



FAQ • 11/2015

Configuring and Parameterizing HART Modules

TIA Portal and SIMATIC PDM

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1 Introduction

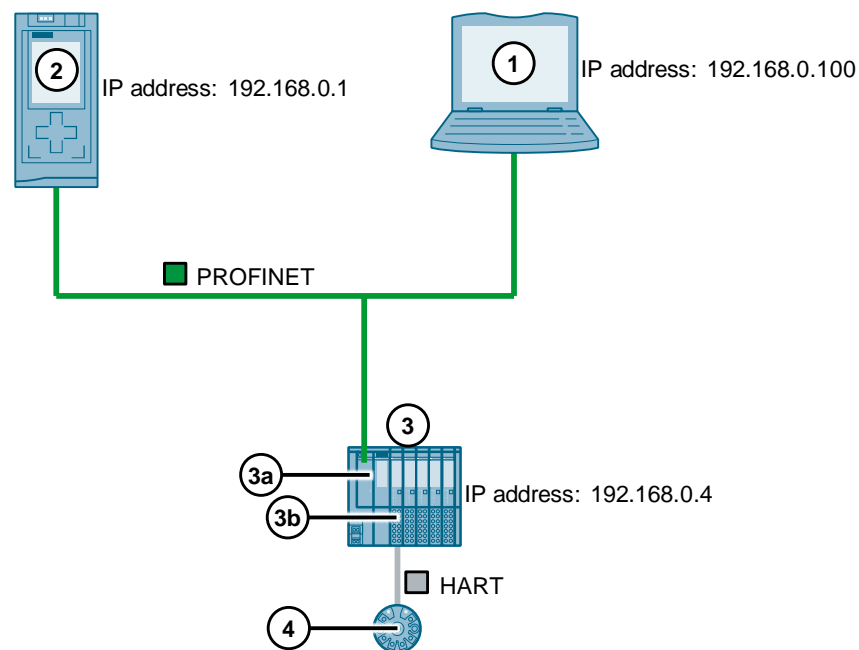
This document describes how to configure HART modules for connecting HART devices in the TIA Portal and parameterize the HART devices with SIMATIC PDM.

Requirements

1. SIMATIC Field PG as Engineering Station with:
 - TIA Portal: In this example we use STEP 7 V13 SP 1 Udp4 (TIA Portal).
 - SIMATIC PDM: In this example we use SIMATIC PDM V8.2 SP1 in "Standalone" mode without STEP 7.
2. PROFINET IO controller: CPU 1516-3 PN/DP (article number: 6ES7516-3AN01-0AB0), for example.
3. PROFINET IO device, ET 200SP, for example, consisting of:
 - a. IM 155-6 PN HF (article number: 6ES7155-6AU00-0CN0)
 - b. AI 4xI 2-wire 4..20mA HART (article number: 6ES7134-6TD00-0CA1)
4. HART device: SITRANS TH300 (article number: 7NG3212-0NN00)

The following figure illustrates the hardware configuration.

Figure 1-1



The IP address of the network card of the SIMATIC Field PG is in the same IP subnet as the IP address of the PROFINET IO controller and the PROFINET IO device. Set the following access point under "Set PG/PC Interface":

S7ONLINE (STEP 7) > Network card.TCPIP

Note

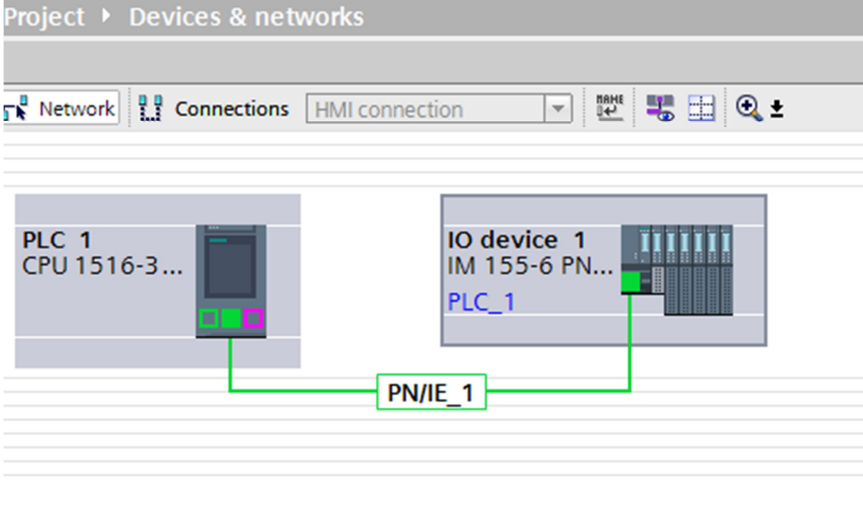
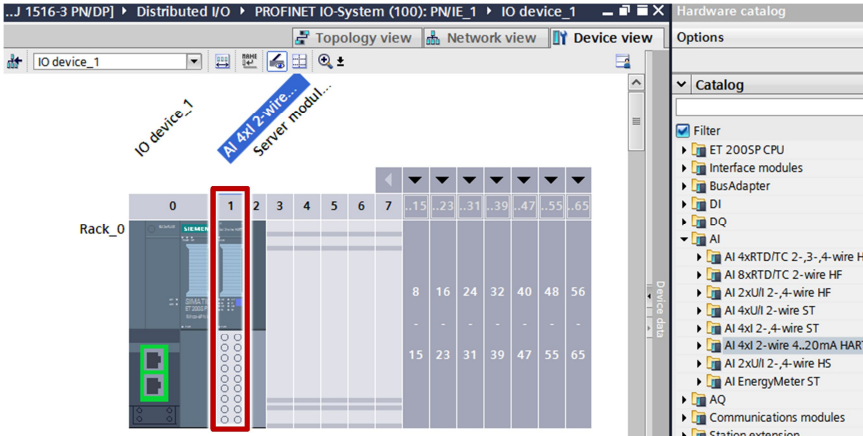
Using a data record gateway, an Engineering Station with SIMATIC PDM can reach field devices several subnets away. The entry below provides information about which modules support the "Data Record Routing" function and which therefore can be used as a data record gateway.

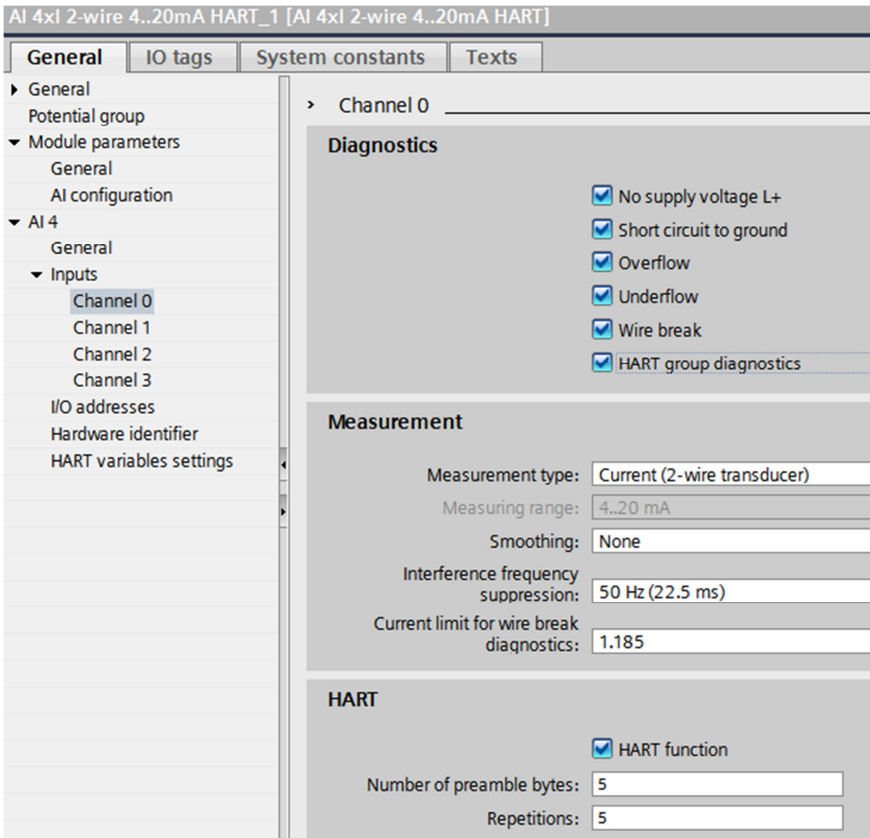
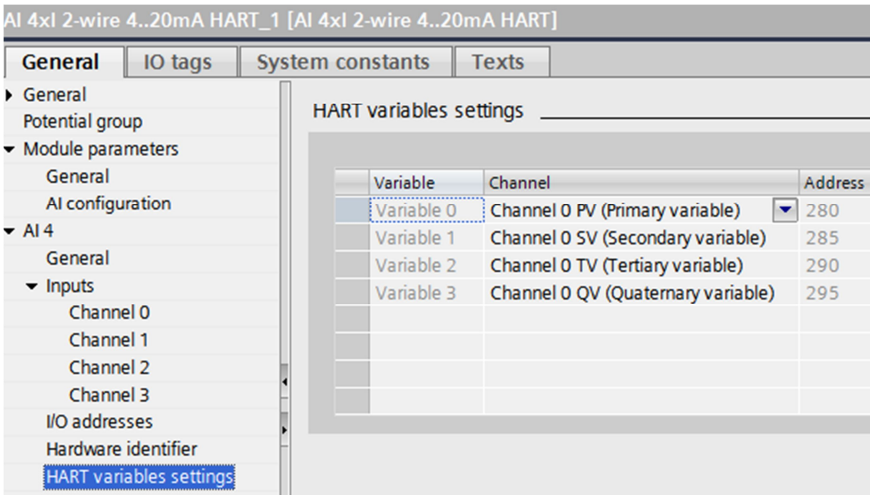
<https://support.industry.siemens.com/cs/ww/en/view/7000978>

