

K50 Pro Parameter Data Function Block

May 16th, 2025

This document covers the installation and use of a function block for Siemen's TIA Portal software package. This function block handles acyclic IO-Link commands to and from a Banner K50 Pro and allows the user to easily change K50 Pro Parameter Data.

Each Banner IO-Link Device Parameter Data function block is meant to be used alongside a Banner IO-Link Device Master Control function block. This paper describes how to set up both blocks.

Components

Banner K50 Library v16.zal16

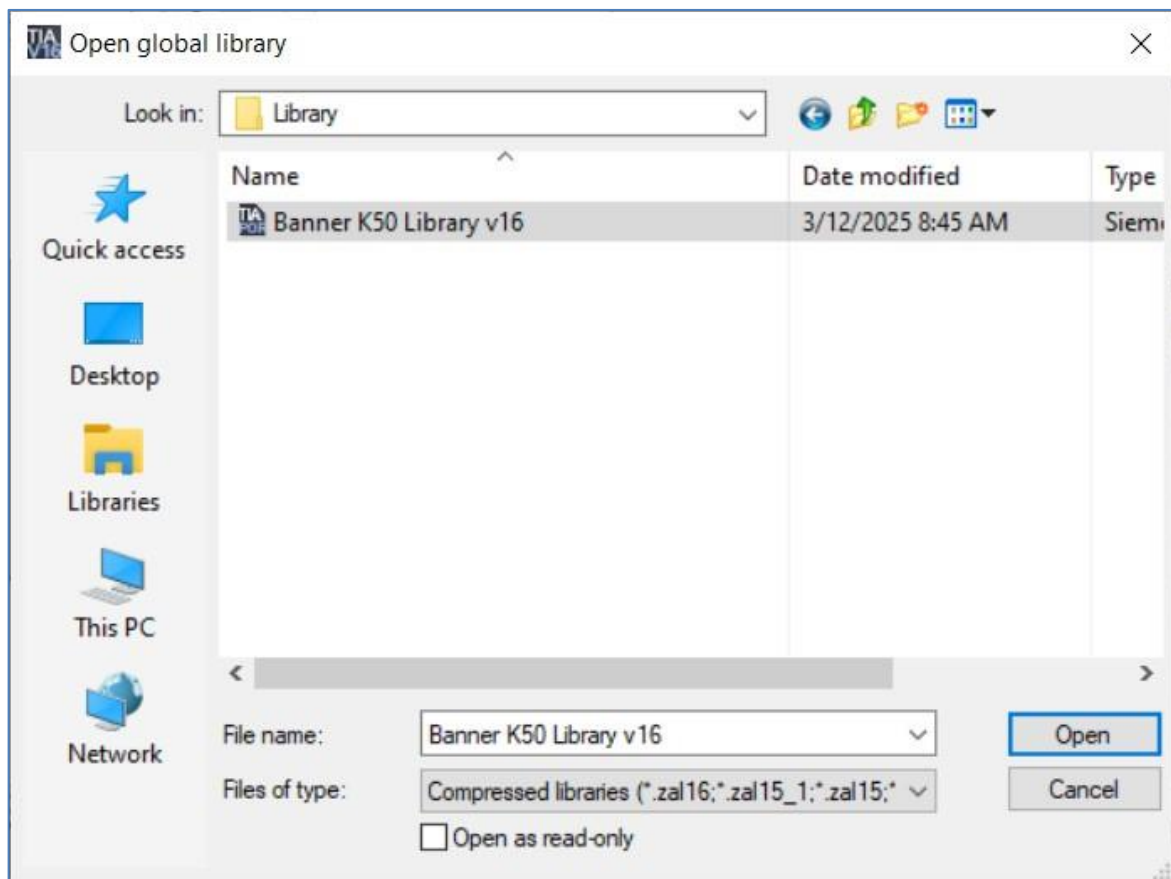
There are two methods for the parameter data. The first is used when creating a connection to Banner's IO-Link masters. The second set of instructions are for systems using other manufacturer's IO-Link masters.

Installation Instructions

1. Open a project.
2. Go to Options > Global Libraries > Retrieve Library.



3. Select the Banner K50 Library v16. Click Open.



4. The library is now accessible in the Libraries tab.
5. Go to page 3 for Banner IO-Link Masters and page 8 for K50 Pro for all other IO-Link Master.

Setup of K50 Pro with a Banner DXMR

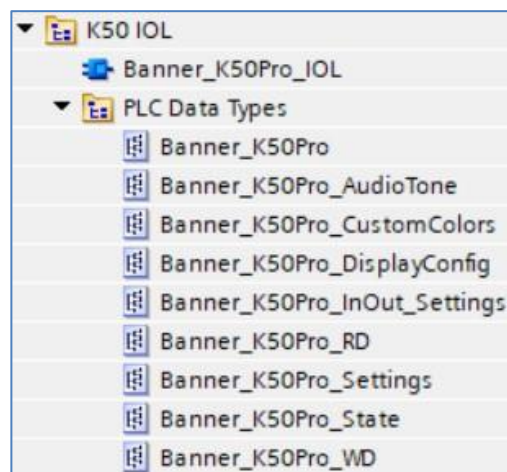
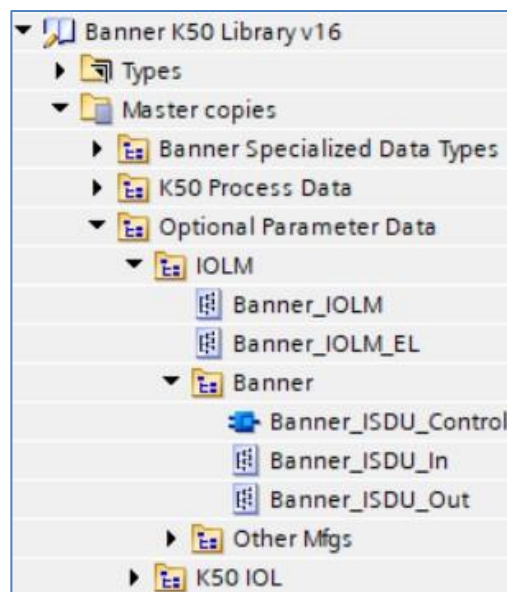
1. Go to Device and Networks to configure the DXMR90-4K or DXMR110-8K. Add the DXM if it has yet to be added to the system.
2. Add Banner IO-Link Master Info to Slot 1. This sets the DXMR for IO-Link mode.

Banner IO-Link Master Info_1	0	1	1...9	Banner IO-Link Master Info
------------------------------	---	---	-------	----------------------------

3. Open the IO-Link Generic Devices and select the proper module. The IO-Link ISDU 190/190 Byte_1 is required for this Function Block. Make note of the I address for the Slot 10. The inputs data starts at I185 while the outputs data starts at Q185 for this example.

