



TECHNICAL SPECIFICATIONS

FOR

1000A, 440V, AC LT PANEL BOARD (LTPB)

GETCO/ E / TS – LTPB 4201 / R3 June, 2022

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TECHNICAL SPECIFICATIONS FOR 1000A, 440V, AC LT PANEL BOARD (LTPB)

1.1. SCOPE:

The scope covers supply of 1000 Amp, 440 V AC, LT Panel Board including design, engineering, manufacturing, assembly, testing at manufacturer's works and supervision of testing & commissioning at site with all required accessories for complete installation.

1.2. STANDARDS:

The design, manufacture, installation, testing and commissioning of the equipment and materials covered by this specification shall conform to the latest editions (amended up to date) of the following standards unless otherwise stated in this specifications.

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|---------|------------------------------|---|---|
| 1.2.1. | IS: 3043 | - | Code of practice of earthing. |
| 1.2.2. | IS: 8623
(Part-1)
1993 | - | Specification for low voltage switchgear and control gear assemblies – Requirement for Type Tested and Partially Type Tested Assemblies |
| 1.2.3. | IS/IEC 60947-1 | - | Low-Voltage switchgears and Control gears
- General rules. |
| 1.2.4. | IS: 5578 | - | Guide for marking of insulated conductors. |
| 1.2.5. | IS: 11353 | - | Guide for uniform system of marking and identification of conductors and apparatus terminals |
| 1.2.6. | IS: 13703-1 & 2 | - | LV fuses for voltage not exceeding 1000V AC or 1500V DC – General Requirements & Fuses for use by authorized person. |
| 1.2.7. | IS: 1554 (Part-1) | - | Specification for PVC insulated (Heavy Duty) Electrical cables – For working voltages up to and including 1100V. |
| 1.2.8. | IS: 732 | - | Code of practice for electrical wiring Installation. |
| 1.2.9. | IS: 3646 (Part-1) | - | Code of practice for interior illumination – General requirement and recommendation for working interiors. |
| 1.2.10. | IS: 694 | - | Polyvinyl chloride insulated unsheathed |

and sheathed cables/cords with rigid & flexible conductor for rated voltages up to and including 450/750V.

- 1.2.11. IS: 1567 - Specification for metal clad switches (current rating not exceeding 100A).
- 1.2.12. IS/IEC 60947-3 - Low-voltage switchgear and control gear – Switches, Disconnectors, Switch- Disconnectors and Fuse – Combination Units.

In addition to the above, the 1000A, 440V AC L.T. Panel board shall meet all applicable Indian Electricity Rules. All equipment and its components shall be new and of superior quality in all respects. All works shall be done with a neat workmanship acceptable to the purchaser

1.3. REQUIREMENTS OF FEEDERS:

[A] INCOMING FEEDERS:

[1] I/C. – I from Source-I [Say-M1]

- a) The Rating of I/C. – I feeder shall be 1000 A.
- b) It shall be provided with 1000A rated, 3-Pole, draw out type, Microprocessor Based, Electrically Operated, [220/110V DC], [With min. breaking capacity= 30kA], motor wound spring charged stored energy type operating mechanism, Air Circuit Breaker with standby provision for manual spring charging operation, provided with mechanically operated targets to show open & closed and spring charging positions.
- c) The ACB shall have;
 - Thermal setting 600A to 1000A & Short Circuit setting 6In to 10In.
 - Shunt trip for interlocking purpose.
 - Mechanically operated trip push button.
 - 6NO + 6NC Aux. Contacts.
 - Safety Shutter.
 - Anti-Pumping Facility.
- d) The I/C. – I shall be provided with following equipments / components:
 - Indicating Lamps
 - i. Type – LED
 - ii. Rating – 220V DC / 230V AC (As per circuit)
 - iii. Size – 30mm Diameter (22.5mm cutout)
 - iv. Purpose & Colour
 - a) ACB ON : Red
 - b) ACB OFF : Green
 - c) ACB Trip : Amber
 - d) DC Supply Healthy : White
 - e) R-Ph Supply : RED
 - f) Y-Ph Supply : Yellow
 - g) B-Ph Supply : Blue
 - Trip-Neutral-Close Breaker control switch
 - i. Type : Spring Return

- ii. Rating : Continuous Current 25A
- iii. Configuration : 2 Trip, 2 Close, 4 Pole.
- Push Buttons
 - i. Type : Metallic or Polycarbonate
 - ii. Rating : Thermal current 10A
 - iii. Contact Configuration : As per scheme requirement,
 - iv. Size : 22.5mm Diameter
 - v. Purpose & Colour
 - a) Emergency OFF : Red
 - b) Breaker Reset : Black
- Voltmeter with selector switch
 - i. Type : Moving Iron
 - ii. Scale : 0 to 500V AC
 - iii. Size : 96mm X 96mm
 - iv. Mounting : Flush mounting
 - v. Class of Accuracy : 1.0
- Ammeter with selector switch
 - i. Type : Moving Iron
 - ii. CT Input : 0 to 5A
 - iii. Scale : 0 to 1000A AC
 - iv. Size : 96mm X 96mm
 - v. Mounting : Flush mounting
 - vi. Class of Accuracy : 1.0
- 3-Nos. C.Ts confirming to IS: 2705
 - i. Type : Ring Type, Tape Insulated
 - ii. Ratio : 1000/5A
 - iii. Burden : 10VA
 - iv. I.S.F : <5
 - v. Class of Accuracy : 0.5
- 1-No. of Electromechanical Under-Voltage Relay(s) setting 40-70% Voltage. The relay(s) shall supervise all the three phases. Suitable arrangement shall be made to suite Input voltage requirement of relay if direct mains input supply is not suitable.
- 3-Ø, KW meter
 - i. Type : 3Ph, 3 Wire
 - ii. CT Input : 5A
 - iii. PT Input : 415V
 - iv. Scale : 0-800kW (0° to 90°)
 - v. Mounting : Flush Mounting
 - vi. Size : 96mm X 96mm
 - vii. Class of Accuracy – 1.5
- 1-No. Digital KWH meter.
 - i. Type : 3-Ø, 4-wire,
 - ii. Number of Elements : 3 Elements
 - iii. Display : 6 Digits
 - iv. CT Input : 5A
 - v. PT Input : 415V

