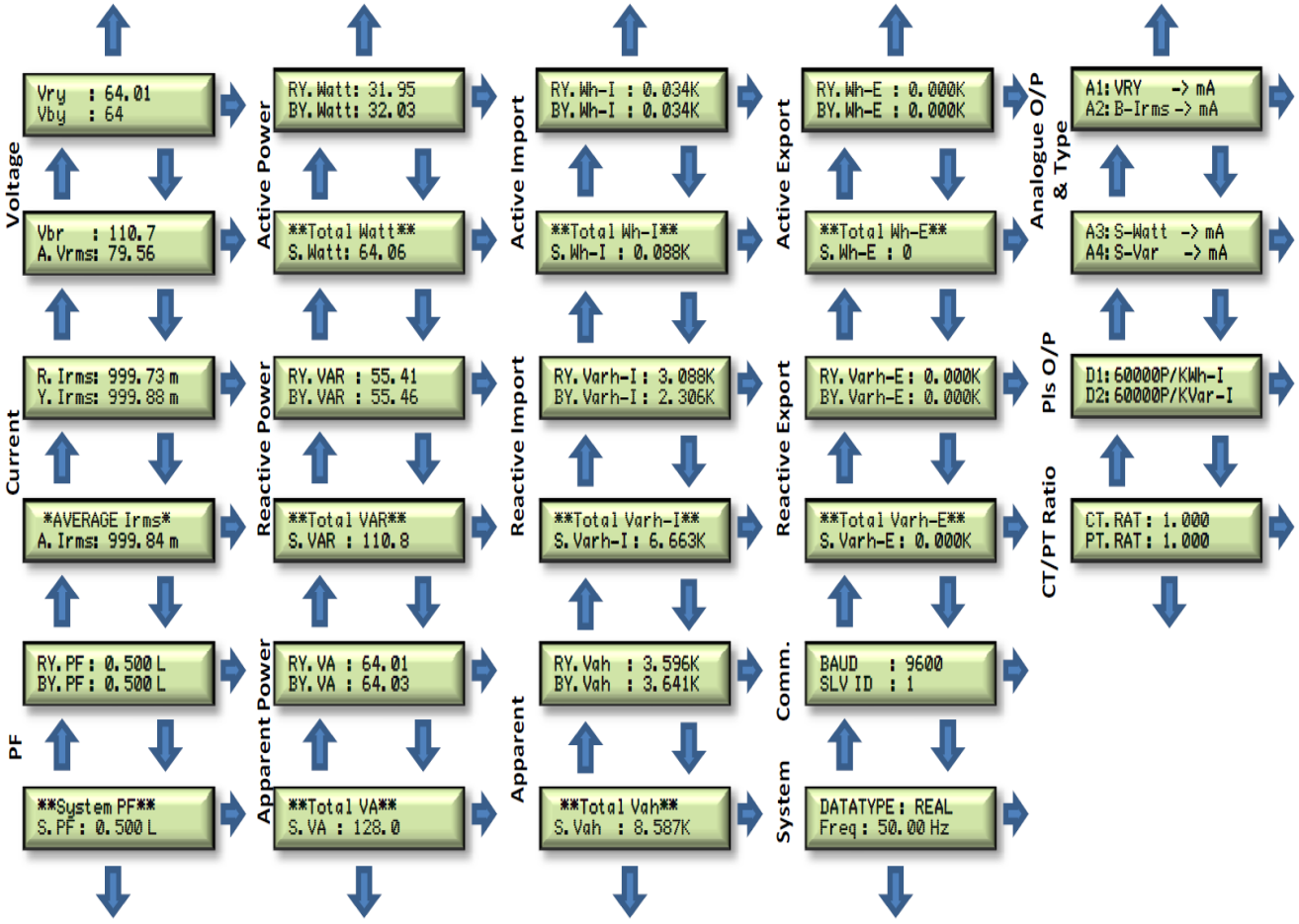
7.2.1 Display Page Matrix for 3 Phase 4 Wire System



3-Phase 4-Wire

Note:-
Above screens are only for information of RUN MODE pages, values inside the screens are not actual.
When ordering code is w/o LCD then Chapter – 7 will not be useful.

7.2.2 Display Page Matrix for 3 Phase 3 Wire System



3-Phase 3-Wire

Note:-
Above screens are only for information of RUN MODE pages, values inside the screens are not actual.
When ordering code is w/o LCD then Chapter – 7 will not be useful.

7.3 Program Mode Detail

The PROGRAM Mode can be entered by pressing the PGM key. Once the key is pressed, the unit prompts for four digit password as shown below.

Factory default password is 0001.If you have configured this password as per your choice then apply that password by setting blinking cursor position using three keys: SHIFT key to shift cursor position, UP & DOWN to change the digit value. After password is set press the PGM key to enter in to programming mode. If applied password is incorrect, it will show incorrect password message as shown in below screen and automatically comes out from program mode to normal mode.

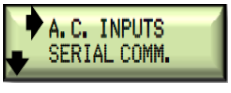
If the entered password is correct, it will flash as below:

And then the following screen is displayed:

Here arrow is a pointer at default position. By moving the pointer you can select the mode. By using UP or DOWN key, you can set arrow position and hence selection is made upon pressing PGM key. To get back to the previous menu press SHIFT key, as it is now functioning as ESCAPE key. Before starting this, see the flow diagram so you will have whole idea for where you want to go and which parameter you want to update or see. In PROGRAM mode you can enter from anywhere by pressing PGM key and you can escape from anywhere of PROGRAM mode by pressing SHIFT key for one step back at each pressing time.

7.4 Edit Mode Detail

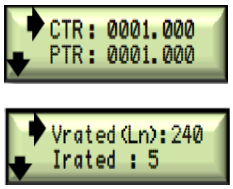
By Pressing PGM key on EDIT MODE, below screen will be shown:



To enter in to any option you have to apply same procedure as applied as at EDIT MODE i.e. set the arrow position and press PGM key. If you are pressing SHIFT key, you will come back one step and position of arrow will be at where you entered.
IP RESET option use only when MFT is with Ethernet.

7.4.1 A.C.INPUTS

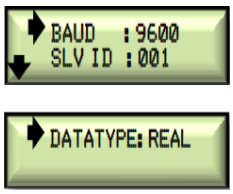
For this, screen will be shown like below:



Now here four parameters are available: CT RATIO, PT RATIO, Vrate and Irate. To change any parameter, set arrow and press PGM key, so blinking cursor will be on right most digits. Use SHIFT key to change position of blinking cursor digit by digit and update the digit by UP and DOWN keys. Select the required value and save it by pressing PGM key. Now you will come out from that stage so blinking cursor will be removed. If required, go for other and change the value. Before ***if you change Vrate and Irate parameters confirm that input to device is not more than 120% of Vrated or Irated.if it is above 120% of set value device may get damaged or malfunction.*** Finally press the SHIFT key to get escape from this screen and come back one step. Here arrow will be at where you entered.

