West Bengal State Electricity Distribution Company Limited

(A Govt. Of West Bengal Enterprise)

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Technical Specification for 12 kV, 400 A, 18.4 kA Outdoor SF_6-Insulated Switchgear with Vacuum Interrupter, Metering Unit, and Line-Side LBS Extension Provision.

1.0 SCOPE

This specification covers Design, manufacture, assembly of components, testing at Manufacturer's Works, supply and delivery of 12kV, 400A, 18.4 kA Plinth Mounted Outdoor Type Totally Enclosed 11kV Metering and protection arrangement (as per given SLD) including all accessories by Road Transport to different stores throughout West Bengal. The outdoor Switchgear panel along with CT, PT, battery and battery charger and metering enclosure Unit is to be supplied against this specification is required for vital installations of point of Supply to Bulk consumer Load Connection. The design, materials and manufacture of the equipment shall, therefore, be of the highest order to ensure continuous and trouble-free service over the years.

The Outdoor Circuit Breaker where Vacuum as arc Quenching medium enclosed in the main tank using SF_6 Gas for Insulated Bus Chamber Extensible to line side Metering Unit (ODGISVCB & MU) offered shall be compact, maintenance free, easy to install, reliable, safe and easy to operate and complete with all parts necessary for their effective and trouble-free operation. Such parts will be deemed to be within the scope of the supply irrespective of whether they are specifically indicated in the commercial order or not.

It is not the intent to specify herein complete details of design and construction. The offered equipment shall conform to the relevant standards and be of high quality, sturdy, robust and of good design and workmanship complete in all respects and capable to perform continuous and satisfactory operations in the actual service conditions at site and shall have sufficiently long life in service as per statutory requirements. In actual practice, notwithstanding any anomalies, discrepancies, omissions, in-completeness, etc. in these specifications, the design and constructional aspects, including materials and dimensions, will be subject to good engineering practice in conformity with the required quality of the product, and to such tolerances, allowances and requirements for clearances etc. as are necessary by virtue of various stipulations in that respect in the relevant Indian Standards, IEC standards, I.E. Rules, I.E. Act and other statutory provisions.

The Tenderer/supplier shall bind himself to abide by these considerations to the entire satisfaction of the purchaser and will be required to adjust such details at no extra cost to the purchaser over and above the tendered rates and prices.

It shall also encompass all necessary project management, data engineering, acceptance testing, documentation, warranty services.

Each outdoor Switchgear panel along with metering Unit shall include its own power supply unit (including auxiliary power transformer, batteries, and battery charger), which shall provide a stable power source for the outdoor Switchgear panel along with metering Unit.

Scope of Work

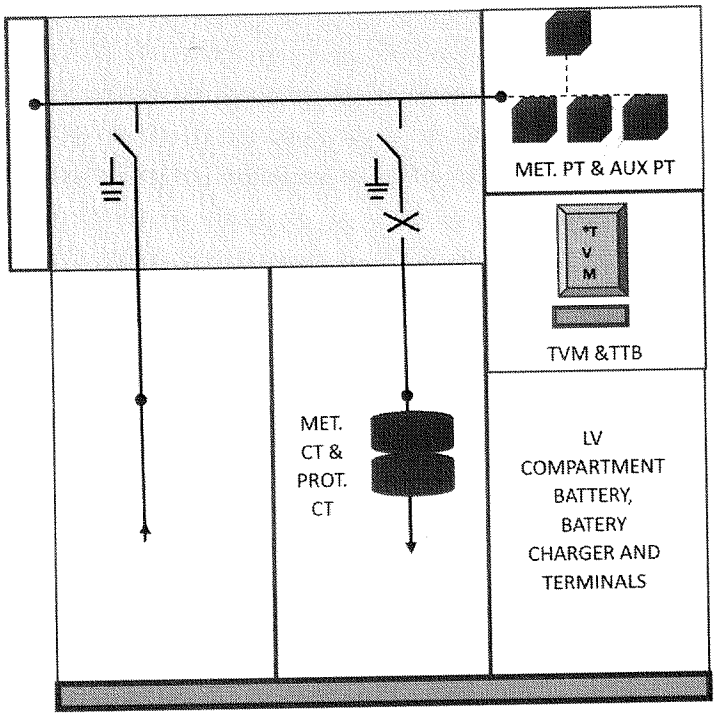
- Supply of outdoor SF6 insulated Switchgear panel along with metering Unit.
- Supply of battery charger and battery.
- Supply of right-angle boots for covering the bare cable lug.

Tolerances: Tolerances on all the dimensions shall be in accordance with provisions made in the relevant Indian/IEC standards amended up to date and in this specification. Otherwise the same will be governed by good engineering practice in conformity with required quality of the product.

2.0 Key Outdoor Circuit Breaker Embedded in SF6 Gas Insulated Bus Chamber along with Metering Unit (ODGISVCB & MU) Components:

Key **ODGISVCB & MU** components are listed as follows:

- One Metering unit Containing three nos single phase BUS connected PT for metering, one Aux PT for AC power supply, batteries & battery charger, terminals and switches and space for TVM.
- Motorised and manual operated and One (1) circuit breaker (CB) with three position disconnector with earth switch, towards connecting the motor operated Switchgear panel to Bulk Consumer loop, 11 kV, XLPE cables of size 95 /185 mm^2 cross section aluminium conductors.
- Motorised and manual operated disconnector cum earth switch for incomer cables of size 95 /185 mm^2 cross section aluminium conductors.
- One self powered numerical relay having non-directional O/C and E/F protection for Bulk Power Feeding CB. The Incomers shall have FPI with electrical reset facility.
- All necessary current sensors for incomer LBS and CTs for metering and protection for outgoing CB .
- All necessary potential-free contacts for indications relevant to outdoor Switchgear panel along with metering Unit monitoring and control.
- A power supply unit, including auxiliary power transformer and battery backup, to provide stable 24 V DC sources of power for the CB's spring-charge motors, relays etc. The power supply shall also provide for outdoor Switchgear panel along with metering Unit enclosure lighting fixtures and power-plug receptacles for maintenance/test equipment.
- Capacitor voltage dividers serving live-line cable indicators for both incomer and outgoing compartment. A typical **Outdoor Circuit Breaker Embedded in SF6 Gas Insulated Bus Chamber (ODGISVCB)** configuration is illustrated in Figure-1. In this case, the outdoor Switchgear panel along with incomer AIS HV cable compartment should have **two enclosures of equal height.** Other suitable metering enclosure shall be attached with AIS HV compartment. The SCADA monitoring and control equipment includes the RTU and modem to be supplied by others. Supply of TVM not in the scope of supply.
- Standard 3-Phase 4 Wire Test Terminal Block with cover (without any additional hole so that any TTB terminal can access from outside after sealing) having Sealing Arrangement shall be provided in metering circuit of equipment panel for connection to Energy Meter.
- All battery for Battery Charger, FPI and Relay manufacturing date shall be contemporary to ODGISVCB & MU manufacturing date.
- Operational counter shall be provided for CB and LBS operation.



Extensible SF6 insulated panel with metering unit:

Note:

- ***TVM NOT IN THE SCOPE OF SUPPLY.**
- **The compartment dimensions shall be finalized based on the space requirement during detailed engineering.**
- **Cable side VCB has been shown, Bus side VCB may also be acceptable.**
- **CT position may also be changed during finalisation of the scheme.**

Figure-1: Typical **ODGISVCB & MU** Configuration

3.0 Applicable Standards

The **ODGISVCB & MU** shall be manufactured to the highest quality consistent with best practice and workmanship and in full accord with the Contractor's **quality assurance plan**. The outdoor Switchgear panel along with metering Unit and the work associated with their installation shall also conform to the Indian and equivalent international standards that are applicable.

The Bidder shall provide an English language copy of the applicable Indian and equivalent international standards.

Rating, characteristics, tests and test procedures, protection Relays, monitoring and control devices and accessories including current transformer shall comply with the provisions and requirements of the standards of the IEC and IS where specified.

The latest revision or edition in effect at the time of bid invitation shall apply. Where references are given to numbers in the old numbering scheme from IEC it shall be taken to be the equivalent

number in the new five-digit number scheme. The bidder shall specifically state the precise standard, complete with identification number, to which the various equipment and materials are manufactured and tested. The bid document may not contain a full list of standards to be used, as they only are referred to where useful for clarification of the text.

Table 1-1: Applicable Standards

Standard	Description
Indian Electricity Rules 1956	Latest edition
Indian electricity act 2003	Latest edition
IEC 60694 IS 12729	Common specification for HV switchgear standards
IEC 60298 IS: 3427	A.C metal-enclosed switchgear and control gear for rated voltages above 1KV and up to and including 72 kV
IEC 62271-200	Metal enclosed BS 5311 switchgear
IS/ IEC 60529 Superseding IS 12063	Classification of degrees of protection provided by enclosures of electrical equipment
IS /IEC 60947-4-1 Superseding IS 13947 (P-3)	Control Gears
IEC 1330	High voltage/Low voltage prefabricated substations
IEC 60265	High-voltage switches-Part 1: Switches for rated voltages above 1kV and less than 52 kV
IEC 60801	Monitoring and control
IEC 60185 IS 16227	Current Transformers
IEC 60186 IS 16227	Voltage transformers
BS 159	Busbar
IEC 60137	Bushings
CP 1013(British Code of Practice)	Earthing
IEC 60255	Specification for Static Protective Relays
BS 6231	Wires and wiring
IEC 61000	Electromagnetic compatibility
IEC 60129	Alternating current Disconnector (isolators) and earthing switches
IEC 62271-100	MV AC circuit breaker
IEC 60060-1 BS 923	High Voltage test technique
IEC 60034-1	Motors
IEC 60947-4-1	Control Gears
IEC 60623	Open Ni-Cd prismatic rechargeable cell

Standard	Description
IEC 376	Filling of SF6 gas in ODGISVCB & MU

4.0 Environmental Conditions

All materials supplied and installed shall be capable of operating without fault in a tropical climate, which exhibits a high level of ultra-violet radiation and severe thunderstorms. Relevant environmental conditions are listed as follows:

