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

			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

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

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

			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