

SECTION IX: GUARANTEED TECHNICAL PARTICULARS (GTP)

TECHNICAL SPECIFICATION OF 11 KV VCB SWITCHGEAR PANELS – INDOOR TYPE.

1. SCOPE:

- 1.1 This specification covers design, engineering, manufacture, testing, inspection before dispatch, packing, forwarding, transportation, insurance during transit, delivery of 11 kV VCB Switchgear Panels – Indoor Type
- 1.2 All the VCBs must be manufactured by ISO 9000 certified Organization and shall have been Type Tested at CPRI or any NABL Accredited Laboratory prior to 5 years from the date of e-NIT. The bidder shall demonstrate compliance with this requirement by supplying with the bid, copies of the Type Test Certificates together with the Performance Certificates from Tenderers/Users.

2. INTRODUCTION:

- 2.1.1 This Specification covers design, engineering, manufacture, testing, inspection before dispatch, packing, forwarding, transportation, insurance during transit and delivery of 3 phase 1250 A, 11kV VCB Switchgear Panels (Indoor Type) with horizontal draw out interrupter in conformity to IS: 13118 [1991] / IEC 62271-100 with latest amendment thereof.
- 2.2 The Switchgear Panel should be complete in all respects with insulators, interrupting chamber, operating mechanisms, control cabinet, interlocks, auxiliary switches indicating devices, supporting structures and allied accessories briefly listed in the schedule of requirements. Accessories which are mandatory for the smooth functioning of the equipment and specifically not mentioned shall be deemed to be included in the scope of supply
- 2.3 All the equipment shall be suitable for satisfactory operation in tropical / arctic climates and dry dust laden atmosphere prevailing in the location where it shall be used against the Contract. The equipment shall be able to with stand a wide range of temperature variation in the required location.
- 2.4 All plant/apparatus/equipment supplied shall comply in all respect with the requirement of J&K Electricity Act 2010 and relevant Electricity Rules with latest amendment thereof during the execution of contract where-ever applicable.
- 2.5 Equipment conforming to other International Standards shall also be considered if performance and constructional feature are superior to the listed standard.

3. BASIC TECHNICAL REQUIREMENT:

- 3.1 The VCBs are required to meet the following basic technical requirements
(Refer Standard: IEC 62271-100 & IEC 62271-200 associated Standards listed in this Specification)

S.No.	Particulars	Requirement
1.	Service Type	Indoor
2.	Number of Poles	3
3.	Nominal System Voltage	11kV
4.	Highest System Voltage	12kV
5.	Rated Normal current:	
(i)	For Bus Bar at 50 °C	1600 A

(ii)	For Interrupter of Circuit Breaker	1250 A
(iii)	For Outgoing Feeders & For Incomer	1250 A
6.	Rated Short Circuit Breaking Current (rms)	25kA
7.	Rated Short Circuit Making Current (peak)	65.75kA*
8.	Rated Short Time Current withstand capability for 3 seconds	26.3kA* (for Panel & Vacuum Interrupter)
9.	Rated Insulation Level:	
(i)	One minute Power Frequency withstand Voltage to earth (wet and dry) (rms)	28kV*
(ii)	Impulse withstand Voltage to earth with 1.2/50 μ sec. wave of +ve and -ve Polarity (peak)	75kV*
10.	First Pole to clear factor	1.5
11.	Rated Operating Sequence	O-0.3sec-CO-3min-CO
12.	Maximum break time	3 cycles
13.	Rated out of phase breaking current	25% of the Symmetrical Short Circuit breaking
14.	Maximum Pole Scatter	10 millisecond
15.	Rated Auxiliary Supply For Spring	230 V AC
16.	Rated supply Voltage for Tripping/Closing coils	30Volts DC
17.	Minimum Creepage distance (mm)	As per IS
18.	Minimum protected creepage distance (mm)	As per IS

* *Bidders shall design and manufacture equipments / material keeping in view Special Service Conditions, conforming to IS/IEC 62271-1 : 2007 ; IEC 60071-2; IEC 60932; IEC 62271-300 or IEC 62271-1 and IEC 60721 etc.*

3.2 Auxiliary Supplies available at the various sub-station are as follows :

i.	A.C. Supply	230Volts with +/- 10% Variation
ii.	D.C. Supply	30V DC with +10% to -25% variation. Moreover, Tripping Coil should operate at 75% and Closing Coil at 85% of rated Voltage.
iii.	Frequency	50Hz with +/- 5% variation

1. STANDARDS:

4.1 The circuit Breaker shall confirm to the latest revision with amendment available of relevant standards, rules, and code. Some of which are listed herein for ready reference.

