

REQUEST FOR QUOTATION



MMI:PU:RF:003

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

RFQ NUMBER:
 AKSPROP146

Due Date/Day: 23.02.2026 MON
 Time : 13:00 HRS

RFQ DATE :
 09.02.2026

(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) 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.

| Sl No. | Description | Qty | Unit | Delivery qty | Delivery Date |
|--------|---|-----|------|--------------|---------------|
| 1 | TI0668104325 Charge Resistor 50 Ohms +/-5% 1500VAC * HSN/SAC : 9032 CHARGE RESISTOR 50 Ohm +/-10% 1500VAC As per PSPEC PS4452543 Rev No 02 | 360 | NO | 360 | 20.05.2026 |

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.

* 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 **precharge resistor for rolling stock applications**. This PQR should be read in conjunction with the Purchase Technical Specification **PS/445/2543 R02 dtd 12.03.2018**.

2. CREDENTIAL

- a) The Bidder should be Manufacturer or authorized dealer / supplier of – **precharge 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



A4 - 12

**PURCHASE SPECIFICATION FOR
PRECHARGE RESISTOR
GROUP: TRACTION ENGINEERING**

P.S NO. : PS4452543

REV. NO: 02

PAGE 00 OF 07

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REVISION HISTORY SHEET

| REV. NO. | DATE | NATURE OF CHANGE | REASONS | PREPARED BY | APPROVED BY |
|----------|------------|-------------------------------|--------------------------|--------------|-------------|
| 00 | 22.12.2015 | FIRST ISSUE | -- | PURUSHOTTAMA | R.SHEKAR |
| 01 | 06.01.2016 | RESISTOR MATERIAL CHANGE | As per Existing Material | PURUSHOTTAMA | R.SHEKAR |
| 02 | 12.03.2018 | Clarification note on Testing | -- | 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 02 DT: 12.03.2018

APPROVED BY: R.SHEKAR

PREPARED BY:

Purushottama Rao

ISSUED BY

TRACTION ENGG

DATE

12.03.2018



A4 - 10

PURCHASE SPECIFICATION FOR PRECHARGE RESISTOR GROUP: TRACTION ENGINEERING

P.S NO. : PS4452543

REV. NO: 02

PAGE 01 OF 07

SPECIFICATION FOR PRECHARGE RESISTOR

Brief description

The pre-charge resistor is used to pre-charge the HV-capacitors before closing the main contactor. The charge resistor is designed to charge a short circuited DC-link capacitor 2 times in one minute.

Detailed Specification

1. Technical Parameters

- a) Nominal Resistance Value at 20°C (1-2) : **50Ω ± 10%**
- b) Maximum common mode Voltage : **AC 3500V**
- c) Maximum Voltage : **AC 1650 V**
- d) Rated Voltage : **AC 1500V**
- d) Insulation Test Voltage : **AC 6900V/50Hz/1min**
- e) Continuous Power Rating : **20KWs**
- f) Maximum Peak Current : **47 A**
- g) Worst case load cycle : **150KWs**

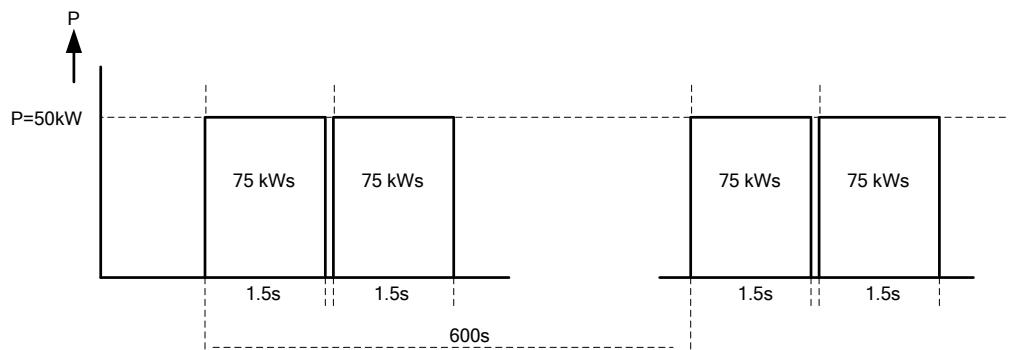


Fig1: Duty Cycle

Note: Change of duty cycle for the temperature rise test keeping energy dissipation constant is allowed with prior approval from BHEL

