

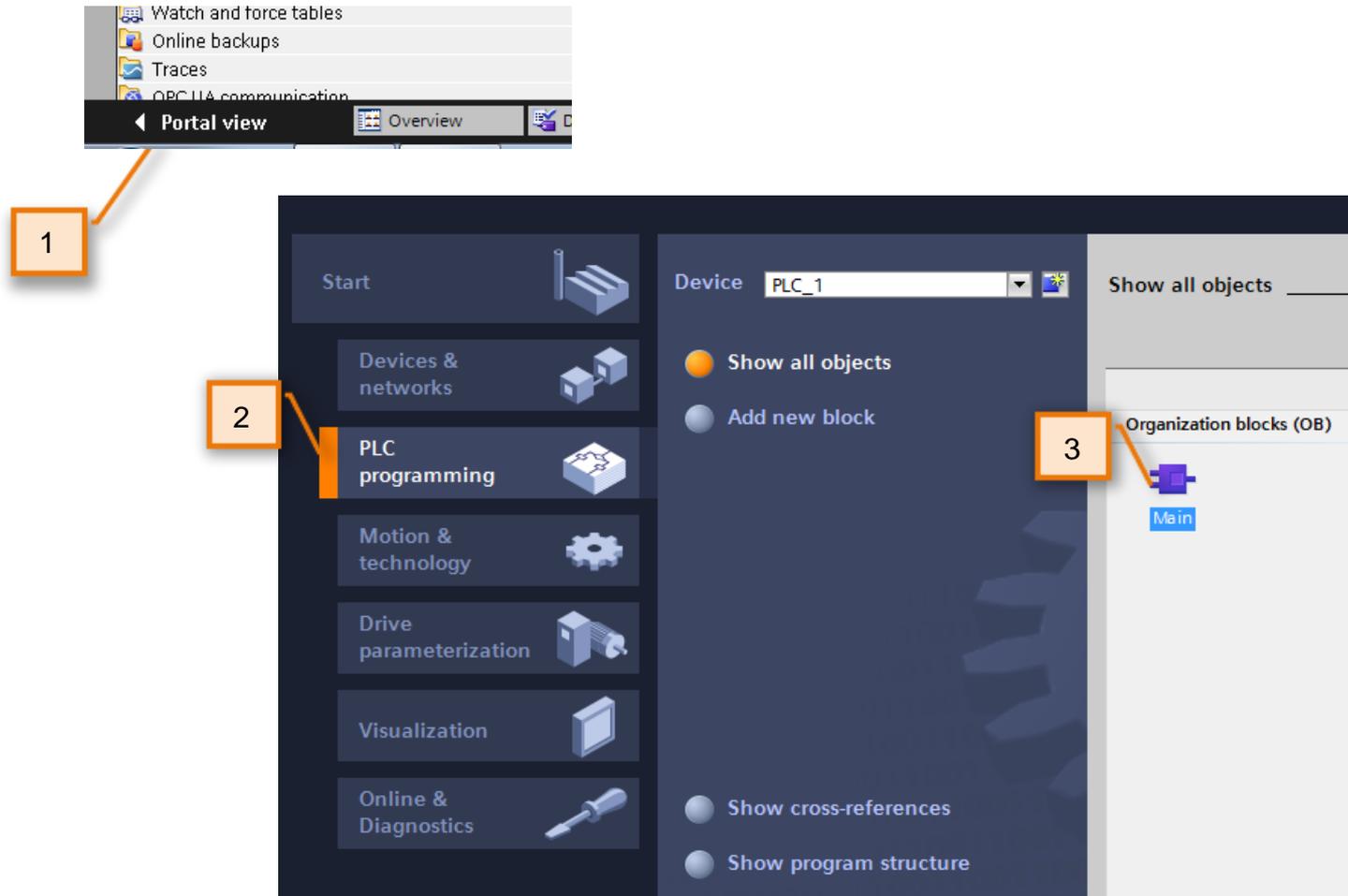


# S7-1200: Basic Controller with Advanced Functions

Efficient Engineering

# TIA Portal: Getting Started

# Efficient Engineering Getting Started



1. Change to the *Portal view*
2. Click on 'PLC Programming'.
3. Double-click on 'Main [OB1]'.

'Main [OB1]' is the primary running program block.



