



# F.A.C.T

**Festo  
Authorized  
and Certified  
Training Centre**

**Training  
Plan**





# FESTO

[www.festo.com](http://www.festo.com)

## Festo - the Automation Company

### **/Festo Industry**

Festo offers components, modules and solutions for all levels of Automation Technology in the Industry. Festo is providing pneumatic, electric and electronics components for all levels and applications in Factory and Process Automation.

The German Company Festo is one of the world leaders in Industrial Automation with more than 15.800 employees worldwide and represented by 58 branches and partners in 170 countries. More than 75 years of experience are waiting to assist you!

### **/Festo Didactic**

From basic training to the planning, control and handling of complex networked CIM-systems, Festo Didactic is the leading supplier of learning and training solutions for all educational and continuous training institutions. Our solutions are developed to meet your specific requirements for fast and effective learning and guaranteed training success. Festo Didactic is providing complete solutions from state-of-the-art training equipment, software, brainware, training programs up to complete turn-key training labs according to international standard.







## Training for the Industry

### \Productivity

The relentless competitive pressure in industry demands that all stakeholders in skills – in particular manufacturing companies and the training organisations that serve them – optimise their productivity in order to survive in the competitive and globalized world. Our training will improve the performance of your technology and your people which will finally directly result in the increase of your Productivity.

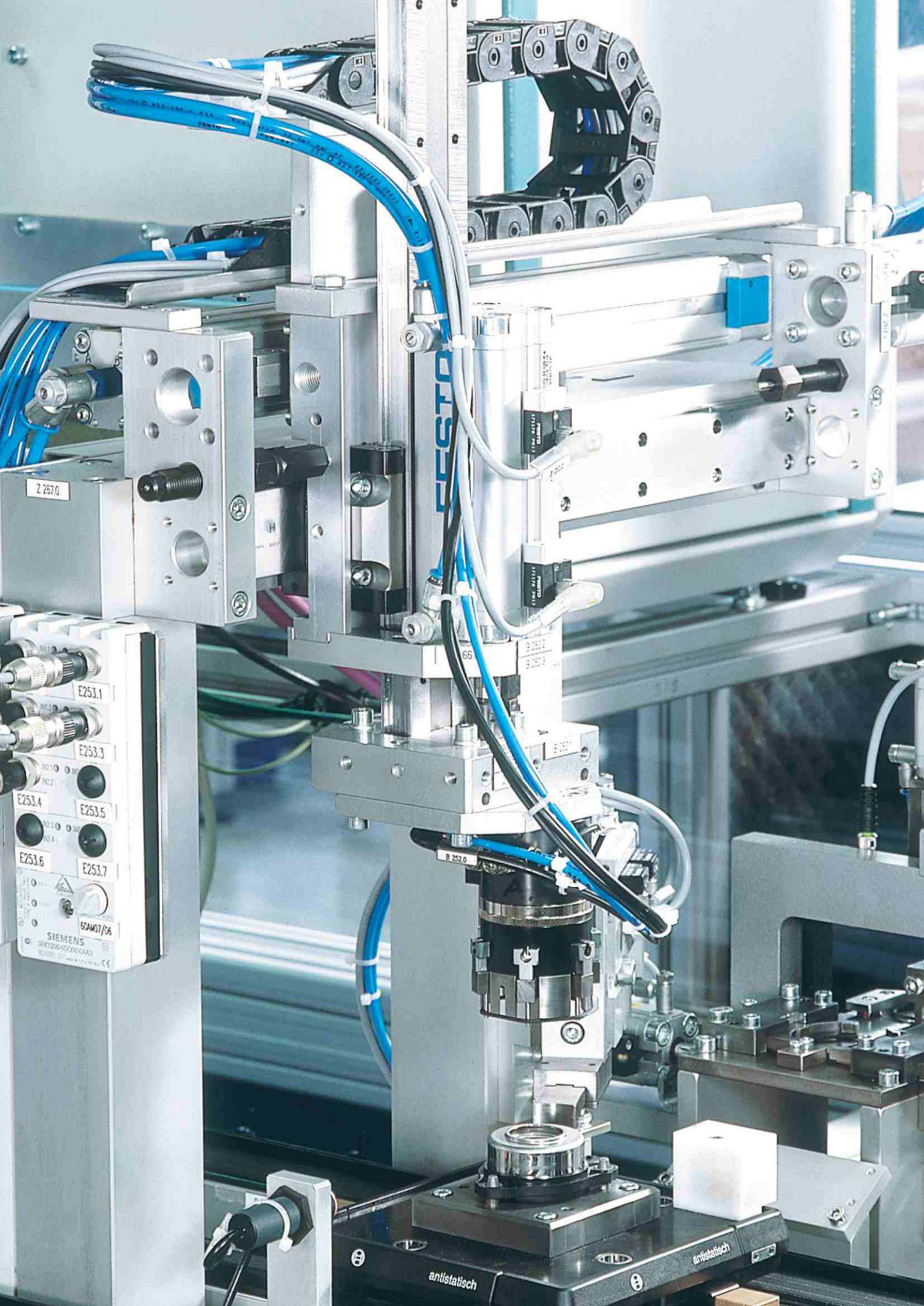
### \Professional Competence

Our training program focus on the Professional Competence, by means of knowledge, skills and professional attitude. Our training equipment is set-up with purely industrial components and enables the participants to work hands-on with a real manufacturing process either in Factory or in Process Automation.