- vi. Mounting : Flush Mounting
- vii. Size : 96mm X 96mm
- viii. Class of Accuracy : 0.5
- Current Transducer.
 - i. Type : 3-Ø
 - ii. Auxiliary supply : 220V/110V DC
 - iii. CT Input : 0 to 5A
 - iv. No. of Output : 3
 - v. Analogue Output : 4 to 20mA
 - vi. Mounting : Din Rail Mounting
- Voltage Transducer.
 - i. Type : 3-Ø
 - ii. Auxiliary supply : 220V/110V DC
 - iii. PT Input : 0 to 500V
 - iv. No. of Output : 3
 - v. Analogue Output : 4 to 20mA
 - vi. Mounting : Din Rail Mounting

[2] I/C. – II from Source-II [Say-M2]

The I/C. – II shall be same as I/C. – I above.

[3] I/C. – III from D.G. Supply Source [Say-DG1]

The I/C. – III shall be same as I /C. – I above but, with following changes:

- The rating of I/C. – III feeder shall be 630A.
- ACB shall have
 - i. Rated current: 630A
 - ii. Thermal setting: 300A to 500A
 - iii. Short Circuit setting: 6In to 10In
- Ammeter with selector switch, scaled 0 to 500A with other parameters as per I/C – I ammeter.
- 3-Ø, KW meter, scaled 0-400kW (0° to 90°), with other parameters as per I/C – I KW meter.
- 3-Nos.C.T. Ratio=500/5A with other parameters as per I/C – I C.T.

[4] Bus Coupler:

- a) The Rating of Bus Coupler shall be 1000 A.
- b) It shall be provided with 1000A rated,3-Pole, draw out type, Microprocessor Based, Electrically Operated [220/110V DC], [With min. breaking capacity= 30kA], motor wound spring charged stored energy type operating mechanism, Air Circuit Breaker with standby provision for manual spring charging operation, provided with mechanically operated targets to show open & closed and spring charging positions.
- c) The ACB shall have;
 - Thermal setting 600A to 1000A & Short Circuit setting 6In to 10In.
 - Shunt trip for interlocking purpose.

- Mechanically operated trip push button.
- 6NO + 6NC Aux. Contacts.
- Safety Shutter.
- Anti-Pumping Facility.

d) Bus Coupler shall be provided with following equipments / components:

- Indicating Lamps
 - i. Type – LED
 - ii. Rating – 220V DC / 230V AC (As per circuit)
 - iii. Size – 30mm Diameter (22.5mm cutout)
 - iv. Purpose & Colour
 - a) ACB ON : Red
 - b) ACB OFF : Green
 - c) ACB Trip : Amber
 - d) DC Supply Healthy : White
 - e) R-Ph Bus-1 Supply : RED
 - f) Y-Ph Bus-1 Supply : Yellow
 - g) B-Ph Bus-1 Supply : Blue
 - h) R-Ph Bus-2 Supply : RED
 - i) Y-Ph Bus-2 Supply : Yellow
 - j) B-Ph Bus-2 Supply : Blue
- Trip-Neutral-Close Breaker control switch
 - i. Type : Spring Return
 - ii. Rating : Continuous Current 25A
 - iii. Configuration : 2 Trip, 2 Close, 4 Pole.
- Push Buttons
 - i. Type : Metallic or Polycarbonate
 - ii. Rating : Thermal current 10A
 - iii. Contact Configuration : As per scheme requirement
 - iv. Size : 22.5mm Diameter
 - v. Purpose & Colour
 - c) Emergency OFF : Red
 - d) Breaker Reset : Black
- 2 Nos. Voltmeter with selector switch for Bus 1 & 2
 - i. Type : Moving Iron
 - ii. Scale : 0 to 500V AC
 - iii. Size : 96mm X 96mm
 - iv. Mounting : Flush mounting
 - v. Class of Accuracy : 1.0
- Ammeter with selector switch
 - i. Type : Moving Iron
 - ii. CT Input : 0 to 5A
 - iii. Scale : 0 to 1000A AC
 - iv. Size : 96mm X 96mm
 - v. Mounting : Flush mounting
 - vi. Class of Accuracy : 1.0
- 3-Nos. C.Ts. confirming to IS: 2705
 - i. Type : Ring Type, Tape Insulated

- ii. Ratio : 1000/5A
 - iii. Burden : 10VA
 - iv. I.S.F : <5
 - v. Class of Accuracy : 0.5
- 2-Nos. of Under-Voltage Relay(s) for Bus-1 & 2, setting 40-70% Voltage. The relay(s) shall supervise all the three phases.
 - 2 Nos. Voltage Transducer for Bus-1 & 2
 - i. Type : 3-Ø
 - ii. Auxiliary supply : 220V/110V DC
 - iii. PT Input : 0 to 500V
 - iv. No. of Output : 3
 - v. Analogue Output : 4 to 20mA
 - vi. Mounting : Din Rail Mounting

[B] OUTGOING FEEDERS:

[1] 300A feeders – 2 Nos.

