

INDENT NO- 20172097; Dt: 01.09.2017; Rev-00**PART - B: Technical Specification for "MECHANIZED HOT WIRE NARROW GAP TIG WELDING SYSTEM"****NOTE:-**

1. The "Offered" Column, the "Deviations" column (If applicable) & "Remarks" Column of this format shall be filled in by the Vendor and submitted along with the offer. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.

2. Point wise Confirmation - Vendor should confirm/clarify point wise (all the points) as per specification and provide original technical leaflet, technical details, photographs, scope of supply etc. at the first instance.

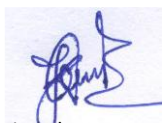
3. The offer and all documents enclosed with offer should be in English language only.

ADDRESS OF THE SUPPLIER :**ADDRESS OF THE INDIAN DEALER****TELEPHONE NOS.:****TELEPHONE NOS.:****FAX NOS.:****FAX NOS.:****E-MAIL ADDRESS :****E-MAIL ADDRESS :**

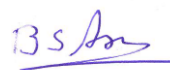
SCOPE: SUPPLY, ERECTION & COMMISSIONING OF "MECHANIZED HOT WIRE NARROW GAP TIG WELDING SYSTEM" COMPLYING WITH REQUIREMENTS AS BELOW :

FOR VENDOR

S. No	SPECIFICATION DETAILS		OFFERED	DEVIATIONS	REMARKS
1.0	PURPOSE & APPLICATION				
1.1	The Mechanized Hot Wire Narrow Gap System should be suitable for carrying out Narrow Gap Hot Wire TIG Welding Process on thick wall rotor to rotor butt joint (In three parts) in down hand (1G) welding position for dissimilar materials.	Vendor to offer			

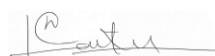


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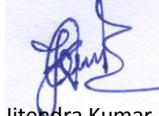


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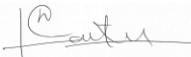
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1.2	This system should be suitable for Narrow Gap Hot Wire TIG Welding Process on thick wall of casing to casing (In three parts) in horizontal (2G) welding position for dissimilar materials on turn table.	Vendor to offer			
1.3	This system should be suitable for weld buttering of rotor & casing part in down hand welding position (1G) on turn table before welding of rotor/ casing butt joint.	Vendor to offer			
1.4	a) The offered system should have separate power source and column boom arrangement for rotor welding mentioned at S No-1.1. b) The offered system should have separate power source and column boom arrangement for casing welding including buttering of rotor & casing parts mentioned at S No-1.2 & 1.3.	Vendor to offer			
1.5	The available space for installation of welding system is 16 M X 15.4 M having under crane area of 13.5 M X 9.4 M (Refer annexure-1A) . The proposed tentative layout of welding system is as per Annexure-1B. The vendor should offer welding system suiting to available space.	Vendor to note			
1.6	The vendor has to submit the actual layout for arrangement of their welding system mentioned at S No-1.1 to 1.4.	Vendor to offer			
2.0	JOB DETAILS AND BASIC WELDING CONDITIONS :				
2.1	a) IP Rotor Drawing No : BHEL/ IPRotor/ 01 (Annexure-2A) b) HP Rotor Drawing No : BHEL/ HPRotor/ 02 (Annexure-2B) c) IP Casing Drawing No : BHEL/ IPCasing/ 03 (Annexure-2C) d) Mock-up pieces : BHEL/ Mock-up/ 04 (Annexure-2D)	Vendor to note			
2.2	Material: For Rotor: Alloy Steel Machined Forging grade X12CrMoWVNbN 10 11 / Inconel 617M. For Casing: Alloy Steel Machined Forging grade X12CrMoWVNbN 10 11 / Inconel 625. -Chemical composition and other properties as per Annexure-3.	Vendor to note			


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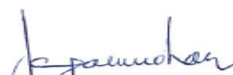

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2.3	Welding Consumable : "ERNiCrCoMo-1" for Hot Wire Narrow Gap TIG Welding process for rotor welding	Vendor to note			
2.4	Preheat/ Inter pass/Post heating Temperature: 200±25/300/400°C (For weld buttering only). Note: No pre-heating required for narrow gap joint welding of dissimilar parts.	Vendor to note			
2.5	Stress Relieving Temperature : 670-700 °C (In Furnace)	Vendor to note			
2.6	Work piece / job details				
2.6.1	IP Rotor				
	Total length of rotor - 8800 mm (Approx)	Vendor to note			
	Weight - 45000 kg (Approx)	Vendor to note			
	Maximum diameter - 1110 mm (Approx)	Vendor to note			
	Diameter at joint - 1000 mm (Approx)	Vendor to note			
	Thickness of weld joint - 250 mm (Radial Direction)	Vendor to note			
2.6.2	HP Rotor				
	Total length of Mock-up - 5640 mm (Approx)	Vendor to note			
	Weight - 16400 kg (Approx)	Vendor to note			
	Maximum diameter - 940 mm (Approx)	Vendor to note			
	Diameter at joint - 790 mm (Approx)	Vendor to note			
	Thickness of weld joint - 250 mm (Radial Direction)	Vendor to note			

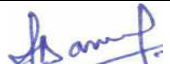

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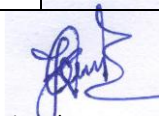

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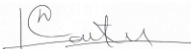

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2.6.3	IP Casing				
	Maximum diameter - 3250 mm	Vendor to note			
	Maximum Weight - 35000Kg (approx.) for half casing	Vendor to note			
	Maximum height - 5200 mm (Approx)	Vendor to note			
	Thickness of weld joint - Varing thickness up to 320 mm	Vendor to note			
2.6.4	Mock-up Piece Details	Vendor to note			
	Size: OD/ID - 800/300 mm; L=1000 mm for X12CrMoWVNbN 10 11 & Size: OD/ID - 800/300 mm; L=500 mm for Inconel-617M/625 Total length of welded mock-up = 1500mm (1000 mm + 500mm) Note: There will be two sets of mock-up. One for rotor welding in down hand (1G) welding position & another for casing welding in horizontal (2G) welding position.	Vendor to note			
2.6.5	Note: 1. However the supplied machine should be capable to weld rotor of length up to 10000 mm, weight up to 60 T & weld joint thickness up to 300 mm. 2. Supplied machine should be capable to weld casing of length 6000 mm & weight 100 T. (Considering eccentric loading).	Vendor to offer			
2.7	Weld joint details				
2.7.1	Type of Edge preparation: Narrow Groove 'J' Type for welded rotor/casing as per Annexure -4. Note: Details of weld deposition during buttering also included in annexure-4	Vendor to note			
2.7.2	Weld joint preparation : By Machining	Vendor to note			


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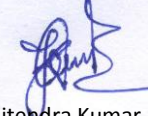

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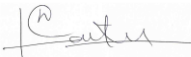

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2.7.3	Weld joint location : As per attached drawings (Annexure-2A,2B &2C)	Vendor to note			
2.7.4	Weld joint testing requirement : Acceptance norms for UT & DP test will be mutually decided during technical evaluation	Vendor to note			
3.0	"MECHANIZED HOT WIRE NARROW GAP TIG WELDING SYSTEM" FOR ROTOR WELDING STATION (In 1G position) COMPRISING OF FOLLOWING:				
3.1	Digital Hot Wire TIG Welding Power source for rotor welding station.	Vendor to offer			
3.2	Column & Boom fitted with cross slide for holding the welding head for rotor to rotor narrow gap butt welding for rotor welding station.	Vendor to offer			
3.3	Rotator for rotating the rotor and rotor support system for supporting the Rotor for rotor welding station.	Vendor to offer			
3.4	Welding head including Hot Wire Narrow Gap TIG Welding Torch (NG TIG Torch) & Wire feeder unit for rotor welding station.	Vendor to offer			
3.5	Shielding and trailing gas arrangement for rotor welding station.	Vendor to offer			
3.6	Twin video camera with video display & recording system for rotor welding station.	Vendor to offer			
3.7	Cooling unit for rotor welding station.	Vendor to offer			
3.8	Infrared temperature sensor for rotor welding station.	Vendor to offer			
3.9	Control cabinet with industrial PC and data acquisition system for rotor welding station.	Vendor to offer			
3.10	Operator platform for Rotor Welding Station.	Vendor to offer			


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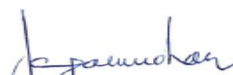

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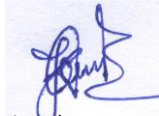

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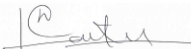

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3.11	Servo Voltage Stabilizer for rotor welding station.	Vendor to offer			
3.12	Uninterruptible Power Supply (UPS) unit for rotor welding station	Vendor to offer			
3.13	Air compressor with drier for rotor welding station. (If applicable)	Vendor to offer			
	DETAILED TECHNICAL SPECIFICATION FOR ROTOR WELDING STATION				
4	DIGITAL HOT WIRE TIG WELDING POWER SOURCE FOR ROTOR WELDING STATION				
4.1	Type: Micro-Processor control, Programmable, Inverter type Constant current power source	Vendor to offer			
4.2	Output Current Range : Min. 5A or less and Max 500A or more (DC)	Vendor to offer			
4.3	Current Duty Cycle : Min. 400 A @ 100% duty cycle	Vendor to offer			
4.4	Integrated hot wire current & Duty Cycle : 150 Amps @ 100% duty cycle	Vendor to offer			
4.5	Input power : 3-PH, 50 Hz, 415V ($\pm 10\%$)	Vendor to note			
4.6	Provision of gas Pre-flow / gas Post flow control (Time & flow rate)	Vendor to offer			
4.7	Memory to store welding program: Minimum 99 or more	Vendor to offer			
4.8	Welding current slope time	Vendor to specify			
4.9	Program transfer/loading: Through USB memory stick	Vendor to offer			
4.10	Cooling: External/separate cooling unit	Vendor to offer			


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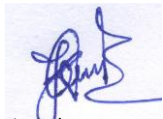

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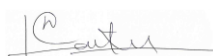

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4.11	The power source should have following features/functions:	Vendor to offer			
4.11.1	Ammeter & Voltmeter	Vendor to offer			
4.11.2	Remote control pendant	Vendor to offer			
4.11.3	Trailing/ Shielding gas control with programmable mass flow meter and safety valve (indications up to 50L/min)	Vendor to offer			
4.11.4	Extra gas kit with programmable mass flow meter and safety valve (0-50L/min indications) for backing gas.	Vendor to offer			
4.11.5	Wire feed control Axis	Vendor to offer			
4.11.6	Flow safety valve for external cooling unit	Vendor to offer			
4.11.7	Arc Voltage Control (AVC) axis	Vendor to offer			
4.11.8	Torch Oscillation Control (OSC) axis	Vendor to offer			
4.11.9	Measurement card for Data acquisition	Vendor to offer			
4.11.10	Complete cable package for the torch (gas/cooling liquid/power cables) and the control cable for cross slides movements and longitudinal movement.	Vendor to offer			
4.11.11	Gas hose and argon gas pressure regulators	Vendor to offer			
4.12	Power source rating (KVA)	Vendor to specify			
4.13	Size & Weight	Vendor to specify			
4.14	Make & Model	Vendor to specify			


