



TATA POWER

TECHNICAL SPECIFICATION COVER SHEET

Document No. : TPU-D-ENG-EHV-10068

Document Title : 33KV RMU

Release date : 11-03-2025

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Document No:

Document Title: Technical Specification of 33KV RMU

TECHNICAL SPECIFICATION

33KV Ring Main Unit (RMU)

Central Engineering Services

TPC-M/TPDDL/TATA POWERODL/TPNODL/TPWODL/TPSODL/TPADL

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1.0	Scope	This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and performance of 33kV Ring Main Units with all accessories and necessary training for trouble free & efficient performance. It is not the intent to specify completely herein all the details of tech design and construction of material. However, the material shall conform to practices consistent with sound environmental management and local statutes. It is also expected that equipment shall comply in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in manner acceptable to the TATA POWER, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble-free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.																																		
2.0	APPLICABLE STANDARDS	The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with latest editions of the following Standards /IEC and shall conform to the regulations of local statutory authorities. <table><tr><th>Standards</th><th>Details</th></tr><tr><td>IEC 62271-200:2021</td><td>HV switchgear and control gear-AC Metal Enclosed switchgear and control gear for voltages above 1kV and up to and including 52Kv.</td></tr><tr><td>IEC 62271-100:2021/Cor2:2022</td><td>Alternating-current circuit-breakers</td></tr><tr><td>IS 513</td><td>Cold Rolled Low Carbon Steel Sheets and Strips.</td></tr><tr><td>IEC 62271-1:2017/AMD1:2021</td><td>High-voltage switchgear and control gear - Part 1: Common specifications for alternating current switchgear and control gear</td></tr><tr><td>IEC 62271-102:2022</td><td>HV switchgear and control gear-Alternating current disconnectors and earthing switches</td></tr><tr><td>IEC 62271-103:2021</td><td>High-voltage switchgear and control gear - Part 103: Alternating current switches for rated voltages above 1 kV up to and including 52 kV</td></tr><tr><td>IEC 60529</td><td>Degrees of protection provided by enclosures (IP Code)</td></tr><tr><td>IEC 62262</td><td>Degrees of protection provided by enclosures for electrical equipment against mechanical impacts (IK Code)</td></tr><tr><td>IEC 60060</td><td>High-voltage test techniques part-1 to 3</td></tr><tr><td>IEC 61439-1</td><td>Low-voltage switchgear and control gear assemblies - Part 1: General rules</td></tr><tr><td>IEC 60255-3</td><td>Electrical relays – Part 3: Single input energizing quantity measuring relays with dependent or independent time.</td></tr><tr><td>IEC 61869-2 / IS 2705</td><td>Current Transformers</td></tr><tr><td>IEC 60376</td><td>Specification of technical grade Sulphur hexafluoride (SF6) for use in electrical equipment</td></tr><tr><td>IEC 62271-213:2021</td><td>High-voltage switchgear and control gear - Part 213: Voltage detecting and indicating system</td></tr><tr><td>IEC 62271-215:2021</td><td>High-voltage switchgear and control gear - Part 215: Phase comparator used with VDIS</td></tr><tr><td>IS 13573-2</td><td>Cable accessories for extruded power cable for Working Voltages from 3.3 kV up to and Including 33 kV.</td></tr></table>	Standards	Details	IEC 62271-200:2021	HV switchgear and control gear-AC Metal Enclosed switchgear and control gear for voltages above 1kV and up to and including 52Kv.	IEC 62271-100:2021/Cor2:2022	Alternating-current circuit-breakers	IS 513	Cold Rolled Low Carbon Steel Sheets and Strips.	IEC 62271-1:2017/AMD1:2021	High-voltage switchgear and control gear - Part 1: Common specifications for alternating current switchgear and control gear	IEC 62271-102:2022	HV switchgear and control gear-Alternating current disconnectors and earthing switches	IEC 62271-103:2021	High-voltage switchgear and control gear - Part 103: Alternating current switches for rated voltages above 1 kV up to and including 52 kV	IEC 60529	Degrees of protection provided by enclosures (IP Code)	IEC 62262	Degrees of protection provided by enclosures for electrical equipment against mechanical impacts (IK Code)	IEC 60060	High-voltage test techniques part-1 to 3	IEC 61439-1	Low-voltage switchgear and control gear assemblies - Part 1: General rules	IEC 60255-3	Electrical relays – Part 3: Single input energizing quantity measuring relays with dependent or independent time.	IEC 61869-2 / IS 2705	Current Transformers	IEC 60376	Specification of technical grade Sulphur hexafluoride (SF6) for use in electrical equipment	IEC 62271-213:2021	High-voltage switchgear and control gear - Part 213: Voltage detecting and indicating system	IEC 62271-215:2021	High-voltage switchgear and control gear - Part 215: Phase comparator used with VDIS	IS 13573-2	Cable accessories for extruded power cable for Working Voltages from 3.3 kV up to and Including 33 kV.
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Central Engineering Services					TECHNICAL SPECIFION FOR 33KV Ring Main Unit (RMU)	
			16	Breaker Duty Cycle	O – 3min - CO - 3min - CO	
			17	Rated cable charging interrupting current of incomer- - Load Break Switch	10 A	
			18	Rated cable charging breaking current of breaker	25 A	
			19	Insulating medium	SF6	
			20	Interrupting medium	Vacuum- for CB and SF6 for LBS and earth switch	
			21	Temperature Rise	Maximum permissible temperature rise for bus bar shall not be 65°C at an ambient temperature not exceeding 40°C, as per IEC 62271-1. However, the temperature rise for accessible enclosures and covers shall not exceed 30K and in case, they are not required to be touched during normal operation, the limit shall be raised by 10K.	
			22	Cable compartment	Front opening cable compartment for all feeders	
			23	Motorization	All configurations shall have Motorized LBS compartment	
4.1	RMU CONFIGURATIONS	Types of Ring Main Units shall be as under (All configurations shall have Motorized LBS compartment) for 33 kV 1. 4 Way with 4 LBS (For Indoor/Outdoor application): Non extensible 4 Nos. 630A Load Break Switches + Electronic Fault Passage Indicator in each LBS compartment (of TATA POWER approved make). 2. 4 Way with 2CB (For Indoor/Outdoor application): Non extensible 2 Nos. 630A Load Break Switches + 2 Nos. 630A Feeder Vacuum Circuit Breakers with self-powered O/C + E/F relays + shunt trip coil (230V AC) + Electronic Fault Passage Indicator in each LBS compartment (of TATA POWER approved make).. 3. 3 Way with 3 LBS (For Indoor/Outdoor application): Non extensible 3 Nos. 630A Load Break Switches + Electronic Fault Passage Indicator in each LBS				

