



Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

An ISO 9001
Company

CAPITAL PURCHASE / MATERIALS MANAGEMENT / MANUFACTURING

ENQUIRY	Phone: +91 431 257 79 38 Fax : +91 431 252 07 19 Email : tvenkat@bheltry.co.in Web : www.bhel.com
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	Enquiry Number: 2620700070	Enquiry Date: 10.08.2007	Due date for submission of quotation: 25.09.2007
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You are requested to quote the Enquiry number date and due date in all your correspondences. This is only a request for quotation and not an order

Item	Description	Quantity	Delivery (Item required at BHEL on)
10	High Productive Orbital Tube Welding Station (Orbital TIG welding system for boiler tubes) as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	6 Nos.	30.09.2008

BHEL commercial terms & conditions with Price Bid and Bank Guarantee formats along with technical specifications can be downloaded from BHEL web site <http://www.bhel.com> or from the Government tender website <http://tenders.gov.in> (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference “2620700070”.

Tenders should reach us before 14:00 hours on the due date Tenders will be opened at 14:30 hours on the due date Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present	Yours faithfully, For BHARAT HEAVY ELECTRICALS LIMITED Manager / Capital Purchase / MM / Manufacturing
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PART A**ORBITAL TIG WEDLING SYSTEM****SECTION – I QUALIFYING CRITERIA**

The Bidder / Vendor (OEM) has to compulsorily meet the following requirements to get qualified for consideration of the technical offer for the ORBITAL TIG WELDING SYSTEM FOR BOILER TUBES.

S. No.	PARTICULARS	VENDOR'S RESPONSE
1.0	The Bidder / Vendor (OEM) shall have a minimum of TEN Years of Continuous Experience in the field of Design, Manufacture and Supply of ORBITAL TIG WELDING EQUIPMENT used for welding Boiler Tubes	
2.0	Only those vendors (OEMs), who have supplied and commissioned at least ONE complete ORBITAL TIG WELDING SYSTEM of the offered Model in the past ten years (on the date of opening of Tender) and such machine is presently working satisfactorily for more than one year after commissioning (on the date of opening of Tender), should quote. However, if such machine (s) has/ had been supplied to BHEL, then such machine should be presently working satisfactorily for more than six months after its commissioning and acceptance (on the date of opening of Tender) in BHEL. Performance certificate from the customers regarding satisfactory performance of ORBITAL TIG WELDING SYSTEM supplied to them in attached format to be enclosed along with technical offer.	
3.0	BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected.	

SECTION – II

The Bidder / Vendors are requested to provide the following details

4.0	Number of Years of Experience of the Bidder / Vendor in the field of design, manufacture, supply and installation of ORBITAL TIG WELDING SYSTEMS.	
5.0	Number of ORBITAL TIG WELDING SYSTEMS supplied, installed and commissioned till date (with details on machine type / model, configuration, customer and quantity)	
6.0	Details on International Standards / Design Process Codes followed in Design and Manufacture of the Equipment.	
7.0	Details on SERVICE-AFTER-SALES Set-Up in India including the Addresses of Agents / Service Centers in India and competency & Experience of the Local Service Agency are to be provided.	
8.0	Any Additional Data to supplement the manufacturing capability of the BIDDER for the subject equipment.	

SECTION – III

Bidder / Vendor to note the following:

9.0	The BIDDER / VENDOR shall submit the offer in TWO PARTS -Technical [with PART A & PART B] & Commercial and Price Bid.	
10.0	The Offer shall contain a comparative statement of Technical Specifications given by BHEL and the Offer Details submitted by the Bidder, against each clause. A mere 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words in the technical comparative statement (without any supporting technical write-ups, photos and datasheets] may lead to disqualification of the Technical Offer.	
11.0	The Technical Offer shall be supported by Product Catalogue and Data Sheets in ORIGINAL and complete technical details of 'Bought-Out-Items' with copies of Product Catalogue and Selection Criteria	
12.0	The Commercial Offer (given with the Technical Offer) shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation	
13.0	BIDDER has to indicate the Country of Origin for the supply of equipment.	

PERFORMANCE CERTIFICATE

(On Customer's Letter Head)

1. Supplier of the machine :

2. Make & Model of the Equipment :

3. Month & Year of Commissioning :

4. Application :

5. Sizes of Jobs Performed in the machine
 - a. Tube diameter :
 - b. Tube thickness (maximum) :
 - c. Tube material :

6. Performance of the Machine : Best in the market /
(Strike off whichever is not applicable) Satisfactory /
Good /
Average /
Not Satisfactory

7. Any other remarks:

Date:

Signature & Seal of the Authority
Issuing the Performance Certificate

PART B

TECHNICAL SPECIFICATIONS FOR ORBITAL TIG WELDING EQUIPMENT


S.No.	PARTICULARS AND BHEL SPECIFICATION	VENDOR'S OFFER (with complete Technical Details)
1.0	PURPOSE & APPLICATION	
1.1	<p>a. The welding station is intended to build up tubular coils (coming in high pressure steam boilers) by joining simple loops / circuits of tubes. [ANNEXURE – 1 & 2 give typical loop/circuit and built-up tubular coil]</p> <p>b. The tubular loops or circuits are inter-connected by means of butt welding the tube ends, by keeping the loops/circuits in horizontally flat position.</p> <p>c. The welding station is expected to carry-out the following operations:</p> <ol style="list-style-type: none"> 1. Butt weld joint fit-up using mechanical fixtures 2. Butt welding of weld joint by automatic orbital welding process 3. Weld data logging and report generation 	[VENDOR is expected to give technical write up on welding station design, construction and operational features to bring out the capability of the proposed equipment, to meet the BHEL specification requirements]
2.0	WORK PIECE / JOB DETAILS	
2.1	TUBE DIMENSIONS (General)	
	Range of Diameter [O.D.]	38.1 mm to 76.1 mm
	Range of Wall Thickness	3.2 mm to 12.5 mm
	Width of Coil to be built-up	2750 mm [maximum]
	Length of Coil to be built-up	20000 mm (20 metres)[maximum]

