

## Annexure-I

### A. Technical Specification of Optical emission metallurgical spectrometer

Sl. No.	Features	Descriptions
01	Basic Design	<p>Supplier should submit the technical compliance statement point wise with supporting document as asked for mentioned below Specification:-</p> <p>The spectrometer must be compact and with inbuilt spark stand, 400 mm focal length optical system with factory calibration to fulfil the following minimum technical requirement:-</p> <p>Spectrometer should be suitable for testing of Ferrous, Aluminium&amp;Copper base alloys .</p> <p>It must have the following bases with calibration:-</p> <ul style="list-style-type: none"><li>- <b>Fe base:</b> Fe Orientation, MS/CS/LAS, CI/SG iron, High Speed steel, Cr-NiSteel, High Mn Steel</li><li>- <b>Al Base:</b> Global Al</li><li>- <b>Cu Base:</b> Cu Orientation, Cu/Zn Alloy, Cu/Ni Alloy, Gunmetal</li></ul>
02	Spark Stand	Spark stand design must be in a way that Samples of various kinds of geometries (rectangular, circular etc.) can be tested directly .
03	Excitation System	Source unit of the Spectrometer should be fully digitalized for better spark stability. Supporting manufacturer technical document must be submitted along with the offer.
03	Detector	Instrument must have <del>a</del> charged couple detector (CCD) and minimum 5 nos. to cover the entire requirement. Vedmet.
04	Standardization	Instrument must have facility of Standardization of the instrument in not more than 6-8 min time. Supporting manufacturer document must be submitted along with offer mentioning time .
05	Ambient Temperature & Humidity Range	Instrument to work between 15-30 <sup>0</sup> C, humidity range 20 to 80%.
06	Testing of Alloys	Direct reading spectrometer based on latest advances in spectroscopy and CCD based technology for accurate and direct metallurgical analysis of metals and alloys samples in solid form and the software must have the facility for generation of reports
07	Application report	Manufacturer application report for Ferrous ,Aluminium and copper base application must be submitted.
08	Wavelength Range(nm)	180 – 600 nm or better
09	Focal Length	Focal length of the Optical system of Spectrometer must be minimum 400 mm or higher

10	Ferrous base alloys	Elements to be tested and required factory calibration for ferrous base alloys are attached as per section B of this document
11	Non-Ferrous base alloys	Elements to be tested and required factory calibration for Copper and Aluminium base alloys are attached as per section C and D of this document .
12	Standard Samples	Supplier must provide minimum 1 no. CRM sample for each calibration for all bases. All the CRMs must be MBH/BAS complied .
13	Data /result	i)It must provide test results directly and printed in % by mass and/or weight %. ii) Storage of complete spectrum of elements for future reference in files/folders.
14	Safety	i) The design of equipment must ensure safety of operators and equipment at all times. ii) A master switch board must be provided on the machine to stop the operation during an event of emergency. iii) Exhaust filters system for flushing out of argon gas.
15	Warranty	Supplier must provide warranty of 1 years from the date of installation
16	Accessories	The requirements of other accessories like 01. UPS (Min. 3 KvA online with inbuilt isolation transformer, battery back up minimum 30 min) required for the smooth operation of the instrument are also to be included along with the instrument.  02. Two (02) Nos. of Argon Gas cylinder with suitable SS regulator & Argon Gas Purifier  03. Suitable Sample preparation grinding machine with adhesive grinding papers setup for ferrous and non-ferrous base material  04.Apart from the above if any other items is required to install the instrument supplier should quote accordingly.  04. Operation and maintenance manual to be provided in hard and/or soft copy form
17	Computer with Monitor/display	Mminimum 8 GB DDR RAM, 512 GB HDD/500GB SSD or better, Installed with original licensed Window 10 or higher operating system, provided with Compatible cables, LAN , Bluetooth, Wifi and USB 3.0 or higher compatible ports so as to establish connections with Suitable colour laser Printer and Monitor.
18	Eligibility Criteria	a) The manufacturer must be minimum 5 years or more in the relevant business and have facility to provide



		<p>service</p> <p>b) Party must submit photo copy of at least 10 nos. successful installation report of the offered model in India.</p> <p>c) Party also need to furnish at least 5 nos. of performance certificate from the above installations.</p>
19	Acceptance test and qualifying Criteria	Performance of the equipment in terms of precision and accuracy is to be demonstrated by the firm with minimum two samples of each matrix and the same sample should be tested at the interval of 4hrs. to check the stability, repeatability of the result. A deviation (by more than 5% or a maximum deviation value mentioned in MBH/BAS certificate) in any single element will attract disqualification.
20	Installation , commissioning and training	Installation and commissioning to be done by the vendor at CSIR-CMERI. Two days hands on training on operation and maintenance to be provided by the vendor within two weeks of commissioning of the machine.

