






Course description

Plant Visualization with HMI

	Difficulty	Intermediate
	Learning time	17 h
	Additionally recommended learning media	Basics of plant visualization with HMI (evaluation)
	Course type	eLab
	Theme category	Factory Automation

After completing the learning units, the learners are familiar with the structure and function of the TIA Portal and WinCC. They can explain the structure and function of an HMI panel and corresponding applications. Taking into account the ergonomic style guide, the learners create basic objects, elements and functions and design a user interface in the context of the MPS system. They can independently perform the commissioning of the HMI and the parameterization of actuators and sensors and are able to interpret malfunctions and derive solution strategies. In addition, they can export significant key figures, such as cycle times, and prepare them for further analysis.

No.	Task	Method	Competency level	Content	Competencies	Learning time	HW/ SW dependent
Learning unit 1: Introduction to user interfaces and HMI programming							
1	Structure and function	Guidance text supported Method	Understand	<ul style="list-style-type: none"> ▪ HMI definition and terms ▪ Application areas ▪ Function and structure ▪ WinCC ▪ Ergonomic design user interfaces 	<ul style="list-style-type: none"> ▪ Can reproduce the structure of the HMI. ▪ Can explain the function of an HMI panel and the applications. ▪ Can describe the basic operations of an HMI. ▪ Can reproduce the basic functions of WinCC. ▪ Know the structure and operation of the various touch technologies. ▪ Know the process for developing a graphical user interface. ▪ Know the ergonomic considerations for developing a graphical user interface. 	90 min.	No
2	Device configuration in the TIA Portal	Guiding text based method	Knowledge	<ul style="list-style-type: none"> ▪ TIA Portal ▪ System functions ▪ HMI ▪ PLC ▪ Configuration ▪ Ethernet connection ▪ Parameterization 	<ul style="list-style-type: none"> ▪ Can describe the structure of a TIA portal. ▪ Can identify the different software components of a TIA portal. ▪ Can parameterize a PLC program in the TIA Portal. ▪ Can describe the procedure for transferring an HMI project via an Ethernet movement using the TIA Portal. ▪ Can configure an HMI in the TIA Portal. 	45 min.	Yes

No.	Task	Method	Competency level	Content	Competencies	Learning time	HW/ SW dependent
3	Projecting basic objects and elements	Guidance text-supported Method	Rate	<ul style="list-style-type: none"> ▪ Ergonomic style guides ▪ Base objects and elements ▪ Functions ▪ TIA Portal ▪ HIM ▪ Display and operating elements ▪ Simulation ▪ User interface 	<ul style="list-style-type: none"> ▪ Can summarize the process for designing graphical user interfaces. ▪ Know the different elements (button, switch) to develop a user interface. ▪ Can conceptualize and design display and control elements. ▪ Can independently integrate display and control elements into a user interface. ▪ Can select display and control elements (image and text) for a specific system/component according to requirements. ▪ Can apply the ergonomic design guidelines for user interfaces. ▪ Can use the basic functions of WinCC. ▪ Can create variables and animate display/control elements. ▪ Can test and validate integrated display/control elements. ▪ Can simulate variables in the TIA Portal. 	120 min.	Yes
4	Development of an HMI for the control of a mechatronic subsystem	Guidance text supported Method	Apply	<ul style="list-style-type: none"> ▪ Ergonomic style guides ▪ Base objects and elements ▪ Functions ▪ TIA Portal ▪ HMI ▪ Display and operating elements ▪ Simulation ▪ User interface ▪ Library ▪ Variables 	<ul style="list-style-type: none"> ▪ Can reflect and assess the psychological impact of ergonomic design. ▪ Know the process for designing graphical user interfaces summarize. ▪ Can conceptualize and design display and control elements. ▪ Can derive the impact when creating an HMI page on the TIA project. ▪ Know the library concept of the TIA Portal. ▪ Can extend base objects and elements with events. ▪ Can work with TIA and classify the terms, function and variable. ▪ Can independently integrate display and control elements into a user interface. ▪ Can define the display and control elements for a concrete system/component. ▪ Can apply the ergonomic design guidelines for user interfaces. 	150 min.	Yes

