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File No. J-11014/3/2025-DD PROJECT-ADG(E-SZ)/E305658

Dt: 28.04.2026

Subject: Budgetary quote request for Design, manufacturing, pre dispatch testing, delivery and SITC of **11KV, 630A 5 way, Motorized, SCADA Compatible, SF6 Outdoor Ring Main Unit (RMU) from vendors / OEM - Reg**

Sir/Madam,

Technical specification for Design, manufacturing, pre dispatch testing, delivery and SITC of **11KV, 630A 5 way, Motorized, SCADA Compatible, SF6 Outdoor Ring Main Unit (RMU) from vendors / OEM**

Budgetary quote may kindly be provided by email to **tvproject_sz@yahoo.com** on or before **04.05.2026**.

भवदीय /Regards,

T. Nalini
28/4/2026
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कृतेअपरमहानिदेशक (प्र.सं.)(द.क्षे) / for ADG(BO)(SZ)

TECHNICAL SPECIFICATION FOR SUPPLY OF 11KV 5 Way RMU and Integration with the Power Supply System

1.0 SCOPE:

The specification covers Design, manufacturing, pre dispatch testing, delivery and SITC of **11KV, 630A, 5 way, Motorized, SCADA Compatible, SF6 Outdoor Ring Main Unit (RMU)** in accordance with the technical requirements mentioned in the specification and relevant standards, including foundation as per the recommendation of the Manufacturer as required.

Integration with the Feeder Cables from the 4 Pole Structure, laying of HT Cables (120 Sq.mm) to and from the 500KVA 2 Nos outdoor transformer and cable terminations with suitable cable termination kits. Finally testing the power supply system.

2.0 STANDARDS:

- a) The equipment delivered shall be new and of high quality, suitable for the purpose it is intended for, free from defects and imperfections and of the classifications listed herein, or their equivalents, subject to acceptance by the TGSPDCL.
- b) The bidding shall be done by original equipment manufacturers only as specified in the bid.
- c) Materials used in the manufacture of the specified equipment shall be of the kind, composition and physical properties best suited to their various purposes and in accordance with the best engineering practices.
- d) The equipment design shall be suitable to render satisfactory operation under the conditions prevailing at site, and the equipment shall operate satisfactorily under normal load and voltage variations and frequency variations (**50 c/s ± 3%**) ensuring the safety, further include all necessary provisions ensuring the safety of the operating and maintenance personnel.
- e) The applicable standards is as specified here below:

2.1 11kV 5 way Ring Main unit

	Description	Standard
	<u>11kV 5 way Ring Main units</u>	
1.	AC metal enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV	IS 3427
2.	Classification of degrees of protection provided by enclosures of electrical equipment	IS 12063
3.	High Voltage Switches	IS 9920 (Parts 1 to 4)
4.	Specification for AC disconnectors and earthing switches for voltages above 1000 V	IS 9921 (Parts 1 to 5)
5.	HV AC Circuit Breakers	IS 13118
6.	Dimensions of terminals of HV Switchgear and Control gear	IS 10601
7.	General requirements of switchgear and control gear for voltages exceeding 1000 V	IS 12729

	Description	Standard
8.	High voltage/Low voltage prefabricated substations	IEC 1330
9.	Common clauses for MV switchgear standards	IEC 62271-100/200
10.	Monitoring and control	IEC 6081
11.	Current Transformers	IS 2705
12.	Voltage transformers	IS 3156
13.	Specification for Static Protective Relays	IS 8686
14.	Standards for high voltage metal clad switchgear up to 52 KV.	IEC 62271-200

2.2 Key RMU Configurations of RING MAIN UNIT

- **Left or Right side extensible** Two (2) Motor operated load break switches (LBSs) **with manual operated** earthing switches **in SF6** and **(3) vacuum circuit breakers** with Electrical closing and tripping along with dis-connector and earthing switches with BUS PT metering module and base channel suitable space for mounting FRTU, battery charger, Auxiliary PT of suitable rating inside metering cubical. The Battery charger along with batteries required for Electrical operations of RMU is in the scope of the Bidder.

3.0 RATINGS:

The Protection and control unit range shall be designed to accommodate the control power supply voltages of 24 V DC voltage.

4.0 Technical parameters

5.0

5.1 Scope of Work

- The scope of work shall include design, manufacture, testing, delivery of new **SCADA Compatible** Ring Main Units capable of being monitored and controlled by the SCADA.
- RMU shall include its own power supply unit (including auxiliary power transformer, batteries, and battery charger, which shall provide a stable power source for the RMU.
- The RMU shall be equipped with main-line load break switches and a fault passage indicator (FPI). Furthermore, to protect each of its lateral / transformer feeders, it shall be equipped with a corresponding set of circuit breakers and self-powered numerical relays. The RMU shall include potential-free contacts so as to connect to SCADA/DMS via FRTUs, so as to:
 - Monitor and control the open/closed status of the RMU circuit breakers and load break switches.

