MATERIAL SPECIFICATION CELL

TECHNICAL SPECIFICATION
OF

LT (FIXED) SHUNT CAPACITOR UNITS (MPP TYPE)
OF 25/30 KVAR CAPACITY
FOR 63/100KVA DISTRIBUTION TANSFORMERS

TECHNICAL SPECIFICATION OF LT (FIXED) SHUNT CAPACITOR UNITS (MPP TYPE) FOR DISTRIBUTION TRANSFORMERS

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1.00 SCOPE:

The specification covers supply of 440 V, 3 Phase delta connected 50 Hz, outdoor, MPP type LT capacitor units of ratings 25 & 30 kVAr intended for improvement of power factor and to be installed on LT side of Polyphase Distribution Transformer of rating 63/100 kVA.

It is not the intent to specify completely herein all the details of design and construction of the capacitor unit. However, the capacitor shall conform to the high standards of design and workmanship mentioned in Clause No. 4 & 5 and be capable of performing continuous and satisfactory operations in the actual service conditions at site and shall have sufficiently long life in service as per statutory requirements. The purchaser shall have power to reject any work or material which in his judgment is not in accordance therewith. The capacitor offered shall be complete with all parts necessary for their effective & trouble free operation. Such components shall be deemed to be within the scope of supplier's supply irrespective of whether they are specifically brought out in the specification and commercial order or not.

The tenderer shall bind himself to abide by these considerations to the entire satisfaction of the purchaser and will be required to adjust such details at no extra cost to the purchaser over & above the tendered rates and prices.

In actual practice, not withstanding any anomalies, discrepancies, omissions, in-completeness, etc. in these specifications, the design and constructional aspects, including materials and dimensions, will be subject to good engineering practice in conformity with the required quality of the product, and to such tolerances, allowances and requirements for clearances etc. as are necessary by virtue of various stipulations in that respect in the relevant Indian Standards, IEC standards, I.E. Rules, I.E. Act and other statutory provisions.

2.00 APPLICABLE STANDARDS:

Unless otherwise stipulated in the specifications, capacitors shall be complying with the latest version of IS 13340:2012 & IS 13341:1992 or IEC 60831-1(with latest version amendments).

LT shunt capacitor meeting any other authoritative standard which ensure equal or better quality than standard mentioned above will also be acceptable but in such cases, a copy of standard (English version) adopted, should be enclosed with the tender.

3.00 OPERATING CONDITIONS:

i)	Installation	Outdoor (to be located on LT side of 63/100kVA Distribution Transformer)
ii)	Ambient Temperature	-10 Deg. C to +50 Deg. C
iii)	Altitude	Not exceeding 1000 meters above sea level

4.00 ELECTRICAL CHARACTERISTICS & FEATURES:

GENERAL REQUIREMENT:

Capacitors of rating 25 & 30 kVAr shall be of Three Phase having metalized (Silver, Zinc, Aluminum) polypropylene (MPP) type material complying with IS: 13340-2012, IS 13341-1992, or IEC 60831-1 (with latest version amendments). Capacitors shall be protected by internal fuses as per IS 12672-1989. Capacitors shall be ISI marked.

The capacitor unit shall be Heavy Duty with modular construction and provided with suitable device per module (inductor coil) to control the inrush current. The capacitor shall have self-healing property & each module shall have the pressure sensitive safety device/ internal fuse elements and shall be suitable for 200 times rated current to take care. The capacitor unit shall be self-cooled totally vermin proof & suitable for outdoor use.

The material used in the capacitor unit shall be of superior quality. Three terminals of the capacitor unit shall be covered with suitable enclosure cover on which MCB of suitable ratings will be clamped/fixed. Connections from the capacitor unit shall be brought out to the MCB. There should be provision for cable entry from bottom for connection of MCB to LT side of the Distribution Transformer. Three Nos. LED indicators shall be provided on the container to be connected between MCB and capacitor for indicating the working status on each phase of the capacitor unit. LED indicators may be provided across a suitable series resistance to indicate failure of capacitor. The capacitor container shall be provided with a clearly marked earth terminal.

The capacitor shall be provided with discharge resistor, which will discharge capacitor when switched off to less than 75V in three minute. In addition a suitable mechanism should be provided for verifying the status/working condition of Capacitor unit. (LED's etc).General requirement is as follows.

