How to create alarms in TIA Portal: data block, PLC logic, and HMI alarm view

This guide shows you how to create alarms in TIA Portal from start to finish. You define alarm signals in a data block, link them to PLC ladder logic, and map them to HMI discrete alarms. You then configure the alarm view, simulate the HMI, and force PLC tag values to watch the alarms appear and clear.

Prerequisites

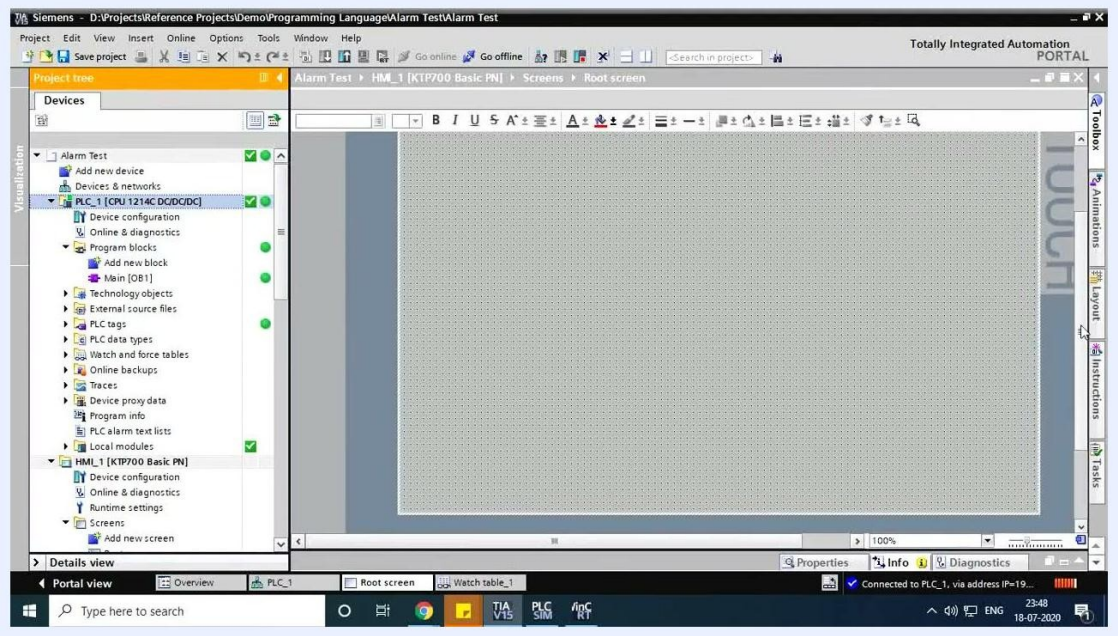
- Siemens TIA Portal is open with the Alarm Test project loaded.
- The project contains a PLC named PLC_1 [CPU 1214C DC/DC/DC].
- The project contains an HMI device named HMI_1 [KTP700 Basic PN].
- The main workspace shows the **Project tree** on the left and a blank **Root screen** in the center.

Create and configure the alarm data block

1. Navigate to the PLC program blocks

1. In the **Project tree** under Devices, expand PLC_1 [CPU 1214C DC/DC/DC].

2. Expand Program blocks to view the available blocks.



TIA Portal with the Project tree, PLC_1 expanded, Program blocks visible, and a blank Root screen

2. Add a new data block

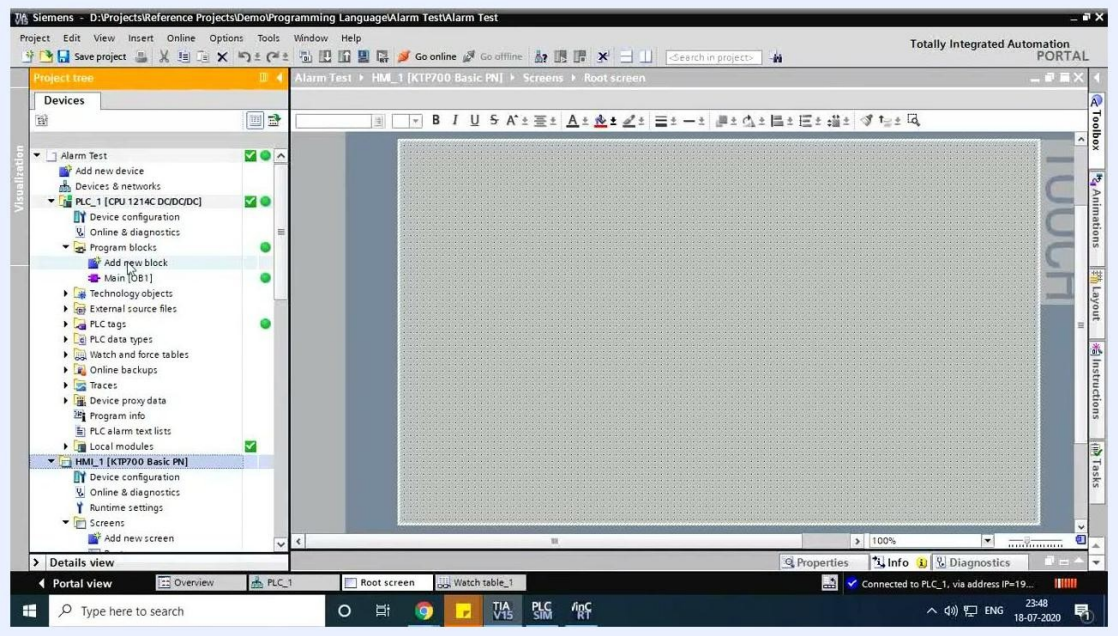
1. Right-click Program blocks, or select **Add new block**.
2. Confirm that a new block named AlarmDB [DB1] appears under Program blocks.

The main workspace does not change yet, but the new block is listed in the tree.

3. Open the data block and confirm the block access warning

1. Double-click AlarmDB [DB1] to open it. The workspace shows the configuration table for the data block.
2. A warning dialog titled **Optimized block access (0604:000402)** appears. It reads: "Change block access. If you deactivate this attribute, the retain settings in the interface change. You may have to adapt and recompile the program."

3. Click **OK** to proceed.

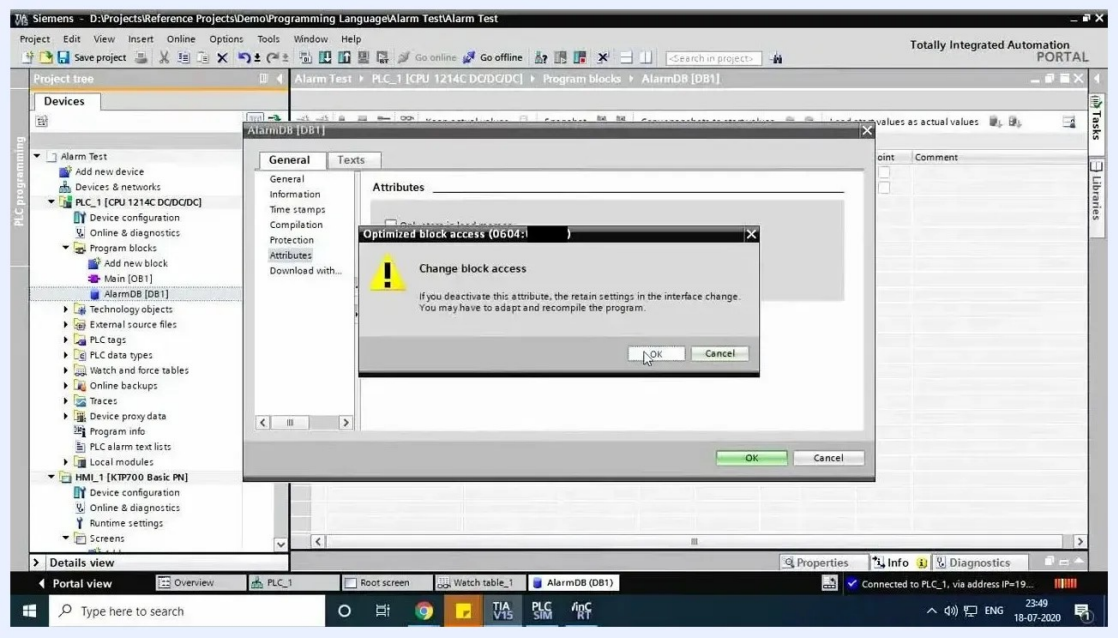


Warning dialog for changing block access in TIA Portal, with OK selected

4. Add the Alarms struct

1. In the AlarmDB table, under the Static section, add a new entry.
2. Enter Alarms as the **Name**.
3. In **Data type**, begin typing Stru... and select Struct from the dropdown list.

The table shows the columns Start value, Retain, Accessible from HMI, Writable from HMI, Visible in HMI, Setpoint, and Comment. For the Alarms entry, the checkboxes for Accessible from HMI, Writable from HMI, and Visible in HMI are selected.



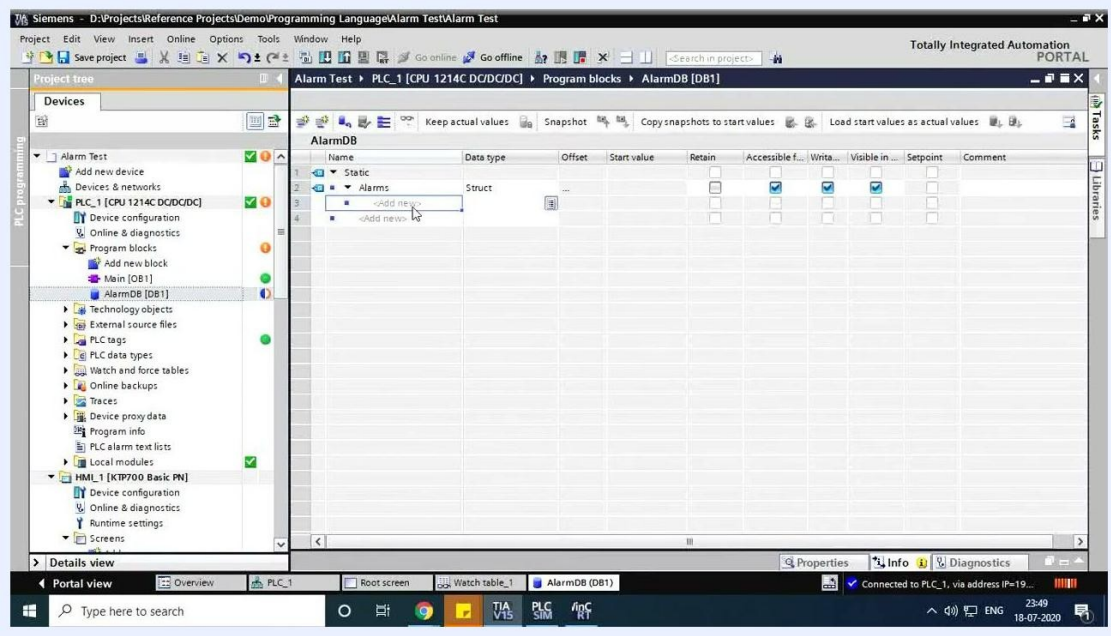
AlarmDB data block being configured, with the Alarms struct and HMI access options checked

5. Add alarm signals to the struct (create alarms in TIA Portal)

This is where you create the alarm signals themselves.

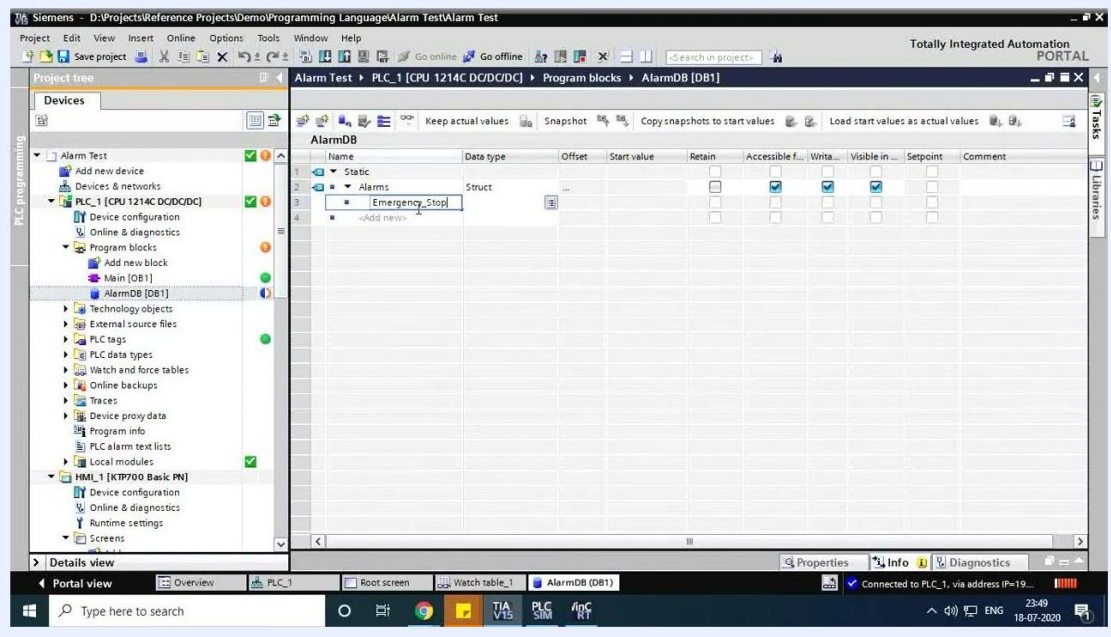
1. In the AlarmDB editor, find the <Add new> row under the Alarms struct.

