



## BHARAT HEAVY ELECTRICALS LIMITED, JHANSI

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| Specification No. | MT-6239, Rev.- 01 |
| Item No.          | MT-1/1559         |
| Location          | FBM               |
| Quantity          | 01 No.            |

### Scope:

Design, Manufacturing, Testing, Supply, Erection & Commissioning of CNC Vertical machining center complying with the specifications mentioned below.

### Note:

1. Vendor must submit complete information against clause No. 22 (Qualifying requirement) and the offers meeting this clause would only be processed.
2. The "offered" column and the "deviations" column (if applicable) of this format shall be filled in by the vendor and submitted along with the offer. Technical details also need to be submitted along with the offer. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specification / requirements shall be treated as non-compliance.
3. The offer and all the documents enclosed with the offer shall be in English only.

### SPECIFICATION CUM COMPLIANCE CERTIFICATE FOR CNC VERTICAL MACHINING CENTER

**SCOPE : Supply, Erection & Commissioning of 1 No. CNC VERTICAL MACHINING CENTER as specified below.**

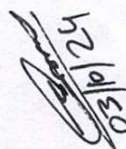
| S.NO.      | DESCRIPTION FOR BHEL REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                | SPECIFIED / TO BE CONFIRMED BY     | BIDDER OFFER | DEVIATIONS |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------|------------|
| <b>1.0</b> | <b>PURPOSE &amp; WORKPIECE MATERIAL</b>                                                                                                                                                                                                                                                                                                                                                                         |                                    |              |            |
| 1.1        | Purpose: All Milling Operations like Plain Milling, Face Milling, Profiling, Keyway Milling, Slot Machining, Drilling, Reaming, Tapping, Grooving, Boring etc.<br><b>Work Piece Material:</b> (Material detail, Hardness etc.)<br><b>Non-Ferrous:</b> Aluminium & Its alloy etc. (Drg No- HSTN205377, 24661850017 & HSTN 310452)<br><b>Ferrous:</b> Carbon Steel, Alloy Steel, Cast Iron & Stainless Steel etc. | Vendor to confirm                  |              |            |
| <b>2.0</b> | <b>MACHINE SPECIFICATION</b>                                                                                                                                                                                                                                                                                                                                                                                    |                                    |              |            |
| <b>2.1</b> | <b>MACHINE CONFIGURATION (3-Axis CNC Vertical Milling Machine)</b>                                                                                                                                                                                                                                                                                                                                              |                                    |              |            |
| 2.1.1      | Spindle Orientation :Vertical                                                                                                                                                                                                                                                                                                                                                                                   | Vendor to confirm                  |              |            |
| 2.1.2      | Time taken to complete machining of job along with groove machining as per drawing no. HSTN205377 R01, R02 or R03 or 24661850017 & HSTN 310452                                                                                                                                                                                                                                                                  | Vendor to specify & submit details |              |            |
| <b>2.2</b> | <b>TABLE :</b>                                                                                                                                                                                                                                                                                                                                                                                                  |                                    |              |            |
| 2.2.1      | Size of Clamping Surface / Table (L X B):2000mmX800mm                                                                                                                                                                                                                                                                                                                                                           | Vendor to confirm                  |              |            |
| 2.2.2      | Max. Weight of Work-piece : 2000 Kg. or more                                                                                                                                                                                                                                                                                                                                                                    | Vendor to confirm                  |              |            |
| 2.2.3      | Details of T-Slots: No / Size / Pitch                                                                                                                                                                                                                                                                                                                                                                           | Vendor to specify                  |              |            |
| 2.2.4      | Tapped Holes: Size / Pitch                                                                                                                                                                                                                                                                                                                                                                                      | Vendor to specify                  |              |            |

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| S.NO.  | DESCRIPTION FOR BHEL REQUIREMENT                                                                                                                                                                                                                                                                                          | SPECIFIED / TO BE CONFIRMED BY | BIDDER OFFER | DEVIATIONS |
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| 2.5.10 | Mechanism for locking / clamping the axes: Servo Lock + Motor Brake                                                                                                                                                                                                                                                       | Vendor to confirm              |              |            |
| 2.5.11 | Clamping force of each axes to be furnished                                                                                                                                                                                                                                                                               | Vendor to confirm              |              |            |
| 2.5.12 | Detail of axes feed mechanism (Details should include diameter of Ball Screws of each axis)                                                                                                                                                                                                                               | Vendor to specify              |              |            |
| 2.5.13 | All linear traversing axes shall be provided with Steel Telescopic covers of rust resistant material with wipers. Joints of telescopic covers should be so sealed to avoid mixing of coolant and other lubricating oil.                                                                                                   | Vendor to confirm              |              |            |
| 2.6    | <b>CONSTRUCTION:</b>                                                                                                                                                                                                                                                                                                      |                                |              |            |
| 2.6.1  | Vendor to furnish material, hardness of guideways & constructional details , including explanatory drawings, of various components/ assemblies like Gear Box, Guideways/ slides, Telescopic covers, Accessories, Table, feed transmission system, hydraulic and lubrication system, feed back system etc. of the machine. | Vendor to confirm & submit     |              |            |
| 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 confirm              |              |            |
| 2.7    | <b>AUTOMATIC TOOL CHANGER:</b>                                                                                                                                                                                                                                                                                            | To be provided                 |              |            |
| 2.7.1  | Type                                                                                                                                                                                                                                                                                                                      | Vendor to specify              |              |            |
| 2.7.2  | Tool selection method                                                                                                                                                                                                                                                                                                     | Random & Shortest              |              |            |
| 2.7.3  | Tool Taper : BT50/ ISO50 DIN 69871                                                                                                                                                                                                                                                                                        | Vendor to specify              |              |            |
| 2.7.4  | Number of Tool holder in the Magazine : 20-25 tools                                                                                                                                                                                                                                                                       | Vendor to confirm              |              |            |
| 2.7.5  | Maximum Diameter of Tool: (a) With all Pockets Full: : (b) With adjacent Pockets Empty:                                                                                                                                                                                                                                   | Vendor to specify              |              |            |
| 2.7.6  | Max Length of Tool                                                                                                                                                                                                                                                                                                        | Vendor to specify              |              |            |
| 2.7.7  | Max Weight of Tool                                                                                                                                                                                                                                                                                                        | Vendor to specify              |              |            |
| 2.7.8  | Limitation regarding length & weight of tool / tool holder clamped in different tool holders for trouble free operation.                                                                                                                                                                                                  | Vendor to specify              |              |            |
| 2.7.9  | Tool Change Time (Tool-to-Tool)                                                                                                                                                                                                                                                                                           | Vendor to specify              |              |            |
| 2.7.10 | Tool Change Time (Chip-to-Chip)                                                                                                                                                                                                                                                                                           | Vendor to specify              |              |            |
| 2.7.11 | The machine shall have manual Tool loading / unloading through push button provided on machine / Auxiliary Hand pendant.                                                                                                                                                                                                  | Vendor to confirm              |              |            |
| 2.7.12 | The spindle taper and tool pocket at changer station will have the provision of cleaning by compressed air blow during ATC cycle. The spindle taper will also have the provision of compressed air blow through push button provided on machine for manual tool change.                                                   | Vendor to confirm              |              |            |
| 2.7.13 | Auxiliary Control, with suitable interlocks, for manual insertion / withdrawal of tool from the tool magazine shall be provided.                                                                                                                                                                                          | Vendor to confirm              |              |            |
| 2.7.14 | Provision for manual insertion / withdrawal of tool from spindle shall be provided.                                                                                                                                                                                                                                       | Vendor to confirm              |              |            |
| 2.7.15 | The Machine operation should be possible with or without referencing ATC.                                                                                                                                                                                                                                                 | Vendor to confirm              |              |            |
| 2.7.16 | One set of tool holder retention stud equal to Tool magazine capacity shall be provided as standard item with the machine.                                                                                                                                                                                                | Vendor to confirm              |              |            |