2 Configuring the HART Module in the TIA Portal

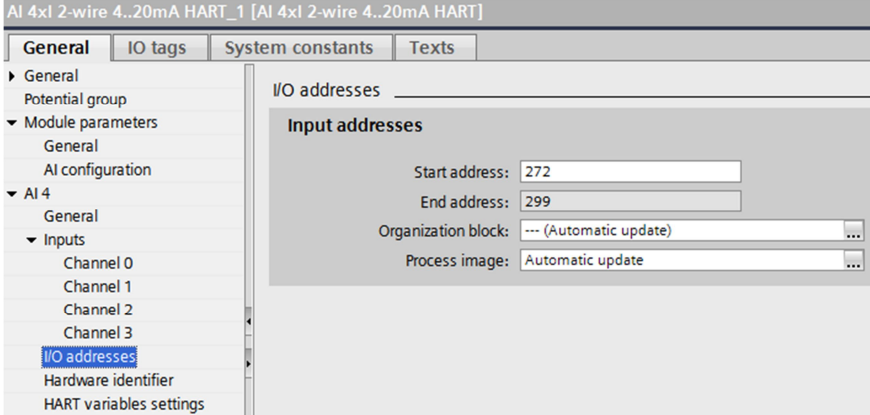
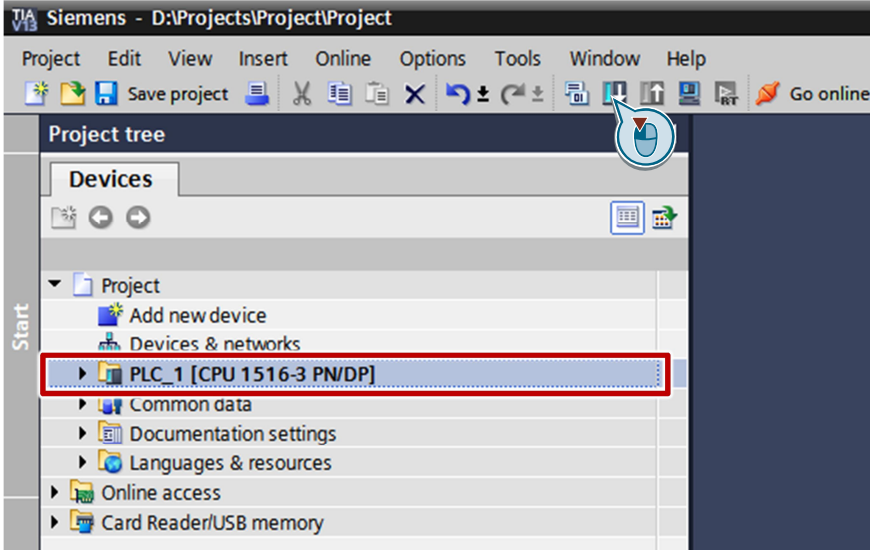
This chapter shows how to configure the HART module in the TIA Portal.

Table 2-1

No.	Description
1.	Open the TIA Portal and create a new project.
2.	Add a new S7 CPU, for example CPU 1516-3 PN/DP.
3.	<p>As PROFINET IO device you configure the ET 200SP consisting of the modules below:</p> <ul style="list-style-type: none"> • Interface module: IM 155-6 HF • Analog input module: AI 4xI 2-wire 4..20mA HART 
4.	<p>In the Device View of the ET 200SP you mark the HART module AI 4xI 2-wire 4..20mA HART. The properties of the HART module are displayed in the inspector window.</p> 

No.	Description															
5.	<p>In the "General" tab you navigate to "AI 4 > Inputs > Channel 0". For channel 0, to which the HART device SITRANS TH300 is connected, you enable diagnostics, set the parameters for measuring and enable the HART function.</p> 															
6.	<p>Go to the "General" tab and navigate to "AI 4 > HART variables settings". Select the relevant primary, secondary, tertiary and quaternary variables of the HART device.</p> <p>Up to 4 HART variables can be shown on the process image.</p> <p>Detailed information about the HART variables is available in the manual of the module AI 4x1 2-wire 4..20mA HART, in the section entitled HART variables.</p>  <table border="1" data-bbox="805 1646 1369 1906"> <thead> <tr> <th>Variable</th> <th>Channel</th> <th>Address</th> </tr> </thead> <tbody> <tr> <td>Variable 0</td> <td>Channel 0 PV (Primary variable)</td> <td>280</td> </tr> <tr> <td>Variable 1</td> <td>Channel 0 SV (Secondary variable)</td> <td>285</td> </tr> <tr> <td>Variable 2</td> <td>Channel 0 TV (Tertiary variable)</td> <td>290</td> </tr> <tr> <td>Variable 3</td> <td>Channel 0 QV (Quaternary variable)</td> <td>295</td> </tr> </tbody> </table>	Variable	Channel	Address	Variable 0	Channel 0 PV (Primary variable)	280	Variable 1	Channel 0 SV (Secondary variable)	285	Variable 2	Channel 0 TV (Tertiary variable)	290	Variable 3	Channel 0 QV (Quaternary variable)	295
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2 Configuring the HART Module in the TIA Portal

No.	Description
7.	<p>Go to the "General" tab and navigate to "AI 4 > I/O addresses". Here you can change the start address of the input addresses of the module "AI 4xI 4..20mA HART" if it is outside the process image of the CPU, for example.</p> 
8.	<p>In the project tree you mark the device folder of the S7-CPU. In the toolbar you click the "Download to device" button to download the configuration and user program into the S7-CPU.</p> 

3 Configuring and Parameterizing the HART Device with SIMATIC PDM

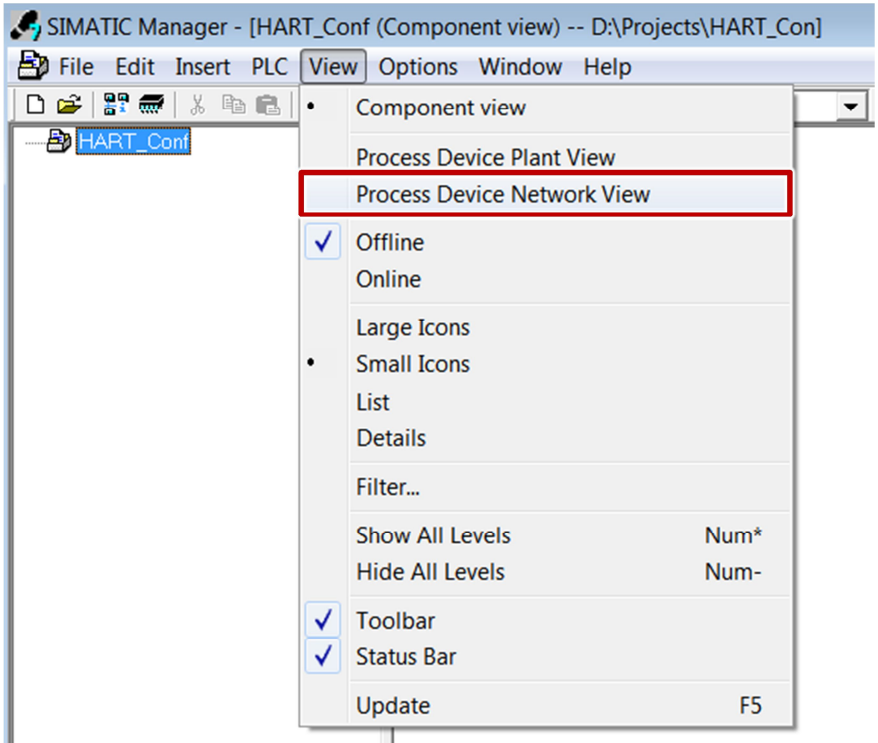
This chapter shows:

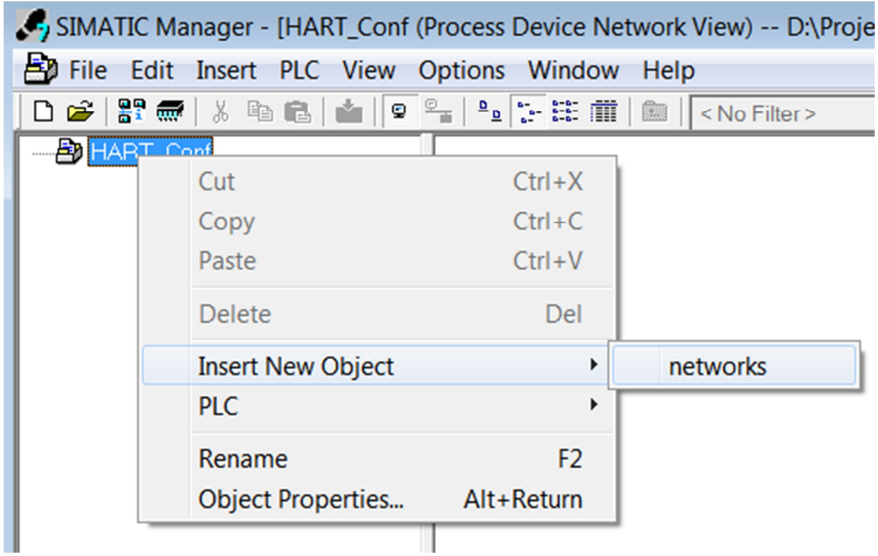
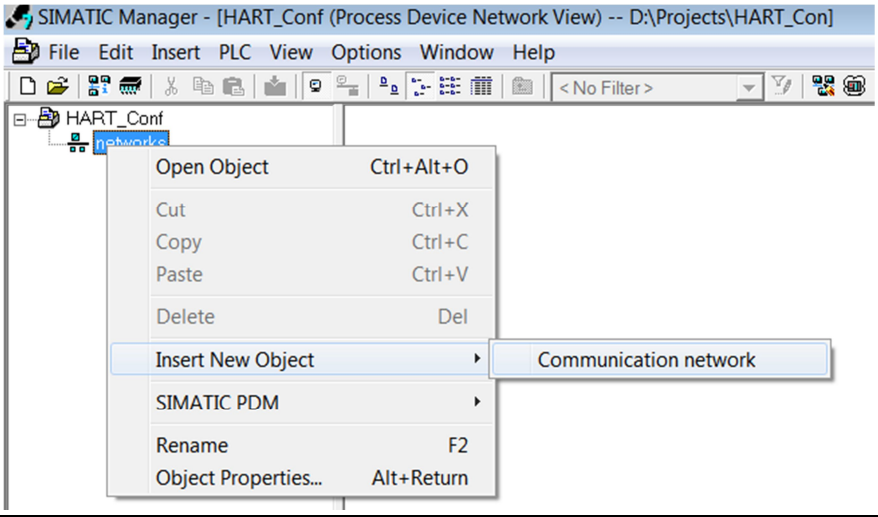
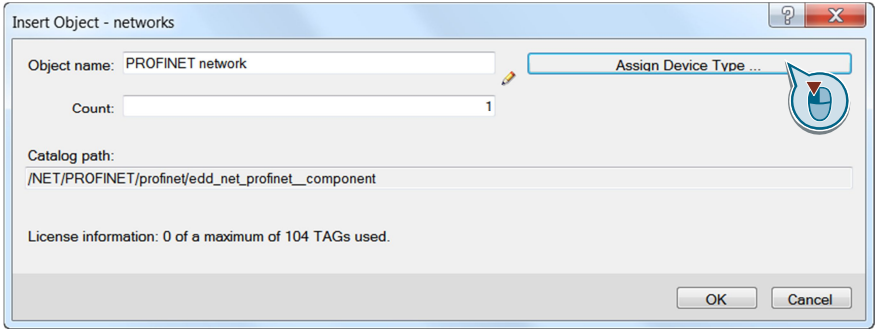
- The configuration of the HART device (SITRANS TH300) in the SIMATIC Manager.
- The parameterization of the HART device in SIMATIC PDM.

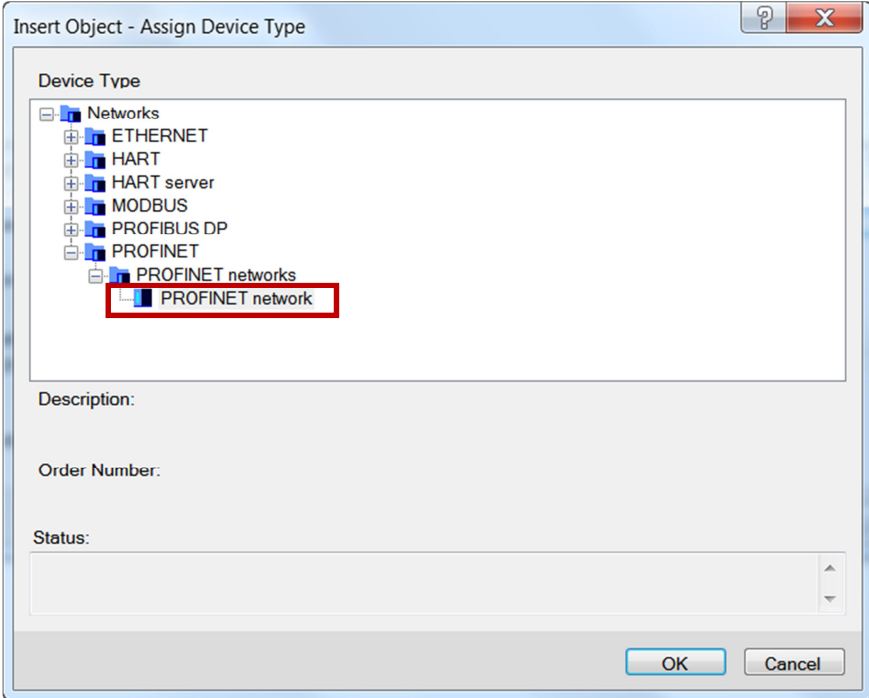
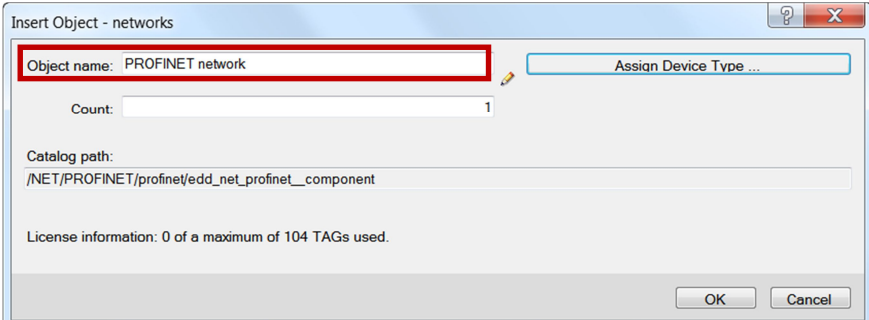
3.1 Configuration of the HART Device in the SIMATIC Manager

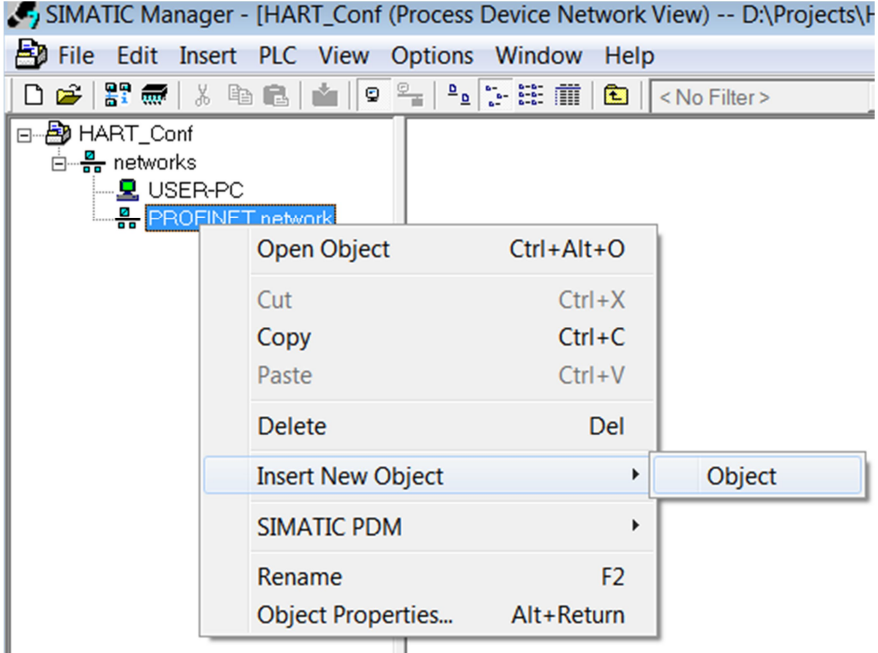
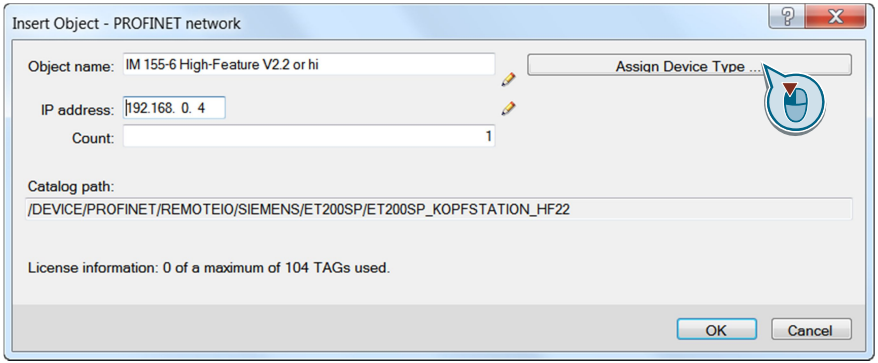
Proceed as follows to configure the HART device in the SIMATIC Manager.

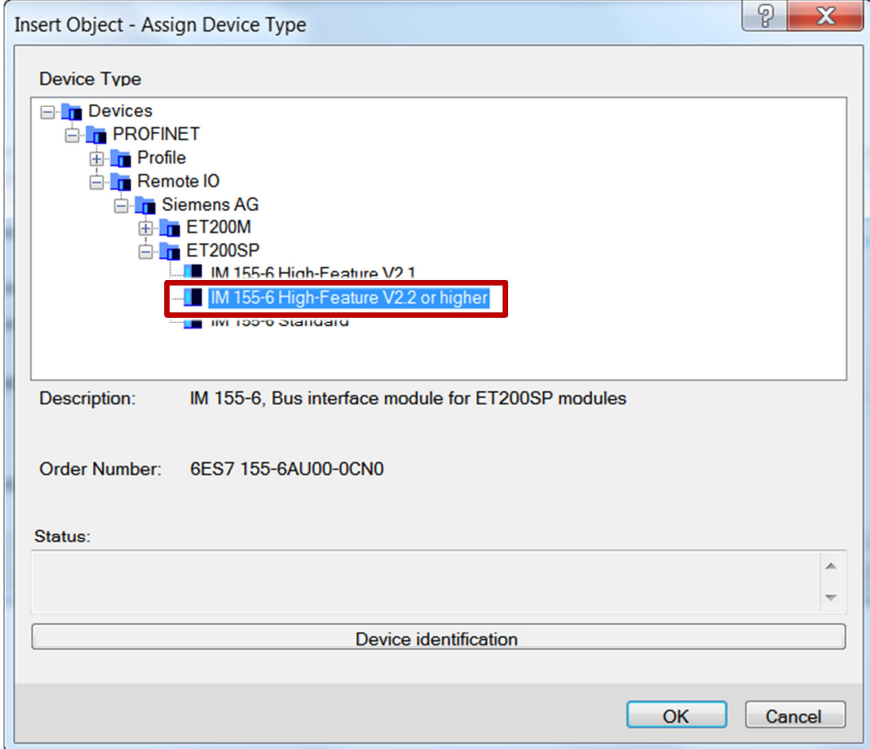
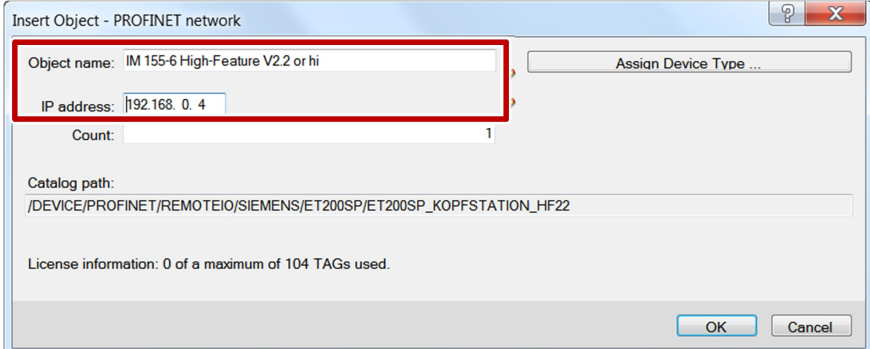
Table 3-1