- Maximum ambient air temperature: 50^0C
- Minimum ambient air temperature: -5^0C
- Maximum relative humidity: 95%
- Average thunder storm days per annum: 50
- Average rainfall per annum: 1450 mm
- Maximum wind pressure: 150 km/sq.m
- Altitude above mean sea level: Max.1000m

5.0 Distribution Network Electrical Parameters:

The main parameters of the WBSEDCL distribution network are as follows:

1	Nominal system voltage:	11 kV(rms)
2	Highest system voltage:	12kV(rms)
3	Number of phases:	3 ph/3wire
4	Frequency:	50 Hz
5	Type of earthing:	Solid
6	Rated normal current:	400 Amps (Bulk Load Feeding)
7	Power frequency withstand voltage	28 kV for 1min
8	Number of electrical operations at full load current.	100
9	Rated cable charging interrupting Current for Line Switch	25A
10	Rated magnetizing interrupting current for Line Switch	16A
11	Minimum number of operations at rated short circuit current on circuit breaker	10 breaking operations
12	Minimum Number of operations at rated short circuit current on earthing switches and CB	5 closing operations
13	Basic impulse withstand voltage Ph to Ph & Ph to earth :	75 kV peak
14	Fault level(minimum) :	18.4 kA for 3 sec
15	Rated short circuit making capacity at rated voltage of line switches and earthing switches and CB	46 kA peak
16	Climatic Condition	Moderately hot and humid tropical climate conducive to rust and fungus growth.
17	Visible or audible corona with switch gear energized at 12kV phase to earth at 50Hz	None

5.1 Circuit Breaker : In addition to the ratings mentioned in this specification, the circuit breaker shall have following:

Cable charging breaking current	25A
Small inductive breaking current	16A

5.2 General data, enclosure and dimension:-

Sl. No	Description	WBSEDCL Requirement
1.	Standard to which Switchgear complies	IEC

Sl. No	Description	WBSEDCL Requirement
2.	Type of **Outdoor Circuit Breaker Embedded in SF6 Gas Insulated Bus Chamber along with Metering Unit (ODGISVCB & MU)**	Metal enclosed panel type, Compact module
3.	Number of phases	3
4.	Whether **ODGISVCB & MU** is Type tested	Yes
5.	Whether facility is provided with pressure relief	Yes
6.	Insulating gas pressure	1.3 bar at 20^0C
7.	Gas leakage rate	0.1% per year
8.	Expected operating lifetime	30 Yrs.
9.	Whether facility is provided for gas monitoring	Yes, temperature compensated Manometer can be delivered.
10.	Material used in tank construction	Stainless steel
	Operations, degree of protection and colors	
1.	Means of disconnector and earthing switch operation	Separate handle
2.	Means of circuit breaker operation	Separate handle and push buttons
3.	Rated operating sequence of Circuit Breaker	O-3min-CO-3min-CO
4.	Opening time of circuit breaker	< 60 mS
5.	Closing time of Circuit Breaker	<60 mS
6.	Mechanical operations of Disconnector switch	1000
7.	Mechanical operation of earthing switch	1000
8.	Mechanical operations of circuit breaker	2000
9.	Disconnector switch/earth switch	3 position combined switch/earth switch

Degree of Protection		
1.	High voltage live parts, SF6, VCB	IP67
2.	Front cover mechanism	IP2X
3.	Cable cover	IP 2X
4.	Outdoor Enclosure	IP54
5.	Metering Unit	IP 54

6.0 Testing

The specified ODGISVCB and metering & Protection CT,PT & Auxiliary Transformer shall be subject to type tests, routine tests, and acceptance tests. Where applicable, these tests shall be carried out as per the standards stated above. Prior to testing, the Contractor shall prepare and submit a detailed test plan for review and approval by the Employer.

7.0 ODGISVCB & MU Design Features

All design features of the proposed ODGISVCB & MU as described in the Contractor's bid and in the bid's reference materials, shall be fully supported by the equipment actually delivered. The key design features include those that relate to:

- Availability, maintainability and lifespan
- Ability to operate in severe outdoor environmental conditions
- Immunity to electrical stress and disturbance
- Acceptable insulation properties
- Termination to SCADA Terminal located at metering Panel for convenient RTU inter connection features.
- All terminals from CB relevant to SCADA, likewise indication, status, command and MODBUS communication wire to be terminated in the SCADA terminal of low voltage enclosure of Breaker panel for remote SCADA communication.

In these and all other specified respects, the ODGISVCB & MU shall meet or exceed the cited standards or where appropriate, other equivalent industry standards.

7.1.0 Availability, Maintainability and Life Span

Availability

The **Outdoor Circuit Breaker where Vacuum as arc Quenching medium enclosed in the main tank using SF_6 Gas for Insulated Bus Chamber Extensible to line side Metering Unit** shall be designed to have a fully enclosed metal housing combined with the single-phase insulation of all primary live parts to reduce the risk of internal faults to an absolute minimum and to provide a high degree of safety Nevertheless, manufacturer standard designs shall be used to the fullest extent possible.

the ODGISVCB & MUs shall be fabricated, assembled, and finished with workmanship of the highest production quality and shall conform to all applicable quality control standards. All materials comprising the ODGISVCB & MU shall be new, unused, and of the best industrial grade, and the ODGISVCB & MU shall incorporate all recent improvements in both design and materials. All components shall be of current production from reliable component manufacturers.

Maintainability

Outdoor Circuit Breaker where Vacuum as arc Quenching medium enclosed in the main tank using SF_6 Gas for Insulated Bus Chamber Extensible to line side Metering Unit designs that do not require periodic preventive maintenance and inspections. If periodic maintenance is required, it shall be possible to perform all such work in the field without requiring the associated distribution network circuits to be de-energized.

7.2.0 Outdoor Features

7.2.1 General

The **Outdoor Unit** shall be designed specifically for outdoor installation and, in this respect, shall be suitable for continuous operation in a tropical climate that includes exposure to severe frequently occurring thunderstorms. They shall also be suitable for conditions in which they will be exposed to heavy industrial pollution, salt-spray, and high levels of airborne dust.

e equipment in the proposed outdoor ODGISVCB & MU shall be conformably coated to meet these climatic conditions. In this respect, standards such as IEC 60870-2-2 covering equipment, systems, operating conditions, and environmental conditions shall apply along with IEC 60721, which covers the classification of such conditions. In particular, the ODGISVCB & MU equipment shall have been type tested for continuous operation under the environmental conditions identified inClause1.5.

In addition to the above, materials promoting the growth of fungus or susceptibility to corrosion and heat degradation shall not be used, and steps shall be taken to provide rodent proof installations.

All live parts, high voltage components, excluding the HV cable termination of the switchgear shall be insulated/ protected in SF6 to provide complete proofing against dangers of flashover between phase and earth and between phases. In particular, the equipment shall be climate free in that no high voltage connection will be exposed to the environment.

7.2.2 Corrosion Protection

The fabricated parts are pretreated using 7 tank process and then coated by layer of zinc phosphate. A finish coat with high scratch resistance or epoxy powder finish paint shall be applied over the primer. The coat thickness shall be of the order of 60 micrometers. The Employer shall approve the finish-coat color. The RAL-7032/RAL-7035/IEC 632 code will be agreed upon with the Bidder during the early design phases of project implementation.

7.2.3 Material

Except for main tank and external hardware which made of stainless steel, all structural steel and outer enclosure as well as nuts and bolts etc. shall be of CRCA/GI steel with epoxy powder finish paint.

7.2.4 Immunity to Electrical Stress and Disturbance

The electrical and electronic components of the ODGISVCB & MU shall conform to relevant standards concerning insulation, isolation, and immunity from electromagnetic interference, radiated disturbance, and electrostatic discharge. The ability to meet these requirements shall be verified by type tests carried out by accredited test laboratories that are independent of the bidder and/or the manufacturer of the ODGISVCB & MU components. Certified copies of all available type test certificates and test results shall beincluded as part of the bidder's proposal. Failure to conform to this requirement shall constitute grounds for rejection of the proposal.

7.2.5 Minimum Insulation of Equipment

The ODGISVCB & MUs shall have SF6 gas-insulated type stainless steel tank with robotic joints. **All live parts shall be fully insulated throughout their joints**.

7.2.6 Nameplate Information

ODGISVCB & MU nameplate information shall be determined in agreement with the Employer. This information may include for example:

- Name of manufacturer and country

- Type, design, and serial number
- Rated voltage and current
- Rated frequency
- Rated symmetrical breaking capacity
- Rated making capacity
- Rated short time current and its duration
- Rated lightning impulse withstand voltage
- Vacuum Interrupter Make and Type
- Purchase Order number and date
- Month and year of supply
- Property label: Property of WBSEDCL
- Guarantee period :5years

7.2.7 Danger Board:

The Danger Board plate as per relevant IS shall be riveted on the front plate of the ODGISVCB & MU.

7.2.8 Interconnecting Cables, Wiring, Connectors, andTerminal Blocks

The Manufacturer shall provide all interconnecting wires, cables, connectors, terminations and other wiring accessories such as terminal blocks required by the ODGISVCB & MU.

7.2.9 Cables

All metallic cables and wiring shall be of required cross-section multiple strands of round copper conductors and have **FRLS** insulation. All wiring shall be neatly laced and clamped.

All wire and cable connectors and terminators shall be permanently labeled for identification. All connection points for external cables and wires shall be easily accessible for connection and disconnection and shall be permanently labeled. Conductors in multi-conductor cables shall be individually color-coded.

The DC cables from the battery unit to ODGISVCB & MU and to Metering Kiosk shall be at least $4mm^2$. CT &PT Control cable will be 2.5 Sq. mm and all other control cable shall be 1.5 mm^2 Cu multi- conductor and shall be screened with half-lapped copper tape. Conductor used for AC and DC circuits shall not be mixed in the same multi-conductor cable.

All wires shall be neatly run in groups and shall be securely fixed by cleats which are made of insulating material. Suitable crimped connectors shall be used for the termination of the wire to the terminal blocks.

All wires, including the spare cores of a multi-core cable, shall be properly numbered by an approved type of interlocking ferrule. All spare relay contacts shall also be wired out to spare terminal block inside the panels. The marking on the ferrules shall not be erased easily. The colour of DC supply circuits shall be grey to differentiate from AC supply (Black) for easy identification.