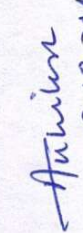
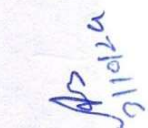
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| 2.2.5  | Max Load on Table : 2000 Kg. or more                                                                                                          | Vendor to specify              |              |            |
| 2.2.6  | Central Slot tolerance                                                                                                                        | Vendor to specify              |              |            |
| 2.2.7  | Lateral Slot size and tolerance                                                                                                               | Vendor to specify              |              |            |
| 2.2.8  | Table top and central slot should be accurately machined and it shall be used as reference surfaces.                                          | Vendor to confirm              |              |            |
| 2.3    | <b>SPINDLE:</b>                                                                                                                               |                                |              |            |
| 2.3.1  | Spindle Diameter                                                                                                                              | Vendor to specify              |              |            |
| 2.3.2  | Spindle Motor Power at 100 % duty cycle (AC Continuous Duty S1) : 15 KW or more                                                               | Vendor to confirm              |              |            |
| 2.3.3  | Spindle Motor Make, Model etc.(Should comply with IEC / IS specifications)                                                                    | Vendor to specify              |              |            |
| 2.3.4  | Spindle Bearing Diameters (Radial & Axial)                                                                                                    | Vendor to specify              |              |            |
| 2.3.5  | Taper in Spindle: BT50/ ISO50 DIN 69871                                                                                                       | Vendor to specify              |              |            |
| 2.3.6  | Spindle speed (Infinitely variable) : 5000 rpm min variable / to suit machine capability in line with specified application.                  | Vendor to specify              |              |            |
| 2.3.7  | Detail of speed ranges (Selectable through program)                                                                                           | Vendor to specify              |              |            |
| 2.3.8  | Range of spindle speed at constant power.                                                                                                     | Vendor to specify              |              |            |
| 2.3.9  | Max Spindle Torque                                                                                                                            | Vendor to specify              |              |            |
| 2.3.10 | RPM at which max. permissible torque is available                                                                                             | Vendor to specify              |              |            |
| 2.3.11 | Torque/Power/Speed diagram of spindle motor is to be submitted with the offer.                                                                | Vendor to confirm              |              |            |
| 2.3.12 | Spindle Orientation (Programmable)                                                                                                            | Vendor to confirm              |              |            |
| 2.3.13 | Distance from Table Top to Spindle Face "200 to 800mm (min - max)" / to suit machine capability in line with specified application.           | Vendor to specify              |              |            |
| 2.4    | <b>TRAVERSES:</b>                                                                                                                             |                                |              |            |
| 2.4.1  | Longitudinal Travel (X-Axis) : 2000 mm or more                                                                                                | Vendor to Specify              |              |            |
| 2.4.2  | Spindle Head Vertical Travel (Z Axis) : 800 mm or more                                                                                        | Vendor to Specify              |              |            |
| 2.4.3  | Column Cross Travel (Y-Axis) : 800 mm or more                                                                                                 | Vendor to Specify              |              |            |
| 2.5    | <b>FEEDS AND DRIVE SYSTEM:</b>                                                                                                                |                                |              |            |
| 2.5.1  | Rapid feed rate X-Axis: 15 m/min (minimum).                                                                                                   | Vendor to Specify              |              |            |
| 2.5.2  | Rapid feed rate Y-Axis : 15 m/min (minimum).                                                                                                  | Vendor to Specify              |              |            |
| 2.5.3  | Rapid feed rate Z-Axis : 15 m/min (minimum).                                                                                                  | Vendor to Specify              |              |            |
| 2.5.4  | Feed Rate in X Axis (Infinitely variable) : 1 to 10,000 mm/min or more                                                                        | Vendor to Specify              |              |            |
| 2.5.5  | Feed Rate in Y-Axis (Infinitely variable) : 1 to 10,000 mm/min or more                                                                        | Vendor to Specify              |              |            |
| 2.5.6  | Feed Rate in Z-Axis (Infinitely variable) : 1 to 10,000 mm/min or more                                                                        | Vendor to Specify              |              |            |
| 2.5.7  | Feed motors & drive : FANUC ai / $\beta$ i or SIEMENS 1FT/1FK series AC servo motors with matching AC servo drives. (Details to be submitted) | Vendor to confirm              |              |            |
| 2.5.8  | Feedback system for X, Y & Z axes. Heidenhain / Fagor / Renishaw sealed linear scales. (Details to be submitted)                              | Vendor to confirm              |              |            |
| 2.5.9  | Details of System to ensure zero backlash for the axes                                                                                        | Vendor to confirm              |              |            |

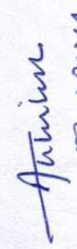
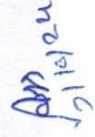
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| 2.7.17  | Working of Tool Changer Arm should be explained in details. Full ATC catalogue should be submitted with the offer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Vendor to confirm                  |              |            |
| 2.8     | <b>OPERATION AND CONTROL SYSTEM:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                    |              |            |
| 2.8.1   | <b>OPERATOR'S PANEL:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                    |              |            |
| 2.8.1.1 | Swiveling type air conditioned Operator's Pendant/Desk of Rittal/Schneider make (preferable) or equivalent Internationally reputed make having complete CNC and machine control system with 10.4" min. color LCD/LED/TFT of required configuration shall be provided on the operator platform. All switches with suitable interlock with table rotation should be within reach of operator of average height (170cm) for easy & safe operation. All displays/indications should also be conveniently placed accordingly. Safety cage is required for control panel. Layout showing complete details should be submitted. | Vendor to confirm                  |              |            |
| 2.8.2   | <b>CNC SYSTEM &amp; FEATURES :</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                    |              |            |
| 2.8.2.1 | Make : Siemens/Fanuc                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Vendor to specify                  |              |            |
| 2.8.2.2 | Type : PC based latest version                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Vendor to specify                  |              |            |
| 2.8.2.3 | Model (Latest version of hardware and firmware equivalent to Siemens 828D/Fanuc Oi MF or better , as available at the time of ordering should be supplied)                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Vendor to confirm                  |              |            |
| 2.8.2.4 | Details of Standard features (List to be Submitted)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Vendor to confirm                  |              |            |
| 2.8.2.5 | Details of optional features, recommended by vendor. (Including features required for Prove-Out Components)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Vendor to specify                  |              |            |
| 2.8.2.6 | The system should have full alphanumeric keyboard, LCD/LED/TFT colour display(10.4" or more), additional draw-out type Query Key Board and mouse in suitable enclosure , suitable interface for printer, network ready with LAN, electronic hand wheels for all axes, Solid state hard disk of sufficient capacity (2TB Min), graphic simulation and preinstalled system software & other required softwares etc.(Details should be submitted by Vendor). The CNC System shall also have USB Port with 1 GB Pen drive (for each machine) for data input/output,                                                          | Vendor to offer and submit details |              |            |
| 2.8.2.7 | Provision for automatic safe shut down of CNC Control in case of Power Failure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Vendor to confirm                  |              |            |
| 2.8.2.8 | The Controller should have feature to accept USB Pen-Drives / PCMCIA/Flash Card for Part Program and Machine data transfer both ways.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Vendor to confirm                  |              |            |
| 2.8.2.9 | UPS of 30 Minutes for CNC system with inbuilt cooling and charge status display                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Vendor to confirm                  |              |            |
| 2.8.3   | <b>MANUAL CONTROL:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                    |              |            |
| 2.8.3.1 | Complete manual control of machine with required switches/ keys should be provided on operator's panel for selection of required axis, axis direction, cutting feed, table/ spindle speed, cutting feed on/off, display of axis position values etc. for manual operation without using CNC program, CNC option Manual Turn or MDI mode. Diagrams/ sketches for switches/ keys provided on operator's pendant should be submitted.                                                                                                                                                                                       | Vendor to confirm                  |              |            |
| 2.8.4   | <b>HAND HELD UNIT:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                    |              |            |

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| 2.8.4.1     | Hand Held unit, along with sufficient length of interfacing cable is to be offered for handwheel (MPG) operation of individual axis in jog & increment mode & provision for spindle inch in c.w. & c.c.w. directions.                                                                                                                         | Vendor to confirm                    |              |            |
| <b>2.9</b>  | <b>MACHINE LIGHTS:</b>                                                                                                                                                                                                                                                                                                                        |                                      |              |            |
| 2.9.1       | Machine Lights for sufficient illumination of complete working area should be provided for clear visibility.                                                                                                                                                                                                                                  | Vendor to confirm                    |              |            |
| 2.9.2       | A magnetic base portable spot light with sufficiently long cable should also be provided.                                                                                                                                                                                                                                                     | Vendor to confirm                    |              |            |
| 2.9.3       | All light fittings, consumables, adapters/receptacles should have compatibility with Indian equivalents                                                                                                                                                                                                                                       | Vendor to confirm                    |              |            |
| 2.9.4       | Flashing / rotary type End of Cutting and Program Stop Light.                                                                                                                                                                                                                                                                                 | Vendor to confirm                    |              |            |
| <b>2.10</b> | <b>AIR CONDITIONERS:</b>                                                                                                                                                                                                                                                                                                                      |                                      |              |            |
| 2.10.1      | Air Conditioners with Dehumidifiers of suitable / sufficient capacity should be provided for all Electrical / Electronic Panels / Cabinets including Operator's Panel considering specified ambient conditions. Acceptable makes Werner Finley/ Rittal/ Advance cooling only.<br>Detailed specifications of the same to be submitted.         | Vendor to confirm                    |              |            |
| <b>2.11</b> | <b>HYDRAULIC SYSTEM : Details should be submitted by the vendor.</b>                                                                                                                                                                                                                                                                          |                                      |              |            |
| 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 or equivalent from a reputed manufacturer. (Details to be submitted)                                                                                                                                                                                                                                            | Vendor to specify                    |              |            |
| 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 and submit details |              |            |
| 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 confirm                       |              |            |
| 2.11.9      | <u>First filling of all required oil &amp; grease etc.</u> should be supplied by vendor. Indigenous (Indian) source, or Indian Equivalent, and specifications of oils/ greases also should be provided by the vendor.                                                                                                                         | Vendor confirm                       |              |            |
| <b>2.12</b> | <b>COOLANT SYSTEM :</b>                                                                                                                                                                                                                                                                                                                       |                                      |              |            |
| 2.12.1      | Coolant System with all accessories for following variants shall be provided. Selection of all the variants shall be through program and push buttons as well. a) Recirculating Type Flood Coolant System through adjustable trajectory multiple nozzles around the spindle b) High Pressure Coolant through Spindle                          | Vendor to confirm                    |              |            |
| 2.12.2      | All attachments, tool holders, adapters etc. shall have the provision so that coolant is available directly at the tool-cutting tip.                                                                                                                                                                                                          | Vendor to confirm                    |              |            |
| 2.12.3      | Coolant collection and recirculation system should be leakproof & perfect to avoid any spillage on shop floor, trenches for cables & foundation pit of the machine etc.                                                                                                                                                                       | Vendor to confirm                    |              |            |

