INDIAN INSTITUTE OF TECHNOLOGY MADRAS
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The Manager (Project Purchase) Date: 04.10.2022

Open Tender Reference No: MM/MURU/037/2022/AW-DED

GEM NAR ID: GEM/GARPTS/30092022/4CL6V89KNI3C Due Date/Time: 25.10.2022@ 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: "**Converting manual welding setups into robotic welding and arc-wire directed energy deposition (AW-DED) additive manufacturing systems**" 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**	**:**	**Vendor registration code.** Vendor registration with IC&SR (IITM) is mandatory for bidders to participate in tenders. ** **For Vendor Registration & Guidelines, Please follow the website :** https://icandsr.iitm.ac.in/vendorportal; Helpdesk: vendorhelpdesk@icsrpis.iitm.ac.in

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	**:**	**25.10.2022 @ 3:00 PM**
Date & time of opening of tender	**:**	**26.10.2022 @ 3:00 PM**

3. Instructions to the Bidder:

A)	**Searching for tender documents**	**:**	• 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.
B)	**Assistance to bidders**	**:**	• 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]
C)	**Enrollment Process to Bidders**	**:**	**REGISTRATION** • 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 (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 • 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".
D)	**Preparation of bids**	**:**	• 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.

E)	**Submission of bids**	**:**	• 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 bidders should follow this time during bid submission. • 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.**

F)	**Marking on Technical Bid**		• 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.
G)	**Marking on Price Bid**		• 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)	**Preparation of Tender**: The bidders should submit the bids in two bid system as detailed below. **Bid I _Technical Bid** The technical bid should consist of bidder eligibility criteria and technical specification compliance sheet as per Annexure-B. **Bid II _Price Bid** 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.
5)	**Price:** 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 Metallurgical and Materials 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)	**Tenderer shall submit along with this tender:** **(**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)	**Terms of Delivery:** Supplier will be fully responsible for the safe carriage, Installation/Commissioning of goods up to the Department of Metallurgical and Materials Engineering, IIT Madras or named place as per PO, Insurance coverage will be in the scope of the supplier. 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. 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.
8)	**Period for which the offer will remain open:** 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.
9)	**EMD:** The EMD of **Rs. 90, 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 summarily as non-responsive. 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. 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).

10)	**Performance Security: -** 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. 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. 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.
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)	**Risk Purchase Clause** 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.
16)	**Payment:** (i) No Advance payment will be made. However, 90% Payment against Delivery and 10% after installation are agreed to wherever the installation is involved. (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.
17)	**On-site Installation:** 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.
18)	**Warranty/Guarantee:** 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).

	**** Note: PO which involves installation, warranty/guarantee shall be applicable from date of installation.**
19)	**Acceptance and Rejection:** 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. 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.
20)	**Debarment from Bidding:** 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.
21)	**Disputes and Jurisdiction:** **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 on 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. 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. b. Any legal disputes arising out of any breach of contact pertaining to this tender shall be settled in the court of competent jurisdiction located within the city of Chennai in Tamil Nadu.
22)	**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. 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. 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.
23)	**Eligibility Criteria:** ➢ **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 Competent Authority" as per Order of DoE F.No.6/18/2019-PPD dated 23.07.2020 as mentioned.</u>**
24)	**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). ➢ **'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-II 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-II 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.** ****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**

25)	**Evaluation of Bids** Bid evaluation will take place in two stages. **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. **Stage II: Price Bid Evaluation** The price bid evaluation will be based on price quoted by the bidder. The rate quoted for **Converting manual welding setups into robotic welding and arc-wire directed energy deposition (AW-DED) additive manufacturing systems** will be taken up for arrival of Lowest Bid (L1) value.
26)	**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.
27)	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.
28)	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.
29)	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.
30)	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.

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

ANNEXURE – A

Bidder Eligibility Criteria and Technical Specification for Converting manual welding setups into robotic welding and arc-wire directed energy deposition (AW-DED) additive manufacturing systems

Tender No. MM/MURU/037/2022/AW-DED

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 should provide an authorization certificate from Fronius India to submit the bid for the tender in a format provided in the Annexure G.
2. 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).
3. The bidder should have supplied and exhibited capabilities in integrating welding power sources with robots. They should have supplied at least two such arc welding robot machines with additive manufacturing capabilities to IITs/NITs/other CFTIs/National laboratories/government organizations within last 7 years.
4. A global reference list as well as a user list in India should be enclosed.
5. The operational status of all the equipment in India should be provided.

III. TECHNICAL SPECIFICATION for
Converting manual welding setups into robotic welding and arc-wire directed energy deposition (AW-DED) additive manufacturing systems

Sl. No.	Complete description of items	Quantity required
1.	Accessories for existing cold metal transfer gas metal arc (GMA) welding system for converting it to robotic operation and full integration as detailed in the specifications.	1 set
2.	Accessories for mounting GTA torch, micro-plasma torch and wire feeders to the robotic arm	1 set
3.	Tilting turntable and related accessories as detailed in the specifications.	1 set
4.	6-axis arc welding robot along with the related accessories and software's as detailed in the specifications.	1 set
5.	Necessary software	1 set
6.	Extended Warranty for 2 years after warrantyperiod if any to be quoted.	1 Nos
7.	AMC after completion of Extended warranty Period if any to be quoted	1 Nos

The detailed specifications of each item are given below.