# Efficient Engineering Editor Layout

**Taskbar**

**Task cards (editor-specific)**

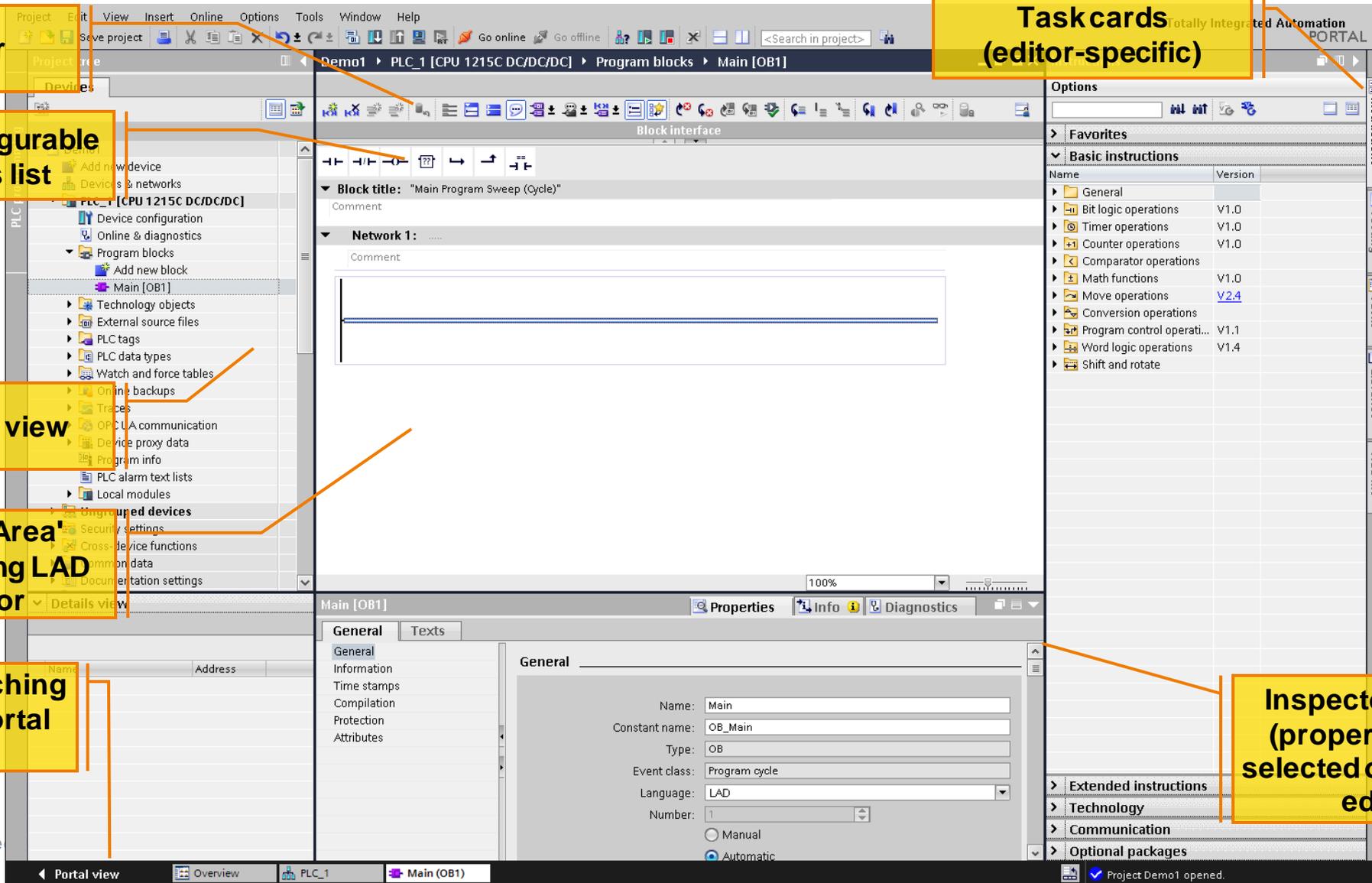
**Freely configurable favorites list**

**Project view**

**'Work Area' displaying LAD editor**

**Fast switching to the portal view**

**Inspector window (properties of the selected object in the editor)**

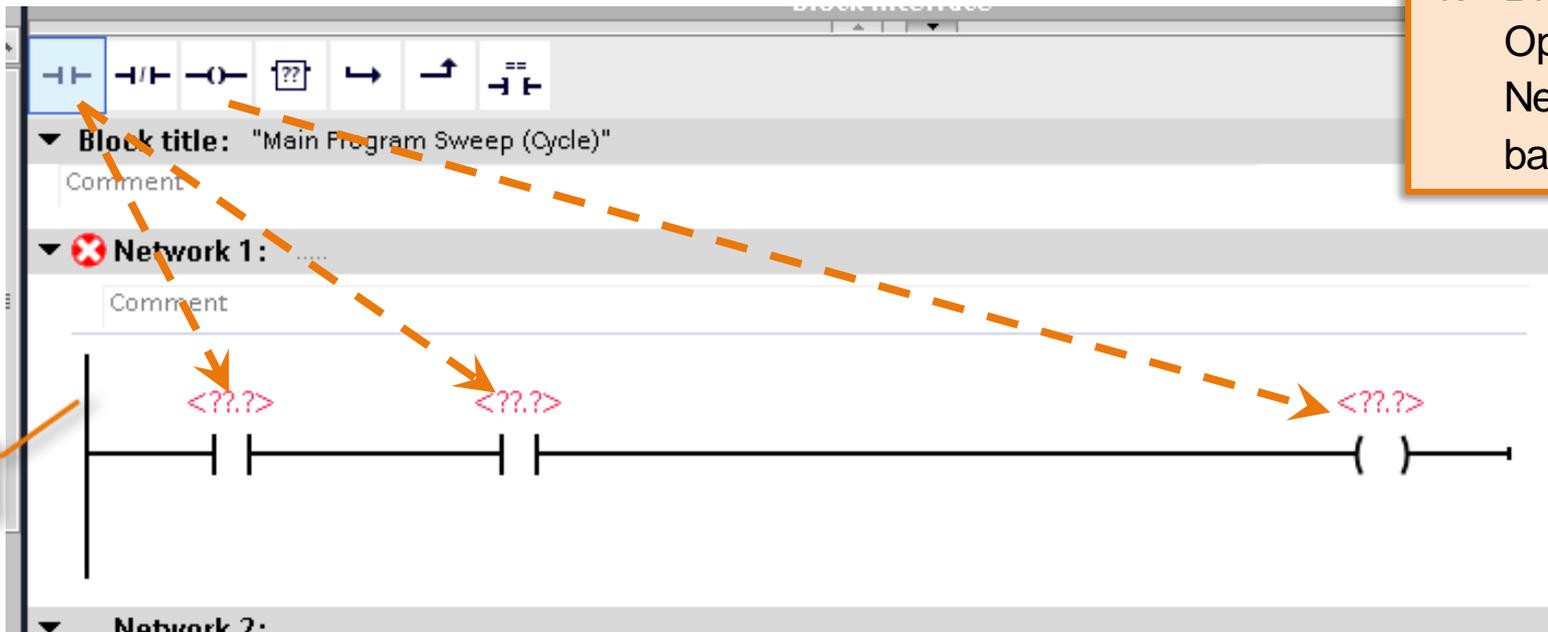


Unrestricted



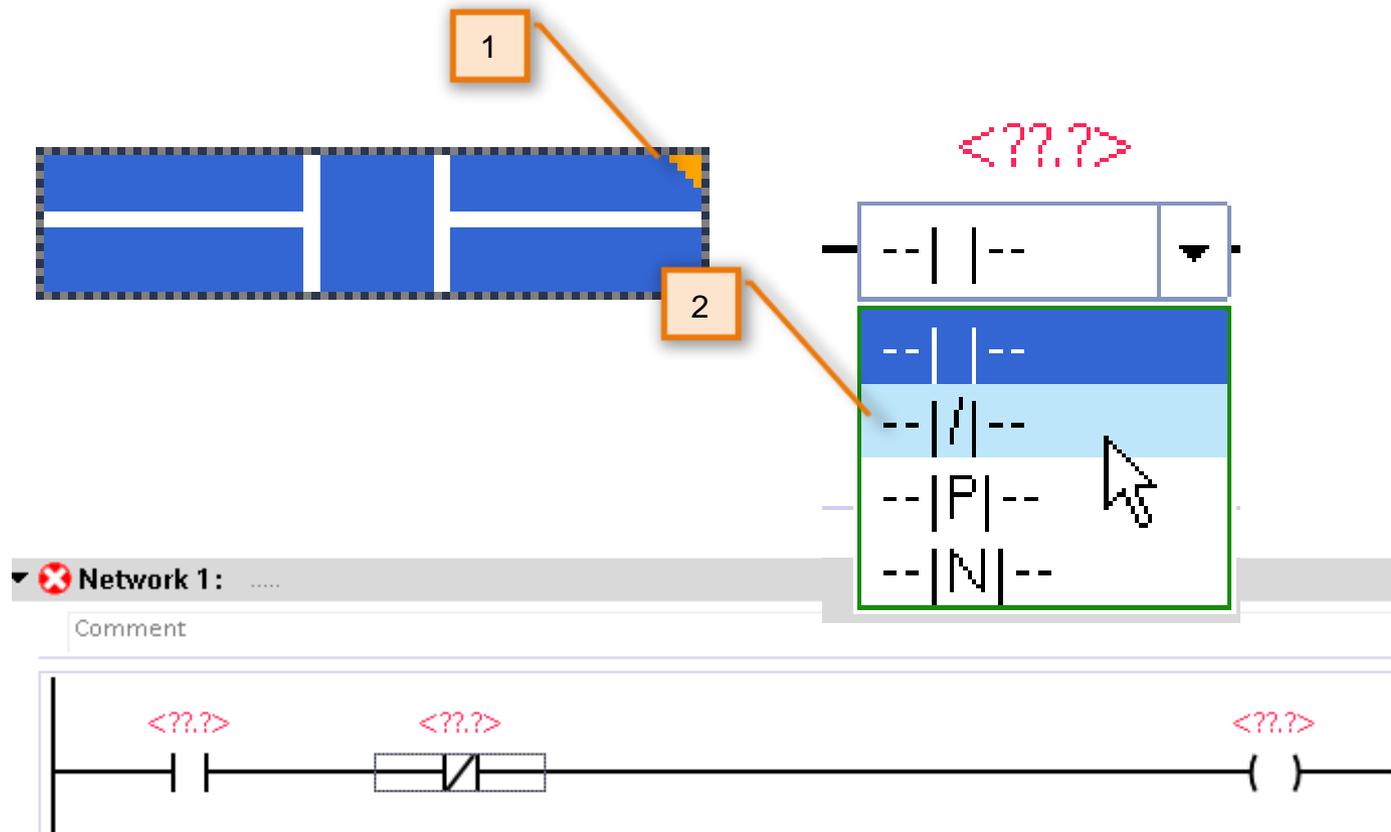
# Efficient Engineering

## Drag and drop



1. Drag and drop two 'Normally Open' contacts and a coil onto Network 1 from the favorites bar as shown.



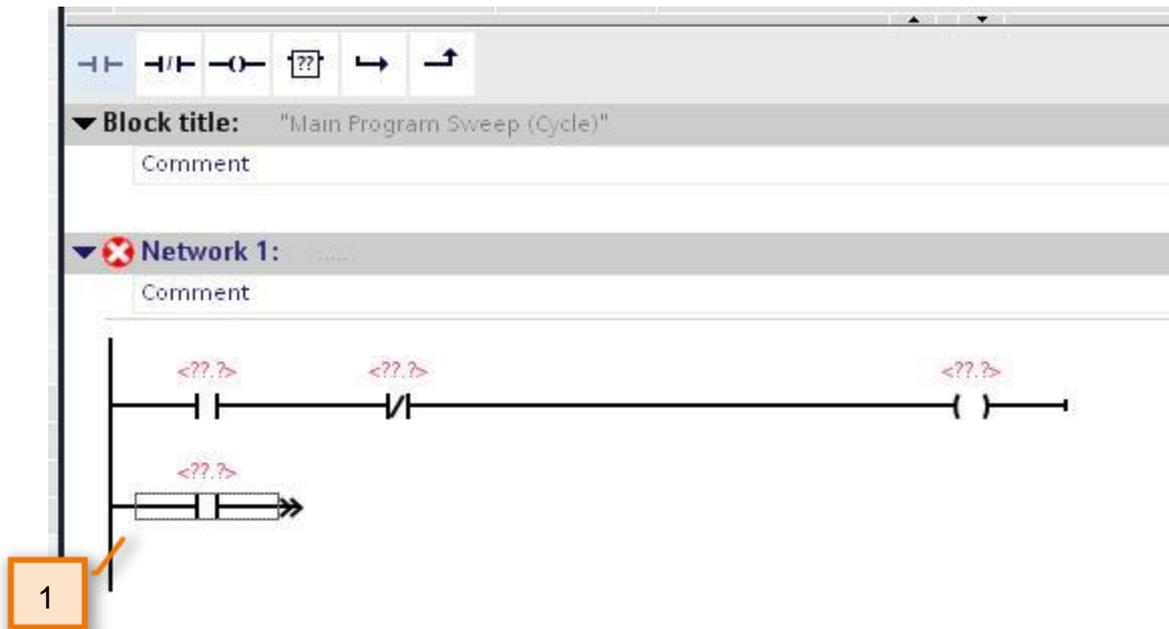


Oops - we made a mistake! The second normally open contact is actually supposed to be normally closed.