7.4.2 SERIAL COMM.

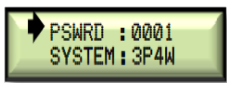
For this, screen will be shown like below:



Here three parameters are available: BAUD, SLV ID and DATA TYPE. BAUD is for Baud-Rate and SLV ID is for Slave Address of Meter for Modbus-RTU (Master-Slave) communication while DATA TYPE decides the data type in which the MFT sends data on RS-485 line. BAUD has three options like 09600, 19200 and 38400 , SLV ID should be between 1 and 247 and DATA TYPE has two option REAL and LONG .To change the value of BAUD, set the arrow and press PGM key, it will show blinking cursor before left most digit of present value of BAUD. Now just press UP or DOWN key to set required value and press PGM key to store this value in to EEPROM. For SLV ID, blinking cursor will be at right most digit of value, set the value as per previous explanation and save it. For DATA TYPE using UP or DOWN key select the required data type and press PGM key to store this value in to EEPROM. Finally press the SHIFT key to get escape from this screen and come back one step. Here arrow will be at where you entered.

7.4.3 METER SETTING

For this, screen will be shown like below:



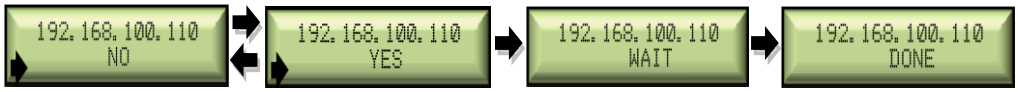
Here two parameters are available like: PSWRD & SYSTEM setting. PSWRD is for four digit password to security purpose. SYSTEM is used to whether MFT is for 3 phase 4 wire or for 3 phase 3 wire.

Note: Wiring for 3P4W and 3P3W are different so, change/check the wiring also if you are changing this parameter in installed device.

To change PSWRD value, apply same procedure as applied as in previous and save it. Finally press the SHIFT key to get escape from this screen and come back one step. Here arrow will be at where you entered.

7.4.4 IP RESET

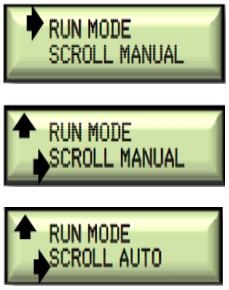
For this, screen will be shown like below:



IP RESET is for Default IP to **192.168.100.110**
Now for Reset IP, press PGM key, it will show blinking cursor left most value of NO, Now just press UP or DOWN key to set IP Reset NO or YES. If set YES and press PGM key than display WAIT and then after DONE, it show that the Default IP is store to EEPROM. Finally press the RIGHT SHIFT key to get escape from this screen and come back one step. Here arrow will be at where you entered.

7.5 AUTO/MANUAL SCROLL

AUTO/MANUAL SCROLL change can be done as mentioned below:



AUTO SCROLL

- From flow diagram you can see, the screens are in ROW and COLUMN. It will automatically scroll the page every 8 seconds COLUMN wise and will jump to next adjacent COLUMN for AUTO SCROLL.
- To toggle SCROLL mode i.e. Auto to Manual and Manual to Auto, press SHIFT key for 5 seconds, it will not get programmed, so till MFT gets Power off it will remain in that mode.
- To program MANUAL SCROLL and freeze particular page every time it get Power ON, first let that page come in AUTO SCROLL or go to that particular page using temporary MANUAL SCROLL than press PGM key to enter in to Program mode.
- In second line of display change it from AUTO SCROLL to MANUAL SCROLL by pressing PGM key again.
- If it is showing MANUAL SCROLL than change it to AUTO and then make it MANUAL SCROLL.

MANUAL SCROLL

- In MANUAL SCROLL, SHIFT, UP or DOWN Key will work as mentioned in 6.2.
- To toggle SCROLL mode i.e. Auto to Manual and Manual to Auto, press SHIFT key for 5 seconds, it will not get programmed, so till MFT gets Power off it will remain in that mode.
- To enter in to AUTO SCROLL go into the Programming mode and then change the selection from MANUAL SCROLL to AUTO SCROLL.
- In this mode '**:**' on every RUN MODE page will blink for indicate MANUAL SCROLL.

7.6 RESET REGS

In this mode you can reset energy registers. There are six types of registers like: Active [Im] for Active Import Energy, Active [Ex] for Active Export Energy, Reactive [Im] for Reactive Import Energy, Reactive [Ex] for Reactive Export Energy, Apparent for Apparent Energy and at the end one option is given to reset all these registers at the same time. It is indicated as RST ALL REG.

At a same time only two registers can be shown. For other registers, there is an indication of ▼ or ▲. So you can set arrow by using UP and DOWN key. In above screen first two registers are shown, having ▼ indication .i.e. these shown registers are up the list. Now suppose you are pressing DOWN key up to arrow is for Reactive [Im]. Now press DOWN key only once, screen will be shown like below:

Here it is showing both UP indication for some registers which are at upside and DOWN indication for some registers which are at down side. Now suppose you are pressing DOWN key up to arrow is for Apparent and RESET registers. Now press DOWN key only once, screen will be shown like below:

So you can set arrow as per this and press PGM key to enter ‘RST ALL REG.’ where screen shows like below:

Here is the confirmation that whether you are sure or not to erase energy data to reset it. If you set arrow before YES and pressed PGM, all registers (phase wise plus total) of this kind, energy will start from zero and you will come back one step where you entered, so you can go for another. If you set arrow before NO and pressed PGM key, you will come back one step where you entered without any reset. By this way you can reset any register.

8. MODBUS DETAILS

RS – 485 interface is provided to communicate with the MFT. The interface is available at the terminals. (Refer Wiring Details)

When controllers are setup to communicate on a Modbus network using RTU (Remote Terminal Unit) mode, each 8–bit byte in a message contains two 4–bit Hexadecimal characters. The main advantage of this mode is that, it's greater Character density allows better data throughput than ASCII for the same baud rate.
Use only following function codes for data read/write purpose

CODE	MEANING	ACTION
03	Read holding registers	Obtains current binary value in one or more holding registers.
04	Read Input registers	Obtains current binary value in one or more Input registers.
06	Preset single register	Place a specific binary value into a holding register.
16	Preset multiple register	Place a specific binary value into a multiple holding register.

8.1 Modbus Register Map for 3P4W parameters

Data read Query = [0 x Slave Id], [0 x Fun. Code], [0 x ADD. High], [0 x ADD. Low], [0 x No. of data word, High], [0 x No. of data word. Low] [0 x CRC Low] [0 x CRC High]

Function Code = 0X04
Address – between 30001 to 30097
No. of data word ≤ 98 & in multiple of 2 as all data are of 4 Bytes [Long & Real]. Enter only Even value (data word length).

