REQUEST FOR QUOTATION

MMI:PU:RF:003

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

RFQ NUMBER: AKSPROP060

RFQ DATE : 07.10.2023

Due Date/Day: 23.10.2023 MON
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)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	TI0668104325 Charge Resistor 50 Ohms + /-5% 1500VAC * HSN/SAC : 9032 [redacted] CHARGE RESISTOR 50 Ohm + /-10% 1500VAC [redacted] As per Specification PS4452543 Rev No.02	500	NO	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 PRECHARGE RESISTOR GROUP: TRACTION ENGINEERING	**Ref:** 445/PQ_PR/21 **Rev.** No.: 00 Page 1 of 1

1.0 PRE QUALIFICATION CRITERIA (PQC)

1. The Bidder should be Supplier of Power Resistor 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. PS4452543 Rev. No.02, dated 12-03-2018) 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 Resistor 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 PS4452543, Rev. No. 02 for PreCharge Resistor

REVISION 00	APPROVED AGOSH CHANDRAN R S		
	PREPARED SUNITHA L	ISSUED TRACTION ENGG	DATE 05.01.2020

PURCHASE SPECIFICATION FOR PRECHARGE RESISTOR
GROUP: TRACTION ENGINEERING

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:	ISSUED BY	DATE
Purushottama Rao	TRACTION ENGG	12.03.2018

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**

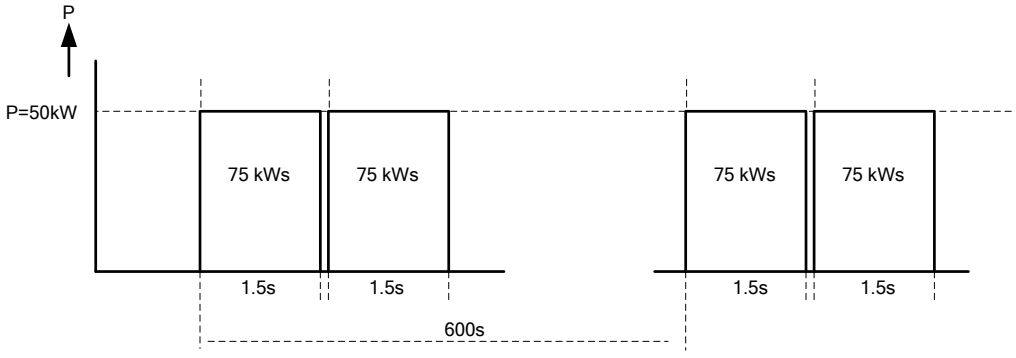


Fig1: Duty Cycle

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

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**

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	

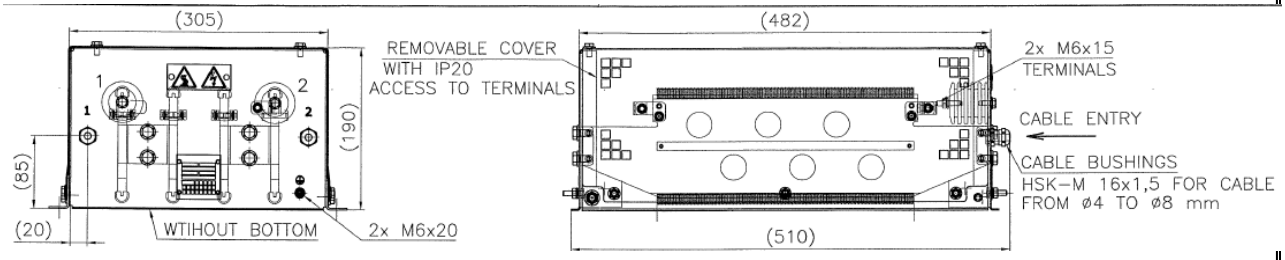
3. Functional requirements

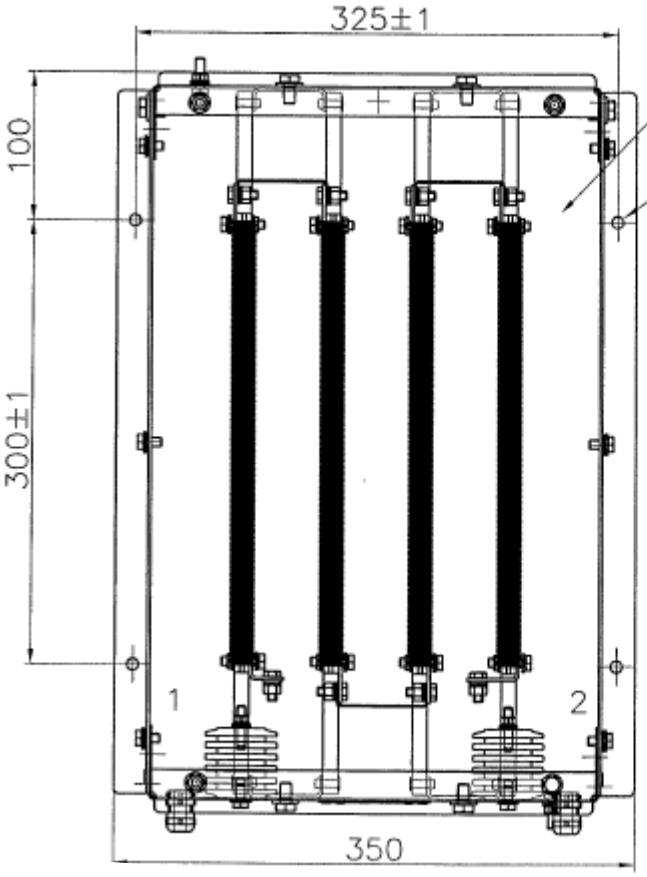
Description	Value	Unit	Notes
operating hours traction converter	8640	hours/year	
operating hours resistor	<=7300	hours/year	normal operation