S.No.	IS	IEC	Item
1.	IS-13118 (1991)	IEC-56	Specification of High Voltage AC Circuit Breaker
2.	IS-12729	IEC-694	Common Clauses for High Voltages Switchgear and control gear Standards
3.	IS-2705 (1992)		Current Transformer
4.	IS-3156 (1992)		Voltage Transformer
5.	IS-3231 (1987)		Relays
6.	IS-1248		Ammeter & Voltmeter
7.	IS-375		Arrangement of Breaker Busbars main

			connection and auxiliary wiring
8.	CBIP Publication No. 325/IS:15959:2011 Companioning Specification (read with latest Amendment)	IEC-60687	Static Energy Meter
9.	IS-3072		Installation and maintenance of Switchgear
10.	IS - 9135		Guide for testing of circuit breakers with respect to out of phase switching
11.		IEC : 60	High voltage testing technique
12.		IEC-17A Study Group Dec. 1981	Sealing of interrupters/breakers
13.	IS-3427		Metal enclosed Switchgear and Control gear
14.	IS-1554	IEC-227	PVC insulated cables upto and including 1000 Volts
15.	IS : 5		Colors for ready mixed paints and enamels
16.		IEC : 529	Degree of protection
17.	IS : 996	IEC-34	Single phase Small AC and universal electrical motors
18.	IS : 2629, 2633	ISO : 1460	Hot dip galvanizing

- 4.2 Equipment conforming to other International Standards will also be considered if they ensure performance and constructional feature equivalent or are superior to the standard listed above. Bidder shall clearly indicate the standard as adopted.

5. **BUS BARS AND CONNECTORS:**

- 5.1 Busbars and all other electrical connection between various components shall be made of electrolytic copper of rectangular cross sections. The bus bars section shall be of ample capacity to carry the current of 1600 Amperes continuously without excessive heating and for adequately meeting the thermal and dynamic stresses in the case of short circuit in the system up to full MVA rating specified in Clause 6.2 above.

6. **CIRCUIT BREAKER:**

The Vacuum Circuit Breaker (VCB) shall be draw out type and shall comply with IS-13118 (1991)/ IEC 62271-100 with latest amendment thereof. Construction of breaker shall be such that the points, which require frequent maintenance, shall be easily accessible.

7. **PROTECTION RELAYS:**

- 7.1 All relays shall conform to the requirements of IS: 3231/IEC-60255 or other applicable standards. Relays shall be suitable for flush or semi-flush mounting on the front with connections from the rear. The relay for entire project shall be of same type. The protective relay shall be numerical type.

- 7.2 **Technical requirement of Protection Relays is given as under:**

S. No.	Feature and Function	Technical Requirement
1.	Purpose and Application	<p>(i) It is intended to automate the Switchgears specified in the scope of supply and use communicable numeric relays for Protection, Control, Metering and Status monitoring. This specification is based on the understanding that an integrated automation system along with protections shall be provided and same shall have provisions for integration with common control center in future so that all the feeders shall be controlled from the center in addition to local control.</p> <p>(ii) Numerical relays should be IEC: 61850 compliant (60870-6, 61850, 60870-5 DNP3 or MODBUS protocol). Relay should have 4 CT input, 3 input for O/C and residual E/F protection. One CT input may be used for unbalanced current protection.</p>
2.	Main Protection Feature for non-directional O/C&E/F Relay	<p>(i) Electrical overload protection with selectable IEC curves with two stage, first stage to be used as Definite Time / IDMT and second stage to be used as highest for short circuit protection.</p> <p>(ii) Earth fault protection in two stages with IEC characteristics. First stage to be used as IDMT / Definite Time and second stage to be used as instantaneous elements. Earth fault element should be suitable for both CBCT and residual type CT connection.</p> <p>(iii) The Relay should be immune to DC switching while carrying current. i.e. no spurious trip should be generated if relay DC is made On and Off</p> <p>(iv) The Relay should conform to the IEC: 255-4 or BS:142 for Inverse time characteristics.</p> <p>(v) The Relay should have features to monitor for broken conductor and CB opening time</p>
3.	Processor feature	<p>(i) Relay shall be completely Numerical with protective elements having software algorithm based on sampling of analog inputs.</p> <p>(ii) Sampling Rate of Analog Signal: The sampling rate should be 1000 Hz for 50 Hz signal or better for each analog channel.</p> <p>(iii) Hardware based measurements shall not be acceptable</p>
4.	Operational Philosophy	<p>(i) The operation of Relay shall be possible from both locally from the switchgear and remote and Local Work Station. The local position shall be displayed in remote/local work station and remote operation shall be blocked if the switch is in Local.</p> <p>(ii) Clear control priorities shall prevent initiation of operation of a single switch at the same time from more than one of the various control levels and there shall be interlocks among various control levels. The priority shall always be with the lowest enabled control level. Relay accuracy shall not be affected by system frequency fluctuation.</p>