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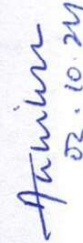
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| 2.12.4      | <b>Coolant Filtration System:</b> Recirculating type coolant system with Vacuum Rotary drum type System/ Cartridge Type Filtration System and magnetic separator.                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Vendor to confirm              |              |            |
| 2.12.5      | Coolant Flow Diagram showing filters, pumps, valves, tanks etc. to be submitted with the offer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Vendor to confirm              |              |            |
| 2.12.6      | Pressure & rate of flow of coolant for different variants should be furnished in the offer. The Pressure should be sufficient for the coolant to reach the tool tip at full pressure.                                                                                                                                                                                                                                                                                                                                                                                                                               | Vendor to confirm              |              |            |
| 2.12.7      | Coolant Tank Capacity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Vendor to confirm              |              |            |
| 2.12.8      | Coolant pump and motor details for all variants                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Vendor to Specify              |              |            |
| 2.12.9      | The coolant tank should be fitted with skimmer for regular cleaning of coolant from contamination with tramp oil.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Vendor to confirm              |              |            |
| <b>2.13</b> | <b>ELECTRICAL:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                |              |            |
| 2.13.1      | 415V (fluctuation + 10% / -10%), 50HZ (fluctuation +/-3 HZ), 3 Phase AC (4 wire system with neutral) Power Supply Voltage 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 accept & confirm     |              |            |
| 2.13.2      | <b>Tropicalisation:</b> All electrical / electronic equipment shall be tropicalized                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Vendor to confirm              |              |            |
| 2.13.3      | All electrical & electronic control cabinets & panels should be dust and rodent proof                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Vendor to confirm              |              |            |
| 2.13.4      | All electrical components should be mounted on DIN Rail                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Vendor to confirm              |              |            |
| 2.13.5      | Electrical cabinets should be of Rittal/Schneider make or any other equivalent from reputed International make, properly air conditioned and sealed from ingress from all liquids & encroachments of rodents. Operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220Volts, 5/15 Amp AC. All adapters/receptacles should have compatibility with Indian equivalents.                                                                                                                                                                                    | Vendor to confirm              |              |            |
| 2.13.6      | Motors shall conform to IEC or Indian Standards                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Vendor to confirm              |              |            |
| 2.13.7      | All cables moving with traversing axes should be installed in caterpillar / Drag chain. Additionally, all the cable trays required for laying of cables should be included in the offer.                                                                                                                                                                                                                                                                                                                                                                                                                            | Vendor to confirm              |              |            |
| 2.13.8      | Vendor should ensure the proper earthing for the machine and its peripherals.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Vendor to confirm              |              |            |
| 2.13.9      | In-cycle hour counter with reset facility.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Vendor to confirm              |              |            |
| <b>2.14</b> | <b>SAFETY ARRANGEMENTS:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                |              |            |
|             | Following safety features in addition to other standard safety features should be provided on the machine:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Vendor to confirm              |              |            |
| 2.14.1      | 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              |              |            |
| 2.14.2      | A detailed list of all alarms / indications provided on machine should be submitted by the supplier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Vendor to confirm              |              |            |

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| S.NO.  | DESCRIPTION FOR BHEL REQUIREMENT                                                                                                                                                                                                                                                                     | SPECIFIED / TO BE CONFIRMED BY | BIDDER OFFER | DEVIATIONS |
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| 2.14.3 | 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 | All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations.                                                                                                                                                                                        | Vendor to confirm              |              |            |
| 2.14.5 | Emergency Switches at suitable locations as per International Norms are to be provided.                                                                                                                                                                                                              | Vendor to confirm              |              |            |
| 2.14.6 | Oil & water pipe lines should not run with electrical cable in the same tray / trench.                                                                                                                                                                                                               | Vendor to confirm              |              |            |
| 2.15   | <b>ENVIRONMENTAL PERFORMANCE OF THE MACHINE :</b>                                                                                                                                                                                                                                                    |                                |              |            |
|        | The Machine shall conform to following factors related to environment :                                                                                                                                                                                                                              |                                |              |            |
|        | (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              |              |            |
|        | (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              |              |            |
|        | (g) Proper guard for chips fly coolant splash to be provided                                                                                                                                                                                                                                         | Vendor to confirm              |              |            |
|        | <b>CHIP CONVEYOR:</b>                                                                                                                                                                                                                                                                                |                                |              |            |
| 3.0    | A chip conveyor to carry both short and curly chips efficiently and effectively to the chip bin on the floor, should be provided at the side of the machine. Two chip bins of appropriate size of Indian make, with wheels and handle for movement, should also be supplied.                         | Vendor to confirm              |              |            |
| 3.1    | Type of chip conveyor                                                                                                                                                                                                                                                                                | Vendor to specify              |              |            |
| 3.2    | Width of conveyor                                                                                                                                                                                                                                                                                    | Vendor to specify              |              |            |
| 3.3    | Elevation of chip conveyor for chip bin                                                                                                                                                                                                                                                              | Vendor to specify              |              |            |
| 3.4    | Material of chip conveyor (to be rust resistant)                                                                                                                                                                                                                                                     | Vendor to specify              |              |            |
| 3.5    | Provision for smooth flow of chips to the conveyor.                                                                                                                                                                                                                                                  | Vendor to specify              |              |            |
| 3.6    | Operation of chip conveyor (forward & reverse) through push buttons on operator's panel and at Chip Conveyor                                                                                                                                                                                         | Vendor to confirm              |              |            |
| 3.7    | Layout showing location of chip conveyor should be submitted.                                                                                                                                                                                                                                        | Vendor to confirm              |              |            |
| 3.8    | <b>COMPRESSED AIR POINTS:</b>                                                                                                                                                                                                                                                                        |                                |              |            |
| 4.0    | Compressed Air Point with manual ON/ OFF Valve and flexible pipe of suitable length for work piece cleaning.                                                                                                                                                                                         | Vendor to offer                |              |            |
| 4.1    | <b>TOOLINGS:</b>                                                                                                                                                                                                                                                                                     |                                |              |            |
| 5.0    | Vendor to supply 1 set of required tools & fixture for machining of components as per drg no- HSTN205377 R01, R02 or R03 or 24661850017 & HSTN 310452.                                                                                                                                               | Vendor to confirm and submit   |              |            |
| 5.1    |                                                                                                                                                                                                                                                                                                      |                                |              |            |

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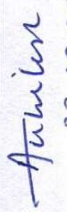
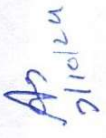
| S.NO. | DESCRIPTION FOR BHEL REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                         | SPECIFIED / TO BE CONFIRMED BY | BIDDER OFFER | DEVIATIONS |
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| 5.2   | All supplied tool holders, cutting Tools, adapters etc. shall have built in system for the coolant so that coolant is available directly on the cutting tip during all possible operations. Provision for external coolant shall also be provided.                                                                                                                                                                       | Vendor to confirm and submit   |              |            |
| 5.3   | All types of tool holders, adapters, sleeves, pull studs, Centering Devices etc. required for the machine.                                                                                                                                                                                                                                                                                                               | Vendor to confirm and submit   |              |            |
| 5.4   | Tooling from SANDVIK, SECO, ISCAR, KENNAMETAL & WIDIA or any equivalent international make operating in India shall be supplied along with the offer.                                                                                                                                                                                                                                                                    | Vendor to confirm and submit   |              |            |
| 5.5   | Detailed drawing/catalogue of all the toolings are to be supplied in the event of order.                                                                                                                                                                                                                                                                                                                                 | Vendor to confirm and submit   |              |            |
| 5.6   | Vendor to supply consumables (inserts) for machining of 3 set of three components                                                                                                                                                                                                                                                                                                                                        | Vendor to confirm and submit   |              |            |
| 6.0   | <b>DIAGNOSTIC SYSTEM</b>                                                                                                                                                                                                                                                                                                                                                                                                 |                                |              |            |
| 6.1   | Supplier's own diagnostic system with required hardware and software should be supplied and installed on the CNC system. This should include standard auto-diagnostic system with supporting hardware and software which shows detailed cause and remedy for the fault on the display and supplier's smart diagnostic system for full video diagnostic help for faults related to mechanical and electrical maintenance. | Vendor to offer                |              |            |
| 7.0   | <b>LEVELING &amp; ANCHORING SYSTEM</b>                                                                                                                                                                                                                                                                                                                                                                                   |                                |              |            |
| 7.1   | Complete anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc should be supplied                                                                                                                                                                                                                                                                                               | Vendor to confirm              |              |            |
| 8.0   | <b>TOOLS FOR ERECTION, OPERATION &amp; MAINTENANCE :</b>                                                                                                                                                                                                                                                                                                                                                                 |                                |              |            |
| 8.1   | 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 brought. List of such tools should be submitted with offer                                                                                                                                                                              | Vendor to confirm              |              |            |
| 8.2   | Test mandrel for checking run-out/taper & alignment should be brought.                                                                                                                                                                                                                                                                                                                                                   | Vendor to confirm              |              |            |
| 9.0   | <b>ACCESSORIES:</b>                                                                                                                                                                                                                                                                                                                                                                                                      |                                |              |            |
| 9.1   | Machine shall have sound dampening enclosure with interlocked doors in the tool and workpiece area and access door at operator's panel. Enclosure shall have large safety glass, viewing window for viewing the job and ongoing process.                                                                                                                                                                                 | vendor to confirm              |              |            |
| 9.2   | Tool Cabinet to be provided                                                                                                                                                                                                                                                                                                                                                                                              | vendor to confirm              |              |            |
| 10.0  | <b>SPARES:</b>                                                                                                                                                                                                                                                                                                                                                                                                           |                                |              |            |
| 10.1  | Itemised breakup of mechanical, hydraulic, electrical and electronic spares used on the machine (as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis) should be offered by vendor. The list to include following in additio to other recommendd spares. (Unit price of each item, make & model of spare shall be offered)                                     | Vendor to offer & submit       |              |            |