**Always one step ahead by partnering with Festo !**







## Benefits of industrial Training

The advantages for you to send your employees and staff to our short-term training program are obvious:

- short-term training program in each 3-days modules
- immediate access to high-tech and state-of-the-art technologies and equipment
- increase the independency of suppliers

- increase Productivity because the training is based on Professional Competence
- increase the self-confidence of the employees and staff
- effectively handling of new manufacturing and control systems
- the training program is authorized and certified by Festo - a global player in Automation Technology







## FACT Centre Laboratories

### \Basic Technologies

Training in the basic disciplines of Mechatronics is the very first step of education and training in Factory and Process Automation. To be able to think and act within a networked system, the basic technologies must be fully understood. As an important technology in the Industry, all aspects of Fluidics can be trained in this lab.

### \Fully Automation

Our lab of Fully Automation is divided into the 2 sections of industrial manufacturing.

**Factory Automation** is the handling of solid workpieces throughout the entire manufacturing process, by means of in each step of the process the shape, dimension, orientation and material is known.

**Process Automation** is the control of all flowing materials, such as fluids, gas or powdery material, manual or automated processes i.e. the production, transportation, treatment and disposal.







## Training program

Please refer to our short-term training program overview.

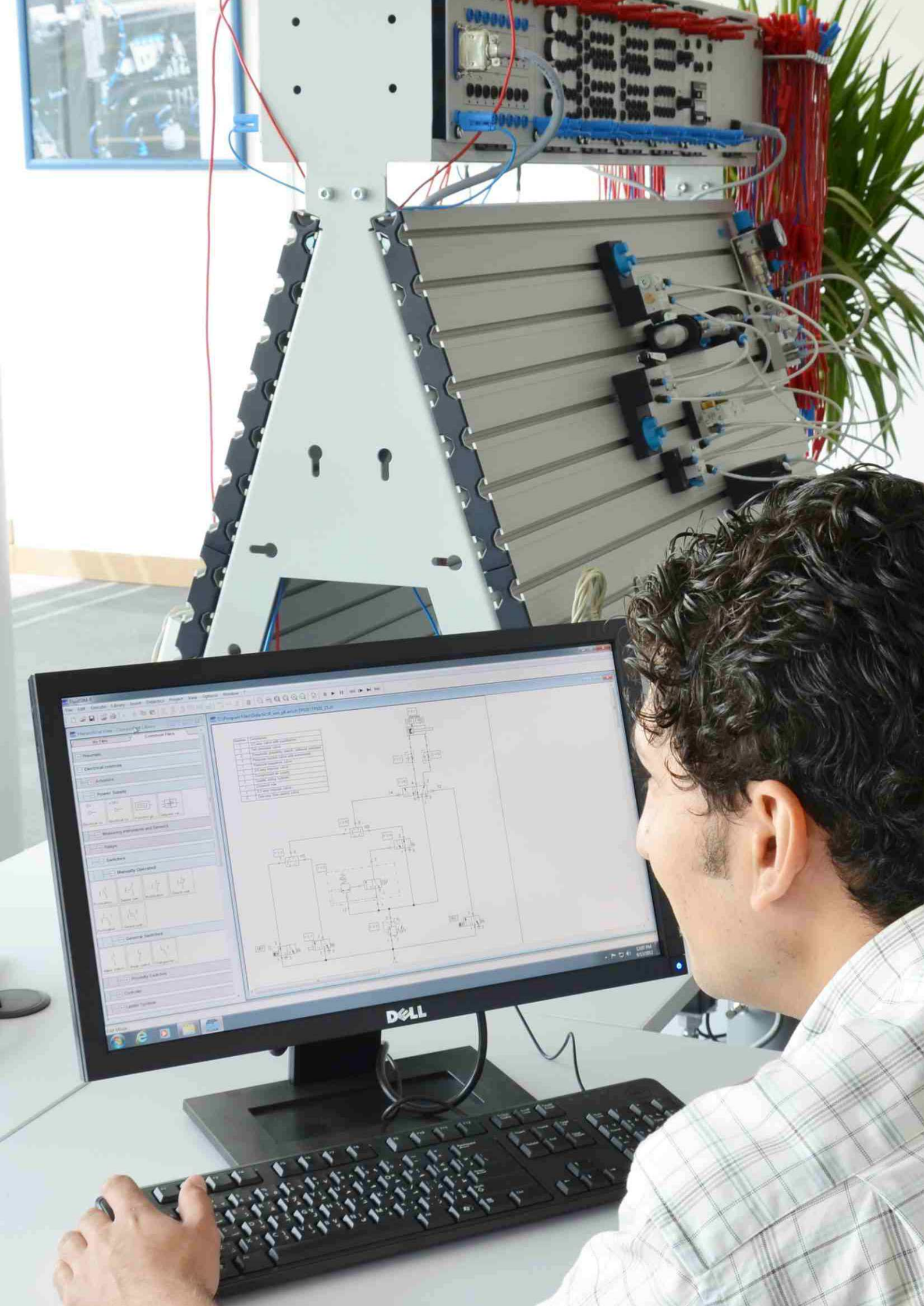
All of our modules are designed as a 3 to 4 days short-term training program for your convenience.

On request, we can also offer some of our training modules in-house, by means of we will come to you to conduct the training there !