5.	Auxiliary Supply	30V DC with Voltage variation of (-) 25% to (+)10%. Necessary software shall be in-built for proper shutdown and restart in case of power failure. Auxiliary supply burden will be around 20 Watt
6.	Rated CT secondary	5/1Amp (site selectable)
7.	Rated frequency	50Hz \pm 5%
8.	Ambient condition	(i) Operating ambient temperature upto 55 ⁰ C (ii) Operating Humidity upto 100% (iii) Relay shall meet the requirement for withstanding electromagnetic interference according to relevant part so of IEC: 61850(60870-6, 61850, 60870-5 DNP3 or MODBUS protocol). Failure of single component within the equipment shall neither cause unwanted operation nor lead to a complete system break down
9.	Module and Mounting	(i) Relay should be flush mounted type (ii) If module is draw out type then it should have CT shorting facility of make before break type. (iii) Mounting in switchgears located in non AC rooms. (iv) Galvanic isolation between field connection and relay hardware should be there
10.	Watch dog and self Monitoring	The Relay should have facility to monitor the health in itself circuits and components by own monitoring system. In case of any problems, the alarm should be generated by one of the output contacts. Necessary support documentation explaining the self-diagnostic feature shall be furnished. Watch dog contact shall be provided
11.	Setting	Approximate settings possible should be as follows: (i) Nominal Feeder current 2% to 110% (ii) CT Ratio setting 10-1000(approx.) (iii) Earth Fault current 5 to 40% with time delay IEC Curves, 2 nd stage for instantaneous trip (less than 50 ms) (iv) Over current trip : 50% to 200 % of 1/5 Amp with timed relays as per IEC Curves. (v) High set with delay 200% to 2000% (vi) IEC Curves for all O/C and E/F have user selectable
12.	Relay software and Man Machine Interface	(i) The relay should have native IEC: 61850 Communication Protocol (60870-6, 61850, 60870-5 DNP3 or MODBUS protocol). (ii) Should have password protected keypad lock. (iii) Necessary software for relay setting, retrieving trip log and downloading wave form should be supplied by the Manufacturer. (iv) Manufacturer has to supply communication hardware for relay setting, this device should be compatible to USB/Ethernet port.

		(v) It shall be possible to transfer the data stored to computer. The data format shall be compatible for dynamic protection relay testing on relay test kit. Data viewer software is to be provided
13.	Lugs and terminators	All CT and PT terminals shall be provided as fixed (screwed) type terminals on the relay to avoid any hazard due to loose connection leading to CT opening or any other loose connection. Necessary amount flugs should be supplied along with each relay for CT connection and control wiring
14.	Manuals, Drawings and literature	(i) The relays should be supplied with manuals with all technical and operating instructions. (ii) All the internal drawings indicating the logic sand block diagram details explaining principle of operation should be given at the time of supply. (iii) Mapping details shall be submitted in IEC format
15.	Extendibility in Future	The Manufacturer shall provide all necessary software tools along with source codes to perform addition of bays in future. These software tools shall be able to configure relay, add analog variable, alarm list, event list, and modify interlocking logics for additional panels / equipments which shall be added in future
16.	Life Span	The supplier should mention following:- (i) Product maturity: The Manufacturer should mention he time period for which the product is in the market (ii) Expected production life (iii) Hardware / Firm ware change notification process. (iv) Upgrades to be provided free of cost within the Guarantee period / 5 years whichever is later. (v) Life span of standard tools and processes for relay configuration, querying and integration
17.	Communication Port	(i) Two Nos. IEC: 61850 protocols (60870-6, 61850, 60870-5 DNP3 or MODBUS protocol) compliant Ethernet RS485/ RJ45 for communication system through two managed Ethernet Switches operating in redundant mode. The communication shall be made in 1+1 mode between individual IED to Switch, such that failure of one set of LAN shall not affect the normal operation. (ii) Functioning of Relay shall no the amper to fault to occurring any inter connected relay. (iii) One Front port Ethernet RS485/USB2for relay parameterization and configuration etc. with the help of PC. (iv) Relays should be Siem in, Schineder ABB or Ashida. (v) Relay should generate GOOSE message as per IEC: 61850 (60870-6, 61850, 60870-5 DNP3 or MODBUS protocol) standard for inter locking and also ensure inter operability with third party relays

