

शुद्धिपत्र / Corrigendum

कार्य का नाम: बैनर गेट, आईआईएसईआर, पुणे के पास प्लॉट पर प्लांट प्रसार सुविधा के लिए विद्युत वितरण प्रणाली प्रदान करना।

NAME OF WORK: PROVIDING ELECTRICAL DISTRIBUTION SYSTEM FOR PLANT PROPOGATION FACILITY AT PLOT NEAR BANER GATE IISER PUNE.

एनआईटी संख्या: 22/आईआईएसईआर/पुणे/2024-25

NIT No.: 22/IISER/Pune/2024-25

निविदा आईडी: 2024_IISRP_824110_1

Tender Id: 2024_IISRP_824110_1

विषय: बीओक्यू आइटम के विनिर्देशों में संशोधन।

Subject : Revision in Specifications of BOQ items.

निविदा के विनिर्देशों में संशोधन, संशोधन संलग्न है। बोलीदाताओं से अनुरोध है कि वे इसका ध्यान रखें और तदनुसार उद्धरण दें।

Revision in the Specifications of Tender, revision is as appended. Bidders are requested to take note of it and quote accordingly.



शुद्धिपत्र / CORRIGENDUM

खंड II पेज नं / Volume II Page no	विशिष्टता प्रकाशित Specification published	विशिष्टता संशोधित Specification Revised
139	BOQ item No 37 Supplying, installation, testing & commissioning of fault isolator complete with base as required.	Please read BOQ ITEM no 37 : "Supplying, installation, testing and commissioning of microprocessor based intelligent addressable main fire alarm panel, central processing unit with ONE loop modules and capable of supporting not less than 120 devices (including detectors) and minimum 120 detectors per loop and loop length up to 1 km, LCD display with other keypad and minimum 100 events history log in the non-volatile memory (EPROM), power supply unit (230 \pm 5 % V, 50 Hz), 48 hrs back-up with 24 volt sealed maintenance free batteries with automatic charger. and shall be complete with all accessories. The panel shall be compatible for IBMS system with open protocol BACnet/ Modbus over IP complete as per specifications. Supplying, installation, testing & commissioning of fault isolator complete with base as required."
140	BOQ item No 48 Providing Main LT feeder with 1 incoming 400 A and 4 outgoings MCCBs 125 A as per specifications attached	Please read BOQ ITEM no 48 : "Supplying, Transportation, installation, testing & commissioning loading & unloading of cubical type LT panel suitable for 415V, 3 phase, 4 wire 50 Hz AC supply system. Panel shall be fabricated in compartment form from CRCA sheet steel of 2mm thick for frame work & covers, 3mm thick for gland plates including cleaning & finishing complete with tank process for powder coating having thickness of minimum 80 micrometres in approved shade, the panel shall be as per IS 8623 specifications & having valid CPRI Test Certification 4000Amp, 50KA for 1sec. Tender specifications data sheet. Refer Annexure A For details of specifications of above said panels. Copy attached .a) Incoming Section as under : (a.1) Incomers MCCB :- 400A, 4P, 35 KA Moulded Case Circuit Breaker (MCCB) with inbuilt Microprocessor release (LSIG) over load , short circuit, instantaneous, Ground Fault : 1 Number (a.2) Control MCB 6A , Class-C as shown on SLD : (a.3) Indications : LED Indication : RYB for Phase & ON/OFF/TRIP indication lamp for MCCB Status with required control MCB as



		<p>shown on SLD - For each incomer (a.4) Analogue Voltmeter 96x96 mm 0-500 Volts With 7 Position Selector Switch : 1 set (a.5) Meters: Microprocessor based Digital Load manager for : KW .KWH,KVA, KVAR,KVARH, Hz, Volts,Amp, p.f. TDH, & MD KVA with RS 485 Serial communication port duly wired for ready to use (a.6) Resin Cast Current Transformers : 3 Nos. 400 / 5 A ,15 VA CL:1 CT's for Metering : for incomer b) Outgoings feeders as under b.1)Type of Feeders : TPN Moulded Case Circuit Breaker (MCCB) Inbuilt Adjustable Microprocessor Over current, Short circuit ,Instantaneous, and Earth fault release (LSIG) Rating of Outgoings feeders: b.2) 04 Nos 125 Amp 35KA TPN MCCB b4 : Indications : LED ON/OFF/TRIP Indication for each outgoings b.2 : Meters: 3 Phase 4 Wires connected Multifunction meters for KWH and Amp with RS 485 serial Communication Port duly wired and ready to use for each outgoing feeder. b.3: Resin Cast Current Transformers : 1 Set of 3 Nos CTs with 15 VA CL:1 ,125/ 5 Amp, 63 / 5 Amp Secondary Current CT's for each outgoings feeders for Metering e) Busbars as under e.1) Main Horizontal Busbar :400A 4P Aluminium 35 K.A. 1-Sec , busbar at current density of 0.8 Amp /Sq.mm for each bus section e.2) Vertical TPN Busbar : Amp rating of Vertical TPN Busbar shall be Sum of total connected Feeder at current density of 0.8 Amp /Sq.mm . "</p>
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बोली दाता ई-खरीद पोर्टल पर इस शुद्धिपत्र के संदर्भ में बोली प्रस्तुत करें।