**B. Analytical programme for Ferrous matrices should have (at least) the following ranges of the elements with calibration module & calibration sample for each classifications:**

Element	Orientation		low alloy		cast iron		Cr-Cr/Ni		Mn steel	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
C	0.0020	4.50	0.0020	1.50	1.40	4.50	0.0020	2.50	0.0020	1.65
Si	0.0100	6.50	0.0050	5.50	0.0050	5.00	0.0100	4.25	0.0050	1.60
Mn	0.0010	20.3	0.0010	2.35	0.0010	4.20	0.0010	15.9	0.200	20.3
P	0.0050	2.45	0.0015	0.125	0.0015	2.45	0.0015	0.150	0.0015	0.125
S	0.0040	0.45	0.0010	0.200	0.0010	0.240	0.0010	0.400	0.0010	0.065
Cr	0.0030	33.5	0.0020	8.70	0.0030	9.50	0.0030	33.0	0.0030	4.10
Mo	0.0050	9.90	0.0040	2.50	0.0040	2.25	0.0040	7.00	0.0050	2.20
Ni	0.0030	43.9	0.0030	5.60	0.0030	5.50	0.0030	43.9	0.0030	4.00
Al	0.0020	2.85	0.0020	1.90	0.0020	1.35	0.0020	2.85	0.0015	0.41
Co	0.0050	18.7	0.0040	2.10	0.0040	0.210	0.0040	18.7	0.0040	0.37
Cu	0.0010	8.40	0.0010	1.15	0.0010	2.55	0.0010	6.40	0.0010	0.55
Nb	0.0050	3.00	0.0010	0.33	0.0020	0.280	0.0050	3.00	0.0020	0.063
Ti	0.0020	2.90	0.0010	0.85	0.0005	0.46	0.0020	2.90		

V	0.0020	10.2	0.0010	1.00	0.0010	0.64	0.0020	10.2	0.0010	0.34
W	0.050	21.4	0.0200	3.20	0.0200	0.130	0.0200	6.30		
Pb	0.0100	0.36	0.0050	0.200	0.0100	0.058	0.0100	0.070		
Sn			0.0015	0.135	0.0015	0.240	0.0020	0.200		
Mg	0.0020	0.230			0.0020	0.230				
As			0.0030	0.135	0.0050	0.200				
Zr			0.0015	0.230	0.0015	0.070				
Ca			0.0001	0.0125						
Ce					0.0100	0.095				
B	0.0010	0.115	0.0010	0.0140	0.0010	0.115	0.0010	0.0110		
Zn			0.0040	0.0260	0.0040	0.044				
La					0.0010	0.0250				

C. Analytical programme for Aluminium base matrices should have (at least) the following ranges of the elements with calibration module & calibration sample for each classifications:

Element	global calibration	
	Min	Max
Si	0.0025	24.4
Fe	0.0025	11.8
Cu	0.0015	54.6
Mn	0.0015	31.4
Mg	0.0020	10.9
Cr	0.0010	0.48
Ni	0.0030	2.95
Zn	0.0050	11.6
Ti	0.0010	5.15
Ag	0.0010	1.00
B	0.0015	0.0220
Be	0.0001	0.0220



Bi	0.0050	0.74
Ca	0.0001	0.040
Cd	0.0050	0.34
Co	0.0030	1.60
In	0.0030	0.100
La	0.0015	0.0160
Li	0.0002	8.40
Na	0.0001	0.0210
Pb	0.0050	1.50
Sb	0.0150	0.57
Sn	0.0050	21.0
Sr	0.0003	0.135
V	0.0020	0.115
Zr	0.0010	0.240
Sc	0.0005	0.41

D. Analytical programme for Copper matrices should have (at least) the following ranges of the elements with calibration module & calibration sample for each classifications:

Element	Cu-Orientation		Cu/Zn-alloys		Cu/Ni-alloys		gunmetal	
	Min	Max	Min	Max	Min	Max	Min	Max
Zn	0.0100	50.9	1.00	50.9	0.0050	0.84	0.0200	12.10
Pb	0.0030	22.80	0.0030	5.25	0.0030	0.100	0.0030	7.60
Sn	0.0030	15.40	0.0020	9.80	0.0015	0.125	1.00	9.80
P	0.0040	1.05	0.0020	0.240	0.0020	0.048	0.0020	0.240
Mn	0.0050	18.80	0.0015	18.80	0.0015	2.00	0.0015	0.240
Fe	0.0030	6.50	0.0030	4.80	0.0020	2.65	0.0020	0.81
Ni	0.0050	35.0	0.0030	4.70	2.50	35.0	0.0030	5.70
Si	0.0040	6.30	0.0020	6.30	0.0020	0.95	0.0020	0.045
Mg	0.0010	0.180	0.0010	0.0210	0.0010	0.038	---	---

Cr	0.0015	2.50	0.0010	0.090	0.0080	2.50	0.0080	0.053
As	0.0050	0.40	0.0025	0.230	0.0025	0.0250	0.0025	0.260
Sb	0.0200	1.75	0.0100	0.82	---	---	0.0100	1.75
Bi	0.0100	6.00	0.0030	6.00	0.0030	0.120	0.0020	6.00
Ag	0.0030	1.60	0.0015	0.034	---	---	0.0015	0.064
Co	0.0050	2.45	0.0040	0.43	0.0050	0.160	0.0040	0.43
Al	0.0020	13.00	0.0020	8.60	0.0020	0.125	0.0020	0.125
S	0.0020	0.220	0.0015	0.052	0.0020	0.125	0.0010	0.220
Be	0.0020	3.10	0.0020	0.0100	---	---	---	---
B	---	---	0.0015	0.0060	---	---	---	---
Ti	---	---	---	---	0.0005	0.81	---	---
Nb	0.0030	1.25	---	---	0.0030	1.25	---	---