Softwell Automation

Knowledge Think Skills Engineer

Trainer Bhawesh Kumar Singh
Experiance 18 Years in Installation , Commissiong & Corporate Training

Hardware

Panel 1 . Basic VFD
Sinamics G120C / V20

Panel 2. Advance VFD
Sinamics G120

panel 3 . Basic PLC
Siemens S7-1200

Panel 4 . Advance PLC
Siemens S7-1500

Panel 5 . Distributed CPU
Distributed PLC Siemens ET-200S

Panel 6 . RIO
Distributed Remote Input Output

Panel 7 .Siemens HMI
WinCC RT Advance

Panel 8 .
Siemens PLC/ Panel Wiring

Software

- TIA Selection Tool
- Wireshark
- PLC TIA portal V17
- VFD Starter V5.4.2.1
- HMI TIA WinCC V17
- SCADA WinCC Explorer V 7.5 SP2

Language

- Ladder Diagram / FBD / STL/ SCL

Siemens PLC HMI SCADA VFD & Networking

Protocols:- Profinet/Ethernet IP, USS & Modbus RTU, OPC UA & Web Server

Objective

This course aims to provide participants with a comprehensive understanding of Siemens PLC,HMI/SCADA, VFD, SQL Server & Web SCADA systems, with a focus on integration and communication using the following protocols: Profinet/Profibus, USS, and Modbus RTU. By the end of this course, participants will be able to:

Couse Outline

Introduction to Industrial Automation: Overview of industrial automation and control systems

- Module 1: Siemens PLC Programming : Introduction to Siemens PLCs (e.g., S7-1200, S7-1500 series).
- Module 2: Configuring and programming Siemens Distributed CPUs: Communication protocols for distributed systems (e.g., Profinet)
- Module 3: Overview of Siemens Configuring and programming Remote I/Os, Network communication for remote I/Os (e.g., Profibus, Profinet)
- Module 4: Siemens HMI Design and Programming, Introduction to Siemens HMI panels (e.g., SIMATIC Comfort Panels), HMI design principles and best practices. Integrating HMI with Siemens PLCs
- Module 5: SCADA Integration with Siemens Systems Configuration and integration of Siemens WinCC for SCADA, Communication between SCADA and PLCs/Distributed CPUs
- Module 6: Variable Frequency Drives (VFD) Configuration, Overview of Siemens VFDs (e.g., SINAMICS series), Configuration and programming of VFDs for motor control, Communication between PLCs and VFDs (e.g., USS, Modbus)
- Module 8: Instrument Interfacing : Connecting RTD sensors to Siemens PLCs through Modbus RTU. Encoder & Energy Meter on Modbus RTU

Case Studies and Practical Applications

- Real-world examples of Siemens integration projects
- Hands-on exercises for programming and configuring Siemens systems
- Troubleshooting and debugging common integration issues

Project Work and Final Assessment

- Participants work on a comprehensive integration project
- Final assessment to evaluate understanding and practical skills

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Week 01

Objective

"The course has been designed to familiarize Engineers with the many different aspects associated with the Parameterisation of G120 AC drives. To allow the students to gain the greatest possible benefit from the course, application-specific exercises, actual drawings, and program listings are used wherever possible."

Software

- **TIA Selection tool**
- **Starter V5.4.2.01**
- **TIAStart Drive V17**

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Siemens G120 AC Drives Course

Course Contents

Week 01 (10:00 AM to 6:00 PM)

- To understand the basic techniques of controlling an AC motor.
- Terminology Concept:- HP, Power, Torque, Frequency, Cube Law, Square Law
- Drive theory:- Converter, Inverter, Regeneration & DBR.
- Linear Control, Quadratic Control, Vector control.
- Flying restart, dynamic brake, closed-loop control
- Cataloging of Sinamics drive, application, and selection of siemens Drive
- Block diagram of the product, terminal details,
- How a G120 & S120 drive is constructed, and how the various protection features work.
- Selection of PM & CU
- Operation of the G120/S120, range and specification.
- Protection Control connections.
- Speed and Torque control.
- Introduction to S120 Drives.
- Basic difference Between G120 and S120 Sinamic drives
- Application wise usage of G120 & S120 Drives

Software installation of "Starter"

- Parameter structure and quick commissioning procedure
- Selection of Macro as per application
- Reset to default, Motor Parameterization and auto-tuning
- Digital and analog I/O wiring and configuration
- Diagnostics of wiring
- Parameter– with BICO technology working with programmable binary
- and analog inputs and outputs
- Using various Data sets – CDS, DDS Different types of Braking methods
- Diagnostics and troubleshooting – Practical exercises using the training case
- Designed
- Hands-on exercise for projects, service, maintenance
- backup of the drive, communication and configuring different Protocol, online
- parameter modification, uploading, and downloading.
- control word and status word read and Interfacing code of starter V 5.4.2.1