बीओक्यू आइटम की मात्रा और इकाई में कोई परिवर्तन नहीं।

बोली दाताओं से अनुरोध है कि वे इसका ध्यान रखें और तदनुसार उद्धरण दें।

Bidder to submit the bid with reference to this corrigendum on E-procurement portal.



भारतीय विज्ञान शिक्षा एवं अनुसंधान संस्थान पुणे

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No change in the quantity and unit of the BOQ item.

Bidder are requested to take note of it and quote accordingly.

जारी करने की तिथि : 06 / 09 / 2024

Date of Issue : 06 / 09 / 2024

A handwritten signature in blue ink, appearing to be 'M. O. S.', written over the printed name of the Superintending Engineer.

अधीक्षण अभियंता,

Superintending Engineer,

आईआईएसईआर पुणे।

IISER Pune.

अनुलग्नक: विनिर्देशों के लिए अनुलग्नक ए।

Encl. : Annexure A for specifications for LT feeder.

Annexure A for specifications for LT feeder.

A. TECHNICAL SPECIFICATION FOR LT PANELS

1.1 The power control panels shall be metal clad, totally enclosed, rigid, floor mounting, air insulated, cubical type for use on 415 volts, 3 phase, 4 Wire 50 cycles system. The equipment shall be designed for operation in high ambient temperature and high humidity tropical atmospheric conditions. Means shall be provided to facilitate ease of inspection, cleaning and repairs, for use in installations where continuity of operation is of prime importance.

1.2 The equipment shall be designed to confirm to the requirements of:

- a) IS 4237 - General requirements for switchgear and control gears for voltages not exceeding 1100 volts.
- b) IS 2147 - Degree of protection provided by enclosures for low voltages switchgear and control gear.
- c) IS 375 - Marking and arrangements of busbars. Individual equipment housed in the power control to the following IS specifications:
 - i) Air circuit breakers - IS:13947-2 1993
 - ii) MCCB - IS 13947-2-1993
 - iii) MCB - IS 8828 (1996) IEC 898 (1995)
 - iv) Current Transformer - IS 2705.
 - v) Voltage Transformer - IS 3156.
 - vi) Relays - IS 3231.
 - vii) Indicating Instruments - IS 1248.
 - viii) Integrating Instruments - IS 711.
 - ix) Control Switches and push buttons - IS 6875.
 - x) Auxiliary contractors - IS 2959.

1.3 CONSTRUCTIONS:

The power control panels shall be :

- i) Of the metal enclosed, indoor, floor mounted, free standing type.
- ii) It shall be made up of the requisite vertical section, which when coupled together shall form continuous dead front switch boards.

Special Conditions:

CENTER FOR DATA SCIENCE, QUANTUM TECHNOLOGY AND ECS

189 | Page

- iii) Provide dust and dump protection, the degree of protection being not less than IP 52 for indoor and IP-65 for outdoor panels.

iv) Be readily extensible on both sides by the addition of vertical sections after removal of the end covers. Each vertical section shall comprise of:

- a) A front framed structure rolled / folded sheet steel channel section of minimum 3mm thick, rigidly bolted together. This structure shall house the components contributing to the major height of the equipment, such as circuit breaker cassettes, fuse switch units, main horizontal bus bars, vertical risers and other front mounted accessories.
- b) The structure shall be mounted on a rigid base frame of folded sheet steel of minimum 3mm thick and 100mm height. The design shall ensure that the weight of the components is adequately supported without deformation or loss of alignment during transit or during operation.
- c) A cable chamber shall house the cable end connections of power / control cable termination. The



design shall be to ensure generous availability of space for easy installation and maintenance of cabling, and adequate safety for making in one vertical section without coming into accidental contact with live parts in and adjacent sections.

