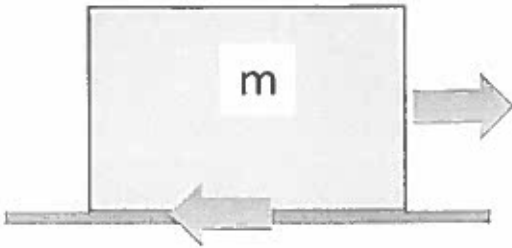


**Bando 23461 - PROVA TEST 2**

- 1. Fenomeno dell'attrito tra i corpi (coefficiente d'attrito, relazione tra grandezze coinvolte)**

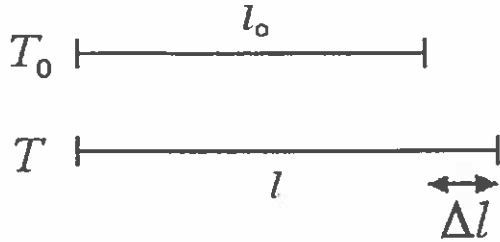


- 2. Descrivere cosa sono lo zero macchina e lo zero pezzo.**
- 3. Che procedimento useresti per creare un cono in AutoCAD?**

sc  
by  
AR  
  
AB

**Bando 23461 - PROVA TEST 1**

1. Dilatazione termica lineare dei solidi (coefficiente di dilatazione, relazione tra grandezze coinvolte)



2. Quali sono i principali materiali usati per utensili da tornio e per le frese.

3. Cosa si intende per quota parametrica?

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# Numerical control

**Numerical control** (also **computer numerical control**, and commonly called **CNC**)<sup>[1]</sup> is the automated control of machining tools (such as drills, lathes, mills and 3D printers) by means of a computer. A CNC machine processes a piece of material (metal, plastic, wood, ceramic, or composite) to meet specifications by following coded programmed instructions and without a manual operator directly controlling the machining operation.



*A CNC machine that operates on wood*

A CNC machine is a motorized maneuverable tool and often a motorized maneuverable platform, which are both controlled by a computer, according to specific input instructions. Instructions are delivered to a CNC machine in the form of a sequential program of machine control instructions such as G-code and M-code, and then executed. The program can be written by a person or, far more often, generated by graphical computer-aided design (CAD) or computer-aided manufacturing (CAM) software. In the case of 3D printers, the part to be

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printed is "sliced" before the instructions (or the program) are generated. 3D printers also use G-Code.

CNC is a vast improvement over non-computerized machining that must be manually controlled (e.g. using devices such as hand wheels or levers) or mechanically controlled by pre-fabricated pattern guides (see pantograph mill). In modern CNC systems, the design of a mechanical part and its manufacturing program are highly automated. The part's mechanical dimensions are defined using CAD software and then translated into manufacturing directives by computer-aided manufacturing (CAM) software. The resulting directives are transformed (by "post processor" software) into the specific commands necessary for a particular machine to produce the component and then are loaded into the CNC machine.

Since any particular component might require the use of a number of different tools – drills, saws, etc. – modern machines often combine multiple tools into a single "cell". In other installations, a number of different machines are used with an external controller and human or robotic operators that move the component from machine to machine. In either case, the series of steps needed to produce any part is highly automated and produces a part that closely matches the original CAD drawing.

## Description

Motion is controlling multiple axes, normally at least two (X and Y),<sup>[2]</sup> and a tool spindle that moves in the Z (depth). The position of the tool is driven by direct-drive stepper motors or servo motors in order to provide highly accurate movements, or in older designs, motors through a series of step-down gears. Open-loop control works as long as the forces are kept small enough and speeds are not too great. On commercial metalworking machines, closed-loop controls are standard and required in order to provide the accuracy, speed, and repeatability demanded.

## Parts Description

As the controller hardware evolved, the mills themselves also evolved. One change has been to enclose the entire mechanism in a large box as a safety measure, often with additional safety interlocks to ensure the operator is far enough from the working piece for safe operation. Most new CNC systems built today are 100% electronically controlled.

CNC-like systems are used for any process that can be described as movements and operations. These include laser cutting, welding, friction stir welding, ultrasonic welding,

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