No.	Description
1.	Open the SIMATIC Manager. This is supplied with SIMATIC PDM and is installed when you install SIMATIC PDM.
2.	Create a new project in the SIMATIC Manager.
3.	<p>In the SIMATIC Manager you open the Process Device Network View via the menu "View > Process Device Network View".</p>  <p>The screenshot shows the SIMATIC Manager interface with the 'View' menu open. The menu items are: Component view, Process Device Plant View, Process Device Network View (highlighted with a red box), Offline (checked), Online, Large Icons, Small Icons (checked), List, Details, Filter..., Show All Levels (Num*), Hide All Levels (Num-), Toolbar (checked), Status Bar (checked), and Update (F5).</p>

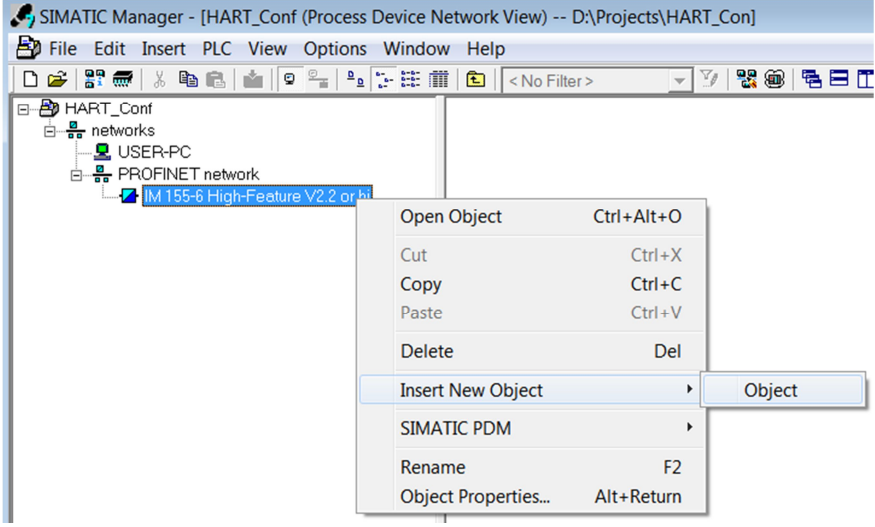
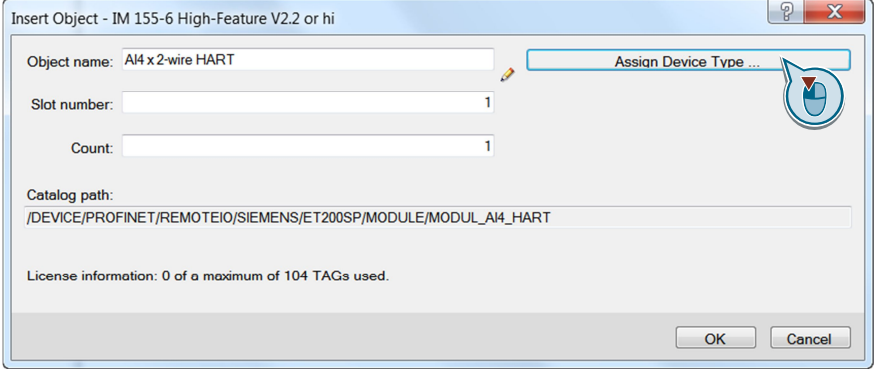
No.	Description
4.	<p>In the Process Device Network View you right-click the project name. Via the pop-menu "Insert New Object > Networks" you insert the object "Networks".</p> 
5.	<p>Right-click the "Networks" object. Via the pop-menu "Insert New Object > Communication Networks" you open the dialog "Insert Object – networks".</p> 
6.	<p>Click the "Assign Device Type" button. The "Insert Object – Assign Device Type" dialog opens.</p> 

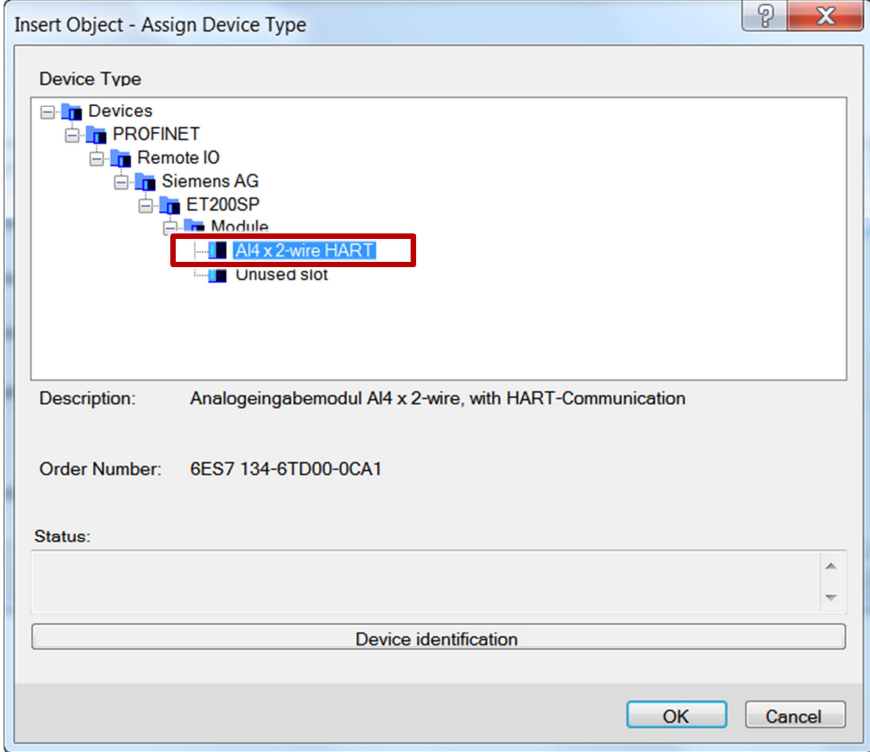
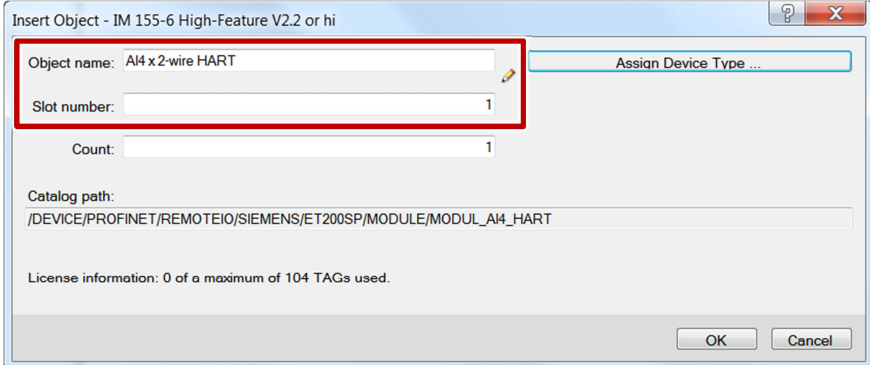
No.	Description
7.	<p>Under "Networks > PROFINET > PROFINET networks" you select the PROFINET network. Click "OK" to close the dialog.</p>  <p>The screenshot shows a dialog box titled "Insert Object - Assign Device Type". It contains a tree view under "Device Type" with the following structure: <ul style="list-style-type: none"> Networks <ul style="list-style-type: none"> ETHERNET HART HART server MODBUS PROFIBUS DP PROFINET <ul style="list-style-type: none"> PROFINET networks <ul style="list-style-type: none"> PROFINET network (highlighted with a red box) Below the tree are fields for "Description:", "Order Number:", and "Status:". At the bottom are "OK" and "Cancel" buttons. </p>
8.	<p>The object name "PROFINET network" is displayed in the "Insert Object – networks" dialog. Click "OK" to close the dialog.</p>  <p>The screenshot shows a dialog box titled "Insert Object - networks". It contains the following fields: <ul style="list-style-type: none"> "Object name: PROFINET network" (highlighted with a red box) "Assign Device Type ..." button "Count: 1" (with a spinner box) "Catalog path: /NET/PROFINET/profinet/edd_net_profinet__component" "License information: 0 of a maximum of 104 TAGs used." At the bottom are "OK" and "Cancel" buttons. </p>

