

SPEC No- EDM/TQM/19-20/01,
Dt - 23/10/19

	BHARAT HEAVY ELECTRICAL LIMITED		Enquiry No. :
	UNIT'S ADDRESS:		Due Date :
	CONTACT PERSON'S NAME/DESIGN./PHONE NO./E-MAIL (FROM PURCHASE DEPTT.)		Supplier Qtn. No.:
			Date :

SPECIFICATION CUM COMPLIANCE CERTIFICATE OF CNC WIRE CUT EDM.

NOTE:-

- Vendor must submit complete information against clause no. 23. The offer meeting this clause would only be processed.
- The "Offered" Column and where applicable, the "Deviations" & "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.
- The offer and all documents enclosed with offer should be in English language only.

NAME & ADDRESS OF THE SUPPLIER :	NAME & ADDRESS OF THE INDIAN AGENT :
TELEPHONE NOS.:	TELEPHONE NOS.:
FAX NOS.:	FAX NOS.:
E-MAIL ADDRESS :	E-MAIL ADDRESS :

SCOPE: SUPPLY, ERECTION & COMMISSIONING OF CNC WIRE CUT EDM WITH SPECIFICATIONS AS BELOW:

SNO	DESCRIPTION FOR BHEL REQUIREMENT	TO BE SPECIFIED/ CONFIRMED BY	REMARKS
1.0	PURPOSE(OPERATIONS& JOB INVOLVED) & WORKPIECE MATERIAL Purpose :- The CNC controlled EDM wirecut machine is required to perform the following operations: 1) Two dimensional profile cutting. 2) Taper cutting to provide back-taper for clearance purpose. 3) The form accuracy and positional accuracy should be achieved within 0.005 mm over the whole length. 4) Best surface Finish to reach up to 0.15 micron. The CNC EDM wirecut machine shall be provided with either axis movement of the table or axis movement of the wire holding guide or combination of both along with automatic wire threading, wire cutting and wire rethreading in case of wire breakage. It should also have two additional axis movement U & V for taper cutting. The typical operations to be done are shown in the drawings attached in annexure1. Above mentioned components or similar components to be machined at BHEL works to prove the machining cycle time, accuracy and finish etc. In addition any special test job shall be done to test the accuracy on maximum profile size and pitch. Actual component may vary depending on their availability at the time of commissioning of the machine.	Vendor to confirm	
1.1			
1.2	Work Piece Material: (Material detail, Hardness etc.): -The materials of the components to be cut are as indicated below:- i) Mild Steel component. ii) High carbon high chromium steel upto 62 HRC. iii) Carbide tool and other carbide item. iv) Copper and copper alloy.	Vendor to confirm	
2.0	MACHINE SPECIFICATION (MINIMUM REQUIREMENTS) MACHINE CONFIGURATION:- The proposed CNC EDM wirecut machine shall be of following configuration:- 1. It shall be 5 - axis single column machine. 2. It should have technology for automatic determination of work-piece plane and position. 3. This machine should be capable of working in submerged mode. 4. The water tank door should be front open/ drop door. 5. It should be supplied along with a dedicated programming software.	Vendor to confirm	
2.1			

[Signature]
AB 23-10-19

SNO	DESCRIPTION FOR BHEL REQUIREMENT	TO BE SPECIFIED/ CONFIRMED BY	REMARKS
2.2	WORK AREA AND JOB DIMENSIONS:		
2.2.1	Maximum Size of workpiece to be loaded (L x W) - 1000*700mm	Vendor to confirm	
2.2.2	Maximum height of workpiece (H) /Thickness which can be loaded- 300 mm	Vendor to confirm	
2.2.3	Max. workpiece weight which can be loaded- 1000Kg	Vendor to confirm	
2.2.4	Work area accessibility: Front	Vendor to confirm	
2.2.5	Door system: Drop door/front open	Vendor to confirm	
2.2.6	Clamping surface made of stainless steel with proper arrangement of clamping.	Vendor to confirm	
2.3	WIRE DRIVE SYSTEM:		
2.3.1	Automatic wire threading and rethreading with annealing	Vendor to confirm	
2.3.2	Threadable height with Automatic wire threading: up to 300mm	Vendor to confirm	
2.3.3	Wire guide for wire diameter: 0.20-0.33mm	Vendor to confirm	
2.3.4	Round Wire guide System: Diamond guide	Vendor to confirm	
2.3.5	Wire spool weight: Minimum 15 Kg	Vendor to confirm	
2.3.6	suitable loading facility must be provided if spool wt. is more than 20 kg.	Vendor to confirm	
2.3.7	Wire disposal System- Wire should be collected in a removable container on wheel for easy disposal of used wire	Vendor to confirm	
2.3.8	Min. dia of threading hole: 2mm	Vendor to confirm	
2.3.9	During threading work tank need not to be completely emptied.	Vendor to confirm	
2.3.10	In case of wire breakage automatic adjustment of generator output	Vendor to confirm	
2.4	TRAVERSES:		
2.4.1	Horizontal traverse minimum- 550*350 mm	Vendor to confirm	
2.4.2	Vertical traverse minimum- 300mm	Vendor to confirm	
2.4.3	Axes travel for taper cutting - 75(+/-)*75(+/-) mm	Vendor to confirm	
2.4.4	Max. taper angle: +/- 15 degree at 260mm or more height	Vendor to confirm	
2.5	FEEDS AND DRIVE SYSTEM:		
	The friction free guideway system of all the axes , supported 100% on guideways. The axis drive system should be backlash free		
2.5.1	Rapid positioning of all Axes: minimum 2m/min	Vendor to confirm	
2.5.2	Cutting rate with 0.25mm wire : Speed of 200sq mm/min or more must be achieved.	Vendor to confirm	
2.5.3	Feed drives/motors	Vendor to specify the make	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	TO BE SPECIFIED/ CONFIRMED BY	REMARKS
2.5.4	Feed back system for all axes-Make: Heidenhain/Mitsubishi/Mitutoyo/Fanuc/Siemens	Vendor to confirm	
2.5.5	Details of System to ensure zero backlash for the axes	Vendor to furnish	
2.5.6	Detail of axes feed mechanism	Vendor to furnish	
2.5.7	Provision of anti collision system.	Vendor to confirm	
2.6	CONSTRUCTION:		
2.6.1	Vendor to furnish constructional details , including explanatory drawings, of various components/ assemblies like Guideways / slides, Telescopic covers, Accessories, Table, feed transmission system, hydraulic and lubrication system, feed back system etc. of the machine.	Vendor to furnish	
2.6.2	Video images on CD including hard copy explaining the technical features / Literature with photographs, drawings explaining the technical features should be enclosed with the offer	Vendor to furnish	
2.7	POWER GENERATOR:		
2.7.1	Maximum working current	Vendor to specify	
2.7.2	Different wire cutting technology modules	Vendor to specify	
2.7.3	Non electrolysis power supply to eliminate corrosion	Vendor to confirm	
2.7.4	Corner control/compensation	Vendor to confirm	
2.7.5	Automatic power optimisation with work-piece height	Vendor to confirm	
2.7.6	Anti recast power supply to avoid recasting	Vendor to confirm	
2.7.7	Taper cutting correction/compensation	Vendor to confirm	
2.8	OPERATION AND CONTROL SYSTEM:		
2.8.1	OPERATOR'S PANEL:		
2.8.1.1	Air conditioned Operator's panel having complete CNC and machine control system with 14" or larger Color TFT/LCD of required configuration shall be provided. All displays/indications should also be conveniently placed accordingly. <i>Machine Operator Panel with hard switches for selection of Mode, Axes, Feed over-ride, Direction to be provided.</i> Layout showing complete details should be submitted. Some of these features can also be provided on the operator's hand held unit	Vendor to furnish	
2.8.1.2	Hand held unit for manual axes movements and setup functions for wire drive, work tank and pick-up cycles to be provided. Complete manual control of machine with required switches/ keys should be provided on operator's hand held unit for selection of required axis, axis direction, table speed, display of axis position values, alarm reset, emergency etc. Diagrams/ sketches for switches/ keys provided on operator's pendant should be submitted.	Vendor to confirm	

