

# CNC Gear Hobbing



*Inspiring Thoughts*



**OPAL** Series **AG 225**

Aeromech introduces indigenously developed CNC Gear Hobbing Machine in Opal Series. Opal Series is a new trend in high speed and high accuracy gear manufacturing.

## CNC Gear Hobber **OPAL** Series **AG 225**



The state of art machine with exceptional high performance and clean wet hobbing are the main characteristics of this new generation Opal Series machines.

In gear manufacturing, the technology of high speed dry and wet hobbing has greatly reduced the machining time while improving the gear quality.

#### **New technology in hobbing demands—**

- Higher hob and table speeds, high torque, high static and dynamic stiffness of work table, improved thermal stability, fast removal of chips and good dampening characteristics of bed.
- Automation means to reduce floor to floor time and hence increase productivity.

These demands have been amply incorporated in the Opal AG Series gear hobbing machines.

**Opal series AG225 CNC** indigenous machine concept also offers a number of significant new concepts which have contributed to set a new standard in gear production—

- Hob spindle and work spindle built with direct drive motors.
- Stationary table slide and moving column
- Closed loop oil circulation in the machine bed.
- External Chip conveyor facilitates easy cleaning of coolant tank, and allows fine chips to settle on the bottom of auxiliary tank.
- User friendly programming software developed indigenously with pictorial display of parameters.
- Direct encoders on the ball screw axis aids for accurate feedback of axis positions.



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## Machine Concept

Opal series comprise of 8 CNC axes

### Four Linear Axes

- X-axis or radial feed axis is by preloaded ball screw with column moving on turcite coated bed guide ways with lateral supports by roller guides.
- Z-axis or axial feed axis is by preloaded ball screw with vertical slide moving on turcite coated column guides. Lateral support by guides.
- Y-axis or tangential feed axis is by preloaded ball screw with tangential slide moving on LM guides of hob head
- V-Axis or Tailstock Axis is by preloaded ball screw with LM Guides. The Axis will work in Position and Torque mode for Apply the requisite clamping load.

### Four Rotary Axes

- A-axis or hob head swivel axis on vertical slide
- B-axis or hob spindle rotation
- C-axis or work spindle rotation
- W-axis or Automation Axis

### Hob Head with Direct drive:

The hob spindle is driven by maintenance free high dynamic synchronous built-in motor. The drive power of 30 kW and speeds up to 3000 rpm, suitable for latest coated PM hobs, HSS hobs and coated carbide hobs.

### Machine Table with Direct drive:

High speed hobbing, particularly with carbide hobs, call for table drive which is completely free from backlash. Hitherto used complex mechanical gear drive has been completely replaced by the use of high dynamic direct drive. This fulfils all requirements as regard to speed, accuracy and torque.

### Machine Column & Vertical Slide:

The machine column carries vertical slide moving on bed guide ways. Radial and axial feed drives are housed in the column.

The vertical slide moves on the column guides and carries hob head. Generously dimensioned guide ways provide excellent damping properties during extreme hobbing conditions.



Machine bed



Machine Column & Vertical Slide



Steady Column

### Machine bed

It is a welded steel structure with Hydraulic concrete filling in the critical load bearing areas.

Increases stiffness and dampening as compared to cast iron bed.

Analysis of bed conducted by CMTI reports that these parameters are better than cast iron bed by 3.5~4 times.

### Steady Column:

Steady column of high rigidity houses tailstock which moves on LM guides by a CNC Axis.

This Axis positions the top clamp in position mode and then applies the required clamping torque as programmed in the application.

This Column includes the Ring Loader Automation for high productivity.



## Work piece Clamping

Clamping concept has been optimized for clamping reliability, clamping time and automation. In standard version, the fixtures are bolted to machine table using the pilot bore in the table. As an economic alternative, manual fixture change with a bayonet type connector is possible. Hydraulic clamping cylinder with continuously variable pressure is most versatile arrangement for a wide variety of components. Standard and special fixtures are available to solve any clamping problem.