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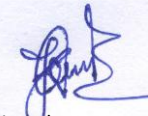

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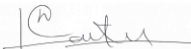

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5	COLUMN & BOOM FITTED WITH CROSS SLIDE FOR HOLDING THE WELDING HEAD FOR ROTOR TO ROTOR NARROW GAP BUTT WELDING JOINT FOR ROTOR WELDING STATION				
5.1	Motorized horizontal movement (X axis) of travel car (carriage) with column & boom parallel to rotor axis-	Vendor to offer			
5.1.1	Carriage Travel Length of 10000 mm	Vendor to offer			
5.1.2	Carriage with column & Boom should be placed on the rail for its smooth movement.	Vendor to offer			
5.1.3	Drive should be supported with AC Servomotor of Siemens latest version with absolute encoder feedback	Vendor to offer			
5.1.4	Control of above drive should be of Siemens make with 4-quadrant transistor convertor	Vendor to offer			
5.1.5	Following modes of carriage motions (X-axis) required-	Vendor to offer			
5.1.6	Mode 1- Slow movement for high precision torch positioning	Vendor to offer			
5.1.7	Mode 2- Rapid movement with speed	Vendor to offer			
5.1.8	There should be provision of stoppers for carriage at both ends of rails.	Vendor to offer			
5.1.9	Emergency stop button at the column should be synchronized with the power source.	Vendor to offer			
5.2	Motorized vertical movement (Y axis) of boom perpendicular to rotor axis-	Vendor to offer			
5.2.1	Boom Travel in vertical direction of 4000 mm	Vendor to offer			
5.2.2	Minimum height upto bottom line of Boom from top edge of rails	Vendor to specify			


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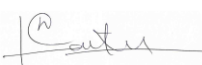

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5.2.3	Drive should be supported with AC Servomotor of Siemens latest version with absolute encoder feedback	Vendor to offer			
5.2.4	Control of above drive should be of Siemens make with 4-quardant transistor convertor	Vendor to offer			
5.2.5	Following modes of boom motions (Y-axis) required in vertical direction-	Vendor to offer			
5.2.6	Mode 1- Slow movement for high precision torch positioning	Vendor to offer			
5.2.7	Mode 2- Rapid movement with speed	Vendor to offer			
5.2.8	There should be provision of stoppers for boom at both ends of rails.	Vendor to offer			
5.3	Motorized horizontal movement (Z axis) of boom perpendicular to rotor axis-	Vendor to offer			
5.3.1	Boom Travel in horizontal direction of 3000 mm	Vendor to offer			
5.3.2	Drive should be supported with AC Servomotor of Siemens latest version with absolute encoder feedback	Vendor to offer			
5.3.3	Control of above drive should be of Siemens make with 4-quardant transistor convertor	Vendor to offer			
5.3.4	Following modes of boom motions (Z-axis) required in horizontal direction-	Vendor to offer			
5.3.5	Mode 1- Slow movement for high precision torch positioning	Vendor to offer			
5.3.6	Mode 2- Rapid movement with speed	Vendor to offer			
5.3.7	There should be provision of stoppers for boom at both ends of rails.	Vendor to offer			
6	ROTATOR FOR ROTATING THE ROTOR AND ROTOR SUPPORT SYSTEM FOR SUPPORTING THE ROTOR FOR ROTOR WELDING STATION				


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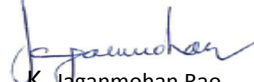

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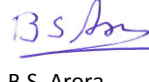

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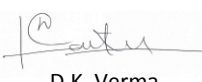

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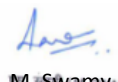
6.1	Rotator for rotating the rotor	Vendor to offer			
6.1.1	Suitable motorized rotator capable of rotating the rotor weight up to 60T	Vendor to offer			
6.1.2	Speed of the rotator from 0.01 rpm to 3.0 rpm, infinitely variable through knob on control panel with speed variation of $\pm 3\%$ of set value	Vendor to offer			
6.1.3	There should be provision of rotation of rotor clockwise/ anti clockwise separately & clockwise & anti clockwise alternatively in programme & manual mode both. The rotation movement should be controlled by main control panel.	Vendor to offer			
6.1.4	Drive should be supported with AC Servomotor of Siemens latest version with absolute encoder feedback	Vendor to offer			
6.1.5	Control of above drive should be of Siemens make with 4-quadrant transistor convertor	Vendor to offer			
6.1.6	Emergency stop buttons on rotator should be provided synchronized with the power source.	Vendor to offer			
6.1.7	Following technical data to be mentioned for rotator-				
	Load capacity	Vendor to specify			
	Torque	Vendor to specify			
	Dimension of rotator (Height x Width x Depth)	Vendor to specify			
6.2	Rotor support system for supporting the Rotor				
6.2.1	Four sets of rollers of self-centering type	Vendor to offer			
6.2.2	Maximum Loading on all rollers- 60 MT Note- considering asymmetric loading of rollers	Vendor to offer			


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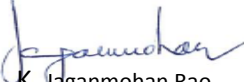

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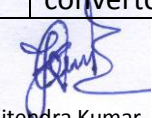

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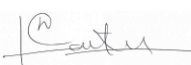

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6.2.3	All the four rollers should be made of steel with surface hardened and should be designed to rotate smoothly the rotor (cylindrical job) with rotor surface temperature up-to 300° C in contact with rollers during welding.	Vendor to offer			
6.2.4	All the rollers should be mounted on rails so that it can be moved along the axis of the rotor after placement of rotor. For this vendor to specify following - a) Total stroke in back/forth direction b) Inching stroke in back/forth direction should be 0.05mm maximum c) Speed range in back/forth direction	Vendor to offer & specify			
6.2.5	There should be provision of controlling of Left/Right movement of rollers so as to ensure alignment of rotor perpendicular to the rotor axis before start of welding. For this vendor to specify following - a) Total stroke in left/right direction b) Inching stroke in left/right direction should be 0.05mm maximum c) Speed range in left/right direction	Vendor to offer & specify			
6.2.6	There should be provision of controlling the height of rollers so as to ensure alignment of rotor axis before start of welding. For this vendor to specify following - a) Total stroke in up/down direction b) Inching stroke in up/down direction should be 0.05mm maximum c) Speed range in up/down direction	Vendor to offer & specify			
6.2.7	In each set of rollers assembly, there should be provision of adjustment of the distance between the rollers and can be locked in position to accommodate rotor with diameter suitable to job requirement (Refer Drawings at annexure-2A,2B, 2C &2D).	Vendor to offer			
6.2.8	Control of all drives for various types of movement mentioned above (at S No-6.2.4, 6.2.5 & 6.2.6) should be supported with AC Servomotor of Siemens latest version with absolute encoder feedback	Vendor to offer			
6.2.9	Control of above drive should be of Siemens make with 4-quardant transistor convertor	Vendor to offer			


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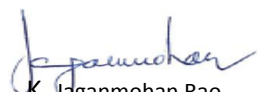

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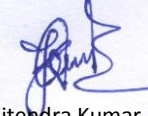

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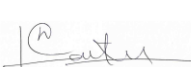

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6.2.10	Rotor supporting System should be equipped with proper pneumatic/ hydraulic clamping device for keeping its position during the complete welding process including pre-heat.	Vendor to offer			
6.2.11	Vendor to mention following details of roller support system-				
	Diameter of each roller	Vendor to specify			
	Width of each roller	Vendor to specify			
	Sliding range of each set of rollers on rails to accommodate rotors	Vendor to specify			
	Range of rotors diameter that offered rollers can accommodate	Vendor to specify			
	Minimum Length of the job which can be accommodated by the roller support system	Vendor to specify			
7	WELDING HEAD INCLUDING HOT WIRE NARROW GAP TIG WELDING TORCH (NG TIG TORCH) & WIRE FEEDER UNIT FOR ROTOR WELDING STATION				
7.1	300 mm Narrow Gap TIG torch (NG-TIG Torch) for welding in down hand (1G) position	Vendor to offer			
	The narrow gap hot-wire torch should be capable of multi-pass TIG welding with hot-wire feeding for welding of rotor having weld thickness up to 300 mm. The NG-TIG torch shall have features for synchronized oscillation of tungsten electrode and filler wire while welding.	Vendor to offer			
7.1.1	Suitable for welding wire sizes of diameter 0.8, 1.0 & 1.2 mm	Vendor to offer			
7.1.2	NG-TIG Torch Dimension:	Vendor to offer			
	Thickness: 8 mm max.	Vendor to offer			


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	Depth: 300 mm minimum	Vendor to offer			
7.1.3	Type of connection: Quick connector type	Vendor to offer			
7.1.4	Type of NG-TIG Torch cooling: Close loop water cooled via circulation of coolant through chilling unit	Vendor to offer			
	Cooling circuits: 2 nos.	Vendor to offer			
7.1.5	TIG Torch Duty Cycles :				
	Average Current (A) at 100% Duty cycle	Vendor to specify			
	Maximum peak current at 60% Duty cycle	Vendor to specify			
7.1.6	Thermal Limits: The NG-TIG torch shall be capable to withstand heating at least up to 350°C during welding and function smoothly.	Vendor to offer			
7.1.7	NG-TIG torch should have following feature of Oscillation Amplitude:	Vendor to offer			
	Oscillation stroke	Vendor to specify			
	Vertical axis	Vendor to specify			
	Manual wire oscillation adjustment Synchronized with the electrode, amplitude adjustment (mm) +1 to -2	Vendor to specify			
	Horizontal axis (synchronized with the electrode)	Vendor to specify			
7.1.8	NG-TIG torch should have following feature of Manual filler wire adjustment:	Vendor to specify			
	Vertical adjustment (mm) +/- 5	Vendor to specify			



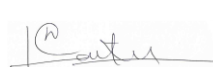
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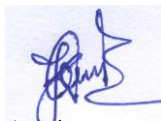


