



नव मंगलूर पत्तन प्राधिकरण  
**NEW MANGALORE PORT AUTHORITY**  
यांत्रिक अभियंता विभाग  
**Mechanical Engineering Department**  
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No.8/9/ESD-III/SS/LT-Panel

Date: 02-12-2024

**REQUEST FOR BUDGETARY OFFER**

Sir,


**Sub: "SITC of LT 415 V, TPN, 50 Hz, LT Distribution Panel" – Budgetary Offers invited - Reg.**

Budgetary Offer in sealed cover superscribed as **"SITC of LT 415 V, TPN, 50 Hz, LT Distribution Panel"** may please be submitted addressed to **"The Executive Engineer (Elec.), Electrical Division, Administration Building, New Mangalore Port Authority, Panambur, Mangalore- 575010"** not later than **3.00 PM on or before 11-12-2024.**

Sl No.	Item Description	Qty	Unit	Rate (Rs)	Amount (Rs)
1	Supply, Installations, testing, commissioning of LT 415 V, TPN, 50 Hz, LT Distribution Panel/switch board with 2 incomers with 1 changeover switch & 1 Bus coupler, and 2 incomer with interlock, outgoing MCCB feeders including necessary base frame, channels, foundation bolts, and all the required items are in contractors scope as per specification <b>(Annexure-I)</b> and site requirement	1	No.		
	<b>Total</b>				
	<b>Applicable GST</b>				
	<b>Grand Total</b>				

**TERMS & CONDITIONS:**

1. The rate quoted for the items shall be firm and F.O.R destination basis. Please note that NMPA is not issuing any concessional C or D forms.
2. Applicable GST will be paid as extra as per actual.

  
Executive Engineer (E)  
Electrical Division, NMPA

**1. TECHNICAL SPECIFICATION FOR LV SWITCHGEAR:**

Document Title: Technical Specification for LV Switchgear

**i. SCOPE:**

This specification covers the design, manufacture, shop floor tests, type and routine tests and delivery of indoor LV switchgear of voltage rating 440 Volts. For quantity, type of breaker, short time rating and other specific details. (Refer SLD of LT panel).

The equipment to be offered under this specification shall be of proven design further, the switchgear must have been type tested in the same configuration that has been offered.

This Specification shall be also read in conjunction with the relevant data sheets and Single Line Diagram.

Compliance with the specification, codes and standards does not relieve the Supplier of the responsibility for supplying equipment of proper design and construction, fully suitable for all specified operating conditions.

Supplier / Vendor shall conform fully to the requirements of this specification and shall provide adequate performance and rating margins.

The scope for LV Switchgear and associated equipment shall include all responsibilities, design activities, materials, requirements, tests, documentations, instructions, spare parts, packing, shipping, type testing, factory routine testing, site testing and commissioning, transportation, unloading, installation etc. as stated in this specification, Data Sheet and, single line diagrams.

**ii. CLIMATIC CONDITIONS:**

The equipment is required to operate satisfactorily under the following site conditions:

Max. Ambient Temperature	40° C
Min. Ambient Temperature	22° C
Max. Relative Humidity	95%
Maximum wind pressure	130 Kg/Sq.mm
Average annual rainfall	3000 mm
Maximum altitude above mean sea level	Less than 5 mtrs.
Climatic conditions	Hot and Humid (modr.)
Maximum temp in ground	50° C
Soil resistivity	Less than 100 ohm mtr.
Soil	Normally dry, IS 1200

### **iii. DESIGN AND PERFORMANCE REQUIREMENT:**

All the 440V AC, devices/equipment like bus support insulators, circuit breakers, etc., mounted inside the switchgear shall be suitable for continuous operation and satisfactory performance under the following supply conditions;

- a. Variation in supply voltage:  $440V \pm 10\%$  TPN (Neutral Distributed and Solidly Earthed).
- b. Variation in supply frequency:  $50 \text{ Hz} \pm 5\%$ .
- c. Combined voltage and frequency variation : 10%

### **iv. CONSTRUCTION:**

1. The panel shall be designed, manufactured and tested in accordance with relevant Indian Standards. The panels shall be indoor, metal enclosed, single/double front, free standing type. All MCCB and air circuit breaker feeders shall be in fully compartmentalised fixed/draw out design as specified in the specific requirement sheets. The sheet steel (CRCA) used for fabrication shall be of 1.6 mm for non-load bearing members and 2.0 mm for load bearing members. The panels shall be supplied with required base channels. The insulators shall be made of high epoxy resin moulding. The bus bars and cable chambers shall be housed in separate chambers. The bus bar and cable chambers should be fitted with bolted covers with gaskets and should be shrouded to avoid direct access to live parts immediately after opening respective covers. The bus bars and jumper connections shall be insulated to full maximum operating voltage. The cubicle shall be designed for **IP4X** protection. The vermin proofing shall be such that the vermin cannot enter from one compartment to another/bus bar chambers. Neoprene gaskets shall be used for all doors, covers and openings.