d) A cover plate at the top of the vertical section, provided with a ventilating hood where ever necessary. Any aperture for ventilation shall be covered with a perforated sheet having not less than 1mm diameter perforation to prevent entry of vermin.

e) Front and rear doors shall be fitted with nuts/bolts including neoprene gaskets with fasteners designed to ensure proper compression of the gaskets. When covers are provided in place of doors, generous overlap shall be assured between sheet surfaces with closely space fasteners to preclude the entry of dust. The height of the panel should not be more than 2400mm. The maximum height of any operating mechanism shall not be more than 2100mm. The total depth should be adequate to cater for proper cabling space.

f) Doors and covers shall be of minimum 14 guage sheet steel. All sheet steel work forming the exteriors or switchboards shall be smoothly finished, leveled and free from flaws. The corners should be rounded. The apparatus and circuits in the power control panels shall be so arranged as to facilitate their operation and maintenance and at the same time to ensure the necessary degree of safety.

v) Apparatus forming part of the power control panels shall have the following minimum clearances:

- a) Between phases - 25 mm
- b) Between phases and neutral - 25 mm
- c) Between phases and earth - 25 mm
- d) Between neutral and earth - 25 mm

Special Conditions:

CENTER FOR DATA SCIENCE, QUANTUM TECHNOLOGY AND ECS

190 | Page

vi) If for any reason, the above clearances are not available suitable insulation shall be provided. Clearance shall be maintained during normal services conditions.

vii) Creepage distances shall comply to those specified in relevant standards. All insulating materials used in the construction of the equipment shall be arranged in multi-tier formation, except that not more than two air circuit breakers shall be housed in a single vertical section. Metallic / insulated barriers shall be provided within vertical sections and between adjacent sections to ensure prevention of accidental contact with:

a) Main bus bars and vertical risers during operation, inspection or maintenance of functional units and front mounted accessories.

b) Cable termination of one functional units, where working of those of adjacent unit / units.

viii) All covers providing access to live power equipments / circuits shall be provided with tool operated fasteners to prevent unauthorized access. Provision shall be made for permanently earthing the frames and other metal parts of the switch gear by two independent connections.

1.4 METAL TREATMENT AND FINISH:

All steel work used in the construction of the switchboards should have undergone a rigorous metal treatment process as follows:

a) Effective cleaning by hot alkaline degreasing solution followed by cold water rinsing to remove traces of alkaline solution.

b) Picking in dilute sulfuric acids to remove oxide scales and rust formation, if any, followed by cold water rinsing to remove traces of acidic solution.



- c) A recognized phosphating process to facilitate durable coating of the paint on the metal surfaces and also to prevent the spread of rusting in the event of paint film being mechanically damaged. This again, shall be followed by hot water rinsing to remove traces of phosphate solution.
- d) Passivating in de-oxalite solution to retain and augment the effects of phosphating.
- e) Drying with compressed air in a dust free atmosphere.
- f) Primer coating, with two coats of highly corrosion resistant primer, applied wet on stove dried under strictly controlled conditions of temperature and time.
- g) A finishing coat of stoving synthetic enamel paint to the specified shade of IS. The total thickness of paint should not be less than 25 microns.

1.5 BUS BARS

Special Conditions:

CENTER FOR DATA SCIENCE, QUANTUM TECHNOLOGY AND ECS

191 | Page

- a) The bus bars shall be air insulated and made of high conductivity, high strength aluminium / copper alloy as in BOQ complying with the requirement of grade E91E of IS 5082.
- b) High tensile bolts and spring washers shall be provided at all bus bar joints.
- c) The main phase bus bars shall have continuous current rating throughout the length of each power control panel, and the neutral busbars shall have a continuous rating of atleast 50% of the phase bus bars.
- d) Bus bars shall be colour coded for easy identification of individual phases and neutral and protective earth.
- e) CURRENT TRANSFORMER: Current transformer shall comply with the requirements of IS 2705. They shall have ratios, outputs and accuracy's as specified / required.
- f) INDICATING / INTERGRATING METERS: All indicating instruments shall be of flush mounting industrial pattern, conforming to the requirements of IS 1248. The instrument shall have nonreflecting dial, clearly divided and legibly marked scales and shall be provided with adjusting devices in the front.
- g) CABLE TERMINATION: Cable entries and terminals shall be provided in the switch-board to suit the number, type and size of aluminum conductor, power cable and copper conductor control cable specified in the detailed specifications.
- h) Provision shall be made for top or bottom entry of cables as required. Generous size of cabling chambers shall be provided, with the position of cable glands and terminals such that cables can be easily and safely terminated. The minimum depth of the panel shall be restricted to 1600 mm for this purpose.
- i) Barriers or shrouds shall be provided to permit safe working at the terminals of one circuit currents without accidentally touching that of another live circuit. Cabling risers shall be adequately supported to withstand the effects of rates short circuit currents without damage and without causing secondary faults. Cable sockets shall be of copper and of the crimping type as specified.

