

XPERT-LITE

Electrical Power Meter



USER'S MANUAL

TRINITY
MAKING ENERGY MATTER

USER'S MANUAL

XPERT-LITE

Electrical Power Meter

This document contains the latest technical information about Xpert-Lite which is a micro-controller based Electrical Power Meter. The unit is tested against the latest "MTE" Standard Model PRS 1.3 having basic accuracy of 0.05%, traceable upto International Standards derived using appropriate ratio techniques.

The product, Xpert-Lite is sophisticated electronic equipment, and the user is advised to read this User's Manual carefully before attempting to install or operate the equipment.

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Introduction

The digital power meter XPERT-LITE is a micro-controller based unit which measures electrical parameters, and sequentially displays them on a 128 X 64 backlit graphical LCD.

The unit is meant for use in three phase four wire/ three wire systems. In three phase four wire L.T. systems, it requires four wires from R, Y, B & N, in addition to six wires from the three current transformers mounted on the three phases. It thus uses the three wattmeter method to arrive at the system KVA and KW. On the other hand, for use in three phase three wire system, it requires three phases from the PT secondary (usually 110 VAC) and only four wires from the HT current transformer secondary of two phases. The KVA and KW are calculated by the two wattmeter method.

The unit measures the three phase voltages and currents, frequency and power factors for all three phases. Based on these inputs, the system KVA, KW and KWh are calculated.

For the correct operation of the unit, the only basic care required is to ensure that the phase sequence of the three phases is R-Y-B and the polarity of the CT secondary is correct. The S1 terminal in

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every CT will go to the M terminal of unit. Similarly, the S2 end of the CT will go to the L terminal of the unit.

The unit is fully solid state and will give years of trouble-free service once installed correctly.

The Main Features available in this Model

- Site selectable 1A or 5A CT secondary
- CT and PT Ratio site selectable
- All readings are true RMS measurements
- KVA or KW Demand is site selectable
- THD for each voltage and current.
- KWh pulse output on LED for 1000 impulses/KWh
- RS485 communication indication RX/TX dual colour LED.
- RS-485 port for connection to SCADA/EMS
- 128x64 backlit LC display
- Multi-parameter monitoring
- Measures all important Electrical Values
- All parameters with default accuracy class 1.0S
- Compact 96 X 96 X 55 mm DIN enclosure
- Two relay contacts for alarm or trip
- Alarm relays are individually programmable for different parameters including Demand.
- LED and display indication for both relay status

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Technical Specifications

Parameters		
Type	Name	Statistics
INPUT	Supply	Three Phases and Neutral of a 3P4W system / Three Phases of a 3P3W system
	Voltage	Direct Voltage Input : Up to 500V L-L, Up to 300V L-N PT Ratio : Site Selectable Burden : 0.5VA
	Current	Secondary Current : 5A or 1A (Site Selectable) Input CT Primary : Site Selectable Range of Reading: 5 - 5000A Burden : < 1.0VA Overload : 5A CT = 6A RMS Continuous 1A CT = 12A RMS Continuous
	Power Supply	Auxiliary Supply : 80 - 270 VAC, 50-60 Hz.
OUT PUT	Relay	Two. Individually Field Programmable. 3A @ 230 VAC, Resistive Load

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Parameters		
Type	Name	Statistics
MEASUREMENT	True RMS Basic Parameters	Voltage (Volts L-N & L-L) VL-N - Accuracy : 0.5% of Reading VL-L - Accuracy : 1.0% of Reading
		Current (Amps IR, IY, IB) Accuracy : 0.25% of Reading
		Line Frequency 45 to 65 Hz Accuracy : 0.3% of Reading
	Power	Active Power (P) Accuracy : 1% of Reading (For IPFI>0.5)
		Reactive Power (Q) Accuracy : 1.5% of Reading (Between 0.5 Lag to 0.8 Lead)
		Apparent Power (S) Accuracy : 1% of Reading
		Power Factor For Individual phases and System Accuracy : 1.0% of Reading (IPFI=0.5) Range of Reading: 0.05 to 1.00 Lag/Lead

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Parameters			
Type	Name	Statistics	
MEASUREMENT	Energy	Total Active Energy (KWh) Range of Reading : 0 to 9999999.9 Accuracy : 1.0S as per IS13779.	
		Total Apparent Energy (KVAh) Range of Reading : 0 to 9999999.9 Accuracy : 1.0% of Reading	
		Total Reactive Energy (KVARh) Range of Reading : 0 to 9999999.9 Accuracy : 1.5% of Reading	
Power Quality	THD for each Voltage		
	THD for each Current		
MISCELLANEOUS	Dimensions	Bezel	96 X 96 mm
		Panel Cutout	92 X 92 mm
		Depth of installation	55 mm
		Display	128 X 64 Graphical LCD
		Operating temp	10°C to 50°C
		Weight	0.35 Kgs (Approx.)
		Operating Current Range	0.4% to 120% of CT primary
	COMM	RS485	Modbus-RTU Protocol
		Calibration LED	Red Color 1000 impulses/KWh(Without PT/CT)
		Communication LED	Dual colour LED Data Receive - Green LED Data Transmit - Red LED