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	Filler wire height adjustment in torch	Vendor to specify			
7.1.9	Tungsten electrode diameter	Vendor to specify			
	Tungsten electrode and filler wire alignment tool shall be provided	Vendor to specify			
7.1.10	NG-TIG torch should have arrangement of Shielding Gas as per following :	Vendor to specify			
	Welding gas used: Argon/mix gas	Vendor to comply			
	Welding gas outlets	Vendor to specify			
	Type of Gas lens	Vendor to specify			
7.1.11	Integrated Gas Trailer: A gas trailer should be provided which is fitted to the 300 mm NG-TIG torch for ensuring a perfect gas protection. The gas trailer shall have the following features/functions:	Vendor to specify			
	Gas used: Argon/Mix	Vendor to comply			
7.2	Conventional hot wire TIG Torch				
7.2.1	Suitable conventional hot wire TIG torch should be offered for wire sizes 0.8/1.0/1.2mm	Vendor to comply			
7.2.2	Tungsten electrode diameter	Vendor to specify			
7.3	Wire Feeder Unit				
7.3.1	Wire Feeder unit - Light weight, compact and rigid wire feeder with powered and grooved Roller drive and wire straightener	Vendor to offer			



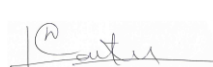
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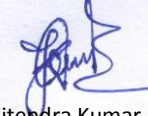


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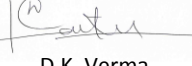
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7.3.2	Suitable for welding wire sizes of diameter 0.8, 1.0 & 1.2 mm	Vendor to offer			
7.3.3	Size of wire spool : Up to 15 Kg	Vendor to offer			
7.3.4	Diameter of wire feed roll	Vendor to specify			
7.3.5	Wire feed speed	Vendor to specify			
7.3.6	Type of wire feed motor	Vendor to specify			
8	SHIELDING & TRAILING GAS ARRANGEMENT FOR ROTOR WELDING STATION				
8.1	Shielding & trailing gas arrangements suiting to weld joint geometry of jobs mentioned in annexure-4.	Vendor to offer			
8.2	Flow meter should be provided on each gas path at appropriate location for gas flow measurement.	Vendor to offer			
9	TWIN VIDEO CAMERA WITH VIDEO DISPLAY & RECORDING SYSTEM FOR ROTOR WELDING STATION				
9.1	Two video cameras (one front and one rear) shall be supplied and integrated to the 300 mm NG-TIG torch. The front camera is fixed within the body of the NG-TIG torch to cover the molten weld pool and rear camera is fixed on the outer surface (external) of the NG-TIG torch to cover the solidified weld metal respectively.	Vendor to offer			
9.1.1	Objects viewed from front camera:	Vendor to offer			
	Welding arc	Vendor to offer			

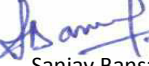

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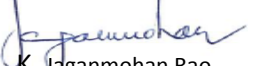

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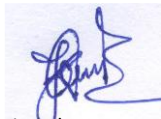

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	Tungsten electrode	Vendor to offer			
	Groove edge	Vendor to offer			
	Molten weld pool	Vendor to offer			
	Filler wire	Vendor to offer			
9.1.2	Objects viewed from rear camera:	Vendor to offer			
	Solidified weld bead	Vendor to offer			
	Groove edge	Vendor to offer			
9.1.3	Optical Characteristics of Front Camera:	Vendor to offer			
	Size of object field: 24 mm x 18 mm (Horizontal x Vertical)	Vendor to offer			
	Type of CCD: 1/6 ² CCD sensor	Vendor to offer			
	CCD sensing: Remote CCD sensor	Vendor to offer			
	Optical : 460 mm optical extension + micro objective f6mm	Vendor to offer			
	Image Focusing: Video control unit	Vendor to offer			
	Protective Glass: Heat absorbing	Vendor to offer			
	LED source: 15W LED source	Vendor to offer			



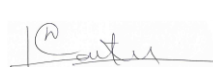
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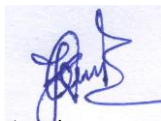


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9.1.4	Optical Characteristics of Rear Camera:	Vendor to offer			
	Size of object field: 28 mm x 21 mm (Horizontal x Vertical)	Vendor to offer			
	Type of CCD: 1/4 ² CCD sensor	Vendor to offer			
	Optical: Objective f50 mm + 90° prism	Vendor to offer			
	Lighting arrangement on torch: 25W Halogen lighting	Vendor to offer			
	Protection to camera and light: Using protective glass	Vendor to offer			
9.2	Video Display and recording System :				
9.2.1	The video display and recording system should be supplied and integrated to the 300 mm NG-TIG torch for on-line (live) viewing of the welding and recording the welding images and video files. The live video of weld pool display shall be clear to naked eye for doing necessary changes in the welding parameters using remote pendant to get a sound and defect free welds.	Vendor to offer			
9.2.2	A video control container consists of :	Vendor to offer			
	Monitor : Two 8.4 ² LED video monitoring screens	Vendor to offer			
	Control of camera unit: Video controller integrated in side cabinet	Vendor to offer			
	Safety interlocks: Provided through PLC program	Vendor to offer			
	FRL unit for compressed air: Mounted on back side of cabinet	Vendor to offer			



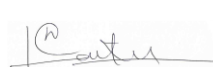
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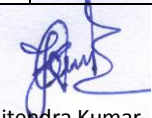


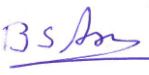
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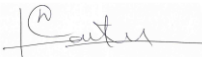
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9.2.3	Power supply: Single phase 230V AC 50 Hz	Vendor to offer			
9.2.4	Application derivative: 2006/42/EC "Machinery" Directive.	Vendor to offer			
	2004/108/EC Electromagnetic compatibility.	Vendor to offer			
	2006/95/EC Electrical equipment designed for use within certain voltage limits.	Vendor to offer			
	Video recording system	Vendor to offer			
10.0	COOLING UNIT FOR ROTOR WELDING STATION				
	Adequate cooling unit with closed water cycle for welding head, torch and other accessories like pyrometer & camera etc as required to be provided with following technical data :	Vendor to offer			
10.1	Cooling medium	Vendor to specify			
10.2	Power consumption	Vendor to specify			
10.3	Input voltage	Vendor to specify			
10.4	Capacity of water tank	Vendor to specify			
10.5	Weight of water tank	Vendor to specify			
11	INFRARED TEMPERATURE SENSOR FOR ROTOR WELDING STATION				
	There should be provision of suitable Infrared temperature sensor (digital highly accurate pyrometer) for non-contact type for temperature measurement of the rotor during its welding to control the inter pass temperature.	Vendor to offer			


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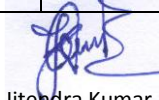

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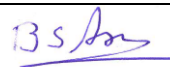

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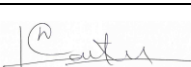

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12	CONTROL CABINET WITH INDUSTRIAL PC AND DATA ACQUISITION SYSTEM FOR ROTOR WELDING STATION				
12.1	Control cabinet: The machine should be supplied with a Control Cabinet with industrial PC for programming purpose with a licensed software and with at least 19" screen and A4 printer.	Vendor to offer			
12.2	Data Acquisition: The data acquisition set should be connected to the PC power source and should consist of a measurement axis card fitted into the power source rack, acquisition unit and the concerned software which should be installed in the programming laptop which is to be supplied with the power source.	Vendor to offer			
12.3	The Data signals should be recorded at a frequency of 200Hz. The data acquisition set should be able to register process parameters like the welding current, welding voltage (measured close to the electrode), location of the weld position, welding speed, wire speed and hot wire current. All these parameters should be stored on the hard disk.	Vendor to offer			
12.4	Licensed copy of all software's used on the machine along with necessary accessory and communication cable.	Vendor to offer			
13	OPERATOR PLATFORM FOR ROTOR WELDING STATION				
	Suitable platform for good access to the welding area along the way of rotor axis to be provided. Vendor to provide necessary sketches with the offer.	Vendor to offer			
14	SERVO VOLTAGE STABILIZER FOR ROTOR WELDING STATION				
	Oil / Air Cooled suitable Servo Controlled Voltage Stabilizer (of reputed Indian make e.g. Neel, Mumbai) suitable for complete machine, its drives, controls, PLC etc., if required, for unbalanced load & supply conditions considering specified power supply & ambient conditions (5-50 deg. C)	Vendor to offer			
14.1	Rating	Vendor to specify			

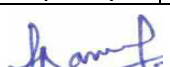

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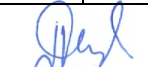
 
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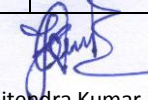

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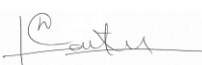

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14.2	Make & Model	Vender to specify			
14.3	Main supply- 415 V AC, 3 phase, 3 wire, 50 HZ	Vendor to note			
14.4	Technical leaflet of the offered model to be submitted along with the offer.	Vender to submit			
15	UNINTERRUPTIBLE POWER SUPPLY (UPS) UNIT FOR ROTOR WELDING STATION				
15.1	Suitable uninterruptible power supply (UPS) for rotor welding station should be supplied with the machine. Vendor to provide following information about UPS	Vendor to offer			
15.2	Make & Model	Vender to specify			
15.3	Technical leaflet of the offered model to be submitted along with the offer.	Vender to submit			
16	AIR COMPRESSOR FOR ROTOR WELDING STATION (IF APPLICABLE)				
	Suitable air compressor system consisting of air compressor of reputed Indian make e.g. Chicago/ Ingersoll/ Atlas Copco/ Elgi .	Vendor to offer			
16.1	Make & Model	Vendor to specify			
16.2	Air Pressure	Vender to specify			
16.3	Air Flow rate	Vender to specify			
16.4	Electrical Power	Vender to specify			
16.5	Capacity of receiver tank	Vender to specify			
16.6	Technical leaflet of the offered model to be submitted along with the offer.	Vender to submit			


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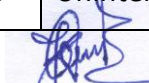

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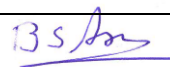

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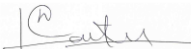

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17	"MECHANIZED HOT WIRE NARROW GAP TIG WELDING SYSTEM FOR BUTTERING OF ROTOR/CASING (IN 1G POSITION) AND CASING WELDING (In 2G position)" COMPRISING OF FOLLOWING:				
17.1	Digital Hot Wire TIG Welding Power source/sources for buttering & welding for casing welding station	Vendor to offer			
17.2	Column (Fixed) & boom for holding the welding head for buttering of rotor/casing and narrow gap butt welding of casing welding station.	Vendor to offer			
17.3	Turn table of capacity 100 T (minimum) for casing welding station	Vendor to offer			
17.4	Welding head including Hot Wire Narrow Gap TIG Welding Torch (NG TIG Torch) & Wire feeder unit for casing welding station	Vendor to offer			
17.5	Shielding and trailing gas arrangement for casing welding station.	Vendor to offer			
17.6	Twin video camera with video display & recording system for casing welding station.	Vendor to offer			
17.7	Cooling unit for casing welding station.	Vendor to offer			
17.8	Infrared temperature sensor for casing welding station.	Vendor to offer			
17.9	Control cabinet with industrial PC and data acquisition system for casing welding station.	Vendor to offer			
17.11	Heating arrangement system for pre-heat before buttering of rotor/casing part for casing welding station.	Vendor to offer			
17.12	Servo Voltage Stabilizer for casing welding station.	Vendor to offer			
17.13	Uninterruptible Power Supply (UPS) unit for casing welding Station	Vendor to offer			

