TIA Portal V11 – Exercises

Micro Automation
**Basics: PLC exercise**

- Basics: HMI exercise
- Exercise: Hardware Configuration
- IECPL-Exercise: Programming

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Task: Start TIA Portal and create a new project

What to do:
1. Select the option “Create new project” and name it “my_first_project”. Create the project with the button “Create”.
Task: Create a new program.

What to do:
2. Under “First steps” choose the option “Write a PLC program”
   -> You now have to specify a PLC. Select a S7-317PN/DP
      (E.g.: 6ES7317-2EK13-0AB0).
      The block “Main” is the shown.

3. With double-click on the program block “Main”, the program block editor on the project
   view is opened.
   The program block “Main” is directly opened.
Exercise: First program with TIA Portal

Task: Programming in the program block “Main”.

What to do:

4. Create a program in network 1, like the one shown above. The instructions from the favorite list, like contacts for example, can be used in the program via Drag & Drop or double click.
   Provide the symbolic names to the instructions: “START_1“, “STOP“ and “Drive_1“.

5. Save your project

6. Select the network. Using the “Define Option” on the context menu an address to each variable in the network can be defined.

7. Change the zoom in your network to 120% using the zoom function.
Exercise: First program with TIA Portal

Task: Defining a variable in the variable table

What to do:
8. On the project tree, open the “Default tag table” from the “PLC_tags”. Using the auto fill function, add the variables “START_2” to “START_8.” The tags should be added, not overwritten.
Task: Copy network 1 to network 2 using Drag & Drop

What to do:
9. Select the code in network 1 using the lasso-function.
10. Copy the code using the context menu.
11. Select the circuit (the horizontal line) in network 2 and paste the copied network.
12. In network 2, rename “START_1” to “START_2”.
13. In network 2, rename “Drive_1” to “Drive_2”.
14. Save your project.
Task: Add elements to favorite list in TIA Portal

What to do:
15. Select the Block title and change the programming language from LAD to FBD in the properties of the inspector window.
16. Using Drag & Drop, add an “On-Delay Timer” from the task card “Simple instructions” to the favorite list.
17. Close the task menu “Instructions” using the button “Collapse automatically”.
   Note: the task cards is then normally minimized and is shown when the user click on it.
18. Add an On-Delay timer in network 2, so that Drive_2 is activated 2 seconds after the request.
19. Confirm the menu pressing “OK”. An Instance DB is automatically created.
Task: Assign an absolute address to „Drive_2“ using Drag & Drop.

What to do:
20. Open the “Device view” with a double click in “Device configuration”
21. Add an DI8/DO8 module from the hardware catalogue.
   e.g.: 6ES7 323-1BH01-0AA0
22. Change the zoom to 300%
23. Divide the working area, as seen in the figure.
24. Assign the absolute output address Q 0.2 to “Drive_2” via Drag & Drop.
25. Close the block “Main”.
Task: Configure a PROFINET network

What to do:
26. Change the view to “Network view”
27. From the hardware catalog, add an ET200S-Profinet station. e.g.: 6ES7 151-3BA23-0AB0
   It can be found on “Distributed I/O” → "ET200S" → "Headmodule" → "PROFINET".
28. Link the ET200S station with the PLC.

Result: The PROFINET connection and the related PN protocol are configured with a single mouse click.
Task: Establishing a hardware configuration

What to do:

29. Change the view to “Device view”

30. From the hardware catalog, add
    one power module (e.g.: 6ES7 138-4CA01-0AA0),
    one digital input module (e.g.: 6ES7 138-4BD01-0AA0),
    and one digital output module (e.g.: 6ES7 132-4BD32-0AA0)
**Task:**
Start the simulation

**What to do:**
31. Select the PLC on the project navigation.
32. Start the simulation.
33. Add the output byte QB0 in the simulation

**Note:**
The components that are downloaded in the PLC when a simulation is started can be configured in “Options” → “Settings”.

**Settings**

<table>
<thead>
<tr>
<th>General</th>
<th>PLC simulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fail-safe settings</td>
<td>Behavior at the start of simulation</td>
</tr>
<tr>
<td>Hardware configuration</td>
<td>✓ Load hardware automatically</td>
</tr>
<tr>
<td>PLC programming</td>
<td>✓ Load software automatically</td>
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<tr>
<td>Simulation</td>
<td>Confirm start of simulation</td>
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<tr>
<td>FLC simulation</td>
<td></td>
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<tr>
<td>Online &amp; Diagnostics</td>
<td></td>
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<tr>
<td>Visualization</td>
<td></td>
</tr>
</tbody>
</table>
Task: Download in PLCSIM

What to do:
34. After the start of the simulation the dialogue “Extended Loading” is opened automatically.
   Select the interface to PLCSIM and load your configuration into the PLC.

