



**GUJARAT ENERGY TRANSMISSION
CORPORATION LTD.**

**SARDAR PATEL VIDYUT BHAVAN,
RACE COURSE, VADODARA - 390 007**

TECHNICAL SPECIFICATIONS

FOR

400A L. T. PANEL BOARD

GETCO/E/TS –LTPB 4202/ R5 April, 2025

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TECHNICAL SPECIFICATION FOR L. T. PANEL BOARD

1.1 SCOPE:

- 1.1.1 This specification covers the design, manufacture, assembly, testing at manufacturer's works, supply and delivery of L.T. Panel boards with all accessories required for complete installation.

1.2 STANDARDS:

The design, manufacture, identification, 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 specification.

1. IS: 3043 - Code of practice for earthing.
2. IS : 4237 - General requirements for low voltage switchgear and control gear assemblies.
- 3 IS:8623 - Specification for low voltage switchgear and control gear assemblies.
(Part-1)

1993
4. IS : 2147 - Degree of protection provided by enclosures for L.V. switchgear.
5. IS : 375 - Marking and arrangements for switchgear bus-bars, main connections and auxiliary wiring.
6. IS : 2208 - H.R.C. Cartridge fuses.
7. IS : 1554 - Part – I: PVC Insulated cables.
8. IS : 3016 - Code of practice for selection installation and maintenance of fuses (voltage not exceeding 650 volts).

9. IS : 732 - Code of practice for electrical wiring installation (system voltage not exceeding 650 volts).
10. IS : 3646 - Code of practice for interior illumination Part-I and II.
11. IS : 694 - Specification for PVC Cables and codes for electrical power and lighting for working voltages upto and including 650 volts to earth.
12. IS : 1567 - Specification for metal clad switches (current rating not exceeding 100 Amps.)
13. IS : 1913 - General and Safety requirements.
14. IS : 4047 - Specification for heavy-duty air-break switches and composite units of Air-break switches and fuses for voltages not exceeding 1000 volts.

In addition to the above, the L.T. Panel board cubical shall meet all applicable Indian Electricity Rules. Fire Insurance regulations and other local statutory codes. All requirement 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 GENERAL DESIGN OF SWITCH BOARD CUBICLE:

- 1.3.1 The L.T. Panel board cubicle shall be of metal clad, totally enclosed, sheet steel cubicle, indoor floor mounting, and freestanding type. It shall be completely dust-tight, weather & vermin proof and highly corrosion-resistive. Rubber gasket shall be provided between adjoining surfaces of the doors and enclosures to make the switchboard dust-tight and vermin proof. The panel will be suitable for IP-5X degree of protection. The panel shall be with basic standard components of cubicle like; space heaters with thermostat, & Switch and 15A, Multi pin Power supply socket & Switch.
- 1.3.2 The sheet steel parts shall be subjected to finishing process of chemical degreasing, pickling, phosphate coating, a primer coat and finally a two tone finishing shall be given by using two shades of synthetic enamel of light grey shade colour as per shade 631 of IS:

5. The finishing shall be elegant and enduring. The colour scheme shall be subject to purchaser's approval.

1.3.3 The L.T. Panel board shall be of unit type in construction, compact in size and neat in appearance. The design of feeder units shall be such as to minimize the floor area required. The overall dimensions of the L.T. Panel board cubicle shall be as near as possible but not less than the width = 1600 mm, Height = 2000 mm and breadth = 350 mm with ± 10 mm tolerance.

1.3.4 The feeder units shall be arranged in individual compartments in vertical section and a vertical wire way shall be provided to accommodate all control cables. Wire way shall be so designed that even if the doors of wire way is opened, there is no access to the bus bars. The wiring layout shall be planned for easy screw and quick circuit tracing. Wiring shall be properly bunched and arranged in such a way that there shall be no sag. Each compartment shall be covered with sheet steel hinged door having rounded edges and maintenance to be carried out from the front. Inspection as well as maintenance shall be done safely and easily without affecting the other feeders. All switches and switch fuse units shall be front operated type and shall be interlocked with the hinged doors. The sheet steel used shall be not less than 2 mm thick for all sides. EC grade copper bus bars shall be used for connections from Main Bus bar to respective switches of incoming / outgoing feeders & the size of the same shall be stated on the drawing.

1.3.5 The main bus bars shall be of EC grade copper and arranged vertically. The minimum size of bus bars shall be as mentioned below.

a) The size of R, Y, B phase Bus bar shall be 250mm².

b) The size of Neutral Bus bar shall be 150mm².