S.No.	PARTICULARS AND BHEL SPECIFICATION			VENDOR'S OFFER (with complete Technical Details)																														
3.0	TUBE SIZES in detail																																	
3.1		<table border="1"> <thead> <tr> <th data-bbox="486 304 633 339">S.No.</th> <th data-bbox="633 304 882 339">OD, in mm</th> <th data-bbox="882 304 1339 339">THICKNESS, in mm</th> </tr> </thead> <tbody> <tr> <td data-bbox="486 339 633 368">1</td> <td data-bbox="633 339 882 368">38.1</td> <td data-bbox="882 339 1339 368">3.2 / 4.0 / 5.0 / 6.3</td> </tr> <tr> <td data-bbox="486 368 633 399">2</td> <td data-bbox="633 368 882 399">44.5</td> <td data-bbox="882 368 1339 399">4.0 / 4.5 / 5 / 6.3 / 8 / 9 / 10</td> </tr> <tr> <td data-bbox="486 399 633 429">3</td> <td data-bbox="633 399 882 429">47.63</td> <td data-bbox="882 399 1339 429">5 / 6.3 / 8 / 10</td> </tr> <tr> <td data-bbox="486 429 633 459">4</td> <td data-bbox="633 429 882 459">51.0</td> <td data-bbox="882 429 1339 459">3.6 / 4 / 4.5 / 5 / 6.3 / 8 / 10 / 12</td> </tr> <tr> <td data-bbox="486 459 633 489">5</td> <td data-bbox="633 459 882 489">54.0</td> <td data-bbox="882 459 1339 489">3.6 / 4 / 4.5 / 5 / 6.3 / 8 / 10 / 12</td> </tr> <tr> <td data-bbox="486 489 633 520">6</td> <td data-bbox="633 489 882 520">57.0</td> <td data-bbox="882 489 1339 520">4 / 5 / 6.3 / 8 / 10</td> </tr> <tr> <td data-bbox="486 520 633 550">7</td> <td data-bbox="633 520 882 550">60.3</td> <td data-bbox="882 520 1339 550">4 / 5 / 6.3 / 8 / 10 / 12.5</td> </tr> <tr> <td data-bbox="486 550 633 580">8</td> <td data-bbox="633 550 882 580">63.5</td> <td data-bbox="882 550 1339 580">4.8 / 5.6 / 6.3 / 10 / 12.5</td> </tr> <tr> <td data-bbox="486 580 633 611">9</td> <td data-bbox="633 580 882 611">76.1</td> <td data-bbox="882 580 1339 611">7.1 / 10 / 12.5</td> </tr> </tbody> </table>	S.No.	OD, in mm	THICKNESS, in mm	1	38.1	3.2 / 4.0 / 5.0 / 6.3	2	44.5	4.0 / 4.5 / 5 / 6.3 / 8 / 9 / 10	3	47.63	5 / 6.3 / 8 / 10	4	51.0	3.6 / 4 / 4.5 / 5 / 6.3 / 8 / 10 / 12	5	54.0	3.6 / 4 / 4.5 / 5 / 6.3 / 8 / 10 / 12	6	57.0	4 / 5 / 6.3 / 8 / 10	7	60.3	4 / 5 / 6.3 / 8 / 10 / 12.5	8	63.5	4.8 / 5.6 / 6.3 / 10 / 12.5	9	76.1	7.1 / 10 / 12.5		<p>[NOTE : All are OD (Outer Diameter) controlled tubes with a tolerance of maximum +18 %, on tube wall thickness.]</p>
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4.0	MATERIAL SPECIFICATION																																	
	<p>A) CARBON STEEL : SA 192, SA 210A1, SA 210C [ASTM]</p> <p>B) ALLOY STEEL : SA 209T1, SA 213T11, SA 213T22, T-23 SA 213T91, T-93</p> <p>C) STAINLESS STEEL : SA 213 TP304H, SA 213 TP321H, SA 213 TP347H</p>																																	
5.0	WELD JOINT DETAILS																																	
5.1	<p>a. Style of Edge Preparation : Refer to EP Styles given in ANNEXURE – 3</p> <p>b. Tube End Condition : Machined in automatic end preparation line</p> <p>c. Weld Joint Location : Length of straight portion on either side of weld joint \geq 250 mm</p> <p>c. Preheating Temperature : Min. 200 deg C [for Alloy Steel Tubes only]</p> <p>d. Weldment Testing Modes : Radiography and / or Ultrasonic Testing</p> <p>e. Weld Quality Appraisal : As per ASME Section I, V and VIII (Division 1 & 2) for Radiography Test</p>																																	

