



Computer Numerical Control (CNC) Milling and Turning for Machining Process in Xintai Indonesia

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ABSTRACT: Machine CNC (Computer Numerical Control) is a machine controlled by a computer with command data code numbers, letters and symbols, according to standard ISO. CNC Machine Tools systems work similar, then the CNC machine tools more accurate, more precise, more flexible and suitable for the production of metal. Yang designed to support production and requires a high level of complexity and can reduce operator intervention during machine operation. A CNC machine tool cutting process, device processing the workpiece, as the object that is being processed. Ingestion will conduct the workpiece, the program can be modified to process a new job. Computer Numerical Control (CNC) a format in the form of program automation, machinery and other equipment controlled by programs that contain data, code, numbers. Alphabetic and numerical data that instructs the job to operate the machinery. Machine CNC (Computer Numerical Control). Change the code data into a series of instructions, which servo mechanism, such as a stepping motor that rotates with a predetermined amount, improving with each driving from the desk job and tools to implement, workmanship with machining and movement defined by a system of repetition SCARA closed or open, CNC-controlled machine can do the work linear shape, circumference, insertion or parabolic, sbagai software.

Keyword : CNC Milling, Turning, Machining Proses

I. INTRODUCTION

Working Principle of CNC machine is a machine that is used for automatic control in the industrial world. This machine is used to control the performance of other machines used. Both NC (Numerical Control) and CNC (Computer Numerical Control) is a term used to indicate that a manufacturing equipment; eg lathes, milling machines, etc., numerically controlled based computer that is able to read the instruction code N, G, F, T, and others, where the codes will be instructed to CNC machines to work in accordance with a program that had been made to do workpiece to be made, Operation using CNC machines, the accuracy of a product can be guaranteed up to 1/1000 mm (microns) workmanship mass product with exactly the same result at the right time of rapid machining.

CNC functions in this case more displace the work of the operator in a conventional machine tools. Eg setting work tool or regulate the movement of the chisel until the position is ready to cut, cutting motion and movement retraced early, and others. Similarly, the setting cutting conditions (cutting speed, feeding speed and cutting depth) as well as other regulatory functions such as the replacement of a chisel, alteration, power transmission (number of revolutions of the main shaft), and the direction of rotation of the main shaft, pengekleman, setting the coolant and so forth.

CNC machine tools equipped with a variety of cutting tools that can make precise workpiece and can interpolate directed numerically (by number). CNC operating system parameters can be changed through the software program (software load program) as appropriate. CNC has been widely used in the metal industry. In this condition, CNC mechanical system used to control machines and metal cutting tools. So how thick and long pieces of metal produced by metal cutting machines, can be set by the CNC machine. This time not only the metal industry which utilizes CNC machining technology as automatisasinya process.

The use of CNC machines has grown rapidly, so has changed the manufacturing industry who use manpower konvensional become cnc machine, as the development of industry the CNC machine required to perform even complex workpieces and can work in large numbers. Production manufacture of components and parts, using a cnc machine able to produce mass quantities and receive consumer demand for different types of components in large quantities in a relatively short time, with high quality. The quality of the workpiece,

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precision quality in a short time and in large numbers, machine tools CNC (Computer Numerical Control), programmed following the instructions of the computer. CNC machine can work automatically or semi-automatically once programmed beforehand. Program to create a workpiece that has been planned and designed before, workpiece will be carried out by CNC machines, checking the program repeatedly that the program correctly and in accordance with the prototype of the shape of the workpiece to be desired, and can really be done by CNC, Checks can be through the monitor screen display found on the machine, can also be through a plotter mounted on a chisel holder milling and lathe, and the program has been true to be operated according to plan.