**we can design a specific training program for you - please ask us !**

Title	Order No.	Code	Length	Page
Introduction to Control Technology	FACT-INT101-1012	INT101	4 days	13
Pneumatics	FACT-PNB111-1012	PNB111	4 days	14
Electro-Pneumatics Basic	FACT-EPB121-1012	EPB121	4 days	15
Electro-Pneumatics Advanced and Safety	FACT-EPA122-1012	EPA122	4 days	16
Hydraulics Basic	FACT-HYB311-1012	HYB311	4 days	17
Electro-Hydraulics Basics	FACT-EHB321-1012	EHB321	4 days	18
Proportional Hydraulics Basics	FACT-HYP331-1012	HYP331	4 days	19
Dc Drives Control and Characteristics	FACT-EDDC311-1012	EDDC311	4 days	20
AC Drives Control and Charateristics	FACT-EDAC321-1012	EDAC321	4 days	21
FA - Introduction to Automation and Mechatronics	FACT-INT201-1012	INT201	4 days	23
FA - PLC Programming Basics	FACT-PLC131-1012	PLC131	4 days	24
FA - PLC Programming Advanced	FACT-PLC232-1012	PLC232	4 days	25
PA - PLC Programming Higher Functions	FACT-PLC233-1012	PLC233	4 days	26
PA - Closed Loop Control in Process Automation	FACT-CLC241-1012	CLC241	4 days	27
FA - Commissioning and Trouble Shooting	FACT-ICT211-1012	ICT211	4 days	29
Introduction to Robotics	FACT-ROB 111-1017	ROB111	4days	31
CNC / ISO G-Code Language		CNC411	4 days	33
CNC Basics / ISO G-Code Language – According to FANUC Series 21 Lathe and Mill		CNC412	4 days	34
CNC Basics / ISO G-Code Language – According to Sinumerik 810/840D Lathe and Mill		CNC413	4 days	35
CNC Advanced / ISO G-Code Language – According to FANUC Series 21 Lathe and Mill		CNC421	4 days	36
CNC Advanced / ISO G-Code Language – According to Sinumerik 810/840D Lathe and Mill		CNC422	4 days	37





## Introduction to Control Technology

Code: INT 101

Short description: This training module is focussing on the technical overview of different control technologies - from Pneumatics to hard-wired Electro-Pneumatics up to the free programmable logic controller called PLC.

Contents:

- Theory of Pneumatics - air-pressure supply and components
- Handling of the planning and simulation software FluidSim
- Plan, edit and test circuits on FluidSim and the real training equipment
- Theory of Electrics and Electro-Pneumatics
- Plan, edit and test circuits on FluidSim and the real training equipment
- Theory of Programmable Logic Controllers - PLC
- Hardware addresses - absolute and symbolic addressing
- Structural programming
- Plan, edit and test of projects using the PLC and real training equipment

Competencies: The participant ....

- understands the theory of Pneumatics, air-supply and components
- is able to plan, design and test Pneumatic circuits
- understands the theory of Electrics and Electro-Pneumatics
- is able to plan, design and test Electro-Pneumatic circuits
- understands the importance of PLC in the Industry
- knows the differences between the different control technologies
- knows the absolut hardware addresses and symbolic addressing of a PLC
- knows the meaning of structural programming and the different languages
- is able to plan, edit and test a project using a PLC

Prerequisites: No prerequisites required

Duration: 4 days

Order Number: FACT-INT101\_1012



**Pneumatics**

Code: PNB 111

Short description: Pneumatics is one of the most important technology used in the Industry. This workshop will provide the necessary know-how based on hands-on training on real industrial equipment.

Contents:

- Introduction Basic Technologies of Mechatronics
- Theory in Pneumatics - fundamentals, applications, air pressure-supply
- Function of the components
- Handling of FluidSim Pneumatics
- Direct and indirect control of pneumatic cylinders
- Memory control
- Basic digital functions - AND, OR, NOT, RS-FF
- Pressure and time control
- Interlacing circuit

Competencies: The participant ....

- understands the importance of Pneumatics in the Industry
- understands the physical fundamentals of Pneumatics
- understands all important aspects of air-pressure supply
- knows the construction and function of components
- is able to handle the planning, design and simulation software FluidSim
- is able to plan, design, set-up and test of Pneumatic circuits
- understands the speed control of Pneumatic actuators
- understands the function of end-position sensors
- understands the pressure- and time control of Pneumatic actuators

Prerequisites: No prerequisites required

Duration: 4 days

Order Number: FACT-PNB111-1012

**Electro-Pneumatics Basics**

Code: EPB 121

Short description: Electro-Pneumatics is the perfect tool to be prepared for the next step of PLC controlled manufacturing process. This workshop will work-out all basic aspects of electrical control in Pneumatics.

Contents:

- Introduction Basic Technologies of Mechatronics
- Theory in Pneumatics and Electrics - fundamentals, applications, supply
- Function of the components
- Handling of FluidSim Pneumatics
- Direct and indirect control in Electro-Pneumatics
- Interlacing circuit
- Memory control
- Basic digital functions - AND, OR, NOT, RS-FF
- Function of end-position sensors

Competencies: The participant ....

- understands the importance of Pneumatics in the Industry
- understands the physical fundamentals of Pneumatics and Electrics
- understands all important aspects of air-pressure supply
- knows the construction and function of components
- is able to handle the planning, design and simulation software FluidSim
- is able to plan, design, set-up and test of Electro-Pneumatic circuits
- understands the speed control of Pneumatic actuators
- understands the function of end-position sensors
- understands the function of electronic proximity switches

Prerequisites: No prerequisites required

Duration: 4 days

Order Number: FACT-EPB121-1012



**Electro-Pneumatics Advanced and Safety**

Code: EPA 122

Short description: This workshop will work-out all advanced aspects of electrical control in Pneumatics. Further to that, we will work on sensors as well as the important aspects of safety within industrial applications.

Contents:

- Summarization of Electro-Pneumatics basics
- Planning, design, set-up and test of circuits with 2 cylinders
- Planning, design, set-up and test of time control
- Planning, design, set-up and test of pressure control
- Sensors in Factory Automation - description and functions
- Projects using different sensors
- General safety aspects in the Industry
- Safety circuits in Electro-Pneumatics

Competencies: The participants ...