SNO	DESCRIPTION FOR BHEL REQUIREMENT		TO BE SPECIFIED/ CONFIRMED BY	REMARKS
2.8.2	CNC SYSTEM & FEATURES :			
2.8.2.1	Make :			
2.8.2.2	Type : Digital based latest version		Vendor to specify	
2.8.2.3	Model (Latest hardware & firmware version, as available at the time of delivery should be supplied)		Vendor to specify	
2.8.2.4	Details of Standard features		Vendor to specify	
2.8.2.5	Details of optional features, recommended by vendor.		Vendor to specify	
2.8.2.6	Details of other optional features which are to be selected by indentor		Vendor to specify	
2.8.2.7	Operating system type and latest version.		Vendor to specify	
2.8.2.8	Servo controlled axes		Vendor to confirm	
2.8.2.9	Smallest programmable step- 0.001mm		Vendor to confirm	
2.8.2.10	Maximum path correction		Vendor to confirm	
2.8.2.11	Pickup cycle for easy determination of Workpiece plane & position		Vendor to confirm	
2.8.2.12	Automatic technology selection based on machining requirements and job data		Vendor to confirm	
2.8.2.13	Import of Job specific data from CAD/CAM systems in DXF or iges format		Vendor to confirm	
2.8.2.14	Predefined machining strategies with auto sequence		Vendor to confirm	
2.8.2.15	Provision for automatic safe shut down of CNC Control in case of Power Failure		Vendor to confirm	
2.8.2.16	Data Storage type and Capacity		Vendor to confirm	
2.8.2.17	Data storage media- Hard disc, USB/Flash drives,CD ROM for updates and online manual.		Vendor to specify	
2.8.2.18	Help functions function, explanations with text and graphics		Vendor to specify	
2.8.2.19	Machining simulations 2D &/3D views(dynamic)		Vendor to confirm	
2.8.2.20	Automatic instructions & command executions for activities viz. i) centering in holes & slots, ii) Zeros searching, iii) Vertical position searching, iv) Vertical position return v) Start point return vi) Edge searching with tolerance, vi) Return to working point by programmed path vii) Allowed working zone definition		Vendor to confirm	
2.8.2.21	Automatic machining sequence definition for multiple workpieces clamping		Vendor to confirm	
2.8.2.22	Rethreading on wire break/ on "no thread" detection		Vendor to confirm	
2.8.2.23	Machine restoration after power failure		Vendor to specify	
2.8.2.24	Simultaneous machining and program editing		Vendor to confirm	
2.8.2.25	Cooling system for control unit and generator unit to be provided		Vendor to confirm	
2.8.2.26	Back lash compensation must be available		Vendor to confirm	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	TO BE SPECIFIED/ CONFIRMED BY	REMARKS
2.8.2.27	Pitch error compensation must be available	Vendor to confirm	
2.8.3	AUTOMATIC SETTING OF PART REFERENCE POSITION (Automatic alignment of the m/c axes to the job axes with automatic rotation of the programme based on the position of the part on the table)		
2.8.3.1	Measuring probe type:Renishaw	Vendor to confirm	
2.8.3.2	Stylus length & ball Dia.	Vendor to specify	
2.8.3.3	Details of Standard features	Vendor to specify	
2.8.3.4	Details of optional features, recommended by vendor.	Vendor to specify	
2.8.3.5	Details of other optional features which are to be selected by indentor	Vendor to specify	
2.8.4	PROGRAMMING FEATURES and FACILITIES:		
	SOFTWARE for CAD / CAM Programming to be provided with postprocessor for the machine by the vendor.		
2.8.4.1	Details of Standard features	Vendor to specify	
2.8.4.2	Details of optional features, recommended by vendor.	Vendor to specify	
2.8.4.3	Details of other optional features which are to be selected by indentor	Vendor to specify	
2.8.4.4	Mirror programming, multipocket programming etc.	Vendor to confirm	
2.8.4.5	Imported geometry can be used for programming	Vendor to confirm	
2.8.4.6	Should be compatible with Latest version of software(autocad,unigraphics etc.) wherein drawings can be converted into Dxf or Iges format.	Vendor to confirm	
2.8.4.7	Easy preparation of machining programme	Vendor to specify	
2.8.4.8	Easy preparation of job templates	Vendor to specify	
2.8.4.9	Machining simulations 2D & 3D views	Vendor to specify	
2.8.4.10	PC based programming station for programming & data loading having configuration required for programming software. (Latest hardware and software versions at the time of delivery should be supplied)	Vendor to specify	
2.8.5	UPS FOR THE CNC SYSTEM:		
2.8.5.1	UPS for 15 minutes back up is required for PC based systems with HDD.	Vendor to confirm	
2.9	MACHINE LIGHTS:		
2.9.1	Machine Lights for sufficient illumination of complete working area should be provided for clear visibility. (preferably 230V ac supply)	Vendor to confirm	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	TO BE SPECIFIED/ CONFIRMED BY	REMARKS
2.9.2	All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents	Vendor to confirm	
2.9.3	Flashing / rotary type End of Cutting and Program Stop Light.	Vendor to confirm	
2.10	DIELECTRIC UNIT:		
2.10.1	Filtrate Quality	Vendor to specify	
2.10.2	Integrated heat exchanger/ Chilling unit for dielectric cooling.	Vendor to confirm	
2.10.3	Displaying of conductivity value on screen.	Vendor to confirm	
2.10.4	Automatic water compensation system	Vendor to confirm	
2.11	HYDRAULIC SYSTEM: if required (Details should be submitted by the vendor).		
2.11.1	System should be centralised. Hydraulic Tank shall preferably be located at floor level	Vendor to confirm	
2.11.2	Make Rexroth / Vickers Sperry / HAWE or equivalent from a reputed manufacturer. (Details to be submitted)	Vendor to confirm	
2.11.3	Filtration System	Vendor to specify	
2.11.4	Failure indication	Vendor to specify	
2.11.5	Automatic shut off provision (Details to be submitted)	Vendor to confirm	
2.11.6	Refrigerated type cooling and electric heating (Electric heating only if required) system of sufficient capacity to maintain complete Hydraulic System, including lubrication oil, hydrostatic oil and gearbox oil, etc. at a temperature not exceeding 40 deg C irrespective of the ambient conditions. Complete details should be submitted	Vendor to confirm	
2.11.7	Hydraulic pump capacity (flow / pressure)	Vendor to specify	
2.11.8	Each pump should have an independent motor. Tandem pumps should not be used	Vendor to confirm	
2.11.9	First filling of all required oil & grease etc. should be supplied by vendor. Indigenous (Indian) source, or Indian Equivalent, and specifications of oils/ greases also should be provided by the vendor.	Vendor to confirm	
2.12	ELECTRICAL:		
2.12.1	415V + 10% / -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 point to different parts of the machine/control cabinets, shall be the responsibility of vendor. Requirement of grounding/earthing with required material details is to be informed by vendor well in advance so that same could be incorporated during construction of foundation.	Vendor to confirm	

