TECHNICAL SPECIFICATIONS FOR DISTRIBUTION PANELS

L.T. PANEL

The non-draw out type L.T. Panel shall be with copper bus bars, indoor type, free standing, floor mounting type, extensible on either side.

SITE CONDITIONS :

Max. peak room temperature in shade : 45°C.
Altitude – 200 Mtrs. Above mean sea level

STANDARDS:

The design, manufacture & testing of the various items are covered by the following standards:

IS 8623 – 1993 : Low Voltage switchgear & gear assemblies.
IS 13947(PI)-1993 : General requirement for Switchgear and Control gear for voltages not exceeding 1000v.
IS 12729-1988 : General requirement for Switchgear and Control gear for voltages exceeding 1000v.
IS 13947(PI)-1993 : Degree of protection provided by enclosure for low voltage switchgear and Control gear.
IS 3619-1966 : Phosphate treatment
IS 6005-1970 : Color for ready mixed paints & enamels.
IS 5-1978 : Wrought aluminum for electrical purpose.
IS 5082-1969 : Clearances & creepage for bus systems.
BS-162 : Marking arrangement for busbar/cable.
IS 5578 : Clearances & Creepages for devices.
IS 13947 Part-I : Push buttons & control (Part-I, Sec-I) switches including control contactors.
IS 13703 Part I & : HRC Fuses.
IS 13945 (P-2)-1993 : LV switchgear & control gear circuit breakers.
IS 3231-1965 : Protective relays
IS 3156-1992 : Voltage transformers.
IS 8878-1993 : Miniature Circuit Breakers
IS 10118(P3)-1982 : Code of Practice for Installation of Switchgear.

SPECIFICATIONS :

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<th>Specification</th>
<th>Details</th>
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<tr>
<td>Rated System</td>
<td>415V 50Hz.TPN</td>
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<td>Rated insulation level</td>
<td>1100V rms.</td>
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<td>HV withstand busbar (for 1 min)</td>
<td>2.5 KV for power circuit. 1.5 or 2.00KV rms for control circuit</td>
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<tr>
<td>Horizontal busbar</td>
<td>As indicated in B.O.Q</td>
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<td>Rating</td>
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<tr>
<td>Rated short time</td>
<td>Upto 50kA rms for 1 sec 110 kA</td>
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<tr>
<td>Rating of H.Bus &amp; V. Bus</td>
<td>peak (36 MVA).</td>
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<tr>
<td>Protection of enclosure</td>
<td>IP43</td>
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CONSTRUCTION :

The standard L.T Panel shall contain a basic frame assembly reinforced with formed sheet steel profiles and cross members. Sheet steel partitions shall be bolted to this frame to form the full structure. Basic structure is made out of minimum 2 mm. Thick sheet steel. The load bearing members are made out of 2 mm thick and non-load members items are out of 1.6 mm. Thick sheet steel. All sheet steel shall be cold rolled.

The pretreatment process shall involve de-greasing, rinsing, de-scaling, rinsing, de-rusting, rinsing, phosphating, rinsing & passivation. After this, it shall be spray finished with a primer, oven dried and spray painted with a finish paint, 2 coats wet on wet. Then it shall be baked in oven to achieve an uniform, smooth and tough film. The standard shade offered shall be light gray shade 631 semi gloss as per IS:5. The painting shall be with synthetic enamel stoving grade to a final over all dry film thickness of 30/40 microns. 7 tank process will be used for this purpose.

The Panel design shall be single front cubicle with horizontal bus bars mounted at top, extensible on either side. The breaker, instruments and aux, equipments shall be accessible from front. The cable terminations shall be accessible from the rear side.

A standard transportable shipping section shall contain max. three sections with length not exceeding 3 m and weight not exceeding 2.5 tones.
The incoming terminals for the breakers shall be connected to the bus bar by suitable links. The outgoing terminals shall be extended in the cable chamber for direct Bus Trunking/cable connections. These shall be identified by colored PVC tape/paint, wherever required link extension to form bus duct entry from top shall also be provided. Adequate shrouding and caution notice plate shall be provided to prevent the accidental contact to live terminals.

The ACB’s shall be mounted on the channel frame and shall be partitioned at the top by insulated barrier on the either side by sheet metal barrier with necessary cutout for power linking for control wiring. The control equipment, fuses, timers, contractors, etc., shall be laid out in standard fashion on a painted base plate and fixed with screws to the frame at appropriate location.

