COURSES CATALOGUE

CONTROL SYSTEMS AND VISUALIZATION

Electrical engineering and automation
- Siemens S7-300/400
- SIEMENS S7 Migration Step7 - TIA Portal
- Siemens S7-300/400 TIA Portal
- Siemens S7- 1200 TIA Portal
- Siemens S7-1500 TIA Portal
- SIEMENS S7-SCL/GRAPH in TIA Portal
- Siemens Safety Integrated
- HMI/SCADA
- Industrial networks
- SIMATIC PCS7
- CoDeSys
- Drive systems
- Industrial sensors
- MITSUBISHI
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and Safety Advanced in SIMATIC SAFETY

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The Engineering Training Center specializes in providing trainings for engineers in the area of mechatronics and broadly defined engineering techniques. Our main training sections are:

- Visualization and control systems
- Mechanical engineering
- Material engineering
- Production quality
- Industrial robots
- Production quality management
- Machinery safety
- SIEMENS PLM

We organize workshops, conduct consultations, implementation advice and support; we sell software and systems automation products, as well as run measurements and tests for specific purposes.

EMT-Systems has been operating on the training market for many years. We offer innovative approach to training engineers and technicians working in different branches of industry. Our courses are based on comprehensive programs focused on the needs of maintenance services and designers working with CAD/CAM/CAE software. They are often created to suit the specific requirements of the customer.

Trainings offered by EMT-Systems are the guarantee of high quality and professionalism resulting from years of experience in developing course programs for firms, public institutions, education units and individual clients. Success of our clients is our best recommendation.

Our mission is to conduct highest quality trainings for industrial personnel to help them adapt to modern jobs using innovative technologies. We help to identify training needs of each participant and suggest the optimal course path for them. Through the comparison of initial and final tests' results we monitor the increase in knowledge and skills, which automatically allows us to prove the effectiveness of our work.
QUALITY POLICY. PRIZES AND AWARDS

Quality policy
Prizes and awards

Because we are constantly improving the quality of our training services, we have implemented the Product Certification System according to the following standards:

- PN-EN ISO 9001:2015
- ISO 29990:2010

The awarded certificates encourage us to constantly improve and update our services.

We have been a member of the Polish Chamber of Training Companies since June 2013. We are obliged to obey the regulations of the Code of Good Practice and use them in our everyday work. We have also signed the Training Service Standard document. We are driven by the rules of professional ethics and business integrity.

We have received numerous awards and prizes:

- 2018 Innovation Laurel for the training: Chemoset and thermostet polymeric composites - introduction to polymer chemistry, composite properties and manufacturing methods
- 2018 European Medal for all trainings in: „Industrial Robots”
- 2017 Training Company of the Year emblem received from Central Office of National Certificaton.
- 2017 European Medal for all trainings in: „Plastics”.
- 2016 Caesar of Silesian Business awarded at the solemn Business Centre Club gala.
- 2016 European Medal for the training „CNC1: CNC Operator/Programmer”.
- The prestigious Highest Quality Gold Emblem 2016 a grand prix in the category Services in the most pro quality program in Poland, organized under the patronage of the Polish Agency for Enterprise Development, Polish Committee for Standardization and Polish Forum ISO 9000.
- 2016 Training Company of the Year emblem received from Central Office of National Certificaton.
- 2015 Enterprise of the Future.
- 2014 Training Company of the Year emblem received from Central Office of National Certificaton.
- The award of the Marshal of the Silesian Voivodeship during the conference „Innowacja. Cię rozwija” Innosilesia.
The Engineering Training Center EMT-Systems is the authorized training partner for the producer of PLC, PLM, CNC – Siemens CNC Training Partner, Siemens PLM Software, MITSUBISHI Electric Europe Bwadz.V. The contracts signed between the institutions enables us to run certified courses. Constant supervision of industrial partners ensures the highest quality of and access to the latest software and training materials.

- **Training laboratories**
  Participants can enjoy well-equipped training positions, which enable the practical exercises. We provide cutting-edge workstations built on the basis of actual components for industrial automation.

- **Experienced trainers**
  Trainers from the departments of maintenance and design firms with extensive technical knowledge to the design, implementation, and maintenance and repair of equipment and automation systems and high educational qualifications.

- **Training material and course documentation**
  Participants receive professional documentation in the form of textbooks, technical documentation, instructions and other publications. There is also the option of using materials and diagrams provided by the client.

- **Extra classes**
  Participants are entitled to participate in free extra classes on the chosen days, after the scheduled classes.

- **Training methodology**
  We focus on practical exercises and application of our tutors’ knowledge backed up by real-life examples. As a rule, 30% of time is devoted to theoretical training and 70% of time is designated to active forms of participation – workshops and exercises which allow the participants to gain practical skills on operating machines and systems.

- **Two different course types: open and closed**
  Such a solution provides the participants with the opportunity of choosing the best option. Open courses are aimed towards individual participants while closed courses are dedicated to firms.

- **Catering**
  For courses carried out in our training rooms we provide daily coffee breaks, hot and cold drinks, cookies and two course lunches.

- **Post-training and implementation support**
  We also provide support and help within the topics included in the courses in your everyday work.
SPECIALIZED TRAINING
IN THE FIELD OF INDUSTRIAL AUTOMATION

ELECTRICAL ENGINEERING AND AUTOMATION

Course symbol AM1
Course name Electrical engineering and control cabinet equipment
Course aims Reading circuit diagrams and identification of devices in the control cabinet; terminating cables and creating electrical connections according to the documentation (e.g. connecting I/O of the PLC); control wire protection; building and diagnosing relay control systems (e.g. star-delta starters); diagnosing PLC peripheral circuits; using digital multimeters; unassisted measurement of various signals that can be found in automation (current, voltage, resistance thermometers PT100); detecting and repairing malfunctions of the automation equipment.
Course summary
- Basics of electrical engineering
- Hazards
- Protection against electric shock in electrical equipment with an operating voltage not greater than 1 kV
- Rules for working with electrical equipment
- Fire protection
- Cables, wiring and cable termination
- Overview and demonstration of electrical devices
- Circuit diagrams
- Signals in automation
- Connecting devices in the control cabinet
- Locating and diagnosing defects in control systems
Duration 3 days - 21 hours
Course type Open training

Course symbol AM2
Course name Introduction to industrial automation and control systems
Course aims Knowledge of control signals in automation and relay control systems; learning about basic regulation systems used in industry; industrial sensors; PLC-based control systems and visualization of industrial processes; industrial communication networks; frequency converters.
Course summary
- Open and close
- Control signals
- Using multimeters
- Diagrams of connecting automation systems
- Overcurrent protection
- Terminal blocks, relays and contactors
- Tasks - building relay control systems
- Basics of electropneumatics
- Operating principle and connecting electric motors
- Industrial sensors
- Signal converters
- Tasks - building measurement loops and signal measurement
- Basic regulators
- Parameters of a PID controller
- Safety circuits
- Design and operating principle of a PLC
- Industrial communication networks
- SCADA and HMI systems
- Frequency converters
Duration 3 days - 21 hours
Course type Open training

Course symbol AM3
Course name Safety systems and devices in industrial automation
Course aims Overview of the basic control elements connected with machine safety, based on the latest solutions by the leading manufacturers of industrial automation components; introduction to the aspect of key problems related to legislation and requirements in the field of machine safety; basics of machinery directive; key requirements in the field of health and safety regulations regarding design, production and operation of machinery; identification of machine hazards based on numerous examples; the concept of safety; practical exercises as the laboratory workstations.
Course summary
- Machine safety
- European directives
- World and European standardization organizations
- Hazard identification
- The concept of safety
- Elements of a control system connected with safety (safety sensors)
- Elements of a control system connected with safety (logic units)
- Elements of a control system connected with safety (output systems)
- Signalling elements
- Practical exercises at laboratory workstations
Duration 2 days - 14 hours
Course type Open training

Course symbol NAP1
Course name Basics of drive systems (course description on page 16)
### Course: SIEMENS SIMATIC S7-300/400 programming - basic course

**Course name:** SIEMENS SIMATIC S7-300/400 programming - basic course

**Course aims:**
- Introduction to PLC issues; design and functions of the Simatic S7300/400 logic controllers and Simatic Step 7 software; learning about the S7 environment with its basic programming functions, configuration and diagnostic tools; editing and performing simple controlling tasks in graphic languages LAD, FBD; basic STL programming.

**Course summary:**
- Short history and family of SIMATIC S7
- Starting a project in STEP 7
- Configuring the connection with the PLC
- Hardware configuration
- Addressing PLC inputs and outputs
- CPU - basic operation
- Principles of writing programs - structure and elements of programs
- Logic operations
- LAD language
- Monitoring and testing tools
- Basics of structured programming - using the functions with no parameters
- Function FC
- Flip-flop and edge detection
- FBD language
- XOR gate in FBD language
- Variable table VAT
- Explanation of data: BYTE, WORD and DOUBLE WORD
- Byte order in WORD
- Project management
- Clock Memory – pulse generator
- Basic diagnostic
- Forcing variables
- Jump functions in LAD and FBD
- Introduction to STL language
- Monitor tools for programs written in STL
- Integer math instructions in STL
- Comparing integers in STL
- Jump instructions in STL
- Counters and timers in STL

**Duration:** 5 days - 35 hours

**Course type:** Open training

### Course: SIEMENS SIMATIC S7-300/400 programming - advanced course

**Course name:** SIEMENS SIMATIC S7-300/400 programming - advanced course

**Course aims:**
- Structure and operation of logic controllers SIEMENS Simatic series S7-300/400; advanced programming, configuration, operation and diagnostic functions of logic controllers SIEMENS Simatic S7-300/400; Information about advanced programming STL methods and its application in practice; revision, consolidation and extension of the knowledge included in the basic course.