Response = [0 x Slave Id], [0 x Fun. Code], [Byte count], [Data High], [Data Low] …... [Data. High], [Data. Low] [0 x CRC Low] [0 x CRC High]
[Data Format:** Long & Real**]

S. No.	Address	Measured parameter	words	Multiplication Factor (if data type is long)
1	30001	Frequency	2	0.01
2	30003	R. PF	2	0.001
3	30005	Y. PF	2	0.001
4	30007	B. PF	2	0.001
5	30009	System. PF	2	0.001
6	30011	R. Vrms	2	0.1
7	30013	Y. Vrms	2	0.1
8	30015	B. Vrms	2	0.1
9	30017	A. Vrms	2	0.1
10	30019	Vrms R_Y	2	0.1
11	30021	Vrms B_Y	2	0.1
12	30023	Vrms B_R	2	0.1
13	30025	R. Irms	2	0.001
14	30027	Y. Irms	2	0.001
15	30029	B. Irms	2	0.001
16	30031	A. Irms	2	0.001
17	30033	Reserved	-	-
18	30035	R. Watt	2	1
19	30037	Y. Watt	2	1

20	30039	B. Watt	2	1
21	30041	S. Watt	2	1
22	30043	R. Var	2	1
23	30045	Y. Var	2	1
24	30047	B. Var	2	1
25	30049	S. Var	2	1
26	30051	R. VA	2	1
27	30053	Y. VA	2	1
28	30055	B. VA	2	1
29	30057	S. VA	2	1
30	30059	R. Wh-Import	2	0.1
31	30061	Y. Wh-Import	2	0.1
32	30063	B. Wh-Import	2	0.1
33	30065	T. Wh-Import	2	0.1
34	30067	R. Wh-Export	2	0.1
35	30069	Y. Wh-Export	2	0.1
36	30071	B. Wh-Export	2	0.1
37	30073	T. Wh-Export	2	0.1
38	30075	R. Varh-Import	2	0.1
39	30077	Y. Varh-Import	2	0.1
40	30079	B. Varh-Import	2	0.1
41	30081	T. Varh-Import	2	0.1
42	30083	R. Varh-Export	2	0.1
43	30085	Y. Varh-Export	2	0.1
44	30087	B. Varh-Export	2	0.1
45	30089	T. Varh-Export	2	0.1
46	30091	R. Vah	2	0.1
47	30093	Y. Vah	2	0.1
48	30095	B. Vah	2	0.1
49	30097	T. Vah	2	0.1

8.2 Modbus Register Map for 3P3W Parameters

Data read Query = [0 x Slave Id], [0 x Fun. Code], [0 x ADD. High], [0 x ADD. Low], [0 x No. of data word, High], [0 x No. of data word. Low] [0 x CRC Low] [0 x CRC High]

Function Code = 0X04
Address – between 30001 to 30097
No. of data word ≤ 98 & in multiple of 2 as all data are of 4 Bytes [Long & Real].

Response = [0 x Slave Id], [0 x Fun. Code], [Byte count], [Data High], [Data Low] …... [Data. High], [Data. Low] [0 x CRC Low] [0 x CRC High]
[Data Format:** long & Real**]

S. No.	Address	Measured parameter	words	Multiplication Factor (if data type is long)
1	30001	Frequency	2	0.01
2	30003	R_Y. PF	2	0.001
3	30005	Reserved	-	-
4	30007	B_Y. PF	2	0.001
5	30009	System. PF	2	0.001
6	30011	R_Y.Vrms	2	0. 1
7	30013	R_B.Vrms	2	0. 1
8	30015	B_Y.Vrms	2	0. 1
9	30017	A.Vrms	2	0. 1

10	30019	Reserved	-	-
11	30021	Reserved	-	-
12	30023	Reserved	-	-
13	30025	R. Irms	2	0.001
14	30027	Reserved	-	-
15	30029	B. Irms	2	0.001
16	30031	A. Irms	2	0.001
17	30033	Reserved	-	-
18	30035	R_Y. Watt	2	1
19	30037	Reserved	-	-
20	30039	B_Y. Watt	2	1
21	30041	S. Watt	2	1
22	30043	R_Y. Var	2	1
23	30045	Reserved	-	-
24	30047	B_Y. Var	2	1
25	30049	S. Var	2	1
26	30051	R_Y. VA	2	1
27	30053	Reserved	-	-
28	30055	B_Y. VA	2	1
29	30057	S. VA	2	1
30	30059	R_Y. Wh-Import	2	0.1
31	30061	Reserved	-	-
32	30063	B_Y. Wh-Import	2	0.1
33	30065	T. Wh-Import	2	0. 1
34	30067	R_Y. Wh-Export	2	0. 1
35	30069	Reserved	-	-
36	30071	B_Y. Wh-Export	2	0. 1
37	30073	T. Wh-Export	2	0. 1
38	30075	R_Y. Varh-Import	2	0. 1
39	30077	Reserved	-	-
40	30079	B_Y. Varh-Import	2	0. 1
41	30081	T. Varh-Import	2	0. 1
42	30083	R_Y. Varh-Export	2	0. 1
43	30085	Reserved	-	-
44	30087	B_Y. Varh-Export	2	0. 1
45	30089	T. Varh-Export	2	0. 1
46	30091	R_Y. Vah	2	0. 1
47	30093	Reserved	-	-
48	30095	B_Y. Vah	2	0. 1
49	30097	T. Vah	2	0. 1

Note: If data type is **long** in power meter then set **Swapped long** in Modbus master. If data type is **Real** power meter then set **Swapped Float** in Modbus master.
Note: Energy will be in Kilo for Real data type and for Long data type multiply with constant stated to get energy in Kilo unit.
Note: *Ignore address which are not mentioned in the memory map as they are useful in 3P4W mode.*
Note: Ignore value for **Reserved** in Modbus Memory Map.

8.3 Modbus Register Map for configuration parameters

Read Holding Register

Data read Query = [0 x Slave Id], [0 x Fun. Code], [0 x ADD. High], [0 x ADD. Low], [0 x No. of data word, High], [0 x No. of data word. Low] [0 x CRC Low] [0 x CRC High]

Function Code = 0X03
Address – between 40001 to 40015
No. of data word ≤ 16 & in multiple of 2 as all data are of 4 Bytes [Swapped Float].

Function Code = 0X03
Address – between 40101 to 40153
No. of data word ≤ 53 & in multiple of 1 as all data are of 2 Bytes [Decimal].

Response = [0 x Slave Id], [0 x Fun. Code], [Byte count], [Data High], [Data Low] …... [Data. High], [Data. Low] [0 x CRC Low] [0 x CRC High]

Preset Single Register

Data write Query = [0 x Slave Id], [0 x Fun. Code], [0 x ADD. High], [0 x ADD. Low], [0 x Data High], [0 x Data Low], [0 x CRC Low] [0 x CRC High]

Function Code = 0X06
Address – Any Single Register between 40101 to 40153
Data = Data of 1 word, as all data are of 2 Bytes [Decimal].