6/26

SNO	DESCRIPTION FOR BHEL REQUIREMENT	TO BE SPECIFIED/ CONFIRMED BY	REMARKS
2.12.2	Tropicalisation: All electrical / electronic equipment shall be tropicalized	Vendor to confirm	
2.12.3	All electrical & electronic control cabinets & panels should be dust and rodent proof	Vendor to confirm	
2.12.4	Motors shall conform to IEC or Indian Standards	Vendor to furnish	
2.12.5	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm	
2.12.6	In-cycle hour counter with reset facility.	Vendor to confirm	
2.13	SAFETY ARRANGEMENTS:		
	Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to confirm	
	1. Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, workpiece and the operator due to the malfunctioning or mistakes. Machine functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages (on CNC display and panels) should be available.	Vendor to confirm	
	2. A detailed list of all alarms / indications provided on machine should be submitted by the supplier.	Vendor to confirm	
	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	
2.14	4. Emergency Switches at suitable locations as per International Norms are to be provided.	Vendor to provide	
	5. Water pipe lines should not run with electrical cable in the same tray / trench.	Vendor to confirm	
	ENVIRONMENTAL PERFORMANCE OF THE MACHINE :		
	The Machine shall conform to following factors related to environment :	Vendor to confirm	
	(a) Maximum noise level shall be 85 dB(A) at normal load condition, 1 M 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. Supplier to demonstrate compliance to noise level, if so required.	Vendor to confirm	
	(b) There shall not be any emissions from the machine except fumes of cutting fluid during machining.	Vendor to confirm	
	(c) There should not be any effluent from the machine. In case there are any effluents from the machine, requisite effluent treatment plant or pollution control device should be built into the machine by the supplier.	Vendor to confirm	
	(d) No hazardous chemicals shall be required to be used in the machine.	Vendor to confirm	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	TO BE SPECIFIED/ CONFIRMED BY	REMARKS
	(e) If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.	Vendor to confirm	
	(f) Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant.	Vendor to confirm	
3	ULTRA ISOLATION TRANSFORMER		
3.1	Ultra Isolation Transformer suitable for complete machine, its drives, controls, PLC etc. in TTN/DTN configuration.	Vendor to confirm	
3.2	Make	Vendor to specify	
3.3	Model & Rating	Vendor to specify	
3.4	Catalogue of the Ultra Isolation Transformer shall be submitted with the offer.	Vendor to furnish	
4.0	PNEUMATIC SYSTEM:		
4.1	Independent Air Compressor (of reputed Indian make viz. Elgi, Atlas Copco, Ingersol rand.) with refrigerated type Dryer & Filter of same make as compressor of suitable capacity for the total compressed air requirements of the machine & accessories and to suit required air quality should be supplied. The system should be so designed to have additional provision and required accessories so that BHEL compressed air supply having pressure 4 bar could be used as and when required. The compressor unit should be suitable for continuous duty.	Vendor to confirm	
4.1.1	Make & Model of Air Compressor, Dryer, Filter	Vendor to specify	
4.2	Capacity (Flow, Pressure, & KW)	Vendor to specify	
4.3	Compressed Air Point with manual ON/ OFF Valve and flexible pipe of suitable length for work piece cleaning.	Vendor to confirm	
5.0	LEVELLING & ANCHORING SYSTEM :		
5.1	Complete anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc should be supplied	Vendor to confirm	
6.0	TOOLS FOR ERECTION, OPERATION & MAINTENANCE		
6.1	Special Tools and equipment required for erection and 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.	Vendor to confirm & specify	
7.0	TOOLING AND ACCESSORIES :		
7.1	Alignment and centering device for wire guide system	Vendor to confirm	