2. Place the cursor in that row to enter the name of the new alarm signal.



Adding a new alarm signal under the Alarms struct in AlarmDB, with the cursor at the Add new row

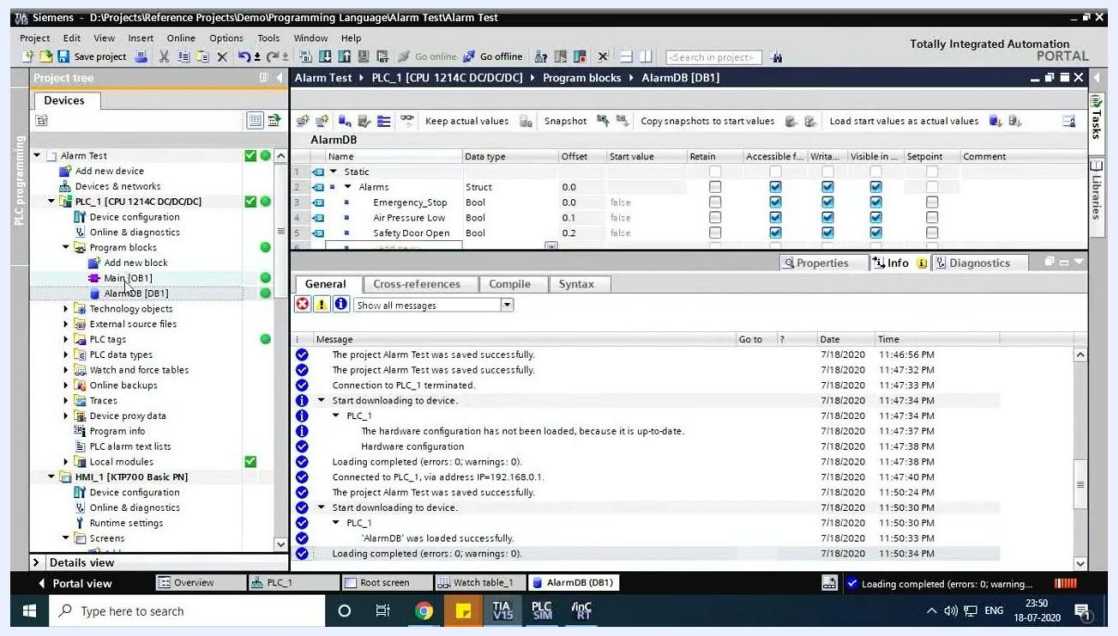
3. Enter Emergency_Stop as the **Name**. The data type defaults to Bool, and the row appears under the Alarms struct.



The Emergency_Stop alarm signal added under the Alarms struct with data type Bool

4. Add two more signals, both with data type Bool: Air Pressure Low and Safety Door Open.
5. For each alarm signal, make sure these checkboxes are selected: Accessible from HMI, Writable from HMI, and Visible in HMI.

The table now lists Emergency_Stop, Air Pressure Low, and Safety Door Open, each as Bool with a Start value of false.



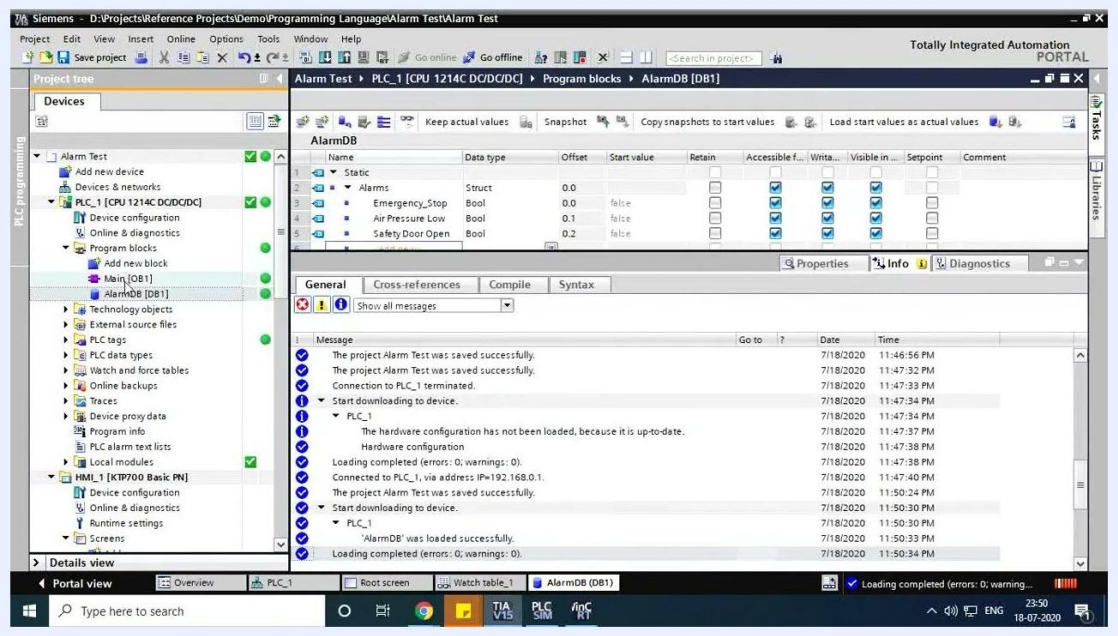
The Emergency_Stop, Air Pressure Low, and Safety Door Open alarms added, all with HMI access options checked

6. Save and compile the data block

Save the project after you enter all the alarm signals. The lower pane then displays these messages:

- "The project Alarm Test was saved successfully."
- "AlarmDB was loaded successfully."
- "Loading completed (errors: 0; warnings: 0)."

These messages confirm that the data block is configured correctly and loaded to the PLC.



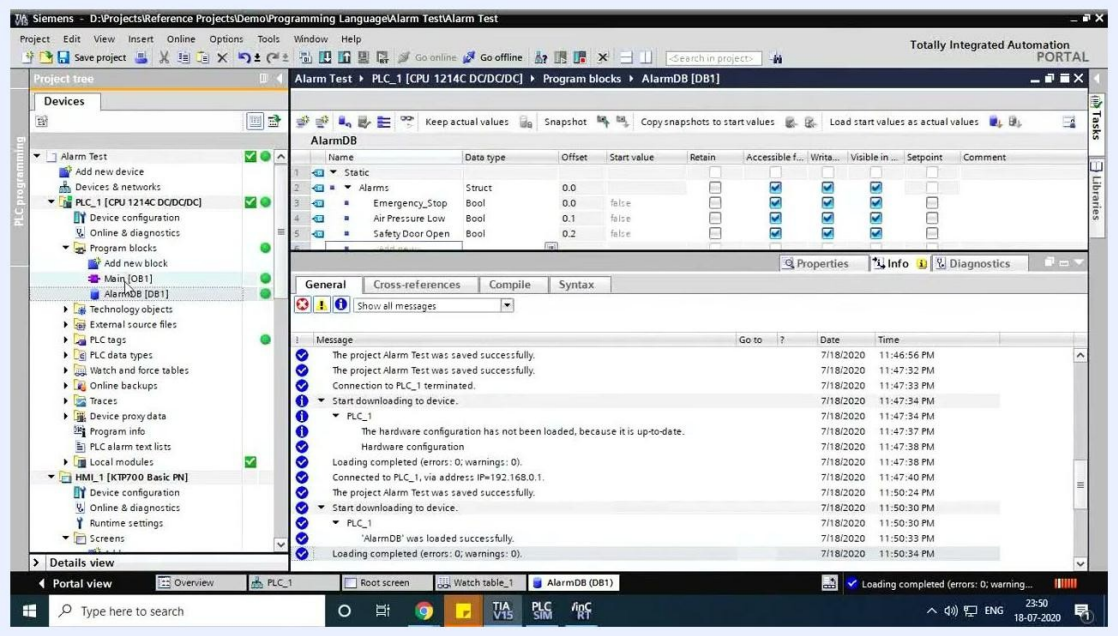
Compilation and download messages confirming AlarmDB loaded successfully

Integrate alarm signals into the PLC logic

7. Link the Emergency Stop alarm in ladder logic

1. Open the main PLC program block, Main [OB1]. The ladder logic editor shows several networks.

2. In Network 3, edit the rung. The left side contains a contact %I0.0 with the comment "E Stop". The right side is where you link an alarm signal.



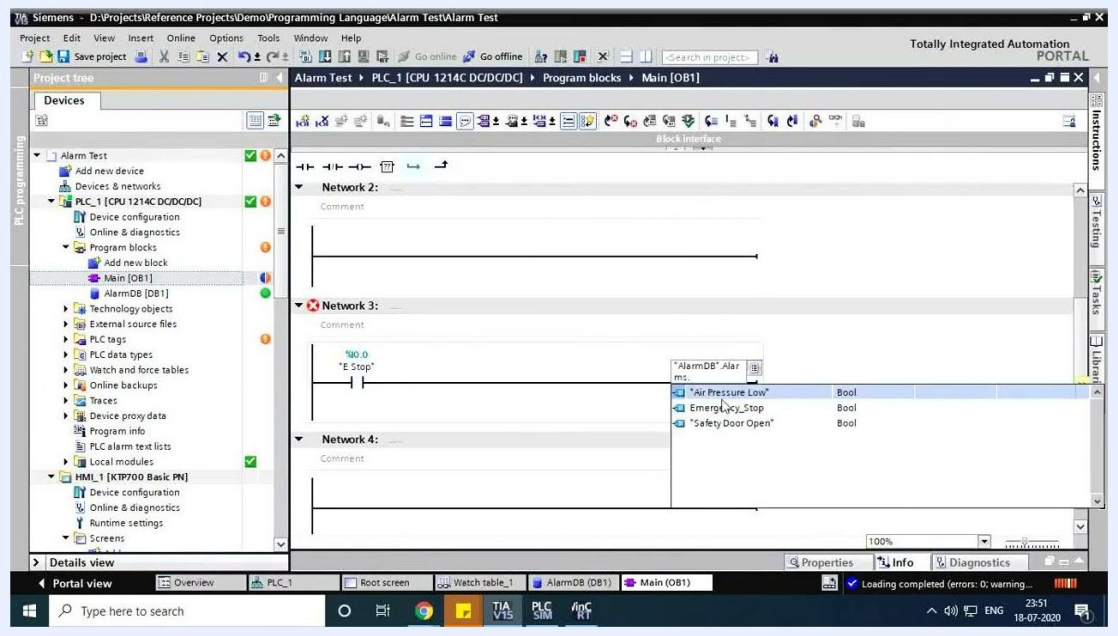
Ladder logic editor, Network 3, with the %I0.0 "E Stop" contact and the output being configured

3. When the **Rename tag** dialog appears, it shows these values:

   - **Name:** Tag_1
   - **Section:** Global Input
   - **Address:** %I0.0
   - **Data type:** Bool
   - **PLC tag table:** Default tag table

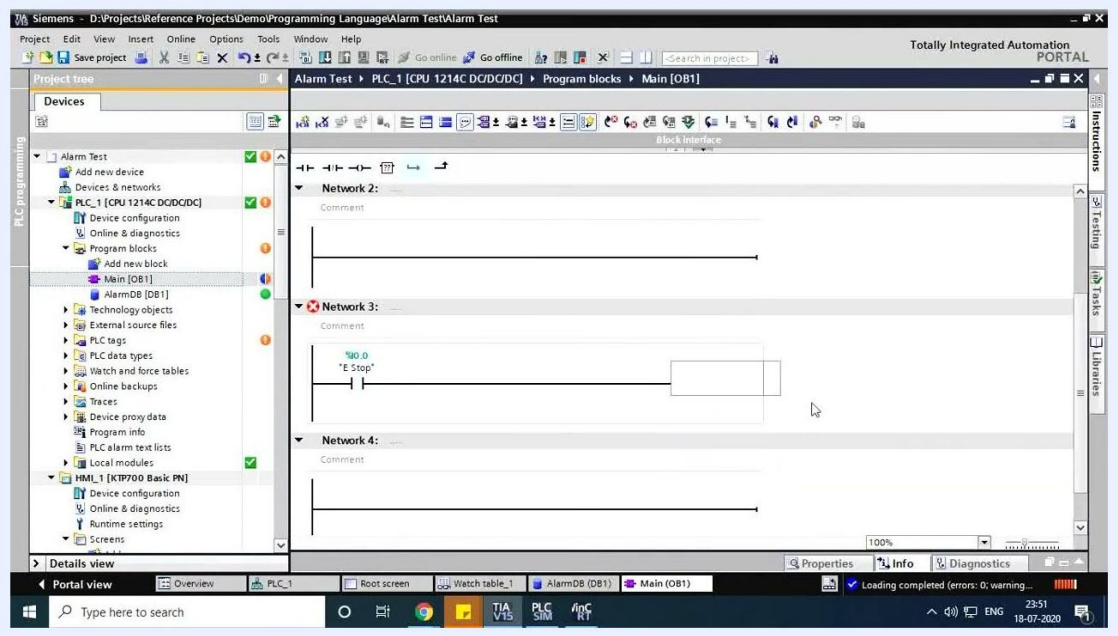
4. In the output coil assignment, open the dropdown menu. It lists the alarm signals from the AlarmDB.Alarms struct: "Air Pressure Low", "Emergency_Stop", and "Safety Door Open".

5. Select the alarm signal to link to the rung output.



Dropdown menu showing the available alarm signals from the AlarmDB.Alarms struct for the output assignment

The output coil is now ready to be linked to the selected alarm signal.



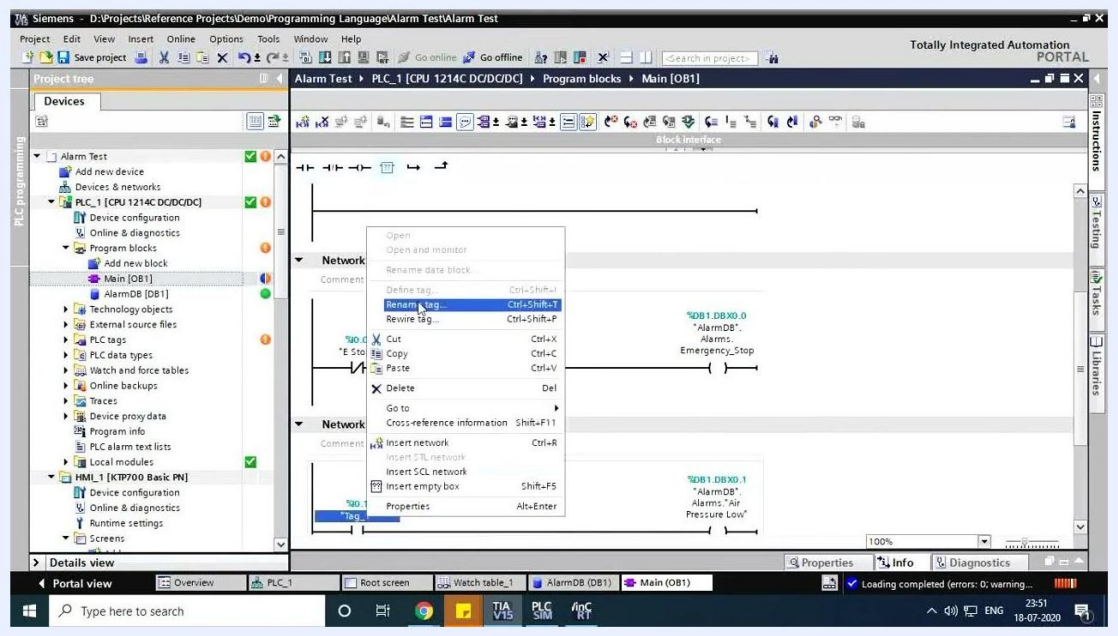
Ladder logic rung with the %I0.0 "E Stop" contact and the output coil ready for assignment

8. Review the Emergency Stop rung

Verify that Network 3, labeled "Emergency Stop", is configured correctly. It contains:

- A contact %I0.0 labeled "E Stop".
- An output coil %DB1.DBX0.0 labeled "AlarmDB".Alarms.Emergency_Stop.

