



INDIAN INSTITUTE OF TECHNOLOGY MADRAS
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The Manager (Project Purchase)

Date: 10.02.2023

Open Tender Reference No: MM/MURU/82/2023/LASERPOWDERBED

GEM NAR ID: GEM/GARPTS/08022023/04HLKP5Q3H9A

Due Date/Time: 23.02.2023@ 3:00 PM

Dear Sir/Madam,

On behalf of the Indian Institute of Technology Madras, Tenders are invited in two bid system from Class-I local suppliers and Class II local suppliers, for the supply of: **“Laser Powder Bed Fusion based additive manufacturing system”** Conforming to the specifications given in **Annexure -A**.

Tender Documents may be downloaded from Central Public Procurement Portal <https://etenders.gov.in/eprocure/app>. Aspiring Bidders who have not enrolled / registered in e-procurement should enroll / register before participating through the website <https://etenders.gov.in/eprocure/app>. The portal enrolment is free of cost. Bidders are advised to go through instructions provided at **“Help for contractors”**. [Special Instructions to the Contractors/Bidders for the e-submission of the bids online through this eProcurement Portal”]

Bidders can access tender documents on the website (For searching in the NIC site, kindly go to Tender Search option and type ‘IIT’. Thereafter, click on “GO” button to view all IIT Madras tenders). Select the appropriate tender and fill them with all relevant information and submit the completed tender document online on the website <https://etenders.gov.in/eprocure/app> as per the schedule attached.

1)	Pre-bid Meeting Details	:	NA
2)	ICSR Vendor Registration	:	<p><u>Vendor registration code.</u> Vendor registration with IC&SR (IITM) is mandatory for bidders to participate in tenders.</p> <p>** <u>For Vendor Registration & Guidelines, Please follow the website :</u> https://icandsr.iitm.ac.in/vendorportal; Helpdesk: vendorhelpdesk@icsrpis.iitm.ac.in</p>

No manual bids will be accepted. All tender documents including Technical and Financial bids should be submitted in the E-procurement portal.

Last date for receipt of tender	:	23.02.2023 @ 3:00 PM
Date & time of opening of tender	:	24.02.2023 @ 3:00 PM

3. Instructions to the Bidder:

<u>A)</u>	Searching for tender documents	:	<ul style="list-style-type: none"> • There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, organization name, location, date, value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as organization name, form of contract, location, date, other keywords etc. to search for a tender published on the CPP Portal. • Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. These tenders can be moved to the respective “My Tender” folder. This would enable the CPP Portal to intimate the bidders through SMS / email in case there is any corrigendum issued to the tender document. • The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.
<u>B)</u>	Assistance to bidders	:	<ul style="list-style-type: none"> • Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contact person indicated in the tender. • Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk. The contact number for the helpdesk is [0120-4200462, 0120-4001002, 0120-4001005]
<u>C)</u>	Enrollment Process to Bidders	:	<p><u>REGISTRATION</u></p> <ul style="list-style-type: none"> • Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal URL:https://etenders.gov.in/eprocure/app by clicking on “Online Bidder Enrollment”. Enrollment on the CPP Portal is free of charge. • As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts. • Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal. • Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / TCS / nCode / eMudhra etc.) • Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSCs to others which may lead to misuse. • Bidder then may log in to the site through the secured log-in by entering their user ID / password and the password of the DSC / eToken. • Possession of a Valid Class II/III Digital Signature Certificate

			<p>(DSC) in the form of smart card/e-token in the company's name is a prerequisite for registration and participating in the bid submission activities through https://etenders.gov.in/eprocure/app</p> <ul style="list-style-type: none"> Digital Signature Certificates can be obtained from the authorized certifying agencies, details of which are available in the web site https://etenders.gov.in/eprocure/app under the “Information about DSC”.
<u>D)</u>	Preparation of bids	:	<ul style="list-style-type: none"> Bidder should take into account any corrigendum published on the tender document before submitting their bids. Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid. Bidder, in advance, should prepare the bid documents to be submitted as indicated in the tender document / schedule and generally shall be in PDF / XLS formats as the case may be. Bid documents may be scanned with 100 dpi with black and white option. To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, GSTIN Details, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use “My Documents” area available to them to upload such documents. These documents may be directly submitted from the “My Documents” area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.
<u>E)</u>	Submission of bids	:	<ul style="list-style-type: none"> Bidder should log into the site well in advance for bid submission so that he/she can upload the bid in time i.e. on or before the bid submission date and time. Bidder will be responsible for any delay due to other issues. The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document. Bidder has to select the bid security declaration. Otherwise, the tender will be summarily rejected. A standard BOQ format has been provided with the tender document to be filled by all the bidders. Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. Bidders are required to download the BOQ file, open it and complete the detail with their respective financial quotes and other details (such as name of the bidder). If the BOQ file is found to be modified by the bidder, the bid will be rejected. The server time (which is displayed on the bidders’ dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The

		<p>bidders should follow this time during bid submission.</p> <ul style="list-style-type: none"> • The Tender Inviting Authority (TIA) will not be held responsible for any sort of delay or the difficulties faced during the submission of bids online by the bidders due to local issues. • The uploaded tender documents become readable only after the tender opening by the authorized bid openers. • Upon the successful and timely submission of bids, the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details. • Kindly add scanned PDF of all relevant documents in a single PDF file of compliance sheet. • More information useful for submitting online bids on the CPP Portal may be obtained at: https://etenders.gov.in/eprocure/app. • All tender documents including pre-qualification bid, Technical Bid & Financial Bid should be submitted separately in online CPP portal as per the specified format only. Right is reserved to ignore any tender which fails to comply with the above instructions. No manual bid submission will be entertained.
<u>F)</u>	Marking on Technical Bid	<ul style="list-style-type: none"> • The bidder eligibility criteria, technical specification and supply of item for this tender is given in Annexure A. • The Bidders shall go through the specification and submit the technical bid. • The Technical bid should be submitted in the proforma as per Annexure-B in pdf format only through online (e-tender). No manual submission of bid will be entertained. • The technical bid should have a page-wise heading as “Technical Bid” and page no. in all pages with seal and signature of authorized signatory. The total no. of pages should be mentioned at the last page of the documents. • The technical bid should consist of bidder eligibility criteria details and all technical details along with catalogue/ pamphlet which will give a detailed description of product with technical data sheet so that technical compliance can be verified.
<u>G)</u>	Marking on Price Bid	<ul style="list-style-type: none"> • Financial bid (BoQ) should be submitted in the prescribed proforma format as per Annexure-C in xls format through e-tender only. No manual or other form of submission of Financial Bid will not be entertained

4)	<p>Preparation of Tender: The bidders should submit the bids in two bid system as detailed below.</p> <p>Bid I _Technical Bid</p> <p>The technical bid should consist of bidder eligibility criteria and technical specification compliance sheet as per Annexure-B.</p> <p>Bid II _Price Bid</p> <p>The price bid should be submitted in excel format (BoQ) as per the proforma (Annexure C) uploaded in the e-Tender web site. The Quoted price should be for supply and installation of the item and inclusive of all cost and statutory levies at IIT Madras.</p>
5)	<p>Price:</p> <ol style="list-style-type: none"> a) The price should be quoted only in INR net per unit (after breakup) and must include all packing, transit insurance and delivery charges to the Department of Material and Metalurgical Engineering. b) The rate quoted shall be all inclusive of all taxes and no extra payment will be made other than statutory revisions as per the terms and conditions stipulated in this contract document. c) The percentage of tax & duties should be clearly indicated separately. IIT Madras is eligible for custom duty (5.5%). Relevant certificates will be issued wherever necessary. d) The offer/bids should be submitted through online only in two bid system i.e. Technical Bid and Financial Bid separately.
6)	<p>Tenderer shall submit along with this tender:</p> <ol style="list-style-type: none"> (i) Proof of having ISO or other equivalent certification given by appropriate authorities. (ii) Name and full address of the Banker and their swift code and PAN No. and GSTIN number. (iii) GST registration proof showing registration number, area of registration etc. (iv) All of your future correspondences including Invoices should bear the GST No. and Area Code.
7)	<p>Terms of Delivery:</p> <p>Supplier will be fully responsible for the safe carriage, Installation/Commissioning of goods up to the Department of Material and Metalurgical Engineering., IIT Madras or named place as per PO, Insurance coverage will be in the scope of the supplier.</p> <p>The tenderer should indicate clearly the time required for delivery of the item (subject to the approval of the Executive Committee-IIT-Madras). In case there is any deviation in the delivery schedule, liquidated damages clause will be enforced or penalty for the delayed supply period will be levied.</p> <p>In the event of delay or non-supply of materials/execution of Contract beyond the date of delivery/completion of job. The penalty will be levied @1% per week of delay subject to a max of 10% of the value of purchase order and if the delay is more than accepted time frame by IIT M, the PO would be partially or fully cancelled and liquidated damages will be enforced accordingly.</p>
8)	<p>Period for which the offer will remain open:</p> <p>The Tender shall remain open for acceptance/validity till: 120 days from the date of opening of the tender. However, the day up to which the offer is to remain open being declared closed holiday for the Indian Institute of Technology Madras, the offer shall remain open for acceptance till the next working day.</p>
9)	<p>EMD: EMD:</p> <p>The EMD of Rs.6,00,000/- to be transferred to the account details mentioned in Annexure D and proof should be enclosed in the Technical Bid. Any offer not accompanied with the EMD shall be rejected</p>