Undrilled removable type Cable Gland fixing Plates for power and control cables of not less than 2 mm shall be provide for cable entry to the panel.

2. The bus bars and connectors shall be made of high conductivity Copper. The bus bars shall be amply sized to carry the rated continuous current under the specified ambient temperature without exceeding the total temperature of  $85^{\circ}\text{C}$ . Unless otherwise stated, the entire bus bar shall be rated for the continuous rated current of the incomer. When sectionalised with a bus coupler, both the bus bars shall be of the same rating. The entire switchboard along with all components shall be designed for the ambient site condition. The minimum area of cross section of the neutral shall be half that of the phase bus bar. Current Density shall be maximum 1 Amp. Per Sq. mm for single bus-bar to withstand 50 KA fault level.
3. The bus bars and their connections shall be capable of withstanding, without damage, the thermal and mechanical effects of through fault

currents equivalent to the short time rating of the switchgear. It shall be possible to extend the switchboard on both sides. The bus bars shall be sleeved and with respective phase colour. The sleeves shall be rated for an insulation level of 1.1 KV.

4. Each compartment shall have hinged doors with gaskets. Suitable door interlock with switch / breaker shall be provided with provision for emergency defeat feature.
5. Suitable lifting hooks shall be provided. These hooks when removed shall not leave any opening on the enclosure.
6. Switchgear shall be designed for a bottom cable entry and the bus bars shall be located at top / bottom with respect to the cable entry.
7. There shall be positive indication for various position of the trolley.
8. All switchgears compartments shall be totally enclosed with necessary barriers & adjustable horizontal frame with rail arrangement. It shall be possible to change the module size by repositioning compartment supports.
9. All switched drives other than rotary switches shall be lockable in "OFF" position.
10. Shutters shall be provided at bus bar chamber cut out for closing the same when the withdrawable chassis of the modules are drawn out. The bus bar shutters shall be automatically operated by the movement of the carriage.
11. Insulators of moulded or resin bonded material shall have a durable, non-hygroscopic surface finish having a high anti-tracking index. Insulators, barriers made out of hylam, synthetic resin bonded paper, treated wood will not to be accepted. Insulators shall be mounted on the switchgear structure such that there is no likelihood of their being mechanically over-stressed, during normal tightening of the mounting and bus bars, connections etc.

#### **v. AIR CIRCUIT BREAKERS:**

1. The circuit breaker shall be capable of making and breaking the specified fault currents without straining or damaging any part of the switchgear. The breakers shall be air break, motor/manual operated, and horizontal draw out type.
2. The circuit breaker shall be stored energy closing type, manual/electrically operated with tripping mechanism. The circuit breaker shall be provided with 4 NO + 4 NC (specifically for purchaser's

use) of auxiliary potential free contacts required for indication, control, interlocking and other purposes. All contacts shall be wired to a terminal block.

3. Circuit Breakers with stored energy closing mechanism shall be capable of making the rated short-circuit current, when the stored energy is suitably charged by a spring.
4. It shall also be capable of closing on no-load without suffering undue mechanical deterioration. The maximum make- time shall also be not exceeded.
5. The direction of motion of the handle, for manual spring charging shall be marked. A device indicating when the spring is charged fully shall also be provided.
6. Motors and their electrically operated auxiliary equipment for charging a spring shall operate satisfactorily between 85% and 110% of the rated supply voltage.
7. The breaker operating mechanism should store energy for O-C-O operation and shall not, in any case, get stuck in closed position during this cycle. After failure of power supply to the motor, at least one open-close-open operation of the circuit breaker shall be possible.
8. The breaker operating mechanism shall be electrically and mechanically trip-free in all positions. The breaker should also be provided with both mechanical and electrical anti-pumping devices.
9. The ACBs shall be provided with microprocessor based comprehensive releases for protection against overload, short circuit and earth faults.
10. The circuit breakers shall be suitable for locking in fully isolated condition. Following interlocks and features shall be provided so that;
  - a. Truck can be moved within panel only when CB is off.
  - b. CB can be closed only when the test (or) service limit switches permit.
  - c. Breaker compartment door cannot be opened when the CB is in Service/test position.
  - d. Breaker cannot be put in to service position with compartment door open.
  - e. Earth slide beyond the test position till trolley is drawn out.
11. Manual mechanical operating Push Button for On/Off of the breaker shall be provided.

