

# **Final Common technical specifications for 25/63/100 kVA L.T. Distribution Box with “Incoming Disconnect Switch” and “Outgoing Porcelain Fuse Units”.**

## **1. Scope:**

The Specification covers design, manufacturing, factory testing and supply of “L.T. Distribution Boxes” with Switch disconnecter and Porcelain Fuse units for protection and control of 25/63/100 KVA Distribution Transformers and LT line in urban, rural and industrial areas as per reference drawing attached herewith and as per IS/IEC: 60947 (P. 1, 2, 3) of 2004, 2003 & 1999 respectively with latest amendment/revision if any and also other applicable IS Nos. mentioned in Specification.

- 1.1** The Distribution Box shall comprise of (1) suitable enclosure (factory built assembly) fabricated from new CRC Steel Sheet (2) Porcelain Fuse units as per IS: 2086/1993 with latest Amendment/ Revision if any on the date of inviting tender and as per our specification. (3) Incoming Switch disconnecter as per IS/IEC: 60947 with latest amendment/revision if any on the date of inviting tender.

## **2. General Requirements:**

L. T. Distribution Box should be designed to have maximum utilization of transformer capacity and shall be well equipped with adequate protection to transformer and feeder against overload and short circuit and minimum interruption in power supply.

### **2.1 Service Conditions:**

#### **a) Temperature**

The materials used in Construction of the Distribution Box shall be suitable for use under following conditions.

|                                           |                  |
|-------------------------------------------|------------------|
| Maximum ambient temperature               | 55° C            |
| Maximum daily average ambient temperature | 37° C            |
| Minimum temperature                       | 00° C            |
| Altitude                                  | 0 to 1000 meters |
| Maximum yearly average air temp.          | 35° C            |

#### **b) Relative Humidity:**

This does not exceed 50% of maximum temperature of 40 ° C and 90 % at 20° C care shall be taken for moderate condensation which may occasionally occur due to variation in temperature. Even on sea shore side having heavy pollution the box should function satisfactorily.

#### **c) Mode of Installation:**

The boxes are normally to be mounted either on plinth near transformer or on M.S. Channels fixed between two PSC / Girder Poles with suitable size of hot dip galvanized bolts and nuts.

#### d) System Details:

These Distribution Boxes are meant for control and protection of Distribution Transformer and feeder with required technical parameters as under:

| 1 | kVA Rating                                        | 25 kVA                                         | 63 kVA                                         | 100 kVA                                        |
|---|---------------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|
| 2 | Voltage                                           | 415 Volts, 3 Phase with Solidly grounded earth | 415 Volts, 3 Phase with Solidly grounded earth | 415 Volts, 3 Phase with Solidly grounded earth |
| 3 | Frequency                                         | 50 Hz + 5%                                     | 50 Hz + 5%                                     | 50 Hz + 5%                                     |
| 4 | Approx. (Max) Load current for transformer        | 60 Amp                                         | 125 Amp                                        | 200 Amp                                        |
| 5 | Nos. of outgoing circuits                         | 2 Nos.                                         | 2 Nos.                                         | 2 Nos.                                         |
| 6 | Rated short time withstands current of Dist. Box. | 7.5 KA for one Sec.                            | 7.5 KA for one Sec.                            | 7.5 KA for one Sec.                            |
| 7 | No. of poles per phase                            | 1                                              | 1                                              | 1                                              |

#### e) Applicable Standards:

- (1) IS/IEC: 60947 (P.1&3) amended up to date/ revised for incoming Switch Disconnector.
- (2) IS/IEC: 60947 (P.1&2) amended up to date/ revised for incoming MCCB.
- (3) IS: 2086/1993 and its latest amendments/revised for Porcelain Fuse Units.
- (4) IS/IEC: 60947 (P.1) amended up to date / revised for enclosure
- (5) IS/IEC: 61439-1 & 2:2011 amended up to date/ revised up to date.
- (6) IS: 1730/1989 with latest amendment and IS: 2062/2011 with latest amendment.
- (7) IS: 2551/1982 with latest amendment / revision if any.
- (8) IS: 5/2007 with latest amendment if any.

### 3. Detailed Specifications:

The specification is subdivided into the four parts.

- (1) Enclosure (2) Bus Bar and Connections (3) Components of Circuits. (4) Switch-Disconnector

#### 3.1 Enclosure Panel:

- a) The box shall be suitable for outdoor installation as per attached reference Drawing. The box is expected to be mounted below the transformers and it shall be mounted on PSC/ Girder poles or on Plinth as the case may be.

- b) The thickness of CRC Steel Sheet be of 1.6 mm. Thickness (before painting) i.e. 16 gauge + tolerance as per IS.
- c) Maximum portion of the box shall be made by folding same new CRC sheet to minimize welded joints.
- d) Minimum 4 Nos. of door hinges on each door shall be properly welded to box and cover in such a way that load of the door shall be equally distributed on each hinge . The box shall open at side i.e. horizontal opening. Swing of door opening be minimum 90°. Hinges shall be provided from inside only the arrangement of door shall be as per drawing (Face to face).
- e) The door locking device similar to that of “Godrej” type three way locking arrangement shall be provided. In addition to this, Padlocking arrangement be also provided at centre.
- f) Two sets of M.S. Clamps as shown in the reference drawing duly hot dip galvanized be supplied.
- g) Durable gasket shall be provided around the boxes to prevent outside dust entering inside and to have proper vermin proofing. The rubber lining should be minimum 3 mm thick. The lining should be irremovable from the groove.
- h) The roof should be given a slope of 5 o to 15 o to drain the rainwater easily.
- i) Two sets of louvers shall be provided on the side walls (as shown in drawing) The louvers shall be backed up by perforated stainless steel sheets of 0.5 mm. thickness welded from inside the box for preventing dust, insects and rain water getting inside the box. As such box will be provided with IP- 44 protection and entry of fresh cool air and to maintain the temperature rise limits of various components provided inside the box as per IS.
- j-i) The current carrying parts should be properly connected using non-magnetic stainless steel bolts, nuts & washers. The nuts and bolts should be of hexagonal type with groove for bolt
- j-ii) All other bolts, nuts and plain washers used for tightening purpose including connectors should be of M.S. hot dip galvanized. Bolts, nuts washers also shall be hot dip galvanized.
- j-iii) However, Hardware below 16 mm may be electroplated.
- k) The overall dimensions of the box shown in the tender drawing is for reference only, however internal clearance shown in the drawing shall be strictly maintained. Over all dimensions of the box shall be such that the box will withstand temperature rise limits as per IS and Company’s Specification. The schematic drawing attached is illustrative giving outline of Company’s operation and to have sufficient space for working during maintenance. The size of the box will depend on the size of disconnector switch and Porcelain fuses to be provided and other relevant provision

