

10.b PLC Programming

Functional Area: Op/Log/ R&D

Assessment criteria (RA)	Knowledge
<p>LO10b.1: Defines and designs advanced programmed automated systems</p> <p>Advanced:</p> <p>Data acquisition Intelligent sensors, IoT</p> <p>Remote management</p> <p>Remote diagnostic</p> <p>“Artificial Vision” current technology (note: not as a utopia but a current technology can be associated with artificial intelligence base (artificial intelligence))</p> <p>Basic</p> <p>Cybersecurity</p> <p>Virtual commissioning or advanced in the future</p> <p>1. Recognizes programmable devices involved in the control of dynamic systems, identifying their functionality and determining their technical characteristics.</p> <p>2. Program logic controllers applied to advanced sensors, identifying the typology of process data and using advanced programming and parameterization techniques. Intelligent sensors</p> <p>3. Recognizes the advanced sensors involved in the control of automatic systems, identifying their functionality and determining their technical characteristics. Intelligent sensors</p>	<p>1. Recognition of programmable devices involved in the control of dynamic systems:</p> <p>1.1 Automatic applications for dynamic control systems. Structure of dynamic control systems. Dynamic controls of speed, position, among others.</p> <p>1.2 Criteria for selecting, sizing and integrating programmable devices for use in dynamic control systems. Voltage, intensity, pulse signals, among others.</p> <p>2. Advanced programming of logic controllers:</p> <p>3.1 Data types in programmable automata.</p> <p>3.2 Conversion of different types of data.</p> <p>3.3 Advanced PLC programming functions. Displacement, calculation, processing and storage functions</p> <p>of data, among others.</p> <p>3.4 Treatment and conditioning of analogue input and output signals in programmable automata.</p> <p>Type of standard voltage and running signals, scaled and de-scaled, analog/digital and digital/analog converters.</p> <p>3.5 Programmable automata programming blocks. Standard library and user blocks.</p> <p>3.6 Treatment of warnings and alarms using blocks or interruption routines.</p> <p>3.7 Configuration and programming of special cards: temperature, PID, positioning, among others.</p> <p>3.8 Applications of static control systems. Control of temperature, flow, pressure, among others.</p> <p>3.9 Applications of dynamic control systems. Control of motors by means of a frequency converter. Positioning control with quick counting, servo motor control, step-by-step motor control, brushless and special, among others.</p>

4. Program logic controllers applied to advanced sensors, identifying the typology of process data and using advanced programming and parameterization techniques. **Intelligent sensors**

5. It configures the different control and monitoring equipment involved in an automatic system, programming the equipment and integrating communications to a production plant. **Diagnostics and remote control. (remote management, remote diagnostic) Data Acquisition**

6. Program and configure the different buses used in the industrial field, identifying the elements that integrate it and relating them to the rest of devices that configure an automatic system.

7. Program and configure the different buses used in the industrial field, identifying the elements that integrate it and relating them to the rest of devices that configure an automatic system. **Basic cybersecurity**

3.10 Structuring of equipment programs and documentation with maintenance criteria.

3.11 Programming of applications with energy-saving and efficiency techniques.

3.12 Systems of protection.

3. Recognition of advanced sensors involved in the control of automatic systems:

1.1 Automatic applications for control systems incorporating advanced sensors. **Intelligent sensors**

1.2 Selection criteria for advanced sensors. **Intelligent sensors**

1.3 Characteristics of RFI identification and traceability systems: interface modules, read/write units, data carriers, handheld terminals, among others.

1.4 Characteristics of the systems of identification and traceability by printing. Type of barcodes in 1D, in 2D, among others.