- Monitor the local/remote position of RMU manually-operated switches that can be used to enable and disable remote monitoring.
- Monitor the health of the power supply, which will include battery failure and low voltage indications.
- Monitor the open/closed status of RMU earthing switches.
- **Facility for remote reset of FPI.**
- Monitor for low SF₆ gas pressure indication.
- Monitor for circuit breaker relay operations.
- Monitor for indication of main-circuit fault detected by the RMU's FPI.

5.1.1 Environmental Conditions

All materials supplied shall be capable of operating under relevant environmental conditions are listed as follows:

- Maximum ambient air temperature: - **40 °C**
- Minimum ambient air temperature: - 0 °C
- Average ambient air temperature : - 40 °C
- Maximum relative humidity: - 0-100 %
- Average thunder storm days per annum: - 10
- Average rainfall per annum: - 400 mm
- Maximum wind speed: - 119 km/hr
- Altitude above mean sea level - 1000 m

5.1.2 Distribution Network Electrical Parameters

The main parameters of the distribution network are as follows:

- Nominal system voltage : 11 kV (rms)
- Highest system voltage : 12 kV (rms)
- Number of phases : 3
- Frequency : 50 Hz
- Variation in frequency : **50 ±3% Hz**
- Type of earthing : Solid
- Power frequency withstand voltage : 28 kV rms
- Basic impulse withstand voltage : 75 kV peak

5.1.3 Testing

The specified RMUs 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 in accordance with TGSPDCL.

5.1.4 11 KV 5 way RMU TECHNICAL PARAMETERS

5.1.4.1 The scope is supply of 11 KV 5 Way RMU suitable for outdoor application.

5.1.4.2 The RMU to be supplied shall be compact and shall meet the following requirements:

- Easy to install
- Safe and easy to operate
- Compact
- Low maintenance

5.1.4.3 It shall include, within the same metal enclosure number of MV functional units required for connection,

- Power supply including the battery bank for controlling the LBS and breakers ,
- Load break switches,
- Earthing Switches
- Breakers
- Relays
- BUS PT metering module, FPI's and other allied equipment.
- **Dimensions of FRTU will be 1000 mm (H) X 600 mm (W) X 300 mm (D). Sufficient space shall be provided in the LV compartment of RMU to accommodate this FRTU.**

5.1.4.4

5.1.4.5 Equipment and material conforming to any other standard, which ensures equal or better quality, may be accepted. In such case copies of English version of the standard adopted shall be submitted.

5.1.4.6 The electrical installation shall meet the requirement of Indian Electricity Rules, 1956 as amended up to date, relevant IS code of practice and Indian Electricity Act, 1977. The Electricity Act, 2003 and Amendment if any shall also apply. In addition other rules and regulations applicable to the work shall be followed. In case any discrepancy the most stringent and restrictive one shall be binding.

5.1.4.7 The high-tension switchgear offered shall in general comply with the latest issues

including amendments of the Standards as per specification but not restricted to them.

5.1.4.8 All design features of the proposed RMU, as described in the supplier'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:

- Maintainability, expandability, and life span
- Ability to operate in severe outdoor environmental conditions.
- Immunity to electrical stress and disturbance.
- Acceptable insulation properties.
- Convenient FRTU interconnection features.

5.2 Maintainability, Expandability, and Life Span

5.2.1 Maintainability

The Utility intends to be self-reliant for RMU maintenance. To this end, the Supplier shall provide the support, documentation, and training necessary to operate and repair the RMU. The Utility will prefer RMU designs that do not require periodic preventive maintenance and inspections. To facilitate expansion and maintenance, the RMUs should be of modular type.

5.2.2 Expandability

The whole switchgear (RMU) should be suitable for extension on at least one side either left or right.

5.2.3 Life Span

RMU shall have a design life of at least 20 years from the date of final acceptance. The Contractor/agency shall make available, at no cost to the organization, the manufacturing drawings, wiring diagrams, bill of material, foundation detail drawings, unpacking and transportation instructions, operation & maintenance manual, as-built drawings and other relevant documentation. The specific components of each component/sub-assembly shall be identified and referenced in Supplier-supplied documentation.

5.3 Outdoor Features

5.3.1 General

- The RMUs shall be designed specifically for outdoor installation with ingress protection degree of IP54. They shall also be suitable for conditions in which they will be exposed to heavy industrial pollution, and high levels of airborne dust.

- The Outdoor RMU shall be conformably coated to meet these climatic conditions. In this respect, standards such as IEC 62271-200, covering equipment, systems, operating conditions, and environmental conditions shall apply. In particular, the RMU equipment shall have been type tested for IP54. Failure to conform to this requirement shall constitute grounds for rejection of the proposal
- 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 proofness.

