



MAHAVITARAN
Maharashtra State Electricity Distribution Co. Ltd.

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Draft SPECIFICATION NO. MSEDCL/ DIST:MSC-III/LT MPP CAP/11/2009/R0

SPECIFICATIONS FOR MPP TYPE L.T. CAPACITOR

UNITS OF

25 / 30 KVAR CAPACITY

(FOR 63 / 100 KVA DISTRIBUTION TRANSFORMERS)

(Approved on 28.10.2009)

**TECHNICAL SPECIFICATION FOR LOW TENSION (FIXED) SHUNT CAPACITOR UNITS (MPP TYPE) FOR
DISTRIBUTION TRANSFORMERS Spec. No. MSEDCL/Dist:MSC-III/ LT MPP CAP/11/2009/R0**

**TECHNICAL SPECIFICATION FOR LOW TENSION (FIXED) SHUNT CAPACITOR
UNITS (MPP TYPE) FOR DISTRIBUTION TRANSFORMERS
(Spec. No. MSEDCL/Dist:MSC-III/ LT MPP CAP/11/2009/R0)**

INDEX

Sr.No	Particulars	Page No
1.	Scope	3
2.	Operating Conditions	3
3.	Electrical Characteristics & Features	4-7
4.	Tests & Inspection	7
5.	Type Tests	7-8
6.	Acceptance Tests	8
7.	Routine Tests	9
8.	Qualifying Requirements	9
9.	Drawings and Catalogues	9
10.	Guarantee	9-10
11.	Packing	10
12.	Schedules	10
13.	Guaranteed Technical particulars Schedule 'A'	11-12
14.	Schedule of deviation from Specification Schedule 'B'	13
15.	Schedule of Tenderer's experience Schedule 'C'	14
16.	Schedule of deviation from specified test requirement Schedule 'E'	15

TECHNICAL SPECIFICATION FOR LOW TENSION (FIXED) SHUNT CAPACITOR UNITS (MPP TYPE) FOR DISTRIBUTION TRANSFORMERS

1.0 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. 3 & 4 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/ supplier 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, notwithstanding any anomalies, discrepancies, omissions, incompleteness, 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.

2.0 OPERATING CONDITIONS:

1)	Installation	Outdoor (to be located on LT side of 63/100 KVA Distribution Transformer)
2)	Ambient temperature	- 10° C to +50° C
3)	Altitude	Not exceeding 1000 meters above sea level.

3.0. ELECTRICAL CHARACTERISTICS & FEATURES:

3.1 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: 13340/1993, IS 13341/1992, or IEC 831-1 (**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 50V in one 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 12 hrs. in every 24 hrs 1.15 times Rated Voltage for Max. duration 30 min. in every 24 hrs
6	Maximum over current.	1.43 times Rated Current.
7	Capacity 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

TECHNICAL SPECIFICATION FOR LOW TENSION (FIXED) SHUNT CAPACITOR UNITS (MPP TYPE) FOR DISTRIBUTION TRANSFORMERS Spec. No. MSEDCL/Dist:MSC-III/ LT MPP CAP/11/2009/R0

Sr. No.	Particulars	Requirements
11	Max. average temperature value over 24 hrs.	40° C
12	Discharge devices.	Discharge voltage less than 50V within one minute.
13	Life expectancy	100000 Hrs.
14	Insulation level	3 KV
15	Reference standards.	IS: 13340/1993, IS 13341/1992, IS12672/1989, IEC 831-1

3.2 RATED VOLTAGE:

The rated voltage shall be 440 volts with fluctuation in supply voltage as specified in IS: 585/ 1962 and IS: 12360/ 1951 (with latest amendment) and shall not affect the normal working of the equipment.

3.3 PERMISSIBLE OVERLOADS:

1) Permissible overload should be as per IS: 13340/1993.

i) Voltage: Capacitor shall be suitable for prolonged operation at RMS voltage between terminals not exceeding 1.10 times the rated voltage as per IS13340/1993.

