

# REQUEST FOR QUOTATION



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

RFQ NUMBER:  
AKSPROP014

RFQ DATE :  
16.07.2022

Due Date/Day: 29.07.2022 FRI  
Time : 13:00 HRS

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.

SI No.	Description	Qty	Unit	Delivery qty	Delivery Date
1	TI0668104341 SOFT CROWBAR RESISTOR 2,71 Ohm + /-5% * HSN/SAC : 9032 [REDACTED] [REDACTED]  SOFT CROWBAR RESISTOR 2,71 Ohm + /-5% 2800Vdc [REDACTED]  As per Specification PS4452542 Rev No 01	500	NO	500	[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

1 OF 1



**PREQUALIFICATION CRITERIA (PQC)**  
**FOR SOFT CROWBAR RESISTOR**  
**GROUP: TRACTION ENGINEERING**

Ref: 445/PQ\_SR/21

Rev. No.: 00

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**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. PS4452542 Rev. No.01, dated 06-01-2016) 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 PS4452542, Rev. No. 01 for Soft Crowbar Resistor

REVISION 00

APPROVED

AGOSH CHANDRAN R S

PREPARED

SUNITHA L

ISSUED

TRACTION ENGG

DATE

05.01.2020

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**PURCHASE SPECIFICATION FOR  
SOFT CROWBAR RESISTOR  
GROUP: TRACTION ENGINEERING**

P.S NO. : PS4452542

REV. NO: 01

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**REVISION HISTORY SHEET**

REV. NO.	DATE	NATURE OF CHANGE	REASONS	PREPARED BY	APPROVED BY
00	27.11.2015	FIRST ISSUE	--	Purushottama	R.SHEKAR
01	06.01.2016	Typographical errors corrected	--	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: 06.01.2016

APPROVED BY: R.SHEKAR

PREPARED BY:

ISSUED BY

DATE

Purushottama Rao

TRACTION ENGG

06.01.2016



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**PURCHASE SPECIFICATION FOR  
SOFT CROWBAR RESISTOR  
GROUP: TRACTION ENGINEERING**

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**SPECIFICATION FOR SOFT CROWBAR RESISTOR**

**Brief description**

The soft crow-bar is used to limit the DC-link voltage during dynamic conditions. The soft-crow bar resistor is controlled by a step-down chopper operating at an average switching frequency of 150 Hz.

**WIRING  
DIAGRAM**

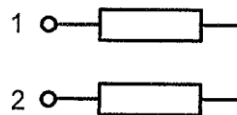


Fig1: Wiring Diagram



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**PURCHASE SPECIFICATION FOR  
SOFT CROWBAR RESISTOR  
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## Detailed Specification

### 1. Technical Parameters

a)	Nominal Resistance Value at 20°C (1-2)	:	<b>2.71 <math>\Omega</math> <math>\pm</math> 5%</b>
b)	Minimum Resistance	:	<b>2.5 <math>\Omega</math></b>
c)	Maximum Resistance at operating temperature and manufacturing tolerance	:	<b>3.65 <math>\Omega</math></b>
d)	Nominal Voltage	:	<b>DC 2800V</b>
e)	Maximum Voltage	:	<b>DC 3300V</b>
f)	Maximum Peak Voltage	:	<b>DC 3800V</b>
g)	Insulation Test Voltage	:	<b>AC 6900V/50Hz/1min</b>
h)	Maximum Current	:	<b>DC 1360A</b>
i)	Continuous Power Rating	:	<b>20KW</b>
j)	Maximum Temperature of the Resistive Material:	:	<b>520°C</b>
k)	Minimum Creeping Distance	:	<b>85 mm</b>
l)	Minimum Air Clearance	:	<b>32 mm</b>
m)	Cooling	:	<b>Natural Convection</b>
n)	Inductance	:	<b><math>\leq</math> 10<math>\mu</math>H</b>
o)	Energy Rating	:	<b>3*0.475 MWs</b>
p)	Duty Cycle	:	<b>As per Appendix I</b>