1.6 CONTROL WIRING:

- a) All control wiring shall be carried out with 1100 / 660 V grade single core FRLS cable conforming to IS 694 / IS 8130 having standard copper conductor of minimum 2.5 Sqmm section for potential circuits and 2.5 mm section for current transformer circuits. Wiring shall be neatly bunched, adequately supported and properly routed to allow for easy access and maintenance.
- b) Wiring shall be identified by numbered ferrules at each end. The ferrules shall be of the ring and



of non-deteriorating materials. They shall be firmly located on each wire so as to prevent free
Special Conditions:

CENTER FOR DATA SCIENCE, QUANTUM TECHNOLOGY AND ECS

192 | Page

movement. All control circuit fuses shall be mounted in front of the panel and shall be easily accessible.

1.7 TERMINAL BLOCKS:

Terminal blocks shall be of 500 volts grade of finger touch proof type. Insulating barriers shall be provided between adjacent terminals.

1.8 LABELS:

Labels shall be on anodized aluminium, with white engraving on black background. They shall be properly secured with fasteners.

1.9 TESTS:

Routine tests shall be conducted on each power control panel in accordance with CI 81, 2.2 of IS 8623 and shall comprise of:

- a) Inspections of the power and control circuits including inspection of wiring and electrical operational tests where necessary.
- b) Dielectric tests.
- c) Checking of protective measures and electrical continuity of the protective circuits.

1.10 STORING:

The panels shall be stored in a well ventilated dry places. Suitable polythene covers shall be provided for necessary protection against moisture.

1.11 ERECTION:

Switch boards shall be installed on suitable foundation. Foundation shall be as per the dimensions supplied by the panel manufacturer. The foundation shall be flat and level. Suitable grouting holes shall be provided in the foundation. Suitable MS base channel shall be embedded in foundation on which the panel can be directly installed. The switch boards shall be properly aligned and bolted to the foundation by bottom plate or top plate as the case may be, by using brass Siemens type compression glands. The individual cables shall then be led through the panel to the required feeder compartments for necessary terminations. The cables shall be clamped to the supporting arrangements. The switch board earth bus shall be connected to the local earth grid.

1.12 PRE-COMMISSION TESTS:

Special Conditions:

CENTER FOR DATA SCIENCE, QUANTUM TECHNOLOGY AND ECS

193 | Page

Panels shall be commissioned only after the successful completion of the following tests.

The tests shall be carried in the presence of the Engineer.

- a) All main and auxiliary bus bar connections shall be checked and tightened.
- b) All wiring terminations and bus bars joints shall be checked and tightened.
- c) Wiring shall be checked to ensure that it is according to the drawings.
- d) All wiring shall be tested for insulation resistance by a 1000 Volts Megger.
- e) Phase rotation tests shall be conducted.
- f) Suitable injection tests shall be applied to all the measuring instruments to establish the correctness and accuracy of calibration and working order.
- g) Suitable injection tests shall be applied to all the measuring instruments to establish the



correctness and accuracy of calibration and working order.

h) All relay and protective devices shall be tested for correctness of settings and operation by introducing a current generator and ammeter in the circuit.

2. CIRCUIT BREAKERS:

Air Circuit Breakers:

2.1 General

· Air circuit breakers shall confirm to - IS:13947-2 1993 / IEC947-1 for general rules and IS13947- 2 /IEC947-2 for circuit breakers.

· ACBs shall be suitable for operation on 3 phase 660 Volts,50Hz AC supply and shall have a rated insulation voltage of 1000V AC.

· All circuit breakers shall be fully tropicalized -(T2) standard. and pollution degree IV.

2.2 Type & Construction:

· The Breaker shall be suitable for rear horizontal & vertical mounting and line load reversibility, without any deration.

· The breaker shall comply with isolating function requirement of IS 13947-2/ IEC 947- 2 sec

7.1.2.

· The breaker shall offer total insulation of the control part with respect to the power part and shall offer double insulation on the front face(Class II degree of operating safety).