Each feeder shall be provided with following equipment / components:

- MCCB having.
 - i. Rated current: 300A
 - ii. Breaking capacity : 25kA
 - iii. Number of Poles : 3
- ON, OFF [Red, Green] indicating LED Lamps with parameters as per I/C – 1.
- Ammeter, scaled 0-300A with selector switch having Class of accuracy 1.0 and other parameters as per I/C – 1 ammeter.
- 3-Nos. C.Ts. Ratio=300/5A; Cl. of Acc.=1.0 and other parameters as per I/C – 1 CT.
- 1-No. Digital KWH meter with parameters as per I/C – 1 KWH meter.

[2] 200A feeders – 4 Nos.

Each feeder shall be provided with following equipment / components:

- MCCB having
 - i. Rated current : 200A
 - ii. Breaking capacity : 25kA
 - iii. Number of Poles : 3
- ON, OFF [Red, Green] indicating LED Lamps with parameters as per I/C – 1.
- Ammeter scaled 0-200A with selector switch having Class of accuracy 1.0 and other parameters as per I/C – 1 ammeter.
- 3-Nos. C.Ts. Ratio=200/5A; Cl. of Acc. =1.0 and other parameters as per I/C – 1 CT.

[3] 100A feeders – 6 Nos.

Each feeder shall be provided with following equipment / components:

- MCCB having
 - i. Rated current: 100A
 - ii. Breaking capacity : 10kA

- iii. Number of Poles : 3
- ON, OFF [Red, Green] indicating LED Lamps with parameters as per I/C – 1.
- Ammeter scaled 0-100A with selector switch having Class of accuracy 1.0 and other parameters as per I/C – 1 ammeter.
- 3-Nos. C.Ts. Ratio=100/5A; Cl. of Acc. =1.0 and other parameters as per I/C – 1 CT.

[4] 63A feeders – 22 Nos

Each feeder shall be provided with following equipment / components:

- MCCB having.
 - i. Rated current: 63A
 - ii. Breaking capacity : 10kA
 - iii. Number of Poles : 3

[5] 32A feeders – 10 Nos

Each feeder shall be provided with following equipment / components:

- MCCB having
 - i. Rated current: 32A
 - ii. Breaking capacity : 10kA
 - iii. Number of Poles : 3

[6] 32A feeders – 04 Nos

Each feeder shall be provided with following equipment / components

- MCB having
 - i. Rated current: 32A
 - ii. Breaking capacity : 3kA
 - iii. Number of Poles : 2

[C] INTERLOCKING SCHEME

- i. Under normal condition I/C – I i.e. M1 breaker shall remain “ON” when Source – I supply is healthy, irrespective of supply position of Source – II and it shall feed to half of each type of the total outgoing feeders.
- ii. Under normal condition I/C – II i.e. M2 breaker shall also remain “ON” when Source – II supply is healthy, irrespective of supply position of Source – I and it shall feed to half of each type of the total outgoing feeders.
- iii. When either of I/C – I [M1] or I/C – II [M2] supply fails, its own respective breaker shall trip first and then Bus-Coupler breaker shall be switch “ON” (automatically as well as manually).
- iv. In case of supply failure at both Source – I & Source – II, both breaker shall be trip first and D.G. Supply I/C – III breaker and Bus Coupler breaker shall be switch “ON”, when D.G. Set is running & U/V Relay confirms healthy D.G. Supply.
- v. On resumption of healthy supply at either Source – I or Source – II, the D.G. and Bus Coupler breaker should be tripped first (manually) & then respective Source supply breaker shall be allowed to switched “ON” with Bus Coupler breaker (automatically as well as manually).

- vi. On resumption of healthy supply at both Source – 1 and Source – 2, Bus Coupler breaker shall be tripped manually prior to allowing switching on the 2nd Source (switching ON of 2nd source breaker, automatically as well as manually),

WARNING: IN NO CASE SUPPLY OF DIFFERENT SOURCES SHOULD BE MIXED.

For this interlocking, LOCKABLE AUTO / MANUAL selection switch shall be provided along with LOCAL / REMOTE selection switch.

1.4 SCADA Compatibility

The LT Panel Board shall be SCADA compatible. All the required equipments/components for SCADA i.e. Transducers, Auxiliary contactors, Switches, etc. shall be provided to integrate all the data in SCADA and for monitoring & control from remote. The list of required Digital Inputs, Outputs and Analogue Inputs are as under;

Sr. No.	Bay	Analogue signals	Digital outputs	Digital Inputs
1	LTPB		LTPB in LOCAL	
			LTPB in REMOTE	
			LTPB in Auto	
			LTPB in Manual	
2	Incomer Feeder – 1	R-Y Line Voltage	Incomer - 1 ACB ON status	Incomer - 1 ACB ON Command
		Y-B Line Voltage		
		B-R Line Voltage	Incomer - 1 ACB OFF status	Incomer - 1 ACB OFF Command
		R – Phase Current		
		Y – Phase Current		
		B – Phase Current		
3	Incomer Feeder – 2	R-Y Line Voltage	Incomer - 2 ACB ON status	Incomer - 2 ACB ON Command
		Y-B Line Voltage		
		B-R Line Voltage	Incomer - 2 ACB OFF status	Incomer - 2 ACB OFF Command
		R – Phase Current		
		Y – Phase Current		
		B – Phase Current		
4	Bus Coupler	Bus-1 R-Y Line Voltage	BC ACB ON Status	BC ACB ON Command
		Bus-1 Y-B Line Voltage		
		Bus-1 B-R Line Voltage	BC ACB OFF Status	BC ACB OFF Command