- Chucking fixture for manual loading of bore type components
- Clamping fixture for auto loading of bore type components
- Clamping fixture for manual or auto loading of shaft type components

## Automation Concept

- Different automation systems suited to work piece geometry, required storage capacity and retooling flexibility are available. High speed loaders, chain conveyors, ring loaders are few example of versatility of automation in gear hobbing.
- Optimized floor area, with improvised rapid auto loaders of various capacities on component storage are available.
- Unique design with automation of workpiece dia 20-180 mm. Shaft type and bore type blank with a weight of 3Kg/pc can be accommodated.



## Application Software

The application software developed in Aeromech provides the user with all the programming flexibility with minimum training requirements.

- Different types of gears can be programmed and recalled after a period.
- Programming of Multiple hobbing of gears is feasible.
- Bad sector identification in hob and exclusion during the hobbing process is possible (up to 2 sectors).
- The pictorial display of the parameters at the time of programming indicates that minimum training is sufficient for any operator.

## The Electronics

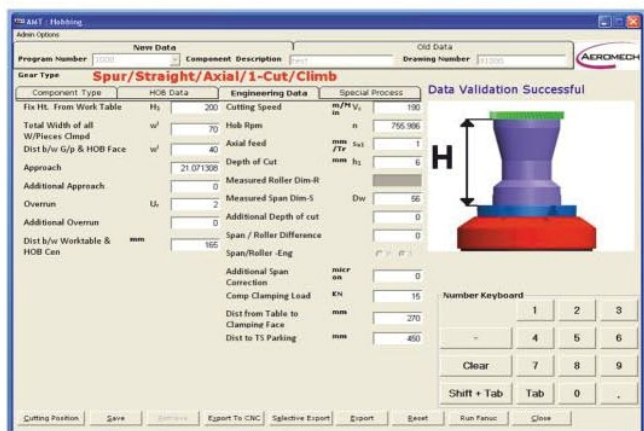
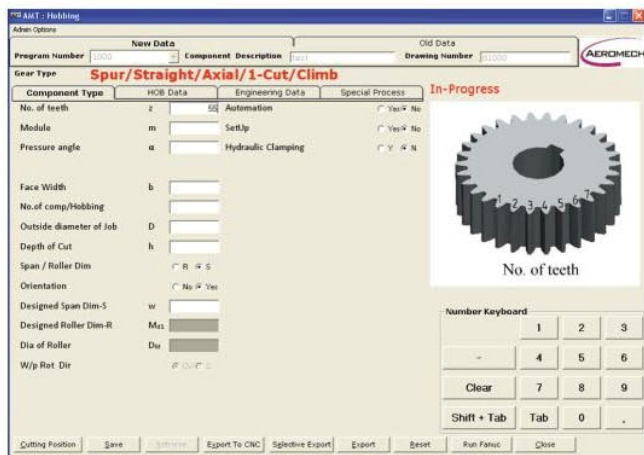
Control system of **Fanuc 31i MB** with Fanuc drives and Fanuc absolute encoders provide state of the art nano technology in electronic controls.

The control panel attached to the machine guard on left side of the operator contains all controls for the machine operation.

