

3. System automation, control and system support

Functional Area: Op&Log

Assessment criteria	Knowledge
<p>LO3.1: Defines and designs mechatronics systems</p> <p>1. Identifies the elements of an electrical-electronic nature in a machine, industrial equipment or automated line, describing the function they perform and their relationship with the other elements.</p> <p>2. It configures automated systems, at machine level and to automated installation, adopting the most appropriate solution and complying with the established operating conditions.</p> <p>3. Identification and functions of the elements of the regulating loop. Intelligent sensors</p> <p>Data acquisition Intelligent sensors, i lot</p> <p>Remote management</p> <p>Remote diagnostic</p> <p>4. Differentiates the different operating modes and their specific characteristics from real or simulated systems, in real and digital systems. Digital twin and Virtual commissioning</p> <p>Digital twin</p> <p>Virtual commissioning</p>	<p>1. Identification of circuits and components of machinery feeding, protection and starting electric systems:</p> <p>1.1 Fundamentals of alternating current.</p> <p>1.2 Electrical switchgear elements.</p> <p>1.3 Actuators of an electrical nature.</p> <p>1.4 Sensors and transducers.</p> <p>1.5 Electrical-electronic protection and safety systems.</p> <p>1.6 Industrial communication components and buses.</p> <p>1.7 Characteristics of DC and AC motors.</p> <p>1.8 Characteristics of transformers.</p> <p>1.9 Parameters and connection of AC and DC motors, transformers. In-service and vacuum operation.</p> <p>1.10 Start and stop systems.</p> <p>1.11 Power factor correction systems.</p> <p>1.12 Quantities to be controlled in speed control systems</p> <p>2. Configuration of automatisms and elements of electrotechnical technology:</p> <p>2.1 Calculation and selection of elements in electronic electrical systems.</p> <p>2.2 Characteristics and parameters of the components of the electronic devices of the control and manoeuvring equipment.</p> <p>2.3 Development of functional diagrams.</p> <p>2.3.1 Development of schematics for command, force and start-up systems, among others.</p> <p>2.3.2 Software for the representation and simulation of electrical-electronic systems.</p> <p>2.3.3 Calculation of values of the quantities of the installation parameters.</p> <p>2.3.4 Standard graphic symbology of electrical-electronic systems.</p>

	<p>3. Identification and functions of the elements of the regulating loop:</p> <p>3.1 Components of a regulation and control system. Intelligent sensors</p> <p>3.2 Control and power schemes.</p> <p>3.3 Types of control (open and closed loop).</p> <p>3.4 Control of discrete event processes.</p> <p>3.5 Control of continuous processes.</p> <p>3.6 Transfer function. Stability.</p> <p>3.7 Elements of controlled systems. Regulators.</p> <p>3.8 Typology and functional characteristics.</p> <p>3.9 Control systems (P, PI, PID).</p> <p>3.10 Data acquisition</p> <p>3.11 lot</p> <p>(NEW Knowledge linked to assessment criteria 5)</p> <p><i>4. Characterisation of different operating modes and their specific characteristics of real or simulated systems, in real and digital systems. Digital twin and Virtual commissioning</i></p> <p><i>4.1 Components of a real and simulated system.</i></p> <p><i>4.2 Characteristics and parameters of the components of Digital Twin</i></p> <p><i>4.3 Start-up in simulated systems. Virtual commissioning</i></p> <p><i>4.4 Modes of operation of simulated systems.</i></p> <p><i>4.5 Relationship between the different operating modes (PLC, CNC, Robots, among others).</i></p> <p><i>4.5 Simulation software for simulated systems</i></p>
	<p>Skills (CA)</p> <p>1. Identifies electrical-electronic elements in a machine, industrial equipment or line automated, describing the function they perform and its relationship with the other elements.</p> <p>1.1 Recognizes the characteristics of the AC signal.</p> <p>1.2 Identifies the structure and components of power supply facilities on an automated machine or line.</p> <p>1.3 Identifies actuators of an electrical nature present on automated machines or lines.</p>