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 transit.

3.4 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.

3.5 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.

3.6 A. HOUSUNG 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.

B. 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. Copy of GA drawing is enclosed for reference. 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.

3.7 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. Approved make of MCB's shall be Siemens / Havells / Schnieder / Hagger (L&T) / Indo Asian etc. Type test for MCB shall be submitted before supply. 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	63 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)

3.8 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.

3.9 RATING PLATE:

The following information shall be marked indelibly, either directly or by means of a plate, on each capacitor unit in accordance with clause 10.1 of IS: 13340/1993.

**TECHNICAL SPECIFICATION FOR LOW TENSION (FIXED) SHUNT CAPACITOR UNITS (MPP TYPE) FOR
DISTRIBUTION TRANSFORMERS Spec. No. MSEDCL/Dist:MSC-III/ LT MPP CAP/11/2009/R0**

- 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 / # and type of dielectric MPP/MP
- k) Connection Symbol as per Cl. 10.2 of IS:13340 /1993
- l) Internal fuses, if included shall be indicated by wording or by symbol.
- m) Insulation level U_i in kV
- n) Symbol for over pressure disconnecter
- 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.

3.10 SAFTY REQUIRMENTS:

- 1) Capacitor unit shall be provided with directly connected discharge device as per IS: 13340/1993.(with latest amendment)
- 2) The discharge devise shall reduce the residual voltage from the crest value of the rated voltage to 50 V or less within one 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

4.0 TESTS AND INSPECTION:

4.1 TYPE TESTS:

All the tests indicated at Clause 12.2.2 of IS: 13340/1993 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: 13340/1993 & the requirements specified in IS : 13341/1993 for ageing test, self healing test & destruction tests. The detailed Type test reports have to be submitted to CE (Dist) for approval prior to the commencement of supply.

Type tests shall comprise of the following.

- i) Voltage Test between Terminals

TECHNICAL SPECIFICATION FOR LOW TENSION (FIXED) SHUNT CAPACITOR UNITS (MPP TYPE) FOR DISTRIBUTION TRANSFORMERS Spec. No. MSEDCL/Dist:MSC-III/ LT MPP CAP/11/2009/R0

- ii) A. C. Voltage Test between Terminals and Container
- iii) Thermal Stability Test
- iv) Capacitor Loss Tangent (Tan δ) measurement at elevated temperature.
- v) Self healing test
- vi) Lightning Impulse Voltage Test between Terminals & Container
- vii) Short Circuit Discharge Test.

In addition to the above following Special tests as per amendment 1 to IS:13340/1993 shall be carried out & submitted for approval.

- i) Ageing test
- ii) Destruction test

The tenderer shall furnish copies of type test reports as per relevant, IS, or the confirmatory tests as per the equivalent international standard as the case may be, for the equipments material offered along with the tender. The tenderer should note that the offers received without type test reports shall stand rejected.

The equipment offered shall be fully type tested as per the relevant standards for all the type tests specified in the IS at the testing laboratories accredited by National Accreditation Board of Testing and Calibration Laboratories (NABL). The offered equipments should be type tested prior to maximum five years before the date of opening of tender. In case the Tender is not accompanied by the type test Certificates Board reserves the right of cancel / reject the Tender.

4.2 ACCEPTANCE TESTS:

All the tests specified at Clause 12.3.1 of IS: 13340/1993 (with latest amendments) for MPP type capacitors shall constitute the acceptance tests as follows.

- i) Visual examinations.
- ii) Test for output and capacitance
- iii) Capacitor loss tangent (tan delta) measurement.
- iv) Insulation Resistance Test.
- v) A. C. Voltage test between terminals
- vi) A. C. Voltage test between terminals & container.
- vii) Test for discharge device.
- viii) Sealing test.

Sampling plan shall be as per Annex 'F' Clause 12.3 table 5 of IS: 13340/1993. The same is reproduced bellow.

