

Unit D Sweden	Title of the unit: Working with safety systems		
Prerequisites:	<ul style="list-style-type: none"> - Basic knowledge about most common sensors (optical, inductive, capacitive, mechanical) - Basic knowledge of machine safety - Basic knowledge of electricity - Basic pneumatic systems 		
Work tasks:	<ul style="list-style-type: none"> - 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:	<i>Knowledge</i>	<i>Skills</i>	<i>Competence</i>
	<ul style="list-style-type: none"> - He/she knows how to recognize syntax of ST-language according to IEC 61131-3. 	<ul style="list-style-type: none"> - He/she is able to construct a simple logical function and/or sequence using ST-commands. 	<ul style="list-style-type: none"> - He/she is responsible for applying IEC 61131-3 to create a PLC-program using ST.
	<ul style="list-style-type: none"> - 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. 	<ul style="list-style-type: none"> - He/she is able to construct and connect a production module using a few components including a PLC. 	<ul style="list-style-type: none"> - He/she is responsible for applying risk evaluation protocol to perform risk assessment procedure according to EN ISO 14121 and EN ISO 12100.
	<ul style="list-style-type: none"> - 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. 	<ul style="list-style-type: none"> - He/she is able to connect mechanical and electrical safety components to a safety system controlled by relays or failsafe PLC. 	<ul style="list-style-type: none"> - He/she is responsible for creating a program with a failsafe PLC.
	<ul style="list-style-type: none"> - He/she knows how to recognize the symbols used in schedules for industrial purposes. 	<ul style="list-style-type: none"> - 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. 	<ul style="list-style-type: none"> - He/she is responsible for monitoring, analysing and modifying a PLC program after testing.
			<ul style="list-style-type: none"> - 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:	The Netherlands	Sweden	Finland	Spain
	Middenkader Engineering Technicus (crebo 94421)	El och Energiprogrammet, inriktning Automation Industri tekniska programmet, inriktning Drift och underhållsteknik Teknikprogrammet, inriktning Produktionsteknik	Grundexamen inom el- och automationsteknik Grundexamen inom maskin- och metallbranschen	Automatización y robótica Industrial Técnico Superior en Mecatrónica Industrial Técnico superior en Mantenimiento de Equipo Industrial
Reference to NQF:	Level 4	N/A	N/A	Level 5
Reference to EQF:	Level 4*	Level 4*	Level 4*	Level 5*
ECVET points	N/A**			
Assessment:	Observations			

* The unit has been identified as part of the above mentioned national vocational qualifications and has by that been referenced to the same EQF level of the qualification.

** Further experimentation of the concept of ECVET points is required at European level before utilisation in practice.

Assessment Grid		
Name Student:		
Name Assessor:		
Location of Assessment:		
Date of Assessment:		
Time of Assessment:		
Unit Assessed:	Working with safety systems	
Level that the student is being assessed on is 'under surveillance'.		
	Yes	No
1		
The student shows an analysis of the work process on paper.		
The student makes an input output list (on the computer).		
The student chooses the right logical combination and/or sequence combination.		
The student shows a working program of a PLC.		
The student shows a working program of a failsafe PLC.		
2		
The student explains the electrical drawing with inputs and outputs including safety aspects.		
The student explains the mechanical drawing with inputs and outputs including safety aspects.		
The student explains the industrial diagram symbols.		
The student explains the different functions in the PLC program including safety aspects.		
The student explains what the action of the actuator is when the output is high including safety aspects.		
The student uses the monitor function of the PLC program.		
The student explains if the sequence stops, why it stops including safety aspects		
3		

Working in Industrial Automation

The student explains the function of some mechanical and electrical safety components.		
The student describes the difference between the security components at different levels (SIL), including relays and PLC.		
The student explains how the EU's Machinery Directive and industrial European standards are related.		
The student is able to perform a risk assessment procedure according to the standards.		
4		
The student makes notes of his measurements.		
The student takes notes while troubleshooting is performed.		
The student can (then) use annotations to explain the measurement results and troubleshooting strategy.		
5		
The student puts off the energy while working on the machine.		
The student works according to the safety rules the workplace.		
6		
The student co-operates with colleagues.		