

REQUEST FOR QUOTATION

 MMI:PU:RF:003	BHARAT HEAVY ELECTRICALS LIMITED Electronics Division PB No. 2606, Mysore Road Bangalore - 560026 INDIA	RFQ NUMBER: AKSPROP054	Due Date/Day: 03.10.2023 TUE Time : 13:00 HRS [REDACTED]
		RFQ DATE : 16.09.2023	[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)Reverse Auction Clause: BHEL shall be resorting to Reverse Auction (RA) (Guidelines as available on www.bhel.com) for this tender. RA shall be conducted among all the techno-commercially qualified bidders. Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered as initial bids of bidders in RA. In case any bidder(s) do(es) not participate in online Reverse Auction, their sealed envelope price bid along with applicable loading, if any, shall be considered for ranking.

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
1	TI0668103779 CAPACITOR 1.085mF 2800Vdc 300A * HSN/SAC : 8532 [REDACTED] [REDACTED] CAPACITOR 1.085mF 2800Vdc 300A [REDACTED] As per Specification PS4452714 Rev No.00	2,000	NO	2,000	[REDACTED]

Total Number of Items - 1

- 1.
- 2.

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]
 [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

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PREQUALIFICATION CRITERIA (PQC)
FOR 1085 μ F RESONANT CAPACITOR
GROUP: TRACTION ENGINEERING

Ref: 445/PQ_1085uFC/21

Rev. No.: 00

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1.0 PRE QUALIFICATION CRITERIA (PQC)

1. The Bidder should be Supplier of Capacitors used in Traction 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. PS4452714 Rev. No.00, dated 03-02-2021) 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 Power Capacitors for power electronic converters used in traction applications directly or through any agency to Indian Railways during the last 5 years to be submitted.

3.0 REFERENCE DOCUMENTS

- a) Purchase Specification No PS4452714, Rev. No. 00 for 1085 μ F Resonant Capacitors.

REVISION 00

APPROVED

AGOSH CHANDRAN R S

PREPARED

JAMUNA RANI S

ISSUED

TRACTION ENGG

DATE

03.02.2021

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**PURCHASE SPECIFICATION FOR
1085 μ F RESONANT CAPACITOR
GROUP: TRACTION ENGINEERING**

P.S NO. : PS4452714

REV. NO: 00

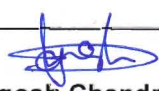
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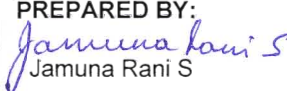
REVISION HISTORY SHEET

REV. NO	DATE	NATURE OF CHANGE	REASONS	PREPARED BY	APPROVED BY
00	03.02.2021	FIRST ISSUE	--	Jamuna Rani S	Agosh Chandran

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.

REVISIONS 00 DT: 03.02.2021

APPROVED BY:  Agosh Chandran R S

PREPARED BY:

Jamuna Rani S

ISSUED BY
TRACTION ENGG

DATE
03.02.2021



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**PURCHASE SPECIFICATION FOR
1085 μ F RESONANT CAPACITOR
GROUP: TRACTION ENGINEERING**

P.S NO. : PS4452714

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SPECIFICATION FOR 1085 μ F RESONANT CAPACITOR

Brief description

A 100Hz ripple voltage arise because of the single –phase powered and DC loaded system. To reduce the 100Hz DC-link ripple voltage a series resonant filter is used. This filter comprises an inductor and a capacitor bank. The series resonant circuit serves to filter out the current at double the line frequency, and is tuned to this frequency.

This document specifies a 100Hz series resonant capacitor, used in IGBT propulsion systems. A simplified schematic of the main power scheme can be found in **Figure 1: Simplified main power scheme.**

Figure 1:

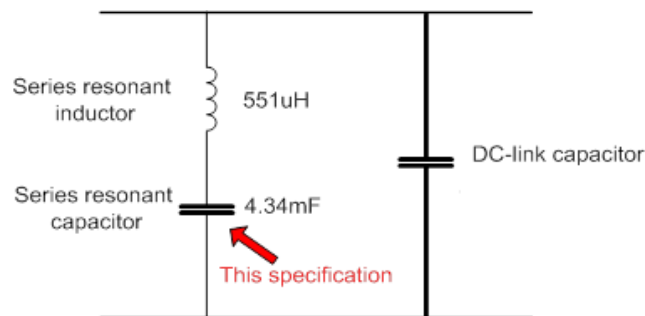


Figure 1: Simplified main power scheme

The capacitor will be fitted in the traction converter cubicle. It will be natural cooled, no forced ventilation. **The capacitor must be dry, oil filled is not allowed.**

1. Detailed Specification

1. Electrical Parameters	
Capacitance per Capacitor	1085 μ F +/-5% (4 capacitors in parallel)
Rated DC Voltage	2800 VDC
Maximum Voltage	3640 V
Rated Current	300 Arms 1200A for 4 capacitors in parallel
Test Voltage b/w terminals	DC 5265V/10sec
Test Voltage b/w terminals	AC 6900V/60sec
Series resistance	<0.28m Ω
Tangent of Loss Angle	2×10^{-4}
Self-Inductance	approx. 100nH
Maximum Peak Current	25 kA
Maximum Surge Current	75 kA
Cooling	Natural Convection