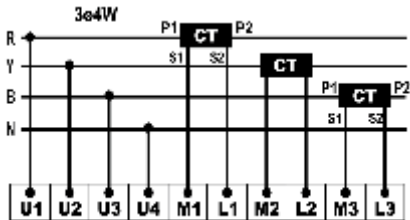
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Installation and Commissioning

The Xpert-Lite supports two installation modes – 3P4W and 3P3W. Follow the following steps to install / commission the unit.

3P4W Mode Installation

1. Push the unit into the panel and mount using the clamps provided.
2. Connect the Auxiliary supply (80V AC to 270V AC) to the terminals marked P and N.



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3. Connect the three phases with the phase sequence being R-Y-B to the terminals marked U1, U2 and U3 respectively, on the unit. Make sure that the three phases coming to the unit come through control fuses of 1.0 Amp rating. This will protect the electronics inside from damage due to severe over voltages or phase faults in the system. Connect the neutral to the terminal marked U4.
4. Connect the two wires from the R-phase CT to terminals marked M1 & L1 such that S1 from CT goes to M1 on the unit.
5. Connect the two wires from the Y-phase CT to terminals marked M2 & L2 such that S1 from CT goes to M2 on the unit.
6. Connect the two wires from the B-phase CT to terminals marked M3 & L3 such that S1 from CT goes to M3 on the unit.
7. Switch on the auxiliary supply and also, the three phase supply. The unit will come alive and display some information for about three seconds.

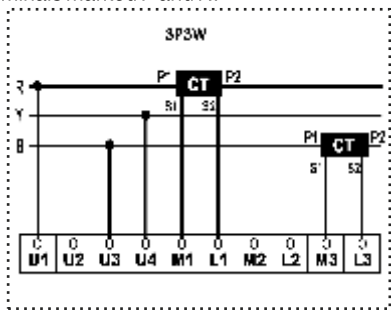
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8. First of all, set the correct CT Primary, CT secondary, PT ratio and scroll seconds etc. on the unit. For this refer to the OPERATIONAL DETAILS chapter.
9. The unit is ready for operation.

3P3W Mode Installation

1. Push the unit into the panel and mount using the clamps provided.
2. Connect the Auxiliary supply (80 V AC to 270V AC) to the terminals marked P and N.

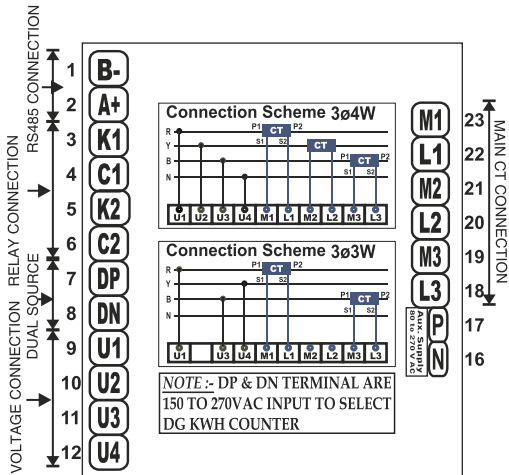


3. Connect the three phases with the phase sequence being R-Y-B to the terminals marked U1, U4 and U3

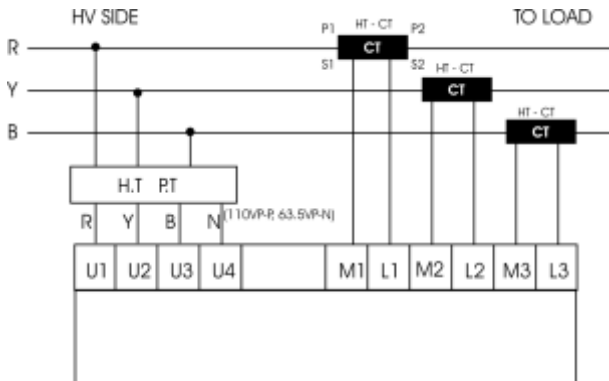
respectively, on the unit. Make sure that the three phases coming to the unit come through control fuses of 1.0 Amp rating. This will protect the electronics inside from damage due to severe overvoltages or phase faults in the system.

