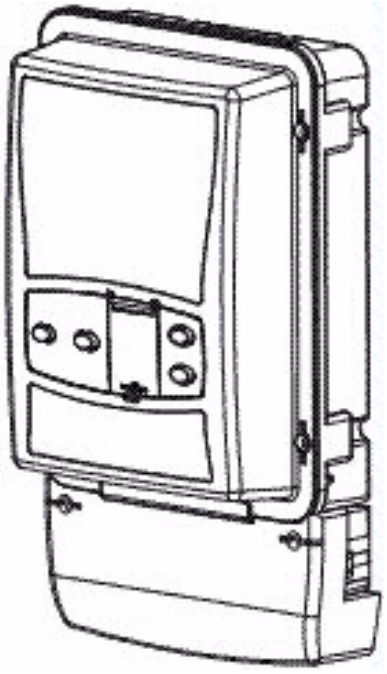


Table of contents

1) GENERAL

- Meter measures
  a. **Active, reactive and apparent** energies in all four quadrants,in forward and reverse directions.
  b. **Instantaneous parameters –** phasewise voltages & currents, power, frequency, rising demand, phase sequence, power factor and date & time.
- **8 Energy accumulators available** – kWh, kVArh (lag and lead), & kVAh in **forward and reverse** directions.
- **Data collection** is possible through the optically isolated serial interface, using a PC or MRI.
- **kWh & kVArh pulse output LEDs** available on front panel.
- **LCD,** with back lighting feature and **LCD Segments** for indicating presence of voltages and currents in each phase separately is available.
- **Keys** to scroll through display parameters and to perform manual reset.
- **Internal Battery** option to view display, collect data during power failure.
- **Rugged polycarbonate casing** makes it a good insulator and so no external "**EARTHING TERMINAL**" is required.
- **Built in self supervision system** ensures reliable performance of data processing. Periodic setup/program data check is carried out and anomaly is indicated on error occurrence.
- **EEPROM backup** is used to store meter data,ensures data safety in power failures. Retention period is 10 years in case of power failures.
- **RTC with battery backup** is used for time keeping. It has a calendar of 100 years.
- **Conforms to standards**:
  CBIP-88, IS 14697, IS 13779 and other relevant standards depending on the configuration.

2) Meter features

- The **features in the meter** are as follows, which are configurable as per customer requirement.
  i. Uni-directional / Bi-directional- Confguration of kVAh
  ii. PT and CT ratio programming
  iii. Reset type -Auto monthly,Manual or Auto-monthly & Manual reset.
  iv. Maximum demand- Block/sliding method.
  v. Load survey recorders- Load pattern during integration periods.
  vi. Time of the day – Time zones
  vii. Various Tamper features- For Tamper / fraud detections.
  viii. Displaying of parameters.

2.1) Uni-directional / Bi-directional- Configuration of kVAh :-

The meter can be programmed as a uni-directional or a bi-directional meter.

- **Uni-directional configuration :** Records forward energies (F) in forward registers. The reverse energies(R) are added to the forward registers and are also recorded separately in reverse registers. i.e. Forward register = F + R and Reverse register = R .
- **Bi-directional configuration:** The meter records forward energies (F) in forward registers and reverse energies (R) in reverse registers. i.e.
  Forward register = F ;Updated if algebraic sum of energy is +ve.
  Reverse register = R ;Updated if algebraic Sum of energy is -ve

NOTE : The convention followed for forward / reverse is based on current flow direction.
Forward - when current flows from 'M' to 'L' of the current terminals.
Reverse - when current flows from 'L' to 'M' of the current terminals.

VAh calculation methods

The meter can be configured for –

- **Leading PF to be treated as UPF:** Whenever the PF is leading, apparent energy is same as active energy, lead reactive energy is ignored
- **Leading PF to be treated as Lead:** Even if the PF is leading, lead reactive energy is considered along with active energy for apparent energy calculation.

2.2) PT and CT ratio programming:

The meter can be programmed for external CT/PT ratios.
Primary & secondary can be programmed independently between 1 to 9999.(max. CTxPT<=10,00,000).
All the parameters are actual values and no external multiplication factors are required.

CT x PT	Display format	CT x PT	Display format
<10	xxxxxx.xx K	<10000	xxxxxx.xx K x 10^3
<100	xxxxxxx.x K	<100000	xxxxxxx.x K x 10^3
≤1000	xxxxxxxx K	≤1000000	xxxxxxxx K x 10^3

2.3) RESET

2.3.1) RESET MODES

Meter can be factory set to one of following reset modes.

1. **Manual Reset :** Reset by operating a push button on the front panel.
   Lockout days i.e. no. of days after which another manual reset is accepted, is programmable between 0 to 99 days.
2. **Auto Monthly :** Reset at preset date and time.The date could be a positive absolute date (1 to 28) i.e. the meter resets on the set date and time **or**
   The date could be set as a negative no. (0 to –27) i.e. the no. of days from the end of the month.
   Eg. If the date is programmed to -2, then reset will occur automatically on 29th Jan, 26th Feb. (if non leap year), 29th March, 28th April and so on at the preset time.
3. **Auto Monthly / Manual Reset:** Meter can be set for the above two features.
4. **CMRI reset:** Command can be issued by CMRI to reset the meter. Only factory set.. Field configurability is not possible.