Sr. No.	Particulars	Requirements
1	Rated voltage	440 Volts
2	Rated frequency	50 Hz
3	Rated kVAr	25, 30 kVAr, 440V (poly phase)
4	Phase & Connections	3-phase Delta connected
5	Maximum over voltage	1.1 times Rated Voltage for Max. duration 8 hrs. in every 24 hrs
		1.15 times Rated Voltage for Max. duration 30 min. in every 24 hrs
6	Maximum over current	1.5 times Rated Current
7	Capacitance tolerance	-5% to 10%
8	Temperature	- 25◦C to 50◦ C
9	Loss (Watts/kVAr)	0.5 Watts/kVAr (Max.)
10	Max. ambient temperature	50◦C

11	Max. average temperature over 24 hrs.	40◦ C
12	Discharge devices	Discharge voltage less than 75V within three minute
13	Life expectancy	100000 Hrs.
14	Insulation level	3 kV
15	Reference standards	IS: 13340-2012, IS 13341-1992, IS12672-1989, IEC 60831-1

RATED VOLTAGE:

The rated voltage shall be 440 volts with fluctuation in supply voltage as specified in IS: 585-1962 and IS:12360 (with latest amendment) and shall not affect the normal working of the equipment.

PERMISSIBLE OVERLOADS:

1) Permissible overload should be as per IS: 13340-2012.

i) Voltage: The permissible over loads shall not exceed the limits set by IS 13340-2012.

ii) Current: Capacitor shall be suitable for continuous operation at R.M.S. line current of 1.30 times, the current that occurs at rated sinusoidal voltage and rated frequency excluding transients.

DIELECTRIC:

The capacitor elements should be wound in Metalized polypropylene film. The capacitor unit shall be self-cooled. Dielectric consists of three layer metalized (Silver, Zinc, Aluminum) polypropylene (MPP) with heavy edge.

IMPREGNATION:

The elements shall be impregnated with a impregnant which has been completely refinished and degasified so as not to have any deterioration of the dielectric material. The impregnant used shall have high dielectric constant, low viscosity and high chemical stability. The impregnant should be NPCB (Non - poly chlorinated Biphenyl) with low RAPID BIO DEGRADATION AND LOW TOXICITY and should be non - oxidizing and especially suitable for capacitors.

HOUSING FOR CAPACITOR UNIT

The Housing in CRCA sheet steel (Square Type or Cylindrical type) enclosures fully metal with 2 mm thick & shall be coated with weather proof & corrosion resistant paint of dark admiral grey shade OR the housing with SMC box conforming to IS - 13410 with thickness of enclosure not less than 2 mm.

HOUSING ASSEMBLY:

Where more than one units are used these individual units should be housed in metallic enclosure (square type) made of minimum 2 mm thick CRCA sheet with proper ventilation and with front-hinged door to enable the easy maintenance and replacement in case of damage of any units. Only three terminals shall be brought to the individual

MCB of suitable ratings, which are clamped in the enclosure on the back sheet. There should be provision for cable entry.

The outside of the enclosure should have smooth and tidy look and shall be coated with weather proof & corrosion resistant paint of dark admiral grey shade. There should be proper provision for clamping so as to mount the metallic enclosure on the transformer pole structure. Proper cable glands wherever necessary should be provided. The maximum length of the cable required shall be 5 mtrs/ Installation & the same shall be supplied by the supplier. Lugs of proper size shall be crimped to the cable.

MCBs:

TP type MCBs being provided shall be of appropriate rating as per the rating of the capacitor. The MCBs shall be suitable for capacitor switching duty ('D' Curve) & shall conform to IS: 8828-1995 / IEC: 60898. Type test for MCB shall be submitted alongwith offer. Interconnection wire between capacitor to MCB shall be of flexible copper wire of suitable size.

The typical rating of MCB and PVC Cable are as given below

Rating of capacitors	Rating of MCB	Interconnection wire between capacitor to MCB	Connection between MCB to Transformer
25 kVAr	63 Amps,3P, 10KA MCB ('D' Curve)	10 SQ. MM, Copper , FR Grade wire (ISI marked)	16 Sq. mm PVC insulated, Unarmored Aluminum . 3 core, Cable (ISI marked)
30 kVAr	100 Amps,3P, 10KA MCB ('D' Curve)	10 SQ. MM, Copper , FR Grade wire (ISI marked)	25 Sq. mm PVC insulated, Unarmored Aluminum . 3 core, Cable (ISI marked)

BUSHINGS:

Ceramic /porcelain or FRP fiberglass to ensure good insulation with threaded M.S. Tin terminals are to be provided. Also to provide copper cable of length 5 metres, 16 sq.mm for connections.