5. Connect the two wires from the R-phase CT to terminals marked M1 & L1 such that S1 from CT goes to M1 on the unit.
6. Connect the two wires from the B-phase CT to terminals marked M3 & L3 such that S1 from CT goes to M3 on the unit.
7. Switch on the auxiliary supply and also, the three phase supply. The unit will come alive and display some information for about three seconds.
8. First of all, set the correct CT Primary, CT secondary, PT ratio and scroll seconds etc. on the unit. For this refer to the OPERATIONAL DETAILS chapter.
9. The unit is ready for operation.

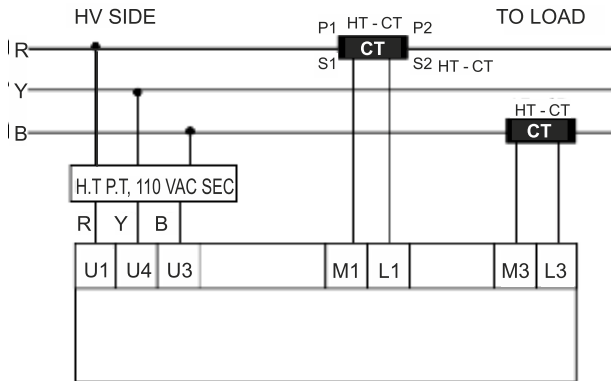
Connection Schemes:



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**3 Phase 4 Wire HT Connection with HT PT
having Star Point and HT CTs**



**3 Phase 3 Wire HT Connection with HT PT
Without Star Point and HT CTs (2 Nos Only)**

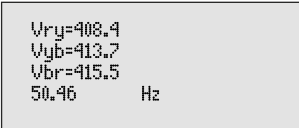
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Operational Details

The electrical power meter, Xpert-Lite is a versatile meter, with all the features needed to implement a robust electrical load management system.

The unit has two types of Modes such as (a) Programming Mode and (b) Run Mode.




After supplying power (80 VAC to 270V AC), the unit comes alive and after some delay, the display will show as under:



```
Vry=408.4  
Vyb=413.7  
Vbr=415.5  
50.46      Hz
```

The unit can be taken to Programming Mode to configure for all the programmable parameters.


Programming Mode

The unit can be programmed by use of the three keys provided on the front of the unit, i.e. ,  and  keys. If on entering the programming mode, no keys are operated for one minute, the unit will automatically revert to the Run Mode.

1. Selecting Demand On, Demand Window

Demand On can be selected for the calculation of Demand. The unit supports demand based on either KVA or KW, for an integration period of 30/15 minutes.






To select Demand On, proceed the following instructions:

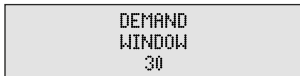
In Run Mode, press  key for about four seconds. The display will prompt **DEMAND ON** such as shown below.









DEMAND ON
KVA

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2. Press  key. Immediately, "P" starts blinking which indicates that the parameter can now be changed. Select the desired parameter to either KVA or KW by pressing  and  keys. Press  key again to confirm the selected parameter which will also stop blinking "P".
3. To enter into next programmable parameter, Demand Window, press  key. The display will prompt DEMAND WINDOW such as shown below.



```
DEMAND  
WINDOW  
30
```


4. Press  key to get or 'P' blinking as before, and select 15 minutes or 30 minutes using  and  keys. Press  key again to confirm the selected parameter which will also stop blinking "P".
5. If the setting is completed, press  key for about four seconds to return into Run Mode. Otherwise, press  key to enter into next programmable parameter.

Selecting Installation type







The unit supports two types of electrical installations: 3P3W and 3P4W. According to your electrical installation, user should select to either 3P3W or 3P4W.

To select the installation types, proceed the following instructions.

1. In Run Mode, press  key for about four seconds. The display will prompt DEMAND ON and then, press  key till you get display of INSTALLATION (**INST.**) as shown below.



INST.
3P4W

2. Press  key. Immediately, “P” starts blinking which indicates that the parameter can now be changed. Select the desired parameter to either 3P4W or 3P3W by pressing  and  keys and then, press  key again to confirm the selected parameter which will also stop blinking "P".
3. If the setting is completed, press  key for about four seconds to enter into Run Mode. Otherwise, press  key to enter into next programmable parameter .



Setting PT Gain

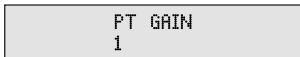
The unit has **PT Gain** (PT Ratio) on the basis of HT PT installations in between primary voltage and secondary voltage. **PT Gain** is selectable from one of the following values: 1, 3.7727, 4.0000, 6.2727, 30, 60, 100, 200, 300, 600, 1200.

The following table is shown the values of **PT Gain** to be selected.







PT Primary	PT Secondary	PT Gain (PT Ratio)
No multiplying factor		1
3300	110	30
6600	110	60
11000	110	100
22000	110	200
33000	110	300
66000	110	600
132000	110	1200
415	110	3.7727
440	110	4.0000
690	110	6.2727

To select the **PT gain**, follow the instructions below:

1. In Run Mode, press  key for about four seconds. The display will prompt DEMAND ON and then, press  key till you get display of PT GAIN such as shown below.