		compartment (of Tata Power approved make). 4. 3 Way with 1 CB (For Indoor/Outdoor application): Non extensible 2 Nos. 630A Incomer Load Break Switches + 1 No. 630A Local Feeder/transformer Control Vacuum Circuit Breaker with self-powered O/C + E/F relays+ shunt trip coil (230V AC) + Electronic Fault Passage Indicator in each LBS compartment (of TATA POWER approved make). 5. 5 Way with 3 CB (For Indoor/Outdoor application): Non extensible 2 Nos. 630A Load Break Switches + 3 Nos. 630A Feeder Vacuum Circuit Breakers with self-powered O/C + E/F relays + shunt trip coil (230V AC) + Electronic Fault Passage Indicator in each LBS compartment (of TATA POWER approved make). Cable Voltage presence Indicators to be provided in each compartment of all type of RMUs in above mentioned combination. All LBS, EW and CB shall be with auxiliary contacts for SCADA status indication. Note- All shunt trip coils shall be 230V AC
5.0	General construction for RMU	
1	MAIN TANK	5.1.1 The switchgear and bus bar shall be contained in a stainless steel tank filled with SF6 gas and the outer body shall be made of GI high tensile steel/CRCA 2mm thick with thick gland plates as per IS 513. 5.1.2 The tank shall have SS sheet of 2.5 mm thickness minimum (or as per type tested design of bidder with undertaking on letter head) and meet the "sealed pressure system" criteria in accordance with the IEC 62271-200. This is a system for which no handling / refilling of gas shall be required throughout the expected operating life, i.e. 30 years. Sealed pressure systems are completely assembled, filled and tested in the factory. 5.1.3 The maximum leakage rate of SF6 gas shall be lower than 0.1% of the total initial mass of SF6 gas per annum from main tank. The filling pressure for the switchgear shall be just above the atmospheric pressure so as to prevent the tendency to leak. SF6 gas used for the filling of the RMU shall be in accordance with IEC 376. 5.1.4 It is mandatory to fit an absorption material in the tank to absorb the moisture from the SF6 gas and to regenerate the SF6 gas following arc interruption. The degree of protection for RMU tank (Indoor/Outdoor) shall be IP 67. 5.1.5 The RMU shall be complete with all connection and copper bus bar with continuous current carrying capacity of 630A. The bus bar shall be fully encapsulated by SF6 gas inside the steel tank. 5.1.6 The tank shall have separate SF6 refilling valve and the filling pressure must be mentioned near the valve. And the refilling valve should be marked properly. 5.1.7 If same valve is used for pressure indicator or remote communication, then the procedure to refill to be mentioned near the NRV from with permanent sticker. 5.1.8 The SF6 tank shall be completely enclosed in the enclosure such way that any rodent entry on top or side of tank is deterred. 5.1.9 All configurations should be in one tank without any coupling/joint on main Busbar. 5.1.10 Tank explosion vent shall be at the bottom.

5.2	GENERAL DETAILS	5.2.1 The mimic board shall be provided with IP2X/IP3X degree of protection for Indoor RMUs and protection for Outdoor RMUs shall be minimum IP 54(Main door closed). Cable compartment shall be IP54. 5.2.2 The RMU shall be suitable for mounting on plinth with trench below and shall have base frame on sides with mounting bolt accessibility from outside of RMU the mounting bolts provision shall be min. M12 bolts on all four sides. The mounting bolts and nuts shall be of hot dip galvanized to avoid rusting. The provision for cabling shall be through base plate from bottom of RMU through trench below. The RMU shall be designed so that the position of the different devices is visible to the operator on the front face plate with permanent type indicators. 5.2.3 The RMU shall be identified by an appropriately sized permanent labels which clearly indicates the functional units and their operation directions etc. The ON or OFF shall be marked as words and only I/O labelling shall not suffice. 5.2.4 The RMU shall be designed to be tamper proof to prevent access to all live parts during operation without the use of special tools. 5.2.5 The earth bus bar shall be covered if passing through the cable chamber and enclosed in an enclosure housing to prevent theft/tampering. Only extension outside enclosure shall open for access. 5.2.6 There shall be continuity between the metallic parts of the RMU and cables so that there is no electric field pattern in the surrounding air, thereby ensuring the safety of people. The enclosure and cable compartment and tank shall be connected to common earthing. 5.2.7 All parts of main circuit to which access is required or provided shall be capable of being earthed prior to becoming accessible. This does not apply to removable parts which become accessible after being separated from the switchgear and control gear. The cables shall be earthed by an earth switch with short-circuit making capacity in compliance with IEC 62271-102. 5.2.8 The LBS /CB shall not be closed in case Earth Switch is closed. The earth switch shall be fitted with its own operating mechanism and manual closing shall be driven by a fast-acting mechanism, independent of operator action. Mechanical interlocking systems shall prevent access to the operating shaft to avoid all operator errors such as closing the earth switch when the Load break switch is closed or when cable is charged. 5.2.9 All panel covers shall be provided with anti-vandal screw bolts so that opening of panel covers is only possible with special tools, which shall be provided by the Bidder as mandatory spare/tool. 5.2.10 The default design of cable compartment for TATA Power shall be suitable for 3Cx300 sq.mm cables in feeder compartments & in the breaker compartment 11kV, 1CX185 sq. mm cables. 5.2.11 The circuit breakers, Load break switches and earthing switches shall have pad lock provision & can be locked in the open or closed position by 1 to 3 padlocks 6 to 8mm in diameter. 5.2.12 Anticorrosive fasteners & components to be provided on switchgear. 5.2.13 The main bus bar current density shall be less than 2.7A/sq.mm. 5.2.14 The cable gland plate shall have split type design having two parts for removal of
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		cable with termination. 5.2.15 The vacuum interrupter shall withstand 10-7 milli-bar Vacuum Pressure ensuring high quality vacuum for interruption and shall have Copper Chromium Arcing Contacts. The interrupter manufacturing unit shall have shall be single Shot brazing and have high First pass Yield. (Shall be part of Bidders own vendor evaluation criteria) 5.2.16 For each terminals bolt should be provided with Cup or Belleville Washer and flat washers. (Note- The cut spring washers are not accepted) 5.2.17 The CT secondary wires & Trip coil wires shall not have any joint in-between CT & TB or relay.
5.3	INTERNAL ARC TESTING	Any accidental over pressure inside the sealed chamber tank shall be limited by the opening of a pressure limiting device provided at the bottom part of the tank. Gas shall be released to the bottom without affecting cables and termination of the RMU with partition between cable chamber such way that gas releases away from the operator. Bidder shall provide type test report to prove compliance to the 'Internal fault IAC- A FL minimum for indoor and A-FLR for outdoor with bottom release' as per IEC 62271-200 on main tank and cable chambers. An anti-reflex mechanism on the operating lever shall prevent any attempts to reopen immediately after closing of the switch or earth switch. All manual operations shall be carried out on the front of the RMU. In case of SF6 gas leakage from gas tank or any kind of repair should be done at site or replacement of complete RMU to be done free of cost within guarantee period.
5.4	Incomer Load Break Switches (LBS)	5.4.1 Load break switches shall be maintenance-free. The position indicator shall provide positive contact indication in accordance with IEC 60265-1. In addition, manufacturer shall prove reliability of indication in accordance with the standard. The switches shall be of the "increased operating frequency" in accordance with IEC 60265-1. 5.4.2 The LBS shall have at least 3 positions, open-disconnected, closed, and earth (with making capacity) and shall be constructed in such a way that natural interlocking prevents unauthorized operations. 5.4.3 The disconnecter should have the maximum 200 micro-ohm contact resistance. 5.4.4 Earthing of the cable shall be either through a three position switch of a separate snap action type or Earth Switch having fault making capacity. 5.4.5 The switches shall be fully mounted and inspected in the factory. Provision for future motorization of LBS and CB should be kept in configuration while designing RMU. 5.4.6 The load break switch and earthing switch operating mechanism shall have mechanical endurance of at least 1000 (M0) operations. The type test reports to be submitted along with Bid. 5.4.7 Load break switch shall have mechanical switch operation counter and should be visible on front in horizontal alignment. 5.4.8 The Load break switch should have minimum spare 3 NO+ 3 NC auxiliary contacts and 1NO+1NC for earth switch. The load break switch shall be compatible for remote operation without any modification of the operating mechanism and without de-energizing the RMU, The LBS shall be fitted with an electrical operating mechanism and can remotely open-disconnected, closed and earthed from a reserved location.
5.5	Circuit Breaker For Transformer /	5.5.1 The circuit breakers/ interrupter shall be of the maintenance free. 5.5.2 The circuit breakers shall have at least 2 positions: Open-disconnected and closed

Local Feeder
Control

and shall be constructed in such a way that natural interlocks prevent all unauthorized operations.

