

**TECHNICAL SPECIFICATION FOR AUTOMATIC TIG WELDING SYSTEM
SPECIFICATION NO. EMT - 6713 REV. 00.**

SL. NO	DESCRIPTION OF BHEL REQUIREMENT	REQUIRED	OFFERED	DEVIATION
1.0	PURPOSE :			
	Automatic TIG Welding System will be used for welding of Steel Tubes (sl. no. 3.2) with Steel Plate (sl. no. 3.3) WITHOUT FILLER WIRE by TIG - PULSE process			
2.0	SCOPE :			
	The scope of supply includes design, manufacturing, supply, erection, commissioning and proving of the complete Automatic TIG Welding System including its accessories etc. at BHEL Haridwar works.			
3.0	JOB DESCRIPTION, GRADE OF PARENT MATERIAL & TECHNICAL REQUIREMENT OF JOB :			
3.1	Job Description : Internally water cooled Stator Winding Bar of large size Turbogenerator as per the Annexure -II.			
3.2	Steel Tube : Size 14.0 X 4.0 X 0.9 mm Outer Corner radius : 1.25 mm Material Grade : X2CrNi1911			
3.3	Steel Plate : Reference Annexure - I for dimensional details. Material Grade : X5CrNi1810			
3.4	Steel tubes (sl. no. 3.2) are held in the windows of steel plate (sl. no. 3.3) as shown in the attached Annexure - II. Steel tubes will project 0.8 to 1.2 mm from the face of steel plate as shown in the attached Annexure - II. Projected length 0.8 to 1.2 mm of steel tube, will be controlled. On ensuring the specified projected length 0.8 to 1.2 mm, mouth of steel tubes will be expanded by pneumatic operated mandrel to remove the available gap between the slots of steel plate and all around the steel tubes. 10 nos. steel tubes (sl. no. 3.2) will be housed in each steel plate on each end of stator winding bar. Refer attached Annexure I and II.			

3.5	Job Description and Welding Position of Job			
3.5.1	Stator winding bar with assembled steel tubes (sl. no.3.2) and steel plate (sl. no. 3.3), will be placed on the stands (BHEL scope) distributed along its length 11.0 metre. Stator winding bar will be handled with existing overhead crane for loading and removal of stator winding bars from the stands. 4 nos. stator winding bars will be placed on the stands as shown in attached Annexure - III. Gap between the steel plates of adjacent stator winding bars at the ends, will be 250 mm approximately as shown in attached Annexure - III.			
3.5.2	Steel plate with assembled steel tubes are to be held on Quick Clamping cum Holding Fixture to arrest any undesired displacement / vibration, during welding process. NOTE : Quick Clamping cum Holding Fixture is in the SCOPE OF VENDOR.			
3.6	Welding Process : TIG Pulse welding Without Filler Wire, will be followed for welding of steel tubes (sl. no. 3.2) and steel plate (sl. no. 3.3) as shown in attached Annexure - II.			
3.7	SEQUENCE OF COMPLETE WELDING OPERATION :			
3.7.1	TIG torch will be positioned in front of the steel plate of first stator winding bar			
3.7.2	Location of first steel tube will be generated by the control system. Welding of this steel tube will be performed.			
3.7.2.1	TIG Torch will travel to the position of second steel tube as per the CNC programm and welding is to be performed.			
3.7.2.2	Similarly welding of remaining 8 nos. steel tube of the first steel plate, is to be completed.			
3.7.3	TIG Torch will be positioned in front of the steel plate of second stator winding bar and welding of 10 nos. steel tube is to be performed as stated in sl. no. 3.7.2, 3.7.2.1 and 3.7.2.2 above.			