PT GAIN
1


2. Press  key. Immediately, “P” starts blinking which indicates that the parameter can now be changed. Select the PT GAIN by pressing  and  keys and then, press  key again to confirm the selected parameter which will also stop blinking "P".
3. If the setting is completed, press  key for about four seconds to enter into Run Mode. Otherwise, press  key to enter into next programmable parameter.

Selecting CT Primary







The CT Primary is selectable from 5 to 5000 and, should be set so as to give actual current value for CT operated meter.

To select the CT Primary, proceed the following instructions.

1. In Run Mode, press  key for about four seconds. The display will prompt DEMAND ON and then, press  key till you get display of CT PRIMARY as shown below.



CT PRIMARY
500

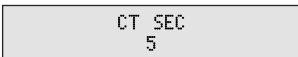
2. Press  key. Immediately, “P” starts blinking which indicates that the parameter can now be changed. Set the desired parameter by pressing  and  keys and then, press  key again to confirm the selected parameter which will also stop blinking "P".
3. If the setting is completed, press  key for about four seconds to enter into Run Mode. Otherwise, press  key to enter into next programmable parameter.

Selecting CT Secondary







The CT SECONDARY should be selected to either 1 or 5 so as to give actual current value for CT operated meter.

To select the CT Secondary, proceed the following instructions.

1. In Run Mode, press  key for about four seconds. The display will prompt DEMAND ON and then, press  key till you get display of CT SECONDARY such as shown below.



CT SEC
5

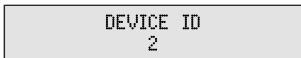
2. Press  key. Immediately, "P" starts blinking which indicates that the parameter can now be changed. Set the desired parameter by pressing  and  keys and then, press  key again to confirm the selected parameter which will also stop blinking "P".
3. If the setting is completed, press  key for about four seconds to enter into Run Mode. Otherwise, press  key to enter into next programmable parameter.

Setting Device ID, Baud Rate






The unit also supports RS485 communication port and it should therefore be set the Device ID from 1 to 255 for the communication of it. Hence, the unit can also be selected from any one of the following Baud rates: 9600, 19200, 4800 for its communication.

To select the DEVICE ID and BAUD RATE, proceed the following instructions.

1. In Run Mode, press  key for about four seconds. The display will prompt DEMAND ON and then, press  key till you get display of DEVICE ID such as shown below.





DEVICE ID
2

2. Press  key. Immediately, “P” starts blinking which indicates that the parameter can now be changed. Set the desired parameter, Device ID by pressing  and  keys and then, press  key again to confirm the selected parameter which will also stop blinking "P". To set for next parameter, Baud Rate, press  key with the following display.

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BAUD RATE
9600

3. Set the BAUD RATE such as above instruction. In case, the setting is completed, press  key for about four seconds to enter into Run Mode. Otherwise, press  key to enter into next programmable parameter.

Operation of Alarm Contact (Relay Contact)

The meter has two alarm contacts. The relay contact is rated at 3A @ 230 VAC. The contact is normally open. The operation of the relay contact can be programmable at site. For this specification, there are three parameters to be programmed:

- a. The **Alarm Parameter (K1 ON)** for which the alarm has to be generated should be selected from any one of the following parameters: DMND, PF, Avg_V. Avg_A, KVA, KW, KVAR.
- b. The **Alarm Values (K1 VALUE)** which are programmable from 5 to 5000 should be selected for which the alarm parameter has to be generated. In case of PF, the Alarm value can be set from 60 to 100.
- c. The **Time Delay (K1 TIME)** for a selected alarm parameter, it should also be set from 5 seconds to 180 seconds. In case of DEMAND, it will be fix 2 seconds.

Understanding Hysteresis

There is a time delay involved in switching ON and OFF the relay. Also, if there is no hysteresis in the switching operation of the relay, there is bound to be frequent switching of the relay near the alarm value. To avoid this, a band of 5 % is added to the programmed value, which acts when the time to switch off the relay comes .e.g. Say, the parameter is set to KW; the value for operating the relay is programmed to 100 and the time delay is set to 30 seconds. The relay will, thus operate when the KW crosses 100, and stays more than 100 for 30 seconds continuously.

The relay will now open when the KW falls below 95, and stays that way for 30 seconds continuously.

Thus, there is a time delay involved, and also a 5% band. However, since Demand is already an integrated parameter, there is only 2 seconds delay involved when the alarm contact is set for KW Demand or KVA Demand.