Each ACB module compartment shall be provided with front access door made out of 2 mm. Thick sheet steel.

Basic instrument such as ammeter, voltmeter with selector switch and lamps shall be provided on the ACB module door itself. Meters such as KW, Hz, PF may be provided in a separate module for a single tier ACB or on the vertical bus door for a 2 tier ACB panel. KWh meters or KVA meter with a without MDI and protective relays shall be located in the bottom most compartment or on the vertical bus chambers. Meters/relays shall be identification name plate when they are located away from feeder module.

Suitable inscription plates shall be provided to identify the feeders, function of the doors mounted devices and caution plate shall be provided at appropriate locations.

Cubicle illuminating lamp, 240 V 5A, 3 pin plug and socket shall be provided with MCB for protection in cable chamber a standard item in each compartment.

Suitable M.S. removable undrilled gland plates shall be provided. For single core cables non magnetic gland shall be provided.

SAFETY INTERLOCKS :

The following safety interlock shall be provided for each module

i) When ACB is ON door cannot be opened – electrically or mechanically (Defeat interlock to be provided.)

ii) Padlocking in OFF position (locks to be provided.)

iii) Castell interlocks for feeder co-ordination as per B.O.Q./Drawings.

AIR CIRCUIT BREAKERS :

The air circuit breakers shall comply with IS-13118-1991.

The air Circuit breakers shall be draw out type either manually operated or with motor operated store charged , (as indicated in the schedule of quantities),spring closing mechanism in which case the door shall be suitable for 220V AC/DC supply. The motorized mechanism shall charge a closing spring upon circuit connection. This charged spring may be electrically or manually released effecting the closer of the breaker. The closing spring shall automatically be recharged for the next closing command. An Operator shall also be in position to manually charge the closing spring. The spring condition ‘Charged’ or ‘Free’ shall be through the indicator.
Fault lock out/anti-pumping device shall be provided on each break so that it could not be re-closed after tripping on fault without manual resetting being done.

The incoming and the outgoing breakers shall be either with static trip release integrally mounted on fault without resetting being done.

The incoming and the outgoing shall be provided either with microprocessor based trip release integrally mounted on the breakers/or CDG-31 relay. This release/relays should have the following adjustments.

a) Over current pick-up.

b) Inverse tripping time at 6 times the current settings.

c) Short time delay pick up at various current settings.

d) Short time delay- instantaneous.

e) Earth fault pick up at various current settings.

f) Earth fault delay – instantaneous.

g) Reverse Power Relay (Only on ACB being used for DG set Duty)

h) Release should be COMPUTER COMPATIBLE.

The breakers used us bus couplers shall be without integral release. An AC shunt trip release shall be provided with under voltage release backup to operate these bus coupler breakers.

The air circuit breaker being used as incomer shall have the following accessories, indications, meters, provided on its housing:

i) 3 No. Phase indicating Lamps.

   ii) 1 No. power factor meter (-) 0.5-1-(+)0.5 range.

   iii) 1 No. 0-500 V range voltmeter with selector switch.

   iv) 1 No. ammeter of suitable range and C.T.s as indicated on the drawing/s with selector switch.

   v) 1 No. Indiating Lamps for the following.

      a) ACB ON/OFF/TRIP

The air circuit being used on out going feeder shall have the following accessories, indications, meter, provided on its housing:

i) 1 No. ammeter of suitable range and C.T.s as indicated on the drawing/s with selector switch.

ii) 1 No. Indicating Lamps for the following:

      a) Red for ACB ON
MOULDED CIRCUIT BREAKERS:

The normal Molded case circuit breakers shall have all live parts totally enclosed in a molded insulated housing. It shall have a quick make and quick break mechanism. The mechanism shall be trip free so that the contacts can not be held closed against a fault. The bi-metallic mechanism shall be provided for inverse time current trip characteristic, to prevent interruption on normal inrush currents or temporary overloads. The instantaneous release shall be provided to protect equipment against very high current or short circuit. There shall have a common trip bar so that in case of fault on any of the phases, all the three phases trip together.

All MCCB’s to be fitted with electronic type releases, rotary operating handles and remote trip facility.

The arcing shall be totally contained within the housing so that the possibility of any damage to any adjacent or personnel due to accidental mishandling is avoided. Individually arc chutes shall be provided on each phase to draw the arc away from the contact tips, thus, quenching it rapidly.

a) The minimum breaking capacity of Molded Case Circuit Breakers at 415 V AC and 0.3 PF shall be as specified in the BOQ. $I_{cs} = I_{cu}$.
b) Minimum breaking capacity will be 25 kA upto 100A, 35kA upto 200A, 50kA for 200A plus.