2.3.2) RESET DATA

RESET BACKUPS for last 12 reset periods are provided.
The following reset parameters are available-

- **Date and Time stamp** of reset : Whenever a reset is performed, the date and time of the reset is stored along with the TYPE of reset (power on auto / power off auto / power on manual / battery manual reset) performed.
- **Reset energies** (cumulative at reset): tariffwise for all backups and independent of tariffs (for present reset & for one previous backup on meter, all backups on PC)
- **MDs**- tariffwise and independent of tariffs
- **Average PF**– tariffwise and independent of tariff (only for present reset & one previous backup on meter, all backups on PC)
- **Reset count –** No. of resets performed (Rolls over at 99 to 0)

2.4) MAXIMUM DEMAND (MD) REGISTERS

A **Max. of three MD registers** out of the eight energy types can be selected and programmed for separate integration periods.
MD1 can be configured for **Block/Sliding window method.**
MD2 and MD3 can be configured for **Block method** only.
Integration periods of 1,2,3,4,5,6,10,12,15,20,30,60 mins and **Subintegration periods** (for MD1 only) of 1,2,3,4,5,6,10,12,15,20,30,60 mins. are programmable.

- **Reset MD Registers without tariff :**These are MDs, independent of tariff after reset.
- **Reset MD Registers with tariffs :**These are tariffwise MDs after reset.

If a reset is performed, above MD values are pushed to backups and the registers get cleared.

- **Cumulative MD Registers without tariff :** Whenever a reset is performed, the reset MDs independent of tariffs, are added to the existing cumulative MD registers without tariff.
- **Cumulative MD Registers with tariffs:**Whenever a reset is performed, the tariffwise reset MDs are added to the existing cumulative MD registers with tariff.
  Cumulative MD feature helps to discourage unauthorised MD reset.

2.4.1) Method of MD calculation

Normal or Block method: At the end of each fixed intg. period average power for that period is calculated. If this value is greater than the already existing value then this is stored as the MD.

Sliding window Method: At the end of a sub intg. period the average power is calculated for one intg. period. If this value is greater than the already existing alue then this is stored as the MD. The intg. period slides by a window of the sub intg. period.
Example:

MD Number	Method	Integration Period	Sub Integration Period
MD1	SLIDING	30 minutes	15 minutes
MD2	BLOCK	30 minutes	30 minutes

Assume a load pattern of the following type –

20kVA	**30kVA**	**30kVA**	**20kVA**
15 mins.	**15 mins.**	**15 mins.**	**15 mins.**

09:00 09:15 09:30 09.45 10:00

For MD1 (Sliding window method)-
Demand - 09:00 to 09:30 block = (20*15+30*15)/30 = 25kVA
Demand - 09:15 to 09:45 block = (30*15+30*15)/30 = 30kVA
Demand - 09:30 to 10:00 block = (30*15+20*15)/30 = 25kVA
MD1 at the end of 10:00 = 30 kVA

For MD2 (Block method)-
Demand - 09:00 to 09:30 block= (20*15+30*15)/30= 25kVA
Demand - 09:30 to 10:00 block= (30*15+20*15)/30= 25kVA
MD2 at the end of 10:00 = 25 kVA

2.5) LOAD SURVEY RECORDERS

Out of the 8 energy types, **upto 4 load survey** recorders can be selected. These recorders store selected energies consumed for the programmed integration period.
Integration period of 1,2,3,4,5,6,10,12,15,20,30 or 60 **mins. is** programmable.(Programability is optional).

Tamper snap shot can be selected or deselected only in the factory. It indicates separately if any tamper/ power failure occurred during the integration period.

2.6) TIME OF THE DAY (TOD) METERING

The meter offers a flexible tariff structure. This feature provides a useful way of following different tariff structures during different times of the day for different seasons.

- **Seasons -** A year can be programmed for a max. of 4 seasons. Each day of a season can be assigned a particular profile.
- **Profiles -** Daily profile contains the time zones for which a particular tariff must become active. A max. of 4 profiles can be programmed.
- **TODs** - It is the time zones into which a day is divided and assigned a specific tariff. A max. of 10 defined slots (11 undefined slots) can be programmed.
- **Tariff registers -** It defines the register (for MDs and energies) to be updated depending on the time of the day. A max. of 8 tariff registers (0 to 7) can be selected.
- **Special days -** Specific days of a year can be assigned a profile. This over-rides the profile selected for the day of the season. A max. of 4 special days can be selected.

Note:
Reset time and the TOD settings should be a multiple of the integration periods of MD registers.

2.7) TAMPER/FAILURE RECORDING

2.7.1) TAMPER TYPES-PHASEWISE

The meter detects/records the following tamper/failure conditions if the tamper persists for the persistence time programmed.

