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Plc Based Induction Motor Controller

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ABSTRACT: As the technology in industries and IT sector is changing rapidly these years, some traditional bulk electronic appliances have to be monitored for a long time. All of their control devices such as communication interfaces gradually enter the Internet Information era. The control of all equipment has been performed through the use of computers.Most equipment uses PLC to connect with computers to monitor each load and electricity consuming devices. Programmable Logic Controllers (PLC) are widely used for controlling induction motor in automatic mode and manual mode because they are inexpensive, easy to install and very flexible in applications. This paper presents implementation of PLC based control for the 3-phase induction motor linked with PLC and Ladder language code in LD micro software.

Keywords: PLC,Induction motor, Automatic and Manual mode, Ladder Language, LD micro.

I. INTRODUCTION

In this paper, we have provided automatic mode of control for the directional and speed control of the induction motor. In automatic mode of operation the directional and speed control is achieved with the help of PLC (Programmable Logic Controller) and Ladder software. So just by sitting in the control room and by making the communication link between the PC, PLC and Ladder software, the induction motor can be controlled and can rotate in both directions.

PLC as a System Controller

Programmable Logic Controllers are modular, industrially hardened computers which perform control functions through modular input and output (I/O) modules. The modularity of PLC allows the user to combine generic I/O modules with a suitable controller to form a control system specific to his is most simply understood needs. The operation of a controller by envisioning that it repeatedly performs three steps:

1. Reads inputs from input modules
2. Solves pre-programmed control logic
3. Generates outputs to outputs modules based on the control logic solutions. Input devices and output devices of the process are connected to the PLC Input devices and output devices of the process are connected to the PLC Input devices and output devices of the process are connected to the PLC Input devices and output devices of the process are connected to the PLC Input devices and output devices.

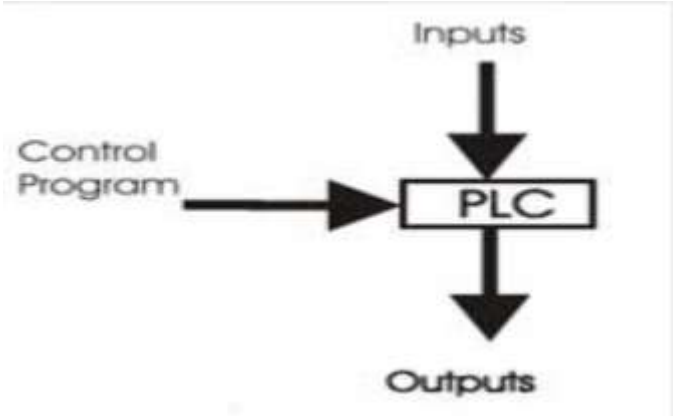

Fig.1 Control action of a PLC

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In our application it controls through analog and digital inputs and outputs the varying load constant operation of an induction motor. Also the PLC continuously monitors the inputs and activates theoutputs according to the control program. This PLC system is of modular type composed of modules, which plug directly into a proprietary bus, a CPU, a power supply unit, input-output modules I/O and program terminal.

Control System Of Induction Motor

The software models generated in the Software Requirements Analysis phase of the development project are refined and embellished in the design phase of the project. This phase involves making implementation decisions such as the interfacing between different software modules, the breakdown of software across multiple processors, assigning inputs and outputs to I/O cards, etc. PLC software, once written must be easy and intuitive to follow.PLCs are an integrated part of thedomain system, advances in the technology of the system will effect the requirements of PLC.