IO-Link ISDU 190/190 Byte_1	0	10	185...380	185...380	IO-Link ISDU 190/190 Byte
-----------------------------	---	----	-----------	-----------	---------------------------

4. Open the “Optional Parameter Data” folder and then the IOLM folder.
5. Drag the “Banner_IOLM” and “Banner_IOLM_EL” to the PLC Data Types area under your PLC. These are found in the IOLM folder.
6. Open the Banner folder and drag the “Banner_ISDU_Control” to the Program blocks area.
7. Drag the “Banner_ISDU_In” and “Banner_ISDU_Out” to the PLC data Types area.
8. Now open the “K50 IOL” Folder
9. Move the “Banner_K50Pro_IOL” to the Program blocks area.
10. Open the “PLC_Data_Types” Folder.
11. Finally move the “Banner_K50Pro”, “Banner_K50Pro_AudioTone”, “Banner_K50Pro_CustomColors”, “Banner_K50Pro_DisplayConfig”, “Banner_K50Pro_InOut_Settings”, “Banner_K50Pro_RD”, “Banner_K50Pro_Settings”, “Banner_K50Pro_State”, and “Banner_K50Pro_WD” to the “PLC Data Types” folder in the PLC.



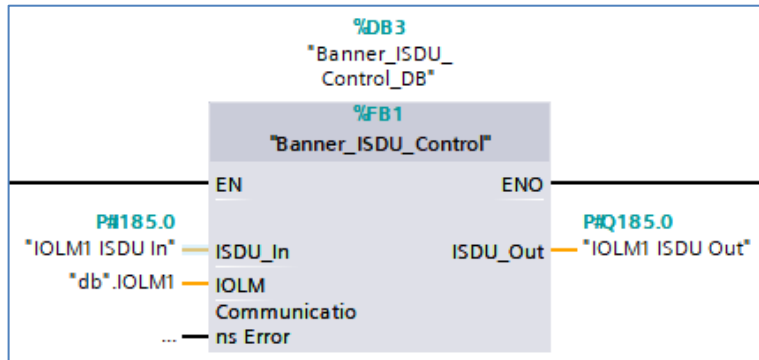
12. Go to PLC Tags. Create two tags. The first tag “IOLM1 ISDU In” and the second tag is “IOLM1 ISDU Out”. Use the %I and %Q values from step 2.

▶ IOLM1 ISDU In	*Banner_ISDU_In*	%I185.0
▶ IOLM1 ISDU Out	*Banner_ISDU_Out*	%Q185.0

13. Go to Program blocks. Add a new Data block if necessary. In this example the new data block is named “db”.
14. Create a tag with the type of “Banner_IOLM”. This example uses IOLM1.
15. Expand the IOLM1 tag, then expand the Port Controlled section. The Port Controlled tag array determines which of the ports has a function block-controlled Banner IO-Link device plugged into it. Each Port Controlled array tag with **true** as the start value is considered to have such a device connected. Correctly setting this array allows the Device and IO-Link Master function blocks to control the device on that port. Errors will occur if a port without an IO-Link device is set to true.

db			
	Name	Data type	Start value
[-DI]	[-] ▼ IOLM1	*Banner_IOLM*	
[-DI]	[-] ▼ Port Controlled	Array[1..8] of Bool	
[-DI]	[-] Port Controlled[1]	Bool	true
[-DI]	[-] Port Controlled[2]	Bool	true
[-DI]	[-] Port Controlled[3]	Bool	true
[-DI]	[-] Port Controlled[4]	Bool	false
[-DI]	[-] Port Controlled[5]	Bool	false
[-DI]	[-] Port Controlled[6]	Bool	false
[-DI]	[-] Port Controlled[7]	Bool	false
[-DI]	[-] Port Controlled[8]	Bool	false
[-DI]	[-] ▶ Port Activate	Array[1..8] of Bool	
[-DI]	[-] ▶ Port Read Request	Array[1..8] of Bool	
[-DI]	[-] ▶ Port Write Request	Array[1..8] of Bool	
[-DI]	[-] ▶ Port RW Complete	Array[1..8] of Bool	
[-DI]	[-] ▶ Port Device Read	Array[1..8] of Bool	
[-DI]	[-] ▶ Transfer Data	Array[0..231] of B...	
[-DI]	[-] Wr_Length	UInt	0
[-DI]	[-] Rd_Length	UInt	0
[-DI]	[-] IO-Index	Int	0
[-DI]	[-] Reset	Bool	false

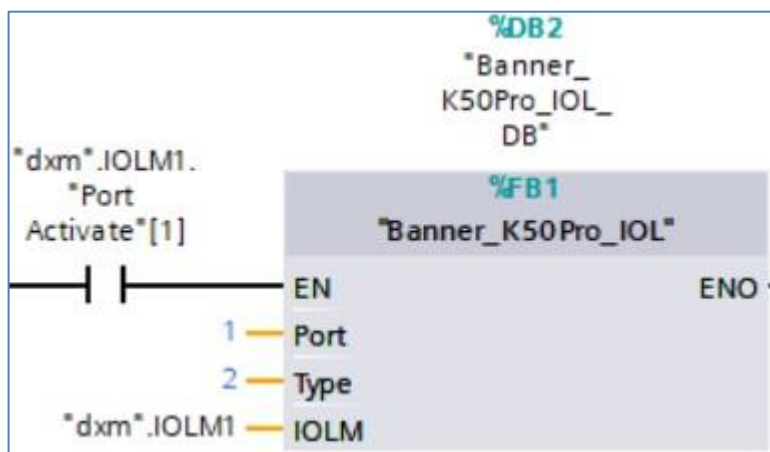
16. Next add the “Banner_ISDU_Control” function block to an OB ladder. You will be prompted to make a new data block. You now must define three input variables for this function block: ISDU_In, ISDU_Out, and IOLM.



17. Link the IOLM variable to the database IOLM tag created in step 14. While ISDU_In and ISDU_Out are linked to variables created in step 12.
18. Now add the “Banner_K50Pro_IOL” function block to an OB ladder. You will be prompted to make a new data block. Type in the port number for the device, then link the “IOLM” variable to the IO-Link master variable created in step 14.

Set Type to 0 if a K50 Pro Touch Audible is being used
 Set Type to 1 if a K50 Pro is being used
 Set Type to 2 if a K50 Pro Touch Display is being used
 Set Type to 3 if a K50 Pro Compact Audible is being used

As a final step, the Port Activate bit is added on the same rung as the K50 Pro function block to ensure orderly behavior. The IO-Link Master function block will cycle through all ports, giving each connected device function block a time to shine.



19. The K50 Pro Parameter Data function block is now set up. Compile the project and download it to the PLC. Go online, then open the K50 Pro data block. When the function block starts out, it does an initial global read of all K50 Pro information. The Read Data section of the data block shows this information.