made as in IS/IEC: 60947/ (P1, 2&3), IS 2086/1993. The box will fulfil following requirement, bidder can give suitable design of enclosure with all the equipments / accessories and electrical clearances as per IS.

- k-i) The enamelled danger notice plate as per IS: 2551 /1982 with latest amendment/revision of size 200x150mm shall be riveted in pilfer proof manner on front cover of the box.
- k-ii) The incoming and outgoing terminals of the, disconnecter Porcelain Fuses and the bus bars shall have suitable termination disconnecter and Porcelain Fuses should have extended terminals for proper clearance to be maintained between phases (Minimum 75mm).
- k-iii) All other minimum clearance between phases, between phase and earth shall be as per minimum requirement of IS/IEC:60947 (P1, 2 & 3) with latest amendment/revision and as mentioned in drawing.
- k-iv) The temperature rise shall be within limits specified in IS/IEC: 60947 (P1, 2&3) and also mentioned at Annexure- "A" attached with specification. The temperature rise test be conducted with the current (specified in the Annexure -A) passing through the incoming circuit and proportional rated current through outgoing circuits. This test should be conducted with enclosure doors properly closed and the entire box as in the actual service. The test certificate from Government approved and NABL accredited Laboratory such as CPRI, NPL, ETDC, ERDA, ERTL etc. for the same should be submitted, which shall not be more than five years old from the date of the tender.
- k-v) Separate half round clamps of 2 mm MS sheet should be provided for holding the incoming & outgoing cables, so that cables do not rest directly on the terminals.
- k-vi) Number plate containing following details shall be riveted inside the door of the L.T. Dist. Box and also outside on front side name of the firm as well as MGVCL should be embossed with manufacturing year.
  - 1) Company's Name with full address
  - 2) Capacity of Box
  - 3) Serial No. of Box
  - 4) A/T No. with date
  - 5) Property of MGVCL
  - 6) Date of supply of L.T. Dist. Box

#### 4. Surface Treatment

All sheet metal work shall undergo 7 tank chemical & mechanical cleaning process as per annexure-P enclosed and thereafter Powder coating finished.

- a) The inside & outside colour of powder coating is same for all size of LTDB.
- b) The colour is light green for 25KVA, light brown for 63 KVA and light grey for 100 KVA LTDB.
- c) All other metal parts used in the distribution boxes shall be treated as under:

**M.S. Parts:**

All MS Parts should be hot dip galvanized with Min. thickness of galvanize coating should be 80 microns.

**Such as base plates:**

Zinc Plating.

**Bus bars, Joints and connections:** All bus bars, joints-jumpers-connections should be covered with heat shrinkable colour coded insulating sleeves have minimum insulating capacity 1.1 KV class Y having temp limit of 90 degree cent indicating R, Y, B phase. PVC adhesive tape should not be used.

The paint on enclosure and external parts of assembly shall have good colour retention property and shall be weather and UV resistance as per IS/IEC: 61439 (part-I)

#### 4.1 Neutral:

A solid neutral link of aluminium shall be provided for terminating neutral core of incoming and outgoing cables directly. The neutral shall be duly supported on insulating supports and aluminium lugs with washer will be provided for connections. Cross sectional area of neutral link shall be 100% of main bus bar current capacity. Neutral bus bar shall withstand rated short time current for one sec as per IS/IEC: 61439 with latest amendment.

#### 4.2 Cable Termination:

- a) For connecting internal circuit i.e. incoming and outgoing connections, the suitable size of aluminium bus bar of sufficient capacity to meet the required ampere loading for the box. The calculation of bus bar size for Amp loading is to be provided in the bid for reference.
- b) Incoming cables shall enter from the bottom portion of the box just parallel to the terminals of the installed isolator switch and outgoing cable shall enter of the welded bottom plates with separate gland plate having minimum size of 100 x 100 mm and having suitable knock out / drilled holes suitable for cable sizes as specified in the drawing. The separate gland plate shall be fitted with the proper size of hardware

The size of cable to be used are as under:

| 1 | kVA Rating              | 25 kVA | 63 kVA | 100 kVA |
|---|-------------------------|--------|--------|---------|
| 2 | Incoming Cable size mm2 | 25     | 150    | 150     |
| 3 | Outgoing Cable size mm2 | 25     | 150    | 150     |
| 4 | Numbers of circuits O/G | 2      | 2      | 2       |

- c) All the three terminals of Disconnecter shall be extended by suitable aluminium strips.
- d) Adequate cabling space shall be provided in the box for incoming and outgoing cables.
- e) Flexible PVC glands (25 sq. mm. to 150 sq. mm.) shall be provided for incoming and outgoing cable as per the attached specifications.