This rung links the physical E-Stop input to the corresponding alarm signal in the data block.

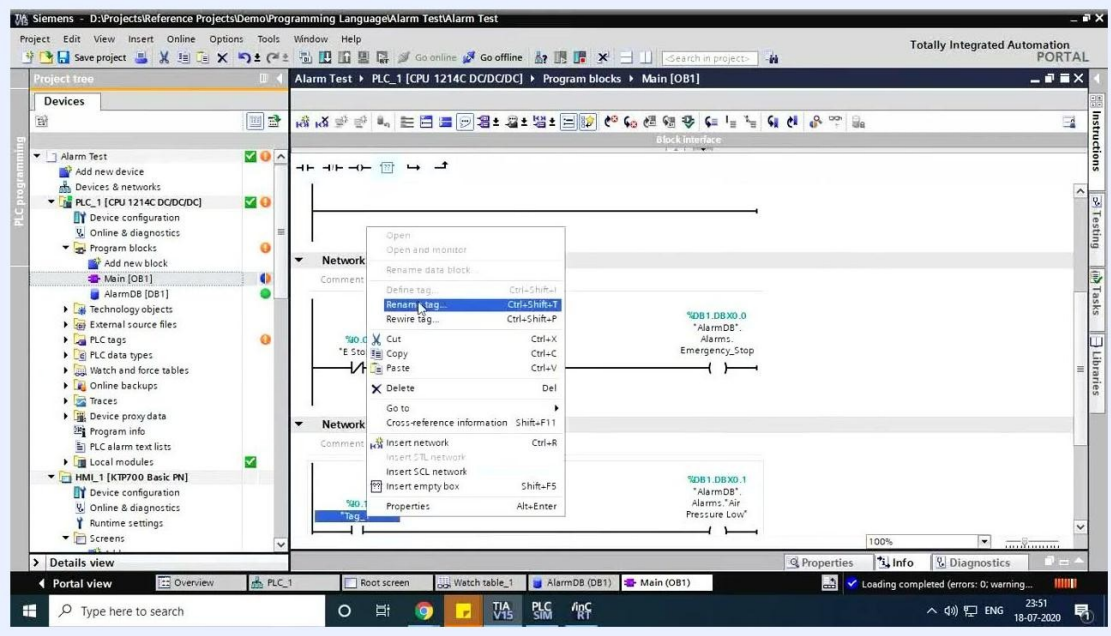


Ladder logic Network 3 with the Emergency Stop alarm rung fully configured

9. Add the Air Pressure Low alarm logic

1. In the ladder logic editor, go to **Network 4**.
2. Add a contact %I0.1 labeled "Air Pressure Low".
3. Add an output coil %DB1.DBX0.1 labeled "AlarmDB".Alarms.Air Pressure Low.

4. Right-click the output coil and select **Rename tag...** to assign the correct tag name for the alarm output.

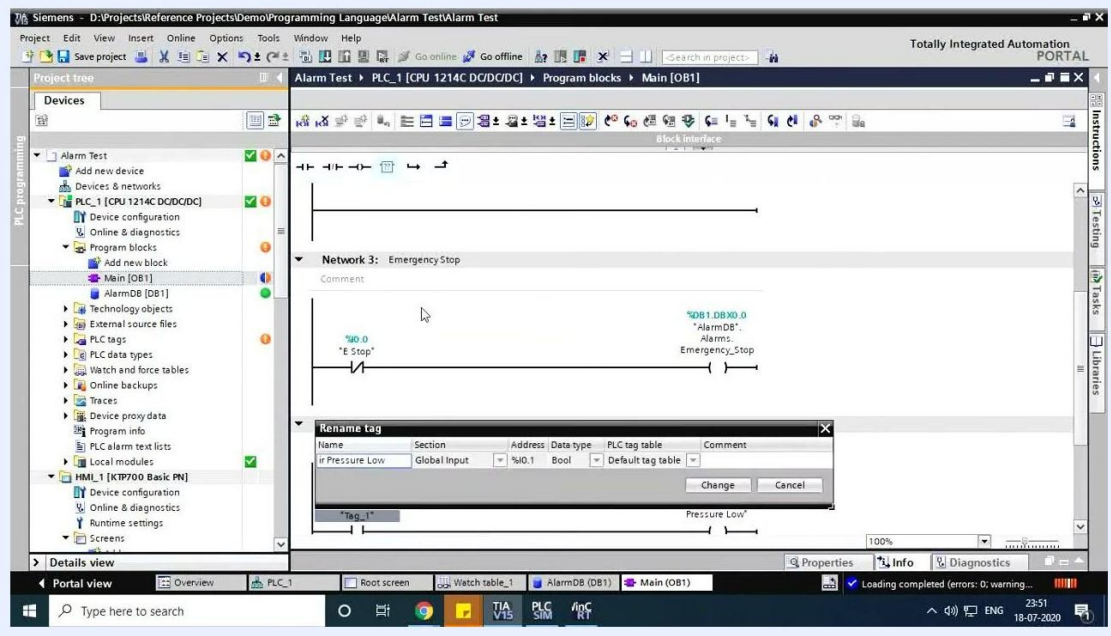


Context menu for the output coil with Rename tag selected for the Air Pressure Low alarm

5. In the **Rename tag** dialog, enter these values:

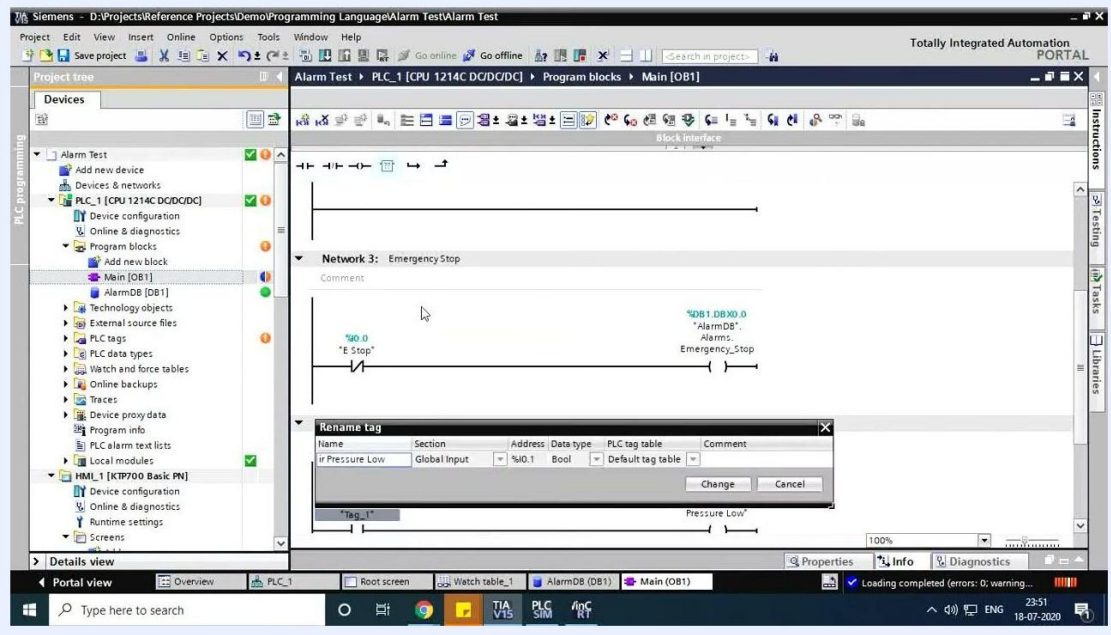
   - **Name:** Air Pressure Low
   - **Section:** Global Input
   - **Address:** %I0.1
   - **Data type:** Bool
   - **PLC tag table:** Default tag table

6. Click **Change** to confirm.



Rename tag dialog for the Air Pressure Low alarm output

Confirm that the rung now has the contact %I0.1 ("Air Pressure Low") and the output coil %DB1.DBX0.1 ("AlarmDB".Alarms.Air Pressure Low).



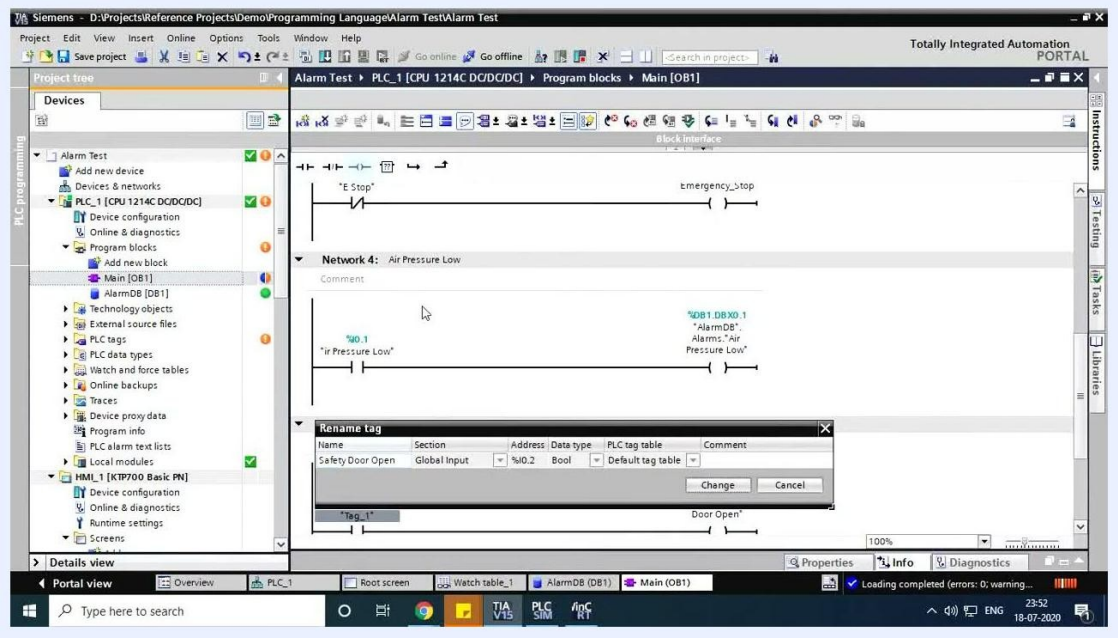
Ladder logic Network 4 with the Air Pressure Low alarm rung fully configured

10. Add the Safety Door Open alarm logic

1. In the ladder logic editor, go to **Network 5**.
2. Add a contact %I0.2 labeled "Safety Door Open".
3. Add an output coil %DB1.DBX0.2 labeled "AlarmDB".Alarms.Safety Door Open.
4. Right-click the output coil and select **Rename tag...**.
5. In the **Rename tag** dialog, enter these values:

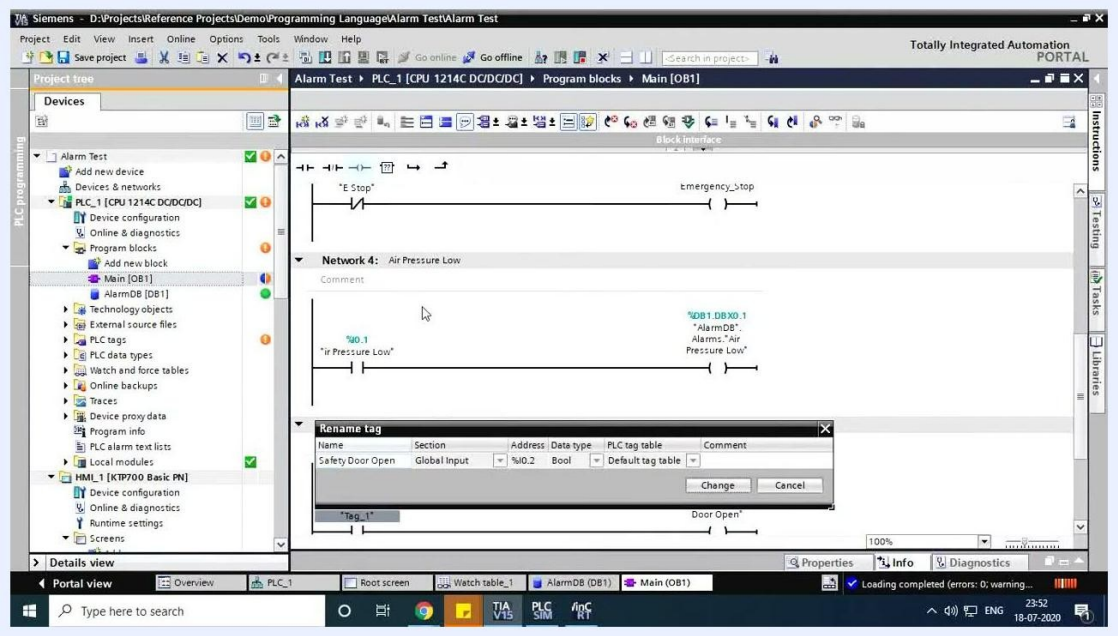
    - **Name:** Safety Door Open
    - **Section:** Global Input
    - **Address:** %I0.2
    - **Data type:** Bool
    - **PLC tag table:** Default tag table

6. Click **Change** to confirm.



Rename tag dialog for the Safety Door Open alarm output

Confirm that the rung now has the contact %I0.2 ("Safety Door Open") and the output coil %DB1.DBX0.2 ("AlarmDB".Alarms.Safety Door Open).