S.No.	PARTICULARS AND BHEL SPECIFICATION	VENDOR'S OFFER (with complete Technical Details)																						
6.0	MACHINE OUTPUT / PRODUCTIVITY																							
6.1	<p>VENDOR has to specify the minimum output of welded joints, possible from the workstation, for the tubes with the following dimensions/details, in a single shift of 8 hrs:</p> <p>a. Built-Up Coil Length : ≤ 20000 mm</p> <p>b. Width of Built-Up Coil : ≤ 2500 mm</p> <p>c. Weld Joint Style as per the EP Sketches : (Bevel – J) Annexure-3</p> <p><u>Expected productivity is as follows:</u></p> <p>d. Tube Size: 51mm (OD) x 7.1mm (wall thickness) – 25 Joints 47.63mm (OD) x 5.6mm (wall thickness) – 30 Joints</p> <p>e. Tube Material: SA213T91 , SA213T22</p>																							
7.0	Orbital TIG Welding Sets – Scope of Supply of equipment:																							
7.1	<p>Orbital TIG Welding sets and accessories consisting of the following:</p> <table border="1" data-bbox="322 810 1507 1216"> <tbody> <tr> <td>1. Welding Power Source with Controls</td> <td>6 Nos</td> </tr> <tr> <td>2. Orbital TIG Welding head and its related accessories</td> <td>6 Sets</td> </tr> <tr> <td>3. Welding head Control Unit</td> <td>6 Nos</td> </tr> <tr> <td>4. Data Logger</td> <td>1 No</td> </tr> <tr> <td>5. Pendant Controller</td> <td>6 Nos</td> </tr> <tr> <td>6. Tube Butt Joint Fit-Up Fixture / Job Clamping Unit</td> <td>12 Nos.</td> </tr> <tr> <td>7. Portable Tungsten Electrode Grinder</td> <td>6 Nos</td> </tr> <tr> <td>8. Inter-connecting Cables and Hoses</td> <td>6 sets</td> </tr> <tr> <td>9. Operating and Service Tool Kit</td> <td>6 sets</td> </tr> <tr> <td>10. Non Contact type temperature sensor (optional)</td> <td>6 Nos</td> </tr> <tr> <td>11. Pen drive / Memory stick – 512MB</td> <td>6 Nos</td> </tr> </tbody> </table>	1. Welding Power Source with Controls	6 Nos	2. Orbital TIG Welding head and its related accessories	6 Sets	3. Welding head Control Unit	6 Nos	4. Data Logger	1 No	5. Pendant Controller	6 Nos	6. Tube Butt Joint Fit-Up Fixture / Job Clamping Unit	12 Nos.	7. Portable Tungsten Electrode Grinder	6 Nos	8. Inter-connecting Cables and Hoses	6 sets	9. Operating and Service Tool Kit	6 sets	10. Non Contact type temperature sensor (optional)	6 Nos	11. Pen drive / Memory stick – 512MB	6 Nos	
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S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
8.0	WELDING POWER SOURCE AND CONTROLLER		
8.1	Type	Micro-processor controlled, Programmable, Inverter type	
8.2	Make & Model	Vendor to specify	
8.3	Switching Frequency	Vendor to specify	
8.4	Welding Process	GTAW, DC Straight Polarity, Constant Current	
8.5	Memory	99 Welding Programs	
8.6	External Memory	Does equipment have provision to store welding programs in Pen drive (Memory stick)?	
8.7	Multiple Parameter Values within a program (for sectoral programming)	Vendor to specify number of programmable levels	
8.8	Welding Data Entry	Through a 'dust & moisture proof' Membrane Key Pad – Rugged Type	
8.9	Front Panel Display (in English)	Vendor to describe	
8.10	Output Current Range	3 to 200A [D.C.] @ 100%	
8.11	Current Accuracy	±1% of setting	
8.12	Welding Voltage Range	Vendor to Specify	
8.13	Gas Pre-flow / Gas Post-flow Time	Vendor to Specify	
8.14	Current Pulse Frequency	Vendor to Specify	
8.15	Pulse Current Time	Vendor to Specify	
8.16	Background Current Time	Vendor to Specify	
8.17	Current Up-slope / Down-slope Time	Vendor to Specify	
8.18	Rotation Start / Stop Delay	Vendor to Specify	
8.19	Wire Feed Start / Stop Delay	Vendor to Specify	
8.20	Torch Rotation Speed	Vendor to Specify	
8.21	Torch Rotation Speed Regulation	±1% of setting	
8.22	Filler Wire Feed Speed	Vendor to Specify	
8.23	Filler Wire Feed Speed Regulation	±1% of setting	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
8.24	Torch Oscillation Speed	Vendor to Specify	
8.25	Oscillation Dwell Time at both ends (independently adjustable)	Vendor to specify	
8.26	AVC Function	±1% regulation	
8.27	Programming increments for welding current & time parameters	0.5 Amp / 0.1 Sec.	
8.28	Welding parameter override during welding	Programmable limits (Vendor to specify range)	
8.29	High Frequency Unit	For arc starting. Vendor to confirm	
8.30	Water Cooling Unit for Torch	Built-in and of suitable capacity for the weld head and torch. Vendor to provide details	
8.31	Gas hose with end fittings – Gas cylinder to power source	Length to suit long travel on cable festoon	
8.32	Fault Protection Sensors	For gas & cooling water flow	
8.33	Arc Sensing	Vendor to specify means & modes for arc initiation and sensing	
8.34	Data Logger [with facility to retrieve weld parameters for each pass/joint]	Is it Built-in or Stand alone? Vendor to specify. If it is Stand alone, provision for connecting data logger to be confirmed by vendor.	
8.35	Maximum Number of Data Log Files in Memory	Vendor to specify	
8.36	Data logger connectivity to PC	Vendor to confirm	
8.37	Safety Lock	Lock for Programming / Operation	
8.38	EMI Interference Suppressor	Vendor to specify the details for EMI suppression in input supply line	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
9.0	ORBITAL TIG WELDING HEAD		
9.1	Type	Low profile tube orbital welding head of rugged construction	
9.2	Rating	200A 100% duty cycle	
9.3	No.of passes of welding	Minimum 5 Continuous Passes	
9.4	Cooling for Torch & Body	Water cooled	
9.5	Segmental Clamp Ring Type Mounting on Tube	For easy mounting / dismounting of head	
9.6	Axial Clearance	250 mm	
9.7	Radial Clearance (Clear gap between tubes) 	100mm	
9.8	Servo controlled Oscillation & Dwell Stroke Length Speed Dwell Time	16mm (minimum) Vendor to specify the actual stroke	
9.9	Servo Controlled AVC	13mm stroke	
9.10	Servo Controlled Rotation Motor	Speed - Vendor to specify	
9.11	Cross Seam Adjustment	Vendor to specify range	
9.12	Servo Controlled Synchronized Pulsed or Continuous Wire Feed Motor (on board)	Vendor to specify	
9.13	Wire Size	0.8mm (Standard) 0.9 & 1.0mm (Optional)	
9.14	Wire Nozzle Adjustment (Manual)	Vertical, horizontal & angular	
9.15	Lead / Lag adjustment	Vendor to specify	
9.16	Tilt In / Out	Vendor to specify	
9.17	Wire Nozzle and its mounting arrangement	Shall be capable of withstanding the high temperatures without loosening	
9.18	Wire Spool Carriers	Low Profile, Head mounted type	
9.19	Miniature Wire Spools	500gms	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
9.20	Maximum Wire Spool weight that can be mounted on the welding head	Vendor to specify	
9.21	Tungsten Electrode Size	Ceriated Tungsten Electrode Size 2.4mm	
9.22	Tungsten Tip included angle	15 Deg. to 30 Deg.	
9.23	Cable and Hose Package	The cable and hose package for the welding head shall be adequately sheathed with heat and abrasion resistant material. It shall withstand repeated winding / rewinding while in operation. It is proposed to mount the equipment on a mobile platform and suspend welding head, controller, job clamps etc from top supporting rail. Hence, the length of the cable and hose package should have sufficient length to reach the joint location. Length of Cable and Hose required is 8 metres minimum.	
9.24	Number of Coiling Required	Cable and hose winding shall be of sufficient length for continuous operation of 6 passes on the tube without interruption.	
9.25	Thermal Stability	All the metallic and non-metallic components of the welding head shall withstand the intense heat radiation during above welding.	