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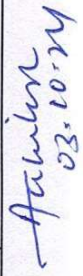
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| S.NO.  | DESCRIPTION FOR BHEL REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                   | SPECIFIED / TO BE CONFIRMED BY | BIDDER OFFER | DEVIATIONS |
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| 10.1.1 | <b>Mechanical &amp; Hydraulic Spares:</b> All types of Pumps, Valves, Pressure Switches, Transducers, Flow Switches, Filters, Seals, O-rings, Hydraulic Hoses etc                                                                                                                                                                                                                                                                  | Vendor to offer                |              |            |
| 10.1.2 | <b>Electrical / Electronic / CNC Spares:</b> 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, CNC controller, Operator's panel with Display Unit, I/O Cards for PLC, Servo Motors for Feed Drives, Power Module & Control Cards for Main Drive as well as Feed Drives etc | Vendor to offer                |              |            |
| 10.1.3 | All types of spares for total machine and accessories should be available for at least ten years after supply of the machine. If machine, software 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 offer                |              |            |
| 10.1.4 | List of recommended set of spares for all assemblies & sub assemblies of machine are to be offered with details                                                                                                                                                                                                                                                                                                                    | Vendor to offer                |              |            |
| 10.1.5 | 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 offer                |              |            |
| 11.0   | <b>DOCUMENTATION :</b><br>Three sets of following documents (Hard copies) in English language should be supplied along with the machine                                                                                                                                                                                                                                                                                            | Vendor to confirm              |              |            |
| 11.1   | Operating manuals of Machine & CNC system                                                                                                                                                                                                                                                                                                                                                                                          |                                |              |            |
| 11.2   | Programming Manuals of Machine & CNC system                                                                                                                                                                                                                                                                                                                                                                                        |                                |              |            |
| 11.3   | Detailed Maintenance manual of machine with all drawings of machine assemblies/sub-assemblies/parts including Electrical / Pneumatic/ Coolant / Hydraulic circuit diagrams. All Assembly/ Sub Assembly Drawings shall be supplied with the part list also                                                                                                                                                                          |                                |              |            |
| 11.4   | Maintenance, Interface & commissioning manuals for CNC system, spindle & feed drives.                                                                                                                                                                                                                                                                                                                                              |                                |              |            |
| 11.5   | Manufacturing drawings for all supplied tool holders, coolant connections, adapters, sleeves, fixtures etc.                                                                                                                                                                                                                                                                                                                        |                                |              |            |
| 11.6   | Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.                                                                                                                                                                                                                                                                                                                                           |                                |              |            |
| 11.7   | Detailed specification of all rubber items and hydraulic/lube fittings                                                                                                                                                                                                                                                                                                                                                             |                                |              |            |
| 11.8   | Operating Manuals, Maintenance Manuals & Catalogues for supplied Automatic Tool Offset & Job Measuring Systems, Voltage Stabilizer, Isolation Transformer, Air-Compressor and all supplied Accessories.                                                                                                                                                                                                                            |                                |              |            |
| 11.9   | PLC program print-outs with comments in English.                                                                                                                                                                                                                                                                                                                                                                                   |                                |              |            |
| 11.10  | PLC program on CD, NC data & PLC data on SSD.                                                                                                                                                                                                                                                                                                                                                                                      |                                |              |            |
| 11.11  | Complete back-up of hard disk on GHOST CD and clear written Instructions (3 copies) to take back-up and reloading of a new SSD.                                                                                                                                                                                                                                                                                                    |                                |              |            |
| 11.12  | Complete Master List of parts used in the machine shall be submitted by the vendor.                                                                                                                                                                                                                                                                                                                                                |                                |              |            |
| 11.13  | Detailed assembly drawings of all the mechanical components .                                                                                                                                                                                                                                                                                                                                                                      |                                |              |            |

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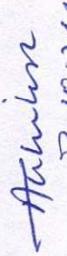
| S.NO. | DESCRIPTION FOR BHEL REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SPECIFIED / TO BE CONFIRMED BY | BIDDER OFFER | DEVIATIONS |
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| 11.14 | One additional set of all the above documentation on CD ROM, wherever possible.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                |              |            |
| 12.0  | <b>TRAINING</b><br>BHEL Persons should be trained at supplier's Works for 7 days in the area of<br>(a) CNC Part Programming / Technology, Use of all CNC Features, Programming for Measuring Systems & supplied accessories etc. 1 Person<br>(b) Electrical, Electronic & CNC maintenance for machine & other supplied equipments. 1 Person<br>(c) Mechanical & Hydraulic maintenance of the machine & other supplied equipments. 1 Person<br>(d) Operation of the machine & other supplied equipments. 1 Person                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Vendor to confirm              |              |            |
| 12.1  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                |              |            |
| 12.2  | Air-fare, boarding & lodging for the trainees shall be borne by BHEL.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                |              |            |
| 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 / days basis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Vendor to confirm              |              |            |
| 12.5  | Vendor should commit to organise training of Electronics Engineer and Programmer at the CNC system at Manufacturer's works for advance features and specialised training of so required by BHEL.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Vendor to confirm              |              |            |
| 13.0  | <b>FOUNDATION :</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                |              |            |
| 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. 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 <b>45 days</b> after getting BHEL's approval. The layout should consist of all requirements pertaining to complete machine including space requirement for Isolation Transformer, Air compressor, Chip Bin & any other accessories. BHEL shall construct complete foundation for the machine under supervision of supplier and at supplier's responsibility. 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  | <b>ERECTION &amp; COMMISSIONING</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                |              |            |
| 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 shall also be responsibility of the vendor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Vendor to confirm & offer      |              |            |
| 14.3  | Successful proving of BHEL components by the supplier shall be considered as part of commissioning. All tests, as mentioned at clause 20 (Machine Acceptance) shall form part of the commissioning activity.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Vendor to confirm              |              |            |

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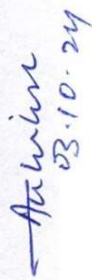
| S.NO.  | DESCRIPTION FOR BHEL REQUIREMENT                                                                                                                                                                                                                                                                                                           | SPECIFIED / TO BE CONFIRMED BY | BIDDER OFFER | DEVIATIONS |
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| 14.4   | Test mandrel for checking run-out/taper & alignment should be supplied.                                                                                                                                                                                                                                                                    | Vendor to confirm              |              |            |
| 14.5   | 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              |              |            |
| 14.6   | Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the supplier on returnable basis.                                                                                                                                                                                              | Vendor to confirm              |              |            |
| 14.7   | All Cover Plates required for the machine and its peripherals including pits, if any, shall be supplied and installed by the vendor. The plates should be sourced from India                                                                                                                                                               | Vendor to confirm              |              |            |
| 14.8   | 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              |              |            |
| 14.9   | Schedule of Erection and Commissioning shall be submitted with the offer.                                                                                                                                                                                                                                                                  | Vendor to submit               |              |            |
| 14.10  | E & C time from call of commissioning by BHEL shall be 2 month max.                                                                                                                                                                                                                                                                        | Vendor to confirm              |              |            |
| 14.11  | Supply time from the date of PO shall be 4 month max.                                                                                                                                                                                                                                                                                      | Vendor to confirm              |              |            |
| 14.12  | Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.                                                                                                                                                                                                                         | Vendor to submit               |              |            |
| 15.0   | <b>ACCURACY TESTS:</b>                                                                                                                                                                                                                                                                                                                     |                                |              |            |
| 15.1   | <b>GEOMETRICAL ACCURACIES :</b>                                                                                                                                                                                                                                                                                                            |                                |              |            |
| 15.1.1 | Submit test chart for all accuracies as per DIN 8609/ ISO 10791 standard or equivalent applicable standard.                                                                                                                                                                                                                                | Vendor to confirm and submit.  |              |            |
| 15.1.2 | 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              |              |            |
| 15.2   | <b>MACHINE POSITIONING ACCURACIES &amp; REPEATABILITY:</b><br>Should be measured as per VDI/ DGQ3441/ ISO 230-2 (Latest Revision) using LASER INTERFERO METER.                                                                                                                                                                             | Vendor to confirm              |              |            |
| 15.2.1 | Positioning accuracy in X / Y axis (Pa) per 1000 mm: 025 mm or better                                                                                                                                                                                                                                                                      | Vendor to confirm and submit   |              |            |
| 15.2.2 | Positioning accuracy in Z axis (Pa) per 1000 mm: 025 mm or better                                                                                                                                                                                                                                                                          | Vendor to confirm and submit   |              |            |
| 15.2.3 | Repeatability in X / Y axis (Ps): 0.01 or better                                                                                                                                                                                                                                                                                           | Vendor to confirm and submit   |              |            |
| 15.2.4 | Repeatability in Z axis (Ps) : 0.01 or better                                                                                                                                                                                                                                                                                              | Vendor to confirm and submit   |              |            |
| 15.2.5 | Positioning accuracy over entire traverse in X / Y axis (Pa)                                                                                                                                                                                                                                                                               | Vendor to specify              |              |            |
| 15.2.6 | Positioning accuracy over entire traverse in Z axis (Pa)                                                                                                                                                                                                                                                                                   | Vendor to specify              |              |            |
| 16.0   | <b>OPERATING CONDITIONS &amp; THERMAL STABILITY</b>                                                                                                                                                                                                                                                                                        |                                |              |            |