5.3.2 Corrosion Protection

- The main SF₆ tank, housing the on-load break switches and the vacuum circuit breakers, should be of 2.5 mm thick (minimum) stainless steel tank so as to have high corrosion resistance and ensure high longevity. **The normal operating pressure shall be 1.2 bar @ 20 deg C. However offer with nominal operating gas pressure shall be as per manufacture standard and suitable to satisfy the rated dielectric strength.** This tank containing SF₆ should be hermetically welded and sealed for life, ensuring a leakage rate not more than 0.1 % per annum. Except for stainless steel, all steel surfaces that are not galvanized shall be treated to protect against corrosion. As a minimum, corrosion treatment shall include the following procedures:
 - The surface shall be cleaned to bare material by mechanical or chemical means.
 - Must be powder coated by means of seven tank process.
 - **All outdoor metal enclosures shall be treated in 7 tank Pre-treatment process & should be painted with UV Resistant Pure Polyester Powder coating. The powder coated sheet steel fabrication shall fulfill 700 Hrs of Salt spray test. The thickness of Painting/Powder coating shall be of 80-90 microns to withstand tropical heat and extremes of weather.**

5.3.3 Immunity to Electrical Stress and Disturbance

The electrical and electronic components of the RMU shall conform to relevant standards concerning insulation, isolation, and **the product shall comply with IEC 60270 Immunity** to electrical stress & disturbance. 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 RMU components. Certified copies of all available type test certificates and test results shall be included as part of the bidder's proposal.

5.3.4 Minimum Insulation of Equipment

The RMUs shall be of SF6 gas-insulated type with normal operating pressure shall be 1.2 bar @ 20 deg C. However offer with nominal operating gas pressure shall be as per manufacture standard and suitable to satisfy the rated dielectric strength.

5.4 Name plate Information

RMU nameplate information shall be determined in agreement with the organisation. 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
- Purchase Order number and date
- Month and year of supply

The RMU shall also exhibit a Danger Board to indicate the presence of high voltage (11,000 V).

5.5 Interconnecting Cables, Wiring, Connectors, and Terminal Blocks

The Contractor shall provide all interconnecting wires, cables, connectors, terminations and other wiring accessories such as terminal blocks required by the RMU.

5.5.1 Metallic Cables

- All metallic cables and wiring shall be of required cross-section solid or multiple strands of round copper conductors and have flame retardant 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.

5.5.2 Connectors

- **Nuts & Bolts type terminal blocks shall be provided in LV compartment for SCADA connectivity and to accommodate FRTU.**

5.5.3 RMU-FRTU Connectors

- For ease of installation and maintenance, the interconnection between the RMU and the FRTU, (FRTU is not in the scope of the bidder) in a separate enclosure shall be supported by having heavy-duty terminal blocks with **Nuts & Bolts type** terminals shall be provided by the supplier for necessary cable terminations. In using a terminal block, no more than two cables or wires shall be connected to any of its individual terminals.
- Making 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 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.

5.6 RMU Characteristics

- As a minimum, the RMUs shall be equipped with on-load break switches and a fault passage indicator (FPI), circuit breakers, and **self powered** numerical relays for the protection of transformer feeders, and provision for wiring for multifunction transducer (MFT is not in the scope of the bidder) for monitoring voltage, current, power, energy, and power factor readings and tripping and protection functionalities from the Communicable Numerical relay to be provided on the RMU. **Each LBS shall be provided with 1No. FPI thus RMU shall be with 2 No. FPI.** The Load Break Switches and earthing switches shall be housed in SF6 and the Circuit Breakers used in the RMU shall be **vacuum interrupter type**.
- In addition, each RMU shall be equipped with all necessary connectors, terminal blocks, and other accessories that will allow it to be connected to the FRTU, which in-

turn will send required indications and measurements to the DMS via the communications system.

5.7 General Requirements

- The RMU shall include its own power supply, including battery and battery charger. In addition, RMU should have a bus connected PT panel (air insulated), which shall serve as the power supply's 230 V AC input.
- Within this context, the general requirements of the RMU shall include, but shall not be limited to provision of the following monitoring and control features:
 - Positions of local/remote switches as used to control local and remote access to circuit breakers and load break switches
 - Power supply indications including battery failure and voltage alarms
 - Open/closed position of load break switches, circuit breakers, and earthing switches
 - SF₆ gas-pressure low indication.
 - Circuit breaker relay indications
 - Indications of fault in the RMU's main feeder circuit as detected by the FPI
 - Load break switch and circuit breaker open/close control
 - FPI reset control

5.8 Parameter Requirements

The RMUs shall be suitable for cable networks of 630 Amps and loop cable networks of 400 Amps. The minimum design parameters to which their major components shall conform or exceed are summarized in the following tables.