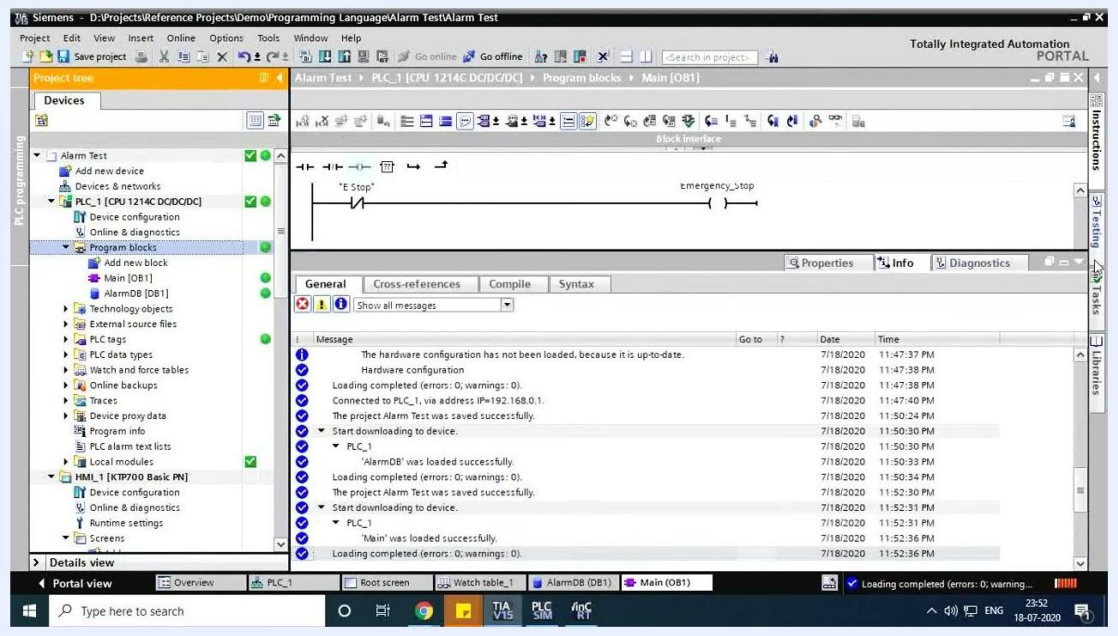
Ladder logic Network 5 with the Safety Door Open alarm rung fully configured

11. Save and download the updated PLC program

Save the project, then download the updated PLC program to the device. In the lower pane, verify these messages:

- "The hardware configuration has not been loaded, because it is up-to-date."
- "Loading completed (errors: 0; warnings: 0)."
- "AlarmDB was loaded successfully."
- "Main was loaded successfully."

Confirm that the **Info** tab shows no errors or warnings.



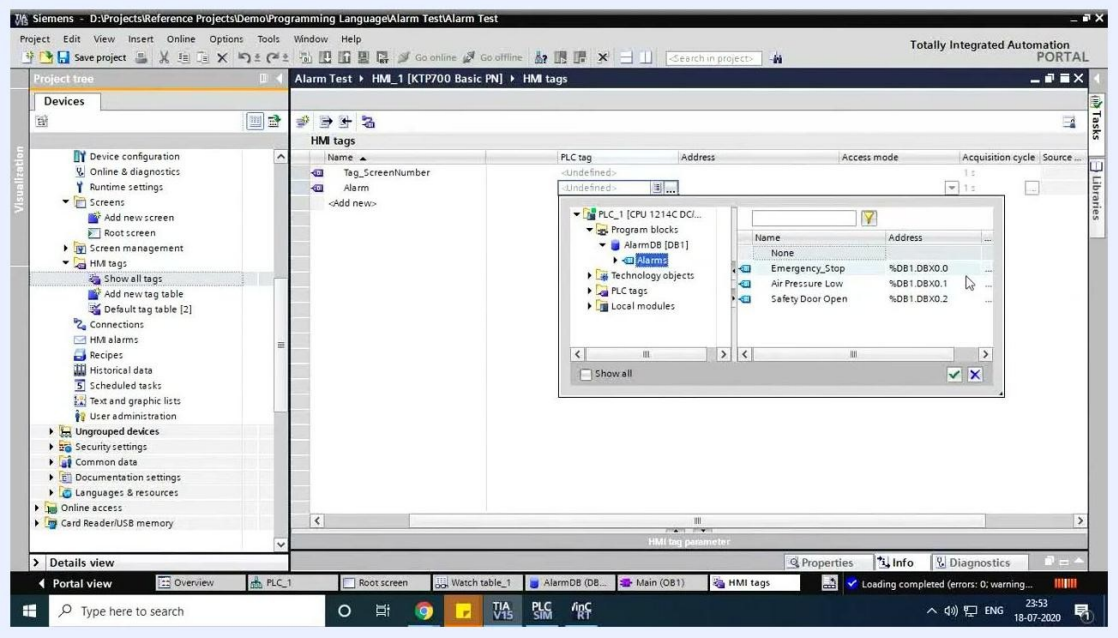
Compilation and download messages confirming the PLC program update succeeded

Configure HMI tags and discrete alarms

12. Open the HMI tags table

1. In the **Project tree**, expand Devices > HMI_1 [KTP700 Basic PN] > Screens > HMI tags.
2. Select HMI tags to display the tag table.

The table lists two tags: Tag_ScreenNumber and Alarm. The right pane shows a PLC tag selection dialog with the available tags Emergency_Stop, Air Pressure Low, and Safety Door Open under AlarmDB [DB1]. This is the initial tag configuration view.

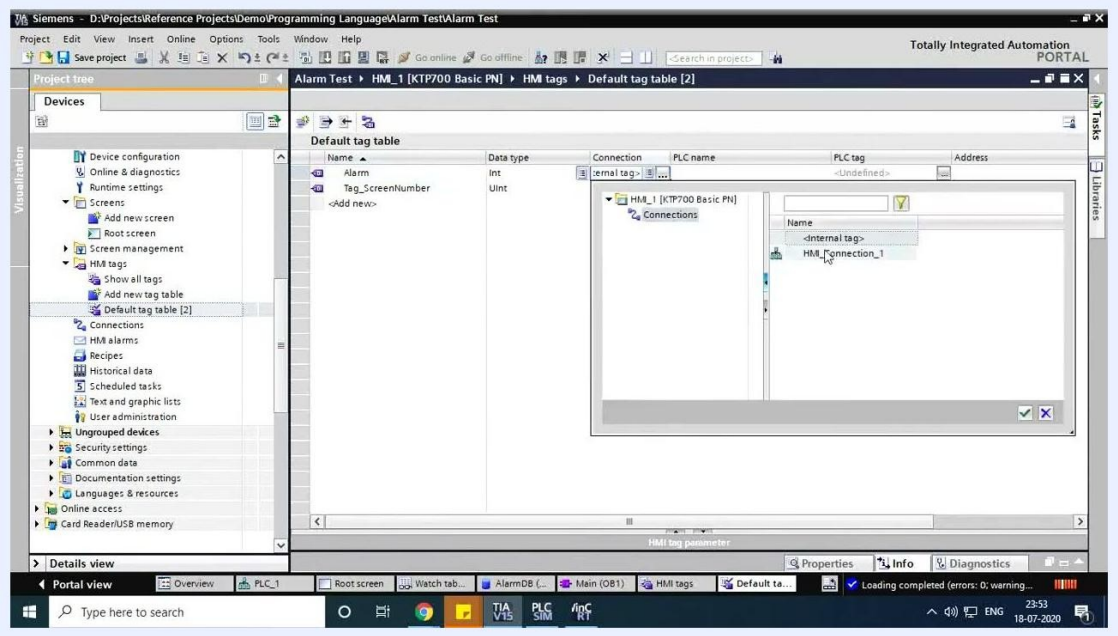


HMI tags table open with the PLC tag selection dialog showing the available alarm tags and addresses

13. Select the HMI connection

1. In the Default tag table [2], click the connection field for the Alarm tag.

2. In the dialog that shows the available connections (<internal tag> and HMI_Connection_1), select HMI_Connection_1 to link the HMI tag to the PLC.



Selecting HMI_Connection_1 as the connection for the Alarm tag in the default tag table

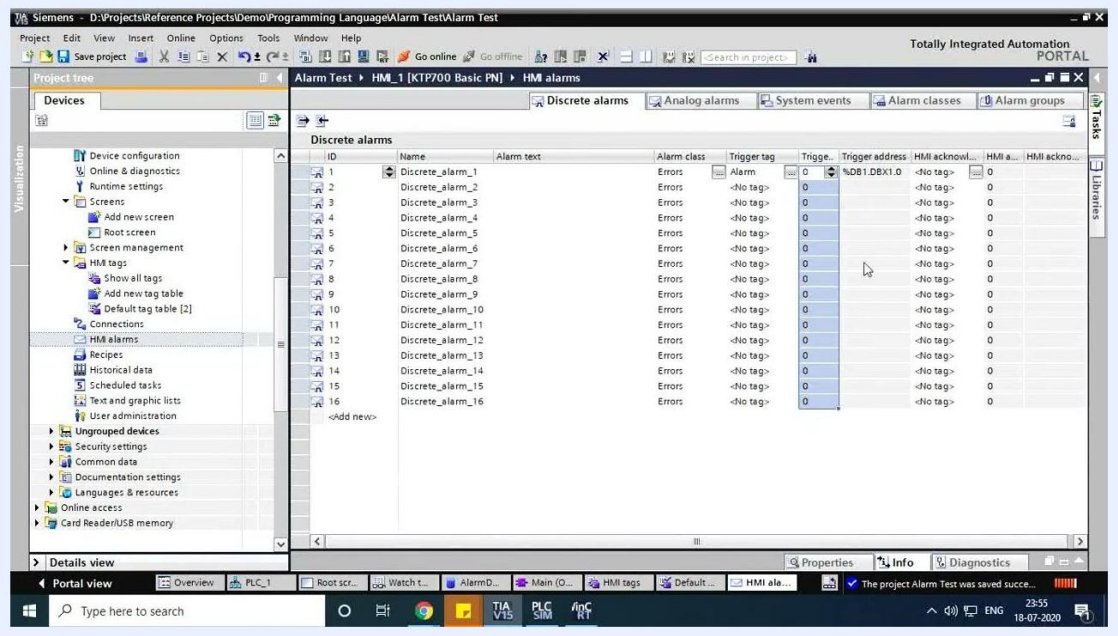
14. Assign the PLC name and tag

1. In the same table, set the PLC name for the Alarm tag to PLC_1.
2. Click the PLC tag selection button to open the PLC tag browser. It displays Program blocks, Technology objects, PLC tags, and Local modules.
3. Make sure the correct PLC (PLC_1) is selected.

The table then shows the Alarm tag with these values:

- Connection: HMI_Connection_1
- PLC name: PLC_1
- Address: %DB1.DBW0

- Access mode: <absolute access>



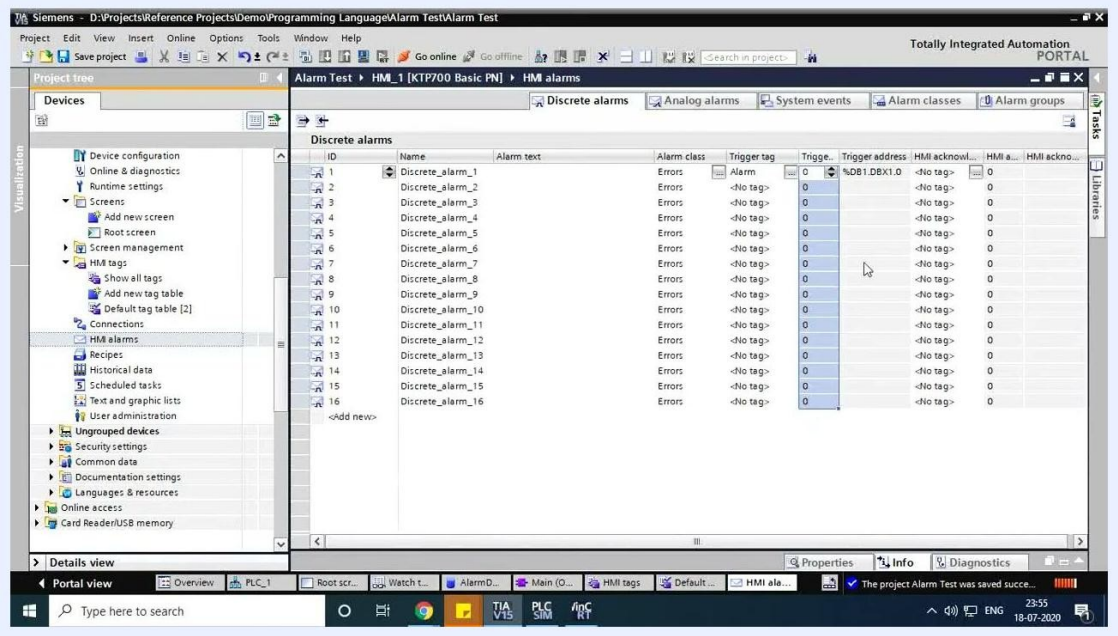
The Alarm tag assigned to HMI_Connection_1 and PLC_1, with address %DB1.DBW0 and absolute access

15. Open the discrete alarms

In the project tree, expand HMI alarms and select Discrete alarms. The table lists an alarm with these values:

- ID: 1
- Name: Discrete_alarm_1
- Alarm class: Errors
- Trigger tag: Alarm
- Trigger address: %DB1.DBX1.0

The trigger tag is linked to the Alarm HMI tag you configured earlier.