In case of PF, the hysteresis is not there. However, PF has a multiplying factor (MF) of 100. Thus, a PF value of 0.98 is set as 98. All this is summarized below:

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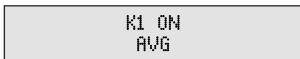
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Sr. No.	Alarm parameter	Relay switches on at	Relay switches off at	Settable Time Delay
1.	Avg. Volts	>Set value	<95 % of set value	5 to 180 sec.
2.	Avg. Amps.	>Set value	<95 % of set value	5 to 180 sec.
3.	KVA	>Set value	<95 % of set value	5 to 180 sec.
4.	KW	>Set value	<95 % of set value	5 to 180 sec.
5.	KVAR	>Set value	<95 % of set value	5 to 180 sec.
6.	Demands	>Set value	<95 % of set value	2 sec.(fixed)
7.	PF	<Set value	>Set value	5 to 180 sec.

Setting Alarm (K1) Parameter, Alarm (K1) Value and Alarm(K1) Delay

To set the Alarm parameters, proceed the instructions below:


1. In Run Mode, press  key for about four seconds. The display will prompt DEMAND ON and then, press  key several times till you get display of ALARM PARAMETER (K1 ON) such as shown below.



2. Press  key. Immediately, "P" starts blinking which indicates that the parameter can now be changed. Set the desired parameter by pressing  and  keys and then, press  key again to confirm the selected parameter which will also stop blinking "P". To set for next parameter, K1 VALUE, press  key with the following display.





K1 VALUE
100

3. Set the ALARM VALUE (K1 VALUE) such as above instruction and then, press  key to enter into next programmable parameter, ALARM DELAY (K1 TIME) such as shown below.



K1 TIME
10

4. Set ALARM DELAY such as above instruction. Now, if the setting is completed, press  key for about four seconds to enter into Run Mode. Otherwise, press  key to enter into next programmable parameter.

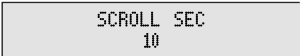
Setting Alarm(K2) Parameter, Alarm(K2) Value and Alarm(K2) Delay, for seconds alarm can also be proceeded such as above instruction.

Setting SCROLL Second

The Scroll Page Time for Run Mode is settable from 05 to 12 seconds. The unit will either continue to display the parameter steadily or scroll automatically. If the scroll seconds is set to Zero, the unit will be in FREEZE mode, and will not scroll automatically. In this case, the user can view the next or previous parameter by pressing the ▲ and ▼ keys.







To set the Scroll Second, proceed the following instructions.

1. In Run Mode, press  key for about four seconds. The display will prompt DEMAND ON and then, press ▲ key till you get display of SCROLL SECOND such as shown below.



SCROLL SEC
10

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2. Press  key. Immediately, “P” starts blinking which indicates that the parameter can now be changed. Set the desired parameter, SCROLL SECOND by pressing  and  keys and then, press  key again to confirm the selected parameter which will also stop blinking “P”.
3. If the setting is completed, press  key for about four seconds to enter into Run Mode. Otherwise, press  key to enter into next programmable parameter.

Selecting Run Time

The Run Time can be selected to either Load Run Hour or Run Hour. The Run hour is the time to be counted right from the auxiliary power supply received by the meter and the Load Run Hour is the time to be counted right from the load received. This Run time is applicable only for the unit with Dual source (both EB and DG).







To select the Run Time, proceed the following instructions.

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1. In Run Mode, press  key for about four seconds. The display will prompt DEMAND ON and then, press  key several times till you get display of RUN TIME such as shown below.



TIME
RunHr

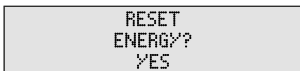
2. Press  key. Immediately, "P" starts blinking which indicates that the parameter can now be changed. Select the desired parameter, RUN TIME to either Load Run Hour or Run Hour by pressing  and  keys and then, press  key again to confirm the selected parameter which will also stop blinking "P".
3. If the setting is completed, press  key for about four seconds to enter into Run Mode. Otherwise, press  key to enter into next programmable parameter.

Resetting Counter Energy







The Energy counter can be reset to zero according to user's requirement.

To reset the Energy, proceed the following instructions.

1. In Run Mode, press  key for about four seconds. The display will prompt DEMAND ON and then, press  key several times till you get display of RESET ENERGY such as shown below.



RESET
ENERGY?
YES

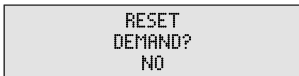
2. Press  key. Immediately, "P" starts blinking which indicates that the parameter can now be changed. Reset the Energy by pressing  and  keys and then, press  key again to confirm the selected parameter which will also stop blinking "P".
3. If the setting is completed, press  key for about four seconds to enter into Run Mode. Otherwise, press  key to enter into next programmable parameter.

Resetting Demand







Both KW Demand and KVA Demand can be reset to zero according to user's requirement.

To reset the Demand, proceed the following instructions.

