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DOCUMENT TITLE	TECHNICAL SPECIFICATION FOR MCCB WITH ENCLOSURE (OUTDOOR APPLICATION)	EFFECTIVE DATE 04/04/2025
DOCUMENT NUMBER:	TPWODL/ENGG/SPEC/022/2025	REVISION NO: R1

TECHNICAL SPECIFICATION FOR MCCB WITH ENCLOSURE (Outdoor Application)

DETAILS OF DOCUMENT REVISION:					
Rev. No.	Rev. Date	Details of document update	Updated By	Reviewed By	Approved By
R0	24/11/2021	MCCB with Distribution Enclosure - Thermal Magnetic / Fully Magnetic	Saurav Behera	Anup Jawase	SB Kundargi
R1	04/04/2025	MCCB with Enclosure - Microprocessor Based Electronic Release	Santosh Patra	Jyotiprakash Mohanty	Pramod Tupe

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1.0 SCOPE:

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing and forwarding unloading at TPWODL stores/sites of Four Pole MCCBs with Enclosure. The MCCBs with Enclosure shall be complete with all accessories for efficient and trouble-free operation.

2.0 APPLICABLE STANDARDS:

The material covered by this specification shall unless otherwise stated, be designed, constructed and tested in accordance with the latest revisions of relevant IS /IEC Standards and shall conform to the regulations of local statutory authorities.

Indian/International Standard (IS/IEC)	Title
IS/IEC 60947-1	Specification for LV Switchgear & Control gear - General Rules
IS/IEC 60947-2	Specification for LV Switchgear & Control gear - Circuit Breakers
IEC 60529	Degree of Protection provided by Enclosures
IS 2551	Danger Notice Plates
IEC 60664	Insulation co-ordination within low voltage systems including clearances & creepage distances for equipment
IEC 61140	Installation through door of Class-II Switchboards / Enclosures
IS 14772-2000	General requirements for enclosures for accessories for household and similar fixed electrical installation.

**In case of any conflict on any technical particular in the specification, the stricter requirement mentioned in the relevant standard shall be valid.*

3.0 CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDITIONS	VALUES
1	Max. altitude above sea level	1000m
2	Max. Ambient Temperature	50 °C
3	Max. Daily average ambient temp	35 °C
4	Min Ambient Temp	0 °C
5	Maximum temperature attainable by an object exposed to sun	60 °C
6	Maximum Humidity	95%
7	Minimum Humidity	10%
8	Average No. of thunderstorm days per annum	70
9	Average Annual Rainfall	150 cm
10	Average No. of rainy days per annum	120

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11	Thermal Resistivity of soil	150 Deg. Ccm/W
12	Wind Pressure	126 kg/sq. m up to an elevation of 10 meter.
14	Earthquakes of intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
15	Earthquakes of intensity in vertical direction	equivalent to seismic acceleration of 0.15g
16	Wind velocity	200 km/hr.

Environmentally, some of the regions, where the work will take place includes hilly areas, subject to high relative humidity, which can give rise to condensation. Atmosphere is generally laden with mild acid and dust due to industrial activities. Some places are in heavily industrial polluted areas. On occasions, the combination of humid, acidic and dust condensation may create pollution conditions for outdoor equipment's. Therefore, outdoor materials and equipment's shall be designed and protected for use exposed, heavily polluted, acidic, corrosive, tropical and humid atmosphere.

4.0 GENERAL TECHNICAL REQUIREMENT:

SR. NO.	DESCRIPTION	REQUIREMENT
1	Type of MCCB	Fixed type, Auto/ Manually Operated
2	Type of Releases	Microprocessor Based Electronic Release
3	Rating (A)	40, 100 160, 250 A
4	Overload Release setting	0.4-1 In
5	No. of Poles	Four
6	Rated Voltage	415V
7	Rated ultimate short circuit breaking capacity (Icu)	35kA rms
8	Rated service short circuit breaking capacity (Ics)	100% of Icu
9	Utilization Category	B
10	Rated Insulation Voltage	750 V
11	Rated Impulse withstand voltage	8 Kvp
14	Max. Permissible temp.	85C on current carrying parts at an ambient temperature of 50 degrees
15	Min. Clearance b/w phases	25 mm
16	Min. Clearance b/w phase to earth	20 mm
17	Degree of Protection of enclosure	IP 55