		Bus-2 R-Y Line Voltage		
		Bus-2 Y-B Line Voltage	Bus-1 U/V	
		Bus-2 B-R Line Voltage	Bus-2 U/V	
5	DG Incomer -	R-Y Line Voltage	DG Incomer ACB ON status	DG Incomer ACB ON Command
		Y-B Line Voltage		
		B-R Line Voltage	DG Incomer ACB OFF status	DG Incomer ACB OFF Command
		R – Phase Current		
		Y – Phase Current		
		B – Phase Current		

1.5 GENERAL DESIGN OF SWITCH BOARD CUBICLE:

- 1.5.1 The LT Panel board shall be totally enclosed, C.R. sheet steel cubicle, indoor floor mounting, self-supporting, free standing, naturally air cooled, unit type in construction, compact in size and neat in appearance. It shall be completely dust-tight, weather & vermin proof and highly corrosion-resistive. The complete structures shall be rigid, free from flows, twists and bends. All cut-outs shall be true in shape and devoid of sharp edges.
- 1.5.2 The LT Panel Board shall be manufactured using cold-rolled sheet steel. The minimum thickness of C.R. sheet steel shall be 2mm, for non-load bearing members and 3mm, for load bearing members, base plate & gland plates. The panel board shall be with Base channel of size 75 x 40 x 6 mm (ISMC).
- 1.5.3 The L.T. Panel board shall be capable of being easily expandable on either side and shall have a high degree of flexibility for easy transportation & erection in part (preferably 4 sections) considering the size of panel. All sections shall have 4 Nos. of Eye-Lifting hooks. The design of feeder units shall be such as to optimize the floor area required. The overall dimensions of the LT Panel board cubicle shall be as near as possible but not less than the width = 6050 mm, Height= 2375mm and depth = 900 mm [With \pm 10 mm tolerance].
- 1.5.4 All the components shall be front operated type and shall be interlocked with the hinged doors except 32A feeder [6].
- 1.5.5 The panel board edges and cover & door edges shall be reinforced against distortion by rolling, bending or by the addition of welded reinforcement members.
- 1.5.6 Effective gasket shall be provided between adjoining surfaces of the doors and covers to make the switch board dust-tight and vermin proof. The panel will shall conform to IP 4X degree of protection as per IS 60947-1(Latest revision).
- 1.5.7 All compartments shall have concealed hinges with door knobs except cable alley.
- 1.5.8 Surface finish shall be with 7 tank process followed by powder coating. The colour shade shall be Light grey shade 631 of IS 5 for exterior and glossy white

for Interior. Base channel colour shall be black. Paint thickness shall be 60 to 100 microns. The finishing shall be elegant and enduring.

1.5.9 Wire mesh shall be provided between live bus and doors & covers, so that person opening the door / cover shall not have access to live parts of the panel accidentally.

1.5.10 The cable alley chamber shall have adequate space to accommodate cable terminations, terminal blocks, glands, and incoming & outgoing power as well as control cables. Outgoing feeder terminals shall be brought out into the cable alley for easy connection of cables. Copper / Aluminum lugs according to the rating of the feeders and associated cable shall be provided. Cable entries of I/C & O/G feeders shall be arranged from bottom.

1.5.11 The LT Panel Board shall be, completely wired, ready for connecting to the purchaser's equipments.

1.5.12 EARTHING

1.5.12.1 Other than feeder compartment doors, all doors/covers shall be earthed through 6mm wide flexible copper braid.

1.5.12.2 Feeder compartment doors shall be earthed by using 2.5 mm² Green FRLSH flexible copper cable.

1.5.12.3 All metallic cases of relays, instruments and other mounted equipment shall be connected to earth bus directly without any looping to any other equipments/components by using insulated copper wires of size not less than 2.5 mm². The colour of the earthing wire shall be green.

1.5.13 Separate AC auxiliary circuit for illumination, heater and Power supply socket (multi-pin socket combined with ON-OFF switch) shall be provided with 16Amp MCB. Each section shall have sufficient illumination by providing 11W LED lamp with door switch. Thermostat and space heater shall be provided in all the sections.

1.5.14 Aluminum anodized engraved name plate of suitable size with white letter on black background shall be provided for all incoming & out going feeders as well as internal & external components & equipments.

1.5.15 LT Panel Board shall be provided with name plate marked with following details.

- a) Name of item.
- b) Type designation and Serial No making it possible to get all relevant information from manufacturer.
- c) Type of application.
- d) Panel Rating Data including DC Auxiliary Voltage
- e) Year of manufacturing.
- f) Order details.
- g) Property of GETCO.
- h) Name of manufacturer.