- can identify and explain symbols of Electro-Pneumatic components
- can identify and describe the construction features of components
- can interpret technical specifications of Electro-Pneumatic components
- is able to plan, design, set-up and test circuits using 2 cylinders
- is able to plan, design, set-up and test time control circuits
- is able to plan, design, set-up and test pressure control circuits
- understands the function of sensors used in Factory Automation
- is able to plan, design and test circuits using different sensors
- understands the general aspects of safety in industrial applications
- is able to plan, design and test safety circuits

Prerequisites: Complete EPB 121 or basic know-how in Electro-Pneumatics

Duration: 4 days

Order Number: FACT-EPA122-1012

**Hydraulics Basics**

Code: HYB 311

Short description: If it comes to high force & high precision in the industry. Hydraulics is required. This workshop will provide the necessary know-how based on hands-on training on real industrial equipment

Contents:

- Introduction Basic Technologies of Mechatronics
- Theory in hydraulics - fundamentals, applications & supply
- Function of the components
- Handling of FluidSim hydraulics
- Differences between hydraulics & pneumatics
- Plan, Design, set-up & test of basic hydraulics circuits
- Plan, Design, set-up & test of pressure control circuits
- Plan, Design, set-up & test of flow control circuits

Competencies: The participant ....

- understands the importance of hydraulics & pneumatics in the Industry
- understands the physical fundamentals of hydraulics
- understands all important aspects of hydraulic power unit
- knows the construction and function of components
- is able to handle the planning, design and simulation software FluidSim
- is able to plan, design, set-up and test of basic hydraulic circuits
- understands the speed control of hydraulic actuators
- understands the pressure control of hydraulic actuators
- understands the function of end-position sensor

Prerequisites: No prerequisites required

Duration: 4 days

Order number: FACT-HYB311-1012



**Electro-Hydraulics Basic**

Code: EHB 321

Short description: Electrohydraulics are in use in numerous areas of industrial automation to give a few examples, woodworking machines, machine tools, process engineering plants, presses, plastics processing machines & conveyor. Systems worldwide are operated using electro-hydraulic control systems

Contents:

- Introduction Basic Technologies of Mechatronics
- Theory in hydraulics and Electrics - fundamentals, applications, supply
- Function of the components
- Handling of FluidSim Hydraulics
- Memory Control
- Basic digital functions-AND, OR, NOT, RS-FF
- Function of end-position sensors

Competencies: The participant ....

- understands the importance of hydraulics in the Industry
- understands the physical fundamentals of hydraulics and Electrics
- understands all important aspects of power supply
- knows the construction and function of components
- is able to handle the planning, design and simulation software FluidSim
- is able to plan, design, set-up and test of Electro-hydraulic circuits
- understands the speed control of Pneumatic actuators
- understands the speed control of hydraulic actuators
- understands the function of end-position sensor

Prerequisites: No prerequisites required

Duration: 4 days

Order number: FACT-EHB321-1012

**Proportional Hydraulics Basics**

Code: HYP331

Short description: You will become familiar with the function & actuation of proportional valves and the design of basic circuits in relevant industrial applications. The extensive practical part provides you with an opportunity to design circuits, adjust parameters and gain experience of commissioning in proportional hydraulic control systems.

Contents:

- Basic principles of proportional hydraulics.
- Design, function & characteristics data for proportional and directional control valves
- Generation of target values (analog & digital)
- Adaptation of amplifier electronics to required conditions
- Development & interpretation of proportional hydraulic circuit
- Current standards and safety regulations for practical operation and exercises

Competencies: The participants ...

- Understands the principles of proportional hydraulics
- Can explain the structure and mode of operation of proportional way
- Can interpret the characteristics data of proportional valves
- is able to adapt amplifier electronics to the required conditions
- is able to develop and read proportional hydraulics circuit diagram

Prerequisites: Complete EHP 321 or basic know-how in Electro-Hydraulics

Duration: 4 days

Order number: FACT-HYP331-1012



**DC Drives Control and Characteristics****AC Drives Control and Characteristics**

Code: EDDC 311

Short description: This course will allow the participants acquire the appropriate competencies to select appropriate DC motors and their installation according to the industrial necessities to get the best efficiency. The laboratory is equipped with the top equipment for this purpose.

Contents:

- Direct Current Machines
- SI Units & Electrical Basics
- DC Motors Classification
- DC Motor Structure & Components
- DC Motor Speed, Direction & Torque
- DC Motor Control & Protection
- DC Motor Commissioning
- DC Motor Braking Techniques
- DC Motor Graphical Representation & Characteristic Curve
- DC Motor Performance

Competencies: The participants ...

- Become familiar with the working principle of the DC motor.
- Diagnose the operation of DC motors.
- Choose the appropriate type of DC motor according to application & load.
- Interpret the electrics diagrams.
- Interpretation of engine variables of its operation.
- Choosing the appropriate elements of motor protection.
- Will be able to handle motor simulation using DriveLab Software.
- Implementation of motor connection.
- Learn to implement of braking techniques.
- Become familiar with the DC Motor commissioning.
- Become familiar with the DC Motor control.

Prerequisites:

- Basic knowledge of electricity
- Good knowledge in operating a PC with a windows interface

Duration: 4 days

Order number: FACT-EDDC311-1012

Code: EDAC 321

Short description: This course will allow the participants acquire the appropriate competencies to select appropriate AC motors and their installation according to the industrial necessities to get the best efficiency. The laboratory is equipped with the top equipment for this purpose.

