


REQUEST FOR QUOTATION

| | | | |
|--|---|---|---|
|  | BHARAT HEAVY ELECTRICALS LIMITED Electronics Division PB No. 2606, Mysore Road Bangalore - 560026 INDIA | RFQ NUMBER: AKSPROP106 RFQ DATE : 10.01.2025 | Due Date/Day: 24.01.2025 FRI Time : 13:00 HRS <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> |
| MMI:PU:RF:003 | | | |
| (address for communication) : | | (for all correspondence) Purchase Executive : ABHISHEK Phone : 26998102 Fax : 00918026989215 E-mail: singh.abhishek@bhel.in | |

| This RFQ is for entering into Rate contract(RC)for 1 year. | | | | | |
|---|--|-----|------|--------------|---------------|
| SI No. | Description | Qty | Unit | Delivery qty | Delivery Date |
| 1 | TI0668104333 Discharge Resistor 30KOhms + /-5% 2800VDC * HSN/SAC : 9032 <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> DISCHARGE RESISTOR 30 kOhm + /-5% 2800Vdc <div style="background-color: black; height: 15px; width: 100%; margin-top: 5px;"></div> As per Specification PS4452544 Rev No 01 | 500 | NO | 500 | 30.04.2025 |
| Total Number of Items - 1 | | | | | |
| <div style="border-bottom: 1px dashed black; margin-bottom: 10px;"></div> <div>1.</div> <div>2.</div> | | | | | |

| | |
|--|---|
| | |
| 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. <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> * 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 |

1. SCOPE

The Pre-Qualification Requirement document specifies the requirements to be met by the vendors (hereafter called Bidder) who wish to participate in the tender for supply of **discharge resistor for rolling stock applications**. This PQR should be read in conjunction with the Purchase Technical Specification **PS/445/2544 R01 dtd 22.12.2015**.

2. CREDENTIAL

- a) The Bidder should be Manufacturer or authorized dealer / supplier of – **discharge resistor** used in Rolling Stock applications. Documentary proof like relevant POs / invoice copies, valid authorization certificate etc shall be provided along with the offer.
- b) The Rolling Stock Applications under consideration shall include Locomotive, EMU, MEMU, Metro Trains, High Speed Trains, Train sets, Inspection Cars and Special Track Machines.
- c) For the vendors outside India, documentary proof for usage of the product in rolling stock applications shall be submitted. Acceptance of such certification shall be at BHEL's discretion.
- d) The Bidder should not be under the category of "hold" or "blacklisted" by any of the BHEL units/ any Govt of India PSU/ Govt of India/ statutory bodies of any state Govt as on date of bid submission. A declaration to this effect shall be submitted along with the offer.

3. QUALITY SYSTEM

- a) The manufacturer should have valid ISO 9001:2015 or latest certification covering the manufacturing and testing of the subject item
- b) The manufacturer should possess a clearly laid down quality Assurance Plan for the product covering the following aspects
Organization Chart, clearly indication the quality control set up
Qualification of key personnel and officials deployed in the quality control cell.
- c) Process Flow Chart indicating process of manufacture for an individual product or for a family of products, if the process is same.
- d) Quality Assurance System – Inspection and Testing plan to cover
 - Incoming material
 - Process control
 - Product control
 - System control
 - Testing facility
- e) Stage inspection details shall include the inspection procedure, inspection parameters, method of testing/ test procedure, sample sizes for destructive & non-destructive testing etc.
- f) Calibration scheme and status of calibration of test equipment
The process, testing and measuring equipment shall be duly calibrated by approved agency and the validity of calibration should be current.