1.6 BUS BARS:

1.6.1 The Bus bars shall be of EC grade copper. The size of Bus bars shall be as mentioned below.

- 1.6.1.1 The size of R, Y, B phase Bus bar shall be 1000mm².
- 1.6.1.2 The size of Neutral Bus bar shall be 600mm².
- 1.6.2 Bus bar and droppers shall be insulated with color-coded heat shrinkable sleeves.
- 1.6.3 The Bus bar shall be supported on SMC non-hygroscopic, non-combustible, track resistant, high strength polyester fiber glass moulded insulators.
- 1.6.4 The rating of Bus bar shall be as mentioned below.
 - 1.6.4.1 Continuous rating
 - a. The continuous current rating of R, Y, B phase Bus bar shall be 1000A.
 - b. The continuous current rating of neutral Bus bar shall be 600A.
 - 1.6.4.2 Short time rating
 - a. The short time current rating of R, Y, B phase Bus bar shall be 30kA for 1 second.
 - b. The short time current rating of neutral Bus bar shall be 16kA for 1 second.
- 1.6.5 The Bus bar to respective incomers / feeders dropper shall be of EC grade copper strip having sizes as mentioned below.
 - 1.6.5.1 For incomer [1] and [2] of 1000A.
 - a. R, Y, B Phase – 1000mm².
 - b. Neutral – 500mm².
 - 1.6.5.2 For incomer [3] D G Supply source of 630A.
 - a. R, Y, B Phase – 500mm².
 - b. Neutral – 300mm².
 - 1.6.5.3 For outgoing feeder [1] 300A.
 - a. R, Y, B Phase – 250mm².
 - b. Neutral – 150mm².
 - 1.6.5.4 For outgoing feeder [2] 200A.
 - a. R, Y, B Phase – 150mm².
 - b. Neutral – 150mm².
- 1.6.6 Earthing bus-bar of Aluminium of size 50mm x 10mm shall be provided running through the entire length at the board at bottom with the arrangement for connection to purchaser's main Earthing grid.
- 1.6.7 The temperature of bus-bar and bus-bar connections when carrying rated current at rated frequency shall not exceed 90°C for a maximum ambient temperature of 50°C.

1.7 Terminal Blocks:

1.7.1 Terminal blocks for control & auxiliary circuit shall be 800V grade, 45 amps rated as per IEC 60947-7-1, single piece molded, complete with insulated barriers, stud type, melamine housed brass terminals, washers, brass nuts and brass lock nuts and identification strips.

1.7.2 Terminals blocks for power circuit shall be provided as described hereunder;

Sr. No.	Circuit rating	Voltage grade of TB	Current rating of TB	Wire termination
1	32A	800V	76A	Stud type – Nut driver operated
2	63A	800V	125A	
3	100A	800V	192A	

It shall be single piece molded, complete with insulated barriers, stud type, melamine housed brass terminals, washers, brass nuts and brass lock nuts and identification strips.

1.7.3 Markings on the terminals strips shall correspond to wire number on the wiring diagrams. Not more than 2 wires shall be connected on any single side of terminals.

1.7.4 Terminal blocks for CT, CVT and VT secondary leads shall be provided with test links and isolating facilities. CT secondary wiring shall be such that it can connect additional circuit in series.

1.7.5 Minimum 20% spare terminals shall be provided in each panel board duly distributed uniformly on all terminal blocks, near each group of connections for function wise circuits.

1.7.6 All spare contacts and terminals of the panel mounted equipment and devices shall be wired up to terminal blocks with ferrule numbers starting with U.

1.7.7 Unless otherwise specified, terminal blocks shall be suitable for connecting the following conductors of purchaser’s cables on each side.

1.7.7.1 All DC and auxiliary AC circuits – minimum one of 2.5mm² copper.

1.7.7.2 All CT & PT circuits – minimum two of 4 mm² copper.

1.7.7.3 32A Power Circuit – minimum two of 6 mm² copper.

1.7.7.4 63A Power Circuit – minimum two of 16 mm² copper.

1.7.7.5 100A Power Circuit – minimum two of 35 mm² copper

1.7.8 Terminal blocks to be used shall be self-extinguishing or resistant to flame propagation, substantially non-hydroscopic and shall not carbonize when tested for tracking. The insulation between any terminal and frame work between adjacent terminals shall with stand test of 2 kV rms for one minute. The molding shall be mechanically robust to withstand handling while making terminations.

1.7.9 Easily removable Protective transparent plastic covers of appropriate size shall be provided for placing over the live parts of the terminal blocks.

1.8 WIRING:

1.8.1 All wires shall be flexible, multi-strand, untinned, FRLSH, 1100V copper wire.

- 1.8.2 All control wiring shall be carried out by 1.5 mm² wire grey in colour.
- 1.8.3 All CT & PT Wiring shall be carried out by 2.5 mm² wire.
- 1.8.4 All other circuits shall be wired using 1.5 mm² wires.
- 1.8.5 Red, Yellow, Blue & Black wires shall be used for Phase & Neutral identification in AC and CT&PT circuits.
- 1.8.6 Black wires shall be used for AC auxiliary circuit.
- 1.8.7 All wires upto 6 mm² shall have tinned copper lug & protective sleeve at both ends.
- 1.8.8 All wires above 6 mm² shall have tinned copper lug at both ends.
- 1.8.9 All wires shall have machine printed ferrules at both ends.
- 1.8.10 The connection from Bus bar to following feeders, up to Terminals & Terminal Blocks shall be of flexible, multi-strand, FRLSH, 1100 V copper wire having size as mentioned below;
 - 1.8.10.1 For outgoing feeder [3] 100A.
 - a. R, Y, B Phase – 35mm².
 - b. Neutral – 16mm².
 - 1.8.10.2 For outgoing feeder [4] 63A.
 - a. R, Y, B Phase – 16mm².
 - b. Neutral – 6mm².
 - 1.8.10.3 For outgoing feeder [5] & [6] 32A.
 - a. R, Y, B Phase – 6mm².
 - b. Neutral – 4 mm² for 3-Φ feeders and 6 mm² for 1-Φ feeders.