- 5.5.3 In view of safety each VCB shall be assisted with disconnecter having 3 positions, open-disconnected, closed, and earth (having fault making capacity) and shall be constructed in such a way that natural interlocking prevents unauthorized operations.
- 5.5.4 They shall be fully mounted and inspected in the factory.
- 5.5.5 Breaker contact resistance should be ≤ 50 micro-ohms. The various circuit contact resistance should comply with provisions in IEC 62271-200.
- 5.5.6 The breaker should have minimum spare 2 NO + 2 NC auxiliary contacts.
- 5.5.7 An operating mechanism can be used to manually close and open the circuit breaker with single push on push buttons. It shall be fitted with a local system for manual tripping by an integrated push button. There will be no mechanical automatic re-closing.
- 5.5.8 The circuit breaker compartment shall have three current transformers, an electronic self-powered relay, a Series & Shunt trip coil for CB tripping.
- 5.5.9 CT shall be mounted on cables. The mounting arrangement shall be flexible to move to & fro, up and down based on site condition of cable terminations etc. The mounting arrangement shall ensure that the CT should not reach less than 300mm from live part of bushing. The CT mounting shall be fixed at position while dispatch such that the cable entry, the bushing terminal bolt, and CT core hole are co-axial.
- 5.5.10 Fixing bracket to be provided for fixing CT on particular position without touching termination cores. Bolting arrangement to be provided for fixing CT on the mounting bracket.
- 5.5.11 In any mounting the CT shall be mounted in such a way that the secondary connection shall be accessible and visible from front side after opening cable compartment door
- 5.5.12 Breaker shall have mechanical endurance of at least 2000 (M1) operations. Relevant type test reports to be submitted along with bid.
- 5.5.13 Breaker operation counter should be provided and should be visible on front in horizontal alignment.
- 5.5.14 In control cabinet the Terminal block shall have AC input wiring provision and MCB provision for incoming of LT AC supply.
- 5.5.15 The relay auxiliary power, communication ports and other required ports should be wired up on the TB. The breaker should have one series trip coil and one shunt trip coil.
- 5.5.16 The shunt trip coil shall be of 230V AC & wired up on TB
- 5.5.17 Protection relay:
- Electronic self-powered target latched by battery or capacitive unit.
 - There shall be Conformal Coating on relay PCB
- The protection relaying shall have following features:
- ☐ Phase Protection: With Definite time/ IDMT element having standard characteristics of Standard Inverse, Very inverse, Extremely Inverse (as per IEC 255-3) or Fuse Characteristics.

		□ Earth Fault Protection: With Definite time or IDMT element having standard characteristics of Standard Inverse, Very inverse, Extremely Inverse as per IEC 255-3 standard. □ The CTs of 5P10 Class shall be employed. CT ratio shall be 200/1 (Further CT ratio may finalized during detailed engineering) The preferable make of relay is Ashida (ADR 241S), make relay. 5.5.18 The touch proof cable termination to be supplied with the 33 kV RMU by the vendor along with the cable termination bolt for termination 33 kV 400 Sq. mm cables. 5.5.19 The make of the vacuum bottle shall be same as that of the Type tested design.
5.6	Bushings and Cable terminations	5.6.1 Bushing should be of Epoxy resin. Each cable compartment shall be provided with three bushings of adequate sizes to terminate the incoming and outgoing cables. The termination bolt shall be M12 for Tata Power supplies 5.6.2 The bushings shall be conveniently located for proper bend so as to allow easy working and termination of cables. The cable termination shall be done with Heat shrinkable /Push ON termination method so that adequate clearances are maintained between phases & cable shall be held by HDPE/Nylon (fire retardant) cleat. The Sizes of incoming and outgoing cable shall be as per clause no. 5.2.10. 5.6.3 Bidder should provide bimetallic washer for connection between Copper bushing stud and Aluminium Lug. Necessary spring and flat washers to be provided on each terminal. The bimetallic washer shall be suitable M12 bolt for supply and 630A rating in all compartments with minimum thickness of 2mm and sufficiently cover the completely copper bushing stud. The bidder can alternately offer tinned copper surface of bushing then bimetallic washer not required. 5.6.4 The Terminal bolt shall have arrangement for fixing the cable test rod through cable boot opening. Cable boot should have opening for test rod insertion. 5.6.5 The bolt tightening pressure must be written inside each cable chamber with permanent sticker. 5.6.6 Cable boot for cable termination should be as per IS 13573-2. Boot should be easy to install. 5.6.7 The cable compartment must be without any holes or gaps and properly vermin proofed before inspection. 5.6.8 The cable compartment doors shall have interlocks such that doors can be opened only with earth switch in closed position. 5.6.9 Termination boots shall be as per type tested design. And should have a proper opening to facilitate the testing. The opening in boot shall be covered by means of removable protection cap. 5.6.10 All cable compartments shall have front door opening. The cable cover door shall be pad lockable and shall be Tamper and Arc proof. The circuit breaker and earth switch shall be lockable in the open or closed positions by 1 to 3 padlocks. 5.6.11 In outdoor RMU the door should have pad lock provision and cable door shall have interlock so that it shall not be opened by external forces. Also it shall not be possible to operate the load break switch / isolator or breaker from outside once door closed. This is required to prevent pilferage. 5.6.12 Locking provision of cable compartment door to be provided in case of any switch/CB is at earth position to avoid pilferage.

		Note: Supply of touch proof cable termination is part of RMU supply in 33 KV RMU
5.7	Earthing:	5.7.1 The RMU outdoor metal clad switchgear enclosure, load Break Switch, VCB, SF6 tank etc. shall be equipped with an copper earth bus throughout all compartments and securely fixed along the base of the RMU with cover. 5.7.2 The extension of this earth bus shall be taken out minimum 50mm outside the enclosure on both sides for fixing of the Tata Powers GI earth flat of 50mm width. The extension coming out of enclosure shall be properly sealed such a way to ensure vermin proofing of the cable compartment. 5.7.3 The size of copper earth bus-bar should be Min.105 sq.mm inside the enclosure to withstand short time current carrying capacity as per IEC. 5.7.4 Two nos. body earthing bolts of M12X70 mm to be provide on the extended bus-bar. 5.7.5 The mother earth needs to be extended up to 250mm periphery of cable entry hole so that the cable termination earthing can be connected easily to the main mother earth with 12mm bolt and washers. This arrangement needs to be provided in each compartment of RMU. 5.7.6 The main tank must be connected to mother earth at least two positions with proper contact. 5.7.7 In outdoor type compact design bidders should ensure the earthing from mother earth is provided inside the cable compartment for earthing of the cable terminations. that TATA POWER shall provide only two main earthing on switchgear 5.7.8 Bidder to ensured that the earth bus shall be single conductor/bus suitable for taking specified fault current and both main earthing are interconnected by earth bus and not through tank or enclosure. 5.7.9 If bolt are provided as current carrying path then the bolt material shall be brass and size shall be suitable to carry specified fault current. 5.7.10 Two nos. body earthing bolts of M12X70 mm to be provide on the extended bus-bar. Bolts must be hot dipped galvanized.
5.8	Voltage indicator lamps and phase comparators	5.8.1 Each compartment of RMU shall be equipped with a fixed type voltage indicator lamps having dip ports for insertion of phase comparators or line tester to check the phase sequence or presence of charge in cable. This is to be fixed on the front face plate to indicate presence of voltage in the cables. The capacitive dividers will supply low voltage power to the indicator lamps. Three inlets can be used to check the synchronization of phases with phase comparator or other device. These devices shall be in compliance with IEC 62271-206:2011 standard. The VPIS without dip ports are not accepted. 5.8.2 All the VIPS installed on compartments shall have auxiliary contacts wired up to the terminal block of respective compartment which shall be further used for remote status indication at SCADA.
5.9	Front Cover	5.9.1 The front cover shall provide a clear mimic diagram that indicates the different functions. This shall be permanent in nature throughout the useful life of the RMU. 5.9.2 The position indicators shall give a true reflection of the position of the main contacts. Position Indicators shall be clearly visible to the operator. 5.9.3 The lever operating direction shall be clearly indicated in the mimic diagram. 5.9.4 The bidder shall provide a operating sequence process on each compartment with permanent type arrangements. So that all data shall be self-explanatory.