1. Click on the second Normally Open contact and click on the orange triangle in the upper-right corner of the instruction
2. Select the Normally closed instruction from the drop-down to change the instruction.



# Efficient Engineering Intuitive Programming



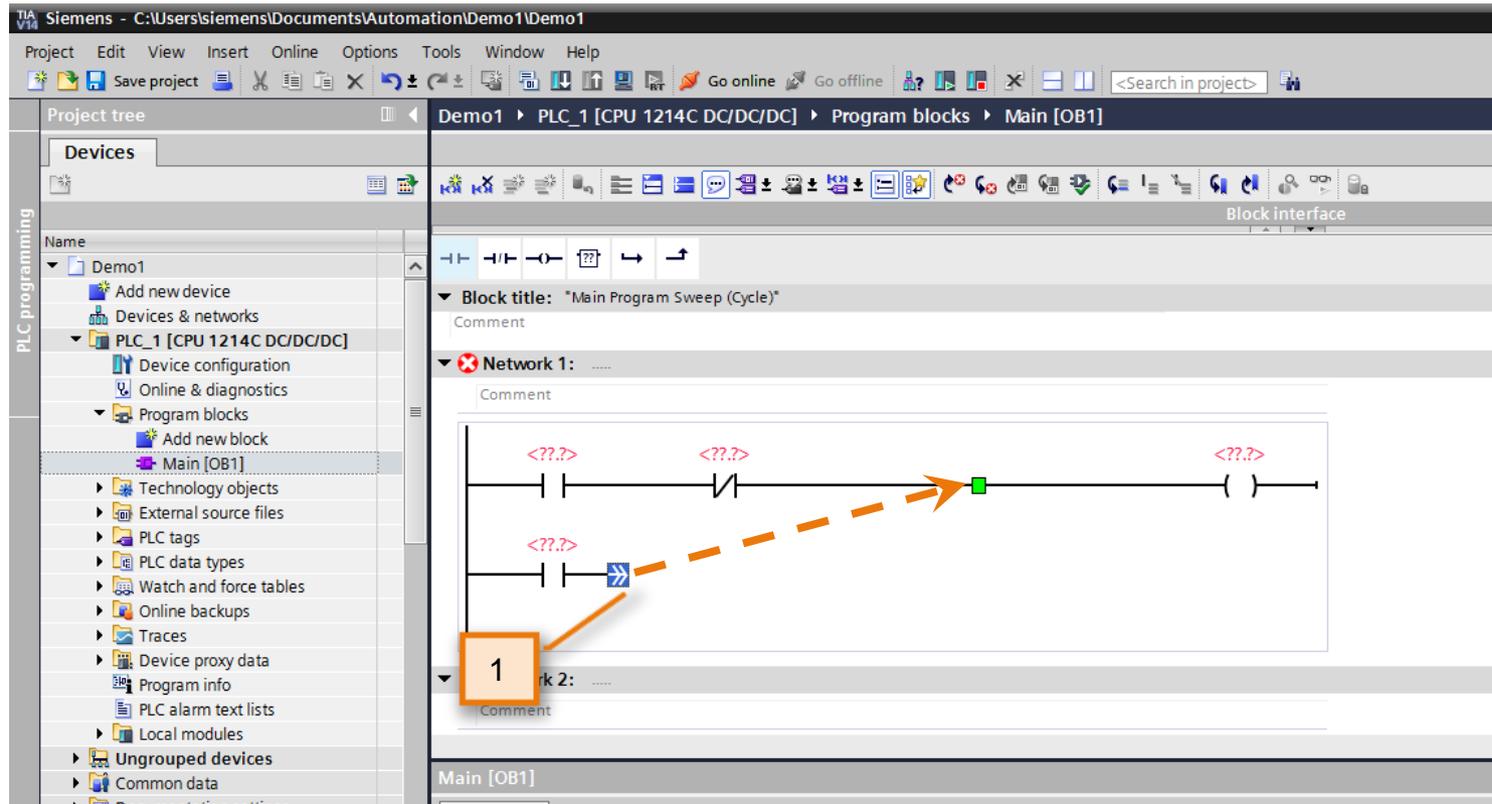
1. Drag and drop another 'Normally Open' contact underneath the first contact.

Notice the different junction suggestions STEP 7 Basic offers you. The green highlights the position.



# Efficient Engineering Intuitive Programming

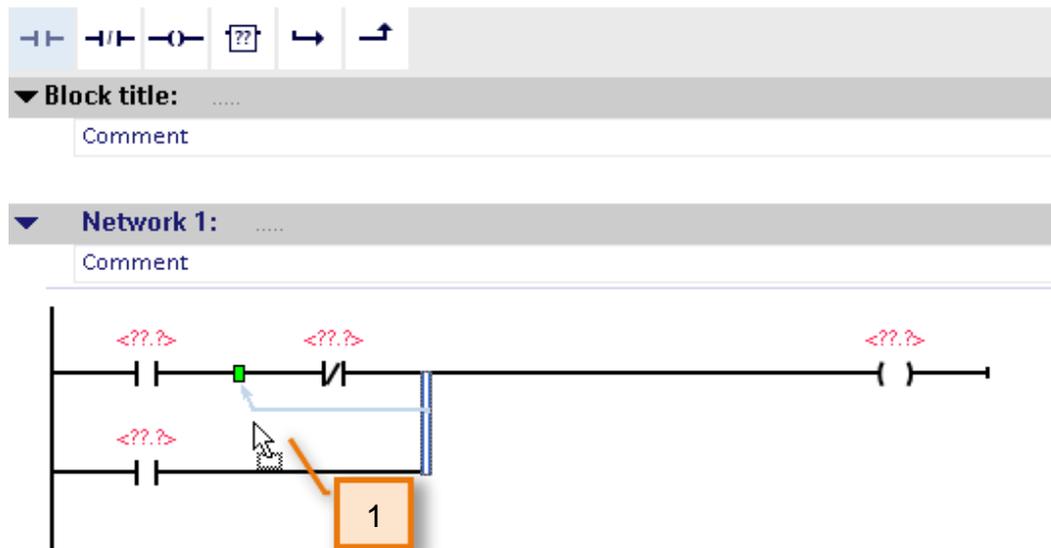
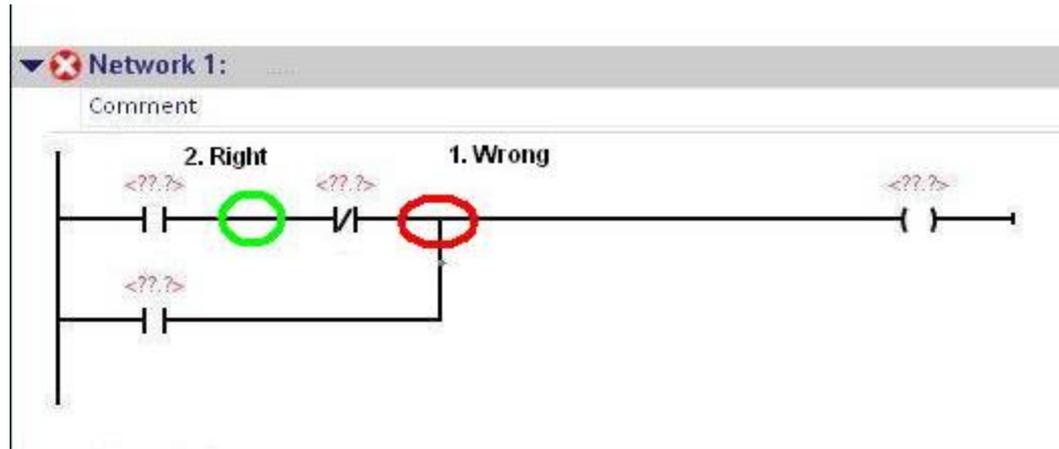
**SIEMENS**  
*Ingenuity for life*