The bus bar shall be supported on non-hygroscopic, non-combustible, track resistant, high strength polyester fiber glass moulded insulators.

1.3.6 The cable box chamber shall have adequate space to accommodate cable boxes, glands packing glands and incoming and outgoing

power and control cables. Outgoing feeder terminals shall be brought out into the cable box chamber for easy connection of cables. Crimp type tinned copper lugs terminal arrangement according to the rating of the feeders and associated cable shall be provided. Cable entries shall be arranged from bottom.

- 1.3.7 Earthing bus-bars of EC Grade copper of 25mm x 6mm shall be provided running through the entire length at the bottom of each control center with the arrangement for connection to GETCO's earthing strip of 25 mm x 6 mm.
- 1.3.8 Adequate illumination shall be provided for interior of the cubicle by providing 1 (One) No. of 14W CFL/ **9W LED lamp** with door switch, Control fuse and Link in each cable alley.
- 1.3.9 Indicating instruments [viz. Voltmeter Ammeter, LED type indicating lamps for supply 'ON' indication] shall be mounted on the front, on the outgoing side of the main incoming switch. Ammeters and voltmeters shall be of flush mounting type and preferably of 96 x 96 mm size. Voltmeter & Ammeter shall be AC Moving Coil Rectifier type with full scale deflection of 240 Deg. And accuracy class +/- 1.5% of full scale. The switchboard panel shall be, completely wired, ready for connecting to the purchaser's equipment. Nameplate with required details shall also be provided on the front.
- 1.3.10 Wiring shall be done with 1.1KV **single core, multi strand flexible, FRLSH,** PVC copper conductors of suitable size.
- 1.3.11 **KWH METER :**
- Meter shall be 3 ϕ , 4 W, 415 V, 50 Hz suitable for unbalanced load. It shall be provided with **six-digit digital display type meter**, one for incomer 300 Amp rated (TPN) feeder and one of the outgoing 63 Amp rated (TPN) feeder for colony. KWH meters shall be flush mounted.
- 1.3.11.1 **Current Transformers:** Ring Type / tape insulated.
- i) C.T. shall be ring type / tape insulated as per IS: 2705 of latest version for CT operated Energy meters.

- ii) C.T. shall have a short circuit current 3.0 KA (rms) for 1.0 second and dynamic peak current 7.5 KAp (shall not be less than 2.5 times rated thermal current).
- iii) The C.T.s. shall have following characteristics:
 - a) No. of core : One for metering.
 - b) Class of Accuracy : 0.5
 - c) Burden : 10 VA
 - d) ISF : 5
 - e) C.T. Ratio : 300 / 5 Amp (Primary/secondary) & 60 / 5 Amp (Primary/secondary)
 - f) Rated service voltage : 660 volts
 - g) Frequency : 50 Hz
 - h) One minute P.F. : 3 kV (rms) for 1.0 minute voltage withstand test on winding
 - i) Tests : All routine and type tests as per IS: 2705 of latest version (Manufacturer's test certificates are required to be submitted by successful Bidder).

1.3.11.2 CTs.: Required for metering and instrumentation shall be within the scope of supply. All wiring required for current and potential terminals of the C.T. operated KWH meter shall be provided.

Note: Each C.T. shall have sleeved secondary heads with tinned copper crimping pins of required length for connecting directly to KWH meter of the L.T. Panel.

1.3.12 SCADA Compatibility (If specified in Schedule-A)

The LT Panel Board shall be fully SCADA compatible. It shall have sufficient Nos of potential free contacts & transducers (4-20mA output) for digital and analogue signals respectively. It shall also be possible to **monitor** various functionality of LT Panel Board from SCADA system through hard wire connection.

Typical I/O requirement is tabulated here under. The exact number and description shall be as per detailed engineering.

PARAMETERS	DIGITAL INPUTS	ANALOGUE INPUTS (4-20mA)
Incomer Off	√	
Incomer On	√	
Bus Voltage – R Phase		√
Bus Voltage – Y Phase		√
Bus Voltage – B Phase		√
Incomer Current – R Phase		√
Incomer Current – Y Phase		√
Incomer Current – B Phase		√
Bus Under Voltage	√	
Bus Over Voltage	√	

Note: *Separate 3 phase Over voltage and Under Voltage relay shall be provided to monitor 3 phase O/V & U/V of Bus Voltage from remote. The relay(s) shall supervise all the three phases.

1.4 MAIN BUS:

- 1.4.1 The main bus bar shall be rated for 500V, 400 Amps continuous current. The short time current rating shall be 16KA for 3 sec. All bus-bar connections shall be silver-plated and the bus bar shall be high conductive copper. Bus Bars shall be suitably insulated by means of insulating colour sleeves of 0.5 KV rating. The chemical and electrical characteristics of the insulating tape compound shall be clearly brought out in the tender. 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.