**Course summary:**
- Explanation of RLO and STA
- Flip-flops and edge detections
- Overview of accumulator instructions
- Basic jump instructions
- Monitoring tools in STL
- Integer math functions
- Function FC and TEMP area
- Comparator, Counter and timer instructions
- Overview of analog input/output module
- Block diagram of analog module
- Properties of analog input module
- Scale and Unscale functions
- Accuracy of analog-to-digital converter
- Cyclic interrupts
- Properties of OB135
- Data block DB
- Declaring variables in DB
- Troubleshoot tools in STEP7
- Reference data
- Module information
- Startup of PLC
- Retentive areas
- Properties of OB100
- Advanced jump instructions
- Word logic instructions
- Jump to labels
- LOOP Instruction
- Indirect addressing
- Different types of pointers
- Address registers
- Project archiving

**Duration:** 5 days - 35 hours

**Course type:** Open training
### SIEMENS S7 - 300/400

<table>
<thead>
<tr>
<th>Course symbol</th>
<th>PLC3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course name</strong></td>
<td>SIEMENS SIMATIC S7-300/400 - diagnostics</td>
</tr>
<tr>
<td><strong>Course aims</strong></td>
<td>Learning to use available functions, identify, diagnose and eliminate problems that may arise while working with control systems based on SIEMENS Simatic S7-300/400 controllers; OB analysis - interrupt handling, error handling, effective monitoring, analysis and modification of the advanced projects and programs: diagnosing causes of CPU stopping, errors of signal modules and using hardware interrupts.</td>
</tr>
</tbody>
</table>
| **Course summary** | • PG – PLC communication  
• New project and hardware configuration  
• Selection and installation of controller’s modules  
• Variable forcing tool FORCE  
• Step by step program operation analysis  
• WinPLC-Analyzer  
• CPU error diagnostics  
• Signal modules diagnostics  
• Reference data  
• OB 10 - OB 17 – Time-of-day interrupts  
• OB 20 - OB 23 – Time delay interrupts  
• OB 30 - OB 38 – Cyclic interrupts  
• OB 40 - OB 47 – Hardware interrupts  
• OB 80 - OB 88 – Asynchronous error interrupts  
• OB 121 - OB 122 – Synchronous error interrupts  
• Error and interrupt blocking  
• Program parameterization of controller’s modules |
| **Duration** | 5 days - 35 hours |
| **Course type** | Open training |

<table>
<thead>
<tr>
<th>Course symbol</th>
<th>PLC5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course name</strong></td>
<td>PLC 5: S7-GRAPH sequence programming</td>
</tr>
<tr>
<td><strong>Course aims</strong></td>
<td>Acquainting the participants with the sequence programming in SIMATIC STEP 7: developing simple and advanced sequence algorithms in S7-GRAPH; monitoring and diagnostics possibilities of the developed sequencer and its integration with the rest of the control program; presentation of the useful programmable conditions in LAD and FBD; learning about interlocks and supervisions, presentation of the examples of using timers and counters.</td>
</tr>
</tbody>
</table>
| **Course summary** | • Operation principles of a sequencer  
• Basic elements and structures  
• S7-GRAPH user’s interface  
• Edition and monitoring of the user’s program  
• Supervision Errors and Acknowledgment  
• Event-Dependent Actions  
• Troubleshooting  
• Synchronization  
• Subsequencer  
• Initial step  
• The Modes of the Sequential Control System  
• Test Functions of STEP 7  
• Printing the Sequencer |
| **Duration** | 2 days - 14 hours |
| **Course type** | Open training |

<table>
<thead>
<tr>
<th>Course symbol</th>
<th>PLC6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course name</strong></td>
<td>S7-SCL programowanie</td>
</tr>
<tr>
<td><strong>Course aims</strong></td>
<td>The principles and the concepts of using structural programming languages on the example of the environment Simatic S7-SCL: overview of application examples for which SCL language should be used: learning software development with practical examples using the SCL language; familiarization with the process of diagnosis and monitoring program error.</td>
</tr>
</tbody>
</table>
| **Course summary** | • Introduction  
• First steps  
• Program structure  
• Structure programming  
• Logic and mathematical operations  
• Conditional operations  
• Program loops  
• Step by step program execution  
• Data blocks  
• Counting incidents and measuring time  
• Additional functions |
| **Duration** | 3 days - 20 hours |
| **Course type** | Open training |

**Workstations**
- Individual workstations fitted with actual manufacturing equipment:
  - PLC1: S7-300 controllers
  - PLC2: STEP 7 software
  - PLC3: sets of actuators
  - PLC4: PLC5: PLC6: More details on page 23
<table>
<thead>
<tr>
<th>Course symbol</th>
<th>Course name</th>
<th>Course aims</th>
<th>Course summary</th>
<th>Duration</th>
<th>Course type</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIA1</td>
<td>Project migration from STEP 7 to TIA PORTAL</td>
<td>Familiarizing the latest version of Step 7 software available within TIA Portal; using new functionalities introduced to TIA Portal Step 7, including operator panels; learning the process of creating configuration for SIEMENS Simatic S7-300/400, PROFIBus DP network as well as edition, implementation and diagnostics of the controller application; software migration to TIA Portal Step7 with identification of potential difficulties and their solutions.</td>
<td>- FBID programming in TIA Portal - STL programming in TIA Portal - Variables monitoring and modification - Comparison of controller’s contents and the project - Compare online/offline - Project migration – verification of program components - Project migration – Preparation of the target project - Project migration from STEP 7 to TIA – Using the tool available in TIA Portal - Project migration from the controller S7-200 to S7-1200 – Introduction - Visualization migration excluding the PLC program - Device Proxy PLC – PLC project in STEP 7 and the visualization in WinCC TIA - Introduction to SCL - Introduction to the language S7-GRAF</td>
<td>3 days - 23 hours</td>
<td>Open training</td>
</tr>
<tr>
<td>TIA2</td>
<td>PLC Siemens Simatic S7-300/400 programming in TIA PORTAL - basic course</td>
<td>Understanding the concept of automatic control of devices using logic controllers; introduction to the TIA environment (Totally Integrated Automation Portal); maintenance, configuration and programming Simatic S7 300/400 controllers with the use of TIA Portal Step 7 software; learning about three basic programming languages for Simatic controllers: LAD, FBD and STL.</td>
<td>- TIA PORTAL Step7 Professional v11– creation and management of the project in Step7 - Connection between PLC and PC - Hardware configuration - Input/output modules - Basic CPU maintenance - Principles of writing programs in LAD/FBD using logic and arithmetic operations, timers and counters - STL language – programming - Testing and monitoring tools for LAD/FBD/STL languages - Project archiving</td>
<td>5 days - 35 hours</td>
<td>Open training</td>
</tr>
<tr>
<td>TIA3</td>
<td>TIA3: PLC Siemens Simatic S7-300/400 programming in TIA PORTAL - advanced course</td>
<td>Introducing the Participants to the detailed design and functions of SIEMENS logic controllers series S7-300/400; acquiring the knowledge about the advanced functions of programming, configuration, operation and diagnostics of Simatic S7 controllers; learning about the methods of programming industrial objects in TIA Portal Step 7 environment using different block types and STL language; expanding the knowledge and improving skills acquired at the basic course that is integral part of the complete training program.</td>
<td>- New project and hardware configuration - Programming in STL - REAL variables - Analogue modules - OB 35 cyclic interrupts - Data Blocks DB - Function Blocks FB - CPU error diagnostics - Application range of the controller resources - Controller and OB. 100 start-up - Operation commands on accumulator bits - Controller status word and advanced jumps - Logic operations on words - Indirect addressing</td>
<td>5 days - 35 hours</td>
<td>Open training</td>
</tr>
</tbody>
</table>

**Course Workstations:**
- Sets of actuators
- S7-300 controllers
- TIA Portal software
- Workstations fitted with actual manufacturing equipment.
SPECIALIZED TRAINING IN THE FIELD OF INDUSTRIAL AUTOMATION

SIEMENS SAFETY INTEGRATED

Course symbol: SAF300
Course name: Programming and designing with Distributed Safety in Simatic Safety Integrated S7-300 Controllers

Course aims: Knowledge on using PLC Simatic S7 in F (FailSafe) versions used to perform tasks connected with safety functions; explanation of the concept of Safety Integrated and Distributed Safety in the Siemens Simatic family; introduction to the certified library „S7 Distributed Safety“ and rules of creating safe programs illustrated with practical exercises; using ISO-EN standards connected with functional safety; overview of the safety functions available in converters and exercises with examples of uses.

Course summary:
- Functional safety in practice
- Components used in safety systems
- Principles of connecting safety system signals to PLC
- PROFIsafe – operation principle
- Solutions for Simatic Safety Integrated
- Configuration of the PLC S7 project
- Preparing a user program for PLC
- Preparing a user program for the operator panel of the HMI visualization system
- Preparing a user program for the frequency converter
- Principles of creating safety programs in PLC
- Overview of standard functions of Distributed Safety libraries
- Safety modes of converter drives as illustrated with Siemens Sinamics G converter

Course type: Open training
Workstation: Individual workstations fitted with actual manufacturing equipment:
- S7-315F 2PN/DP controllers
- S7-1516F 3PN/DP controllers
- sets of actuators

More details on page 26

SIEMENS S7 - 1200 TIA PORTAL

Course symbol: PLC9
Course name: Siemens SIMATIC S7-1200 programming in TIA PORTAL – basic course

Course aims: Gaining knowledge on the design and functions of the S7-1200 logic controllers; learning the basics of programming, configuration, maintenance and diagnostics of SIEMENS SIMATIC S7-1200 logic controllers; SIMATIC HMI Basic Panel programming in the SIMATIC STEP7 Basic environment.

Course summary:
- General information about the S7 1200 products
- Assembly, installation and exploitation of the PLC controller
- Configuration and starting of the device
- Symbols
- Binary and digital operations (including timers and counters)
- Introduction to HMI and basics of the PROFINET network
- PLC and HMI variables management PLC, HMI
- Step7 Basic software installation
- Available editors and block architecture
- Analog values processing
- Using Data Blocks (OB) and Organization Blocks (OB)
- Identifying basic errors of the user
- Project management – documentation, archiving and saving the program

Duration: 5 days - 35 hours
Course type: Open training
SIEMENS SIMATIC S7-1200 programming in TIA PORTAL – advanced course

Course aims
Introduction to the rules of configuration and application of analogue modules, interrupts, counters, PTO, PWM and PID; using technological functions, data logging and www servers; modifications on operator panels; writing advanced applications in SCL; introduction to configuration and launching data exchange between controllers via Ethernet.