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Learning unit 2: HMI programming on the stacking magazine and conveyor modules							
5	Commissioning the HMI control panel	Guidance text supported Method	Apply	<ul style="list-style-type: none"> ▪ Commissioning ▪ HMI panel ▪ TIA Portal ▪ Device configuration ▪ PROFINET ▪ Troubleshooting ▪ Error Search Strategy ▪ Troubleshooting 	<ul style="list-style-type: none"> ▪ Can mechanically and electrically commission an HMI panel as specified. ▪ Can integrate an HMI panel into an Ethernet network. ▪ Can configure an HMI panel for a PROFINET network. ▪ Can configure a connection between HMI and PLC in a TIA portal. ▪ Can compile an HMI device configuration independently. ▪ Can perform troubleshooting and derive troubleshooting strategies. ▪ Can reflect and summarize results. 	90 min.	Yes
6	Development of an HMI project for the display of sensor states	Guidance text supported Method	Apply	<ul style="list-style-type: none"> ▪ Module tape ▪ Functionality and structure of the interfaces ▪ WinCC ▪ User interface ▪ I/O objects ▪ Base objects and elements ▪ HMI panel ▪ HMI project ▪ Project Library ▪ System test 	<ul style="list-style-type: none"> ▪ Know the structure and function of the module tape. ▪ Can independently research which components are necessary to create an HMI page in the TIA Portal. ▪ Can project basic objects for an HMI user interface. ▪ Can add animations to projected base objects and elements. ▪ Can transfer prepared components from a project library into the project. ▪ Can create and configure symbolic I/O object as two-state output. ▪ Can load an existing HMI project onto an HMI panel. ▪ Can configure and connect sensors of a station with an HMI panel. ▪ Can test the project planning on a mechatronic system. 	90 min.	Yes

No.	Task	Method	Competency level	Content	Competencies	Learning time	HW/ SW dependent
7	Runtime monitoring of a cylinder on the HMI	Guidance text supported Method	Apply	<ul style="list-style-type: none"> ▪ Module stacking magazine ▪ Functionality and structure of the interfaces ▪ WinCC ▪ User interface ▪ I/O objects ▪ Base objects and elements ▪ HMI panel ▪ HMI project ▪ Project Library ▪ System test 	<ul style="list-style-type: none"> ▪ Know the structure and function of the stacking magazine module. ▪ Can extend the menu navigation in an HMI panel. ▪ Can add and parameterize prepared components from the project library. ▪ Can describe different input/output data types. ▪ Can create and configure a symbolic I/O object as a two-state output. ▪ Can determine various PLC variables for the process connection from a PLC program. ▪ Can link different HMI variables with PLC variables. ▪ Can map and monitor cycle times of a pneumatic actuator on an HMI panel. ▪ Can load the project engineering into a controller and HMI panel. ▪ Can test the project planning on a mechatronic system. ▪ Can reflect on the knowledge gained. 	120 min.	Yes
8	Speed control of the tape module via the HMI	Guidance text supported Method	Apply	<ul style="list-style-type: none"> ▪ Module tape ▪ Analog value processing ▪ Potentiometer ▪ Belt speed ▪ Motor controller ▪ HMI variables ▪ Project planning 	<ul style="list-style-type: none"> ▪ Know the structure and function of the module tape. ▪ Know the basics of analog value processing. ▪ Can control the belt speed analog with the help of a potentiometer and the controller. ▪ Can set the belt speed on the HMI panel using a slider. ▪ Can link the outputs of the motor controller with HMI variables. ▪ Can load a project engineering into the control and the HMI panel. ▪ Can test the project planning on a mechatronic system. ▪ Can reflect on the knowledge gained. 	90 min.	Yes

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Learning unit 3: HMI programming on the Distribute Pro system module

9	Extension and commissioning of the HMI with a stacking magazine	Technical exploration	Apply	<ul style="list-style-type: none"> Module stacking magazine Smart sensors HMI extension Project planning System test Troubleshooting 	<ul style="list-style-type: none"> Know the structure and function of the stacking magazine module. Know the structure and function of smart sensors. Know the difference between traditional and smart sensors. Can add a module to an existing HMI user interface. Can configure the necessary components such as Smart Sensors for the HMI panel. Can load a project engineering into the control and the HMI panel. Can test the project planning on a mechatronic system. Can perform troubleshooting and derive optimization measures. Can reflect and reproduce the knowledge gained. 	90 min.	Yes
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10	Viewing the process data of the stacking magazine via HMI	Technical exploration	Develop	<ul style="list-style-type: none"> Module stacking magazine Process data HMI extension Project planning OPC UA HMI user interface popup Push messages Smart Maintenance Mobile Device System test Troubleshooting 	<ul style="list-style-type: none"> Know the structure and function of the stacking magazine module. Know the structure and function of smart sensors. Can interpret the process data from the Smart Sensors using the HMI panel. Can interpret significant data in the context of Smart Maintenance. Can add messages in the form of popups to the HMI user interface as part of Smart Maintenance. Can classify the relevance of smart maintenance and the use of mobile devices. Know the term OPC UA and its possibilities. Can possible scenarios in the context of Smart Maintenance and OPC UA (push message). Can interpret the findings obtained. Can draw conclusions from the knowledge gained in the context of optimization measures. 	120 min.	Yes
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