All wiring colour classification, wire terminal sleeve colour and wire numbering system shall be subjected to WBSEDCL's approval.

All AC and DC wiring terminals that are easily accessible by operating personnel shall be adequately shielded by suitable means.

7.2.10 Connectors

Terminal connectors shall be used for inter panel connection. The connectors shall be polarized to prevent improper assembly. **However Metering CT and PT connection must be as per WBSEDCL Choice.**

7.2.11 Terminal Blocks

Suitable Disconnecting type terminal blocks shall be provided for Protection CT circuits only with necessary spares with 5 mm minimum machine screws shall be provided for other necessary metallic cable terminations. In using a terminal block, no more than two cables or wires shall be connected to any of its individual terminals.
Self-extinguishing fireproof vinyl marking strips shall be used to identify all external connection blocks. Marking tags shall be read horizontally. All terminals to which battery or other high voltages are connected shall be provided with fireproof covers.

All individual status input, AC voltage input, and control output points shall be isolatable without the need to remove wiring by means of individual terminal blocks of the removable link type. In order to avoid open circuits on the secondary side of Protection CTs, termination blocks with by-pass bridges shall be provided for all AC current inputs.

Terminal blocks shall comply with IEC 60947-7-1 (2009): Low-voltage Switchgear and Control Gear, Part 7-1: Ancillary Equipment, Terminal Blocks for Copper Conductors.

TBs shall be mounted onto suitable insulation materials via channels. TBs shall be able to withstand 2 kV AC rms voltage continuously for 1 minute between terminal and terminal to earth.

One TB shall be used for one feeder panel. TBs shall be suitably spaced and labeled to enable easy and neat termination. Each terminal shall be labeled according to the CB panel and Metering Panel. **The use of embossing tape for such purpose is not acceptable.**

7.3.0 General Requirements

Each ODGISVCB & MU shall include its own power supply, including battery and battery charger. In addition, space must be provided for the ODGISVCB & MU's auxiliary power transformer.
Within this context, the general requirements of the ODGISVCB & MU shall include, but shall not be limited to provision of the following local and remote monitoring and control features through SCADA:

- Positions of local/remote switches as used to control local and remote access to circuit breakers.
- Power supply indications including battery failure.
- Open/closed position of circuit breakers, and earthing switches.
- Enclosure door-open indications.
- SF6 gas-pressure low alarm and Lockout.

- Circuit breaker relay protection indications.
- Circuit breaker open/close control.
- FPI indication in LBS.

SCADA wire termination at Metering Unit shall have to be standardized. Hence, sequence of termination shall be subject to WBSEDCL's Drawing approval.

7.4.0 **Design Details**

- The ODGISVCB & MU shall be designed to operate at the rated voltage of 12 kV. It shall consist of one (1) number of SF6 insulated 400 Amp Vacuum Circuit Breakers for Bulk load.
- It shall include, within the same metal enclosure, earthing switch, disconnector for Circuit Breaker.
- Suitable fool-proof interlocks shall be provided to the earthing switches to prevent inadvertent or accidental closing when the circuit is live and the concerned Circuit Breaker is in its closed position.
- Enclosures filled with gas at suitable pressure to ensure adequate insulation and safe operation shall be used. The assembly shall not require further gas processing during its expected operational life.
- The degree of protection required against prevailing environmental conditions, including splashing water and dust, shall be not less than IP54.
- The active parts of the switchgear shall be maintenance free. Rest parts shall be of low-maintenance type.
- The tank shall be made of an adequate thickness of stainless steel and internally arc tested.
- The ODGISVCB & MU shall be suitable for mounting on its connecting cable trench.
- For each ODGISVCB & MU enclosure, a suitably sized nameplate clearly identifying the enclosure and the electrical characteristics of the enclosed devices shall be provided.
- The positions of the different devices shall be clearly visible to an operator when standing in front of each enclosure with its door open. Device operations shall be clearly visible.
- The ODGISVCB & MU design shall be such that access to live parts shall not be possible without the use of OEM-supplied tools.
- The design shall incorporate features that prevent any accidental opening of the earth switch when it is in the closed position. Similarly, accidental closing of a Circuit Breaker shall be prevented when the same is in an open position. This includes protection against accidental closing resulting from the release of any latch or spring in tension due to vibrations caused externally or internally.
- Circuit breakers shall be enclosed in the main tank using SF6 gas as insulating and vacuum as arc quenching medium. The main tank shall be non-magnetic, non-ferrite stainless steel sheet of adequate thickness to ensure leak rate below 0.1% per year and preferably robotically/TIG welded with a pressure relief arrangement. The minimum thickness of main tank of ODGISVCB & MU shall not be less than 2.00 mm.
- The main tank (Inner enclosure of Circuit Breaker) and all Switchboard assembly shall be housed in a single compact metal clad suitable for both indoor/outdoor applications. The design of enclosure for Switchgear, ODGISVCB & MU& Switchboard housing shall be in accordance with IEC 298.

- A temperature compensating gas pressure indicator offering a simple indication shall constantly monitor the SF6insulating medium. Gas pressure shall be proper scale marking so that inside gas pressure can be measured.
- Relay compartment door shall be hinged type.
- The unit shall be internal arc proof and tested and totally safe for human beings. The release of gas to be from the top or bottom of the unit, so that, even if the person is operating the unit, opening the cover, the release will be at the top or bottom. The release in no case should be from any side of the unit, as the same is unsafe for the operating personnel/pedestrian or general public.
- **The clearances of all live parts to earth and between phases shall be to approval and shall be in no way less than clearances specified in the relevant standards of this technical specification.** All equipment shall be designed so as to minimize corona or any other electrical discharges under all atmospheric conditions.
- **Verification of one prototype RMU, covering the metering unit, TVM position, and CT and PT compartments, etc. shall be carried out by WBSEDCL's inspector for finalization of the design.**

7.5.0 Sulphur Hexa Fluoride Gas (SF6 GAS):

The SF6 gas shall comply with IEC 376, 376A and 376B and shall be suitable in all respects for use in ODGISVCB & MUs under the stipulated service conditions. The SF6 shall be tested for purity, dew point air hydrolysable fluorides and water content as per IEC 376,376A and 376B and test certificate shall be furnished to the owner indicating all the tests as per IEC 376 for each lot of SF6 Gas.

7.6.0 ENCLOSURE:

Metering enclosures shall be sized to provide convenient access to all enclosed components along with clear access to CT & PT Secondary terminals. It shall not be necessary to remove any component to gain access to another component for maintenance purposes or any other reason.

The enclosures shall also be designed to ensure that the enclosure remains rigid and retain its structural integrity under all operating and service conditions with and without the enclosure door closed. Door sealing provision shall be made for all openable doors and covers.

7.7.0 Outer Enclosure:

The ODGISVCB & MU enclosure (Outer) shall be made up of CRCA/GI steel of minimum 1.6mm thickness. The rating of enclosure shall be suitable for operation on three phase, three wire, 12 kV, 50 cycles, A.C. System with short-time current rating of 18.4 for 3 seconds for 12 kV supply with Panels. The complete ODGISVCB & MU enclosure shall be of degree of protection **IP 54**. The enclosure shall provide full insulation, making the Switchgear insensitive to the environment like temporary flooding, high humidity etc. The active parts of the Switchgear shall be maintenance-free and the unit shall be of minimum maintenance.

The complete ODGISVCB & MU unit shall be powder coating of RAL 7032/RAL 7035 Grey to DIN Standard 43656/IEC 632.

The Switchgear shall be designed such that the position of the different devices is visible to t operator on the front of the Switchgear and operations are visible.

In accordance with the standards in effect, the Switchgear shall be designed so as to prevent access to all live parts during operation without the use of tools.

7.8.0 Inner enclosure (Main tank)

The tank shall be preferably made of time tested welded stainless steel sheet of adequate thickness to ensure leak rate less tank 0.1% per year. The tank shall be sealed and no handling of gas is required throughout the service life. However, the SF6 gas pressure inside the tank shall be at 1.3 bar relative minimum to ensure the insulation and breaking functions and constantly monitored by a temperature compensating gas pressure indicator offering a simple go, no-go indication. The gas pressure indicator shall be provided with green pressure and red pressure zones along with temperature compensated gas pressure reading. There shall be one Non – return valve to fill up the gas. The manufacturer shall give guarantee for maximum leakage rate of SF6 gas will be lower than0.1 % / year. There shall be no requirement to 'top up' the SF6 gas. An absorption material such as activated alumina in the tank shall be provided to absorb the moisture from the SF6 gas to regenerate the SF6 gas following arc interruption. The degree of protection of the inner enclosure shall be IP 67.

Oil or Air filled Switchgear will not be considered. The temperature rise test shall be carried out on complete ODGISVCB & MU unit and test reports shall be submitted with the offer.

The compact ODGISVCB & MU Unit shall be provided with a **base frame to mount the unit on plain surface.** Means of enabling the SCADA to monitor the open/closed status of the enclosure door shall be provided.

7.9.0 Earthing

- There shall be continuity between metallic parts of the ODGISVCB & MUs and cables so that there is no dangerous electric field in the surrounding air and the safety of personnel is ensured.
- The ODGISVCB & MU frames shall be connected to the main earth bars, and the cables shall be earthed by an Earthing Switch having the specified short circuit making capacity.
- The Earthing Switch shall be operable only when the Circuit Breaker is open. In this respect, a suitable mechanical fail-proof interlock shall be provided.
- The Earthing Switch shall be provided with a reliable earthing terminal for connection to an earthing conductor having a clamping screw suitable for the specified earth fault conditions. The connection point shall be marked with the earth symbol.
- The Earthing Switch shall be fitted with its own operating mechanism. In this respect, manual closing shall be driven by a fast acting mechanism independent of the operator's action.

- All parts of the switchgear metal enclosure, metal relay and instrument cases, cable glands, earthing terminals and other metal work on switchgear shall be connected to earth by means of main and subsidiary earth bus bars.

- The switchgear earth bar and earth conductors shall be of tin plated high conductivity copper and their sizes shall be selected in accordance with BS CP 1013 taking into consideration the rated short circuit currents of the switchgear.