Course summary
- New project and hardware configuration for the controller S7-1200
- Binary commands in LAD representation using TIA
- Symbolic names - tags and comments in the program
- Upload – uploading the program from the controller
- INT, UINT, DINT, UDINT, REAL variables and conversion between variable formats
- Analog I/O modules
- Data Blocks DB
- Using tables for variable declarations
- Function Blocks FB
- CPU diagnostics
- Analysis of the project using Cross-references
- Comparing the controller's content with the project – Compare online/offline
- Variables forcing
- Using a CPU real-time clock
- Time of day interrupt – interrupts based on the real-time clock (OB 10)
- Time delay interrupts (OB 20)
- Cyclic interrupts (OB 30)
- Hardware interrupts (OB 40)
- Controller behaviour after going into the STOP mode and the CPU start-up process CPU (OB 100)
- Advanced options regarding supporting data in DB blocks
- Fast hardware counters
- Technological functions - pulse outputs in controlling the stepper motor
- Shift and rotation commands
- Logic operations on words
- Web server shared by CPU
- User Pages – own webpages on the CPU server
- Data archiving in the CPU memory – Data Logging
- Program and controller protection levels
- Basics of using SCL language
- A tool of graphic variables monitoring - Traces
- Introduction to designing visualizations in TIA Portal
- Project archiving

Workstations
- PLC9
- PLC10

Individual workstations fitted with actual manufacturing equipment:
- S7-1200 controllers
- TIA Portal software
- sets of actuators

More details on page 23
SPECIALIZED TRAINING
IN THE FIELD OF INDUSTRIAL AUTOMATION

## SIEMENS S7 - 1500 TIA PORTAL

### Course 1: Siemens SIMATIC S7-1500 programming - basic course

**Course aims**
- Introduction to the idea of automatic control using logic controllers.
- Introducing participants to Totally Integrated Automation Portal environment: mastering the skills of operating, configuring and programming SIMATIC S7-1500 controllers using TIA Portal STEP 7 software: knowledge of the three major programming languages Simatic, i.e. LAD, FBD and STL.

**Course summary**
- The idea of controlling a process or machine
- Siemens control systems.
- Modular design of S7-1500 controllers.
- Connection between the programmer and controller
- Creating a project in TIA Portal STEP 7
- Setting up the connection with the controller
- Configuring the controller and its modules
- Input and output addressing
- The concept of a tag and its use
- Rules of writing programs - the structure and components
- Logical operations.
- Programs in LAD and FBD
- Monitoring and testing the program
- Basics of structured programming - working with functions
- Integer numerical types in TIA Portal STEP 7
- Arithmetic instructions
- Number systems
- Counter systems
- Comparisons and jumps
- Timers
- Project Management
- The role and use of memory cards in the PLC
- Monitoring Support - Trace function
- Introduction to STL
- Flip-flops and edges in STL
- The arithmetic instructions in STL
- Comparisons operators and jumps in STL
- Counter systems in STL
- Timers in STL

**Course symbol** TIA1500-1

**Course type** Open training

**Duration** 5 days - 35 hours

### Course 2: Siemens SIMATIC S7-1500 programming advanced course

**Course aims**
- Introduction to the design and functions of the Siemens SIMATIC S7-1500 logic controllers; learning about the advanced programming functions, configuration, maintenance and diagnostics of the SIMATIC S7-1500 logic controllers; introduction to the methods of programming industrial objects in the TIA Portal STEP7 environment using different type of blocks and STL language; broadening the knowledge and enhancing the skills acquired during the basic course.

**Course summary**
- Hardware and CPU configuration of S7-1500 systems
- Analogue modules configuration
- STL programming
- Real type and its arithmetics
- Other types used in programs
- Status word and jumps
- Data Blocks, functions and function blocks
- Analogue signals handling
- Cyclic interrupts
- Fast counters/encoders
- Indirect addressing
- Diagnostic functions of the software
- Diagnostic front panel
- Project analysis - Reference Data
- Security settings of the project and controller

**Course symbol** TIA1500-2

**Course type** Open training

**Duration** 5 days - 35 hours

### Course 3: Motion Control functions of the controller S7-1500T

**Course aims**
- Ability to create a complete design of automation system from scratch: starting from the empty design, can successfully add the devices - configure them, make the necessary physical connections and then - prepare software for the system; ability to configure and program servo-drives, PLCs and create system visualizations with control functions from HMI interface.

**Course summary**
- What is a servo-drive?
- Introduction to the SINAMICS series of drives
- Introduction to the controller S7-1500T
- PROFINET IO IRT network
- Technological objects S7-1500T
- End position of the axis
- System referencing
- Speed linear synchronization
- Angle linear synchronization
- Synchronization to the current and preset value
- Cam feedback
- Installing external encoder
- Configuration of the technological object of the encoder
- Virtual axis, simulated axis
- Fast input (measuring input)
- Precise output (output cam)
- Safety in Motion Control systems
- Kinematic systems (2/3/4D)
- Acyclic communication with the drive
- Diagnostics of the technological axis

**Course symbol** TIA1500-T

**Course type** Open training

**Duration** 5 days - 35 hours

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### Workstations

- Individual workstations fitted with actual manufacturing equipment:
  - TIA1500-1: S7-1516 3PN/DP controllers
  - TIA1500-2: S7-1516F 3PN/DP controllers
  - TIA1500-T: S7-1516F 3PN/DP controllers
  - TIA Portal software
  - Sets of actuators

More details on page 23

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10
## SIEMENS S7-SCL/GRAPH IN TIA PORTAL

### Course

<table>
<thead>
<tr>
<th>Course symbol</th>
<th>TIA-SCL</th>
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<tbody>
<tr>
<td>Course name</td>
<td>57-SCL programming in TIA PORTAL</td>
</tr>
<tr>
<td>Course aims</td>
<td>Learning about the operating principle and the concept of using a high-level programming language in TIA Portal environment; presentation of examples of applications where it is worth using SCL; learning to develop software, with the use of practical examples, using SCL; introduction to the process of diagnosing and monitoring program errors.</td>
</tr>
</tbody>
</table>
| Course summary | • Creating blocks: OB, FC and FB in editor SCL of TIA Portal environment  
• Variable declaration in SCL  
• Assignment operations, logic operations, arithmetic operations, comparisons  
• Using system functions  
• Conditional operations IF, CASE OF  
• Program loops FOR, REPEAT, WHILE  
• Control instructions: CONTINUE, EXIT, RETURN  
• Jump to section: GOTO  
• Monitoring and debugging a program written in SCL  
• Using data blocks  
• Counting events and measuring time  
• Additional functions available in SCL |
| Duration       | 3 days - 22 hours |
| Course type    | Open training |

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## HMI / SCADA

### Course

<table>
<thead>
<tr>
<th>Course symbol</th>
<th>TIAW1</th>
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<tbody>
<tr>
<td>Course name</td>
<td>WinCC Panele HMI in TIA Portal</td>
</tr>
<tr>
<td>Course aims</td>
<td>Acquiring the skills of configuring PLC systems and HMI panels; developing the skills of creating visualization screens using basic and advanced elements; learning about the capabilities of different panels and PLCs; gaining experience in using the inbuilt applications of Basic and Comfort panels.</td>
</tr>
</tbody>
</table>
| Course summary | • Introduction to TIA Portal - Controller 1200 CPU  
• Introduction to WinCC Basic - KTP 600 or 700 Basic Panel  
• Basic elements  
• Communication  
• Practical advice, shortcuts  
• Adding the panel TP1500 Comfort and controller S-7 1500F CPU to the project  
• Conditional instructions and loops  
• Faceplate  
• User management  
• Multi-language applications  
• Libraries  
• Alarms  
• Address multiplexing  
• Reports  
• Archives  
• Charts and trends  
• Formulas  
• Extension  
• Summary |
| Duration       | 5 days - 35 hours |
| Course type    | Open training |

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### Course

<table>
<thead>
<tr>
<th>Course symbol</th>
<th>W1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course name</td>
<td>WinCC SCADA</td>
</tr>
<tr>
<td>Course aims</td>
<td>Gaining expert knowledge on creating new visualization project and typical maintenance tasks; learning the useful functions and capabilities of the Win CC suite on specific examples/tasks for individual solution. Trainers make a great effort to adjust the course content to the client’s requirements so that the participants gain knowledge which is applicable strictly to the client’s activity profile at the same time preparing the participants to face new challenges.</td>
</tr>
</tbody>
</table>
| Course summary | • Introduction to Industrial Visualisation Systems  
• Basic information on WinCC  
• Project management  
• Variables management  
• Basics of creating visualization screens  
• C scripting  
• VBS scripting  
• Basics of diagnostics in WinCC  
• Users management  
• Creating visualization screens - advanced functions  
• Multilanguage applications  
• Alarms management  
• Variables archiving  
• Diagrams  
• Creating user defined reports |
| Duration       | 5 days - 35 hours |
| Course type    | Open training |
SPECIALIZED TRAINING
IN THE FIELD OF INDUSTRIAL AUTOMATION

### HMI / SCADA

<table>
<thead>
<tr>
<th>Course symbol</th>
<th>Course name</th>
<th>Course aims</th>
<th>Course summary</th>
<th>Duration</th>
<th>Course type</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIAW2</td>
<td>WinCC in TIA SCADA</td>
<td>Introduction to the WinCC Professional TIA environment; configuration of communication channels; creating advanced visualization screens; proper configuration and using the system of archiving and reporting.</td>
<td>• WinCC tag tables&lt;br&gt;• WinCC software&lt;br&gt;• HMI visualizations – introduction and SCADA systems&lt;br&gt;• Color change animation&lt;br&gt;• Layers and visibility&lt;br&gt;• Loops and switch statement&lt;br&gt;• Indirect modification of object parameters via VBS&lt;br&gt;• Multilingual applications and SIEMENS Translation tool&lt;br&gt;• Symbol libraries&lt;br&gt;• Screen window – basic cell of a SCADA screen&lt;br&gt;• Convenient keyboard shortcuts</td>
<td>5 days - 35 hours</td>
<td>Open training</td>
</tr>
</tbody>
</table>