Note: Choose for the actual increment of the software: MPI for the connection with PLCSIM.
Exercise: First program with TIA Portal

What to do:

35. Select the Program container in the project navigation.

36. By using the button “Load” your program could be loaded to PLCSIM.
   Note: this task is only necessary when the program is not loaded to the PLC with starting PLCSIM.
   This behavior is depending on your settings for the simulation.

37. In the Load preview you can select how the blocks should be loaded to the PLC.
   Select “Load all” or “Consistent download” and load your program to the PLC.

38. Close the dialogue.

39. Start your PLC in PLCSIM (select RUN-P)
Exercise: First program with TIA Portal

Task: Monitoring a program

What to do:
40. Open the program block “Main”
41. Press the button “Monitoring on/off” to monitor the actual state of the block in the editor.
42. Activate the memory tag “START_1” using the context menu “Modify” → ”Modify to 1”.
Task: Adding a variable

What to do:
43. Create a new watch table using “Add new watch table” in the project tree.
44. Detach the watch table window using the button “Float”.
45. Using the lasso function, select the elements in network 1 and using Drag & Drop inserts them in the watch table.
46. The values for “START_1” and “STOP” can be given in the column “Modify value”. These values are sent to the controller using the “Modify the selected values once and now”.
47. Go “offline”.

- Basics: PLC exercise
- **Basics: HMI exercise**
- Exercise: Hardware Configuration
- IECPL-Exercise: Programming
Task: Configuring a new panel

What to do:
1. In the portal view, on the “Device and network” menu, select “Add new device”.
2. Select HMI as device to be added.
3. Select the TP700 Comfort panel
4. Start the “Device wizard”.

Exercise: First HMI project in TIA Portal
What to do:

5. Establish a connection to the controller.
What to do:

6. Activate the “Page header” for the panel.
What to do:

7. Configure the alarms as shown in the slide.
What to do:

8. Define the screen navigation as shown in the slide. Name the screens as shown (i.e.: Drives, PID and Communication).
Exercise: First HMI project in TIA Portal

What to do:

9. Activate the system screens.
What to do:

10. Arrange the system buttons as seen in the slide.
11. Close the wizard pressing “Finish”.
Task: Showing the state of “Drive_1”.

What to do:
12. Open the screen “Drives” with a double click.
13. Select the “PLC tags” → "Default tag table” in the project tree. All variables are now shown in the detail view.
14. Drag the variable “Drive_1” to the screen “Drives”.
15. Insert a text field and write in it: “Drive_1”
Task: Adding a button to start the output “Drive_1”.

What to do:
16. Add a button from the “Toolbox”. Give it the label “START_1”.

Exercises for TIA Portal V11 (Micro Automation)
Exercise: First HMI project in TIA Portal

**What to do:**

17. Select the button “START_1“.
18. Open the task card “Properties” in the inspector window.
19. Select the task card “Events”.
20. With “Press” the function “SetBit” should run.
21. Select the PLC tag “START_1“ for the function.
What to do:

22. Select in the task card “Events” the event “Release”.

23. With “Release” the function “ResetBit” should run. Select for the function the PLC tag “START_1”.

Hands-on
Exercise: First HMI project in TIA Portal

**Task:**
Create a button to stop the Output “Drive_1“.

**What to do:**
24. Copy the button “START_1“ and rename it to “STOP“.
25. Select the button and select in the inspector window the task card “Properties”.
26. Select the task card “Events”.
27. Attach the PLC tag “STOP” to the event “Press”.
**Exercise: First HMI project in TIA Portal**

**What to do:**

28. Attach the PLC tag “STOP” to the event “Release”.

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Task: Showing the cross-reference in TIA Portal

What to do:
29. Choose in your screen the I/O field for the variable “Drive_1”.
30. Select the task card “Info” in the inspector window.
31. Choose the “Cross-reference” task card.

Result: All locations for the selected variable are then shown.
Task: Start the HMI simulation

What to do:

32. Choose the screen “Drives” in the project tree.
33. Start the simulation using the button “Start simulation”.

Exercise: First HMI project in TIA Portal
TIA Portal V11 – Exercises

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Hardware- and Network Editor Exercise with S7-1200:  
Create New Project

What to do:
- Create a new project with the Project > New menu
- Name the project “S7-1200_Hands-on”
- Select “Add new device”
Hardware- and Network Editor Exercise with S7-1200: Insertion of Unspecified CPU and HW Detection

Hands-on

What to do:

1. Insert a PLC > SIMATIC S7-1200 > CPU > Unspecified CPU 1200 > 6ES7 2XX-XXXX-XXXX
2. Upload the hardware configuration from the connected S7-1200
3. Select the S7-1200 from the list of accessible devices
4. Double-check the transferred hardware configuration with that of your S7-1200 demo case
5. Select the CPU and change the PLC name under the properties
6. Select the SM1234 and in the properties set the following:
   1. Analog Inputs > Channel0 – Measurement Type to +/- 5V
   2. Analog Outputs > Channel0 – Analog Output Type to Current
7. Change to the Network view
Hardware- and Network Editor Exercise with S7-1200: 
Engineering an ET200S Station

What to do:

- Distributed I/O > ET200S > Interfacemodule > PROFINET > IM151-3 PN > 6ES7 151-3BA23-0AB0 with FW Version 6.1
- Distributed I/O > ET200S > Interfacemodule > PROFINET > IM151-3 PN > 6ES7 151-3BA23-0AB0 with FW Version 6.1
- Select the ET200S and change the name under properties
- Connect the PLC and ET200s with a PROFINET IO-SYSTEM
- Change to the device view for the ET200s
- Insert PM > PM-E DC24V > 6ES7 138-4CA01-0AA0 in Slot 1
- Insert DI > 4DI x DC24V HF > 6ES7 131-4BD01-0AB0 in Slot 2
- Insert DI > 4DI x DC24V HF > 6ES7 131-4BD01-0AB0 in Slot 3
- Insert DO > 4DO x DC24V / 0,5A ST > 6ES7 132-4BD02-0AA0 in Slot 4
- Insert DO > 4DO x DC24V / 0,5A ST > 6ES7 132-4BD02-0AA0 in Slot 5
Hardware- and Network Editor Exercise with S7-1200:

Load the HW-Configuration

What to do:

- Change to network view, select the PLC and activate the context menu with the right mouse button
- Select **Compile > Hardware configuration**
- Select **Download to device > Hardware configuration**
- Configure your PG/PC-interface in the “Extended download to device” dialog
- Check “Show all accessible devices”, if the CPU cannot be reached
- Select the S7-1200 CPU
- Click “Load”
- Click “Load” in the “Load preview” dialog
- In the “Load results” dialog, select “Start All” and click “Finish”
Hardware- and Network Editor Exercise with S7-1200: Assigning a Device Name

What to do:
- Activate the PROFINET Subnet’s context menu by clicking with the right mouse button
- Select “Assign name”
- Configure the PG/PC-interface
- Search for accessible devices in the network
- Choose ET200S from the DropDown list and select the IM151-3 from the list of accessible devices
- Click “Assign name”
TIA Portal V11 – Exercises

- Basics: PLC exercise
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**Task:**  Create a new STEP 7 project and add a new device to the project.

**What to do:**
1. Create a new project.
2. Add a new PLC station.
3. Create the hardware configuration (only for the central rack)
4. Download the hardware configuration
Exercise: Creating tags

Task: Create new tag tables with tags inside.

What to do:
1. Create four new tag tables and move them to the shown folders.
2. Create new tags in the tag tables as shown above.
Task: Create a new function block (FB) with the language LAD.
Exercise: Programming the FB in LAD

**Task:** Program the FB as shown above.

**What to do:**
1. Create the interface of the FB, as shown above.
2. Insert the shown program to the FB.
Exercise: Calling the FBs in OB 1

Task: Call the FB twice in the OB 1 and connect the inputs and outputs as shown above.
Exercise: Downloading the program

Task: Download the program to the PLC
Task: Monitor the FB and change the call environment.

What to do:
1. Open the FB and start monitoring.
2. Change the call environment (switch between instance DBs)
3. IMPORTANT: To change the call environment in this beta version you have to follow these steps:
   3.1 If a message occurs, that the block cannot be monitored, close this message.
   3.2 Activate the test mode manually via:
      “Testing” task card → Breakpoints → test mode
   3.3 Start monitoring again.
**Task:** Create a new watch table and insert the content of the instance DBs.

**What to do:**
1. Create a new watch table.
2. Drag and drop the content of the instance DBs for Engine 1 und 2 to the watch table.
4. Modify the „Speed“ tags.
Exercise: Forcing inputs and outputs

Task: Open the forcing table and force I1.0 and Q0.1 to “TRUE”.

What to do:
1. Open the forcing table
2. Insert two new lines for I1.0:P und Q0.1:P an.
3. Set the forcing values to “TRUE”
4. Activate forcing.
Thank you for your attention!

IA AS CS 2 FA

Gleiwitzerstr.555
90475 Nürnberg

Phone: +49 (911) 895 - 4646
E-Mail: sss.simatic@siemens.com