	<p>summarily as non-responsive.</p> <p>The EMD of the unsuccessful bidders shall be returned within 30 days of the end of the bid validity period. The same shall be forfeited, if the tenderers withdraw their offer after the opening during the bid validity period. The Institute shall not be liable for payment of any interest on EMD.</p> <p>EMD is exempted for Micro and Small Enterprises (MSE) as defined in MSE Procurement Policy issued by Department of Micro, Small and Medium Enterprises (MSME) and Startups as recognized by Department of Industrial Policy & Promotion (DIPP). (MSE/MSME/DIPP PROOF should be enclosed in the cover containing technical bid).</p>
10)	<p>Performance Security: -</p> <p>The successful bidder should submit Performance Security for an amount of 3% of the value of the contract/supply. The Performance Security may be furnished in the form of an Account Payee DD, FD Receipt in the name of “The Registrar, IIT Madras” from any scheduled commercial bank or Bank Guarantee from any scheduled commercial bank in India. The performance security should be furnished within 14 days from the date of the purchase order.</p> <p>Performance Security in the form of Bank Guarantee: - In case the successful bidder wishes to submit Performance Security in the form of Bank Guarantee, the Bank Guarantee should be routed directly to IIT Madras from the Bank.</p> <p>The Bank Guarantee should remain valid for a period of sixty days beyond the date of completion of all contractual obligations of the supplier including the warranty obligations.</p>
11)	For the same tender, either the OEM or the authorized dealer/service provider can only quote. But both of them cannot quote separately for the same tender.
12)	The offers/bids should be sent only for a item/Equipments of latest version that is available in the market and supplied to a number of customers. A list of customers in India with details must accompany the quotations. Quotations for a prototype machine will not be accepted
13)	Original catalogue (not any photocopy) of the quoted model duly signed by the principals must accompany the quotation in the Technical bid.
14)	Compliance or Confirmation report with reference to the specifications and other terms & conditions should also be obtained from the principal/OEM.
15)	<p>Risk Purchase Clause</p> <p>In the event of failure of supply of the item/equipment within the stipulated delivery schedule, the purchaser has all the right to purchase the item/equipment from other sources on the total risk of the supplier under risk purchase clause.</p>
16)	<p>Payment:</p> <p>(i) No Advance payment will be made. However, 90% Payment against Delivery and 10% after installation are agreed to wherever the installation is involved.</p> <p>(ii) Advance Payment: No advance payment is generally admissible. In case a specific percentage of advance payment is required, the Vendor has to submit a Bank Guarantee from a scheduled commercial bank in India equivalent to the amount of advance payment.</p>
17)	<p>On-site Installation:</p> <p>The equipment/item or Machinery has to be installed or commissioned by the successful bidder within the number of days (as prescribed by PI) from the date of receipt of the item at the site of IIT Madras.</p>
18)	<p>Warranty/Guarantee:</p> <p>The offer should clearly specify the warranty or guarantee period for the machinery/equipment. Any extended warranty offered for the same has to be mentioned separately (For more details please refer our Technical Specifications).</p>

	** Note: PO which involves installation, warranty/guarantee shall be applicable from date of installation.
19)	<p>Acceptance and Rejection:</p> <p>Failure to comply with any of the instructions stated in this document or offering unsatisfactory explanations for non-compliance will likely to lead to rejection of offers.</p> <p>I.I.T. Madras has the right to accept the whole or any part of the Tender or portion of the quantity offered or reject it in full without assigning any reason.</p>
20)	<p>Debarment from Bidding:</p> <p>In case of breach of Terms & Conditions, Bidder may be suspended from being eligible for bidding in any contract with the IIT Madras up to 2 Years [as per Rule 151(iii) of GFR] from the date of Tender.</p>
21)	<p>Disputes and Jurisdiction:</p> <p>Settlement of Disputes: Any dispute, controversy or claim arising out of or in connection with this PO including any question regarding its existence, validity, breach or termination, shall in the first instance be attempted to be resolved amicably by both the Parties. If attempts for such amicable resolution fails or no decision is reached within 30 days whichever is earlier, then such disputes shall be settled by arbitration in accordance with the Arbitration and Conciliation Act, 1996. Unless the Parties agree on a sole arbitrator, within 30 days from the receipt of a written request by one Party from the other Party to so agree, the arbitral panel shall comprise of three arbitrators. In that event, the supplier will nominate one arbitrator and the Project Coordinator of IITM shall nominate an arbitrator. The Dean IC&SR will nominate the Presiding Arbitrator of the arbitral tribunal. The arbitration proceeding shall be carried out in English language. The cost of arbitration and fees of the arbitrator(s) shall be shared equally by the Parties. The seat of arbitration shall be at IC&SR IIT Madras, Chennai.</p> <p>a. The Applicable Law: The Purchase Order shall be construed, interpreted and governed by the Laws of India. Court at Chennai shall have exclusive jurisdiction subject to the arbitration clause.</p> <p>b. Any legal disputes arising out of any breach of contract pertaining to this tender shall be settled in the court of competent jurisdiction located within the city of Chennai in Tamil Nadu.</p>
22)	<p>Force Majeure: The Supplier shall not be liable for forfeiture of its performance security, liquidated damages or termination for default, if and to the extent that, it's delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure.</p> <p>For purposes of this Clause, "Force Majeure" means an event beyond the control of the Supplier and not involving the Supplier's fault or negligence and not foreseeable. Such events may include, but are not limited to, acts of the Purchaser either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.</p> <p>If a Force Majeure situation arises, the Supplier shall promptly notify the Purchaser in writing of such conditions and the cause thereof. Unless otherwise directed by the Purchaser in writing, the Supplier shall continue to perform its obligations under the Contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.</p>
23)	<p>Eligibility Criteria:</p> <ul style="list-style-type: none"> ➤ As per the Government of India Order, only "Class - I Local Suppliers" and "Class - II Local Suppliers" <u>can participate in this tender.</u> ➤ <u>Bidder should confirm their acceptance that they comply with the provisions with report to "Guidelines for eligibility of a bidder from a country which shares a land border with India as detailed at Annexure-F. The bidder should submit Certificate for "Bidder from/ Not from Country sharing Land border with India & Registration of Bidder with</u>

