

TECHNICAL SPECIFICATIONS

SWIVEL ARM GRINDING MACHINE

1. PURPOSE :

The Grinding machine is required for taper grinding of the Root and Shroud of the Turbine blades within close tolerances during assembly of the Blades . The Blades will be assembled in steam turbine Rotors and Casings of various ratings . Blade material shall be Martensitic stainless steel grade DIN X22 Cr MoV 121 having tensile strength of up to 900 N/mm².

2. SPECIFICATIONS :

2.1 HORIZONTAL TABLE :

- a) Length * Width Min. 600 * 300 MM
- b) Number of T-Slots Min. 2 Nos.
- c) A Sine table shall be mounted on the Machine table. Mechanism to set the sine table to be provided.
- d) A Electro-magnetic table shall be mounted on the Sine table. Size of the Magnetic table shall be 400 * 200 MM.
- e) The Machine shall be supplied with Sine table and Electro-magnetic table of 'CRYSTAL' brand from M/S Armatech Associates , Pune .
- f) The Electro-magnetic table shall have the provision of magnetizing and demagnetizing. Magnetising power of the magnetic table will be sufficient enough to hold the turbine blades during grinding while taking heavier cuts . In case of sudden power failure , sufficient time lapse should be available before demagnetisation of the table takes place . Suitable safety guards should be provided all around the magnetic table .
- g) During Grinding operation , the depth of cut shall be given by the vertical movement of the Machine table.
- h) Min. possible movement of the table shall be 0.01 MM through Manual feed only .
- i) Max. safe weight on Table 50 Kg.

2.2 GRINDING SPINDLE WITH VERTICAL AXIS :

- a) Speed 3000 RPM
- b) Grinding wheel diameter 250 MM
- c) The Grinding wheel shall be segmental type having 14 grinding segments around the periphery.
- d) The Grinding segments shall have Aluminium root with hexagonal nut , Size 32/64 * 48.4 * 50 & Grade 30A24 - 1D18V4 . Mounting details of the Grinding wheel / segments shall be as per the existing machine at BHEL Hardwar to ensure interchangeability.
- e) Swivel of Grinding head shall be manual only . Suitable handle to be provided on the Grinding head arm to swivel the grinding wheel over the surface of the magnetic table.
- f) The Grinding area covered shall be the complete surface of the Magnetic table 400 * 200 MM.
- g) Distance between the Grinding wheel and Magnetic table surface shall be 0 - 300 MM.
- h) Suitable arrangement for changing and dressing of the grinding wheel to be provided.
- i) Swivel arm should have a balanced and smooth jerk free movement on its axis.

2.4 POWER :

- | | |
|----------------------------------------------------------------------------|--------|
| a) Main Motor | 5.0 HP |
| b) Coolant Pump motor | 0.5 HP |
| c) Discharge of the Coolant pump at max. height of spindle face (Lit./min) | 70 lpm |

2.5 SPACE REQUIRED :

- Length * Width * Height 1.2 m * 1.2 m * 1.6 m
(including all possible movements and adjustments)

3. ESSENTIAL FEATURES / REQUIREMENTS :

- The basic machine shall have a robust and vibration free construction and high power rating to ensure accurate grinding of the Blades .
- All drives should be of reputed make . Motors should be protected against over-heating. In Electrical panel all accessories should be of reputed make.
- Machine should have push-buttons controlling the different functions of the machine . Devices should be protected against short-circuiting with proper safety measures.
- The Coolant recirculating / recovery system should have a sump at a suitable location in the machine. The coolant pump should start and stop along with the spindle. However separate switch is to be provided to switch off the coolant pump independently also.
- Guards around the working area of the machine shall be provided to ensure that undue coolant does not drench the operator during operation.
- Suitable lubrication system to be provided. .
- Standard operation and service tools shall be supplied along with the machine.
- The machine shall be supplied with complete electrical equipment ready for the connection to the power mains .
- 5 sets of Operation and Maintenance manuals of the Machine and its control to be supplied in English language along with the Machine.

4. COLOUR :

- Colour of the machine shall be Apple Green.

5. COMMISSIONING AND ACCEPTANCE :

- Civil works will be in the BHEL's scope .The foundation drawings shall be supplied by the party .
- Provisional acceptance of the machine can be made by BHEL's representative at supplier's work prior to despatch to ensure compliance with the specifications and proper functioning of the machine .This will be at the discretion of the BHEL .
- Final acceptance shall be made at BHEL, Hardwar following successful erection , assembly, test run and commissioning . Achieving specified accuracy and surface finish on a test job shall also be part of successful commissioning .
- It shall be the sole responsibility of the supplier to rectify any shortcomings in the design or operation of the machine observed during commissioning , free of cost.
- Test / Geometrical accuracy charts for testing the machine shall be supplied along with the machine .

- f) The vendor shall impart training to BHEL personnel in operation and maintenance of the machine during installation and commissioning.

6. SPARES :

- a) Following essential spares to be provided along with the Machine :
- Lead screw and Nuts - 1 Set
 - Grinding spindle bearings - 1 Set
 - V - Belts - 1 Set
 - Swivel arm head bearings - 1 Set
 - Electrical spares - 1 Set
- b) Five spare sets of segmental Grinding wheels fitted with (14 segments per grinding wheel) to be supplied with the Machine .

7. GUARANTEE :

- The vendor shall offer performance guarantee of the machine for 18 months from the date of final acceptance .

8. TECHNICAL SUPPLY CONDITION :

The machine should be able to operate in following technical conditions:

- POWER:
Machine should be suitable to operate on 3-phase A.C. supply of 415 Volts \pm 15%, 50 Hz \pm 3%.
- ENVIRONMENT:
Tropical environment consists of dust-laden atmosphere during some part of the year.

Temperature	Minimum 3°C
	Maximum 45°C
Relative Humidity	95% Maximum.

9.0 QUALIFYING CONDITIONS :

- 9.1 This is a special purpose Machine and therefore the design and operation of the Machine should preferably be similar to existing machine working at BHEL , Hardwar to ensure similarity in machine operation and interchangeability of toolings . Machine manufacturers interested in the development of the Machine may discuss and study the working of the existing machine at BHEL , Hardwar and shall give a compliance certificate along with the offer .
- 9.2 The supplier should be a reputed original machine tool manufacturer.