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| S.NO. | DESCRIPTION FOR BHEL REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | SPECIFIED / TO BE CONFIRMED BY | BIDDER OFFER | DEVIATIONS |
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| 16.1  | <p>Total machine including CNC system and all supplied items should work trouble free and efficiently under following operating conditions and should give specified accuracies.</p> <p>Power Supply:<br/> Voltage: 415 V - 10%, +10%<br/> Frequency: 50 Hz +3%, - 3%<br/> No. of phases = 3<br/> Ambient Conditions: Temperature = 5 to 45 degree celsius<br/> Relative Humidity = 95% max.<br/> (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)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Vendor to confirm              |              |            |
| 16.2  | <p>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. Max. temperature variation is up to 25 deg Celsius in 24 hours.<br/> (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)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Vendor to confirm              |              |            |
| 16.3  | <p>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.<br/> (Confirm that machine is suitable for above and details of provisions on the machine for the same should be furnished)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Vendor to confirm              |              |            |
| 17.0  | <b>PROVEOUT OF BHEL COMPONENT: 2 Sets of three components on each machine</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                |              |            |
| 17.1  | <p>Vendor to carry out complete machining of THREE prove out components as per enclosed drawing (Drawing no. HSTN205377 R01, R02 or R03 or 24661850017 &amp; HSTN 310452 ). Vendor to submit preliminary process, time study &amp; tool list &amp; fixture recommended by them. Change in process/tools may be mutually discussed and agreed. Complete machining of prove out components shall be done by Vendor at BHEL works to the specified design accuracy and surface finish, using cutting tools, fixture and CNC programs provided by the vendor to prove the machine after complete erection, testing &amp; test piece machining etc. Material for the prove out components shall be provided by BHEL. Vendor should submit the CNC programs, setting schemes, process sheets, tooling layouts, time studies etc. for the prove out components. <b>Vendor to supply cutting tools (along with adaptor, holders, sleeves, inserts etc) and required fixture to hold the prove out components for successful machining.</b></p> | Vendor to confirm              |              |            |
| 17.2  | <p>Vendor shall be fully responsible for machining of proveout component as per drawing and other requirements specified by BHEL to the full satisfaction of BHEL. Clarifications, if any required by vendor, regarding accuracy requirements of the proveout components, whether specified or not, should be discussed and cleared by vendor during initial technical discussions.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Vendor to confirm              |              |            |

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| S.NO.  | DESCRIPTION FOR BHEL REQUIREMENT                                                                                                                                                                                                                                                                                                                              | SPECIFIED / TO BE CONFIRMED BY           | BIDDER OFFER | DEVIATIONS |
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| 17.3   | Vendor shall be responsible for any deviation/rejection in proveout component due to wrong machining or malfunctioning of the machine during proveout machining and also for the delay in machining due to improper recommended tooling etc. Regarding the cost of such deviation/rejection, commercial condition as informed separately shall be applicable. | Vendor to confirm                        |              |            |
| 18.0   | <b>MACHINE ACCEPTANCE: (Tests/Activities should be Performed by Vendor)</b>                                                                                                                                                                                                                                                                                   | Should be accepted & confirmed by Vendor |              |            |
| 18.1   | <b>Tests/Activities should be carried out at supplier's works on the machine before dispatch :</b>                                                                                                                                                                                                                                                            |                                          |              |            |
| 18.1.1 | Geometrical accuracies as per standar and test chart. Clause 17.1                                                                                                                                                                                                                                                                                             | Vendor to accept & confirm               |              |            |
| 18.1.2 | Positioning accuracies as per VDI/ DGQ3441/ ISO 230-2. Clause 17.2                                                                                                                                                                                                                                                                                            | Vendor to accept & confirm               |              |            |
| 18.1.3 | The machine should be tested for continuous running of 24 hrs. If any break down occurs during this test, the test should be repeated for 24 hrs from that time.                                                                                                                                                                                              | Vendor to accept & confirm               |              |            |
| 18.1.4 | Demonstration of all features of the machine, control system & accessories                                                                                                                                                                                                                                                                                    | Vendor to accept & confirm               |              |            |
| 18.1.5 | Machining of test piece as per NAS/AFNOR/ISO. Vendor to supply test piece and tooling for it's machining                                                                                                                                                                                                                                                      | Vendor to accept & confirm               |              |            |
| 18.2   | <b>Tests/Activities should be carried out at BHEL works while commissioning the machine :</b>                                                                                                                                                                                                                                                                 |                                          |              |            |
| 18.2.1 | Geometrical accuracies as per standar and test chart. Clause 17.1                                                                                                                                                                                                                                                                                             | Vendor to accept & confirm               |              |            |
| 18.2.2 | Positioning accuracies as per VDI/ DGQ3441/ ISO 230-2. Clause 17.2                                                                                                                                                                                                                                                                                            | Vendor to accept & confirm               |              |            |
| 18.2.3 | Full load test to demonstrate the maximum power & cutting capacity of the machine.                                                                                                                                                                                                                                                                            | Vendor to accept & confirm               |              |            |
| 18.2.4 | The machine should be tested for continuous running of 24 hrs. If any break down occurs during this test, the test should be repeated for 24 hrs from that time.                                                                                                                                                                                              | Vendor to accept & confirm               |              |            |
| 18.2.5 | 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 accept & confirm               |              |            |
| 18.2.6 | Two weeks supervision of independent operation of machine by BHEL after pieces and tooling for it's machining.                                                                                                                                                                                                                                                | Vendor to accept & confirm               |              |            |
| 18.2.7 | Proveout machining of 2sets of three components as per drg no- HSTN205377 R01, R02 or R03, or 24661850017 & HSTN 310452 on each machine.                                                                                                                                                                                                                      | Vendor to accept & confirm               |              |            |
| 18.2.8 | Machining test piece as per NAS/AFNOR/ISO. Vendor to arrange Test pieces and tooling for it's machining.                                                                                                                                                                                                                                                      | Vendor to accept & confirm               |              |            |

 03.10.24  
 21/10/24

| S.NO.       | DESCRIPTION FOR BHEL REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | SPECIFIED / TO BE CONFIRMED BY | BIDDER OFFER | DEVIATIONS |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------|------------|
| 18.2.9      | 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 accept & confirm     |              |            |
| 18.2.10     | Demonstration by actual use of all supplied attachments and accessories to their full capacity.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Vendor to accept & confirm     |              |            |
| <b>19.0</b> | <b>PACKING:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                |              |            |
| 19.1        | Sea worthy & rigid packing for all items of complete machine, CNC System, all Accessories and other supplied items to                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Vendor to confirm              |              |            |
| <b>20.0</b> | <b>GUARANTEE :</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                |              |            |
| 20.1        | 24 months from the date of commissioning & acceptance of the machine at BHEL Jhansi.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Vendor to confirm              |              |            |
| <b>21.0</b> | <b>GENERAL :</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                |              |            |
| 21.1        | Machine Model                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Vendor to specify              |              |            |
| 21.2        | Total connected load (KVA):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Vendor to specify              |              |            |
| 21.3        | Floor area required (Length, Width, Height) for complete machine & accessories                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Vendor to specify              |              |            |
| 21.4        | Painting of Machine / Electrical Panels : RAL 6011 Apple Green (Polyurethane Paint)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Vendor to confirm              |              |            |
| 21.5        | Total weight of the machine                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Vendor to specify              |              |            |
| 21.6        | Weight of heaviest part of machine                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Vendor to specify              |              |            |
| 21.7        | Weight of the heaviest assembly / sub-assembly of the Machine                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Vendor to specify              |              |            |
| 21.8        | Dimensions of largest part/ sub-assembly/ assembly of the machine                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Vendor to specify              |              |            |
| 21.9        | 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 submit               |              |            |
| 21.10       | Detailed catalogues, sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Vendor to submit               |              |            |
| 21.11       | Hydraulic, Pneumatic & oil pipings should be preferably metallic except places where flexible pipings are essential. All the pipes required for the same shall be included in the standard scope of the machine.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Vendor to submit               |              |            |
| <b>22.0</b> | <b>QUALIFYING REQUIREMENTS (QR) :</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |              |            |
| 22.1        | Only those vendors (OEMs) or OEM authorized dealer /distributors , who have supplied and commissioned at least 1 No. 3-Axis CNC Vertical Milling Machine of 15 KW or higher capacity spindle power in the past 7 years from the date of tender opening should quote. If the bidder is OEM-authorized dealer or distributor then bidder to submit valid authorization certificate from OEM & Letter from OEM for technical support for this tender & back to back gaurantee for satisfactory performance of the offered machine from OEM in compliance to all specified tender requirements. The following information is also to be submitted by all the bidders for qualification of their offer (BHEL may verify the supply and satisfactory performance / submitted credentials). | Vendor to accept & confirm     |              |            |

