


# REQUEST FOR QUOTATION

	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> Electronics Division PB No. 2606, Mysore Road Bangalore - 560026 INDIA	<b>RFQ NUMBER:</b> AKSPROP057  <b>RFQ DATE :</b> 30.09.2023	<b>Due Date/Day:</b> 16.10.2023 MON <b>Time</b> : 13:00 HRS <div style="background-color: black; height: 20px; width: 100%; margin-top: 5px;"></div> <div style="background-color: black; height: 20px; width: 100%; margin-top: 5px;"></div>
MMI:PU:RF:003			
(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](http://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	TI0668104317 3-PHASE COIL 0.18MH + /-10% 184A 415VAC * HSN/SAC : 8504 <div style="background-color: black; height: 15px; width: 100%; margin-top: 5px;"></div> <div style="background-color: black; height: 15px; width: 100%; margin-top: 5px;"></div> <div style="background-color: black; height: 15px; width: 100%; margin-top: 5px;"></div> 3-PHASE COIL 0.18MH + /-10% 184A 415VAC <div style="background-color: black; height: 15px; width: 100%; margin-top: 5px;"></div> As per Specification PS4452498 Rev No.04	750	NO	750	<div style="background-color: black; height: 15px; width: 100%;"></div>

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.
2. Bidders / Representatives who would like to be present during opening of offers are required to furnish authorization letter for the same.

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

For and On behalf of BHEL.

ABHISHEK  
Control Equipment

1 OF 1



**PREQUALIFICATION CRITERIA (PQC)**  
**FOR SINE FILTER INDUCTOR**  
**GROUP: TRACTION ENGINEERING**

Ref: 445/PQ\_filt\_ind/21

Rev. No.: 01

Page 1 of 1

**1.0 PRE QUALIFICATION CRITERIA (PQC)**

1. The Bidder should be Supplier of Sine Filter Inductors for Traction equipment with working voltage till 1KV or higher.
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. PS4452498 Rev. No.04, dated 18-10-2021) 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 Sine Filter Inductors 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 PS4452498, Rev. No. 04 for Sine Filter Inductor.

REVISION 01

APPROVED

AGOSH CHANDRAN R S

PREPARED

L SUNITHA

ISSUED

TRACTION ENGG

DATE

07.06.2022





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PURCHASE SPECIFICATION  
GROUP: TRACTION ENGINEERING

P.S NO. : PS4452498

REV. NO: 04

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## SPECIFICATION FOR SINE WAVE FILTER INDUCTOR

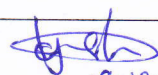
## REVISION HISTORY SHEET

REV. NO.	DATE	NATURE OF CHANGE	REASONS	PREPARED BY	APPROVED BY
00	02.04.2014	FIRST ISSUE		David J	Shekar R
01	23.07.2014	SECOND ISSUE		David J	Shekar R
02	12.12.2015	THIRD ISSUE		Venkatesh R	Shekar R
03	21.09.2018	FOURTH ISSUE	Winding Material	Purushottama	Shekar.R
04	18.10.2021	FIFTH ISSUE	PSI Clause	L Sunitha	Agosh C

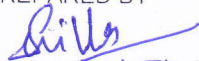
REVISIONS

04

APPROVED BY

  
18.10.21

PREPARED BY

  
L. SUNITHA

ISSUED BY

TRACTION ENGG.

DATE

18.10.2021

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**PURCHASE SPECIFICATION**  
**GROUP: TRACTION ENGINEERING**

P.S NO. : **PS4452498**

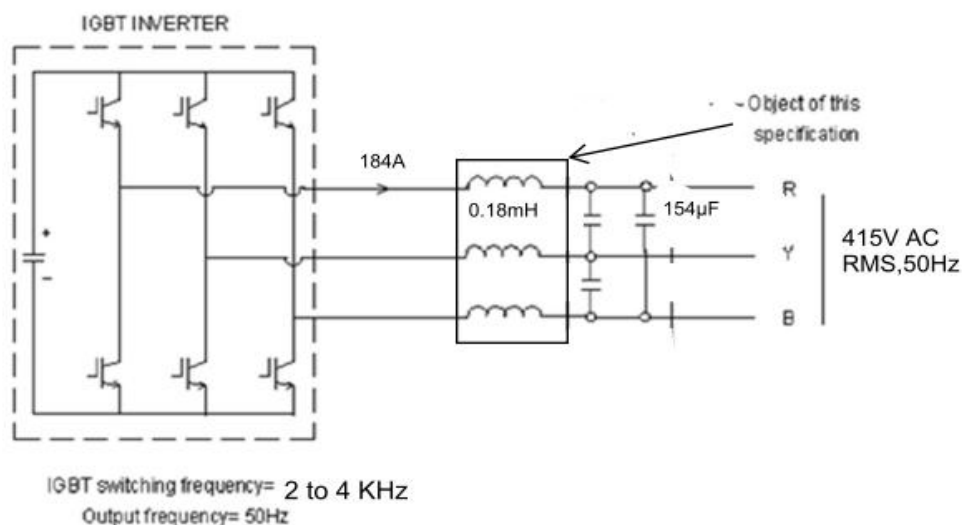
REV. NO: 04

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**SPECIFICATION FOR SINEWAVE FILTER INDUCTOR**

**1.0 Functional requirements:**

This document covers specification of a Sine wave filter Inductor, to be used at the output of an IGBT based inverter. The Inductor will be mounted in a cabinet/enclosure and will be used in traction applications for on board mounting. The block diagram is shown below.