Table 1: System Parameters

Parameter	Value
Nominal System Voltage	11 kV
Highest System Voltage	12 kV
Rated Voltage	12 kV
System frequency	50 Hz
Number of Phases	3 Phase/3 Wire

Table 2: Circuit Breaker Parameters

Parameter	Value
Lightning Impulse Withstand Voltage Phase-to-Phase & Phase-to- Earth:	75 kV (peak)
Power Frequency Withstand Voltage to Earth, Between Poles, & Across Opening Span	28 kV rms for 1 minute
Rated Short Time Withstand/Breaking Current:	20 kA (rms)
Rated Duration of Short Circuit:	3 seconds
Rated Normal Current:	630 Amps (rms)

Table 3: Load Break Switch Parameters

Parameter	Value
Rated Short Circuit Making Capacity	50 kA peak at rated voltage (both LBS & Earthing Switch)
Rated Load Interrupting Current	630 Amps
Rated Cable Charging Interrupting Current	10 Amps

The RMU switchgear shall be capable of withstanding the specified currents without damage in accordance with the latest versions of IEC 60694 (Common Specifications for High-Voltage Switchgear and Control Gear Standards) and IS 3427 (AC Metal Enclosed Switchgear and Control Gear for Rated Voltages above 1 kV and up to and including 52 kV).

The equipment offered shall be as per the standards specified in the bid specification and if the offered equipment is tested with any other international standards which is superior to the standards specified they can also be considered and the bidder has to submit the documentary evidence for the same.

5.9 Design Details

- The RMU shall be designed to operate at the rated voltage of 12 kV.
- It shall include, within the same metal enclosure, On-load break switch, circuit breakers and earthing switches for each Load Break Switch/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 Load Break Switch/Circuit Breaker is in its closed position.
- The degree of protection required against prevailing environmental conditions, including splashing water and dust, shall be not less than IP 54 as per IS 12063.
- The active parts of the switchgear shall be maintenance free. Otherwise, the RMU shall be of low-maintenance type.
- **The tank shall be made of minimum 2.5 mm thickness of stainless steel.**
- The Stainless Steel tank should be completely welded so as to ensure IP 67 degree of protection and shall be internal arc tested.
- The RMU shall be suitable for mounting on its connecting cable trench.
- For each RMU enclosure, a suitably sized nameplate clearly identifying the enclosure and the electrical characteristics of the enclosed devices shall be provided.
- The access to the **cable compartment should be from the front** of the switchgear only to have minimum operating & maintenance space at site.
- The RMU design shall be such that access to live parts shall not be possible without the use of 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 or Load Break Switch shall be prevented when the same is in an open position.
- The RMU tank must be equipped with a suitable pressure relief device. The pressure relief must ensure that the escaping gases are dissipated to the rear / top of the switchgear.
- The complete RMU shall be tested in an accredited INDIAN or FOREIGN laboratory and designed for an Internal Arc.

5.10 Earthing

- There shall be continuity between metallic parts of the RMUs and cables so that there is no dangerous electric field in the surrounding air and the safety of personnel is ensured.
- The RMU 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 main switch 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 flexible connections between the earthing blade and the frame shall have a cross-section of at least 50 mm² copper or equivalent in GI or conventional type copper plate earthing system should be provided as per standard requirement for 5 Way RMU.
- No of earthing should be decided by tenderer as required.
- 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.

5.11 Incomer Load Break Switches

- The Load Break Switches shall be maintenance free. With outdoor canopy doors open, the position of power contacts and earthing contacts shall be clearly visible from the front of the RMU through the Mimic facia.
- 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. These switches shall have three positions (or states), i.e., Open, Closed, and Earthed, and shall be constructed in such a way that natural interlocking prevents unauthorized operations.
- The switches shall be fully assembled, tested, and inspected in the factory.
- In case of Manual operation without motors, opening and closing shall be driven by a fast-acting mechanism independent of manual operator action.
- The Load Break Switches shall be provided with a motorized operating mechanism suitable for SCADA control.
- A facility shall be provided with an electrical operating mechanism allowing an operator at the RMU site to operate the Load Break Switches without any modification of the operating mechanism and without de-energizing the RMU.
- The switch and earthing switch mechanisms shall have a mechanical endurance of at least 1,000 operations.