Parameter	Condition
Voltage Failure	Phase voltage < set threshold value (default 55% Vn.)
Current Failure	Phase current < set threshold value (default 2% Ib)
Voltage Unbalance	(Maximum of three phase voltages – any of the other phase voltage) > 30% Vn
Current Unbalance	(Maximum of three phase currents– any of the other phase current)>20% Ib
Current Bypass	Vector sum of Ir,Iy,Ib and Ineutral > 20% I_{basic}
Current Reversal	Whenever a phase current is reversed, the meter records a current reversal for that phase.
LowPF/Current Reversal	Whenever a particular phase current is in a quadrant where the reversal is doubtful i.e. it could be either a reversal or a genuine case, then it records a low pf/ current reversal.

Vn=Nominal Voltage; I_{basic} =Basic Current; Ir,Iy,Ib= R,Y,B phase currents respectively.

2.7.2) TAMPER RECORD

For each of the above tamper types the following data is recorded.

- **Cumulative Tamper count –**No. of times the tamper occurred since installation.(Rolls over at 99 to 0)
- **Cumulative Tamper duration –** Since installation.

Note: Tamper duration does not include power failure duration, which may occur during the period of any continuing tamper.

- **Tamper Status –** indicates the present tamper status.
- Tamper occurrence date/time and duration of tamper

2.7.3) TAMPER FEATURES

- **Tamper storage method:** The max. no. of tamper records stored depends on storage modes are –

  i) Sequential storage – Selected tampers types are stored in the order of occurrence upto 376 latest events. i.e. 188 records of tamper occurrence time & duration.

  ii) Block storage –10 backups (fixed) of occurrence time and duration for each tamper type-phasewise is stored separately. i.e. 360 latest events.

- **Persistence time:** Time for which each tamper must persist before it is recorded as a tamper is 2 mins.

2.7.4) POWER FAIL RECORDS

- Latest 10 records (record-fail time / date & duration of failure)
- Other power fail records –
  - Total power fail time from installation
  - Total power fail count from installation (Rolls over at 99 to 0)
  - Total power ON time from installation
  - Total power ON time of previous billing period

2.8) <u>DISPLAY DETAILS</u>

All the parameters are actual values and no external multiplication factors are required.

- **LCD**-The parameters calculated by the meter are displayed on a custom built LCD.
- **Display parameters selectable-** Can select any out of 339 parameters. Parameters 339 to 350 are reserved for selecting extra customer specific parameters.
- **Sequence** - The sequence of display parameters is selectable.
- **Scroll rate** - The scroll rate of the display parameters is programmable from 3 to 60 secs. in steps of 3 secs..
- **Display modes**- 3 display modes are available.

  Mode 1:
  - Display parameters selectable upto 55 nos. in any sequence required.
  - Auto and manual scroll facility available.

  Mode 2:
  - Display parameters selectable upto 255 nos. in any sequence required.
  - Manual scroll facility only

  Mode 3:
  - Display parameters fixed- High resolution cumulative forward & reverse kWh/ kVArh/ kVAh.,available in 2+6 format i.e. "**xx.xxxxxx".**
  - Manual scroll facility only
- **Mode Switching –** Switching between modes is possible by simultaneously pressing the UP and DOWN keys.
  If no key is pressed for 5mins. then meter automatically switches back to MODE 1 auto display.
- **Manual scrolling –** Manual scrolling within a display mode is possible by using UP or DOWN keys.

2.8.1) INSTANTANEOUS PARAMETERS

- **Voltages and Currents -** The instantaneous values of currents and voltages are available phasewise.Three segments on LCD indicate the presence/absence of phase voltages and currents. If voltage is absent in a phase, the corresponding phase segment is OFF. If only voltage is present in that phase then it is ON. If both voltage and current are present in that phase then it blinks at a fixed rate.

- **Frequency -** The meter calculates the instantaneous value of the system frequency.

- **Power Factor (PF) -** The meter calculates the instantaneous PF of the system. The sign of the PF is the same as that of the reactive power. If the apparent power is zero the power factor is displayed as '**PF -.---**'.

- **Instantaneous Powers -** The meter calculates instantaneous active, reactive and apparent powers irrespective of the configuration of the meter.

- **Phase Sequence -** The meter detects the phase sequence of both voltage and current circuits.

- **Rising Demand (RD)**

Rising MD = Energy consumed in the intg.period till the particular instant ÷ the complete integration period.
The same settings of MDs i.e. no., type, method and integration period, is applicable to rising demand registers.

Refer APPENDIX C for more details of display parameters.

2.9) COMMUNICATION

2.9.1) COMMUNICATION INTERFACE

An optically isolated serial interface port conforming to IEC 61107 standards is available. Data collection and programming of the meter is possible through this interface using IEC 61107 protocol.

RS232 /RS485 communications can be provided on request (With configurable baud rates). RS232 with IEC protocol or RS485 with MODBUS protocol is offered based on request.

2.9.2) PROGRAMMING MODE RECORDS: Date/time and count of latest 10 correct password entries is stored.