Response = [0 x Slave Id], [0 x Fun. Code], [0 x ADD. High], [0 x ADD. Low], [0 x Data High], [0 x Data Low], [0 x CRC Low] [0 x CRC High]

Preset Multiple Register

Data write Query = [0 x Slave Id], [0 x Fun. Code], [0 x ADD. High], [0 x ADD. Low], [0 x No.of Reg.High], [0 x No.of Reg.Low], [0 x No.of Byte], [0 x Data High], [0 x Data Low], [0 x CRC Low] [0 x CRC High]

Function Code = 0X16
Address – Any Multiple Register between 40001 to 40015
Data = Data of 2 word, as all data are of 4 Bytes [Swapped Float].

Response = [0 x Slave Id], [0 x Fun. Code], [0 x ADD. High], [0 x ADD. Low], [0 x No.of Reg.High], [0 x No.of Reg.Low], [0 x CRC Low] [0 x CRC High]

S. No.	Address	Measured parameter	words	Minimum value	Maximum value
1	40001	A1 measurand range low (see note 1)	2	(see Table 1)	(see Table 1)
2	40003	A1 measurand range High (see note 1)	2	(see Table 1)	(see Table 1)
3	40005	A 2 measurand range low (see note 1)	2	(see Table 1)	(see Table 1)
4	40007	A 2 measurand range High (see note 1)	2	(see Table 1)	(see Table 1)
5	40009	A3 measurand range low (see note 1)	2	(see Table 1)	(see Table 1)
6	40011	A3 measurand range High (see note 1)	2	(see Table 1)	(see Table 1)
7	40013	A4 measurand range low (see note 1)	2	(see Table 1)	(see Table 1)
8	40015	A4 measurand range High	2	(see Table 1)	(see Table 1)

		(see note 1)			
9	40101	Password	1	1	9999
10	40102	Slave address	1	1	247
11	40103	Baud rate (9600, 19200, 38400)	1	9600	38400
12	40104	Energy type for D1 (see Table 2)	1	0	9
13	40105	System type (see Table 3) (see note 4)	1	0	1
14	40106	PF1 type (read only value) (see Table 4)	1	0	2
15	40107	PF2 type (read only value) (For 3P4W only) (see Table 4)	1	0	2
16	40108	PF3 type (read only value) (see Table 4)	1	0	2
17	40109	System PF type(read only value) (see Table 4)	1	0	2
18	40110	CT Ratio – High byte(see note 2)	1	0	152
19	40111	CT Ratio – low byte(see note 2)	1	1000	65535
20	40112	PT Ratio – high byte(see note 2)	1	0	152
21	40113	PT Ratio – low byte(see note 2)	1	1000	65535
22	40114	Rated Voltage(P-N secondary) (64,110,120,240)	1	64	240
23	40115	Rated Current secondary(1,5)	1	1	5
24	40116	Pulse constant for D1	1	1	65000
25	40121	Data type(see Table 6) (see note 3)	1	0	1
26	40130	Reset All/Individual Energy Reg.(Write only)(see Table 5)	1	80	85
27	40131	Energy type for D2 (see Table 2)	1	0	9
28	40132	Pulse constant for D2	1	1	65000
29	40133	A1 o/p Parameter selection (see Table 7)	1	0	30
30	40134	A2 o/p Parameter selection (see Table7)	1	0	30
31	40135	A3 o/p Parameter selection (see Table 7)	1	0	30
32	40136	A4 o/p Parameter selection (see Table 7)	1	0	30
33	40137	A1 Output Type (see Table 8) (see note 6)	1	0	2
34	40138	A2 Output Type (see Table 8) (see note 6)	1	0	2
35	40139	A3 Output Type (see Table 8) (see note 6)	1	0	2
36	40140	A4 Output Type (see Table 8) (see note 6)	1	0	2
37	40141	Firmware version	1	-	-
38	40142	A1 PF Type Low(see Table 9)	1	1	2

39	40143	A1 PF Type High(see Table 9)	1	1	2
40	40144	A2 PF Type Low(see Table 9)	1	1	2
41	40145	A2 PF Type High(see Table 9)	1	1	2
42	40146	A3 PF Type Low(see Table 9)	1	1	2
43	40147	A3 PF Type High(see Table 9)	1	1	2
44	40148	A4 PF Type Low(see Table 9)	1	1	2
45	40149	A4 PF Type High(see Table 9)	1	1	2
46	40150	A1 PF direction(see Table 10)	1	0	1
47	40151	A1 PF direction(see Table 10)	1	0	1
48	40152	A1 PF direction(see Table 10)	1	0	1
49	40153	A1 PF direction(see Table 10)	1	0	1
50	40154	IP Reset (see Table 11)	1	0	1

Note 1: For writing to this Register Address use Function code 16 and select data type Swapped float. Also take care measurand range low should not equal or greater than measurand range High.

Note 2: Maximum CT & PT Ratio value is 9999999 i.e. maximum values is 9999.999 & minimum value is 1000 i.e. 1.000

For entering CT and Pt ratio refer the below example.

Example:

For entering CTR value 1234.567, convert 1234567 in to hexadecimal i.e. 2D687.
Now enter lower four byte (D687) at 40111 and higher four byte (0012) at 40110 addresses respectively.

Note 3: If data type is **long** in MFT then set **Swapped long** in Modbus master.
If data type is **float** MFT then set **Swapped Float** in Modbus master.

Note 4: ignore address which is not mentioned in the memory map as they are useful in 3P4W mode, do proper wiring as stated in Wiring detail section. Also Check the AO Parameters as mapping and Availability of particular Parameter is different for 3p4w and 3p3w; see Table 7 for more detail.

Note 5: Energy will be in Kilo for float value and for Long data type multiply with constant stated to get energy in Kilo unit.

Note 6: For changing the O/P type one also need to change the J2,J3,J5,J6,J7,J8 jumper on AO card and J8,J9 on Ethernet Card. put female jumper between pin 1&2 for current(4-20mA) o/p and 2&3 for Voltage o/p(0-10V).