5.12 Circuit Breakers

- The Circuit Breakers shall be maintenance free and, when standing in front of the RMU with outdoor canopy doors open, their positions shall be clearly visible, through

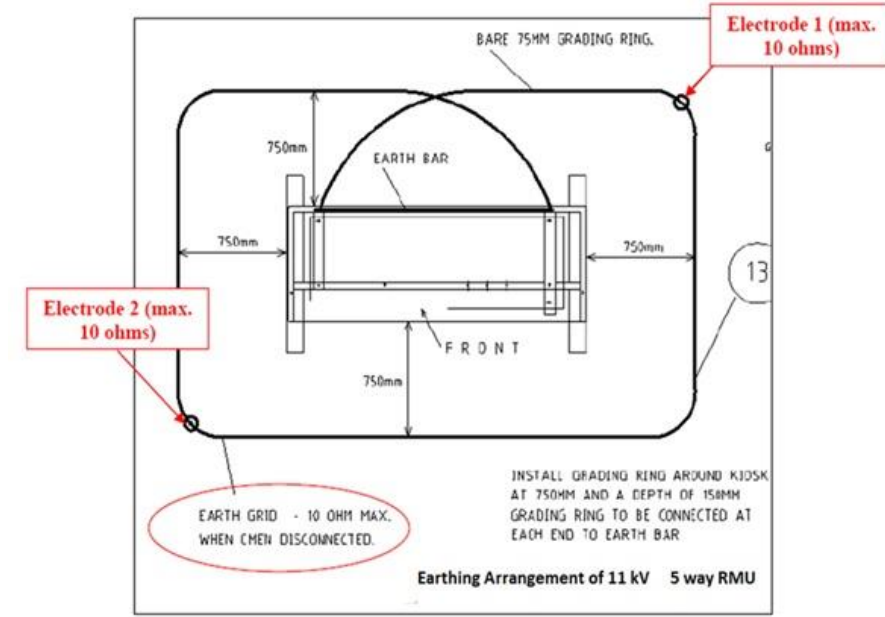
the Mimic facia. The position indicator shall provide positive contact indication in accordance with IS 9920. The breakers shall have three positions (or states), i.e., Open, Closed, and Earthed, and shall be constructed in such a way that natural interlocking prevents unauthorized operations. They shall 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.
- Each Circuit Breaker shall operate in conjunction with a suitable protection relay under transformer feeder/ circuit phase and earth fault conditions. In addition, the Circuit Breaker shall be provided with a motorized operating mechanism that can be remotely controlled by the SCADA.

5.13 Cable Termination

- Bushings shall be conveniently located for working with the specified cables and shall allow for the termination of these cables in accordance with the prevailing practice and guidelines of cable manufacturers. The dimensions of the terminals shall be in accordance with IS 10601.
- **The 11 KV XLPE cable size shall be 3cx300 Sq.mm and suitable busing studs and cable clamps shall be arranged.**
- A non Ferro-magnetic cable clamp arrangement shall be provided for each cable to be terminated in the RMU.
- A suitable arrangement for the Circuit Breakers, Earthing Switches, and Load Break Switches shall be provided so that these devices can be padlocked in the "Open" and "Closed" positions.
- A permanent "Live Cable" indication as per IEC 61958 shall be provided for each cable using a capacitor voltage divider.
- It shall be possible to test the core or sheath insulation of the cables without disconnecting the cables in the cable compartment, after accessing the cable compartment.

There are 2 connections to the earth electrodes, which also couple as a grading ring.



5.14 Safety of Equipment

- With respect to the RMU'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 and to the rear bottom or top of the tank without endangering the operator or anyone else in the vicinity of the RMU.
- All manual/motorized operations, monitoring of open/close position of switches/breakers, live line indicators, FPI indication, SF₆ gas pressure indication **access to the cable compartment shall be carried out from the front of the RMU only.**

5.15 Current and Voltage Transformers.

The RMU shall be provided with current and voltage transformers. These CTs & PTs shall meet the electrical and mechanical ratings as per the relevant standards.

5.15.1 Current Transformers

- 3 nos., ring type, single core CTs shall be provided in each incoming load break switch for metering purposes. A similar arrangement shall be provided in each circuit breaker cable compartment to mount a 3 nos., single-core, ring type CT for protection purposes.
- The CTs shall conform to IS 2705. 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 distinguishing CTs used for metering from CTs used for protection are listed as follows:

5.15.1.1 CTs for Metering:

- Material: Epoxy resin cast/ Tape wound
- Burden: 2.5VA
- Ratio: 400-200-100/1 A
- Accuracy Class: 0.5

5.15.1.2 CTs for Protection:

- Material: Epoxy resin cast/ Tape wound
- Burden: 2.5VA
- Ratio: 400-200-100/1 A
- Accuracy Class: 5 P 10

- The RMU's other CTs / sensors, i.e., those used by Fault Passage Indicators (FPIs), shall be supplied by the manufacturer. These CTs/sensors shall be an integral part of the FPI's design to ensure that they properly match the requirements of the FPI.