▼ Static			
■ ▼ Data	"Banner_K50Pro"		
■ Initial Global Read	Bool	false	TRUE
■ Command	Int	0	0
■ ▼ Read	"Banner_K50Pro_RD"		
■ Master Cycle Time	USInt	0	51
■ Min Cycle Time	USInt	0	50
■ M-Sequence Capability	USInt	0	9
■ IO-Link Version ID	USInt	0	17
■ Process Data Input Length	USInt	0	16
■ Process Data Output Length	USInt	0	137
■ Vendor ID Combined	UDInt	0	451
■ Vendor ID 1	USInt	0	1
■ Vendor ID 2	USInt	0	195
■ Device ID Combined	UDInt	0	393220
■ Device ID 1	USInt	0	6
■ Device ID 2	USInt	0	0
■ Device ID 3	USInt	0	4
■ Serial Number	String	"	'19-12-0512:29:51'

The Write Data section of the data block shows all the writeable parameter data for the K50 Pro.

▼ Write		"Banner_K50Pro_WD"		
■	System Command	USInt	0	0
■	Parameter Access Lock	Bool	false	FALSE
■	Data Storage Lock	Bool	false	FALSE
■	Local Parameterization Lock	Bool	false	FALSE
■	Local User Interface Lock	Bool	false	FALSE
■	Operating Mode	USInt	0	2
■	▶ Settings	"Banner_K50Pro_Settings"		
■	▶ InOut Settings	"Banner_K50Pro_InOut_Settings"		
■	▶ State Parameters	Array[1..5] of "Banner_K50Pro_State"		
■	▶ Custom Colors	"Banner_K50Pro_CustomColors"		
■	▶ Custom Audio Tone	"Banner_K50Pro_AudioTone"		
■	▶ Display Config	"Banner_K50Pro_DisplayConfig"		

Go to "Using K50 Pro" section to see how to adjust Write parameters.

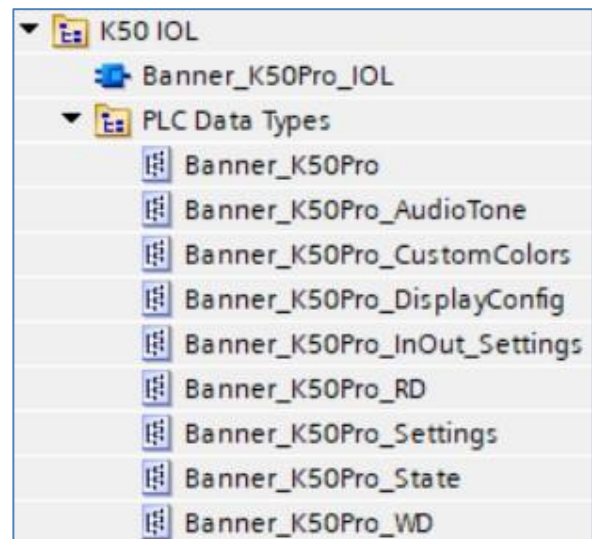
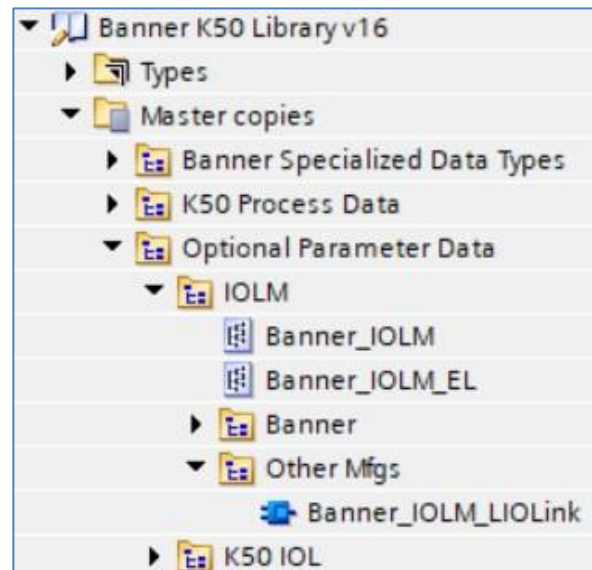
Setup of K50 Pro with other IO-Link Masters