C/2

SNO	DESCRIPTION FOR BHEL REQUIREMENT	TO BE SPECIFIED/ CONFIRMED BY	REMARKS
7.2	suitable dial holder with indicator.	Vendor to confirm	
7.3	Recommended set of clamping arrangements to clamp the jobs specified in drawing attached in annexure 1.	Vendor to confirm	
8.0	SPARES : OPTIONAL- To be quoted separately		
8.1	Offer for following Spares have to be provided : Itemised breakup of mechanical, hydraulic, electrical and electronic spares as below are to be offered. The list to include following spares: (Unit Price of each item of spare should be offered). The spares will be ordered as per requirement. Note: The price of the spares will not be considered for the evaluation of the machine cost (L1 criteria).	Vendor to furnish	
	a) Mechanical & Hydraulic Spares: All types of Pumps, Valves, Pressure Switches, Transducers, solenoid valves, Flow Switches, Filters, Seals, O-rings, Hydraulic Hoses etc.	Vendor to furnish	
	b) Electrical /Electronic / CNC Spares: All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, Encoders, Scanning Heads for Linear Scales, MMC / HMI module, NC module, Operator's panel with Display Unit, I/O Cards for PLC, Servo Motors for Feed Drives, Power Module & Control Cards for axes Feed Drives etc. Spares for Generator circuit, Optical Fibre cable for communication, spare hand held unit also to be supplied.	Vendor to furnish	
8.2	All types of spares for total machine and accessories should be available for atleast 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 them in advance, if required	Vendor to furnish	
8.3	Vendor to confirm that complete list of spares for machine and accessories, along with specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine	Vendor to furnish	
8.4	CONSUMABLES:		
8.4.1	Initial consumables for the first 2000 hrs. of troublefree operation to be provided.	Vendor to confirm	
9.0	DOCUMENTATION :		
	Five sets of following documents (Hard copies) in English language should be supplied along with the machine	Vendor to confirm	
9.1	Operating manuals of Machine & CNC system	Vendor to confirm	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	TO BE SPECIFIED/ CONFIRMED BY	REMARKS
9.2	Programming Manuals of Machine & CNC system	Vendor to confirm	
9.3	Detailed Maintenance manual of machine with all drawings of machine assemblies/ sub-assemblies/parts including Electrical / Pneumatic/ Coolant / Hydraulic circuit diagrams, PLC program with cross reference and comments in english.. All Assembly/ Sub Assembly Drawings shall be supplied with the part list also.	Vendor to confirm	
9.4	Maintenance, Interface & commissioning manuals for CNC, PLC, Drives, feedback and generator system.	Vendor to confirm	
9.5	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.	Vendor to confirm	
9.6	Detailed specification of all rubber items and hydraulic/lube fittings	Vendor to confirm	
9.7	Operating Manuals, Maintenance Manuals & Catalogues for Voltage Stabilizer, Isolation Transformer, Air-Compressor, UPS and all supplied Accessories.	Vendor to confirm	
9.8	PLC program, NC data & PLC data on CD.	Vendor to confirm	
9.9	Detailed remedial action for all the alarms and messages	Vendor to confirm	
9.10	Complete back-up of CNC system on CD must be provided.	Vendor to confirm	
9.11	One additional set of all the above documentation on CD ROM, wherever possible.	Vendor to confirm	
10.0	ACCURACY TESTS:		
10.1	GEOMETRICAL ACCURACIES :		
10.1.1	Submit test chart for all accuracies as per ISO 230-1(96) standard or equivalent applicable standard.	Vendor to furnish	
10.1.2	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at supplier's works and during erection & commissioning at BHEL works.	Vendor to confirm	
10.2	POSITIONAL ACCURACIES & REPEATABILITY: Should be measured as per ISO 230-2(97) or equivalent standard using LASER INTERFEROMETER.		
10.2.1	Submit test chart for all accuracies as per ISO 230-2(97) standard or equivalent applicable standard.	Vendor to furnish	
10.2.2	All the above accuracies should be demonstrated to BHEL engineers during pre-acceptance at supplier's works and during erection & commissioning at BHEL works.	Vendor to demonstrate	
10.3	JOB ACCURACIES: Following(10.3.1 to 10.3.3) are the accuracy requirements for the prove out components to be done at the time of PDI and during commissioning at BHEL works.		