Table 1:

Parameter mapped to AO Channel	Min. Value	Max. Value
Frequency(Hz)	0.0	65.0
PF	-1.0	1.0
Phase Voltage(V)	0.0	10,00,000.0
Line Voltage(V)	0.0	10,00,000.0
Current(A)	0.0	10,000.0
Active Power(W)	-2,00,00,00,000.0	2,00,00,00,000.0
Reactive Power(Var)	-2,00,00,00,000.0	2,00,00,00,000.0
Apparent Power(VA)	0.0	2,00,00,00,000.0

Table 2:

Value	Energy type for Pulse Output
0	KWh Import
1	KWh Export
2	KVarh - Import
3	KVarh - Export
4	KVAh
5	MWh Import
6	MWh Export
7	MVarh - Import
8	MVarh - Export
9	MVAh

Table 3:

Value	System Type
0	3P4W
1	3P3W

Table 4:

Value(read only)	PF Type
0	Unity
1	Lag
2	Lead

Table 5:

Value(write only)	Reset Energy Register
80	Active Import
81	Active Export
82	Reactive Import
83	Reactive Export
84	Apparent
85	All Energy

Table 6:

Value	Data Type
0	Swapped Long
1	Swapped Float

Table 7:

Value	AO Parameter mapping	
	3P4W	3P3W
0	R-Phase Frequency	R_Y Phase Frequency
1	Y-Phase Frequency	-
2	B-Phase Frequency	B_Y Phase Frequency
3	System Frequency	System frequency
4	R Phase PF	-
5	Y Phase PF	-
6	B Phase PF	-

7	System PF	System PF
8	R Phase Voltage	R_Y Phase Voltage
9	Y Phase Voltage	B_R Phase Voltage
10	B Phase Voltage	B_Y Phase Voltage
11	Average Voltage	Average Voltage
12	R_Y Phase Voltage	-
13	B_R Phase Voltage	-
14	B_Y Phase Voltage	-
15	R Phase Current	R Phase Current
16	Y Phase Current	-
17	B Phase Current	B Phase Current
18	Average Current	Average Current
19	R Phase Active Power	R_Y Phase Active Power
20	Y Phase Active Power	-
21	B Phase Active Power	B_Y Phase Active Power
22	Total Active Power	Total Active Power
23	R Phase Reactive Power	R_Y Phase Reactive Power
24	Y Phase Reactive Power	-
25	B Phase Reactive Power	B_Y Phase Reactive Power
26	Total Reactive Power	Total Reactive Power
27	R Phase Apparent Power	R_Y Phase Apparent Power
28	Y Phase Apparent Power	-
29	B Phase Apparent Power	B_Y Phase Apparent Power
30	Total Apparent Power	Total Apparent Power

Table 8:

Value	Output Type
0	Current 4-20mA
1	Voltage 0-10V
2	Disable(~0mA for current o/p & -0.7V for Voltage o/p)

Table 9:

Value	System Type
1	Lag
2	Lead

Table 10:

Value	System Type
0	Anticlockwise
1	Clockwise

Table 11:

Value	Status
0	(Write 0) No change
1	(Write 1) IP Reset to 192.168.100.110
2	Wait for IP Reset
3	IP Reset Done

8.4 Exception Responses

Exception response is a notification of an error. The exception response codes are listed in the table below. When a slave detects one of these errors, it sends a response to the master consisting of slave address, function code, error code and error check field.
To indicate that the response is a notification of an error, the high order bit of the function code is set to 1.

CODE	NAME	MEANING
01	Illegal Function	The message function received is not an allowable action for slave.
02	Illegal Data Address	The address referenced in the data field is not an allowable address for the addressed slave location.
03	Illegal Data Value	The value referenced in the data field is not allowable in the addressed slave location.
06	Slave Device Busy	The slave is engaged in processing a program command. The master should retransmit the message later when slave is free.

Example

Query Message

SLAVE ADDR	FUNCTION CODE	H.O START ADDR	L.O START ADDR	H.O NO OF REG	L.O NO OF REG	ERROR CHECK FIELD	ERROR CHECK FIELD
0x0A	0x01	0x00	0x24	0x00	0x02	0xFC	0xBB

The query requests the status of input 0036 in slave no. 10. Since the function is an invalid function for 2160-A, so the following error response will be generated.

Response Message

SLAVE ADDR	FUNCTION CODE	EXCEPTION CODE	ERROR CHECK	ERROR CHECK
0x0A	0x81	0x01	0xF0	0x52

The function field is the original function code with the high order bit set and exception code 01 indicates an illegal function field.
When slave device that is power meter is in the PROGRAM mode, a busy state is transmitted indicating that slave device is busy and the master should retransmit the message later when the slave is free. So here exception code 0x06 is transmitted. Response message is shown below.

Response Message

SLAVE ADDR	FUNCTION CODE	EXCEPTION CODE	ERROR CHECK	ERROR CHECK
Device ID	Fun. Code + 0x80	0x06	0xC3	0x02

8.4.1 Read Holding Register (Function Code 03)

To get value of configuration parameters (CT Ratio, PT Ratio, Pls/KWh, Baud, Slave address etc.) and Analogue Measurement range parameters, you have to use function code **03.** Here the addressing allows to **8** registers (2- words) and **41** registers (Words) to be obtained at each request.

8.4.2 Preset Single Register (Function Code 06)

Function (06) will overwrite controller memory.

Function (06) allows the user to modify the contents of a holding register for configuration parameter. The values are provided in binary, up to the maximum capacity of the controller and unused higher bits must be set to zero.

Example

This example will set the CT Ratio value in slave number 17. Here CT Ratio and PT ratio requires 2 integer register for each. So you should write higher integer and lower integer value to get whole Ratio value. Suppose you want to write CT RATIO = 5,then you have to take 5000 to write because in unit side this 5000 will be divided by 1000 i.e. you will get 5.Now Hex value of 5000 is 0x1388,so you will take 0x00 for higher integer register and 0x1388 for lower integer register. The address of CT Higher integer is 0x6D and value to be programmed is 0x0000.

Similarly you can do for lower integer and also for PT RATIO. The normal response to a preset single register request is to transmit the query message after the register has been altered,

If the value is an illegal value then the response message will be an exception response (Error Message). For the details of maximum and minimum values of any parameter refer to manual.

8.4.3 Preset multiple Register (Function Code 16)

Function (16) will overwrite controller memory.

Function (16) allows the user to modify the contents of a multiple holding register for configuration parameter. The values are provided in binary, up to the maximum capacity of the controller and unused higher bits must be set to zero.

Example
This example will set the Analog channel measurand Low value in slave number 17. Select Data type Swapped float in PC based modbus software. Write Value 100.0 in this register

Query Message

SLAVE ADDR	FUNC CODE	H.O START ADDR	L.O START ADDR	NO. OF REG. HIGH	NO. OF REG. LOW	NO. OF BYTE	DATA VALUE H.O.	DATA VALUE L.O.	ERROR CHECK FIELD	ERROR CHECK FIELD
0x11	0x10	0x00	0x00	0x00	0x02	0x04	0x42 C8	0x0000	0x66	0x29

Similarly you can write more than one float register at a time with this Function code.

Response Message

SLAVE ADDR	FUNC CODE	H.O START ADDR	L.O START ADDR	NO.OF REG. HIGH	NO.OF REG. LOW	ERROR CHECK FIELD	ERROR CHECK FIELD
0x11	0x10	0x00	0x00	0x00	0x02	0x89	0x84

If the value is an illegal value then the response message will be an exception response (Error Message). For the details of maximum and minimum values of any parameter refer to manual.