		5.9.5 The mimic shall have clear Words for “CLOSE/OPEN/EARTH’ at each desired place. 5.9.6 All status indicators shall be marked appropriately with permanent labels as Earth On/OFF, Disconnecter/LBS On/OFF, CB On/OFF. 5.9.7 All operating ports shall have marking like spring charging provision, three position disconnecter port and Shutter operator for interlocking, Operation allowed along with arrow indication and labeled as earth operation or disconnecter operation. 5.9.8 For better clarity of earthing related operations shutters and ports shall be painted in Green (TATA POWER) background such way that the persons should get clear indication that if operating in yellow region means he is performing earthing related operation. The details shall be as per annexure-2 of this specification. 5.9.9 There shall be one label for SF6 gas pressure indicator and a clear message must be fixed near pressure indicator that region of safe operation and Alert message stating ‘If GAS pressure not OK. Do not operate any switchgear and report to OEM (name) customer care/engineer in charge’ this message should be clearly visible in front with suitable background and shall be with permeant marked. 5.9.10 For gas pressure indication a dial type manometer to be provided with will show actual pressure. Gas pressure shall have SCADA compatible contacts and wired up on TB with labeling. 5.9.11 All the other accessories and boxes shall be properly labelled with permanent marking/printing such a way that the product is self-explanatory for user. 5.9.12 The mimic plate or cover should be separate for each module/feeder of the RMU in view of safety. In case of any work to be done on mechanism of any one feeder then operation staff shall have only access to particular feeder via opening feeder mimic pate or cover plate.
5.10	Fault Passage Indicators	5.10.1 Fault Passage Indicators shall be installed on the Ring Main Unit. These devices shall be electronic devices with dual energy source – with self-powered inbuilt battery and with provision of 24V DC aux supply. It must be connected to Single 3 phase Split Core CTs for O/C. These shall be provided with bright LED s / flag Indicators, which shall be clearly visible in the daytime. These shall have the following resetting facilities: - Manual reset - Resetting after a set time duration - Electrically reset from remote with at least 2-spare potential free contacts. - Resetting on restoration of LV 5.10.2 The unit shall have Short Circuit adjustable to different settings with separate Current transformer. They shall be fully field-programmable and shall have at least and 5 settings for Phase fault or over current. 5.10.3 The preferred range is – O/C setting range 200-1000A. 5.10.4 The default setting shall be and 300A for overcurrent. This shall be ensured before inspection call in each RMU. 5.10.5 It shall be possible to Test these indicators at site thru “Test” push button.The Fault Passage Indicators shall also be provided with a SCADA output contact.

- 5.10.6 The process of fixing the FPI shall be fixed on the wall of the incomer LBS cable compartment along with pictorial view.
- 5.10.7 FPI connecting wires should be properly dressed and covered in insulated sleeve and tied to the side walls with help of cable ties. If sticking type arrangement is provide, then it must be with good quality permanent adhesive from reputed makes like 3M and should not come out with force of 10kN.
- 5.10.8 These shall confirm to the following standards:
- IEC 60068-2-6, IEC 60068-2-9 : Environmental testing – For Vibration, solar radiations
- IEC 60950 : Information Technology equipment – Safety
- IEC 1000-2 : Electromagnetic compatibility for low-frequency conducted disturbances and signaling in public low power supply systems
- IEC 1000-4 : EMC – Testing & Measurement
- IEC 1000-6 : EMC- Immunity for Residential, Commercial and light industrial environments.

.11

Remote
Control of the
RMU:

LV Box at top (accessible from front side only)

For motorized RMU- The motors to be fitted in LBS sections only. The fitting of the motors to the mechanism must not in any way impede or interfere with the manual operation of the switches. An auxiliary contact to prevent motorized operation of the mechanism while the operating handle is inserted into the operating point shall also be provided. Harting plug arrangement to be provided on each feeder of RMU. All the pins not used in harting plugs needs to be provided separately as spare. Preferred communication protocol for FRTU shall IEC-60870-5-104.

All Close-Open coils / signaling contacts shall be rated for 24 V DC. Following signaling contacts are essential for remote operation of RMU:

- A) Aux. contact for Line Isolator (Status)
- B) Aux. contact for all earthing switch (Status)
- C) Aux. contact for Breaker (Status)
- D) Aux. contact for FPI indication
- E) Aux. contact for Protection trip (Breaker module)
- F) Aux. Contact for Low Gas Pressure

2 Nos. spare relay tripping NO, NC contacts to be provided. Flag Indications on RMU when tripped should be on shunt trip. A provision for physical disconnection of motor supply (like fuse) of line isolator must be provided in RMU unit itself.

(A flag is required for series and shunt coil actuation).

There should be harting plug arrangement for individual Isolator as well as breaker motor connections, which will be fitted on the RMU body itself. Also the PCB of motor should be covered by anti-tracking agent. There should be relay with timer instead of only relay, which is used in the latching circuit.

Suitable unlatching system to be provided to prevent mal operation of motor in case of any latched command/ non executed command at RMU (case like fuse failure etc.)

		The separator between terminals to be provided to avoid any tracking etc. Signal requirement for field RTU (which shall be mounted near RTU) is attached (refer Annexure-1).
5.12	Paint	All paint shall be applied on clean dry surfaces under suitable atmospheric conditions by seven tank process and powder coating. The overall paint thickness shall not be less than 70 microns. The paint shall not scale off or crinkle or be removed by abrasion during normal handling. The enclosure of the RMU shall be painted with shade light Grey, i.e. RAL 7032. If any damage observed after delivery same need to be touch-up painted after delivery at site.
5.13	SLD and configuration	SLD to be provided by the bidder during bidding stage for reference
5.14	Control Cabinet	5.14.1 Control cabinet with a terminal block (TB) located at convenient accessible location so as to wire all inputs & outputs (IOs) up to the terminal block (TB). All the cable secondary wiring should be rooted through marshalling box separately for relay, CT etc. 5.14.2 The wiring of the relay to be done on the TB for its terminals along with communication terminals. 5.14.3 All terminals wires shall have proper identification ferrules and the identification marking provided on TB. 5.14.4 Control cabinet shall have control cable entry arrangement on both sides of the RMU top control cabinet with proper grommet such that the opening are sealed in normal installations when not used for our door extension box arrangement to be provided any other arrangement to be explained in drawing during tender.
6.0	NAME PLATE & MARKING: -	All the components and operating devices of the RMU shall be provided with durable and legible nameplates containing all technical parameters. Name plates shall be suitably embossed with " PO no. with date", "PROPERTY OF Tata Power-' & "CODE NUMBER" along with the following information. A Danger plate of appropriate size shall also be provided on the enclosure. a) Manufacturer's Name b) Month and year of supply c) PO Number d) Type/Model e) Rated Voltage f) Rated current g) Service voltage h) System Frequency i) Rated Short time withstand current for 1 sec j) Rated Impulse withstand Voltage k) Degree of Protection l) Type Designation or Serial no. m) Year and month of manufacture. n) Applicable Rated values o) Mass of unit p) SF6 gas filling pressure. q) Warranty period
		The sr. no. and year of manufacturing shall be painted in black color with yellow background ON SIDE.