At 21/0

SNO	DESCRIPTION FOR BHEL REQUIREMENT	TO BE SPECIFIED/ CONFIRMED BY	REMARKS
10.3.1	Position accuracy of cut contours in X , Y axis over entire travel for 50mm thick job-0.005mm	Vendor to confirm	
10.3.2	Form accuracy including straightness and ovality for 50mm thick job-0.005mm	Vendor to confirm	
10.3.3	Surface roughness with maximum 4 cuts- 0.50 μmm	Vendor to confirm	
10.4	Resolution of measuring system: 0.001mm	Vendor to confirm	
10.5	Repeatability in all axis.: 0.005mm	Vendor to confirm	
10.6	Measuring system should be both direct & contactless.	Vendor to confirm	
10.7	Electronic machine accuracy inspection of all axes with laser interferometer.	Vendor to confirm	
11.0	PREDESPATCH INSPECTION AND TESTS:		
	Tests/Activities should be carried out at supplier's works on the machine before dispatch : This should be the basis for despatch clearance.	Vendor to confirm	
11.1	Geometrical accuracies as per test chart ISO 230-1(96) standard or equivalent applicable standard.	Vendor to confirm	
11.2	Positioning accuracies as per ISO 230-2 (97) standard or equivalent applicable standard.	Vendor to confirm	
11.3	The machine should be tested for continuous running of 8hrs. If any break down occurs during this test, the test should be repeated for 8 hrs from that time.	Vendor to confirm	
11.4	Demonstration of all features of the machine, control system & accessories.	Vendor to confirm	
11.5	Machining of any job of thickness 50mm or more on the machine at vendor's works . The accuracies should be measured as per the requirement mentioned at 10.3.1 to 10.3.3. The required tooling and inspection of job shall be arranged by Vendor.	Vendor to confirm	
12.0	TRAINING		
12.1	BHEL Engineers should be trained at supplier's Works for five days in the area of: (a) CNC Part Programming / Technology, Use of all CNC Features, Programming for Measuring Systems & supplied accessories, Operation of the machines and other supplied equipments etc.- 1 Person (b) Electrical, Electronic & CNC maintenance for machine & other supplied equipments- 1 Person (c) Mechanical & Hydraulic maintenance of the machine & other supplied equipments- 1 Person	Vendor to confirm	
12.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.	Vendor to confirm	
12.3	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Vendor to confirm	
12.4	Vendor to quote for training, on man / day basis	Vendor to confirm	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	TO BE SPECIFIED/ CONFIRMED BY	REMARKS
12.5	Vendor should provide on the job training of 4 days to BHEL personnels after commissioning the machine for programming,operation and maintenance.	Vendor to confirm	
13.0	FOUNDATION :		
13.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI) / P.O. whichever is earlier. Soil condition data will be furnished by BHEL along with the approval. Complete Foundation Design including details viz. static / dynamic load details etc. and Final Layout drawings shall be submitted by the supplier within three months after getting BHEL's approval. The layout should consist of all requirements pertaining to complete machine including space requirement for Voltage Stabilizer, Isolation Transformer, Air compressor, Chip Bin & any other accessories.	Vendor to confirm	
13.2	BHEL shall construct complete foundation for the machine. Vendor should arrange equipments required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specifications of grouting compound and Grouting procedure etc. for foundation bolts of the machine.	Vendor to confirm	
14.0	ERECTION & COMMISSIONING		
14.1	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other supplied equipment, machining of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by supplier 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.	Vendor to confirm	
14.2	Erection & Commissioning of Isolation Transformer & Air Compressor with dryer and filter shall also be responsibility of the vendor.	Vendor to confirm	
14.3	All tests, as mentioned at clause 16 (Machine Acceptance) and clause 17 shall form part of the commissioning activity.	Vendor to confirm	
14.4	Tools, Tackels, Test Mandrels, instruments and other necessary equipment including Laser equipment required to carry out all above activities should be brought by the supplier. .	Vendor to confirm	
14.5	All Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.	Vendor to confirm	

SNO	DESCRIPTION FOR BHEL REQUIREMENT	TO BE SPECIFIED/ CONFIRMED BY	REMARKS
14.6	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 should supply sufficient quantity of touch-up paint of various colours of paint used.	Vendor to confirm	
14.7	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to confirm	
14.8	Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.	Vendor to confirm	
15.0	AMBIENT CONDITIONS & THERMAL STABILITY :		
15.1	Total machine including CNC system and all supplied items should work trouble free and efficiently under following operating conditions and should give specified accuracies. Power Supply: Voltage: 415 V - 10%, +10% Frequency: 50 Hz +3%, - 3% No. of phases = 3 No neutral (Vendor to confirm that machine is suitable for above and details of provisions on the machine for the same are to be furnished by Vendor)	Vendor to note and confirm	
15.2	Thermal Stability of the complete machine keeping in view specified Ambient Conditions and accuracy requirements of BHEL components and trouble free operation of the machine should be ensured by vendor. that machine is suitable for above and details of provisions on the machine for the same should be furnished)	Vendor to confirm	
15.3	Ambient Temp. condition	Vendor to specify	
15.4	Relative humidity	Vendor to specify	
16.0	Machine acceptance:		
	Tests/Activities should be carried out at BHEL works while commissioning the machine for the final acceptance :		
16.1	Geometrical accuracies as per test chart ISO 230-1(96) standard or equivalent applicable standard.	Vendor to confirm	
16.2	Positioning accuracies as per ISO 230-2 (97) standard or equivalent applicable standard..	Vendor to confirm	
16.3	Cutting speed of 200sq.mm/min or more as per the clause 2.5.2 must be demonstrated on job.	Vendor to confirm	
16.4	The machine should be tested for continuous running of 48 hrs. If any break down occurs during this test, the test should be repeated for 48 hrs from that time.	Vendor to confirm	