	<u>Competent Authority” as per Order of DoE F.No.6/18/2019-PPD dated 23.07.2020 as mentioned.</u>
24)	<p>Preference to “class I Local Suppliers”: preference will be given to “class 1 local suppliers” (subject to class -I local supplier’s quoted price falling within the margin of purchase preference) as per public procurement (preference to make in India) order 2017 .O.M No P- 45021/2/2017 – pp(BE - 11) dt 04/06/2020 subject to the conditions that the “class 1 Local Supplier” should agree to supply goods / provide service at L1 rate and furnish a certificate with the technical bid document that the goods/service provided by them consists local content equal to or more than 50%.(certificate from Chartered Accountant in case value of contract exceeds Rs 10 crore).</p> <ul style="list-style-type: none"> ➤ ‘Class - I local supplier’ means a supplier or service provider whose goods, services or works offered for procurement consists of local content equal to or more than 50% as defined under the above said order. Declaration to be provided as per Annexure-E per item/service/work. ➤ ‘Class - II local supplier’ means a supplier or service provider whose goods, services or works offered for procurement consists of local content equal to 20% but less than 50% as defined under the above said order. Declaration to be provided as per Annexure-E per item/service/work. ➤ ‘Margin of purchase preference’: - The margin of purchase preference shall be 20%. The Definition of the margin of purchase preference is defined in the Govt. of India Order No: P-45021/12/2017-PP (BE-II) Dt.4th June, 2020) Order 2017. As per the Government of India Order – “Margin of Purchase Preference” means the maximum extent to which the price quoted by a “Class-I local supplier” may be above the L1 for the purpose of purchase preference. <p>**Note: Local content percentage to be calculated in accordance with the definition provided at clause 2 of revised public procurement preference to Make in India Policy vide GoI Order no. P-45021/2/2017-PP (B.E.-II) dated 15.06.2017 (subsequently revised vide orders dated 28.05.2018, 29.05.2019and 04.06.2020) MOCI order No. 45021/2/2017-PP (BE II) Dt.16th September 2020 & P-45021/102/2019-BE-II-Part(1) (E-50310) Dt.4th March 2021</p>
25)	<p>Evaluation of Bids Bid evaluation will take place in two stages.</p> <p>Stage I Technical Bid evaluation All bidders who have fully complied with bidder eligibility criteria I,II and technical evaluation (Annexure A) will only be considered for opening of price bid.</p> <p>Stage II: Price Bid Evaluation The price bid evaluation will be based on price quoted by the bidder. The rate quoted for Laser Powder Bed Fusion based additive manufacturing system unit will alone be taken up for arrival of Lowest Bid (L1) value.</p>
26)	<p>Selection of successful bidder and Award of Order The order will be directly awarded to the technically qualified bidder as per the condition in para 3A of DIPP, MoCI Order No. 45021/2/2017-PP (BE II) dated 16th September 2020.</p>
27)	<p>All information including selection and rejection of technical or financial bids of the prospective bidders will be communicated through e-Tender portal. In terms of Rule 173(iv) of General Financial Rule 2017, the bidder shall be at liberty to question the bidding conditions, bidding process and/or rejection of bids.</p>
28)	<p>The tenderer shall certify that the tender document submitted by him / her are of the same replica of the tender document as published by IIT Madras and no corrections, additions and alterations made to the same. If any deviation found in the same at any stage and date, the bid / contract will be rejected / terminated and actions will be initiated as per the terms and conditions of the contract.</p>
29)	<p>Due to Covid-19 pandemic pre-bid meeting will be conducted through online. Clarification to the queries and doubts raised by the bidders will be issued as a corrigendum/addendum in the e-tenders portal.</p>
30)	<p>Due to Covid-19 pandemic the bidders will not be entertained to participate in opening of Bids. Since the tender is e-tender, the opening of the bids may be checked using the respective logins of the bidders.</p>

ACKNOWLEDGEMENT

It is hereby acknowledged that I/We have gone through all the points listed under “Specification, Guidelines, Terms and Conditions” of tender document. I/We totally understand the terms and conditions and agree to abide by the same.

**SIGNATURE OF TENDERER ALONG WITH SEAL OF
THE COMPANY WITH DATE**

Bidder Eligibility Criteria and Technical Specification for Laser Powder Bed Fusion based additive manufacturing system

Tender No. MM/MURU/82/2023/LASERPOWDERBED

Bidder Eligibility Criteria – I (Public Procurement – Preference to Make in India)

Only 'Class-I local suppliers' and 'Class-II local suppliers', as defined under DIPP, MoCI Order No. P-45021/2/2017-PP (BE-II) dated 16th September 2020 and other subsequent orders issued therein.

Bidder Eligibility Criteria – II

1. The bidder/OEM should have supplied at least 1 L-PBF (Laser powder bed fusion) metal additive manufacturing machine to IITs, NITs, IISERs, CSIR Labs or other Govt. R&D organizations in the last 5 years, PO copies or installation certificates along with contact details of end user need to be submitted as the proof of supply. IIT Madras reserves its right to verify the claims submitted by the bidder and the feedback from the previous customers will be part of technical evaluation.

2. A global reference list as well as user list in India should be enclosed.
3. The operational status of all the equipment in India should be provided.

III. TECHNICAL SPECIFICATION For Laser Powder Bed Fusion based additive manufacturing system

1. Technology requirement

- 1.1. Laser powder bed fusion (LPBF) additive manufacturing (AM) technology using the laser(s) as a melting source to produce metal printed parts directly from the CAD model by using a raw metal/metallic alloy powders.
- 1.2. The laser(s) heat source should be capable of completely melting the powder feedstock (raw material) to form a melt pool and create a part/component with a relative density as high as 99.9 %, without any addition of binders.
- 1.3. The system should be equipped with a fibre laser heat source of 500 W or higher power. Besides, the laser(s) equipped with the system should have the following features.
 - 1.3.1. Preferably a single mode continuous wave Yb-fiber laser
 - 1.3.2. Wavelength: 1030 – 1100 nm
 - 1.3.3. Focus diameter: 75µm
- 1.3.4. Source: India/US/Europe
- 1.3.5. Optional requirements:
- 1.3.6. Preferably, there should be a provision for future upgradation or retrofitting of the laser source of higher power rating to 700 W or higher
- 1.3.7. Laser power calibration (manual or automatic) with the required hardware such as a pocket monitor from M/s Primes. Complete details need to be clearly provided.
- 1.4. The following specification with reference to the optics should be adhered to:
 - 1.4.1. The machine must be equipped with Dual scan system. The machine must be equipped with full field scan system. Every scan system should be able to access all the corners of the build plate to increase productivity.
 - 1.4.2. The optical system supplied with the machine should have:
 - 1.4.3. High-speed mirror deflection system with precision galvanometer scanner, integrated servo electronics, and data transmission with a digital signal processor
 - 1.4.4. The system shall be capable of achieving scan speeds up to 7 m/s or higher and the build rate should be 15 cm³/hr. or more.

- 1.4.5. The machine's scanner should scan the complete build volume without any dead corners on the dead plate and should not have any manual movement
- 1.4.6. Cooling – Integrated cooling system as required for cooling the source, optics, etc. should be provided
- 1.4.7.
- 1.5. The thinnest possible layer should 20 micrometers or smaller. The system should be capable of printing the the layer thickness up to 120 micrometers or higher.
 - 1.6. Layer thickness should be editable in the entire range in increments of 1 μm .
 - 1.7. Movement of the build platform should be in closed loop and precise with a repeatability of $\pm 5 \mu\text{m}$ or better
 - 1.8. Minimum feature size should be 150 micrometers or smaller. There must be a provision to extract unmelted powder from a feature of 150 micrometers or smaller.
 - 1.9. Surface roughness as built after the cleaning of the building part should be in the range of 5-10 micrometers
 - 1.10. System should be capable of building parts with a final dimension of $320 \times 320 \times 400 \text{ mm}^3$ or higher. In other words, the build envelop or powder bed size should be capable of producing parts of $320 \times 320 \times 400 \text{ mm}^3$ or higher.
 - 1.11. Build platform temperature: The build plate must be capable of being heated to a temperature of $200 \text{ }^\circ\text{C}$ or higher.
 - 1.12. Provision for external preheating of the build-up to a temperature of $200 \text{ }^\circ\text{C}$ or higher must be provided.
 - 1.13. Build plates for three different materials, i.e., Al Alloy, Titanium Alloy, and Stainless steel should be quoted.
 - 1.14. System should be capable of printing the parts in nitrogen and argon atmosphere. There must be a provision to supply nitrogen and argon with controlled flow rate into the build chamber.
 - 1.15. With the inert atmosphere, the permissible oxygen concentration in the build chamber should be $<1000 \text{ ppm}$
 - 1.16. Gas consumption should be $<10 \text{ litres per minutes (l/min.)}$
 - 1.17. Nitrogen gas generators should be provided along with the machine, preferably from a nitrogen generator (mandatory accessory)
 - 1.18. Provision for connecting externally supplied Argon gas cylinders should be included.
 - 1.19. Gas flow should be laminar flow and print must run continuously without any gas flow interruption.
 - 1.20. Provision to interrupt the building if oxygen level crosses the permissible limit.
 - 1.21. Oxygen level and gas flow shall be monitored and displayed.
 - 1.22. Ambient operating conditions:
 - 1.22.1. Temperature range: 10°C to 30°C
 - 1.22.2. Relative humidity range: 30% to 80% (non-condensing).
 - 1.23. All the process parameters governing the additive manufacturing process should be open and freely editable to IIT Madras for academic research, innovation and and development purpose. A complete list of process parameters for the standard materials should be provided by the manufacturer in their technical bids.
 - 1.24. A video camera based or any other monitoring system, showing the build operation to the user should be provided and this system should have the capability for closed loop control of the process.
 - 1.25. The equipment should be equipped with an automatic powder dosage system which controls the powder dosing required for each layer using an appropriate image processing based control techniques.
 - 1.26. The recoater system should have the following requirements
 - 1.26.1. Re coater can be uni-directional/bi-directional
 - 1.26.2. The powder coating blade's material and the coating blade's type must be specified.
 - 1.26.3. The coating blade must be easy to remove and insert without removing the complete recoater system.
 - 1.27. The compressed air pressure should be 6-10 bar.
 - 1.28. The following specifications with regard to the Process Monitoring System should be adhered to:
 - 1.28.1. The machine shall be provided with an integrated process monitoring system.
 - 1.28.2. The process monitoring system must have the features given below.
 - 1.28.3. Editable gas flow parameters according to the build material