1.9 Cable Glands and Lugs:

- 1.9.1 The cable glands shall be double compression type metal glands.
- 1.9.2 The lugs shall be of tinned Copper / Aluminium as per the type of cable.
- 1.9.3 The size of lugs and glands shall be suitable for following cable size.

Aluminium cable	Copper Cable
3.5CX300 mm ²	4CX10 mm ²
1CX300 mm ²	4CX4 mm ²
1CX240 mm ²	4CX2.5 mm ²
1CX150 mm ²	2CX4 mm ²
3.5CX120 mm ²	2CX2.5 mm ²
3.5CX50 mm ²	
3.5CX25 mm ²	
4CX10 mm ²	

1.9.4 Supply of all required Double Compression Metal Cable Glands and tinned Copper / Aluminium Lugs shall be in the scope of bidder if specified in Schedule - A of the tender.

1.9.5 CT circuit wiring shall have tinned copper Ring 'O' Type lugs.

1.10 TYPE TESTS:

1.10.1 TYPE TESTS:

The following tests from NABL accredited laboratory shall be carried out in accordance with **IS:8623 (Part-1):1993 or the latest version thereof/ IEC Pub 439 – 1 (1985) or the latest / amended / up to date IS/IEC. The bidder has to submit the all type test reports as stated hereunder for the offered item along with the technical bid. The type test reports from NABL approved laboratory shall not be older than TEN years. Type test reports shall be valid as on the last date of submission of bid.**

- a) Verification of temperature-rise limits.
- b) Verification of the dielectric properties.
- c) Verification of the short-circuit strength.
- d) Verification of the continuity of the protective circuit.
- e) Verification of clearances and creep age distances.
- f) Verification of mechanical operation.
- g) Verification of the degree of protection **(IP-4X as per IS 60947-1).**

1.10.2 **In case of non-submission /partial submission or type test reports of which validity is over, bidder shall submit pending type test report/s from NABL accredited laboratory, in the event of an order, before commencement of supply without affecting delivery schedule, free of cost to GETCO. Confirmation for above shall be invariably submitted along with technical bid.**

1.11 ROUTINE AND ACCEPTANCE TESTING:

1.11.1 Routine tests shall be performed according to relevant ISS as well as approved quality assurance plan to ensure that the equipment complies with the requirements of this specifications.

1.11.2 Following Routine tests shall be performed on 100% quantity of LT Panel Board to be offered for inspection;

- 1.11.2.1 Verification of dimensions.
- 1.11.2.2 Visual inspection.
- 1.11.2.3 High Voltage Test – 2kV r.m.s for 1 Minute.
- 1.11.2.4 IR test – Busbar.
- 1.11.2.5 IR Test – Auxiliary / Control circuit.
- 1.11.2.6 Earth continuity test.
- 1.11.2.7 Door Interlock check.

- 1.11.2.8 Scheme test – Interlocking, Control, Power, Metering, Heater & Illumination circuits as per approved drawings.
- 1.11.3 On successful completion of routine test, the report along with RTCs shall be submitted. Purchaser reserves right for witnessing of routine test as and when required, in presence of Purchaser's representative.
- 1.11.4 After successful completion of routine tests, LT Panel Board shall be offered for acceptance testing & inspection.
- 1.11.5 The supplier shall give advance intimation to the purchaser to enable him to depute his representative for witnessing the acceptance tests.
- 1.11.6 Acceptance tests to be performed are same as routine tests specified in Clause No, 1.11.2, but it shall be performed on 10% of LT Panel Board of each lot. If total offered quantity is less than 10, then, acceptance test on minimum one LT Panel Board shall be performed.
- 1.11.7 Acceptance test shall be performed in presence of GETCO representative in case of direct supply to GETCO.
- 1.11.8 In case of supply through EPC contract, representative of EPC contractor shall also witness acceptance test with GETCO representative.

1.12 INSPECTION:

- 1.12.1 The LT panel board shall be offered for inspection.
- 1.12.2 No material shall be dispatched without inspection.
- 1.12.3 The purchaser shall have access at all the times to the works of manufacturer where LT Panel Boards are being manufactured. The supplier shall provide purchaser's representative all facilities for unrestricted inspection of the works, raw material, bought out items, accessories and for conducting necessary tests.
- 1.12.4 The successful bidder shall have to give advance intimation of inspection programme.
- 1.12.5 On successful completion of acceptance testing, inspection report shall be submitted.
- 1.12.6 On acceptance of inspection report, dispatch instruction will be issued from Chief Engineer (Project), GETCO, Vadodara.
- 1.12.7 LT panel board shall be dispatched only after receipt of dispatch instruction.
- 1.12.8 The acceptance of any quantity of the equipment shall in no way relieve the successful bidder from his responsibility for meeting all the requirements of this specifications & shall not prevent subsequent rejection, if such equipments are found defective later.
- 1.12.9 Inspection during manufacturing.
 - 1.12.9.1 The inspection may be carried out by the purchaser at any stage of manufacture. The successful bidder shall grant free access to the purchaser's representative at a reasonable time when the work is in progress. Inspection and acceptance of any equipment under this specification by the purchaser shall not relieve the supplier of his

obligation of furnishing equipment in accordance with the specifications and shall not prevent subsequent rejection if the equipment is found to be defective.

- 1.12.9.2 The supplier shall keep the purchaser informed well in advance, about the manufacturing program so that the arrangement can be made for inspection.