2.9.3) DATA COLLECTION

2.9.3.1) ENERGY ACCUMULATORS

8 energy accumulators record the following energies : -

1. Forward Active Energy
2. Forward Lagging (Inductive) Reactive Energy
3. Forward Leading (Capacitive) Reactive Energy
4. Forward Apparent Energy
5. Reverse Active Energy
6. Reverse Lagging (Inductive) Reactive Energy
7. Reverse Leading (Capacitive)
8. Reactive Energy Reverse Apparent Energy

2.9.3.2) ENERGY ACCUMULATION METHODS

The records below are available for all 8 energies.

- **Cumulative energies without tariff :**Sum of energies recorded in all tariffs from date of installation and cannot be reset.
- **Cumulative energies with tariff s:** Tariffwise energies for all 8 energy types available from date of installation and cannot be reset.
- **Reset energies (cumulative) with tariffs :** Tariffwise energies for all 8 energy types at the time of reset.
- **Reset energies (cumulative) without tariffs :** Sum of energies recorded in all tariffs at the time of reset.

Note:
PC software derives from above energies –

- Reset energies (cumulative) at reset, independent of all tariffs, for all the eight energy types.
- Energy consumption for present billing period, previous billing period and all backups, independent of tariffs.
- Energy consumption for present billing period, previous billing period and for all backups,tariffwise.
- Average PF - tariffwise & independent of tariffs for all backups

Consumption of energy for present billing period=(Cumulative energy – Reset energy at latest reset)
Consumption of energy for previous billing period = (Reset energy at latest reset – Reset energy at last but one reset)

2.9.3.3) SPECIFIC DATA COLLECTION

The following specific data can be collected from the meter-

- Present billing data – cumulative energies since installation, cumulative reset energies at latest reset, MDs of present billing period.
- Previous Billing Data – cumulative reset energies at latest reset, cumulative reset energies at last but one reset and MDs of previous billing period.
- Tamper Data
- Instantaneous values

- Load survey

2.9.3.4) ALL DATA COLLECTION : This feature enables to collect all the parameters calculated by the meter.

Note:- i) Field Programmability of the meter is optional based on the customer requirement.
ii) Each meter is given a unique number at the factory.

3) ACCURACY TESTS

The meter supports different means for testing accuracy.

3.1) Pulse counting method

KWh & kVArh pulse output LEDs are provided on the front panel.

Pulses/kWh (or kVArh)	Voltage/Current
2,500 / (external CT*PT)	3ph 4W 415V(L-L) / 5A
12,500 / (external CT*PT)	3ph 4W 415V(L-L) / 1A
10,000 / (external CT*PT)	3ph 3W/4W110V(L-L) /5A
50,000 / (external CT*PT)	3ph 3W/4W110V(L-L) /1A
416.66667	3ph 4W 415V(L-L) / (10-60A)
250.00	3ph 4W 415V(L-L) / (50-100A)

3.2) High resolution display

A high resolution display of 8 energies is available. The display format is xx.xxxxxx
This value is dependent on the meter configuration- uni directional and method of VAh calculation set in the meter.

3.3) Using MRI

On receiving a start/stop command from MRI, the meter sends Wh and Varh energies in high resolution, for the duration between start and stop, to the MRI through the optical interface.

3.3.1) Phasor Support: Meter supports the display of phasor diagram on MRI, online.

4.) INSTALLATION

4.1) Incoming Inspection

Before the meter is installed, visual inspection, for any damage in the process of transportation, has to be carried out. If damages are found, refer to warranty clause in Appendix D and take proper action.

4.2) Re packing

If the meter has to be returned to the supplier, repack the unit in the packing in which it was supplied.

4.3) Optimum Field Conditions

For the reliability and better life of the product the unit has to be operated at moderate temperatures and humidity. The meter is designed to work from -5 to 60 deg C and humidity of 95% RH non condensing.

4.4) Storage

In case if the meter is not installed after receiving, it has to be stored in a dry place in the original packing material.

4.5) Mounting

The meter can be fixed on any flat, even surface or on a standard metering panel on three points, one on top used for hanging the meter and the other two at the bottom used to mount the meter. These points are as shown in the fig. 2 of appendix A. The meter is mounted using 3 nos of M4x25 screws (Pan Head) . The recommendation is for mounting on a metal box of 1 mm thick sheet.

4.6) Extra precautions

Make sure of supply voltage, supply current and configuration. Wrong connection can severely damage the instrument, which is not covered under our warranty.

We recommend to install necessary protective device along with the meter like Circuit breaker / Fuse / MCB / Switch /Isolator to take care of unexpected faults.