BUS BAR SYSTEM:

HORIZONTAL BUSBAR:

The horizontal bus bars shall be located at the top/ bottom/ center bus bar compartment. Current density will be minimum 1.2 A/sq.mm for copper and 1.0 A/sq.mm for Al.

VERTICAL BUSBAR:

The vertical bus bar shall also be from high conductivity electrical grade copper/ Al sections, the rating and size shall depend upon the total rating of all feeders in the column considering the diversity factor 0.9. The bus bars shall be provided with black shrinkable PVC sleeving/PVC taping with R.Y. B. phase identification at regular intervals.

NEUTRAL BUS:

It shall run parallel to horizontal and vertical bus bars. Standard neutral bus bars size is half the size of main bus bar

CONTROL BUSBAR:

Control bus of 60 A and 415 V shall be provided at top in the front portion. These shall be supported with insulator at required interval.
EARTH BUS:

100 x 6 mm copper earth bus shall be provided in the bottom most compartment along the entire length at required interval.

BUS JOINTS:

Joining between bus bars shall be by using rigid or flexible bus links.

BUS BAR SUPPORTS:

Both horizontal and vertical bus bars shall be supported at uniform intervals on high impact, anti-tracking, non-hygroscopic, arc resistant, flame retardant, self extinguishing GRP (Glass reinforced plastic), insulators. These insulators shall be type tested for short circuit withstand capacity.

MODULES:

ACB is single tier or in 2 tier shall be provided as incomer from transformer. Cable entry from top & bottom shall be provided for each incomer breaker:

OUTGOING FEEDERS:

The outgoing feeders shall be as indicated in B.O.Q/Drawing. Irrespective of the panel depths, the panels shall be coupled front flush. Each outgoing feeder shall have the provision for Cable/bus duct connection from the bottom/top.

CONTROL WIRING:

All control wiring shall be done as a standard, using 1.5 sq.mm. Multi-strand PVC insulated copper wires. These shall be black in color for AC and gray in color for DC. The C.T. connections shall be done using 2.5 sq.mm multi-strand PVC insulated copper wires of red color.

The outgoing control wires shall be terminated from the equipment terminals to control terminal block in cable chamber. Whenever required PVC channels shall be used for wire routing. On either ends of these wires self locking yellow ferrules with black letters shall be provided. Multi-strand wire termination shall be provided with crimping type lugs.

INTER-MODULE WIRING:

The control wiring between modules located in the same vertical section shall be connected at the respective terminal blocks/terminals. These shall be routed through the cable duct in PVC wire channels. Inter connections between adjacent cubicle in the same shipping sections shall be done in a similar way.

CURRENT TRANSFORMERS & FUSES:

All CT’s to be of cast resin type of class 10p10. All fuses shall be of the HRC cartridge type, conforming to IS:13703 mounted on plug-in type of fuse bases having a prospective current rating of not less than 50 KA. Fuses shall be provided with visible operation indicators to show that they have operated. Insulated fuse pulling handle shall be supplied with each control panel.
INDICATING INSTRUMENTS & METERS:

Electrical indicating instruments shall be flush mounted digital type having min. 96 mm square dial.

CONTROL AND SELECTOR SWITCHES

Control and instruments switches shall be of the rotary type and shall be provided with properly designated plate. Control switches shall have monetary contacts spring return to center with pistol grip handle. Instruments and selector switches shall have stay out contacts.

PUSH BUTTONS:

All push buttons shall be push to actuate type having 2 ‘NO’ and 2 ‘NC’ self reset contacts. They shall be provided with designation plates, engraved with their functions push button contacts shall be rated fro 10 amps at 415 V A.C and 0.6 Amp inductive breaking at 220 V D.C.

INDICATING LAMPS:

Indicating lamps shall be of LED type only. Colour of lens shall be as per enclosed drawing/data sheet. Lamp grip shall be supplied along with the panel so that replacement of the bulb can easily be done from the front of the panel.

The panel boards having power factor relay as one of the components, shall have enough space to house the power factor correction capacities banks also in the panel itself.

DRAWINGS:

The contractor shall provide the following drawings for approval to Consultants/Engineer in Charge before commencement of supply/fabrication.

i) General layout Plan, section, elevations
i) Foundation
ii) Wiring-Power & Control