

## TECHNICAL SPECIFICATIONS

### RADIAL DRILLING MACHINE, CAPACITY =DIA 80 MM

#### 1.0 PURPOSE

Radial Drilling Machine shall be required to drill, core drill, ream and counter bore holes of different sizes upto 80 mm diameter, having accuracy upto H7 grade and surface finish upto 1.6 Microns (Ra), on different components of Steam Turbine.

#### 2.0 WORK PIECE MATERIAL:

The machine shall be suitable for drilling in components of Ferrous and non-ferrous metals like Carbon Steel, alloy steel, cast steel, cast iron, Bronze, Copper, Aluminum and similar other materials.

#### 3.0 MACHINE SPECIFICATIONS:

3.1 Maximum drilling capacity in steel (of 600 MPa tensile strength)	: 80 mm
3.2 Tapping in steel (maximum)	: M 75
3.3 Taper in spindle nose	: Morse Taper-6
3.4 Spindle speeds	: 15 to 1400 RPM (approx)
3.5 Spindle feed	: 0.04 to 2.5 mm/rev or more
3.6 Vertical travel of spindle	: 450 mm or more
3.7 Distance from the axis of spindle to the guideways of the column	: 500 mm to 2500 mm (approx)
3.8 Distance from the spindle nose to Base Plate	: 500 to 2000 mm (approx)
3.9 Maximum vertical traverse of the arm	: 1200 mm or more
3.10 Rotation of arm around column	: 360 Degree
3.11 Power of main motor	: 10 KW (or more)
3.12 Drill Head travel (motorised)	: 2000 mm or more
3.13 Working surface of Base Plate (minimum)	: 3000 mm X 1500 mm

#### 4.0 ACCESSORIES / OTHER ITEMS :

##### NOTES:

- List of standard accessories to be supplied with the offer, along with details of each item
- Cost of each item to be supplied separately

- 4.1 Box Table 1000 mm X 750 mm X 500 mm having T-slots on each clamping face
- 4.2 Coolant supply equipment with pump and motor
- 4.3 Set of Reduction Sleeves MT-6/ MT-5, MT-6/ MT-4, MT-6/ MT-3, MT-6/ MT-2 & MT-6/ MT-1 (Qty. 1 of each)
- 4.4 Foundation Bolts/ Anchoring material required for fixing of machine on the foundation
- 4.5 First filling of oil

#### 5.0 OTHER FEATURES:

- 5.1 Hydraulic arm clamping on the column
- 5.2 Hydraulic Head clamping on Arm
- 5.3 Powered Arm rotation
- 5.4 Powered head traverse
- 5.5 The machine should be capable of high stock removals with close tolerances on work piece. Metal removing rate in cc/min to be specified.

- 5.6 The machine must have rigid streamlined and vibration free construction. All gears must be case hardened and ground and all the slides should be rigid to withstand heavy stock removal. It should have independent main drive and feed drive motors.
- 5.7 A suitable, preferably centralised lubricating system for lubrication of all moving / rotating elements should be there preferably with interlock / alarm system in case of it's failure.
- 5.8 Each axis should have electrical limit switches interlocked with feed/ rapid drive as well as mechanical stopper.

## 6.0 **ACCURACY TESTS:**

All standard accuracy tests to be conducted at vendor's /customer's work shall be intimated with full details, giving reference to ISO / DIN standards. Drawings of test piece with details of cutting - accuracy tests to be conducted shall also be intimated. Test Piece shall be supplied by the vendor.

