



2020 CODESYS Training - Saint Paul, MN



WHEN

August 25-28, 2020
8AM - 5PM each day

WHERE

Power/mation
Saint Paul Office

1310 Energy Lane
Saint Paul, MN 55108

COST

- \$2000 per participant
- Course materials on USB drive supplied to students to keep at no additional charge.

LUNCH PROVIDED

CLICK TO REGISTER

Join Power/mation for a fast-paced, in-depth training on the world's most widely accepted IEC61131-3 standard industrial programming environment.

This training utilizes intensive hands-on learning techniques to combine the traditional 3-day introductory and 2-day advanced courses into one 4-day training experience. After this class you will be ready to bring the power of CODESYS to bear on your next industrial controls programming job. You will be well qualified to program the millions of industrial controllers around the world powered by CODESYS.

SUBJECT MATTER:

- CODESYS Integrated Development Environment (IDE)
- IEC61131-3 Industrial Programming Languages
- Object-oriented programming and its application to industrial controls
- (see syllabus on page 2 for details)

PREREQUISITES:

- General knowledge of Industrial Controls programming
- Openness to new methodologies and paradigms
- Well rested and ready to drink from the fire hose

REQUIREMENTS AND PRE-CLASS PREPARATIONS:

- Participants will provide their own Windows Laptop computer with CODESYS pre-installed and tested.

THE BENEFITS OF CODESYS

- In the 1990s, the industry developed standardized programming languages and now CODESYS represents the evolution of a single development environment to better implement those languages.
- CODESYS brings a standard IDE (Integrated Development Environment) to a growing number of Power/mation's key industry partners such as ABB, Lenze, Nidec Control Techniques, Turck and Festo. These manufacturers can modify the technology with their own libraries and other customization, but the core is CODESYS.



- CODESYS brings a standard IDE (Integrated Development Environment) to implement the industry's standard IEC-61131-3 programming languages in one package (Ladder, Function Block Diagram, Structured Text, Instruction List, and Sequential Function Chart)
- CODESYS caters to users' preference to code with the languages in which they are familiar
- Power/mation carries the automation products necessary to your application that support CODESYS.
- CODESYS adoption is growing quickly. Here is a current list of other companies that use the platform:



2020 CODESYS Training Continued

TABLE OF CONTENTS

Topic 1: Intro to IDE

- About CODESYS
 - Company Overview
 - CODEYS Product Ecosystem
 - Support Options
 - The Development System
 - Benefits of the IEC 61131-3
 - Version Handling
 - Caveat
 - Device Tree
- Starting a new project
- Starting the simulator
- Scanning for devices
- Logging in and running
- Breakpoints and single step
- Lab Notes

Topic 2: Help, Settings and Layout

- Tour of Online Help
- Options
- Customize the CODESYS Dev. System
- Project Settings
- Miscellaneous settings
- Page Layout
- Other Sources of Help

Topic 3: CODESYS Projects

- Multiple Devices in a single Project
- Programmable vs Parameterizable
- Managing CODESYS IDE Objects
- Active Application
- Online Status
- Updating Devices and Project Archive

Topic 4: Variables and Data Types

- Basic Data Types
- Declaring Variables and Auto Declare
- Upper and Lower Limit of Basic Types
- Arrays and Array Initialization
- Global vs Local Scope
- Input and Output Variables
- Strings
- Display Radix
- Declaring instances of Function Blocks

Topic 5: Ladder Logic and FBD Editor

- Adding a Ladder POU
- Using the tool box
- Adding comments
- Box Vs Box w/ EN/ENO
- Adding declared boxes
- Using the tool bar
- Building a basic ladder diagram
- Converting to FBD

Topic 6: Sequential Function Chart

- Overview
- SFC Elements
 - Steps, Transitions, and Actions
- SFC Sequence Methods
 - Simple, Alternative, Simultaneous
- Building an SFC
 - Adding steps, branches, and actions
 - Toolbar Options and Properties
 - Window

Topic 7: Structured Text

- Introduction to ST
- Assignments
- Operators
- Conditionals
- Loops: For, While, Repeat
- Enumerations
- Accessing Function Block I/O Variables
- State Machines in Structure Text

Topic 8: Advanced Debugging

- Simulation Vs Control Win
- Breakpoints, Single Step, Watch List
- Flow Control
- Force and Write
- Browse, Definition, Call Tree, Cross
- Reference
- Online Change, Trace and Trend
- Operating Mode, Core Dump and Load
- Reset and Clean
- Device Log and Messages

Topic 9: Functions and Function Blocks

- Program Organization Units - POUs
- Functions – FUN
 - Limitations
 - Standard Functions
- Function Block – FB
 - Standard FBs
 - Instances
 - In- & Outputs
- Input Assistant for FBs
- Should I make this a FUN or an FB?

Topic 10: Continuous Function Chart

- Editing Basics
- Using Methods
- Editing Pins and Blocks
- Parameters
- Examples

Topic 11: The Power of OOIP

- OOIP vs OOP
- Why OOIP
- Traditional Task-Based vs OOIP
- Plant View
- Control and Equipment View
- Mapping for object re-use
- Simulation

Topic 12: User Defined Types

- Multi-Dimensional Arrays
- Structures and Enumerations
- Unions and Alias
- Composite Pins, Structure Mapping
- FBs as Data Structures
- Direct Connect

Topic 13: I/O Devices and Fieldbus

- Adding Local I/O to device
- Configure local I/O
- Adding an Ethernet Fieldbus Device
- Installing a Device with EDS file
- Configuring an Ethernet IP Device
- Online Config Mode