#### 4.3 Bus bars & Connectors:

- a) Aluminium bus bar shall be used for Kit Kat fuse connections.
- b) Current capacity of aluminium bus bars shall be adequate to meet the requirement as per IS. (Calculation should be enclosed by the bidder)
- c) Aluminium bus bars and links should be properly drilled, debarred and bolted to minimize heating of joints.
- d) Bus bars shall be covered with colour coated heat shrinkable Insulating sleeve with R, Y, B coding.
- e) Approximate Bus bar size should be for 25 KVA 3x25 mm, for 63/100 KVA 6x25mm or 5x30mm. The size given is for reference only. Bidder will have to specify suitable size supporting with calculations.
- (f) Aluminium lug type terminal made of aluminium material, with the long barrel long palm.

#### 4.4 Components of circuits

##### 4.4.1 Incoming Circuit:

The offers are invited for distribution boxes with disconnector. Each distribution box shall have one three pole Switch Disconnector. The rating and other technical parameters of incoming Switch Disconnector shall be as follows.

| Sr No | Characteristics                                                | 25 kVA / 63 kVA                                                                                                | 100 kVA                                                                                                        |
|-------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| 1     | Basic Rating                                                   | 100/200 Amps                                                                                                   | 250 Amps                                                                                                       |
| 2     | Type of Mechanism                                              | Manual independent quick make quick break                                                                      | Manual independent quick make quick break                                                                      |
| 3     | Standard Applicable                                            | IS/IEC: 60947/ (P1.2&3) amended up to date with latest revision.                                               | IS/IEC: 60947/ (P1.2&3) amended up to date with latest revision.                                               |
| 4     | Utilization Category                                           | AC - 23 A                                                                                                      | AC - 23 A                                                                                                      |
| 5     | Mechanical Endurance                                           | As per table IV to IS/IEC60947 (P.3) with latest amendment / revision if any.                                  | As per table IV to IS/IEC60947 (P.3) with latest amendment / revision if any.                                  |
| 6     | Electrical Endurance (Verification of Operational performance) |                                                                                                                |                                                                                                                |
| 7     | Rated duly                                                     | Un interrupted Rated Duly                                                                                      | Un interrupted Rated Duly                                                                                      |
| 8     | Making / Breaking capacity                                     | Not less than the requirement of AC - 23 A as per relevant IS/IEC 60947 (P.1&3) with latest amendment/revision | Not less than the requirement of AC - 23 A as per relevant IS/IEC 60947 (P.1&3) with latest amendment/revision |
| 9     | Rated short time withstand current for all three sequence      | 7.5 KA for 1 Second                                                                                            | 7.5 KA for 1 Second                                                                                            |

The Switch Disconnector shall have extended contacts and casing of switch Disconnector shall be plastic / thermo engineering material moulded. The handle of switch disconnector should be detachable easily for security purpose, while working on L.T. line. The handle should be insulated. However earlier following make approved or any other approved make in DISCOMs under GUVNL of switch disconnector can be used.

#### 4.4.2 Outgoing Circuit:

Each Dist. Box shall have 6 nos. Porcelain Fuse units for 25 KVA, 6 Nos. Porcelain Fuse Units for 63 KVA and 6 Nos. Porcelain Fuse Units for 100 KVA Transformer to control and protecting outgoing circuit.

| Rating of Porcelain Fuse Unit | For 25 KVA LTDB | For 63 KVA LTDB | 100KVA LTDB |
|-------------------------------|-----------------|-----------------|-------------|
|                               | 63A             | 100A            | 200A        |

**Note: -**

The drawing attached is for reference, showing 2 Nos. outgoing circuits, but bidder will have to attach separate drawing for each type of distribution boxes offered with nos. of circuit specified in the specification.

#### 4.4.3. General construction requirement of Kit Kat Fuse

**(A) Materials:**

This rewirable fuses units shall be made of ceramics which shall be of sand fine grain homogenous non-porous chemically inert and high electrical and mechanical strength and shall be thoroughly verified and smoothly glazed shall cover at least those surfaces which are exposed when the fuses have been mounted in intended manner. The mounting surface may be left unglazed. The materials should not have any defect such as:

|      |            |                                                                                                                                                |
|------|------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| i)   | Cracking   | A hairline crack in glaze of ceramic material.                                                                                                 |
| ii)  | Dunt       | A hair line fracture extending through the body and the glaze and cause by strains set up in the process of manufacture of ceramics materials. |
| iii) | Projection | A raised imperfection, projecting more than 0.75 mm above the surface of the ceramic materials.                                                |
| iv)  | Water      | The ceramics material shall not absorb more than absorption 2% of its weight of water when broken and tested for.                              |

**B) The design and dimension of the fuses shall be in accordance with the drawing attached with tender and relevant IS.**

**(C) Protection:**

The porcelain fuse shall be mounted such a way that there cannot be any possibility of the live contact to touch with the / have minimum clearance with the body.

**(D) Handling Grip:**

The fuse shall have Puller Grip to pull out male part i.e. top portion without damaging or disturbing the female contact/parts and it should pull out easily as and when required.

**(E) Metal Parts:**

All metal parts shall be protected against corrosion by suitable method and shall be hot dip galvanized.

#### 4.4.4 Fuse Base:

- (A) The fuses base shall be provided with two fixing holes for fixing the fuse base by means of screw or bolts.
- (B) The fuse base shall have contacts for suitably engaging with the contacts of the fuse top rigidly under any condition. The contacts shall be made out of such a metal which will not lose its electricity due to heating of the contracts on full load with 20% overload current or heat generated and required pressure is maintained even after repeated engagements and disengagement. The contact for rating 32A and above will also have extended strips for fixing cable by means of bolts/lugs. The fuse base should have extended electrolytic copper strips at both ends to connect the cable with bolts/lugs. The cross section area of electrolytic copper extension strips should not be less than specified limit mentioned below.

| Sr No | Rating of porcelain fuse units | Width of extension strips | Thickness of extension strips | Min. cross section area of extension strips |
|-------|--------------------------------|---------------------------|-------------------------------|---------------------------------------------|
| 1     | 63 Amps. - 415 V               | 15 mm                     | 3 mm                          | 45 mm <sup>2</sup>                          |
| 2     | 100 Amps.-415 V                | 17 mm                     | 3 mm                          | 51 mm <sup>2</sup>                          |
| 3     | 200 Amp.- 415 V                | 25 mm                     | 6 mm                          | 150 mm <sup>2</sup>                         |

