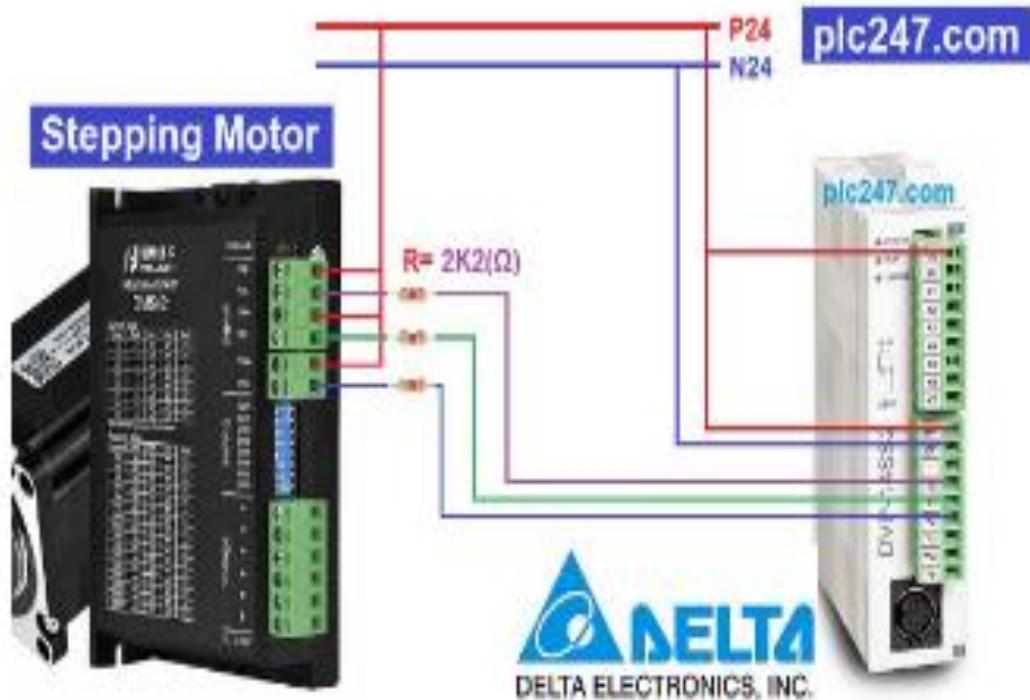


# **STEPPER MOTOR USING DELTA PLC**

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# COURSE: PLC PROGRAMMER AND TROUBLE SHOOTER – BATCH 6



# INTRODUCTION

In this application PLC is used to control the operation of a stepper motor. Ladder Logic Diagram, the PLC program, uses step ladder instructions for implementation of the control algorithm. The motion control algorithm includes the control of stepper motor speed and direction of rotation.

Every motor converts power. Electric motors convert electricity into motion. Stepper motors convert electricity into rotation. Not only does a stepper motor convert electrical power into rotation, but it can be very accurately controlled in terms of how far it will rotate and how fast.

## WORKING MECHANISM :

It receives control pulses from PLC's Output Module. These pulses are conditioned on the driver board and then applied to the individual phases of the stepper motor. Switches X1 and X2 on the Input Module are used for controlling the motion of the stepper motor.

## MAIN COMPONENTS

The main components in this plc to using stepper motor , plc controller , stepper motor , digital stepping drive (TD550S) , switch mode power supply (SMPS) , wire , PLC communication may require various cables and connections from RS232 serial,

A stepper motor is an electromechanical device it converts electrical power into mechanical power. Also, it is a brushless, synchronous electric motor that can divide a full rotation into an expansive number of steps. The motor's position can be controlled accurately without any feedback mechanism, as long as the motor is carefully sized to the application. Stepper motors are similar to switched [reluctance motors](#). The stepper motor uses the theory of operation for magnets to make the motor shaft turn a precise distance when a pulse of electricity is provided. The stator has eight poles, and the rotor has six poles. The rotor will require 24 pulses of electricity to move the 24 steps to make one complete revolution. Another way to say this is that the rotor will move precisely 15° for each pulse of electricity that the motor receives.

## Programmable Logical Controllers (PLC)

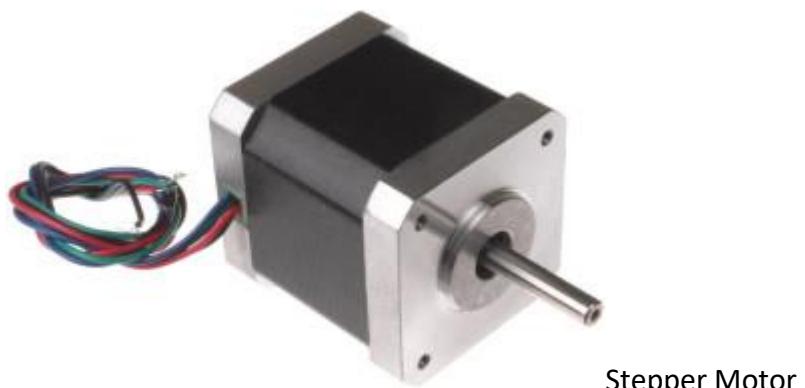
A programmable logic controller (PLC) is a type of digital computer that has an input and an output interface, controlled by a simulated program designed in a computer and it is used for automation for electromechanical process, typically for industrial use. In industry, PLCs are made to control the machinery of production lines. A PLC is designed for multiple input and output arrangements and these inputs and outputs are logically programmed in different forms, such as a ladder diagram, a structural text and a functional block diagram and

stored in the PLC's memory. PLCs are reprogrammable and they can have monitors online to know the status of the operation. A PLC is an example of a hard real time system since output results must be produced in response to input conditions within a limited time, otherwise an unintended operation will result.