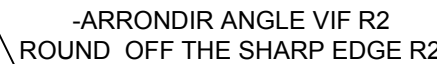
Attachment  
03.10.24

03/10/24

31/12/24

| S.NO.                                                                                                                                                                                                                                  | DESCRIPTION FOR BHEL REQUIREMENT                                                                                                                                                                                                                                                                                               | SPECIFIED / TO BE CONFIRMED BY | BIDDER OFFER | DEVIATIONS |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------|------------|
| 22.2                                                                                                                                                                                                                                   | Purchase order copy (Unpriced) along with proof of supply (Tax Invoice / GEM CRAC etc.) and proof of commissioning (commissioning certificate / commissioning MOM etc.) of minimum one number 3-Axis CNC Vertical Milling Machine of 15 KW or higher capacity spindle power during last 7 years from the date of this enquiry. | Vendor to submit               |              |            |
| 22.3                                                                                                                                                                                                                                   | Satisfactory Performance report from the customer for at least one year from date of commissioning of the same 3-Axis CNC Vertical Milling Machine or self declaration regarding satisfactory working of supplied 3-Axis CNC Vertical Milling Machine for last one year from date of enquiry.                                  | Vendor to submit               |              |            |
| 22.4                                                                                                                                                                                                                                   | Name of the customer / company                                                                                                                                                                                                                                                                                                 | Vendor to submit               |              |            |
| 22.5                                                                                                                                                                                                                                   | Complete postal address of the customer.                                                                                                                                                                                                                                                                                       | Vendor to submit               |              |            |
| 22.6                                                                                                                                                                                                                                   | Month & Year of commissioning                                                                                                                                                                                                                                                                                                  | Vendor to submit               |              |            |
| 22.7                                                                                                                                                                                                                                   | Name and designation of the contact person of the customer.                                                                                                                                                                                                                                                                    | Vendor to submit               |              |            |
| 22.8                                                                                                                                                                                                                                   | Phone, FAX no. and email address of the contact person of the customer.                                                                                                                                                                                                                                                        | Vendor to submit               |              |            |
| 23                                                                                                                                                                                                                                     | 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                                                                                                                                                  | Vendor to confirm              |              |            |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><i>Akhileshwar</i><br/>03.10.24</p> </div> <div style="width: 45%; text-align: right;"> <p><i>Ashis Kumar</i><br/>03.10.24</p> </div> </div> |                                                                                                                                                                                                                                                                                                                                |                                |              |            |
| Akhileshwar Kumar/ Sr. Manager-FBM                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                | Satish Soni/ Sr. Manager-WEX   |              |            |

DRG. NO.



NOTE :- THIS DRAWING IS EXACTLY SAME AS HSTN 205377 SHEET-2 EXCEPT FOR  
4 NOS. Ø 60 HOLES MARKED \* AND LOCATION OF SEC. F-F.

|                                  |
|----------------------------------|
| P2 ALLEGA 284-01 ANTICORODAL-110 |
| WEIGHT 39.4 KG.                  |

|                                                                                          |          |         |         |                                                                                                                                                                                                                                                  |  |                                                                                                             |  |                                            |  |                                                  |  |                              |  |                                             |  |                            |  |
|------------------------------------------------------------------------------------------|----------|---------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------|--|--------------------------------------------|--|--------------------------------------------------|--|------------------------------|--|---------------------------------------------|--|----------------------------|--|
| ADDITIONAL INFORMATION                                                                   |          |         |         | mRikn dk gdkj ;k<br>xzkgd A ifj;ksutk dk uke                                                                                                                                                                                                     |  |                                                                                                             |  | 7775 KVA FRT. LOCO TRANSFORMER             |  |                                                  |  |                              |  |                                             |  |                            |  |
| STATUS OF DRAWING                                                                        |          |         |         | TYPE OF PRODUCT OR<br>NAME OF CUSTOMER/PROJECT                                                                                                                                                                                                   |  |                                                                                                             |  | M/S :- C.L.W.                              |  |                                                  |  |                              |  |                                             |  |                            |  |
| DISTRIBUTION OF PRINTS                                                                   |          |         |         | <div>Hkkj gsoh bysfDV<sup>d</sup>Yl fyfeVsM<br/>&gt;iklh<br/>BHARAT HEAVY ELECTRICALS LTD.<br/>JHANSI</div> <div><div><div><div><div><div></div></div></div><div><div><div></div></div></div></div><div><div><div></div></div></div></div></div> |  |                                                                                                             |  | uke ANAME                                  |  | glrk-SIGN-                                       |  | fn-DATE                      |  | osfj dh<br>laf;k<br>NO. OF<br>VAR           |  |                            |  |
| TRE                                                                                      | TRP      | QAX     | BAY-6&7 |                                                                                                                                                                                                                                                  |  |                                                                                                             |  | cuk;k<br>DRN<br>AJAY SRIVASTAVA            |  |                                                  |  | 28.07.14                     |  |                                             |  |                            |  |
| 1                                                                                        | 1        | 1       | 2       |                                                                                                                                                                                                                                                  |  |                                                                                                             |  | tkipk<br>CKD<br>A.K. SRIVASTAVA            |  |                                                  |  | 28.07.14                     |  |                                             |  |                            |  |
| cuk;k<br>DRN<br>N.VARSHNEY                                                               |          |         |         |                                                                                                                                                                                                                                                  |  |                                                                                                             |  |                                            |  | 28.07.14                                         |  |                              |  |                                             |  |                            |  |
| REV-                                                                                     | DATE     | ALTERED |         | foHkKX<br>DEPT TRE<br>UNTOL DIMS- GR-<br>lh-A-e-A-Q/NVF                                                                                                                                                                                          |  | wuglkr<br>SCALE<br><div><div><div><div></div></div><div><div></div></div></div><div><div></div></div></div> |  | Hkkj %fd-zvk-<br>WEIGHT ( KG)              |  | Ws- M <sup>o</sup> kbZx dk lanHkZ<br>DRAWING NO- |  | en dz-<br>ITEM NO-           |  | en laf;k<br>NO. OF<br>ITEM                  |  |                            |  |
| 01                                                                                       | 18.03.15 | CHECKED |         | dksM<br>CODE 206                                                                                                                                                                                                                                 |  | 1 : 5                                                                                                       |  |                                            |  |                                                  |  |                              |  |                                             |  |                            |  |
| ZONE A-7 DIM. 110 WAS 115 AND 125 WAS 115.<br>ZONE E-7 DIM. 389 WAS 384 AND 155 WAS 160. |          |         |         | 'kh" kZdTITL                                                                                                                                                                                                                                     |  |                                                                                                             |  | PLAQUE DE BORNES<br>BUSHINGS PLATE HT SIDE |  |                                                  |  | dkMZ<br>dksM<br>CARD<br>CODE |  | vkjs[k dzaDRA<br>DRAWING NO-<br>24661850017 |  | iqu <sup>o</sup> REV<br>01 |  |
|                                                                                          |          |         |         |                                                                                                                                                                                                                                                  |  |                                                                                                             |  | i" B dz-SHT- NO- 02                        |  | i" Bksa dh loNOOF SHT- 03                        |  |                              |  |                                             |  |                            |  |

[illegible]

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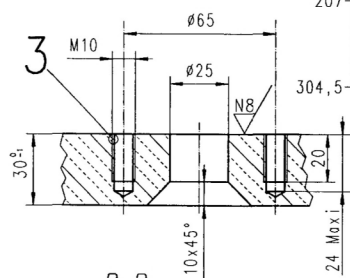
**AB**  
ASEA BROWN BOVERI



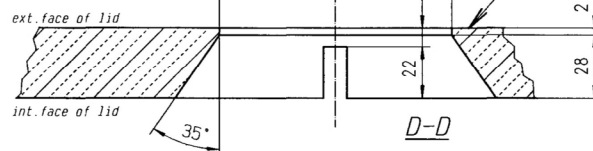
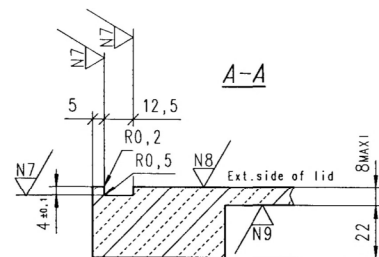
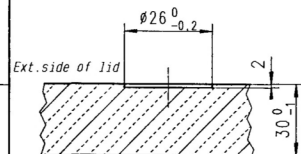
R1

⊕ DT 1/250

⊙ DT 3/2000



E-E



HSTN 205 377

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Linéaires et angulaires "moyen" ☒ "grossier" ☐ De forme et position  
selon DIN 7168 T 1, ISO 2768 DIN 7168 T 2 : ...