**2.0 APPLICATION :** Sine filter Inductor

**3.0 TYPE :** Dry Type, Air natural cooling

**4.0 REFERENCE STANDARDS:**

IEC 60076/ IS5553	Power transformers
IEC 60077-1	Railway applications – electric equipment for rolling stock-part 1.
IEC 60085	Thermal evaluation and classification of electrical insulation
IEC 60146-1-3	Semiconductor converters ... Transformers and reactors
IEC 60310	Traction transformers and inductors
IEC 61287-1	Electronic power converters installed on rolling stock
IEC 61373	Railway applications – Rolling stock equipment –shock and vibration tests
EN50124	Railway Applications - Insulation Coordination Basic Requirements - Clearance And Creepage Distances
IEC60571/EN50155	Operating conditions

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# **PURCHASE SPECIFICATION** **GROUP: TRACTION ENGINEERING**

P.S NO. : PS4452498

REV. NO: 04

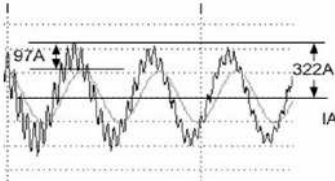
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## **SPECIFICATION FOR SINEWAVE FILTER INDUCTOR**

### **5.0 ENVIRONMENTAL CONDITIONS:**

- 5.1 Ambient Temperature : 55°C
- 5.2 Maximum Temperature : 70°C (when locomotive standing dead under sun)  
55°C (when locomotive working)  
47°C Nominal
- 5.3 Relative Humidity : IEC60571  
up to 95% any moisture condensation during operation shall not lead any damage Or failure  
Yearly average  $\leq 75\%$  Rel. Humidity
- 5.4 Altitude : up to 1200 m above mean sea level
- 5.5 Atmosphere during hot weather: Extremely dusty and desert terrain in certain areas. The dust concentration in air may reach a high value of 1.6mg/cub meter.
- 5.5 Air Pollution : The equipment shall be designed to work in coastal area in humidity and salt laden Corrosive atmosphere. The maximum values will be as follows  
(a) Maximum pH Value : 8.5  
(b) Sulphate : 7mg/liter  
(c) Maximum concentrate of chlorine: 6mg/liter  
(d) Maximum conductivity: 130 $\mu$ Siemens
- 5.6 Climate : Tropical, Hot and humid Climate

### **6.0 ELECTRICAL REQUIREMENTS**

Issue	Unit	Min	Nom	Max	Notes
Output power	kVA		132.5	265	265kVA during 5 sec At nominal output voltage
Output voltage	V	0	415	436	Maximum voltage = 415 + 5%
L	$\mu$ H		180		Total 3 x 180
Inom	Arms		184	194	286Arms during 5 sec
Ripple	%	50			Peak peak
I_Linearity (10%)	Apeak	322			up this current the inductance must be in a tolerance +/-10% 50% of 194 = 97A <sub>app</sub> => 48.5A <sub>peak</sub>
					194A <sub>ac</sub> gives 194.SQRTT(2) = 274A <sub>peak</sub> Max peak current: 274+48.5 = 322A
asymmetry	%			10	
Frequency	Hz	25	50	53	continuously
Fs	kHz		2	4	Switching frequency of the inverter
Udc	Vdc		700		DC-link voltage.

Noise Level Max: 75db

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# **PURCHASE SPECIFICATION** **GROUP: TRACTION ENGINEERING**

P.S NO. : PS4452498

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## **SPECIFICATION FOR SINEWAVE FILTER INDUCTOR**

### **7.0 CONSTRUCTION**

#### **7.1 Core:**

7.1.1 Electrical steel should be CRGO with grade of M4 or better along with test certificate.

7.1.2 The inductor is open type, the inductor shall be compact.

**7.2 Winding:** Windings to be of electrolytic Grade copper LITZ wire

#### **7.3 Cooling Type:**

7.2.1. Supplier shall indicate if additional cooling is required and the required airflow.

7.2.2 Suitable temperature sensor shall be incorporated for the winding where maximum HOTSPOT is Anticipated and the method of temperature measurement shall be indicated in the offer.