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A4 - 11

**PURCHASE SPECIFICATION FOR
PRECHARGE RESISTOR
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P.S NO. : PS4452543

REV. NO: 02

PAGE 02 OF 07

The charge resistor to be designed to charge a short circuited DC-link capacitor 2 times in one minute After 2 pulses there's a cooling down time of 10 minutes

- h)** Maximum Temperature of the Resistive Material: **250°C**
- i)** Minimum Creeping Distance : **75 mm**
- j)** Minimum Air Clearance : **40 mm**
- k)** Cooling : **Natural Convection**
- l)** Inductance : **≤ 1000μH**
- m)** Degree of Protection : **IP 20**
- n)** Total Weight of the Resistor : **12 Kg ± 10%**
- o)** Thermal Capacity : **870 J/K**
- p)** Thermal Resistance : **0.150 K/W**
- q)** Cooling Time Constant : **720 s**
- r)** Material of Resistor Element : **Constantan (Ni- 45% Cu-55%)**
- s)** Material of Enclosure : **AISI 304 (1.4301)**
- t)** Over Voltage Category : **OV2**
- u)** Degree of Pollution : **PD4**
- v)** Earth Connection : **Yes**

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A4 - 11

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P.S NO. : PS4452543

REV. NO: 02

PAGE 03 OF 07

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 | <=7300 | hours/year | normal operation |

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A4 - 11

**PURCHASE SPECIFICATION
PRECHARGE RESISTOR
GROUP: TRACTION ENGINEERING**

P.S NO. : PS4452543

REV. NO: 02

PAGE 04 OF 07

4. Ambient conditions / operating conditions

| Description | Value | Unit | Notes |
|--|---|----------------------------|---|
| operation temperature distribution over the year | -25..+75 +75 +65 +55 +40 < +40 | °C °C °C °C °C | 10 days/year 20 days/year 90 days/year 100 days/year 130 days/year |
| storage average year temperature | -25..+70 + 40 | °C °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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A4 - 11