Contents:

- SI Units & Electrical Basics
- AC Motors Introduction
- AC Motors Classification
- Induction Motors
- 3-Phase Asynchronous Motor
- 3-phase Motor Speed, Direction & Torque
- 3-phase Motor Control & Protection
- 3-phase Motor Commissioning
- 3-phase Motor Braking Techniques
- 3-phase Motor Graphical Representation & Characteristic Curve
- 3-phase Motor Performance

Competencies: The participants ...

- Diagnose the operation of electrics motors.
- Choose the appropriate type of motor according to an application.
- Interpret the electrics diagrams.
- Will be able to handle motor simulation using DriveLab Software.
- Interpretation of engine variables of its operation.
- Choosing the appropriate elements of engines protection.
- Dimensioning of installation components.
- Implementation of motor connection.

Prerequisites:

- Basic knowledge of electricity
- Good knowledge in operating a PC with a windows interface

Duration: 4 days

Order number: FACT-EDAC321-1012





## Introduction to Automation and Mechatronics

Code: INT 201

Short description: This training module introduces the 4 important tasks which are required in the Industry - Installation&Commissioning, Programming, Communication and Maintenance&Trouble Shooting.

Contents:

- Planning to set-up a Flexibel Manufacturing System - FMS
- Installation and Commissioning of the FMS
- Test the entire material- and signal flow through the FMS
- Function of a PLC in general and of the ML 1500 in particular
- Structure of a PLC program
- Project solutions for the single FMS stations in Ladder Diagram
- Theory about Industrial Communication in general and I/O in particular
- Theory about the 3-phases of Trouble Shooting
- Trouble Shooting within the entire FMS process

Competencies: The participant ...

- the four tasks required by the Industry
- is able to plan a project according to a workpiece description
- is able to set-up a networked system
- is able to adjust mechanical, electrical and pneumatic components
- understands the basic principals of a PLC
- is able to plan, edit and test project solutions with PLC's
- understands the 3 levels of industrial communication
- understands the difference between Maintenance and Trouble Shooting
- is able to detect errors, limitate errors and eliminate errors professionally

Prerequisites: No prerequisites required

Duration: 4 days

Order Number: FACT-INT201\_1012



### Factory Automation - PLC programming Basics

---

Code: PLC 131

Short description: This training program is focussing on the structure and mode of operation of PLC as well as how to create basic logic association programs. A key element of the workshop is application and handling, using the programming terminology and taking into account the various interfaces between the individual technologies (mechanical, pneumatics, electrical and PLC).

Contents:

- Overview of controllers used in the Industry
- PLC fundamentals in general
- Functions of the components used in Electro-Pneumatics
- Handling of the PLC programming software
- Definition of the in- and output addresses
- Absolute and symbolic addressing
- Structural programming and uncondition and condition call
- Planning, edit and test projects in digital technology

Competencies: The participant ...

- knows the different controllers used in the Industry
- understands the function of all Electro-Pneumatic componentes
- understands the function of a PLC
- is able to define the in- and outputs
- understands the absolute and symbolic addressing of in- and outputs
- has an overview about the PLC programming languages - LAD, STL, FBD
- knows all basic digital modules - AND, OR, NOT, RS-FF ...
- is able to plan, edit and test PLC projects in Ladder Diagram

Prerequisites: No prerequisites required

Duration: 4 days

Order Number: FACT-PLC131-1012

### PLC programming Advanced

---

Code: PLC 232

Short description: This training module is based on the know-how of the basic PLC programming module by transferring that know-how to the single stations of a Flexible Manufacturing System. The participants will plan, edit and test PLC project solutions for the single stations of the Factory Automation system called MPS 200.

Contents:

- Functions of the single FMS stations
- Components - specification and function
- Definition of the input and output addresses of the FMS stations
- Absolute and symbolic addressing
- Plan, edit and test PLC projects for each single FMS station
- Planning of the I/O-communication between the single stations
- Plan, edit and test the I/O-communication
- Plan, edit and test the material- and signal flow through the entire FMS

Competencies: The participant ...

- knows the functions and symbols of different sensors and actuators
- is able to distribute an entire project into logical steps
- is able to plan a step-by-step programming solution with a PLC
- is able to test a programming solution according to a specification
- understands the levels of industrial communication
- is able to plan an I/O-communication within a FMS
- understands the Stop and Emergency Stop conditions within a FMS
- is able to test an entire project solution according to a specification

Prerequisites: Completion of PLC 131 or basic know-how in PLC programming

Duration: 4 days

Order Number: FACT-PLC232-1012



## PLC programming Higher Functions

---

Code: PLC 233

Short description: As a preparation of controlling analogue signals and closed loop Process Automation equipment, we have to work-out the know-how in Word processing, arithmetic functions of a PLC and analogue in- and output control first. This workshop is providing that know-how using our high sophisticated Process Automation Workstations.

Contents:

- Functions of the MPS PA Workstations
- Components - specification and function
- Definition of the input and output addresses
- Absolute and symbolic addressing
- Theory of analogue inputs and normalization
- Arithmetic functions of the PLC - theory and exercises
- Project using analogue inputs and normalization to the process variable
- Project using analogue outputs and normalization to the process variable
- Plan, edit and test of a 2-step controller

Competencies: The participant ...

- understands the difference between binary, analogue and digital signal
- knows the function of components used in Process Automation
- understands the difference between absolute and symbolic addressing
- knows the theory of analogue in- and outputs of a PLC
- is able to plan, edit and test projects using analogue signals
- is able to plan, edit and test normalization of analogue signals
- is able to plan, edit and test a 2-step controller

Prerequisites: Completion of PLC 131 and/or PLC 232

Duration: 4 days

Order Number: FACT-PLC233-1012

## Closed Loop Control in Process Automation

---

Code: CLC 241

Short description: More and more closed loop process in the Process Automation Industry are controlled by PLC's not by Industrial Controllers anymore. Using a PLC has several advantages which this workshop is focusing on.