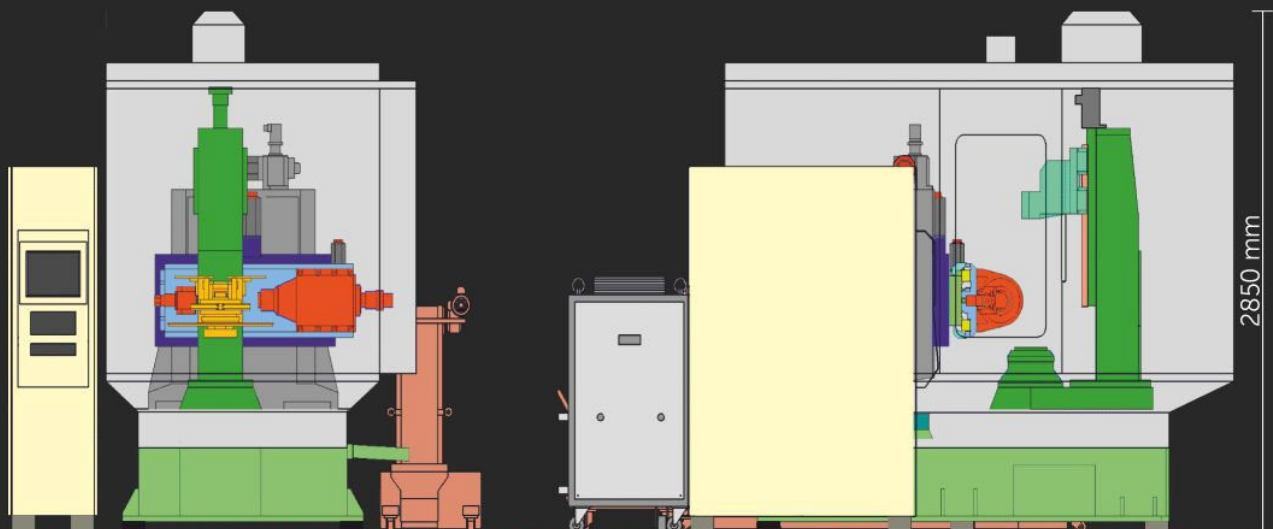
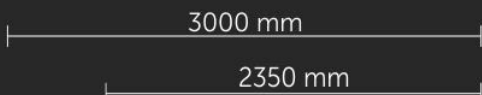
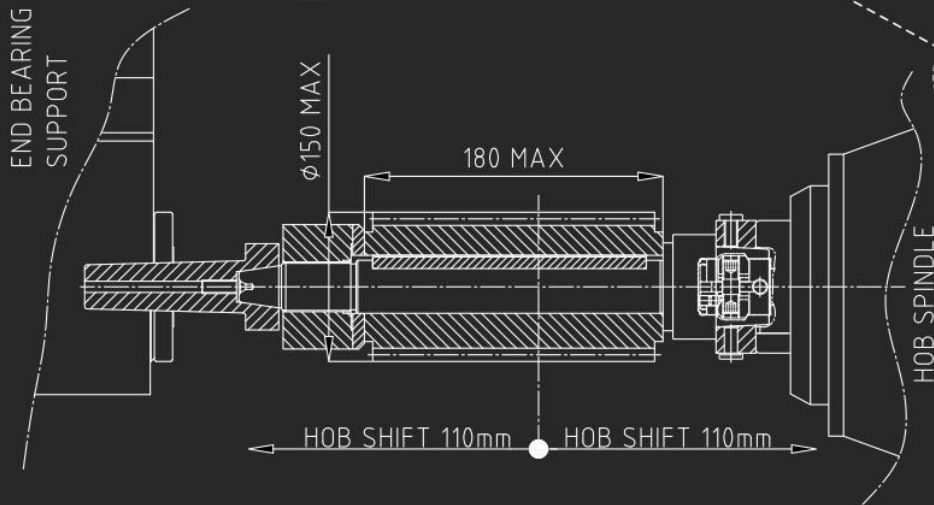
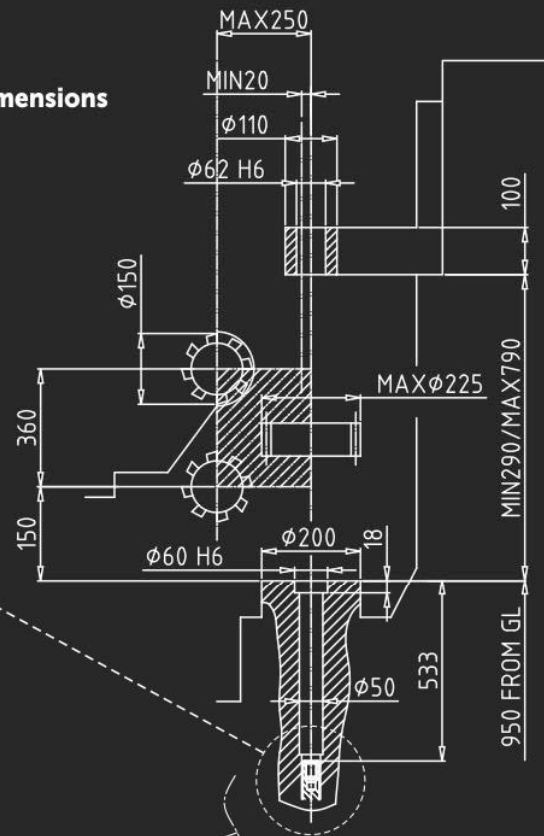
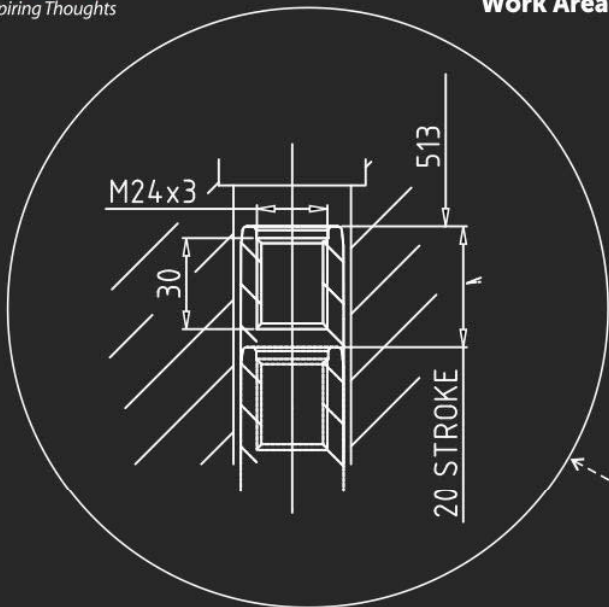
The primary considerations in the design of control panel are ergonomic placement, ease of serviceability, space and form factor.