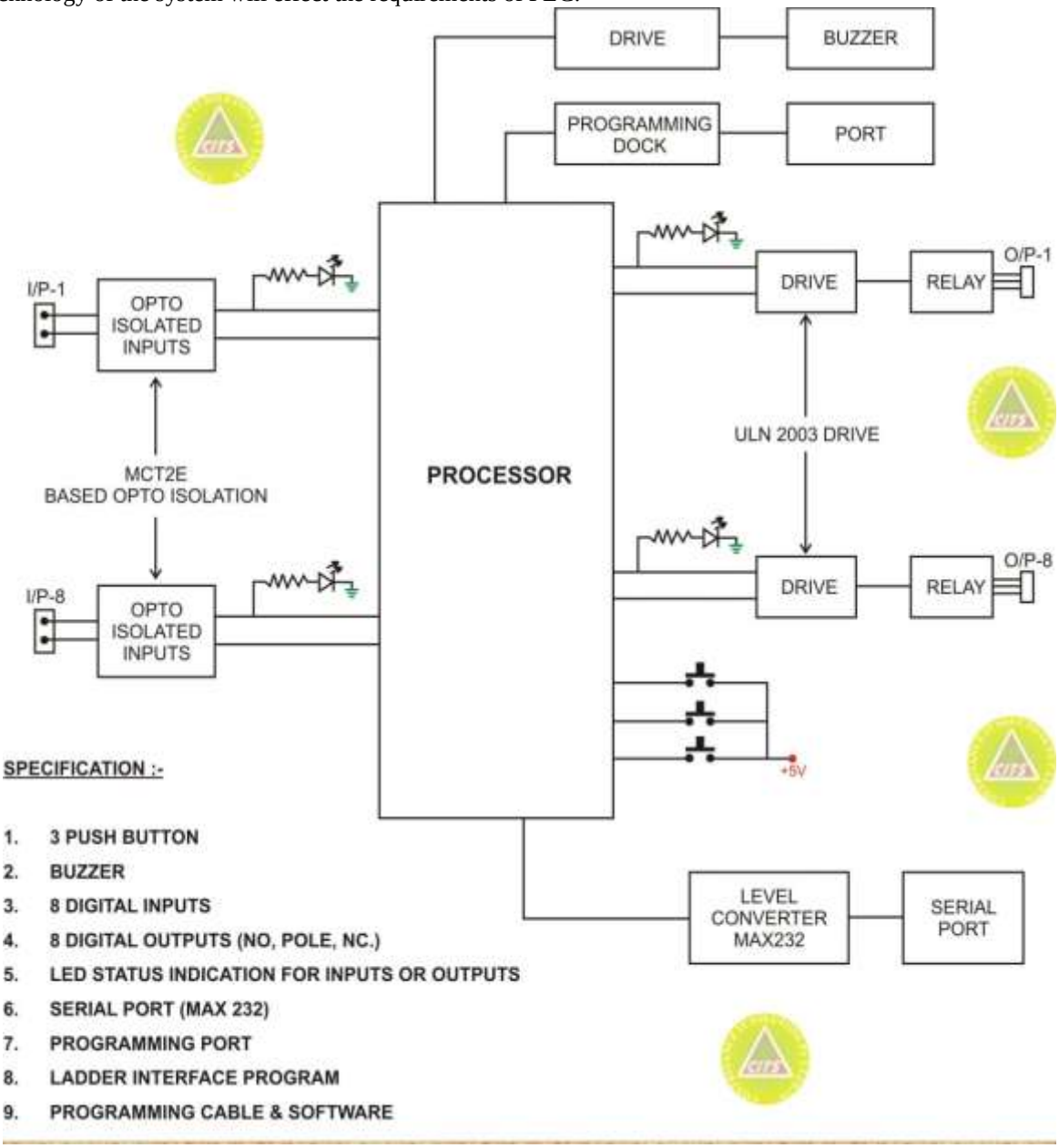

Fig.2 Design of PLC based control system of induction motor

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The programming method used is the ladder diagram method. The PLC system provides a design environment in the form of software tools running on a host computer terminal which allows ladder diagrams to be developed, verified, tested, and diagnosed. First, the high-level program is written in ladder diagrams. Then, the ladder diagram is converted into binary instruction codes so that they can be stored in random-access memory (**RAM**) or erasable programmable read-only memory (**EPROM**). Each successive instruction is decoded and executed by the CPU. The function of the CPU is to control the operation of memory and I/O devices and to process data according to the program. Each input and output connection point on a PLC has an address used to identify the I/O bit. The ladder program is then executed rung by rung. Scanning the program and solving the logic of the various ladder rungs determine the output states.

The development system comprises a host computer (PC) connected via an RS232 port to the target PLC. The host computer provides the software environment to perform file editing, storage, printing, and program operation monitoring.The process of developing the program to run on the PLC consists of: using an editor to draw the source ladder program, converting the source program to binary object code which will run on the PLC' s microprocessor and downloading the object code from the PC to the PLC system via the serial communication port.

Design And Implementation

As a microprocessor-based system, the PLC system hardware is designed and built up with the following modules :

central processor unit (CPU);

• discrete output module (DOM);
• discrete input module (DIM);
• analog outputs module (AOM)
• analog inputs module (AIM)
• power supply.

The speed control software is illustrated. The software regulates the speed and monitors the constant speed control regardless of torque variation. The inverter being the power supply for the motor executes this while, at the same time, it is controlled by PLC' s software. The inverter alone can not keep the speed constant without the control loop with feedback and PLC. From the control panel, the operator selects the speed set point nsp and forward/backward direction of rotation. Then, by pushing the manual start pushbutton, the motor begins the rotation. If the stop button is pushed, then the rotation is stopped.

The sequence of the operations is stated below :

• In overloading situations, the motor is cut off and the trip lamp (yellow) is lit. The operator must release the thermal relays and then must turn off the trip lamp by pushing trip or stop button. The thermal relays are set to the motor rated current 4 A. Following this, the motor can be started again.
• The motor can be cut off by the operator pushing the stop button: the display of the actual speed is set to zero, the start lamp (green) turns off, and the stop lamp (red) turns on and remains lit for 3 s.
• The load must be disconnected immediately after the motor cuts off and before the drive system is restarted. The motor will not start before 3 s after cutoff even if the start button is pushed.

The PLC controlled system works with very low slip values, almost zero. In all speed and load torque conditions, the configuration :

a) has a smaller slip than configuration

b) thus the higher values of efficiency can be justified and especially at high speeds and frequencies. At lower frequencies, the magnetic flux increases and, thus, there is an increase in magnetizing current resulting in increased losses. This system presents a similar dynamic response as the closed-loop system with V/f speed control. Its transient performance is limited due to oscillations on torque and this behavior restricts the application of this system to processes that only require slow speed variation.

II. RESULT

A model in the PC is implemented for speed control of the induction motor in automatic mode. In automatic mode of operation, once the programming in Ladder language in LD micro software is completed. Then click on the runtime option. The pressing of switch will either increase or decrease the speed of the induction motor or turn it off. In this way the system can be operated in automatic mode as per requirements.The system was tested during operation with varying loads including tests on induction motor speed control performance and tests for trip situations. The PLC monitors the motor operation and correlates the parameters according to the software.

III. CONCLUSION

We have successfully obtained the experimental results that the PLC can be used in automated systems with an induction motor. The monitoring control system of the induction motor controlled by PLC proves it can be used wherever required.Successful experimental results were obtained from the previously described scheme indicating that the PLC can be used in automated

systems with an induction motor. The monitoring control system of the induction motor controlled by PLC proves its high accuracy in speed regulation.

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