RATING PLATE:
The following information shall be marked indelibly, either directly or by means of a plate, on each capacitor unit in accordance with Cl. No. 26.1 of IS: 13340 (Part 1)-2012.

a) Reference IS :
b) Name of manufacturer :
c) Type of capacitor :
d) Serial No. & year of manufacture :
e) Rated output in kVAr :
f) Rated voltage in Volts :
g) Rated frequency :
h) Temperature Category:
i) Discharge device shall be indicated by wording or the symbol ----------

or by the rated resistance in kilo-ohms or megaohms; the symbols I or E shall be used for internal or external discharge device and IC for inductive coil when provided in the capacitor

j) Reference to self healing design; SH or # or "self healing" and type of dielectric MPP
k) Connection Symbol as per Cl. No. 26.2 of IS:13340 (Part 1) -2012
l) Internal fuses, if included shall be indicated by wording or by symbol
m) Insulation level Ui in kV
n) Symbol for over pressure disconnector
o) The words "PROPERTY OF M.S.E.D.C.L" shall be marked cautiously on the outer enclosure of capacitor unit with legible marking along with details of Purchase Order No., date, rating etc.

SAFTY REQUIRMENTS:

1)Capacitor unit shall be provided with directly connected discharge device as per IS: 13340-2012 (with latest amendment)
2)The discharge device shall reduce the residual voltage from the crest value of the rated voltage to 75 V or less within three minute after the capacitor is disconnected from the source of supply.
3)Earth Connection: The Capacitor Container shall be provided with as suitable earth terminal clearly marked. It should be suitable to take up a lug suitable for 10 Sq.mm conductors with a bolt hole dia. of 10 mm.

5.00 TESTS:

TYPE TESTS:

All the Type Tests indicated at Cl. No. 6.2 of IS: 13340 (Part 1)-2012 with latest amendments shall constitute the type tests. All the type tests shall be carried out at the laboratories accredited by National Accreditation Board of Testing and Calibration Laboratories (NABL) in accordance with the IS:13340 (Part 1)-2012 & the requirements specified in IS:13340 (Part 2)-2012/IS: 13341 1992 for ageing test, self healing test & destruction tests. The Type Tests should have been carried out within 10 years prior to the date of opening of tender. The tenderer shall submit following Type Test reports to the office of Chief Engineer (Testing) and get those approved as per Tender conditions.

i) Thermal Stability test
ii) Measurement of the Tangent of the loss angle($\mathrm{Tan}\delta$) of the Capacitor at elevated temperature
iii) Voltage Test between Terminals
iv) Voltage Test between Terminals and Container
v) Lightning Impulse Voltage Test between Terminals & Container
vi)Discharge test
vii)Ageing test
viii)Self healing test
ix)Destruction test

ACCEPTANCE TESTS:

The inspecting officer will carry out the following Acceptance Tests for MPP type capacitors as per IS 13340 (2012).

a) Visual Examination

b) Sealing Test
c) Measurement for capacitance and output
d) Insulation Resistance Test
e) Capacitor loss tangent (tan delta) measurement
f) A.C. Voltage Test between terminals
g) A.C. Voltage test between terminals & container
h) Test for discharge device

ROUTINE TESTS:

All individual capacitor units shall be subjected to the routine tests at the manufacturer's Works (at the cost of the manufacturer) for the detail tests specified in Cl. No. 6.1 of IS: 13340 (Part 1)-2012. A certificate detailing the results of such tests shall be furnished by the supplier along with inspection call to the purchaser.

TESTS AT SITE:

The purchaser reserves the right to conduct all or any of tests on LT shunt capacitors after arrival at stores/site and the contractor shall guarantee test certificate figures under actual service condition. The capacitor loss should not be more than 0.5 watts/kVAr. The bidder must indicate the loss of the capacitors offered without fail.

6.00 QUALIFYING REQUIREMENT – As per Tender

7.00 DRAWINGS:

The tender must accompany relevant catalogues and sectional drawings showing necessary details of equipments offered. One copy of dimensional drawing and internal construction drawing (on A3/A4 paper size only) should be submitted with tender. The successful tenderer will have to submit the detailed dimensions and internal construction drawings along with the samples to the C.E. (Testing) for his approval before the bulk supply. No extra period will be allowed in period and delivery schedule given to the tenderer.

8.00 INSPECTION:

The inspection may be carried out by the MSEDCL at any stage of manufacture. The successful Tenderer shall grant free access to the MSEDCL's representative at a reasonable time when the work is in progress. Inspection and acceptance of any equipment under this specification by the MSEDCL, shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment is found to be defective. The supplier shall keep the MSEDCL informed in advance, about the manufacturing programme so that arrangement can be made for inspection.

9.00 GUARANTEE:

Capacitor/MCB offered shall be guaranteed for a period of 24 months from the date of commissioning or 30 months from the date of supply whichever is earlier.

The supplier should keep sufficient stock at stores so that complaint can be attended within one week from the date of reporting.