C/19

11.10

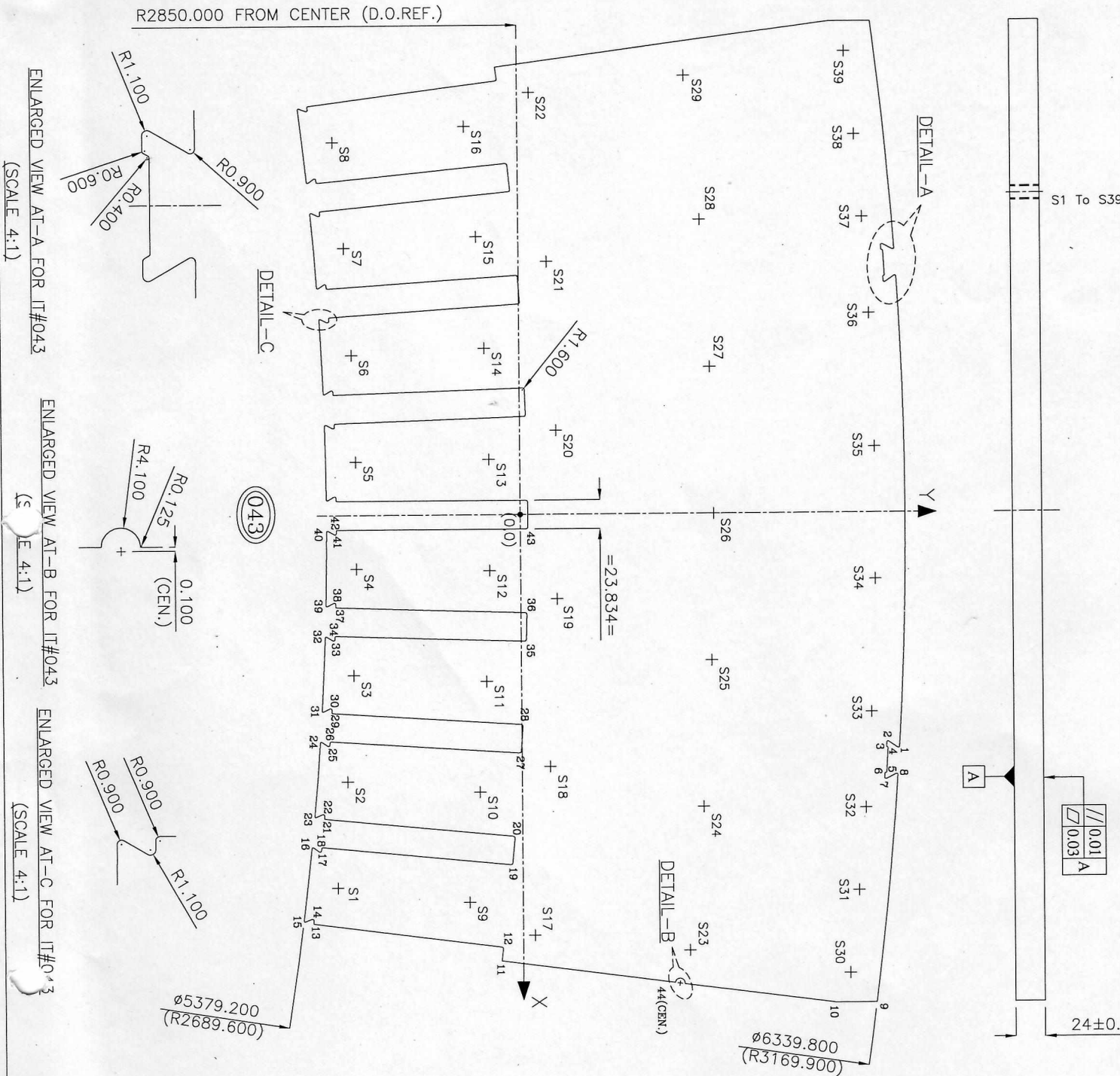
11.10

SNO	DESCRIPTION FOR BHEL REQUIREMENT	TO BE SPECIFIED/ CONFIRMED BY	REMARKS
16.5	Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine	Vendor to confirm	
16.6	One week supervision of independent operation of machine by BHEL after Tests & demonstration mentioned at 16.1 to 16.5.	Vendor to confirm	
16.7	Training of BHEL machine operators in operation of complete machine & accessories etc by the supplier's experts / engineers during their stay at BHEL works	Vendor to confirm	
16.8	Demonstration by actual use of all supplied attachments and accessories.	Vendor to confirm	
16.9	Prove out of component as per the clause 17	Vendor to confirm	
17.0	PROVE OUT OF COMPONENTS AT BHEL SITE: The proving out of component must be as per the accuracy requirement mentioned at 10.3.1 to 10.3.3.		
17.1	<u>EDM of Complete stripper drawing no.1598254 attached in annexure 1</u>	Vendor to confirm	
17.2	<u>EDM of steeling drawing no.1598254 item no. 2 attached in annexure 1</u>	Vendor to confirm	
18.0	PACKING:		
18.1	Sea worthy & rigid packing for all items of complete machine, CNC System, all Accessories and other supplied items to avoid any damage/loss in transit. When machine is despatched in containers, all small loose items shall be suitably packed in boxes	Vendor to confirm	
19.0	GUARANTEE :		
19.1	24 months from the date of acceptance of the machine.	Vendor to confirm	
20.0	GENERAL :		
20.1	Machine Model	Vendor to specify	
20.2	Total connected load (KVA):	Vendor to specify	
20.3	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to specify	
20.4	Total weight of the machine	Vendor to specify	
20.5	Weight of heaviest part of machine	Vendor to specify	
20.6	Weight of the heaviest assembly / sub-assembly of the Machine	Vendor to specify	
20.7	Dimensions of largest part/ sub-assembly/ assembly of the machine	Vendor to specify	
20.8	Vendor to submit, along with offer, reference list of customers where similar machines have been supplied mentioning broad specifications of the supplied machine i.e. Model, table size, Spindle power, Load Capacity, Max job Envelope, CNC System etc	Vendor to furnish	
20.9	Detailed catalogues, sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer	Vendor to furnish	

