REQUEST FOR QUOTATION

MMI:PU:RF:003

BHARAT HEAVY ELECTRICALS LIMITED
Electronics Division
PB No. 2606, Mysore Road Bangalore - 560026
INDIA

RFQ NUMBER: AKSPROP070

RFQ DATE : 16.11.2023

Due Date/Day: 30.11.2023 THU
Time : 13:00 HRS
[redacted]

(address for communication) :

(for all correspondence)
Purchase Executive : ABHISHEK
Phone : 26998102
Fax : 00918026989215
E-mail: singh.abhishek@bhel.in

1)This RFQ is for entering into Rate contract (RC) with BHEL for the tendered item. Validity of the RC will be 1 year from the award of rate contract. Firm orders will be placed during the tenure of rate contract. Prices will remain firm till the validity of RC or till the completion of supplies against the Purchase Orders placed against this rate contract whichever is later. Please note that these quantities are projections based on the current business scenario and expected orders from customers. In the eventuality of business not coming through, BHEL is not obligated to exhaust the ordering of RC quantities.

2)Quantity distribution shall be applicable for the tendered item in the following manner:
L1 will be decided by considering total cost to BHEL and
a. L1 bidder shall be awarded 60 % of tender quantity.
b. L2 bidder shall be offered 40% of tender quantity.

NOTE: 40 % quantity shall be offered to L2 bidder at L1 unit rate. If L2 bidder do not agree to supply at L1 unit rate, BHEL may consider offering entire tender quantity to L1 bidder.

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
1	TI0668104228 DC LINK CAPACITOR C= 750 uF, Ue= 2800V, * HSN/SAC : 3921 [redacted] CAPACITOR (DRY TYPE-DC LINK) CAPACITOR C= 750 uF, Ue= 2800V, In= 150A conforming to spec PS4452596 As per Specification PS4452596 Rev No 01	4,500	NO	4,500	[redacted]

Total Number of Items - 1

1.
2.

[redacted]

NOTES:
1. This RFQ is governed by:
a) INSTRUCTIONS TO BIDDERS/SELLERS and GENERAL CONDITIONS OF CONTRACT FOR PURCHASE available at **http://edn.bhel.com (RFQ-PO Terms & Conditions)**
b) Any other specific Terms and Conditions mentioned.
[redacted]

* The HSN/SAC no mentioned against the line items in the RFQ are indicative only.

For and On behalf of BHEL.

ABHISHEK
Control Equipment

	PREQUALIFICATION CRITERIA (PQC) FOR DC LINK CAPACITOR GROUP: TRACTION ENGINEERING	Ref: 445/PQC_DC/22 Rev. No.: 02 Page 1 of 1

1.0 PRE QUALIFICATION CRITERIA (PQC)

1. The Bidder should be Supplier of dry type DC LINK CAPACITOR for Traction equipment for rolling stock applications.

2. BHEL shall approach and submit credentials/details furnished by vendor with their offers to customer and await customer's decision for a maximum of one month from the date of tender opening. If approval is not received within the above period, BHEL shall treat the offer as "Not meeting" Pre-qualification criteria and offer shall be rejected.

3. It is preferred that the bidder is the manufacturer of this item. If the bidder is importing some portion of the components, then minimum value addition shall be 20%. Bidder to confirm this in the offer. Value addition less than 20% is not acceptable.

2.0 DOCUMENTS SUBMISSION

1. Bidder to submit clause by clause compliance to complete technical specification (Technical specification no. PS4452596 Rev. No.01, dated 10-11-2023) along with copy of type test report.
2. Should possess a valid type test report, not older than five years, conducted at a NABL accredited laboratory as per relevant standards mentioned in the specification with respect to time during the bid submission.
3. Proof of supply of DC LINK CAPACITOR or higher rating capacitors used in traction applications directly or through any agency to Indian Railways during the last 5 years to be submitted.
4. For the vendors already qualified and added in the source list, the above points (point no. 2 & 3) are not applicable.

3.0 REFERENCE DOCUMENTS

a) Purchase Specification No PS4452596, Rev. No. 01 for DC LINK CAPACITOR.