The capacitor/MCB found defective within the above guarantee period shall be replaced/ repaired by the supplier free of cost; within one week of receipt of intimation. If the defective stores/material are not replaced/repaired within the specified period as above, the purchaser shall recover an equivalent amount plus 15% supervision charges from any of the bills of the suppliers.

10.00 PACKING:

The material shall be suitably packed for the safe dispatch to the consignee. The supplier shall be responsible for all the damages/losses due to improper packing. Replacement shall be made free of cost regarding material pointed out defective by consignee.

11.00 SCHEDULE

The tenderer shall fill in the following schedule which form part of tender Specification & offer. If the schedule is not submitted duly filled in with the offer, the offer shall be liable for rejection.

SCHEDULE 'A' – GUARANTEED TECHNICAL PARTICULARS

TECHNICAL SPECIFICATION OF LT (FIXED) SHUNT CAPACITOR UNITS (MPP TYPE) FOR DISTRIBUTION TRANSFORMERS

SCHEDULE – 'A'
GUARANTEED TECHNICAL PARTICULARS
LT (FIXED) SHUNT CAPACITOR UNITS (MPP TYPE)

Sr. No.	Particulars	MSEDCL Requirement	To be offered by Bidder
1.	Name of manufacturer, address & Trademark	To be specified by manufacturer	Text
2.	Type of capacitor	MPP Type	Text
3.	Rated out put in KVAR	25 kVAr / 30 kVAr	Text
4.	Country of manufacture	To be specified by manufacturer	Text
5.	Country of origin of Equipment	To be specified by manufacturer	Text
6.	Manufacturer's type & description	To be specified by manufacturer	Text
7.	Whether ISI Marked	Yes	Text
8.	Reference Standard	IS 13340 -2012 amended upto date	Text
9.	Rated Voltage of each capacitor unit in Volts	440 Volts	Text
10.	Rated Current in Amp	To be specified by manufacturer	Text
11.	Rated Frequency in Hz	50 Hz	Text
12.	Phase and connection	3-phase Delta connected	Text
13.	Type of protection	Internal Fuse Protection	Text
14.	Maximum over voltage		
	Max. duration 8 hrs. in every 24 hrs	1.1 x Rated voltage 440 V	Text
	Max. duration 30 min. in every 24 hrs	1.15 x Rated voltage 440 V	Text
15.	Maximum over current	1.5 times Rated Current	Text
16.	Insulation level	3 kV	Text
17.	Dielectric used	Metalized polypropylene	Text
18.	Type of impregnate used	NPCB (Non - poly chlorinated Biphenyl)	Text
19.	Max. temperature rise	To be specified by manufacturer	Text
20.	Hot spot temperature rise	To be specified by manufacturer	Text
21.	Capacitor loss in Watts/kVAR including Discharge resistor (Max. 0.5 watts/ kVAr)	(Max. 0.5 watts/ kVAr)	Text
22.	Material of container	CRCA sheet steel/SMC	Text
23.	Shape of container	Square/Cylindrical	Text
24.	Dimensions of metallic enclosure Diameter (mm)	To be specified by manufacturer	Text
25.	Dimensions of metallic enclosure Length (mm)	To be specified by manufacturer	Text

26.	Dimensions of metallic enclosure Breadth (mm)	To be specified by manufacturer	Text
27.	Dimensions of metallic enclosure Height (mm)	To be specified by manufacturer	Text
28.	Thickness of metallic enclosure (mm)	2mm	Text
29.	Shape of Basic element	To be specified by manufacturer	Text
30.	Is capacitor having self healing property	Yes	Text
31.	Thickness of film (Microns)	To be specified by manufacturer	Text
32.	No of film layers	Three	Text
33.	Voltage Stress (Volts/Microns)	To be specified by manufacturer	Text
34.	Voltage rating of each pack	To be specified by manufacturer	Text
35.	Capacitance of Capacitor Unit in microfarad	To be specified by manufacturer	Text
36.	Device used per module to control In rush current	Inductor Coil	Text
37.	Voltage Proof test (Test Voltage between terminals)	2.15xUn for 10 Sec	Text
38.	Voltage Proof test (Test Voltage between terminals and container)	3kV for 1 min.	Text
39.	Rating plate provided as per specification & relevant IS	Yes	Text
40.	Weight of each capacitor unit	To be specified by manufacturer	Text
41.	Whether all the Type Test reports as per Technical specification are submitted	Yes	Text
42.	Whether submitted drawings	Yes	Text
43.	Whether submitted Quality Assurance Plan	Yes	Text
44.	Whether submitted Test Certificate for raw material	Yes	Text