- 1.28.4. Powder bed monitoring option
- 1.28.5. Automatic build time calculation feature
- 1.28.6. Job history details
- 1.28.7. Axis control option
- 1.28.8. Powder level indicator option
- 1.28.9. Filter clogging status
- 1.28.10. Build tank/cylinder removal and loading option
- 1.28.11. Part positioning option
- 1.28.12. Oxygen level, process chamber temperature, gas flow, differential pressure all parameter variation statuses should be shown graphically.
- 1.28.13. Job quality report must be generated, and it should be printable
- 1.28.14. The total laser hours should be indicated on the HMI
- 1.28.15. Inert gas selection based on materials.
- 1.28.16. Provision for automatic dosage and blower control
- 1.28.17. Viewing the model and the sliced component in the HMI
 - 1.29. The machine should be equipped with beam shapers which gives the flexibility to change the laser beam shape from Gaussian to flat profile for academic research purposes.
 - 1.30. The laser optics should have the capability to change the fly focus adjustment where the laser spot diameter can be varied in the same layer of a particular build for academic research purposes.
 - 1.31. The system should be equipped with melt pool monitoring system using a high-quality vision system which can capture melt pool images. Provisions should be provided to use the obtained images to analyse the melt pool stability using customised algorithms developed at IIT Madras and identify defects formation during printing.

2. Feedstock/powder requirement

- 2.1. System should have a capability to use standard and non-standard commercial metals and metallic alloy powders.
- 2.2. The machine should be capable of printing both reactive and non-reactive material as listed below, for e.g.
 - 2.2.1. Stainless steels, al-base alloys, Ti-base alloys, Ni-base superalloys , high strength steels such as maraging steels and tool steels, to name a few of the alloys.
 - 2.2.2. The machine should also be capable to print copper and tungsten and its alloys.
 - 2.2.3. Bare minimum requirement of any alloy that weldable should be printable in the systems
- 2.3. The system should permit the use of feedstock powders with custom-designed alloy compositions, designed in IIT Madras or elsewhere.
- 2.4. The system should allow parametric development for custom-designed alloy compositions by IIT Madras on their own or with the help of the supplier without any additional charges within and beyond the warranty period.
- 2.5. The supplier should help IIT Madras to identify the process parameters to build parts from custom designed alloy powders without any additional charges within and beyond the warranty period.
- 2.6. Use of third-party feedstock powders or custom designed powders by IIT Madras should not void the warranty of the equipment.
- 2.7. System software should be capable of using any third-party materials with an unlimited possibility to edit the parameters.
- 2.8. Minimum powder requirement to print a component should not be more than two times of the build chamber volume.
- 2.9. The following requirements of the powder loading system should be adhered to:
 - 2.9.1. Provision for automatic powder loading system if available.
 - 2.9.2. The actual capacity of the build tank volume and powder loading procedure details are to be provided.
- 2.10. Demonstration of mechanical properties of build materials
 - 2.10.1. The mechanical properties of the building shall be near to the original materials' standard properties – i.e. key properties such as YS, UTS, % elongation, hardness, density, etc.
 - 2.10.2. A complete data sheet should be provided of all the materials that will be offered.

3. Sieving unit

- 3.1. Powder sieving must be handled in separate units for reactive and non-reactive powders.

- 3.2. Powder collection and sieving must be handled in a controlled atmosphere.
 - 3.3. The system must be equipped with ultrasonic Gun to clean the sieve mesh and avoid clogging
 - 3.4. Provision should be present for inert gas purging to avoid oxygen contamination and reaction between metal powders, the oxygen level should be indicated in the sieving system.
 - 3.5.
4. **Build volume reducer and tank removal system**
 - 4.1. The machine should have a build tank removal station
 - 4.2. The build tank removal process must be done automatically through HMI
 - 4.3. The system should be equipped with build volume reducer to print parts of smaller dimension consuming less amount of metal powder for spreading each layer with a minimum build size of 125 mm x 125 mm x 150 mm or less.
5. **Filtration system**
 - 5.1. The machine should have 2 stage filtration system for continuous operation.
 - 5.2. The machine should have a Class 6 HEPA filter for fine filtering as per ISO 14644. Filter life shall be higher to ensure longer usage (up to 1500 Laser hours or more)
 - 5.3. The necessity for changing the filter unit should be detected/ monitored on the system screen.
 - 5.4. The filter housing should be reusable and can be set up with freely available, recyclable filter cartridges. Provision for purging to be provided for safe filter disposal.
6. **Machine control software requirement**
 - 6.1. Software should have a module for automatic support structure generation capabilities for any given design. Software should also be capable of changing the support structure design as per user requirement.
 - 6.2. Software should support standard neutral formats such as IGES/STEP/STL. Additionally, it should preferably be capable of supporting AMF format.
 - 6.3. Software should be capable of correcting errors in the CAD data to heal the geometry and convert into machine readable format.
 - 6.4. Necessary software for conversion of 3D CAD data (of any readable format) into L-PBF system compatible format to be included.
 - 6.5. Software should be freely able to communicate with PC/workstation with MS-windows 10 or higher operating system.
 - 6.6. A free license for the system software should be provided with the equipment
 - 6.7. Software should be capable of analysing linear and non-linear scaling, translation and rotational displacements.
 - 6.8. Software should be capable of estimating build time and powder requirement for major engineering metals and alloys.
 - 6.9. Software should be capable of producing a detailed report, describing part geometry, build process and results.
 - 6.10. Software should be capable of varying the process parameters (including laser power, focal length and scanning speed) as a function of (x,y) coordinates for a given layer on a build platform.
 - 6.11. Software should be capable of producing volume and surface lattice designs (including internal light weighting lattices, infills and surface textures).
 - 6.12. Software should be capable of carrying out lattice advance design (using a finite element analysis-based lattice analysis and optimisation, lattice structure development for smooth and internal shell features.
7. **Pre-processing software requirements**
 - 7.1. Pre-processing software should have the capabilities of all the specifications mentioned against machine control software (section 3).
 - 7.2. Software should provide an automatic pre-processing slicing and capability to generate 3D digital part files.
 - 7.3. Software should be capable of nesting of parts to optimise powder bed volume and improve build time.
 - 7.4. Software should be capable of automatically plan the part placement to optimise the build time.
 - 7.5. Suitable software should be provided to speed up the parametric development. This software should have a capability to include material properties and laser interactions to narrow down the possible printing parameters with minimal trial and error sequences.
 - 7.6. Data preparation software should have the minimum required features given below.
 - 7.6.1. The software should be user-friendly, and it must operate without any interruptions.
 - 7.6.2. Provision for support structure optimization

- 7.6.3.Provision for process parameter optimization for R&D work
- 7.6.4.Automatic and manual support generation
- 7.6.5.Automatic orientation
- 7.6.6.The option to fix the part error manually and automatically.
- 7.6.7.Automatic nesting option
- 7.6.8.Provision for part Boolean operation and engraving.
- 7.6.9.Sliced layer viewer and multi-section viewer options.
- 7.6.10.Automatic build time estimate option
- 7.6.11.Provision to export STL files.
- 7.6.12.Automatic build volume and support volume estimator for single and multiple parts.
- 7.6.13.Software license should be perpetual.
- 7.6.14. Complete details should be provided for all the above points.**
- 7.6.15. There should be a provision for adaptive slicing in the software where in the same part/ build can be sliced and printed with different layer thickness.**
- 7.6.16.Provision for unique scanning strategies developed at IIT Madras such as Hybrid MAT(Medial Axis Transformation), Continuous paths and provision for manipulating vector paths must be available in the software**
- 7.6.17.Provision for CLI (Binary) & CLI (Ascii) import/export should be available for custom path planning strategies developed at IIT Madras.**
- 7.6.18.**

8. Software licenses

- 8.1. License for both machine control (item 3) and pre-processing software should be included with the system. Free and perpetual software license for pre and post processing software module should be provided.
- 8.2. A free license for pre and post processing software should be provided to install in multiple standalone PCs/workstations or with a floating network licenses.
- 8.3.Software license should facilitate to develop/edit the process parameters.

