

Annexure-II

**RECONDITIONING, UPGRADATION AND CNC RETROFITTING OF
CINCINNATI COPY MILLING MACHINE, MODEL H400-224 HYPOWERMATIC,
PLAN NO. 2-345, BLOCK-III**

A. MACHINE DESCRIPTION:

Two axes milling machine
Make: Cincinnati,UK
Model: H400-224 HyPowermatic

A.1 Machine Size:

Length: 160"
Width: 87"
Maximum height: 102 ½"

A.2 Net Weight of the machine: Approx. 9 T

A.3 Movements: 2-axes (table longitudinal and spindle carrier vertical)

Table longitudinal: About 48"
Spindle carrier vertical : About 17 ¼" (Spindle carrier can be
raised or lowered)

Both the axes have lead screws.

**A.4 Control : Machine has got a Rate-modifying tracer control attachment which
controls a variable discharge hydraulic pump giving variable speeds
through hydro motors.**

**A.5 Feed and rapid speeds: Feed of the elevating spindle carrier is ¼"- 50" per
minute. Rapid traverse of the spindle carrier is 50" per minute. The
actual tracing rate along the slope of the cam varies within the
minimum and maximum table feed and carrier feed ranges
depending upon the slope of the cam at any given point**

**A.6 Drives: Spindle motor is 25 hp AC asynchronous motor. Table longitudinal
and Spindle carrier vertical axes are driven by Hydraulic motors**

A.7 Hydraulic system:

1. Machine hydraulic system has got an electric motor driven variable delivery pump which provides the hydraulic pressure to control the table and spindle carrier movements.
2. The hydraulic system also provides power to operate the tracer movements.
3. Spindle carrier counterbalance is performed through a hydraulic cylinder-piston
4. Power of hydraulic motor is 7 ½ hp.

A.8 Lubrication system: Most of the lubrication requirements of the machine

are met by the machine hydraulic system and an automatic lubrication system. The oil selected for use in the hydraulic system has excellent lubrication qualities and is directed to gears and bearings. The automatic lubrication system supplies lubrication to all sliding components and to the screws that drive them. Each arbour support has its own oil reservoir and sight gauge. Following sliding, moving parts are lubricated by the automatic lubrication system:

- i.) Outboard elevating screw
- ii.) Front and rear outer support ways
- iii.) Carrier lubrication of front and rear ways, front and rear clamps, solid and gib sides
- iv.) Carrier elevating screw
- v.) Front and rear table ways

B. BROAD SCOPE OF WORK:

1. Reconditioning and upgradation of the complete machine to suit for CNC operation and restoration of accuracies as per original test chart of the m/c.
2. Fitment of new precision ball screws and nut assemblies for spindle carrier elevating assembly (main vertical axis and overarm support vertical axis) and table longitudinal axis
3. Installation and commissioning of a New Hydraulic system:
With the proposed CNC upgradation of the machine, hydraulics requirement of the machine shall be greatly reduced. It shall be limited to supplying fluid to the cylinder-piston for spindle carrier counter balance system and lubrication of spindle gears and bearings.
A strainer should be attached to the inlet line of the hydraulic pump to filter the oil before it enters the system and a 5-microm filter after the oil leaves the pump. A magnet should be mounted in the reservoir to remove magnetic particles from the oil.
4. New Lubrication system: Bed of the machine acts as the reservoir for the lubrication system. All existing lubrication points shall be connected with the new system and proper lubrication shall be ensured. Should a need for new pipes/hoses arise, the party shall arrange the same.

Lubrication and hydraulic systems shall be monitored in the PLC through new pressure switches and flow switches suitably installed at critical points.

Vendor shall ensure that there shall be no leakage of oil from the system.

5. Other Works:

All activities related to

- 5.1 Dismantling of existing hydraulic system including the hydraulic motors of spindle carrier elevating and table longitudinal traverse
- 5.2 Installation and commissioning of a suitable CNC system configured for two-axes interpolation and one spindle whose existing AC asynchronous motor shall be retained.
- 5.3 Mounting and cabling of AC servomotors for feed replacing the existing hydraulic motors
- 5.4 Installation and commissioning of AC Servodrives for the new feed motors.
- 5.5 Interfacing the spindle and axes with the CNC.
- 5.6 Development of PLC program and its commissioning
- 5.7 Installation of new operator panel with side handles having the new MCP, Monitor display, CNC keyboard, handwheel, required Push buttons, selector Switches etc.
- 5.8 Installation of a new electrical cabinet having contactors, MPCBs, MCB's, plug sockets, relay modules, DC power supply and other required electrical switchgear
- 5.9 Prove-out of the part programs for machining of external and internal profile

of T4-50 blades

6. All the material including CNC system, servodrives, servomotors, new ball screws etc for completing the above mentioned activities shall be in the scope of supply of vendor.

Note: **Party may suggest any other work for further improvement and productivity enhancement of the machine**