S.No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
10.0	REMOTE OPERATOR PENDANT		
10.1	Features	Pendant shall contain the following controls: a. Selector Switch: Weld / Setting b. Welding Program Access & Selection c. Display screen for welding parameters d. Emergency stop e. Sequence Start / Stop f. Gas flow switch g. Inching operation (by toggle switch control or joystick control) for the following functions: i) AVC function ii) Torch oscillation amplitude iii) Torch Centering iv) Wire feed speed v) Head travel speed vi) Welding current up/down (manual override)	
11.0	TUNGSTEN ELECTRODE GRINDER		
11.1	Type	Portable, Electric Motor operated	
11.2	Electrode to be ground	Ceriated Tungsten	
11.3	Tungsten Diameter	2.4mm	
11.4	Tungsten Grinding angle	15 to 30 degrees	
12.0	NON CONTACT TYPE TEMPERATURE SENSORS (OPTIONAL)		
12.1	Type	Portable – Infrared sensing	
12.2	Temperature range	20 deg C to 300 deg C	
12.3	Display	Digital	
12.4	Unit of display	Degrees Centigrade	
12.5	Accuracy	+/- 0.5 deg C	

S. No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
13.0	ELECTRICAL & ELECTRONICS SYSTEMS		
13.1	415V ± 10%, 50HZ +/-3 Hz, 3 Phase AC [3 wire system without neutral] power supply will be provided by BHEL at a single point near the machine, as per layout recommended by Vendor. All types of cables, connections, circuit breakers etc. required for connecting BHEL's power supply during construction of foundation.	Vendor to confirm	
13.2	Tropicalization: All electrical / electronic equipment shall be tropicalized.	Vendor to confirm	
13.3	All electrical & electronic control cabinets & panels should be dust and vermin proof	Vendor to confirm	
13.4	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to confirm	
13.5	Control circuit voltage shall not exceed 110 V.	Vendor to confirm	
13.6	All Electric enclosures shall have IP 54 protection	Vendor to confirm	
13.7	All electrical and electronic panels including operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220 V, 5/15 Amp AC. All adapters /receptacles should have compatibility with Indian equivalents.	Vendor to confirm	
13.8	All motors shall be of any of the following makes : M/S Siemens / Asea Brown Boveri / GE or other makes conforming to IEC standards	Vendor to confirm	
13.9	All cables moving with traversing axes should be installed in Caterpillar / Drag Chain arrangement. Additionally, all the cable trays required for laying of cables should be included in the offer.	Vendor to confirm	
13.10	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION	VENDOR'S OFFER (with complete Technical Details)	
14.0	Is Tele-diagnostic system available as standard built in feature?		
15.0	FAULT DIAGNOSTIC SYSTEM		
15.1	Vendor's own diagnostic system with required hardware & software shall be supplied and installed in the Control System. This shall include customized auto-diagnostic system, which shows detailed cause and remedy for the fault on the display for faults related to mechanical and electrical maintenance.	Vendor to confirm	
15.2	Help guide shall be provided to use both diagnostic systems	Vendor to confirm	
16.0	IN-BUILT SAFETY ARRANGEMENTS		
16.1	Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to confirm	
16.2	A detailed list of all alarms / indications provided on machine should be submitted by the Vendor.	Vendor to specify	
16.3	All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hindrance to machine operator's movement for effective use of machine.	Vendor to Confirm	
16.4	Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, work piece and the operator due to the malfunctioning or mistakes.	Vendor to specify	
16.5	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations and suitably guarded.	Vendor to Confirm	
16.6	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to Confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
17.0	ENVIRONMENTAL PERFORMANCE OF THE MACHINE		
17.1	The Machine should confirm to following factors related to environment:	Vendor to Confirm	
17.2	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.	Vendor has to demonstrate	
17.3	There shall not be any emissions from the machine except fumes of welding during butt welding.	Vendor to confirm	
17.4	Paint of the machine should be oil / coolant resistant and should not peel off and react with gases/fumes.	Vendor to confirm	
18.0	TOOLS FOR ERECTION, OPERATION & MAINTENANCE		
18.1	The Vendor shall bring special tools and equipment required for erection of the machine. Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc. for operation and maintenance of the machine should be supplied. List of such tools should be submitted with offer	Vendor to confirm	
18.2	Any Test mandrel required for checking & alignment of the machine components etc. should be supplied	Vendor to confirm.	
19.0	MACHINE SPARES		
19.1	Itemized break-up of mechanical, hydraulic, electrical and electronic spares used in the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis shall be offered by vendor. The list is to include following, in addition to other recommended spares: (Unit Price for each item of spare shall be offered)	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
19.2	Mechanical & Hydraulic Spares: All types of Pumps, Valves, Pressure Switches, Transducers, Flow Switches, Filters, Seals, O-rings, Water cooled Hoses.	Vendor to confirm	
19.3	Electrical / Electronic / PLC Spares: All types of Printed Circuit Boards, Relays, Contactors, Proximity Switches, Push Buttons, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, Encoders, Indicating Lamps, Spares for PLC System, Servo Motors for Feed Drives, Power Module & Control Cards for Drives etc.	Vendor to confirm	
19.4	Recommended set of spares for all attachments are to be offered with details.	Vendor to confirm	
19.5	All types of spares for total machine and accessories shall be available for at least ten years after supply of the machine. If machine or control is likely to become obsolete in this period, the vendor should inform BHEL sufficiently in advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure these in advance, if required	Vendor to confirm	
19.6	Vendor to confirm that complete list of spares for machine and accessories, along with item part no / specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
20.0	MACHINE DOCUMENTATION		
20.1	O & M Manuals	<ul style="list-style-type: none"> a. Three Copies of the Operation & Maintenance Manual to be given in Hard Bound Paper Copies with three copies in CD form (SOFT COPY), for each set of Orbital TIG welding set. b. One Hard Copy of O & M Manual shall be submitted at the time of INSPECTION of the Orbital Welding Station by BHEL Officials, at the Supplier's Works. c. The documents and details [given under the Clause Sl. No. 20.2] shall form part of the Operation & Maintenance Manual 	
20.2	Documents and Technical Details	<ul style="list-style-type: none"> a. GA Drawing of the Orbital Welding Station. b. GA Drawing of Individual Sub-Systems and Mechanisms. c. Sub-Assembly Drawings (without dimensions) for sub-systems for maintenance purpose.. d. Electrical Wiring Drawings – Power & Control Circuits f. PLC Ladder Diagrams (Soft Copy) with Flash Memory Card for m/c operation logic backup. g. PLC Ladder Diagrams (Hard Copy) h. Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls in CD. i. Alarm Log, Error Code, Error Messages & Remedies and On-Line Fault Diagnostics to be provided. j. PLC Programming Tool: On-Line Troubleshooting, Software Modification, Upload and Down-load of Programs. k. PLC of Allen Bradley, Siemens, Fanuc is only required. l. Fault diagnostics and remedies and on line sequence of operations should be displayed in HMI unit. 	