9. Documentation requirement

The following documentations should be provided (one set of each in English)

- 9.1. Operation manual
- 9.2. Software instruction manual
- 9.3. Maintenance, troubleshooting and safety guidelines manuals
- 9.4. Manuals to handle accessories and guidelines
- 9.5. Process Parameters data for common engineering alloy feedstocks (titanium and its alloys, stainless steels, aluminium and its alloys, cobalt and nickel based alloys) should be given in a CD/flash drive.
- 9.6. Occupational Health and Safety (OHS) guidelines and warnings.

10. Warranty and Annual Maintenance Contract requirements

- 10.1. A 3-year complete system warranty (including for laser power source) should be provided from the date of installation.
- 10.2. Possibility of extending the warranty beyond the mandatory period should be clearly mentioned with the appropriate cost. Vendor should give separate quotation for subsequent year(s).
- 10.3. Bidder should have provision for a continuous Annual Maintenance Contract upon the completion of warranty period.
- 10.4.Comprehensive maintenance contract should include cost of services as well as spares.
- 10.5.Vendor should also give schedule of preventive maintenance in their offer. During the period of contract vendor should respond to breakdown within 72 hours of reporting.
- 10.6.The vendor should also mention the payment schedule for AMC along with their offer.

11. Additional mandatory requirement from OEM for continuous support and operation

- 11.1. One senior onsite application engineer for six months - Trained in machine operation and data preparation - Trained in basic machine maintenance - Trained in basic post-processing - Trained in creating QA reports for 3D Printed parts - Trained in giving feedback to customer if CAD file needs modification for 3D Printing
- 11.2. Design for Additive Manufacturing Consulting (DfAM) / Industrial Training with case studies - Includes Design, Simulation, Business Case calculation & justification
- 11.3. Design for Additive Manufacturing Curriculum Development & Classroom Training – IIT Madras will provide workstations with Design/Simulation tools – 3D CAD, Generative Design, Structural Analysis, CFD, Mold Simulation

12. Inspection, installation, commissioning and training

- 12.1. All the essential requirements ensuring a ready-to-use set up at IIT Madras should be supplied.
- 12.2. Delivery time of the machine should be maximum 4-6 months after placement of Purchase order.
- 12.3. Overall dimensions of the machine to be shown schematically, specifying the area required to install the machine in all three dimensions with the accessories.
- 12.4. Clear documentation on the site requirements and site needs should be provided.
- 12.5. OEM should carry out the installation and commission of the machine at the Customer site, the cost for the same to be provided separately.
- 12.6. After installation and commissioning of the machine, there will be a Site Acceptance Test (SAT) on mutually agreed terms.
- 12.7. Training should be provided on-site at the time of installation and acceptance test. There should not be any restriction on number of persons to be trained.
- 12.8. However, training shall be restricted to one batch of few persons.
- 12.9. All the training instructions have to be in English only. Duration of training should be adequate for the identified operators to understand and operate the machine independently.

13. On-site technical support

- 13.1. Depending on the nature of support, On-line/On-Site technical support to be provided during the period of warranty & AMC.
- 13.2. To suggest design modifications to make the parts suitable for 3D printing.
- 13.3. Establishing parameters for materials specified.
- 13.4. Deciding orientation of job and supports for building the job successfully.
- 13.5. Guide in handling of the metal powders
- 13.6. Post processing of job which include Heat treatment, shot peening, etc.
- 13.7. Guide technicians in operating the machine.

14. Spares, consumables, mandatory accessories and standard feedstocks

- 14.1. Bidder should offer a list of essential spare parts and accessories with their part numbers for a continuous operation for three years. Bidder should also ensure that the spare parts and accessories should be made available to procure for a smooth operation over at least 15 years from the date of installation.
- 14.2. However, the consumables and parts required for the system's installation and standardisation should be given free of cost.
- 14.3. 50 kg of (i) Titanium (preferably, Ti-6Al-4V alloy) , (ii) 316L stainless steel and (iii) Aluminium alloy (preferably AlSi10Mg), (iv) Maraging steel, (v) Tool steel-H13, (vi) IN718 and (vii) IN625 powders should be supplied with the equipment for the system optimisation during installation and commissioning.
- 14.4. The following consumables list and quantity details shall be provided including other spares not mentioned in the list.
 - 14.4.1. Filters
 - 14.4.2. Re-coater blades
 - 14.4.3. Ethanol and Isopropyl alcohol (IPA)
 - 14.4.4. Lens cleaning tissues (soft tissues)
 - 14.4.5. Hard tissues
 - 14.4.6. Emery sheets

14.5. The following mandatory accessories should be offered along with the machine:

14.5.1.Cleaning kits for optics and other subsystems

14.5.2.Chiller unit for laser source

14.5.3.Nitrogen Gas Generator : Purity 99.9 %, Nitrogen flow rate must be 5.3 m³ per hour or more, outlet pressure must be 5 bar or more.

14.5.4.Clamping systems for firm holding of the build plate

14.5.5.Re-coater blades

14.5.6.Additional Build Cylinder should be provided

14.5.7.Additional Powder Transfer assembly, powder tank and loading unit must be provided.

14.5.8.Part Removal Station

14.5.9.UPS (30 kVA) with 30 min Backup should be provided with the equipment

14.5.10.Wire Cutting Machine (350 X 450 mm) as per the following specifications should be provided : worktable size 450 x 650 mm (min), Z height 450 mm (min), max. work piece weight 300 kg, minimum cutting increment 0.001 mm.

14.5.11.Air Compressor (52 CFM, 9.5 Bar working Pressure)

14.5.12.Setting Table (Drawer roller cabinet, min. size 650 mm x 450 mm x 950 mm or bigger)

14.5.13.Powder storage rack (600 D x 1320 L x 2000 Ht)

14.5.14. Fork lift with a load capacity of 1500 kg, max. lifting height of 1600 mm, fork length of minimum 650 mm should be provided.

14.5.15.Long life Filtration System should be provided along with the systems with all consumables and replaceable spares.

14.5.16.The above list is indicative only. Any accessories other than the above which are required for the smooth running of the LPBF machine or post-processing of jobs should be quoted. If any of the above accessories are not required for the smooth functioning of the system, may be omitted and if other additional accessories are required should be mentioned.

14.6. A separate build chamber/build platform for titanium, stainless steel and aluminium alloys should be provided.

14.7. HEPA grade filter as per OEM specification to achieve highest level of safety should be provided. Enough filters should supplied to ensure smooth operation of the equipment during the warranty period.

14.8. At least five numbers of ceramic/HSS or suitable recoater blades (suitable for all the feedstocks) should be supplied as a spare.

14.9. A high purity nitrogen generator and 10 numbers Argon cylinders with 99.99 purity should be supplied with the system.

14.10. Powder sieve station with an ability to sieve both reactive and non-reactive feedstock powders should be supplied.

14.11. An industry grade dry vacuum cleaner (explosion proof / Atex 22 grade) should be supplied with the equipment.

15. Power supply

15.1. The machine and other auxiliary equipment should work on a 3-phase AC power supply of 400 V, 50 Hz, or Single-phase AC power of 230 V, 50 Hz.

16. Additional mandatory conditions

16.1. A continuous operational support to IIT Madras should be provided without any additional cost during the warranty period (at least three years from the date of installation).

16.2. There should be a minimum of two visits per year by the service engineer and application engineer of the equipment supplier (preferably from OEM).

16.3. The total cost of the system should be inclusive of these visits.

16.4. The bidder must either be OEM or legal representatives of the OEM in India. The bidder and the legal representatives should have ISO certification for quality standards (a copy of ISO certification should be attached with the technical bid).

16.5.Total weight of the system

16.6. Personnel safety accessories (goggles, masks etc.)

16.7. Special design/provision should be made to prevent accidents while in operation.

16.8.“Emergency Stop” button(s) should be provided at convenient and easily accessible location.