Symboles de rugosité selon  
DIN ISO 1302

-Ebavurer les angles vifs 0,2 à 0,5 x 45°  
-Round all the sharp edges 0,2 to 0,5 x 45°

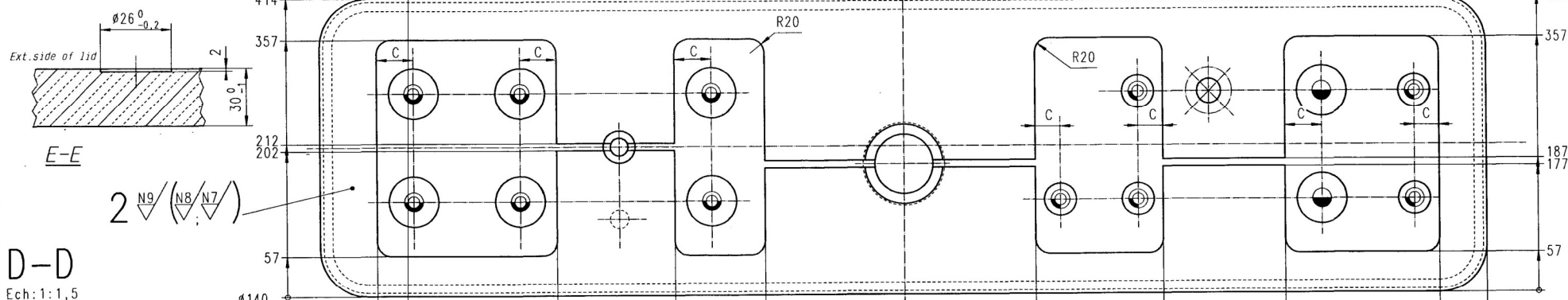
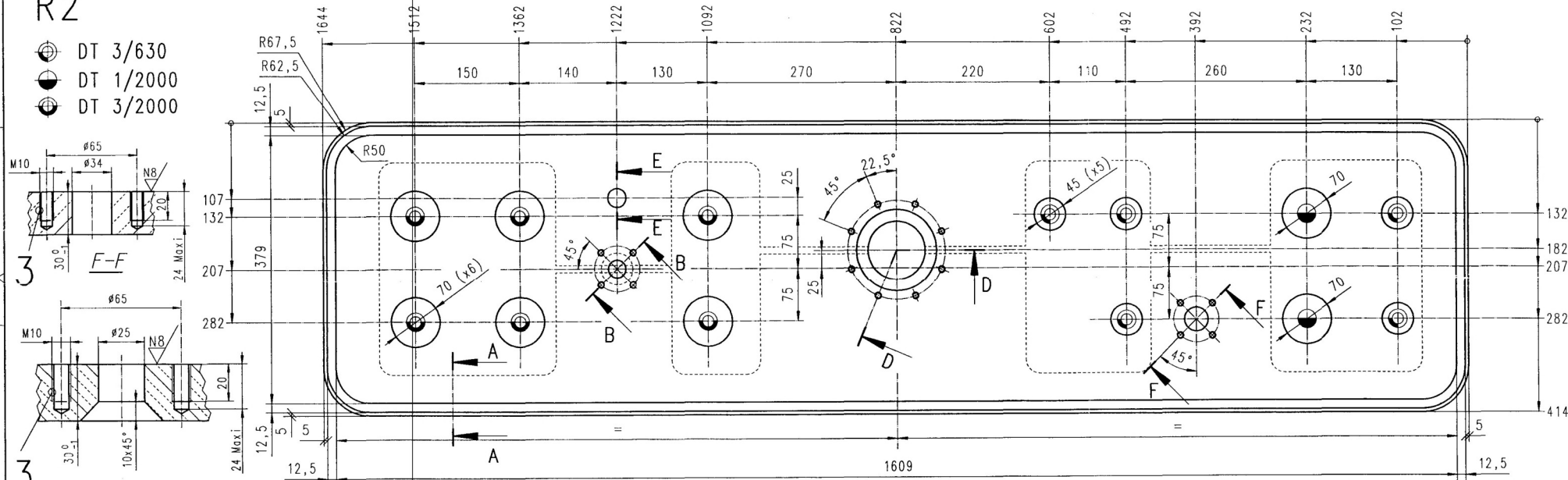
|                                  |                             |                                                 |                      |
|----------------------------------|-----------------------------|-------------------------------------------------|----------------------|
| Etabli : 94/04/26<br>MONGE       | Issu de :                   | Nomencl. sdp: de n. N° de n° d'1. Echelle : 1:4 | Gen. doc. Format : 2 |
| Contrôlé :                       | Service responsable : TTT-C | PLAQUE DE BORNES<br>BUSHINGS' PLATE             | Langue : 8           |
| Bon pr. ex. : 94/04/26<br>DORMIA | Service acquiescent :       |                                                 |                      |
| Modification : D) 95-05-30       |                             | 16882 WAPS/WAG9                                 | No. files : 3        |
| ABB ABB Sécheron SA              |                             | HSTN 205 377                                    |                      |
|                                  |                             | File n° : 1                                     |                      |

C<sup>+</sup> Voir dessin HSTN 422883 file 2/2  
See drawing HSTN 422883 file 2/2

P1 ALLEGA 284-01 ANTICORRODAL-110  
weight ≈ 37,9 kg

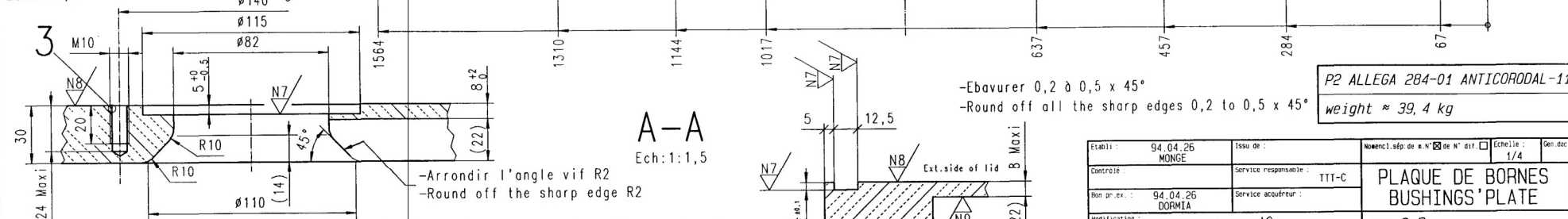
R2

- DT 3/630  
 DT 1/2000  
 DT 3/2000



D-D

Ech: 1:1,5



-Ebavurer 0,2 à 0,5 x 45°  
-Round off all the sharp edges 0,2 to 0,5 x 45°

P2 ALLEGA 284-01 ANTICORODAL-110  
weight ≈ 39,4 kg

HSTN 205 377

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Linéaires et angulaires "moyen" ☒ "grossier" ☐ De forme et position  
selon DIN 7168 T.1 : ISO 2768

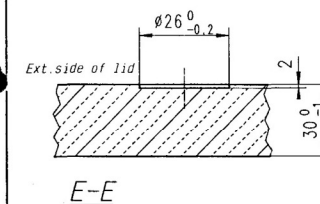
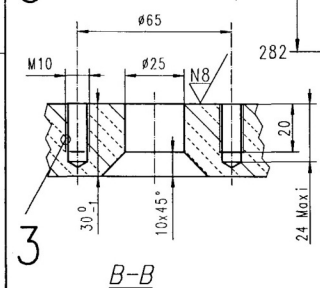
Symboles de rugosité selon  
DIN ISO 1302

|                     |                    |                       |       |                                 |           |            |          |
|---------------------|--------------------|-----------------------|-------|---------------------------------|-----------|------------|----------|
| Établi :            | 94.04.26<br>MONGE  | Issu de :             |       | Nomencl. sdp. de n° de N° dit : | Echelle : | Gen. doc : | Format : |
| Contrôle :          |                    | Service responsable : | TTT-C |                                 | 1/4       |            | 2        |
| Bon pr. ex. :       | 94.04.26<br>DORMIA | Service acquéreur :   |       |                                 |           |            |          |
| Modification :      | D) 95-05-30        |                       |       | 16882 B020                      |           |            |          |
| ABB ABB Sécheron SA |                    |                       |       | HSTN 205 377                    |           |            |          |

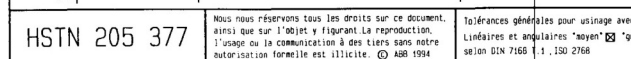
PLAQUE DE BORNES  
BUSHINGS' PLATE

weight ≈ 39,4 kg

DT 3/630  
DT 3/2000



Ech: 1:1,5



HSTN 205 377

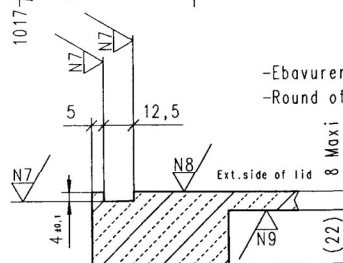
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Linéaires et angulaires "moyen" ☒ "grossier" ☐ De forme et position  
selon DIN 7168 1.1, ISO 2768 || DIN 7168 1.2 : ...

