

# Direction Control Of Three Phase Induction Motor Using PLC And SCADA

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**Abstract**-Automation or automatic control is the use of various control systems for operating equipments such as machinery and other applications with minimal or reduced human intervention. Some processes like speed control and directional control, etc have been completely automated. AC motors used in industries for various operations due to reliable, low cost and simple operations. The implementation of condition monitoring system for the 3-phase induction motor based on programmable logic controller (PLC) & Supervisory control and data acquisition (SCADA) technology is described. All the required control and motor performance monitoring data will be taken to a personal computer by SCADA Software Wonderware InTouch via PLC RS Linx and RS 500logix for further analysis.

**Keywords:** Forward and Reverse Induction Motor, PLC, SCADA etc.

## 1. Introduction

In today's world industries demand process automation in all sectors because automation results in increase in output (production) and quality of product and also reduction in cost [6]. The purpose of this process, to change the direction of a three phase induction motor rotation with the help of PLC and SCADA which is fully automated [3]. A control program has been developed, in accordance of which PLC continuously monitors the inputs and activates the outputs accordingly. By this we can control the direction of motor by sitting location from the field. As we are using three phase induction motor due to its simplicity and low cost. We can operate the motor manually as well as remotely. This can be accomplished by using two contactors one for the forward or clockwise direction and other for the reverse or anticlockwise direction. Also relays which is used to control the PLC signal which is in DC. As the supply of 230 volt AC is given to the SMPS. SMPS converts this 230 Volt AC into 24 volt DC, this signals are given to the PLC unit. PLC unit operates only on 24 volt DC supply. This signals are required to only actuate the relay. Then Relay gives 230 AC supply to the contactor and contactor gives this signal to induction motor and motor starts rotating in forward direction and vice versa for reverse direction by giving a command to the PLC programming through control room computer. Thus, PLC proves themselves as a very versatile and effective system in industrial control of electric drives [5].

**2. THREE PHASE INDUCTION MOTOR** : The device which converts electrical energy into a mechanical energy is known as electric motor. For AC operation, most widely used motor is three phase induction motor as this type of motor does not require any starting device or we can say they are self starting induction motors. For understanding, the principle of three phase induction motor, the essential constructional feature of this motor must be known to us. It has two major parts: [2]

**Stator:** Stator of induction motor is made up of numbers of slots to construct a 3-phase winding circuit which is connected to 3 phase AC source. The winding of motor is arranged in such a manner in the slots that they produce a rotating magnetic field after 3 Ph. AC supply is given to them [2].

**Rotor:** Rotor of three phase induction motor consists of cylindrical laminated core with parallel slots that can carry conductors. Conductors are of heavy copper or aluminum bars which fit in each slot & they are short-circuited by the end rings. The slots are not

parallel to the axis of the shaft but are slotted a little skewed because this arrangement reduces magnetic humming noise & can avoid stalling of the motor [2].

### 3. PROGRAMMABLE LOGIC CONTROLLER (PLC):

A PLC is a computer application used to carry out control of various operations in industries. The well-known and common applications of PLC are control of process flow, control of movements of machinery, remote operation of process and easy installation at drastic sites etc. PLC have input-output module, Central Processing Unit, inbuilt SMPS and a Monitor display. By using input module, PLC take input in any form and then forward it to CPU. Then CPU performed necessary action according to ladder logic and output is taken from output module. PLC also has memory to use which is available in CPU. In this project, Allen Bradley micrologix 1100 series B.

#### Ladder Diagram and the PLC:

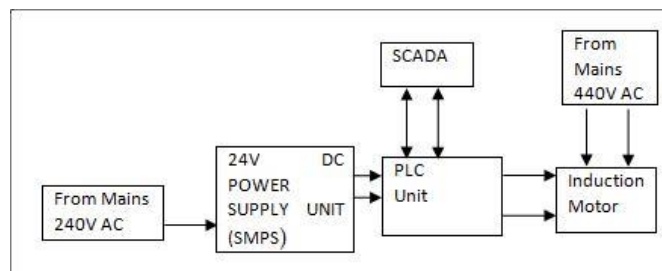
The ladder diagram has and continues to be the traditional way of representing electrical sequences of operations. These diagrams represent the inter-connection of field devices in such a way that the activation or turning ON, of one device will turn ON another device according to a predetermined sequence of events.

