**Revised Technical Specification of**

**‘Macro Thermogravimetric Analysis based Proximate Analyser as per ASTM No. D7582’**

**1.** “Macro-Thermogravimetric Analysis based Proximate Analyser as per ASTM D7582” should be able to determine Moisture, Volatile Matter (VM), Fixed Carbon (FC) and ash in Coal and Coke from a from a single aliquot of sample in compliance to ASTM D7582. The equipment should be capable of analyzing at least 19 samples simultaneously. It should work automatically through external PC control.

**2. Equipment**

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| **2.1. No. of Sample** : Sample Carousal should hold at least 20 Nos. (19+1) of crucibles for simultaneous analysis and reference |  |  |  |
| **2.2 Balance:** capacity upto 5 grams with a sensitivity of 0.1 mg or better. Weight loss with a precision of 0.02% of RSD, It should be shielded and protected against any interference (turbulence and vibration) from other internal components. |  |  |  |
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| **3. Material of heated components:** All heated parts like sample carousal, balance pedestal, crucible and crucible cover must be made of high temperature resistant ceramic material with low thermal conductivity. The supplier should provide thermal conductivity of material used. |  |  |  |
| **4. Sample Carousal** : Automatic pneumatically driven two carousal system or pneumatic–cum-motor driven single carousal system through software program. |  |  |  |
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**5. Furnace:**

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| 5.1 Temp. Range: 100 deg-C to 1000 deg-C temperature; stability +/-2 deg-C or better; Programmable ramp as per ASTM D7582 specification |  |  |  |
| 5.2. Provision for at least two independent Pneumatically driven cranck Shafts with Programmable furnace Lid operation. Supplier should arrange physical demonstration on demand. |  |  |  |
| 5.3 Fast Cooling: Provision of at least one number of Internal cooling fan for fast cooling to ambient temperature |  |  |  |
| 5.4 Thermocouples: The analyzer should have at least two numbers of thermocouples, (i) one control thermocouple for preventing overheating and (ii) the rest measurement thermocouple to measure real time temperature of crucible/sample during the run as per ASTM standard. Supporting document is to be provided. |  |  |  |
| 5.5 Atmosphere: The equipment should work in both oxidizing and inert atmosphere; Provision should be made for automatic changing of atmosphere/ gas selection through software. Gas flow rate shall be adjustable between 4 Lpm to 10 Lpm or wider range. |  |  |  |
| 5.6 Exhaust system:Exhaust system should be provided for expelling released gases from the instrument to outside. |  |  |  |

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| **6. Furnace temperature & weight calibration Kit for calibration at site:** Equipment should have provision for calibration of furnace temperature, crucible temperature. The manufacturer should provideKits for temperature calibration and weightcalibration alongwith 'calibration certificates'. |  |  |  |
| **7. Hardware Electronic part:** The instrument should have all built-in necessary hardware and electronic components. Separate PC will be provided for controlling equipment and data logging. |  |  |  |

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| **8. Application Software & data logging:**  (i)The original/ licensed copy of the compatible application software should be supplied along with the instrument. The system should have provision to draw analytical calibration line against standard and report the result of ash, moisture, volatile matter and fixed carbon.  (ii) Licensed Application software for equipment control, calibration, analytical program, result output, graphic, etc should be provided. The real-time data should be retrievable in tabular along with trend graph)  (iii) Software should have provision for multipoint calibration of Volatile matter against reference standard, CRM and SRM.  (iv)Program storage **:** The instrument should be able to store at least 10 nos. of analytical programs for moisture, volatile matter and ash determination etc. by user depending upon the nature of the sample. |  |  |  |

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| **9. Power:** The equipment should work in Electrical connection of 230V/single phase/50Hz. |  |  |  |
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**10. Essential consumables and Accessories:**

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| 10.1 Ceramic Crucibles with cover: 40 Nos. |  |  |  |
| 10.2 One set of ceramic carousel/Turn Table to be provided additionally |  |  |  |
| 10.3 Three Nos. of international NIST SRM of coal with certified values on volatile matter in the range of 20%-50% , at least 50 g each, should be provided; (prefererably, SRM2683C, SRM2684C, SRM1635a, SRM1632e) |  |  |  |
| 10.4 Gas Regulators : Standard quality gas regulators with double stage stainless steel diaphragms one for each gas Nitrogen, Oxygen & Compressed air should be supplied |  |  |  |
| 10.5 Accessories to handle crucibles (Crucible tongs, Heat resistant forceps etc.) are to be provided. All consumables like necessary tubing, Ferrules, Septum, brass nuts and bolts suitable to the diameter of the tubing, moisture trap, gas liner, exhaust duct, exhaust fan, if any, should be included in the scope of supply. A complete list of all consumables is to be provided by the supplier. The supplier may modify the list of consumables if necessary to suit the application. |  |  |  |
| 10.6 **UPS :** UPS System of reputed brand of at least 10 KVA capacity with at least one hour battery backup for Proximate analyzer, computer and Printer |  |  |  |
| 10.7 **External PC, Printer, Operating System software :**  Reputed branded (HP/DELL) Personal computer with Intel i7 or higher processor, 8 GB RAM (minimum), Hard disk with a minimum 1TB capacity, USB ports, RS232/RS422/RS485/IEEE488 ports as suited to equipment, DVD-RW Drive for loading operating system, 21’’ flat screen TFT monitor, Key board, Optical mouse, licensed Windows10 Operating System software preferably in CD/DVD, High Speed laser printer of latest configuration of reputed make (Make: HP/Samsung/Canon), with all accessories i.e., Necessary power adaptor, connecting cables, Driver, toner cartridge etc. |  |  |  |
| 10.8: Vibration free Table: One vibration free table is to be provided as stable platform to Macro-TGA unit |  |  |  |

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| **11.** Detailed Service & Operation manual should be provided. |  |  |  |
| **12.** Installation and Commissioning of the equipment is to be done by the service provider or its authorized Indian Agent at CSIR-NML site |  |  |  |
| **13. Training:** On site training at CSIR-NML is to be provided by the manufacturer or its Indian agency |  |  |  |
| **14**. List of Pre-installation requisite (Electrical/gas /civil) is to be provided along with the offer. |  |  |  |
| **15. Warranty and Support:** The supplier should provide on-site warranty for a period of 2 Years from the date of successful commissioning certified by the user/purchaser of the equipment. |  |  |  |

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| **16. Performance Justification:** The macro-TGA should have been supplied to at least five installations in India. The vendor should provide at least three purchase orders of the supplied Macro-TGA based proximate analyzer issued by CSIR-Lab/CSIR institutes/PSUs/Govt. Organization/R&D Labs in the last five years along with the performance certificates. |  |  |  |

**17. Conditions:**

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| (i) All technical specifications must be supported through technical literature. |  |  |  |
| (ii) The supplier/vendor should have an office or reputed agency in India for providing training and service of the equipment. |  |  |  |
| (iii) The supplier must furnish the list of users and their address for communication (including email, Telephone No., & Fax No.) |  |  |  |