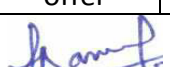

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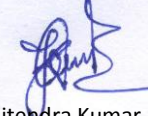

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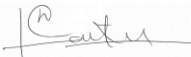

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	DETAILED TECHNICAL SPECIFICATION FOR CASING WELDING STATION				
18	DIGITAL HOT WIRE TIG WELDING POWER SOURCE/SOURCES FOR BUTTERING & WELDING FOR CASING WELDIN STATION				
18.1	Type: Micro-Processor control, Programmable, Inverter type Constant current power source	Vendor to offer			
18.2	Output Current Range : Min. 5A or less and Max 500A or more (DC)	Vendor to offer			
18.3	Current Duty Cycle : Min. 400 A @ 100% duty cycle	Vendor to offer			
18.4	Integrated hot wire current & Duty Cycle : 150 Amps @ 100% duty cycle				
18.5	Input power : 3-PH, 50 Hz, 415 (±10%)	Vendor to note			
18.6	Provision of gas Pre-flow / gas Post flow control (Time & flow rate)	Vendor to specify			
18.7	Memory to store welding program: Minimum 99 or more	Vendor to offer			
18.8	Welding current slope time	Vendor to offer			
18.9	Program transfer/loading: USB memory stick	Vendor to offer			
18.10	Cooling: External/separate cooling unit	Vendor to offer			
18.11	The power source should have following features/functions:	Vendor to offer			
18.11.1	Ammeter & Voltmeter	Vendor to offer			
18.11.2	Remote control pendant	Vendor to offer			


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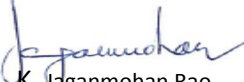

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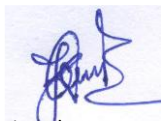

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18.11.3	Trailing/ Shielding gas control with programmable mass flow meter and safety valve (indications up to 50L/min)	Vendor to offer			
18.11.4	Extra gas kit with programmable mass flow meter and safety valve (0-50L/min indications) for backing gas.	Vendor to offer			
18.11.5	Wire feed control Axis	Vendor to offer			
18.11.6	Flow safety valve for external cooling unit	Vendor to offer			
18.11.7	Arc Voltage Control (AVC) axis	Vendor to offer			
18.11.8	Torch Oscillation Control (OSC) axis	Vendor to offer			
18.11.9	Measurement card for Data acquisition	Vendor to offer			
18.11.10	Complete package for the torch (gas/cooling liquid/power cables) and the control cable for cross slides movements and longitudinal movement.	Vendor to offer			
18.11.11	Gas hose and argon gas pressure regulators	Vendor to offer			
18.11.12	Power source rating (KVA)	Vendor to specify			
18.11.13	Size & Weight	Vendor to specify			
18.12	Make & Model	Vendor to specify			
19	COLUMN (FIXED) & BOOM FOR HOLDING THE WELDING HEAD FOR BUTTERING OF ROTOR/CASING AND NARROW GAP BUTT WELDING OF CASING FOR CASING WELDING STATION				
19.1	Motorized vertical movement (Y axis) of boom-	Vendor to offer			



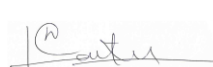
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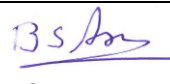
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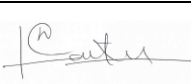


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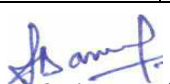
19.1.1	Boom Travel in vertical direction of 6000 mm	Vendor to offer			
19.1.2	Vertical movement of boom should be such that torch travel for welding should correspond to 6000mm boom travel starting from top surface of the turn table.	Vendor to specify			
19.1.3	Drive should be supported with AC Servomotor of Siemens latest version with absolute encoder feedback	Vendor to offer			
19.1.4	Control of above drive should be of Siemens make with 4-quardant transistor convertor	Vendor to offer			
19.1.5	Following modes of boom motions (Y-axis) required in vertical direction-	Vendor to offer			
19.1.6	Mode 1- Slow movement for high precision torch positioning	Vendor to offer			
19.1.7	Mode 2- Rapid movement with speed	Vendor to offer			
19.1.8	There should be provision of stoppers for boom at both ends of rails.	Vendor to offer			
19.2	Motorised horizontal movement (Z axis) of boom -				
19.2.1	Boom Travel in horizontal direction of 3000 mm	Vendor to offer			
19.2.2	Drive should be supported with AC Servomotor of Siemens latest version with absolute encoder feedback	Vendor to offer			
19.2.3	Control of above drive should be of Siemens make with 4-quardant transistor convertor	Vendor to offer			
19.2.4	Following modes of boom motions (Z-axis) required in horizontal direction-	Vendor to offer			
19.2.5	Mode 1- Slow movement for high precision torch positioning	Vendor to offer			
19.2.6	Mode 2- Rapid movement with speed	Vendor to offer			

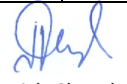

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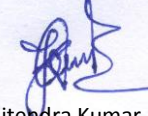

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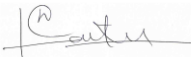

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19.2.7	There should be provision of stoppers for boom at both ends of rails.	Vendor to offer			
20	TURN TABLE OF CAPACTY 100 T (MINIMUM) FOR CASING WELDING STATION				
	Turn table should be suitable for-	Vendor to offer			
20.1	a. For welding of IP casing made of 3 parts (Refer annexure-2C) b. For weld buttering of rotor & casing parts made of material X12CrMoWVNbN 10 11	Vendor to offer			
20.2	Capacity of Turn Table- 100 T (min) Note- considering eccentric loading of casing	Vendor to offer			
20.3	Diameter of Turn Table- 3500mm	Vendor to offer			
20.4	Drive should be supported with AC Servomotor of Siemens latest version with absolute encoder feedback	Vendor to offer			
20.5	Control of above drive should be of Siemens make with 4-quardant transistor convertor	Vendor to offer			
20.6	Height of Turn Table above Floor	Vendor to specify			
20.7	Speed of turn Table	Vendor to specify			
20.8	The turn table should has facility to rotate in clock wire and anti-clock wise direction	Vendor to offer			
21	WELDING HEAD INCLUDING HOT WIRE NARROW GAP TIG WELDING TORCH (NG TIG TORCH) & WIRE FEEDER UNIT FOR CASING WELDING STATION				
21.1	450 Narrow Gap TIG torch (NG-TIG Torch) for welding in horizontal (2G) position	Vendor to offer			


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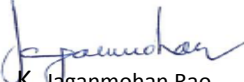

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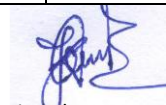

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	The narrow gap hot-wire torch shall be capable of multi-pass TIG welding with hot-wire feeding for welding of rotor having weld thickness up to 450 mm. The NG-TIG torch shall have features for synchronized oscillation of tungsten electrode and filler wire while welding.	Vendor to offer			
21.1.1	NG-TIG Torch Dimension:	Vendor to offer			
	Thickness: 10 mm max.	Vendor to offer			
	Depth: 450 mm minimum	Vendor to offer			
21.1.2	Cable Bundle Type : Quick-release connection	Vendor to offer			
21.1.3	Type of NG-TIG Torch cooling: Close loop water cooled via circulation of coolant through chilling unit	Vendor to offer			
	Cooling circuits: 2 nos.	Vendor to offer			
21.1.4	TIG Torch Duty Cycles:	Vendor to offer			
	Average Current (A) at 100% Duty cycle	Vendor to specify			
	Maximum peak current at 60% Duty cycle	Vendor to specify			
21.1.5	Thermal Limits: The NG-TIG torch shall be capable to withstand heating at least up to 350°C during welding and function smoothly.	Vendor to offer			
21.1.6	NG-TIG torch should have following feature of Oscillation Amplitude:	Vendor to specify			
	Oscillation stroke	Vendor to specify			
	Horizontal axis	Vendor to specify			



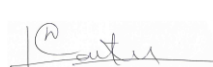
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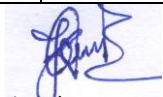


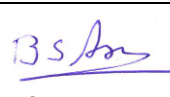
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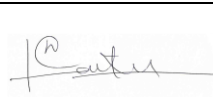
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	Vertical axis (synchronized with the electrode)	Vendor to specify			
21.1.7	NG-TIG torch should have following feature of Manual filler wire adjustment:	Vendor to specify			
	Horizontal adjustment	Vendor to specify			
	Filler wire height adjustment in torch	Vendor to specify			
	Filler wire diameters can be used: 0.8 mm, 1.0 mm and 1.2 mm	Vendor to comply			
21.1.8	Tungsten electrode of 3.2 mm diameter shall be provided	Vendor to comply			
	Tungsten electrode and filler wire alignment tool shall be provided	Vendor to comply			
21.1.9	NG-TIG torch should have arrangement of Shielding Gas as per following :	Vendor to specify			
	Welding gas used: Argon/mix gas	Vendor to comply			
	Welding gas outlets	Vendor to specify			
	Type of Gas lens	Vendor to specify			
21.1.10	Integrated Gas Trailer: A gas trailer shall be provided which is fitted to the 450 mm NG-TIG torch for ensuring a perfect gas protection. The gas trailer shall have the following features/functions:	Vendor to specify			
	It should be motor powered	Vendor to comply			
	Type of connection: Quick connector type	Vendor to comply			
	Cooling system: Close loop water cooled	Vendor to comply			

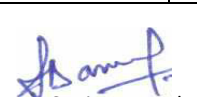

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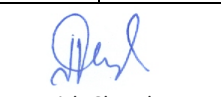

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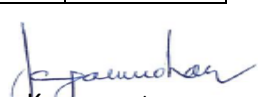

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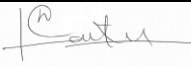

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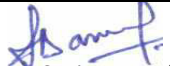
	Gas used: Argon/mix	Vendor to comply			
21.2	Buttering TIG torch for welding in down hand (1G) position				
21.2.1	Vendor to offer one number of buttering TIG torch with technical details. This torch will be used for weld buttering on X12 part of rotor & casing in down hand(1G) welding position on turn table. Refer Annexure-4 for details.	Vendor to offer			
21.3	Wire feeder unit				
	Wire Feeder unit - Light weight, compact and rigid wire feeder with powered and grooved Roller drive and wire straightener	Vendor to offer			
21.3.1	Suitable for welding wire sizes of diameter 0.8, 1.0 & 1.2 mm	Vendor to offer			
21.3.2	Size of wire spool : Up to 15 Kg	Vendor to offer			
21.3.3	Diameter of wire feed roll	Vendor to specify			
21.3.4	Wire feed speed	Vendor to specify			
21.3.5	Type of wire feed motor	Vendor to specify			
22	SHIELDING & TRAILING GAS ARRANGEMENT FOR ROTOR WELDING STATION				
22.1	Shielding & trailing gas arrangements suiting to weld joint geometry of jobs mentioned in annexure-4.	Vendor to offer			
22.2	Flow meter should be provided on each gas path at appropriate location for gas flow measurement.	Vendor to offer			