- All metal parts of the switchgear which do not belong to main circuit and which can collect electric charges causing dangerous effect shall be connected to the earthing

- Conductor made of copper having cross section area of minimum 120 sq.mm. Each end of conductor shall be terminated by M12/equivalent quality and type of terminal for connection to earth system installation. Earth conductor location shall not obstruct access tocable terminations.

- The following items are to be connected to the main earth conductor by rigid or copper conductors having a minimum cross section of 75 sq. mm (a) earthing switches (b) Cable sheath or screen (c) capacitors used in voltage control devices, if any.

- The metallic cases of the relays, instruments and other panel mounted equipment's shall be connected to the earth bus. The colour code of earthing wire shall be green. Earthing wires shall be connected on the terminals with suitable clamp connectors and soldering shall not be permitted.

8.0 Circuit Breakers

The Circuit Breakers shall be maintenance free and, when standing in front of the ODGISVCB & MU with enclosure doors open, their positions shall be clearly visible. The position indicator shall provide positive contact indication in accordance with IS 9920. In addition, the manufacturer shall prove the reliability of indication in accordance with IS 9921.

The breakers shall have two positions (or states), i.e., ON and OFF, in association with three position disconnector ON-OFF-EARTHED and shall be constructed in such a way that natural interlocking prevents unauthorized operations. They shall be fully assembled, tested, and inspected in the factory.

An operating mechanism shall be used to manually close the Circuit Breaker and charge the mechanism in a single movement. It shall be fitted with a local system for manual tripping. There shall be no automatic reclosing. The Circuit Breaker shall be capable of closing fully and latching against the rated making current. Mechanical indication of the OPEN, CLOSED, and EARTHED positions of the Circuit Breaker shall be provided.

The circuit breaker shall be fitted with a mechanical flag, which shall operate in the event of fault occurrences. The breaker indications **ON** and **OFF** positions shall be indicated by suitable flag. For **ON** position indication by Red flag and **OFF** position indication by Green flag shall be provided.

The circuit breaker shall be operated by the same unidirectional handle or switch. The ra operating sequence shall be **O-3min-CO-3 min-CO**.

Each Circuit Breaker shall operate in conjunction with a suitable protection relay under lateral circuit phase and earth fault conditions. In addition, the Circuit Breaker shall be provided with a motorized operating mechanism that can be remotely monitored and controlled from the SCADA.

9. 0 BUSBARS:

The Three nos. of continuous Busbars made up of copper of rating 630 Ashall be provided. The Short time rating current shall be 18.4 kA for 3 seconds for 12 kV. All joints and connectors shall be SF6 insulated in accordance to this specification. Any component directly connected to the power cables shall also be capable of withstanding the DC test voltage applied to the cables. Earth busbar shall be tin/silver plated copper made having minimum cross sectional area 120 Sq mm. Cross section of the main Busbar shall not be less than that stated in GTP.

10.0 BUSHINGS

All the bushings shall be of same height, parallel, on the equal distances from the ground and protected by a cable cover. It is preferable to have bushings accessible from the front side of the ODGISVCB & MU.

11.0 CABLEBOXES

All cable compartment shall be air insulated suitable for dry type cable terminations. The cable compartment of the circuit breaker shall be suitable up to **12 kV 3Core 95/185 sq.mm XLPE** types vertically ascending cable preferably for front type connection. Necessary Right angle Boot should be supplied for cable terminations. Compound filled cable compartment are not acceptable. The cable box shall be arc resistant as per IEC 62271-200 amended up to date. The internal arc fault test on cable box shall be carried out for 12 kV systems for 18.4 kA for 1 second. The clearance between phase to phase and phase to earth shall be as per IEC 61243–5 amended up to date. The cable compartment provided shall be of adequate dimension to house an air-insulated cable termination. It shall be able to accommodate crossing of phase cores, if necessary. The cable compartment shall be rated in accordance with the rated insulation level of the switchgear.

Phases of all primary terminals shall be positively marked on the main structure and not on the removable covers.

12.0 Voltage detecting and indicating system (VDIS)

The ODGISVCB & MU shall be equipped with a Voltage detecting and indicating system (VDIS) . It shall be possible for incoming and outgoing cable of the ODGISVCB & MU to be equipped with a permanent voltage indication Confirming with the standard IEC 62271-213:2021 to indicate whether or not there is voltage on the cables. The capacitive dividers will supply low voltage power

to VDIS voltage presence lamp must be used to indicate live cables. The lamp shall be of adequate dimensions to provide clear indication under all conditions.

13.0 Operating lever

An anti-reflex mechanism on the operating lever shall prevent any attempts to re-open immediately after closing of the switch or earthing switch. All manual operations shall be carried out on the front of the switchboard. The effort exerted on the lever by the operator should not be more than 250 N for the switch and circuit breaker. The overall dimensions of the ODGISVCB & MU shall not be increased due to the use of the operating handle. The operating handle should have two workable positions 180° apart.

14.0 Safety of Equipment

With respect to the ODGISVCB & MU's SF6-filled equipment, any accidental overpressure inside the sealed chamber shall be limited by the opening of a pressure-limiting device in the enclosure so that the gas will be released away from the operator without endangering the operator or anyone else in the vicinity of the ODGISVCB & MU.

All manual operations shall be carried out from the front of the ODGISVCB & MU. The effort required to be exerted on the lever as used by the operator shall not exceed 250 N.

15.0 Front Plate

The front plate shall include a clear mimic diagram indicating ODGISVCB & MU functionality. The position indicators shall correctly depict the position of the main contacts and shall be clearly visible to the operator. The lever operating direction shall be clearly indicated.

16.0 Current Transformers:

16.1 The equipment shall be provided with2 (two) nos. Single core single ratio per phase or 1 (one) no dual core single ratio per phase, ring type, Epoxy resin cast Current Transformer (C.T.) having following particulars :

CURRENT TRANSFORMER FOR METERING	
1. Ratio	100/1A
2. No. of Core	Metering
3.Accuracy Class	0.2S for Metering Core with ISF less than equal to 10.
4.V.A. Burden	2.5 VA
5. Short time Current	18.4 kA for 1 second
6. BIL	0.73kV/3kV
C.T. shall be resin-cast and shall be free from absorption of moisture.	
C.T. shall be connected with P1 at Bus side.	
C.T. shall be rated to carry continuous 120% of its rated current.	
C.T. shall be suitably supported to withstand stresses due to maximum short circuit current to absorb operational shock and also to take care any thermal expansion.	
C.T. shall be easily replaceable by removing cover of the equipment.	
Secondary Terminals of C.T. shall be easily accessible to facilitate easy replacement/removal	

and testing of C.T. at site without dismantling.
One of the Secondary Terminal of each C.T. shall be shorted and earthed at terminal point.
C.T. shall be provided with terminal marking, wiring diagram and rating plate as per provision in I.S.
The ring-type CT with mounting frame shall have a height-adjustable fixing arrangement to permit vertical movement after installation on the power cable for proper access to secondary terminals.

16.2 CURRENT TRANSFORMER FOR PROTECTION

A panel fixture shall be provided in each circuit breaker enclosure to mount single-core ring-type CT at power cable compartment for protection purposes. CT access for maintenance or any other purpose shall be from the front, or back of these panels.

The CTs shall conform to IS 16227. The design and construction shall be sufficiently robust to withstand thermal and dynamic stresses during short circuits. Secondary terminals of CTs shall be brought out suitably to a terminal block, which will be easily accessible for testing and terminal connections.

Further characteristics and features for CTs used for protection are listed as follows:

CTs for Protection (for Outgoing) :

- Material: Epoxy resin cast
- Type: ring type
- BIL: 0.73kV/3kV
- Class of insulation: E or better
- Frequency: 50Hz
- Burden:2.5 VA
- Ratio: 100/1A
- Accuracy Class: 5P10

17.0 Potential Transformers:

POTENTIAL TRANSFORMER (Metering)		
The equipment shall be provided with Three phase Five Limb or Three no. Single Phase Potential Transformer (P.T.) having following particulars.		
1	No. of Phase	3 (Three)
2	Ratio	11000/√3V:110/√3V-110/3V
3	Vector Group	Star / Star- Open Delta with neutral earthed in both Primary and Secondary side for star connected winding.
4	Winding identification	Winding 1 : Metering; Winding 2 : Residual (Open Delta) [Residual voltage winding is to be used only for damping purposes]
5	Accuracy Class	Winding 1: 0.2
6	VA Burden	Winding 1: 10 VA / Phase; Winding 2: 10 VA / Phase
7	Over voltage factor	1.2 continuous & 1.9 for 8 hours
8	Protection of H.V. & L.V.	H.R.C. Fuses
9	Damping resistance for PT's second winding (Open Delta formation)	Damping resistance of 250 ohm and 80 W shall be provided and connected across the open delta terminal.

P.T. should be 3 phase, 5 Limb or 3 single phase unit with Star Connection made to form 3 phase PT having Star point Earthed for both type of PT in HV & LV side.
P.T. shall be dry or resin-cast type.
P.T. shall be connected at Bus side.
P.T. shall be non-draw out fixed type.
P.T. shall be provided with suitable H.R.C. Fuses both at H.V. & L.V. sides which shall be easily accessible without dismantling.
P.T. shall be suitably supported to absorb operational shock and also to take care any thermal expansion.
P.T. Secondary Fuse Boxes shall be provided with sealing arrangement.
P.T. shall be suitable for use in effectively earthed system.
P.T. shall be provided with terminal marking, wiring and vector diagram and rating plate as per provision in I.S.
Rigidity of primary star point with earth bus shall be confirmed. Connection of Primary neutral with main earth bus to be made with solid copper wire & minimum 10 mm diameter or equivalent copper flat.
Provision shall be made to ensure that all secondary terminals and the primary neutral terminal are easily accessible from the front side of the RMU panel without requiring dismantling of any PT after installation.