7.0	TESTS FOR RMU	All the Routine and acceptance tests shall be carried out in accordance with the relevant IS/IEC standards. All routine/acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components within the RMU enclosure shall have been tested for Routine/acceptance and Type tests as per the relevant standards. All Type tests as per latest IS / IEC shall have been carried out on the RMU as a whole as per relevant IS/IEC. Following tests shall be necessarily conducted on the equipment and its components as specified in IEC 62271-200: Note- In case of any conflict on any technical particular in the specification, the stricter requirement mentioned in the relevant standard shall be valid.																																																																			
7.1	TYPE TESTS	<table><tr><th>Sr. No.</th><th>Type Tests stipulated as per Tender Spec.</th><th>Applicable standard</th><th>Acceptance Clause as per IS / IEC</th></tr><tr><td>1</td><td>PF withstand voltage test & Lightning Impulse voltage withstand test for Switches</td><td>IEC62271-103</td><td>CI 6.2 of IEC62271-103, CI 7.2.7.2 & 7.2.7.3 of IEC62271-1</td></tr><tr><td>2</td><td>PF withstand voltage test & Lightning Impulse voltage withstand test for CB</td><td>IEC 62271-200</td><td>CI 6.2.6.1 & 6.2.6.2- IEC 62271-200</td></tr><tr><td>3</td><td>Measurement of contact resistance & Temperature rise test LBS & CB combined unit (if individual then two separate reports required)</td><td>IEC 62271-200</td><td>CI 6.4 & CI 6.5 of IEC 62271-200</td></tr><tr><td>4</td><td>Short Time current and Peak current withstand tests Main Circuit</td><td>IEC 62271-200</td><td>CI 6.6 a & b -IEC 62271-200</td></tr><tr><td>5</td><td>Short Time current and Peak current withstand tests Earthing Circuit</td><td>IEC 62271-200</td><td>CI 6.6 a & b -IEC 62271-200</td></tr><tr><td>6</td><td>Short Circuit Breaking current tests LBS</td><td>IEC 62271-103</td><td>CI 6.101, Table 3 of IEC 62271-103</td></tr><tr><td>7</td><td>Short Circuit Making current test on LBS</td><td>IEC 62271-103</td><td>CI 6.101.1.2, Table3 of IEC 62271-103</td></tr><tr><td>8</td><td>Short Circuit Making test on Earth Switch</td><td>IEC 62271-102</td><td>CI 7.101 of IEC 62271-102</td></tr><tr><td>9</td><td>Short circuit making & Breaking tests on CB – three phase fault</td><td>IEC 62271-100</td><td>CI 6.112.1 of IEC 62271-100</td></tr><tr><td>10</td><td>Single Phase test on CB</td><td>IEC 62271-100</td><td>CI 6.108 of IEC 62271-100</td></tr><tr><td>11</td><td>Double Erath Fault test on CB</td><td>IEC 62271-100</td><td>CI 6.108 of IEC 62271-100</td></tr><tr><td>12</td><td>Mechanical operation tests on LBS</td><td>IEC 62271-200</td><td>CI 6.102.2 - IEC62271-200</td></tr><tr><td>13</td><td>Mechanical operation tests on CB</td><td>IEC 62271-200</td><td>CI 6.102.2 - IEC62271-200</td></tr><tr><td>14</td><td>Mechanical Endurance tests on LBS</td><td>IEC 62271-103</td><td>CI 6.102.2. - IEC 62271-103</td></tr><tr><td>15</td><td>Mechanical Endurance tests on CB</td><td>IEC 62271-100</td><td>CI 6.101.2.4 of IEC 62271-100</td></tr></table>				Sr. No.	Type Tests stipulated as per Tender Spec.	Applicable standard	Acceptance Clause as per IS / IEC	1	PF withstand voltage test & Lightning Impulse voltage withstand test for Switches	IEC62271-103	CI 6.2 of IEC62271-103, CI 7.2.7.2 & 7.2.7.3 of IEC62271-1	2	PF withstand voltage test & Lightning Impulse voltage withstand test for CB	IEC 62271-200	CI 6.2.6.1 & 6.2.6.2- IEC 62271-200	3	Measurement of contact resistance & Temperature rise test LBS & CB combined unit (if individual then two separate reports required)	IEC 62271-200	CI 6.4 & CI 6.5 of IEC 62271-200	4	Short Time current and Peak current withstand tests Main Circuit	IEC 62271-200	CI 6.6 a & b -IEC 62271-200	5	Short Time current and Peak current withstand tests Earthing Circuit	IEC 62271-200	CI 6.6 a & b -IEC 62271-200	6	Short Circuit Breaking current tests LBS	IEC 62271-103	CI 6.101, Table 3 of IEC 62271-103	7	Short Circuit Making current test on LBS	IEC 62271-103	CI 6.101.1.2, Table3 of IEC 62271-103	8	Short Circuit Making test on Earth Switch	IEC 62271-102	CI 7.101 of IEC 62271-102	9	Short circuit making & Breaking tests on CB – three phase fault	IEC 62271-100	CI 6.112.1 of IEC 62271-100	10	Single Phase test on CB	IEC 62271-100	CI 6.108 of IEC 62271-100	11	Double Erath Fault test on CB	IEC 62271-100	CI 6.108 of IEC 62271-100	12	Mechanical operation tests on LBS	IEC 62271-200	CI 6.102.2 - IEC62271-200	13	Mechanical operation tests on CB	IEC 62271-200	CI 6.102.2 - IEC62271-200	14	Mechanical Endurance tests on LBS	IEC 62271-103	CI 6.102.2. - IEC 62271-103	15	Mechanical Endurance tests on CB	IEC 62271-100	CI 6.101.2.4 of IEC 62271-100
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Central Engineering Services				TECHNICAL SPECIFION FOR 33KV Ring Main Unit (RMU)	
		16	Mechanical Endurance tests on DS	IEC 62271-102	CI 7.102.3 of IEC 62271-102
		17	Partial Discharge test on CB & LBS	IEC 62271-200	Annex BB , Procedure B of IEC 62271-200
		18	Pressure withstand test of gas filled compartment/Tank	IEC 62271-200	CI 6.103.1 of IEC62271-200
		19	IP67 of Gas compartment/Tank	IEC 62271-200	CI 6.7.1 of IEC62271-200
		20	IP54 for outdoor RMU	IEC 62271-200 & IEC- 60529	CI 6.7.1 of IEC62271-200
		21	IAC on Cable Compartment	IEC 62271-200	CI 6.106 IEC62271-200
		22	IAC on Gas Compartment	IEC 62271-200	CI 6.106 IEC62271-200
		23	Cable charging current breaking test	IEC 62271-100	CI 6.102, 6.105 of IEC 62271-100
		24	Capacitive current switching test	IEC 62271-100	CI 6.111 of IEC 62271-100
		Note: The bidder can submit the test report with combination of above listed tests. The test of CB & LBS to be done on combined unit. If bidder submits individual unit CB/LBS tests then both units test detailed test reports are to be submitted.			
7.2	ROUTINE TESTS	Following routine tests are to be done on 100% of the lot quantity 1. Power Frequency Withstand Test. 2. Dimensional & Visual Checks 3. Operational & Interlock Tests of breaker & isolator switches. 4. Helium leakage detection test in vacuum chamber 5. Sf-6 leakage test. 6. HV withstand test across isolator distance. 7. HV withstand test of control and auxiliary circuits. 8. Voltage Indication Tests on VPIS 9. Breaker Contact Resistance Test 10. Total Trip Time Check Test through Current Injection in primary. 11. IR Value. For other components, as per applicability, the RTC as per relevant IS/IEC from Original Equipment manufacturer (OEM) shall be required: 1. Cable Boots 2. Routine test report of the Relay 3. CT 4. Motor			
7.3	ACCEPTANCE TESTS	The test mentioned in ITP attached as annexure-3 to this document shall be carried out as acceptance test on random samples. Minimum 10% units (or minimum 2 RMU if lot size is small) of the lot shall be selected for acceptance test shall be selected for testing from each offered lot.			