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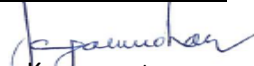
 
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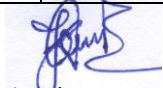

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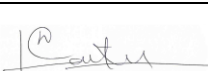

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23	TWIN VIDEO CAMERA WITH VIDEO DISPLAY & RECORDING SYSTEM FOR CASING WELDING STATION				
23.1	Two video cameras (one front and one rear) shall be supplied and integrated to the 300 mm NG-TIG torch. The front camera is fixed within the body of the NG-TIG torch to cover the molten weld pool and rear camera is fixed on the outer surface (external) of the NG-TIG torch to cover the solidified weld metal respectively.	Vendor to offer			
23.1.1	Objects viewed from front camera:	Vendor to offer			
	Welding arc	Vendor to offer			
	Tungsten electrode	Vendor to offer			
	Groove edge	Vendor to offer			
	Molten weld pool	Vendor to offer			
	Filler wire	Vendor to offer			
23.1.2	Objects viewed from rear camera:	Vendor to offer			
	Solidified weld bead	Vendor to offer			
	Groove edge	Vendor to offer			
23.1.3	Optical Characteristics of Front Camera:	Vendor to offer			
	Size of object field: 24 mm x 18 mm (Horizontal x Vertical)	Vendor to offer			
	Type of CCD: 1/6 ² CCD sensor	Vendor to offer			


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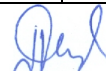

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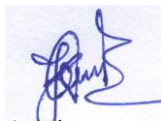

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	CCD sensing: Remote CCD sensor	Vendor to offer			
	Optical : 460 mm optical extension + micro objective f6mm	Vendor to offer			
	Image Focusing: Video control unit	Vendor to offer			
	Protective Glass: Heat absorbing	Vendor to offer			
	LED source: 15W LED source	Vendor to offer			
23.1.4	Optical Characteristics of Rear Camera:	Vendor to offer			
	Size of object field: 28 mm x 21 mm (Horizontal x Vertical)	Vendor to offer			
	Type of CCD: 1/4 ² CCD sensor	Vendor to offer			
	Optical: Objective f50 mm + 90° prism	Vendor to offer			
	Lighting arrangement on torch: 25W Halogen lighting	Vendor to offer			
	Protection to camera and light: Using protective glass	Vendor to offer			
23.2	Video Display and recording System :				
23.2.1	The video display and recording system should be supplied and integrated to the 300 mm NG-TIG torch for on-line (live) viewing of the welding and recording the welding images and video files. The live video of weld pool display shall be clear to naked eye for doing necessary changes in the welding parameters using remote pendant to get a sound and defect free welds.	Vendor to offer			



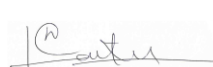
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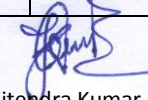


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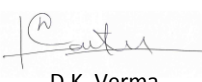
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23.2.2	A video control container consists o	Vendor to offer			
	Monitor : Two 8.4 ² LED video monitoring screens	Vendor to offer			
	Control of camera unit: Video controller integrated in side cabinet	Vendor to offer			
	Safety interlocks: Provided through PLC program	Vendor to offer			
	FRL unit for compressed air: Mounted on back side of cabinet	Vendor to offer			
23.2.3	Power supply: Single phase 230V AC 50 Hz	Vendor to offer			
23.2.4	Application derivative: 2006/42/EC "Machinery" Directive.	Vendor to offer			
	2004/108/EC Electromagnetic compatibility.	Vendor to offer			
	2006/95/EC Electrical equipment designed for use within certain voltage limits.	Vendor to offer			
	Video recording system	Vendor to offer			
24	COOLING UNIT FOR CASING WELDING STATION				
	Adequate cooling unit with closed water cycle for welding head, torch and other accessories like pyrometer & camera etc as required to be provided with following technical data :	Vendor to offer			
24.1	Cooling medium	Vendor to specify			
24.2	Power consumption	Vendor to specify			
24.3	Input voltage	Vendor to specify			


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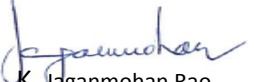

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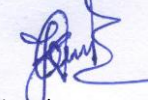

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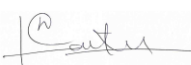

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24.4	Capacity of water tank	Vendor to specify			
24.5	Weight of water tank	Vendor to specify			
25	INFRARED TEMPERATURE SENSOR FOR CASING WELDING STATION				
	There should be provision of suitable Infrared temperature sensor (digital highly accurate pyrometer) for non-contact type for temperature measurement of casing during pre-heat & its welding to control the inter pass temperature.	Vendor to offer			
26	CONTROL CABINET WITH INDUSTRIAL PC AND DATA ACQUISITION SYSTEM FOR CASING WELDING STATION				
26.1	Control cabinet: The machine should be supplied with a Control Cabinet with industrial PC for programming purpose with a licensed software and with at least 19" screen and A4 printer.	Vendor to offer			
26.2	Data Acquisition: The data acquisition set should be connected to the PC power source and should consist of a measurement axis card fitted into the power source rack, acquisition unit and the concerned software which should be installed in the programming laptop which is to be supplied with the power source.	Vendor to offer			
26.3	The Data signals should be recorded at a frequency of 200Hz. The data acquisition set should be able to register process parameters like the welding current, welding voltage (measured close to the electrode), location of the weld position, welding speed, wire speed and hot wire current. All these parameters should be stored on the hard disk.	Vendor to offer			
26.4	Licensed copy of all software's used on the machine along with necessary accessory and communication cable.	Vendor to offer			
27	OPERATOR PLATFORM FOR CASING WELDING STATION				


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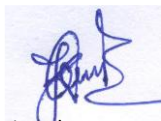

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	Suitable platform for good access to the welding area of casing as well as buttered part of rotor/casing. Vendor to provide necessary sketches with the offer.	Vendor to offer			
28	HEATING ARRANGEMENT SYSTEM FOR PRE-HEAT BEFORE BUTTERING OF ROTOR/ CASING PART FOR CASING WELDING STATION				
	Heating arrangement system is required for following purpose of "Mechanized Hot wire narrow gap welding System: :	Vendor to offer			
28.1	For preheating of both pieces of X12CrMoWVNbN 10 11 part of IP rotor & maintaining preheat temperature during its buttering on turn table. (Refer Annexure- 2A)	Vendor to offer			
28.2	For preheating of both pieces of X12CrMoWVNbN 10 11 part of IP casing & maintaining preheat temperature during its buttering on turn table (Refer Annexure- 2C)	Vendor to offer			
28.3	Preheat temperature will be 200 ± 25 deg. C & post heating will be done at 400 deg. C for all the components mentioned above. Hence, vendor to quote heating arrangement capable of heating upto 400 deg. C	Vendor to Note			
28.4	Offered heating arrangement should be of resistance heating type with heating mats fixed on jacket type in-situ furnaces.	Vendor to offer			
28.5	There should be provision of Temperature Control Station with paperless recorder :	Vendor to offer			
28.5.1	The heating arrangement should have provision of controlled heating/ cooling in programmable mode.	Vendor to offer			
28.5.2	There should be provision of paperless recorder for keeping record of heating cycle during pre-heat & welding.	Vendor to offer			
28.6	There should be provision of thermocouple attachment unit for fixing thermocouples on the job.	Vendor to offer			



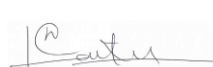
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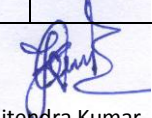


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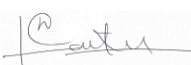
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28.7	The offered furnaces should be such that it should not foul with any part of Rotor/ Casing welding system during welding cycle.	Vendor to Note			
28.8	There should be provision of lifting hook on each of the furnaces	Vendor to offer			
28.9	All connection cables from transformer to control station, control station to furnaces, earthing cable, input cable etc. should be provided with plug & socket.	Vendor to offer			
28.10	Additionally, contact type hand held thermocouple to be provided for local temperature measurement.	Vendor to offer			
28.11	Following information about the heating system to be submitted by the vendor :	Vendor to offer			
28.11.1	Type & rating of Heating Transformer	Vender to specify			
28.11.2	Size & Weight of Heating Transformer	Vender to specify			
28.11.3	No. of offered furnaces to accommodate jobs mentioned at S No- 28.1 & 28.2	Vender to specify			
28.11.4	Type & rating of heaters used in the furnaces	Vender to specify			
29	SERVO VOLTAGE STABILIZER FOR CASING WELDING STATION				
	Oil / Air Cooled suitable Servo Controlled Voltage Stabilizer (of reputed Indian make e.g. Neel, Mumbai) suitable for complete machine, its drives, controls, PLC etc., if required, for unbalanced load & supply conditions considering specified power supply & ambient conditions (5-50 deg.C)	Vendor to offer			
29.1	Rating	Vender to specify			
29.2	Make & Model	Vender to specify			


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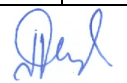
 
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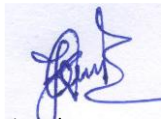

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29.3	Main supply- 415 V AC, 3 phase, 3 wire, 50 HZ	Vendor to note			
29.4	Technical leaflet of the offered model to be submitted along with the offer.	Vendor to submit			
30	UNINTERRUPTIBLE POWER SUPPLY (UPS) UNIT FOR CASING WELDING STATION				
30.1	Suitable uninterruptible power supply (UPS) for casing welding station should be supplied with the machine. Vendor to provide following information about UPS	Vendor to offer			
30.2	Make & Model	Vendor to specify			
30.3	Technical leaflet of the offered model to be submitted along with the offer.	Vendor to submit			
31	SPARES/ CONSUMABLES FOR ROTOR AND CASING WELDING STATION				
	Vendor to quote following essential consumables/ spares with identification no-				
31.1	One no of each types of TIG torch - a) NG-300 TIG torch for Rotor Welding b) NG-450 TIG torch for Casing Welding c) Conventional TIG torch for buttering	Vendor to offer			
31.2	Consumables for NG-300 for Rotor Welding Station	Vendor to offer			
31.2.1	Brazed lance- 8 nos	Vendor to offer			
31.2.2	Wire guide tube feed- 6 nos	Vendor to offer			