Additional Component Needed

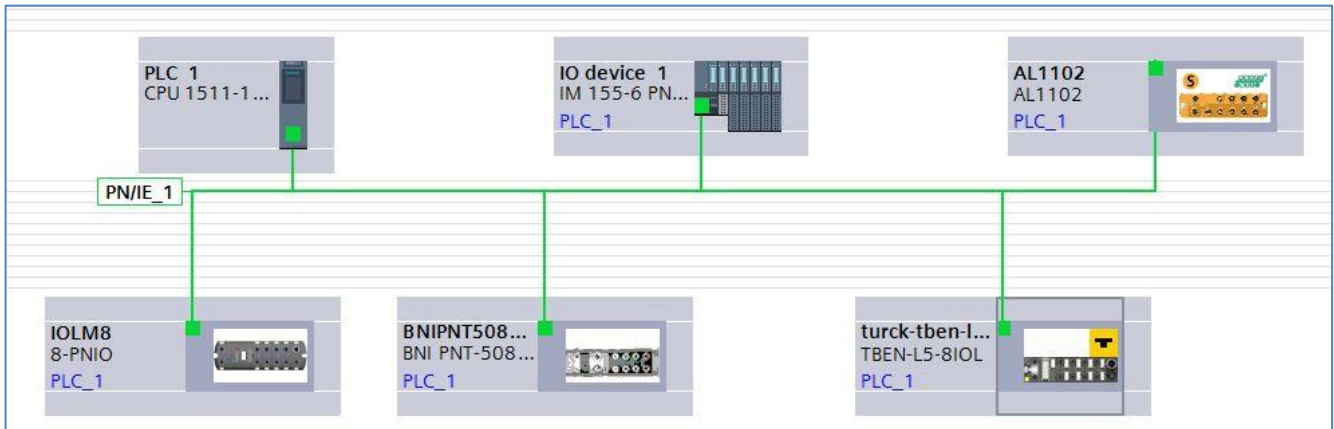
Siemens LIOLINK_DEVICE function block

Installation Instructions

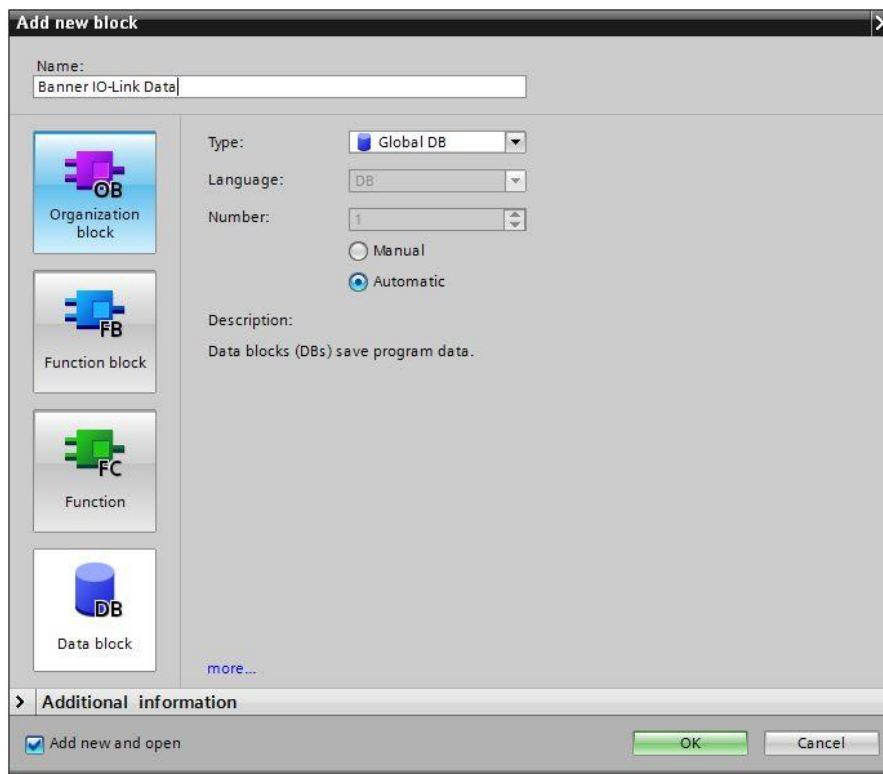
1. The Banner K50 library will now be in the Global Library List. Expand the Master copies section.
2. Open the “Optional Parameter Data” folder and then the IOLM folder.
3. Drag the “Banner_IOLM” and “Banner_IOLM_EL” to the PLC Data Types area under your PLC. These are found in the IOLM folder.
4. Open the “Other Mfgs” folder and drag the “Banner_IOLM_LIOLink” to the Program blocks area.
5. Move the “Banner_K50Pro_IOL” to the Program blocks area.
6. Open the “PLC_Data_Types” Folder.
7. Finally move the “Banner_K50Pro”, “Banner_K50Pro_AudioTone”, “Banner_K50Pro_CustomColors”, “Banner_K50Pro_DisplayConfig”, “Banner_K50Pro_InOut_Settings”, “Banner_K50Pro_RD”, “Banner_K50Pro_Settings”, “Banner_K50Pro_State”, and “Banner_K50Pro_WD” to the “PLC Data Types” folder in the PLC.



8. Go to Devices and networks to configure the system as necessary. Below is an example of what a configuration might look like. This example shows 5 different IO-Link Masters connected to the same PLC.



9. Go to Program blocks. Add a new Data block if necessary. In this example the new data block is named "Banner IO-Link Data".



10. Go to Program blocks. Add a new Data block if necessary. In this example the new data block is named "db".
11. Create a tag with the type of "Banner_IOLM". This example uses IOLM1.
12. Expand the IOLM1 tag, then expand the Port Controlled section. The Port Controlled tag array determines which of the ports has a function block-controlled Banner IO-Link device plugged into it. Each Port Controlled array tag with **true** as the start value is considered to have such a device connected. Correctly setting this array allows the Device and IO-Link Master function blocks to control the device on that port. Errors will occur if a port without an IO-Link device is set to true.

db			
	Name	Data type	Start value
[-]	[-] IOLM1	"Banner_IOLM"	
[-]	[-] Port Controlled	Array[1..8] of Bool	
[-]	[-] Port Controlled[1]	Bool	true
[-]	[-] Port Controlled[2]	Bool	true
[-]	[-] Port Controlled[3]	Bool	true
[-]	[-] Port Controlled[4]	Bool	false
[-]	[-] Port Controlled[5]	Bool	false
[-]	[-] Port Controlled[6]	Bool	false
[-]	[-] Port Controlled[7]	Bool	false
[-]	[-] Port Controlled[8]	Bool	false
[-]	[-] Port Activate	Array[1..8] of Bool	
[-]	[-] Port Read Request	Array[1..8] of Bool	
[-]	[-] Port Write Request	Array[1..8] of Bool	
[-]	[-] Port RW Complete	Array[1..8] of Bool	
[-]	[-] Port Device Read	Array[1..8] of Bool	
[-]	[-] Transfer Data	Array[0..231] of B...	
[-]	[-] Wr_Length	UInt	0
[-]	[-] Rd_Length	UInt	0
[-]	[-] IO-Index	Int	0
[-]	[-] Reset	Bool	false

13. Next add the “Banner_IOLM_Control” function block to an OB ladder. You will be prompted to make a new data block. You now must define three input variables for this function block: CAP, ID Control state, and IOLM.

Defining an input variable for the fourth input, Communications Error, is optional.

The Client Access Point (CAP) varies, depending on the specific IO-Link Master used.

IO-Link Master	CAP
Balluff (BNI PNT-508-105-Z015)	255
Control (IOLMPN8P)	255
ifm (AL1102)	46080
Siemens (CM 4xIO-Link)	227
Turck (TBEN-L5-8IOL)	251

The ID Control state variable should be “true” if using an IO-Link Master from ifm; otherwise it should be set to “false”.

Link the “IOLM” input variable to the tag created in step 11.

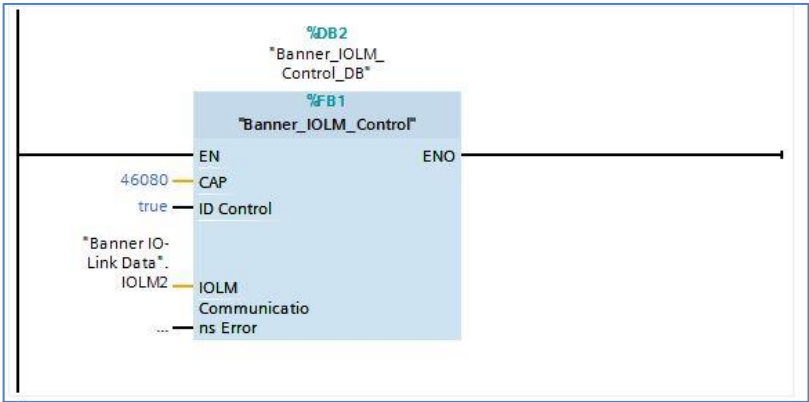


Figure 1: An example using an ifm IO-Link Master

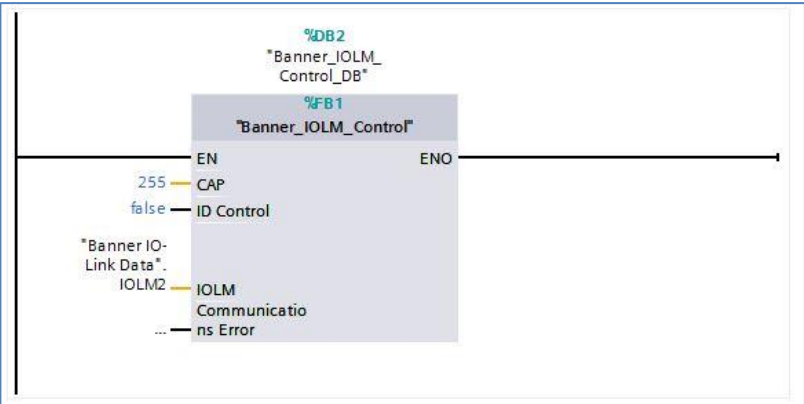


Figure 2: An example using a Balluff IO-Link Master

14. The ID Control true/false state is linked to an array called “ID_Array”, found in “Banner_IOLM_Control_DB”. This array contains the Hardware ID property of the PROFINET configuration.