18.0 METERS & METERING ACCESSORIES :

METERS & METERING ACCESSORIES :
Test Terminal Block : Standard 3-Phase 4 Wire Test Terminal Block with cover (without any additional hole so that any TTB terminal can access from outside after sealing) having Sealing Arrangement shall be provided in metering circuit of equipment panel for connection to Energy Meter. Metering Core of CT to be used for this purpose.
Space & Wiring for Energy Meter : Necessary space shall be provided in the equipment panel for housing projected mounted type Energy Meter. Provision shall be made for detaching this portion of panel having space of 300 mm. (height) & 250 mm.(width) for Energy Meter. Necessary wiring shall be drawn from Test Terminal Block for connection to Energy Meter. Space at man height to be provided for Energy Meter.

19.0 Protection Relay

The ODGISVCB & MU shall be equipped with self powered numerical relays as used to trip the ODGISVCB & MU circuit breakers.

19.1 General

The Circuit Breaker enclosures in the ODGISVCB & MU shall be outfitted with a communicable-type numerical (feeder protection) relay, i.e., one for each circuit breaker. The protection relay's auxiliary contacts shall be hard wired to the SCADA Terminal Block. The relay shall also interface with the RTU via an RS 485 port in order to send, as a minimum, real-time phase current, readings using the MODBUS protocol.

The numerical relay shall be self powered and be provided with Inverse Definite Minimum Time (IDMT) and Instantaneous protection characteristics. On this basis, the relay as a minimum shall provide:

- Phase Over current Protection: Non-directional (50/51)
- Earth Fault Protection :Non-Directional (50N/51N)

Tripping and closing of ODGISVCB & MU shall be done through suitable tripping and closing co the ODGISVCB & MU. A flag/LED indicator shall be provided for signaling the occurrence of trip conditions in the numerical relay.

19.2 Features and Characteristics

The numerical relay shall have the following minimal features and characteristics noting that variations may be acceptable as long as they provide similar or better functionality and/or flexibility.

The make of the Numerical relay shall be as per Annexure-A.

The bidders will have to send the numerical relay of same make, model, Firmware & type as offered in the bid documents as well as to Distribution Testing Department on the pre scheduled date & time for testing of the relay in respect of relevant features as per specification and Communications via a MODBUS RS232/RS485 port to provide the RTU (and hence the SCADA) with phase current measurements and tripping indications. The bidder will have to provide the necessary software for testing of the communication part. This is a part of Techno-commercial evaluation and it is the responsibility of the bidder to show all the features of the relay, failing which they will not be considered as Techno-commercially acceptable. The date & time of such tests at Distribution Testing Department, , will be intimated to the bidder at least 10 (Ten) days prior to the date of testing. The particular relay thus tested will have to be supplied during execution of the Order if placed upon them.

- It shall be housed in a flush mounting case and if required, will be powered by the ODGISVCB & MU power supply unit.
- It shall have three phase over current elements and one earth fault element.
- IDMT trip current settings shall be 20-200% in steps of 1% for phase over current and 10- 80% in steps of 1% for earth fault.
- Instantaneous trip current settings shall be 100-3000% in steps of 100% for phase over current and 100-1200% in steps of 100% for earth fault.
- Selectable IDMT curves shall be provided to include, for example, Normal Inverse, Very Inverse, Extreme Inverse, Long Time Inverse, and Definite Time. Separate curve settings for phase over current and earth fault shall be supported.
- For IDMT delay multiplication, the Time Multiplier Setting (TMS) shall be adjustable from .01 to 1in .01 steps.
- The relay shall have local independent LED indications for Healthy, Trip, I>, I>>, IN>, and IN>> conditions.
- The relay shall also be provided with:
  - Alphanumeric Liquid Crystal Display (LCD) for measurement andrelay setting.
  - Communications via a MODBUS RS232/RS485 port to provide the RTU (and hence the SCADA) with phase current measurements. It is also desirable that this same means of communication can be used by the RTU to send setting.
  - Front USB port for local communications with a laptop PC.

- Parameter change capability that is password protected.
- Capability to record up to 5 of the latest fault records duly time stamped and stored in non-volatile memory for subsequent reading via the above referenced USB port.

20.0 Power Supply

Each ODGISVCB & MU shall be outfitted with a power supply, including batteries and battery charger, suitable for operation of a ODGISVCB & MU. The following operational specifications shall apply:

- The power supply unit shall conform to the following requirements:
  - Input: 230 V AC nominal from the auxiliary power transformer allowing for possible variations from 190 to 300VAC
  - Output: Stable 24VDC
  - Batteries: 24VDC
  - **Receptacles: 2 x 230 V AC (fortest equipment)**
  - Lighting Fixtures: One for each enclosure
- The auxiliary power transformer's inputs shall be equipped with surge protection devices in accordance withIEC62305.
- The 24 V DC batteries shall have sufficient capacity to supply power to the following devices with a nominal backup of8 hours:
  - To restore a depleted battery to 80% of full capacity in less than8 hours.
  - To deliver the load of ODGISVCB & MU's trip coils, close coils, and relays, spring charge motor.
- The batteries shall be of Dry type/VRLA/ Ni-Cad type, comply with IEC 60623 and shall have a minimum life of five (5) years at 25°C. The nominal capacity in ampere-hours shall be the capacity for twenty hour discharge (C20). The cell shall be of a suitable type for high rate/medium rate discharge. A cell of low rate of discharge is not acceptable. The battery shall have the capability to close and open the switches for at least 10 close-open cycles (this must be verified by calculation). When sizing the AH capacity of the battery, the effect of aging shall be taken into consideration. The AH rating of the battery shall be greater than calculated AH but not less than 26 AH.
- The battery charger shall be fully temperature compensated and minimum continuous current rating shall be 10 Amp at rated voltage 24 Volts.
- To prevent deep discharge of the batteries on loss of AC power source, the battery charger shall automatically disconnect all circuitry fed by the batteries following a user-adjustable time period or when the battery voltage falls below a preset value.
- The battery charger shall be provided with an alarm displayed at the local control panel and remotely at the SCADA to account for any of the following conditions:
  - Low battery voltage
  - High battery voltage
  - Battery failed

- Battery charger overvoltage
- Grounded battery/battery-charger
- Input MCB off
- Station AC supply fail
- Battery Charger fail
- Others according to manufacturer's design

- The capacity of battery and charger and the basis of calculation shall be declared in the GTP.

20.1 Battery Charger

The charger shall be designed to provide a well regulated DC supply to the load while float charging or quick charging the battery. The charger shall be the constant potential, current limiting fully automatic type. The charger shall automatically switch to float charge after the battery is restored to 80% of its nominal capacity under BOOST charge. The BOOST charge shall be automatically ON after an emergency discharge and the duration of BOOST charge shall be less than 8 hours.

The float charge voltage shall not vary by more than +/- 2% of the set value irrespective of AC input voltage variation of +/- 10 % and of load variation from 0% to 100%. The r.m.s ripple voltage across the battery shall not exceed 1% of the nominal output voltage.

The charger shall be protected against low battery voltage and short circuit at the output by employing current limiting feature. It shall also be protected against reversed battery voltage. Suitable protection shall be incorporated for DC output, transformer secondary, rectifier etc. The charger shall be designed to operate continuously at a temperature of 55^{o} C. To ensure long service life for the charger, all semiconductor devices shall be of industrial grade.

The following instrument and control shall be provided on the charger:-

- Mains ON/OFF input circuit breaker with Mains ON neon or LED indicator, DC output MCBs with spare. All MCBs shall be of double pole design with auxiliary voltage free contact.
- Voltmeter and Ammeter to measure charger/battery voltage and current.
- All visual alarm indication shall be of LED type with its function clearly mentioned.

21.0 Distribution Automation System Interface

The ODGISVCB & MU shall be equipped so that it can be monitored and controlled via the SCADA.

A list of input/output points required for Circuit Breaker Unit is presented in Table 1-2 below. Digital Input points and control Output points shall be connected via auxiliary relay to be provided by SCADA Vendor and analog value and protection alarms shall be provided via IED/Relay through MODBUS through RS-485 ports.

Table 1-2: Data Points per ODGISVCB & MU Configuration
4-Way ODGISVCB & MU

FRTU: Site Name RTU ADD:XXX IP ADD: xx.xx.xxx.xxx

SINGLE POINT	Hardware Signal	State	Double Point	Hardware Signal	State
VCB Tripped on fault	SS	Tripped	VCB ON-OFF STATUS	DS	ON/OFF
Site Name SF6 PRESURE	**SS**	LOW	DS ON-OFF STATUS (IN CB)	DS	ON/OFF
RMU or TVM or CT, PT chamber Door open	SS	Open(All signals are in Series)	ES ON-OFF STATUS (IN CB)	DS	ON/OFF
			LBS ON-OFF STATUS	DS	ON/OFF
			ES ON-OFF STATUS (INLBS)	DS	ON/OFF
			LOCAL/SCADA	DS	L/S
MODBUS Signal	**From Relay**		**Common Signal**		**State**
Site Name VCB1 CURR L1	**Analog value**		Battery Charger Input AC supply	SS	Fail
Site Name VCB1 CURR L2			Site Name Batt Charger	SS	Fail
Site Name VCB1 CURR L3			Site Name Batt Volt	SS	Low
Site Name VCB1 CURR E					
MODBUS Signal	**From Relay**				
Site Name VCB Fault	O/C				
Site Name VCB Fault	E/F				

CONTROL	Hardware Signal	State
Site Name VCB1 BRK Control Command	Double Command	Open/ Close
DS Control Command	Double Command	Open/ Close
LBS Control Command	Double Command	Open/ Close

21.1 Numerical Relay Interface with RTU

The Bidder is required to furnish the numerical relay information that pertains to interfacing the relay with the RTU through an RS 485 serial communications link. The protocol details along with the MODBUS mapping data as implemented in each relay shall be provided.

All relays of specified make must be complied the availability of WBSEDCL specified/ listed status, and measurement parameter over MODBUS for remote SCADA communication. Numerical relays shall have latest up to dated firmware and that need to be mentioned during approval of drawing.

Offered numerical relay is to be tested at WBSEDCL laboratory in respect of its functionality. Manufacturer will have to arrange the third party MODBUS simulator software for that purpose to show the requirement of WBSEDCL for SCADA communication during the evaluation of tender.

21.2 Construction

The ODGISVCB & MU shall be sufficiently sturdy to withstand handling during shipment, installation, and start-up without damage. The configuration for shipment shall adequately protect the ODGISVCB

& MU equipment from scraping, banging, or any other damage. The Bidder shall assume responsib for correction of all such damage prior to final acceptance of the equipment.