4.7) Connection

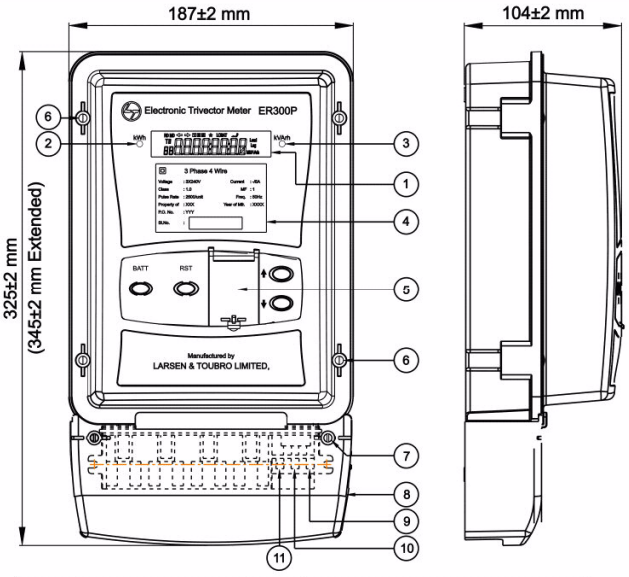
The meter uses a polycarbonate casing and so is a good insulator.
Hence it **DOES NOT HAVE ANY EARTH TERMINAL.**
For the WIRING connections the terminal block has been provided with 8 terminals.
The WIRING connections are to be done as shown in the Appendix A.

Terminal cover is to be used to protect the meter terminals from being tampered with. As soon as the connections are made the terminal block has to be covered and sealed by terminal cover. It can be fixed using two sealable screws.

4.8) Ventilation

No specific ventilation is recommended. Meter is capable of working satisfactorily at Ambient between – 5ºC to 60º.

APPENDIX A



ITEM	DESCRIPTION	ITEM	DESCRIPTION	
1	DISPLAY (LCD)	7	SEALING SCREW, TERMINAL COVER	
2	LED, kWh PULSE	8	TERMINAL COVER	
3	LED, kVArh PULSE		COMM. FOR RS232	COMM. FOR RS485
4	NAME PLATE	9	Rx	D+
5	OPTICAL PORT	10	Tx	D-
6	SEALING SCREW, TOP COVER	11	Gnd	Com

Fig. i

3 PHASE TRIVECTOR METER PARTS, OVERALL DIMENSIONS AND PANEL MOUNTING DETAILS.

CONNECTION DIAGRAM

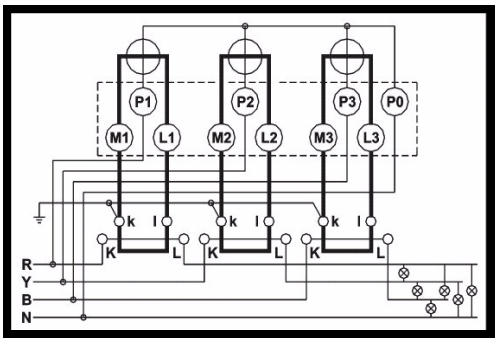


FIG. ii 3PHASE 4WIRE WITH CT

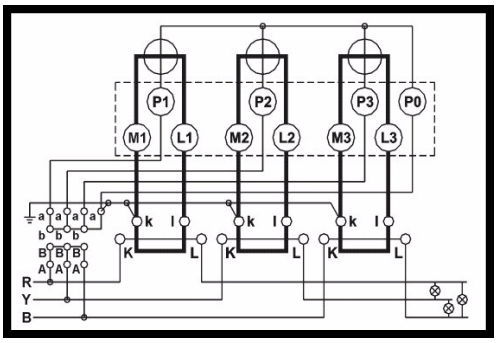


FIG. iii 3PHASE 4WIRE WITH CT & PT

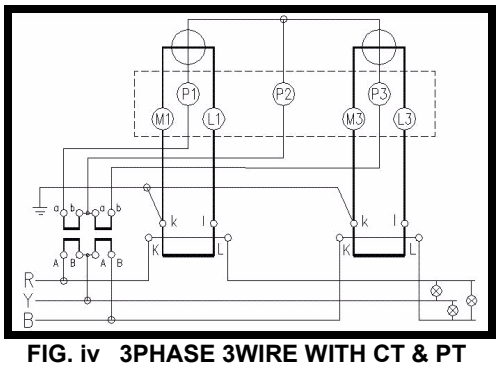


FIG. iv 3PHASE 3WIRE WITH CT & PT

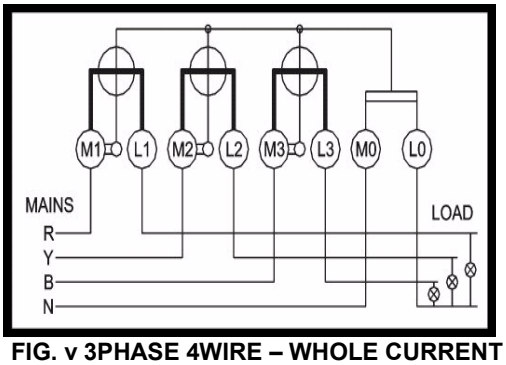


FIG. v 3PHASE 4WIRE – WHOLE CURRENT

APPENDIX B

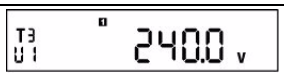
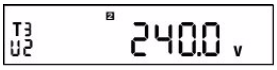
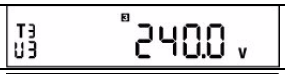
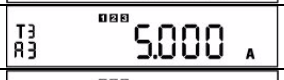
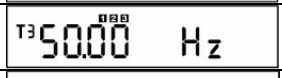
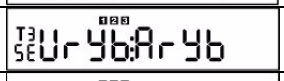
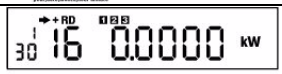
I) TECHNICAL SPECIFICATIONS:

Accuracy	IS 13779/CBIP-88 (Class 1.0) IS14697/CBIP-88 (Class 0.5 S/Class 0.2 S)
Voltage(Vn)	3Ph 4W - 415VAC (-40% to +20%)
Current (In)	CT operated - 5A (to 200%) Or Whole current
Starting current	0.1% In (Class 0.5S/Class 0.2s) 0.2% Ib (Class 1.0)
Power Factor	4 quadrant operation
Frequency	50Hz +/- 5%
Load characteristics	**Potential circuit** <8VA At rated voltage (240V/ 110V/ 63.5V) **in current circuit** < 0.5VA in CT operated < 4VA in whole current
Electromagnetic compatibility	IEC1036/IS13779/CBIP-88 (Class 1.0) IEC 60687/CBIP-88/IS14697(Class 0.5S)
Case material	Plastic moulded with transparent Cover. Protected to - IP51-IEC 1036/IS 13779/CBIP-88 (class 1.0) IP51-IEC 60687/CBIP-88/IS 14697 (Class 0.5S)
Measurement category	" I V "
Installation Category	Over Voltage Category III
Insulation properties	HV & insulation resistance IEC1036/IS13779/CBIP-88 (Class 1.0) IEC 60687/CBIP-88/IS14697 (Class 0.5S)
" " 	: Double Insulated Symbol
Max Internal cable temperature rise	: 20^0c during operation
Temperature	-5^0c to 60^0 c for operation -20^0c to 70^0c for storage
Humidity	95% RH non condensing
Dimension	320L x 175W x 110H
Weight	<2.5Kgs for CT operated <4.5Kgs for whole current

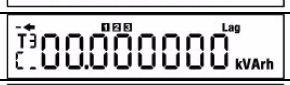
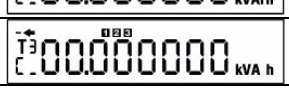
APPENDIX C

I) DISPLAY PARAMETERS

NOTE:THE ACTUAL DISPLAY ON LCD IS AS INDICATED.
(No. of Parameters on Display shall be customer specification)
Instantaneous Values

1	R Phase Voltage	
2	Y Phase Voltage	
3	B Phase Voltage	
4	R Phase Current	
5	Y Phase Current	
6	B Phase Current	
7	Frequency	
8	Phase sequence	
9	Inst. Active Power	
10	Inst. Reactive Power	
11	Inst. Apparent Power	
12	Instantaneous PF	
13	RTC	
14	Rising MD1	
15	Rising MD2	
16	Rising MD3	

High Precision Energies

17	Cumulative Forward kWh	
18	Cum. Forward kVArh lag	
19	Cum. Forward kVArh lead	
20	Cum. Forward kVAh	
21	Cum. Reverse kWh	
22	Cum. Reverse kVArh lag	
23	Cum. Reverse kVArh lead	
24	Cum. Reverse kVAh	

Total Cumulative Energies (Tariff independent)

25	Cumulative Forward kWh	
26	Cum. Forward kVArh lag	
27	Cum. Forward kVArh lead	
28	Cum. Forward kVAh	
29	Cum. Reverse kWh	
30	Cum. Reverse kVArh lag	
31	Cum. Reverse kVArh lead	
32	Cum. Reverse kVAh	

Cumulative Energies Tariffwise

33- 40	Cum. Forward kWh Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is C0 and so on)	
41-48	Cum. Reverse kWh Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is C0 and so on)	
49-56	Cum. Forward kVArh lag Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is C0 and so on)	
57-64	Cum. Reverse kVArh lag Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is C0 and so on)	
65-72	Cum. Forward kVArh lead Tariffwise (0 in picture changes to identify the tariff i.e. for Tariff T0 it is C0 and so on)	
73-80	Cum. Reverse kVArh lead Tariffwise (0 in picture changes to identify the tariff i.e. for Tariff T0 it is C0 and so on)	
81-88	Cum. Forward kVAh Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is C0 and so on)	
89-96	Cum. Reverse kVAh Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is C0 and so on)	

Energies at reset, tariffwise (Latest Backup)

97-104	Cum. Kwh -Latest backup Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is L0 and so on)	
105	Cum. For. KWh (Latest backup)Ind.Tarif	