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	

5. Dimensional details

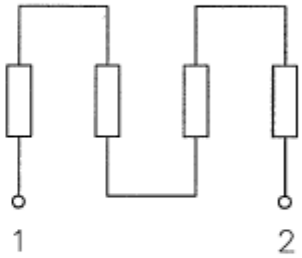




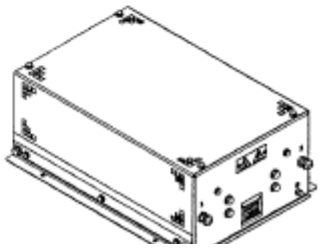
DRAWN WITHOUT TOP COVER

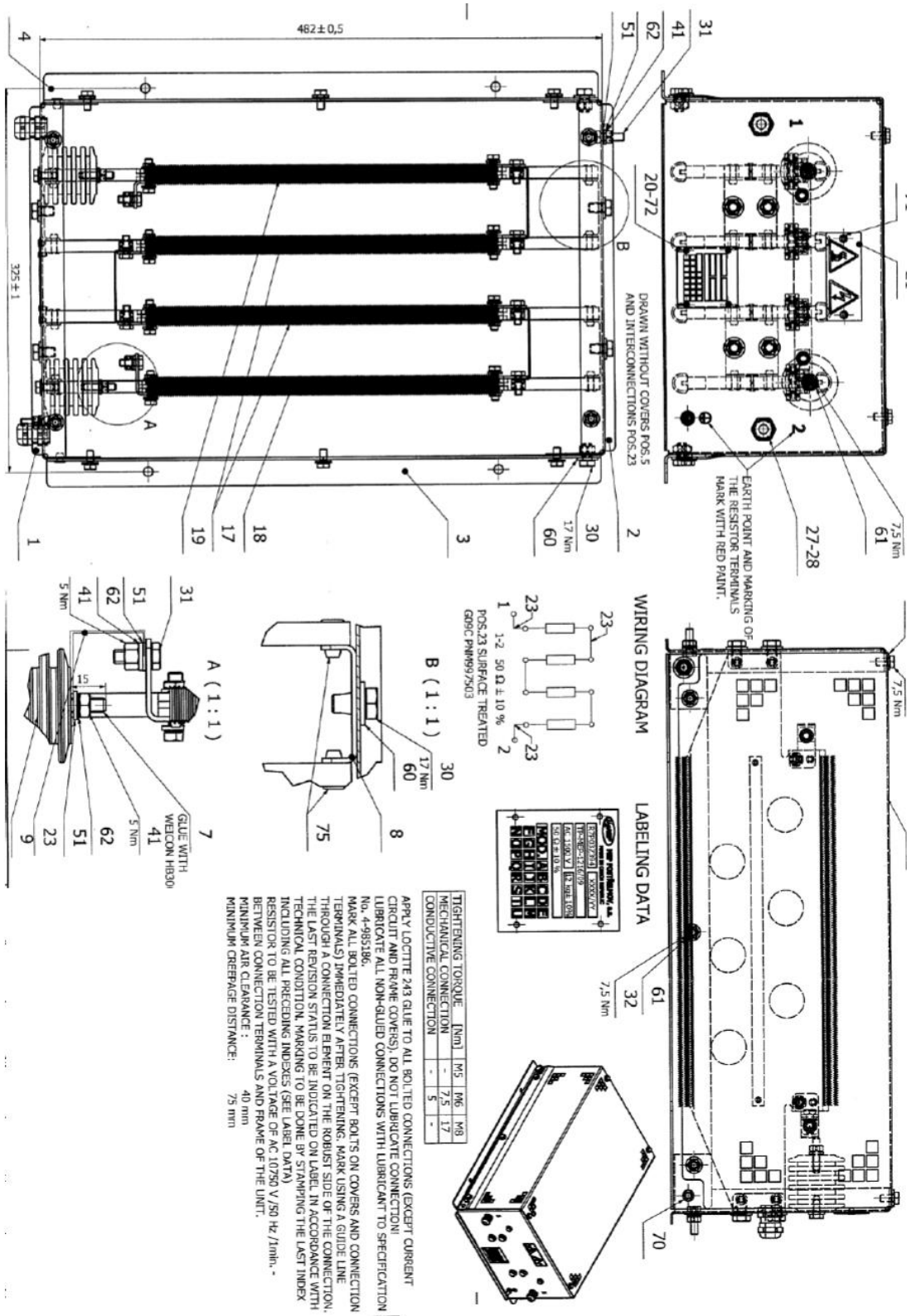
4x ø8 ASSEMBLY HOLES

WIRING DIAGRAM:



50 Ω ±10 %





TIGHTENING TORQUE [Nm]	M5	M6	M8
MECHANICAL CONNECTION	-	7,5	17
CONDUCTIVE CONNECTION	-	5	-

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 Kg ± 10%.
6	Measurement of Resistance	
6.1	Measurement of cold Resistance before temperature rise test	50Ω ± 5% i.e. within range of 47.5 Ω -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	≤ 2000 μH
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 MΩ
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, Di electric 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 enevelope dimensions), Clause 3, Clause 6.1, Clause 8 and Clause 9 are sufficient to be conducted on the resistors manufactured after prototype.