## STEPPER Motor Controller

The **construction of a stepper motor** is fairly related to a [DC motor](#). It includes a permanent magnet like Rotor which is in the middle & it will turn once force acts on it. This rotor is enclosed through a no. of the stator which is wound through a magnetic coil all over it. The stator is arranged near to rotor so that magnetic fields within the stators can control the movement of the rotor.



Stepper Motor

The stepper motor can be controlled by energizing every stator one by one. So the stator will magnetize & works like an electromagnetic pole which uses repulsive energy on the rotor to move forward. The stator's alternative magnetizing as well as demagnetizing will shift the rotor gradually & allows it to turn through great control.



## HMI:

A Human-Machine Interface (HMI) is a user interface or dashboard that connects a person to a machine, system, or device. While the term can technically be applied to any screen that allows a user to interact with a device, HMI is most commonly used in the context of an industrial process.

HMIs are similar in some ways to Graphical User Interfaces (GUI) but they are not synonymous; GUIs are often leveraged within HMIs for visualization capabilities.

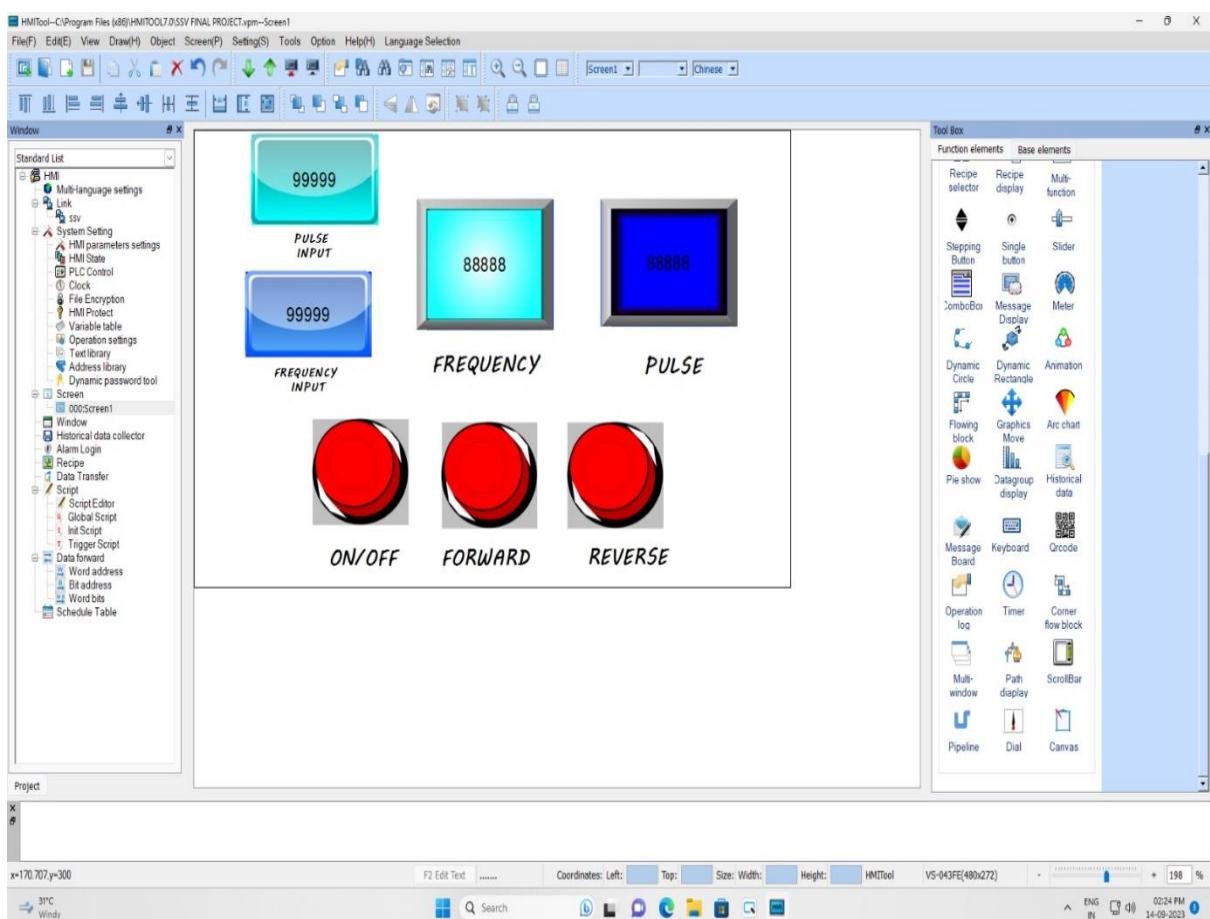
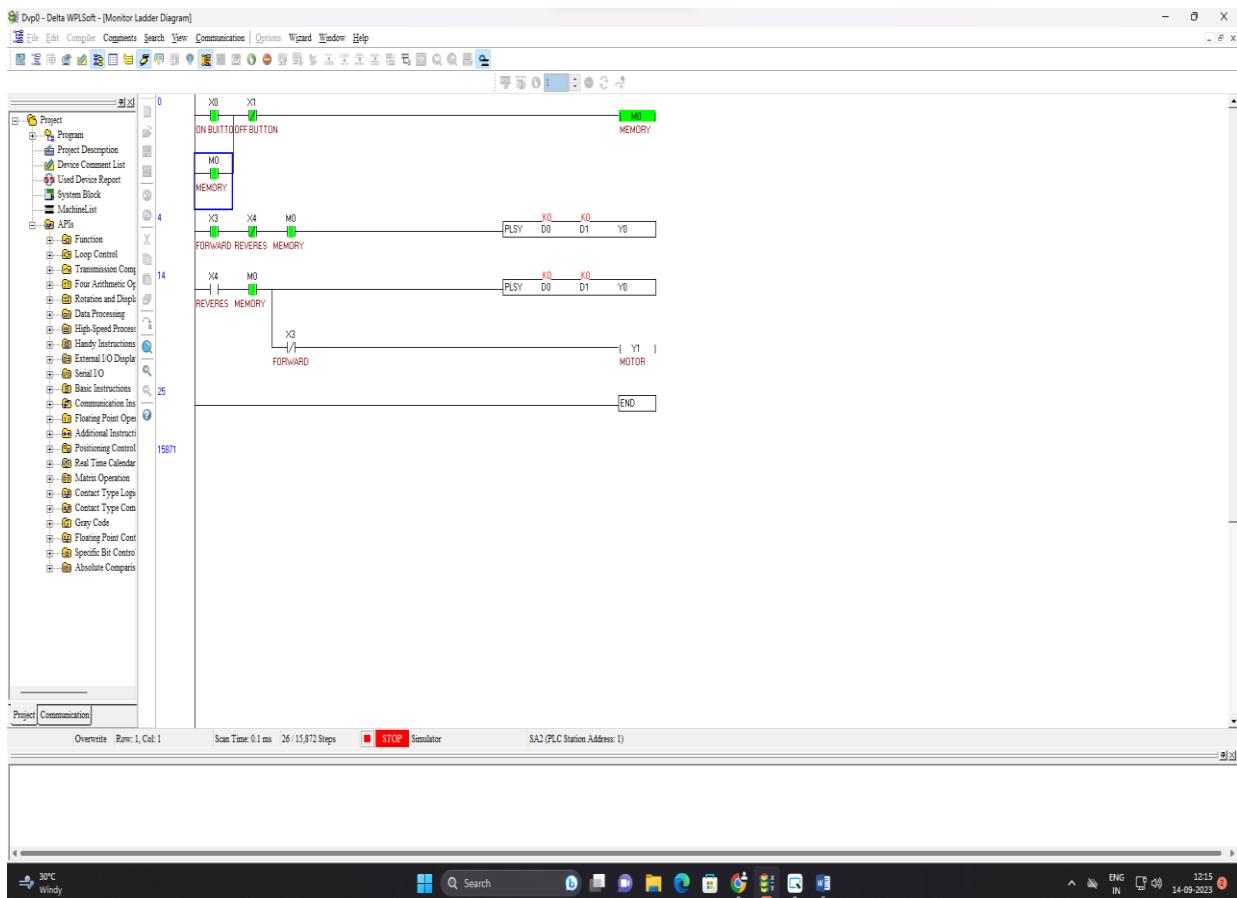
In industrial settings, HMIs can be used to:

- Visually display data
- Track production time, trends, and tags
- Oversee KPIs
- Monitor machine inputs and outputs
- And more

**LADDER DIAGRAM AND HMI INTERFACE** are used in project which has given below

## DEVICES:

DEVICES	FUNCTION
X0	ON BUTTON
X1	OFF BUTTON
X3	FORWARD
X4	REVERES
YO	MOTOR



## Application

- stepper motors are used in floppy disk drives
- flatbed scanners
- computer printers
- plotters
- slot machines
- image scanners
- compact disc drives
- intelligent lighting
- camera lenses
- CNC machines
- 3D printers.

## Conclusion

In conclusion, the project successfully demonstrates the design and implementation of Programming and controlling movements of a stepper motor is possible by using a PLC. The power of stepper motor depends of outputs module from PLC. When PLC contains relays on outputs it is possible to supply coils of stepper motor at different value of voltage and courant stepper motors are excellent for positioning applications. Stepper motors can be precisely controlled in terms of both distance and speed simply by varying the number of pulses and their frequency.