

SPECIFICATIONS OF VERTICAL MILLING MACHINE WITH D.R.O.

1.0 **PURPOSE**

The machine shall be required for machining of small components of various shape and sizes involving a high level of efficiency and accuracy.

2.0 **WORK PIECE MATERIAL**

Non-ferrous metals like aluminum alloys, bronze and ferrous materials like carbon steels, alloy steels, tool steels etc.

3.0 **MACHINE SPECIFICATIONS**

3.1 SPINDLE

- 3.1.1 Spindle position : Swiveling type Vertical
Swiveling angle +/- 45 deg.
- 3.1.2 Spindle taper : ISO 50
- 3.1.3 Spindle motor power : 7.5 KW or more
- 3.1.4 Spindle speed range : 20 to 2000 r.p.m. (approx.)
- 3.1.5 Vertical movement of quill : 70 mm or more

3.2 TABLE

- 3.2.1 Overall clamping area : 1600 mm X 300 mm or more
- 3.2.2 Max. permissible load on table : 500 kg or more
- 3.2.3 The table top should have longitudinal T-slots. The dimension of T-slots is to be specified by supplier.
- 3.2.4 Longitudinal traverse : 1200 mm or more
- 3.2.5 Vertical traverse : 400 mm or more
- 3.2.6 Cross traverse : 300 mm or more

3.3 FEED RATES

- 3.3.1 Rapid traverse rate
 - Longitudinal & cross : 4000 mm/min or more
 - Vertical : 800 mm/min or more
- 3.3.2 Feed rates
 - Longitudinal & cross : 8 – 1600 mm/min (approx.)
 - Vertical : 1.6 – 320 mm/min (approx.)

3.4 SPECIAL FEATURE

- 3.4.1 The machine to be equipped with Digital Read-Out system of 0.01 mm for longitudinal, cross & vertical traverse. The DRO must be of Heidenhein (Germany) make.

4.0 **GENERAL FEATURES OF MACHINE**

- 4.1 The specification of feed drive motors with make, model no., max. & nominal torque should be specified.
- 4.2 Preferably the guideways of all axes should have telescopic type protective covers with adequate sealing on joints to prevent seepage of dust & coolant oil inside. Guide ways should be of hardened steel with hardness HRC60 or more
- 4.3 The machine should be capable of high stock removals with close tolerances on work piece. Metal removing rate in cc/min to be specified.
- 4.4 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.
- 4.5 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.
- 4.6 Each axis should have electrical limit switches interlocked with feed/ rapid drive as well as mechanical stopper.
- 4.7 Each axis should have hydraulic clamps interlocked with feed/ rapid drive

5.0 **ATTACHMENT & ACCESSORIES**

The following accessories should be quoted separately giving their individual prices. (Catalogs of all these accessories should be submitted by the supplier along with the offer.)

- 5.1 Machine vices with fixed base, width of jaws 160 mm.
- 5.2 Universal swivel vices with fixed base, width of jaw 200 mm.
- 5.3 Universal dividing head with tail stock 135 mm height, 3-jaw self-centering chuck, dead centre & draw bolt.
- 5.4 Self-centering vice (50-150mm).
- 5.5 Manually operated rotary table Dia 300 mm or more. (Accuracies to be specified).

5.6 REDUCTION MILLING SOCKETS

5.6.1 TANG TYPE: ISO 50 / MT 1
/ MT 2
/ MT 3
/ MT 4
/ MT 5

5.6.2 DRAW BOLT TYPE: ISO 50 / MT 1
ISO 50 / MT 2
ISO 50 / MT 3
ISO 50 / MT 4
ISO 50 / MT 5

5.10 COLLET ADOPTER

5.10.1 Collet Adopter ISO 50

5.10.2 Set of collets (metric) of sizes (4,6,8,10,12,16,20,25 & 32 mm)

5.11 STUB ARBORS WITH KEY

5.12 Re-circulatory type coolant system.

5.13 Work piece illumination light.

5.14 Splash – guards.

5.15 Foundation parts.

5.16 Any other standard / optional attachment which will increase the productivity / performance of the machine should be quoted with their individual prices.

6.0 **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.

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 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 Spares should have 2 nos. of each of Electromagnets and electrical coils of directional valves.
- 7.2.8 List of fast moving spares should be mentioned.
- 7.2.9 The machine should have machine lamp of 220V AC supply.

8.0 MANUALS / DOCUMENTS

- 8.1 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 1st set to be sent along with offer.
- 8.2 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.
- 8.3 Foundation drawing is to be submitted by supplier within 4 weeks of placement of LOI.
- 8.4 Each document for operation, maintenance & service manual should be given on CD.

9.0 VOLTAGE TRANSFORMER & STABILIZER

The required voltage stabilizer and matching isolation transformer if recommended by supplier, should be part of offer.

10.0 GENERAL

- 10.1 Total power requirement of the machine to be specified by the supplier.
- 10.2 Overall space required for installation of the machine to be specified by the supplier.
- 10.3 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.
- 10.4 Training of machine operation, mechanical & electrical maintenance should be provided free of cost at supplier works for one week.
- 10.5 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.
- 10.6 Color of the machine should be apple green as per ISO.
- 10.7 The supplier is to submit a clause wise deviation statement against each clause of this technical specification along with the offer.