### SIMATIC PCS7

<table>
<thead>
<tr>
<th>Course symbol</th>
<th>Course name</th>
<th>Course aims</th>
<th>Course summary</th>
<th>Duration</th>
<th>Course type</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCS7-UR</td>
<td>SIMATIC PCS7 in maintenance</td>
<td>Introduction to the PCS7 system; architecture and overview of the system; configuration of all levels of system operation (from devices to control room); distributed inputs/outputs ET200; program modification in languages CFC and SFC; motor, measurement, regulator and valve blocks; WinCC visualization modification in PCS7 (synoptic screens, ignitions, trends, Picture Tree Manager); PCS7 diagnostics.</td>
<td>• Compatibility of the system’s elements&lt;br&gt;• Installation of PCS7&lt;br&gt;• Saving/uploading backup files&lt;br&gt;• Types of views (Plant view, Component view, Process Object View)&lt;br&gt;• Operating principle of the controller in PCS7&lt;br&gt;• Basic systems based on blocks: motor systems, valve systems, regulator systems and measurement systems&lt;br&gt;• Working with SFC sequences&lt;br&gt;• Compiling and uploading changes into the controller&lt;br&gt;• Overview of WinCC Explorer – visualization management in PCS7&lt;br&gt;• Creating new synoptic screens, ignitions and trends&lt;br&gt;• Adding measurements to archives&lt;br&gt;• Compiling and uploading changes into the OS server&lt;br&gt;• Error diagnostics</td>
<td>3 days - 22 hours</td>
<td>Open training</td>
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</tbody>
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<thead>
<tr>
<th>Course symbol</th>
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<th>Course aims</th>
<th>Course summary</th>
<th>Duration</th>
<th>Course type</th>
</tr>
</thead>
<tbody>
<tr>
<td>W2</td>
<td>WinCC flexible</td>
<td>Gaining expert knowledge on creating new visualization project and typical maintenance tasks; presentation of useful functions and capabilities of the WinCC flexible suite on specific examples and tasks for individual solution.</td>
<td>• Introduction to HMI systems&lt;br&gt;• Project creation&lt;br&gt;• Basic menu and tools&lt;br&gt;• Basics of screens creation&lt;br&gt;• Navigation within a project&lt;br&gt;• Variables management&lt;br&gt;• Textual and graphic lists&lt;br&gt;• Multilanguage application&lt;br&gt;• Advanced panels project&lt;br&gt;• Screen objects&lt;br&gt;• Functions&lt;br&gt;• Basics of programming - Visual Basic Script&lt;br&gt;• Communication&lt;br&gt;• Communication areas&lt;br&gt;• Users management&lt;br&gt;• Alarms management&lt;br&gt;• Archives&lt;br&gt;• Diagrams&lt;br&gt;• Recipes.&lt;br&gt;• Multiplexing&lt;br&gt;• Reporting system&lt;br&gt;• Additional functions and tools</td>
<td>5 days - 35 hours</td>
<td>Open training</td>
</tr>
</tbody>
</table>

| Workstations | | Individual workstations fitted with actual manufacturing equipment: | | | |
| TIAW1        | - S7-300 controllers | - S7-1000 or 1500 controllers | | | |
| TIAW2        | - dedicated software | - operator panels | | | |

More details on page 31

<table>
<thead>
<tr>
<th>Course symbol</th>
<th>Course name</th>
<th>Course aims</th>
<th>Course summary</th>
<th>Duration</th>
<th>Course type</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCS1</td>
<td>PCS1: SIMATIC PCS7 – basics of developing applications</td>
<td>Gaining detailed knowledge regarding configuration of automation stations (controllers) to co-operate with the PCS7 operator stations; acquiring skils of programming in CFC, SCL and SFC languages available in the SIMATIC PCS7 suite; learning to use the additional SIMATIC PCS7 library.</td>
<td>• PLC or DC59&lt;br&gt;• Standard architectures&lt;br&gt;• What’s new in PCS7 V99&lt;br&gt;• Chart-in-Block Programming method&lt;br&gt;• I/O attributes [S7_m_c ]&lt;br&gt;• Exercises – programming with Chart-in-Block&lt;br&gt;• Operate - Op001, Op003, OpAnL&lt;br&gt;• Drives - MotL, VlvL&lt;br&gt;• Control and dosage PIDConL, DoseL&lt;br&gt;• Exercises – using API blocks in multiproject&lt;br&gt;• Properties of A5&lt;br&gt;• Exercises – interlocks in the project&lt;br&gt;• Basics of sequential control&lt;br&gt;• Steps, transitions and phases&lt;br&gt;• Simultaneous branch&lt;br&gt;• Exercises – sequential control with SFC&lt;br&gt;• Exercises – control sequence with control strategy and setpoints</td>
<td>5 days - 35 hours</td>
<td>Open training</td>
</tr>
</tbody>
</table>

| Workstations | | Individual workstations fitted with actual manufacturing equipment. | | | |
| PCS7-UR      | | | | | |
| PCS1         | | More details on page 34 | | | |
## SPECIALIZED TRAINING
### IN THE FIELD OF INDUSTRIAL AUTOMATION

### INDUSTRIAL NETWORKS

<table>
<thead>
<tr>
<th>Course symbol</th>
<th>Course name</th>
<th>Course aims</th>
<th>Course summary</th>
<th>Duration</th>
<th>Course type</th>
</tr>
</thead>
</table>
| SP1           | AS-Interface | Practical skills of designing and implementing control systems of machines based on AS-interface: explanation of the communication problems occurring in the networks built of devices made by different manufacturers; introduction to AS-i diagnostics. The knowledge gained in the course does not depend on the equipment used, it relates to the open and manufacturer-independent AS-interface. | - Introduction to the physical layer of the industrial network AS-interface: designing, installation, network diagnostics  
- Co-operation of interconnected pieces within AS-interface network (system initialization, Master-Slave communication)  
- Configuring and launching the AS-Interface network  
- Software development, digital and analog variables addressing  
- Error analysis in the physical and logic layers  
- Examples of visualization screens created in CodeSys  
- Maintenance – replacing devices within your system  
- Maintenance – diagnostics of devices operating within AS-i network (diagnostics of modules and transmissions, setting reaction time)  
- Maintenance – methods of optimizing transmissions in the AS-i network, ways to improve the operation of the whole network | 2 days - 14 hours | Open training |

<table>
<thead>
<tr>
<th>Course name</th>
<th>SP2</th>
<th>Course aims</th>
<th>Course summary</th>
<th>Duration</th>
<th>Course type</th>
</tr>
</thead>
</table>
| PROFIBUS DP diagnostics | Broadening participants’ knowledge by including advanced knowledge about DP protocol, transmission media and advanced PROFIBUS DP diagnostics; practical exercises in analyzing typical elements of networks, diagnostic problems and errors common for PROFIBUS DP network; detailed information about maintenance, functions and diagnostic methods of PROFIBUS Tester 4. This training includes theoretical part relating to PROFIBUS DP/PA allowing to begin practical exercises. | - PROFIBUS DP network compared with other industrial communication networks  
- Good assembly practices of PROFIBUS network  
- Topology of PROFIBUS network  
- Characteristics of the physical layer RS 485  
- Characteristics of connectors DB9, M12 in PROFIBUS network  
- Parameters of PROFIBUS network (available transmission speed options, cable length)  
- Rules of screening cables in PROFIBUS network  
- Active terminator and adjustment of the network  
- Repeater and segmentation of PROFIBUS network  
- DP/DP Coupler  
- Most common mistakes in creating a network  
- Exercise: Locating errors on the diagram/topology of the network  
- Exercise: configuration of the network  
- Influence of inductance, capacitance and impedance on the quality of the network  
- Overview of typical failures in PROFIBUS network  
- Measurement of network’s parameters using a multimeter  
- Detection of network errors using a multimeter  
- Overview of the advantage of dedicated diagnostic tools over a multimeter  
- Detection of network errors using a PBQ One tester by INDUSOL  
- Creating network’s topology at student workstations  
- Preparing a report presenting the results of the analysis of PROFIBUS network  
- Detection of network errors using a ProfiCore tester by Procentec  
- Analysis of PROFIBUS data packages  
- Exercise: Locating defects of a damaged network at student workstations using the available diagnostic tools  
- Diagnostic repeater  
- Optical link module and optical fibre | 3 days - 21 hours | Open training |
### INDUSTRIAL NETWORKS

#### SPECIALIZED TRAINING
**IN THE FIELD OF INDUSTRIAL AUTOMATION**

### Course: CAN and CANopen
**Course symbol:** SP4
**Course name:** CAN and CANopen
**Course aims:** Familiarizing participants with the CAN standards; learning the structure and capacities of networks based on CAN bus; gaining specialist knowledge on the CAN bus configuration; acquiring practical skills of connecting and configuring devices plugged into the CAN bus.
**Course summary:**
- General CAN bus characteristics
- Basic standards applied in CAN bus
- CAN in Automation
- Physical layer:
  - Network topology according to ISO11898-2
  - Electrical connection to the bus, voltage levels
- Basic connectors
- Data link layer:
  - Base and extended data frame
  - Arbitration
- Data frame, Remote Transmission Request, error frames
- CANopen® application layer:
  - CiA specifications
  - CANopen device model
  - CANopen protocols (NMT, SDO, PDO, EMCY, SYNC)
  - Identifier structure
  - Object dictionary
  - Operational status
**Duration:** 3 days - 21 hours
**Course type:** Open training

### Course: PROFINET in TIA
**Course symbol:** SP3-TIA
**Course name:** PROFINET in TIA
**Course aims:** Gaining knowledge and detailed information about the PROFINET system; overview of system’s differences as compared with communication-based installations with other communication networks; gaining knowledge about configuration of the PROFINET network in TIA PORTAL and integration of devices from different manufacturers; acquiring practical skills of starting, controlling and diagnosing systems with PROFINET network.
**Course summary:**
- The genesis of PROFINET
- PROFINET compared with other networks
- Operating principle
- Configuring and starting PROFINET (components from different manufacturers)
- GSDML files
- Communication in PROFINET
- Operation modes in PROFINET
- Diagnostics of PROFINET via TIA Portal
- Synchronization in a REAL-TIME mode
- Redundancy on PROFINET using the domain
- Optional functions in PROFINET
- Application profiles in PROFINET
**Duration:** 5 days - 35 hours
**Course type:** Open training