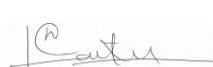
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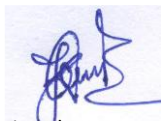


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31.2.3	Motor for NG TIG Torch- 1 no	Vendor to offer			
31.2.4	Set protective glass- 20 nos	Vendor to offer			
31.2.5	Each type of set screw used in the NG Torch- 40 nos each	Vendor to offer			
31.2.6	Axial choke- 20 nos.	Vendor to offer			
31.2.7	Tungsten electrode- 40 nos.	Vendor to offer			
31.2.8	Red wire sheath dia 0.8/ 1.0 / 1.2 mm- 20 nos/ 5 nos/ 5 nos	Vendor to offer			
31.2.9	Teflon hose -40 m	Vendor to offer			
31.2.10	CCD back protection glass assembly- 20 nos	Vendor to offer			
31.2.11	Lance ceramic- 40 nos	Vendor to offer			
31.2.12	Contact nozzle dia 0.8/ 1.0/ 1.2 mm- 40nos/ 10nos/ 10nos	Vendor to offer			
31.2.13	Wire pressing roller- 30 nos	Vendor to offer			
31.2.14	Roller for polyfil compact - dia 0.8/ 1.0/ 1.2 mm- 30 nos/ 10 nos/ 10 nos	Vendor to offer			
31.2.15	Contact tip – dia 0.8, 1.0 and 1.2 mm- 300 nos/ 50 nos/ 50 nos	Vendor to offer			
31.2.16	Pressure roll for polyfil compact - dia 1.2 mm- 25 nos	Vendor to offer			
31.2.17	Straightening roller- 25 nos	Vendor to offer			



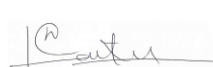
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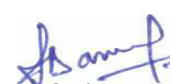
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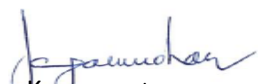
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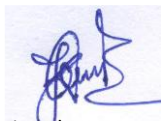


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31.2.18	Nozzle contact dia 0.8, 1.0 and 1.2 mm- 25 nos/ 10 nos/ 10 nos	Vendor to offer			
31.2.19	Filter 10x5 shade no 4- 20 nos	Vendor to offer			
31.2.20	Filter 10 x5 shade no 6- 20 nos	Vendor to offer			
31.2.21	Any other spares recommended by the vendor	Vendor to offer			
31.3	Spare parts for Welding Head for Rotor Welding Station	Vendor to offer			
31.3.1	Impulse emitter- 5 nos	Vendor to offer			
31.3.2	Wire sheath comply with e connect- 10 nos	Vendor to offer			
31.3.3	Blue wire sheath 0.8, 1.0 and 1.2 mm- 20 nos/ 5 nos/ 5 nos	Vendor to offer			
31.3.4	Female connector- 20 nos	Vendor to offer			
31.3.5	Hot wire guide tube- 10 nos	Vendor to offer			
31.3.6	Motor for Welding Head- 2 nos	Vendor to offer			
31.3.7	Wire feeder end piece- 40 nos	Vendor to offer			
31.3.8	Any other spares recommended by the vendor	Vendor to offer			
31.4	Consumable for NG-450 for Casing Welding Station	Vendor to offer			
31.4.1	Brazed lance- 8 nos	Vendor to offer			



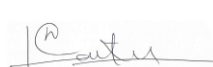
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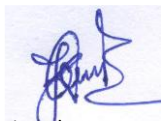


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31.4.2	Wire guide tube feed- 6 nos	Vendor to offer			
31.4.3	Motor for NG TIG Torch- 1 no	Vendor to offer			
31.4.4	Set protective glass- 20 nos	Vendor to offer			
31.4.5	Each type of set screw used in the NG Torch- 40 nos each	Vendor to offer			
31.4.6	Axial choke- 20 nos	Vendor to offer			
31.4.7	Tungsten electrode- 40 nos	Vendor to offer			
31.4.8	Red wire sheath dia 0.8/ 1.0 / 1.2 mm- 20 nos/ 5 nos/ 5 nos	Vendor to offer			
31.4.9	Teflon hose -40 m	Vendor to offer			
31.4.10	CCD back protection glass assembly- 20 nos	Vendor to offer			
31.4.11	Lance ceramic- 40 nos	Vendor to offer			
31.4.12	Contact nozzle dia 0.8/ 1.0/ 1.2 mm- 40nos/ 10nos/ 10nos	Vendor to offer			
31.4.13	Wire pressing roller- 30 nos	Vendor to offer			
31.4.14	Roller for polyfil compact - dia 0.8/ 1.0/ 1.2 mm- 30 nos/ 10 nos/ 10 nos	Vendor to offer			
31.4.15	Contact tip – dia 0.8, 1.0 and 1.2 mm- 300 nos/ 50 nos/ 50 nos	Vendor to offer			
31.4.16	Pressure roll for polyfil compact - dia 1.2 mm- 25 nos	Vendor to offer			



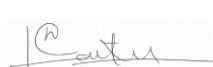
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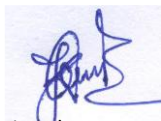


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31.4.17	Straightening roller- 25 nos	Vendor to offer			
31.4.18	Nozzle contact dia 0.8, 1.0 and 1.2 mm- 25 nos/ 10 nos/ 10 nos	Vendor to offer			
31.4.19	Filter 10x5 shade no 4- 20 nos	Vendor to offer			
31.4.20	Filter 10 x5 shade no 6- 20 nos	Vendor to offer			
31.4.21	Any other spares recommended by the vendor	Vendor to offer			
31.5	Spare parts for Welding Head for Casing Welding Station	Vendor to offer			
31.5.1	Impulse emitter- 5 nos	Vendor to offer			
31.5.2	Wire sheath compl with e connect- 10 nos	Vendor to offer			
31.5.3	Blue wire sheath 0.8, 1.0 and 1.2 mm- 20 nos/ 5 nos/ 5 nos	Vendor to offer			
31.5.4	Female connector- 20 nos	Vendor to offer			
31.5.5	Hot wire guide tube- 10 nos	Vendor to offer			
31.5.6	Motor- 2 nos	Vendor to offer			
31.5.7	Wire feeder end piece- 40 nos	Vendor to offer			
31.5.8	Any other spares recommended by the vendor	Vendor to offer			
31.6	Welding consumable for Conventional TIG Torch for buttering	Vendor to offer			



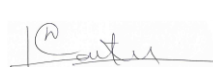
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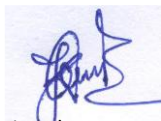


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31.6.1	Tungsten electrode- 40 nos	Vendor to offer			
31.6.2	Chuck - 25 nos	Vendor to offer			
31.6.3	O-ring seal- 25 nos	Vendor to offer			
31.6.4	Gas lens - 25 nos	Vendor to offer			
31.6.5	Seal - 20 nos	Vendor to offer			
31.6.6	Ceramic gas nozzle- 20 nos	Vendor to offer			
31.6.7	Any other spares recommended by the vendor	Vendor to offer			
31.7	Spare parts for Power Source	Vendor to offer			
31.7.1	Set of All PCB of Power source- 2 nos each	Vendor to offer			
31.7.2	Relay of each type- 5 nos each	Vendor to offer			
31.7.3	Fuse kit- 5 nos	Vendor to offer			
31.7.4	Cooling liquid- 100 Lit	Vendor to offer			
31.7.5	Gas solenoid valve-5 nos	Vendor to offer			
31.7.6	Gas fitting connector-10 nos	Vendor to offer			
31.7.7	Water fitting connector-10	Vendor to offer			

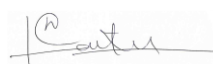


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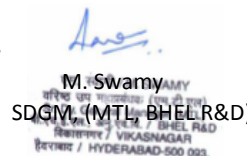


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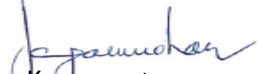
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31.7.8	Internal circuit- 20 nos	Vendor to offer			
31.7.9	Any other spares recommended by the vendor	Vendor to offer			
31.8	Moreover, vendor should quote other spares /consumables as per their recommendation for 2 years of trouble free operation. The list should include the identification number for each item.	Vendor to offer			
32	TOOLINGS ROTOR AND CASING WELDING STATION				
32.1	Portable Tungsten Grinder- 2Nos	Vendor to offer			
32.1.1	Make & Model	Vendor to specify			
32.1.2	Technical leaflet of the offered model to be submitted along with the offer.	Vendor to submit			
32.1.3	Recommended spares & consumables	Vendor to offer			
32.2	Tooling's for Mechanized Hot Wire Narrow Gap TIG Welding System in a proper Tool Box including wrenches, screwdriver, files, soft head/ Engineer's hammer, pliers, files, hand grinder, hand drilling m/c, drills, grinding/ cutting discs, gas nozzle cleaner, measuring tape, Lubricant/grease, grease gun & any other item recommended by the vendor.	Vendor to offer			
32.3	Tooling's for Local Heating System in a proper Tool Box including spanners, screwdrivers, hammer, Allen keys, crimping plier, cutting plier & any other item recommended by the vendor	Vendor to offer			
32.4	Tooling's for other accessories i.e Voltage Stabilizer, UPS & Air Compressor (If applicable) as recommended by the vendor.	Vendor to offer			
33	PRE DISPATCH INSPECTION (PDI) OF MACHINE & TRAINING AT VENDOR'S WORK	Vendor to offer			

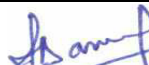

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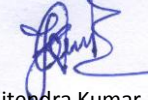

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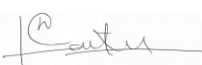

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	Scope of pre dispatch inspection at vendor's works will be as follows-	Vendor to offer			
33.1	Mechanized Hot Wire Narrow Gap Welding System & its accessories-	Vendor to comply			
	a) Checking of all the items including spares/ consumables/ tooling's as per ordering scope.	Vendor to comply			
	b) Pre-dispatch Inspection of the "Mechanized Hot Wire Narrow Gap Welding System" & its accessories for functional test including movement/ travel of column & boom, welding heads, rotator & roller support system.	Vendor to comply			
33.2	Welding trials should be done on following mock-up pieces :				
33.2.1	To demonstrate the capability of the machine for buttering operation on a circular area of 200mm dia to be deposited using austenitic welding consumable on a thick carbon steel plate (min 50mm thick) for a deposit thickness of 10mm. The buttered area (after final pass) will be subjected to 100% liquid penetration test (DP). Acceptance norms for DP test will be mutually decided during technical evaluation.	Vendor to comply			
33.2.2	The welding trials shall be carried out with 300mm NG-TIG torch (for rotor welding) demonstration in 1G position. For this any standard dissimilar material combination (e.g carbon steel / austenitic stainless steel) with a narrow gap groove design (Refer annexure-5) of depth 250 mm shall be used. The weld joint shall be subjected to 100% liquid penetration test (on final run of 50mm thick pipe) & radiography test. Acceptance norms for DP & RT test will be mutually decided during technical evaluation.	Vendor to comply			
33.2.3	The welding trials shall be carried with 450mm NG-TIG torch (for casing welding) demonstration in 2G position. For this any standard dissimilar material combination (e.g carbon steel / austenitic stainless steel) with a narrow gap groove design (Refer annexure-5) of depth 250 mm shall be used. The weld joint shall be subjected to 100% liquid penetration test (DP) & radiography test (RT). Acceptance norms for DP & RT test will be mutually decided during technical evaluation.	Vendor to comply			