1. Drag the connection from the contact to the position as shown.



# Efficient Engineering Intuitive Programming

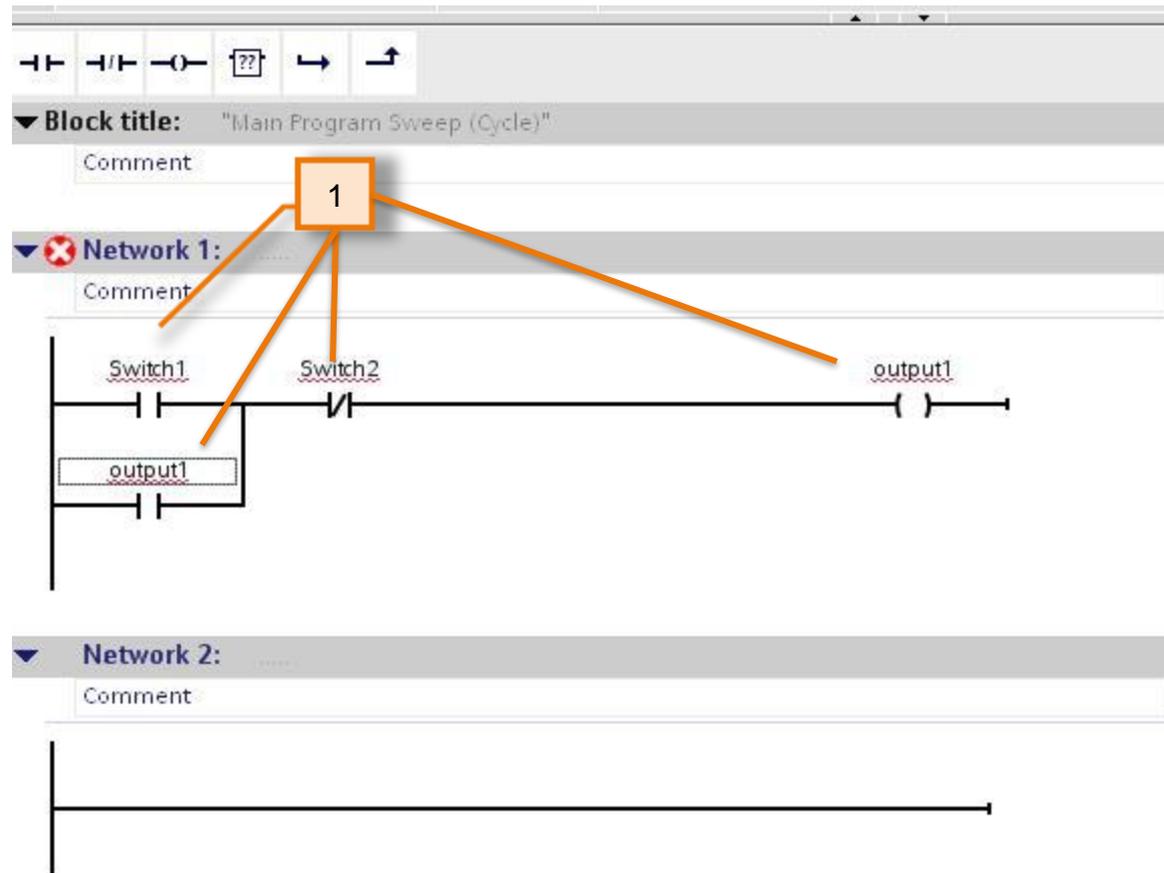


Oops! we actually meant to place the connection in the correct position *behind* the NC contact.

1. Drag and drop the connection to the correct point as shown



# Efficient Engineering Intuitive Tag Definition



1. Type in the symbol names as shown: Switch1, Switch2, and Output1 (for both coil and “seal”).



# Efficient Engineering

## Intuitive tag definition

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The screenshot shows the Siemens TIA Portal software interface. On the left, the Project tree is expanded to show the 'Device configuration' option for the selected PLC. In the main area, the hardware configuration for a SIMATIC S7-1200 is displayed, including a CP 1243 module, a CPU 1215C DC/DC/DC, and an SM 1223 DC/RLY module. The I/O addresses are visible, such as DI 10.0-10.7, DI 11.0-11.5, DI 18.0-18.7, DO 00.0-00.7, and DO 08.0-08.7. Callout boxes indicate the steps: 1. Double-click on 'Device configuration' in the Project tree. 2. Zoom the view to 400%. 3. Click the 'Float' button in the top toolbar.

1. Double-click on 'Device configuration' to switch to the Device view.
  2. Now zoom the view of the PLC hardware to 400%.
- Notice the I/O addresses can actually be seen live.
3. 'Float' the device window