REVISION 02	APPROVED AGOSH CHANDRAN R S		
	PREPARED L SUNITHA	ISSUED TRACTION ENGG	DATE 10.11.2023

PURCHASE SPECIFICATION FOR 750 µF DC LINK CAPACITOR

GROUP : TRACTION ENGINEERING , EDN

REVISION HISTORY SHEET

REV. NO	DATE	NATURE OF CHANGE	REASONS	PREPARED BY	CHECKED BY	APPROVED BY
00	18.04.2018	FIRST ISSUE	--	VVNSSRM Krishna	VVNSSRM Krishna	R Shekar
01	10.11.2023	Revision	Mounting bracket included	L Sunitha	R.S. Agosh Chandran	Bharat Arora

THIS DOCUMENT IS A SPECIFICATION CUM DATA SHEET. VENDOR TO GIVE CONFIRMATIONS AND DATA AS REQUIRED AND SUBMIT THE SAME TO BHEL / EDN, BANGALORE. ANY DEVIATIONS TO THIS DOCUMENT TO BE BROUGHT OUT CLEARLY BY VENDOR.

	Distribution	Approved: (Bharat Arora) 10/11/23		
Revision: 01 Date : 10.11.2023	PES TE Wrench	(L Sunitha) Prepared	(R S Agosh Chandran) Checked	10.11.2023 Date

SPECIFICATION FOR 750µF DC LINK CAPACITOR

Brief description

The capacitor in this specification is the main filter capacitor used in IGBT propulsion systems. A simplified main power schematic is given in Fig.1.

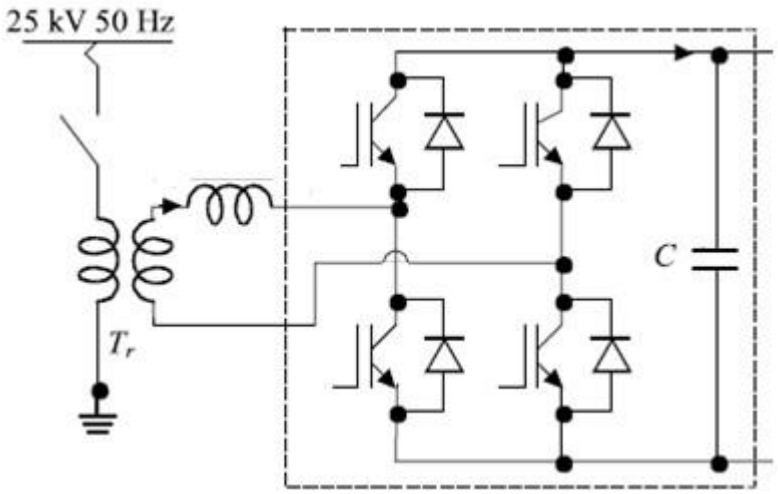

Figure 1: Simplified main power scheme

1. Detailed Specification:

Description	Value
Electrical Parameters	
Capacitance	750 µF +/- 5%
Rated Voltage	2800 V DC
Rated Current	150A RMS
Non-recurrent Surge Voltage	4200 V DC
Test voltage b/w terminals and case	AC 6900 V /50 Hz/1 min
Test voltage b/w terminals	DC 4200 V/10 sec
Series resistance	<0.3mΩ
Tangent of Loss angle	$2*10^{-4}$
Self-Inductance	<30nH
Maximum Peak current	>20KA
Maximum Surge Current	>40KA
Cooling	Natural convection
Superimposed AC Ripple frequency	0.3 to 2 KHz
Mechanical Parameters	
Height	Refer to Fig-2
Width	Refer to Fig-2
Depth	Refer to Fig-2
Terminal Height	Refer to Fig-2
Power Terminals type	Bar
Weight	24 Kg +/-10%
Materials	
a) Type	Dry type, Resin filled, Self-healing
b) Case	Stainless Steel
c) Brackets	Stainless Steel
d) Terminals	Copper , Tin plated
e) Earthing Contact	Stainless Steel
Clearance distance between terminals	>= 60mm
Clearance distance between terminals and case	>= 40mm
Rating plate/Marking	As per specification Clause 8
Colour	Grey RAL 7031
Shock Resistance	As per IEC 61373
Vibration	As per IEC 61373