II. FORMULATION OF THE PROBLEM

The author will discuss this study as follows:

1. Type and type what the cnc machine?
2. How good way to Operate a CNC Machine?
3. What is a programming language?

III. WRITING PURPOSE

From the above problems the author has the following objectives:

1. Know the elements - elements and types of CNC machine in use
2. Knowing how to properly and correctly in order to operate a CNC machine and effective in its consumer
3. Knowing in detail in the process of machining processes, cnc machine

IV. DISCUSSION

Type and Type CNC

In the medium and large scale industries, many will be found to support the use of CNC machines in mass production process. Broadly speaking, the CNC machine is divided into two (2) kinds of uses, namely:

1. CNC lathe machine
2. CNC milling machine

Each brand and type of CNC machines have different characteristics and different based on the factory that makes the machine. Specifications of the manufacturer, In such an outline, the characteristics of how to operate the machine CNC machining can be done in two ways, namely:

Operating System Absolute

In this system a starting point for the placement of the cutting tools are used as a reference is set reference point remains valid during machining operations take place. on a lathe (Turning Machine), its reference point is placed on the axis (center) of the workpiece that will be done at the end. While the milling machine (Milling Machine), its reference point is placed at the junction between the two sides of the workpiece to be process.

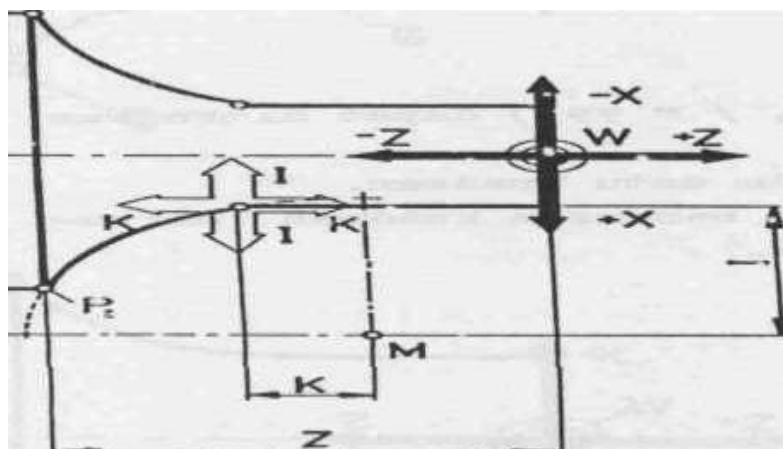


Figure 1. Operating System Absolute

Incremental Operating System

At the starting point Incremental placement system that is used as a reference point is always moving in accordance with the actual point (zero point) stated last. on a lathe or milling machine treated the same, until every time a movement in the process of the workpiece ends, the end point of the movement of the cutting tool and even then regarded as the starting point of the movement of the cutting tools (cutting tools) at a later stage. In line with the growing need for a variety of industrial products which vary with the level of difficulty are varied and complex, it has developed a wide variety of CNC machine itself, which is intended to meet the needs of this type of work with a high degree of difficulty (high precision), as in the following demonstrated a wide variety of CNC machines.

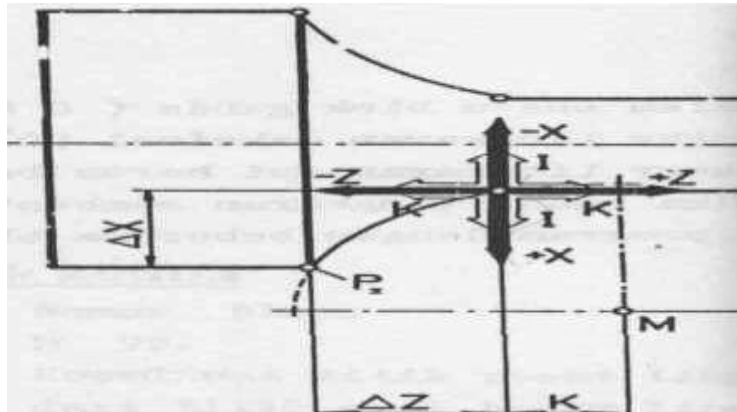


Figure 2. Incremental Operating System

CNC Machine Programming

Programming is a sequence that is the command sequence detailed meticulously each block in the block to provide feedback on the machining processes of CNC machine tools on what to do, to make up the programming on CNC machines needed things and programming methods below:

Incremental Programming Methods

Programming method where the reference point is always changing, which is the last point of the destination becomes the point of a new reference to the size of the required next, before studying the system programming beforehand it must fully understand the system persumbuan, the pivot point of CNC lathes, the scheme sledge transverse and sledge elongated, which could be governed cnc machine moves according to the program that has been determined.