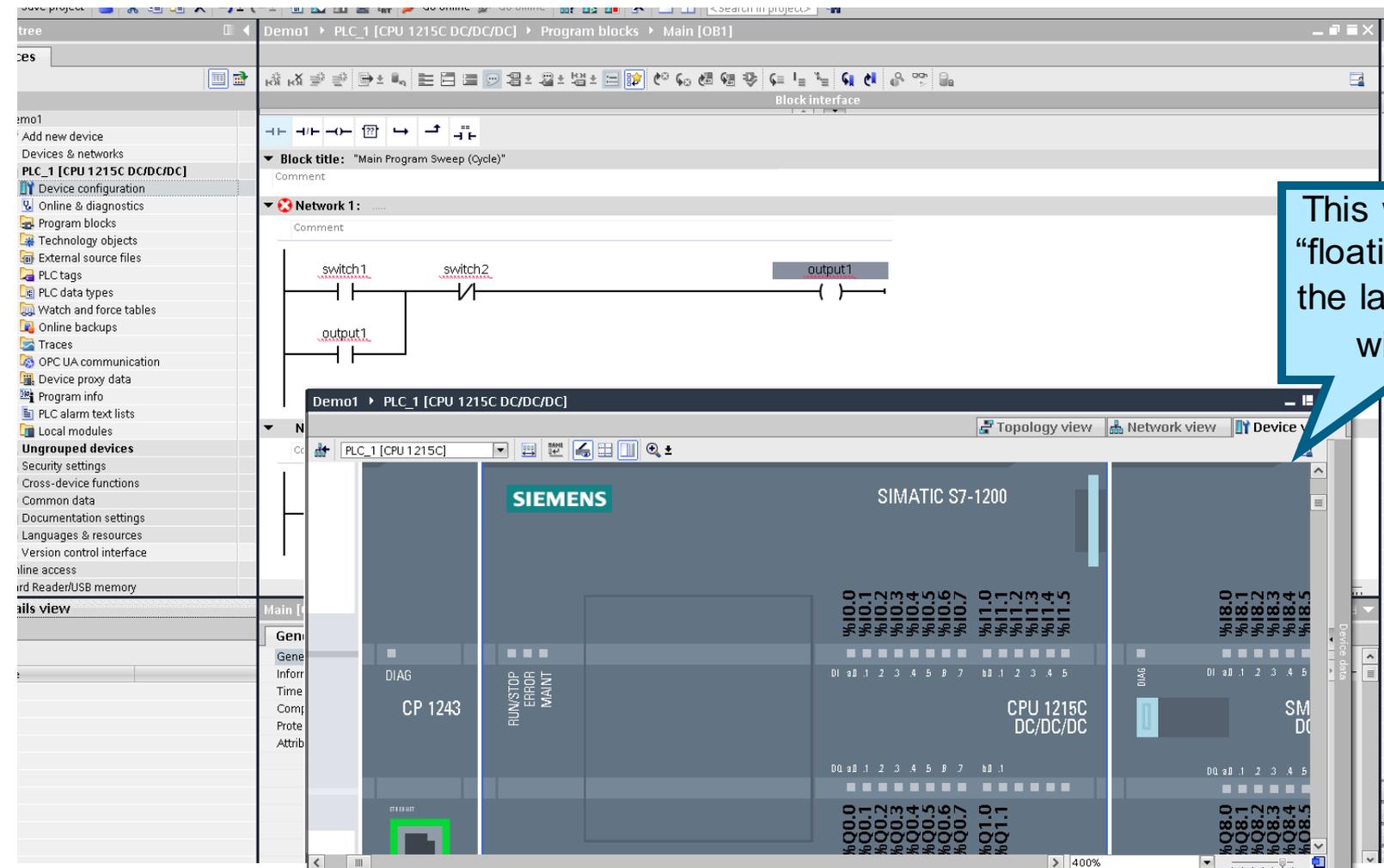


# Efficient Engineering

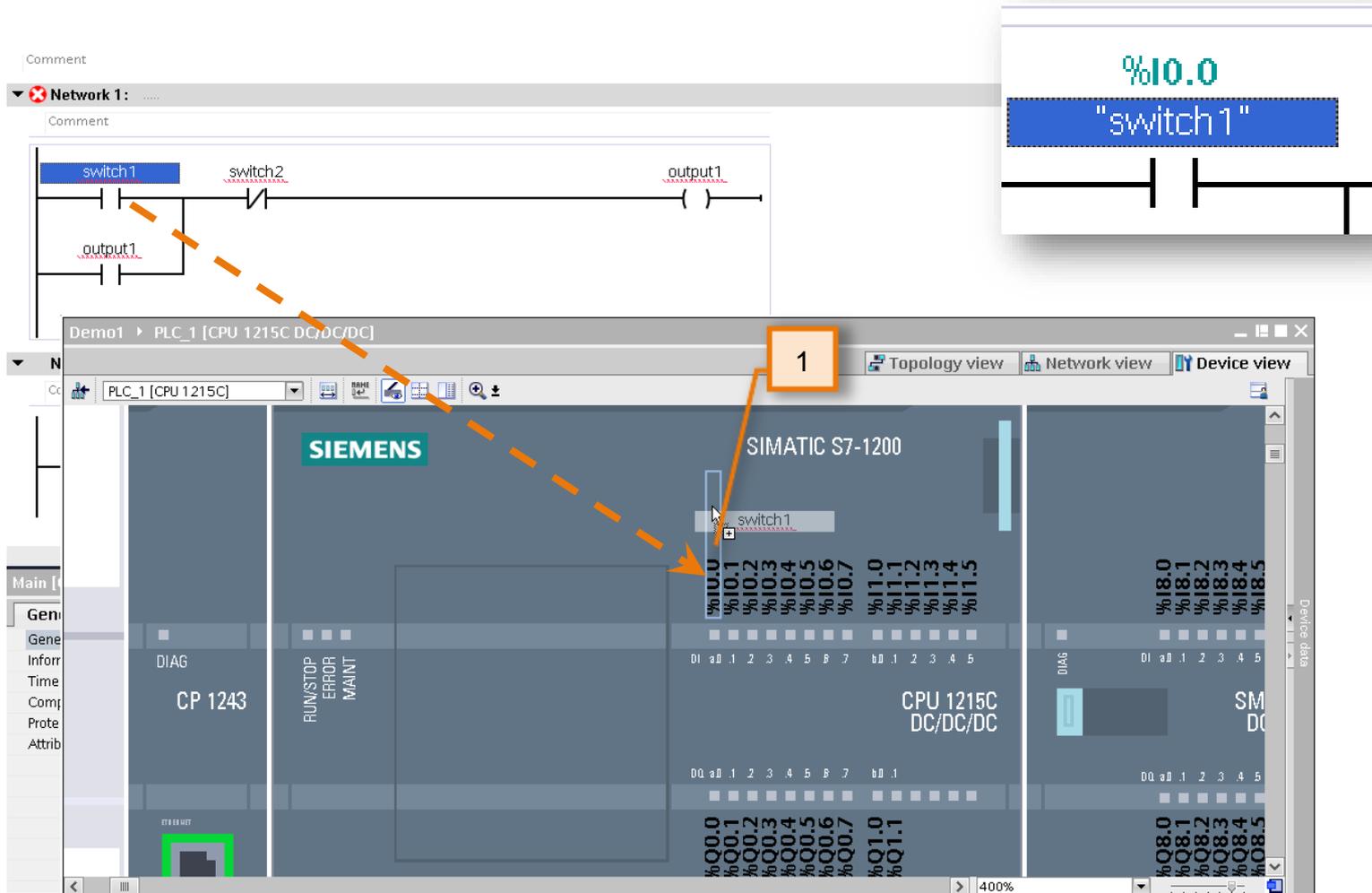
## Customize layout with 'floating' windows

Make sure that the zoomed in PLC hardware window floats above the ladder logic window as shown. You might have to resize the floating window.

This window is "floating" above the ladder logic window.



# Efficient Engineering Intuitive tag definition



1. Drag and drop the text 'Switch1' directly on top of input address 'I0.0' on the PLC hardware.

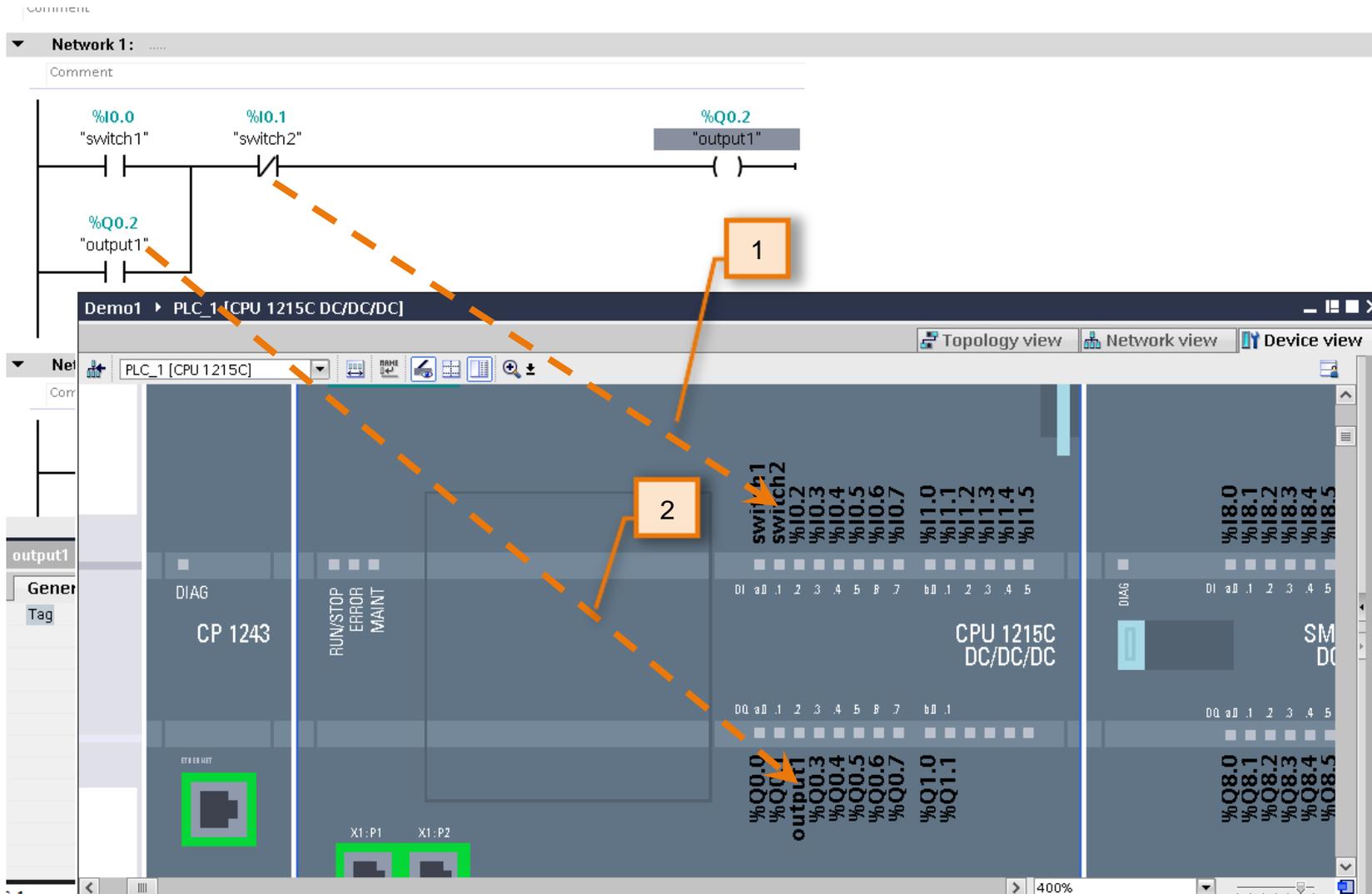
Notice the symbolic tag 'Switch1' which represents 'I0.0', is now the same in the ladder logic and on the hardware.