106-113	Cum. Rev Kwh-Latest backup Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is L0 and so on)	
114	Cum. Rev. KWh (Latest backup)Ind.Tarif	
115-122	Cum. Fwd. KVArh Lag-Latest backup Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is L0 and so on)	
123-130	Cum. Rev KVArh Lag-Latest backup Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is L0 and so on)	
131-138	Cum. Fwd. KVArh Lead-Latest backup Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is L0 and so on)	
139-146	Cum. Rev. KVArh Lead-Latest backup Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is L0 and so on)	
147-154	Cum. Fwd. KVAh -Latest backup Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is L0 and so on)	
155	Cum. For. KVAh (Latest backup)Ind.Tarif	
156-163	Cum. Rev. KVAh-Latest backup Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is L0 and so on)	
164	Cum. Rev. KVAh (Latest backup)Ind.Tarif	

Energies at previous reset,tariffwise (First Backup)

165-172	Cum. For. KWh-at Previous reset backup Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is F0 and so on)	
173	Cum. Fwd. KWh at previous reset(Ind. Tariff)	
174-181	Cum. Rev. KWh-at Previous reset backup Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is F0 and so on)	
182	Cum. Rev. KWh at previous reset(Ind. Tariff)	
183-190	Cum. Fwd. KVArh Lag-at Previous reset backup Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is F0 and so on)	
191-198	Cum. Rev. KVArh Lag- at Previous reset backup Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is F0 and so on)	
199-206	Cum. Rev. KVArh Lead- at Previous reset backup Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is F0 and so on)	
207-214	Cum. Rev. KVArh Lead- at Previous reset backup Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is F0 and so on)	

215-222	Cum. Fwd. KVAh- at Previous reset backup Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is F0 and so on)	
223	Cum. Fwd. KVAh at previous reset(Ind. Tariff)	
224-231	Cum. Rev. KVAh- at Previous reset backup Tariffwise T0-T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is F0 and so on)	
232	Cum. Rev. KVAh at previous reset (Ind.Tariff)	

Present Reset MDs. Tariffwise (Since reset)

233-256	Reset period MDs Tariffwise (In picture 'r' represents reset period,next character to 'r'represents tariffs 0 to 7, and next character '1' represents MD1,similarly MD2 and MD3 are represented by digits '2' and '3'respectively.	

Maximum of Reset MDs (independent of tariffs)

257	Reset Period MD1 (ind. of Tariff)	
258	Reset Period MD2 (ind. of Tariff)	
259	Reset Period MD3 (ind. of Tariff)	
260-283	Previous MDs. In picture 'b' represents billing period,next character to 'b'represents tariffs 0 to 7, and next character '1' represents MD1,similarly MD2 and MD3 are represented by digits '2' and '3'respectively.	

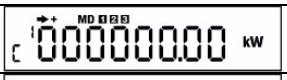
Maximum of previous MDs,independent of Tariff(Billing period)

284	Maximum of Previous MD1 (ind. of tariff)	
285	Maximum of Previous MD2 (ind. of tariff)	
286	Maximum of Previous MD3 (ind. of tariff)	

Cumulative MDs,tariffwise

287-310	Cum. MDs.In picture 'C' represents cumulative period,next character to 'C'represents tariffs 0 to 7, and character '1' above 'C0' represents MD1,similarly MD2 and MD3 are represented by digits '2' and '3'respectively.	

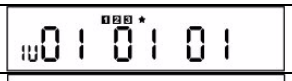
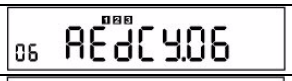
Cumulative MDs independent of Tariff

311	Cum. MD1 (ind. of Tariff)	
312	Cum. MD2 (ind. of Tariff)	
313	Cum. MD3 (ind. of Tariff)	
314	Reset Period – Average PF (ind. of Tariff)	

Previous reset Average PF,Tariffwise(Billing period)

315-322	**Previous Reset – Average PF Tariffwise T0 to T7 (0 in picture changes to identify the tariff i.e. for Tariff T0 it is b0 and so on)**	
323	**Previous Reset – Average PF, ind. of Tariff(Billing period).**	
324	**Reset Count**	

Total Tamper Counts

325	**Voltage Failure Count**	
326	**Current Failure Count**	
327	**Voltage Unbalance Count**	
328	**Current Unbalance Count**	
329	**Current Reversal Count**	
330	**Low PF Count**	
331	**Cumulative Power On Time (Days:Hours)**	
332	**Communication Count**	
333	**CT Ratio**	
334	**PT Ratio**	
335	**Multiplication Factor**	
336	**Anomaly String** **A= anomaly string.** **S=anomaly indicating NVRAM setup Checksum error.** **t=anomaly indicating invalid RTC time** **000=reversal not present in particular phases R,Y,B respectively.** **L = low pf/current reversal in particular phase.** **1 = Current reversal in particular phase.**	
337	**Version**	
338	**Display Check**	

NOTE : The following information is displayed in all modes of display
'123' - indicates presence of voltages in phases R,Y& B.
The respective displays blink to indicate the presence of currents.
'*' - indicates the presence of a continuing tamper
'LOBAT'- indicates RTC battery low condition
The parameter **'T0 to T7'** on the display indicates **Time Zones**, and should not be confused with the **Tariff**.

APPENDIX D

I) WARRANTY :

Larsen & Toubro Limited warrants that all the L&T products will meet L&T's published product specifications, and will be free of defects in workmanship and materials for a period of 12 months from the date of invoice from L&T.