### 4. SUPERVISORY CONTROL AND DATA ACQUISITION: SCADA stands for Supervisory

Control and Data Acquisition. SCADA refers to a system that collects data from various sensors at a factory, plant or in other remote locations and then sends this data to a central computer which then manages and controls the data. The term SCADA is used broadly to portray control and management solutions in a wider range of industries. One of the key processes of SCADA is the ability to monitor an entire system in real time [4]. The main purposes for the use of a SCADA system would be to collect the needed data from remote sites and even the local site, displaying them on the monitor of the master computer in the control room, storing the appropriate data to the hard drive of the master computer and allowing the control of field devices (remote or local) from the control room. SCADA systems are equipped to make immediate corrections in the operational system, so they can increase the life-period of your equipment and save on the need for costly repairs. It also translates into man-hour saved and personnel enabled to focus on tasks that require human involvement [1].

### 5. Block Diagram:

Proposed system block diagram shown in Fig. 1 and it consists of two power supplies, one is 230V and the other is 440V. The 230V supply from main is converted into 24V DC and it is given to the PLC unit. The second supply from main 440V is directly given to the SMPS. The PLC (Programmable Logic Controller) unit in the block diagram is used to control the SCADA and through the SMPS the motor is controlled. [2]



fig(1): Block diagram of working of project

**6.Ratings**

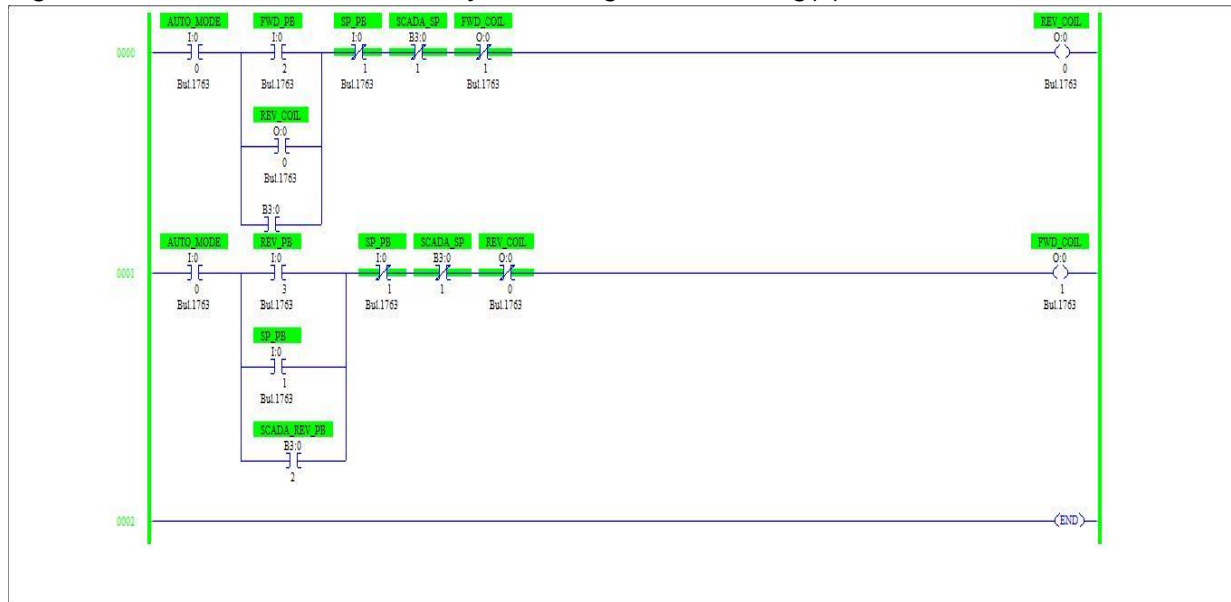
The tableno.(1)ratingsofthreephasesquirrelcageinductionmotorsisgiveninthe tables.