4. GENERAL REQUIREMENTS

- a) 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 in India shall be 20%. Bidder to confirm this in the offer. Value addition less than 20% is not acceptable. A declaration to this effect shall be submitted along with the offer.
- b) The technical bid of bidders, which qualify technically but are not approved for the subject item by the Customer Approving Authority, shall be referred by BHEL to the customer Approving Authority for approval with intimation to the bidder. Consequent to the decision of Customer Approving Authority, the bidder shall be added to the vendor list of the subject item for future tenders. Concurrently BHEL shall consider placing developmental order on the bidder after assessing the capability of the bidder to manufacture / develop the subject item. However, BHEL shall treat the offer as “Not meeting” Pre-Qualification Criteria for the subject tender.
- c) The Customer Approving Authority shall be RDSO/CLW/BLW/PLW/ICF/RCF/MCF or any other agency as designated by the Customer.
- d) The bidder should possess a valid type test report, not older than five years, as per relevant standards mentioned in the specification with respect to time during the bid submission in case of catalog items. In case of custom made items, a bidder can submit the type test report of an item of similar or higher rating with a declaration for conducting the type test in case of award of order or developmental order. The bidder can also submit the test reports conducted in their own facility with the document of their lab accreditation. However, BHEL reserve it's right to insist on conducting the Type test again in a laboratory of it's choice.
- e) For the bid of vendors already qualified and appearing in BHEL's source list, the requirement of type test report and proof of supply shall not be applicable.

5. DOCUMENTATION TO BE SUBMITTED ALONG WITH OFFER

- a) Documentary proof for experience as per clause 2.a
- b) Clause by Clause compliance to the technical specification
- c) Declaration regarding status as per clause 2.d
- d) Declaration on MII (Make in India) as per clause 3.a
- e) Declaration for conducting Type Test as per clause 3.d



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**PURCHASE SPECIFICATION FOR
EARTH DISCHARGE RESISTOR
GROUP: TRACTION ENGINEERING**

P.S NO. : PS4452544

REV. NO: 01

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REVISION HISTORY SHEET

| REV. NO. | DATE | NATURE OF CHANGE | REASONS | PREPARED BY | APPROVED BY |
|-------------|------------|------------------|----------------------------------|--------------|-------------|
| 00 | 04.08.2015 | FIRST ISSUE | -- | SADAT | R.SHEKAR |
| 01 | 22.12.2015 | MAJOR | TYPE TEST CLAUSES MODIFIED | PURUSHOTTAMA | R.SHEKAR |

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.

Note:

Reference document :
Material Code :

REVISIONS 01 DT: 22.12.2015

APPROVED BY: R.SHEKAR

PREPARED BY:

ISSUED BY

TE

DATE

22.12.2015



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**PURCHASE SPECIFICATION FOR
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SPECIFICATION FOR DISCHARGE/EARTHING RESISTOR

Brief description

This resistor has two functionalities:

1. Global passive discharge of DC-link HV-capacitor
2. Earth fault detection

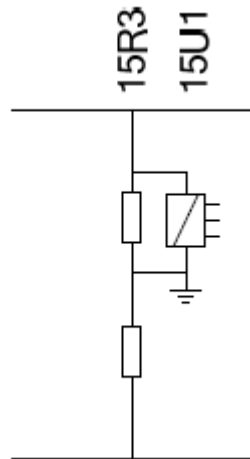


Fig1: Circuit Diagram

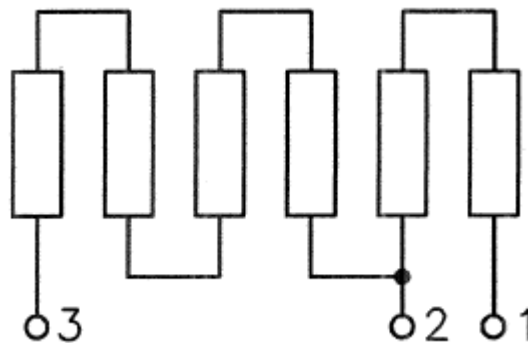


Fig2: Wiring Diagram



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EARTH DISCHARGE RESISTOR
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Detailed Specification