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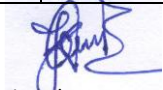

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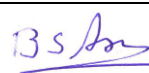

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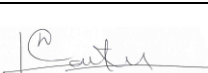

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33.2.4	All the materials and consumable needed for the trials at vendor's work shall be arranged by the vendors only.	Vendor to comply			
33.2.5	The welded samples have to be returned to BHEL along with the equipment for conducting further tests.	Vendor to comply			
33.2.6	Other accessories (Pre-Heating system /Air Compressor / Voltage Stabilizer etc.)	Vendor to comply			
33.2.7	Demonstration of all features of the above accessories to the satisfaction of BHEL for efficient & effective use as mutually agreed.	Vendor to comply			
33.2.8	Note: In case of foreign vendor, any accessories are of Indian make, inspection of accessories may be carried out at Indian vendor's work which will be coordinated by the supplier before dispatch.	Vendor to comply			
33.3	Training at OEM works :				
33.3.1	Four visiting persons shall be trained at vender's works by the vendor in the following areas (Including pre dispatch inspection)- 1. Operation of equipment 2. Programming & Technology 3. Mechanical Maintenance 4. Electrical & Electronic Maintenance	Vendor to comply			
33.3.2	Demonstration of all the features of the "Mechanized Hot Wire Narrow Gap TIG Welding System, Local Pre-heat System and all its accessories for their efficient and effective use by BHEL.	Vendor to comply			
33.3.3	Demonstration of complete welding operation on suitable cylindrical mockup samples (Refer Clause no- 33.2) for efficient and effective understanding of the visiting personnel's.	Vendor to comply			
33.3.4	Programming features of the control system and training on programming & entering the programmed data into the system.	Vendor to comply			
33.3.5	Mechanical & hydraulic/ pneumatic maintenance of the system & other supplied equipment's.	Vendor to comply			

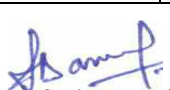

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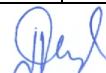

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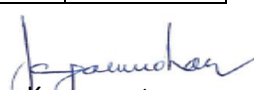

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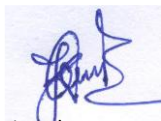

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33.3.6	Electrical & electronic maintenance of the system and other supplied equipment's.	Vendor to comply			
33.3.7	Air fare, boarding & lodging for the visiting engineers for PDI/training shall be borne by BHEL.	Vendor to note			
33.3.8	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of visiting personnel's.	Vendor to comply			
34	ERECTION & COMMISSIONING (INCLUDING JOB PROVING)				
34.1	ERECTION ACTIVITIES :				
34.1.1	Vendor shall submit the preliminary layout drawings for getting BHEL's approval within one month from the date of Letter of Intent (LOI) or Purchase Order, whichever is earlier.	Vendor to comply			
34.1.2	Soil condition at BHEL, Haridwar is mentioned below : (a) Soil strata : Silty sand up to 2.5 meter depth (b) Average density of soil = 1.8 T/cubic m (c) Angle of internal friction = 35° (up to 3.0 m depth) (d) Coefficient of elastic uniform compression "Cu" = 3.0 Kg/cubic cm (at 7m depth for 10sq.m base area and 1.0 Kg/sq.cm confining pressure) (e) Bearing capacity at 1.5 meter depth = 10T/sq.m (f) Water table = 25 meter below ground level	Vendor to note			
34.1.3	Complete Foundation Design including details viz. static / dynamic load details etc. and final layout drawings shall be submitted by the supplier within one month after getting BHEL's approval for Preliminary layout Drgs. The layout should consist of all requirements pertaining to complete machine including space requirement for all accessories/ attachments/ offered items.	Vendor to comply			



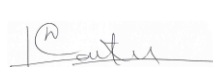
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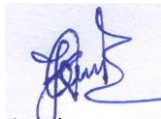


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34.1.4	BHEL shall construct complete foundation for the system under supervision of supplier (if required) and at vendor's responsibility.	Vendor to comply			
34.1.5	Vendor should arrange equipment's required for the testing of foundation, if required by the vendor.	Vendor to comply			
34.1.6	The vendor shall also indicate detailed specifications/requirement of earthing material, grouting compound and grouting procedure etc. for foundation bolts of the machine.	Vendor to comply			
34.1.7	Erection & Commissioning of the complete "Mechanized Hot Wire Narrow Gap TIG Welding System" and other accessories/attachments with all electrical & mechanical connections shall be the responsibility of the vendor.	Vendor to comply			
34.1.8	Tools, Tackles, instruments and other necessary equipment required to carry out all erection & commissioning activities should be arranged and brought by the supplier on returnable basis.	Vendor to comply			
34.2	COMMISSIONING ACTIVITIES INCLUDING JOB PROVING AT BHEL WORKS:	Vendor to comply			
34.2.1	Demonstration of all features of the "Mechanized Hot Wire Narrow Gap TIG Welding System & Local Heat Treatment System including all its accessories to the satisfaction of BHEL for efficient and effective use of the	Vendor to comply			
34.2.2	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to comply			
34.2.3	Activities for welding of mock-up pieces :	Vendor to comply			
34.2.3.1	Welding for Rotor Mock-up				



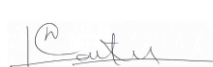
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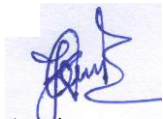


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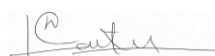
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	a) Buttering on X12CrMoWVNbN 10 11 part of mock-up piece (ID/OD- 300/800 mm, length 1000), which will be then stress relieved in the furnace. Achieving smooth buttering weld joint free from surface defects (100% liquid penetration test on final pass) and sound weld deposit free from defects (by UT test, 100%) is necessary condition for acceptance of the welding on buttered mock-up. Acceptance norms for UT & DP test will be mutually decided during technical evaluation.	Vendor to comply			
	b) Weld edge preparation for narrow gap TIG welding will be done on this X12CrMoWVNbN 10 11 part of mock-up and Inconel-617 part before conducting welding of dissimilar parts of mock-up. Note: This activity will be in the scope of BHEL.	Vendor to note.			
	c) Welding of mock-up pieces consisting of buttered X12CrMoWVNbN 10 11 part & Inconel 617 part in down hand position (1G) to develop Welding Procedure Specification (WPS) for rotor welding to the full satisfaction of BHEL. Achieving smooth welding joint, free from surface defects (100% liquid penetration test on final pass) and sound weld deposit free from defects (by UT test, 100%) is necessary condition for acceptance of the welding on mock-up. Acceptance norms for UT & DP test will be mutually decided during technical evaluation.	Vendor to comply			
	Welding for Casing Mock-up				
34.2.3.2	Buttering on X12CrMoWVNbN 10 11 part of mock-up piece (ID/OD- 300/800 mm, length 1000), which will be then stress relieved in the furnace. Achieving smooth buttering weld joint free from surface defects (100% liquid penetration test on final pass) and sound weld deposit free from defects (by UT test, 100%) is necessary condition for acceptance of the welding on buttered mock-up. Acceptance norms for UT & DP test will be mutually decided during technical evaluation.	Vendor to comply			


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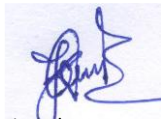

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	Weld edge preparation for narrow gap TIG welding will be done on this X12CrMoWVNbN 10 11 part of mock-up and Inconel-627 part before conducting welding of dissimilar parts of mock-up. Note: This activity will be in the scope of BHEL.	Vendor to note.			
	Welding of mock-up pieces consisting of buttered X12CrMoWVNbN 10 11 part & Inconel 625 part in horizontal position (2G) to develop Welding Procedure Specification (WPS) for casing welding to the full satisfaction of BHEL. Achieving smooth welding of joint, free from surface defects (100% liquid penetration test on final pass) and sound weld deposit free from defects (by UT test, 100%) is necessary condition for acceptance of the welding on mock-up. Acceptance norms for UT & DP test will be mutually decided during technical evaluation.	Vendor to comply			
34.2.3.3	Note- a) It is suggested to establish welding parameters on separate trial mock-up piece before carrying out welding on actual mock-up. b) During welding of the mock-up pieces, arranging qualified welding operators on 3-shift basis will be the responsibility of the vendor. c) After completion of welding of mock-up piece, activities for establishing of WPS will be carried out. There will be time gap between welding on mock-up piece and prototype rotor due to activities of post weld heat treatment, preparation of samples for WPS/PQR & carrying out testing of sample pieces for establishing WPS.	Vendor to note.			
34.2.4	Welding on actual IP Rotor & IP Casing (Job proving) :				



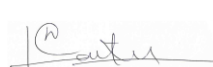
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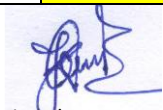


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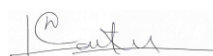
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	Welding of one no of IP rotor & one no of IP casing will be carried out during commissioning. During welding of actual jobs (IP Rotor & IP Casing), vendor is desired to be present at BHEL works for following activities : i) At the start of welding of IP rotor for one week (approx.). ii) At the start of welding of IP casing for one week (approx.). iii) If there is any problem in welding of IP rotor/casing with respect to machine operation, vendor to come for its resolution. Note: After welding of IP Rotor & IP Casing, it will be subjected to 100% liquid penetration test on final pass and 100 % UT test. Acceptance norms for UT & DP test will be mutually decided during technical evaluation. Commissioning of machine will be considered complete after satisfactory test results as mentioned above.	Vendor to comply			
34.2.5	The required material and consumable for carry out trials to prove the machine operation at site will be provided by the BHEL.	Vendor to note			
34.2.6	Terms & conditions for Erection & Commissioning should be furnished in detail separately by vendor along with offer.	vendor to offer			
34.2.7	Portion, if any, of the machine, accessories/attachments and other supplied items where paint got rubbed or peeled off during transit or erection should be repainted and matched with the original adjoining paint by the vendor. For this purpose, the vendor should supply sufficient quantity of touch-up paint of various colors/shades of paints used. The vendor shall ensure performing touching after commissioning but before final acceptance.	Vendor to comply			
34.2.8	The supplier shall impart training to BHEL's personnel on the operation & maintenance of the complete welding system during erection/ commissioning at BHEL works.	Vendor to comply			
35	SERVICES PROVIDED BY BHEL				