21.3 Metering Unit With Control Cabinet

The ODGISVCB & MU shall be outfitted with a separate enclosure, referred to herein as the Control Cabinet, to house the following equipment as a minimum:

- Auxiliary transformer for ODGISVCB & MU AC Aux. Power Supply will be required.
- SCADA terminal blocks shall be mounted on base plate inside **Metering Unit With Control Cabinet**. All doors shall be free from any terminals.
- ODGISVCB & MU Power Supply Unit including Charger and Batteries
- Other equipment according to manufacturer's design
- One Illumination lamp and one heater to be provided in the metering Unit.

The **Metering Unit With Control Cabinet** shall be similar in style and finish as the other ODGISVCB & MU enclosures.

The cabinet shall have a hinged front access door with a three-point latch locking system and a latch operating lockable handle. The door shall be fitted with a perimeter flange and gasket (rubber or neoprene) to prevent the entrance of water. **In addition, a means of monitoring and indicating that the door is open shall be provided.**

A metal screen with holes shall be provided on the top and bottom of the control cabinet to provide ventilation aimed at avoiding condensation inside. Venting however shall in no way reduce the effectiveness of the control cabinet's water-tight, dust-tight, and corrosion- resistant characteristics. To augment the cabinet's effectiveness in preventing the ingress of dust, insects, vermin, and small objects, all electronic parts within the control cabinet shall be enclosed in modules. Such parts and modules shall be separated from the power supply modules as also installed in the cabinet.

The thickness of all enclosure panels shall be at least 1.6 mm. The control cabinet shall also be provided with:

- Weatherproof fittings for control cables.
- Provision for handle and padlock.
- Grounding terminal, with solder less clamp type connector suitable for steel stranded conductor of suitable diameter and complete with lock washer of stainless steel or better.
- Provision for separately grounding the ODGISVCB & MU's electronic items.
- Means of protection against rain water, corrosive salt formations, and high levels of air borne dust(IP-54).
- Circuit diagram of control unit for maintenance purpose affixed permanently.
- Others according to manufacturer's design.

21.4 Auxiliary Transformer

The ODGISVCB & MU shall be outfitted with a single-phase auxiliary power transformer with a turns ratio of 11000/√3 to 230, i.e., it shall be connected line-to-neutral to the ODGISVCB & MU 11 kV bus and used to provide the required 230 VAC input to the ODGISVCB & MU's power supply. The auxiliary power transformer shall have a capacity of at least 1.0 KVAand maximum allowable voltage regulation shall be 5%. During supply, however, the bidder shall assess this requirement by taking into account the actual load corresponding to the RTU and Modem (supplied by others) as well as

the load represented by the ODGISVCB & MU motors, etc. In this respect, with a suitable margin approved by the Employer, the auxiliary transformer must be capable of supporting the power supply requirements that correspond to a 5-way ODGISVCB & MU. HRC fuses shall be provided on both the HV and LV sides of the transformer.

21.5 Motors

The ODGISVCB & MU shall be factory fitted with Closing motors of insulation Class E or better in accordance to IEC 60085 and allowing the circuit breakers to be operated without manual intervention. Motor speed shall ensure closing in 40-60 ms. Independently of SCADA control, the mechanism shall ensure that the motors start up immediately once the spring becomes discharged, so that the breaker becomes ready for the next operation.

In addition to allowing circuit breaker tripping by the ODGISVCB & MU's protection relays, the motorized operating mechanism shall be suitable for remote control by the SCADA.

The motors along with a Contractor supplied control panel shall allow Employer personnel to electrically operate the circuit breakers at site without any modification of the operating mechanism and without de-energizing the ODGISVCB & MU.

The motors shall be of a reputable make in the form of a 24 VDC, single phase type. They shall be enclosed and completely dust proof and sized with a suitable margin to meet the torque requirement of the spring charge mechanism. The motors shall comply with IEC 60034-1 and continuously rated. An 'ON-OFF' switch shall be installed on the ODGISVCB & MU for isolation of the motor from the supply and a thermal device or other approved means shall be provided for protection of the motor.

The DC motor shall be able to withstand 'BOOST' voltage of the battery charger.

22.0 Operating Mechanism:

22.1 Manual Operation:

Each of the Circuit Breaker shall be provided with an independent manual closing and opening mechanisms complete with operating handles. An approved visual indicating device coupled to the operating mechanism shall be provided to show whether the breaker is open or close.

The operating mechanism shall be of robust construction and shall be designed to operate with minimum mechanical shock and to prevent inadvertent operation due to vibration or other causes.

The circuit breaker shall be operated from the front of the equipment.

22.2 Motorised Operation:

The circuit breakers/Isolators shall in addition be provided with motor actuator to enable them to be remotely operated. If the actuator mechanism is to be detached before manual operation is possible, simple means of detaching the mechanism shall be provided. Pad-lockable cover shall be provided over the actuator and its linkages.

22. 3 Fault Passage Indicator(FPI)

This shall facilitate quick detection of faulty cable. The fault indication may be on the basis of monitoring fault current through the device. The unit shall be self contained requiring no auxiliary

supply. FPI shall be integral part of each Isolator and shall be capable of displaying fault. It shall h LED indication and electrical reset facility. It shall sense short circuit and earth fault current separately. It shall have multiple ampere and time setting both for short circuit and earth fault. The FPI should be put through current sensor with site selectable setting/CBCT in all the three phases of the Ring of the ODGISVCB & MUs. FPI should have suitable connectivity with the FRTUs for the SCADA purpose.

22.4 Integral Cable Earthing Switch

Each circuit breaker/Isolator shall be provided with an integral cable earthing switch. A visual indication device coupled to the earthing switch mechanism shall be provided to show clearly whether the cable earthing switch is in the 'cable earthed' or 'cable unearthed' position. Each earthing switch shall be Pad-lockable.

22.5 Cable Testing and Test Plug

Provision shall be made for the high voltage testing of cables connected to the switchgear. All parts of the switchgear directly connected to a cable including any necessary test plugs shall be capable of withstanding at any time the high voltages that may be applied during the testing of the connected cable. The insulation between poles and to earth of the test plug should be at least 10,000 meg-ohm when tested with a 5000 volts insulation resistance tester.

22.6 Indicators

The front of the equipment shall provide clear, unambiguous indication of the position and state of the circuit breaker.

A single line diagram and mimic system of the ODGISVCB & MUs, indicating the layout and connection of the Circuit Breakers and bus bars shall be provided at the front of the equipment.

Positively driven mechanical indication of the operating positions of a switching device shall be provided. Separate labels shall indicate ON, OFF and EARTH ON for the Circuit breakers. Separate labels shall indicate MAIN SWITCH and EARTH SWITCH for breakers and earth switch mechanism.

22.7 Interlocks

Each switch panel shall be provided with a comprehensive interlocking system to prevent dangerous or undesirable operations.
The interlocks shall be by mechanical means only.

The following minimum interlocks to prevent:-

i. Inadvertent operation of the Circuit breaker from ON to EARTH position.

ii. Opening of test access cover to access test terminals until the switch is in CABLE EARTHED position. Switch can't be closed until the test access cover has been replaced.

iii. Earthing of cable when Disconnector is in ON position.

iv. Operation of switch from ON to OFF and Earth switch from Earth ON to OFF for a minimum period of three seconds subsequent to the achievement of the ON or EARTH ON positions respectively.

v. Remote ON/OFF from SCADA shall not be done when ODGISVCB & MU is in Local position.

22.8 SF6 Gas Pressure Gauge

Pressure gauge with safety level bar with proper dial scale marking shall be provided for monitoring SF6 gas pressure. A pair of voltage free contact shall be provided for remote monitoring of low pressure alarm.

22.9 Padlocks

Provision for handle and padlock shall be provided for RMU main hydraulic operated cover and for metering unit door. Padlocks or other approved locking devices shall be provided for locking each panel in the ON, OFF, Cable Earth or Unearthed positions.

22.10 Provision of Supervisory Control

Control Circuits of ODGISVCB & MU

The interposing relays for remote opening and closing of the ODGISVCB & MU shall be provided by SCADA vendor. Necessary wiring shall be provided by the ODGISVCB & MU manufacturer upto the terminal blocks assigned for SCADA. Circuits from the motors as well as the power supply for the operation must be wired up to the TB in such a way that remote operation on the ODGISVCB & MU are possible through the contact of the corresponding interposing relay in the supervisory control equipment. There should not be any connector/joints in between ODGISVCB & MU internal TB to SCADA TB. MODBUS wiring from relays to SCADA TB is to be wired.

22.11 Position indication of Circuit breakers

Voltage free auxiliary contacts must be wired up to the terminal blocks assigned for SCADA interface for each circuit breaker for both ON/OFF indications.

A Remote/Local switch shall be provided to control motorized Circuit breakers.

The Remote and local indication shall be connected and wired up to a separate terminal block assigned for SCADA interface.

Voltage free contact must be wired for other alarms as detailed in Table-1-2.

23.0 TYPE and ROUTINE TEST:

23.1 Type tests:

The equipment offered in the tender should have been successfully type tested at NABL accredited third party laboratories in India or equivalent international laboratories in line with the relevant standard and technical specification Validity of type test shall be as per latest CEA guidelines, i.e., within the last 15 (Fifteen) years from the date of offer. The bidder shall be required to submit complete set of the type test reports along with the offer.

The list of type tests is as follows:

I. Short time current withstand test and peak current withstand test.

II. Lightning Impulse voltage with-stand test.

III. Temperature rise test.

IV. Short Circuit current making and breaking tests.

V. Power frequency voltage withstand test(dry).

VI. Capacitive current switching test conforming to IEC.

a) **Rated line-charging breaking current;**
b) **Rated cable-charging breaking current**

VII. Mechanical operation test **both for disconnector and CB.**

VIII. Measurement of the resistance of the main circuit.

IX. Degree of protection of main tank and outer enclosure.

X. Circuit breaker, earthing switch making capacity.

XI. Switch, circuit breaker breaking capacity.

XII. Internal arc withstand for **main tank & cable chamber.**

Metering Current Transformer	a) Short Time Current Test b) H.V. dry power frequency voltage withstand test
Metering Potential Transformer	a) Impulse Voltage Withstand Test b) H.V. dry power frequency voltage withstand test c) Temperature Rise Test d)PD testing

The details of type test certificate according to the composition of the Switchboard shall be submitted with the offer. In addition, for switches, test reports on rated breaking and making capacity shall be supplied. For earthing switches, test reports on making capacity, short-time withstand current and peak short-circuit current shall be supplied.