L&T's obligation under this warranty shall be limited to servicing or replacing defective parts subject to the following terms and conditions provided the notice of defects and satisfactory proof thereof is given to L&T by its distributor or its customer within the Warranty period.

1. L&T's shall provide repairs and maintenance service for all equipment sold/or distributed by L&T, and products which cannot be repaired by L&T will be returned, subject to L&T's prior consent for free repairs .

2.Defective parts shall be serviced or replaced by L&T on one way freight paid basis.

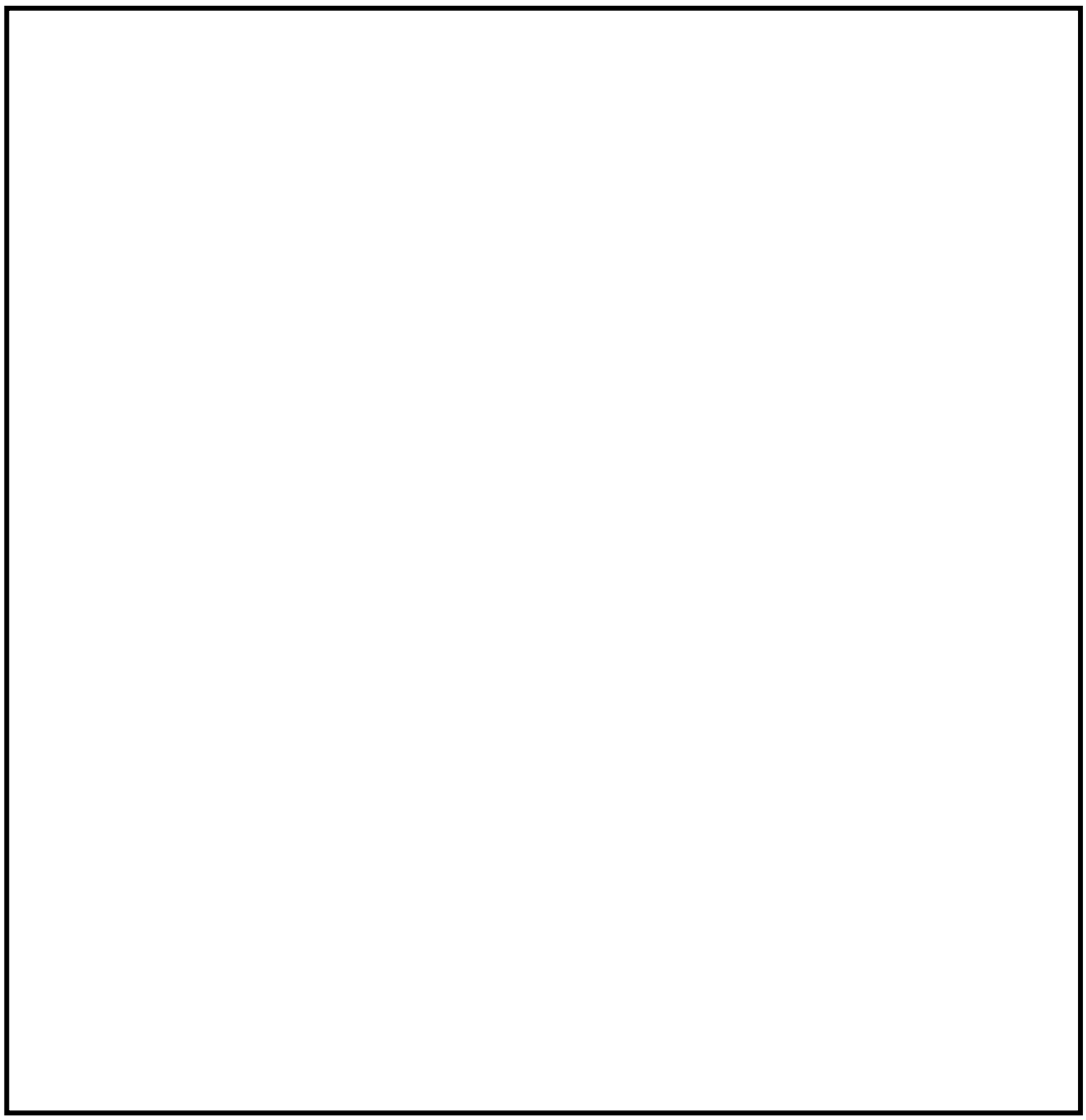
This warranty does not cover any defect in the product caused by accident, misuse, neglect, alteration modification or substitution of any of the components or parts, or any attempt at internal adjustment by unauthorized service personnel .

Under no circumstance shall L&T be liable for any consequential or resulting injury or for loss, damage of expense directly or indirectly from the use of this product .

The foregoing warranty is in lieu of all other warranties, expressed or implied, and is the sole and exclusive remedy for any claim arising from any defect in L&T products.

II) DISCLAIMER :

Sufficient care is taken to provide all information regarding the product but L & T does not claim any responsibility for the damages caused by using the product directly or indirectly.



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