1.13 QUALITY ASSURANCE PLAN:

- 1.13.1 The bidder shall invariably furnish along with his offer, the quality assurance plan adopted in him/his sub-supplies in the process of manufacturing of all major equipments/components and LT Panel board.
- 1.13.2 Precaution taken in testing for ensuring usage of quality raw materials and sub-components shall be stated in the quality assurance plan.
- 1.13.3 In the event of supply order, the bidder shall have to submit Quality Assurance Plan to be adopted for manufacturing LTPB specifying detailed manufacturing process right from raw material to finished product testing for approval of the purchaser.
- 1.13.4 The bidder shall specifically express their consent to accept additions, revisions to their quality assurance plan to meet the purchaser's requirements, if needed.

1.14 DRAWINGS & DOCUMENTATION:

- 1.14.1 The bidder shall furnish, as a part of their offer, complete set of following documents of the offered product
- a. Technical literature / catalogues & manuals.
 - b. GA & Schematic drawings.
 - c. Bill of quantity.
 - d. Type test reports.
 - e. Quality Assurance Plan.
- 1.14.2 In the event of order, the successful bidder shall have to submit following drawings / documents, such that it can be got approved within commencement period.
- a. Bill of quantity along with General arrangement drawing showing front view, side view, plan & mounting arrangement of the Panel Board with detailed dimensions (in three sets) (Dimensions shall be in metric units only).
 - b. Detailed schematic drawing (in three sets).
 - c. Internal wiring and cabling arrangement along with terminal diagram (in three sets).
 - d. Type test reports (Pending only).
 - e. Quality Assurance Plan.
- 1.14.3 Supplier shall provide Instruction manual clearly indicating the installation checks, commissioning, preventive & trouble shooting maintenance.
- 1.14.4 **All the drawings submitted in soft form shall be in pdf format. However, requirement in AutoCAD form shall be at the discretion of GETCO.**

1.15 PACKING AND TRANSPORT

- 1.15.1 All equipment/material shall be suitably packed for transport, carriage at site and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit due to improper and inadequate packing. The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbols i.e. 'FRAGILE' 'HANDLE WITH CARE', 'USE NO HOOK' etc. The contents of each package shall bear marking that can be readily identified from the package list and packing shall provide complete protection from moisture, termites and mechanical shocks etc.
- 1.15.2 Wherever necessary proper arrangement for attaching slings for lifting shall be provided and all packages clearly marked with gross weight, signs showing 'UP' and 'DOWN' sides of boxes, contents of each package, order no. and date, name of the plant/Substation of which the material in the package forms part of and any handling & unpacking instructions considered necessary. Any material found short inside the intact packing cases shall be supplied by the manufacturer/supplier without any extra cost.
- 1.15.3 Bidder shall ascertain, prior to shipment, from concerned authorities, the transport limitations like weight and maximum allowable package size for transportation. Fragile material such as relay cases, Instruments and other glass material shall be carefully covered with shock absorbing protective materials, such as thermocol. Silica gel or equivalent moisture absorbent material in small cotton bags shall also be placed inside the packing wherever necessary.
- 1.15.4 Each consignment shall be accompanied by a detailed packing list containing the following information.
- a. Purchase order reference.
 - b. Name of consignee.
 - c. Details of consignment.
 - d. Destination.
 - e. Total weight of consignment.
 - f. Handling and unpacking instructions.
 - g. Bill of materials indicating contents of each package.
 - h. Sign showing upper / lower side of the crate.

1.16 ERECTION, TESTING AND COMMISSIONING

- 1.16.1 The successful bidder shall have to carry out supervision of testing and commissioning of LT Panel Board by deputing his Engineer/s at site without any extra cost to GETCO.
- 1.16.2 The service charges for above purpose shall not be paid during first testing & commissioning and any services to be provided within guarantee period of 36 months after commissioning.

1.17 SCHEDULES

1.17.1 The bidder shall fill in the following schedules which form part of the tender specifications and offer. In case of non-submission of the same, the offer is liable to be rejected.

Schedule – B	Guaranteed technical particulars
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1.17.2 Any deviation from the specifications shall be mentioned in Annexure – 12 (schedule of deviation) only. Any deviations mentioned other than above shall not be considered.

1.18 INFORMATION TO BE FILLED IN INVARIABLY BY THE BIDDER

For ready reference of the purchaser, the items of information required to be invariably furnished by him in his offer, are listed below;

1. Schedule – “B”.
2. Documents and drawings listed in Clause 1.14.1.
3. Documents specified in Clause No. 1.13.
4. Schedule of deviations (Annexure – 12).

1.19 GUARANTEE PERIOD

LT Panel Board supplied against this specification shall be guaranteed for a period of 36 months from the date of receipt at the destination store center / substation. However, any engineering error, omission, wrong provision, failure etc. if found during actual commissioning or guarantee period of the LT Panel board in any of the equipments, components, accessories, it shall be replaced by the bidder within 15 days time free of cost. Any transportation required shall be arranged by the bidder. The guarantee period in such case shall be considered from the date of the replacement i.e. receipt of the new material at the site.

SCHEDULE – B
GUARANTEED TECHNICAL PARTICULARS FOR 1000A, 440V AC LT
PANEL BOARD.

TO BE FILLED BY BIDDER

The bidder must fill up all the point of GTP for offered item/s. Instead of indicating “refer drawing, or as per IS/IEC”, the exact value/s must be filled in.