9. ETHERNET DETAILS

Ethernet interface is provided to remotely communicate with the MFT. The RJ-45 Connector provided on the front side of MFT.

9.1 Interface Standard

The configuration details to communicate with the transducer are given below
Interface : RJ45
Speed : 10/100 Mbps
Protocol : Modnet
Data type : Swapped Float/ Swapped Long/Decimal

9.2 Protocol

The Ethernet interfaces use MODNET Protocol in RTU Mode. Communicating with MFT involves sending commands to the transducer for reading and writing the particular register. The IP address can be changed through MASIBUS configuration software or web.

9.3 Modnet Register Map for 3P4W parameters

***[Data Format:** Long & Real]*

S. No.	Address	Measured parameter	words	Multiplication Factor (if data type is long)
1	40001	Frequency	2	0.01
2	40003	R. PF	2	0.001
3	40005	Y. PF	2	0.001
4	40007	B. PF	2	0.001
5	40009	System. PF	2	0.001
6	40011	R. Vrms	2	0.1
7	40013	Y. Vrms	2	0.1
8	40015	B. Vrms	2	0.1
9	40017	A. Vrms	2	0.1
10	40019	Vrms R_Y	2	0.1
11	40021	Vrms B_Y	2	0.1
12	40023	Vrms B_R	2	0.1
13	40025	R. Irms	2	0.001
14	40027	Y. Irms	2	0.001
15	40029	B. Irms	2	0.001
16	40031	A. Irms	2	0.001
17	40033	Reserved	-	-
18	40035	R. Watt	2	1
19	40037	Y. Watt	2	1
20	40039	B. Watt	2	1
21	40041	S. Watt	2	1
22	40043	R. Var	2	1
23	40045	Y. Var	2	1
24	40047	B. Var	2	1
25	40049	S. Var	2	1
26	40051	R. VA	2	1
27	40053	Y. VA	2	1
28	40055	B. VA	2	1
29	40057	S. VA	2	1
30	40059	R. Wh-Import	2	0.1
31	40061	Y. Wh-Import	2	0.1

32	40063	B. Wh-Import	2	0.1
33	40065	T. Wh-Import	2	0.1
34	40067	R. Wh-Export	2	0.1
35	40069	Y. Wh-Export	2	0.1
36	40071	B. Wh-Export	2	0.1
37	40073	T. Wh-Export	2	0.1
38	40075	R. Varh-Import	2	0.1
39	40077	Y. Varh-Import	2	0.1
40	40079	B. Varh-Import	2	0.1
41	40081	T. Varh-Import	2	0.1
42	40083	R. Varh-Export	2	0.1
43	40085	Y. Varh-Export	2	0.1
44	40087	B. Varh-Export	2	0.1
45	40089	T. Varh-Export	2	0.1
46	40091	R. Vah	2	0.1
47	40093	Y. Vah	2	0.1
48	40095	B. Vah	2	0.1
49	40097	T. Vah	2	0.1

Note: Use function code: 03-Read Holding Register, Data Type: Swapped Float

9.4 Modnet Register Map for 3P3W Parameters

***[Data Format:** long & Real]*

S. No.	Address	Measured parameter	words	Multiplication Factor (if data type is long)
1	40001	Frequency	2	0.01
2	40003	R_Y. PF	2	0.001
3	40005	Reserved	-	-
4	40007	B_Y. PF	2	0.001
5	40009	System. PF	2	0.001
6	40011	R_Y.Vrms	2	0. 1
7	40013	R_B.Vrms	2	0. 1
8	40015	B_Y.Vrms	2	0. 1
9	40017	A.Vrms	2	0. 1
10	40019	Reserved	-	-
11	40021	Reserved	-	-
12	40023	Reserved	-	-
13	40025	R. Irms	2	0.001
14	40027	Reserved	-	-
15	40029	B. Irms	2	0.001
16	40031	A. Irms	2	0.001
17	40033	Reserved	-	-
18	40035	R_Y. Watt	2	1
19	40037	Reserved	-	-
20	40039	B_Y. Watt	2	1
21	40041	S. Watt	2	1
22	40043	R_Y. Var	2	1
23	40045	Reserved	-	-
24	40047	B_Y. Var	2	1
25	40049	S. Var	2	1
26	40051	R_Y. VA	2	1
27	40053	Reserved	-	-
28	40055	B_Y. VA	2	1
29	40057	S. VA	2	1

30	40059	R_Y. Wh-Import	2	0.1
31	40061	Reserved	-	-
32	40063	B_Y. Wh-Import	2	0.1
33	40065	T. Wh-Import	2	0. 1
34	40067	R_Y. Wh-Export	2	0. 1
35	40069	Reserved	-	-
36	40071	B_Y. Wh-Export	2	0. 1
37	40073	T. Wh-Export	2	0. 1
38	40075	R_Y. Varh-Import	2	0. 1
39	40077	Reserved	-	-
40	40079	B_Y. Varh-Import	2	0. 1
41	40081	T. Varh-Import	2	0. 1
42	40083	R_Y. Varh-Export	2	0. 1
43	40085	Reserved	-	-
44	40087	B_Y. Varh-Export	2	0. 1
45	40089	T. Varh-Export	2	0. 1
46	40091	R_Y. Vah	2	0. 1
47	40093	Reserved	-	-
48	40095	B_Y. Vah	2	0. 1
49	40097	T. Vah	2	0. 1

Note: Use function code: 03-Read Holding Register, Data Type: Swapped Float

9.5 Modnet Register Map for configuration parameters

S. No.	Address (READ)	Address (WRITE)	Measured parameter	word	Minimum value	Maximum value
1	40099	41026	A1 measurand range low (see note 1)	2	(see Table 1)	(see Table 1)
2	40101	41028	A1 measurand range High (see note 1)	2	(see Table 1)	(see Table 1)
3	40103	41030	A 2 measurand range low (see note 1)	2	(see Table 1)	(see Table 1)
4	40105	41032	A 2 measurand range High (see note 1)	2	(see Table 1)	(see Table 1)
5	40107	41034	A3 measurand range low (see note 1)	2	(see Table 1)	(see Table 1)
6	40109	41036	A3 measurand range High (see note 1)	2	(see Table 1)	(see Table 1)
7	40111	41038	A4 measurand range low (see note 1)	2	(see Table 1)	(see Table 1)
8	40113	41040	A4 measurand range High (see note 1)	2	(see Table 1)	(see Table 1)
9	40115	41042	Password	1	1	9999
10	40116	41043	Slave address	1	1	247
11	40117	41044	Baud rate (9600, 19200, 38400)	1	9600	38400
12	40118	41045	Energy type for D1 (see Table 2)	1	0	9
13	40119	41046	System type (see Table 3) (see note 4)	1	0	1
14	40120	-	PF1 type (read only value) (see Table 4)	1	0	2
15	40121	-	PF2 type (read only value) (For 3P4W only) (see Table 4)	1	0	2