# Efficient Engineering

## Intuitive tag definition

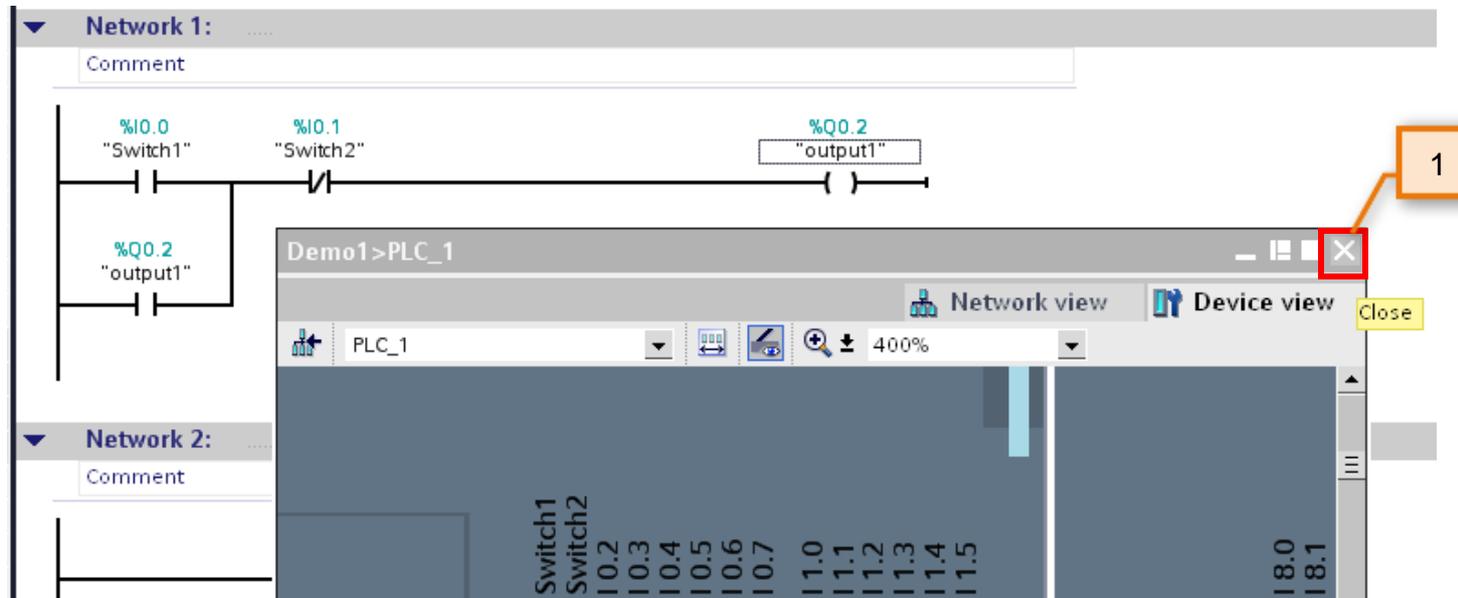
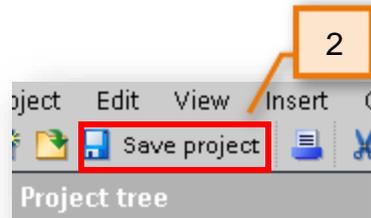
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1. Assign 'switch2' to I0.1
2. Assign 'output1' to Q0.2



# Efficient Engineering



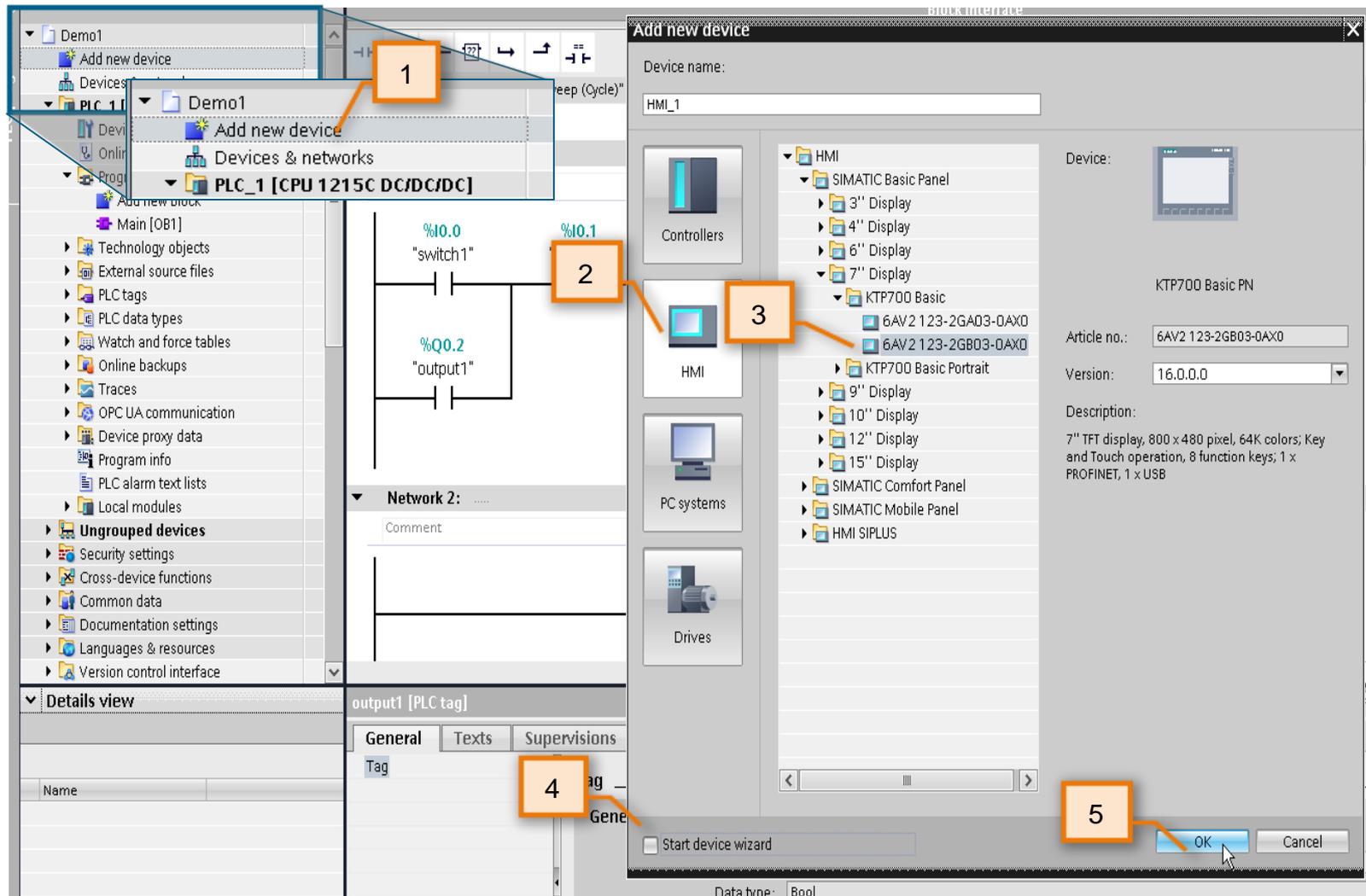
1. Close the Device view of the PLC hardware so that only the ladder logic remains.
2. Save your project.