**7.4 Insulation:** Class H All windings to be uniformly insulated. Neutral point of secondary windings to be Insulated to full line voltage. Should meet the requirement as per IS2026 /IEC 60076  
Insulation Voltage 2500 Vrms – Test voltage 50Hz/1min  
Pollution degree: PD3A as of EN50124

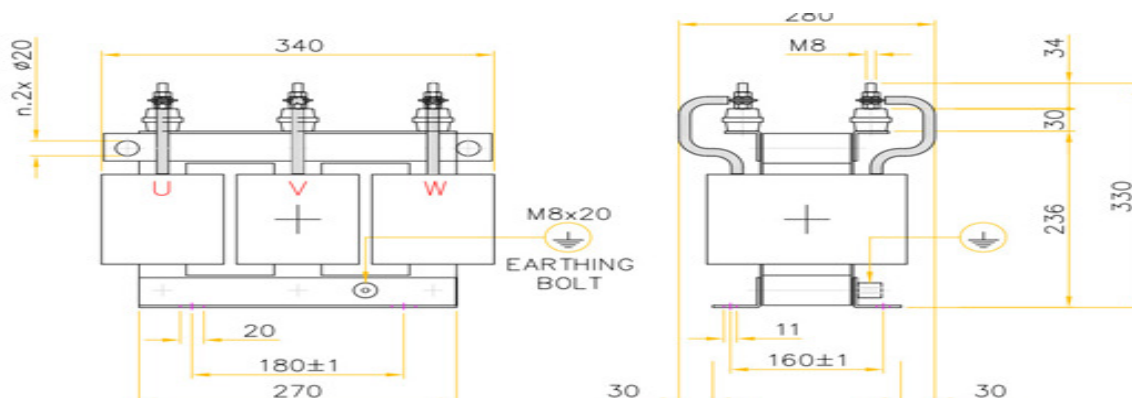
#### **7.5 Impregnation:**

Inductor assembly impregnated under vacuum with epoxy based resin for achieving high hygroscopic acid & Alkali resistant insulation. The complete winding should have smooth finish after impregnation to ensure high Mechanical strength. Thickness of the resin should be uniform. The insulation should be self-extinguish type.

**7.5 Terminals ,markings, and connections:** As per IS : 2026 and existing inductor

### **9.0 MECHANICAL DIMENSION LIMITATION**

The inductor dimensions (overall & mounting) shall not exceed the dimensions indicated in the below sketch. This sketch is given for guidance only for limiting dimensions



Supplier to prepare detailed drawing & submits to BHEL for approval before commencing manufacturing process

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# **PURCHASE SPECIFICATION** **GROUP: TRACTION ENGINEERING**

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## **SPECIFICATION FOR SINEWAVE FILTER INDUCTOR**

### **10.0 TESTS TO BE CONDUCTED AT SUPPLIER'S WORKSPACE**

Three Phase inductor	IEC60310 Clause		
	Type	Routine	Investigative
Preliminary checks	–	10.3.3	
Measurement of winding resistance	–	10.3.4	
Measurement of losses	10.3.5	–	
Measurement of inductance	10.3.6	10.3.6	
Temperature-rise	10.3.7	–	
voltage between terminals withstand	10.3.8.1	10.3.8.1	
separate source voltage withstand		10.3.8.2	
full wave impulse voltage withstand	10.3.8.3		
Shock and vibration withstand	10.3.9		

### **Tolerance – According to IEC-60289**

### **11.0 TEST PROTOCOL**

Supplier shall submit test protocol for Routine & Type tests along with techno-commercial offer. List of tests are as per clause 5.0 of this specification.

### **12.0 DOCUMENTATION**

12.1 Information required along with techno commercial offer without which offer is liable for rejection.

12.2 Supplier shall furnish clause wise confirmation/comments to the technical specification in the Typical format given below. Deviation, if any, shall be clearly brought out indicating the clause Number, original specification, deviation sought with proper technical backup (catalogue, Technical brochure, international standards, calculations etc.

If no deviations required, then supplier shall furnish certificate indicating “NO DEVIATION REQUESTED” and we comply fully with all the technical requirements of this specification no.

**PS4452498**

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## **SPECIFICATION FOR SINEWAVE FILTER INDUCTOR**

- 12.3 Supplier shall take a copy of this specification and sign on each page and submit the signed copy along with offer.
- 12.4 Supplier shall furnish winding material, winding resistance, winding cross section.
- 12.5 Supplier shall furnish the type of core used along with technical details of core.
- 12.6 Information required after the placement of order
- 12.7 Detailed dimensional drawing for BHEL approval
- 12.8 Test protocol for BHEL approval.
- 12.9 Information required along with material supply.
- 12.10 Two sets of Test certificates.
- 12.11 BHEL engineer witnessed Pre inspection report.

### **13.0 ACCEPTANCE**

- 13.1 Dimensions as per approved drawing
- 13.2 Routine test certificate

### **14.0 TYPE TEST**

BHEL reserves the right to demand for type test reports/ type testing on the component on sample basis, whenever required, for quality performance testing.

### **15.0 RATING PLATE DETAILS**

Weather proof Rating Plate (with following information) shall be fixed at a suitable position.

- 15.1 BHEL Specification No.
- 15.2 Rated Inductance
- 15.3 Rated Voltage
- 15.4 Rated Current
- 15.5 Serial number
- 15.6 Month & Year of Manufacture
- 15.7 Total mass
- 15.8 Ambient Temperature
- 15.9 Type of Reactor
- 15.10 IP class
- 15.11 Manufacturer' Name
- 15.12 Insulation level/Insulation Class
- 15.13 Number of Phases
- 15.14 Rated Frequency
- 15.15 Type of Cooling
- 15.16 Thermal class of Insulation

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