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TABLE OF CONTENTS CONTINUED

Topic 14: Visualization Overview

- Visualization Manager
- Displaying Values
- Getting Inputs
- Animation
- Reusing Visualization/Object Oriented Visualization
- Dialogs

Topic 15: Libraries

- Types of Libraries
- Library Manager
- Library Repository
- Available Libraries
 - Standard, CAA, OSCAT, etc.
- Codesys Store
- Creating a Custom Library
- Implement your Custom Library

Topic 16: Task Configuration

- Introduction
- Task Types
- Task Priorities
- Task Monitoring
- Watchdog Timer

Topic 17: OPC UA and Peer to Peer

- OPC-UA
- Symbol Configuration
- Network Variables

Topic 18: CODESYS Security

- Configure an Owner
- Project Permissions
- Project File Encryption
- Encrypted Connection
- Device (PLC) Security

Topic 19: Recipes

- Overview
- Recipe Manager
- Recipe Files
- Recipe Definitions
- Loading and saving recipes to your local machine
- Recipe Management
- Programmatic Recipes

Topic 20: Using a Trace

- What is a trace
- How does a trace work
- What is the trace functionality
- Adding a Trace
- Trace Configuration
- Adding a variable
- Display settings
- Using a Trace

Topic 21: CODESYS Store & Professional

- Developers Edition (PDE)
- SL Runtimes
- CODESYS UML
- CODESYS Profiler
- CODESYS Static Analysis
- Demos & Misc
- Packages

• Topic 22: Subversion and Collaborative Design

- What is SVN (Subversion)
- Tasks of a Source Code Management System
- SVN Integration in CODESYS
- Differences to Engineering Interface (ENI)
- Advantages
- Availability

Topic 23: Miscellaneous Topics

- Controller Handling
- Source Code Management
- Debugging
- Useful Coding Tools
- Advanced Coding Features

Topic 24: OOP and Inheritance

- What the **** is OOP?
- Precedence of methods and variables
- Interfaces
- References and Pointers

Final Project

Bottled Happiness

ABOUT THE INSTRUCTOR

This class will be conducted by Mr. Gary L. Pratt, P.E.

Mr. Pratt began his career in 1982 with Chevron Corporate Engineering, and recently retired as president of the CODESYS Corporation. He is an enthusiast and evangelist for both IEC61131-3 and CODESYS and has published many articles on the latest programming techniques enabled by IEC61131-3 and CODESYS. He also holds several patents in the area of industrial controls.

Mr. Pratt has been teaching this course and refining the course material for many years with the goal of providing the most comprehensive and effective training on the subject available. He is pleased to be able to share his knowledge and experience with the next generations of controls engineers.

2020 CODESYS Training Continued

MANUFACTURERS SUPPORTING CODESYS

- 3S-Smart Software Solutions GmbH
- Advantech Europe B.V.
- akYtec GmbH
- Altus Sistemas de Informática S.A.
- AMK Arnold Müller GmbH & Co. KG
- ASEM S.p.A.
- Automata GmbH & Co. KG
- Beck IPC GmbH
- Beijer Electronics
- Berghof Automation GmbH
- BIVIATOR AG
- Bizerba GmbH & Co. KG
- Bosch Rexroth AG
- Brunner Elektronik AG
- CAM Technology Corporation
- Christ Elektronik GmbH
- CMZ SISTEMI ELETTRONICI S.r.l.
- CONTEC Co., Ltd.
- CREVIS CO.,LTD
- CrossControl AB
- Datawatt BV
- DEIF Wind Power Technology
- Eaton Automation AG
- ECKELMANN AG
- EleSy Company
- elrest Automationssysteme GmbH
- epis Automation GmbH & Co. KG
- ESA AUTOMATION
- Eurotherm by Schneider Electric
- exceet electronics AG
- EXOR Deutschland GmbH
- Festo AG & Co. KG
- Googol Technology (SZ) Limited
- Grossenbacher Systeme AG
- Hans Turck GmbH & Co. KG
- HEINZMANN GmbH & Co. KG
- Hitachi Europe GmbH
- Hottinger Baldwin Messtechnik GmbH
- IDS GmbH
- ifm electronic gmbh
- INTER CONTROL - Hermann Köhler Elektrik
- GmbH & Co. KG
- Janz Tec AG
- JUMO GmbH & Co. KG
- KEB Automation KG
- KEBA AG
- Kendrion Kuhnke Automation GmbH
- Lenze Automation GmbH
- Liebherr-Elektronik GmbH
- LTI Motion GmbH
- Mitsubishi Electric EUROPE B.V.
- MKT Modulare Komponenten Technik
- Motorola Solutions Israel Ltd.
- NAP automotive Produkte GmbH
- NEXCOM
- Nidec Control Techniques Limited
- NIVUS GmbH
- Num AG
- Parker Hannifin GmbH
- PsiControl Mechatronics
- Qube Solutions UG
- Research Laboratory of Design Automation
- Ritter Elektronik GmbH
- SBS S.p.A.
- Schneider Automation S.A.S.
- Schraml GmbH
- Schubert System Elektronik GmbH
- SchulerControl GmbH
- Sensor-Technik Wiedemann GmbH
- Servotronix Motion Control Ltd.
- sm motion control gmbh
- SMART IN OVATION GmbH
- Sontheim Industrie Elektronik GmbH
- STÖBER ANTRIEBSTECHNIK GmbH & Co. KG
- SYS TEC electronic GmbH
- Syslogic Group
- SysTec GmbH
- TELESTAR S.r.l.
- TRsystems GmbH
- VELTRU AG
- WAGO Kontakttechnik GmbH & Co. KG
- ZheJiang SUPCON Electronics Co. Ltd.

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