9/18

SNO	DESCRIPTION FOR BHEL REQUIREMENT	TO BE SPECIFIED/ CONFIRMED BY	REMARKS
21.0	Hydraulic, Pneumatic & oil pipings should be preferably metallic except places where flexible pipings are essential. All pipes required for the same shall be included in the standard scope of the machine.	Vendor to specify	
22.0	OTHER FEATURES:		
22.1	Networking: The programming workstation mentioned at 2.8.4.10 and the machine should be networked for two way program transfer.	Vendor to confirm	
23.0	QUALIFYING CONDITIONS :		
23.1	The vendor must be an Original Equipment Manufacturer (OEM)	Vendor to confirm	
23.2	The vendor must have supplied at least five (5) numbers CNC Wire cut EDM Machine in past 10 years of same or higher sizes (X axis travel : 550 mm , Y axis travel : 350 mm, z axis: 300mm) on the date of opening of tender. Vendor should submit proof of the same.	Vendor to confirm	
23.3	The machine referred to in Clause 23.2 must be working satisfactorily for more than one year (on the date of opening of Tender). Vendor should submit proof of the same.	Vendor to confirm	
23.4	Out of five supplied machines as referred to in Clause 23.2, at least one should have been supplied in the country other than country of origin. Vendor should submit proof of the same.	Vendor to confirm	
23.5	NOTES: 1. Indian Machine Tool manufacturers who do not meet the qualifying criteria as mentioned in sub clauses 23.2 to 23.4, can be considered, if a) They have running Collaboration/ Joint Venture/ Joint Working Arrangement with a foreign partner who meets all of the qualifying criteria as mentioned in sub clauses 23.1 to 23.4. b) The Collaboration/ Joint Venture/ Joint Working Arrangement of the Indian Machine Tool manufacturer with its foreign partner should be of at least 2 years old (on the date of opening of tender). c) The Indian Machine Tool manufacturer should have supplied and commissioned at least one such machine (Refer clause 23.2) after Collaboration/ Joint Venture/ Joint Working Arrangement. d) The Indian Machine Tool manufacturer shall submit from their foreign partner a back to back guarantee for performance of the machine. 2. BHEL reserves the right to assess the OEM with respect to their technical and financial capability. In respect of Indian Machine Tool manufacturers as noted above, BHEL reserves the right to assess the Indian Vendor & their foreign Partner with respect to their technical and financial capability.	Vendor to confirm	26-2 26-2

SNO	DESCRIPTION FOR BHEL REQUIREMENT	TO BE SPECIFIED/ CONFIRMED BY	REMARKS
23.6	The following information should be submitted by the vendor about the companies where same or higher sizes machine(s) have been supplied. This is required from all the vendors for qualification of their offer.		
23.6.1	Name of the customer(s)/company(s) where referred machine is installed.	Vendor to specify	
23.6.2	Complete postal address of the customer(s).	Vendor to specify	
23.6.3	Month & Year of commissioning	Vendor to specify	
23.6.4	Parameters of the machine(s) supplied (as specified in Clause 23.2) & application for which the machine is supplied.	Vendor to specify	
23.6.5	Name and designation of the contact person of the customer/s.	Vendor to specify	
23.6.6	Phone, FAX no. and email address of the contact person of the customer/s.	Vendor to inform	
23.6.7	Performance certificates from two (2) customers regarding satisfactory performance of machine supplied to them (Original Certificate or through E-mail directly from the customer). Indian machine tool manufacturers having Collaboration/ Joint Venture/ Joint Working Arrangement with foreign partner who meet qualifying requirement should submit Performance certificate of at least one machine supplied by them after Collaboration/ Joint Venture/ Joint Working Arrangement. The original certificate may be returned after verification by BHEL, if required.	Vendor to confirm.	
23.6.8	BHEL reserves the right to verify the information provided by vendor at their referred customer's works including machining accuracies. It shall be the responsibility of the vendor to facilitate the visit of BHEL's team at their referred customer's works. In case the information provided by vendor is found to be false / incorrect, the offer shall be rejected.	Vendor to note and confirm.	