S. No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
20.2	Documents and Technical Details	m. Flash memory card for CPU of PLC to be ensured. n. Specifications/Ratings of All Bought-Out-Items. o. Warranty / Guarantee Card for all Bought-Out-Items. p. Trouble Shooting Chart for Main and all Sub-Systems. q. Machine related PC Details – Machine Operating Softwares, Parameters Selection Software, File Handling, and Display Recording. CD Read and Write unit, Serial and USB Ports to be ensured.	
21.0	EQUIPMENT INSPECTION & ACCEPTANCE		
21.1	Inspection and Acceptance	1. The Orbital TIG welding equipment and Accessories shall be tested for its performance prove-out as per BHEL Specifications, at the Supplier's Works prior to despatch. 2. Welding trials have to be conducted on short length sample tubes, in presence of BHEL Engineers, at Supplier's works, for a minimum of 10 Joints in each of the tube sizes given below: a) Tube Dia 51mm x thick 7.1mm / SA213 T91 b) Tube Dia 63.5mm x thick 12.5mm / SA213TP347H c) Tube Dia 38.1mm x thick 7.1 / SA213 T22 The tubes shall be supplied by BHEL. Welding consumables are to be arranged by the supplier. The Welded samples have to be returned to BHEL along with the equipment for conducting further tests. 3. The sample welded joints should pass through the Radio-graphic Test and satisfy the requirements of BHEL. 4. Supplier to provide necessary arrangements for recording the programmed process parameters.	

S. No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
22.0	TRAINING		
22.1	The Vendor shall train Four BHEL's Engineers in Operation and Maintenance (Mechanical, Electrical/ Electronics and PLC System) of the Machine at Vendor's works, for not less than 5 working days. Vendor to quote in Manday basis.	Vendor to confirm	
22.2	The Vendor shall impart training to BHEL's Machine Operators and Maintenance crew in Operation and Maintenance after the commissioning of the Machine at BHEL works for not less than 10 working days. Vendor to quote in Manday basis.	Vendor to confirm	
22.3	Airfare, boarding & lodging for the BHEL Trainees shall be borne by BHEL.	Vendor o Confirm	
22.4	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel	Vendor to Confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
23.0	MACHINE ERECTION & COMMISSIONING		
23.1	Vendor to take full responsibility for supervision of the erection, vendor shall start up, test the machine, it's control & all types of other supplied equipment, carrying out welding of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by Vendor in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL.	Details of these requirements should be informed by Vendor in advance	
23.2	Successful proving of BHEL Requirements by the Vendor shall be considered as part of commissioning. All tests, as mentioned in SPECIFICATION CLAUSE No. 24.1 shall form part of commissioning activity.	Vendor to confirm	
23.4	Tools, Tackles, Test Mandrels, instruments and other necessary equipment required to carry out all above activities should be brought by the Vendor.	Vendor to confirm	
23.5	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the Vendor on returnable basis.	Vendor to confirm	
23.6	Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor. For this purpose, the Vendor shall supply sufficient quantity of touch-up paint of various colours of paint used.	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION	VENDOR'S OFFER (with complete Technical Details)
24.0	MACHINE PERFORMANCE PROVE-OUT AT BHEL WORKS	
24.1	<p>a. The prove-out trials of the welding operation shall be for the tubular coils / circuits or for other sizes given by BHEL during the technical discussions / at the time of releasing the Purchase Order.</p> <p>b. The production rate expected out of the machine, as detailed under the Specification Clause No. 6.1, will be the base.</p>	Vendor to confirm
25.0	AMBIENT CONDITIONS & THERMAL STABILITY	
25.1	The Orbital Welding Station with all sub-systems shall be suitable for operation in an ambient temperature of 25 to 50°C and with a Relative Humidity of 90% (both higher values do not occur simultaneously).	Vendor to confirm
25.2	Weather conditions are tropical, Atmosphere may be dust laden. Machine shall be kept in the normal shop floor condition - The ENTIRE EQUIPMENT shall be TROPICALISED in Design and CONSTRUCTION. [The offered machine shall be suitable for the above and details of provisions on the machine for the same are to be furnished by Vendor]	Vendor to confirm
25.3	The machine, including attachments and accessories, should be suitable for 24 hrs. Continuous operation to its full capacity for 24 hour a day and 7 days a week throughout.	Vendor to Confirm

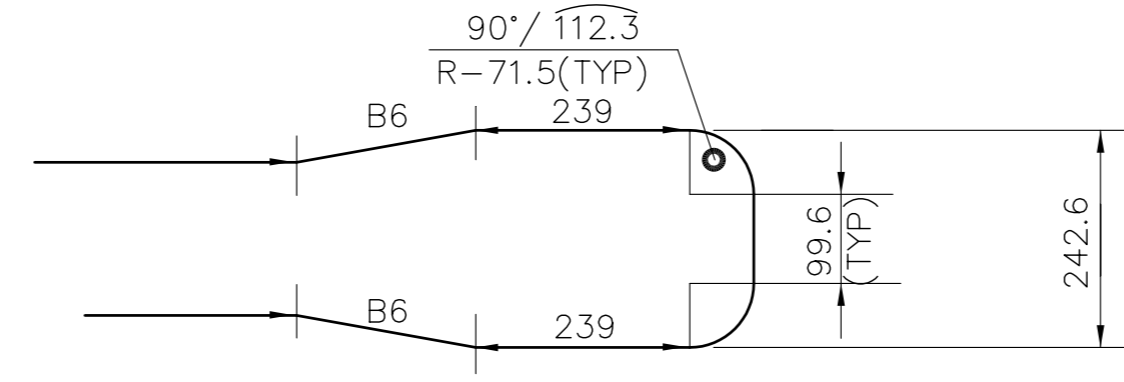
S. No.	PARTICULARS AND BHEL SPECIFICATION		VENDOR'S OFFER (with complete Technical Details)
26.0	MACHINE PACKING		
26.1	Sea worthy & rigid packing for all items of complete machine, control system, all accessories and other supplied items to avoid any damage/loss in transit. When machine is dispatched in containers, all small loose items shall be suitably packed in boxes	Vendor to confirm	
27.0	GUARANTEE TERMS		
27.1	Performance Guarantee for a minimum period of 24 months (for the machine in total and sub-systems or bought-out items in particular) from the date of acceptance of the machine.	Vendor to confirm	
28.0	GENERAL POINTS		
28.1	Machine Model Number and other related details	Vendor to provide	
28.2	Total Connected Load (in kVA)	Vendor to specify	
28.3	Total Weight of the Machine & Accessories	Vendor to specify	