See Appendix A for more information on how to find the correct value for your specific IO-Link Master.

In the case of an IO-Link Master from ifm, each port has a different Hardware ID and each number must be entered into the correct place. The example shown in Figure 3 is of an IO-Link device connected to port 6 of an ifm IO-Link Master. The ifm IO-Link Master’s port 6 Hardware ID is entered into the “ID_Array[6]” slot. This full array of different Hardware IDs, based on port used, is used when the “ID Control” variable is set to true (i.e. only when the IO-Link Master is from ifm).

IO-Link Masters from other vendors use a single Hardware ID value for all ports. In this case, the Hardware ID is entered into the “ID_Array[1]” slot of the array, regardless of the port to which the device is connected. This array is ignored (but the [1] slot is still important) when the “ID Control” variable is set to false.

▼ ID_Array	Array[1..8] of HW_IO	
■ ID_Array[1]	HW_IO	0
■ ID_Array[2]	HW_IO	0
■ ID_Array[3]	HW_IO	0
■ ID_Array[4]	HW_IO	0
■ ID_Array[5]	HW_IO	0
■ ID_Array[6]	HW_IO	279
■ ID_Array[7]	HW_IO	0
■ ID_Array[8]	HW_IO	0

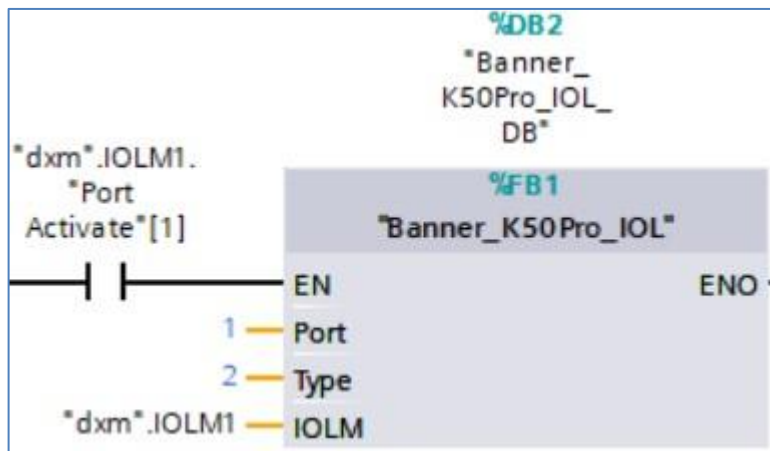
Figure 3: The ID_Array when using an ifm IO-Link Master; device attached to port 6

▼ ID_Array	Array[1..8] of HW_IO	
■ ID_Array[1]	HW_IO	309
■ ID_Array[2]	HW_IO	0
■ ID_Array[3]	HW_IO	0
■ ID_Array[4]	HW_IO	0
■ ID_Array[5]	HW_IO	0
■ ID_Array[6]	HW_IO	0
■ ID_Array[7]	HW_IO	0
■ ID_Array[8]	HW_IO	0

Figure 4: The ID_Array when using a Balluff IO-Link Master; device attached to any port (only ID_Array[1] is used)

15. Now add the “Banner_K50Pro_IOL” function block to an OB ladder. You will be prompted to make a new data block. Type in the port number for the device, then link the “IOLM” variable to the IO-Link master variable created in step 13.

As a final step, the Port Activate bit is added on the same rung as the K50 Pro function block to ensure orderly behavior. The IO-Link Master function block will cycle through all ports, giving each connected device function block a time to shine.



16. The K50 Pro Parameter Data function block is now set up. Compile the project and download it to the PLC. Go online, then open the K50 Pro data block. When the function block starts out, it does an initial global read of all K50 Pro information. The Read Data section of the data block shows this information.

Banner_K50Pro_IOL_DB				
	Name	Data type	Start value	Monitor value
7	▼ K50Pro Data	"Banner_K50Pro"		
8	Initial Global Read	Bool	false	TRUE
9	Command	Int	0	0
10	▼ Read Data	"Banner_K50Pro_RD"		
11	Master Cycle Time	USInt	0	56
12	Min Cycle Time	USInt	0	50
13	M-Sequence Capability	USInt	0	9
14	IO-Link Version ID	USInt	0	17
15	Process Data Input Length	USInt	0	16
16	Process Data Output Length	USInt	0	137
17	Vendor ID Combined	UDInt	0	451
18	Vendor ID 1	USInt	0	1
19	Vendor ID 2	USInt	0	195
20	Device ID Combined	UDInt	0	393220
21	Device ID 1	USInt	0	6
22	Device ID 2	USInt	0	0
23	Device ID 3	USInt	0	4
24	Serial Number	String	"	'18-10-1521:09:34'
25	► Write Data	"Banner_K50Pro_W..."		
26	Reset	Bool	false	FALSE

17. The Write Data section of the data block shows all the writeable parameter data for the K50 Pro.

▼ Write		"Banner_K50Pro_WD"		
■	System Command	USInt	0	0
■	Parameter Access Lock	Bool	false	FALSE
■	Data Storage Lock	Bool	false	FALSE
■	Local Parameterization Lock	Bool	false	FALSE
■	Local User Interface Lock	Bool	false	FALSE
■	Operating Mode	USInt	0	2
■	▶ Settings	"Banner_K50Pro_Settings"		
■	▶ InOut Settings	"Banner_K50Pro_InOut_Settings"		
■	▶ State Parameters	Array[1..5] of "Banner_K50Pro_State"		
■	▶ Custom Colors	"Banner_K50Pro_CustomColors"		
■	▶ Custom Audio Tone	"Banner_K50Pro_AudioTone"		
■	▶ Display Config	"Banner_K50Pro_DisplayConfig"		

Go to "Using K50 Pro" section to see how to adjust Write parameters.

Using the K50 IOL to Adjust Parameters

1. Any of the parameters shown in the Write section can be adjusted.
2. In this example the “Operating Mode” parameter will be adjusted.