### Course: PROFINET
**Course symbol:** SP3
**Course name:** PROFINET
**Course aims:** Knowledge and detailed information on PROFINET system; explanation of the differences resulting from the comparison with installations based on the communication in PROFibus DP; knowledge on the configuration of PROFINET and integration of devices made by different manufacturers; acquiring practical skills of implementing, controlling and diagnosing systems based on PROFINET.
**Course summary:**
- Ethernet in control systems
- Beginnings and development of PROFINET (CBA, IO)
- Comparison of PROFibus and PROFINET
- Ethernet network: OSI model, transmission media, protocol and distribution of Ethernet frames, switching technologies
- TCP/IP protocol and its functions
- PROFINET installation with a physical layer
- PROFINET IO: models and tasks of the devices in PROFINET IO; communication channels and standards protocols
- Configuration, parameterization and launching PROFINET IO
- Other bus systems and possibilities of integration with PROFINET IO
- Using diagnostic interrupts in error handling in PROFINET IO
- Using SNMP protocol for the diagnostic purposes
- Communication processors in PROFINET IO
- PROFINET CBA as a modular production system
- PROFINET as a real-time network, operation modes
- Elements of radio communication in PROFINET IO
**Duration:** 5 days - 35 hours
**Course type:** Open training

### Course: PROFINET IO
**Course name:** PROFINET IO
**Course aims:** Knowledge and detailed information on PROFINET system; explanation of the differences resulting from the comparison with installations based on the communication in PROFibus DP; knowledge on the configuration of PROFINET and integration of devices made by different manufacturers; acquiring practical skills of starting, controlling and diagnosing systems with PROFINET network.
**Course summary:**
- Ethernet in control systems
- Beginnings and development of PROFINET (CBA, IO)
- Comparison of PROFibus and PROFINET
- Ethernet network: OSI model, transmission media, protocol and distribution of Ethernet frames, switching technologies
- TCP/IP protocol and its functions
- PROFINET installation with a physical layer
- PROFINET IO: models and tasks of the devices in PROFINET IO; communication channels and standards protocols
- Configuration, parameterization and launching PROFINET IO
- Other bus systems and possibilities of integration with PROFINET IO
- Using diagnostic interrupts in error handling in PROFINET IO
- Using SNMP protocol for the diagnostic purposes
- Communication processors in PROFINET IO
- PROFINET CBA as a modular production system
- PROFINET as a real-time network, operation modes
- Elements of radio communication in PROFINET IO
**Duration:** 5 days - 35 hours
**Course type:** Open training
INDUSTRIAL NETWORKS

Course symbol SP5
Course name Automation systems AS-I/S7 integrator
Course aims Unassisted design, configuration and launch of the AS-interface networks working with master networks Profinet and Profinet: configuration of the network settings in the SIEMENS TIA Portal and Step7 environment; fast efficient diagnosis of the AS-interface state.

Course summary
- Introduction to the physical layer of the industrial network AS-interface: historical overview, design process, basic components
- Cooperation of the interconnected pieces within AS-interface network (network topology, system initialization, communication, communication frame structure)
- Configuring and launching AS-interface network, basic network components
- Modules: electro-pneumatic, sensors with integrated network interface, special solutions, useful accessories, RFID code readers
- Application capabilities in terms of providing safety for machines and devices – machinery directive and AS-interface Safety at Work networks
- Aspects of creating software and variable addressing
- Introduction to the programming environment TIA Portal, configuring, off-line and on-line testing
- Creating software projects, semantics of binary and analogue variable addressing, starting the application
- Configuration from the side of the master controller using the Profinet protocol: SIEMENS controllers series S7-300/400, S7-1200 and S7-1500
- Starting own applications using industrial sensor systems
- Maintenance – development, servicing and replacing devices in the owned system
- Diagnostics of the devices working in the AS-I network (diagnostics of modules, diagnostics of transmission, determining the time of reaction)

Duration 2 days - 15 hours
Course type Closed training

Workstations
- Individual workstations fitted with actual manufacturing equipment:
  - S7-300 controllers
  - dedicated software
  - operator panels
  - PROFIBUS /PROFINET modules
  - many other
- More details on page 27

Course symbol PLC4
Course name PROFIBUS DP - SIEMENS SIMATIC S7-300/400 communication
Course aims Learning about the functions of Step7 software, PROFIBUS DP, FMS, MPI and other protocols used for data exchange between devices of the control system; getting familiar with the elements, tools and principles of configuring connections and communication in industrial networks supported by Simatic S7-300/400 controllers; acquiring detailed information about integration solutions, data exchange and diagnostics relating to drives, operator panels and master/slave devices made by different manufacturers.

Course summary
- Preparing a project for Programmable Logic Controller
- Using communication networks in the industry
- Physical layer of the MPI/PROFIBUS network
- MPI bus
- Practical configuration of the PROFIBUS network – CPU with embedded port
- OP configuration – connection via PROFIBUS
- Overview of PROFIBUS DP operating principles
- PLC error handling with regard to communication networks
- PROFIBUS diagnostics using dedicated testers – illustrated with Softing (PROFIBUS Tester 4) and Procentec (ProfiTrace) products
- Operating CPU working in the Slave mode
- Communication processors for the PROFIBUS network

Duration 5 days - 35 hours
Course type Open training
SPECIALIZED TRAINING
IN THE FIELD OF INDUSTRIAL AUTOMATION

CODESYS

Course symbol: CDS1

Course name: CoDeSyS 2.3 - PLC programming

Course aims: Introduction to the popular controller programming environment CoDeSys; learning the essential and in accordance with the IEC standard programming languages applied in the industry; acquiring basic skills of writing and analyzing control programs; mastering the basics needed for further development in the field of modern automation systems.

Course summary:
- The concept of controlling
- PLC operation principles
- Starting a new project and basic parameterization of devices
- Controller memory organization and addressing principles
- CPU maintenance
- Role and defining symbolic variables, different types of data
- Programming languages for the controllers, structure of PLC program block
- Logic operations in LD and FBD languages
- Monitoring and testing the program
- Basic of structured programming – different types of blocks and their application
- Flip-flops and jumps
- PLC number systems
- Arithmetic instructions
- Counter instructions
- Timers
- Project management
- Introduction to IL

Duration: 5 days - 35 hours

Course type: Open training

Course symbol: CDS2

Course name: CoDeSyS 3.5 – PLC programming

Course aims: Working in the CoDeSys 3.5 environment; learning about the essential, compliant with IEC standard programming languages used in the industry; skills of creating and analysing control programs; knowledge for further development in the area of modern automation systems; aspects of fieldbus control (CAN/CANopen®).

Course summary:
- Introduction to the idea of control
- Overview of basic aspects of programming PLCs
- Operating principle of a PLC
- Review of basic elements of CoDeSys 3.5 environment
- Creation and organization of a project in CoDeSys 3.5 environment
- Constants, variables, tables, public and local structures
- Numeral systems in PLCs
- Overview of programming languages ST, FBD, LD, CFC, Logic operations
- Counter instructions, Time elements, SET/RESET elements
- Monitoring and testing the program
- Working with a simulator
- Rising edge and Falling edge detection, Internal libraries, Repository
- Installation of Export packages and import of a project, Creative project archive, Generating project boot
- Installation of targets for PLCs
- Individual exercises with real equipment
- Introduction to mobile control systems

Duration: 5 days - 35 hours

Course type: Open training

DRIVE SYSTEMS

Course symbol: NAP1

Course name: Basics of drive systems

Course aims: Introduction to the basic aspects of drive systems; introduction to the basic aspects of industrial electrical engineering; learning about the types of electric motors in the aspect of their application in the industry; acquiring the skills of proper selection and configuration of electric drive systems’ parameters; understanding the aspects of drive systems’ mechanics influencing the occurrence of failures and defects of electric drives; introduction to the capabilities offered by the modern drives.

Course summary:
- Introduction to electrical engineering
- Basic types of power grids
- Appliance classes of electrical devices
- Introduction to the mechanics of drives
- Engines – basic features and parameters
- Selection of propulsion engine
- DC motors
- Step motors
- AC motors
- Servo-motors
- Start-up and control of AC motors
- Softstarters
- Frequency converters
- Sensors in drive systems
- Gears – design, lubrication and defects
- Selection of electric drives’ parameters
- Diagnostics of drive systems
- Exercises in the configuration and parameterization of frequency converters

Duration: 3 days - 21 hours

Course type: Open training

Workstations:
- Individual workstations fitted with actual manufacturing equipment:
  - S7-300 controllers
  - STEP 7 software and Starter
  - Sets of actuating units (frequency converters, asynchronous motors, encoders, analog and digital signal generators)
- NAP1-TIA
- TNS1-TIA
- TNS3-TIA
- More details on page 32

Workstations:
- Individual workstations fitted with actual manufacturing equipment:
  - CDS1
  - More details on page 30
SPECIALIZED TRAINING
IN THE FIELD OF INDUSTRIAL AUTOMATION

SIEMENS DRIVE SYSTEMS

Course name: Siemens Sinamics G120 in TIA Portal - configuration, starting and diagnostics
Course aims: Unassisted configuration of converters Sinamics G120 in TIA Portal environment; using the software SINAMICS Startdrive in connection with the controller S71500; providing knowledge and teaching skills related to Siemens SINAMICS G drives; presenting methods of selection and diagnostics of systems built of a frequency converter Sinamics G and electric motor; providing knowledge about diagnostic analysis and servicing of electric drives SINAMICS G.
Course summary:
- Basic information about Siemens frequency converters and motors
- Electrical properties of drives
- Preparing the project for a PLC
- Preparing the drive to work in Profinet IO and Proibus DP networks
- Configuration of a drive with a view to exchanging data with the PLC, test start-up of a drive, optimization of a drive
- Controlling the drive via the function prepared by the user
- Reading and modification of the selected parameters of a converter via multiple V-ribbed belt
- Using a dedicated library to control the drives provided with SINAMICS Startdrive software
- Other methods of controlling drives (such as, for instance, analog and digital I/O)
- Diagnostics of drives using SINAMICS Startdrive software (diagnostic windows, tracing time courses - Trace)
- Configuration of a drive using local panels BOP and IOP
- Different sets of drive parameters - CDS/DDS
- Free function blocks - Free Modules
- Configuration of drive axles and using the blocks relating to technological functions of a S71500 controller to control the drives
- Embedded safety functions in Sinamics G drives (shown with an example of STO, SS1, SBC)
- Using the positioning mode - Basic Positioner