#### **vi. MCCB's**

1. The MCCB's shall conform to the latest applicable standards.
2. MCCB's in AC circuits shall be of four pole construction arranged for simultaneous four pole manual closing and opening. Operating mechanism shall be quick-make, quick-break and trip free type. The ON & OFF positions of the MCCB shall be clearly visible to the operator. Operating handle for operating MCCBs from door of board shall be provided.
3. MCCB terminals shall be shrouded and designed to receive cable lugs for cable sizes relevant to circuit ratings.
4. The MCCBs shall be with adjustable overload and fixed short circuit with high breaking capacity.

#### **vii. CURRENT TRANSFORMERS:**

The current transformers shall have synthetic cast resin insulation and be of the single phase type, with number of cores as per the specific requirements.

The primary & secondary connections shall be clearly labeled.

All current transformers shall have insulation level and short time rating as per main switchgear. All current transformers shall be dimensioned to carry continuously a current of 120% of the rated current. The ratios shall be as per the specific requirements.

#### **viii. METERS, RELAYS AND OTHER ACCESSORIES:**

##### **a. Relays:**

Relays shall be provided with hand reset type contacts. The flag indication shall be suitable for external hand resetting and mechanically interlocked to prevent falling when relays are subjected to vibration. The rating of the auxiliary contacts shall not be less than 10 amps at 240 V AC and 5 amps for 24V DC.

##### **b. Instruments:**

Indicating instruments shall be flush mounted digital type. Size of the instruments shall be 96 x 96 mm.

##### **c. Multi Function Meter:**

Flush mounting type Multi Data Meter Digital 5A, 415 Volts

Parameters: 3 phase Volts, Amps, Watts, KWH, KVAH, MD, PF and Frequency.

**d. Control Switches / Selector Switches:**

Ammeter selector switches shall be with off position and with make before break feature and shall have 3 positions to read the three phase currents. Voltmeter selector switches shall also be of 3 positions and off position, suitable to read phase to phase voltages.

The control switches, operating handles, meters, relays etc shall be mounted at the front of the switchgear panels. Ammeters and Voltmeters are to be provided with selector switches and shall be located at a height not ease of operation height.

Breaker Control switches wherever provided shall be so designed that when released by the operator it shall automatically return to a neutral position. They shall be fitted in sequence with lock to avoid inadvertent operation and shall be arranged such that after passing the "closed" position the control switch cannot be moved into the "Closed" position again without passing the "open" position. Each panel shall have indicating lamps for "ON", "OFF", "TRIP" "TRIP CIRCUIT HEALTHY" and "SPRING CHARGED".

**ix. CONTROL WIRING:**

1. Stud type terminals with identification ferrules shall be used. Local dependent marking as well as remote end dependent marking may be indicated in the ferruling at terminal blocks. Interlocking type ferrules shall be used. All wires carried within the switchgear enclosure shall be HRPVC insulated and neatly arranged so as to be readily accessible and to be easily replaceable. Wherever necessary the wires should be run in cable troughs and the wiring should be routed so that the same remains away from areas where electrical flame or flash over may occur. No conduit or cables shall be carried through the bus bar chamber.
2. The voltage transformer wiring shall be done by FRLS / HRPVC insulated, 1100V grade multi stranded flexible copper conductor of size 1.5 sq.mm and all the current transformer and DC control wiring shall be of the same type of cable as specified above with conductor size of 2.5 sq.mm. The colour coding shall be as per IS 375.
3. AC and DC wiring are to be distinguishable function wise, AC and DC terminals are to be separated by shrouded terminal separators and colour of AC and DC terminals shall be distinct for easy identification.
4. All spare contacts of switches / relays shall be wired up to the terminal blocks.
5. 20% extra spare terminals shall be provided. All terminals shall be suitable for terminating 2 wires from bottom and top side of the terminal block. However not more than one wire shall be terminated from either side on any terminal.

6. All CT wiring shall be terminated on shorting and disconnecting type terminals.

**x. NAME PLATE:**

Hard synthetic material / acrylic designation tags shall be embossed on all the switchboards and individual compartments.