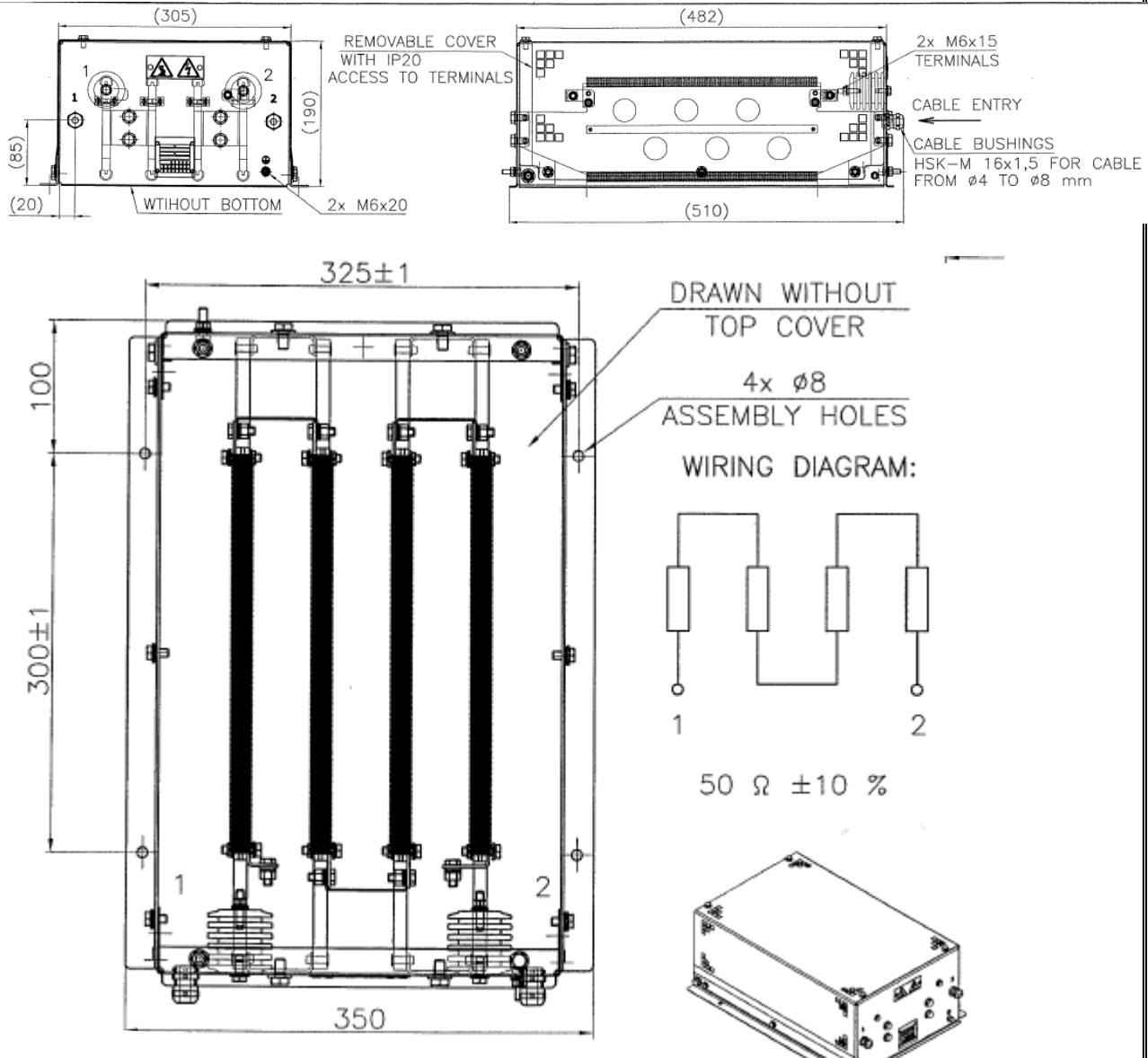
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GROUP: TRACTION ENGINEERING**