Contents:

- Preparation of the MPS PA Workstations
- Installation and Commissioning of the MPS PA
- Theory of closed loop technology
- Closed loop control of the level and flow using the computer
- Optimize the parameters for level and flow control using the computer
- Analogue in- and output normalization
- Closed loop control of the level, pressure and flow with the PLC

Competencies: The participant ...

- is able to install and commission Process Automation stations
- understands the theory of closed loop technology
- is able to set-up a closed loop control by a computer
- is able to optimize the corresponding parameters for level and flow control
- understands the functions of analogue in- and outputs of a PLC
- is able to normalize the signals of analogue in- and outputs
- is able to plan, edit and test a closed loop control with a PLC

Prerequisites: Completion of PLC 233

Duration: 4 days

Order Number: FACT-CLC241-1012





## Commissioning and Trouble Shooting

Code: ICT 211

Short description: A very essential part of the professional competence in the Industry is not only to be able to plan and set-up automated Flexible Manufacturing Systems - FMS but also to fully maintain them and professionally conduct Trouble Shooting.

Contents:

- Functions of the single MPS stations of the FMS
- Functions of the components used within the FMS
- Plan and set-up a FMS according to a specification
- Mechanical, pneumatical and electrical adjustment of the FMS
- Run and observe an example process of the FMS
- Theory of Trouble Shooting
- Three-phase model of professional Trouble Shooting
- Trouble Shooting within the FMS

Competencies: The participant ...

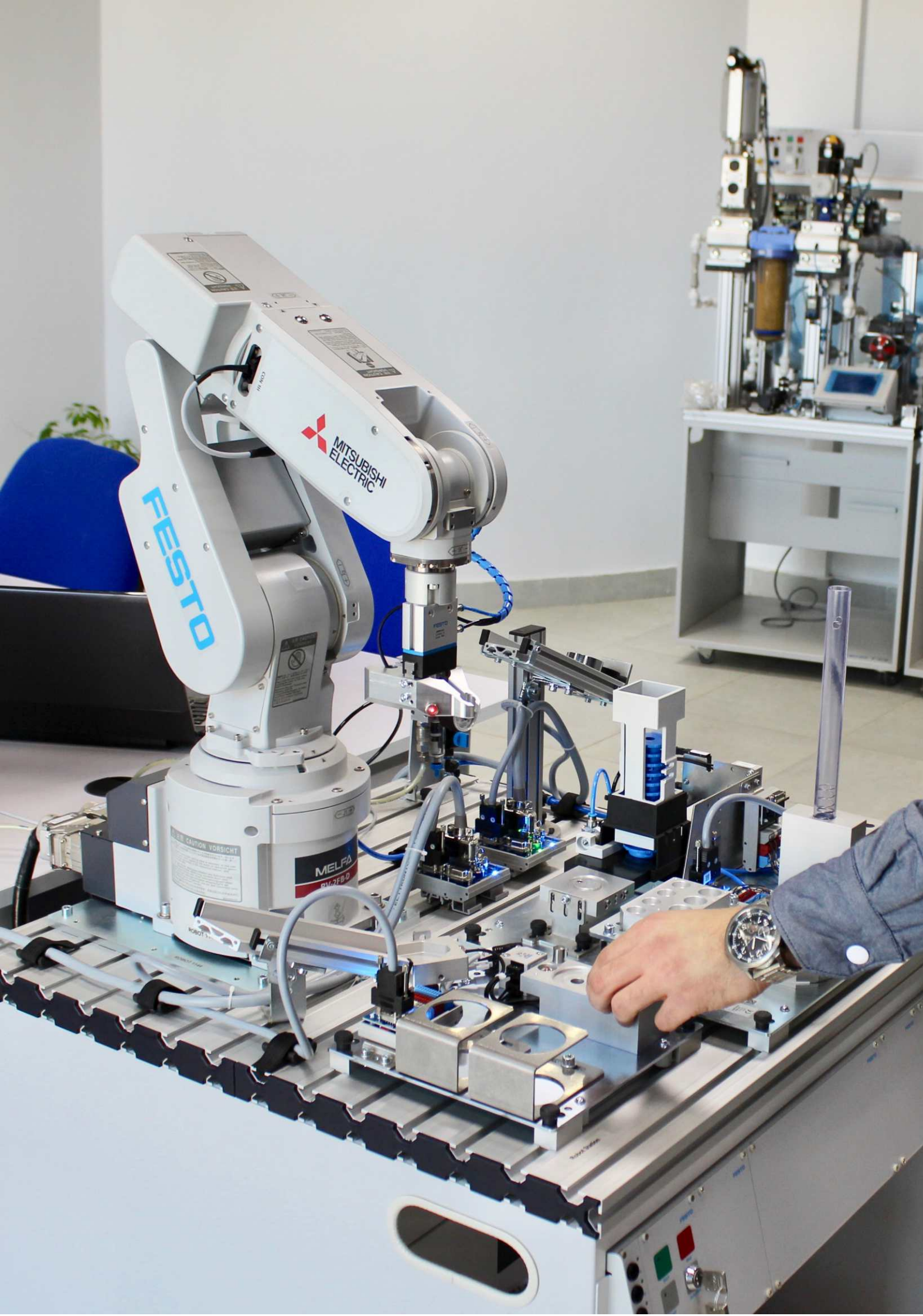
- is able to understand and describe the functions of a FMS
- is able to plan and set-up a FMS
- is able to conduct the full commissioning of a FMS
- is able to download user programs and test-run the process
- understands the theory and measurement methods in Trouble Shooting
- knows the differences between commissioning/maintenance errors
- can perform systematic Trouble Shooting within a FMS
- can perform systematic Trouble Shooting within a PLC program

Prerequisites: Complete EPB 121 and/or basic know-how in Electro-Pneumatics and PLC

Duration: 4 days

Order Number: FACT-ICT211-1012





## Introduction to Robotics

Code: ROB 111

Short description: For many years robotics has been evolving fast, providing speed, precision, and quality in production processes. This course provides you with an insight into robotics hardware technology, its function, and operation.