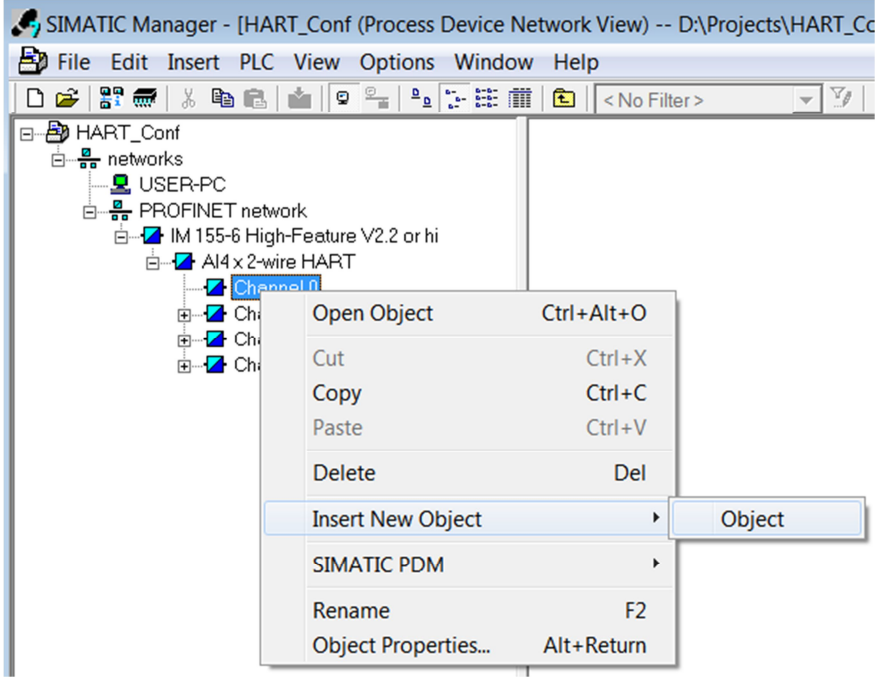
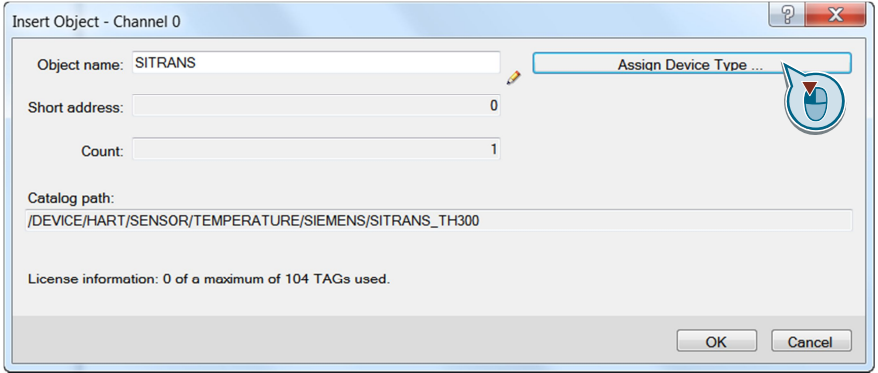
No.	Description
9.	<p>Right-click the "PROFINET network" object. Via the pop-menu "Insert New Object > Object" you open the dialog "Insert Object – PROFINET network".</p>  <p>The screenshot shows the SIMATIC Manager interface with the 'HART_Conf' project open. In the 'networks' folder, the 'PROFINET network' object is selected. A context menu is displayed over it, with 'Insert New Object' highlighted. A secondary menu is open for 'Insert New Object', showing 'Object' as the selected option.</p>
10.	<p>Click the "Assign Device Type" button. The "Insert Object – Assign Device Type" dialog opens.</p>  <p>The screenshot shows the 'Insert Object - PROFINET network' dialog box. The 'Object name' field contains 'IM 155-6 High-Feature V2.2 or hi'. The 'IP address' field contains '192.168. 0. 4'. The 'Count' field contains '1'. The 'Catalog path' field contains '/DEVICE/PROFINET/REMOTEIO/SIEMENS/ET200SP/ET200SP_KOPFSTATION_HF22'. The 'License information' field contains '0 of a maximum of 104 TAGs used.'. The 'Assign Device Type' button is highlighted.</p>

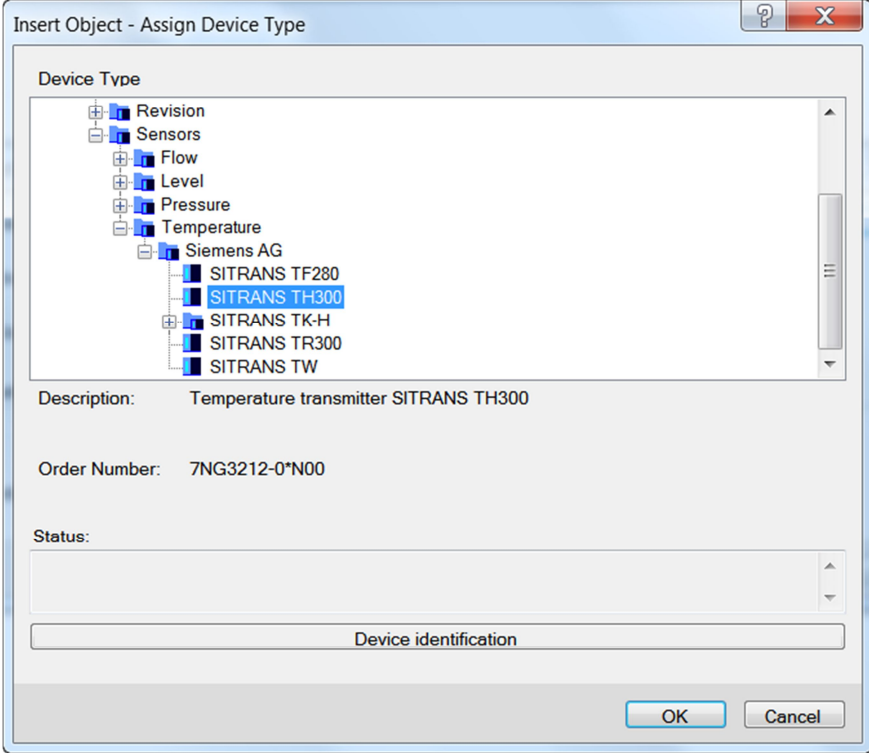
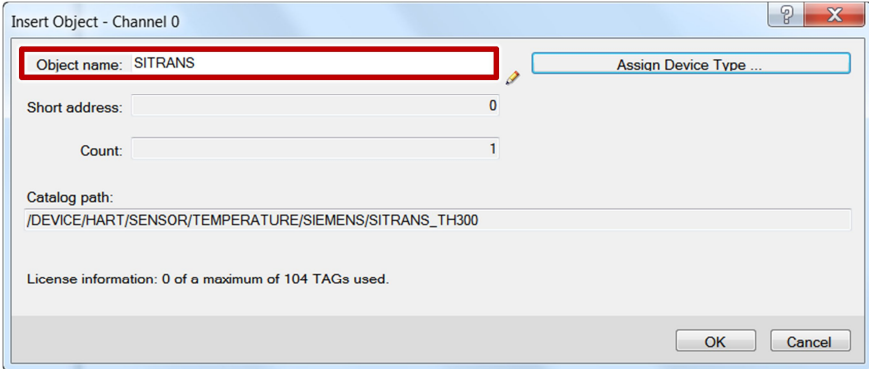
No.	Description
11.	<p>Under "Devices > PROFINET > Remote IO > Siemens AG > ET 200SP" you select the relevant interface module. In this example we use an IM 155-6 High-Feature V2.2 or higher. Click "OK" to close the dialog.</p> 
12.	<p>The object name "IM 155-6 High-Feature V2.2 or higher" is displayed in the dialog "Insert Object – PROFINET network". Enter the IP address 192.168.0.4 of the IM 155-6 PN HF. Click "OK" to close the dialog.</p> 

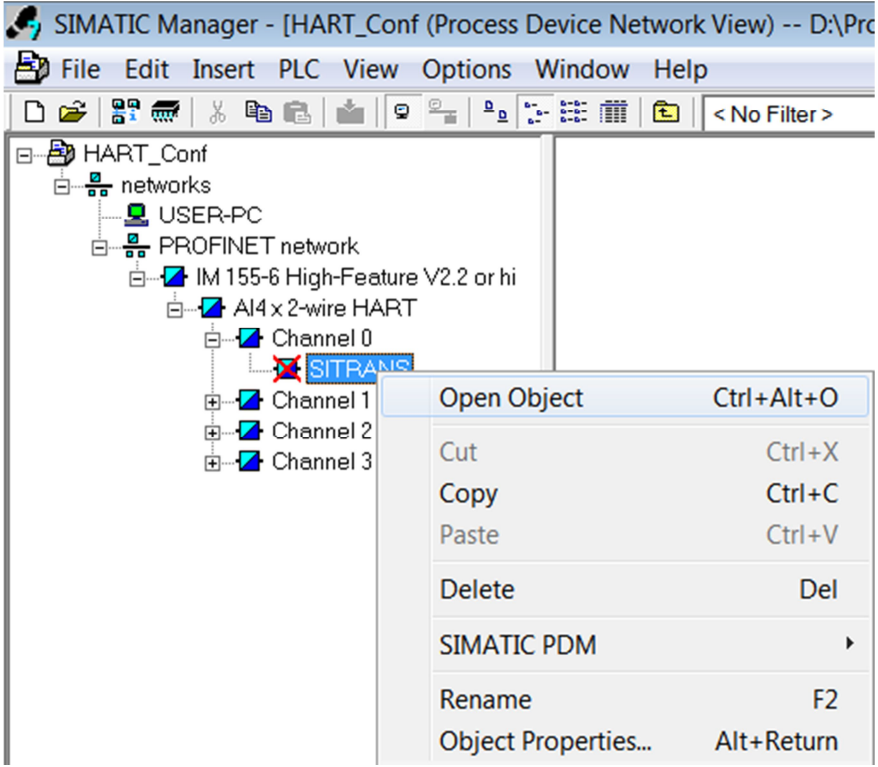
3 Configuring and Parameterizing the HART Device with SIMATIC PDM