Symboles de rugosité selon  
DIN ISO 1302

A-A  
Ech:1:1,5

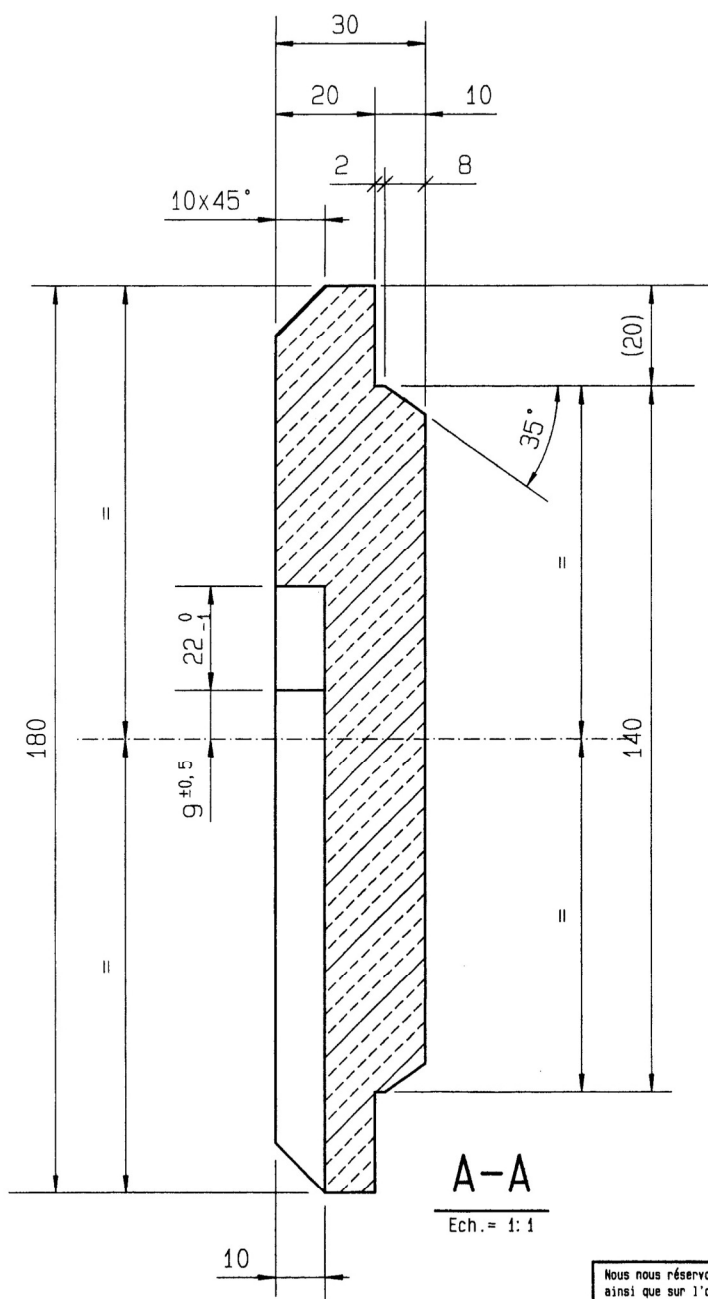
- Arrondir l'angle vif R2
- Round off the sharp edge R2



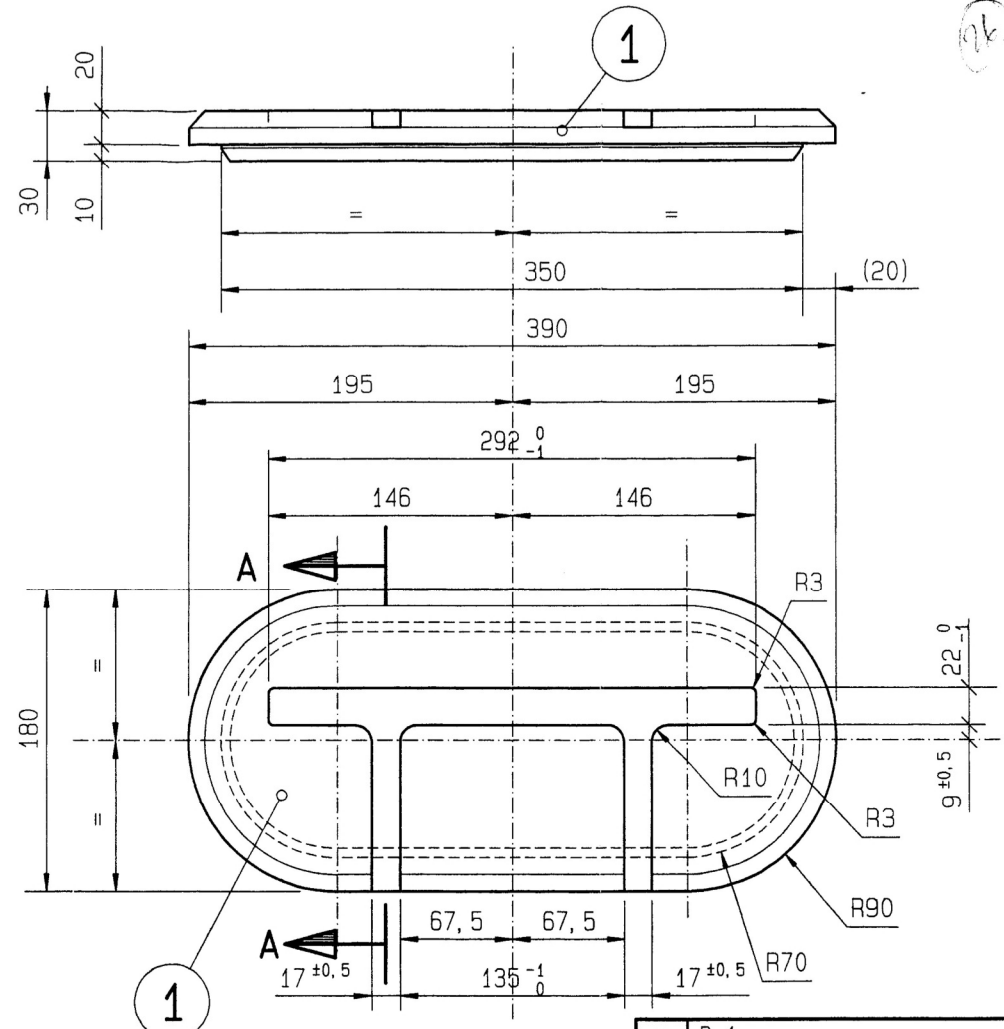
- Ebavurer 0,2 à 0,5 x 45°
- Round off all the sharp edges 0,2 to 0,5 x 45°

weight  $\approx 39,4 \text{ kg}$

|                                                                                                       |                                |                       |                                                                                                                     |                                     |     |          |             |               |
|-------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----|----------|-------------|---------------|
| (Eclair):                                                                                             | 95-05-30<br>BENEDICT           | Issu de :             | Nom et séq. de n° <input checked="" type="checkbox"/> de n° <input type="checkbox"/> d'aj. <input type="checkbox"/> | Echelle :                           | 1/4 | Gen. des | Format :    | 2             |
| Contrôle :                                                                                            |                                | Service responsable : | TTT-C                                                                                                               | PLAQUE DE BORNES<br>BUSHINGS' PLATE |     |          | Langue<br>B | No. file<br>3 |
| Gen. pr. ex. :                                                                                        | 95-05-30<br>DORMIA             | Service acquiescent : |                                                                                                                     |                                     |     |          |             |               |
| Modification :                                                                                        | DJ 95-05-30 <i>[Signature]</i> |                       |                                                                                                                     | 16939 CoCo                          |     |          |             | No. file<br>3 |
|  ABB Sécheron SA |                                |                       |                                                                                                                     | HSTN 205 377                        |     |          |             | File n°<br>3  |



**A-A**  
Ech. = 1:1



|                 |           |
|-----------------|-----------|
| Pos. 1          | masse Kg. |
| Anticorodal-110 | 4,7       |

|            |                  |
|------------|------------------|
| Pour TTT-C | P.1              |
|            | Allega N° 284-01 |

|                                          |                             |                                                                                             |               |             |            |
|------------------------------------------|-----------------------------|---------------------------------------------------------------------------------------------|---------------|-------------|------------|
| Etabli : 10.06.1992<br>HUMBERT           | Issu de :                   | Nomencl.sép.de m.N° <input checked="" type="checkbox"/> de N° dif. <input type="checkbox"/> | Echelle : 1:3 | Gen.doc     | Format : 3 |
| Contrôlé : <i>[Signature]</i>            | Service responsable : TTT-C | BRIDE<br>(console cuve)                                                                     |               |             |            |
| Bon pr.ex. : <i>[Signature]</i>          | Service acquéreur :         |                                                                                             |               |             | Langue : F |
| Modification : B) . 07.12.1992 HUMBERT ★ |                             | 16851                                                                                       | Class-92      | Nb.files: 1 |            |
| ABB ABB Sécheron SA                      |                             | HSTN 310452                                                                                 |               |             | File N°: 1 |

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