CNC :

Computerised Numerical Control (Computer + Numerical Control) .Numerical control is a programmable automation in which process is controlled by Numbers, Letters, and symbols. CNC Machining is a process used in the manufacturing sector that involves the use of computers to control machine tools like lathes, mills and grinders.

CNC Machining necessity-
To manufacture complex curved geometries in 2D or 3D was extremely expensive by mechanical means (which usually would require complex jigs to control the cutter motions). Machining components with high Repeatability and Precision. Unmanned machining operations . To improve production planning and to increase productivity .To survive in global market CNC machines are must to achieve close tolerances.

MAJOR COMPONENTS RELATED TO CNC MACHINE TOOLS

Any CNC machine tool essentially consists of the following parts:

Part program:

• A series of coded instructions required to produce a part.

• Controls the movement of the machine tool and on/off control of auxiliary functions such as spindle rotation and coolant.

• The coded instructions are composed of letters, numbers and symbols.

Program input device

• The program input device is the means for part program to be entered into the CNC control.

• Three commonly used program input devices are punch tape reader, magnetic tape reader, and computer via RS-232-C communication.

Machine Control Unit

The machine control unit (MCU) is the heart of a CNC system. It is used to perform the following functions:

• To read the coded instructions.

• To decode the coded instructions.

• To implement interpolations (linear, circular, and helical) to generate axis motion commands.

• To feed the axis motion commands to the amplifier circuits for driving the axis mechanisms.

• To receive the feedback signals of position and speed for each drive axis.

• To implement auxiliary control functions such as coolant or spindle on/off and tool change.

Machine Tool

• CNC controls are used to control various types of machine tools.

• Regardless of which type of machine tool is controlled, it always has a slide table and a spindle to control position and speed.

• The machine table is controlled in the X and Y axes, while the spindle runs along the Z axis.

Feed Back System

• The feedback system is also referred to as the measuring system.

• It uses position and speed transducers to continuously monitor the position at which the cutting tool is located at any particular instant.

• The MCU uses the difference between reference signals and feedback signals to generate the control signals for correcting position and speed errors.

Drive System

• Drives are used to provide controlled motion to CNC elements

• A drive system consists of amplifier circuits, drive motors, and ball lead-screws.

• The MCU feeds the control signals (position and speed) of each axis to the amplifier circuits.

• The control signals are augmented to actuate drive motors which in turn rotate the ball lead-screws to position the machine table.

COMMONLY USED WORD ADDRESSES

N-CODE: Sequence number, used to identify each block with in an NC program and provides a means by which NC commands may be rapidly located. It is program line number. It is a good practice to increment each block number by 5 to 10 to allow additional blocks to be inserted if future changes are required.

• **G-CODE**: Preparatory Word, used as a communication device to prepare the MCU. The G-code indicates that a given control function such as G01, linear interpolation, is to be requested.

• **X, Y & Z-CODES**: Coordinates. These give the coordinate positions of the tool.

• **F-CODE:** Feed rate. The F code specifies the feed in the machining operation.

• **S-CODE**: Spindle speed. The S code specifies the cutting speed of the machining process.

• **M-CODE:** Miscellaneous function. The M code is used to designate a particular mode of operation for an NC machine tool.