3.7.4	Subsequently welding of steel tubes with steel plate of third and fourth stator winding bar, will be completed progressively as stated in sl. no. 3.7.2, 3.7.2.1, 3.7.2.2 and 3.7.3 above.			
3.7.5	On completion of welding of steel tubes with steel plates at one end of all the 4 nos. of stator winding bar (as placed on the stands - reference attached Annexure III), TIG Torch will be pushed back to its parking position. Quick Clamping and Holding Fixture (reference sl. no. 3.5.2) to be released and withdrawn from the clamping position. Stator winding bars will be lifted up from the stands, turned and positioned on the stand to face TIG Torch. Quick Clamping and Holding Fixture (sl. no. 3.5.2) will be mounted on the steel plates of stator winding bars. Welding process will be repeated as per sl. no. 3.7.1, 3.7.2, 3.7.2.1, 3.7.2.2, 3.7.3 and 3.7.4 above.			
3.8	Volume of Production : In 8 hours shift, welding of steel tubes will be taken up for 8 nos. stator winding bars. Thus total four settings will be required. On each setting, 40 nos. steel tubes (corresponding to 4 nos. stator winding bar - for each end) will be welded. Reference Annexure I, II and III.			
3.9	Quality of Welded Joints : Welded joints <u>MUST BE HERMETICALLY SEALED.</u>			
4.0	TECHNICAL SPECIFICATION OF AUTOMATIC TIG WELDING SYSTEM :			
4.1	Technical Data of suitable Welding Generator for TIG -Pulse welding operation : Detail Specification will be furnished by the vendor.			
4.2	Automatic Position of TIG Torch : Details of travel of TIG Torch to cover all the positions of steel tubes (fixed in one steel plate - reference Attached Annexure I and II) in one setting operation, will be submitted by the vendor.			
4.3	Details of suitable arrangement for hanging and holding the TIG Torch, will be furnished by the vendor. The details are to be supplemented with relevant drawing / sketch.			

4.4	Quick Clamping cum Holding Fixture for the clamping of the steel plate (Refer sl. no. 3.5.2) : Drawing / sketch of Quick Clamping and Holding Fixture, will be submitted by the vendor.			
4.5	Cooling Water : If required for the function of the Automatic TIG Welding System, dedicated closed loop cooling water system will be offered by the vendor. Detail specification of the offered system, will be furnished in the offer.			
4.6	Gas System : Details of the gas system required for the function of the offered Automatic TIG Welding System, will be furnished by the vendor.			
4.7	Requirement of Compressed Air : Dedicated and matching air compressor will be offered by the vendor, if the same is required for the function / control of the offered Automatic TIG Welding System.			
4.8	Data Acquisition : Suitable and Reliable Data Acquisition system for traceability of the welding parameters, will be furnished by the vendor. NOTE : This item will be classified as an Optional item.			
5.0	GENERAL ARRANGEMENT DRAWING OF Automatic TIG Welding System			
5.1	General Arrangement drawing of the offered Automatic TIG Welding System including the schematic sketch / drawing of the Automatic Positioning / Travel of TIG Torch (sl. no. 4.2), Arrangement for hanging the TIG Torch (sl. no. 4.3) and Quick Clamping cum Holding Fixture (sl. no. 4.4), location of Welding Generator (sl. no. 4.1), control panel, operator's desk control, air compressor (sl. no. 4.7), cooling unit (sl. no. 4.5) and other auxiliaries if any, total plan area, total power requirement, maximum weight of single consignment etc. are to be furnished alongwith the offer.			

6.0	CNC CONTROL AND CONTROL PANEL			
	The offered Automatic TIG Welding System shall be equipped with suitable control with standard features.			
6.1	Vendor shall furnish the technical brochure of the offered control system, with relevant details of its standard features and description of its functioning and interfacing of various modules.			
6.2	Operator's desk pendant should be suitably indicated in General Arrangement drawing. Reference sl. no. 5.1 above.			
6.3	Main Electrical Control Panel & Operator Pendant shall be complete with proper cooling arrangement for working in environment condition as specified in sl. no. 8.2. Electrical control panel shall be provided with a 220V, 5 amp socket for maintenance purpose.			
6.4	Pneumatic control for the function of any component / instrument of Automatic TIG Welding System, should be clearly indicated in the offer. Suitable capacity and effective air compressor with drier shall be supplied by the Indian representative in case foreign vendor, in Indian Rupees. Refer Sl. No. 9.0.			
7.0	OPERATIONAL & MAINTENANCE MANUAL OF AUTOMATIC TIG WELDING SET			
7.1	5 sets of operational & maintenance manual in English language, will be supplied with the Automatic TIG Welding System. Out of these 5 sets, one set manual is to be supplied on CD			
7.2	NOTE : In addition to other information, O&M Manual should contain the following also :			