1. In Run Mode, press  key for about four seconds. The display will prompt DEMAND ON and then, press  key several times till you get display of RESET DEMAND such as shown below.



RESET
DEMAND?
NO

2. Press  key. Immediately, “P” starts blinking which indicates that the parameter can now be changed. Reset the Demand to YES by pressing  and  keys and then, press  key again to confirm the selected parameter which will also stop blinking "P".
3. If the setting is completed, press  key for about four seconds to enter into Run Mode. Otherwise,  press key to enter into next programmable parameter.

Run Mode

In the run mode, the various parameters calculated by the meter are displayed on different pages on a 128 X 64 Graphical backlit LC Display.

Display in 3P4W and 3P3W

Display in Run Mode

Descriptions

```
Vry=415.8  
Vyb=415.7  
Vbr=415.9  
50.02 Hz
```

The display shows phase to phase voltage between R & Y phase, Y & B phase and B & R phase. If selected PT ratio is greater than 10, all values will be displayed in KV. In case of 3P3W system, B & R phase voltage will not display. Last line displays value of system frequency in Hz.

```
Ir=30.05  
Iy=30.45  
Ib=30.84
```

The display shows current of R, Y & B phase. In case of 3P3W system, Y phase current will not display.

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```
PF
R 0.985 LG
Y 0.987 LD
B 0.989 LG
```

The display shows R, Y & B phase power factor with LAG or LEAD indication. In case of 3P3W system, this page will not display

```
KVA=7.21
KW=6.45
KVAR=1.27
PF=0.985 LG
```

The display shows Apparent Power(KVA), Active Power (KW), Reactive Power (KVAR) & System Power Factor with LAG or LEAD indication. If values are greater than 9999, it will display values in Mega.

```
KVAh
751.5
KWh
684.2
```

The display shows Apparent and Active energy

```
KVArh
125.9
TEB
00001:06:16
```

The display show Reactive energy and in case of DUAL, Run Hour or Load Run Hour according to selection types of total run time for EB.

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```
DG  KVAh
14.8
DG  KWh
13.5
```

In case of DUAL, the display shows Apparent and Active Energy of DG.

```
DG  KVArh
17.6
TDG
00001:04:35
```

In case of DUAL, the display shows Reactive Energy of DG and Run Hour or Load Run Hour according to selection types of total run time for DG.

```
KVA-D
24
MAX  DMD
259
```

The display shows user defined KW instantaneous and maximum demand.

If user defined KVA demand in programmable parameter, the display will show KVA instantaneous and maximum demand.

```
Vrn=240.1
Vyn=240.5
Vbn+240.2
```

The display shows Phase to Neutral voltage of R , Y & B. In case of 3P3W system, this page will not display.

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THD[%]			
Vr	15.1	Ir	12.1
Vy	9.2	Iy	10.8
Vb	10.1	Ib	9.6

The display shows Total harmonic Distortion of Volts and Amps of R, Y & B.

```
RELAY 1:- ○  
KUA (300) 215  
RELAY 2:- ●  
KW (410) 415
```

The display shows relay status with its selected parameter for which alarm has to be generated. Value displayed in bracket indicates the value programmed for assigned parameter. Value displayed without bracket indicates run time value of assigned parameter.

LED Output

Xpert-Lite has four led output labeled with Pulse, RL1, RL2 and RX/TX.

Pulse led gives KWh pulse output for 1000 impulse/KWh (without CT/PT Ratio).

RL1 and RL2 will be ON/OFF according to RELAY 1 and RELAY 2 status respectively.


RX/TX led is dual led. It will be green when receiving data and red while transmitting data over RS485.

Ordering Options

Xpert-Lite can be ordered with the following options, according to your requirements.

XPERT-LITE		
Load Manager/ Maximum Demand Controller		
Model	Features of Parameters Displayed on Xpert-Lite	Optional features to be specified while ordering
	<ul style="list-style-type: none">• Volts L-N, Volts L-L(Average (on RS485) & Phase wise), Current (Avg. & Phasewise),• Power: KW, KVA, KVAR, Power Factor; (System & Phasewise), Frequency.• Energy: KWh, KVAh, KVARh,	Dual Source

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Model	Features of Parameters Displayed on Power Pro	Optional features to be specified while ordering
 <p>128 x 64 LCD</p>	<ul style="list-style-type: none">• Max. Demand, Active & Apparent Power (KW or KVA), Sliding window,• THD for each voltage & current• RS485 port for Communication EMS/ PLC/ SCADA• Dual Source Measurement (optional)• Alarm on : Avg. V, Avg. A, PF, KW, KVA, KVAR, Demand• Two individually programmable relays 3A @ 230 VAC, Resistive load.• Run hour for both EB & DG (optional).	<p>Import-Export</p>

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Control Output

The relay contacts provided in Xpert-Lite are rated for 3A @ 230V AC. There are two relays in Xpert-Lite which are programmable for the various parameters according to your requirements. These are also protected by snubbers against fast voltage transients that occur when inductive loads are switched off.