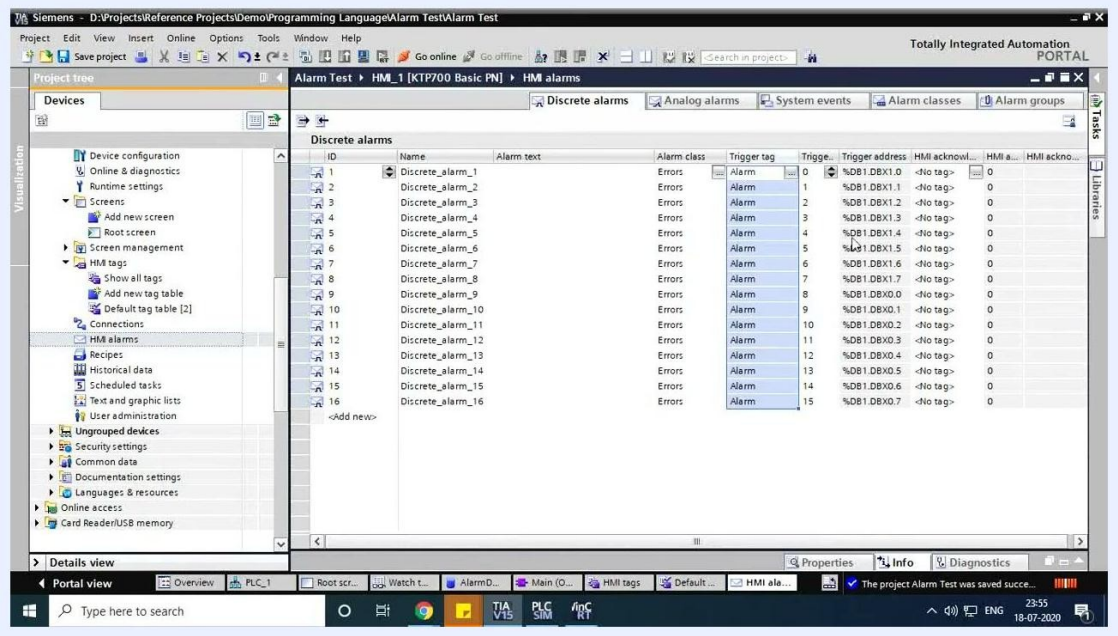
Discrete alarms table showing Discrete_alarm_1 with trigger tag Alarm and address %DB1.DBX1.0

16. Review the discrete alarms table

Review the Discrete alarms table under HMI alarms for HMI_1 [KTP700 Basic PN]. It lists 16 alarms, Discrete_alarm_1 to Discrete_alarm_16, each with:

- ID (1–16).
- Name (for example, Discrete_alarm_1).
- Alarm class, all set to Errors.
- Trigger tag, Alarm.
- Trigger bit (0–15).
- Trigger address (for example, %DB1.DBX1.0, %DB1.DBX1.1, ..., %DB1.DBX0.7).
- HMI acknowledgment tag and address (all <No tag>, 0).

This step is a review only; you do not edit anything yet.

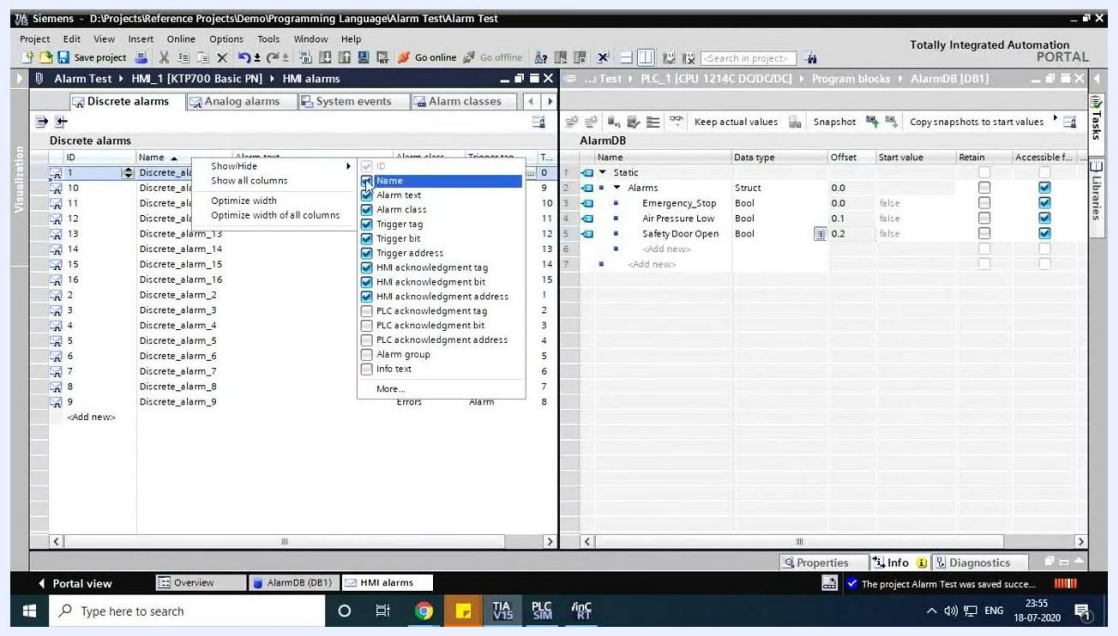


Discrete alarms table showing 16 alarms, all with alarm class Errors, trigger tag Alarm, and unique trigger addresses

17. Customize the visible columns

1. Right-click the column header area of the Discrete alarms table.
2. In the context menu, choose from these options:
   - **Show/Hide** columns, with a checkbox for each column (for example, Name, Alarm text, Alarm class, Trigger tag).
   - **Optimize width**.
   - **Optimize width of all columns**.
3. Select or deselect columns to customize the table view.

The right pane displays the AlarmDB PLC data block with the tags Emergency_Stop, Air Pressure Low, and Safety Door Open.

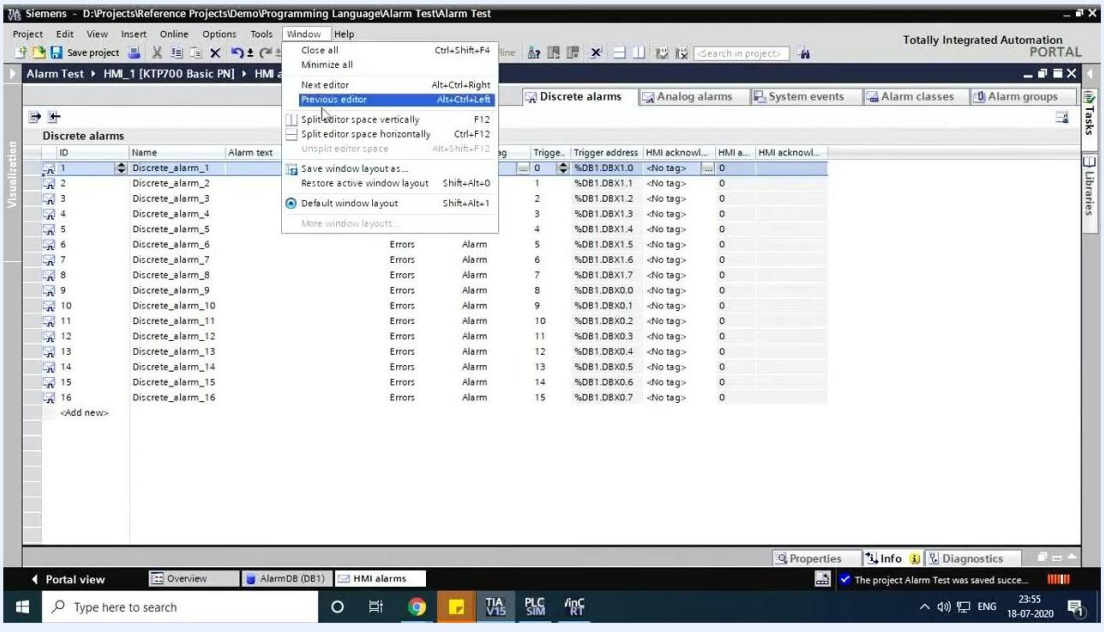


Show/Hide columns context menu open in the Discrete alarms table, with AlarmDB PLC tags visible on the right

18. Edit the alarm text and alarm class

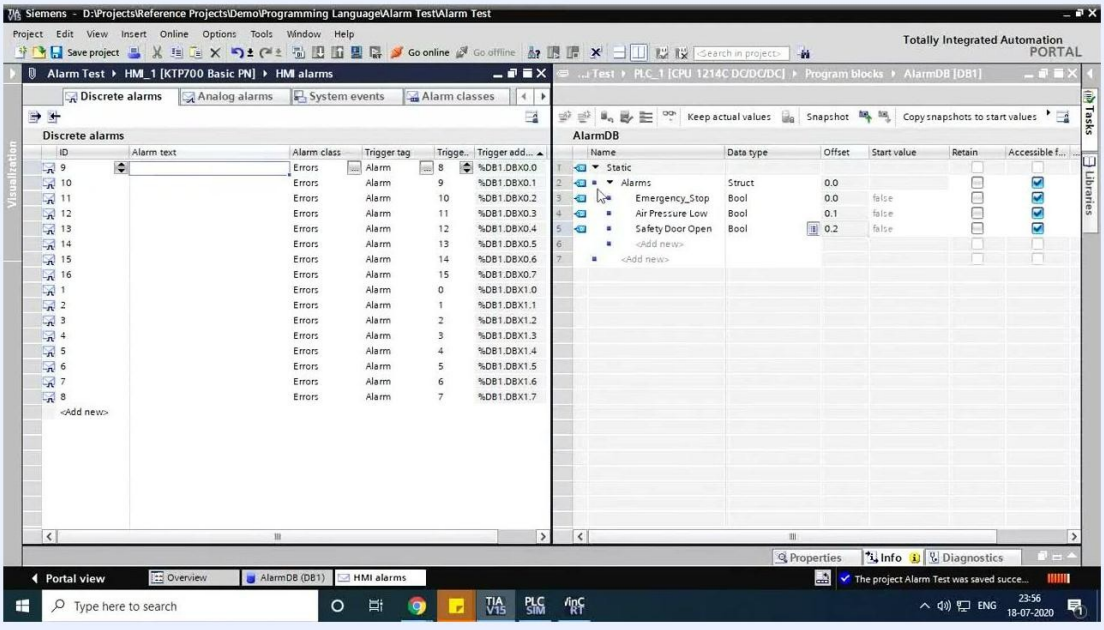
1. Select the alarm with ID 10 and begin editing its Alarm text and Alarm class fields. The Alarm text field is empty and ready for input.

2. Change the Alarm class from Errors to another class.



Editing the Alarm text and Alarm class fields for a discrete alarm, with AlarmDB PLC tags visible

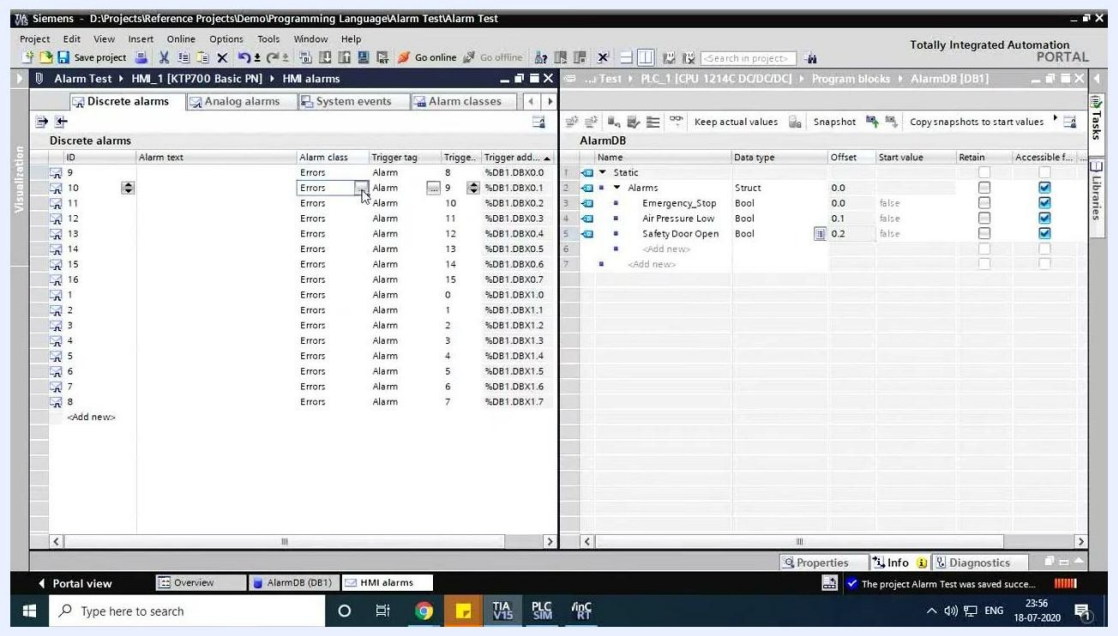
3. Open the Alarm class dropdown. It shows the available classes: Acknowledgement, Errors, No Acknowledgement, and Warnings.



Alarm class dropdown open, showing the available classes for assignment

4. Select Warnings for alarm ID 10.

The Alarm class field for this alarm now shows Warnings, while all other alarms remain set to Errors.



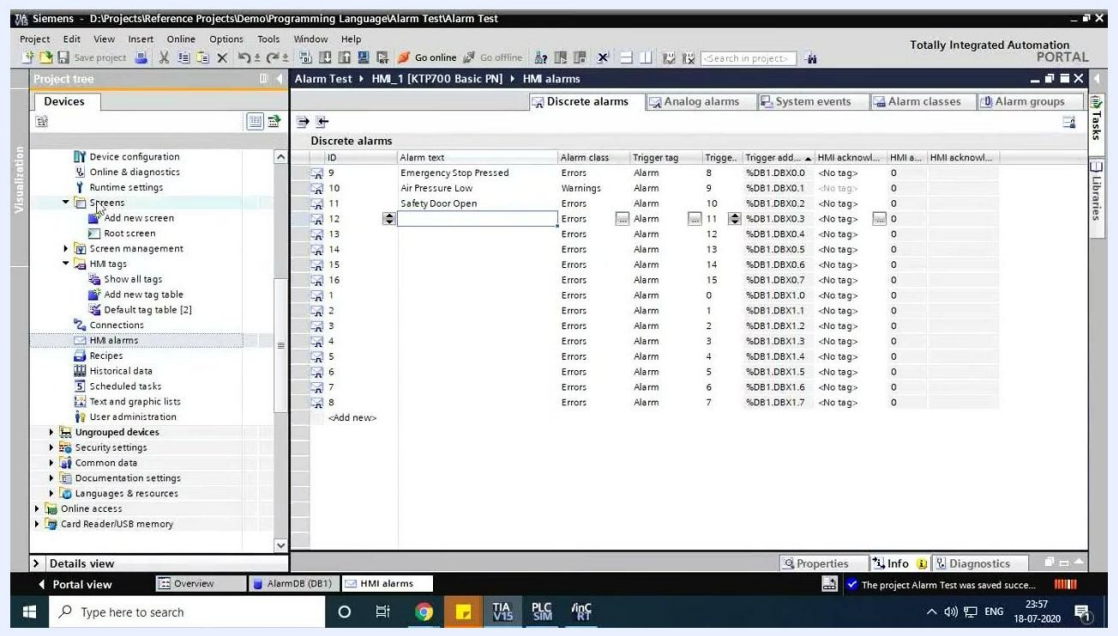
Alarm class for one alarm changed to Warnings while the others remain Errors

19. Enter descriptive alarm texts

In the Discrete alarms table, enter a descriptive text for each alarm:

- Alarm ID 10 (alarm class Warnings): Emergency Stop Pressed.
- Alarm ID 11 (alarm class Errors): Air Pressure Low.
- Alarm ID 12 (alarm class Errors): Safety Door Open.