▼ Write	*Banner_K50Pro_WD*		
■ System Command	USInt	0	0
■ Parameter Access Lock	Bool	false	FALSE
■ Data Storage Lock	Bool	false	FALSE
■ Local Parameterization Lock	Bool	false	FALSE
■ Local User Interface Lock	Bool	false	FALSE
■ Operating Mode	USInt	0	2
■ ▶ Settings	*Banner_K50Pro_Settings*		
■ ▶ InOut Settings	*Banner_K50Pro_InOut_Settings*		
■ ▶ State Parameters	Array[1..5] of *Banner_K50Pro_State*		
■ ▶ Custom Colors	*Banner_K50Pro_CustomColors*		
■ ▶ Custom Audio Tone	*Banner_K50Pro_AudioTone*		
■ ▶ Display Config	*Banner_K50Pro_DisplayConfig*		

3. The “Operating Mode” has a default value of 2. Here we will be changing the value from 2 to 0.

Operating Mode	USInt	0	0
----------------	-------	---	---

4. Next it is necessary to determine the command needed to initiate the write operation. Look in the Write column for the value for “Operating Mode”. The value of 46 represents the value for “Operating Mode”.

K50 Pro

Rules	Read	Write	IOL Index	RO - 0	WO - 1	RW - 2
1	1			Global Read All		
2	2		0	Direct Parameters 1		
3		43	2		Standard Command	
4	4	44	12			Device Access Locks
5	5		21	Serial Number		
6	6	46	80			Operating Mode
7	7	47	81			Settings (Custom Animation)
8	8	48	82			In Settings (Touch)
9	9	49	83			Output Settings
10	10	50	84			State Parameters 1
11	11	51	85			State Parameters 2
12	12	52	86			State Parameters 3
13	13	53	87			State Parameters 4
14	14	54	88			State Parameters 5
15	15	55	88/90			Custom Color 1
16	16	56	89/91			Custom Color 2
17	17	57	90			Custom Audio Tone
18	18	58	96			Display Configuration

5. Enter the value of 46 into Command. Do not use “System Command”. Need to use Command.

Data	*Banner_K5.
Initial Global Read	Bool
Command	Int

6. Command will automatically change back to 0 after the write is completed.
 7. Repeat this process for every Index that needs to be updated.

Appendix A IO-Link Master Hardware ID Numbers

The Hardware ID number used in “ID_Array” in the “Banner_IOLM_Control_DB” function block is not trivial to find. Each manufacturer uses the Hardware Identifier of a slightly different subcomponent as the value required for our purposes. Furthermore, the particular Hardware Identifier numbers will change based on the number of devices in your configuration. These pictures show which subcomponent’s Hardware ID is relevant to the function block.

In each case, click on the hardware device from the “Devices & Networks” view. Click on “Properties”, then click on “System Constants” to see the screen shots below.

Balluff

Use the Hardware Identifier from the “BNI_PNT-508-105-Z015_1” Hw_SubModule. Type this number into the [1] slot of the ID_Array found in the “Banner_IOLM_Control_DB” data block.

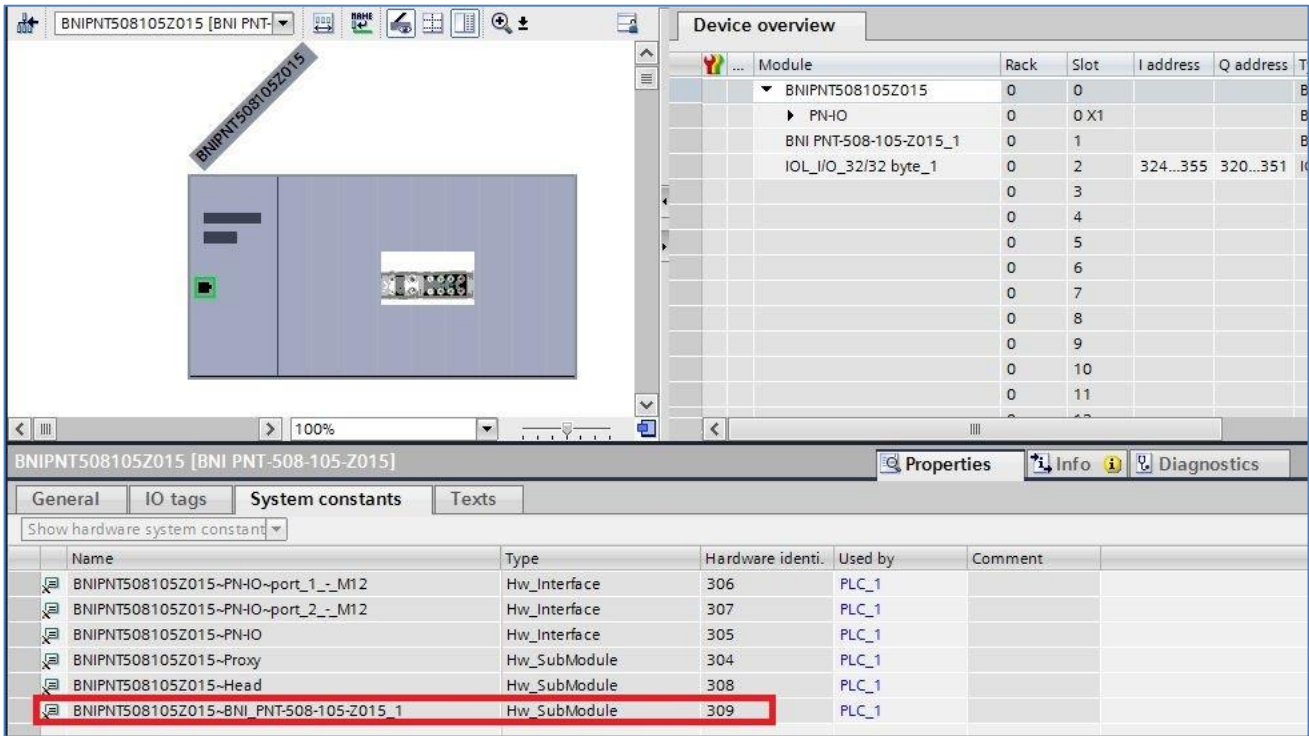


Figure 5: Balluff BNI005H. Type this value into the “ID_Array[1]” location.

Control

Use the Hardware Identifier from the “Head” Hw_SubModule. Type this number into the [1] slot of the ID_Array found in the “Banner_IOLM_Control_DB” data block.