2. Standards

Standard	Description
IEC61881-1	Rolling stock equipment – capacitors for power electronics
IEC61373	Shock and vibration test
EN50125-1	Environmental conditions
IEC61376	Creepage and clearance

3. Functional requirements

Description	Value	Unit
Operating hours	8640	hours/year
Typical load	continuous operation	
Surge current	1	times/year

4. Ambient conditions / operating conditions

Description	Value	Unit	Remarks
Operation	-25 to +75	◦C	
Temperature distribution over the year	+75	◦C	10 days/year
	+65	◦C	20 days/year
	+55	◦C	90 days/year
	+40	◦C	100 days/year
	<+40	◦C	130 days/year
Storage	-25 to +75	◦C	
Average year temperature	+40	◦C	
Relative humidity	<95	%	During app 3-4 months (rainy season) per year frequent condensation can occur
Altitude	<1200	m	
Pollution levels			
Operation in coastal areas			
Maximum pH	8.5		of water damp
Maximum concentration of sulphate	7	mg/liter	of water damp
Maximum concentration of chlorine	6	mg/liter	of water damp
Maximum conductivity	130	µS/cm	of water damp
Operation in desert terrain			
Dust content in air	1.6	mg/m^3	

5. Reliability, availability, maintainability and Safety

Description	Value	Unit	Notes
Design life	30	years	Expected lifetime: 30 x 8640 = 260000 hours
Failure rate	50	FIT	
Maintenance		To be defined by supplier	
Safety		The risk of explosion due to over voltage, ageing, loss or other	