Programming method Absolut

Programming method in which the reference point is always fixed (static) ie one point, used as a reference point for all of the desired size and processed in the programming.

Programming language

The programming language is the format commands in one block to another block, using the code letters, numbers, and symbols, in CNC machine tools are computer device called the Machine Control Unit (MCU) which MCU serves to translate the code into the form persumbuan appropriate shape and movement form the work piece. The codes of language in CNC machine tools known by the code G and M, where the codes have been standardized by the ISO Standard, or agency International Standard other, on the application of the code letters, numbers, and symbols on CNC machine tools is diverse depending on the control system and the type of machine is used, but in principle relatively similar. So as to the operation of CNC machine tools with a different type will not be any significant difference, in the example: Machine Tools CNC control systems EMCO, their code is incorporated into standard DIN, the language of this code can serve as a medium of communication between the machine and the operator in the operation, which is to provide the data to the machine operations to further understand, and to enter data into the program memory of the machine can be done with a keyboard or other devices such as floppy disks, plash disk, USB, and can also through the RS-232 cable.

How CNC Machine Operation

Basic Principles of CNC Milling Machine or machine tool CNC machine tools is that the operation is the process of workpiece by chisels assisted with computer numerical control, or CNC (Computer Numerical Control).). To move the chisel on CNC machine tools agreed upon using the coordinate system. Coordinate system on a CNC milling machine is a coordinate system with three axes / axis is the X-, Y- and Z-axis X-axis is defined as moving horizontal axis, Y-axis is defined as an axis which moves transversely, and the Z-axis is defined as the axis moves vertically, Milling is a machining process where the cutting tool or cutting tool rotates on its spindle and workpiece move toward lengthwise and crosswise cuts as far as desired.

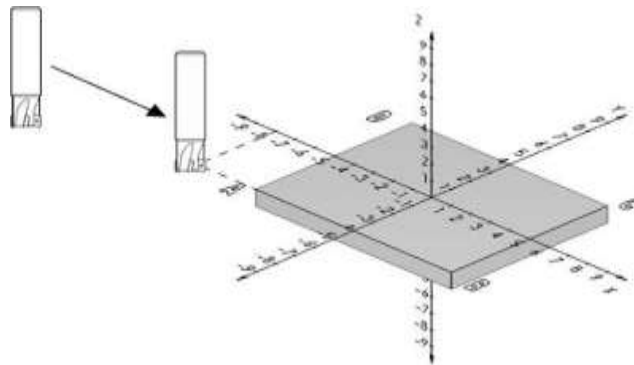


Figure 3. Process CNC Milling

CNC Milling Machine Control Panel

At its tenet machine control panel on each brand CNC Milling machine have the same functionality and usability, only perbedaan sipat and karakteristiknya, usually located on the type of button that is in use, and there are also several function keys functions and uses a combination of a few buttons on the panel, because the functionality and usability of each button in the control panel have in common so that, in the explanation of this guide will refer to the use of CNC Milling machine tools with standard with standard control.

The function of each button on the panel

1. Emergency Stop: To stop all of the operating system on the machine.
2. EDIT: Used to fix or create a new program or for input and output of the external device
3. MEMORY: The option to run the execution of the program that has been created (AUTO MODE)
4. MDI: MDI mode options for the mode (Manual Data Input)
5. HANDLE: Used to regulate the movement of the axis / axis manually using the handle
6. JOG: use to regulate the movement of the axis / axis manually, the movement speed is set using the "Override feedrate". And the movement of the axis / axis is set using switches and buttons select axis
7. RPD: use to regulate the movement of the axis / axis manually, the movement speed is set using the "Rapid Override". And the movement of the axis / axis is set using switches and buttons select axis
8. ZRN: Used to restore the axis / axis to the initial axis machines or point 0 on the machine.
9. Regulation: Used to decrease or increase the spindle rotation speed manually
10. Coolant 10. Key: Used to mengidupkan coolan are elderly or automatically
11. feedrate Override: Used to change the speed of feeds between 0-150% of the speed or the feeding set ddidalam program at the machine in automatic or MDI mode and adjust the speed of movement of the axis / axis will be undertaken manually during the engine in JOG mode
12. Spindle Speed: Used to change the spindle rpm of the engine between 50-120%.