No.	Description
13.	<p>Right-click the object "IM 155-6 High-Feature V2.2 or higher". Via the pop-menu "Insert New Object > Object" you open the dialog "Insert Object – IM 155-6 High-Feature V2.2 or higher".</p> 
14.	<p>Click the "Assign Device Type" button. The "Insert Object – Assign Device Type" dialog opens.</p> 

No.	Description
15.	<p>Under "Devices > PROFINET > Remote IO > Siemens AG > ET 200SP > Module" you select the HART module. In this example we use an AI4 x 2-wire HART. Click "OK" to close the dialog.</p> 
16.	<p>The object name "AI4 x 2-wire HART" is displayed in the dialog "Insert Object – IM 155-6 High-Feature V2.2 or higher". The slot must match the slot of the module in the TIA Portal. Click "OK" to close the dialog.</p> 

No.	Description
17.	<p>Right-click the object "Channel 0" of the HART module AI4 2-wire HART. Via the pop-menu "Insert New Object > Object" you open the dialog "Insert Object – Channel 0".</p>  <p>The screenshot shows the SIMATIC Manager interface. The project tree on the left is expanded to show the 'AI4 x 2-wire HART' module, with 'Channel 0' selected. A context menu is open over 'Channel 0', listing options such as 'Open Object', 'Cut', 'Copy', 'Paste', 'Delete', 'Insert New Object', 'SIMATIC PDM', 'Rename', and 'Object Properties...'. The 'Insert New Object' option is expanded, and the 'Object' sub-option is highlighted.</p>
18.	<p>Click the "Assign Device Type" button. The "Insert Object – Assign Device Type" dialog opens.</p>  <p>The screenshot shows the 'Insert Object - Channel 0' dialog box. It contains fields for 'Object name' (SITRANS), 'Short address' (0), and 'Count' (1). The 'Catalog path' is set to '/DEVICE/HART/SENSOR/TEMPERATURE/SIEMENS/SITRANS_TH300'. A button labeled 'Assign Device Type ...' is highlighted with a blue selection box. The dialog also shows 'License information: 0 of a maximum of 104 TAGs used.' and 'OK' and 'Cancel' buttons at the bottom.</p>

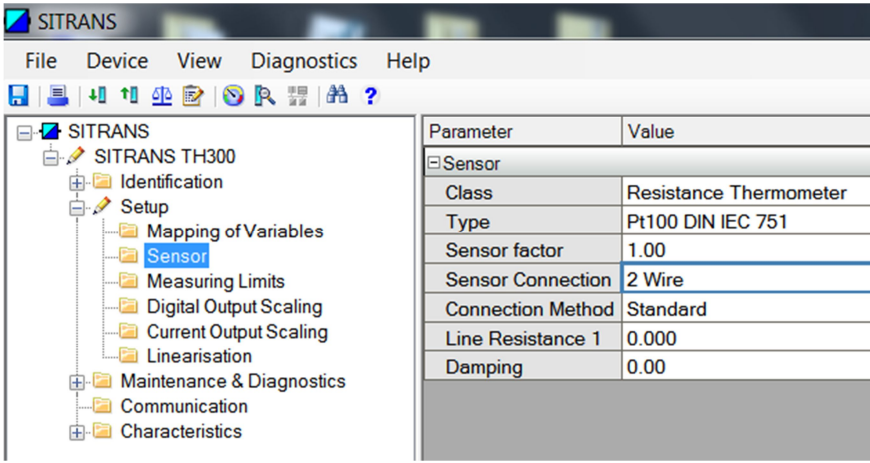
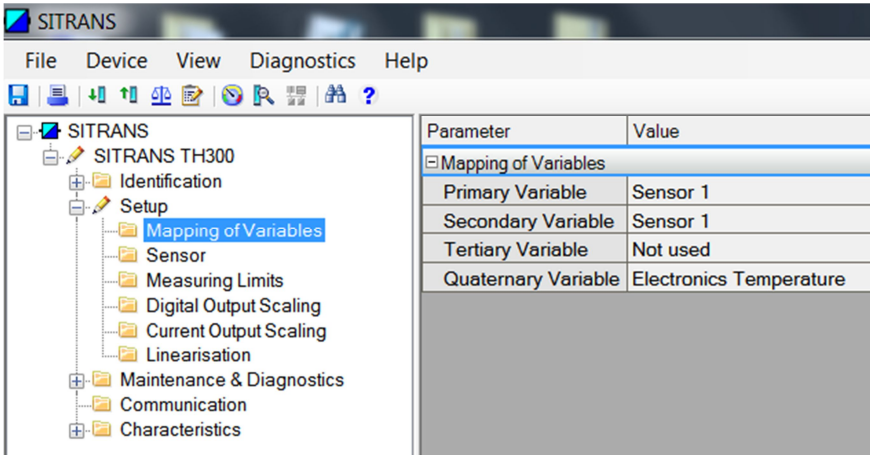
No.	Description
19.	<p>Select the HART device. In this example we use a SITRANS TH300. This HART device is located under "Sensors > Temperature > Siemens AG". Click "OK" to close the dialog.</p>  <p>Requirements</p> <ul style="list-style-type: none"> • The library entitled "PDM_Device_Library" must be installed. • The device description of the HART device must be integrated in the "Device Integration Manager" tool.
20.	<p>The object name "SITRANS" is displayed in the "Insert Object – Channel 0" dialog. Click "OK" to close the dialog.</p> 

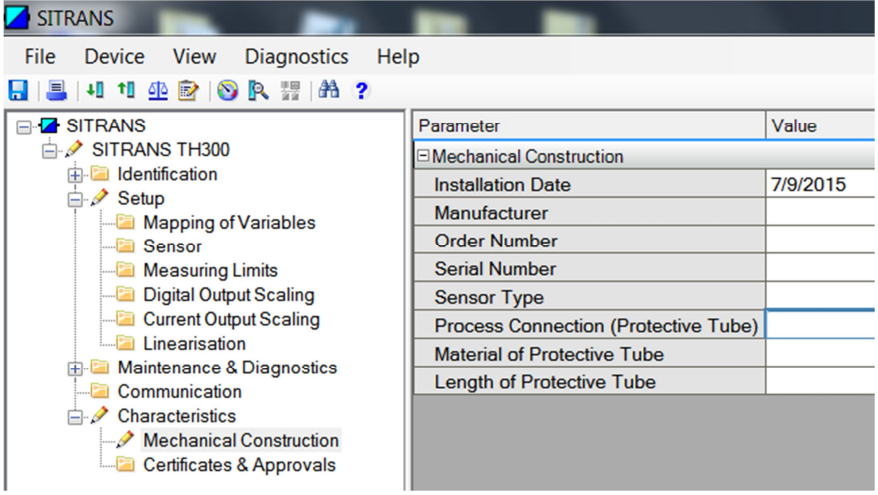
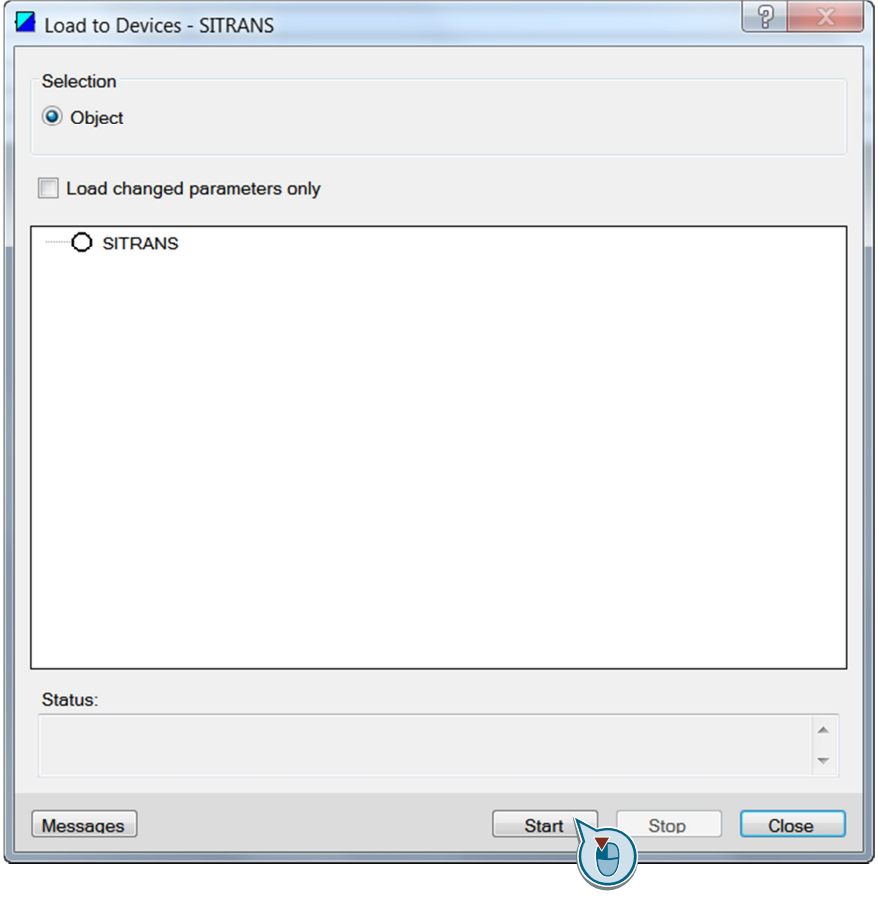
No.	Description
21.	<p>Right-click the "SITRANS" object. In the pop-up menu you select "Open object". SIMATIC PDM opens.</p>  <p>The screenshot shows the SIMATIC Manager interface. The title bar reads 'SIMATIC Manager - [HART_Conf (Process Device Network View) -- D:\Pr...'. The menu bar includes 'File', 'Edit', 'Insert', 'PLC', 'View', 'Options', 'Window', and 'Help'. The toolbar contains various icons for file operations and navigation. The main workspace displays a tree view of the HART device configuration. The tree structure is as follows:</p> <ul style="list-style-type: none"> HART_Conf <ul style="list-style-type: none"> networks <ul style="list-style-type: none"> USER-PC <ul style="list-style-type: none"> PROFINET network <ul style="list-style-type: none"> IM 155-6 High-Feature V2.2 or hi <ul style="list-style-type: none"> AI4 x 2-wire HART <ul style="list-style-type: none"> Channel 0 <ul style="list-style-type: none"> SITRANS (highlighted with a red box) Channel 1 Channel 2 Channel 3 <p>A context menu is open over the 'SITRANS' object. The menu items and their keyboard shortcuts are:</p> <ul style="list-style-type: none"> Open Object (Ctrl+Alt+O) Cut (Ctrl+X) Copy (Ctrl+C) Paste (Ctrl+V) Delete (Del) SIMATIC PDM (indicated by a right-pointing arrow) Rename (F2) Object Properties... (Alt+Return)