16	40122	-	PF3 type (read only value) (see Table 4)	1	0	2
17	40123	-	System PF type(read only value) (see Table 4)	1	0	2
18	40124	41047	CT Ratio – High byte (see note 2)	1	0	152
19	40125	41048	CT Ratio – low byte (see note 2)	1	1000	65535
20	40126	41049	PT Ratio – high byte (see note 2)	1	0	152
21	40127	41050	PT Ratio – low byte (see note 2)	1	1000	65535
22	40128	41051	Rated Voltage(P-N Secondary) (64,110,120,240)	1	64	240
23	40129	41052	Rated Current secondary(1,5)	1	1	5
24	40130	41053	Pulse constant for D1	1	1	65000
25	40135	41054	Data type(see Table 6) (see note 3)	1	0	1
26	-	41055	Reset All/Individual Energy Reg.(Write only)(see Table 5)	1	80	85
27	40145	41056	Energy type for D2 (see Table 2)	1	0	9
28	40146	41057	Pulse constant for D2	1	1	65000
29	40147	41058	A1 o/p Parameter selection (see Table 7)	1	0	30
30	40148	41059	A2 o/p Parameter selection (see Table7)	1	0	30
31	40149	41060	A3 o/p Parameter selection (see Table 7)	1	0	30
32	40150	41061	A4 o/p Parameter selection (see Table 7)	1	0	30
33	40151	41062	A1 Output Type (see Table 8) (see note 6)	1	0	2
34	40152	41063	A2 Output Type (see Table 8) (see note 6)	1	0	2
35	40153	41064	A3 Output Type (see Table 8) (see note 6)	1	0	2
36	40154	41065	A4 Output Type (see Table 8) (see note 6)	1	0	2
37	40155	-	Firmware version	1	-	-
38	40156	41066	A1 PF Type Low(see Table 9)	1	1	2
39	40157	41067	A1 PF Type High(see Table 9)	1	1	2
40	40158	41068	A2 PF Type Low(see Table 9)	1	1	2
41	40159	41069	A2 PF Type High(see Table 9)	1	1	2
42	40160	41070	A3 PF Type Low(see Table 9)	1	1	2
43	40161	41071	A3 PF Type High(see Table 9)	1	1	2
44	40162	41072	A4 PF Type Low(see Table 9)	1	1	2
45	40163	41073	A4 PF Type High(see Table 9)	1	1	2
46	40164	41074	A1 PF direction(see Table 10)	1	0	1
47	40165	41075	A1 PF direction(see Table 10)	1	0	1
48	40166	41076	A1 PF direction(see Table 10)	1	0	1
49	40167	41077	A1 PF direction(see Table 10)	1	0	1

Note: For read Use function code : 03-Read Holding Register
Data Type : Decimal/Swapped float
For write Use function code : 06/16-Write single/multiple Holding Register
Data Type: Decimal/Swapped float
Use function code 06 and data type decimal for 1 word length resister and for 2 word length resister
Use function code 16 and data type Swapped float for writing.

Note 1: For writing to this Register Address use Function code 16 and select data type Swapped float. Also take care measurand range low should not equal or greater than measurand range High.

Note 2: Maximum CT & PT Ratio value is 9999999 i.e. maximum values is 9999.999 & minimum value is 1000 i.e. 1.000
For entering CT and Pt ratio refer the below example.

Example:
For entering CTR value 1234.567, convert 1234567 in to hexadecimal i.e. 2D687.
Now enter lower four byte (D687) at 40111 and higher four byte (0012) at 40110 addresses respectively.

Note 3: If data type is **long** in MFT then set **Swapped long** in Modbus master.
If data type is **float** MFT then set **Swapped Float** in Modbus master.

Note 4: ignore address which is not mentioned in the memory map as they are useful in 3P4W mode, do proper wiring as stated in Wiring detail section. Also Check the AO Parameters as mapping and Availability of particular Parameter is different for 3p4w and 3p3w; see Table 7 for more detail.

Note 5: Energy will be in Kilo for float value and for Long data type multiply with constant stated to get energy in Kilo unit.

Note 6: For changing the O/P type one also need to change the J2,J3,J5,J6,J7,J8 jumper on AO card and J8,J9 on Ethernet Card. put female jumper between pin 1&2 for current(4-20mA) o/p and 2&3 for Voltage o/p(0-10V).

Table 1:

Parameter mapped to AO Channel	Min. Value	Max. Value
Frequency(Hz)	0.0	65.0
PF	-1.0	1.0
Phase Voltage(V)	0.0	10,00,000.0
Line Voltage(V)	0.0	10,00,000.0
Current(A)	0.0	10,000.0
Active Power(W)	-2,00,00,00,000.0	2,00,00,00,000.0
Reactive Power(Var)	-2,00,00,00,000.0	2,00,00,00,000.0
Apparent Power(VA)	0.0	2,00,00,00,000.0

Table 2:

Value	Energy type for Pulse Output
0	KWh Import
1	KWh Export
2	KVarh - Import
3	KVarh - Export
4	KVAh
5	MWh Import
6	MWh Export
7	MVarh - Import
8	MVarh - Export
9	MVAh

Table 3:

Value	System Type
0	3P4W
1	3P3W

Table 4:

Value(read only)	PF Type
0	Unity
1	Lag
2	Lead

Table 5:

Value(write only)	Reset Energy Register
80	Active Import
81	Active Export
82	Reactive Import
83	Reactive Export
84	Apparent
85	All Energy

Table 6:

Value	Data Type
0	Swapped Long
1	Swapped Float

Table 7:

Value	AO Parameter mapping	
	3P4W	3P3W
0	R-Phase Frequency	R_Y Phase Frequency
1	Y-Phase Frequency	-
2	B-Phase Frequency	B_Y Phase Frequency
3	System Frequency	System frequency
4	R Phase PF	-
5	Y Phase PF	-
6	B Phase PF	-
7	System PF	System PF
8	R Phase Voltage	R_Y Phase Voltage
9	Y Phase Voltage	B_R Phase Voltage
10	B Phase Voltage	B_Y Phase Voltage
11	Average Voltage	Average Voltage
12	R_Y Phase Voltage	-
13	B_R Phase Voltage	-
14	B_Y Phase Voltage	-
15	R Phase Current	R Phase Current
16	Y Phase Current	-
17	B Phase Current	B Phase Current
18	Average Current	Average Current
19	R Phase Active Power	R_Y Phase Active Power
20	Y Phase Active Power	-

21	B Phase Active Power	B_Y Phase Active Power
22	Total Active Power	Total Active Power
23	R Phase Reactive Power	R_Y Phase Reactive Power
24	Y Phase Reactive Power	-
25	B Phase Reactive Power	B_Y Phase Reactive Power
26	Total Reactive Power	Total Reactive Power
27	R Phase Apparent Power	R_Y Phase Apparent Power
28	Y Phase Apparent Power	-
29	B Phase Apparent Power	B_Y Phase Apparent Power
30	Total Apparent Power	Total Apparent Power

Table 8:

Value	Output Type
0	Current 4-20mA
1	Voltage 0-10V
2	Disable(~0mA for current o/p & -0.7V for Voltage o/p)

Table 9:

Value	System Type
1	Lag
2	Lead

Table 10:

Value	System Type
0	Anticlockwise
1	Clockwise

10. IMPORTANT NOTES

Before starting Installed transducer, go through these notes:

- Confirm the connection configuration
- Confirm that all energy parameters are going to start from zero, if not, make them zero.
- Vrated and Irated should be set equal to PT secondary P-N Voltage and CT secondary Current Respectively.
- Apply proper CT – PT Ratio as per requirement, which must pass the below mathematical conditions for 3P3W and 3P4W.