1.5 SWITCH FUSES UNITS:

- 1.5.1 Switch Fuse units shall be 3 pole units for A.C. capable of breaking of the associated circuit. Switches shall be quick make and quick break design. Switch contacts shall be silver-plated and contact spring shall be of stainless steel. Compartment doors shall be interlocked with the operating handle of the switch so as to prevent opening of the door when the switch is closed. Switch handles shall have provision for locking in both fully open and fully closed position.
- 1.5.2 Fuses shall be H.R.C. type. They shall be provided with visible indicators to show that they have operated the final steady state temperature of the fuse link contacts when carrying their rated current shall not exceed 100°C. The fuse rating shall be according to the load of the circuit.

1.6 TESTS:

1.6.1 TYPE TESTS :

The following tests from NABL accredited laboratory shall be carried out in accordance with latest / amended / up to date IS/IEC. The bidder has to submit all the 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.

Following Type test reports are to be submitted with Tech. 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 creepage distances.
- f) Verification of mechanical operation.
- g) Verification of the degree of protection.

Important Note :

In case of non-submission / partial submission of type test reports of which validity is over, the 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.

1.6.2 ROUTINE **AND ACCEPTANCE** TESTS :

Routine tests shall be performed in compliance of relevant ensure that the equipment comply with the requirements of this specification.

1.6.3 The routine test certificates shall be submitted to the purchaser for his approval prior to the dispatch of the equipment.

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

1.6.5 **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.**

1.6.6 **After successful completion of routine tests, LT Panel Board shall be offered for acceptance testing & inspection.**

1.6.7 **The supplier shall give advance intimation to the purchaser to enable him to depute his representative for witnessing the acceptance tests.**

1.6.8 **Acceptance tests to be performed are same as routine tests, 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.**

1.6.9 **Acceptance test shall be performed in presence of GETCO representative in case of direct supply to GETCO.**

1.6.10 **In case of supply through EPC contract, representative of EPC contractor shall also witness acceptance test with GETCO representative.**

1.7 DRAWINGS :

1.7.1 Drawings incorporating the following particulars shall be submitted by the Bidder with the tender to the purchaser for preliminary study.

General outline drawing showing dimensions, weights etc.

1.7.2 The Bidder may submit any other drawings found necessary in addition to the drawings stated above.

1.7.3 On receipt of order the supplier shall have to get approval of the following drawings.

1) **Bill of quantity along with General arrangement drawing** showing front elevation, side elevation and plan of the L.T. Panel board with detailed dimensions (Dimensions shall be in metric units only)

2) Detailed drawing of mounting arrangement.

3) **Detailed schematic drawing**

4) Outline drawing of internal wiring and cabling arrangement **along with terminal diagram**

5) **Quality assurance plan**

1.8 FEEDERS :

1.8.1 The L.T. Panel Board suitable for A.C. system voltage of 500V, 3- ϕ , 50 Hz. shall comprise of the following feeders :

i) 300 Amps. rated, incoming switch fuse unit feeder (TPN) having 300 Amps. quick make quick break switch fuse unit with 3 Nos. 300 Amps. H.R.C. fuses and a neutral link complete with cable box suitable for 3½ cores, 185mm² PVC cable. Lamps indicating supply 'ON' position shall also be provided.

- ii) 200 Amps. rated, 1-outgoing switch fuse unit feeders (TPN) each having 200 Amps. quick make, quick break switch fuse unit equipped with 3 Nos. 200 Amps. H.R.C. fuses and a neutral link complete with glands suitable for PVC cable.
- iii) 100 Amps. rated, 1-outgoing switch fuse unit feeders (TPN) each having 100 Amp. quick make, quick break switch fuse unit equipped with 3 Nos. 100 Amps. H.R.C. fuses and a neutral link complete with glands suitable for PVC cable.
- iv) 63 Amps. rated, 3-outgoing switch fuse unit feeders (TPN) each having 63 Amps. quick make, quick break, switch fuse unit equipped with 3 Nos. of 63 Amps. H.R.C. fuses and a neutral link complete with glands suitable for PVC cable.
- v) 63 Amps rated, 2-outgoing switch fuse unit feeder (TPN) each having 63 Amps. quick (make quick break switch fuse unit with 3 Nos. of 63 Amps. H.R.C. fuses and a neutral link complete with glands.
- vi) 32 Amps. rated, 5-outgoing three phase neutral feeders (TPN) each having 32 Amps. switch fuse units, equipped with suitable H.R.C. fuses and complete with glands for PVC cable.
- vii) 16 Amps. rated, 4-outgoing single phase neutral feeders (SPN) each having 16 Amps. Switch fuse units equipped with suitable H.R.C. fuses and complete with glands for PVC cable.