The right pane shows the AlarmDB tags Emergency_Stop, Air Pressure Low, and Safety Door Open, which confirms the mapping between alarm texts and PLC tags. No other alarms are edited at this stage.



Discrete alarms table with descriptive texts entered for Emergency Stop Pressed, Air Pressure Low, and Safety Door Open, with AlarmDB PLC tags visible

Review the updated table to confirm the entries:

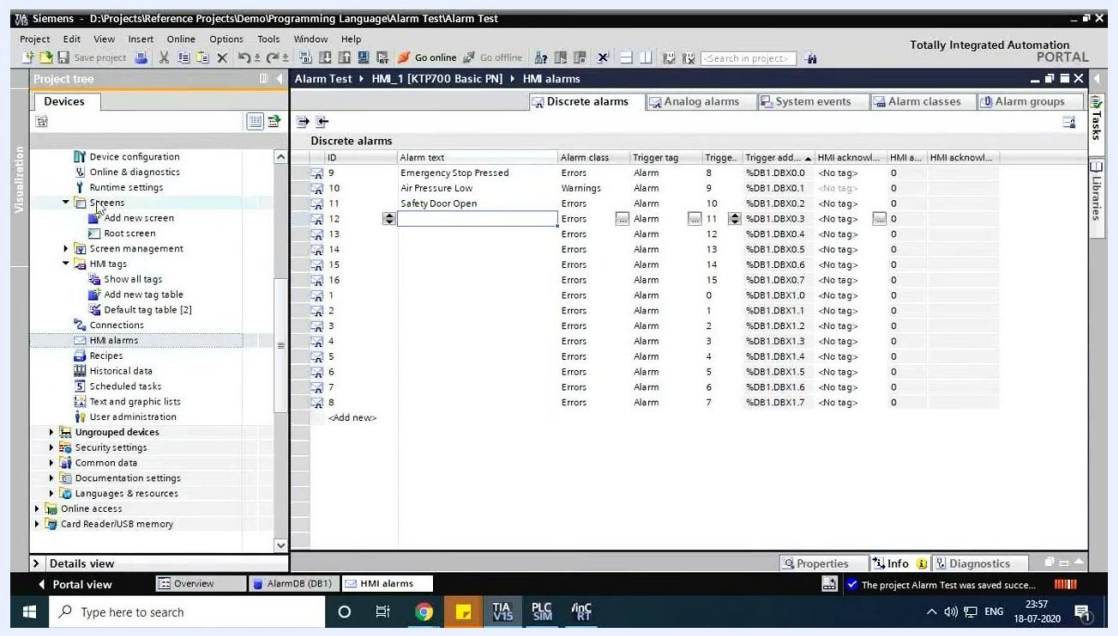
- ID 10: Emergency Stop Pressed (Warnings)
- ID 11: Air Pressure Low (Errors)
- ID 12: Safety Door Open (Errors)

All other alarms keep their default names and classes.

Configure the alarm view display properties

20. Open the HMI root screen

Navigate to the Root screen under Screens for the HMI device. The root screen editor opens with a blank HMI layout showing the "SIEMENS" logo and the "SIMATIC HMI" header. The right pane shows the **Toolbox** with basic objects (line, ellipse, rectangle, text, image) and controls, including the alarm view and user management. This is the workspace where you design the HMI interface that displays the alarms.



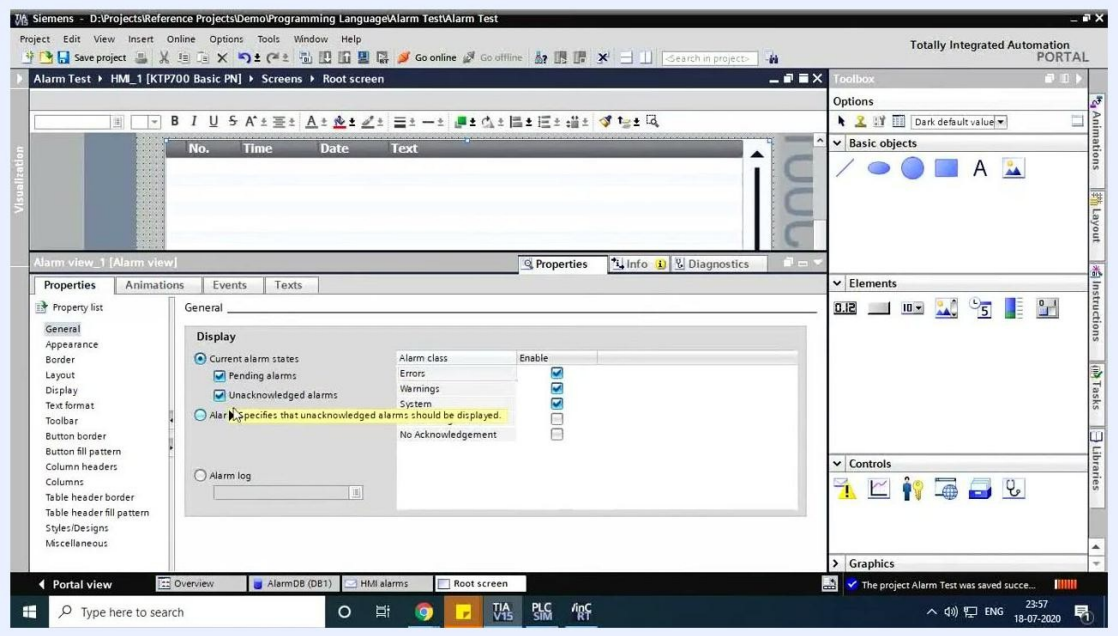
Root screen editor open with the Siemens logo, SIMATIC HMI header, and toolbox visible

21. Set the alarm view display options

Select the Alarm view control on the root screen. In the **Properties** pane (**General > Display**), set these options:

- Select Current alarm states to display active alarms.
- Enable Pending alarms.
- Enable Unacknowledged alarms.
- Under Alarm class, enable Errors, Warnings, and System.
- Leave Acknowledgement and No Acknowledgement disabled.

Tooltips explain each option, for example "Specifies that active alarms of the selected alarm class are displayed". This configuration makes the HMI show the relevant active and pending alarms to the operator.

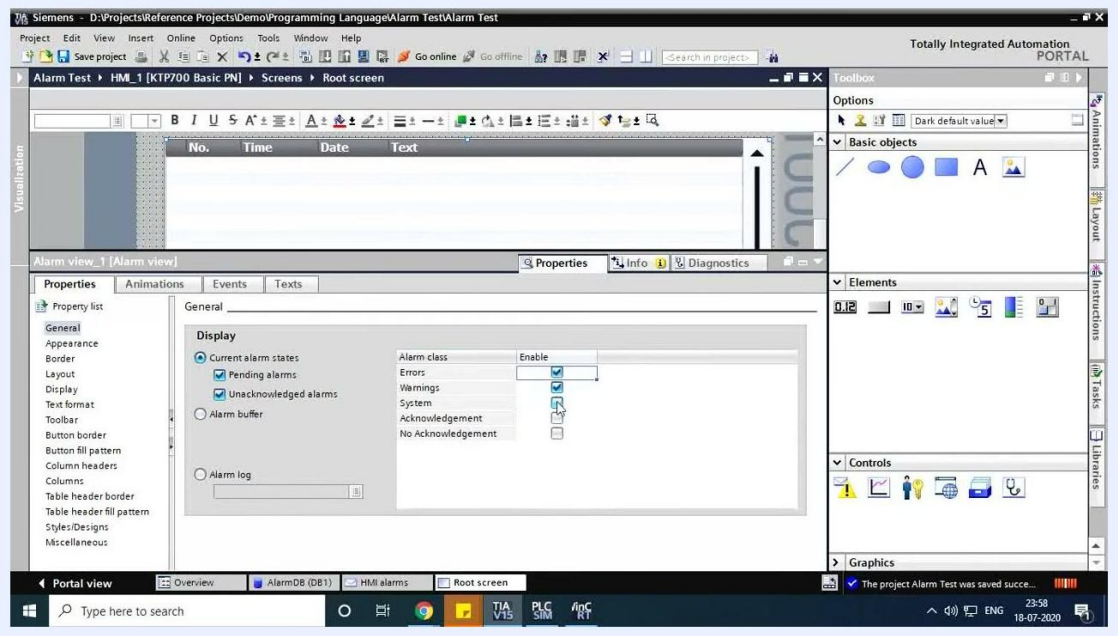


Alarm view properties with display options for current alarm states, pending alarms, unacknowledged alarms, and enabled alarm classes

22. Adjust the alarm classes in the alarm view

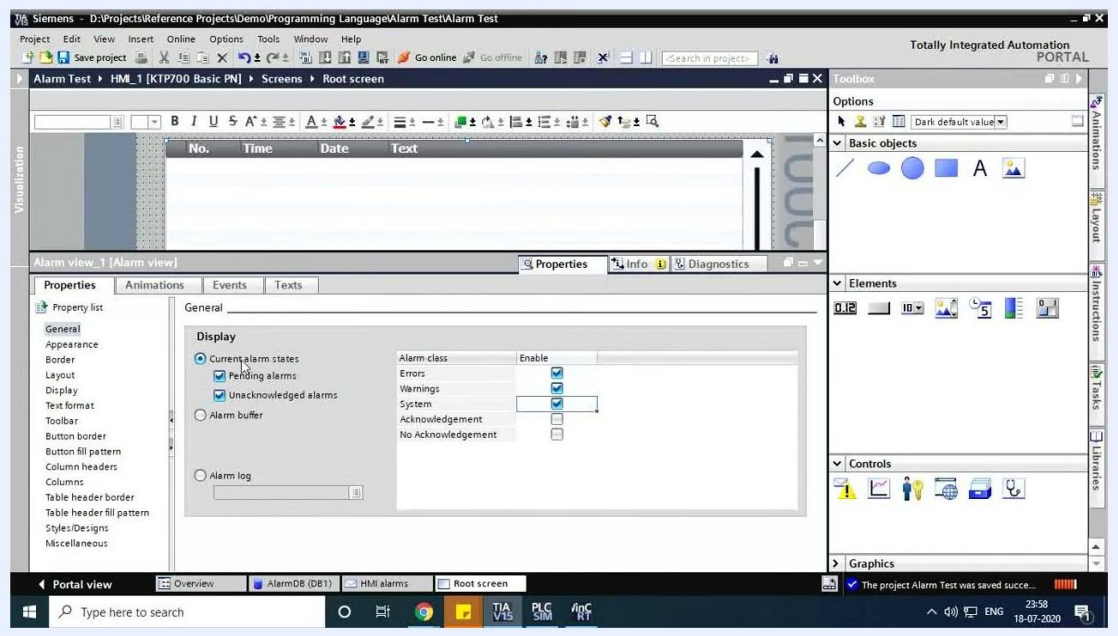
1. Open the properties panel for Alarm view_1 [Alarm view].
2. On the **General** tab under **Display**, make sure Current alarm states is selected and both Pending alarms and Unacknowledged alarms are checked.
3. In the Alarm class table, keep Errors and Warnings checked and Acknowledgement and No Acknowledgement unchecked.

4. Click the System checkbox to toggle that class.



Alarm class configuration in the Alarm view properties, with the Errors, Warnings, and System checkboxes being toggled

5. Confirm that System is now unchecked, while Errors and Warnings remain enabled. Also confirm that Current alarm states is still selected with both Pending alarms and Unacknowledged alarms checked.

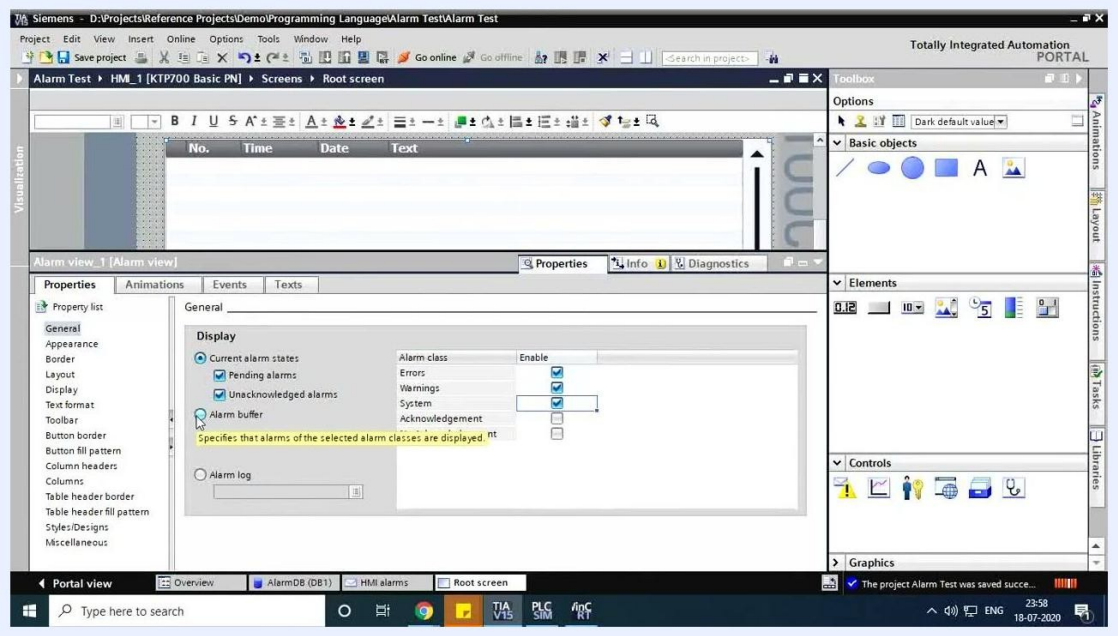


Alarm view properties showing Errors and Warnings enabled, System disabled, and the alarm state options selected

23. Enable the alarm buffer option

1. Under **Display**, select the Alarm buffer radio button.
2. Read the tooltip: "Specifies that alarms of the selected alarm classes are displayed."