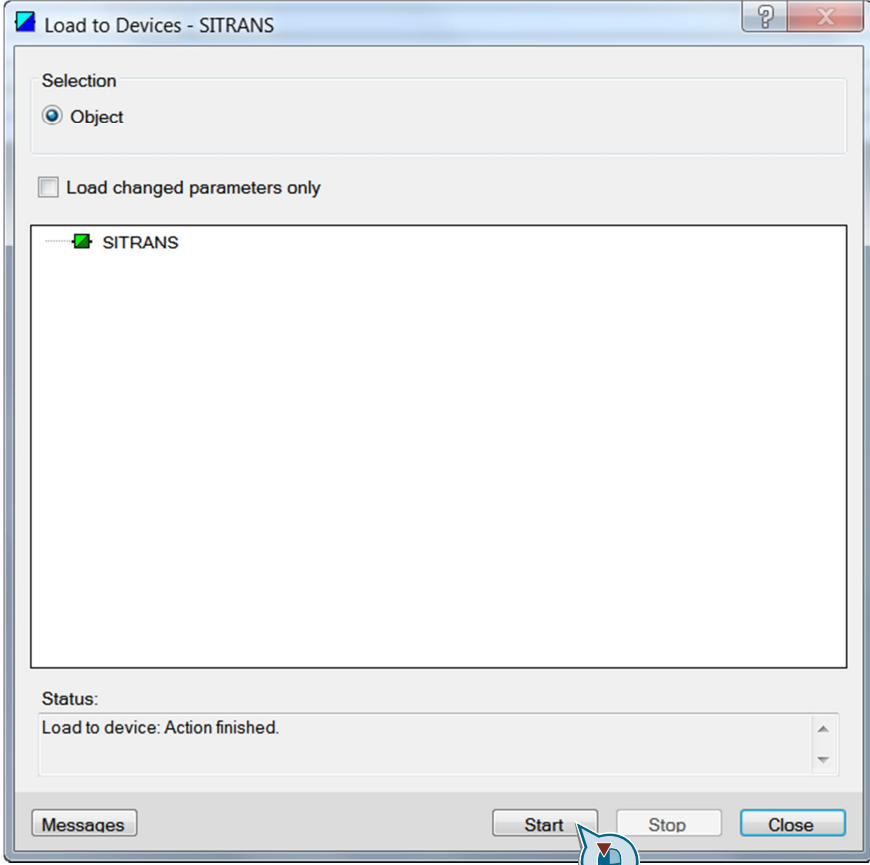
3.2 Parameterization of the HART Device in SIMATIC PDM

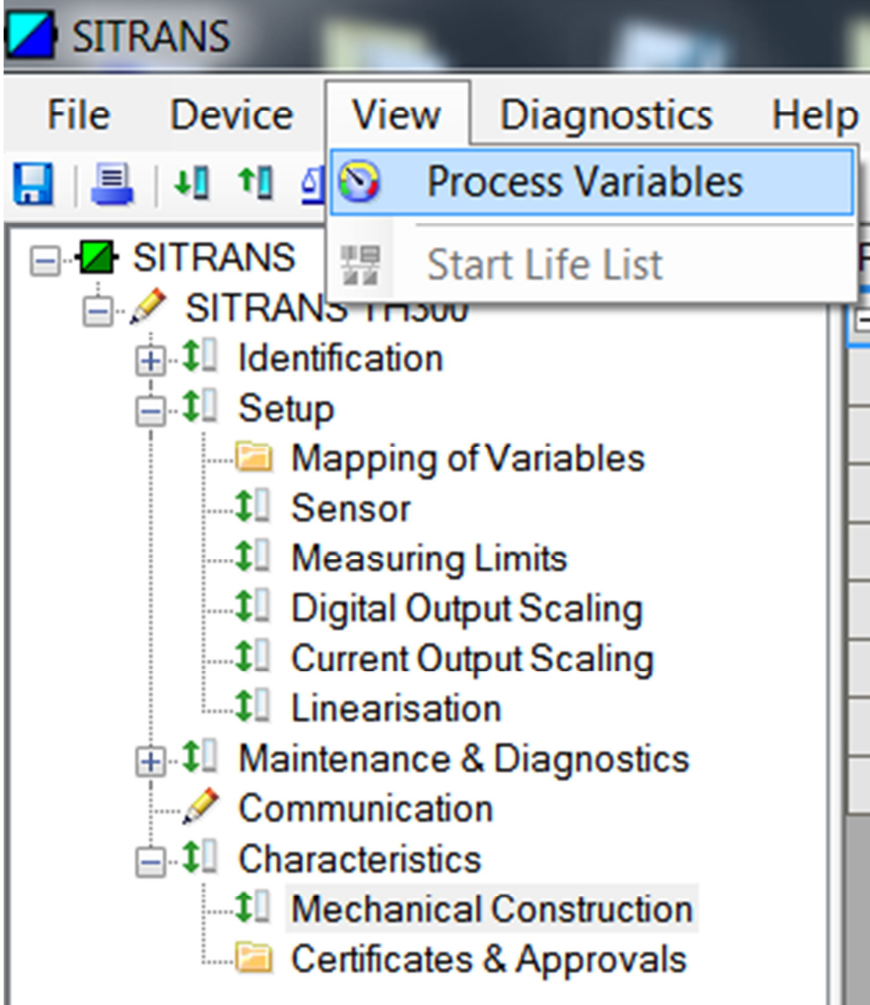
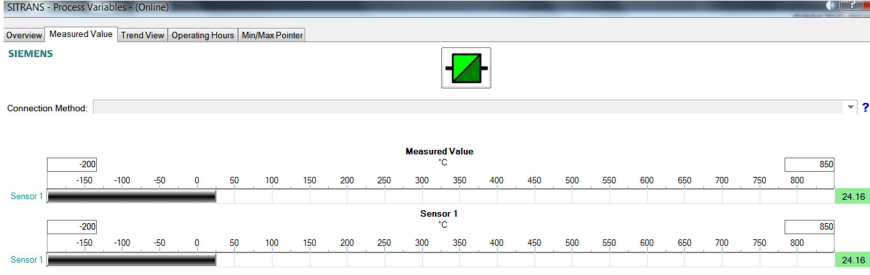
Proceed as follows to parameterize the HART device in SIMATIC PDM.

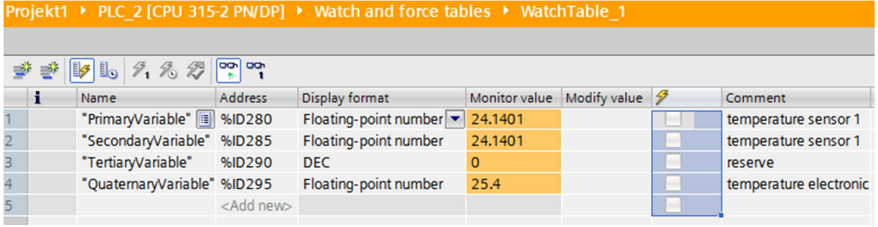
Table 3-2

No.	Description
1.	<p>In SIMATIC PDM you set the parameters for the HART device SITRANS TH300. Under "SITRANS > SITRANS TH300 > Setup > Sensor" you can set the type and sensor connection, for example.</p> <p>In this example we use the type Pt100 DIN IEC 751 and a two-wire sensor connection.</p> 
2.	<p>Under "SITRANS > SITRANS TH300 > Setup > Mapping of Variables" you see which values are assigned to the primary, secondary, tertiary and quaternary variables. You can read these out later via the monitoring table in the TIA Portal or you access the HART variables from the user program via the process image.</p> 