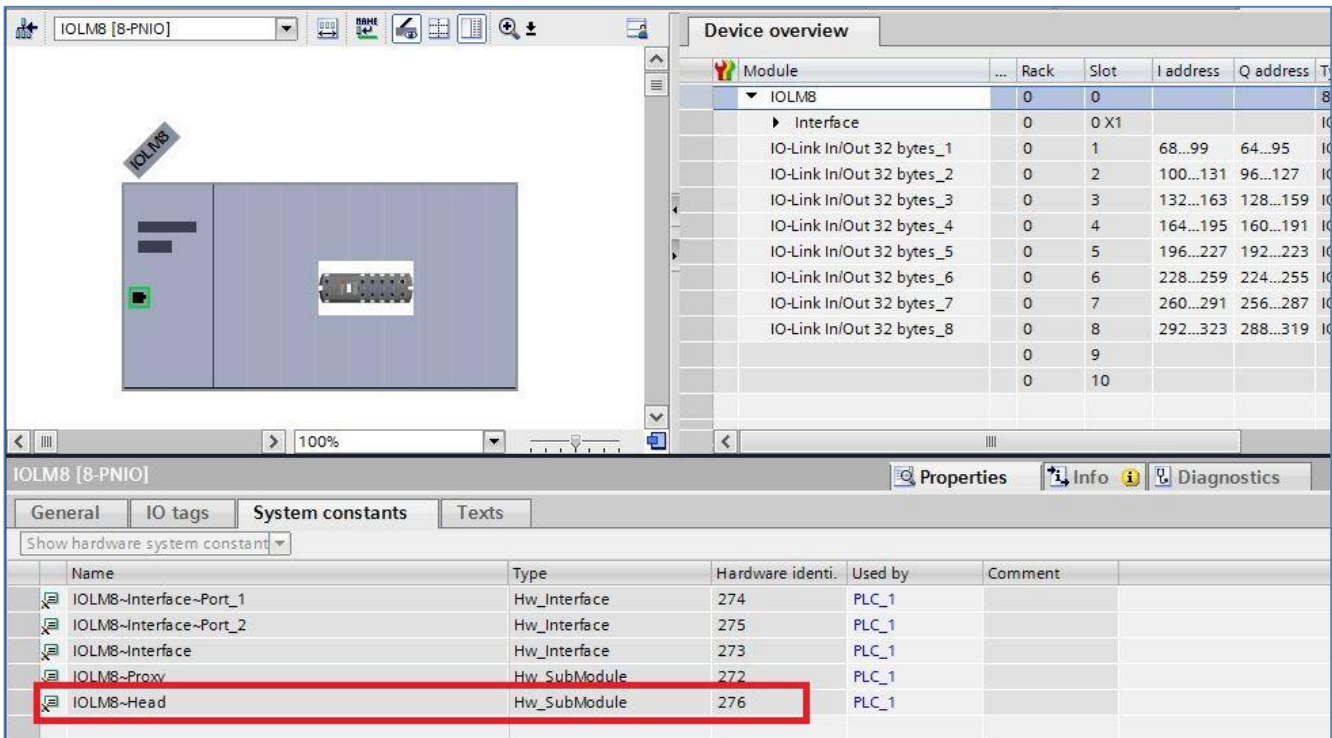


Figure 6: Control IOLM8 PNIO. Type this value into the “ID_Array[1]” location.

Turck

Use the Hardware Identifier from the “Basic_1” Hw_SubModule. Type this number into the [1] slot of the ID_Array found in the “Banner_IOLM_Control_DB” data block.

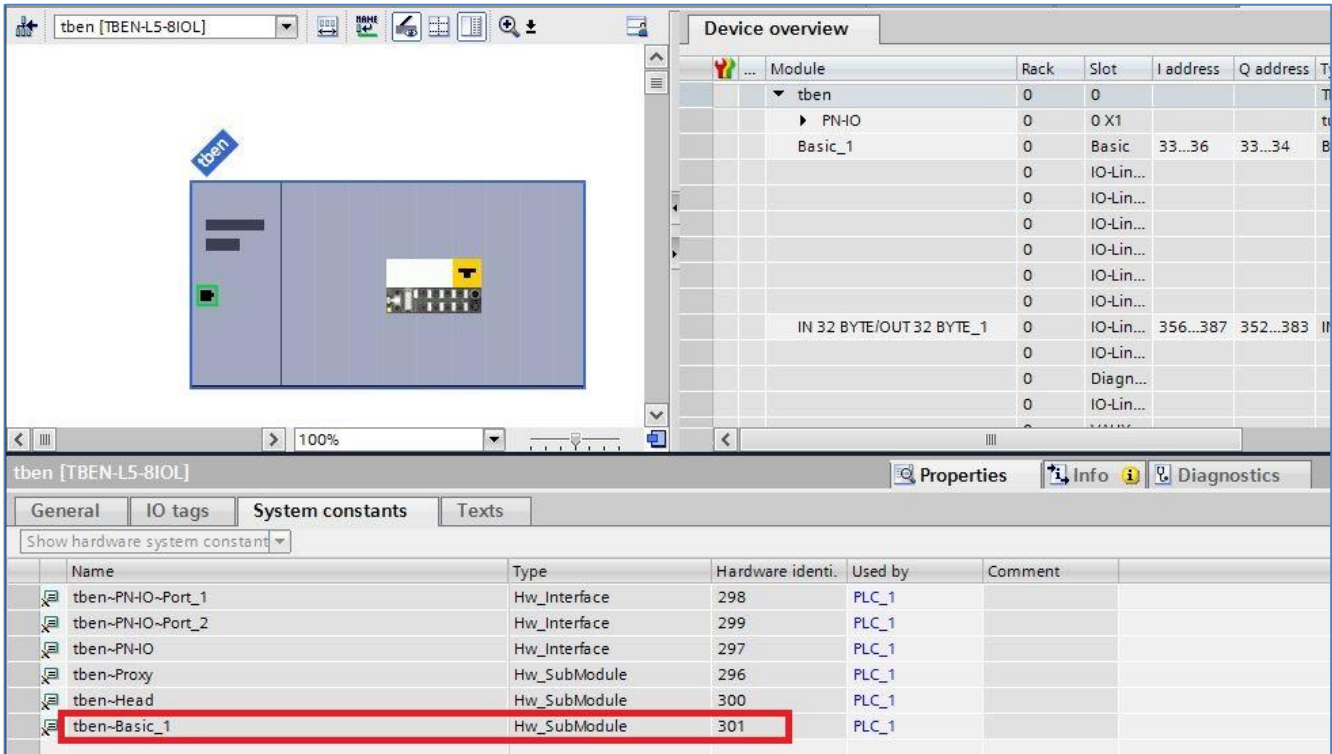


Figure 7: Turck TBEN-L5-8IOL. Type this value into the “ID_Array[1]” location.

Siemens

Use the Hardware Identifier from the “CM_4xIO-Link_1” Hw_SubModule. Type this number into the [1] slot of the ID_Array ID_Array found in the “Banner_IOLM_Control_DB” data block.