16.9. Safety manuals and charts should be provided.

16.10.Supplier should provide safety training at the time of installation.

16.11. Flow line diagrams and electrical circuit diagrams should be provided.

- 16.12. A preinstallation instructions should be provided with the equipment, indicating electrical, space, gas connections and safety protocols should be provided.
17. **It is mandatory that equipment supplier should demonstrate the manufacturing capabilities of the equipment upon installation by printing a standard design given by the IIT Madras (with the specifications given in section 1, 2 and 9).**
 18. **A detailed compliance statement, clearly indicating the compliance (or deviation) against each technical specification to above mentioned specifications should be provided along with technical and financial quotes.**
 19. **Financial bids should be provided as a modular bid with a list price for each and individual item. Price should be FOR IIT MADRAS Chennai.**

TECHNICAL BID PROFORMA

Tender No. MM/MURU/82/2023/LASERPOWDERBED

Item Name: Laser Powder Bed Fusion based additive manufacturing system

1.0 Bidder Eligibility Criteria:

I	Bidder Eligibility Criteria-I (Public Procurement – Preference to Make in India)	Class I / Class II	Local Content value	Reference, Page No.
I	Only 'Class-I local suppliers' and 'Class-II local suppliers', as defined under DIPP, MoCI Order No. P-45021/2/2017-PP (BE II) dated 16 th September 2020 and other subsequent orders issued therein.			
2.0	Bidder Eligibility Criteria-II	Compliance (Yes/No)	Reference Page No.	Remarks, If any
1	.The bidder/OEM should have supplied at least 1 L-PBF (Laser powder bed fusion) metal additive manufacturing machine to IITs, NITs, IISERs, CSIR Labs or other Govt. R&D organizations in the last 5 years, PO copies or installation certificates along with contact details of end user need to be submitted as the proof of supply. IIT Madras reserves its right to verify the claims submitted by the bidder and the feedback from the previous customers will be part of technical evaluation.			
2	A global reference list as well as user list in India should be enclosed.			
3	The operational status of all the equipment in India should be provided.			

2.0 Technical Compliance:

Specifications	Complied/Not Complied	Ref, Page, No
1. Technology requirement		
1.1. Laser powder bed fusion (LPBF) additive manufacturing (AM) technology using the laser(s) as a melting source to produce metal printed parts directly from the CAD model by using a raw metal/metallic alloy powders.		
1.2. The laser(s) heat source should be capable of completely melting the powder feedstock (raw material) to form a melt pool and create a part/component with a relative density as high as 99.9 %, without any addition of binders.		
1.3. The system should be equipped with a fibre laser heat source of 500 W or higher power. Besides, the laser(s) equipped with the system should have the following features.		
1.3.1. Preferably a single mode continuous wave Yb-fiber laser		
1.3.2. Wavelength: 1030 – 1100 nm		
1.3.3. Focus diameter: 75µm		
1.3.4. Source: India/US/Europe		

	1.3.5.Optional requirements:		
	1.3.6.Preferably, there should be a provision for future upgradation or retrofitting of the laser source of higher power rating to 700 W or higher		
	1.3.7.Laser power calibration (manual or automatic) with the required hardware such as a pocket monitor from M/s Primes. Complete details need to be clearly provided.		
	1.4. The following specification with reference to the optics should be adhered to:		
	1.4.1. The machine must be equipped with Dual scan system. The machine must be equipped with full field scan system. Every scan system should be able to access all the corners of the build plate to increase productivity.		
	1.4.2. The optical system supplied with the machine should have:		
	1.4.3. High-speed mirror deflection system with precision galvanometer scanner, integrated servo electronics, and data transmission with a digital signal processor		
	1.4.4. The system shall be capable of achieving scan speeds up to 7 m/s or higher and the build rate should be 15 cm ³ /hr. or more.		
	1.4.5. The machine's scanner should scan the complete build volume without any dead corners on the dead plate and should not have any manual movement		
	1.4.6. Cooling – Integrated cooling system as required for cooling the source, optics, etc. should be provided		
	1.4.7.		
	1.5. The thinnest possible layer should 20 micrometers or smaller. The system should be capable of printing the the layer thickness up to 120 micrometers or higher.		
	1.6. Layer thickness should be editable in the entire range in increments of 1 µm.		
	1.7. Movement of the build platform should be in closed loop and precise with a repeatability of ± 5 µm or better		
	1.8. Minimum feature size should be 150 micrometers or smaller. There must be a provision to extract unmelted powder from a feature of 150 micrometers or smaller.		
	1.9. Surface roughness as built after the cleaning of the building part should be in the range of 5-10 micrometers		
	1.10. System should be capable of building parts with a final dimension of 320 x 320 x 400 mm ³ or higher. In other words, the build envelop or powder bed size should be capable of producing parts of 320 x 320 x 400 mm ³ or higher.		
	1.11. Build platform temperature: The build plate must be capable of being heated to a temperature of 200 °C or higher.		
	1.12.Provision for external preheating of the build-up to a temperature of 200 °C or higher must be provided.		
	1.13. Build plates for three different materials, i.e., Al Alloy, Titanium Alloy, and Stainless steel should be quoted.		
	1.14. System should be capable of printing the parts in nitrogen and argon atmosphere. There must be a provision to supply nitrogen and argon with controlled flow rate into the build chamber.		
	1.15. With the inert atmosphere, the permissible oxygen concentration in the build chamber should be <1000 ppm		
	1.16.Gas consumption should be <10 litres per minutes (l/min.)		
	1.17. Nitrogen gas generators should be provided along with the machine, preferably from a nitrogen generator (mandatory accessory)		

	1.18.Provision for connecting externally supplied Argon gas cylinders should be included.		
	1.19.Gas flow should be laminar flow and print must run continuously without any gas flow interruption.		
	1.20.Provision to interrupt the building if oxygen level crosses the permissible limit.		
	1.21.Oxygen level and gas flow shall be monitored and displayed.		
	1.22.Ambient operating conditions:		
	1.22.1.Temperature range: 10°C to 30°C		
	1.22.2.Relative humidity range: 30% to 80% (non-condensing).		
	1.23.All the process parameters governing the additive manufacturing process should be open and freely editable to IIT Madras for academic research, innovation and and development purpose. A complete list of process parameters for the standard materials should be provided by the manufacturer in their technical bids.		
	1.24. A video camera based or any other monitoring system, showing the build operation to the user should be provided and this system should have the capability for closed loop control of the process.		
	1.25.The equipment should be equipped with an automatic powder dosage system which controls the powder dosing required for each layer using an appropriate image processing based control techniques.		
	1.26.The recoater system should have the following requirements		
	1.26.1. Re coater can be uni-directional/bi-directional		
	1.26.2.The powder coating blade's material and the coating blade's type must be specified.		
	1.26.3.The coating blade must be easy to remove and insert without removing the complete recoater system.		
	1.27. The compressed air pressure should be 6-10 bar.		
	1.28.The following specifications with regard to the Process Monitoring System should be adhered to:		
	1.28.1.The machine shall be provided with an integrated process monitoring system.		
	1.28.2. The process monitoring system must have the features given below.		
	1.28.3. Editable gas flow parameters according to the build material		
	1.28.4. Powder bed monitoring option		
	1.28.5. Automatic build time calculation feature		
	1.28.6. Job history details		
	1.28.7. Axis control option		
	1.28.8. Powder level indicator option		
	1.28.9. Filter clogging status		
	1.28.10. Build tank/cylinder removal and loading option		
	1.28.11. Part positioning option		
	1.28.12. Oxygen level, process chamber temperature, gas flow, differential pressure all parameter variation statuses should be shown graphically.		
	1.28.13. Job quality report must be generated, and it should be printable		

	1.28.14. The total laser hours should be indicated on the HMI		
	1.28.15. Inert gas selection based on materials.		
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	1.28.17. Viewing the model and the sliced component in the HMI		
	1.29.The machine should be equipped with beam shapers which gives the flexibility to change the laser beam shape from Gaussian to flat profile for academic research purposes.		
	1.30.The laser optics should have the capability to change the fly focus adjustment where the laser spot diameter can be varied in the same layer of a particular build for academic research purposes.		
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	2.1. System should have a capability to use standard and non-standard commercial metals and metallic alloy powders.		
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	2.2.1.Stainless steels, al-base alloys, Ti-base alloys, Ni-base superalloys , high strength steels such as maraging steels and tool steels, to name a few of the alloys.		
	2.2.2.The machine should also be capable to print copper and tungsten and its alloys.		
	2.2.3. Bare minimum requirement of any alloy that weldable should be printable in the systems		
	2.3.The system should permit the use of feedstock powders with custom-designed alloy compositions, designed in IIT Madras or elsewhere.		
	2.4.The system should allow parametric development for custom-designed alloy compositions by IIT Madras on their own or with the help of the supplier without any additional charges within and beyond the warranty period.		
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	2.7.System software should be capable of using any third-party materials with an unlimited possibility to edit the parameters.		
	2.8. Minimum powder requirement to print a component should not be more than two times of the build chamber volume.		
	2.9. The following requirements of the powder loading system should be adhered to:		
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	2.10.2.A complete data sheet should be provided of all the materials that will be offered.		
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	6.8.Software should be capable of estimating build time and powder requirement for major engineering metals and alloys.		
	6.9.Software should be capable of producing a detailed report, describing part geometry, build process and results.		