#### 4.4.5 Fuse Carrier:

- (A) The fuse carried should have two brass screws with brass washers for fixing of fuse wire. The fuse carrier shall be so constructed that it is capable of being reversible for introduction into the fuse base. The contacts shall be made out of the metal which will not get loose its elasticity on account of heating of the contacts on full load with 20% overload conditions or heating due to blowing of the fuse element due to short circuit. The side leaves on the base should be sufficiently thick and stiff to ensure tight fitting of “U” contact with base block the asbestos cloth shall be provided in base of fuse shall be of fire proof insulating and of sufficient length, width and thickness to avoid short circuit between earth and fuse wire where fuse wire is made to pass through the hole provided in the porcelain carrier and asbestos tube must be inserted in the hole to avoid direct heating of the porcelain.
- (B) The asbestos cloth to be provided in fuse shall be fire proof insulating and of sufficient length width and thickness.
- (C) **Screws:**
  - i) Screws upon which the general assembly of the fuse base and carriers' terminals and contacts depend shall be prevented from loosening of backing out by lock, washers, stacking of other reliable means.
  - ii) If screws used in the assembly of a fuse are loosened or removed in order to install the fuse elements or to connect the fuse into a circuit they should be thread into metal and shall be provided with washers.

#### 4.4.6 Current Carrying Parts:

- i) Current carrying parts shall be of robust construction and capable of carrying rated current without exceeding the temperature rise limits of IS specification 2086-1993 with latest amendment/revision.
- ii) Iron and steel parts shall not be used for current carrying part including screws provided in the base terminal block and “U” contact.

#### 4.4.7 Contacts:

The contact of the Fuse Base, fuse carrier terminal blocks/strips shall be as under.

| Sr No | Description                           | For 63 & 100 A Fuse Unit | 200 A Fuse Unit |
|-------|---------------------------------------|--------------------------|-----------------|
| 1     | Fuse Carrier Contacts (Male Contacts) | Tinned copper            | Tinned Brass    |
| 2     | Fuse Base Contacts (Female Contacts)  | Phosphor Bronze          | Phosphor Bronze |
| 3     | Terminal Block / Strips               | Tinned Brass             | Tinned Brass    |

The contact used should be perfect so as to provide easy but Perfect “U” contact should penetrate full depth of back contact. The Mini. Thickness and width of “U” contact used should be as below. (Table 2)

| Sr No | Rating of Porcelain fuse units | Dimension of Width of “U” contact.     | Thickness of “U” contact. | Dimension of terminal block |
|-------|--------------------------------|----------------------------------------|---------------------------|-----------------------------|
| 1     | 63 Amp. - 415 V                | 12.5                                   | 1.8 mm                    | 14X20X18 mm                 |
| 2     | 100 Amp. - 415 V               | 19.0                                   | 2.5 mm                    | 17X22X25 mm                 |
| 3     | 200Amp. - 415 V                | As per drawing of 200 Amp Kit Kat fuse |                           |                             |

The current carrying screws and washers shall be of tinned brass while the screw, washers not carrying current shall be of M.S. hot dip Galvanized bolt and nut with one plain washer and one spring washer suitable for 50mm<sup>2</sup>, 70mm<sup>2</sup> and 150 mm<sup>2</sup> cable lugs shall be provided with extended strips for 63 A, 100 A & 200A fuse respectively.

#### 4.4.8 Chemical Composition of Contacts:

Electrolytic copper (Tinned phosphor bronze Tinned) use for contacts of Kit Kat fuse shall confirm various IS as stated below.

##### a) Electrolytic Copper:

Copper strips used for contacts of Kit Kat fuse should confirm to IS: 1897/1983 with latest amendment. The material shall be of Electrolytic Tough Pitch (ETP) grade with minimum 99.9% of copper and silver as per table 1 of IS 191 part IV with latest amendment/revision.

##### b) Phosphor Bronze:

The phosphor bronze used for contact of KK fuse shall confirm to any of the grade-I,II or III given in IS: 7814/1985 (with latest amendments.) The requirement of metal composition should be as per IS: 7814 with latest amendment/revision.

**c) Brass:**

It shall conform to grade LCB1 as per IS:292-1983/DCB2 of IS-1264/1997 (with latest amendment)/.The metal composition for casting shall be as per IS 1264 and that of brass sheet, as per IS 410 with latest amendment/revision.

**4.4.9 Embossing:**

**(A) Every fuse carrier shall be clearly embossed with the following information.**

- i) Rated current.
- ii) Rated voltage
- iii) Size of fuse wire.
- iv) Manufacturer's name / Trade mark.
- v) Name of DISCOM
- vi) Year of Manufacture

**(B) Every fuse base shall be clearly marked with the following.**

- i) Manufacturers name / Trade mark.
- ii) Name of DISCOM
- iii) Year of manufacture

**5 Type Test Certificate**

**(A) Type Tests:**

Type test reports not more than 7 years old from the date of tender from Government approved/ NABL approved laboratories such as CPRI, NPL, ETDC, ERDA, ERTL etc. to be furnished with all certified attested drawing to prove that the equipment's offered meet the requirement of the specification and relevant IS. All the type tests of MCCB/Disconnect switch & Porcelain Fuse units and complete box are required to be carried out as under:

- 1) Type Test for complete dist. Box as per IS/IEC:61439 (Part-I) with latest amendment/revision as under.