Sr. No.	Tests details	Applicable standard	Acceptance Criteria
1	PF withstand voltage test on LBS and CB combined with switches closed position	IEC62271-103 & IEC 62271-200	CI 6.2 Of IEC62271-103, CI 7.2.7.2 & 7.2.7.3 of IEC62271-1 CI 6.2.6.1 & 6.2.6.2-IEC 62271-200
2	HV withstand test across isolator distance with opened contact of VCB	IEC 62271-200	
3	Voltage Indication Tests on VPIS	-	VPIS indication should lit up when voltage applied in all phases
4	Measurement of contact resistance on LBS & CB combined with all switches in closed condition	IEC 62271-200	CI 6.4 & CI 6.5 of IEC 62271-200 Total resistance limit shall be maximum 350micro ohm with busbar & switches closed.
5	Dimensional & Visual Checks	-	As per approved drawing and technical compliance document for tender
6	Operational & Interlock Tests of breaker & isolator switches	As per specification	All interlock shall operate without fail in any operation
7	Leak Detection Test at bushing terminals after RMU assembly	IEC 62271-1 clause 8.5	For gas-filled systems tested in factory, the probing test using a sniffing device to be done. The sensitivity of the sniffing device shall be at least 10 ⁻⁸ Pa × m ³ /s.
8	HV withstand test of control and auxiliary circuits of motorised and Smart RMU		Should withstand 2kV for one minute
9	Insulation resistance test		With open contacts and closed contacts of switches. Should be in Giga-ohms.
10	Other components, as per applicability, the RTC as per relevant IS/IEC from Original Equipment manufacturer (OEM) to be shared for a. cable boot b. Relay c. CT d. motor		OEM reports as per IS and IEC.
11	Relay testing- Relay testing should be done with primary injection kit on installed relay.		Total tripping time with relay & without relay (Without relay shall be done at trip coil directly) timing shall be within specified in specification.

		Bidder should have all the requisite testing equipment's to carry out routine and acceptance test mentioned in ITP and following set up to be arranged for RMU relay testing: - Facility for primary current injection up to 1000amp. - Facility to check total trip timing of breaker along with breaker main contacts through primary current injection.			
8.0	TYPE TEST CERTIFICATE	The Bidder shall furnish the type test certificates of the 33KV RMU of same design as offered in bid for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA or reputed International Laboratory like PHELA, KEMA IPH, etc. as per the relevant standards of IS and IEC. Type tests shall have been conducted in certified Test laboratories during the period not exceeding 10 years from the date of opening the bid. In case if type test conducted beyond 10 years then bidder to certify on letter head of parent OEM that no design change & no manufacturing plant change occurred from type tested product. In the event of any discrepancy in the test reports, i.e. any test report not acceptable or any/all type tests (including additional type tests, if any) not carried out, same shall be carried out without any cost implication to TATA POWER. Bids without all type test report shall stand disqualified.			
9.0	PRE- DISPATCH INSPECTION	Equipment shall be subject to inspection by a duly authorized representative of the TATA POWER. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material is liable to rejection. Supplier shall grant free access to the places of manufacture to TATA POWER's representatives at all times when the work is in progress. Inspection by the TATA POWER or it's authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TATA POWER. Following documents shall be sent along with material - Routine Test reports - MDCC issued by TATA POWER - Invoice in duplicate - Packing list - Drawings & catalogue - Guarantee / Warrantee card - Delivery Challan - Installation and maintenance Manual soft copy for FPI, Relay, RMU - Other Documents (as applicable)			
10.0	INSPECTION AFTER RECEIPT AT STORE	The material received at TATA POWER Store will be inspected for acceptance and shall be liable for rejection if found different from the reports of the pre-dispatch inspection. If any deviation or anomaly observed at this stage same need to be rectified by bidder at bidders own cost at earliest.			
11.0	GUARANTEE	Bidder shall stand guarantee towards design, materials, workmanship & quality of process / manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Purchaser up to a period of at least 48 months from the date of commissioning or 60 months from the date of last supplies made under the contract whichever is earlier, Bidder shall be liable to undertake to replace/rectify such defects at its own costs, within mutually agreed time			

		frame, and to the entire satisfaction of the Purchaser, failing which the Purchaser will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the Purchaser's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum Performance Deposit" as the case may be. In case of GP failure, BA shall report at site within 48 hours from intimation and arrange for rectification of fault within a mutually agreed time. In case rectification at site is not possible then alternative arrangement (replacement) to be made by BA within 15 days of intimation of failure. Bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Purchaser.
12.	PACKING	Bidder shall ensure that all equipment covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The packing should be in such manner that during storage the RMU and its components should not be damaged. No single use plastic to be used in packing material. Packing should be done with environment friendly recyclable materials.
13.0	TENDER SAMPLE	Not applicable. Bidders to mention offered model number or type in GTP along with GA drawing during tender for each variant.
14.0	QUALITY CONTROL	The bidder shall submit with the offer, assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and after finishing, bought out items and fully assembled component and equipment including drives. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's or its nominated representative engineer shall have free access to the manufacturer/sub-supplier's works to carry out inspections. To ensure proper operation of RMU the bidder shall provide onsite training of TATA POWER teams as and when required. To ensure quality of installations bidder shall provide supervision support during impartation. Bidder shall conduct root cause and defect analysis of the failed unit and submit the root cause analysis report within two months of reporting of failure.
15.0	TESTING FACILITIES	Bidder shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards The bidder shall have in-house helium gas leakage detection system and all RMU main tank shall be checked for any leakages.
16.0	MANUFACTURING ACTIVITIES	The successful bidder will have to submit GTP & Drawing with 15 days from placement of order/OLA for approval. The date of Code -2/ Code-1 approval given by TATA Power will be treated as first day for assessment of LD (if applicable).
17.0	SPARES, ACCESSORIES & SPECIAL TOOLS/ GAUGES	Bidder shall give an assurance that spare parts and consumable items will continue to be available through the life of the equipment which shall be 25 years minimum. However, the TATA POWER shall be intimated with a minimum of 12 months notice in the event that the Bidder or any sub-vendor plans to discontinue manufacturing of any component used in this equipment. Bidder shall provide following spares as commissioning spares along with RMU.