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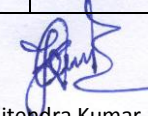

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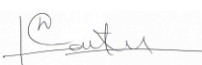

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35.1	Input Power Supply: 415 volt $\pm$ 10 % ; 50 Hz,. 3 phase, 3 wire A.C. supply.	Vendor to note			
35.2	Power Supply will be provided by BHEL at a single point near the "Mechanized Hot Wire Narrow Gap TIG Welding System" as per layout recommended by Vendor. All types of switches, circuit breakers, cables connections (Including BHEL power supply point to Power Distribution Panel or Power Source of Mechanized Hot Wire Narrow Gap TIG Welding System/ Heating Arrangement System & other utilities like Voltage Stabilizer & Air Compressor etc.) required for connecting BHEL's power supply point to different parts of the machine/ control cabinets shall be supplied by the vendor. Length of input cables to be supplied by the vendor as per actual layout of the machine.	Vendor to note			
36	TROPICALISATION				
	All electrical / electronic equipment should be tropicalized	Vendor to comply			
36.1	All electrical & electronic control cabinets & panels should be dust and vermin proof.	Vendor to comply			
36.2	All electrical components in the cabinets should be mounted on DIN Rail.	Vendor to comply			
36.3	All electrical / electronic panels to be provided with adequate door locks. All electrical & electronic panels including operator's panel should have sufficient illumination and power receptacles/plug points of 220Volts, 5/15 Amp AC with on/off switch. All electrical adapters/receptacles, fittings, consumables etc. should be Indian or should have compatibility with Indian equivalents.	Vendor to comply			
36.4	All motors shall conform to IEC or Indian Standards	Vendor to comply			
36.5	Vendor should ensure the proper earthing for the machine and its peripherals/accessories. Any material requirement for the same should be informed with foundation design/drawings. The vendor can take earthing connection from the nearest column of the production shop.	Vendor to comply			


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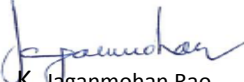

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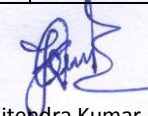

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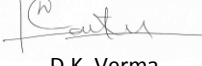

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37	SAFETY ARRANGEMENTS				
	Following safety features in addition to other standard safety features should be provided on the machine :	Vendor to comply			
37.1	Mechanized Hot Wire Narrow Gap TIG Welding System should have adequate and reliable safety interlocks / devices to avoid damage to the system, to the job loaded on the system and to the operator due to the malfunctioning or mistakes. Furnace functions should be continuously monitored and alarm / warning indications through lights/ alarm on the control panel should be available.	Vendor to comply			
37.2	A detailed list of all alarms / indications provided on the Mechanized Hot Wire Narrow Gap TIG Welding System should be submitted by the supplier.	Vendor to comply			
37.3	All the rotating parts used on the Mechanized Hot Wire Narrow Gap TIG Welding System should be statically & dynamically balanced to avoid undue vibrations & noise.	Vendor to comply			
37.4	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to comply			
37.5	Oil & water pipe lines should not run with electrical cable in the same trench.	Vendor to comply			
38	ENVIRONMENTAL PERFORMANCE OF THE MACHINE				
	The Mechanized Hot Wire Narrow Gap TIG Welding System should conform to following factors related to environment :	Vendor to comply			
38.1	Maximum noise level shall be 85 dB(A) at normal load condition, 1 meter away from the machine with correction factor for back ground noise, if necessary. This will be measured as per international standards like DIN 45635-16, if required. Supplier to demonstrate compliance to noise level, if so required.	Vendor to comply			


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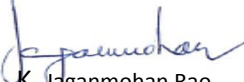

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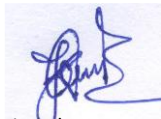

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38.2	There shall not be any hazardous emissions from the Mechanized Hot Wire Narrow Gap TIG Welding System during operation.	Vendor to comply			
38.3	No hazardous chemicals shall be required to be used in the Mechanized Hot Wire Narrow Gap TIG Welding System.	Vendor to comply			
38.4	If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to comply			
38.5	Paint of the machine should be oil / coolant resistant RAL 6011 Apple Green (Polyurethane Paint) and should not get peeled off and mixed up with coolant etc.	Vendor to comply			
39	DOCUMENTATION				
	Three sets of following documents (Hard copies) in English language should be supplied along with the machine.	Vendor to comply			
39.1	One additional set of all the above documentation on CD ROM/ Pen drive, wherever possible.	Vendor to comply			
39.2	Detailed operation & maintenance manual of complete "Mechanized Hot Wire Narrow Gap Welding System" including column & boom, support rollers and manipulator/ positioner with all drawings of machine assemblies/sub-assemblies/parts including Electrical / Pneumatic/ hydraulic circuit diagrams. All Assembly/ Sub Assembly Drawings shall be supplied with the part list also.	Vendor to comply			
39.3	Detailed operation & maintenance manual of the complete local pre-heat system including power transformer, control station and furnaces with all drawings of machine assemblies/sub-assemblies/parts including Electrical circuit diagrams. All Assembly/ Sub Assembly Drawings shall be supplied with the part list also.	Vendor to comply			
39.4	Operation & maintenance manual of Voltage Stabilizer & Air Compressor.	Vendor to comply			



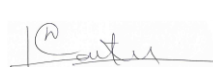
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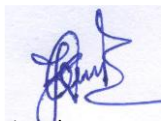


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39.5	Catalogues, Operation & Maintenance Manuals of all bought out items including drawings, wherever applicable.	Vendor to comply			
39.6	PLC user programme (hard copy) along with comments in English List.	Vendor to comply			
39.7	Complete list of parts/ items(Bill of materials) used in the system in English language.	Vendor to comply			
39.8	Complete list of spares for Mechanized Hot Wire Narrow Gap Welding System, sub-system and accessories, along with specification / type / model, and name & address of the spare supplier	Vendor to comply			
39.9	Preventive maintenance check list for Electrical and mechanical system.	Vendor to comply			
40	AMBIENT CONDITIONS & THERMAL STABILITY				
	The complete "Mechanized Hot Wire Narrow Gap TIG Welding System" should be suitable for continuous operation to its full capacity for 24X7 Days in the Fabrication Shop under existing power supply and ambient operating conditions, as mentioned below:	Vendor to note			
40.1	Power Supply (AC): Voltage = 415V $\pm$ 10% , Frequency= 50Hz $\pm$ 3 , No. of phases = 3 phase.	Vendor to note			
40.2	Ambient Operating Conditions: Temperature = 5 to 45 degree Celsius Relative Humidity = 95% max. Weather conditions are tropical. Atmosphere may be dust laden during some part of the year. Machine shall be kept in the normal shop floor condition without any temperature controlled enclosure/shop. Max. temperature variation is 25 deg Celsius in 24 hours.	Vendor to note			



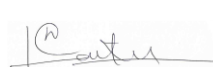
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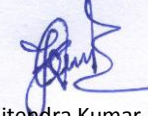


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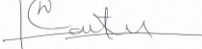
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40.3	Thermal Stability: Thermal Stability of the complete "Mechanized Hot Wire Narrow Gap TIG Welding System" & it's accessories along with all supplied items including controls for their trouble free operation with specified accuracy in the specified ambient conditions should be ensured and confirmed by vendor.	Vendor to comply			
41	TELE-DIAGNOSTIC SERVICE				
	Tele-diagnostic service should be provided through Ethernet port along with required Hardware / Software package for the supplied "Mechanized Hot Wire Narrow Gap TIG Welding System" for remote diagnosis and correction of the problems in CNC/PLC System of the machine. This should be provided free of charge for the warrantee period. Terms and conditions for the service after warrantee period should be informed by vendor. Subsequently, it should be possible to use other platforms, such as Internet or ISDN, subject to their availability in future.	Vendor to comply			
42	PACKING				
	Sea worthy & rigid packing for all items of Mechanized Hot Wire Narrow Gap TIG Welding System, its sub system, controls, all accessories and other supplied items to avoid any damage/ loss in transit. When machine is dispatched in containers, all small loose items shall be suitably packed in boxes. In case machine is dispatched in container, the container shall be brought up to BHEL, Haridwar. De- stuffing of container shall be carried out at BHEL, Haridwar in presence of the vendor's representative. Any type of material handling equipment required for the de-stuffing of the container shall be brought by the vendor at Haridwar on returnable basis. Note: Seaworthy wooden boxes should be packed in top open containers & hooking rope (two for each boxes) should remain at the boxes in the container for easy unloading with overhead crane at BHEL works.	Vendor to comply			
43	WARANTEE				


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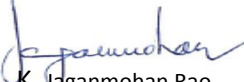

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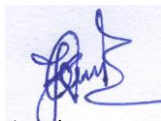

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	Warrantee for complete "Mechanized Hot Wire Narrow Gap TIG Welding System and all supplied accessories/ attachments/ equipment's/ items for 24 months from the date of commissioning/ acceptance of the machine.	Vendor to comply			
44	GENERAL				
44.1	Mechanized Hot Wire Narrow Gap TIG Welding System / Machine Model No.	Vendor to specify			
44.2	Total connected load (KVA)	Vendor to specify			
44.3	Total Space required (Length, Width, Height) including crane hook height from floor required for complete "Mechanized Hot Wire Narrow Gap TIG Welding System" and accessories/ attachments.	Vendor to specify			
44.4	Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)	Vendor to comply			
44.5	Total weight of the "Mechanized Hot Wire Narrow Gap TIG Welding System".	Vendor to specify			
44.6	Weight of the heaviest assembly of the "Mechanized Hot Wire Narrow Gap TIG Welding System" .	Vendor to specify			
44.7	Dimensions of largest part of the "Mechanized Hot Wire Narrow Gap TIG Welding System".	Vendor to specify			
44.8	All the outsourced items / standard sub deliveries should be from reputed suppliers and details should be mentioned in the offer	Vendor to confirm			
44.9	Detailed catalogues, sketches /drawings / photographs pertaining to the offered "Mechanized Hot Wire Narrow Gap TIG Welding System" and accessories/attachments/items should be submitted with the offer.	Vendor to comply			



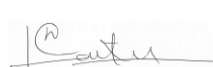
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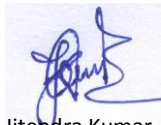


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44.10	Hydraulic, Pneumatic & Oil piping should be preferably metallic except places where flexible piping is essential. All the pipes required for the same shall be supplied by the vendor.	Vendor to comply			
44.11	All Cables and Hoses etc. should be well supported & protected in trays / brackets / drag chains etc.	Vendor to comply			



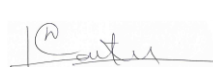
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