7.2.1	Erection Manual			
7.2.2	Detail Operation Manual			
7.2.3	Detail Maintenance Manual, instruction for assembly and dis-assembly of the main items of the Automatic TIG Welding System.			
7.2.4	Electrical wiring diagram indicating layout of the cables, plugs, junction box, terminal strips etc			
7.2.5	Operation & maintenance manual of all auxiliary systems / equipment			
7.2.6	Electrical wiring circuit of all auxiliary system / equipment			
7.2.7	Safety instruction for the operation of the Automatic TIG Welding System and its auxiliaries			
8.0	POWER SUPPLY AND ENVIRONMENT CONDITION :			
8.1	BHEL will provide input power supply 3 phase, 3 wire, 415 + / - 15% volt, 50 + / - 3% Hz to Isolator Switch (BHEL scope) nearby control panel of Automatic TIG Welding System. Cable connection from isolator switch to control panel and remaining cabling / wiring for the Automatic TIG Welding System and other auxiliaries / equipment, will be in the scope of vendor. There will be no neutral wire and earthing will be provided through shop structure column.			
8.2	Environment Condition			
	Automatic TIG Welding System should be suitable for tropical condition with ambient temperature from 0 to 50 Degree Centigrade and relative humidity maximum 97 %			
8.3	Noise Level			
8.3.1	Maximum noise level of Automatic TIG Welding System, should be below 85 dB(A) one meter away from the machine with correction factor for background noise.			
8.3.2	Vendor will demonstrate the noise level as per international standard like DIN 45635-16, if asked for.			
8.4	Voltage Stabilizer			
	Suitable servo-controlled voltage stabilizer cum isolation transformer of reputed Indian make by the Indian representative in case of foreign vendor and of appropriate rating shall be supplied and connected to the Automatic TIG Welding System.			

9.0	AIR COMPRESSOR :			
	As per the requirement of pneumatic system provided in the offered Automatic TIG Welding System, suitable capacity and ELGI / Chicago Pneumatic make air compressor is to be supplied by the Indian agent in case foreign vendor. Maximum noise level of air compressor should be below 85 dB(A), one meter away from the air compressor, as referred in sl.no. 8.3.1			
10.0	SPARES : (Optional) Set of spares indicating essential and optional items on following categories, required for 2 years trouble free operation of the Automatic TIG Welding System and its accessories.			
10.1	Mechanical			
10.2	Electrical			
10.3	Electronics			
10.4	Pneumatic			
10.5	Detailed item wise-price list of the spares along with name and address of suppliers for all bought out items to be offered against each of the above categories along with quantity recommended.			
10.6	Vendor will furnish offer validity of two years for the spares after erection and commissioning of the Automatic TIG Welding System at BHEL Hardwar			
11.0	PAINTING :			
11.1	Automatic TIG Welding System and control panel will be painted to RAL 7038 Grey paint or mutually agreed.			
11.2	NOTE : Vendor will repair the paint with original paint in case the same is damaged in transit / erection, before commissioning of the Automatic TIG Welding System.			
12.0	PRE-ACCEPTANCE OF AUTOMATIC TIG WELDING SYSTEM AT VENDOR'S WORKS :			
12.1	Pre-acceptance of Automatic TIG Welding System with test run, will be witnessed by BHEL engineers deputed for training (sl. no. 14) at vendor's works.			
12.2	NOTE : Materials like Steel Tube (sl. no. 3.2), Steel Plate (sl. no. 3.3) and consumables if any, for mock up sample at vendor's works, will be arranged by the vendor.			

13.0	TRAINING :			
13.1	Training of three BHEL engineers for 2 weeks each / mutually agreed period, covering following fields			
13.1.1	Operation of complete Automatic TIG Welding System			
13.1.2	Mechanical / Pneumatic maintenance of the Automatic TIG Welding System			
13.1.3	Electrical and Electronic maintenance of Automatic TIG Welding System			
13.1.4	Vendor shall quote for the charge of training if any, per man & per day basis			
14.0	FOUNDATION FOR AUTOMATIC TIG WELDING SYSTEM:			
14.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI) or Purchase Order, whichever is earlier. Complete Foundation Design and final layout drawings shall be submitted by the vendor within 30 days after getting BHEL's approval for preliminary layout drawings. The layout drawing should consist of all requirements pertaining to complete Automatic TIG Welding System including space requirement for Voltage Stabilizer, Isolation Transformer, Air Compressor and all other accessories / offered items.			
14.1.1	The vendor shall provide an optimised layout of the offered Automatic TIG Welding System. BHEL shall construct complete foundation for the Automatic TIG Welding System under supervision of vendor and vendor's responsibility. Vendor should arrange equipments required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specification of grouting compound and grouting procedure etc. for foundation bolts of the Automatic TIG Welding System.			
14.1.2	NOTE : Water pipe line, oil pipe line and electrical cables not to be laid in the same cable tray for safety reasons.			
14.2	Foundation bolts, leveling elements, cable trays and other items required for the erection of the Automatic TIG Welding System, shall be supplied along with the main machine			