**xi. EARTHING:**

An earth bus of requisite section not less than 50mmx6mm Copper strip, shall be provided. It shall extend throughout and solidly connect all panels in a line with proper terminals, at the end to connect to the station earthing system. The terminal arrangement at the ends shall be suitable for connection by 50x6 mm GI flat and shall be complete in the bimetallic washers etc.

**xii. CABLE CHAMBER:**

The position of the cable chamber shall be such that the cables can be safely taken and carried through one meter trench at the bottom of the switchgear line up and the jointing carried out in a convenient and satisfactory manner. The cable termination arrangement for multiple cables shall permit connection and disconnection of individual cables without disturbing the other cables.

Each panel shall have a separate cable alley. Cable alleys shall consist of cable supporting arrangement so that the load of the cable does not act on the terminals. Special warning labels shall be provided on removable covers (or) doors giving access to cable terminals and bus bars.

**xiii. PAINTING:**

Colour shade of the final paint shall be RAL 7032.

All unpainted steel parts shall be cadmium plated or suitably treated to prevent rust corrosion. If these parts are on moving element, then these shall be greased.

**xiv. LIST OF DRAWINGS**

The supplier shall furnish the following drawings for the switchgear;

- Overall outline dimensions and general arrangement including plan, front elevation, rear & side elevations, clearances recommended in front and back.
- Switchgear layout plan including floor openings, fixing arrangements and loading details.
- Schematic control diagrams to cover controls, protection, interlocks, instruments, space heaters, etc., for each type of module.
- Detailed internal wiring diagram of each type of module, including terminal block numbers, ferrule numbers and the external cable connection designations.



- Itemized bill of material for each module, listing all devices mounted and also otherwise furnished like cable glands, indicating the Manufacturer's type, rating, quantity & special notes, if any.
- Inter panel interconnection wiring diagram including terminal numbers and ferrule numbers.
- Each type of protection relay and circuit breaker release characteristics.
- The supplier shall be entirely responsible for the correctness of the internal wiring diagrams.
- The supplier shall ensure that the characteristics of the CT's, fuses, protection relays, PT's and all other devices offered by him are such as to be suitable for the purpose for which they are intended.
- ACB internal Wiring Diagram.

**xv. TEST CERTIFICATES:**

Type test certificates of all standard component parts, e.g., breakers, CT's, and for the standard factory built assembly shall be submitted by the supplier.

**xvi. DIMENSIONS / OTHER REQUIREMENT:**

**a. Panel shall have minimum dimensions as following;**

- Height Minimum 2.25 Mtrs
- Depth Minimum 1.10 Mtr (0.55 Mtr Switch gear & 0.55 Mtr Cable chamber)
- Width Minimum 0.85 Mtr

**b. Incomers shall be ACB and consists of the following;**

1. R, Y, B Indication (LED)
2. On, OFF, TRIP and TCR indications (**LED**)-supply derived internally.
3. Breaker control switch Trip, close, Neutral
4. In built Micro processor based SC & OCR and E/F Relays with adjustable settings.
5. Local remote switch.
6. Multi function meter digital.
7. Analogue voltmeter with Selector Switch.
8. Analogue Ammeter with Selector Switch.

**Note:** Volt Meter and indication Lamps shall be wired through Fuses, Power supply for indication lamps shall be derived internally as required and shall be protected with HRC fuses.

**c. LT panel (all out going feeder) shall have the minimum dimensions as following;**

1. 800 Amps/630 Amps/400 amps feeders - minimum width and Height (0.55 X 0.55 Mtr).

2. 250 Amps, 200amps, 160amps, 100Amps and 63 amps feeders - minimum width (0.40 X 0.55 Mtr).
3. All O/G switch/MCCB boards panel with ON, OFF and Trip indications (LED) and required power supply for lamps shall be derived internally with fuses.

**Note:** Indication Lamps shall be wired through Fuses, Power supply for indication lamps shall be derived internally as required and shall be protected with HRC fuses.

**xvii. BUSBARS:**

All Busbars and connections shall be of high conductivity copper material for operation at 415 volts 3 Phase with neutral. Main busbar and Neutral shall be rated for 800 Amps shall be designed with short circuit rating 50 KA for 1 Sec.

All the feeder connections shall be suitable for the feeder ratings.

**xviii. INCOMER AND BUSCOUPLER:**

Two Incomers and Bus-coupler shall be provided with (3 lock and 2 Key) mechanical castell Lock and key interlock so that only 2 Breakers can be closed at a time to avoid parallel operation of the 2 Incoming supply.