	<p>1.4 Relates the sensors and transducers of the machine to the rest of the elements.</p> <p>1.5 Identifies the devices and structure of communication buses in an automated machine or line.</p> <p>1.7 Relates the parameters of AC motors (single and three-phase) and continuous motors and transformers with in-service and empty operation.</p> <p>1.8 Recognises start and stop systems.</p> <p>1.9 Identifies power factor correction systems and their influence on installations.</p> <p>1.10 Draw up a sketch of electronic control and regulation systems.</p> <p>1.11 Identifies the quantities to be controlled in speed control systems.</p> <p>1.12 Calculates parameters and quantities of installations.</p> <p>1.13 Characterizes the protective elements.</p> <p>2. Configures electrotechnical automatism in terms of machine or installation automated, adopting the most appropriate solution and complying with the established operating conditions.</p> <p>2.1 Defines the functional characteristics of electrical automation to be used to the different parts of the machine or automated line.</p> <p>2.2 Proposes solutions for the configuration of electrical automatism with regard to the machine or the installation automated.</p> <p>2.3 Calculates the values of the quantities of the installation parameters.</p> <p>2.4 Adopts the most appropriate solution, meeting the required performance and cost requirements.</p> <p>2.5 Selects the elements of electrical nature to perform the requested function.</p> <p>2.6 Performs drawings and operating schematics of electrical automatism, using computer tools.</p> <p>2.7 Uses standardized symbology.</p> <p>2.8 Draws up functional diagrams.</p> <p>2.9 Select from the catalogues the elements of the control and manoeuvring systems.</p> <p>3. Identifies the elements that make up the regulatory loop of industrial systems, relating their function with the elements that make up the automation processes.</p>
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	<p>3.1 Identifies the different types of regulation used in industry, especially in the field of continuous processes.</p> <p>3.2 Relates the characteristics and variables of a continuous process to its regulatory ties.</p> <p>3.3 Establishes the relationship between the parameters of a PID controller and the response of the variables of a process.</p> <p>3.4 Identifies the equipment, elements and devices of electrotechnical technology (automata, temperature regulators and level regulators, among others) and fluidics of the automatic systems, defining their function, the typology and characteristics. Intelligent sensors</p> <p>3.5 Obtains information from documentation and schematics. Data acquisition</p> <p>3.6 Identifies the devices and components that configure the global automatic system (control, regulation, force, protections, measures, and inputs and outputs, among others), explaining the characteristics and the functioning of each. IoT. Intelligent sensors</p> <p>3.7 Differentiates the different operating modes and their specific characteristics from real or simulated systems. Virtual commissioning and digital twin</p> <p>3.8 Calculates the magnitudes and basic parameters of a system, and contrasts them with the real values measured in the aforementioned system.</p>
	<p>Transferable skills</p>
	<ul style="list-style-type: none"> • Understand descriptions, specifications, manuals and other info typical of the profession in English and prepare them for next phase of project/Customer in understandable manner • Ability to communicate effectively, orally and in writing with “engineering” community and with “society”, extrapolating concepts for “non-experts” through an abstraction approach

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<p>LO3.2: Performs the assembly of the installation and verifies the operation and commissioning of mechatronics systems</p> <p>1. Assembles automated installations, interpreting schemes and applying mounting techniques. with data acquisition technologies, intelligent sensors and IoT.</p> <p>Data acquisition Intelligent sensors, IoT</p> <p>2. Complies with the standards for the prevention of occupational hazards and environmental protection in the assembly, identifying the associated risks, measures and equipment to prevent them.</p>	<p>1. Installation of power supply systems and electrotechnical automation systems:</p> <p>1.1 Installation and maintenance procedures.</p> <p>1.2 Preparation of assembly plans.</p> <p>1.3 Rethinking of installations.</p> <p>1.4 Techniques of assembly.</p> <p>1.5 Installation and connection of equipment and plant elements.</p> <p>1.6 Making of adjustments.</p> <p>1.7 Assembly operations and functional tests.</p> <p>1.8 Regulation and commissioning of the system.</p> <p>2. Risk prevention, safety and environmental protection in the installation of automated electrical and electronic systems:</p> <p>2.1 Regulations for the prevention of occupational hazards.</p> <p>2.2 Prevention of occupational hazards in assembly processes.</p> <p>2.3 Personal protective equipment: characteristics and criteria for use. Collective protection. Means and equipment protective.</p>
	<p>Skills</p> <p>1. Assembles feed installations and associated automation systems, interpreting schemes and applying mounting techniques.</p> <p>1.1 Identifies the procedures used in the installation and maintenance of the installations.</p> <p>1.2 Select the tools according to the type of intervention.</p> <p>1.3 Prepare an installation plan.</p> <p>1.4 Carry out plant reassessments.</p> <p>1.5 Assemble and connect equipment and plant elements.</p>

	<p>1.6 Identifies the physical variables that need to be regulated or controlled.</p> <p>1.7 Makes adjustments to it.</p> <p>1.8 Documents the assembly process.</p> <p>2. Complies with the standards for the prevention of occupational hazards and environmental protection in the assembly, identifying the associated risks, measures and equipment to prevent them.</p> <p>2.1 It identifies the risks and the level of danger involved in the handling of materials, tools, equipment, machinery and means of transport.</p> <p>2.2 Operates with machines and tools, respecting safety standards.</p> <p>2.3 Identifies the most frequent causes of accidents in the handling of materials, tools, cutting and forming machines, among others.</p> <p>2.4 Recognizes the safety features, personal and collective protective equipment (footwear, eye protection, clothing, etc.) to be used in the different assembly operations.</p> <p>2.5 Identifies the correct use of safety elements and personal and collective protective equipment.</p> <p>2.6 Relates the handling of materials, tools and machines to safety and personal protection measures required.</p> <p>2.7 Values the order and cleanliness of installations and equipment as the first risk prevention factor.</p>
	<p>Transferable skills</p>
	<p>Understand descriptions, specifications, manuals and other info typical of the profession in English and prepare them for the next phase of project/Customer in understandable manner.</p> <p>Ability to communicate effectively, orally and in writing with “engineering” community and with “society”, extrapolating concepts for “non-experts) through an abstraction approach</p>