S.NO	SPECIFICATION
1	Accessories for integrating the existing Cold Metal Transfer 500A capacity welding system - Fronius make
1.1	One set containing accessories for converting Fronius make Cold Metal Transfer (CMT), available in the Joining and Additive Manufacturing Lab of Dept. of Metallurgical and Materials Engineering, IIT Madras, 500 A peak current capacity digital inverter manual power source (model number TPS 4000 CMT) into a robotic one.
1.2	One set of cooling unit compatible with a robotic CMT welding torch, preferably FK 4000 R FC model of Fronius make.
1.3	The cooling unit should be suitable to keep the torch cool during continuous welding at rated capacity.
1.4	Throughput of the cooling unit should have a capacity of a minimum of 5 l/min. or more.
1.5	The pressure of the cooling unit should have a capacity of a minimum of 6 bar or better.
1.6	The cooling capacity of the cooling unit should be a minimum of 1400 W or better.
1.7	The minimum lift capacity of the pump should be 45000 mm or better.
1.8	The cooling unit should be able to pump a minimum of 9 litre coolant volume
1.9	The cooling unit should have a protection rating of IP23.
1.10	The cooling unit size should fit below the power source with a single connector interface.
1.11	All functional controls of the cooling unit should be controlled through a power source / remote control unit.
1.12	In case of interruption in the coolant flow through cable hose/ torch, no welding can be done as a precautionary measure. Accordingly, an error message should be indicated on the control panel.
1.13	One set of robotic water cooled CMT welding torch of 6.0 m or more hose with wire buffering unit and drive unit.
1.14	One set of Robacta CMT Drive and torch body (which is the only compatible drive for the existing in-house system)
1.15	The robotic CMT welding torch and drive unit should have an Inbuilt AC servo motor drive unit

	for wire movement in the forward-backwards direction.
1.16	The robotic CMT welding torch and drive unit should be suitable for 0.8 mm to 1.6 mm wire diameters.
1.17	The robotic CMT welding torch and drive unit should have a wire buffer set for accommodating wire during backward movement of wire of suitable length of the torch.
1.18	The robotic CMT welding torch drive unit should have a current capacity of 360 A (Ar-CO_2) 360 A (CO_2).
1.19	The robotic CMT welding torch drive unit should be capable of a minimum wire speed of 20 m/min or more.
1.20	The robotic CMT welding torch drive unit should have a forced contact arrangement in the contact tube.
1.21	The robotic CMT welding torch and drive unit should have external wire feeding, a push button for forward and backward movement of the wire, and a gas test button.
1.22	The length of the hose connecting the torch and power source should have a minimum of 6.0 m or more.
1.23	The robotic CMT torch, drive units and the related hoses should be made of high temperature resistant material.
1.24	There should be a provision for the complete enclosure for the wire spool.
1.25	Wear parts kit for wire feeder and CMT welding torch with quantities sufficient enough for one year's operation.
1.26	Collision box for protecting the robotic torch damage from a collision.
1.27	Digital interface for integrating the power source with the robot.
1.28	Robotic interface for interfacing the TPS 4000 CMT power source system with any robot.
1.29	The robotic interface should provide digital communication between CMT advanced power source and robot.
1.30	Complete signal processing/transfer should be in digital form.

1.31	The robotic interface should facilitate recalling the jobs /programmes created from the robot.
1.32	Collision sensor and flange for accommodating the CMT torch on the robot.
1.33	Warranty: One year mandatory warranty for all the above-mentioned items for the smooth and trouble- free working after installation and commissioning and with an optional two-year extended warranty and AMC after the warranty period should be specified.
1.34	Power supply: 400V +/- 10%, 3 phase, 50 - 60Hz.

Note: Any other accessories or software necessary (other than mentioned above) for the proper installation and commissioning of the welding and air-wire DED system as well as for its hassle-free functioning, also need be supplied by the vendor.

It is the duty of the vendor to perform the full seamless integration operation between the tilting turn table, welding robot, and the Cold Metal Transfer 500 A capacity digital inverter power source, and finally providing the system in working condition, and demonstrate the compatibility by depositing a bench-mark design provided by IIT-Madras.

S.NO	SPECIFICATION
2	Accessories for mounting gas tungsten arc torch, micro plasma torch and wire feeder
2.1.1	Compatible mounting system with a capability to mount existing gas tungsten arc (Fronius make), micro plasma torch (Fronius Robacta PTW 500 torch) and wire feeder nozzle (Fronius KD 4000)
2.1.2	Provision for seamlessly switching the torches with proper tooling from gas metal arc to gas tungsten arc and micro plasma torch.
2.1.3	Robotic arm should have the capability to bear the weight of these torches independently and carry out uninterrupted welding and deposition with or without wire feeding in gas tungsten arc or micro plasma mode or independently with gas metal arc mode.
3	**Titling turn table**
3.1	**Technology requirements**
3.1.1	Tilting turn table should have horizontal load capacity of minimum 200 kg and vertical load capacity of minimum 200 kg.
3.1.2	Turning drive of tilting turn table should be AC servo motor.
3.1.3	The rotation speed range of tilting turn table should be in the range of 0.05 to 1.4 RPM.