18.	Name Plate and Marking	Each IED shall be clearly marked with manufacturer's Name, type, serial no. and electrical rating data. Name plates shall be made of anodized Aluminum with white engraving on black surface
19.	Performance Guarantee	Relays will be guaranteed for the period of five years from the date of last dispatch. Any problem in the said period should be attended free of charge inclusive of repair / replacement of relays / component

7.3 Trip Supervision Relay 30V DC having 2 NO& 2 NC contact

8. **CURRENT TRANSFORMERS:**

CT should conform to IS:2705 or IEC:185

8.1 The requirement of ratio, VA capacity, class or accuracy, limit factor etc. for resin cast CTs installed in different type of units are tabulated below:

Item	Core/CT	Ratio	VA Burden (minimum)	Knee Point Voltage	ALF	Class of Accuracy
Incoming Panel	Core-I Metering	750-375/5A	5.0 (Subject to calculation of VA burden to be provided by bidder)	-	-	0.5
	Core-II Protection	750-375/5A	15	-	10	5P
	Core-III Protection (differential)	750-75/2.89 A	15	Calculation to be provided by bidder	-	PS
Bus-Coupler Panel	Core-I Metering	750-375/5A	5.0 (Subject to calculation of VA burden to be provided by bidder)	-	-	0.5
	Core-II Protection	750-375/5A	15	-	10	5P
Outgoing Panel	Core-I Metering	600-300-150/5A	5.0 (Subject to calculation of VA burden to be provided by bidder)	-	-	0.5
	Core-II Protection	600-300-150/5A	15	-	10	5P

- 8.2 Short time rating of CTs shall be 25kA for 3 second. CTs shall be three core for incomer and double core for outgoing/ bus coupler with dual ratio. Saturation factor for metering core shall not exceed 2.5.
- 8.3 The secondary winding resistance of CTs shall be as low as possible but not greater than 0.2 ohms per 100 turns.
- 8.4 Insulation level: 12/28/75kV* and Class of Insulation :E
- 8.5 CTs shall confirm to IS: 2705 with latest amendment, and will be subjected to all routine and type test specified in the IS.
- * *Bidders shall design and manufacture equipments / material keeping in view Special Service Conditions, conforming to IS/IEC 62271-1 : 2007 ; IEC 60071-2; IEC 60932; IEC 62271-300 or IEC 62271-1 and IEC 60721 etc.*

9. **AUXILIARY/CONTROL WIRING :**

All the secondary wiring in the panel shall have high quality PVC insulation and the same shall have conductor size of not less than 2.5 mm² of copper. Colors of the secondary/auxiliary wiring should confirm to IS- 375: 1963 and latest amendment thereof if any. All wiring shall be neatly run and group of wiring shall be securely fixed by clips so that wiring can be checked without necessity of removing the clamps. Wiring between fixed and moving portion of the panel shall be run in flexible tubes and the same shall be so mounted to avoid any damage to them due to mechanical movements. Ferrules with number shall be provided on both end of the wiring.

10. **COMMISSIONING CHECKS/TESTS:**

After installation of panels, power and Control wiring and connect Contractor shall perform commissioning checks. as listed to proper operation of switchgear/panels and correctness of all respects. In addition the Contractor shall carry out all other checks and tests recommended by the manufacturers.

11. **STATIC TRIVECTOR DLMS COMPLIANT ENERGY METERS, CLASS 0.5S; CATEGORY-A:**

11.1 **SCOPE :**

This specification covers design, engineering, manufacture, inspection, testing at manufacturers works including type testing before dispatch, supply and delivery of three phase 4 Wire tri-vector export/import with “Time of the Day” register, load profile data record “MD” register suitable for both unbalanced and balanced load. Whether should be installed or in separate pack.