Week 02 & 03

Objective

A Siemens PLC S7-1200/S7-1500 course using the TIA Portal (Totally Integrated Automation Portal) software typically covers a wide range of topics related to programmable logic controllers (PLCs), including hardware, programming, networking, troubleshooting, and more. Here's a general outline of what you might expect to find in such a training course using TIA Portal V17:

Software

- **TIA Selection tool**
- **TIA Portal V17**

Protocol

- **Modbus TCP/IP**
- **ProfiNet**
- **Modbus RTU**
- **MQTT**
- **OPC UA**

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Siemens PLC Programming Course

Course Contents

Week 02 & 03 (9:30 AM to 5:30 PM)

- Hardware Overview: Introduction to Siemens S7-1200, S7-300, S7-400 and S7-1500 PLC families.
- Catalogue and Article number: Catalogue and Selection of PM CPU IM SM FM CM Modules families. TIA Selection Tool Software for generate order
- Online Communication: Setting up hardware online diagnostic using the TIA Portal. Firmware update, IP Change, Reset PLC, Device name
- PLC Configuration: Setting up hardware configurations using the TIA Portal.
- Configuring I/O modules, communication interfaces, and other hardware parameters.
- Download in PLC / Uploading from PLC Compare online offline backup
- Data Types and addressing:

Elementary data & complex data Types. Bool | Byte | Word | Double word Pointer | Array | date & time | Struct | string | UDT

- Compare Symbolic & Absolute addressing
- Types of PLC panel: Main control Panel ,Remote Input Output Panel , Operator Panel Box
- Read Electric drawing and make Excel sheet:

Creating basic IO List of Main Control Panel. ,Creating basic IO List of Operator Panel Box. ,Create User define tags/ common data Tags

- Import Export 1000 tags in TIA: Import/ export Tags in TIA portal USE UDT , Create Global DB
- 12. Mapping Page Development as per Industry 4.0: Creating FC Function Page ,Creating Input | Output | Alarm Mapping | ProfiNet Network Status | Tower Mapping
- Logic Development for Human Safety: Creating Logic for Emergency Switch | Light Curtain | safety door Feedback Fault Logic
- Logic Development for electrical Safety: Creating Logic for MCCB Healthy | Transformer MCB Healthy .More than 10 internal Panel feedback healthy Logic as per DCP standard
- Logic Development for Switches: Creating Logic for Auto Mode Selector Switch | Auto Mode Selector Switch
- Auto start Push Button | Auto stop Push Button | Fault reset PB | Fault Ack PB . Lamp Test PB
- Advanced Programming and global Logic for Manual Mode Auto Mode: Pre-Condition and post condition interlock.
- Timer, Counter & Compare:
- Function Block FBs:
- Troubleshooting and Debugging: Techniques for diagnosing and resolving common PLC issues. Using the online/offline simulation for testing and debugging.

Week 04

Objective

These objectives aim to provide participants with a foundational understanding of WinCC RT Advanced V17 HMI and its key features. Adjustments can be made based on the specific focus and duration of the training program.

Protocol

- **Ethernet IP**
- **Profinet**
- **Modbus TCP/IP**

Software

- **TIA WinCC RT Advance**

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Siemens HMI Training

Course Contents

week 04

- 1. Introduction to WinCC Runtime: o Overview of SCADA (Supervisory Control and Data Acquisition) systems. o Introduction to TIA Portal and WinCC Runtime. o Differences between WinCC Runtime Advanced and Basic versions.
- 2. Project Configuration: o Setting up a new WinCC Runtime project. o Configuring communication with PLCs and other devices. o Creating a new HMI (Human-Machine Interface) application.
- 3. Integration with PLCs: o Integrating WinCC Runtime with Siemens PLCs. o Tag linking and data exchange. o Handling PLC faults and errors.
- 4. Creating HMI Screens 01 Machin Status: o Designing and configuring graphical user interfaces. o Adding and customizing objects (buttons, indicators, charts, etc.). o Creating navigation between screens.
- 5. Creating HMI Screens 02 Alarm Management: o Defining and organizing tags for data acquisition. o Setting up alarms and events. o Using tag logging and Discrete Alarm. 6. Creating HMI Screens
- 05: Trends management o Setting up real-time trends and historical data logging.
- 6 Generating and customizing reports. o Data analysis and visualization
- 7. Security and User Management: o Implementing security measures to protect the HMI system. o Configuring user accounts and permissions. o Authentication and access control
- 8. Remote Access and Mobile HMI: o Enabling remote access to the HMI system. o Developing mobile-friendly HMI interfaces. 9. Troubleshooting and Diagnostics: o Common issues and how to troubleshoot them. o Using diagnostic tools and logs.