3.1.4	Tilting turn table should have minimum tilting torque of 3000 Nm and minimum rotation torque of 1500 Nm.
3.1.5	Tilting range of tilting turn table should be ± 90 deg.
3.1.6	Rotating table diameter of tilting turn table should be 450 mm (approximately).
3.1.7	Tilting turn table should be controlled either by a pendent or by a remote control.
3.1.8	Power consumption of rotational drive should be less than 0.35 kW and tilting drive should be less than 0.75 kW.
3.1.9	Remote control of tilting turn table should have controls for rotation, tilt UP/DOWN, speed rotation potentiometer etc.
3.1.10	Power supply to the tilting turn table should be 400 V, 3 phase and 50 Hz.
	3.2 Accessories
3.2.1	A detachable circular modular plate of diameter 600 mm and 25 mm in thickness. This plate should be assembled to the rotating turntable. This plate should have threaded round holes to facilitate clamping for the parts to be joined.
3.2.2	Fixtures to hold circular tubes (chuck) and flat plates.
3.2.3	Accessories other than the above-mentioned items, required for the smooth operation of pipe joining and plate joining over the tilting table at different tilting angles need to be supplied along with the machine.
3.2.4	Warranty: One year mandatory warranty for all the above-mentioned items for the smooth and trouble- free working after installation and commissioning and with an optional two-year extended warranty and AMC after the warranty period should be specified.
3.2.5	Along with the turntable, the supplier should provide detailed operation, maintenance schedule, etc.

Note: Any other accessories or software necessary (other than mentioned above) for the proper installation and commissioning of the tilting turn table as well as for its hassle-free functioning, also need be supplied by the vendor.
The vendor must perform the integration operation between the tilting turntable, welding robot, and the Cold Metal 500 A capacity digital inverter power source, and finally provide the system in working condition.
The integration operation should be performed in such a way that the operator should have the flexibility to run the tilting turntable with or without interfacing with the welding robot.

S.NO	SPECIFICATION			
4	Welding and AW-DED Robot			
4.1	***Technology requirements***			
4.1.1	The welding robot should interface and completely integrate with the Fronius cold metal transfer welding machine to automate the process.			
4.1.2	The welding robot joints should have a range of axes and speeds as given below:			
	Joint 1→	- 170 deg	/ +170 deg	at a speed of min. 260 deg/s
	Joint 2→	- 90 deg	/ 155 + deg	at a speed of min. 230 deg/s
	Joint 3→	- 85 deg	/ + 150 deg	at a speed of min. 260 deg/s
	Joint 4→	-200 deg	/ + 200 deg	at a speed of min. 470 deg/s
	Joint 5→	-150 deg	/ + 150 deg	at a speed of min. 470 deg/s
	Joint 6→	- 455 deg	/ + 455 deg	at a speed of min. 700 deg/s
4.1.3	A hallow arm robot, capable of mounting gas metal arc, gas tungsten arc and plasma torches, independently with or without a wire feeder.			
4.1.4	The robot should have a complete integration with the turn table in all its axes.			
4.1.5	Both robotic arm and turn table should work seamlessly in tandem with 8 axes (6 robotic arm axes and 2 turn table axes)			
4.1.6	The welding robot wrist (4, 5 and 6 axes) should be coated with suitable material to withstand welding preheat and inter-pass temperatures up to 350 °C.			
4.1.7	The welding robot should carry a payload of a minimum of 6 kg.			
4.1.8	The welding robot should carry an extra load of a minimum of 20 kg at base unit/joint 1 and a minimum of 15 kg at arm/joint 3.			
4.1.9	The welding robot should have pose repeatability of ± 0.05 mm or better.			
4.1.10	The welding robot should reach a minimum of 1400 mm or more.			
4.1.11	The welding robot should be mounted to the floor.			
4.1.12	An alternate current servo motor should drive all axes of the arc welding robot.			

4.1.13	The operating noise level of the arc welding robot should be less than 80 dB.
4.1.14	The welding robot should have provision for an external drive-in addition to a controller.
4.1.15	The operating temperature range of a welding robot should be in the range of 0 to 40 °C.
4.1.16	The brakes of all the axes of the welding robot should be either electrical or mechanical.
4.1.17	The welding robot should be able to perform multi-pass and continuous arc welding (specifically cold metal transfer arc welding).
4.1.18	Arc welding robot arm should have a protection rating of IP65 or better.
4.1.19	Arc welding robot should fulfil one or more of the following standard industry applicable safety regulations like EN60204-1:2006, ISO 10218-1:2006, ANSI/RIA R15.06, UL 17410 or equivalent.
4.1.20	Arc welding robot should have electronic mastering provision for all axes.
4.1.21	The permissible input voltage of the arc welding robot should be 200V/415V V ± 10%, three-phase AC.
4.1.22	Provision should be there to mount the existing gas tungsten arc torch, micro plasma torch and the wire feeder (see section 2)
4.2	**Controllers' requirement**
4.2.1	All the six axes of the welding robot should have the facility to control independently.
4.2.2	There should be provision for an additionally two axes minimum.
4.2.3	The controllers' processor should be a multi-processor system, preferably with a PCI bus.
4.2.4	The controller should have well proven real time operating system.
4.2.5	The programming language of the controller should be user friendly through teach pendent and arc welding robot.
4.2.6	The controller should have program memory capacities such as a flash disk for mass memory of at least 1 MB, expansion and additional backup facility will be preferred.
4.2.7	The controller should provide external storage such as PCMCIA card slot/ RW CD/ DVD drive.
4.2.8	The controller should have other requirements such as USB memory interface, energy back-