6. Dimensional Details

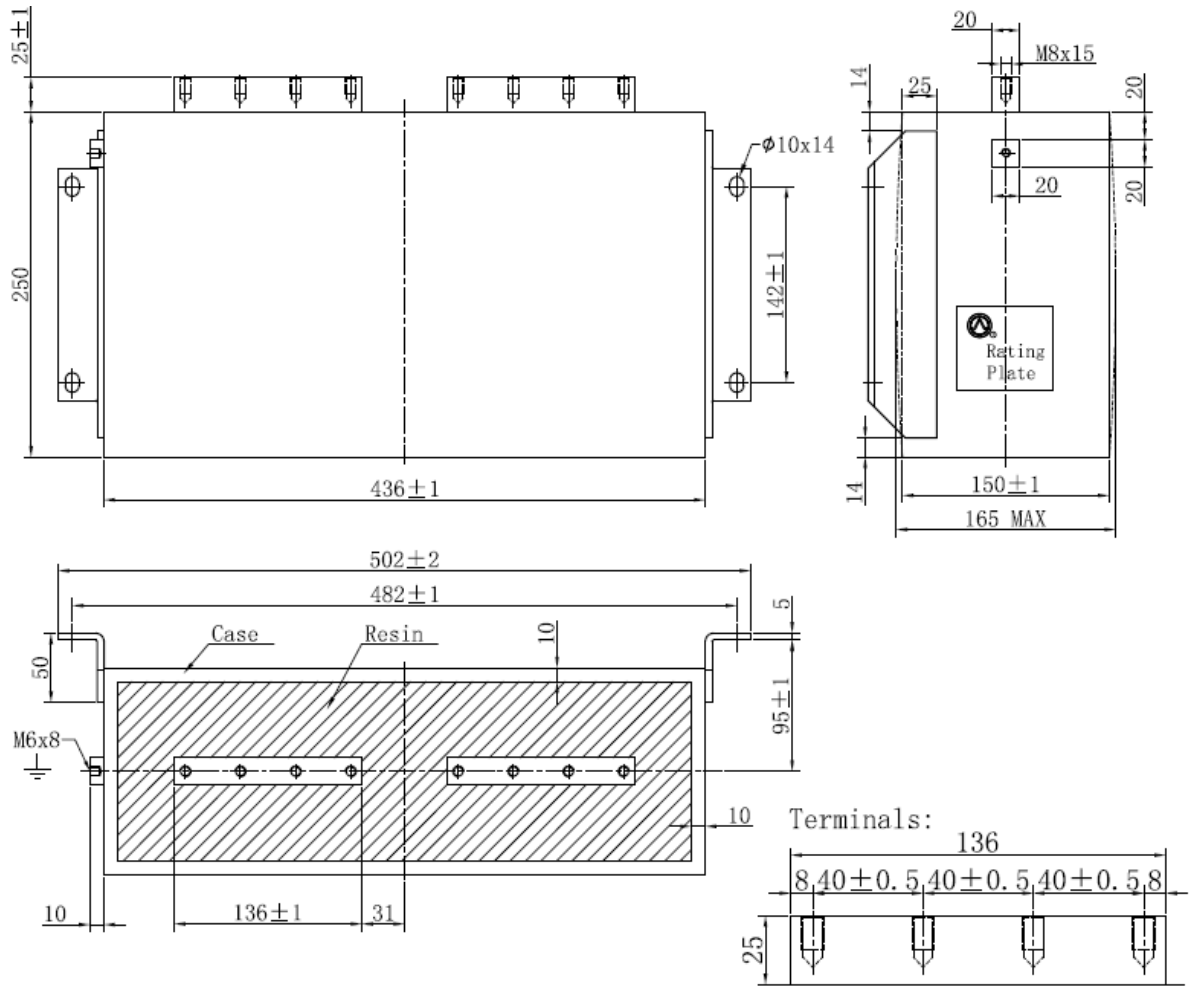

Fig 2: Dimensional Drawing

7. Testing

Sl No	Test	Acceptance criteria	Type/Routine Test
1	Capacitance and Tanδ measurement	Measurements should be within the tolerances specified by the manufacturer	Type/Routine
2	Dimensional check	Dimensions to comply with the Approved drawing	Type/Routine
3	Voltage test between terminals and case	During the test neither flashover nor puncture should occur.	Type/Routine
4	Voltage test between terminals	During the test neither flashover nor puncture should occur. Capacitance measured after the test should be within the range specified	Type/Routine
5	Surge discharge test	After conducting the test capacitance to be measured and the change should be < +/-1%	Type
6	Thermal stability test and loss angle tangent measurement test	No breakdown of the capacitor should occur during the test. The capacitor losses should be measured after the test and should be within the tolerances specified by the manufacturer	Type
7	Self-healing test	Change of capacitance after the test should be < +/- 0.5%	Type
8	Resonance frequency measurement	The self-inductance measured should be within the tolerances specified by the manufacturer	Type
9	Environmental Test 1. Damp heat test 2. Change of temperature	Change of capacitance after the test should be < +/-2%	Type
10	Mechanical tests Mechanical tests of terminals 1. External inspection 2. Vibration and shocks	No mechanical damage should occur after the test.	Type
11	Endurance test	Change of capacitance after the test should be < +/-3%	Type

8. Rating plate

The following information shall be given on the rating plate of each capacitor unit:

1. Manufacturer
2. Identification number and manufacturing date
3. C = µF
4. Tol = %
5. UNDC or UN = V
6. θ min = °C
7. θ max = °C
8. Maximum tightening torque = Nm

9. Documentation

1. Datasheet
2. Dimensional Drawing
3. Type test Procedure, Type test Report
4. Routine test Procedure, Routine test Report

10. Acceptance

1. Routine test report to be submitted along with each delivery.
2. Equipment shall be packed in a manner suitable for delivery and storage at the appointed delivery address. Transport packaging will provide adequate protection against accidental damage during normal handling. Terminals, leads, mounting brackets will be protected from mechanical damage.

Notes:

1. Mounting dimensions needs to be strictly adhered as per the approved drawing submitted by the vendor.
2. Supplier should try to minimize the self-inductance and series resistance to a lower value as much as possible.