No.	Description																				
3.	<p>Under "SITRANS > SITRANS TH300 > Characteristics > Mechanical Construction" you enter the installation date. Then click the "Load to Devices" button. The "Load to Devices" dialog opens.</p>  <p>The screenshot shows the SITRANS software interface. On the left, a tree view shows the configuration path: SITRANS > SITRANS TH300 > Characteristics > Mechanical Construction. On the right, a table lists parameters for Mechanical Construction:</p> <table border="1" data-bbox="906 544 1377 824"> <thead> <tr> <th>Parameter</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td colspan="2">Mechanical Construction</td> </tr> <tr> <td>Installation Date</td> <td>7/9/2015</td> </tr> <tr> <td>Manufacturer</td> <td></td> </tr> <tr> <td>Order Number</td> <td></td> </tr> <tr> <td>Serial Number</td> <td></td> </tr> <tr> <td>Sensor Type</td> <td></td> </tr> <tr> <td>Process Connection (Protective Tube)</td> <td></td> </tr> <tr> <td>Material of Protective Tube</td> <td></td> </tr> <tr> <td>Length of Protective Tube</td> <td></td> </tr> </tbody> </table>	Parameter	Value	Mechanical Construction		Installation Date	7/9/2015	Manufacturer		Order Number		Serial Number		Sensor Type		Process Connection (Protective Tube)		Material of Protective Tube		Length of Protective Tube	
Parameter	Value																				
Mechanical Construction																					
Installation Date	7/9/2015																				
Manufacturer																					
Order Number																					
Serial Number																					
Sensor Type																					
Process Connection (Protective Tube)																					
Material of Protective Tube																					
Length of Protective Tube																					
4.	<p>Click "Start". The parameterization is downloaded to the HART device - SITRANS TH300, for example.</p>  <p>The screenshot shows the "Load to Devices - SITRANS" dialog box. It has a "Selection" section with a radio button for "Object" selected. There is a checkbox for "Load changed parameters only" which is unchecked. Below this is a list box containing "SITRANS". At the bottom, there are buttons for "Messages", "Start", "Stop", and "Close". A mouse cursor is pointing at the "Start" button.</p>																				

No.	Description
5.	<p>At the end of download the status "Load to device: Action finished." is displayed. The HART device "SITRANS" is displayed green. Click the "Close" button to end the dialog.</p> 

No.	Description
6.	<p>You can use SIMATIC PDM to access the HART device online. Select the menu "View > Process Variables". The "SITRANS – Process Variables – (Online)" dialog opens.</p> 
7.	<p>Here you get a display of the measured value, trend view, operating hours and the min/max pointer of the SITRANS TH300 temperature sensor.</p> 

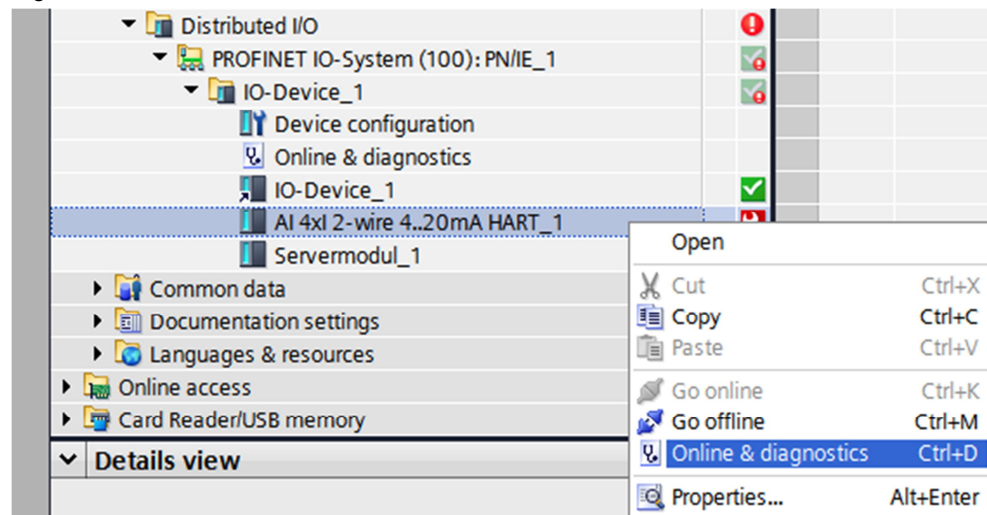
No.	Description																																										
8.	<p>In the TIA Portal you can have the values of the HART variables displayed in the monitoring table. You access the HART variables via the process image of the inputs. Each HART variable consists of 4 Value bytes and one Quality Code byte.</p>  <p>The screenshot shows the 'WatchTable_1' interface in SIMATIC PDM. It features a breadcrumb path: 'Projekt1 > PLC_2 [CPU 315-2 PN/DP] > Watch and force tables > WatchTable_1'. Below the path is a toolbar with icons for search, refresh, and other functions. The main area contains a table with the following data:</p> <table border="1"> <thead> <tr> <th></th> <th>Name</th> <th>Address</th> <th>Display format</th> <th>Monitor value</th> <th>Modify value</th> <th>Comment</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>"PrimaryVariable"</td> <td>%ID280</td> <td>Floating-point number</td> <td>24.1401</td> <td><input type="checkbox"/></td> <td>temperature sensor 1</td> </tr> <tr> <td>2</td> <td>"SecondaryVariable"</td> <td>%ID285</td> <td>Floating-point number</td> <td>24.1401</td> <td><input type="checkbox"/></td> <td>temperature sensor 1</td> </tr> <tr> <td>3</td> <td>"TertiaryVariable"</td> <td>%ID290</td> <td>DEC</td> <td>0</td> <td><input type="checkbox"/></td> <td>reserve</td> </tr> <tr> <td>4</td> <td>"QuaternaryVariable"</td> <td>%ID295</td> <td>Floating-point number</td> <td>25.4</td> <td><input type="checkbox"/></td> <td>temperature electronic</td> </tr> <tr> <td>5</td> <td></td> <td><Add new></td> <td></td> <td></td> <td><input type="checkbox"/></td> <td></td> </tr> </tbody> </table>		Name	Address	Display format	Monitor value	Modify value	Comment	1	"PrimaryVariable"	%ID280	Floating-point number	24.1401	<input type="checkbox"/>	temperature sensor 1	2	"SecondaryVariable"	%ID285	Floating-point number	24.1401	<input type="checkbox"/>	temperature sensor 1	3	"TertiaryVariable"	%ID290	DEC	0	<input type="checkbox"/>	reserve	4	"QuaternaryVariable"	%ID295	Floating-point number	25.4	<input type="checkbox"/>	temperature electronic	5		<Add new>			<input type="checkbox"/>	
	Name	Address	Display format	Monitor value	Modify value	Comment																																					
1	"PrimaryVariable"	%ID280	Floating-point number	24.1401	<input type="checkbox"/>	temperature sensor 1																																					
2	"SecondaryVariable"	%ID285	Floating-point number	24.1401	<input type="checkbox"/>	temperature sensor 1																																					
3	"TertiaryVariable"	%ID290	DEC	0	<input type="checkbox"/>	reserve																																					
4	"QuaternaryVariable"	%ID295	Floating-point number	25.4	<input type="checkbox"/>	temperature electronic																																					
5		<Add new>			<input type="checkbox"/>																																						

4 Diagnostics

You can read out the diagnostics of the HART module in the TIA Portal.

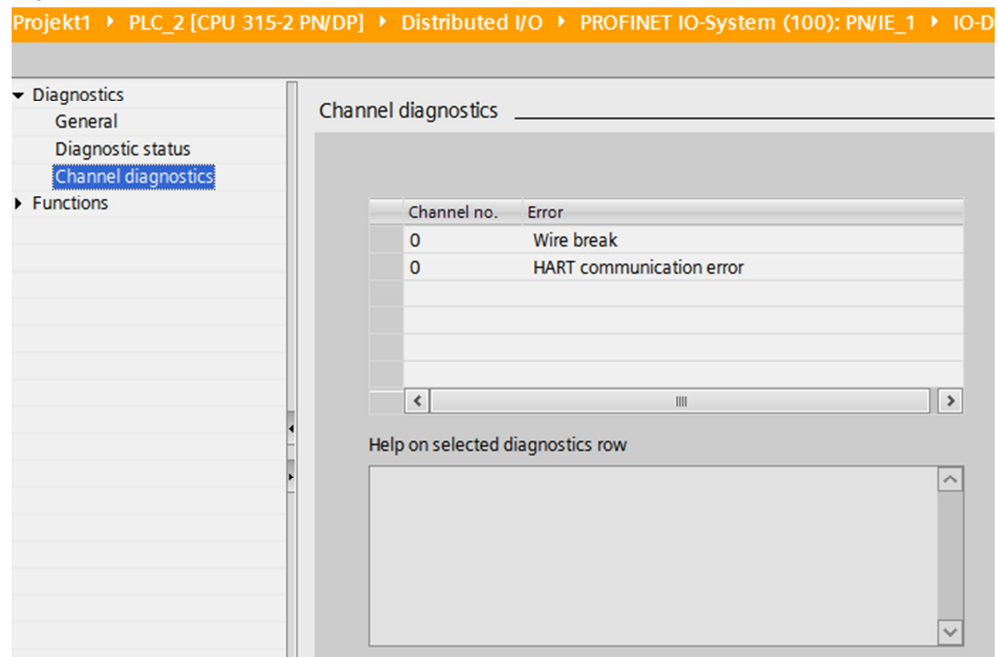
In the Project tree you open the device folder of your CPU and then the subfolder "Distributed I/O". Under "PROFINET I/O System (100): PN/IE_1 > IO Device_1" you click the HART module "AI 4xI 2-wire 4..20mA HART_1". In the pop-up menu you select "Online & diagnostics". The "Online & Diagnostics" dialog opens.

Figure 4-1



In the "Online & Diagnostics" dialog you get a display of the status and the channel diagnostics of the HART module. In this module a wire break is displayed together with the triggered HART communication error.

Figure 4-2



5 Additional Information

More information is available at the following links.

Table 5-1

Entry	Link
Manual: Analog Input Module AI 4xI 2-wire 4...20mA HART	https://support.industry.siemens.com/cs/ww/en/view/105037964
Product News: SIMATIC PDM V8.2	https://support.industry.siemens.com/cs/ww/en/view/92561254
Requirements for SIMATIC PDM data record routing	https://support.industry.siemens.com/cs/ww/en/view/7808062
Modules that support the "Data Record Routing" function	https://support.industry.siemens.com/cs/ww/en/view/7000978