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SR. NO.	DESCRIPTION	REQUIREMENT
18	Spreaders & Phase Barriers	Required to achieve min. electrical clearances as given above
19	Cable Entry	Bottom entry only
20	Cable Size	MCCB Enclosure Shall be suitable for termination of cable sizes as given table 1
21	Electrical and Mechanical Operating cycles	As per IS
22	Maximum Ambient Design Temperature	50 °C

TABLE – 1:

Knockout type openings required in MCCB Enclosure						
S.no.	TRF. Rating	MCCB Rating	Incoming Cables	Outgoing cables	Total no. of openings for incoming cable in base plate	Total no. of openings for outgoing cable in base plate
			LT XLPE Power Cable	LT AB Cable	1-Core	5-Core
1	25kVA	40A, 35kA - FP	1Cx95 sq mm	3Cx95 sq mm + 1Cx70 sq mm + 1Cx16 sq mm	4	1
2	63kVA	100A, 35kA - FP			4	1
3	100kVA	160A, 35kA - FP	1Cx185 sq mm		4	1
4	160kVA	250A, 35kA - FP	1Cx300 sq mm		4	2

5.0 GENERAL CONSTRUCTION:

5.1 ENCLOSURE:

The MCCB shall be housed in an enclosure made of 2mm thick sheet steel and shall be dust and vermin proof. The enclosure shall be provided with robust construction & an overall canopy on top for smooth draining of rainwater. The enclosure shall be suitable for outdoor installation with IP-55 Degree of Protection.

The enclosure shall have a single door arrangement with concealed hinges so that door is not easily removable to avoid pilferage. It shall be so designed that when it is opened and other protective means, if any are removed, all parts requiring access for installation and maintenance, as prescribed by the manufacturer, are readily accessible. Sufficient space shall be provided inside the enclosure for the accommodation of external conductors from their point of entry into the enclosure to the terminals to ensure adequate connection. All parts shall be manufactured in accordance with latest relevant IS / IEC Standards. In case of equipment with conductive enclosures, means shall be provided if necessary to ensure electrical continuity between exposed conductive parts of the equipment and the metal sheathing of connecting conductors. The removable parts of the enclosure shall be firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or

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detached owing to the effects of operation of the equipment or vibrations. Enclosures shall be so designed as to allow the covers to be opened with the use of tools, but means shall be provided to prevent loss of the fastening devices.

Doors of all MCCB enclosure shall have one panel type lock & one padlock at the front of the door. Single Master key shall be provided for all door locks. For mounting the enclosure, the mounting clamps shall be on top & side of the enclosure and shall be of minimum thickness of 5mm. All the hardware used shall be hot dipped Galvanized or Electro-Zinc plated.

For 4-Pole MCCB Enclosure the phase sequence shall be B-Y-R-N from the left, when viewed from the front of the MCCB Enclosure.

5.2 MCCBs:

MCCBs shall have well defined and identified ON, OFF, & Trip positions marked on front face of the MCCB in accordance with Indian and International standards. MCCBs shall have a 'Push to Trip' test button on front face to test the healthiness of Trip unit. MCCB shall be suitable for SCADA communication with necessary arrangements of trip and auxiliary contact also having provision for Earth Fault Protection. Phase Barriers shall be provided on MCCBs to prevent travel of arc between phases during any short circuit fault, and for maximum insulation between phases at power terminals. Phase spreaders and extension link for connection.

5.3 GLAND PLATES:

Detachable CRCA sheet steel gland plates of 3mm thickness shall be provided for accommodating I/C & O/G cables. Rubber seal for all the holes shall be provided separately. The gland plate for each MCCB Enclosure shall be provided with holes (knock out type) suitable for the brass glands in accordance with cables for I/C & O/G mentioned in the table - 1. Details of the no. of holes that should be drilled in the gland plate for particular ratings of MCCB Enclosure along with incoming and outgoing cables sizes are as given in Table – 1 shall be adhered to by the supplier of the MCCB Enclosure.

5.4 TERMINALS & CONNECTIONS:

Current carrying parts shall have the necessary mechanical strength and current carrying capacity for their intended used. All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength. Terminal connections shall be such that the conductors may be connected by means of screws, bolts, spring washers or other equivalent means so as to ensure that the necessary contact pressure is maintained. Standard sizes of bolts, screws, pipe and other fittings shall be used and number of sizes to be kept minimum. Terminals shall be so constructed that the conductors can be clamped. between suitable surfaces without any significant damage either to conductors or terminals. Terminals shall not allow the conductors to be displaced or be displaced themselves in a manner detrimental to the operation of equipment and the insulation voltage shall not be

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reduced below the rated values. Terminals for. connection to external conductors shall be readily accessible during installation.