	6.10. Software should be capable of varying the process parameters (including laser power, focal length and scanning speed) as a function of (x,y) coordinates for a given layer on a build platform.		
	6.11. Software should be capable of producing volume and surface lattice designs (including internal light weighting lattices, infills and surface textures).		
	6.12. Software should be capable of carrying out lattice advance design (using a finite element analysis-based lattice analysis and optimisation, lattice structure development for smooth and internal shell features).		
7.Pre-processing software requirements			
	7.1. Pre-processing software should have the capabilities of all the specifications mentioned against machine control software (section 3).		
	7.2. Software should provide an automatic pre-processing slicing and capability to generate 3D digital part files.		
	7.3. Software should be capable of nesting of parts to optimise powder bed volume and improve build time.		
	7.4. Software should be capable of automatically plan the part placement to optimise the build time.		
	7.5. Suitable software should be provided to speed up the parametric development. This software should have a capability to include material properties and laser interactions to narrow down the possible printing parameters with minimal trial and error sequences.		
	7.6. Data preparation software should have the minimum required features given below.		
	7.6.1. The software should be user-friendly, and it must operate without any interruptions.		
	7.6.2. Provision for support structure optimization		
	7.6.3. Provision for process parameter optimization for R&D work		
	7.6.4. Automatic and manual support generation		
	7.6.5. Automatic orientation		
	7.6.6. The option to fix the part error manually and automatically.		
	7.6.7. Automatic nesting option		
	7.6.8. Provision for part Boolean operation and engraving.		
	7.6.9. Sliced layer viewer and multi-section viewer options.		
	7.6.10. Automatic build time estimate option		
	7.6.11. Provision to export STL files.		
	7.6.12. Automatic build volume and support volume estimator for single and multiple parts.		
	7.6.13. Software license should be perpetual.		
	7.6.14. Complete details should be provided for all the above points.		
	7.6.15. There should be a provision for adaptive slicing in the software where in the same part/ build can be sliced and printed with different layer thickness.		
	7.6.16. Provision for unique scanning strategies developed at IIT Madras such as Hybrid MAT(Medial Axis Transformation), Continuous paths and provision for manipulating vector paths must be available in the software		
	7.6.17. Provision for CLI (Binary) & CLI (Ascii) import/export should be available for custom path planning strategies developed at IIT Madras.		
8. Software licenses			

	8.1. License for both machine control (item 3) and pre-processing software should be included with the system. Free and perpetual software license for pre and post processing software module should be provided.		
	8.2. A free license for pre and post processing software should be provided to install in multiple standalone PCs/workstations or with a floating network licenses.		
	8.3. Software license should facilitate to develop/edit the process parameters.		
9. Documentation requirement			
	The following documentations should be provided (one set of each in English)		
	9.1. Operation manual		
	9.2. Software instruction manual		
	9.3. Maintenance, troubleshooting and safety guidelines manuals		
	9.4. Manuals to handle accessories and guidelines		
	9.5. Process Parameters data for common engineering alloy feedstocks (titanium and its alloys, stainless steels, aluminium and its alloys, cobalt and nickel based alloys) should be given in a CD/flash drive.		
	9.6. Occupational Health and Safety (OHS) guidelines and warnings.		
10. Warranty and Annual Maintenance Contract requirements			
	10.1. A 3-year complete system warranty (including for laser power source) should be provided from the date of installation.		
	10.2. Possibility of extending the warranty beyond the mandatory period should be clearly mentioned with the appropriate cost. Vendor should give separate quotation for subsequent year(s).		
	10.3. Bidder should have provision for a continuous Annual Maintenance Contract upon the completion of warranty period.		
	10.4. Comprehensive maintenance contract should include cost of services as well as spares.		
	10.5. Vendor should also give schedule of preventive maintenance in their offer. During the period of contract vendor should respond to breakdown within 72 hours of reporting.		
	10.6. The vendor should also mention the payment schedule for AMC along with their offer.		
11. Additional mandatory requirement from OEM for continuous support and operation			
	11.1. One senior onsite application engineer for six months - Trained in machine operation and data preparation - Trained in basic machine maintenance - Trained in basic post-processing - Trained in creating QA reports for 3D Printed parts - Trained in giving feedback to customer if CAD file needs modification for 3D Printing		
	11.2. Design for Additive Manufacturing Consulting (DfAM) / Industrial Training with case studies - Includes Design, Simulation, Business Case calculation & justification		
	11.3. Design for Additive Manufacturing Curriculum Development & Classroom Training – IIT Madras will provide workstations with Design/Simulation tools – 3D CAD, Generative Design, Structural Analysis, CFD, Mold Simulation		
12. Inspection, installation, commissioning and training			
	12.1. All the essential requirements ensuring a ready-to-use set up at IIT Madras should be supplied.		

	12.2.Delivery time of the machine should be maximum 4-6 months after placement of Purchase order.		
	12.3.Overall dimensions of the machine to be shown schematically, specifying the area required to install the machine in all three dimensions with the accessories.		
	12.4.Clear documentation on the site requirements and site needs should be provided.		
	12.5.OEM should carry out the installation and commission of the machine at the Customer site, the cost for the same to be provided separately.		
	12.6.After installation and commissioning of the machine, there will be a Site Acceptance Test (SAT) on mutually agreed terms.		
	12.7. Training should be provided on-site at the time of installation and acceptance test. There should not be any restriction on number of persons to be trained.		
	12.8.However, training shall be restricted to one batch of few persons.		
	12.9.All the training instructions have to be in English only. Duration of training should be adequate for the identified operators to understand and operate the machine independently.		
13. On-site technical support			
	13.1. Depending on the nature of support, On-line/On-Site technical support to be provided during the period of warranty & AMC.		
	13.2.To suggest design modifications to make the parts suitable for 3D printing.		
	13.3.Establishing parameters for materials specified.		
	13.4.Deciding orientation of job and supports for building the job successfully.		
	13.5.Guide in handling of the metal powders		
	13.6.Post processing of job which include Heat treatment, shot peening, etc.		
	13.7.Guide technicians in operating the machine.		
14. Spares, consumables, mandatory accessories and standard feedstocks			
	14.1. Bidder should offer a list of essential spare parts and accessories with their part numbers for a continuous operation for three years. Bidder should also ensure that the spare parts and accessories should be made available to procure for a smooth operation over at least 15 years from the date of installation.		
	14.2. However, the consumables and parts required for the system's installation and standardisation should be given free of cost.		
	14.3. 50 kg of (i) Titanium (preferably, TI-6Al-4V alloy) , (ii) 316L stainless steel and (iii) Aluminium alloy (preferably AlSi10Mg), (iv) Maraging steel, (v) Tool steel-H13, (vi) IN718 and (vii) IN625 powders should be supplied with the equipment for the system optimisation during installation and commissioning.		
	14.4. The following consumables list and quantity details shall be provided including other spares not mentioned in the list.		
	14.4.1.Filters		
	14.4.2.Re-coater blades		
	14.4.3.Ethanol and Isopropyl alcohol (IPA)		
	14.4.4.Lens cleaning tissues (soft tissues)		
	14.4.5.Hard tissues		
	14.4.6.Emery sheets		
	14.5. The following mandatory accessories should be offered along with the machine:		