1. Technical Parameters

| | | | |
|----|--|---|---|
| a) | Nominal Resistance Value at 20°C (1-2) | : | 10KΩ \pm 5% |
| b) | Nominal Resistance Value at 20°C (1-3) | : | 30KΩ \pm 5% |
| c) | Maximum Voltage per Resistor | : | DC 3500 V |
| d) | Rated Voltage per Resistor | : | DC 2800V |
| d) | Insulation Test Voltage | : | AC 6900V/50Hz/1min |
| e) | Rated Power | : | 3000W |
| f) | Maximum Temperature of the Resistive Material: | | 415°C |
| g) | Minimum Creeping Distance | : | 75 mm |
| h) | Minimum Air Clearance | : | 36mm |
| i) | Cooling | : | Natural Convection |
| j) | Degree of Protection | : | IP 20 |
| k) | Total Weight of the Resistor | : | 12 Kg \pm 10% |
| m) | Thermal Capacity | : | 5025 J/K |
| n) | Thermal Resistance | : | 0.073 K/W |
| o) | Cooling Time Constant | : | 360 s |
| p) | Material of Resistor Element | : | NiCr8020 |
| q) | Material of Enclosure | : | AISI 304 (1.4301) |

Note:

1) Final surface coating of resistor element - Vitreous enamel coating
2) Supply of 3 nos of 2 meter prefixed cables to avoid opening of enclosure. Proper lugs(Cu ring) and hardware to be used for resistor side cable termination.
Specification of cable: H. V. Cable 9 GKW - AX 6.0 sq. mm 3.6/6KV BLK- Annealed Tin Copper Conductor with EPDM Insulated, Electron beam Irradiated cross linked sheathed cable
Approved makes of cable: Huber+Suhner / Radiant / Si chem / Apar / Polycab



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2. Standards

| Standard | Description | Notes |
|-----------|---|-------|
| EN50125-1 | Environmental conditions | |
| EN50124-1 | Railway applications Isolation co-ordination, Basic requirements. | |
| IEC60077 | Electric equipment for rolling stock | |
| IEC61287 | Power converters | |
| IEC61376 | Creepage and clearance | |
| IEC61373 | Shock and vibration test | |
| IEC60322 | Rules for ohmic resistors | |

3. Functional requirements

| Description | Value | Unit | Notes |
|------------------------------------|-------|------------|------------------|
| operating hours traction converter | 8640 | hours/year | |
| operating hours resistor | 8640 | hours/year | normal operation |

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4. Ambient conditions / operating conditions

| Description | Value | Unit | Notes |
|--|----------|----------|---|
| operation | -25..+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..+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 | µS/cm | of water damp |
| operation in desert terrain | | | |
| dust content in air | 1.6 | mg/m3 | |

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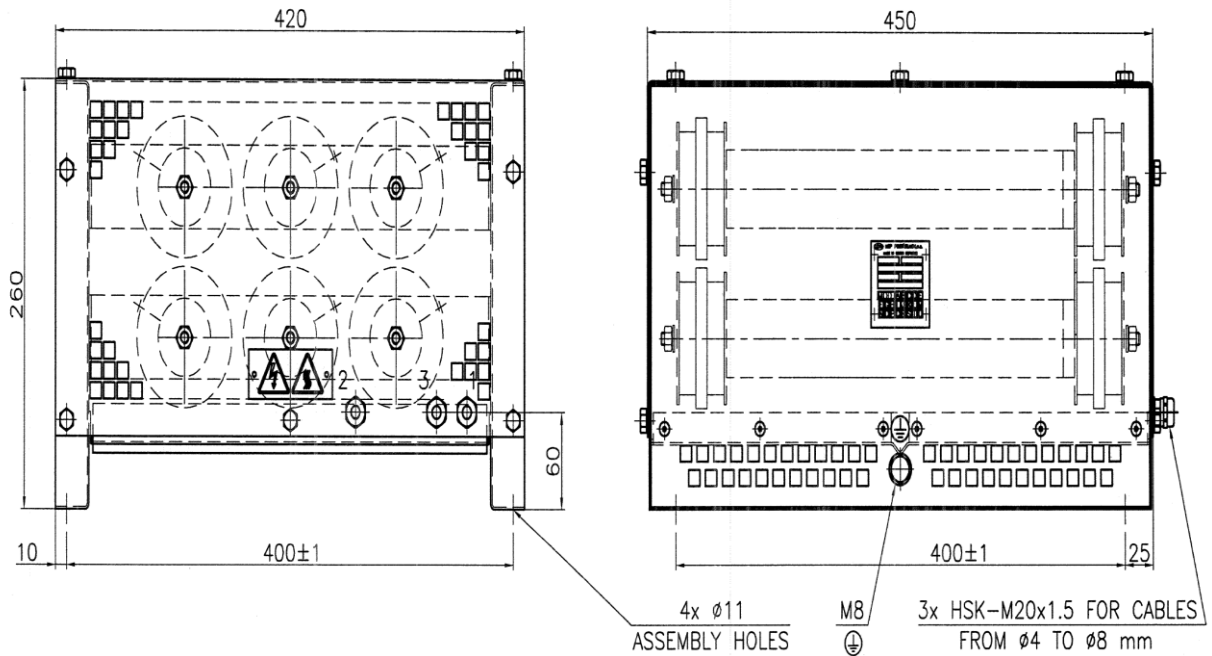
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5. Dimensional details



