Working in Industrial Automation

Unit A Spain	Title of the unit: **Working with FMS (Flexible Manufacturing System) systems**		
Prerequisites:	- Basic pneumatic systems - Basic knowledge of electricity - Basic knowledge about most common sensors (optical, inductive, capacitive, mechanical)		
Work tasks:	- Assembly, programming and commissioning of a production module including SFC (Sequence Function Chart) programming with PLC. - Assembly, programming and commissioning of several production modules into a production line using I/O communication between modules. - Fault finding in a PLC-controlled production modules in order to replace broken components. - Using production stops in a production module programmed by SFC. - Applying general safety rules and writing a test report.		
Learning Outcomes:	Knowledge	Skills	Competence
	- He/she knows how to define the basic processes using SFC (Sequential Function Chart) methods. - He/she knows how to recognise syntax of SFC-language according to IEC 61131-3. - He/she knows how to describe how to program the production modules.	- He/she is able to analyse the process that has to be controlled. - He/she is able to run through a PLC program, using a given SFC, and check if it works properly.	- He/she is responsible for applying IEC 61131-3 to create a PLC-program using SFC.
	- He/she knows how to recognise electro technical symbols and knows in which norm to find them.	- He/she is able to test the output condition and actuators - He/she is able to test the input condition and sensors.	- He/she is responsible for the correct functioning of the installation using the module's diagrams.
	- He/she knows how to recognise if a machine is working in proper conditions.	- He/she is able to decide if a component is broken or working properly. - He/she is able to use the program to monitor the process for fault finding. - He/she is able to check and measure the circuit using a wiring diagram.	- He/she is responsible for applying the right strategy to fix identified faults.
	- He/she knows how to describe the rules for writing a test report.	- He/she is able to evaluate the function of the different parts of the installation.	- He/she is responsible for reflecting upon his/her actions in a test report.
	- He/she knows how to describe the general safety rules.	- He/she is able to point out when a machine doesn't meet with certain safety standards - He/she is able to work in proper conditions, trying to avoid any kind of risk.	- He/she is responsible for applying general and specific branch related safety rules and procedures in his/her work.
			- He/she is responsible for sharing knowledge, experience and insights

Lifelong Learning Programme

			so that electro technical products and systems will be tested properly.
Reference to national qualification:	Middenkader Engineering Technicus (crebo 94421) Level 4 (Netherlands) El och Energiprogrammet, inriktning Automation Level 4 (Sweden) Indutritekniska programmet, inriktning Drift och underhållsteknik Level 4 (Sweden) Teknikprogrammet, inriktning Produktionsteknik Level 4 (Sweden) Grundexamen inom el- och automationsteknik Level 4 (Finland) Grundexamen inom maskin- och metallbranschen Level 4 (Finland) Automatizacion y robotica Industrial Level 5 (Spain) Técnico Superior en Mecatrónica Industrial Level 5 (Spain) Técnico superiro en Mantenimiento de Equipo Industrial Level 5 (Spain)		
Reference to EQF:	Level 4 *		
Assessment:	Practical assessment assignment & theoretical validation of knowledge using industrial validation system ValidMaint		

* The EQF level for the unit of learning outcomes was established by comparing the learning content of the involved national qualifications during the EURIAC project

Unit B the Netherlands	Title of the unit: **Working with motor controllers**		
Prerequisites:	- Basic knowledge about most common sensors (optical, inductive, capacitive, mechanical) - Basic principle of motors and generators - Working with 400V systems - Basic knowledge of using relays and contactors - Basic knowledge of electricity		
Work tasks:	- Produce general scheme drawing of a production module using CAD systems - Assembly, programming and commissioning of a production module including Ladder programming with PLC and motor drivers. - Assembly, programming and commissioning of a production module including Sequence Ladder programming with PLC. - Using relays and contactors controlled by PLC in order to put the Y/D motor into service. - Applying general safety rules according to the low voltage directive - Working with frequency controllers - Using basic principles of measurement in a motor control circuit for fault finding		
Learning Outcomes:	Knowledge	Skills	Competence
	- He/she knows how to define the basic processes using Ladder methods. - He/she knows how to recognise syntax of Ladder-language according to IEC 61131-3. - He/she knows how to describe how to program the production modules.	- He/she is able to analyse the process that has to be controlled. - He/she is able to run through a PLC program, using a given Ladder, and check if it works properly.	- He/she is responsible for applying IEC 61131-3 to create a PLC-program using Ladder.
	- He/she knows how to define the basic components of a frequency controller. - He/she knows how to define the basic parameters and connections of the motor.	- He/she is able to connect a frequency controller to a motor. - He/she is able to connect input to start frequency controller.	- He/she is responsible for applying the right combination of settings of the frequency controller with the parameters of the motors. - He/she is responsible for applying the correct wiring of Y/D motor with its contactors
	- He/she knows how to define the basic principles of a CAD systems. - He/she knows how to recognise electro technical symbols and knows how to use them.	- He/she is able to produce a drawing using CAD.	- He/she is responsible for creating a new up-to-date drawing when changes have been made.
	- He/she knows how to describe the general safety rules for the low voltage directive.	- He/she is able to point out when a machine doesn't meet with certain safety standards - He/she is able to work in proper conditions,	- He/she is responsible for applying general and specific branch related safety rules and procedures