Contents:

- Robot arm design
- Robot controller
- Joint movements
- Coordinate systems
- Speed commands, Movement commands
- Creating Position Lists
- Formulate, download and testing of related sequence programs
- Multi-tasking
- Uploading data from robot controller
- Safety regarding robots

Competencies: The participant ...

- describe the mechanics behind robotics systems
- describe the working principles behind the control of movement and speed
- explain what a coordinate system is
- read and write a basic robotics sequence program
- identify and eliminate faults using the status display

Prerequisites: Completion of EPB 121 or basic know-how in Electro-pneumatics and in operating a PC with a Windows interface

Duration: 4 days

Order Number: FACT-ROB 111-1017



## CNC / ISO G-Code Language



Code: CNC 411

**Short description:** CNC machines are one of the most important equipment used in industry to produce parts. This workshop will provide the necessary know-how based on hands-on training on real industrial equipment upon the ISO G-Code language ISO G-Code language

**Contents:**

- Brief history about the ISO G-Code language: the beginning, the actual state, the industrial point
- Principles of ISO G-Code programming
- Organization of a single instruction and the complete structure of a Block
- Description of the words set: N, G, F, S, F, T, M
- Syntax of the ISO G-Code words for Milling and Turning machines
- Systems of Coordinates: Absolutes and Relatives, Cartesians or Polars
- Machine coordinate system and user coordinate system
- Set-up of the machine for the required job
- Tool path: kind of paths and its control
- Technological parameters
- Structure of a NC program
- Samples

**Competencies:** The participant ....

- understands the basics on how to program a CNC Machine
- understands how to manage the System of Coordinates
- understands how to control the tools and the tool movement
- knows the structure and the syntax of a single block of ISO G-Code
- knows the set of Words for Lathe Machines and for Milling Machines
- is able to read and write simple NC programs
- is able to open an NC program and modify some instructions
- is able to define and put into the NC program the technological parameter
- understands the differences between Machine Coordinate System and User Coordinate System
- is able to simulate the tool path and understand it

**Prerequisites:** Basic engineering understanding

**Duration:** 4 days



**CNC Basics / ISO G-Code Language – According to FANUC Series 21 Lathe and Mill**


---

Code:	CNC 412
Short description:	CNC machines are one of the most important equipment used in industry to produce parts. This workshop will provide the necessary know-how based on hands-on training on real industrial equipment upon the ISO G-Code language ISO G-Code language FANUC variant
Contents:	<ul style="list-style-type: none"> <li>- Brief history about the ISO G-Code language: the beginning, the actual state, the industrial point</li> <li>- Principles of ISO G-Code programming</li> <li>- Organization of a single instruction and the complete structure of a Block</li> <li>- Description of the words set: N, G, F, S, F, T, M</li> <li>- Syntax of the ISO G-Code words for Milling and Turning machines</li> <li>- Systems of Coordinates: Absolutes and Relatives, Cartesians or Polars</li> <li>- Machine coordinate system and user coordinate system</li> <li>- Set-up of the machine for the required job</li> <li>- Tool path: kind of paths and its control</li> <li>- Technological parameters</li> <li>- Structure of a NC program</li> <li>- Samples according to FANUC Series 21</li> </ul>
Competencies:	<p>The participant ....</p> <ul style="list-style-type: none"> <li>- understands the basics on how to program a CNC Machine</li> <li>- understands how to manage the System of Coordinates</li> <li>- understands how to control the tools and the tool movement</li> <li>- knows the structure and the syntax of a single block of ISO G-Code FANUC Series 21</li> <li>- knows the set of Words for Lathe Machines and for Milling Machines equipped with a FANUC Series 21 Numerical Control</li> <li>- is able to read and write simple NC programs through the FANUC Series 21 Machine Interface</li> <li>- is able to open an NC program and modify some instructions or add new blocks/words</li> <li>- is able to define and put into the NC program the technological parameter</li> <li>- understands the differences between Machine Coordinate System and User Coordinate System</li> <li>- is able to simulate the tool path and understand it</li> </ul>
Prerequisites:	Basic engineering understanding
Duration:	4 days