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q)	Degree of Protection	:	<b>IP 20</b>
r)	Total Weight of the Resistor	:	<b>30 Kg ± 10%</b>
s)	Thermal Capacity	:	<b>2.73 KJ/K</b>
t)	Thermal Resistance	:	<b>0.018 K/W</b>
v)	Cooling Time Constant	:	<b>44 s</b>
u)	Material of Resistor Element	:	<b>AISI 310S</b>
w)	Material of Enclosure	:	<b>AISI 304 (1.4301)</b>

**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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**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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**5. Dimensional details**

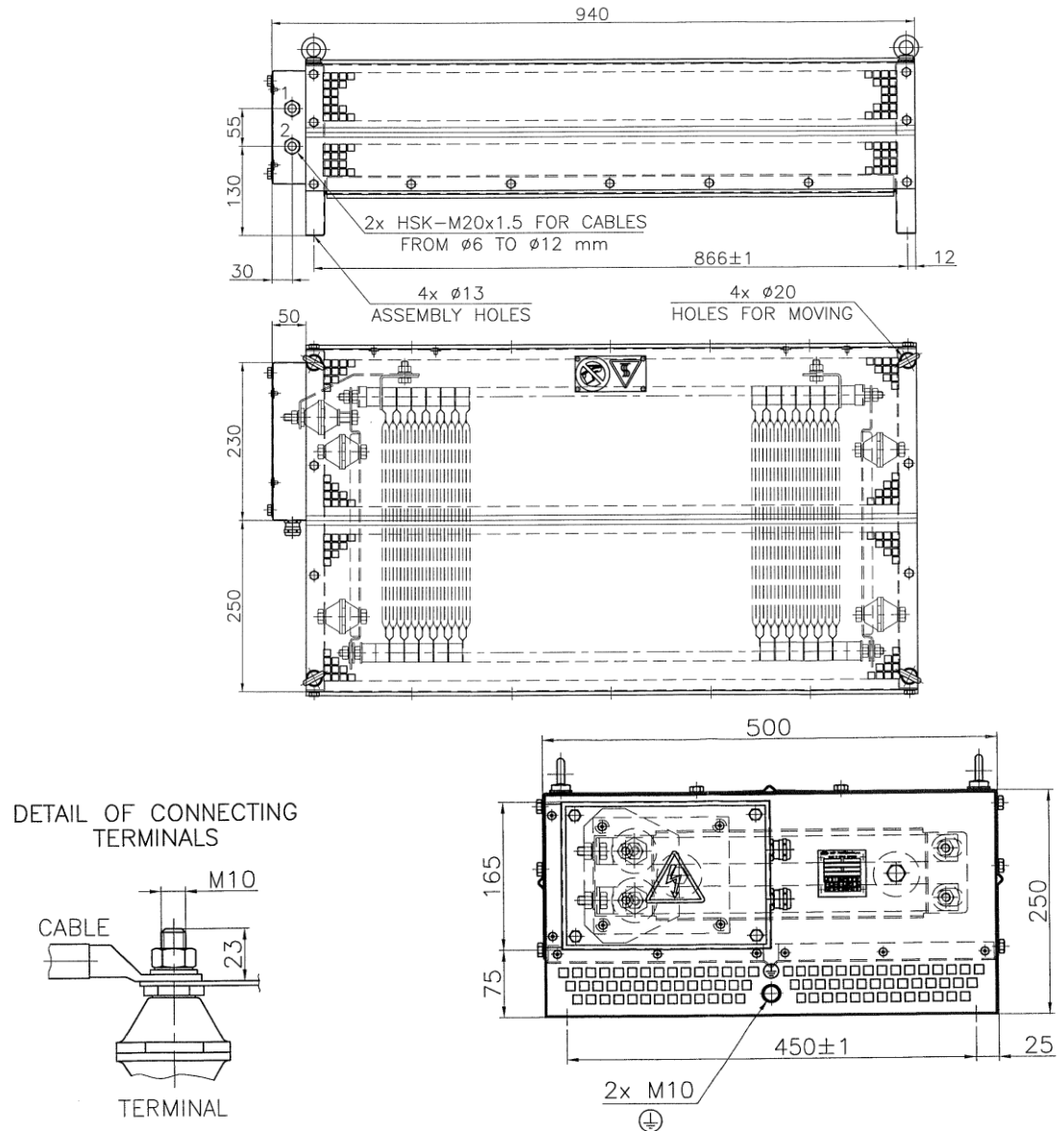


Fig 3: Dimensional Drawing

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## 6. Testing

List of tests to be performed on prototype as follows

Sl No	Test	Acceptance criteria
1	Dimensional check	Dimensions to comply with the drawing
2	Check on creepage and clearance distances	Min. creepage 85mm 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	30 Kg $\pm$ 10%. i.e. within range of 27 Kg to 33 Kg
6	Measurement of Resistance	
6.1	Measurement of cold Resistance before temperature rise test	2.71 $\Omega$ $\pm$ 5% i.e. within range of 2.5745 $\Omega$ - 2.8455 $\Omega$ 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%.