Set the speed of movement of the funeral in the machining process "G0" set out in the program. 1%: Ingestion Speed 1% of the speed set on the program or machine 5%: Ingestion Speed 5% of the speed set on the program or machine 25/50%: Ingestion Speed 25/50% of the speed set on the program or machine 100%: Ingestion Speed 100% of the speed set on the program or machine Program Protect: Used to allow or not allow the program changed Indicator Lamp: Used as a designation of activity / aaktivitas that has been done. If melakukan Point zero retrun the indicator light X, Y, Z will meyala. If enable coolan manually or automatically, the lights will come on and if inidkator Spindle Clam been locked indicator light will illuminate.

Block Delete: This button serves to jump or not to execute a program in which there is a "/". If this button is activated or in the press, the machine will not execute the program that there is a sign /.

DNC: Used in the manufacturing program that will be used is too large, and if the button is activated, the program can be made via PC and CNC in transferrn to connect using the RS-233C cable

agazine Turn: Used to activate the tool at the turn of the call in the program, and can also be used to select tools that are invoked manually using MDI mode

Arm Origin: Used to help restore arm positions that are disrupted by faults (burning electricity goes out and turn the tool unresolved).

Bed Coolant: Used to enable the motor bad coolant

Auto Return: Used to mengembalkikan axis position to the 0 machine automatically

Open & Close: To enable manual operation use the door

Release: If the Release button is active then the door is authorized to be opened when the spindle rotates. However, if the off button is the opposite.

Forward: To rotate clockwise Spindle manually

Stop: To stop the spindle rotation in manual mode

Reverse: To rotate spindle clockwise manually

Used to move the position of the axis X, Y, Z at the time of the machine in handle

X1: 0,001 mm / strip

X10: 0.01 mm / strip

X100: 0.1 mm / strip

Standard Operation of CNC Machine Tools

1. How to Turn Machines

- a) Turn the main switch
- b) Release Emergency Stop
- c) Press the Power ON

2. How to turn off Machine

- a) Position the axis in position zero return mersin
- b) Press the Emergency Stop Button
- c) Press the OFF button
- d) Turn the main sklar OFF
- e) Position the MCB in the OFF position

3. How To Restore Position machine axis to the point 0 (Zero Point Return)

method 1

- a) Position Switch mode on the position of the handle
- b) Press the auto return

Method 2

- a) Position Switch mode at the position ZRN
- b) Position the axis select switch in position Z
- c) Press the axis +
- d) Do the same for the axis / axis X and Y

Method 3

- a) Position Switch mode on the position of MDI
- b) Put the command/program manually by inputting: G91 G28 Z0; G91 G28 X0; G91 G28 Y0;
- c) Press the Insert button on the panel
- d) Press the Star Cycle button to start zero point return

4. Mobilize Axis / Axis direction + X, + Y, + Z or -X, -Y, -Z

Method 1

- a) Position Switch mode on the position of the handle
- b) Use the handle to move the axis
- c) Position the axis select existing in the handle to position X / Y / Z
- d) Position the Rapid that will be used to move the axis / axis X1 = 0.001 mm / strip, X10 = 0.01 mm / strip, X100 = 0.1 mm / strip
- e) Rotate the axis / axis towards the negative (-) or collar is positive (+)

method 2

- a) Position Switch mode at the position JOG
- b) Position the axis select any panel to position X / Y / Z