Tableno(1)

Voltage (Volts)	HP	Sped (rpm)	Phase	Frequeny (Hz)	Curentrating(Ampere)
415	3	1440	3	50	4.9

**7.LadderDiagramm:**

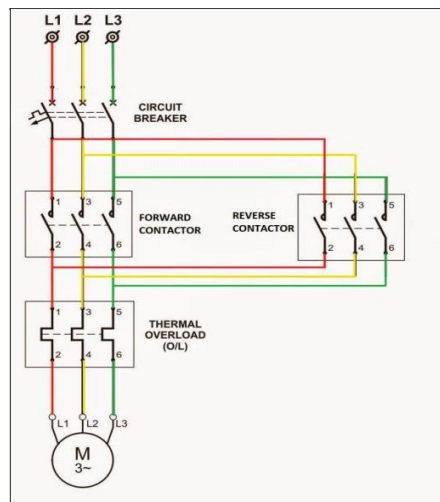
The ladderdiagram languageisasymbolicinstructionsetthat isusedtocreatePLC programs. Theladderinstructionsymbolscanbeformattedtoobtainthedesiredcontrol logic, whichisthenenteredintomemoryladderdiagramshowninfig(2).



fig(2):LadderDiagram

**7.ConnectionDiagram:**

Theconnectiondiagramrepresents thebasicconnectionofmotor. Terminal-1of forwardandreversecontactorsisshortandconnecttosupplyL-1. Terminal-2of bothcontactorsareshortandconnecttothesupplyL-2AndTerminal-3ofthe contactorsalsoconnecttosupplyline-L. Outputsofcontactorisconnectto motoroutputs.Referfig(3).



Fig(3)ConnectionDiagram

## • References

- [1] S.R. Venupriya, K.P. Thanusre, P. Saranya, "A Novel Method Of Induction Motor Speed Control Using PLC", *International Journal for Research in Applied Science & Engineering Technology (IJRASET)*, 3(2), 2015.
- [2] Vaibhav Gupta, "Induction motor speed control using PLC & SCADA" *International Journal for Research of Engineering & Technology (IJRASET)*, 2018.
- [3] Adarsh.R.J\* Narsimpur Tushar.S\*\* Sujatha.M.S\*\*\* MONITORING AND CONTROL SYSTEM FOR THREE PHASE INDUCTION MOTOR FED BY INVERTER DRIVE USING PLC AND SCADA
- [4] Pampashree\*, Dr. Md. Fakhrudin Ansari\*\*\* (Department of Electrical Engg., B.I.T. Sindri, Dhanbad Jharkhand-828123)\*\* (Department of Electrical Engg., B.I.T. Sindri, Dhanbad Jharkhand-828123) "Design and Implementation of SCADA Based Induction Motor Control
- [5] Mr. Manoj M Kharade 1, Prof. Dr. Mrs. N.R. Kulkarni "V/F Speed Control Of Three Phase Induction Motor By Using Plc And Scda"
- [6] Er. JAGATDHIMAN, ER. AJAYLOTHETA "SUPERVISORY AND CONTROL OF THREE PHASE INDUCTION MOTOR USING VFD WITH PLC PROGRAMMING"  
"M. TECH STUDENT, ETERNAL UNIVERSITY jatin.dhiman15@gmail.com
- [7] Yasarbirbir, H. Selcuknogay, "Design and Implementation of PLC-Based Monitoring Control System for Three-Phase Induction Motors Fed by PWM Inverter", *IEEE International Journal of Systems Applications, Engineering & Development Issue 3., Vol. 2, 2008.*
- [8] M. Iacob, G. -D. Andreescu, and N. Muntean, "SCADA system for a central heating and power plant" in *Proceedings of 5th International Symposium on Applied Computational Intelligence and Informatics*, pp. 159–164, May 2009
- [9] S. Da'na, "Development of a monitoring and control platform for PLC-based applications" *Journal Computer Standards & Interfaces*, Vol. 30, Issue 3, pages 157-166, March 2008