**CNC Basics / ISO G-Code Language – According to SIEMENS Sinumerik 810/840D Lathe and Mill**


---

Code:	CNC 413
Short description:	CNC machines are one of the most important equipment used in industry to produce parts. This workshop will provide the necessary know-how based on hands-on training on real industrial equipment upon the ISO G-Code language SIEMENS SINUMERIK variant
Contents:	<ul style="list-style-type: none"> <li>- Brief history about the ISO G-Code language: the beginning, the actual state, the industrial point</li> <li>- Principles of ISO G-Code programming</li> <li>- Organization of a single instruction and the complete structure of a Block</li> <li>- Description of the words set: N, G, F, S, F, T, M</li> <li>- Syntax of the ISO G-Code words for Milling and Turning machines according to SIEMENS</li> <li>- Systems of Coordinates: Absolutes and Relatives, Cartesians or Polars</li> <li>- Machine coordinate system and user coordinate system</li> <li>- Set-up of the machine for the required job</li> <li>- Tool path: kind of paths and its control</li> <li>- Technological parameters</li> <li>- Structure of a NC program</li> <li>- Samples SIEMENS Sinumerik 810/840D</li> </ul>
Competencies:	<p>The participant ....</p> <ul style="list-style-type: none"> <li>- understands the basics on how to program a CNC Machine</li> <li>- understands how to manage the System of Coordinates</li> <li>- understands how to control the tools and the tool movement</li> <li>- knows the structure and the syntax of a single block of ISO G-Code SIEMENS Sinumerik 810/840D</li> <li>- knows the set of Words for Lathe Machines and for Milling Machines</li> <li>- is able to read and write simple NC programs through SIEMENS Sinumerik 810/840D Machine Interface</li> <li>- is able to open an NC program and modify some instructions or add new blocks/words</li> <li>- is able to define and put into the NC program the technological parameter</li> <li>- understands the differences between Machine Coordinate System and User Coordinate System</li> <li>- is able to simulate the tool path and understand it</li> </ul>
Prerequisites:	Basic engineering understanding
Duration:	4 days



**CNC Advanced / ISO G-Code Language – According to FANUC Series 21 Lathe and Mill**

Code:	CNC 421
Short description:	CNC machines are one of the most important equipment used in industry to produce parts. This workshop will provide the necessary know-how based on hands-on training on real industrial equipment upon the ISO G-Code language ISO G-Code language FANUC variant
Contents:	<ul style="list-style-type: none"> <li>- Brief introduction about the ISO G-Code language for advanced programs: tool compensations, coordinate system management, main and sub program, cycles</li> <li>- Principles of ISO G-Code FANUC 21 structured programm</li> <li>- Set of instructions for tool length and radius compensation for lathe and milling machines</li> <li>- How to start and how to close the tool compensation inside a NC program</li> <li>- The User Coordinates System: how to set and how to change it inside a program</li> <li>- How to write a main program and how to write a sub program</li> <li>- The combination of main and sub programs for repeating a job for an exact number of items; how to call a sub program</li> <li>- The combination of main, sub programs and User Coordinate Systems</li> <li>- The set of cycles included for Milling operations</li> <li>- The set of cycles included for Turning operations</li> <li>- Samples according to FANUC Series 21</li> </ul>
Competencies:	<p>The participant ....</p> <ul style="list-style-type: none"> <li>- understands the basics on how to write a structured program for a CNC Machine equipped with FANUC Series 21 Numerical Control</li> <li>- understands how to control the System of Coordinates inside a NC program</li> <li>- understands how to control the tools dimensions inside a NC program</li> <li>- is able to start and stop in the right way the tools dimensions compensation within turning or milling NC programs</li> <li>- knows the structure and the syntax to create a main or a sub program according to ISO G-Code FANUC Series 21</li> <li>- knows how to call a sub program inside a main program or another sub program</li> <li>- knows how many sub program levels can be used</li> <li>- knows the set of standard cycles for Milling operations</li> <li>- knows the set of standard cycles for Turning operations</li> <li>- is able to simulate the tool path and understand it</li> </ul>
Prerequisites:	Basic CNC technology
Duration:	4 days

**CNC Advanced / ISO G-Code Language – According to SIEMENS Sinumerik 810/840D Lathe and Mill**

Code:	CNC 422
Short description:	CNC machines are one of the most important equipment used in industry to produce parts. This workshop will provide the necessary know-how based on hands-on training on real industrial equipment upon the ISO G-Code language SIEMENS SINUMERIK variant
Contents:	<ul style="list-style-type: none"> <li>- Brief introduction about the ISO G-Code language for advanced programs: tool compensations, coordinate system management, main and sub program, cycles</li> <li>- Principles of ISO G-Code SIEMENS Sinumerik 810/840D structured program</li> <li>- Set of instructions for tool length and radius compensation for lathe and milling machines</li> <li>- How to start and how to close the tool compensation inside a NC program</li> <li>- The User Coordinates System: how to set and how to change it inside a program</li> <li>- How to write a main program and how to write a sub program</li> <li>- The combination of main and sub programs for repeating a job for an exact number of items; how to call a sub program</li> <li>- The combination of main, sub programs and User Coordinate Systems</li> <li>- The set of cycles included for Milling operations</li> <li>- The set of cycles included for Turning operations</li> <li>- Samples according to SIEMENS Sinumerik 810/840D</li> </ul>
Competencies:	<p>The participant ....</p> <ul style="list-style-type: none"> <li>- understands the basics on how to write a structured program for a CNC Machine equipped with SIEMENS Sinumerik 810/840D Numerical Control</li> <li>- understands how to control the System of Coordinates inside a NC program</li> <li>- understands how to control the tools dimensions inside a NC program</li> <li>- is able to start and stop in the right way the tools dimensions compensation within turning or milling NC programs</li> <li>- knows the structure and the syntax to create a main or a sub program according to ISO G-Code SIEMENS Sinumerik 810/840D</li> <li>- knows how to call a sub program inside a main program or another sub program</li> <li>- knows how many sub program levels can be used</li> <li>- knows the set of standard cycles for Milling operations</li> <li>- knows the set of standard cycles for Turning operations</li> <li>- is able to simulate the tool path and understand it</li> </ul>
Prerequisites:	Basic CNC technology
Duration:	4 days



## **Contact Data**

# **F.A.C.T**

**Festo Authorized and  
Certified Training Centre**

**at Nile University**

Nile University Campus,  
26th of July Corridor -  
Sheikh Zayed City  
Giza,12588, Egypt

Phone: (+202) 3854-1799  
(+2) 010-2449-3305  
(+2) 010-2333-2312



Fact@nu.edu.eg  
www.fact-nu.com  
www.nileu.edu.eg/fact  
www.festo.com