Enclosures:

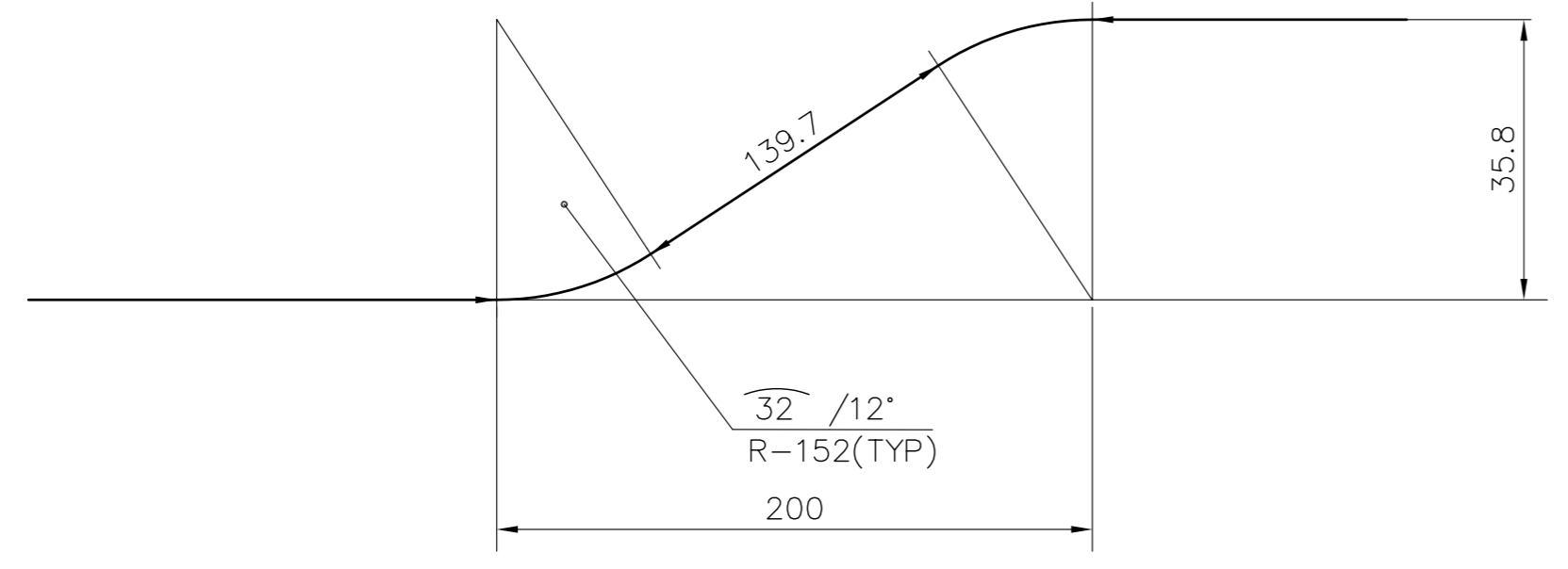
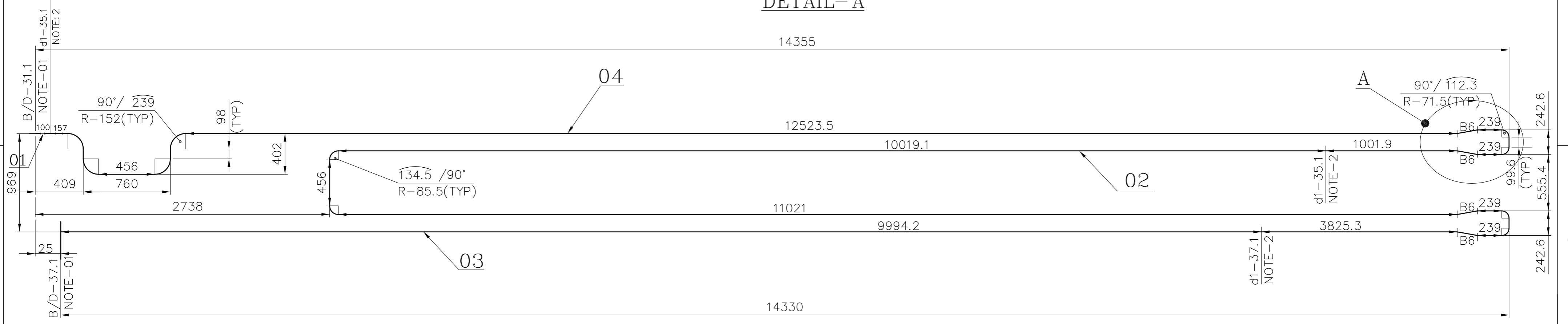
- ANNEXURE - 1 : Typical Loops or Circuits
- ANNEXURE - 2 : Typical Coil to be built-up by Orbital Welding
- ANNEXURE - 3 : Tube End Edge Preparation Styles

DRAWING NO.

FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER PLANT STD. NO TP 023 0299



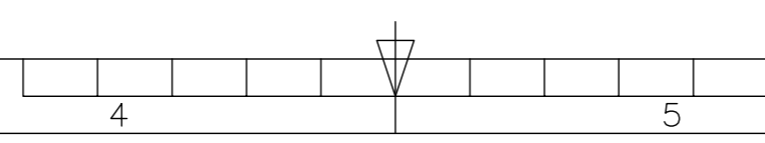
DETAIL-A



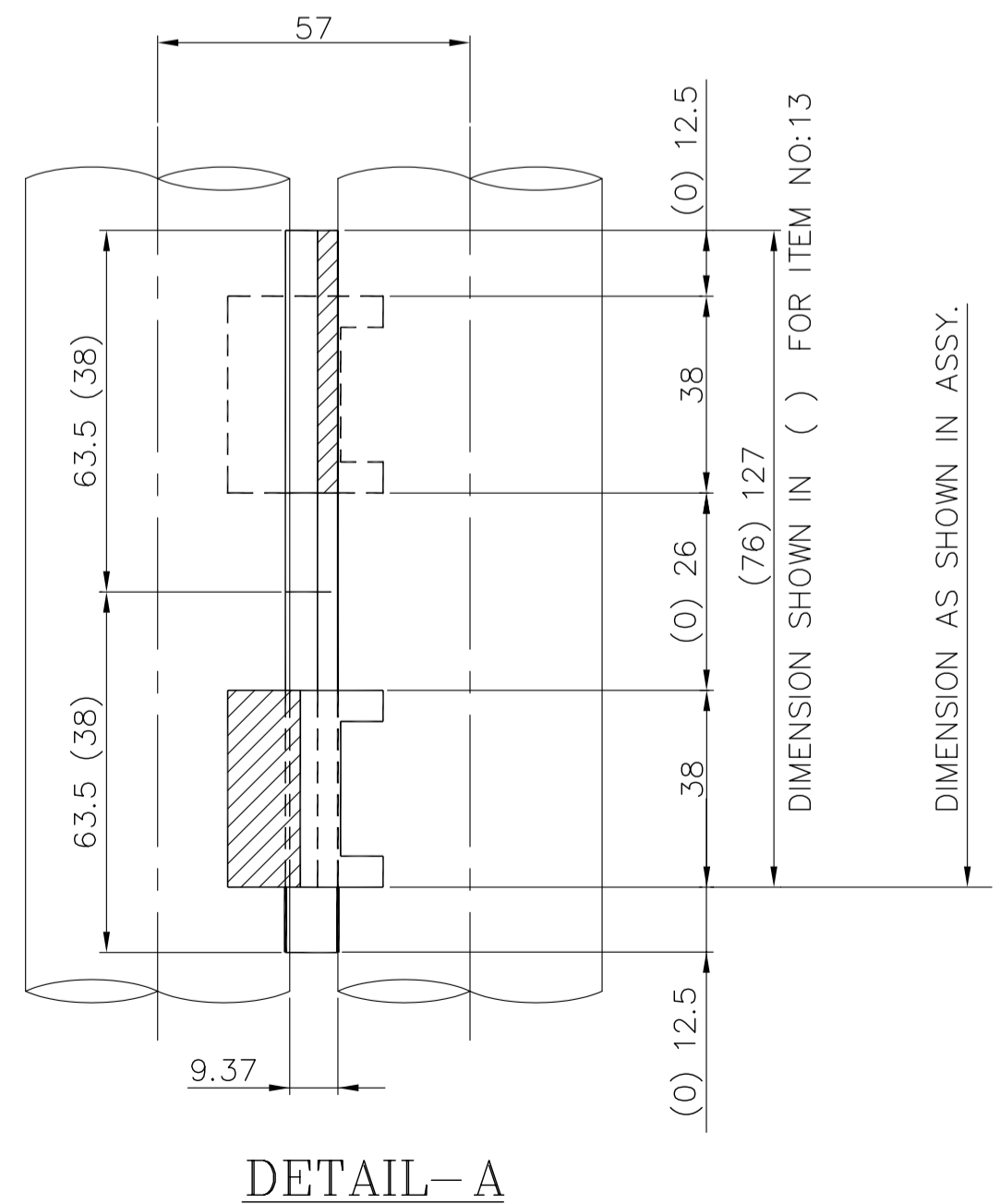
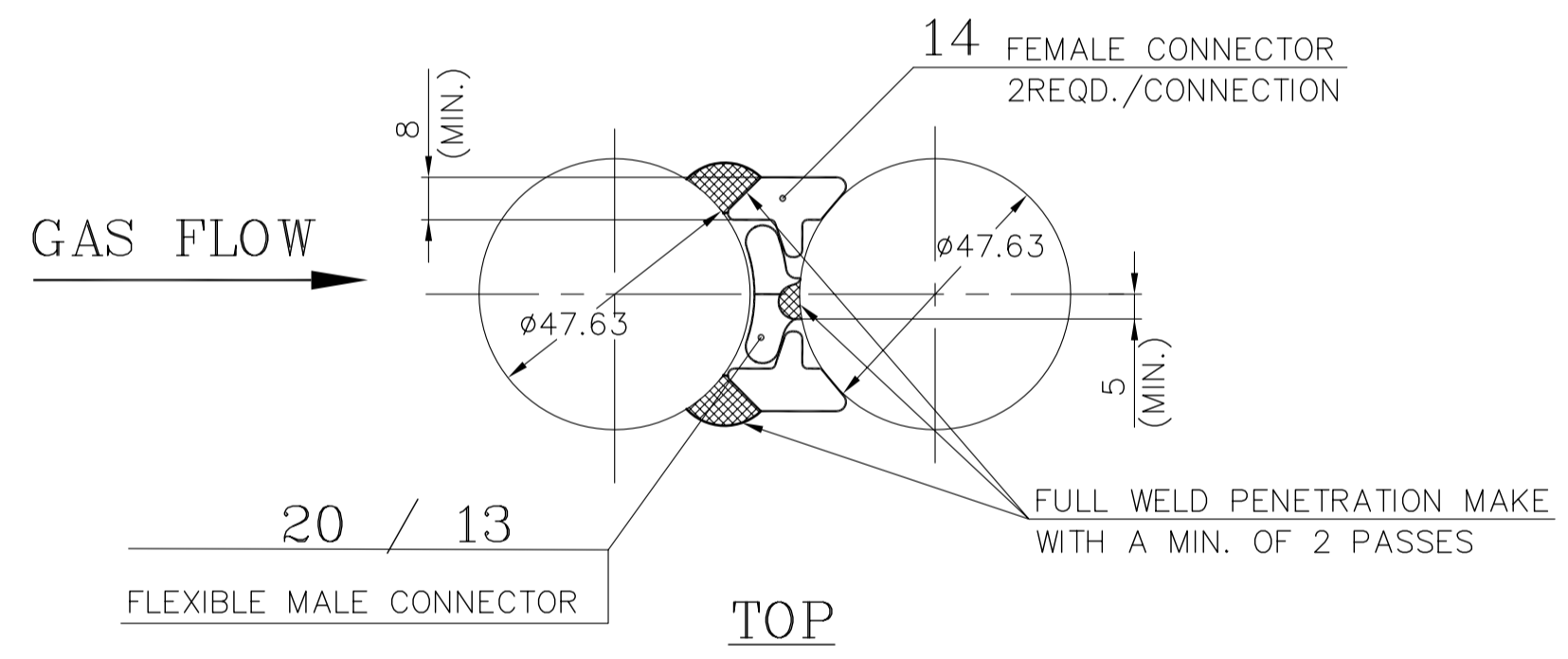
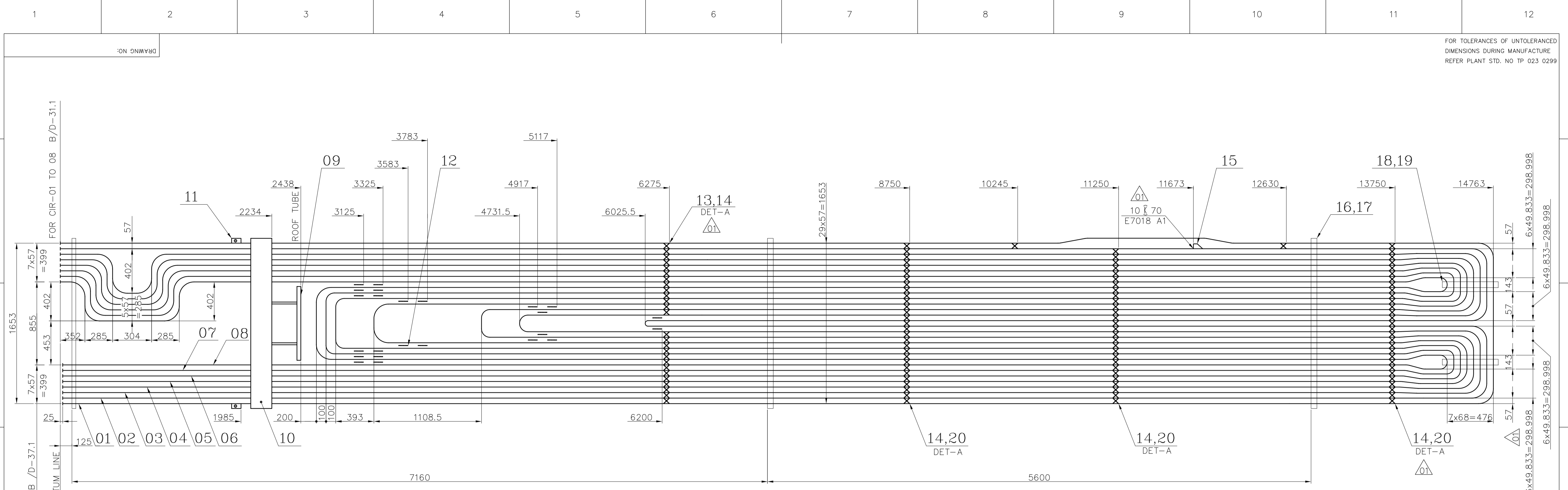
DETAIL-B6

VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO	MATERIAL CODE	A/C/P	UNIT	UNIT WEIGHT	GS	ZONE
					VAR NO	MATERIAL SPECN		DI	QUANTITY		
	04	TUBE D47.63x6.0; 16500 LONG				15-092-043 SA 213 T91	A		107.800		
	03	TUBE D47.63x5.0; 9994.2 LONG				15-189-064 SA 213 T22	A		152.150		
	02	TUBE D47.63x8.0; 26800 LONG				15-189-076 SA 213 T22	A		146.950		
	01	TUBE D47.63x8.0; 100 LONG				15-189-076 SA 213 T22	A		0.830		

CIRCUIT



FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER PLANT STD. NO TP 023 0299



DESIGN PRESSURE : 176.8 KG/CM²(G)

20	FLEX.CONNECTOR (MALE)	4-11-078-01791/01	92-051-040 SA351GR.CH20	C	0.130 88
19	PLATE 6X50; 631 LONG		15-011-092 IS2062FE410WA		1.500 2

ITEM NO	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO	MATERIAL CODE	UNIT	UNIT WEIGHT	QTY	ZONE
18	ISA 6X50X50; 535 LONG			15-013-156	IS2062FE410WA		2.400	2	
17	PLATE 6X50; 1830 LONG			15-011-092	IS2062FE410WA		4.300	3	
16	ISA 6x50x50; 1735 LONG			15-013-156	SA2062FE410WA		7.800	3	
15	SUPPORT LUG	6112-2042-21		92-013-183 SA351GR.CH20		C	0.220	1	
14	FLEX.CONNECTOR (FEMALE)	4-11-395-00503		92-051-023 SA351GR.CH20		C	0.040	228	
13	FLEX.CONNECTOR (MALE)	6112-0032-21		92-005-432 SA351GR.CH20		C	0.040	26	
12	TIE LUG	6112-0030-23		94-287-003 SA387GR.22CL2		C	0.100	24	
11	LIFTING LUG	6112-4020-22		94-182-005 SA387GR.22CL2		C	0.550	2	
10	ROOF SEAL BAND	3-11-278-02188/01		15-942-266 SA387GR.22CL2		C	15.800	2	
09	HEAT SHIELD	3-11-278-02251					3.260	1	
08	CIRCUIT-08	2-11-278-09533					384.130	1	
07	CIRCUIT-07	2-11-278-09532					407.730	1	
06	CIRCUIT-06	2-11-278-09531/01					386.330	1	
05	CIRCUIT-05	2-11-278-09530					380.330	1	
04	CIRCUIT-04	2-11-278-09529					365.330	1	
03	CIRCUIT-03	2-11-278-09528/01					360.930	1	
02	CIRCUIT-02	2-11-278-09527/01					339.730	1	
01	CIRCUIT-01	2-11-278-09526					242.210	1	

SH. VERTICAL PLATEN ASSY.