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2. Technology

Dielectric	Polypropylene film metallized, self-healing
Filling material	N ₂ ; resin, dry

3. Bushing

Internal thread	M12
Max. torque	20 Nm
Height	73 mm
Creepage distance	128 mm

4. Mechanical Parameters

Dimensions	450 x 120 x 560 mm
Weight	40 kg
Casing material	Stainless steel
Mounting position	every position
Clearance distance b/w terminals	≥ 60 mm
Clearance distance b/w terminals and case	≥ 40 mm
Colour	RAL 7033
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



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4. Ambient conditions / operating conditions

Description	Value	Unit	Notes
Operating Temperature	-25..+85	°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..+70	°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
Max. concentration of sulphate	7	mg/liter	of water damp
Max. concentration of chlorine	6	mg/liter	of water damp
Maximum conductivity	130	μ S/cm	of water damp
Operation in desert terrain			
Dust content in air	1.6	mg/m3	

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 reasons should be minimized



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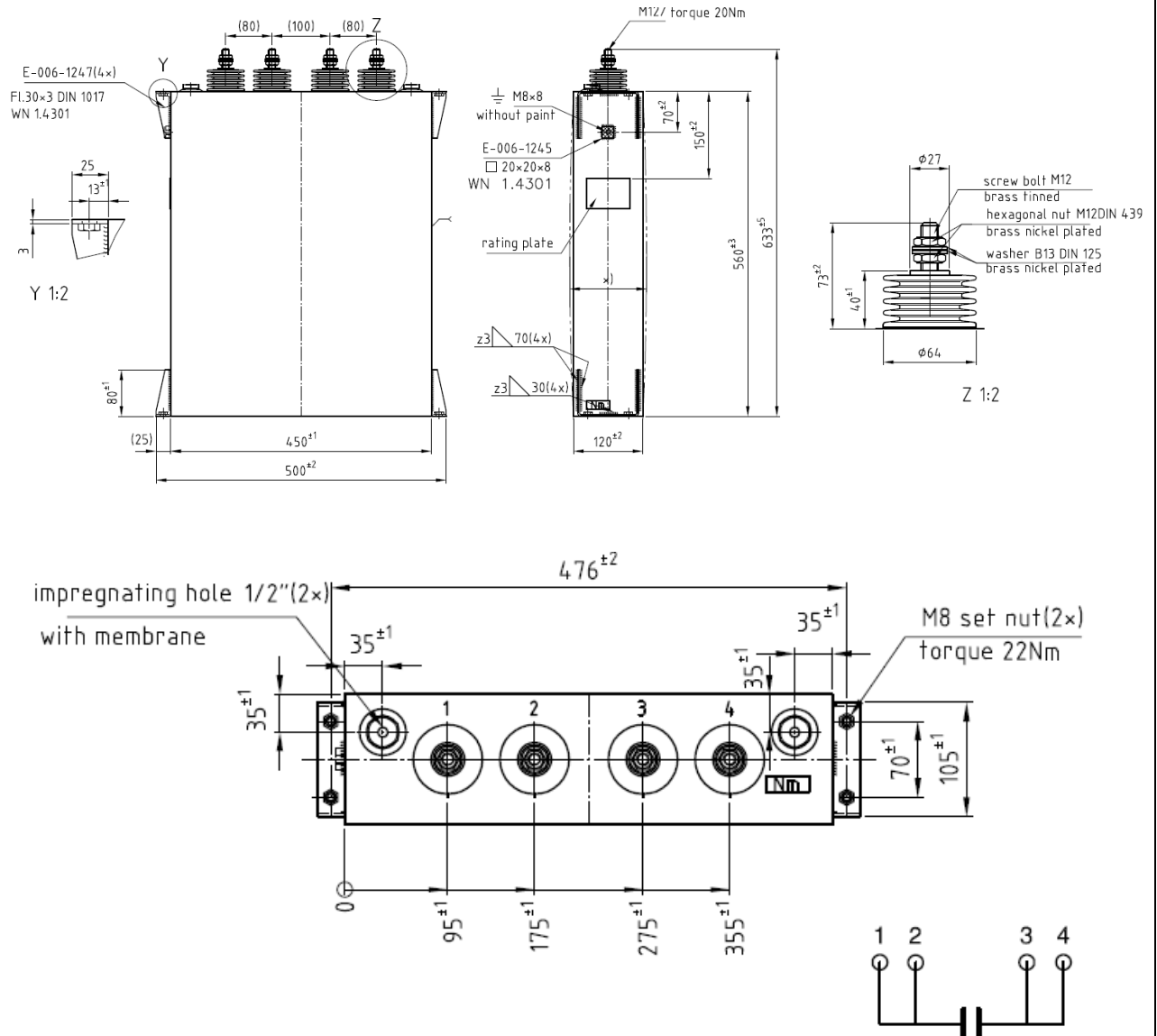
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6. Dimensional details





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7. Testing

List of tests to be performed on prototype as per IEC 61881 are as follows

Sl No	Test	Acceptance criteria	Type/Routine Test
1	Capacitance and Tan δ 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



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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. $C = \mu F$
4. Tol = %
5. UNDC or UN = V
6. $\theta \text{ min} = ^\circ C$
7. $\theta \text{ max} = ^\circ C$
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