# Integrating with an HMI

# Efficient Engineering

## Adding an HMI

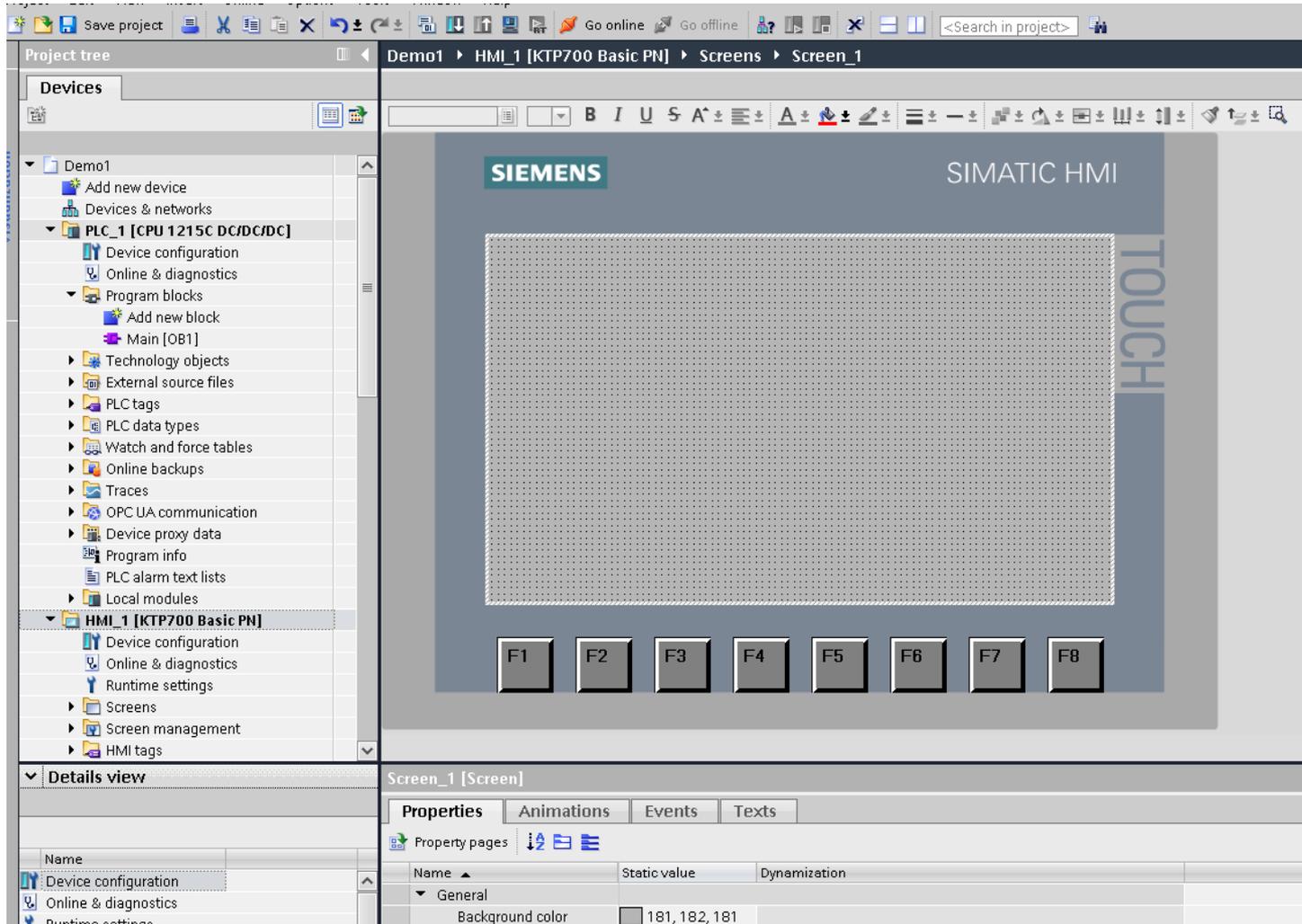


1. Double-click 'Add new device' under the Project tree. The 'Add new device' dialog appears
2. Select HMI
3. Select KTP700 as shown  
**SIMATIC HMI Basic Panel > 7" Display > KTP700 Basic > 6AV2 123-2GB03-0AX0**
4. **Uncheck** the box "Start device wizard"
5. Click 'OK'



# Efficient Engineering HMI visualization

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TIA Portal opens the newly added HMI to the default screen.

Note: Since we did not go through the "Device Wizard", this HMI has no tags configured, no screen objects, no connections to PLC(s) or even IP address settings. It is simply "blank".

When typically configuring an HMI in any automation project, there are more/less these 5 fundamental steps that must occur to engineer a user screen:

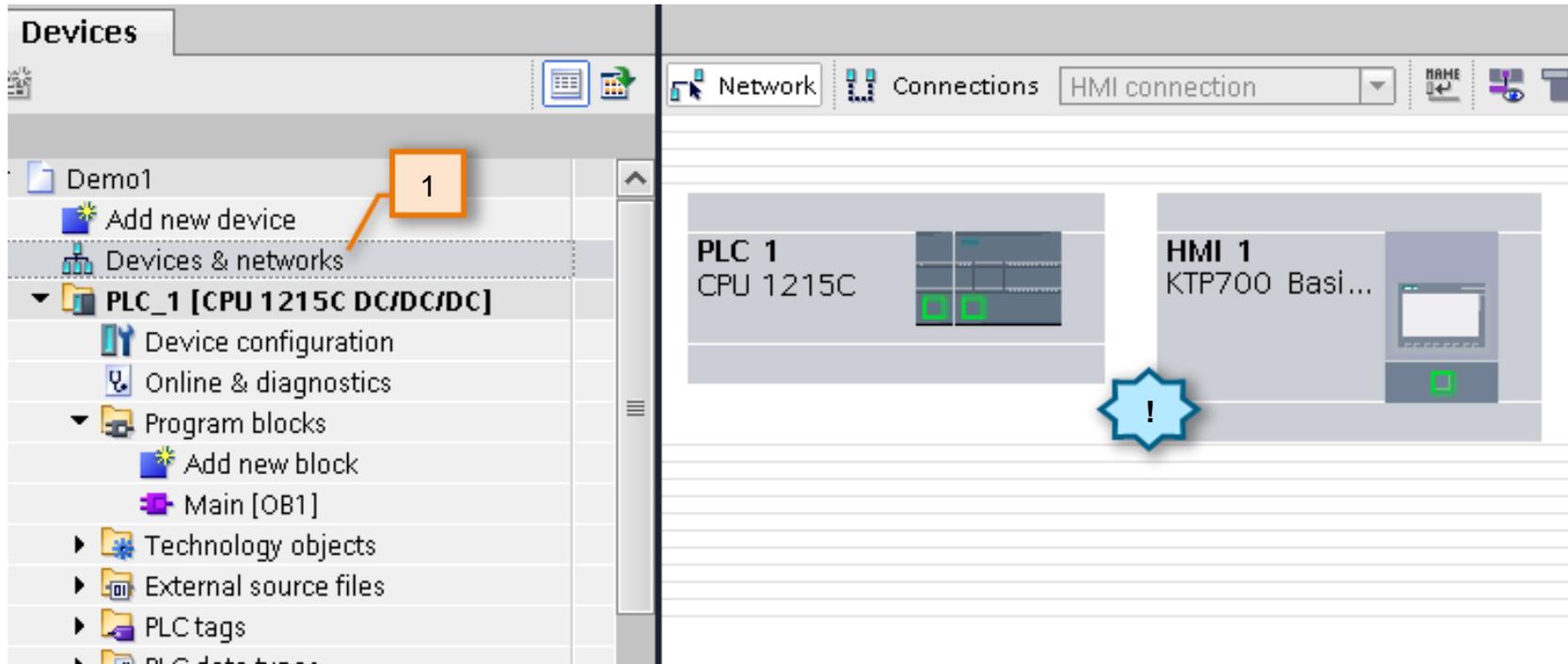
1. A connection/relation to a PLC must be defined
2. HMI tag(s) must be defined
3. We must associate those HMI tags to a corresponding PLC tag
4. We must add an object(s) to the screen
5. We must tie this object to the respective HMI/PLC tag.

We will now demonstrate engineering efficiency of TIA Portal by conducting all 5 steps above with a single action.



# Efficient Engineering HMI visualization

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1. Double-click on 'Devices & networks' under the project tree

Notice there is no connection between the PLC and HMI defined yet.



# Efficient Engineering HMI visualization

Project tree: Demo1 > HMI\_1 [KTP700 Basic PN] > HMI tags

Devices

- Watch and force tables
- Online backups
- Traces
- OPC UA communication
- Device proxy data
- Program info
- PLC alarm text lists
- Local modules
- HMI\_1 [KTP700 Basic PN]**
  - Device configuration
  - Online & diagnostics
  - Runtime settings
  - Screens
  - Screen management
  - HMI tags**
    - Show all tags** (1)
    - Add new tag table
    - Default tag table [0]
    - Connections
    - HMI alarms
    - Recipes
    - Historical data
    - Scheduled tasks
    - Text and graphic lists
    - User administration
  - Ungrouped devices
  - Security settings
  - Cross-device functions

HMI tags

Name	Tag table	Data type
<Add new>		

Discrete alarms | Analog alarms | Logging tags

ID	Name	Alarm text	Alarm class	Trig
----	------	------------	-------------	------

1. In the project tree, navigate to HMI\_1, expand and double-click "Show all tags" under the 'HMI tags' folder.

Notice no internal/external HMI tags are defined yet



# Efficient Engineering HMI visualization

The screenshot displays the Siemens SIMATIC Manager interface. On the left, the Project tree shows the hierarchy: Demo1 > HMI\_1 [KTP700 Basic PN] > Screens > Screen\_1. A blue starburst with an exclamation mark points to the 'Default tag table [38]' in the PLC tags folder. An orange box with the number '2' points to this folder. The main workspace shows a SIMATIC HMI visualization with a grid and function keys F1-F8. At the bottom, the Details view for 'Screen\_1 [Screen]' is open, showing properties like Background color (181, 182, 181) and Grid color (0, 0, 0). An orange box with the number '1' points to the 'Name' property, which is 'Screen\_1'. A blue starburst with an exclamation mark is also present in the Details view area.

1. Open "Screen\_1" via the tabs at the bottom of the project. If you already closed this editor previously, you can navigate to it via the project tree **HMI\_1 > Screens > Screen\_1**
2. Scroll up in the project tree and navigate and **single-click** the PLC tag table "Default tags"

! Notice details of this tag table contents appear in the "Details view" below, including predefined system tags.



# Efficient Engineering HMI visualization

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The screenshot displays the Siemens SIMATIC Manager interface. On the left, the project tree shows the configuration for a PLC and an HMI. The main workspace shows a graphical representation of the HMI screen with a grid and buttons labeled F1 through F8. A dashed orange arrow indicates the drag-and-drop action of the 'output1' tag from the 'Details view' into the screen layout. The 'Details view' at the bottom left shows a table of tags, and the 'Properties' panel at the bottom right shows the configuration for the selected screen.