	up to handle power failure and provision for connecting to external keyboard and external monitor display.
4.2.9	The controller should have external interfaces like device net/ Profibus/ Interbus/ ethernet.
4.2.10	The controller should have a minimum of 256 digital inputs and 256 digital outputs (I/0 points) and should be expandable
4.2.11	The controller should have communication ports such as RS232/ RS485/ Ethernet port.
4.2.12	The controller should have a protection rating of IP54.
4.3	**Operator's panel (teach pendant) requirement**
4.3.1	The cable connecting controller from teach pendant should have a minimum of 8 m in length.
4.3.2	Teach pendant should have basic switches like a lockable emergency, reset, power on/off, mode selector and other functional keys, and joystick/6D mouse for robot axes movement.
4.3.3	The visual display of the teach pendant should be at least 8 inches or bigger with an LCD screen.
4.3.4	Teach pendant should have provision for a hot plug.
	Note: The preferred make of arc welding robots can be Kuka, ABB, FANUC and Yaskawa.
5	**Software requirements**
5.1	***Simulation software:***
5.1.1	Robot OEM's simulation software should have a work cell layout designing and modelling license.
5.1.2	Simulation software should provide motion simulation for robots.
5.1.3	Simulation software should be able to do collision detection, reach and cycle time studies.
5.2	***Offline programming software:***
5.2.1	Robot OEM's offline programming software should have a license for generating the robot programs offline, which is then downloadable to the robot controller.
5.3	***Welding technology software:***

5.3.1	Robot OEM's arc welding technology package should have provision for multi-pass, continuous welding (cold metal transfer arc welding) to generate arc welding programs by defining process parameters such as torch angle, work angle, push/ drag and spin angles, seam and weave data, wire feed, velocity, speed, current, voltage, etc.
5.4	***Software for arc-wire directed energy deposition (AW-DED) operation***
5.4.1	The software should be capable of reading the CAD data, carrying out slicing and path planning operations, communicating with the cold metal arc welding power source and carrying out unattended deposition operation.
5.4.2	Cold metal arc welding power source, robotic arc and turn table should be seamlessly connected with the software and should have the capability to control them independently.
5.5	***Software licenses***
5.5.1	License for Simulation, Offline Programming, Welding Technology and Arc-Wire DED software should be included with the system. Free and perpetual software license for all these software should be provided.
5.5.2	A free license of this software should be provided to install in multiple standalone PCs/workstations or with the floating network licenses.
5.5.3	Software license should facilitate to develop/edit all the process parameters. There should not be any limitation in editing any of the process variables.
5.5.4	The vendor should also provide necessary updates free of cost over the warranty period and during the AMC period.
6	**Documentation requirements**
	The following documentation should be provided (one set of each in English) 1.Operation manual 2.Software instruction manual 3.Maintenance, troubleshooting and safety guidelines manuals 4.Manuals to handle accessories and guidelines 5. Occupational Health and Safety (OHS) guidelines and warnings.
7	**Warranty and Annual Maintenance Contract requirements**
	1. One year mandatory warranty for all the above-mentioned items for the smooth and trouble-free working after installation and commissioning and with an optional two-year

	extended warranty and AMC after the warranty period should be specified.
	2. Possibility of extending the warranty beyond the mandatory period should be clearly mentioned with the appropriate cost.
	3. Bidder should have provision for a continuous Annual Maintenance Contract upon the completion of warranty period.
8	**Inspection, installation, commissioning, and training**
	1. All the essential requirements ensuring a ready-to-use set up at IIT Madras should be supplied.
	2. Comprehensive training for two research fellows/students from IIT Madras should be given on all the above-mentioned software's and related programming, and the welding cell operation for four days, till the research fellows/students gain the confidence.
	3. The training programme should also include the fabrication of components using wire arc additive manufacturing (WAAM). Training on the below mentioned tasks must be covered.
	a) Slicing the three-dimensional CAD model into isoline paths.
	b) Generating the robot programme.
	c) Simulating and checking the generated robot programme using the off-line robot software.
	d) Uploading the developed robot programme into robot control so that the robot can fabricate the component automatically without supervision.
	e) At the end, the vendor needs to demonstrate the fabrication of a bench-mark design provided by the IIT Madras.
	4) The vendor must arrange their trainers visit to IIT Madras in person, two months and four months after commissioning of the system. The trainer needs to interact with the engineers (trained in the above-mentioned software's) at IIT Madras and clarify their
	a) Doubts and any problems in using the software and related programming.
	b) Doubts in operating the welding system.
9	**Spares, consumables, mandatory accessories and standard feedstocks**

	1. Bidder should offer a list of essential spare parts and accessories with their part numbers for a continuous operation for three years. The 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.
	2. However, the consumables and parts required for the installation and standardisation of the system should be given free of cost.
10	**Mandatory conditions**
	1.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).
	2. There should be a minimum of two visits per year by the equipment supplier's service engineer and application engineer (preferably from OEM).
	3. The total cost of the system should be inclusive of these visits.
	4.Total weight of the system
	5. Personnel safety accessories (goggles, masks etc.)
	6. Special design/provision should be made to prevent accidents while in
	7.“Emergency Stop” button(s) should be provided at a convenient and easily accessible location.
	8. Safety manuals and charts should be provided.
	9.Supplier should provide safety training at the time of installation.
	10. Flow line diagrams and electrical circuit diagrams should be provided.
	11.A preinstallation instructions should be provided with the equipment, indicating electrical, space, gas connections and safety protocols should be provided.
	12. Any other accessories or software’s necessary (other than mentioned above) for the proper installation and commissioning of the welding robot as well as for its hassle-free functioning, also need be supplied by the vendor.
	13. It is the duty of the vendor to perform the integrating operation between the tilting turn table, welding robot, and the Cold Metal Transfer advanced pulse 400 A capacity digital

	inverter power source, and finally providing the system in working condition.
	14. The integration operation should be performed in such a way that the operator should have the flexibility to run the welding robot with or without interfacing the tilting turn table.