Week 05

Objective

These objectives aim to provide participants with a foundational understanding of WinCC RT Advanced V17 HMI and its key features. Adjustments can be made based on the specific focus and duration of the training program.

Protocols

- **Profinet**
- **Modbus TCP/IP**
- **OPC UA**
- **Ethernet IP**

Software

- **WinCC Explorer V7.5**

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Siemens SCADA WinCC Explorer

Course Contents

week 05

- **1. Introduction to WinCC Runtime: o Overview of SCADA (Supervisory Control and Data Acquisition) systems. o Introduction to TIA Portal and WinCC Runtime. o Differences between WinCC Runtime Advanced and Basic versions.**
- **2. Project Configuration: o Setting up a new WinCC Runtime project. o Configuring communication with PLCs and other devices. o Creating a new HMI (Human-Machine Interface) application.**
- **3. Integration with PLCs: o Integrating WinCC Runtime with Siemens PLCs. o Tag linking and data exchange. o Handling PLC faults and errors.**
- **4. Creating HMI Screens 01 Machin Status: o Designing and configuring graphical user interfaces. o Adding and customizing objects (buttons, indicators, charts, etc.). o Creating navigation between screens.**
- **5. Creating HMI Screens 02 Alarm Management: o Defining and organizing tags for data acquisition. o Setting up alarms and events. o Using tag logging and Discrete Alarm. 6. Creating HMI Screens**
- **05: Trends management o Setting up real-time trends and historical data logging.**
- **6 Generating and customizing reports. o Data analysis and visualization**
- **7. Security and User Management: o Implementing security measures to protect the HMI system. o Configuring user accounts and permissions. o Authentication and access control**
- **8. Remote Access and Mobile HMI: o Enabling remote access to the HMI system. o Developing mobile-friendly HMI interfaces. 9. Troubleshooting and Diagnostics: o Common issues and how to troubleshoot them. o Using diagnostic tools and logs.**

Week 06

Objective

A Siemens Networking Communication Protocols course that covers various communication scenarios, including PLC to PLC, PLC to VFD on USS Protocol, PLC to VFD on Modbus RTU, and PLC to Energy Meter, would typically provide participants with the knowledge and skills needed to establish communication between different devices in an industrial automation environment. Here's a general outline of what you might expect to find in such a course:

Software

- **TIA Portal V17**
- **TIA WinCC RT**
- **Starter**

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Integration of PLC,Distributed CPU, Remote I/O's, HMI , SCADA, VFD , Energy Meter, Encoder, RTD Sensor

Course Contents

week 06

Sinamics G120 USS Protocol Communication with Siemens PLC:

- Introduction to Sinamics G120 drives and USS protocol.
- Configuring communication parameters for USS protocol.
- Establishing communication between a Siemens PLC and Sinamics G120 using USS protocol.
- Troubleshooting and diagnostics for USS protocol communication.

Sinamics G120 Modbus RTU Protocol Communication with Siemens PLC:

- Overview of Modbus RTU communication.
- Configuring Modbus RTU communication parameters.
- Setting up Modbus RTU communication between a Siemens PLC and Sinamics G120 drives.
- Debugging and troubleshooting Modbus RTU communication issues.

Sinamics G120 Profinet Protocol Communication with Siemens PLC:

- Understanding Profinet communication.
- Configuring Profinet communication settings.
- Establishing Profinet communication between Siemens PLC and Sinamics G120 drives.
- Monitoring and troubleshooting Profinet communication.
- Siemens PLC to Siemens Distributed CPU Communication:
- Introduction to Siemens PLC and Distributed CPU communication.
- Configuring communication parameters for Distributed CPU.
- Setting up communication between Siemens PLC and Distributed CPU.
- Diagnosing and addressing issues with this communication.

Siemens PLC to Distributed/Remote Input-Output Communication:

- Exploring communication options for distributed or remote I/O systems.
- Configuring communication settings for remote I/O devices.
- Integrating Siemens PLCs with distributed or remote I/O systems.
- Troubleshooting and troubleshooting techniques for remote I/O communication.

Throughout the course, participants are likely to engage in hands-on exercises, practical demonstrations, and real-world scenarios to ensure they gain a comprehensive understanding of these communication protocols and integration techniques.