- c) Select the movement speed that will be used by turning the switch "feedrate Override" appropriate in need.
- d) Press and hold the Axis + / Axis- to move the axis / axis

method 3

- a) Position Switch mode at the position RPD
- b) Position the axis select any panel to position X / Y / Z C. Select the movement speed that will be used by turning the switch "Rapid Override" appropriate in need.
- c) Press and hold the Axis + / Axis- to move the axis / axis

Rotating Spindle Machine

method 1

- a) Place the mode switch in position Handle / MEL / RPD / ZRN (Manual Mode)
- b) Press the Forward button to spin clockwise and press the Reverse button to spin counter-clockwise.
- c) The speed or RPM spindle follows last used the machine, but dapatdiatur back speed by turning the "Spindle Regulation".
- d) Press the stop button on the panel to stop the rotation

method 2

- a) Position the mode switch on the position of MDI
- b) Put the command / program manually by inputting S1500 M03 for clockwise rotation and S1500 M04 for counter-clockwise rotation.
- c) Press the Insert button on the panel
- d) Press the cycle start / On to start rotating spindle
- e) Press the Stop or Reset to stop the spindle rotation
- f) Enabling Tool: positioning tool being in use, Position switch modes on the position of MDI, input program commands manually by entering T2 M6 to call the tool no following, press the Insert button on the panel and press the Cycle Start / On to start replacing the tool.

The main motor is a driving force for rotating the workpiece dibble. This motor is a direct current motor type / DC (Direct Current) with variable rotation speed. The main motor of the technical data as follows.

1. Qualification rounds of 600- 4,000 rpm.
2. Power Input 500 watts.
3. Power Output 300 watts.

Sledge / support is the way persumbuan motion machine. For CNC lathes TU-2A can be divided into the following two sections.

1. Eretan longitudinal (Z axis) with a distance of 0-300 mm path.
2. Eretan cross (X) with a track distance of 0-50 mm.

Step motors serve to drive the sled, the movement axes X and Z axis movement Each carriage has its own bike step, as for step motors technical data as follows.

1. The round number of 72 steps.
2. The moment of 0.5 Nm swivel.
3. Speed of movement: Rapid movement maximum of 700 mm / min,

Movement manual operation 5-500 mm / min, Movement programmed CNC machine operation 2-499 mm / min. Housing cutting tool (revolver / toolturret) serves as clamping the cutting tool during the process of the workpiece. The tool used is called or toolturret revolver, revolver is driven by a step motor so it can be moved manually or programmatically. At the revolver can be mounted six cutting tools as well which is divided into two parts following

1. At three positions for the type of cutting tool beyond the size, customized dimensions as the tools: the outside right chisel, chisel cut, chisel threaded, and others.
2. Three places for this kind of cutting tools with a maximum diameter dimension in disesuaika also dg tools and tools in his post: the right chisel, drill, center drill, chisel thread, and others.
3. dibble on a lathe serves to clamp the workpiece during the process that will intersect with its tools. Lathe spindle speed is set using a transmission belt. In the transmission system is divided into six belt drive transmission.

V. Conclusion

1. Computer Numerical Control / CNC (computer numerical control) machine tools is an automation system that operated obey the instructions that are programmed in the form of a numeric code (Numerical System) that is stored on a storage medium and there are two types, namely the type of Lathes (Turning Machine) and machinery frais (Milling Machine).
2. The operation on CNC machine tools is the process of cutting the workpiece in the form of chisel instructed by computer numerical control CNC (Computer Numerical Control) to drive a chisel on a machine tool on the workpiece, using the coordinate system of the CNC milling and turning machines, namely coordinate system with three axes, axes X, Y and Z axes X-axis is defined as a moving horizontal axis, Y-axis moving bersipat a transverse axis, and the Z-axis is a vertical axis that moves.
3. The programming language is a form of instruction in one block to another block, using the code letters, numbers, and symbols (Numerical System), on CNC machine tools are computer device called the Machine Control Unit (MCU), which serves to translate language code into the appropriate form persumbuan movement on the shape of the workpiece. The codes of language in CNC machine tools is called the G and M codes, where the codes already by ISO Standard and International Standards.

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