5.15.2 Voltage Transformers

- A 3 phase single or 3 nos. single phase potential transformers shall be provided. These should be housed in a separate air insulated PT Panel, directly connected to the RMU through main bus. The burden per transformer shall not be more than 50 VA and the voltage ratio shall be $11000 \text{ V} / \sqrt{3} / 110 \text{ V} / \sqrt{3}$. The accuracy class shall be 0.5.
- HRC fuses shall be provided on the HV side.
- The PTs shall be of cast epoxy-resin construction, and they shall conform to IS 3156. Their design and construction, in particular, shall be sufficiently robust to withstand the thermal and dynamic stresses during short circuits.

5.16 Fault Passage Indicator for RMU

The FPI shall facilitate quick detection of faulty section of line. The fault indication may be on the basis of monitoring fault current flow through the device. The FPI should be self-powered and should have internal lithium battery for external indication and setting of FPI in the absence of current. **Each LBS shall be provided with 1No. FPI thus RMU shall be with 2 No. FPI.**

5.16.1 The FPIs shall include:

- Fault detection - Phase to phase and Phase to earth faults.
- One potential-free output contacts for hardwiring to FRTUs. On this basis, the SCADA/DMS will be able to monitor phase / earth fault condition.
- Local Fault Indications - FPI fault indication shall be LCD/LED. Every LBH shall be provided FPI with suitable CT ratio and the FPI shall support SCADA for remote reset and status of over current and earth fault.
- Multiple reset option –
- End of time delay (Adjustable from 2 to 16 Hrs)
- Remote reset (Via potential free input contact of FPI)
- Manual reset (Reset button on front panel of FPI)
- Automatic reset on current restoration.

5.16.2 The characteristics of the FPIs shall include:

- Phase fault thresholds configurable from at least 100 to 800 A

- Earth fault thresholds configurable from at least 20 to 200 A
- Multiple number of steps for adjusting phase and earth fault thresholds.
- Fault current duration range configurable from at least 40 ms to 100 ms in 20 ms steps and further 100 ms to 300 ms in 50 ms steps.
- Variations with respect to these characteristics may be acceptable as long as they prove applicable and provide the same or better flexibility.

5.16.3 Protection Relay

- The RMU shall be equipped with self-powered numerical relays (**Communicable relays shall be with auxiliary power which shall be given from battery but the tripping shall be self powered philosophy**) communicable to trip the RMU circuit breaker.

5.17

5.17.1 General

- 5.17.1.1 The Circuit Breaker in the RMU shall be fitted with a communicable-type, self-powered numerical relay, i.e., one for each outgoing circuit breaker. The protection relay's auxiliary contacts shall be provided for hardwiring to the FRTU. The relay shall also interface with the FRTU via an RS 232/485 port in order to send, as minimum, real-time readings using the MODBUS protocol.
- 5.17.1.2 The numerical relay shall be self-powered and should provide Inverse Definite Minimum Time (IDMT) and Instantaneous protection characteristics. On this basis, the relay as a minimum shall provide:
- Phase Over current Protection (50/51)
 - Earth Fault Protection (50N/51N)
- 5.17.1.3 The relay shall be provided with an input for remote tripping, which shall be realized via an electric output pulse even without presence of phase current. A flag indicator shall be installed for signaling the occurrence of trip conditions.

5.17.2 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:

- It shall be housed in a flush mounting case and powered by the RMU power supply unit.

- It shall have three phase over current elements and one earth fault element.
- IDMT trip current settings shall be 50-200% 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 0.01 to 0.1 in 0.01 steps.
- The relay shall also be provided with:
 - Alphanumeric Liquid Crystal Display (LCD) for relay setting.
 - **Communications via a MODBUS RS232/RS485 port to provide the FRTU (and hence the DMS) with phase current measurements.** It is also desirable that this same means of communication can be used by the FRTU to send setting and control commands to the relay.
 - Parameter change capability that is password protected.

5.18 Power Supply and auxiliary power transformer

The RMU shall be fitted with a power supply, including batteries and battery charger, suitable for operating the motors of the On-load Isolators and Circuit Breakers. On this basis, the following operational specifications shall apply:

- The power supply unit shall conform to the following requirements:
 - Input: 230 V AC nominal from the RMU's auxiliary power transformer allowing for possible variations from 190 to 300 V AC
 - Output: Stable 24 V DC.
 - Batteries: 24 V DC (2 Nos of 12 V DC each)
- **The auxiliary power transformer shall be of suitable rating as per the load calculation and the Auxiliary power transformer shall be protected by HT fuses on primary sites and secondary with HRC fuses.**