3. Confirm that Errors and Warnings remain enabled in the alarm class table.



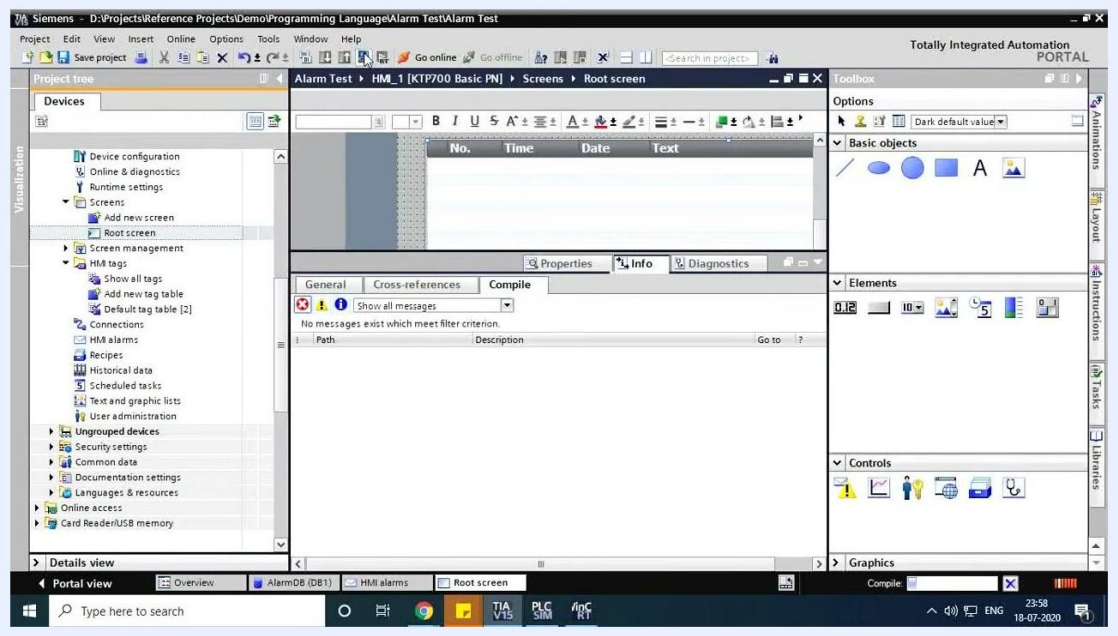
Alarm buffer option selected in the Alarm view properties, with a tooltip explaining its function

Compile the project and start the HMI simulation

24. Compile the project

1. Switch to the **Info** tab at the bottom of the screen.
2. Click the **Compile** tab to check for errors or warnings.

3. Confirm that the message area displays "No messages exist which meet filter criterion", which indicates a successful compile.

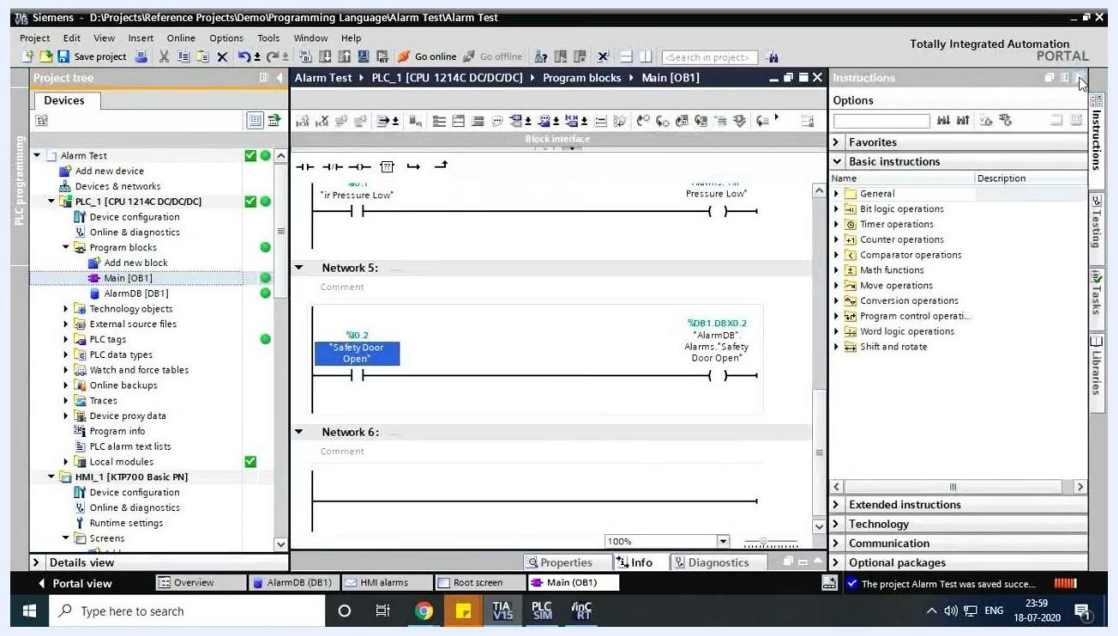


Compile window showing no errors or warnings after compilation

25. Start the HMI simulation

1. When the dialog appears with the message "Start simulation. The simulation starts with screen Root screen.", read it.
2. Optionally, check Do not show this message again if you do not want to see this prompt in the future.

3. Click **OK** to proceed.



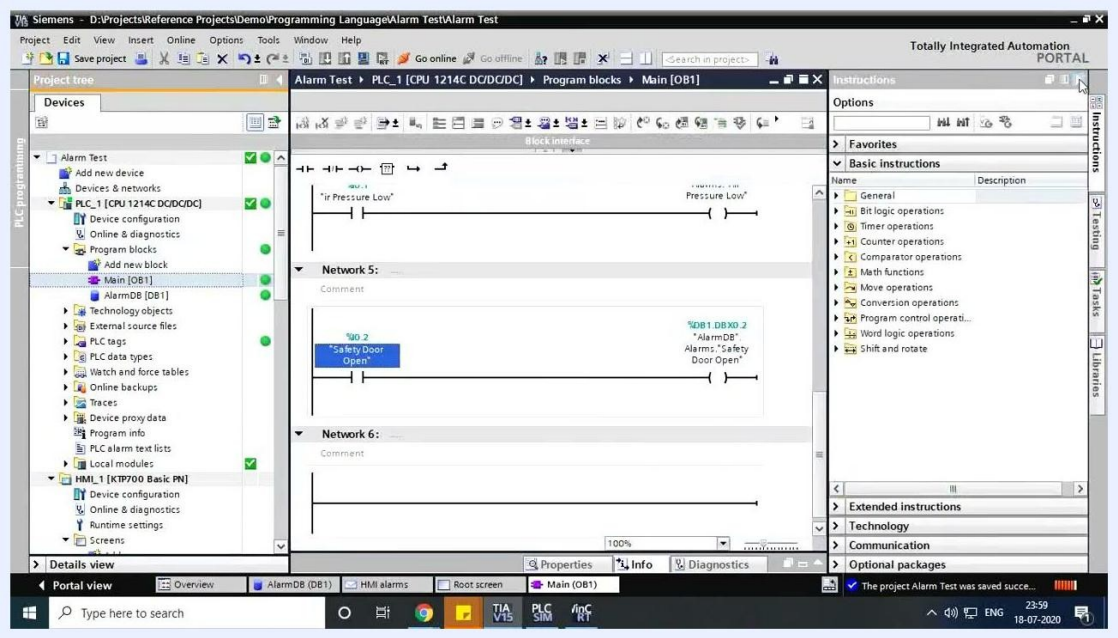
Start simulation dialog with the message about the simulation starting on the Root screen and the OK button

26. Open the PLC program block for alarm testing

Navigate to Main [OB1] under Program blocks for PLC_1 [CPU 1214C DC/DC/DC]. The ladder logic diagram shows the networks. Network 5 is highlighted and labeled "Safety Door Open", with the rung %Q0.2 "Safety Door Open" and %DB1.DBX0.2 "AlarmDB".Alarms."Safety Door Open".

27. Observe the HMI alarm simulation

The screen is split between TIA Portal and a simulated HMI panel labeled "SIMATIC HMI". The HMI panel displays an alarm icon with a count of 1. The alarm table shows a new entry with the date 7/18/2020 and the text "Emergency Stop Pressed". The PLC ladder logic for "Emergency Stop" and "Air Pressure Low" is visible alongside it.



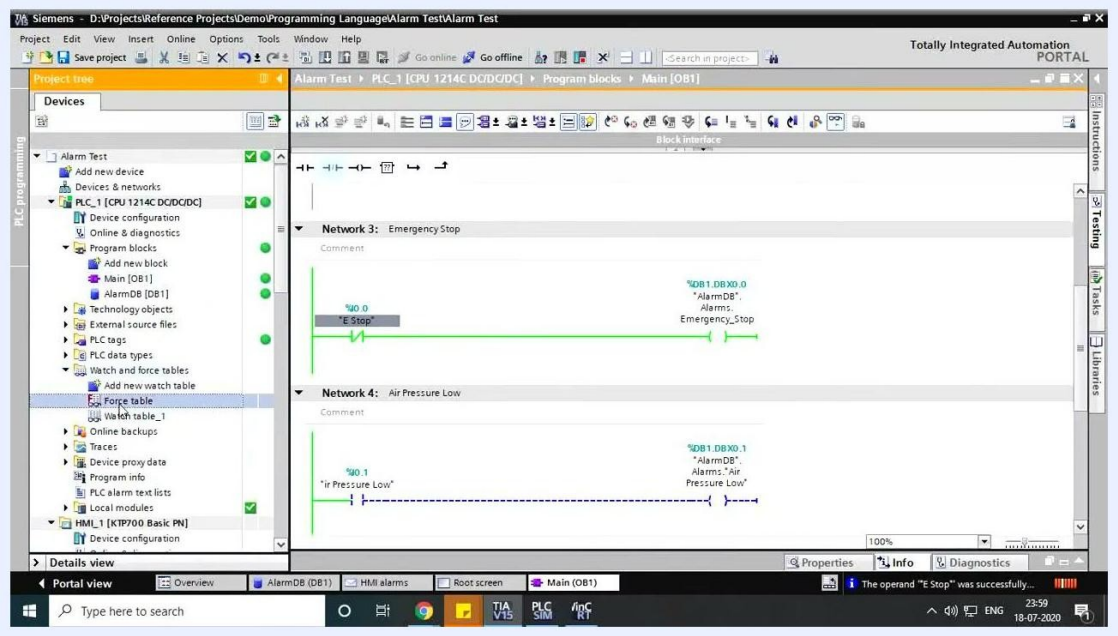
Simulated HMI panel showing the active alarm "Emergency Stop Pressed" next to the corresponding PLC ladder logic

Force PLC tag values and observe alarm behavior

28. Open the Modify menu for a PLC tag

1. In Main [OB1], right-click the %Q0.0 "E Stop" contact in Network 3 ("Emergency Stop").

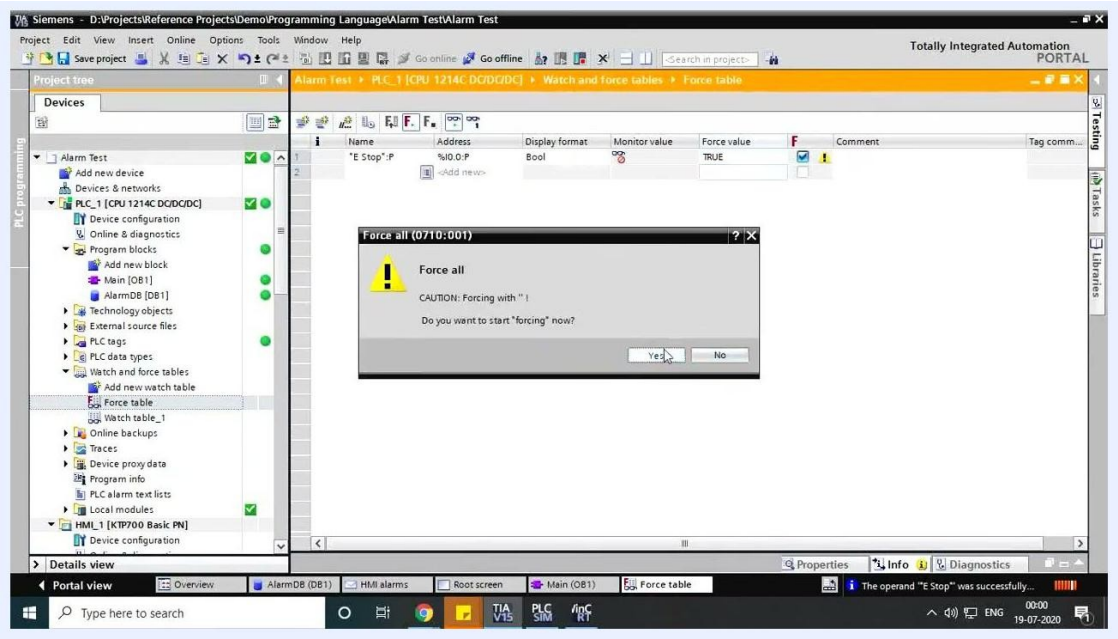
2. In the context menu, hover over **Modify** to expand its submenu. It offers **Modify to 0**, **Modify to 1**, and **Modify operand value**.



Context menu open on the E Stop contact in the PLC ladder logic, with Modify highlighted and its submenu visible

29. Open the force table and start forcing

In the **Force table** view, the tag "E Stop":P with address %Q0.0:P is listed, and its Force value is set to TRUE (checked). A warning dialog titled **Force all (0710:001)** appears with the message "CAUTION: Forcing with '!' Do you want to start 'forcing' now?" Click **Yes** to confirm.