Sr. No.	Parameter	Offered (By Bidder)
1	Manufacturer	
2	Type & Designation (as per type test report)	
3	Product Specification Sheet	
	Construction details	
4	Size	
a	Height (mm)	
b	Width (mm)	
c	Depth (mm)	
5	Colour of Panel	
a	Exterior	
b	Interior	
c	Base Channel	
d	Paint thickness	
6	Thickness of CR sheet steel	
a	All Sides	
b	Doors	
c	Partition	
d	Base Plate	
e	Gland Plate	
f	Frame	
7	Base channel size	
8	Panel structure	
a	Totally enclosed	

b	Self-supporting		
c	Free standing		
d	Floor mountable		
e	Dust tight		
f	Weather & vermin proof		
g	Highly corrosion resistive		
h	Reinforced Panel edges and doors for protection against distortion		
i	Naturally air cooled		
9	Degree of Protection		
10	Doors		
a	Concealed hinges		
b	Door knobs		
11	Feeders		
a	Individual compartment for each feeder		
b	Switches provided on front		
c	Maintenance with ease possible from front for switch fuse unit / indicating meters / indicating lamps		
d	Door Open/Close Interlock		
12	Bus Bars (EC Grade Copper)		
a	Main Busbar rating		
	Continuous	R,Y,B Phase	
		Neutral	
	Short time	R,Y,B Phase	
Neutral			
b	Main Busbar size		
c	1000A dropper		
d	630A dropper		
e	300A dropper		
f	200A dropper		
13	Earthing		

a	Earth Bus (Al.) size	
b	Door earthing	
c	Compartment door earthing	
14	Busbar and dropper insulated with colour coded heat shrinkable sleeves	
15	Support Insulator (SMC)	
a	Non-Hygroscopic	
b	Non-Combustible	
c	Track resistant	
d	Fiber glass moulded	
16	Wires (Copper)	
a	FRLSH 1100V	
b	Flexible, Multi-strand, untinned	
c	Control cable & other circuits (Size)	
d	C.T. & P.T. Cables (Size)	
e	Auxiliary AC Circuits (Size)	
17	Ferrule at both ends of wires	
18	Power Cables (Size)	
a	100A Circuit	
b	63A Circuit	
c	32A Circuit	
19	Lugs	
a	Type	
b	Tinned Copper	
c	Protective heat shrinkable sleeves at both ends for wires upto 6mm ² .	
20	Double compression Cable glands	
21	Maximum Temperature of Bus bar and bus bar connectors at Rated current, frequency and ambient temperature of 50° C.	
22	Air Circuit Breaker	
a	Make & Model	1000A
		630A
b	Breaking Capacity	1000A

		630A	
c	Microprocessor Based		
d	Electrically Operated (220V/110V DC)		
e	Mechanically operated trip push buttons		
f	Spring Charge Motor		
g	Manual spring charging provision		
h	Mechanically operated targets to show open/close position and spring charged/discharged status		
i	Safety shutter		
j	Anti-pumping facility		
k	Thermal setting range	1000A	
		630A	
l	Short Circuit setting range	1000A	
		630A	
m	Auxiliary Contacts	1000A	
		630A	
23	MCCB		
a	Make	300A	
		200A	
		100A	
		63A	
		32A	
b	Model & Type	300A	
		200A	
		100A	
		63A	
		32A	
c	Rating (Continuous/Breaking capacity)	300A	
		200A	

		100A	
		63A	
		32A	
d	Number of Poles	300A, 200A, 100A, 63A & 32A	
24	Current Transformer		
a	Make		
b	I.S. Applicable		
c	Type		
d	Nos. of core		
d	Accuracy class	1000/5A, 500/5A	
		300/5A, 200/5A, 100/5A	
e	VA Burden		
f	I.S.F		
g	C.T. Ratio		
h	One min. P.F. withstand voltage kV (rms)		
i	Rated service voltage		
25	KWH meter		
a	Make		
b	Type		
c	Size		
d	Accuracy class		
26	Ammeter with selector switch		
a	Make		
b	Type		
c	Size		
d	Flush Mounted type		
e	Scale		
f	Accuracy class		
27	Voltmeter with selector switch		
a	Make		
b	Type		

c	Size	
d	Flush Mounted type	
e	Scale	
f	Accuracy class	
28	KW meter	
a	Make	
b	Type	
c	Size	
d	Flush Mounted type	
e	Scale	
f	Accuracy class	
29	Current Transducer	
a	Make	
b	Type	
c	CT I/P	
d	Aux. Supply	
e	Number of Outputs	
f	Analogue Output Range	
g	Mounting	
30	Voltage Transducer	
a	Make	
b	Type	
c	PT I/P	
d	Aux. Supply	
e	Number of Outputs	
f	Analogue Output Range	
g	Mounting	
31	Selector Switches	
a	Make	
b	Rated Capacity (A)	
c	Configuration	
32	TNC Breaker Control Switch	

a	Make	
b	Type	
c	Rating	
d	Configuration	
33	Indicating Lamp	
a	Make	
b	Type	
c	Rating	
d	Size	
34	Push Buttons	
a	Make	
b	Type	
c	Rating	
d	Contact Configuration	
e	Size	
35	Type Tests	
a	Verification of Temperature rise test	
b	Verification of dielectric properties	
c	Verification of short-circuit strength	
d	Verification of the continuity of the protective circuit.	
e	Verification of clearances and creep age distances.	
f	Verification of mechanical operation	
g	Verification of the degree of protection	

Typical General Arrangement Drawing of 1000A, 440V AC LT Panel Board