SL. No.	Name of Spare Parts	Required spares with above 80 No. of RMU	Required spares with above 20 No. up to 80 No. of RMU	Required spares up to 20 No. of RMU
1	Breaker Mechanism	4 No's	3 No's	1 No's
2	Isolator Mechanism	4 No's	3 No's	1 No's
3	Trip Coil	5 No's	3 No's	2 No's
4	CT (All types)	6 Sets (1 Set = 3 Nos.)	4 Set	2 Set (1 Set = 3 Nos.)
5	Bolt (For cable connection)	5 Sets (1 Set = 3 Nos.)	3 Set	2 Set (1 Set = 3 Nos.)
6	"L" Key (All Size)	2 Sets	1 Set	1 Set
7	VPIs	10	6	2
8	Manometer	8	6	2
9	24V DC Motor for Isolator	8	6	2
10	RMU PCB Card with Contactors	6	4	2
11	FPI CT	6 Set (1 Set = 3 Nos)	4 Set	2 Set

THE MANDATORY ITEMS WITH EACH RMU ARE AS BELOW,

1. OPERATING HANDLE.
2. CABLE CONNECTING BOLTS WITH WASHERS
3. TOUCH PROOF CABLE TERMINATIONS FOR 33 KV

18.
0**DRAWINGS & DOCUMENTS**

Following drawings and documents shall be prepared based on TATA POWER specifications and statutory requirements and shall be submitted with the bid:

- a) Completely filled in Technical Particulars
- b) Any deviation sheet or No deviation
- c) General description of the equipment and all components including brochures.
- d) General arrangement for RMU
- e) SLD of each feeder
- f) Arc path drawing of all variants offered
- g) Foundation plan
- h) Experience List
- i) All set of Type test certificates for offered design each variant

Drawings / documents to be submitted for approval after the award of the contract are as under:

Sl. No.	Description	For Approval	For Review/Information	Final Submission
1	General Technical Particulars (GTP)			
2	General Arrangement drawings			

3	Schematic Diagram of MIMIC with ON/OFF and all front labelling			
4	Bill of materials			
5	Arc path drawing for each variant			
6	SLD of complete RMU and feeders			
7	Control wiring diagram and arrangement in control cubicle			
8	Cable compartment internal dimension drawing and one drawing stating standard boots arrangement and cable earthing arrangement with cable			
9	CT mounting arrangement drawing with details of fixing and frame movement etc.			
10	Foundation Plan/Drawing			
11	Installation & Maintenance Instructions and manual			
12	QA & QC Plan			
13	Test Certificates			

All the documents & drawings shall be in English language.

After the receipt of the order, the successful bidder will be required to furnish all detailed drawings of components for TATA POWER approval.

Instruction Manuals: Bidder shall furnish softcopies manuals of RMU, FPI, Relay (In English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices.

19.0	GENERAL TECHNICAL PARTICULARS FOR RMU	S.N.	Description	As specified by TATA Power (Options defined in specs)	As furnished by Bidder
		1.0	RMU Category	3Way - 1CB & 2 LBS or 3 LBS 4Way - 2CB & 2 LBS or 4 LBS 5Way - 3 CB & 2 LBS	
		2.0	RMU application	Indoor or Outdoor as mentioned in tender	
		3.0	Offered Model nos. and OEM type	a. 3Way (NE, I/D or O/D) b. 4Way (NE, I/D or O/D) c. 5Way (NE, I/D or O/D)	
		4.0	Dielectric medium	SF6	
		5.0	Interrupting medium	Vacuum- for CB SF6 for LBS and earth switch	
		6.0	System Frequency	50 Hz	
		7.0	Rated Voltage	36 kV	
		8.0	Service Voltage	33 kV	
		9.0	Rated current -Line Switches	630 A	
		10.0	Rated Current-CB and LBS	630 A for all type	
		11.0	Rated Short time current withstand	As per tender document: 25 kA for 1 s	
		12.0	Rated Short time Making capacity	50 KA	
		13.0	Rated cable charging interrupting current of incomer load break switch	10 A	
		14.0	Rated load interrupting line current	630 A	
		15.0	Rated cable charging breaking current of breaker	25 A	
		16.0	No. of operations at rated short circuit current on line switches, earthing switches should be E2	LBS- 5 close ES- 5 close The ES in line with CB	
		17.0	Opening time of breaker (max.) Without relay time	3 cycle	
		18.0	Closing time of breaker (max.)	3 cycle	
		19.0	Breaker Duty Cycle	O – 3min - CO - 3min - CO	
		20.0	i. Mechanical endurance for Isolator & Earth Switch	Min 1000 (M0) Operations	
			ii. Mechanical endurance for Circuit Breaker	Min 2000 (M1) Operations	
		21.0	Electrical operations of at rated current a. LBS/Disconnecter b. Earth Switch	To be provided by bidder	
		22.0	Temp rise above ambient of +40 deg.	+40 Deg C. (Type Tested as per IEC and complying to requirements)	
		23.0	Min Gas pressure in bar	To be provided by bidder based on type tested design	

		24.0	SF6 Gas pressure manometer with indicating bars/scale to measure the actual gas pressure (indirect method RFS etc. not accepted)	Dial type Manometer to be provided for gas pressure indication Contacts to be provided and wires up on the TB for SCADA communication of gas status	
		25.0	Enclosure	The RMU metal parts shall be greater than 2mm thickness high tensile steel/CRCA. The overall paint thickness shall be not less than 70 microns.	
		26.0	Guaranteed SF6 leakage per annum	Less than 0.1% from main tank	
		27.0	Degree of protection	a. IP 67 for the tank and b. IP2X for the front cover / mimic board and c. IP 54 (Main door closed) for Outdoor RMUs. d. IP 54 for cable compartment	
		28.0	Internal Arc rating	IAC AFL or better	
		29.0	Internal Arc test	25kA for 1 Sec	
		30.0	Lightning Impulse withstand Voltage	170 kVp	
		31.0	Power Frequency withstand voltage	70 kVrms	
		32.0	SF6 Tank design	Hermetically/robotically sealed unpainted stainless-steel enclosure with SF6 Gas. Sealed pressure system by Laser welding so that no refilling of gas is required for 30 years. No gas work at site. Complete body shall be tamperproof to prevent access to live parts. No gaskets shall be used. No bolts shall be provided.	
		32.1	Tank material and grade of SS 304 and welding	Should be of SS 304 and non-corrosive, offered grade of SS to be mentioned. The welding shall be such that there shall be no corrosion of welding for useful life of equipment.	
		33.0	Earth bus bars	In enclosure to prevent tampering.	
		34.0	Material & size of earth bus bar	Copper earth bus-bar should be Min.105 sq.mm	
		35.0	Earthing of main CCT Cables shall be earthed with earth switch with S/C making capacity as per IEC 129. closing shall be possible only when Isolator is open	To be provided by bidder	
		36.0	Incomer Load Break switch: Shall be SF6 insulated with	To be provided by bidder	

			least maintenance. Shall have at least 3 positions, Open, Close & earth with natural interlocks. Fitting of motor at site shall be possible & shall have mechanical interlock		
		37.0	Circuit Breakers: a. With VCB interrupter and SF6 insulated bus with minimum maintenance and shall have at least 2 positions i.e. Open & Close, Manual operation & fitting of motor at site shall be possible if required. b. In view of safety each VCB shall be assisted with disconnector having 3 positions, open-disconnected, closed, and earth (having fault making capacity) and shall be constructed in such a way that natural interlocking prevents unauthorized operations.	To be provided by bidder as per specs.	
		39.0	Make of self-powered Relay & offered model	Ashida,241S	
		40.0	Paint thickness	Minimum 70 microns	
		41.0	The cable compartment doors shall have interlocks such that doors can be opened only with earth switch in closed position	To be provided by bidder	
		42.0	Protection against theft	Design of RMU shall be tamper & arc proof. Anti vandal screws shall be provided. Cable covers shall be pad lockable. All live parts and internal parts etc. shall be covered with antitheft covers.	
		43.0	Doors	Hinged Main doors shall be provided for outdoor type RMU. The hinges for the doors need to be riveted and shall not have any access from outside. Bolted shall not be	