11.2 **Applicable Standards:**

S.No.	Standards	Description
1.	IS : 14697	Specification for AC Static Transformer operated Watt Hour & VAR-Hour meters, classes 0.2 S & 0.5 S
2.	IEC : 60687	AC Static Watt-Hour Meters for Active Energy (classes 0.2 S & 0.5 S)
3.	IS: 15959 (including amendment 2)	Data Exchange for Electricity Meter Reading, Tariff and Load Control – Companion Specification
4.	IEC : 62056-21 (Latest Version)	Data exchange for Meter Reading and Direct Local

		Data Exchange
5.	IEC : 61000-4-5 (2001-04)	For Electro Magnetic Compatibility – Testing and Measurement techniques, Surge immunity test
6.	IEC : 61358	Criteria for selection for tests LIKE Acceptance Inspection
7.	ANSI/IPC-A-610	Workmanship standard for Acceptability of Electronic Assemblies (A standard developed by Institute for Assemblies (A standard developed by Institute for

11.3 **General Requirements**

11.3.1 Electrical Specifications:

S.No.	Particular	Specified Values
1.	Class of Accuracy	0.5 S
2.	Supply Voltage	Suitable for operation from 110 Volts/63.5 Volts Ph-Ph/Ph-N, PT Secondary
3.	Frequency	50 Hz \pm 5%
4.	Power Factor	0.5 Lag – Unity-0.8 Lead
5.	Basic Current Ib	5A
6.	Maximum continuous Current	20 Ib
7.	Minimum starting current	As per IS 14697
8.	Impulse withstand Voltage (1.2/50m Sec):	

11.4 **Guarantee Period**

The offered meters shall be guaranteed for normal operation for at least 5 years from the date of receipt at site without any repair whatsoever.

11.5 **Design and Constructional Features**

11.5.1 Location & Mounting

The Energy meters shall be supplied suitable for indoor installation. Enclosure shall have IP-51 protection. All the feeder meters to be suitable for mounting on Simplex type Vertical Panel with rear door, Energy Meter flush mounted and clearly visible, with disconnecting type TBs, fully wired.

11.5.2 Design:

Meter shall be designed with application specific integrated circuit (ASIC) or Micro Controller; shall have no moving part; electronic components shall be assembled on printed circuit board using surface mounting technology; factory calibration using high accuracy (0.1 class) software based test bench.

All components used shall be approved by reputed testing authority at national level or other international recognized testing authority.

11.5.3 Manufacturing Process, Assembly and Testing

Meters shall be manufactured using latest and ‘State-of- the Art’ Technology and Methods prevalent in Electronics Industry.

All inward flow of major components and sub assembly parts (CT, PT, RTCs/Crystal, LCDs, LEDs, power circuit electronic components etc.) shall have batch and source identification.

Multilayer 'PCB' assembly with 'PTH' (Plated through Hole) using surface mounted component shall have adequate track clearance for power circuits. SMT component shall be assembled using automatic 'pick-and-place' machines with in process 7 stages, Reflow Soldering oven, for stabilized setting of the components on 'PCB'.

For soldered PCBs, cleaning and washing of cards, after wave soldering process is to be carried out as a standard practice.

Assembly line of the manufacturing system shall have provision for testing of sub-assembled cards.

Manual placing of components and soldering, to be minimized to items, which cannot be handled by automatic machine.

Handling of 'PCB' with ICs / C-MOS components, to be restricted to bare minimum and precautions to prevent 'ESD' failure to be provided.

Complete assembled and soldered PCB should undergo functional testing using computerized Automatic Test Equipment.

Fully assembled and finished meter shall undergo 'burn-in' test process for 24 Hours at 55 degree Celsius (Max. temperature to not exceed 60 degree Celsius) under base current (Ib) load condition.

Test points should be provided to check the performance of each block/stage of the meter circuitry.

Testing at intermediate and final stage to be carried out with testing instruments, duly calibrated with reference standard, with traceability of source and date.

11.5.4 Displays:

Displays tested shall be suitable for temperature withstand of 60⁰ C; 7+1 digits (with \pm indication), parameter identifier, backlit Liquid Crystal Display (LCD) of minimum 10 mm height, wide viewing angle. Auto display cycling push button required with persistence time of 12 Seconds.

Sequence of display of various instantaneous electrical parameters shall be as desired by Employer at the time of order.

Normal display shall be Active energy value, on release of push button, at any of the display parameter during scrolling.

11.5.5 Calibration of Meter :

Meters shall be factory calibrated using high accuracy test bench. Energy Meter shall have test output device, accessible from the front, and capable of being monitored with

suitable testing equipment while in operation at site. Resolution of the device shall enable the starting current test in less than 10 minutes. Accuracy of test bench at works shall be as per the guidelines provided in IS: 14697.

11.5.6 Self-Diagnostic Features:

The meter shall have self-diagnostic features to check its circuits for any malfunctioning. The bidder shall furnish the details of the self-diagnostic features.