A CFC free cabinet cooler maintains required temperature inside irrespective of ambient temperature.

The Power failure backup module in the CNC control will ensure that the damage to the Job and Hob is nil in case of power failure.



**Work Area & Dimensions**





**Technical Data**

**AG 225**

Max. workpiece dia.	225 mm
Max. module in steel (UTS 700 Mpa)	6
Max. vertical slide travel	350 mm
Table dia.	200 mm
Centre distance b/w hob and work spindle axis (min./max.)	20/250 mm
Distance of hob axis from table surface (min./max.)	150/360 mm
Max. hob dia.	150 mm
Max. hob length	180 mm
Hob head swivel angle*	+45° to -30°
Hob spindle speed (inf variable) max.	3000 rpm
Rapid traverse axial	5000 mm/min
Rapid traverse radial	5000 mm/min
Rapid traverse tangential	1000 mm/min
Max. driving power, hob spindle	30 kW
Max. torque, hob spindle	286.5 Nm
Max. driving power, work spindle	4.8 kW
Max. torque, work spindle	150 Nm
Total connected load	65 kVA
Machine floor plan	4.6 m x 3.0 m x 2.7 m
Weight of the machine approx.	10 tonnes

\* The tilting angle varies with respect to the Z slide position

**Standard Features**

- Fanuc CNC Control 31i
- Direct Drive Technology for hob and work spindle
- 15" touch screen industrial panel PC
- External magnetic chip conveyor
- Hob and work spindle chiller
- Electrical cabinet cooler
- Main coolant chiller
- Steady column with CNC tailstock
- Hydraulic work clamping unit
- Hob arbor clamping, HSK 63
- Application for spur and helical gear
- Hob arbor dia 27
- 2 Cut cycle

**Optional Features**

- High speed loader with integral chain conveyor for workpiece dia. 22-150 mm
- Ring magazine with workpiece dia. 20-180 mm with 12-24 workpiece pockets
- Tapered/crown hobbing
- Hob arbor dia. 22, 32, 40
- Workpiece clamping fixtures for bore type/shaft type components
- Multihobbing in single setup
- Diagonal hobbing

**Safety Features**

- **Standard**—Instant column retraction in case of power failure
- **Optional**—Voltage stabilizer

Due to continuous improvements machine specifications may be modified



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