1.8.2 **The Bus bar to respective incomers / feeders dropper shall be of EC grade copper strip having minimum sizes as mentioned below.**

- i) **For incomer of 300A**
 - a. **R, Y, B Phase-250 Sqmm**
 - b. **Neutral-150sqmm**
- ii) **For outgoing feeder of 200A**
 - a. **R, Y, B Phase-150 Sqmm**
 - b. **Neutral-150sqmm**
- iii) **For outgoing feeder of 100A**

- a. R, Y, B Phase-100 Sqmm
- b. Neutral-100 sqmm

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.

- i) For outgoing feeder of 63A
 - a. R, Y, B Phase-16 Sqmm
 - b. Neutral-6 sqmm
- ii) For outgoing feeder of 32A
 - a. R, Y, B Phase-6 Sqmm
 - b. Neutral-4 sqmm
- iii) For outgoing feeder of 16A
 - a. R, Y, B Phase-4 Sqmm
 - b. Neutral-4 sqmm

1.9 QUALITY ASSURANCE PLAN:

- 1.9.1 The Bidder shall invariably furnish along with his offer the quality assurance plan adopted by him / his sub-supplies in the process of manufacturing all major equipment/component.
- 1.9.2 Precaution taken for ensuring usage of quality raw materials and sub-components shall be stated in the quality assurance plan.
- 1.9.3 The Bidder should specifically express their consent to accept additions, revisions to their quality assurance plan to meet the purchaser's requirements if needed. The final quality assurance plan to be adopted, with mutual consent, shall be decided after discussion with successful Bidder.

SCHEDULE OF REQUIREMENT

Sr. No.	Description of equipment	Quantity (Complete set)
1.	Metal clad, sheet steel L.T. Switch Board, cubicle, indoor, floor mounting totally enclosed dust and vermin proof, suitable for 3 ϕ -4wire, 500 volts, 50Hz A.C. equipped with 400 Amps. Bus bars chamber comprising of following:	
	(A) <u>INCOMING</u> : 300 Amps. Rated incoming feeder (TPN) with 300Amp. rated quick make, quick break switch fuse unit equipped with 3 nos 300Amps. H.R.C. fuses natural links and complete with suitable cable box and glands.	1 (one)
	(B) <u>OUTGOING</u>: i) 200 Amps. Rated outgoing switch fuse unit feeder (TPN) having 200 Amp. quick make quick break switch fuse unit equipped with 3 Nos. 200 Amp. HRC fuses and complete with glands for PVC cable. ii) 100 Amps. Rated outgoing switch fuse unit feeder (TPN) having 100 Amp. quick make quick break switch fuse unit equipped with 3 Nos. 100Amp. HRC fuses and complete with glands for PVC cable.	1 (one) 1 (one)

Sr. No.	Description of equipment	Quantity (Complete set)
	iii) 63 Amps. Rated outgoing feeder (TPN) unit with quick make, quick break front operated switch equipped with 3 Nos. 63 Amps. H.R.C. fuses and complete with glands suitable for PVC cable. iv) 63 Amps. Rated outgoing feeder (TPN) unit with quick make, quick break front operated switch equipped with 3 Nos. 63 Amps. H.R.C. fuses and complete with glands suitable for PVC cable. v) 32 Amps. Rated, Three-phase neutral outgoing feeder (TPN) unit equipped with 32 Amps. suitable H.R.C. fuses and complete with glands suitable for PVC cable. vi) 16 Amps. Rated single-phase neutral outgoing feeder (SPN) unit equipped with 16 A H.R.C. fuses and a gland suitable for PVC Cable.	3 (Three) 2 (Two) 5 (Five) 4 (Four)

**SCHEDULE OF
GUARANTEED TECHNICAL PARTICULARS
FOR L.T. PANEL BOARD**

(To be filled in & signed by the Bidder)

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

1. Name of Manufacturer :
2. Manufacturer's type & designation :
3. Size :
 - a) Height (mm) :
 - b) Width (mm) :
 - c) Depth (mm) :
4. Colour of panel :
 - a) Outside :
 - b) Inside :

5. Thickness of sheet steel :
 - a) All sides of the panel :
 - b) For doors :
 - c) For partition :
 - d) Bus bar support insulators :
 - i) Make
 - ii) Type-Non combustible, track resistant and high strength type Polyester fibre glass moulded insulators