· Inspection of the main contacts should be facilitated by a mechanical wear indicator.

2.3 Operating Mechanism:

ACBs shall be provided with either motor operated or manually operated quick- make,quick break, trip-free operating mechanism.

Special Conditions:

CENTER FOR DATA SCIENCE, QUANTUM TECHNOLOGY AND ECS

194 | Page

Wherever specified, motorized spring charging mechanism suitable for AC or DC shall be supplied.

2.4 Interlocking & safety arrangement:

The microprocessor control unit shall be equipped with a push to reset mechanical indicator, for antipumping function.

It shall not be possible for breaker to be switched 'ON' until it is either in 'Service' or 'Test' position. The breaker shall be capable of being racked into test or isolated position and kept locked in any of these positions.

It shall not be possible to withdraw the breaker when the spring are charged.

It shall not be possible to insert breaker racking handle when cubicle door is open. It shall have defeat interlock facility.

Safety shutters should be closed automatically when ACB is withdrawn

OFF position pad-locking arrangement is required.

2.5 Rating & Breaking Capacity

· The rating of the circuit breaker shall be as per the drawings and schedule of quantities. The ACB shall have minimum Service Breaking Capacity(Ics) equal to Ultimate Breaking Capacity(Icu)



- The minimum Service breaking capacity(Ics) for rating upto 1600A shall be 65kA and for rating above 1600A ,the service breaking capacity shall be 75kA.
- The Short time withstand(Icw) for 1 sec for rating shall be 50kA.

2.6 Protection:

- The microprocessor release shall be housed in separate enclosure and there shall be total insulation of the release with respect to the power circuit.
- The microprocessor release shall measure the true rms values to make the measurement free from the influence of harmonics.The trip-time shall be within 30 ms and the setting range shall cover the following:
 - Overload - The rated current(I r) adjustable from 0.4 to 1.0 times the nominal current(In) with adjustable time delay settings.
 - Short-circuit - adjustable from 1.5 to 10 times the rated current(Ir) with time delay setting range from Instantaneous to 0.4 sec
 - Instantaneous - adjustable from 2 times the nominal current(In) upto the circuit breaker electrodynamic withstand. It should be possible to switch OFF the Instantaneous protection to enable total time discrimination upto the breaker breaking capacity.
 - Earth fault - adjustable threshold (0.2 to In) with time delay setting range from 100ms to 400ms.
 - Indication of type of fault (O/C, S/C or E/F) locally by LED is required.
 - Local overcurrent pre-trip alarm is to be provided by LED on microprocessor release with 2 levels :-

glowing steady when load current reaches 90% of rated current (Ir)

flashing when load current reaches 105% of rated current (Ir)

Special Conditions:

CENTER FOR DATA SCIENCE, QUANTUM TECHNOLOGY AND ECS

195 | Page

- Thermal Memory: the microprocessor release shall optimize the protection of the equipment or the circuit conductors in the event of repeated overloads or faults by using thermal integration to memorize temperature rises.
- Safety: Internal overheating of the microprocessor control unit shall be signaled by self-monitoring alarm.
- The microprocessor release shall make it possible to have full discrimination with downstream MCCBs.

2.7 Accessories:

ACB shall be provided with following accessories, if specified in schedule of quantities. Further these devices shall be field fit-able from the front and common for all ratings.

Under -voltage

Shunt-trip

Closing coil

Auxiliary contacts: 4NO+4NC (provision for additional changeover switches wherever required)



2.8 Testing :

Test certificate

Original Test certificate of the ACB as per IS13947-2/IEC947-2 shall be provided with out fail.

3.0 Moulded Case Circuit Breakers:

3.1 General

Moulded case circuit breakers shall be incorporated in the PCC/MCC wherever required and shall be of current limiting type and shall be double break type.

MCCBs shall confirm to IS 13947-1/IEC 947-1 for general rules and IS 13947-2/IEC947-2 for circuit breakers in all respects.

MCCB should be suitable for horizontal & vertical mounting and Line -Load reversibility and shall be suitable for Isolation.

MCCB shall be suitable for three phase 660 V, 50Hz, AC with a rated insulation voltage of 750 V AC and impulse withstand of 8 kV.

The MCCB shall be available in three & four pole version (selectable neutral protection at 0, 50% & 100%).

The MCCB shall provide Class II insulation between the front and internal circuits.

All the breakers shall have tropicalisation as a standard feature.