| No. | Characteristic to be verified                                         | Clauses or sub clauses |
|-----|-----------------------------------------------------------------------|------------------------|
| 1   | Strength of material and parts:                                       | 10.2                   |
|     | Resistance to corrosion                                               | 10.2.2                 |
|     | Properties of insulating Materials:                                   | 10.2.3                 |
|     | Thermal Stability                                                     | 10.2.3.1               |
|     | Resistance to abnormal heat and fire due to internal electric effects | 10.2.3.2               |
|     | Resistance to ultra-violet (UV) radiation                             | 10.2.4                 |
|     | Lifting                                                               | 10.2.5                 |
|     | Mechanical impact                                                     | 10.2.6                 |
|     | Marking                                                               | 10.2.7                 |
| 2   | Degree of protection of enclosure                                     | 10.3                   |

|    |                                                                                                      |        |
|----|------------------------------------------------------------------------------------------------------|--------|
| 3  | Clearances                                                                                           | 10.4   |
| 4  | Creepage distances                                                                                   | 10.4   |
| 5  | Protection against electric Shock and integrity of Protective circuits:                              | 10.5   |
|    | Effective continuity between The exposed conductive parts of the ASSEMBLY and the protective circuit | 10.5.2 |
|    | Short-circuit withstand strength of the protective circuit                                           | 10.5.3 |
| 6  | Dielectric properties:                                                                               | 10.9   |
|    | Power-frequency withstand Voltage                                                                    | 10.9.2 |
|    | Impulse withstand voltage                                                                            | 10.9.3 |
| 7  | Temperature-rise limits                                                                              | 10.10  |
| 8  | Short-circuit withstand strength                                                                     | 10.11  |
| 9  | Electromagnetic compatibility (EMC)                                                                  | 10.12  |
| 10 | Mechanical operation                                                                                 | 10.13  |

2) Type Test for Porcelain Fuse as per IS 2086/1982 and its latest Amendment, and for 200 A Kit Kat fuse the tests shall be as per Annexure - A

3) Type test report for Switch Disconnecter as per IS/IEC60947 (all parts) or its latest amendments. The test sequence shall be strictly as per Annexure B.

(B) The Bidder shall have to give Type test certificate for the components being used along with the offer. For the Type test on complete box as per clause 5A (1) the Bidder shall have to give confirmation in the event of Order bidder will give Type test on the Box without effecting Delivery Schedule.

(C) **Acceptance Tests of Lot:**

Following acceptance tests shall be carried out while inspecting lot of materials offered. The following tests shall be carried out on **2% (two percent) of the offered quantity on sample boxes selected randomly.**

1) **The min. offered lot shall be 25% of quantity ordered.** The fifth and onward visit of inspection of Lot shall be on chargeable bases and actual

Rail/Road/Air fare as the case may be, shall be recovered for To & Fro journey from firm. Necessary accommodation to be provided to the engineer visiting for inspection.

- (D) The samples to be taken for tests shall be 2% (two percent) of the total quantity of the offered lot, selected randomly by the Inspector of DISCOM under GUVNL. They should be subjected to acceptance tests mentioned as above. In case of brought out items like Porcelain Fuse Units etc. the same have either tested at firm's works or at the works of original principle manufacturer at supplier's cost. In case the requisite testing facility is not available at firm's works or at original manufacturer works. Then the samples are to be getting tested at Government approved laboratory such as CPRI, NPL, ETDC, ERDA, and ERTL etc. approved laboratories at party's cost. All these tests are to be carried out in presence of Inspector of MGVL and all testing charges are to be borne by the firm only. Temperature rise test shall be taken on one sample from each lot offered for inspection.
- (E) In case of inspection/testing of loose Porcelain Fuse units or disconnector switch is carried out at the manufacturer's works for acceptance tests, the following shall be sampling criteria -
- (1) 2% (two percent of the total offered quantity). From the lot offered minimum 3 pieces shall be taken for type test. The cost of which shall be borne by the bidder. If the facilities not available the same shall be carried out at ERDA, ERTL, ETDC, NPL etc. of any Govt. approved lab or NABL accredited laboratory at the cost of bidder. In case the sample does not confirm any of the test the whole lot shall be rejected and the firm will have to offered the fresh lot, this is applicable to the equipments/materials offered for inspection.

**7. Routine Tests:**

Routine Test to be carried out on all L.T. Dist. Boxes completely including Porcelain Fuse Units or disconnector and as per Annexure 'A'. All results to be entered in separate register to be shown to inspector visiting for inspecting/testing of particular offered lot.

**8. Drawing & Calibration of Instruments**

- (A) The tenderer shall submit detailed constructional and dimensional drawing of complete distribution box with details of Porcelain Fuse Units and Disconnector bus bar, incoming and outgoing circuit details, clearance details along with the offer.
- (B) The firm has to submit list of testing equipment's instruments, stating Sr. No. Make, Capacity, date of last calibration along with test certificate of each instrument along with the offer, same is also required to be provided to inspecting officer at the time of prototype inspection as well as regular lots. The calibration shall be either from original manufacturer of the equipment's / instruments or from Government approved laboratory.
- (C) The following technical details be furnished for Porcelain Fuse Units as well as disconnector switch along with the offer.
- 1) Make/Trade Mark
  - 2) Name and full address of Supplier
  - 3) Basic rating in Amp
  - 4) Rated Voltage in volts
  - 5) Continuous current carrying capacity

- 6) Rupturing capacity in KA and in Amp category Type of mechanism Main and neutral bus bar details Earth leakage if any with size in mm. Type of Disconnecter Switch maintenance free.

**9) Prototype:**

The successful tenderer shall have to offer 1 No. Prototype box for carrying out tests mentioned at specification clause no 6 (c) at their works or at Government approved Laboratory, where no adequate testing facility is available at firm's work in presence of Board's representative. In case of brought out items like Porcelain Fuse Units / Disconnecter switch the same have to be either tested at firm's work or at the works of original manufacturer or at Government approved / recognized laboratory in case of non-availability of adequate testing facility either at firm's works of original manufacturer .However all the testing expenditures of prototype sample testing. Acceptance tests for routine inspection of lots will be borne by the firm only after successful passing of the prototype unit in all the tests and after obtaining the written approval from the competent authority of MGVCL. For prototype box and drawing approval, the firm can commence bulk manufacturing of the ordered boxes. The expenses towards prototype test including visit of our Engineers (2 Nos.) other than your works shall be borne by the bidder.