		trying to avoid any kind of risk.	according to low voltage directives in his/her work.
	- He/she knows how to explain the method of measuring the parameters of a motor controlled by a frequency controller.	- He/she is able to measure the current voltage and power of a motor controlled by a frequency controller.	- He/she is responsible for analysing the condition of the motor using the measuring results.
			- He/she is responsible for sharing knowledge, experience and insights so that electro technical products and systems will be tested properly.
Reference to national qualification:	Middenkader Engineering Technicus (crebo 94421) Level 4 (Netherlands) El och Energiprogrammet, inriktning Automation Level 4 (Sweden) Indutritekniska programmet, inriktning Drift och underhållsteknik Level 4 (Sweden) Teknikprogrammet, inriktning Produktionsteknik Level 4 (Sweden) Grundexamen inom el- och automationsteknik Level 4 (Finland) Grundexamen inom maskin- och metallbranschen Level 4 (Finland) Automatizacion y robotica Industrial Level 5 (Spain) Técnico Superior en Mecatrónica Industrial Level 5 (Spain) Técnico superiro en Mantenimiento de Equipo Industrial Level 5 (Spain)		
Reference to EQF:	Level 4*		
Assessment:	Practical assessment assignment & theoretical validation of knowledge using industrial validation system ValidMaint		

* The EQF level for the unit of learning outcomes was established by comparing the learning content of the involved national qualifications during the EURIAC project

Lifelong Learning Programme

Unit C Finland	Title of the unit: **Working with analogue signals**		
Prerequisites:	- Basic pneumatic systems - Basic knowledge of electricity - Basic knowledge about most common sensors (analogue, optical, inductive, capacitive)		
Work tasks:	- Assembly, programming and commissioning of a production module including a (Logical) FBD-programmed PLC-system. - Creating simple on/off regulating PLC programs - Handling analogue signals, inputs and outputs, (0-10V or 4-20mA) in PLC programs. - Fault finding and recalibration of transmitters - Handling over-ranging and programming an open circuit for safety reasons		
Learning Outcomes:	Knowledge	Skills	Competence
	- He/she knows how to describe the difference between analogue signals and digital signals - He/she knows how to describe the difference between bits, bytes, words and double-words. - He/she knows how to recognize the importance of using HIGH/LOW-limits in an analogue system. - He/she knows how to recognize syntax of FBD-language according to IEC 61131-3.	- He/she is able to read analogue and digital signals in a simple PLC-program. - He/she is able to use analogue and digital signals in a simple PLC-program. - He/she is able to move data between functions in a PLC-program using the right data format. - He/she is able to determine when an analogue signal is behind the HIGH/LOW-level.	- He/she is responsible for monitoring, calculating and scaling an analogue signal to a proper value. - He/she is responsible for creating a program controlling a digital output according to an analogue signal. - He/she is responsible for applying a HIGH/LOW-level limit to a program with analogue signals. - He/she is responsible for applying IEC 61131-3 to create a PLC-program using FBD.
	- He/she knows how to describe the difference between signal modes - He/she knows how to describe the use of a signal transmitter.	- He/she is able to make the right settings to an analogue PLC input for current/voltage signals	- He/she is responsible for applying the right combination of the settings of the analogue modules with the parameters of the sensors. - He/she is responsible for applying the right connections and wiring of a signal sensor to a transmitter and to a PLC analogue input/output to put it into service.
	- He/she knows how to describe the principle of a calibration.	- He/she is able to check the function of a signal transmitter.	- He/she is responsible for performing a complete calibration report. - He/she is responsible for creating a calibration protocol.
	- He/she knows how to describe the	- He/she is able to make a connection in an	- He/she is responsible for creating a