Note:
1.All the above-mentioned items should be supplied with accessories (additionally if needed other than mentioned above) for three years of normal operation and a full three-year warranty.
2.The above-mentioned items should also be supplied with soft and hard copies of installation operation, experimental operation and maintenance manuals, which should be demonstrated at the installation time.
3.A standard tool kit shall be provided for general maintenance service for all the above-mentioned products.
4.Vendors need to submit the complete system pre-installation requirements.

ANNEXURE: B

TECHNICAL BID PROFORMA

Tender No. MM/MURU/037/2022/AW-DED

Item Name: Converting manual welding setups into robotic welding and arc-wire directed energy deposition (AW-DED) additive manufacturing systems

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 16th 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 should provide an authorization certificate from Fronius India to submit the bid for the tender in a format provided in the Annexure G.			
2	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).			
3	The bidder should have supplied and exhibited capabilities in integrating welding power sources with robots. They should have supplied at least two such arc welding robot machines with additive manufacturing capabilities to IITs/NITs/other CFTIs/National laboratories/government organizations within last 7 years.			
4	A global reference list as well as a user list in India should be enclosed.			
5	The operational status of all the equipment in India should be provided.			

3.0 Technical Compliance:

Converting manual welding setups into robotic welding and arc-wire directed energy deposition (AW-DED) additive manufacturing systems

The detailed specifications of each item are given below.

S.NO	SPECIFICATION	COMPLIED/NOT COMPLIED	CATALOGUE PAGE NO
1	Accessories for integrating the existing Cold Metal Transfer 500A capacity welding system - Fronius make		
1.1	One set containing accessories for converting Fronius make Cold Metal Transfer (CMT), available in the Joining and Additive Manufacturing Lab of Dept. of Metallurgical and Materials Engineering, IIT Madras, 500 A peak current capacity digital inverter manual power source (model number TPS 4000 CMT) into a robotic one.		
1.2	One set of cooling unit compatible with a robotic CMT welding torch, preferably FK 4000 R FC model of Fronius make.		
1.3	The cooling unit should be suitable to keep the torch cool during continuous welding at rated capacity.		
1.4	Throughput of the cooling unit should have a capacity of a minimum of 5 l/min. or more.		
1.5	The pressure of the cooling unit should have a capacity of a minimum of 6 bar or better.		
1.6	The cooling capacity of the cooling unit should be a minimum of 1400 W or better.		
1.7	The minimum lift capacity of the pump should be 45000 mm or better.		
1.8	The cooling unit should be able to pump a minimum of 9 litre coolant volume		
1.9	The cooling unit should have a protection rating of IP23.		
1.10	The cooling unit size should fit below the power source with a single connector interface.		
1.11	All functional controls of the cooling unit should be controlled through a power source / remote control unit.		
1.12	In case of interruption in the coolant flow through cable hose/ torch, no welding can be done as a precautionary measure. Accordingly, an error message should be		

	indicated on the control panel.		
1.13	One set of robotic water cooled CMT welding torch of 6.0 m or more hose with wire buffering unit and drive unit.		
1.14	One set of Robacta CMT Drive and torch body (which is the only compatible drive for the existing in-house system)		
1.15	The robotic CMT welding torch and drive unit should have an Inbuilt AC servo motor drive unit for wire movement in the forward-backwards direction.		
1.16	The robotic CMT welding torch and drive unit should be suitable for 0.8 mm to 1.6 mm wire diameters.		
1.17	The robotic CMT welding torch and drive unit should have a wire buffer set for accommodating wire during backward movement of wire of suitable length of the torch.		
1.18	The robotic CMT welding torch drive unit should have a current capacity of 360 A (Ar-CO_2) 360 A (CO_2).		
1.19	The robotic CMT welding torch drive unit should be capable of a minimum wire speed of 20 m/min or more.		
1.20	The robotic CMT welding torch drive unit should have a forced contact arrangement in the contact tube.		
1.21	The robotic CMT welding torch and drive unit should have external wire feeding, a push button for forward and backward movement of the wire, and a gas test button.		
1.22	The length of the hose connecting the torch and power source should have a minimum of 6.0 m or more.		
1.23	The robotic CMT torch, drive units and the related hoses should be made of high temperature resistant material.		
1.24	There should be a provision for the complete enclosure for the wire spool.		
1.25	Wear parts kit for wire feeder and CMT welding torch with quantities sufficient enough for one year's operation.		

1.26	Collision box for protecting the robotic torch damage from a collision.		
1.27	Digital interface for integrating the power source with the robot.		
1.28	Robotic interface for interfacing the TPS 4000 CMT power source system with any robot.		
1.29	The robotic interface should provide digital communication between CMT advanced power source and robot.		
1.30	Complete signal processing/transfer should be in digital form.		
1.31	The robotic interface should facilitate recalling the jobs /programmes created from the robot.		
1.32	Collision sensor and flange for accommodating the CMT torch on the robot.		
1.33	Warranty: One year mandatory warranty for all the above-mentioned items for the smooth and trouble- free working after installation and commissioning and with an optional two-year extended warranty and AMC after the warranty period should be specified.		
1.34	Power supply: 400V +/- 10%, 3 phase, 50 - 60Hz.		