11.5.7 CONSTRUCTION :

- a) Meter Case and Cover
- i) To ensure high reliability, long trouble free life, safety against electric shock, spread of fire and effects of excessive temperature, the meter casing and cover shall be made of high quality industrial grade polycarbonate material having adequate strength, which is unbreakable, corrosion resistant & inert to chemicals, flame retardant, immune to ultra violet radiation and meet UV ageing test as per relevant ASTM standards.
- ii) The bidder shall indicate hardness, melting temperature and tensile yield strength of the material and necessary test certificate of the same shall be furnished.
- iii) The polycarbonate material used shall conform to IS: 11731 (FH-1 category) besides meeting the test requirement of heat deflection test as per ISO: 75 and glow wire test as per the relevant Standard.
- iv) The meter shall be provided with adequate shielding to withstand external magnetic influence from all directions as per latest amendments of CBIP Technical Report No. 325 (read with latest amendment).
- v) Meter cover shall be continuously ultra sonically welded with meter base from all sides. Suitable locking arrangement shall be provided between the base and cover of the meter.

11.5.8 Sealing Arrangement:

Two sealing screws shall be provided for proper fixing of the meter cover so that access to the working part shall not be possible without breaking the seal.

11.5.9 Terminal Block and Cover:

The terminal block shall have adequate insulating properties and mechanical strength. The terminal block shall be made from best quality non-hygroscopic, flame retardant polycarbonate material (capable of passing the flammability tests give in IS: 11731) with nickel-plated brass studs for connecting terminals.

The terminal block is to be enclosed in a metallic housing of steel plate of sufficient thickness to cover its back and sides and provide enough strength for the purpose of tightening of screws. Clamping screws should be provided inside the terminal cover and should have metallic sleeve moulded within the block to avoid damage during tightening of the screws.

The terminals in the terminal block shall be of long socket type suitable for connection of cables with Aluminum conductors along with suitable lugs (lugs to be provided by the

supplier) having cross sectional area, with adequate length. Double screw arrangement shall be provided to achieve adequate termination. All terminals and connecting screws and washers shall be of tinned / nickel plated brass material.

The terminal cover shall be transparent with minimum thickness 2.5 mm and the material shall be same as that of meter case. It shall be of extended type and accommodate, in addition to the terminal block, a suitable length of external cable along with its insulation.

11.5.10 Name Plate and Marking:

Every meter shall have a nameplate clearly visible and indelible and distinctly marked in accordance with IS: 13779 (latest version). The following information shall appear on a nameplate preferably placed within the meter.

- (1) Manufacturer's name & trade-mark and place of manufacture.
- (2) Serial number and year of manufacture.
- (3) Designation of type.
- (4) Number of phases and number of wires for which the meter is suitable.
- (5) Guarantee period.
- (6) Purchaser's name & meter number.
- (7) Principal unit in which the meter records.
- (8) Reference voltage & frequency in Hz.
- (9) Basic current and rated maximum current.
- (10) Meter constant (pulse rate of testing signal).
- (11) Class index.
- (12) Property of "J&K PDD"

11.6 Fixing Arrangement:

Every meter shall have three fixing holes one at the top and two at the bottom. The fixing holes shall be properly matched for mounting inside the meter compartment as per the drawing, and this specification.

11.7 Operational Requirements:

11.7.1 Performance under Influence Quantities: As per IS 14697.

Accuracy for measurement & display of instantaneous quantities shall conform to IS-14697 (read with latest amendment).

11.7.2 Additional Technical Features:

a) Output Device:

- i) Energy Meter shall have test output, accessible from the front, and be capable of being monitored with suitable testing equipment while in operation at site.
- ii) Operation indicator must be visible from the front.
- iii) Test output device shall be provided in the form of LED/LCD.
Resolution of the test output device shall be sufficient to enable the starting current test in less than 10 minutes. Nameplate shall indicate the 'impulse/ Unit' with appropriate resolution.

b) Cumulative Energy Register

Meter should have provision for automatic recording of cumulative kWh & MD

kW at say 24.00 hours on the last day of the month for each of the past six calendar months and same to be stored in the register/memory.

c) **Temperature Conditions**

As per IS- 14697; Meter to perform satisfactorily under Non-Air Conditioned environment in HT sub-station with Indoor switchgear in some of the locations.

11.7.3 Real Time Internal Clock (RTC) of Energy Meter :

RTC shall be pre-programmed for 30 Years Day/date without any necessity for correction. Maximum drift shall not exceed +/- 300 Seconds per year.