Duration: 5 days - 35 hours
Course type: Open training

Course name: Siemens SINAMICS G120
Course aims: Acquiring knowledge and skills regarding Siemens Sinamics G drives: familiarizing diagnostic and selection methods of systems featuring Sinamics G frequency converter and electric motor; gaining knowledge on the diagnostic analysis and maintenance of Sinamics G electrical drives.
Course summary:
- Fundamentals of frequency converters
- Electrical properties of drive systems
- Pierwsza konfiguracja napędu/the first configuration of the drive system
- Setting up a project for PLC
- Controlling drive systems via Proibus DP
- Different methods of connection with a drive system for the configuration purposes
- Advanced drive system control via Proibus DP
- Operation of a drive system in the Profinet network
- Other methods of drive system control
- Drive system diagnostics
- Local operator panels

Duration: 4 days - 30 hours
Course type: Open training

Course name: Siemens MICROMASTER 4
Course aims: Acquiring knowledge and skills regarding Siemens Micromaster 4 drives; familiarizing diagnostic and selection methods of systems featuring Micromaster 4 frequency converter and electric motor; gaining knowledge on the diagnostic analysis and maintenance of Micromaster 4 electrical drives.
Course summary:
- Fundamentals of frequency converters
- Electrical properties of drive systems
- The first configuration of a drive system
- Drive system diagnostics
- Setting up a project for PLC
- Different methods of connection with a drive system for the configuration purposes
- Basic drive system control via Proibus DP
- Advanced drive system control via Proibus DP
- Other methods of drive system control
- Different drive data sets
- Free modules
- Local operation panels
- Functions enhancing the capabilities of drive systems

Duration: 5 days - 35 hours
Course type: Open training

SIEMENS DRIVE SYSTEMS

Course symbol: TNS1-TIA

Course name: Siemens SINAMICS G120
Course aims: Acquiring knowledge and skills regarding Siemens Sinamics G drives: familiarizing diagnostic and selection methods of systems featuring Sinamics G frequency converter and electric motor; gaining knowledge on the diagnostic analysis and maintenance of Sinamics G electrical drives.
Course summary:
- Fundamentals of frequency converters
- Electrical properties of drive systems
- Pierwsza konfiguracja napędu/the first configuration of the drive system
- Setting up a project for PLC
- Controlling drive systems via Proibus DP
- Different methods of connection with a drive system for the configuration purposes
- Advanced drive system control via Proibus DP
- Operation of a drive system in the Profinet network
- Other methods of drive system control
- Drive system diagnostics
- Local operator panels

Duration: 5 days - 35 hours
Course type: Open training

Course symbol: TNS2

Course name: Siemens MICROMASTER 4
Course aims: Acquiring knowledge and skills regarding Siemens Micromaster 4 drives; familiarizing diagnostic and selection methods of systems featuring Micromaster 4 frequency converter and electric motor; gaining knowledge on the diagnostic analysis and maintenance of Micromaster 4 electrical drives.
Course summary:
- Fundamentals of frequency converters
- Electrical properties of drive systems
- The first configuration of a drive system
- Drive system diagnostics
- Setting up a project for PLC
- Different methods of connection with a drive system for the configuration purposes
- Basic drive system control via Proibus DP
- Advanced drive system control via Proibus DP
- Other methods of drive system control
- Different drive data sets
- Free modules
- Local operation panels
- Functions enhancing the capabilities of drive systems

Duration: 5 days - 35 hours
Course type: Open training

SIEMENS DRIVE SYSTEMS

Course symbol: TNS1

Course name: Siemens SINAMICS G120
Course aims: Acquiring knowledge and skills regarding Siemens Sinamics G drives: familiarizing diagnostic and selection methods of systems featuring Sinamics G frequency converter and electric motor; gaining knowledge on the diagnostic analysis and maintenance of Sinamics G electrical drives.
Course summary:
- Fundamentals of frequency converters
- Electrical properties of drive systems
- Pierwsza konfiguracja napędu/the first configuration of the drive system
- Setting up a project for PLC
- Controlling drive systems via Proibus DP
- Different methods of connection with a drive system for the configuration purposes
- Advanced drive system control via Proibus DP
- Operation of a drive system in the Profinet network
- Other methods of drive system control
- Drive system diagnostics
- Local operator panels

Duration: 5 days - 35 hours
Course type: Open training

SIEMENS DRIVE SYSTEMS

Course symbol: TNS2

Course name: Siemens MICROMASTER 4
Course aims: Acquiring knowledge and skills regarding Siemens Micromaster 4 drives; familiarizing diagnostic and selection methods of systems featuring Micromaster 4 frequency converter and electric motor; gaining knowledge on the diagnostic analysis and maintenance of Micromaster 4 electrical drives.
Course summary:
- Fundamentals of frequency converters
- Electrical properties of drive systems
- The first configuration of a drive system
- Drive system diagnostics
- Setting up a project for PLC
- Different methods of connection with a drive system for the configuration purposes
- Basic drive system control via Proibus DP
- Advanced drive system control via Proibus DP
- Other methods of drive system control
- Different drive data sets
- Free modules
- Local operation panels
- Functions enhancing the capabilities of drive systems

Duration: 5 days - 35 hours
Course type: Open training
SPECIALIZED TRAINING
IN THE FIELD OF INDUSTRIAL AUTOMATION

SIEMENS DRIVE SYSTEMS

Course symbol: TNS3-TIA

Course name: Siemens Sinamics S120 in TIA Portal
- configuration, starting and diagnostics

Course aims: Unassisted configuration of converters Sinamics S120, using the software SINAMICS Startdrive in the application with controller S71500; acquiring practical skills of using PLCs to control the SINAMICS S120 drives; presenting the drive diagnostic method; overview of positioning and safety functions.

Course summary:
- Basic information about Siemens frequency converters and motors
- Electrical properties of drives
- Preparing the project for a PLC
- Preparing the drive to work in Profinet IO network
- Configuration of a drive with a view to exchanging data with the PLC, test start-up of a drive, optimization of a drive
- Controlling the drive via the function prepared by the user
- Extended communication frames
- Reading and modification of the selected parameters of a converter via acyclic communication
- Other methods of controlling drives (such as, for instance, analog and digital I/O)
- Diagnostics of drives using SINAMICS Startdrive software (diagnostic windows, tracing time courses - Trace)
- Configuration of drive axes and using the blocks relating to technological functions of a S71500 controller to control the drives
- Embedded safety functions in Sinamics S drives (shown with an example of STO, SS1, SBC)
- Using the positioning mode – Basic Positioner

Duration: 5 days - 35 hours
Course type: Open training

Workstations:
- Individual workstations fitted with actual manufacturing equipment:
  - a converter SINAMICS S120
  - a motion controller SIMOTION D
  - a twin-engine inverter SIMOTION D
  - SIMOTION Scout software

More details on page 32
INDUSTRIAL SENSORS

Course symbol S1

Course name Sensors in industrial applications

Course aims Unassisted exercises in identifying different types of sensors; unassisted exercises in selecting sensors for particular installations; operating range of sensors and calibration range of the quantity measured in relation to the measurement being taken; determining the influence of the material on the sensor reading; adapting the sensors to actual measurement systems.

Course summary
- Sensors – general information, standardization of nomenclature
- Identifying the proper powering option, process connections
- Basic parameters of sensors, acquiring the skills of proper parameter selection
- Types of series, selecting the right housing
- Characteristics of the main output signals
- Theoretical basics of the proximity sensor operating principle
- Operating principles of sensors with energy emission
- Temperature and pressure sensors and monitors
- Selecting the right medium flow sensor, basic types of flow meters used in the industrial applications
- Proper selection of ultrasound sensors, radar probes and level control of bulk materials
- Applications that require rotary angle encoders, incremental and absolute encoders in the aspect of high rotational speed and position memory

A two-day course includes practical exercises covering all the aspects discussed during classes that help consolidate the acquired theoretical knowledge.

Duration 2 days - 14 hours
Course type Open training

Course symbol S2

Course name IO-Link interface - quick reconfiguration of the sensor process parameters

Course aims Independent application launching using the communication modules - Profinet - IO-Link; configuring the application controlling the parameters of the selected sensor via Siemens TIA Portal software; diagnostics of systems using IO-Link interface.

Course summary
- General information, capabilities and limitations of the IO-Link interface
- Identifying the proper powering option, process connections, cabling options
- Basic parameters, system components, essential software
- IODD file support and parameter configuration for optic sensors, flow and temperature monitors, proximity sensors and rotary angle encoders
- Launching the application via Profinet - IO-Link communication modules
- Independent configuration of the application controlling the parameters of the selected sensor via Siemens TIA Portal software

Duration 2 days - 14 hours
Course type Open training

Workstations Individual workstations fitted with actual manufacturing equipment:
S1
S2
More details on page 35
SPECIALIZED TRAINING
IN THE FIELD OF INDUSTRIAL AUTOMATION

MITSUBISHI CONTROLLERS

Course symbol MTB1

Course name Programming MITSUBISHI logic controllers, series MELSEC-FX

Course aims Introduction to the architecture and functions of Mitsubishi FX compact controllers and GXWorks2 software; introduction to the basics of configuration, operation, monitoring and diagnostics of Mitsubishi FX controllers; acquiring practical skills of programming controllers in LAD (Simple Mode), FBD and ST (Structured Mode) languages; presentation of the operation principles of extension modules.

Course summary
- Types of Mitsubishi controllers
- Parameters of the FX series controllers
- GX Works 2 programming environment
- Front panel of the controller
- Configuration of the connection via USB
- Program structure
- Constructing simple commands
- Transferring the program to the controller
- Logical AND and OR
- Basic information about the realization of the program
- FX and FY mapping
- Functions and function blocks
- Functions SET and RST
- Slope detection
- Structured LAD vs FBD
- FBD – introduction
- FBD – XOR gate
- Device Monitor – preview and modification of the values
- Different devices, and bits, bytes, words and double words
- Numerical systems
- Functions MOVE(_E)/MOV, DMOV, DMOVP, MOV
- Arithmetic functions
- Arithmetic operators
- Counters and timers
- Additional CPU functionalities
- Device Memory – initial values
- Comparison of online projects
- PLC Diagnostics
- Cross Reference – reference list
- Device List- list of used addresses
- Password protection of the controller
- System settings
- Other practical online operations
- Simulator
- LAD language (Simple Project)
- Basic differences between Structured and Simple Project
- Global commentaries – projects without symbols
- New shortcut keys
- GX Works2 operation modes
- Relays - markers
- Function blocks
- Set and Reset
- Slope detection
- Data registers – characteristics
- Special registers
- Set registers – „Data blocks”
- Instruction MOV
- Arithmetic instructions
- Operations on 16, 32 and 64 bits
- Comparison operations
- Jumps and subprograms
- Jumps and subprograms – example
- Counters and timers
- Table of commands

Course summary
- Instruction MOV
- Arithmetic instructions
- Operations on 16, 32 and 64 bits
- Comparison operations
- Jumps and subprograms
- Jumps and subprograms – example
- Counters and timers
- Table of commands

Duration 5 days - 38 hours
Course type Open training

Workstations
MTB1
- Individual workstations fitted with actual manufacturing equipment:
  - MITSUBISHI series MELSEC-FX controllers
  - dedicated software
  - MITSUBISHI – GOT2000 operator panels
  - many others

More details on page 37
Training laboratories

We provide modern training sets, built on the basics of actual components for industrial automation.