Thus, the following points are to be taken care of when using these relay contacts:

- Use 230V AC coils only in the contactors. DO NOT use 440V AC coils.
- DO NOT switch small loads like electronic Hooters, small relays with 230V AC coils etc., directly from the relay contact of Xpert-Lite. If done so, the small leakage current from the snubbers will not allow these loads to be switched off fully. Thus, the electronic hooters will give a low hum continuously, and the small relays will switch on but not switch off.
- Use these relay contacts to switch an Auxiliary contactor and put the load on the contactor contacts.

Relays for Alarm Action

The relays can be programmed to operate for Alarm/Trip functions. Each relay is independently programmable for the parameter on which to operate, time delay before operation, and values for the operation to be triggered and release values.

Thus, one or two (optional) relays should be programmed for an alarm action in the programmable parameters according to your requirement as shown below:

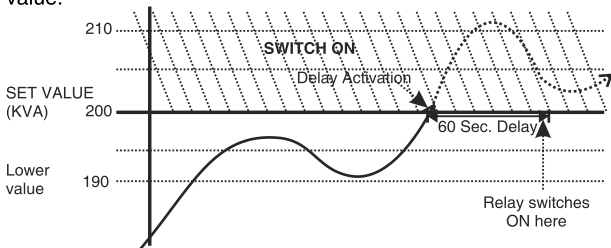
Sr No.	Alarm Relay K1 (to be programmed)	Sr No.	Alarm Relay K2 (to be programmed)
1	K1 VAL=200	4	K2 VAL=98
2	K1 ON = KVA	5	K2 ON = PF
3	K1 TIME = 060	6	K2 TIME = 120

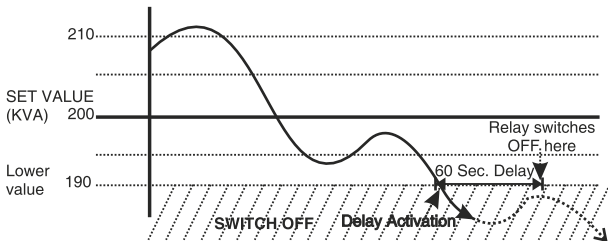
In order to program alarm parameters in one or two relays, user can select any one of the following parameters: Avg. Volt

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$[(V_{ry}+V_{yb}+V_{br})/3]$, Avg. Amps $[(I_r+I_y+I_b)/3]$, KVA, KW, KVAR, DMND (demand), and PF.

For example, in case of Alarm Relay K1, the parameter is set to KVA; the value for operating the relay is programmed to 200 and the time delay is set to 60 seconds. The relay will, thus operate when the KVA crosses 200, and stays more than 200 for 60 seconds continuously. The relay will now open when the KVA falls below 190, and stays that way for 60 seconds continuously. That is why a band (hysteresis) of 5 % is added to the programmed value.





In case of PF, the hysteresis is not there and the operation is also reversed. It has a multiplying factor (MF) of 100. Thus, a PF value of 0.98 is set as 98. Thus, when the PF value falls below 98, the relay will wait for 120 seconds and then close. However, the relay will open when PF crosses 98 with the specified delay.

Communication



RS485 CONNECTION

The industry standard RS-485 communication port option is also available in **Xpert-Lite**. This option makes it possible for a user to select **Xpert-Lite** to provide power and energy information into a variety of existing or new control systems and communication networks.

Modbus RTU on RS 485 Port

In order to download live data for the various system parameters, user can use RS485 connecting to a SCADA or EMS software. Xpert-Lite supports an RS485 port with MODBUS-RTU support. The station id for every meter is site selectable, and so is the baud rate. The data which can be read using MODBUS query # 3 (Read Holding Registers) is provided in an address map, with the applicable multiplication factors, vide Appendix.

Communication line parameters: 4800 or 9600 or 19200 /8/N/1.

The register map is described in Appendix. All addresses are in decimal whose parameters are unsigned long. If illegal address is sent in query or host, try to read more than valid amount of data in one query except message is generated. The parameters name, address and multiplication factor are also mentioned.

Reserved values are for future uses which are transmitted as zeroes. Please refer to the address map for the various parameters in Appendix.