1.5 Features of the 2D, 3D artificial vision systems, among others.

4. Programming of logic controllers applied to advanced sensors:

3.1 Processing and storage of advanced sensor data in programmable automata. **Intelligent sensor**

3.2 Configuration and programming techniques for identification and traceability control equipment.

3.3 Machine vision equipment configuration and programming techniques. **Artificial vision**

3.4 Configuration and programming of special cards.

3.5 Application of logic controller programming to advanced sensors. Identification, traceability, quality control, among others. **Intelligent sensors**

3.6 Structuring of equipment programs and documentation with maintenance criteria.

3.7 Systems of protection.

5. Configuration of the different control and monitoring equipment: Diagnosis and remote control. (remote management, remote diagnostic)

	<p>1.1 Definition and classification of monitoring and control systems involved in an industrial communication system. Systems based on operator panels: keyed, tactile with or without keys. Computer-based systems (SCADA). Diagnostic and remote control. (remote management, remote diagnostic)</p> <p>1.2 Main features of monitoring and control systems. Diagnosis and remote control. (remote management, remote diagnostic)</p> <p>1.3 Ergonomics in the design of monitoring equipment. Graphic design, display distribution and navigation. Use of colours. Textual information. Control and insertion of data by the operator. Representation of trend graphics and tables. Alarms. Among others. Diagnostic and remote control. (remote management, remote diagnostic)</p> <p>1.4 Design of different screens and interaction between them. Hierarchical structure of access to different screens. Security by access to specific application screens (start-up and maintenance).</p> <p>1.5 Visualization and writing of local and global variables.</p> <p>1.6 Generation of small programs or application scripts in monitoring systems. Diagnostic and remote control. (remote management, remote diagnostic)</p> <p>1.7 Graphic representation of dynamic signals. Analogue display tools: clocks, graphs and trend curves.</p> <p>1.8 Recording of values and processing of files.</p> <p>1.9 Link between applications using DDE, OPC, ActiveX, among others.</p> <p>1.10 Data management for use in maintenance techniques: warnings, numerical and graphic recordings, and reporting. Data acquisition systems. Remote control and diagnostic systems (remote management, remote diagnostic)</p> <p>6. Scheduling and configuration of the different communication buses of an industrial plant:</p> <p>1.1 Study and classification of current industrial buses according to the scope of application.</p>
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	<p>1.2 Interconnection of networks. Repeaters. Ponts (bridges). Router (router). Gateway. Among others</p> <p>1.3 Field buses at sensor-actuator level.</p> <p>1.4 Communication network between a controller and decentralized periphery.</p> <p>1.5 Communication network for data exchange between controllers.</p> <p>1.6 Industrial communication network (programmable automata) with office network integration (computers).</p> <p>1.7 Incorporation of different control equipment in the same communication system with data monitoring between them. Diagnostic and remote control. (remote management, remote management)</p> <p>7. Programming and configuration of the different communication buses of an industrial plant: Basic cybersecurity</p> <p>1.1 Systems for access in industrial networks from the outside. Basic cybersecurity</p> <p>1.2 Configuration of industrial networks using wireless technology.</p> <p>1.3 Process control by computer. Diagnostic and remote control. (remote management, remote diagnostic)</p> <p>1.4 Drawing up plans and plans for a communication network in industrial automation systems.</p> <p>1.5 Development of service instruction manuals of communication networks.</p>
	<p>Skills</p> <p>1. Recognizes programmable devices involved in the control of dynamic systems, identifying their functionality and determining their technical characteristics.</p> <p>1.1 Recognizes automatic applications for reading and controlling dynamic signals.</p> <p>1.2 Identifies the structure of the programmed analog control system.</p> <p>1.3 Relates the components of programmable devices to their functionality.</p> <p>1.4 Determines the technical characteristics of the programmable devices seconds the type of control to be</p>

perform.

1.5 Selects the second programmable device the required application.

2. Program logic controllers applied to advanced sensors, identifying the typology of process data and using advanced programming and parameterization techniques intelligent sensors.

3.1 Relates programmable logic controller data types to the signals to be treated.

3.2 Uses programming techniques for storing process signals in data blocks.

3.3 Configure and program identification and traceability control devices.

3.4 Configures and programs machine vision equipment.

3.5 Addressing and configuring signals from special modules of programmable logic controllers.

3.6 Program logic controllers applied to advanced sensors. **Intelligent sensors**

3.7 Optimizes the program, taking into account its ease of maintenance.

3.8 Complies with safety standards.

3.9 Acts responsibly in the accomplishment of the assigned tasks.

3.10 Satisfactorily solves the problems presented.

3. It recognizes the advanced sensors involved in the control of automatic systems, identifying their functionality and determining their technical characteristics. Intelligent sensors

Criteria for the assessment

1.1 Recognizes the different types of advanced sensors used in automatic applications. **Intelligent sensors**

1.2 Identifies the technical characteristics of the different sensors used in identification and traceability and in artificial vision systems.