Courses in the field of visualization and control systems are characterized by using special equipment. Below we present a description of the workstations and individual training positions used by participants during the VISUALIZATION AND CONTROL SYSTEMS courses.
Student workstations, due to their diversity and unique construction based on devices from many different manufacturers, give students a chance to learn different methods of installing devices in a control cabinet and diagnosing faults in control systems.

NEW! - A UNIQUE MULTI-COMPONENT MODEL OF A CONTROL CABINET

Our original workstation for course AM1: Electrical engineering and devices of control cabinets and AM2: Introduction to industrial automation and control systems.

- NO/N buttons and lights
- Frequency converter and resistance thermometer PT100
- Signal converters (resistance to voltage, current to voltage)
- Contactors and relays
- Separating relays (mechanical and semiconductors)
- Safety relays
- Time relays
- Limit switches
- 230VAC/24VDC power supply unit
- Protection systems (residual current device, motor protection switch, overcurrent circuit breaker - mechanical, overcurrent circuit breaker - electronic)
- Three-phase asynchronous motor

MEASUREMENT TOOLS

Each participant has access to basic measurement tools:

- Digital multi-functional meters to measure AC and DC, as well as flow and resistance of AC/DC and for flow and capacity measurements
- A voltage tester for AC/DC from 12 V to 1000 V AC / 1000 V DC, IP65

MULTI-PURPOSE ELECTROTECHNICAL DEVICES

Participants have access to multi-purpose assembly tools:

- Application tool for sleeves, according to DIN 46228-4 0,5 mm² bis 2,5 mm² with a forced block, magazine, cutting unit, wire stripping unit, twisting unit and crimping unit
- Cable shears
- Diagonal cutting pliers
- Wire stripping pliers
- Crimping tools
- Combination pliers
- Half round nose pliers
- Adjustable spanners
- Flat-head screwdrivers VDE 0,4x2,5/0,5x3,0/1,0x4,0/1,0x 5,5, cross-slot screwdrivers: PH0/PH1/PH2
- Control cabinet keys
- Sleeve kits
- Cutters
- Tape measures

and SIEMENS SIMATIC S7-1200 CONTROLLERS
Modern Siemens SIMATIC S7-300, S7-1200 and S7-1500 logic controllers, modules and components of PROFIBUS network, AS-Interface, PROFINET, diagnostic analyzers, operator panels, state-of-the-art software used in industrial automation – these are the basic elements of our laboratory equipment. Additionally, we are the only training center in Poland to include industrial actuating elements such as pneumatic cylinders, stepper motors, encoders, temperature sensors, manifolds and many others into the training equipment.

Laboratories are also equipped with HMI operator panels and SCADA software used in courses in modern visualization systems. Electrical drives mounted at the workstations allow us to run courses in modern methods of electric motor control and explain the concepts of economy and energy efficiency in control systems.

PLC SIEMENS SIMATIC S7-300/400, S7-1200, S7-1500 programming – basic and advanced course

Each participant of a course has their own workstation designed to practice tasks and learn industrial solutions based on the use of PLCs. Each workstation consists of a controller fitted with I/O digital and analog modules, signal generator and I/O signal simulators, as well as a computer with specialist software connected to the controller and actuation station, whose configuration varies according to course level.
In order to enrich our course programs we have included in our workstations actuation units featuring real automation components:

- Air service unit with valve manifold with 3/2, 5/2, 5/3 electropneumatic valves
- An actuator built of two pneumatic cylinders and a gripper
- Reed sensors informing about end positions of the cylinders
- Binary signal simulator

Additionally, in the basic course:

- Digital I/O module
- Pulse ON/OFF switch
- A diode
- A safety switch

Additionally, in the advanced course:

- Electronic proportional regulator
- Stepper motor
- Angle encoder
- PT100 temperature sensor with a 0-10V transcoder
- Frequency converter
- Servo motor with permanent magnets
- Analog I/O (0-10V) simulator with electronic voltage indicators

Additionally, in PLC4 course:

- Digital and analog inputs and outputs by TURCK connected with PROFBUS network
- Valve island by PARKER
- Pneumatic cylinders by PARKER
- Position sensors by Turck
Programming and designing with Distributed Safety and Safety Advanced in SIMATIC SAFETY INTEGRATED controllers

Courses symbols: SAF300, SAF1500

Participants of the course in Programming and designing with Distributed Safety in SIMATIC Safety Integrated controllers have at their disposal individual workstations fitted with the diversified equipment:

- Traditional PLC solutions – CPU 315F 2PN/DP, 1516F 3PN/DP and S7-1500 I/O modules in the FAIL-SAFE version
- CPU 315F 2PN/DP connected via Profinet communication network with ET-200S I/O modules in the FAIL-SAFE version
- Complex solutions based on the ET-200S CPU in the F version

Additionally, workstations feature the following actuators:

- Optical barriers with a travelling product (muting—forcing the barrier to switch off when the product passes)
- „Mini doors” fitted with limit switches
- Sets of two-hand pushbuttons
- Safety „poppets” with double joints
- Ignition with key
- Double – „safe” actuating contactors
Participants of the courses in industrial networks, PROFIBUS and PROFINET in particular, have at their disposal multi-element sets forming an extensive network, which allows performing a variety of exercises and tasks.

The base for network equipment is:

- SIEMENS SIMATIC S7-300 CPU314C-2PN/DP controller.

Additionally, the controller features the following modules:

- ET-200S PROFINET and PROFIBUS,
- CP 342-5 communication processor.

PROFINET in TIA is supported by two stations S7-1511FT and S7-1200+HM.

The diversity of our network stations and the variety of manufacturers makes it possible for the participants to learn different installation and configuration methods for a variety of devices. Additionally, a number of interconnected network stations reflects as far as possible the actual field networks and provides students with a unique opportunity to learn to diagnose and eliminate failures and errors occurring in the industrial field networks.

The unique feature of training courses in industrial networks in EMT-Systems is a number of diagnostic tools our participants have access to. For a quick and effective diagnosis of defects and irregularities and in order to restore the orderly functioning of networks one must practise using the most common and the most available equipment.
INDUSTRIAL NETWORKS

Manual network analyzers:

- **ProfiTrace2 Ultra Pro (Procentec)** - a diagnostic set for PROFIBUS DP and PROFIBUS PA, comprising functionality of a protocol analyzer, oscilloscope and Master DP-V0/V1. A tool for quick diagnosis of network status and signal shape, topology detection, testing products with PROFIBUS interface and preparing professional network status reports.

- **PROFIBUS Tester 4 / BC-600-PB (Softing)** - a powerful tool used for initiating PROFIBUS DP, troubleshooting, diagnostics and error detection, periodic and preventive network analysis, preparing documentation in the form of transparent reports, network optimization through quality assessment of the electric and communication layers.

- **Tester PROFIBUS - PB-Q\textsuperscript{ONE} (Indu-Sol)** - enables modern diagnostics. User receives fast measurement results, which may be easily examined due to graphic interpretation of network status.

During courses in analyzing network AS-I (SP1) we use didactic workstations equipped with dedicated controllers and actuating units, such as: buttons, I/O modules enabling connecting sensors, pneumatic valve terminals controlling the operation of cylinders.
During the courses in CAN i CANOpen (Sp4) we use:

- CAN-USB converter with appropriate software (PC)
- Elements of CAN network with wiring
- CANstudio software, which is an advanced tool, created for designers, integrators and maintenance technicians of the devices and networks using CAN technology
Workstations are designed in a way that helps to learn the tasks and industrial solutions based on the application of controllers made by different producers, but nevertheless compatible with CoDeSys. Our laboratories are equipped with devices manufactured by TÜRCK and ifm electronic for CoDeSys 2.3, WAGO PFC200 and Weintek cMT3072 panel for CoDeSys 3.5.

The workstation is fitted with a controller featuring I/O module and input signal simulator which varies according to the course level program.

Each participant is also provided with a PC featuring CoDeSys software according to the course program.
HMI/SCADA Software

Courses symbols: TIAW1, TIAW2, W1, W2.

Participants of the courses in WinCC, WinCC flexible (W1, W2) have at their disposal:

- The training position consists of the S7-300/400 controllers, fitted with analogue and digital input/output modules combined with a digital and analogue input/output signal simulator
- SIMATIC WinCC/SCADA software (W1 course) used for visualization and control of industrial processes
- Computers with WinCC flexible software (W2 course)
- Siemens OP177B operator panels (W2 course)
Drive systems

Courses symbols: NAP1, TN51, TNS1, TNS2, TNS3, TNS3-TIA, TNS4

Participants of our courses have at their disposal student workstations designed to study applications and industrial solutions based on electric drives with frequency converters. A workstation consists of a frequency converter featuring a digital and analog signal simulator. Each converter is connected to an asynchronous electric motor.

During NAP1 courses there are two types of workstations available, based on different converters.
Our equipment allows students to perform tasks based on the actual elements applied in industrial automation.

- Siemens Sinamics G120/Siemens Micromaster M440
- Siemens Sinamics S120/Siemens Simotion

**Parker AC 890 SD**
- Power 0.55 kW
- 7 digital inputs
- 3 digital outputs
- 4 analog inputs
- 2 analog outputs
- Communication interface: PROFIBUS, PROFINET

**SEW Movitrac B 07**
- Power 0.25 kW
- 6 digital input
- 3 digital output
- 1 analog input
- Communication interface: PROFIBUS
SIEMENS SIMATIC PCS7 - a universal automation system for all branches of automation. PCS7 offers system solutions for all production cycle processes, from order logistics, through the production cycle and production-related processes to the final production optimization and accounting.