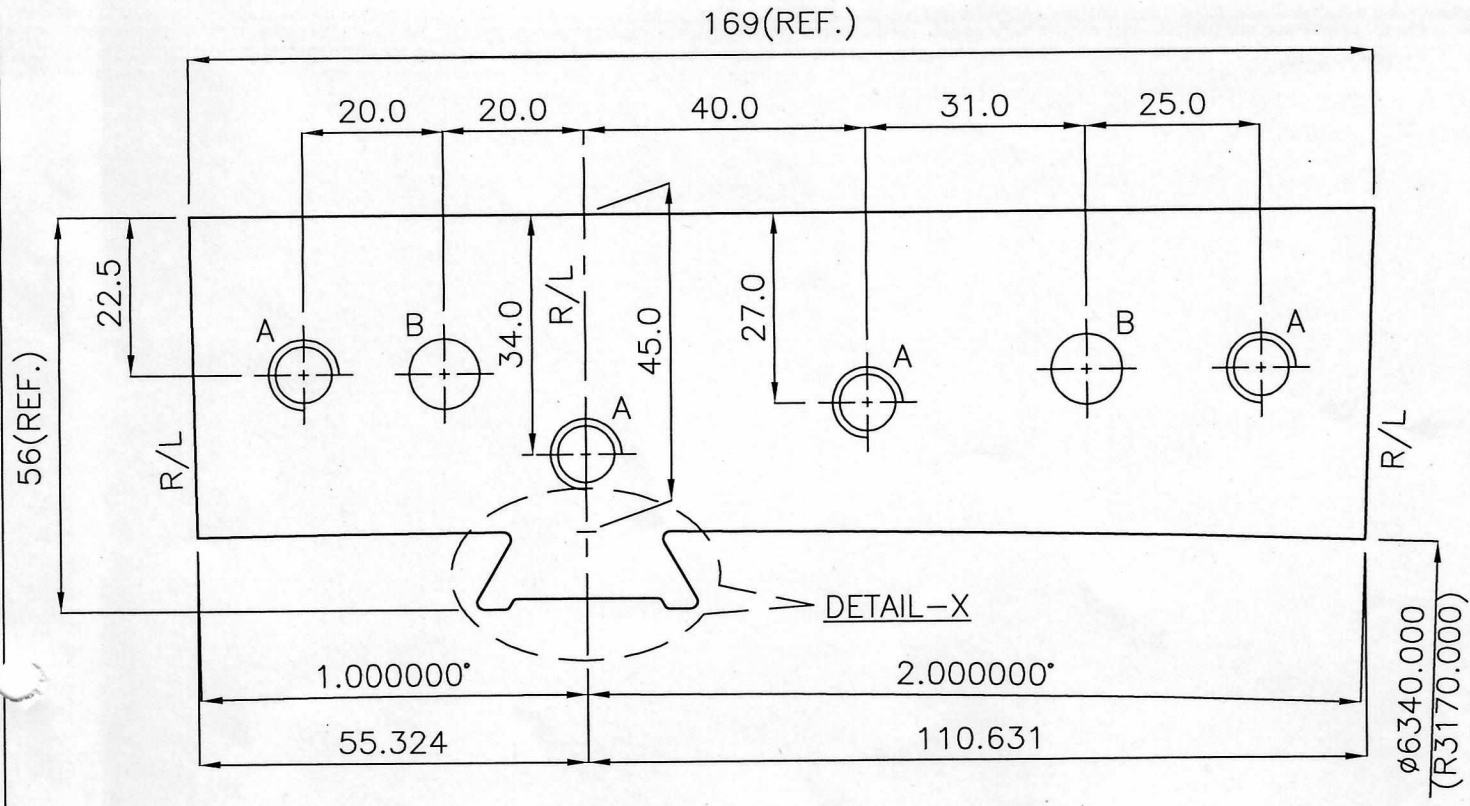


LIST OF COORDINATES		
M.P.	X	Y
1	197.181	313.761
2	190.135	303.216
3	195.488	302.865
4	196.451	304.305
5	216.950	302.962
6	217.716	301.408
7	223.069	301.057
8	217.460	312.432
9	408.900	293.416
10	408.900	259.351
11	372.363	-18.176
12	360.994	-16.680
13	340.292	-173.923
14	335.639	-173.310
15	339.186	-181.873
16	275.543	-174.552
17	280.941	-167.018
18	276.271	-166.558
19	291.816	-8.721
20	268.097	-6.385
21	252.551	-164.222
22	247.881	-163.762
23	251.706	-172.204
24	187.857	-166.969
25	193.006	-159.262
26	188.323	-158.955
27	198.696	-0.695
28	174.913	0.864
29	164.540	-157.396
30	159.857	-157.089
31	163.956	-165.402
32	99.970	-162.259
33	104.864	-154.388
34	100.174	-154.234
35	105.363	4.281
36	81.542	5.061
37	76.352	-153.454
38	71.662	-153.301
39	76.031	-161.475
40	11.976	-160.427
41	16.610	-152.400
42	11.917	-152.400
43	11.917	6.200
44(CEN.)	392.028	130.428

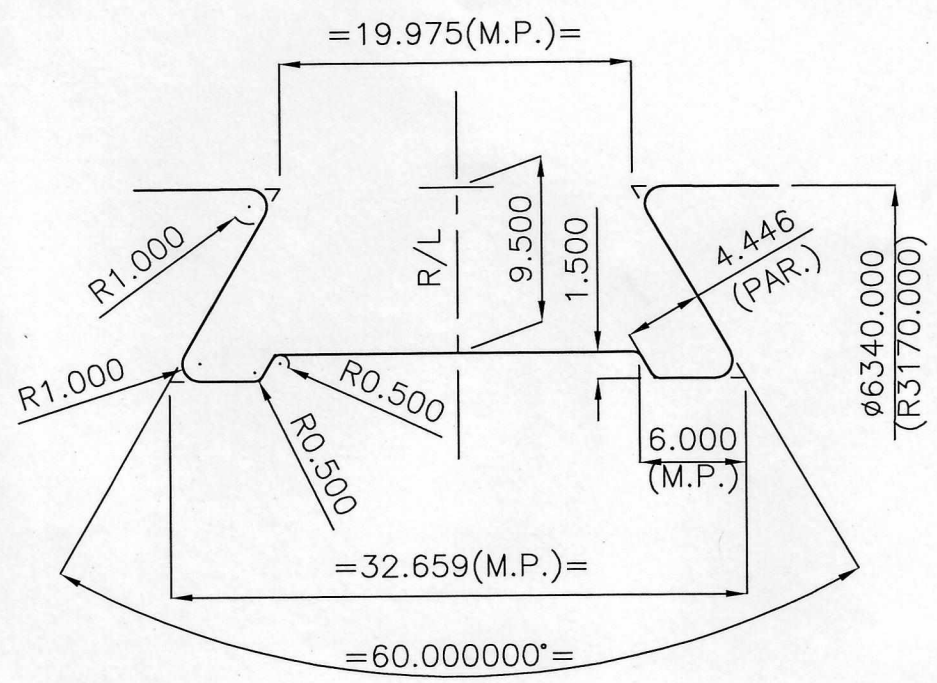
MOULD POINTS "1" TO "43"
ARE SYMMETRICAL
ABOUT Y-AXIS

ENLARGED VIEW AT-A FOR IT#043 (SCALE 4:1)
ENLARGED VIEW AT-B FOR IT#043 (SCALE 4:1)
ENLARGED VIEW AT-C FOR IT#043 (SCALE 4:1)

INSIDE
STRIPPER
1598254



002 2-OFF
PERIMETER= 460.9 (ALL SIDES)



ENLARGED VIEW AT-X FOR IT#002
(SCALE 2.5:1)

IT#002
1598254