Note: Any other accessories or software necessary (other than mentioned above) for the proper installation and commissioning of the welding and air-wire DED system as well as for its hassle-free functioning, also need be supplied by the vendor.
It is the duty of the vendor to perform the full seamless integration operation between the tilting turn table, welding robot, and the Cold Metal Transfer 500 A capacity digital inverter power source, and finally providing the system in working condition, and demonstrate the compatibility by depositing a bench-mark design provided by IIT-Madras.

S.NO	SPECIFICATION	COMPLIED/NOT COMPLIED	CATALOGUE PAGE NO
2	Accessories for mounting gas tungsten arc torch, micro plasma torch and wire feeder		
2.1.1	Compatible mounting system with a capability to mount existing gas tungsten arc (Fronius make), micro plasma torch (Fronius Robacta PTW 500 torch) and wire feeder nozzle (Fronius KD 4000)		
2.1.2	Provision for seamlessly switching the torches with proper tooling from gas metal arc to gas tungsten arc and micro plasma torch.		
2.1.3	Robotic arm should have the capability to bear the weight of these torches independently and carry out uninterrupted welding and deposition with or without wire feeding in gas tungsten arc or micro plasma mode or independently with gas metal arc mode.		
3	**Titling turn table**		
3.1	**Technology requirements**		
3.1.1	Tilting turn table should have horizontal load capacity of minimum 200 kg and vertical load capacity of minimum 200 kg.		
3.1.2	Turning drive of tilting turn table should be AC servo motor.		
3.1.3	The rotation speed range of tilting turn table should be in the range of 0.05 to 1.4 RPM.		
3.1.4	Tilting turn table should have minimum tilting torque of 3000 Nm and minimum rotation torque of 1500 Nm.		
3.1.5	Tilting range of tilting turn table should be ± 90 deg		
3.1.6	Rotating table diameter of tilting turn table should be 450 mm (approximately).		
3.1.7	Tilting turn table should be controlled either by a pendent or by a remote control.		
3.1.8	Power consumption of rotational drive should be less than 0.35 kW and tilting drive should be less than 0.75 kW.		

3.1.9	Remote control of tilting turn table should have controls for rotation, tilt UP/DOWN, speed rotation potentiometer etc.		
3.1.10	Power supply to the tilting turn table should be 400 V, 3 phase and 50 Hz.		
	3.2 Accessories		
3.2.1	A detachable circular modular plate of diameter 600 mm and 25 mm in thickness. This plate should be assembled to the rotating turntable. This plate should have threaded round holes to facilitate clamping for the parts to be joined.		
3.2.2	Fixtures to hold circular tubes (chuck) and flat plates.		
3.2.3	Accessories other than the above-mentioned items, required for the smooth operation of pipe joining and plate joining over the tilting table at different tilting angles need to be supplied along with the machine.		
3.2.4	Warranty: One year mandatory warranty for all the above-mentioned items for the smooth and trouble- free working after installation and commissioning and with an optional two-year extended warranty and AMC after the warranty period should be specified.		
3.2.5	Along with the turntable, the supplier should provide detailed operation, maintenance schedule, etc.		

Note: Any other accessories or software necessary (other than mentioned above) for the proper installation and commissioning of the tilting turn table as well as for its hassle-free functioning, also need be supplied by the vendor.
The vendor must perform the integration operation between the tilting turntable, welding robot, and the Cold Metal 500 A capacity digital inverter power source, and finally provide the system in working condition.
The integration operation should be performed in such a way that the operator should have the flexibility to run the tilting turntable with or without interfacing with the welding robot.

S.NO	SPECIFICATION				COMPLIED/ NOT COMPLIED	CATALOGUE PAGE NO
4	Welding and AW-DED Robot					
4.1	***Technology requirements***					
4.1.1	The welding robot should interface and completely integrate with the Fronius cold metal transfer welding machine to automate the process.					
4.1.2	The welding robot joints should have a range of axes and speeds as given below:					
	Joint 1→	- 170 deg	/ +170 deg	And at a speed of min. 260 deg/s		
	Joint 2→	- 90 deg	/ 155 + deg	at a speed of min. 230 deg/s		
	Joint 3→	- 85 deg	/ + 150 deg	at a speed of min. 260 deg/s		
	Joint 4→	- 200 deg	/ +200 deg	at a speed of min. 470 deg/s		
	Joint 5→	- 150 deg	/ +150 deg	at a speed of min. 470 deg/s		
	Joint 6→	- 455 deg	/ + 455 deg	at a speed of min. 700 deg/s		
4.1.3	A hallow arm robot, capable of mounting gas metal arc, gas tungsten arc and plasma torches, independently with or without a wire feeder.					
4.1.4	The robot should have a complete integration with the turn table in all its axes.					
4.1.5	Both robotic arm and turn table should work seamlessly in tandem with 8 axes (6 robotic arm axes and 2 turn table axes)					
4.1.6	The welding robot wrist (4, 5 and 6 axes) should be coated with suitable material to withstand welding preheat and inter-pass temperatures up to 350 °C.					
4.1.7	The welding robot should carry a payload of a minimum of 6 kg.					
4.1.8	The welding robot should carry an extra load of a minimum of 20 kg at base unit/joint 1 and a minimum of 15 kg at arm/joint 3.					