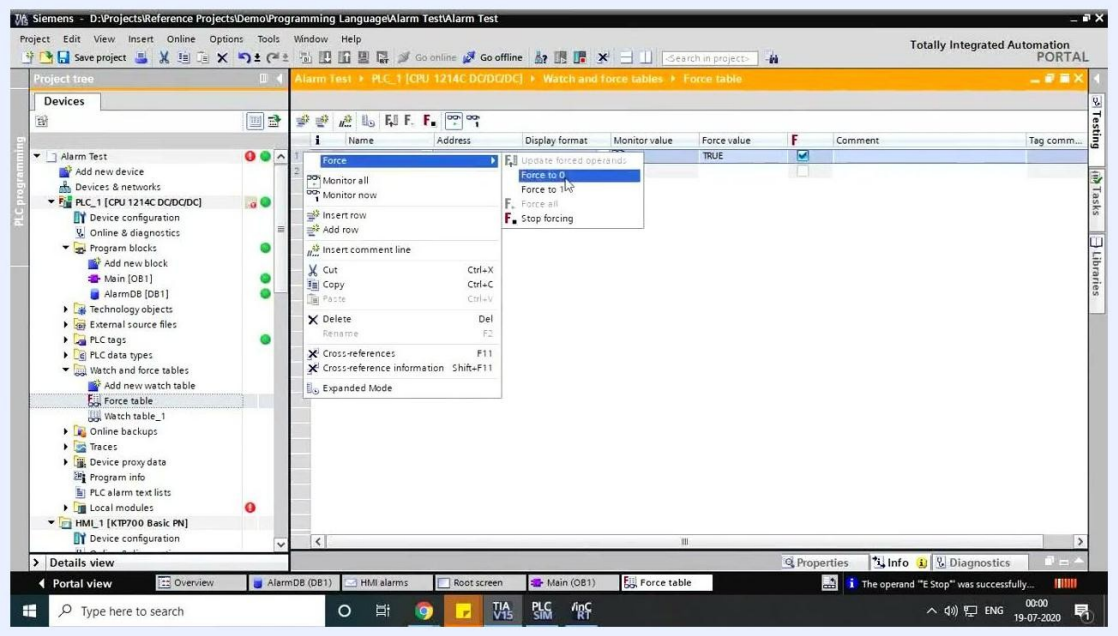


Force table with the E Stop tag set to TRUE and a warning dialog asking you to confirm forcing

30. Force the E Stop tag to 0 and verify alarm clearance

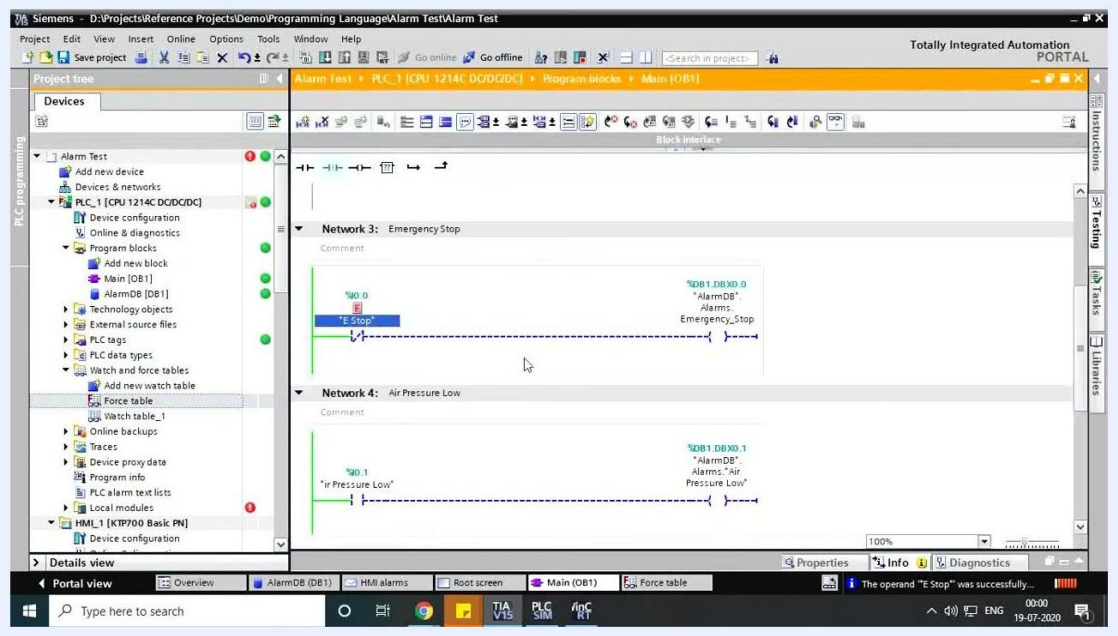
1. In the **Force table**, right-click the forced tag row. The Force value column currently shows TRUE.

2. Hover over **Force** in the context menu, then select **Force to 0** from the submenu. This sets the forced value to `0` (FALSE).



Force table context menu open with Force to 0 highlighted for the E Stop tag

3. Return to the Main [OB1] ladder logic view. The %Q0.0 "E Stop" contact now shows a blue dashed line, which indicates it is forced to 0 (FALSE). The "Emergency Stop" rung is not energized. The "Air Pressure Low" contact in Network 4 is present but not yet forced.



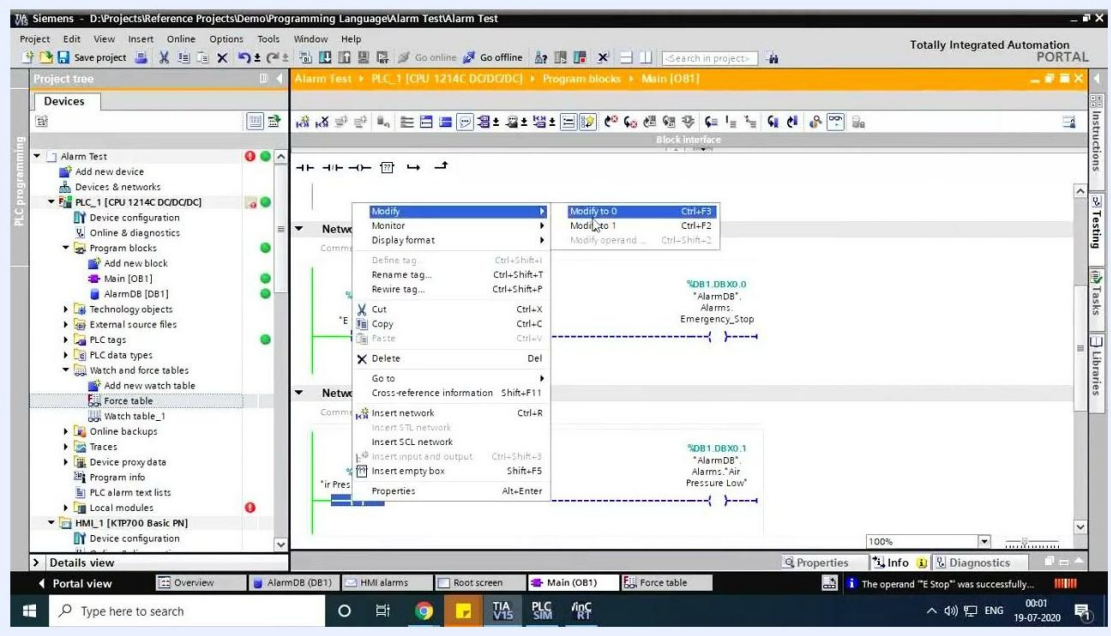
Ladder logic showing the E Stop contact forced to 0 with a blue dashed line and the Emergency Stop rung not energized

4. Switch to the SIMATIC HMI RT Simulator window. The alarm table displays Pending alarms but lists no active alarms, and the alarm icon shows a count of 0. All alarms are cleared.

31. Force the Air Pressure Low tag

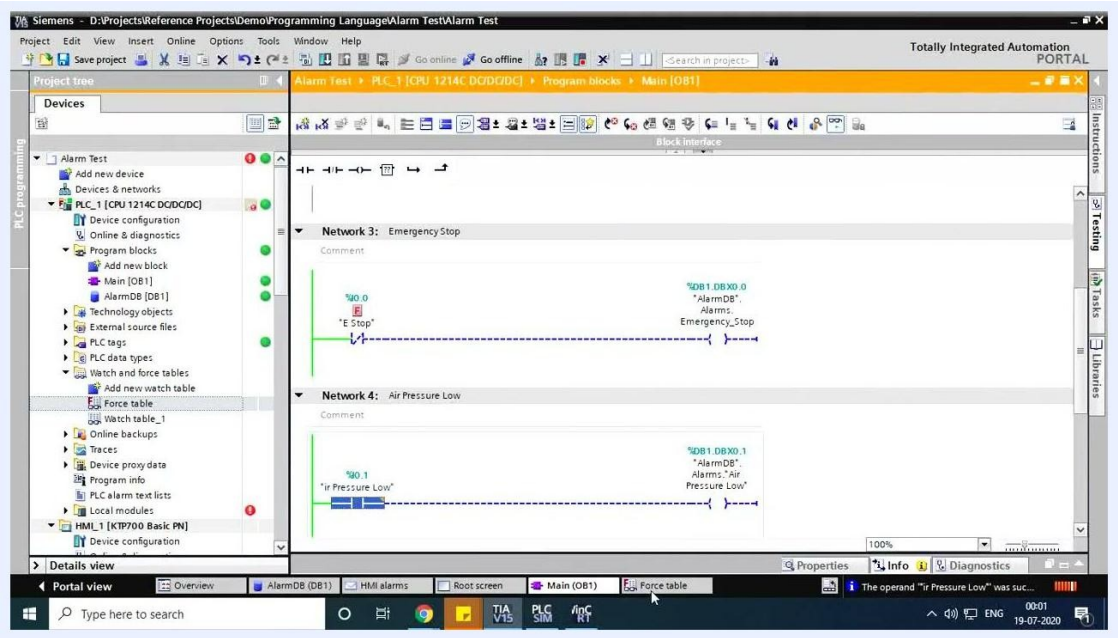
1. Return to the Main [OB1] ladder logic view.
2. Right-click the %Q0.1 "Air Pressure Low" contact in Network 4.

3. Hover over **Modify** and select **Modify to 0** (Ctrl+F3) or **Modify to 1** (Ctrl+F2) as needed.



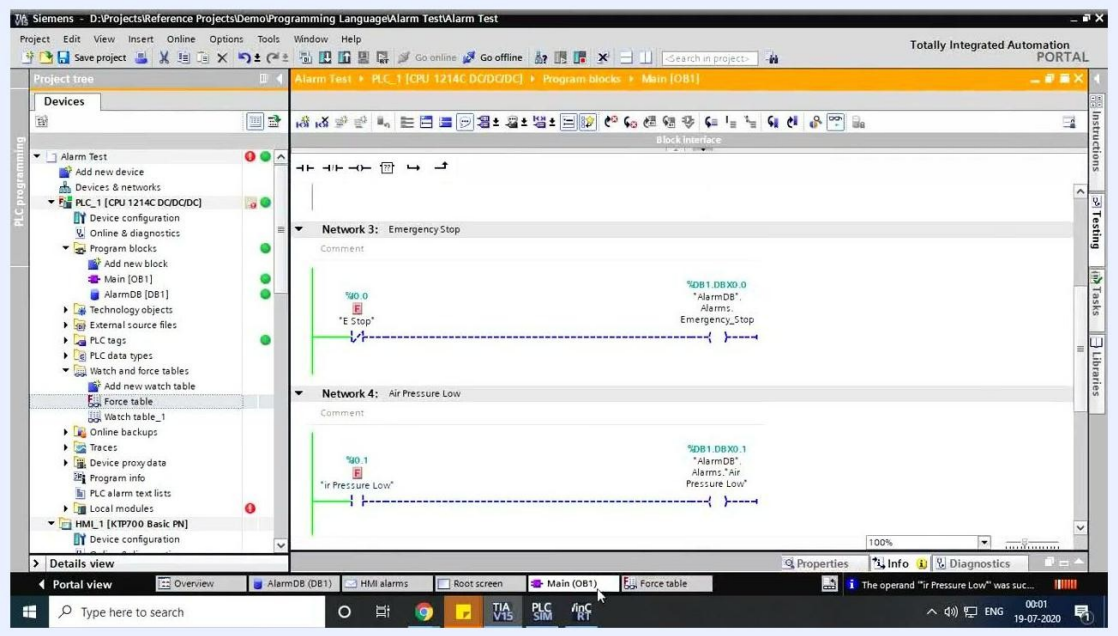
Context menu open on the Air Pressure Low contact in the PLC ladder logic, with the Modify submenu visible

After you modify the tag, the %Q0.1 "Air Pressure Low" contact shows a blue dashed line, which indicates it is being forced. The "Air Pressure Low" rung is energized (green line), while "E Stop" remains forced to 0 (blue dashed line). The status bar confirms: "The operand 'ir Pressure Low' was successfully..."



Ladder logic showing the Air Pressure Low contact forced and its rung energized, with E Stop still forced to 0

Once both tags are forced to 0, both %Q0.0 "E Stop" and %Q0.1 "Air Pressure Low" display blue dashed lines. Neither the "Emergency Stop" nor the "Air Pressure Low" rung is energized, and no alarms are triggered in this state.



Ladder logic showing both the E Stop and Air Pressure Low contacts forced to 0 with blue dashed lines and neither rung energized

Summary

You have now seen how to create alarms in TIA Portal end to end:

- You created the AlarmDB data block with an Alarms struct and three Boolean alarm signals with HMI access enabled.
- You linked each signal to a ladder logic rung and downloaded the program to the PLC.
- You mapped the Alarm HMI tag to the PLC, then reviewed and edited the discrete alarms, including alarm text and alarm class.
- You configured the alarm view on the HMI root screen, compiled the project, and started the HMI simulation.
- You forced the E Stop and Air Pressure Low tags to confirm how alarms appear and clear.

What's next

Continue with further HMI configuration and deployment steps, such as additional alarm visualization controls on the root screen.