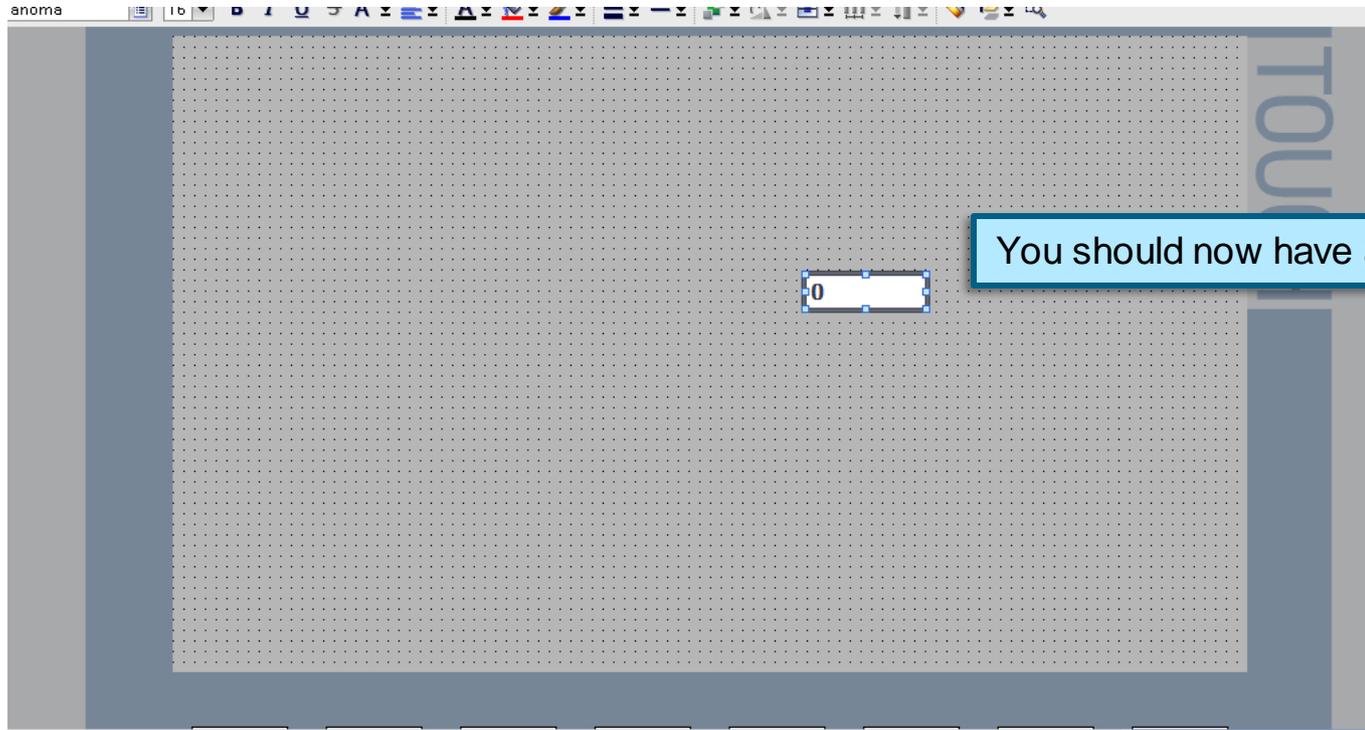
Name	Data type
None	Pip
OB_Main	OB_PCYC...
output1	Bool
PIP 1	Pip
PIP 2	Pip
PIP 3	Pip

Name	Static value	Dynamization
General		
Background color	181, 182, 181	
Grid color	0, 0, 0	
Name	Screen_1	
Number	1	

1. Drag and drop PLC tag 'output1' from the 'Details view' into "Screen\_1" as shown.
2. Save your project.



# Efficient Engineering HMI visualization



You should now have an I/O field object on your screen.

100%

I/O field\_1 [I/O field] Properties Info

**Properties** Animations Events Texts

Property list

- General
- Appearance
- Characteristics
- Layout
- Text format
- Limits
- Styles/Designs
- Miscellaneous
- Security

**General**

**Process**

Tag:

PLC tag:

Address:  Bool

**Type**

Mode:

**Format**

Display format:

Decimal places:

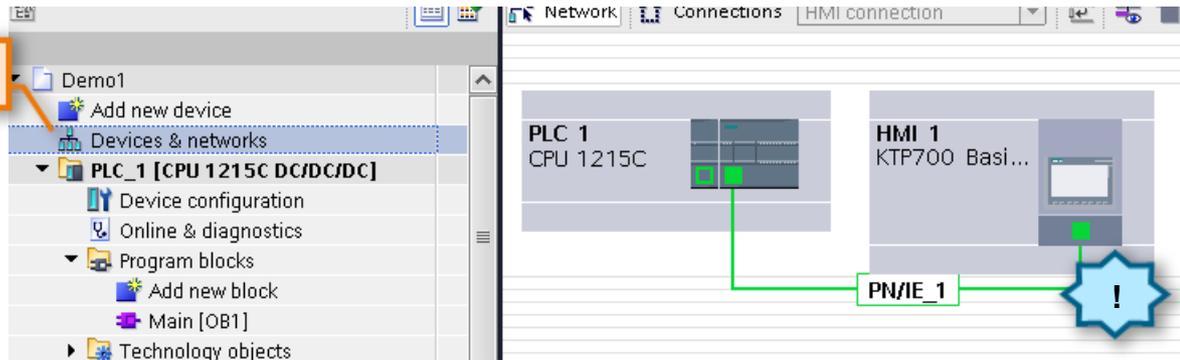
Field length:

Leading zeros:

Format pattern:



# Efficient Engineering HMI visualization



2

Project tree Demo1 > HMI\_1 [KTP700 Basic PN] > HMI tags > Default tag table [1]

Devices

Program info

PLC alarm text lists

Local modules

HMI\_1 [KTP700 Basic PN]

Device configuration

Online & diagnostics

Runtime settings

Screens

Screen management

HMI tags

Show all tags

Add new tag table

Default tag table [1]

Connections

HMI alarms

Business

Default tag table

Name	Data type	Connection	PLC name	PLC tag	Address	Access mode
output1	Bool	HMI_Connection_1	PLC_1	output1		<symbolic access>
<Add new>						

1. Go back to "Devices & networks"



Notice a physical and logical connection to the PLC has been made and the HMI's IP address has automatically been assigned.

2. Go back to your HMI Tag table "Default tag table"



Notice an HMI tag was defined/named and automatically associated with the PLC\_1 tag "output1" via "connection1"



# Efficient Engineering

## HMI visualization – common tag database across editors

The screenshot displays the Siemens SIMATIC Manager interface. At the top, two 'Default tag table' windows are open. The left window, titled 'HMI\_1 [KTP700 Basic PN] > HMI tags > Default tag table [1]', contains a table with columns: Name, Data type, Connection, PLC name, PLC tag, Address, and Access mo... The table has one entry: 'output1' with data type 'Bool', connection 'HMI\_Connection\_1', PLC name 'PLC\_1', and PLC tag 'Light'. The right window, titled '...\_1 [CPU 1215C DC/DC/DC] > PLC tags > Default tag table [38]', contains a table with columns: Name, Data type, Address, Retain, and Acces... The table has three entries: 'switch1' (Bool, %I0.0), 'switch2' (Bool, %I0.1), and 'Light' (Bool, %Q0.0). Two blue starburst icons with exclamation marks are placed over the 'output1' row in the left table and the 'Light' row in the right table. Below these tables is a 'Demo1 > PLC\_1 [CPU 1215C DC/DC/DC]' window showing a 'Device view' of a 'CPU 1215C DC/DC/DC'. The device view displays a grid of digital inputs (DI a0.1-7, b0.1-5) and digital outputs (DQ a0.1-7, b0.1). A 'Light' tag is highlighted in the output grid, with a blue starburst icon and exclamation mark next to it. The bottom of the screenshot shows a 'Discrete alarms' window with a table for 'Light [PLC tag]' and a 'General' tab.

Since the HMI access to the PLC tag is "symbolic" (this is default setting, but can be changed), the physical address of this tag is irrelevant for the HMI. So if you rewire the tag "Output1" to a different physical address (e.g. Q0.0), the HMI can still read its value as long as the symbolic name remains true.

However, the same applies for the symbolic name of the PLC tag. If we rename the tag in the PLC, the HMI connection to that tag does not break either!

This is one advantage of having all devices "totally integrated" into one single engineering framework. Manual synchronization of tags is not required therefore reducing engineering efforts.



# End of 'Efficient Engineering'



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