Time & date setting shall only be possible through one of the following:

Common Meter Reading Instrument (CMRI) or Meter testing work bench and this shall need password enabling for Consumer meter;

11.7.4 Clock Day/Date Synchronization:

Synchronization of Energy Meter 'RTC' Time/Date shall be possible thro' password/Key code enabled command from remote server or Substation 'PC' as per the arrangement. Master Clock reference shall be obtained from Main server or local 'PC'. However the master clock, Main server and Local PC is not in scope of supply.

Synchronization shall be carried only if the 'RTC' drift is within ± 10 minutes.

Error log to be recorder by the system S/W if the 'RTC' time is out of range.

11.7.5 Quantities to be Measured & Displayed

As per Appendix G of IS- 14697.

- a) TOD 'time slot register-wise export & Import (when asked) of kWh &kVAh, kVAh energy;
- b) Maximum kVA or kW demand with elapsed time.
- c) Instantaneous kW, kVA, PHASE WISE kW & kVA, OVERALL p.f, MD reset count, frequency, time & date, RTC battery health;
In addition, present status of abnormality shall also be possible to be displayed.
Tamper details shall be stored in internal memory for retrieval by authorized personnel through either of the following:
 - i) Common Meter Reading Instrument (CMRI)
 - ii) AMR and this shall need password enabling.

11.7.6 Demand Integration Period (DIP):

- i) Energy Meter shall continuously monitor and calculate the average maximum demand for each demand interval time of 30 minutes and maximum of these in a calendar month shall be stored along with date and time when it occurred;
- ii) It shall however be possible to change the demand integration period (DIP), from 30 to 15 minutes at site, with proper security;
- iii) The Maximum demand of past six months shall be stored in the memory with date and time.
- iv) It shall be also possible to retrieve this data through communication port and

MRI.

- v) Media copy of software for downloading of meter data through MRI on to a PC shall be provided on a compact disc. This shall be suitable to window-based operating system. Installation and commissioning manual for the same shall also be provided.

11.7.7 Time of Day (TOD) Registers:

6 different TOD energy registers as per Clause G-8 of IS- 14697 are required. Time block settings shall be advised to the supplier at least 4 weeks before commencing delivery. Change of time period for TOD metering shall be with password enabling from CMRI or from base computer.

11.7.8 Load Survey Data Registers:

Storage in Non Volatile Memory (NVM) for 40 days, 30 minute demand of any of the flow parameters of kW, kVA, kVA_r (or P.F), Average of 3 voltages and phase currents shall be provided.

11.7.9 INDICATIONS:

- i) Meter healthy indicator must be visible from the front.
- ii) Test output device shall be provided in the form of LED/LCD.
- iii) Energy Meter shall have test output, accessible from the front, and be capable of being monitored with suitable testing equipment while in operation at site.
- iv) Resolution of the test output device shall be sufficient to enable the starting current test in less than 10 minutes. Nameplate shall indicate the 'impulse/ Unit' in appropriate resolution.

11.7.10 Communication Facilities & Standards:

For data communication, the data structure adopted within the energy meter shall be on an internationally acceptable method. The data structure/coding details shall be furnished to the Employer. However minimum shall be provided.

- a) Local communication port: Energy meter shall have a galvanically isolated Optical communication port as per IEC- 62056-21 or any other internationally accepted port in front of the meter for data transfer to or from a hand held data Collection Device (Common Meter Reading Instrument 'CMRI' - conforming to CBIP technical report-111) with proper security and without error.
- b) Meter shall be provided with 'RS 485' port. 'RS485' communication port shall be suitable for interfacing multiple Energy Meters. It shall be possible to download stored meter data, on polling basis with the aid of a software schedule by addressing one meter at a time and downloading the stored data into the sub-station data logger/Central data center computer.
- c) Energy Meter shall operate on industry standard 'MODBUS' protocol and shall be individually addressable

11.7.11 Tamper & Fraud Monitoring and Recording

Meters shall at least be immune to tampers elaborated in IS -14697, ANNEX G-10.

All types of tampers for which meter is made immune, shall be listed by the bidder.

These tamper records need not be recorded or stored in the meter memory. Further, compliance to these are to be demonstrated by the bidder during acceptance test by successful bidder.