5.5 INSULATION SUPPORT:

Phase barrier (fire retardant material) shall be provided along with the MCCB.

5.6 PROTECTIVE MEASURES:

The design shall incorporate every reasonable precaution and provision for the safety of all those concerned in the operation and maintenance so that there is no possibility of the operator experiencing a shock during normal operation. All apparatus, connections and cabling shall be designed / arranged to minimize risks of fire and any damage which might cause in the event of fire. Bakelite impregnated / non-impregnated should not be used internally or externally. All apparatus shall be so designed and constructed as to obviate the risks or short circuits of the live parts by lizards / rodents. Insulated barriers shall be provided wherever necessary so as to ensure that no accidental contact with any live parts inside is possible. When the operating person is opening the door, under any circumstances he should not be able to access the live bus directly. Insulated barriers shall be provided on live incoming side terminals of MCCB, so as to ensure that no accidental contact is possible. Each MCCB Enclosure shall be provided with a Danger Plate of Aluminium sheet embossed / engraved or Screen Printed on Enclosure, with 415V AC and danger mark in English and Hindi also effectively secured.

5.7 PROTECTIVE EARTHING:

The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor. The exposed conductive parts (e.g. chassis, framework and fixed parts of metal enclosures) other than those which cannot constitute a danger, shall be electrically interconnected and connected to a protective earth terminal for connection to an earth electrode or to an external protective conductor. Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place.

The MCCB Enclosure shall be provided with an Aluminium Earth bus suitable for the Rated short circuit current of the breaker. Two nos. body earthing studs shall be provided on side of Enclosures for body earthing. Provision of one other stud shall be provided for neutral earthing in those Enclosure which are directly mounted on the transformer. The Earthing bolt should be welded in the Enclosure and not to be fixed. Neutral earthing should be separated from the body with separate studs. The earth terminals/ studs shall be of a suitable size to accommodate the earth conductor and shall be corrosion protected. The earth terminals shall be identified by means of the earthing sign marked in a legible and indelible manner on or adjacent terminals. The earthing studs shall be welded from inside the enclosure and shall be covered from top so as to prevent access for theft. The protective earth terminal shall be

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readily accessible and so placed that the connection of the equipment to the earth electrode or to the protective conductor is maintained when the cover or any other removable part is removed.

5.8. PAINTING:

The paint shall be applied on clean, dry surface under suitable atmospheric conditions by seven tank process followed by powder coating. The paint shade shall be RAL 7032 with thickness of the powder coating not less than 70 microns.

6.0 NAME PLATE AND MARKING:

All the components and operating devices of the MCCB with Enclosure shall be provided with durable and legible nameplates OR Screen printed, containing all technical parameters. MCCB With Enclosure name plate & markings shall be in accordance with IS/IEC 60947-2 along with the following information:

- i) Manufacturer's Name
- ii) Type designation & serial no.
- iii) Reference No. of the relevant standard
- iv) Utilization category
- v) Rated Operational Voltage
- vi) Rated current
- vii) Rated frequency
- viii) Rated service short circuit breaking capacity (Ics)
- ix) Rated ultimate short circuit breaking capacity (Icu)
- x) Line and load terminals
- xi) Neutral pole terminals in MCCB Enclosure
- xii) Protective earth terminal markings on MCCB Enclosure
- xiii) Indication of Open and Closed positions on MCCB
- xiv) Terminal Marking

The Name Plate on MCCB Distribution Enclosure shall be embossed OR Screen Printed with PO NO., Date, "PROPERTY OF TPWODL", "MATERIAL CODE No.", and name of Manufacturer. A danger plate of appropriate size shall be provided on the enclosure OR Screen Printed. Apart from this, 'Suitable for ____ kVA Transformer shall be also printed in order to identify as to which rating of transformer the corresponding MCCB Enclosure is designed on dully printed on the front of the MCCB Enclosure.

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7.0 TESTS:

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS / IEC Standards. Routine / Acceptance tests may be witnessed by the purchaser / his authorized representative, if so desired. All the components as applicable shall be typed as per the relevant standards. The following tests shall be necessarily conducted on the equipment in addition to the others specified in IS / IEC.