	14.5.1.Cleaning kits for optics and other subsystems		
	14.5.2.Chiller unit for laser source		
	14.5.3.Nitrogen Gas Generator : Purity 99.9 %, Nitrogen flow rate must be 5.3 m ³ per hour or more, outlet pressure must be 5 bar or more.		
	14.5.4.Clamping systems for firm holding of the build plate		
	14.5.5.Re-coater blades		
	14.5.6.Additional Build Cylinder should be provided		
	14.5.7.Additional Powder Transfer assembly, powder tank and loading unit must be provided.		
	14.5.8.Part Removal Station		
	14.5.9.UPS (30 kVA) with 30 min Backup should be provided with the equipment		
	14.5.10.Wire Cutting Machine (350 X 450 mm) as per the following specifications should be provided : worktable size 450 x 650 mm (min), Z height 450 mm (min), max. work piece weight 300 kg, minimum cutting increment 0.001 mm.		
	14.5.11.Air Compressor (52 CFM, 9.5 Bar working Pressure)		
	14.5.12.Setting Table (Drawer roller cabinet, min. size 650 mm x 450 mm x 950 mm or bigger)		
	14.5.13.Powder storage rack (600 D x 1320 L x 2000 Ht)		
	14.5.14. Fork lift with a load capacity of 1500 kg, max. lifting height of 1600 mm, fork length of minimum 650 mm should be provided.		
	14.5.15.Long life Filtration System should be provided along with the systems with all consumables and replaceable spares.		
	14.5.16.The above list is indicative only. Any accessories other than the above which are required for the smooth running of the LPBF machine or post-processing of jobs should be quoted. If any of the above accessories are not required for the smooth functioning of the system, may be omitted and if other additional accessories are required should be mentioned.		
	14.6. A separate build chamber/build platform for titanium, stainless steel and aluminium alloys should be provided.		
	14.7. HEPA grade filter as per OEM specification to achieve highest level of safety should be provided. Enough filters should supplied to ensure smooth operation of the equipment during the warranty period.		
	14.8. At least five numbers of ceramic/HSS or suitable recoater blades (suitable for all the feedstocks) should be supplied as a spare.		
	14.9. A high purity nitrogen generator and 10 numbers Argon cylinders with 99.99 purity should be supplied with the system.		
	14.10. Powder sieve station with an ability to sieve both reactive and non-reactive feedstock powders should be supplied.		
	14.11. An industry grade dry vacuum cleaner (explosion proof / Atex 22 grade) should be supplied with the equipment.		
15. Power supply			
	15.1. The machine and other auxiliary equipment should work on a 3-phase AC power supply of 400 V, 50 Hz, or Single-phase AC power of 230 V, 50 Hz.		
16. Additional mandatory conditions			
	16.1. A continuous operational support to IIT Madras should be provided without any additional cost during the warranty period (at least three years from the date of installation).		
	16.2. There should be a minimum of two visits per year by the service engineer and application engineer of the equipment supplier (preferably from OEM).		

	16.3. The total cost of the system should be inclusive of these visits.		
	16.8. Total weight of the system		
	16.9. Personnel safety accessories (goggles, masks etc.)		
	16.10. Special design/provision should be made to prevent accidents while in operation.		
	16.11. “Emergency Stop” button(s) should be provided at convenient and easily accessible location.		
	16.12. Safety manuals and charts should be provided.		
	16.13. Supplier should provide safety training at the time of installation.		
	16.14. Flow line diagrams and electrical circuit diagrams should be provided.		
	16.15. A preinstallation instructions should be provided with the equipment, indicating electrical, space, gas connections and safety protocols should be provided.		
	18. A detailed compliance statement, clearly indicating the compliance (or deviation) against each technical specification to above mentioned specifications should be provided along with technical and financial quotes.		
	19. Financial bids should be provided as a modular bid with a list price for each and individual item. Price should be in CIF Chennai.		

**SIGNATURE OF BIDDER ALONG WITH
SEAL OF THE COMPANY WITH DATE**

FINANCIAL BID (PROFORMA) - BILL OF QUANTITIES (BOQ)

Item Name: Laser Powder Bed Fusion based additive manufacturing system
Tender No. MM/MURU/82/2023/LASERPOWDERBED

It. No	Description of work	Quantity	Units	Basic Rate in INR	GST in Percentage	Total Amount with taxes in INR
1	Laser powder bed fusion additive manufacturing system with all the specified mandatory accessories and with 3 years full warranty.	1	Nos.			
2	2 Years Extended Warranty (Optional)	1	Nos.			
3	2 Years AMC after warranty Period(Optional)	1	Nos.			
	Grand Total					

Total Amount Rupees in words _____

Note: Extended Warranty and AMC will not be considered for Price Bid Evaluation



CENTRE FOR INDUSTRIAL CONSULTANCY & SPONSORED RESEARCH (IC&SR)
INDIAN INSTITUTE OF TECHNOLOGY MADRAS
CHENNAI 600 036



ELECTRONIC CLEARING SERVICE (Credit Clearing)/ REAL TIME GROSS SETTLEMENT (RTGS) FACILITY FOR RECEIVING PAYMENTS

A. Details of Account Holder

Name of the Institution	Indian Institute of Technology - Madras
Complete Contact Address	Industrial Consultancy and Sponsored Research Indian Institute of Technology-Madras, IIT- Madras Campus Post Office, Sardar Patel Road, Guindy, CHENNAI - 600 036
Telephone No./ Fax No.	Tel - 044-2257 8356
E- mail ID of the FO/AO/REG/DIR	dricrs@iitm.ac.in

B. Bank Account Details:

Institution Account Name (As per Bank Record)	The Registrar, Indian Institute of Technology - Madras
Account No.	2722101003872
Account Print Name	IIT F A/C , The Registrar IIT Madras
IFSC CODE	CNRB0002722
Bank Name (in full)	Canara Bank
Branch Name	IIT-Madras Branch
Complete Branch Address	Canara Bank, IIT-Madras Branch, IIT- Madras Campus Post Office, Sardar Patel Road, Guindy, CHENNAI - 600 036
MICR No.	600015085
Account Type	Savings Account

Certified that the Institute's account is in an RTGS enabled branch.

I hereby declare that the particulars given above are correct and complete.

Date:

Signature of the Competent Authority
of the Institution with seal.

FORMAT FOR AFFIDAVIT OF SELF-CERTIFICATION UNDER PREFERENCE TO MAKE IN INDIA – PER ITEM

Tender Reference Number:

Name of the item / Service:

Date: _____

I/We _____ S/o, D/o, W/o, _____

Resident of _____

Hereby solemnly affirm and declare as under:

That I will agree to abide by the terms and conditions of the Public Procurement (Preference to Make in India) Policy vide GoI Order no. P-45021/2/2017-PP (B.E.-II) dated 15.06.2017 (subsequently revised vide orders dated 28.05.2018, 29.05.2019 and 04.06.2020) MOCI order No. 45021/2/2017-PP (BE II) Dt.16th September 2020 & P- 45021/102/2019-BE-II-Part (1) (E-50310) Dt.4th March 2021 and any subsequent modifications/Amendments, if any and

That the local content for all inputs which constitute the said item/service/work has been verified by me and I am responsible for the correctness of the claims made therein.

Tick (✓) and Fill the Appropriate Category	
<input type="checkbox"/>	I/We _____ [name of the supplier] hereby confirm in respect of quoted items that Local Content is equal to or more than 50% and come under “ Class-I Local Supplier ” category.
<input type="checkbox"/>	I/We _____ [name of the supplier] hereby confirm in respect of quoted items that Local Content is equal to 20% but less than 50% and come under “ Class-II Local Supplier ” category.

- The details of the location (s) at which the local value addition is made and the proportionate value of local content in percentage

Address _____ Percentage of Local content: _____%

For and on behalf of (Name of firm/entity)

Authorized signatory (To be duly authorized by the Board of Directors)

<Insert Name, Designation and Contact No.>

[Note: In case of procurement for a value in excess of Rs. 10 Crores, the bidders shall provide this certificate from statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.]

This letter should be on the letterhead of the quoting firm and should be signed by a competent authority. Non-submission of this will lead to Disqualification of bids.

(To be given on the letter head of the bidder)

No. _____

Dated: _____

CERTIFICATE

(Bidders from India)

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and hereby certify that I am not from such a country.

OR (*whichever is applicable*)

(Bidders from Country which shares a land border with India)

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and hereby certify that I from _____ (Name of Country) and has been registered with the Competent Authority. I also certify that I fulfil all the requirements in this regard and is eligible to be considered. *(Copy/ evidence of valid registration by the Competent Authority is to be attached)*

Place:

Date:

Signature of the Tenderer
Name & Address of the
Tenderer with Office Stamp