- The 24 V DC batteries shall have sufficient capacity to supply power to the following devices with a nominal backup of 4 hours:
 - RMU's motors for a minimum of five (5) operations
 - **RMU's trip coils, close coils, FPI or any advanced technology with non storage type mechanism.**
- **The batteries shall be of sealed lead acid VRLA and shall have a minimum life of five (5) years at 25°C.**
- The battery charger shall be fully temperature compensated.
- 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. If the battery voltage falls below the preset value, the time to fully recharge all batteries shall not exceed twenty-four (24) hours.
- An automatic battery checking device shall be provided to check the battery's health and initiate a battery-failed alarm signal in case battery deterioration is detected. Such detection may be based on comparing measurement values with set values (e.g., internal resistance, voltage, etc.).
- The battery charger shall be provided with an alarm displayed at the local control panel and remotely at the DAS to account for any of the following conditions:
 - Low battery voltage
 - Charger failed

5.19 Multi-Function Transducer (MFT)

- The RMU main incoming On-load switches circuits shall be equipped with Communicable Numeric relays **(required for VCB only)**, and the multi-function transducers **to be supplied by TSSPDCL** capable of providing distribution system voltage, current, power factor, power, and energy readings and is in the scope of the bidder. Provision for the wiring from metering current transformer shall be made available for connecting to MFT (MFT is not in the scope of the bidder shall be provided **by the TGSPDCL**). The data from Communicable Numeric relay regarding the tripping functionalities shall be provided and data shall be integrated with the FRTU.

5.20 Construction

The RMU shall be sufficiently sturdy to withstand handling during shipment, installation, and start-up without damage. The configuration for shipment shall adequately protect the RMU equipment from scraping, banging, or any other damage.

5.21 Enclosures

- All supplied enclosures shall be sized to provide convenient access to all enclosed components. 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 retains its structural integrity under all operating and service conditions with and without the enclosure door closed.
- The thickness of all enclosure panels shall be at least **2 mm (minimum) of CRCA steel.**
The appropriate corrosion treatment and finish requirements shall apply to both inside and outside enclosure surfaces. Other required features are as follows:
- Constructed of mild steel according to IEC 60529 with IP rating 54 or better. Must be grit/shot blasted, thermally sprayed with Zinc alloy, phosphate, and subsequently painted with polyurethane based powder paint, the overall paint layer thickness including Zinc spraying shall be of the order of 80 to 90 microns
- Means, such as insulated heat shields and/or air vents, to prevent high temperatures from damaging the RMUs enclosed components. If air vents are installed, these vents shall in no way reduce the effectiveness of the enclosure's protective characteristics.
- A metal pocket attached to the inside of the front door to hold documentation, maintenance log sheets, and other such information.
- Door opening mechanism with built-in key-lock facility suitable for padlocking. An opening mechanism that is less prone to breaking than a projecting door handle is preferred, e.g., a push-button opening mechanism.
- A grounding terminal including grounding bolt and lock washer for connecting a 50 mm² copper or galvanized steel grounding conductor. The grounding bolt and lock washer shall be made of stainless steel.
- Means of preventing moisture from condensing on electronic components mounted inside the enclosure proposed for housing the FRTU. If necessary, heaters providing

adjustable thermostat-control within the range 20 to 60 °C shall be installed in the enclosure for this purpose.

- Means of protection against rain water, and high levels of airborne dust, should be provided.
- Means of enabling the SCADA to monitor the open/closed status of the enclosure door. A SCADA equipment alarm shall be produced whenever the enclosure door is open.
- The outdoor RMU shall include having a minimum protection class of IP 54. It shall be tested in accordance with the latest IEC 60529 standard.
- The outdoor canopy shall have a hinged front access door with a two-point latch locking system with 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.
- **Enclosure shall be embossed with TGSPDCL. The size of the embossing of the word shall be 2 inches.**

5.22 Motors

- The RMU shall be fitted with spring charging **24V DC** motors of high insulation class allowing the circuit breakers and load break switches to be operated without manual intervention.
- In addition to allowing circuit breaker tripping by the RMU's protection relays, the motorized operating mechanism shall be suitable for remote control by the SCADA.
- The motors along with the supplied control card and push buttons shall allow Utility's personnel to electrically operate the circuit breakers and load break switches at site without any modification of the operating mechanism and without de-energizing the RMU.

5.23 Inspection and Test

Inspections and tests shall be performed to ensure RMU compliance with these Technical Specifications. Responsibility for conducting the inspections and tests shall rest with the Supplier. The representatives will participate in the RMU inspections and will witness the testing as described in the following sub-clauses.

5.23.1 Inspections

- The representatives shall be allowed access to supplier's facility where the RMU or its parts are being produced or tested. Such access will be used to verify by inspection that the RMU is being or has been fabricated and tested in accordance with the Technical Specifications.
- The supplier shall give 15 days notice in writing concerning the date and place at which the equipment will be ready for inspection or testing. The supplier shall provide all the necessary assistance and facilities to the representatives to carry such inspections and test witnessing.
- The supplier shall provide any and all documentation that is necessary to complete the inspections. The representatives shall be allowed to inspect the supplier's quality assurance standards, procedures, and records. Inspections, as a minimum, shall include checks on inventory, general appearance, cabling, drawing conformance, and labeling.