ACB shall be 4Pole, 800 Amps 4 pole, draw out type for 440 volts , 50Hz, Icu 50KA, Ics 50KA, Icw 50KA for 1 Sec. as per IS 13947-2, IEC 947-2 and BS EN 60947-2 with protection CT,s. Current Transformers shall be of Resin Cast type, 10 VA, 800/5A, class-1.

ACB shall be fitted with self powered Micro processor based protection for SC, OL and EF protection.

**xix. OUTGOING FEEDERS:**

All out going feeder shall be MCCBs shall be with Micro processor based protection for SC, OL and EF.

**a. Outgoing Feeder connected to Incomer - 1**

Sl. No.	MCCB Rating / Type	Qty	Protection release
1.	800A, 4 Pole, 50KA	1 No.	SC, O/L & E/F
2.	630A, 4 Pole, 50KA	1 No.	SC, O/L & E/F
3.	400A, 4 Pole, 50KA	4 Nos.	SC, O/L & E/F
4.	250A, 4 Pole,36 KA	2 Nos.	SC, O/L & E/F
5.	200A, 4 Pole,36KA	3 Nos.	SC, O/L & E/F

6.	160A, 4 Pole,36KA	3 Nos.	SC, O/L & E/F
7.	100A, 4 Pole,36KA	3 Nos.	SC, O/L & E/F
8.	63A, 4 Pole,10KA	4 Nos.	SC, O/L & E/F
9.	32A, 4 Pole,10KA	4 Nos.	
10.	16A, 2 Pole,10KA	4 Nos.	

**b. Outgoing Feeder connected to Incomer - 2**

Sl. No.	MCCB Rating / Type	Qty	Protection release
1.	800A, 4 Pole, 50KA	1 No.	SC, O/L & E/F
2.	630A, 4 Pole, 50KA	1 No.	SC, O/L & E/F
3.	400A, 4 Pole, 50KA	4 Nos.	SC, O/L & E/F
4.	250A, 4 Pole,36 KA	2 Nos.	SC, O/L & E/F
5.	200A, 4 Pole,36KA	3 Nos.	SC, O/L & E/F
6.	160A, 4 Pole,36KA	3 Nos.	SC, O/L & E/F
7.	100A, 4 Pole,36KA	3 Nos.	SC, O/L & E/F
8.	63A, 4 Pole,10KA	4 Nos.	SC, O/L & E/F
9.	32A, 4 Pole,10KA	4 Nos.	
10.	16A, 2 Pole,10KA	4 Nos.	

**xx. TECHNICAL SPECIFICATIONS FOR MOULDED CASE CIRCUIT BREAKER:**

The Moulded Case Circuit Breaker (MCCB) shall conform to latest IEC-60 947-2/ IS13947-2. The Circuit Breaker shall comply with the isolation function requirement of IEC 60 947-2 section 7.1.2 to be marked as suitable for isolation/ disconnection to facilitate safety of operating personnel while the Breaker is in use.

Moulded Case Circuit Breakers shall be fixed type, Microprocessor release having adjustable O/L & S/C settings with trip-free, manually closing mechanism, accommodated in a Moulded housing of robust and vermin-proof construction matching with switchboards.

All MCCBs shall be designed and tested as per IS - 13947 Part II. Breakers shall be provided with an Inverse Time Delay Electronic Over Current trip device. The trip device shall be direct acting.

MCCB shall be provided with Class II insulation between front cover & internal power circuits to avoid any accidental contact with live current carrying path with the front cover open.

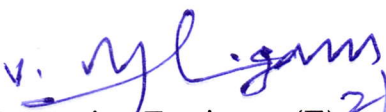
The tripping devices shall be ambient temperature compensated type. The insulating case and cover shall be made of high strength heat resistant and flame retardant thermosetting insulating material.

They shall have line load reversibility. 3-Phase Breakers shall be designed to break all the Poles simultaneously and they shall have a single mechanism.

They shall have auxiliaries and accessories whenever required for signalling, interlocking, shunt trips, under voltage release, castle lock, etc.

All the Circuit Breakers used shall have guaranteed breaking capacities sufficient for the maximum short circuit duties that could possibly be imposed on the different Breakers. MCCB shall have  $I_{cs}=I_{cu}$  for the entire range and rated at ambient 50°C.

MCCB's shall be used with rotary handle and terminal spreaders, Phase barrier and all terminals shall be shrouded to avoid direct contact.

  
Executive Engineer (E) 2/12/24  
Electrical Division, NMPA