4.1.9	The welding robot should have pose repeatability of ± 0.05 mm or better.		
4.1.10	The welding robot should reach a minimum of 1400 mm or more.		
4.1.11	The welding robot should be mounted to the floor.		
4.1.12	An alternate current servo motor should drive all axes of the arc welding robot.		
4.1.13	The operating noise level of the arc welding robot should be less than 80 dB.		
4.1.14	The welding robot should have provision for an external drive-in addition to a controller.		
4.1.15	The operating temperature range of a welding robot should be in the range of 0 to 40 °C.		
4.1.16	The brakes of all the axes of the welding robot should be either electrical or mechanical.		
4.1.17	The welding robot should be able to perform multi-pass and continuous arc welding (specifically cold metal transfer arc welding).		
4.1.18	Arc welding robot arm should have a protection rating of IP65 or better.		
4.1.19	Arc welding robot should fulfil one or more of the following standard industry applicable safety regulations like EN60204-1:2006, ISO 10218-1:2006, ANSI/RIA R15.06, UL 17410 or equivalent.		
4.1.20	Arc welding robot should have electronic mastering provision for all axes.		
4.1.21	The permissible input voltage of the arc welding robot should be 200V/415V V ± 10%, three-phase AC.		
4.1.22	Provision should be there to mount the existing gas tungsten arc torch, micro plasma torch and the wire feeder (see section 2)		
4.2	**Controllers' requirement**		
4.2.1	All the six axes of the welding robot should have the facility to		

	control independently.		
4.2.2	There should be provision for an additionally two axes minimum.		
4.2.3	The controllers' processor should be a multi-processor system, preferably with a PCI bus.		
4.2.4	The controller should have well proven real time operating system.		
4.2.5	The programming language of the controller should be user friendly through teach pendent and arc welding robot.		
4.2.6	The controller should have program memory capacities such as a flash disk for mass memory of at least 1 MB, expansion and additional backup facility will be preferred.		
4.2.7	The controller should provide external storage such as PCMCIA card slot/ RW CD/ DVD drive.		
4.2.8	The controller should have other requirements such as USB memory interface, energy back-up to handle power failure and provision for connecting to external keyboard and external monitor display.		
4.2.9	The controller should have external interfaces like device net/ Profibus/ Interbus/ ethernet.		
4.2.10	The controller should have a minimum of 256 digital inputs and 256 digital outputs (I/0 points) and should be expandable		
4.2.11	The controller should have communication ports such as RS232/ RS485/ Ethernet port.		
4.2.12	The controller should have a protection rating of IP54.		
4.3	**Operator's panel (teach pendant) requirement**		
4.3.1	The cable connecting controller from teach pendant should have a minimum of 8 m in length.		
4.3.2	Teach pendant should have basic switches like a lockable emergency, reset, power on/off, mode selector and other functional keys, and joystick/6D mouse for robot axes movement.		
4.3.3	The visual display of the teach pendant should be at least 8 inches or bigger with an LCD screen.		

4.3.4	Teach pendant should have provision for a hot plug.		
	Note: The preferred make of arc welding robots can be Kuka, ABB, FANUC and Yaskawa.		
5	**Software requirements**		
5.1	***Simulation software:***		
5.1.1	Robot OEM's simulation software should have a work cell layout designing and modelling license.		
5.1.2	Simulation software should provide motion simulation for robots.		
5.1.3	Simulation software should be able to do collision detection, reach and cycle time studies.		
5.2	***Offline programming software:***		
5.2.1	Robot OEM's offline programming software should have a license for generating the robot programs offline, which is then downloadable to the robot controller.		
5.3	***Welding technology software:***		
5.3.1	Robot OEM's arc welding technology package should have provision for multi-pass, continuous welding (cold metal transfer arc welding) to generate arc welding programs by defining process parameters such as torch angle, work angle, push/ drag and spin angles, seam and weave data, wire feed, velocity, speed, current, voltage, etc.		
5.4	***Software for arc-wire directed energy deposition (AW-DED) operation***		
5.4.1	The software should be capable of reading the CAD data, carrying out slicing and path planning operations, communicating with the cold metal arc welding power source and carrying out unattended deposition operation.		
5.4.2	Cold metal arc welding power source, robotic arc and turn table should be seamlessly connected with the software and should have the capability to control them independently.		
5.5	***Software licenses***		

5.5.1	License for Simulation, Offline Programming, Welding Technology and Arc-Wire DED software should be included with the system. Free and perpetual software license for all these software should be provided.		
5.5.2	A free license of this software should be provided to install in multiple standalone PCs/workstations or with the floating network licenses.		
5.5.3	Software license should facilitate to develop/edit all the process parameters. There should not be any limitation in editing any of the process variables.		
5.5.4	The vendor should also provide necessary updates free of cost over the warranty period and during the AMC period.		
6	**Documentation requirements**		
	The following documentation should be provided (one set of each in English) 1.Operation manual 2.Software instruction manual 3.Maintenance, troubleshooting and safety guidelines manuals 4.Manuals to handle accessories and guidelines 5. Occupational Health and Safety (OHS) guidelines and warnings.		
7	**Warranty and Annual Maintenance Contract requirements**		
	1. One year mandatory warranty for all the above-mentioned items for the smooth and trouble-free working after installation and commissioning and with an optional two-year extended warranty and AMC after the warranty period should be specified.		
	2. Possibility of extending the warranty beyond the mandatory period should be clearly mentioned with the appropriate cost.		
	3. Bidder should have provision for a continuous Annual Maintenance Contract upon the completion of warranty period.		
8	**Inspection, installation, commissioning, and training**		