SAMPLE SIZE & PERMISSIBLE NUMBER OF DEFECTIVES

Lot Size	Sample Size	Permissible no. of defectives
(1)	(2)	(3)
Up to 100	8	0
101 to 300	13	0
301 to 500	20	1
501 to 1000	32	2
1001 and above	50	3

TECHNICAL SPECIFICATION FOR LOW TENSION (FIXED) SHUNT CAPACITOR UNITS (MPP TYPE) FOR DISTRIBUTION TRANSFORMERS Spec. No. MSEDCL/Dist:MSC-III/ LT MPP CAP/11/2009/R0

4.3 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 Clause 12.1.1 of IS: 13340/1993. A certificate detailing the results of such tests shall be furnished by the supplier along with inspection call to the purchaser.

4.4 TESTS AT SITE:

The purchaser/Chief Engineer (Dist) 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.

5.0 QUALIFYING REQUIREMENT FOR BIDDER

The bidder should fulfill following qualifying requirements for participation in the tender and submit relevant document and evidence supporting each qualifying requirement along with the offer, failing which the offer shall be liable for rejection.

1. The bidder should have proven experience of not less than 2 years for supply of capacitors / materials offered for equal or higher KVAr rating and 50 % of the quantity supplied shall be in successful operation for more than 1 year. Documentary evidence duly audited by chartered accountant shall be enclosed along with offer.
2. The bidder shall furnish valid type test certificate for 25 KVAr or above rating, 440 V, 3 phase capacitors, as per IS: 13340/1993 carried out from the NABL accredited laboratory. Type test certificate should not be older than 5 years as on the date of opening the tender.

6.0 DRAWINGS AND CATALOGUES:

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. (Dist) for his approval before the bulk supply. No extra period will be allowed in period and delivery schedule given to the tenderer.

7.0 GUARANTEE:

Capacitor/MCB offered shall be guaranteed for a period of 12 months from the date of commissioning or 18 months from the date of supply whichever is earlier.

**TECHNICAL SPECIFICATION FOR LOW TENSION (FIXED) SHUNT CAPACITOR UNITS (MPP TYPE) FOR
DISTRIBUTION TRANSFORMERS Spec. No. MSEDCL/Dist:MSC-III/ LT MPP CAP/11/2009/R0**

The contractor 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 board shall recover an equivalent amount plus 15% supervision charges from any of the bills of the suppliers.

8.0 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.

9.0 SCHEDULES:

The tenderer shall fill in the following schedules, which form the part of tenderer specification and after. If the schedules are not duly filled in with the offer, the offer shall be liable for rejection.

Schedule 'A' Guaranteed Technical particulars.

Schedule 'B' Schedule of deviation from Specification.

Schedule 'C' Schedule of Tenderer's experience.

Schedule 'E' Schedule of deviation from specified test requirement.