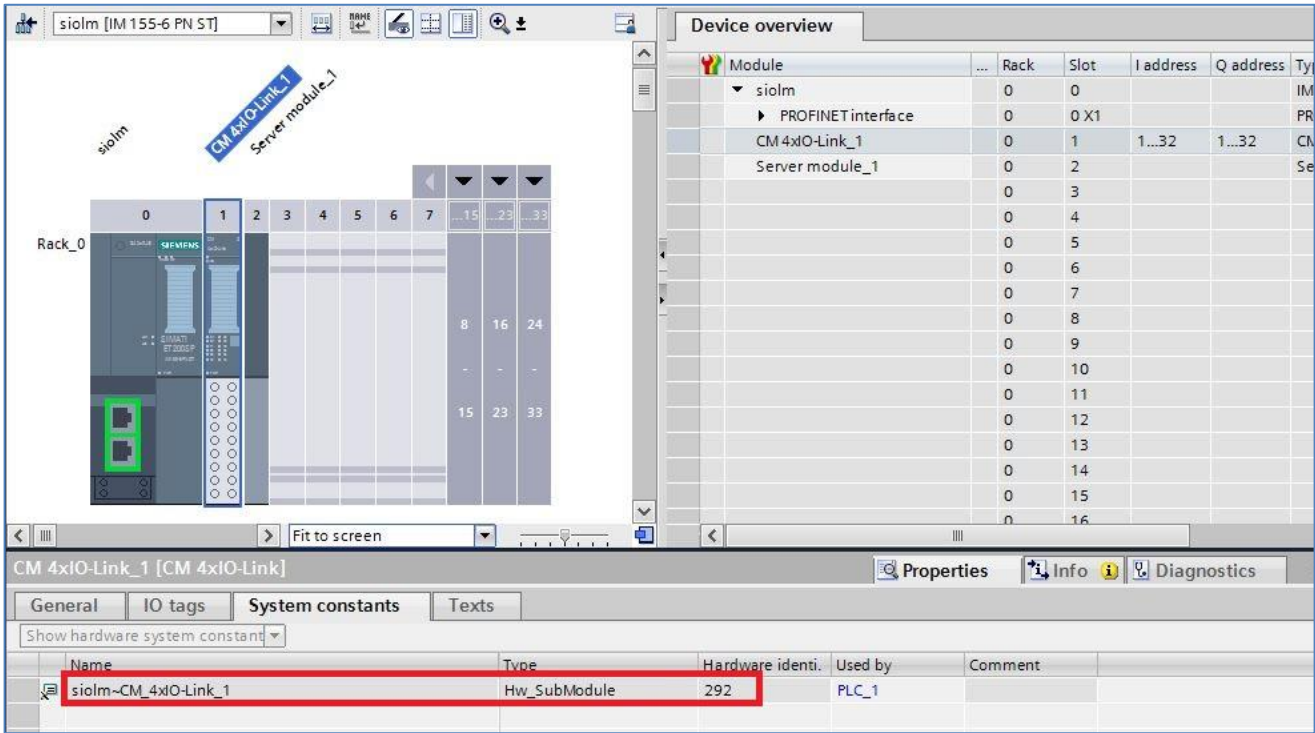


Figure 8: Siemens CM 4xIO-Link Master on ET-200SP. Type this value into the “ID_Array[1]” location.

ifm

Use the Hardware Identifier from the port to which the IO-Link Device you wish to control is connected Hw_SubModule. Each port is a different Hardware identifier. You will need to populate the ID_Array, found in the “Banner_IOLM_Control_DB” data block, with the correct values. In the example below, port 6 on the master has a Hardware ID of “279”. Thus, the [6] entry in the ID_Array variable should be set to “279”.

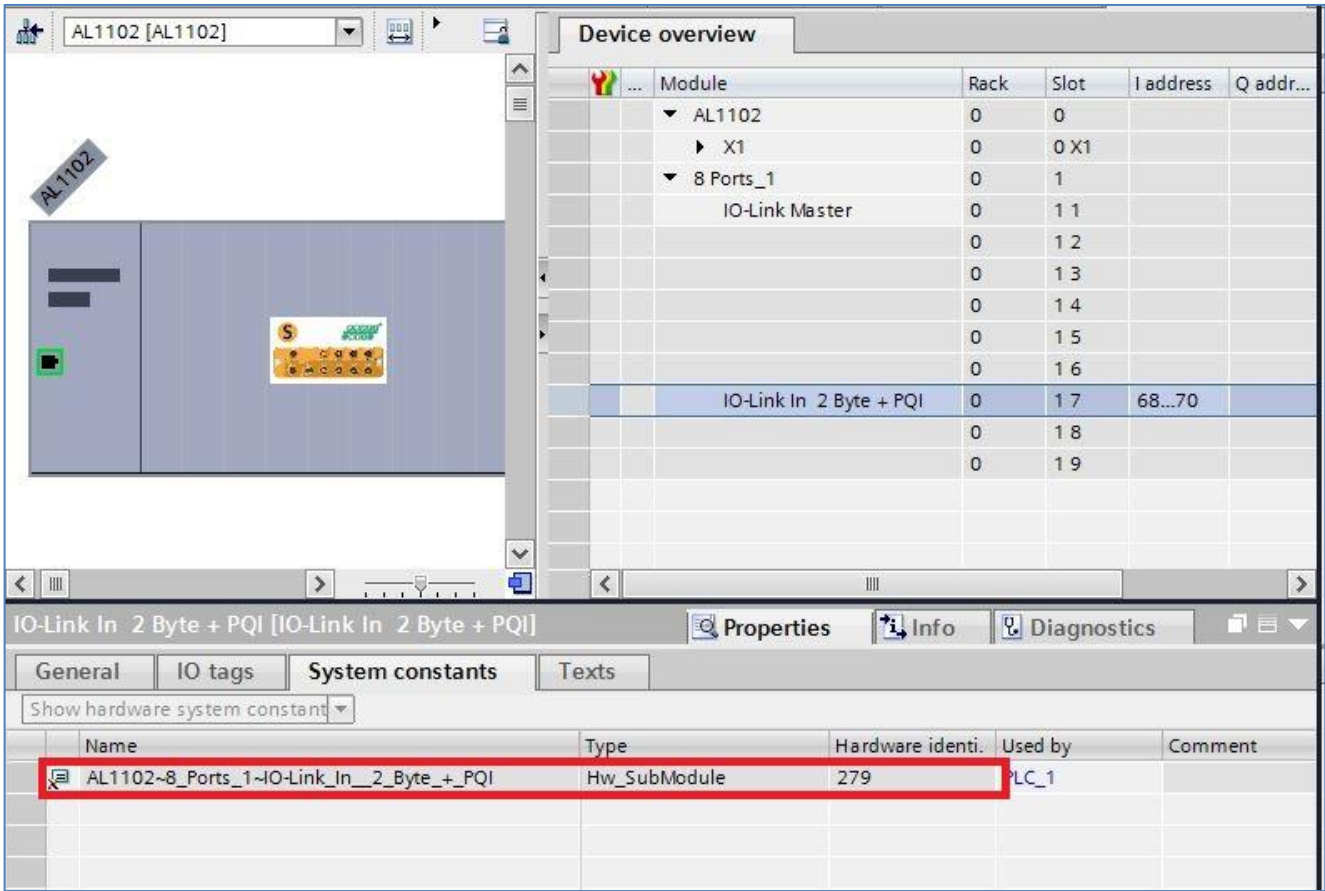


Figure 9: ifm AL1102: each port on the ifm IO-Link Master has its own Hardware ID. Type these values into the correct “ID_Array[x]” location, where ‘x’ is the port number in question ([6] here, as the ports are labeled 2 through 9).