DETAIL OF CONNECTING
TERMINAL
(part of resistor element)

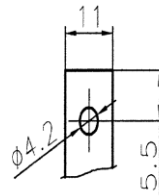


Fig3: Dimensional Drawing

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6. Testing

List of tests to be performed on prototype as follow

| Sl No | Test | Acceptance criteria |
|-------|---|---|
| 1 | Dimensional check | Dimensions to comply with drawing |
| 2 | Check on creepage and clearance distances | Min creepage 75mm and clearance 36mm |
| 3 | Check on rating label | Rating plate to have Make, Type no, Rated voltage, Rated Resistance, Sl no, year of manufacture and weight |
| 4 | Check on Ingress protection | The enclosure is IP 20 that means the cover protects against the incursion of foreign objects and is also used as a protection against accidental touch |
| 5 | Check on weight | 12 Kg \pm 10%. i.e. within range of 10.8 to 13.2 Kg |
| 6 | Measurement of Resistance | |
| 6.1 | Measurement of Resistance before temperature rise test | Between 1-2 10K Ω \pm 10% Between 1-3 30K Ω \pm 10% |
| 6.2 | Measurement of Resistance after temperature rise test | Readings should not differ from the first values indicated in clause 6.1 by more than 3%. |
| 7 | Check on Inductance | Measured inductance should be less than 5mH |
| 8 | Dielectric test | Carried out between the connection and earth terminals of the resistor with a voltage of AC 6900 V/ 50Hz/1 min. No flashover or breakdown occurred during the test |
| 9 | Insulation resistance test | The measurement to carried out with 1000 V megger tester connected across terminals and frame of the resistor. Required minimum value: 5 M Ω |
| 10 | Temperature rise tests ^{B)C)} | |
| 10.1 | Continuous power 3000W | Maximum Temperature of Active material \leq 415 Deg Max temp of the connection terminals \leq 125Deg Max Air temp 200mm above the resistor \leq 95 Deg |
| 10.2 | Constant power at 2800 V and final single pulse of 5s ^{A)} | Between 1-2: Maximum Temperature of Active material \leq 400Deg Between 2-3: Maximum Temperature of Active material \leq 210Deg Between 1-2: Max temp of the connection terminals \leq 135Deg Between 2-3: Max temp of the connection terminals \leq 90Deg Between 1-2: Max Air temp 200mm above the resistor \leq 100 Deg Between 2-3: Max Air temp 200mm above the resistor \leq 100 Deg |

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FOR EARTHY DISCHARGE RESISTOR
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| Sl No | Test | Acceptance criteria |
|-------|--|---|
| 11 | Vibration and shock withstand test ^{B)} | To be done as per the standard IEC 61373. No visual damage and no change in resistance value should occur. Also the specimen has to pass insulation test. |

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- A) This test has to be done in line with the procedure given below separately for terminals 1-2 and 2-3.
For conducting the test, constant power at 2800V needs to be applied between 1-2 terminals till the temperature stabilizes. During this time 2-3 terminals are open. After stabilization of temperatures, voltage will be increased to 3500V for 5sec.
The same procedure is repeated for the terminals 2-3 with 1-2 open terminals
- B) Visual inspection, Di electric test needs, measurement of cold resistance to be performed before and after the test.
- C) Critical hot spot points needs to be identified before the test to monitor and record the temperature during the test.