Special Conditions:

CENTER FOR DATA SCIENCE, QUANTUM TECHNOLOGY AND ECS

196 | Page

3.2 Construction:

The MCCB case & cover shall be made of high strength heat resistant and flame retardant thermosetting insulating material.

The operating handle shall be quick make, quick break trip free type. The operating handle shall have suitable 'ON', 'OFF', 'TRIPPED' indicators.

In order to ensure suitability for isolation complying with IS13947-2/IEC947-2, the operating mechanism shall be designed such that the toggle or handle can only be in 'OFF' position.

Three phase MCCBs shall have a common operating handle for simultaneous operation and tripping of all the three phases.

It shall be possible to "seal on" the thermal-magnetic or electronic trip units to prevent unauthorized access to the settings.

It should be possible to interchange the trip units at site.

3.3 Rating & Breaking Capacity:

The rating of the circuit breaker shall be as per the drawings and schedule of quantities.

The Service Breaking Capacity (Ics) in kA for different ratings at 415V AC, 50Hz, at 0.2 p.f shall be as follows:

- 15kA for ratings up to 100A
- 36KA for ratings above 100A and up to 250A
- 50KA for ratings above 250A and up to 630A.

3.4 Protection:

All breakers up to 250A shall have thermal-magnetic trip unit with adjustable overload protection and fixed magnetic protection.

The MCCBs ratings above 250A shall be fitted with electronic trip unit. The overload setting adjustable from 40% to 100% of the nominal current(In).

It should be possible to have one or more LED indication(s) on the electronic release -

(1) for overload as a pre-trip alarm



glowing at 90% of rated current(Ir).

flashing at 105% of rated current(Ir).

(2) fault trip indication by LED locally on the electronic release for O/C, S/C & E/F(if supplied) wherever release with Communication option(COM) is specified.

The short circuit protection should be adjustable from 2 to 10 times the rated current(Ir).

Special Conditions:

CENTER FOR DATA SCIENCE, QUANTUM TECHNOLOGY AND ECS

197 | Page

The Instantaneous Short Circuit protection to be fixed ,without any time delay at 11 times the nominal current(In).

The Earth fault protection , if specified in schedule, shall have adjustable sensitivity with adjustable time delay settings.

It shall be possible to fully co-ordinate the over-load & short-circuit tripping of the circuit breakers with the upstream and downstream circuit breakers to provide Total Discrimination.

MCCBs for UPS / non linear load applications shall be with 1.6 In neutral protection.

3.5 Accessories:

MCCBs shall be provided with the following accessories, if specified in schedule and all these devices shall be fittable at site. Each of these units shall incorporate a pre-wired terminal strip which is accessible from the front of the breaker without removing the cover. The Shunt trip release and under voltage release shall be snap-in type.

- Under voltage
- Shunt trip
- Alarm switch
- Auxiliary switch
- Motor operated Mechanism

3.6 Interlocking:

MCCBs shall be provided with the following interlocking devices for interlocking the door of the switchboard.

Handle interlock to prevent unnecessary manipulations of the breaker.

Door interlock to prevent door being opened when breaker is in ON or OFF position

Door-interlock defeat to open the door even if the breaker is in ON position.

Front operated rotary handle should have OFF-position pad-locking facility.

3.7 Testing:

Test certificate

Original Test certificate of the MCCB as per IS13947-2/IEC947-2 shall be provided with out fail.

4. Contactors

Contactors shall comply with IS 13947 1 for general rules and IS13947-4-1 for standards pertaining to contactors and motor starters. The contactor shall be capable of withstanding breaking & making capacities per following:

AC3 Category AC4 Category

Making Current - 10 times Rated Current 12 times rated current

Breaking current – 8 times Rated current 10 times rated current

Special Conditions:

CENTER FOR DATA SCIENCE, QUANTUM TECHNOLOGY AND ECS

198 | Page

Contactor shall be capable of withstanding an impulse voltage of 8KV and have an insulation voltage



of 1000V.

The Contactors shall be capable of frequent switching and should operate without any deration at 55 deg. C for AC3 application..

The coil shall have 3 terminals and the insulation class shall be H class, to sustain frequent switching operations. The auxiliary contact block shall have a switching capacity of 240V at 2A.

Contactors shall have one auxiliary in-built and it shall be possible to have additional NO & NC contacts in steps of two.

4.1 Thermal Overload Relay

The Thermal Overload Relay (TOR) shall comply with IS 13947-1 for general rules and IS 13947-1 for standards pertaining to contactor and motor starters and shall be designed for AC3.