For 3P4W
3x1.2xVratedx1.2xIratedx CT Ratio x PT Ratio < 200, 00, 00,000

For 3P3W
√3x1.2x√3xVratedx1.2xIratedx CT Ratio x PT Ratio < 200, 00, 00,000

- Select Energy type for LED Blinking as per your requirement.
- Confirm that transducer is calibrated.
- For Serial communication, MODBUS-RTU, RS485, you will get float/long data from measurement.
- Factory set Password to access the Program mode is 0001.
- Some parameters in configuration are only for factory purposes so please don't disturb these parameters like Analog Output type.
- For 3p3w system, modbus communication, follow the address map for 3p3w.Program mode will be same.

- For Front Blinking LED, select energy type (i.e.-import/KWh-export/KVARh-Import/KVARh-Export/KVAh/MWh-Import/MWh-Export/MVARh-Import/MVARh-Export/MVAh) as per your requirement using Program mode, from OUTPUT and set the value of constant. But here you can get maximum output pulse frequency (& LED Blinking rate) up to 50 msec. so whenever you are using this feature; you should set value of Meter-Constant such a way so it will not cross the limit of 50 ms pulse frequency.

- As pulse frequency is 50 msec, i.e. in one second maximum 20 pulses can be obtained, hence in one hour maximum 72000 pulses can be obtained.

Total no of impulses/second can be calculated as below
(Vrate * Irate * CTR * PTR * Pulse Constant in Wh)/3600 <= 20.

- Example: transducer specification
- V rated = 240V, I rated = 5A, CT ratio = 40 and PT ratio = 100,
- Above transducer can consume maximum of 4.8MWatt.

  I.e. For 3600 pulses/KWh [3.6 pulses/Wh], it will generate 4800 pulses/sec as per above equation, [240*5*40*100*3.6/3600 = 4800] so it will not work for the transducer as it is more than 20 pulses/sec

  I.e. For 2000 pulses/MWh [0.002 pulses/Wh], it will generate 2.666 pulses/sec as per above equation, [240*5*40*100*0.002/3600 = 2.66] so it will work for the transducer as it is less than 20 pulses/sec

  This is for single phase only, in case of three phases, energy will be multiplied by three in 3p4w and hence pulses should be calculated for three phase energy.

- When data type selected for modbus is LONG, Total apparent Energy will overflow from 400GVAhr the transducer will auto reset all energy parameter. This includes Active import and export energy, Reactive Import and Export energy and apparent energy. Such condition of overflow occurrence is depending on CT Ration and PT ratio.
- Example:

For 110V V rated, and 1 A I rated MFT is set for 100A and 66KV line with CT Ratio of 100 and PT Ratio of 600.

- Energy consumed per hour will be 66kV X 100Amps = 6600KVAHr.
- Time to overflow in Hr. = 400GVAhr / 6600KvaHr = 60606 Hr
- Days = 60606 /24 = 2525 Days

- Years = 2525 / 365 = 6.91 Years / Total of Three Phase.
- User has to manually reset all the energy parameter when installing the transducer first time.
- Resolution of the parameter on the Modbus when data is transmitted in LONG format is different and it is mention in modbus map.
- **Provide uniform air flow for better cooling of transducers, inside the panels. This is most important when more than 10 units installed side by side in same panel.**

11. TROUBLESHOOTING TIPS

The information in Table 11– 1 describes potential problems and their possible causes. It also describes checks you can perform or possible solutions for each. After referring to this table, if you cannot resolve the problem, contact our sales representative.

Table 11– 1: Troubleshooting

Potential Problem	Possible Cause	Possible Solution
The display is blank with black light OFF after applying control power to the MFT.	The MFT may not be receiving the necessary Power.	Verify that the MFT line (L) , neutral (N) and Earth (E) terminals are Receiving the necessary power.
The data being displayed is inaccurate or not what you expect.	Incorrect setup values.	Check that the correct values have been entered for MFT setup parameters (CT and PT ratings, System Type).
	Incorrect voltage inputs.	Check MFT voltage input terminals to verify that adequate voltage is present.
	MFT is wired improperly.	Check that all CTs and PTs are connected correctly (proper polarity is observed) and that they are energized. Check shorting terminals.
Cannot communicate with MFT from a remote personal computer.	MFT address is incorrect.	Check to see that the MFT is correctly addressed.
	MFT baud rate (parity, stop bit) is incorrect.	Verify that the baud rate of the MFT matches the baud rate of all other devices on its communications link.
	Communications lines are improperly connected.	Verify the MFT communications connections interchange [D+] & [D-] lines

UNIT NOT TURNING ON

The problem can be bad connection / power of incorrect rating.
First check, power on terminal of the instrument itself if it is not present then the fault is in power chord.

⚠ **One must take care while dealing with Power wirings because it may create electrical shock.**

UNSTABLE READING

Check for loose connections.
First verify that all conventional instrumentation norms have been followed for wiring. Try using shielded cable for sensor input.
Check for ripple on power supplies of Input section and Output sections. If power supplies have ripples, input voltage may be low or there is some failure on power supply card.

⚠ **Please note that this is an isolator, and the Input and Output sections are electrically isolated from each other. Therefore, any power supply measurements should be done with respect to proper grounds.**

OUTPUT NOT MATCHING WITH THE EXPECTED VALUE

It is a normal tendency to doubt the instrument performance, when the Output is not matching the expected value. Kindly make sure that the output is really incorrect with respect to input signal, before attempting any re-calibration.
Account for measuring instrument's inaccuracies, lead errors and calibration errors. Care must be taken when measuring Output signal.

An ordinary 3½ digit multimeter is used it can show reading which deviates from what the instrument is showing as the accuracy of the multimeter may not be as good as the that of the instrument. So use calibrating instrument of accuracy better than 0.1% for purpose of calibration.
If the signal is still found to be out of tolerance, calibration should be attempted as described in the next section.

VAGUE READING
The reason can be reverse input connections.

If these troubleshooting tips do not solve your problem then, please contact technical support at either nearest area office or Main Head Office as given on the first page.