6. Main Bus bars – **400A**
 - a) Material :
 - b) Rated current in Amp :
 - c) Size (mm x mm) :
 - d) Current density-A/mm² :
 - e) Position- vertical :
 - f) Colour sleeves of 0.5KV rating :
 - g) Busbar rating (500V & STC-16KA - 3Sec)

7. **Bus bars for 300A I/C**
 - a) Material** :
 - b) Rated current in Amp** :
 - c) Size (mm x mm)** :
 - d) Colour sleeves of 0.5KV rating** :

8. **Bus bars for 200A Feeder**
 - a) Material** :
 - b) Rated current in Amp** :
 - c) Size (mm x mm)** :
 - d) Colour sleeves of 0.5KV rating** :

9. **Bus bars for 100A Feeder**
 - a) Material** :
 - b) Rated current in Amp** :
 - c) Size (mm x mm)** :
 - d) Colour sleeves of 0.5KV rating** :

10. Earth bus bar
 - a) Material :
 - b) Size :
 - c) Clamp type terminals :
(included in nos.)

11. Current transformer :
 - a) Make :
 - b) I.S. Applicable :
 - c) Nos. of core :
 - d) Accuracy class :
 - e) VA Burden :
 - f) I.S.F. :
 - g) C.T. Ratio :
 - h) One min. P.F. withstand voltage KV (rms) :
 - i) Rated service voltage :

- | | | | |
|-----|---|---|-----------|
| 12. | KWH meter | : | |
| | a) Make | : | |
| | b) Type | : | |
| | c) Size | : | |
| | d) Whether suitable for unbalanced load | : | Yes /No. |
| | e) Flush mounting | : | |
| | | : | |
| 13. | Ammeter | : | |
| | a) Make | : | |
| | b) Size | : | |
| | c) Flush mounted type | : | Yes / No |
| | | : | |
| 14. | Voltmeter | : | |
| | a) Make | : | |
| | b) Size | : | |
| | c) Flush mounted type | : | Yes / No. |
| | | : | |
| 15. | Selector switches | : | |
| | a) Make | : | |
| | b) Rated capacity (Amp) | : | |
| | | : | |
| 16. | LED Type Indicating lamp | : | |
| | a) Make | : | |
| | b) Type | : | |
| | c) Wattage | : | |

17. Switch fuse unit for : Make
- a) 300 Amps. TPN :
- b) 200 Amps. TPN :
- c) 100 Amps. TPN :
- d) 63 Amps. TPN :
- e) 63 Amps. TPN :
- f) 32 Amps. SPN :
- g) 16 Amps. SPN :
18. H.R.C. Fuses : :
- a) Whether ISI Marked : Yes / No.
- b) Make : :
19. **Wires (Copper)**
- a) FRLSH 1100V** :
- b) Flexible, Multi-strand,** :
- c) Control cable & other** :
- circuits (Size)** :
- d) C.T. & P.T. Cables (Size)** :
- e) Auxiliary AC Circuits** :
- (Size)** :
- Power Cables (Size)** :
- a 63A Circuit** :
- b 32A Circuit** :
- c 16A Circuit** :
20. SCADA Compatibility : Yes / No.

21. Constructional details :
- a) Metal clad : Yes / No.
 - b) Totally enclosed : Yes / No.
 - c) Indoor type : Yes / No.
 - d) Floor mounting : Yes / No.
 - e) Free standing : Yes / No.
 - f) Panels shall be vermin proof and highly corrosion resistive. : Yes / No.
 - g) Rubber gaskets provided to all the doors : Yes / No.
 - h) All doors are hinged type and with round edged : Yes / No.
 - i) Interlocks are provided between compartment doors of operating handle of the switches. : Yes / No.
 - j) All feeders provided in individual compartment : Yes / No.
 - k) Switches provided on front
 - l) Maintenance can be carried out from the front for switch fuse unit / indicating meters / indicating lamps. : Yes / No.
 - m) Panel shall be suitable for IP-5X Degree of Protection.
 - n) GA drawing attached with the tender. : Yes / No.
 - o) Cable entry & exist from bottom. : Yes / No.
 - p) Insulating colour sleeves on Busbar : Yes / No.
 - q) KWH meter along with CTs of suitable rating in I/C as well as one of the outgoing **63** Amp TPN feeder : Yes / No.

22. State material of the wire : Yes / No.
used for complete internal
wiring of the panel and
voltage grade.
23. Crimp type tinned Copper : Yes / No.
lugs for terminal
arrangement.