The TOR shall be suitable for Type 1 and Type 2 coordination as per suitable clause in the relevant Indian Standards.

The TOR shall be capable of offering differential protection and shall be ambient compensated type, operable upto 70 deg. C.

The TOR shall be capable of withstanding short circuit equal to seventeen times the rated thermal current (17 Ie).

The TOR will be tripping class 10A as a standard or class 20 for certain applications where specified.

The TOR should have built in single phasing protection and phase unbalance protection as per IEC947-4.

It shall be possible to mount the TOR on the underside of the contactor directly.

The design of the terminal shroud shall be such that it shall offer complete protection against direct finger contact with the power terminal, as under IP 20 protection.

The TOR shall have in built NO & NC contact.

The "Reset" operation shall be clearly distinguished from the "Stop" operation.

The TOR shall have separate "Stop" and "Test" button.

The setting shall be of the adjustable type and there should be a provision of sealing to make the same tamper proof.

Special Conditions:

CENTER FOR DATA SCIENCE, QUANTUM TECHNOLOGY AND ECS

199 | Page

The TOR shall be suitable for Aluminium termination, with a maximum permissible temperature rise of 65K, at the terminals, with an ambient temperature of 40 deg. C.

All the TORs shall have tropicalization as IEC 68 series as a standard feature.

5.0 Miniature Circuit Breakers(MCB)

MCB for ratings upto 125 Amps shall be available in 1,2,3 or 4 pole versions. MCB casing shall be made of self-extinguishing material, tropicalised treatment 2 (relative humidity : 95% at 55 °C).

MCB shall comply with - IS 8828 (1996) IEC 898 (1995)

It shall be suitable for use in frequency range 40Hz to 60Hz and shall accommodate AC/DC supply according to requirements.

Arc chutes should be provided for effective quenching of arc during operations and fault conditions. It shall have trip free mechanism and toggle shall give positive contact indication.

It shall be suitable for mounting on 35mm DIN rail/surface mounting.

Line supply may be connected to either top or bottom terminals i.e there shall be no line load restriction.

Degree of protection, when the MCB is flush mounted, shall be IP40.MCB & shall be supplied with



clamping terminals fully open.

Contact closing shall be independent of the speed of the operator.

MCB's operating temperature range shall be -20 deg C to + 60 deg C

The characteristics should be in accordance with IS8828-1996. The breaking capacity of the MCB shall be 10kA and energy limiting class 3.

The rated impulse voltage Uimp of the MCB shall be greater than 4kV.

The MCB shall be capable of being used as Incomer circuit breaker and shall be suitable for use as an isolator.

Electrical endurance of the MCB should be 20,000 opns.

Power loss per pole shall be in accordance with IS8828 - 1996 and the same shall be furnished by the manufacturer.

In case of multipole MCBs in a single location(DB), it shall be possible to remove MCB without having to disturb other MCB's in the vicinity.

'C' curve type MCB should be used for lighting loads and 'D' curve type for UPS circuits.

6.0 Current transformers.

a) Current Transformers:

Current Transformers shall be in conformity with IS: 2705 (Part I, II and III) in all respects. All current transformers used for medium voltage applications shall be rated for 1.1KV, current transformers shall have rated primary current, rated burden and class of accuracy as specified in the schedule.

However, the rated secondary current shall be 5 A unless otherwise specified. The acceptable minimum class of various applications shall be as given below:

Measuring : Class I

Protection : Class 10 P.

Current transformers shall be capable of withstanding without damage, magnetic and thermal stresses due to short circuit fault of 35 MVA on medium voltage system. Terminals of the current transformers shall be marked permanently for easy identification of poles. Current transformers

Special Conditions:

CENTER FOR DATA SCIENCE, QUANTUM TECHNOLOGY AND ECS

200 | Page

shall be provided with Earthing terminals for earthing chassis frame work and fixed part of the metal casing (if any).

Current transformers shall be mounted such that they are easily accessible for inspection, maintenance and replacement. The wiring for CTs shall be copper conductor, PVC insulated wires with proper termination lugs wiring shall be bunched with cable straps and fixed to the panel structure in a neat manner.