	1. All the essential requirements ensuring a ready-to-use set up at IIT Madras should be supplied.		
	2. Comprehensive training for two research fellows/students from IIT Madras should be given on all the above-mentioned software's and related programming, and the welding cell operation for four days, till the research fellows/students gain the confidence.		
	3. The training programme should also include the fabrication of components using wire arc additive manufacturing (WAAM). Training on the below mentioned tasks must be covered.		
	a) Slicing the three-dimensional CAD model into isoline paths.		
	b) Generating the robot programme.		
	c) Simulating and checking the generated robot programme using the off-line robot software.		
	d) Uploading the developed robot programme into robot control so that the robot can fabricate the component automatically without supervision.		
	e) At the end, the vendor needs to demonstrate the fabrication of a bench-mark design provided by the IIT Madras.		
	4) The vendor must arrange their trainers visit to IIT Madras in person, two months and four months after commissioning of the system. The trainer needs to interact with the engineers (trained in the above-mentioned software's) at IIT Madras and clarify their		
	a) Doubts and any problems in using the software and related programming.		
	b) Doubts in operating the welding system.		
9	**Spares, consumables, mandatory accessories and standard feedstocks**		
	1. Bidder should offer a list of essential spare parts and accessories with their part numbers for a continuous operation for three years. The 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.		
	2. However, the consumables and parts required for the installation and standardisation of the system should be given free of cost.		
10	**Mandatory conditions**		
	1.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).		
	2. There should be a minimum of two visits per year by the equipment supplier's service engineer and application engineer (preferably from OEM).		
	3. The total cost of the system should be inclusive of these visits.		
	4.Total weight of the system		
	5. Personnel safety accessories (goggles, masks etc.)		
	6. Special design/provision should be made to prevent accidents while in		
	7.“Emergency Stop” button(s) should be provided at a convenient and easily accessible location.		
	8. Safety manuals and charts should be provided.		
	9.Supplier should provide safety training at the time of installation.		
	10. Flow line diagrams and electrical circuit diagrams should be provided.		
	11.A preinstallation instructions should be provided with the equipment, indicating electrical, space, gas connections and safety protocols should be provided.		
	12. Any other accessories or software’s necessary (other than mentioned above) for the proper installation and commissioning of the welding robot as well as for its hassle-free functioning, also need be supplied by the vendor.		

	13. It is the duty of the vendor to perform the integrating operation between the tilting turn table, welding robot, and the Cold Metal Transfer advanced pulse 400 A capacity digital inverter power source, and finally providing the system in working condition.		
	14. The integration operation should be performed in such a way that the operator should have the flexibility to run the welding robot with or without interfacing the tilting turn table.		

Note:

1.All the above-mentioned items should be supplied with accessories (additionally if needed other than mentioned above) for three years of normal operation and a full three-year warranty.

2.The above-mentioned items should also be supplied with soft and hard copies of installation operation, experimental operation and maintenance manuals, which should be demonstrated at the installation time.

3.A standard tool kit shall be provided for general maintenance service for all the above-mentioned products.

4.Vendors need to submit the complete system pre-installation requirements.

SIGNATURE OF BIDDER ALONG WITH SEAL OF THE COMPANY WITH DATE

ANNEXURE : C

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

Item Name: Converting manual welding setups into robotic welding and arc-wire directed energy deposition (AW-DED) additive manufacturing systems

Tender No. MM/MURU/037/2022/AW-DED

It. No	Description of work	Quantity	Units	Basic Rate in INR	GST Amount in INR	Total Amount with taxes in INR
1	Accessories for existing cold metal transfer gas metal arc (GMA) welding system for converting it to robotic operation and full integration as detailed in the specifications. With 1 year Warranty	1	set			
2	Accessories for mounting GTA torch, micro-plasma torch and wire feeders to the robotic arm. With 1 year Warranty	1	set			
3	Tilting turntable and related accessories as detailed in the specifications. With 1 year Warranty	1	set			
4	6-axis arc welding robot along with the related accessories and software's as detailed in the specifications. With 1 year Warranty	1	set			
5	Necessary software	1	set			
6	Extended Warranty for 2 years after warranty period if any to be quoted.	1	Nos			
7	AMC after completion of Extended warranty Period if any to be quoted	1	Nos			
	Grand Total					

Total Amount Rupees in words _____

** Note: Extended Warranty and AMC will not be considered for Price bid evaluation and to arrive at L1.

ANNEXURE : D

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	dricsr@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: 19/10/2020

Signature of the Competent Authority
of the Institution with seal.

ANNEXURE – E

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, 29.05.2019and 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 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	
☐	I/We_____[name of the supplier] hereby confirm in respect of quoted items thatLocal Content is equal to or more than 50% and come under **"Class-I Local Supplier"** category.
☐	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.

Annexure – F

(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

Annexure – G

OEM CERTIFICATION FORM
(In Original Letter Head of OEM)

Tender No: ..... Dated: .....

We are Original Equipment Manufacturers (OEM) of..... (Name of the company) Ms..... (Name of the vendor) is one of our Distributors/Dealers/Resellers/Partners (tick one) for the ……. and is participating in the above-mentioned tender by offering our product model.....(Name of the product with model number).

…….. is authorized to bid, sell and provide service support warranty for our product as mentioned above.

Name and Signature of the
authorized signatory of OEM
along with
seal of the company with Date