P.S NO. : PS4452543

REV. NO: 02

PAGE 05 OF 07

5. Dimensional details



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A4 - 11

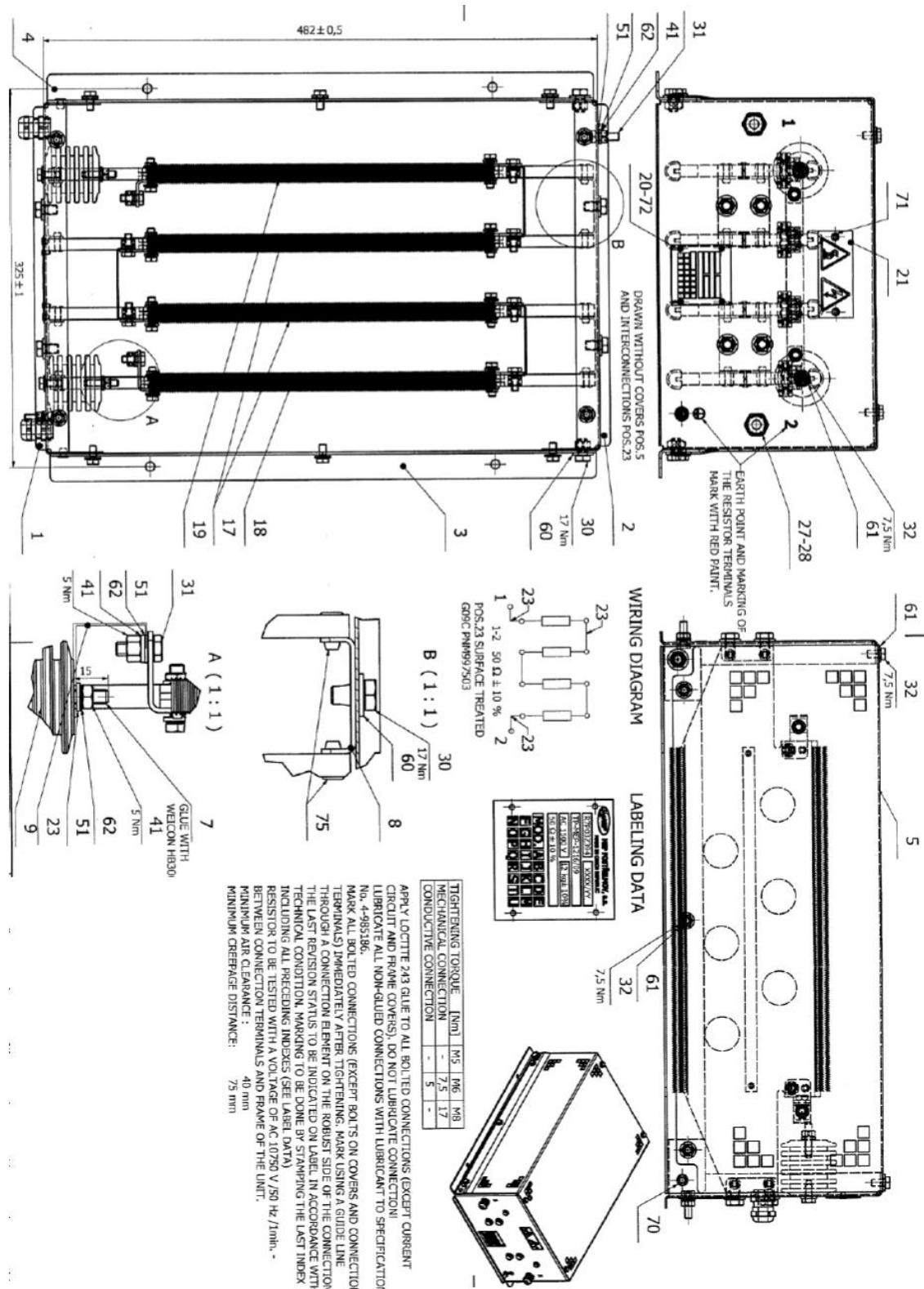
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P.S NO. : PS4452543

REV. NO: 02

PAGE 06 OF 07

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A4 - 11

**PURCHASE SPECIFICATION
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REV. NO: 02

PAGE 07 OF 07

6. Testing: Type tests required for prototype when developed for the first time

| Sl No | Test | Acceptance criteria |
|-------|--|---|
| 1 | Dimensional check | Dimensions to comply with the drawing |
| 2 | Check on creepage and clearance distances | Min. creepage 75mm and clearance 40 mm |
| 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 | $12 \text{ Kg} \pm 10\%$. |
| 6 | Measurement of Resistance | |
| 6.1 | Measurement of cold Resistance before temperature rise test | $50\Omega \pm 5\%$ i.e. within range of 47.5Ω - 52.5Ω at an ambient temperature of 20 Deg. |
| 6.2 | Measurement of cold 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 | $\leq 2000 \mu\text{H}$ |
| 8 | Dielectric test (Ref: 60077) | Carried out between the connection and earth terminals of the resistor with a voltage of AC 6900 V/ with a frequency of 50 Hz, for a period of 1 minute. No disruptive discharge or breakdown occurred during the test |
| 9 | Insulation resistance test | The measurement to be carried out with 1000 V megger tester connected across terminals and frame of the resistor. Required minimum value: $5 \text{ M}\Omega$ |
| 10 | Temperature Rise Test: Repeated duty cycles (Refer Page 1) (Corrected for Ambient Temp of 75 Deg) | Max temp of Active Material ≤ 250 Deg Max temp of the connection terminals ≤ 115 Deg Max Air temp 200mm above the resistor ≤ 110 Deg |
| 11 | Vibration and shock withstand test ^{A)} | 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. |

A) Visual inspection, Dielectric test needs, measurement of cold resistance to be performed before and after the test.

B) Critical hot spot points needs to be identified before the test to monitor and record the temperature during the test.

Note:

- i) All the above tests are to be conducted on the proto type developed.
- ii) Tests under Clause 1 (only mounting pitch and outer envelope dimensions), Clause 3, Clause 6.1, Clause 8 and Clause 9 are sufficient to be conducted on the resistors manufactured after prototype.

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