SCHEDULE-A

GUARANTEED TECHNICAL PARTICULARS OF MPP TYPE

L. T. FIXED CAPACITOR UNITS

Sr. No.	Parameter Name	Parameter type
1.	Type of capacitor	Text
2.	Rated out put in KVAR	Text
3.	Name of the Manufacturer & Trademark	Text
4.	Country of manufacture	Text
5.	Country of origin of Equipment	Text
6.	Manufacturer's type & description	Text
7.	Whether ISI Marked	Boolean
8.	Reference Standard (IS: 13340/1993) with latest amendment if any	Text
9.	Rated Voltage of each capacitor unit in Volts (440))	Numeric
10.	Rated Current in Amp	Numeric
11.	Rated Frequency in Hz (50)	Numeric
12.	Phase and connection	Text
13.	Type of protection (Internal Fuses)	Text
14.	Maximum over voltage	Text
15.	Maximum over current	Text
16.	Insulation level	Text
17.	Dielectric used	Text
18.	Type of impregnate used	Text
19.	Max. temperature rise	Text
20.	Hot spot temperature rise	Text
21.	Capacitor loss in Watts/KVAR including Discharge resistor (Max. 0.5 watts/ KVAr)	Text
22.	Material of container	Text
23.	Shape of container	Text
24.	Dimensions of metallic enclosure Diameter (mm)	Numeric
25.	Dimensions of metallic enclosure Length (mm)	Numeric
26.	Dimensions of metallic enclosure Breadth (mm)	Numeric
27.	Dimensions of metallic enclosure Height (mm)	Numeric
28.	Thickness of metallic enclosure (mm)	Numeric
29.	Shape of Basic element	Text
30.	Is capacitor having self healing property (Yes)	Text
31.	Thickness of film (Microns)	Text
32.	No of film layers	Numeric
33.	Voltage Stress (Volts/Microns)	Text
34.	Voltage rating of each pack	Text
35.	Type of impregnant used	Text
36.	Capacitance of Capacitor Unit in microfarad	Text
37.	Device used per module to control In rush current	Text
38.	Voltage Proof test (Test Voltage between terminals)	Text

**TECHNICAL SPECIFICATION FOR LOW TENSION (FIXED) SHUNT CAPACITOR UNITS (MPP TYPE) FOR
DISTRIBUTION TRANSFORMERS Spec. No. MSEDCL/Dist:MSC-III/ LT MPP CAP/11/2009/R0**

Sr. No.	Parameter Name	Parameter type
39.	Voltage Proof test (Test Voltage between terminals and container)	Text
40.	Rating plate provided as per specification & relevant IS	Boolean
41.	Weight of each capacitor unit	Text
42.	Whether all the Type test reports as per clause 4.1 of the specification are submitted	Boolean
43.	Whether submitted drawings	Text
44.	Whether submitted Quality Assurance Plan	Text
45.	Whether submitted Test Certificate for raw material	Text
46.	Any other particulars which the bidder may like to give	File

**TECHNICAL SPECIFICATION FOR LOW TENSION (FIXED) SHUNT CAPACITOR UNITS (MPP TYPE) FOR
DISTRIBUTION TRANSFORMERS Spec. No. MSEDCL/Dist:MSC-III/ LT MPP CAP/11/2009/R0**

SCHEDULE 'B'

DEVIATIONS FROM SPECIFICATION

Sr. No.	Clause No	Details of Deviation

**TECHNICAL SPECIFICATION FOR LOW TENSION (FIXED) SHUNT CAPACITOR UNITS (MPP TYPE) FOR
 DISTRIBUTION TRANSFORMERS Spec. No. MSEDCL/Dist:MSC-III/ LT MPP CAP/11/2009/R0**

SCHEDULE 'C'

SCHEDULE OF TENDERER'S EXPERIENCE

The tenderer shall furnish here the list of the similar orders executed/under execution by him to whom a reference may be made by the purchaser in case he considers such reference necessary.

Sr.No.	Name of the client & description of the order	Value of order	Period supply & commissioning	Name and address to whom ref can be made

NAME OF THE FIRM-----

NAME & SIGNATURE OF THE TENDERER-----

DESIGNATION-----

DATE-----

TECHNICAL SPECIFICATION FOR LOW TENSION (FIXED) SHUNT CAPACITOR UNITS (MPP TYPE) FOR DISTRIBUTION TRANSFORMERS Spec. No. MSEDCL/Dist:MSC-III/ LT MPP CAP/11/2009/R0

SCHEDULE 'E'

SCHEDULE OF DEVIATION FROM SPECIFIED TEST REQUIREMENTS SPECIFIED IN PRESENT SPECIFICATIONS.

Sr.No	Name of Test	Standard No. and Clause No.	Requirement of standards	Proposed Deviation	Reasons for deviation
1	TYPE TEST				
2	ADDITIONAL TEST				
3	ACCEPTANCE TEST				
4	ROUTINE TEST				

NAME OF THE FIRM-----

NAME & SIGNATURE OF THE TENDERER-----

DESIGNATION-----

DATE-----