23.2 ACCEPTANCE &ROUTINETESTS:

All acceptance as stipulated in the respective applicable standards amended up-to-date for all the equipment shall be carried out by the supplier in the presence of purchaser's representative without any extra cost to the purchaser before dispatch.

The tenderer shall have full facilities to carry out all the acceptance and routine test as per the applicable standards.

After finalization of the program of acceptance testing, the supplier shall give 15 days advance intimation to the purchaser, to enable him to depute his representatives for witnessing the tests.

The routine tests carried out by the manufacturer at his works as per IEC 62271-200 on the ODGISVCB & MU.

The routine tests as per relevant IEC/IS are as follows:

i. Conformity with drawings , diagrams, and GTP,
ii. Measurement of insulation resistance and high voltage test at high voltage and low voltage circuit.
iii. Electrical control and operation checking applying specified control DC voltage.
iv. Protection circuit operation checking.
v. Measurement of closing and opening time/speeds,
vi. Checking of filling pressure,
vii. Dielectric testing and main circuit resistance measurement.
viii. Measurement of contact Resistance.
ix. Mechanical and electrical operation tests.
x. All IO points as scheduled above are to be made available in SCADA TB and to be tested.
xi. All IO and measurement data point address (for remote SCADA communication) of numerical relay to be supplied by the manufacture prior to the inspection. Manufacturer will have to arrange third party MODBUS simulator software for testing the same.
xii. Acceptance test of CT & PT as per relevant IS.

All major type tests shall have been certified at an independent authority with the tests carried outside country of manufacture shall be translated in English and submitted in hard copy.

The supplier in the presence of WBSEDCL's representative shall carry out all above acceptance. The supplier shall give at least 15 days advance intimation to the WBSEDCL to enable them to depute their representative for witnessing the tests.

The WBSEDCL reserves the right for carrying out any other tests of a reasonable nature at the works of the supplier/laboratory or at any other recognized laboratory/research institute in addition to the above mentioned type, acceptance and routine tests at the cost of the WBSEDCL to satisfy that the material complies with the intent of this specification.

24.0 INSPECTION:

The inspection may be carried out by the purchaser at any stage of manufacture. The successful tenderer shall grant free access to the purchaser's representative/s at a reasonable notice when the work is in progress. Inspection and acceptance of any equipment under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment is found tobe defective.

The supplier shall keep the purchaser informed, in advance, about the manufacturing program so that arrangement can be made for stage inspection.

The purchaser reserves the right to insist for witnessing the acceptance/routine testing of the bought out items. The supplier shall keep the purchaser informed, in advance, about such testing program.

25.0 MANUFACTURING FACILITIES:

As ODGISVCB & MU are having sealed pressure system in compliance with IEC 298, manufact shall have complete facility with state of the art equipments for ensuring the quality of produc delivered strictly adhering to IEC 298 GUIDELINES. Following are the work station requirement at manufacturer place to ensure the adherence: -

i. Robotic/TIG welding station for stainless steel main tank ensuring the leak rate less than 0.1%per annum

ii. Work stations with adjustable work benches and torque wrenches, giving flexibility to workmen for proper tightness of internal components of sealed tank.

iii. State of the Gas leak testing system ensuring the quality of sealing and have precision to measure leak rate less than o.1% per annum.

iv. High voltage testing station to have high voltage power frequency test and partial discharge measurement.

v. Computerized system to measure time travel characteristic of breaker before sealing the tank.

vi. Computerized SF6 filling and testing facility.

vii. Partial Discharge Lab for conducting the partial discharge test.

It is mandatory to have the complete assembled tank tested for partial discharge to ensure a high life and reliability of the product.

26.0 QUALITYASSURANCE PLAN:

The raw materials/components are to be procured only from reputed manufacturers. After placement of Purchase Order, the bidder is required to produce on demand the source of each material/component along with their test certificate.

27.0 DRAWINGS:

All drawings shall conform to relevant IEC Standards Specification. All drawings shall be in ink. The Tenderer shall submit along with his tender dimensional general arrangement drawings of the equipment, illustrative and descriptive literature in triplicate for various items in the ODGISVCB & MUs, which are all essentially required for future automation.

1. Schematic diagram of the ODGISVCB & MU panel
2. GA drawing of Incoming AIS panel
3. Instruction manuals
4. Catalogues of spares recommended with drawing to indicate each items of spares
5. List of spares and special tools recommended by the supplier.
6. Drawings of equipment, relays, control wiring circuit, etc.
7. GA drawing of metering CT & PT
8. Foundation drawings of ODGISVCB & MU.
9. Actual single line diagram of ODGISVCB & MU/ODGISVCB & MUs with or without extra combinations shall be made displayed on the front portion of the ODGISVCB & MU so as to carry out the operations easily.

5 sets of the manuals as above shall be supplied to the Chief Engineer/Distribution Six nos. soft copy of the all Technical documents and Drawings furnished in a CD. All drawings shall be prepared in Auto Cad and documents, literature etc. in MS OFFICE format for submission.

28.0 PACKING& FORWARDING:

The equipment shall be packed in crates suitable for vertical/horizontal transport as the case may be and the packing shall be suitable to withstand handling during the transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable materials shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by the supplier without any extra cost.

Each consignment shall be accompanied by a detailed packing list containing the following information:

a. Name of theconsignee.
b. Detailsof consignment.
c. Destination.
d. Total weight of consignment.
e. Sign showing upper/lower side ofthe crate.
f. Handling and unpacking instructions.
g. Bill of material indicating contents ofeach package.

All the equipment covered in this specification shall be delivered to the various stores of the WBSEDCL as will be intimated to the successful tenderers. The equipment shall be delivered to these stores only by road transport and shall be suitably packed to avoid damages during transit in the case of indigenous supplies.

29.0 PERFORMANCE GUARANTEE:

In the event of any defect in the equipment arising out of faulty design, materials, workmanship within a period of 5 (five) years from the date of last dispatch of any integral part of the equipment, the supplier shall guarantee to replace or repair the same to the satisfaction of thepurchaser.

30.0 DOCUMENTATION:

After issue of letter of acceptance, the successful Tenderers shall submit 3 identical sets of complete drawings along with detailed bill of materials for approval, to the Chief Engineer, Planning & Engineering, Distribution. If any modifications are required on these, the same will be conveyed to the supplier who shall modify the drawings accordingly and furnish final drawings for approval. In no case delivery extension will be granted for any delay in drawing approved.

The manufacturing of the equipment shall be strictly in accordance with the approved drawings and no deviation will be permitted without the written approval of the Distribution department.

All manufacturing and fabrication work in connection with the equipment prior to the approv the drawings shall be at the supplier's risk.

After approval of the drawings and bills of materials, the suppliers shall submit detailed packing lists for approval. After approval, copies of these packing lists shall be forwarded to the respective consignees. Copies of packing lists shall also be submitted to the respective site stores.

Before dispatch of equipment to various consignees, the suppliers shall furnish sets of final drawings, including bills of materials and wiring schedules and also sets of technical literature and commissioning manuals. These shall be in Five sets and shall be furnished to the Distribution Procurement department, positively before the dispatch of equipment. All drawings shall preferably be of A3 size. No drawing of width more than 35 cm will be acceptable. One set each of the final drawings, bill of materials, wiring schedules and commissioning manuals shall invariably be forwarded to the consignee along with the each switchgear consignment and shall be listed out in the packing list, when submitted for approval.

In case the supplier fails to furnish contractual drawings and manuals even at the time of supply of equipment, the date of furnishing of drawings/manuals will be considered as the date of supply of equipment for the purpose of computing penalties for late delivery.

31.0 SCHEDULES:

The tenderer shall fill-in the following schedules which is part and parcel of the tender specification and offer. If the schedules are not submitted duly filled-in with the offer, the offer shall be liable for rejection.

Schedule 'A' ... Guaranteed technical particulars.

Schedule 'B' ... Schedule of Tenderer's experience.

Any additional information may be furnished separately by the tenderer, if felt necessary by him.

32.0 ACCESSORIES & SPARES:

The following spares and accessories shall be supplied along with the main equipments at free of costs. This shall not be included in the price schedule.

1. Charging lever for operating load break isolators & circuit breaker of each ODGISVCB & MU.

Provision shall be made for padlocking the Circuit breaker, and the earthing switches in either open or closed position with lock & master key.

33.0 SPARE CT AND PT:

The bidder shall supply additional predefined quantities (5%–10%) of Current Transformers (CTs) and Potential Transformers (PTs) as spares. These spares shall be of the exact same make, type, ratio, rating, accuracy class, and design as those provided in the main supply, to ensure interchangeability and compatibility. The exact quantity of spare CTs and PTs required shall be decided and finalized at the tender stage.

Annexure-A

Standard Make of Relay and fitment

1.	Relays	ABB/Siemens/Schneider Electric/ C&S /CGL/ Ashida Electronics or OEM make
2.	Breaker Control Switch	Kaycee / Alstom / Recom/ Switron/ L&T/ABB/Siemens/GE
3.	Ammeter/Voltmeter Selector switch	Kaycee/ Recom Switron /L&T/ABB/Siemens/GE
4.	Static Ammeter/ Voltmeter	AE/IMP/MECO/RISHOVE/ SECURE
5.	Push Buttons	Alstom / Kaycee / Vaishno/L&T/Siemens
6.	Indicating Lamps with lenses	Alstom / Kaycee / Vaishno/L&T/Siemens
7.	Panel Wiring (FRLS)	ECKO/PHOENIX/Finolex/Havels/KEI/RR Kables/Poly Cab (with ISI mark)
8.	Vacuum Interrupter	**BEL / SCHNEIDER / SIEMENS / ABB/ CGL or OEM make**
9.	FPI	**Preferably OEM make**
10.	Current and Voltage transformer	**ECS/Pragati /Narayan Powertech /BMC/ Plastofab/Ericon transformer**
11.	Battery Charger	**Alan, Gogate Electric**
12.	Battery	**Exide, Amara Raja**
13.	MCB	**Siemens/L&T/Schneider/ABB/Kaycee/Legrand/GE/** C&S/Etorn

SCHEDULE 'B'

SCHEDULE OF TENDERER's EXPERIENCE

The tenderer shall furnish here the list of the similar orders executed/under execution by him to whom a reference may be made by the purchaser in case he considers such reference necessary.