1.3 Select the most suitable sensor according to the required application.

1.4 Identifies the structure of the programmed analog control system.

	<p>1.5 Relates the components of programmable devices to their functionality.</p> <p>4. Program logic controllers applied to advanced sensors, identifying the typology of process data and using advanced programming and parameterization techniques. Intelligent sensors</p> <p>3.1 Relates programmable logic controller data types to the signals to be treated.</p> <p>3.2 Uses programming techniques for storing process signals in data blocks.</p> <p>3.3 Configure and program identification and traceability control devices.</p> <p>3.4 Configures and programs machine vision equipment.</p> <p>3.5 Addressing and configuring signals from special modules of programmable logic controllers.</p> <p>3.6 Program logic controllers applied to advanced sensors. Intelligent sensors</p> <p>3.7 Optimizes the program, taking into account its ease of maintenance.</p> <p>3.8 Complies with safety standards.</p> <p>3.9 Successfully solves the problems presented.</p> <p>5. Configures the different control and monitoring equipment involved in an automatic system, programming the equipment and integrating communications to a production plant. Diagnostic and remote control. (remote management, remote diagnostic)</p> <p>1.1 Relates the functions of a monitoring and control system to industrial applications automation. Diagnostics and remote control. (remote management, remote diagnostic)</p> <p>1.2 Recognizes all configuration tools, and relates them to the function they will perform within the application.</p> <p>1.3 Configures warnings and alarms, and records them in a file for further processing.</p> <p>1.4 Configure and program control and monitoring systems from different manufacturers. Diagnostic and remote control. (remote management, remote diagnostic)</p>
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	<p>1.5 Integrates operator panels and computers as control, monitoring and data acquisition devices in an industrial communication network.</p> <p>1.6 Configures a monitoring and control system for graphical data reporting. Data acquisition (date acquisition). Diagnosis and remote control. (remote management, remote diagnostic)</p> <p>1.7 Gives functionality to the control system to work with data related to machine maintenance or industrial process.</p> <p>1.8 Applies established quality criteria.</p> <p>6. Program and configure the different buses used in the industrial field, identifying the elements that integrate it and relating them to the rest of devices that configure an automatic system.</p> <p>1.1 Identifies the different current industrial buses, and relates them to the communications pyramid.</p> <p>1.2 Configures the equipment of an industrial network for communication between devices.</p> <p>1.3 An industrial network for data exchange between devices is planned.</p> <p>1.4 Configures the components for use in the interconnection of different networks by protocol change or physical means.</p> <p>1.5 Represents industrial communication systems using functional blocks.</p> <p>1.6 Selects equipment and installation elements from manufacturers' technical documentation.</p> <p>1.7 Takes into account the expected process times.</p> <p>1.8 Applies established quality criteria.</p> <p>7. Program and configure the different buses used in the industrial field, identifying the elements that integrate it and relating them to the rest of devices that configure an automatic system. Basic cybersecurity</p> <p>1.1 Configures the equipment of an industrial network for communication between devices. Basic cybersecurity</p> <p>1.2 Program an industrial network for data exchange between devices.</p>
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	<p>1.3 Configures the components for use in the interconnection of different networks by change of protocol or physical medium.</p> <p>1.4 Uses remote access techniques for process control and communication between different industrial equipment. Data acquisition (Acquisition date). Diagnosis and remote control. (remote management, remote diagnostic)</p> <p>1.6 Uses different physical means for communication between equipment and systems.</p> <p>1.7 Represents industrial communication systems using functional blocks.</p> <p>1.8 Selects equipment and installation elements from manufacturers' technical documentation.</p> <p>1.9 Takes into account the expected process times.</p> <p>1.10 Applies established quality criteria</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