				acceptable.	
		44.0	Voltage indicator box shall be fixed type-This device shall be in compliance with IEC 62271-206:2011 standard only	Capacitive dividers type which will supply low voltage to power the lamps AND 3 inlets can be used to check phase sequence or presence of voltage in cable	
		45.0	Cable cleats (full circle)	HDPE/Nylon (Fire Retardant)	
		46.0	Cable compartment suitability shall be	Suitable for cable sizes as per tender document In the isolators & breaker compartment 33 kV, 3C X 400 sq. mm	
		47.0	The cable compartment	All cable compartments shall be bottom entry and front opening type only	
		48.0	Size of bimetallic washer in all compartments	Must be suitable for M12 for TATA POWER bolt and bushing sizes with min. 2mm thick.	
		49.0	Height of bushing terminal from base plate	Minimum 1500mm for proper termination space for 33 KV.	
		50.0	Fault passage indicator	One per RMU in all LBS compartments	
		51.0	Operating handle	To be provided by bidder as a part of RMU with each RMU and to be placed on front or on door	
		52.0	Non removable MIMIC Diagram on Front of panel	To be provided by bidder with detailed descriptions as mentioned in specs. And earth switch marking background shall be Green for TATA POWER, Mumbai background. As per annexure-2	
		53.0	Main Bus bar Material	Copper	
		53.1	Bus bar Cross Section	Copper earth bus-bar should be Min.105 sq.mm	
		54.0	Opening & Closing times with relay	125 ms maximum	
		55.0	Current Transformer for CB compartment	Shall be epoxy resin casted and mounted on cables. The CTs around the cables shall be supported on the sheet steel bracket and should be fixed with bolts. The mounting frame should be moveable up and down or to and fro but shall be fixed at co- axial position with base plat holes and bushing terminal bolts. 400/1, 5P10	
		56.0	Motorization and SCADA	To be provided	

			Compatibility		
		57.0	Guarantee	As per specification	
		58.0	Dimension (LxWxH) (mm x mm x mm)	To be provided by bidder	
		59.0	Total weight	To be provided by bidder	
		60.0	Paint	Light Gray shade RAL 7032	
		61.0	Type test of product	To be provided by bidder as per specification	
		62.0	Availability of spares	Assurance by bidder for 25 years, list of spares as mentioned in specification to be provide along with RMU lot.	
		63.0	VPIS auxiliary contact	The VPIS shall have auxiliary contact such that it can be configured with SCADA for remote status indication of cable charged. The auxiliary contact to be wired up in TB.	
		63.1	VPIS	In all compartments	
		64.0	Breaker operation counter	To be provided by bidder	
		65.0	LBS operation counter	To be provided by bidder	
		66.0	Moisture absorption material in SF6 tank	Bidder should provide the detail of the moisture absorption material.	
		68.0	Making of earthing operations	All earth operation to be marked with green back ground and permanent in nature.	
		69.0	Auxiliary contacts (total numbers and spare numbers)	LBS Earth Switch CB CB Disconnecter - CB earth switch-	
		70.0	Control cable entry provision	To be provided	
		71.0	Shunt trip coil 24V DC/ 230V AC	230V AC shunt trip coil to be provided. Trip coils to be wired up on TB.	
		72.0	MCB for LT AC incomer and TB connection of all CT, Aux switches and relay wiring	To be provided	
		73/0	Cable termination for 33 KV	To be provided	
		a	Type	Heat Shrinkable	
		b	System Voltage	33 KV	
		c	AC High voltage	70 kV for 1 min	
		d	Impulse withstand voltage	170 KVp	
		75	Type test reports	Bidders to provide detailed list of tests conducted at lab name, conducted dates, report number along with full reports.	

For motorized RMU

1	SCADA Compatibility-Remote operation of RMU shall be possible by using motors fitted to operating mechanism of isolators & CB etc.	To be provided	
2	Harting Plug arrangement for individual isolator as well as breaker motor connections, which will be fitted on RMU body itself.	To be provided	
3	Details of I/O	As per Annexure-IO list of this specs	
4	System to prevent mal operation in case of latch command	Bidder to provide inbuilt system to prevent any mal operation in case of latch command at RMU in case of any fuse failure or DC fail situation	
5	Technical Details of motors		
a	Operating Voltage	24 V DC	
b	Max. power rating	240 Watts	
c	Max current drawn	9 Amp (±10%)	
d	Operating time	4-8 seconds	
e	Power Supply	There shall be provision of 230 V AC (maximum 5 Amp current) & 24 V DC	

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**SCHEDULE OF
DEVIATIONS****(TO BE ENCLOSED WITH TECHNICAL BID)**

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL No	Clause No	Details of deviation with justification

We confirm that there are no deviations apart from those detailed above.

ANNEXURE-1

SIGNAL LIST FOR AUTOMATION

Description	Analog Inputs (AI)					Status (DI)		
Type	Amp. Loading-R ph	Amp. Loading-Y ph	Amp. Loading-B ph	Phase Voltage	Power Factor	Switch Close	Switch Open	Reset Element
RMU Switch	0	0	0	0	0	1	1	
*								
Breakers	1	1	1	1	0	0	0	
*								
FPI							1	1

FRTU SIGNAL LIST

Description	Analog Inputs (AI)				
Type	Amp. Loading-R ph	Amp. Loading-Y ph	Amp. Loading-B ph	Phase Voltage	Power Factor
RMU Switch	0	0	0	0	0
*					
Breakers	1	1	1	1	0
*					
FPI	0	0	0	0	0
*					

Note: 0 indicates functionality not required for that element, 1 indicates functionality required for that element

* Denotes the nos of switches/Breakers in RMU based on the type of RMU (3 W, 4 W)

Additional IOs

RMU switch Control Command
Earth Sw. 1 Status Input
Earth Sw. 2 Status Input
FPI Reset
FRTU Local/Remote Position

FRTU Door Open
FRTU Battery Charger Faulty
FRTU Switchgear Supply Off
FRTU Aux Supply Off
FRTU Fault
Relay operation
CB OFF status
CB ON status
CB ON/OFF Command

Annexture-2

Tata power Branding Name plate -

Separate metallic name plate with Tata Power Logo of Dimension 12*12 Inches in clear font as shown below.

Annexture-3

The reference sample MIMIC used for earthing color identifications.



**Annexture-4 Inspection
Test Plan**

Sr. No.	Type Tests stipulated as per Tender Spec.	Applicable standard	Acceptance Clause as per IS / IEC
1	PF withstand voltage test on LBS and CB combined with switches closed position	IEC62271-103 & IEC 62271-200	CI 6.2 of IEC62271-103, CI 7.2.7.2 & 7.2.7.3 of IEC62271-1 CI 6.2.6.1 & 6.2.6.2-IEC 62271-200
2	HV withstand test across isolator distance with opened contact of VCB	IEC 62271-200	
3	Voltage Indication Tests on VPIS	-	VPIS indication should lit up when voltage applied
4	Measurement of contact resistance on LBS & CB combined with closed switch condition	IEC 62271-200	CI 6.4 & CI 6.5 of IEC 62271-200
5	Dimensional & Visual Checks	-	As per approved drawing and technical compliance document for tender
6	Operational & Interlock Tests of breaker & isolator switches	As per specification	All interlock shall operate without fail in any one operation
7	Leak Detection Test at bushing terminals after RMU assembly	IEC 62271-1 clause 8.5	For gas-filled systems tested in factory, the probing test using a sniffing device to be done. The sensitivity of the sniffing device shall be at least 10 ⁻⁸ Pa × m ³ /s.
8	HV withstand test of control and auxiliary circuits.		Should withstand 2kV for one minute
9	Insulation resistance test		With open contacts and closed contacts of switches. With be in Giga-ohms.
10	Other components, as per applicability, the RTC as per relevant IS/IEC from Original Equipment manufacturer (OEM) to be shared for a. cable boot b. Relay c. CT d. motor		OEM reports as per IS and IEC.
11	Relay testing- Relay testing should be done with primary injection kit on installed relay.		Total tripping time with relay & without relay (Without relay shall be done at trip coil directly) timing shall be within specified in specification.