6.3	Measurement of Hot Resistance IMMEDIATELY AFTER temperature rise test	$\leq$ 3.65 $\Omega$
7	Check on Inductance	$\leq$ 10 $\mu$ 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 carried out with 1000 V megger tester connected across terminals and frame of the resistor. Required minimum value: 5 M $\Omega$
10	Temperature rise test <sup>A)B)</sup>	
10.1	Continuous power of 20 KW (Ambient Temp of 25 Deg)	Max temp of Active Material $\leq$ 520 Deg
		Max temp of the connection terminals $\leq$ 115 Deg
		Max Air temp 200mm above the resistor $\leq$ 210 Deg
10.2	Repeated duty cycles (ref: APPENDIX I) (Ambient Temp of 25 Deg)	Max temp of Active Material $\leq$ 490 Deg
		Max temp of the connection terminals $\leq$ 80 Deg
		Max Air temp 200mm above the resistor $\leq$ 200 Deg



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11	Vibration and shock withstand test <sup>A)</sup>	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) 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.

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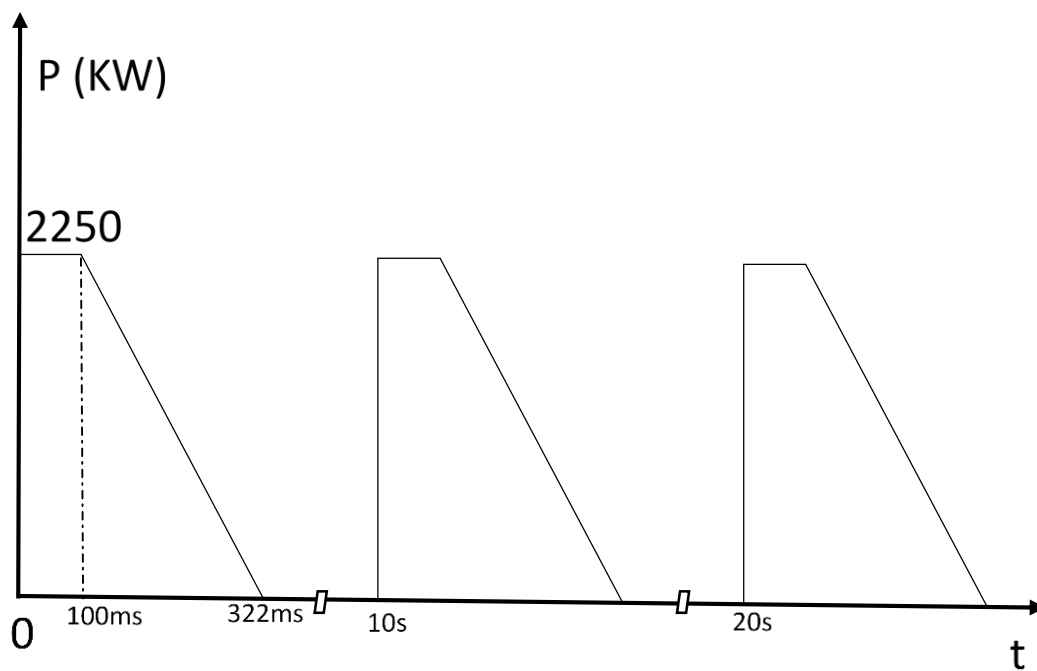
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## APPENDIX-I

Duty cycle Requirement for Temp rise test:



After 3 pulses there's a cooling down time of 10 minutes