	principle of industrial bus systems. - He/she knows how to describe how to move data from one unit to another using an industrial bus system	industrial bus system. - He/she is able to Make proper setting of addresses.	program with an industrial bus system.
			- He/she is responsible for sharing knowledge, experience and insights so that electro technical products and systems will be tested properly.
Reference to national qualification:	Middenkader Engineering Technicus (crebo 94421) Level 4 (Netherlands) El och Energiprogrammet, inriktning Automation Level 4 (Sweden) Indutritekniska programmet, inriktning Drift och underhållsteknik Level 4 (Sweden) Teknikprogrammet, inriktning Produktionsteknik Level 4 (Sweden) Grundexamen inom el- och automationsteknik Level 4 (Finland) Grundexamen inom maskin- och metallbranschen Level 4 (Finland) Automatizacion y robotica Industrial Level 5 (Spain) Técnico Superior en Mecatrónica Industrial Level 5 (Spain) Técnico superiro en Mantenimiento de Equipo Industrial Level 5 (Spain)		
Reference to EQF:	Level 4*		
Assessment:	Practical assessment assignment & theoretical validation of knowledge using industrial validation system ValidMaint		

* The EQF level for the unit of learning outcomes was established by comparing the learning content of the involved national qualifications during the EURIAC project

Lifelong Learning Programme

Unit D Sweden	Title of the unit: **Working with safety systems**		
Prerequisites:	- Basic knowledge about most common sensors (optical, inductive, capacitive, mechanical) - Basic knowledge of machine safety - Basic knowledge of electricity - Basic pneumatic systems		
Work tasks:	- Assembly, programming and commissioning of a production line including a ST-programmed Mitsubishi module based PLC-system. - Assembly, programming and commissioning of a production line controlled by a PLC-system including a safety system. (Failsafe PLC, electrical and mechanical safety components.) - Perform a risk assessment on a PLC-controlled production line. - Fault finding in a PLC-controlled production line including a variety of sensors and actuators.		
Learning Outcomes:	Knowledge	Skills	Competence
	- He/she knows how to recognize syntax of ST-language according to IEC 61131-3.	- He/she is able to construct a simple logical function and/or sequence using ST-commands.	- He/she is responsible for applying IEC 61131-3 to create a PLC-program using ST.
	- He/she knows how to describe the difference between safety components and normal industrial components. - He/she knows how to describe the function of EU´s machinery directive - He/she knows how to define the relationship between directives and standards.	- He/she is able to construct and connect a production module using a few components including a PLC.	- He/she is responsible for applying risk evaluation protocol to perform risk assessment procedure according to EN ISO 14121 and EN ISO 12100.
	- He/she knows how to describe the difference between a failsafe PLC and a normal industrial PLC. - He/she knows how to describe the function of a few mechanical and electrical safety components.	- He/she is able to connect mechanical and electrical safety components to a safety system controlled by relays or failsafe PLC.	- He/she is responsible for creating a program with a failsafe PLC.
	- He/she knows how to recognize the symbols used in schedules for industrial purposes.	- He/she is able to analyse a PLC-program and explain the function, including safety aspects. - He/she is able to test structural fault finding procedures in order to find faults in a production line controlled by PLC.	- He/she is responsible for monitoring, analysing and modifying a PLC program after testing.
			- He/she responsible for sharing knowledge, experience and insights

Lifelong Learning Programme

			so that electro technical, safety and programmed products/systems will be tested properly.
Reference to national qualification:	Middenkader Engineering Technicus (crebo 94421) Level 4 (Netherlands) El och Energiprogrammet, inriktning Automation Level 4 (Sweden) Indutritekniska programmet, inriktning Drift och underhållsteknik Level 4 (Sweden) Teknikprogrammet, inriktning Produktionsteknik Level 4 (Sweden) Grundexamen inom el- och automationsteknik Level 4 (Finland) Grundexamen inom maskin- och metallbranschen Level 4 (Finland) Automatizacion y robotica Industrial Level 5 (Spain) Técnico Superior en Mecatrónica Industrial Level 5 (Spain) Técnico superiro en Mantenimiento de Equipo Industrial Level 5 (Spain)		
Reference to EQF:	Level 4*		
Assessment:	Practical assessment assignment & theoretical validation of knowledge using industrial validation system ValidMaint		

* The EQF level for the unit of learning outcomes was established by comparing the learning content of the involved national qualifications during the EURIAC project