## 7.0 **SPARES**

### 7.1 **Mechanical & Hydraulic spare list should have followings:**

- 7.1.1 One number of each type of the following items used in hydraulic, lubrication and coolant circuit
- (a) Pumps
  - (b) Pressure reducing & pressure relief valves
  - (c) Direction control & flow control valves
  - (d) Pressure switches
  - (e) Level switches
  - (f) Flow switches
  - (g) One complete set of Rubber hoses used in the machine
- 7.1.2 Two numbers filter elements of regenerative type & ten numbers filter elements of disposable type used in hydraulic, lubrication and coolant circuit.
- 7.1.3 One set of each type of lead screw – lead nut used for feed drives of table, cross & vertical axis.
- 7.1.4 One set of wipers used in machine.
- 7.1.5 One number of each type of worm gears & bushes used in machine and spindle bush bearing

### 7.2 **Electrical spares**

- 7.2.1 If the control system incorporates PLC, then the spares should have one nos. of each type of I/O board and power supply unit.
- 7.2.2 All the electrical components should be of reputed make, e.g. Siemens, ABB, etc.
- 7.2.3 Spares should have 5 nos. of each type of indicating lamps and push buttons.
- 7.2.4 Spares should have 2 nos. of each type of relays and contractors.
- 7.2.5 Spares should have 2 nos. of each type of limit switches, proximity switches and pressure switches.
- 7.2.6 If the spindle speed and feed is controlled through a servo drive, then it should be of either Siemens or ABB make.
- 7.2.7 If slip ring is used for carrying power & control signals then its successful functioning must be guaranteed for three year.
- 7.2.8 Spares should have 2 nos. of each of Electromagnets and electrical coils of directional valves.
- 7.2.9 List of fast moving spares should be mentioned.
- 7.2.10 The machine should have machine lamp of 220V AC supply.

## 8.0 **POWER SUPPLY / ENVIRONMENT CONDITION**

- The machine should be suitable for operation in the following conditions: -
- Power supply for the machine: 415 V +10 % / -15 %, 3 phase, 50 Hz +/-3%
- For controls: 230 V +10 % / -15 %; 50 Hz +/- 3 %
- Temperature: 5 to 45 deg C

- Relative humidity: 95 % max.
- Compressed air: 4 to 6 Kg / sq. cm
- Other conditions: Similar to tropical country.
- Water supply industrial: 1.5 to 2.0 Kg / sq. cm
- Dust laden atmosphere during some part of the year.

#### **9.0 ENVIRONMENTAL PERFORMANCE OF THE MACHINE:**

- 9.1 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.
- 9.2 There shall not be any emissions from the machine except fumes of cutting fluid during machining.
- 9.3 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.
- 9.4 No hazardous chemicals shall be required to be used in the machine.
- 9.5 If any safety / environmental protection enclosure is required it should be built in the machine by the vendor.
- 9.6 Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant.

#### **10.0 MANUALS / DOCUMENTS**

- 10.1 5 sets of documents for operation, maintenance and servicing manuals for machine and other equipments to be provided in English language only, out of which 1<sup>st</sup> set to be sent along with offer.
- 10.2 Service manual should contain followings in addition to description
  - (a) Assembly drawings of each unit with marked list of each component with its specification & make
  - (b) Hydraulic, lubrication & coolant diagram with marked list of each component with its specification & make.
  - (c) Detail catalogue of bought – out items with its specification & make.
- 10.3 Foundation drawing is to be submitted by supplier within 4 weeks of placement of LOI.
- 10.4 Each document for operation, maintenance & service manual should be given on CD.

#### **11.0 OTHER REQUIREMENTS :**

- 11.1 Total power requirement of the machine to be specified by the supplier
- 11.2 Overall space required for installation of the machine to be specified by the supplier
- 11.3 Pre-dispatch inspection may be carried out by BHEL representative at Party's works. However it is at the discretion of BHEL and final acceptance will be done at BHEL, Hardwar after carrying out all the required accuracy tests etc.
- 11.4 Training of machine operation, mechanical & electrical maintenance should be provided free of cost at supplier works for one week.
- 11.5 The manufacturer shall take the full responsibility for supervising the erection, start up, testing of machine its controls and other supplied equipment, test piece machining etc. at BHEL Hardwar.
- 11.6 Color of the machine should be apple green as per ISO.
- 11.7 The supplier is to submit a clause wise deviation statement against each clause of this technical specification along with the offer