Appendix 1

RS485 Parameters Address

3 phase 3000-3019	R phase 3030-3049	Y phase 3060-3079	B phase 3090-3109	MF
3000-KVA	3030-KWh	3060-(Vr-THD)	3090-DEMAND*	X100
3002-KW	3032-KVAh	3062-(Ir-THD)	3092-MAX DEMAND*	X100
3004-KVAr	3034-KVARh	3064-(Vy-THD)	3094-(Vb-THD)	X100
3006-PF	--	--	--	X1000
--	3036-Hz	3066-(Iy-THD)	3096-(Ib-THD)	X100
3008-Avg.VLL	3038-Vry	3068-Vyb	3098-Vbr	X100
3010-Avg. VLN	3040-Vr	3070-Vy	3100- Vb	X100
3012-Avg. Amps.	3042-Ir	3072-Iy	3102-Ib	X100

Appendix 2

RS485 Parameters Address including Dual

3 phase 3000-3019	R phase 3030-3049	Y phase 3060-3079	B phase 3090-3109	MF
3000-KVA	3030-KWh	3060 (DG-KWh)	3090 -DEMAND*	X100
3002-KW	3032-KVAh	3062 (DG-KVAh)	3092-MAX DEMAND*	X100
3004-KVAr	3034-KVARh	3064 (DG-KVARh)	3094 (Vb-THD)	X100
3006-PF	--	--	--	X1000
--	3036-Hz	3066 (Vy-THD)	3096 (Ib-THD)	X100
3008-Avg. VLL	3038-Vry	(3068-Vyb)	3098-Vbr	X100
3010-Avg. VLN	3040-Vr	(3070-Vy)	3100- Vb	X100
3012-Avg. Amps.	3042-Ir	(3072-Iy)	3102-Ib	X100
3014-(Vr-THD)	3044-(Ir-THD)	3074 (Iy-THD)	3104 - DG Status*	X100

NOTE : Field marked with (*) indicates that its MF will be X1

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Appendix 3

RS485 Parameters Address (For Single Query)

Address	Parameter	MF
200	KVA	X100
202	KW	X100
204	KVAR	X100
206	PF	X1000
208	AVG_VLL	X100
210	Avg.VLN	X100
212	Avg.Amps.	X100
214	KWH	X100
216	KVAH	X100
218	KVARH	X100
220	FREQ	X100
222	VRY	X100
224	VYB	X100
226	VBR	X100

Address	Parameter	MF
228	VR	X100
230	VY	X100
232	VB	X100
234	IR	X100
236	IY	X100
238	IB	X100
240	DEMAND	X1
242	MAX_DEMAND	X1
244	VR_THD	X100
246	VY_THD	X100
248	VB_THD	X100
250	IR_THD	X100
252	IY_THD	X100
254	IB_THD	X100

Appendix 4

RS485 Parameters Address including Dual (For Single Query)

Address	Parameter	MF
200	KVA	X100
202	KW	X100
204	KVAR	X100
206	PF	X1000
208	Avg.VLL	X100
210	Avg.VLN	X100
212	Avg.Amps.	X100
214	KWH	X100
216	KVAH	X100
218	KVARH	X100
220	FREQ	X100
222	VRY	X100
224	VYB	X100
226	VBR	X100
228	VR	X100
230	VY	X100

Address	Parameter	MF
232	VB	X100
234	IR	X100
236	IY	X100
238	IB	X100
240	DEMAND	X1
242	MAX_DEMAND	X1
244	DG_KWH	X100
246	DG_KVAH	X100
248	DG_KVARH	X100
250	VR_THD	X100
252	VY_THD	X100
254	VB_THD	X100
256	IR_THD	X100
258	IY_THD	X100
260	IB_THD	X100
262	DG Status	X1

DEFINING MULTIPLICATION FACTOR

- Hz has a multiplication factor of 100 & not 1000. e.g. If Hz is 48.33, and then it is sent as 4833.
- For providing resolution, all parameters except PF, Demand, Maximum Demand and DG status are multiplied with 100 before transmitting. Thus if the KVA value is 278.99, it is sent out as 27899. PF has MF of 1000, instead of 100. Thus, for LAG side PF value of 0.987 is sent as 987. For LEAD side PF value of 0.987 is sent as 1987. Here for LEAD side PF, 1000 is added with PF value to indicate LEAD side PF. DG status has MF X1. If DG is ON, it will send 1 else it will send 0.
- If an attempt is made to read some address other than the valid addresses, the exception response is sent.

EXCEPTION CODE

In the event that the query from the HOST has no communication error, but there is some error in specifying the address of registers to be read, the meter returns an exception message. The format of the exception message will be as under:

Unit Address	0X83	Exception code	CRC	CRC
--------------	------	----------------	-----	-----

Exception Code can have only one value, 02: if the address is not a valid, start address or host has requested more than valid amount of data, this code is returned.

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P.O No. :

Customer :

Sr. No. :

Routine and function tests conducted to relevant standards and our Specifications/Literature/O & M Manual. Traceability: tested against "MTE" Standard Model PRS1.3 having basic accuracy of 0.05% traceable upto International Standards derived using appropriate ratio techniques.

Result of Test :

Remarks :

Test engineer :

Date :

TRINITY

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