Sr. No.	Name of the client & description of the order	Value of order	Period of supply & commissioning	Name and address to whom ref can be made

NAME OF THEFIRM.....

NAME & SIGNATURE OF THETENDERER----------

DESIGNATION.....

DATE.....

GURANTEED TECHNICAL PARTICULARS
SCADA Compatible 11 KV SF6 Embedded VCB Panel Outdoor with Extensible Metering Unit
(To be filled by the bidder)

	Manufacturer's Name & Factory Address	
A.	**General** :	
1.	Applicable Standard	
2.	Type/Model	
3.	Rated Voltage	
4.	Highest System Voltage	
5.	Phase	
6.	Frequency	
7.	Rated Normal Current	
8.	Rated Short Circuit Current Capacity	
9.	Rated Breaking Current Capacity (min)	
10.	Rated Making Capacity	
11.	Insulation Level	
12	Minimum Gas Pressure	
13.	Dimension of ODGISVCB & MU(H X W X D)(Maximum Limit)	
14.	Material and Thickness	
	a) Tank	
	b) Outer Structure	
	c) Outdoor enclosure	
15.	Degree of Protection	
	a) High Voltage live parts, SF6, VCB	
	b) Front Cover Mechanism	
	c) Cable Compartment	
	d) Outdoor Enclosure	
16.	Internal Arc for main Tank & Cable Chamber	
17.	Maximum Temperature withstand capacity	
18.	Whether ODGISVCB & MU are designed to withstand all weather conditions including chemical industry and polluted areas	
19.	Whether ODGISVCB & MU has provision for sensors for temperature compensated pressure measurement in the relevant gas compartment to monitor the pressure of SF6 gas	
20.	Whether ODGISVCB & MU is sealed pressure system	
21.	Whether ODGISVCB & MU is manufactured as per IS/IEC standards to hold SF6 gas without leakage	
22.	Whether ODGISVCB & MU is provided with necessary take off terminals for automation	
23.	Weight of ODGISVCB & MU complete with operating mechanism	
24.	Position of the Power Cable entry of the ODGISVCB & MU	
25.	Position of release of Gas during Internal Fault	
26.	Provision of FPI in Incoming cable in Metering Unit	
27.	Provision of Live Line Detectors in all Panels	
28.	Whether ODGISVCB & MU metal clad has sufficient space for integration of: • 2 numbers of Vacuum Circuit breaker • Sufficient space for inspection, testing, etc. • Earthing arrangements • Terminal output points for automation	
29.	Whether Enclosure door-open indications	
30.	Circuit breaker spring charge indications	
31.	Whether ODGISVCB & MU is suitable for remote closing and tripping for SCADA operation.	
32	Whether the enclosure is anti-corrosive, if so give the detail.	
33	Spacing between live parts to earth	
B.	**Vacuum Circuit Breaker**	
1.	Material used for making the body of the breaker	
2.	Make	
3.	Type/Model	

4.	Standard	
5.	Normal Voltage	
6.	Highest System Voltage	
7.	Frequency	
8.	No. of Poles	
9.	Rated Current	
10.	Short Time Current with duration	
11.	a.) Rated Dry PF Withstand Voltage for 1 min (b/w line terminal & earth)	
	b.) Between terminals with breaker contacts open	
12.	a.) Rated 1.2/50 full wave Impulse Withstand Voltage (Between line terminal and earth)	
	b.) Between terminals with breaker contacts open	
13.	Breaking Capacity	
14	Making Capacity	
15	Rated Fault level MVA	
16.	Short circuit breaking current	
	(a)Symmetrical	
	(b)Symmetrical at rated voltage	
	(c)Asymmetrical at rated voltage (i). Per Phase (ii). Average	
	(d)DC Component	
17.	Single Phase Capacitor Breaking Current	
18.	Cable Charging Breaking Current	
19.	Rated restriking voltage at 100% and 50% rated capacity	
	(a)Amplitude factor	
	(b)Phase factor	
	(c)Natural frequency	
	(d)R.R.R.V.(Volts/micro sec.)	
20.	Duty Cycle	
21.	Arcing Time (at rated breaking current)	
22.	Closing time	
23.	Breaking time	
24.	Opening time	
25.	Make time in ms.	
26.	Minimum Phase to Phase Clearance	
27.	Minimum Phase to Ground Clearance	
28.	Type of operating mechanism	
29.	Maximum Temperature withstand capacity	
30.	Mechanical Safety Interlock	
31.	No of Break per Phase	
32.	Mechanical Endurance Capacity	
33.	Thickness of the Tank	
34.	Thickness of enclosures	
35.	Type of welding of the main Tank	
C.	**Vacuum Interrupter**	
1.	Make	
2.	Type & Model	
3.	Current Rating	
4.	STC with duration	
5.	Breaking Capacity	
6.	Mechanical Endurance Capacity	
7.	Electrical Endurance Capacity	
8.	Minimum Electrical Life at STC	
9.	Contact separation distance	
10.	Type of main contacts	
11.	Contact pressure	
12.	Contact resistance	
13.	Details of main contacts making contact with the breaker truck with the panel	
14.	Control circuit voltage AC/DC.	
15.	Whether trip free or not	

	Potential Transformer For Metering	
1.	Make	
2.	Reference Standard	
3.	Whether Fixed Type (Yes/No)	
4.	Insulation level	
5.	Winding connection	
6.	Type of Core connection	
7.	Ratio	
8.	Class of accuracy	
9.	Burden per Phase	
10.	Over Voltage Factor for 8 hrs.	
11.	Installation Position	
12.	Primary Fuse rating	
E.	**Current Transformer for Metering**	
1.	Make	
2.	Type	
3.	Voltage Grade	
4.	Type of Primary winding	
5.	Reference Standard	
7.	One minute PF withstand Voltage on Secondary	
8.	Frequency	
9.	Ratio	
10.	Class of Accuracy	
11.	Rated burden	
12.	STC with duration	
13.	Secondary resistance at 70°C	
14.	Continuous Over Load in percentage(%)	
15.	Class of Insulation	
F.	**Current Transformer for Protection**	
1.	Make	
2.	Type	
3.	Voltage Grade	
4.	Type of Primary winding	
5.	Reference Standard	
6.	Primary Insulation level (PF rms / impulse peak)	
7.	One minute PF withstand Voltage on Secondary	
8.	Frequency	
9.	Ratio	
10.	Class of Accuracy	
11.	Rated burden	
12.	STC with duration	
13.	Secondary resistance at 70°C	
14.	Continuous Over Load in percentage(%)	
15.	Class of Insulation	
G.	**Bus Bar**	
1.	Material	
3.	Maximum Current Density (Amp/sq.mm.)	
4.	Minimum clearance (Phase to Phase)(AIS portion)	
5.	Minimum clearance (Phase to Ground)(AIS portion)	
6.	Cross sectional area of the Bus with dimension	
7.	Current Rating of Bus	
8.	Type of Insulation	
9.	Minimum Creepage Distance of Bus support Insulator (AIS portion)	
H.	**Earth Bus**	
1.	Material	
2.	Size (Minimum)	
I.	**Numerical Relay**	
01.	Make	
02.	Model No.	
03.	Ref. Type	

04.	Ordering Code of Numerical relay		
05.	Applicable Standards		
06.	Current Setting range for		
	(a) Over current relay	IDMT	
	(b) Earth fault Element	Definite Time	
07.	Whether the relay has the in-built facilities of IDMT, OL, EL		
08.	Details of IDMT Characteristics		
09.	Accuracy for different settings and limits of errors		
10.	Whether Alpha numeric / LED display		
11.	Whether compatible for 1 A CT Secondary		
12.	Whether draw out type		
13.	Type of case		
14.	Reset time		
15.	Burden of relay		
16.	Maximum and Minimum, operating ambient air temp.		
17.	Whether technical literature pamphlets about the relay submitted		
18.	Certificate of Proof for Electro Magnetic Interference.		
19.	Communications port – RS 232 / RS 485		
20.	Communication Protocol – MODBUS		
L.	**Painting**		
	a) Support Structure		
	b) Mimic		
	c) Outdoor part		
	d) Thickness		
M.	**Control Wire**		
	a) Make		
	b) Voltage Grade		
	c) Size		
	(i) CT Circuit		
	(ii) Other Circuit		
	d. Colour		
N.	**Accessories**		
	i. Spring Charging Handle		
	ii. VCB operating Handle		
O.	**Battery**		
	i. Make		
	ii. Type		
	iii. Voltage rating (V)		
	iv. Ampere Hour Rating (AH)		
	v. Capacity		
	vi. Discharge Class		
	vii. Min. Back up hours		
	viii. Min. Life Span (yrs)		
P.	**Battery Charger**		
	i. Make		
	ii. Type		
	iii. Voltage rating (V)		
	iv. Ampere Rating (A)		
	v. Variation of O/P Voltage in (%)		
	vi. Whether battery Charger of the offered ODGISVCB & MU is equipped with an alarm at the local control panel and remotely at the SCADA to account for all the conditions specified in the TS of NIT		
Q.	**Auxiliary Transformer**		
	i. Make		
	ii. Type		
	iii. Voltage rating (V)		
	iv. Capacity (KVA)		
	v. Whether input Auxiliary Transformer equipped with surge protection device.		
	vi. Maximum % of voltage regulation		
R.	**Confirmation of list of Input/output points as per Table 1-2: (Data Points per ODGISVCB & MU configuration) of**		

	Technical Specification.	
S.	Guarantee of the total equipment including any integral part of the equipment	

Signature with Designation & Seal
With Name of the Firm