(A) Quantity ordered for a successful tenderer on whom order is placed and this sample will be allowed to be despatched with the last lot of supply. Any modification, rectification of defects etc. will also have to be carried out along with necessary testing on this sample box for all acceptance tests.

**(B) Tenders Samples**

The tenderer shall have to submit one tender sample of each rating offered of L.T. Dist. Box fitted with all the accessories like Porcelain Fuse Units, bus bar, etc. duly tested as per the tender specifications or Disconnecter switch with porcelain fuse unit on or before the date of opening of tender. Tenderer offering additional alternative makes of bought out items viz. Porcelain Fuse Units and Disconnecter Switch etc. shall submit a sample of the box with each alternative brand for each rating offered. The tender without sample or delayed submission of sample will be out-rightly rejected and offer will not be considered neither for technical evaluation nor for price bid consideration. The tender sample will be returned back on whom order is not placed. It will be responsibility of bidder to collect the tender sample within 10 days on receipt of letter from ACE (Procurement) MGVCL. The company is not responsible for any damage or loss of parts etc. if found short during collection of tender sample. If bidder is not lifting the tender sample on receipt of letter from MGVCL, then company will not be responsible for its safe custody. The tender sample will be considered as a part for the successful bidder and after successful passing in all tests, it will be allowed for despatch at the destination, allotted by the company along with the last lot. Supplier has to carry-out all modifications/rectification at his cost suggested by the company on this sample box. The tender samples as per specifications will have to be submitted on or before scheduled date and time of submission of physical bid of the tender to Dy. Engineer (Store), MGVCL, Lalbaug Division Store, Vadodara failing to which the offer is liable for rejection/ignore.

**10) Guarantee**

The tenderer quoting other brand / make of switch disconnecter / Porcelain fuse units or any part provided in the LT Dist. Box and complete LTDB /equipment supplied shall be guaranteed for a period of 18 months from the date of dispatch and or 12 months from the date of commissioning whichever is earlier. The Stores / materials as above found defective or not meeting requirement of specifications within above guarantee period shall be replaced / repaired duly tested by the supplier free of cost within one month of receipt of intimation.

**11) Deviation from Specification**

No deviation from specification shall be permitted. The offers with deviations shall be rejected.

**12) Testing and Manufacturing Facilities**

The tenderer must clearly indicate what testing facilities are available in the works of manufacturer and whether the facilities are adequate to carry out all Routine, and Acceptance Tests. These facilities should be available to MGVCCL's Engineers, if deputed to carry out or witness the tests in the manufacturers to carry out the acceptance tests on the Box. All testing equipment shall be duly calibrated in Govt. / NABL approved laboratory.

**13) Minimum Manufacturing Facility:**

The tender should have following minimum manufacturing facilities to prove his reliability as a manufacture of L.T. Distribution Boxes.

- i) Power operated shearing machine,
- ii) Power operated press brake,
- iii) Power operated power presses,
- iv) Welding machines
- v) Air compressor with spray painting facilities.
- vi) 7 tank chemical & mechanical surface treatment process,
- vii) Assembling tools and
- viii) Drilling Machine (Hand & Table
- ix) Grinder (for surface cleaning)
- x) Facility of Own or Details of sub Vendor having such Powder coating facility.

**14) Minimum Testing Facility**

The tender should have following minimum testing facilities to prove his reliability for supplying good quality manufacturer of L. T. Distribution Box.

- 1. Low voltage High current source.
- 2. H. V. tester
- 3. Megger
- 4. Contact resistance test
- 5. Measuring Instruments like Vernier & Micrometre etc.
- 6. Test equipments related for checking of PH value of solutions utilized in seven tank surface treatment.

**15) Tenderer has to submit document along with his offer, as per clause no. 3 to14 otherwise offer will be considered rejected. Tenderer has also specified manufacturing & supply capacity in qty. for the tendered items from last 5 years from the due date of the tender.**

**16) Factory Inspection:**

Factory inspection shall be carried out with respect to testing and manufacturing facilities factory inspection of works of manufacturer will be carried out by the Board officer for technical evaluation of their offer wherever desired.

## Annexure: “A”

**(1) Calibration of Instruments:-**

The firm has to submit the list of testing equipment's/instruments stating Make, capacity, date of last calibration along with certificate etc. to the inspecting Engineer of MGVL. The calibration should be either from original manufacturer of the equipment/instruments or from the Government approved laboratory.

**(2) ACCEPTANCE TESTS:**

**(a) Visual Examination:**

The L.T. Dist. Box will be inspected visually externally and internally for proper Powder coating layer, fittings of all the components in accordance with MGVL Specification, drawing and relevant IS.

**(b) Verification of dimensions:**

Verification of dimensions, external/internal clearances, will be carried out as per technical specifications and approved drawing.

**(c) Verification of fittings:**

Components like Porcelain Fuse Units, bus bars, neutral links and other fittings will be verified as per technical specification and approved drawings.

**(d) High Voltage Withstand Test at 2.5 KV:**

The Voltage of A.C. 2.5 KV RMS as per IS:61439 table No.8, 50 Hz. Shall be applied for one minute as follows:

**For Porcelain Fuse Units and bus bars:**

**(A) With all the Contacts closed.**

(i) Between each pole and all other poles.

(ii) Between all live parts of the poles connected together and earth.

**(B) With all the contacts open:-**

(i) Between incoming terminals and outgoing terminals of Porcelain Fuse Units.

There shall not be any puncture or flasher during this test. Following this test, the IR test shall be taken and values observed shall not be less than 10 M-Ohm.

**(e) Insulation Resistance Test:**

The IR Value shall be measured with megger of 2500 Volt DC Voltage between terminals as mention in the high voltage test. The ILR Value shall not be less than 10 Meg. Ohm.