The meter should have anti tamper features. These shall at least include:

- i) Phase Sequence Reversal: Meter should work accurately irrespective of phase Sequence of supply.
- ii) Bypassing of Current Coil: Meter must have capability to record bypassing (shunting) of current coil(s) of one or any two phases with date, time and duration with normalization time. Meter should not record tamper if load currents are unbalanced within specified limits permissible in the system.
- iii) Current reversal in current coil: The meter shall register energy consumption correctly in forward direction irrespective of the direction of current in the current coil/Coils with date and time of first occurrence and last restoration along with total number of such occurrences for all phases during the above period.
- iv) Missing potential: Meter shall be capable of detecting and recording occurrences of missing potential (One phase or two phases) and its restoration which can happen due to intentional/accidental disconnection of potential leads with date and time along with total number of such occurrences for all phases during the above period. This recording of tampering shall not be done when meter is without any load i.e. Current in all phases is Zero.
- v) Error recording shall include current unbalance beyond 30% in the phases, RTC clock correction failures (when drift is beyond specified value etc);
- vi) Missing Neutral: Meter shall continue to record accurately even if the neutral of potential supply gets disconnected.

11.7.12 Accuracy :

In case any drift is noticed in the accuracy of the meter, which is beyond the permissible limits, the concerned meter shall be with-drawn from service and Bidder shall supply a new meter without any extra cost as a replacement (within one month of receipt from Employer), during the guarantee period.

11.8 INSPECTION, TESTING AND DESPATCH:

11.8.1 TYPE TESTS :

The meter offered should have successfully passed all type tests described in the IS 14697 and IEC -61000 4-5 Type test certificate shall be submitted along with the offer and the same shall not be more than 36 months old on the date of opening tender. Make & type of major components used in the type-tested meter shall be indicated in the type test certificates.

11.8.2 Acceptance and Routine Tests:

Criteria for selection for such tests and performance requirements shall be as per IS -14697, IEC -61358

13 OUTGOING FEEDER PANEL WITH CT RATIO 600-300-150 /5-5A

Each unit shall have the fittings and equipments as follows:

- 1) 1No. steel totally enclosed, fully interlocked, indoor industrial pattern, metal clad, horizontal draw out, vertical/horizontal isolation floor mounting switch unit complete with transportation truck having integral mechanism and all necessary supports each equipped as under:
 - (i) 1 No. Fabricated sheet steel housing.
 - (ii) 1 No. Complete set of mechanical interlocks.
 - (iii) 1 Set of isolating plugs and sockets [6 nos. rated for 1250 Amp, with automatic safety shutters and pad locking arrangements. Facilities shall be provided for proper opening of the safety shutter for cleaning, inspection and testing.
 - (iv) 1No. 1250 Amp triple pole VCB fitted with isolating sockets, spring operated, manually as well motor charged, manually/electrically released spring closing mechanism with mechanical ON/OFF indicators suitable for a rupturing capacity of not less than 500 MVA at 11 kV for 3 seconds and fitted with one set of direct acting trip coils suitable for operation with AC series trip relays.
 - (v) 1No. Auxiliary switch with minimum four normally closed and four normally opened contacts. The contact terminals shall be brought out and terminated at Terminal Board irrespective of whether terminals are used or not.
- 2) 3 Nos. 600-300-150/5-5A ratio two core resin cast current transformer of required Accuracy, for protection and metering as per Clause 10 of specification.
- 3) 1 No. Ammeter digital static ammeter suitably scaled and must suit CT ratio.
- 4) 1No. static digital Tri vector DLMS Compliant energy meter, Category “A” suitable for three phase 4 Wire un-balanced load and CT, PT, ratio mentioned above, 0.5S accuracy class with load, survey and TOD/Tariff and MRI facility. TVM shall be as per specification attached with this specification.
- 5) 1No. Non directional numerical adjustable IDMT series trip O/C and E/F relay as per specifications.
- 6) 1 No. High Speed Tripping Relay.
- 7) Aux/ Contact multiplication relays as per requirement.
- 8) 1 set of indicating LED lamps operating at 230V AC single phase one coloured RED, GREEN, BLUE to show the position of circuit breaker Closed or Open or Spring Charged as well as 30V DC AMBER and WHITE to show the Auto Trip and Trip Circuit Supervision Relay for Healthy condition of circuit breaker.
- 9) 1No. 80 watts continuously rated tubular/strip type Space Heaters with thermostat and ON-OFF switch working on 230 VAC single phase supply.
- 10) 1No. set of copper bus bars of not less than 1600 Amp. Continuous rating.
- 11) 1No. multi way plug box for secondary wiring between the fix and moving glands.
- 12) 1No. set of independently operated automatic shutters for bus bar cable and voltage transformers orifices, which shall be clearly leveled and individually pad-locked.
- 13) 1No. Sheet instruments panel mounted on the front of the unit with hinged access doors and totally enclosed wiring terminals mounted there.
- 14) 1No. Complete set of self-contained inter connectors, foundation bolts, fine Wiring, wiring terminals board, sundries to complete the unit