15.0	ERECTION & COMMISSIONING OF THE AUTOMATIC TIG WELDING SYSTEM :			
15.1	Vendor shall take full responsibility for carrying out the erection, start up, testing of the Automatic TIG Welding System, it's control & all types of other supplied equipments / accessories etc. Service requirement like power,air and water shall be provided by BHEL., to be indicated by the vendor in their foundation / layout drawings. Details of these requirements should be informed / discussed by the vendor and agreed with BHEL in advance. EOT crane 3 Ton capacity available in the shop. In case higher capacity crane is required, representative of vendor shall hire mobile crane from local sources. Compressed air pressure available in BHEL shop, is in the order 3.0 kg / square centimeter.			
15.2	Erection & Commissioning of Voltage Stabilizer, Isolation Transformer, Air Compressor and other accessories with all electrical & mechanical connections, shall be responsibility of the vendor.			
16.0	JOB PROVING AND FINAL ACCEPTANCE OF THE AUTOMATIC TIG WELDING SYSTEM AT BHEL WORKS :			
16.1	Successful proving of TIG Pulse welding process on MOCK UP ASSEMBLY at BHEL works			
16.2	Demonstration of all features of complete Automatic TIG Welding System, control system & accessories to the satisfaction of BHEL			
16.3	Training of BHEL operators in the operation of complete Automatic TIG Welding System, control system and all the accessories etc. by the vendor's experts during the period of commissioning and proving of the Automatic TIG Welding System, at BHEL works			

16.4	NOTE : Separate price if any, is to be indicated in the commercial bid of the offer, for proving of the complete Automatic TIG Welding System at BHEL works.			
17.0	GUARANTEE :			
	Guarantee for complete Automatic TIG Welding System, Control and all supplied accessories / equipments for 24 months from the date of final acceptance of the machine. Any spare required during guarantee period shall have to be arranged by the vendor free of cost (up to BHEL Haridwar stores) and duty leived have to be borne by the vendor.			
18.0	QUALITY PLAN :			
	Vendor shall submit Quality Plan within two months after issue of Purchase Order.			
19.0	PACKING :			
	Sea worthy and rigid packing for all items of complete Automatic TIG Welding System, Control Panel, all accessories and other supplied items in wooden boxes to avoid any damage / loss in transit. All small and loose items like spares, should be suitably packed in wooden boxes. In case machine is despatched in container, the container shall be brought upto BHEL, Haridwar. De-stuffing of container shall be carried out at BHEL Haridwar by the vendor's representative. Any type of handling material equipment required for the de-stuffing of the container shall be brought by the vendor at BHEL Haridwar on returnable basis.			
20	GENERAL INFORMATION :			
	All the information and drawing attached with the tender document are exclusive property of BHEL Haridwar. Under any circumstance, these information as stated above and attached Annexures, must not be passed on to any third party without prior permission of BHEL and must not be used directly or indirectly detrimental to the interest of BHEL.			

21	QUALIFYING CONDITIONS :			
21.1	Only those vendors should quote, who have supplied and commissioned at least one number Automatic TIG Welding System of same or higher capacity suitable for TIG Pulse Welding operation for the welding of steel tube with steel plate, in last ten years and such / similar Automatic TIG Welding System is (are) presently working satisfactorily for more than one year after commissioning. Following information are to be provided by the vendor,			
21.2	Name of the company / customer, where such / similar Automatic TIG Welding System (s) is (are) commissioned.			
21.3	Performance certificate from the customer to whom the referred machine has been supplied			
21.4	Complete postal address of the company / customer			
21.5	Year of commissioning			
21.6	Type of application for which the such / similar Automatic TIG Welding System, is installed and commissioned			
21.7	Name and designation of the contact person of the company / customer			