Additional element of the PCS7 system is Asset Management suite facilitating maintenance management, overviews etc. Being a distributed control system (DCS), PCS7 uses the standard TIA components and offers modern solutions for all branches of industry: both for the continuous processes (chemical industry, petrochemicals, metallurgy, paper industry, glass industry) and sequence and batch processes (food industry, pharmaceuticals).

SIMATIC PSC7 is not only capable of providing optimal solutions regarding the technological process, but it also offers automation of processes indirectly connected with the production such as transport, packaging, storage, providing media and materials or building automation and power supply.
Classes take place in a modern Laboratory of Sensors, where students have a chance to study and work with different sensors and industrial monitors by various manufacturers. A wide range of equipment and automation elements facilitate individual work on the discussed theoretical problems, which means that each participant has a chance to single-handedly connect and operate:

- induction sensors
- capacity sensors
- magnetic sensors
- optic sensors
- flow monitors
- temperature monitors
- liquid and gas medium monitors
- colour sensors
- RFID readers or barcode readers

as well as many others that can be found in our laboratory. This approach allows the students for the independent analysis and drawing conclusions and helps consolidate the acquired knowledge.
Participants have at their disposal individual workstations dedicated to learn exercises and industrial solutions based on using MITSUBISHI controllers and operator panels.

- MITSUBISHI FX series controllers, which is training system based on
- GOT2000 operator panel
- Computer connected with controller and engineering software suite
- I/O modules and input/output signals simulators
- GX Works 2 software
- Set of actuators connected to I/O controller
M.Eng. Andrzej Kasprzycki

An expert automation engineer with 20 years of experience gained from the starting of extensive industrial automation installations and maintenance of large production lines, i.a.: the first installation of PCS7 in Poland. He specializes in products and systems from SIEMENS, i.a.: Simatic S7 300/400, Simatic STEP 7, TIA Portal, ProTool, PCS7, WinCC Flexible, WinCC, WinCC Profissional, Micromaster and Sinamics S,G drives. Due to his extensive experience, he is the author of many excellent documentations and teaching programs. His trainings are particularly appreciated by the students.

EngD Piotr Świszcz

He is the author of over 70 publications and a few books, as well as many programs and course documentations. In addition to his research, he focuses on the practical application of science. He was a designer and executor of many technologies involving coal and steel, petrochemicals and chemicals as well as technologies for the food industry. He has managed over twenty commissioning processes involving PLCs and DCSs and for many years has served as vice president of an industrial automation company. He is professionally interested in nonlinear systems, automation, sensor systems, artificial intelligence and industrial communication networks. In his projects, he uses devices by SIEMENS, ABB, OMRON, BECKHOFF, GE FANUC and DANFOSS, hence his knowledge of multiple environments, i.a: Simatic STEP 7, AC800M, FREELANCE, CX ONE, Twin Cat, Proficy Machine Edition, APOS. He is also auditor of industrial communication networks and leading auditor of the ISO 50001 standard.

MSc eng. Krzysztof Polczyk

A control engineer and PLC programmer, whose considerable experience allows him to work as a valued, independent specialist both home and abroad. Realizuje prace uruchomieniowe i programistyczne. Poza znajomością Siemens SIMATIC S7, czy WinCC Flexible, Protool, ma liczne doświadczenia w pracy ze sterownikami Allen Bradley, systemem InTouch SCADA, sterownikami bezpieczeństwa PNOZ, Siemens S7 Distributed Safety, Sick and PROFIBUS, PROFINET industrial networks, Ethernet, AS-I, Interbus, Controlnet, Devicenet.

EngD Piotr Gaj

He is a doctor of technical science in the field of information technology, dr inż. Piotr Gaj He specializes in designing industrial IT and automation systems and he actively participates in numerous industrial application projects involving PLC, PROFIBUS and PROFINET industrial networks, drive systems, SCADA, HMI and MES systems from different manufacturers. He has over 20-years of teaching experience in higher education institutions.

EngD Piotr Michalski

He is a specialist in the field of design and operation of machines, dr inż. Piotr Michalski industrial sensors and industrial network with 20-years of industrial experience. He holds certified qualifications in the field of integrated automation systems, issued by such companies as Siemens, IFM electronic, Mitsubishi Electronic and B&R. He has many years of experience in teaching about industrial automation systems. Due to his extensive experience, he is the author of many excellent documentations and teaching programs. His trainings are particularly appreciated by the students.
EXPERTS

M.Eng. Jacek Barcik

A specialist in the field of controlling modern power electronic drive systems based on motors with permanent magnet motors (BLDC, PMSM, stepper motors); designing printed circuit boards (PCB); programmable controllers and microprocessor control systems.

EngD Arkadiusz Domoracki

M.Eng. Kamil Jastrzębski

An expert in the area of configuration and diagnostics of industrial networks PROFIBUS DP and PA. He has gained extensive and comprehensive experience working in the integrator company and in the maintenance department of the FCMG company, where his duties included implementing DCS systems- SIMATIC PCS7, classic control systems PLC+HMI and drive systems based on SIMOCODE and SINAMICS. His knowledge and practical experience from working as a trainer as well as professional teaching techniques are confirmed by a certificate Train The Trainer, which he received after completion of Master of Business Training program at the Poznań University of Economics and Business.

M.Eng. Jacek Barcik

An expert programmer-automation engineer with 15 years of experience gained in the development of software for mobile drivers, microprocess systems and MS Windows environment. He has participated in many R&D projects considering design of control systems, special and civilian vehicles based on CAN / CANopen® in cooperation with companies from Poland and Europe. Developer of professional software called CANStudio for CAN bus to configuration CANopen® nodes, network monitoring of CAN logging. He specializes in writing software for PLCs, micro-controllers and MS Windows in C, C ++, Delphi, CoDeSys with particular emphasis on the CAN bus, CANopen® and J1939 in designing CANopen® stacks and drivers for CAN micro-controllers as well as the creation of diagnostic software configuration and CAN MS Windows environment visualization. He has many years of experience in conducting trainings and workshops on CAN / CANopen® / J1939 CoDeSys.

M.Eng. Arkadiusz Domoracki

M.Eng. Kamil Jastrzębski

M.Eng. Jacek Barcik

M.Eng. Kamil Jastrzębski

M.Eng. Jacek Barcik

M.Eng. Grzegorz Czekała

A design engineer of automation systems involving components from Siemens, Mitsubishi and LabView. He has graduated from the Faculty of Mechanical Engineering at the Silesian University of Technology. He participated in a trainee program at the Faculty of Mechanical Engineering of the University in Skopje in Macedonia. He specializes in products and systems from SIEMENS, i.a.: Simatic S7 300/400, Simatic S7 1200, Simatic STEP 7, TIA Portal, WinCC.

M.Eng. Jacek Stój

EngD Jacek Stój

He is an expert in Industrial Information Technology dr inż. Jacek Stój with 10-years of experience in software design and configuration, as well as modernization and maintenance of industrial computer systems. He has a broad spectrum of relevant expertise regarding PLCs, communication networks, SCADA and MES systems, embedded systems and monitoring systems (including systems based on GSM). He specializes in Siemens SIMATIC S7 300/400, STEP 7, PROFIBUS and PROFINET networks, as well as hardware and software solutions from many other manufacturers (i.e.: GE IP, Beckhoff). He has many years of experience in teaching about industrial systems, including specialist courses and workshops.

M.Eng. Grzegorz Czekała

M.Eng. Krzysztof Noworyta

M.Eng. Krzysztof Noworyta

He has many years of practice in the following areas: responding to the reported serious machinery breakdowns, introducing modifications and improvements to the installed machine park leading to increasing efficiency and enhancing quality of the product, participating in installation and start-up of new or incoming machines, executing designs of new and machine control and safety instructions, programming robots, contacting technical support departments in case of the occurrence of defects that cannot be removed by the maintenance department employees, contacting suppliers of spare parts for the executed designs, carrying out the procedure of technical acceptance of machines in terms of safety, standards and requirements of TAEK, coordinating and ordering spare parts for machines and devices, supervising software database of machines and devices and verifying compliance with instructions, procedures, drawings and other technical documents containing the scope of requirements for standards ISO/TS 16949:2002 and ISO 14001, as well as specific requirements of a client.
Projects completed by our specialists

- The world’s first successful delivery of an automated HMCS (Hyperbaric Monitoring and Control System) for two clients on two different ships. Developing and programming SCADA/HMI systems on WinCC platform (2 pairs of redundant servers, 1 pair of archive servers and 8 clients), commissioning works including SAT, FAT, IO loop tests; fault finding, application tests, software modifications (PLC, SCADA, HMI) - on both ships; support role of one of the vessels after commissioning phase including maintenance, staff training, fault finding, reporting back to the office.

- Control system and developing software (Schneider-Unity Pro) for the car body transport in the car factory’s paint shop.

- SCADA system for oil mixing factory in Shanghai (China) – software development for visualization on 2 Pro-face panels, developing software for visualization on PC station (WinCC), preparing user’s manuals for software, integration of SCADA system and PLC.

- Maintenance support in a car factory in Chennai (India) - HMI support in a paint shop of a car factory; detection and elimination of mistakes and errors in Mitsubishi PLC software; adding new functions to the existing software; software optimization aiming at shortening the production cycle in different areas of the factory; testing new modifications where introduced.

- Implementation and support of HMI for a big tool manufacturer in Łódź - development of software (Step 7 - Siemens S300) preparing for changes on the assembly line; compiling documentation, instructions, training employees in the aspects of maintenance; participation in testing new devices and robots by Kawasaki; preparing instructions and training employees responsible for system maintenance; HMI support - troubleshooting and software optimization.
Niniejsza broszura ma charakter informacyjny i nie stanowi oferty handlowej w rozumieniu art. 66 § 1 Kodeksu Cywilnego. EMT-Systems sp. z o. o. nie bierze odpowiedzialności za wykorzystanie, kompletność i poprawność zamieszczonych w niej materiałów. Wszelkie nazwy własne, pozostałe zastrzeżone znaki towarowe i handlowe należące do podmiotów trzecich, są używane przez EMT-Systems Sp. z o. o. wyłącznie w celach identyfikacyjnych i informacyjnych. W broszurze wykorzystano również zdjęcia stanowiące własność Siemens AG. Wszelkie prawa zastrzeżone.