A) Type Tests for MCCBs:

Tripping Limits & Characteristics
Operational & Overload Performance Capability
Short Circuit Breaking/Making capacities
Dielectric Properties test
Temperature Rise test

B) Type Tests for Enclosure:

Degree of Protection of Enclosure.

C) Routine Tests for MCCB:

Mechanical & electrical Operation
Calibration of Releases.
Continuity of circuit.
Dielectric withstands.

D) Routine Tests for Enclosure:

Verification of clearances
Dimensional Checks

8.0 TYPE TEST CERTIFICATES:

The bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI / ERDA / Other Govt. Lab, as per the relevant standards. Type test should have been conducted in CPRI / ERDA / Other Govt. Lab Test Laboratories during the period not exceeding 5 years from the date of opening the bid. However, Type Test certificates which are older than 5 years from date of bid opening, may be accepted as a special case, provided there is no change in corresponding IS / IEC standards. 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 TPWODL.

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9.0 PRE-DISPATCH INSPECTION:

Equipment shall be subject to inspection by a duly authorized representative of TPWODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPWODL's representatives at all times when the work is in progress. Inspection by the TPWODL or its authorized representatives shall not relieve the bidder of his obligation to furnish the equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPWODL.

The following documents shall be sent along with material

- a) Test reports
- b) MDCC issued by TPWODL
- c) Invoice in duplicate
- d) Packing list
- e) Drawings & catalogue
- f) Guarantee / Warrantee card
- g) Delivery Challan
- h) Other Documents (as applicable)

10.0 INSPECTION AFTER RECEIPT AT STORES:

The material received at TPWODL store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to the Engineering department

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 Company up to a period of at least 12 months from the date of commissioning or 24 months from the date of supply of each Lot made under the contract whichever is earlier, (the time scale of 12/24 months could be enhanced subject to mutual agreements) Associates 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 Company, failing which the Company will be at liberty to get it replaced/rectified at Associate's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the Associate or from the "Security cum Performance Deposit" as the case may be.

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 Company.

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12.0 PACKAGING:

Bidder shall ensure that all equipment covered under 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.

13.0 TENDER SAMPLE:

Not Applicable

14.0 QUALITY CONTROL:

The bidder shall submit with the offer Quality 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 bought out items and fully assembled component and equipment after finishing. 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/ Consultant's engineer shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

15.0 MINIMUM TESTING FACILITIES:

Bidder shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

16.0 MANUFACTURING ACTIVITIES:

The successful bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order.

17.0 SPARES, ACCESSORIES AND TOOLS:

Bidder shall provide a list of recommended spares with quantity and unit prices for 3 years of operation after commissioning. The bidder shall provide a list of complete set of accessories and tools required for erection & maintenance along with the installation procedure.

18.0 DRAWINGS AND DOCUMENTS:

Following drawings & Documents shall be prepared based on TPWODL specifications and statutory requirements and shall be submitted with the bid:

- Completely filled-in Guaranteed Technical Parameters.
- General description of the equipment and all components including brochures
- General arrangement drawings
- Single Line Diagram
- Bill of material
- Type Test Certificates

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- g) Experience List
- h) Foundation fixing drawings.
- i) Manufacturing schedule and test schedule

Drawings/documents to be submitted after the award of the contract:

S. No.	Description	For Approval	For Review Information	Final Submission
1	Technical Parameters	√		√
2	General Arrangement drawings	√		√
3	Dimensional drawings	√		√
4	Schematic Diagram	√		√
5	Bill of Material	√		√
6	Foundation Plan/ Mounting details	√		√
7	Manual/Catalogues/drawings for MCCB		√	
8	Installation Instructions		√	√
9	Instruction for Use		√	√
10	Transport/ Shipping dimension drawing		√	√
11	QA & QC Plan	√	√	√
12	Routine, Acceptance and Type Test Certificates	√	√	√

Bidder shall subsequently provide four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy of all the drawing, GTP, Test certificates shall be submitted after the final approval of the same to purchaser.

All the documents & drawings shall be in English language.

Instruction Manuals: Bidder shall furnish two softcopies and four (4) hard copies of nicely bound manuals (In English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices.

20.0 GUARANTEED TECHNICAL PARTICULARS:

The Bidder shall submit the GTP & Drawing in line with the technical Specification for TPWODL Approval.

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21.0 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:

S. No	Clause No.	Details of deviation with justifications

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

Seal of the Company:

Signature of Bidder:

Name of the Company:

Date:

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