5.23.2 Test Procedures

- The supplier shall provide test plans and detailed procedures for all required testing. The plans and procedures shall ensure that each test is comprehensive and verifies proper performance of the RMU under test and, in this respect, shall be submitted for review and approval by the Utility.
- The test plans shall include all routine tests and acceptance tests as per relevant BIS/IEC standards and shall describe the overall test process including the responsibilities of the test personnel and how the test results will be documented.
- The test procedures shall describe the individual tests segments and the steps comprising each segment, particularly the methods and processes to be followed.

5.23.3 Test Reports

- The Tenderers should, along with the tender documents, submit copies of all Type test certificate of their make in full shape as confirming to **IS 3427 / IEC 62271-100/200** of latest issue obtained from a International/National Govt. Lab/Recognized laboratory.
- The above type test certificates should accompany the drawings for the materials duly signed by the institution that has type test certificate.

- The supplier shall maintain complete records of all test results. The records shall be keyed to the test procedures.
- Upon completion of each test, the supplier should submit a test report summarizing the tests performed and **the results of the tests along with the complete details of type test reports inclusive of drawings.**
- **The bids received without complete type test reports along with drawings will be treated as non responsive.**

5.23.4 Factory Acceptance Test

A formal factory acceptance test shall be conducted to ensure that the RMU has been designed to meet the functional requirements in all respects. The representatives shall witness the test on a representative RMU, and the test shall be carried out in accordance with the supplier's test plan and procedures as approved by the authority. Should the factory acceptance test prove unsatisfactory in any way, the authority reserves the right to have further tests conducted and, if applicable, request further improvements in the supplier's RMU design.

5.23.5 Routine Factory Tests

- These tests shall be carried out during RMU manufacture as a quality control measure, i.e., to ensure each RMU to be delivered meets the Employer's minimum requirements including all relevant standards. Recording and reporting the routine test results shall be the responsibility of the Supplier.
- At the authority discretion, the representatives will witness such testing. This may include requesting the Supplier to perform tests on RMU selected that the Supplier deems ready to be delivered to site. Should any such test prove unsatisfactory, the authority reserves the right to have further tests conducted and for delivery not to take place until a mutually agreed course of action has been reached.
- Further for additional reliability of the manufactured RMU it is mandatory to have the complete assembled tank tested for partial discharge.

5.24 Operating Manuals

- The Supplier shall submit, operating manuals for RMU components including items such as FPI, Relay, and other equipment provided by the bidder. These manuals shall be in English. They shall include the RMU operating instructions. Context sensitivity shall be used to go directly to the appropriate place in the manual.

- The manuals shall be organized for quick access to each detailed description of the operator procedures that are required to interact with the RMU functions. This shall include the procedures to define, build, edit, and expand all data points provided with the RMU.
- The manuals shall present in a clear and concise manner all information that operators, including maintenance personnel, need to know to understand and operate RMU satisfactorily. The manuals shall make abundant use of diagrams and/or photographs to illustrate the various procedures involved.

5.24.1 As-Built Documents and Drawings

The supplier shall submit as built documents including applicable drawings for review and approval. All deliverable documents and drawings shall be revised by the supplier to reflect the as- built RMU components including all the FPI, LLI & Relay. Any errors in or modifications to an RMU resulting from its factory and/or site acceptance test shall be incorporated. Within this same context, all previously submitted documents that are changed because of engineering changes, contract changes, errors, or omissions shall be resubmitted for review and approval. The successful bidder has to provide his quality document to Utility.

5.25 Test certificates certified as per IEC 62271-100 / 200 or relevant IS Standard with latest amendments **not more than 10 years. Following Test Certificates has to be submitted.**

- Dielectric Withstand Test
- Short time withstand - STC withstand test
- Mechanical endurance test
- Internal Arc test - IAC Test. Tank & Cable compartment test
- Degree of protection test – IP test

Note: The bids received without complete type test reports along with drawings will be treated as non responsive

5.26 Warranty: **During the warranty period of 5 years in case of any flash over on bushings whether external or internal, replacement will lies in the scope of bidder.**

SCHEDULE OF MATERIALS

Sl. No.	Description of material	Qty. Required	Delivery location or destination stores
1	11 KV Motorized 5 Way RMU (Compatible for SCADA/DMS)	1no	GD DRC-DTH, Chintlakunta, L B Nagar Hyderabad

NOTE:-

- (i) The prices quoted shall be **FIRM** in Indian Rupees.
- (ii) The prices should be Free at destination stores.
- (iii) **Desired Delivery:** To commence within two months from the date of receipt of purchase order