**(f) Earth Continuity Checking Test:**

Earth continuity shall be checked by megger between two earthing terminals brought out on either side of Dist. Box.

**(g) Mechanical Operations:**

Mechanical operation shall be subjected to 200 cycles as per clause no 10.13 of IS:61439 Switch disconnector & Kit-kat Fuse shall be subjected to 10 No. of “ON” & “OFF” operations.

**(h) Temperature Rise test:**

Test carried out as per IS/IEC:61439 (Annexure D)

**(I) Effective continuity between the expose conductive parts of the assembly and the protective circuit as per IS/IEC:61439 (Annexure D)**

**GENERAL:**

Although samples selected at random by MGVCCL's Inspector at supplier's works, passes the acceptance tests conducted and lot accepted the MGVCCL reserves the right to test the boxes after receipt at destination by arranging testing at any Government approved Laboratory. However, in the event of samples failing in the tests, or the material found defective the supplier shall replace such material free of cost at the destination concerned on receipt of intimation from Company.

**(4) Routine Tests:**

The following Routine Tests shall be conducted by the manufacturer as per IS/IEC: 61439-I & II:2011 clause no. 11.2 to 11.10 on each lot and will keep record inform of register at manufacturer/Firm's works and will show to the inspector for checking purpose.

- (1) Degree of protection of enclosure
- (2) Clearance and creepage distances
- (3) Protection against electric shock and integrity of protective circuits
- (4) Incorporation of built-in components
- (5) Internal electric circuits and connections
- (6) Terminals for external conductors
- (7) Mechanical operation
- (8) Dielectric properties
- (9) Wiring operational performance & function

All the routine tests shall be as per IS/EC.60947 (P.1, 2&3)& IS/IEC 61439-I & II:2011 with latest amendment/revision if any. The tenderer shall submit general layout drawing of the box fitted with all accessories, keeping in view this specification & relevant IS nos. mentioned herein this specification. With special clearances, details of cables, bus bar details, Porcelain Fuse Units etc., with certified copies of type test certificates along with attested copies of all drawings, copy of guaranteed technical particulars along with the offer without which offer is liable to be rejected.

**MANUFACTURER'S NAME AND ADDRESS  
GUARANTEED TECHNICAL PARTICULARS**

**PART: "A"**

Bidders has to confirm following important requirements.

| Sr No    | Particulars                                                                                                                                                                                                                                                                | Confirmation |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>A</b> | <b>Outgoing circuit</b>                                                                                                                                                                                                                                                    |              |
| 1        | KIT KAT fuse conforming to IS:2086/1993 with latest amendment/revision                                                                                                                                                                                                     |              |
| 2        | Utilization category - A                                                                                                                                                                                                                                                   |              |
| 3        | Uninterrupted rated duty                                                                                                                                                                                                                                                   |              |
| <b>B</b> | <b>Incoming Circuit</b>                                                                                                                                                                                                                                                    |              |
| 1        | Three pole switch disconnecter confirms to IS/IEC: 60947(P. 1,2,3) of 2004, 2003 & 1999 respectively with latest amendment/revision                                                                                                                                        |              |
| 2        | Manual independent quick make - quick break mechanism utilization category AC 23A                                                                                                                                                                                          |              |
| 3        | Uninterrupted rated duty                                                                                                                                                                                                                                                   |              |
| 4        | Making / breaking capacity not less than the requirement of AC23A AS PER RELEVANT IS/IEC: 60947 (P1&3) with latest amendment/revision                                                                                                                                      |              |
| 5        | Basic rating (A) for 25/63/100 kVA - 100/200/250 Amps (Min)                                                                                                                                                                                                                |              |
| 6        | Short time withstand capacity<br>(A) For 25/63/100 KVA - 7.5 KA FOR 1 sec                                                                                                                                                                                                  |              |
| <b>C</b> | <b>Complete Box</b>                                                                                                                                                                                                                                                        |              |
| 1        | 25/63/100KVA L.T. Dist. Box shall be supplied as per technical specification as per attached drawing.                                                                                                                                                                      |              |
| 2        | Dist. Box shall withstand rated short time current for one second as per IS/IEC61439-I&II:2011 with latest amendments/revisions if any. (Including phase bus bar and neutral bus bar).<br>For 25KVA L.T.D.B. 7.5 KA One second<br>For 63/100KVA L.T.D.B. 7.5 KA One second |              |

## PART 'B' (FOR 25/63/100 KVA L.T.D.B.)

Bidder has to furnish below details about material.

| Sr No | <u>P A R T I C U L A R S</u>                     | PORCELAIN FUSE UNITS |       |       | SWTICH DISCONNECTOR BASIC RATING AMP. |     |     |
|-------|--------------------------------------------------|----------------------|-------|-------|---------------------------------------|-----|-----|
|       |                                                  | 63 A                 | 100 A | 200 A | 100                                   | 200 | 250 |
| 1     | Make/Trade Make                                  |                      |       |       |                                       |     |     |
| 2     | Name & Full address of Supplier                  |                      |       |       |                                       |     |     |
| 3     | Basic rating in Amp.                             |                      |       |       |                                       |     |     |
| 4     | Rated voltage in Volts.                          |                      |       |       |                                       |     |     |
| 5     | Continuous current carrying capacity in Amps     |                      |       |       |                                       |     |     |
| 6     | Rupturing capacity in kA and category            |                      |       |       |                                       |     |     |
| 7     | Percentage overload carrying capacity            |                      |       |       |                                       |     |     |
| 8     | Size of main bus bar                             |                      |       |       |                                       |     |     |
|       | For 25 KVA L.T.D.B.                              |                      |       |       |                                       |     |     |
|       | For 63 KVA L.T.D.B.                              |                      |       |       |                                       |     |     |
|       | For 100 KVA L.T.D.B.                             |                      |       |       |                                       |     |     |
| 9     | Size of neutral bus bar                          |                      |       |       |                                       |     |     |
|       | For 25 KVA L.T.D.B.                              |                      |       |       |                                       |     |     |
|       | For 63 KVA L.T.D.B.                              |                      |       |       |                                       |     |     |
|       | For 100 KVA L.T.D.B.                             |                      |       |       |                                       |     |     |
| 10    | Current density of aluminium bus bar per Sq. mm. |                      |       |       |                                       |     |     |
| 11    | 1)FOR 25/63/100 KVA L.T.D.B (L x B x H)          |                      |       |       |                                       |     |     |

## 7 TANK TREATMENT PROCESS

Painting of Low tension distribution box shall be carried out after the surface treatment of sheet steel shall be completed as per 7 tank surface treatment process stated below.