7.0 MEASUREMENT INSTRUMENTS:

a) General:

Direct reading electrical instruments shall be in conformity with IEC - 51, BS: 89 or IS: 1248. The accuracy of direct reading shall be 10 for Voltmeter. Other type of instruments shall have accuracy of 1. The errors due to variations in temperature shall be limited to a minimum. The meters shall be suitable for continuous operation between - 10 degree C and +50 degree C. All meters shall be of flush mounting type with square pattern. The meter shall be enclosed in a dust tight housing. The housing shall be of phenolic mould. The design and manufacture of the meters shall ensure the prevention of fogging of instrument glass. Instrument meters shall be sealed in such a way that access to the measuring element and to the accessories within the case shall not be possible without removal of the seal. The meters shall be provided with white dials and black scale



markings. The pointer shall be black in colour and shall have zero position adjustment device which could be operated from outside. The direction of deflection shall be from left to right. Suitable selector switches shall be provided for all voltmeters intended to be used on three phase supply. However digital display meters shall also be used as per BOQ.

b) Ammeters:

Ammeters shall be moving-iron type. The moving part assembly shall be with jewel bearings. The jewel bearing shall be mounted on a spring to prevent damage to pivot due to vibrations and shocks. The damage ammeters shall be manufactured and calibrated as per the latest edition of IS: 1248 or BS: 89. Ammeters shall be instrument transformer operated and shall be suitable for 5 A secondary of instrument transformer. The scales shall be calibrated to indicate primary current, unless otherwise, specified. The ammeters shall be capable of carrying sustained overloads during fault conditions without damage or loss of accuracy.

c) Voltmeters:

Voltmeter shall be moving -iron type. The range for 400 volts, 3 phase voltmeters shall be 0 to 500 volts. Suitable selector switch shall be provided for each voltmeter to read voltage between any two lines of the system. The Voltmeter shall be provided with protection fuse of suitable capacity.

Special Conditions:

CENTER FOR DATA SCIENCE, QUANTUM TECHNOLOGY AND ECS

201 | Page

d) Watt meter, Frequency meters and Power factor meters:

a) Wattmeter:

Watt meter shall be of three phase, electro-dynamic type, suitable for use with current transformers associated with the particular panel. Wattmeter shall be provided with a maximum demand indicator.

i) Power factor meters: Polyphase power factor meters shall be of electro dynamic type with current and potential coils suitable for operation with current transformers associated with the particular panel.

The scale shall be calibrated for 50% lag - 100% - 50% lead readings. Phase angle accuracy shall be +4 degrees.

ii) Energy meters and reactive power meters:

Tri vector meter shall be two element, integrating type kilowatt-hour, KVA, Kilovolt-amperehour reactive meters. The meters shall conform to IEC- 170 in all respects. Energy meters, KVA and KVARH meters shall be provided with integrating registers. The registers shall be able to record energy consumption of 500 hours corresponding to maximum current at the rated voltage and unity power factory. These meters shall be suitable for operation with current and potential transformers associated with the particular panel.

8.0 RELAYS:

a) General

Protection relays shall be provided wherever required to trip and isolate the particular section under fault. All the relays shall be adjusted and co-ordinated for proper range of the particular circuit or equipment. Relays shall be provided with flag type indicators to indicate the cause of tripping. The flag indicators shall remain in position until they are reset by hand reset. The relays contacts shall be of silver or platinum alloy. The case shall be dust tight with a finish suitable for tropical country. The relays shall be capable of disconnecting faulty section of network or faulty equipment without causing interruption or disturbance to the remaining sections.

b) OVERCURRENT RELAYS:



Combined over-current and earth fault relays:

Over-current relays shall be induction type with inverse definite minimum time lag characteristics. The over current relays shall be provided with adjustable current and time settings. The setting for current shall be 50 to 200% in step of 35%. The IDMT over current relays shall have time lag (Delay) of 0 to 3 seconds. The time setting multiplier shall be adjustable from 0.1 to unity. Over current relays shall be fitted with suitable tripping device with trip coil being suitable for operation on 5 amperes. Earth fault relay shall have current setting of 10% to 40% in step of 10% otherwise, the earth fault relays shall conform to specification laid down for over current relays.

Special Conditions:

CENTER FOR DATA SCIENCE, QUANTUM TECHNOLOGY AND ECS

202 | Page

9.0 Instrument Transformers.

1. Instrument transformers shall be tested at factory as per IS: 2705 and IS: 3156. The test shall incorporate routine tests. Original test certificates in triplicate shall be provided.
2. Meters shall be tested as per IS: 1148. The tests shall include routine tests. Original test certificate in triplicate shall be furnished.
3. Suitable injection tests shall be applied to the secondary:
 - a) Circuit of every instrument to establish the correctness calibration and working order.
 - b) All relays and protective devices shall be tested to establish correctness of setting and operation by introducing a current generator and an ammeter in the circuit.

