BHARAT HEAVY ELECTRICALS LIMITED
Corporate R & D
BANGALORE 560 012

Purchase Specification for High Temperature Abrasion Tester for Refractories	No. CTI/LNS/DYM12480/2012/01 REV : 00 DATE : 19.04.2013 PAGE : Page 1 of 3

SL NO	SPECIFICATION	REQUIREMENT
1	Purpose	The equipment should be capable of determining the abrasion resistance of the materials at elevated temperature
2	Scope of Supply	Complete Abrasion Tester equipment along with suitable spare parts to carry out high temperature abrasion of ceramic materials as per ISO/DIS 16349, draft International Standard,2012. Equipment to be supplied along with standard accessories. Detailed technical specification is shown in clause 15.0 of this specification. The Vendor must ensure that the equipment being offered is a new one and not refurbished or repaired one. If any of the equipment supplied by the Vendor is found to be substandard, refurbished or not in a accordance with the description /specification or otherwise faulty, the purchaser will have the right to reject the equipment or its part
3	Qualifying Requirement:	The supplier should be an established manufacturer of abrasion test equipment , wear or erosion testing equipment r similar equipment, the details of the establishment, standards and systems followed for the manufacturing shall be provided in the techno-commercial bid. Minimum 2 (two) references of manufacture and supply of wear/abrasion/erosion test equipment shall be provided along with satisfactory performance certificate suppliers from their customers. Detailed schematic diagram of the proposed equipment shall be provided along with broad specification of the components and accessories of the system shall be provided. All the bought out components shall be of industry standard and its details shall be provided in the tecno-commercial bid. During technical-evaluation stage BHEL reserves the right to modify the bought out components for the purpose of standardization and accordingly the design of the proposed equipment shall be revised.
4	Warranty and Service	One year warranty from the date of completion of installation. All spares supplied for maintenance during warranty period should be free of cost. AMC for two years maintenance to be provided.(optional rates can be quoted)
5	Supporting Equipment	Vendor shall provide all requisite supporting equipments as mentioned in our technical specifications in clause 15.
6	Utilities Requirement :	Various utilities such as compressed air, power connection etc. are to be provided by BHEL separately. However, technical requirement of these utilities are to be furnished by the vendor.
7	Equipment Layout Plan	Information on the requirements for layout plan for installation of equipments with set off dimensions to be furnished along with the offer in order to enable BHEL to check suitability in the identified location.
8	Safety features	Equipment to be provided with suitable Safety arrangements and fire prevention arrangements, since this instrument generates high temperature
9	Standard sample	Standard sample for calibration of the Abrasion Testing system and calibration procedure will be inclusive in the offer.
10	Availability of Spares	The Vendor must assure the availability of spares for servicing of equipment for at least 10 years. Supplier should give an undertaking that spares parts will be supplied within the specified periods as and when ordered.
11	Acceptance Criterion	Manufacturer's test certificate along with test conditions and results should be furnished during the pre-dispatch inspection of the equipment by BHEL. All the measuring instruments shall be calibrated and the calibration certificate shall be provided during pre-dispatch inspection.
12	Training	Three days training should be provided free of cost at the premises of EPD, BHEL BANGALORE on operation and maintenance of the equipment.

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13	**Descriptive literature and User & Service Manuals**	A set of specifications, description and illustrated literature of the equipment, electrical circuit diagram and related peripherals should accompany the Techno-Commercial bid. A set of User's manuals and Service manuals of the main instrument, attachments and related equipment should be supplied with the equipment
14	**Any other information**	Supplier can furnish any other additional information , considering the overall requirements.

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15	**Technical Specification**	
1) Blasting device		
a.	Venturi blast assembly	Barrel with air-delivery nozzle with inlet ID at entry- 2.84- 2.92mm and outlet ID – 2.36 -2.44mm. The air nozzle is covered by 9.4 mm long Teflon tubing with ID 4.7 mm and wall thickness 1.5 mm. ID of barrel shall not exceed 10 mm
b.	Nozzle	Corundum tubing 236 mm long, 7 mm OD with 1.1 mm wall thickness. This tubing is attached to blast assembly using steel tubing 70 mm long 7.15 mm ID. Steel tube glued inside a 9.53 mm tubing nut, which is screwed to end of blast assembly. The Corundum tube in inserted thro' steel tube and an air pressure seal made with rubber grommet when tubing nut is attached to blast assembly. End of corundum tubing within the blast assembly is positioned at a distance of 2mm from air delivery nozzle. This is achieved by placing the glass tube on brass rod 4.5 mm dia, with 7.9 mm shoulder 238 mm from tip.
c.	Protecting tube	Made of corundum withstand temperature of about 1400 C with size 16mm ID of upper interface, 40 mm ID of bottom interface, length125 mm
d.	Separating ring	Corundum 12 mm ID. The bottom interface of nozzle is over separating ring and there is some distance between them. The distance b/w nozzle and separating ring regulates pressure of sample chamber and make pressure of sample chamber stable.
e.	Abrasive feed rate	1000g ±5g of abrasive within 900±10 s
f.	Vacuum gauge	2.5 accuracy for determining the vacuum degree of the blast assembly, min 50 kPa
g.	Air Pressure to blast SiC grains	450 kPa with a precise pressure gauge with accuracy of 0.4 and capacity 0-600 kPa with air regulator to be provided to clamp with BHEL line
2) Test Chamber- air tight		
a.	Furnace	
1.	Continuous working temperature	1100 °C
2.	Furnace temperature	1200 °C
b.	Temperature Variation	

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1.	Temperature difference inside the furnace	Not exceeding ± 10 °C
2.	Temperature drop of test piece	Not exceeding 20 °C
c.	Temperature measurement systems	PID multi-segment temperature controller interfaced with min 3 thermocouples (2 for chamber and 1 for sample) with necessary communication modules suitable for interfacing with computer.
d.	Specimen size	100X100X25-40mm to 114x114x30-40mm
e.	Sample holding device	To be provided
f.	Angle of inclination of sample during testing w.r.t the jet of erodent particles	5-90 degree with provision for maintaining equal distance between the specimen and the nozzle
g.	Distance of specimen from Protecting tube to sample surface	Variable- 120 mm
h.	Pressure inside pressure regulating chamber	300 Pa measured by U-type manometer- Connected to regulating chamber and installs exhaust port. A dust collector used on exhaust port to purify air. A valve attached to regulate pressure
h.	Pressure inside the sample chamber	16 kPa using pressure gauge mounted on sample chamber
3. Other requirements		
a.	Abrasive to be used	FEPA grit size grade P36 600µ: amount retained- 20±2 % 300µ: amount retained 80±3%
b.	X, Y , Z adjustment and tilting	Has to be provided
c.	Collection of erodent after testing in a removable enclosure	Suitable dust collector to be provided
d.	Sound and dust proof enclosure	Has to be provided
e.	Mounting the equipment	Has to be provided
f.	Electronic balance	To be provided Capacity 2000g with accuracy 0.1 g
g.	Compressed air source (6 kg/cm^2)	Not in the scope of supplier (To be provided by BHEL)
4. Consumables		
a.	Corundum tube nozzle	50 Nos
b.	SiC abrasive grain FEPA grit size grade P36 600µ: amount retained- 20±2 % 300µ: amount retained- 80±3%	100 Kg each

Note : Schematics of the assembly may be provided on request

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