### 1 **Degreasing**

This achieved by immersing in alkaline base solution degreasing bath. It removes dirt, grease, oil, like deposits of the dipped parts.

### 2. **Water Rinse**

Rinse in cold water, water should be clean, fresh and continuous overflowing. It removes all loose impurities form the part surface.

### 3. **De-rusting/pickling**

This is achieved by immersing in diluted phosphoric base acid. It removes rust from the surface of sheet metal.

### 4. **Water Rinse**

Rinse in cold water, water should be clean, fresh and continuous overflowing. It enables to wash out all rust and acid form the surface of sheet metal.

### 5. **Phosphatizing**

Immerse in zinc base phosphatizing solution for about 20 minutes. The uniform zinc base phosphatizing solution forms shiny, smooth and crystalline zinc coating on the part. It enables to accelerate the phosphatizing process.

### 6. **Water Rinse**

Rinse in cold water, water should be clean, fresh and continuous overflow. It removes the excessive contaminations of phosphatized part.

### 7. Seal the above phosphate coating with diluted chromic acid base solution.

Dry the surface of sheet metal with compressed air.

#### **PROPERTIES OF THE CHEMICAL SOLUTION:**

PH value of alkaline base solution : 10-10.5

PH value of phosphoric base acid : 2-3

PH value of zinc base phosphatizing solution : 2-4

PH value of chromic acid base solution : 3-3.5

## Annexure: A

(Type test sequence for Kit Kat Fuse) IS-2086with latest amendment/revision

| (A) Mechanical Test Sequence                         |            |                               |                |                                |
|------------------------------------------------------|------------|-------------------------------|----------------|--------------------------------|
| Sr No                                                | Clause No. | Tests                         | For 63 & 100 A | For 200 A                      |
| 1                                                    | 9.1        | Visual Examination            | As per IS      | As per specification           |
| 2                                                    | 9.2        | Test for dimension            |                | As per drawing                 |
| 3                                                    | 9.3        | Test for mechanical endurance |                | 100 Test cycles                |
| 4                                                    | 9.4        | Test for mechanical strength  |                | Min 250g. Max. 275 metal piece |
| 5                                                    | 9.5        | Test for withdrawal force     |                | Min 147N Max-686 N.            |
| (B) Electrical Test Sequence                         |            |                               |                |                                |
| Sr No                                                | Clause No  | Tests                         | For 63 & 100 A | For 200 A                      |
| 1                                                    | 9.6        | Test for Temp. rise           | As per IS      | 65 Degree C                    |
| 2                                                    | 9.7        | Insulation Resistance         |                | 500 V DC $\geq 100\Omega$      |
| 3                                                    | 9.8        | High Voltage Test             |                | 2.5 KV for 1 minute            |
| 4                                                    | 9.9        | Test for breaking capacity    |                | Min 4 KA at $\leq 0.4$ pf      |
| (C) Test for proving material properties             |            |                               |                |                                |
| Sr No                                                | Clause No  | Tests                         | For 63 & 100 A | For 200 A                      |
| 1                                                    | 9.11.1     | Test for Temp. Cycle          | As per IS      |                                |
| 2                                                    | 9.11.2     | Water Absorption Test         |                | Max. water absorb $\leq 2.0$   |
| (D) Chemical Composition tests as per specification. |            |                               |                |                                |

**Annexure: B**  
**(Type test sequence for Switch Disconnecter)**  
**SWITCH DISCONNECTOR**

Utilization category AC-23A

Rated Short time withstand current - 7.5 KA rms for 1.0 second with initial peak of 12.75 KA

**(A) Test sequence - I (General Performance Characteristics) IS/IEC: 60947 Part 3 with latest amendment/revision**

| Sr No | Clause No. | Tests                          |
|-------|------------|--------------------------------|
| 1     | 8.3.3.1    | Temp. rise                     |
| 2     | 8.3.3.2    | Die Electric properties.       |
| 3     | 8.3.3.3    | Making and Breaking capacities |
| 4     | 8.3.3.4    | Die Electric verification      |
| 5     | 8.3.3.5    | Leakage current                |
| 6     | 8.3.3.6    | Temp. Rise verification        |
| 7     | 8.3.3.7    | Strength of actuator mechanism |

**(B) Test sequence - II (Operational Performance Characteristics) IS/IEC: 60947 with latest amendment/revision**

| Sr No | Clause No. | Tests                     |
|-------|------------|---------------------------|
| 1.    | 8.3.4.1    | Operational Performance   |
| 2.    | 8.3.4.2    | Die Electric verification |
| 3.    | 8.3.4.3    | Leakage current           |
| 4.    | 8.3.4.4    | Temp. Rise verification   |

**(C) Test sequence -III IS/IEC60947 (Short Circuit Performance capability )with latest amendment/revision**

| Sr No | Clause No. | Tests                          |
|-------|------------|--------------------------------|
| 1     | 8.3.5.1    | Short time withstand current   |
| 2     | 8.3.5.2    | Short Circuit making capacity. |
| 3     | 8.3.5.3    | Die Electric verification      |
| 4     | 8.3.5.4    | Leakage current                |
| 5     | 8.3.5.5    | Temp. Rise                     |