



SIEMENS OPEN LIBRARY

5 – HMI Alarm Generation

JUNE 6, 2016

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1. Purpose

This document walks through automatically generating HMI alarms for Siemens HMIs. This overview covers tools included in the Open Library. Note that these tools are designed for use with Open Library structures and architecture only. Specifically, these may only be used to generate alarms for bit-packed Data Blocks. Use with any other alarm setup may not work.

2. Intended Use

This document is intended to be used by anyone utilizing the Open Library for PLC and HMI Development after the PLC code has been complete and alarms are ready to be generated.

3. Revision History

Version	Date	Author	Comments
1.0	2016-05-23	DMC	Initial Release

4. Open Library License

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5. Hardware and Software Compatibility

This library was developed in TIA Portal V13 SP1. It has been tested on the S7-1200 and S7-1500 platforms, and untested modifications have been made for compatibility with S7-300 and S7-400. The PLC objects can be used with any HMI, however, the configuration of the faceplates is only available using a Comfort Panel or WinCC Advanced, and have been tested on a 7" Comfort Panel.

6. General Overview

Siemens Comfort Panels and WinCC Advanced Runtime use bits out of words to trigger alarms, and there are no methods to configure Boolean alarms. This library, however, utilizes bits for all alarms. To automate this process the Siemens Open Library includes a Microsoft Excel macro that utilizes a data block of Booleans to generate alarms.

6.1. Excel Macro

The Excel macro uses the definition of Data Blocks to automatically generate alarms. All of the source code is included as part of the Excel macro and can be edited in VBA for custom applications. The Excel macro will work with any non-optimized data block containing only Booleans. The Booleans can be placed directly in the Data Block, nested in User Defined Types, or nested in Structs.

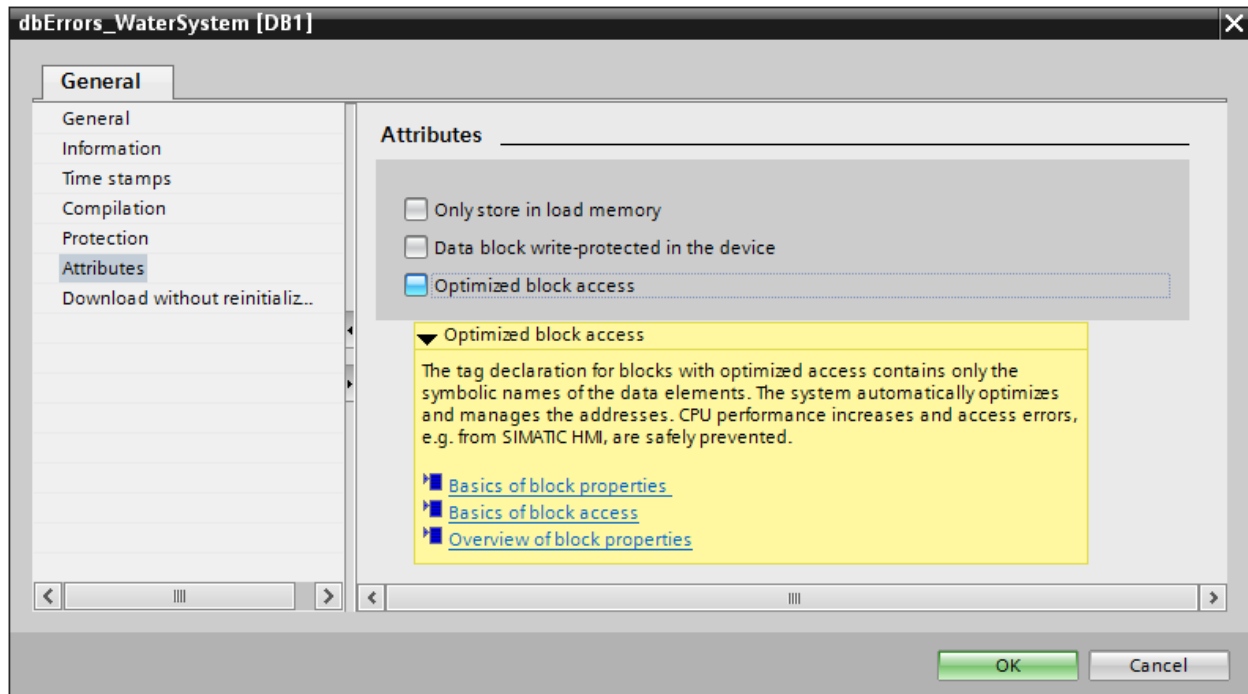
6.2. Alarm Special Considerations

The included Excel macro has the following special considerations in order for the system to function:

1. The Data Block must be non-optimized (applies to 1200/1500 only and is accessible via the properties of the Data Block). See Section 7 of this document or '2- Siemens Open Library - Initial Setup' for details about how to set up a non-optimized data block.
2. The User Defined Type, Struct, and/or individual Boolean comments will be utilized for the alarm text, so it is important to put in meaningful comments on each alarm.
3. The Excel macro will work with nested User Defined Types and Structs.
4. The Excel macro works only with data blocks containing only Booleans, so all automatically generated alarms will need to be Boolean alarms, and should be concentrated in Data Blocks.
5. The Excel macro utilizes the bit comments for alarm text, so arrays are not a recommended structure as they won't generate unique alarm text, but could be used by modifying the Excel Macro to grab relevant information from the array.

7. Verify Non-Optimized Data Blocks

To verify that a data block is non-optimized, right click on the data block and select 'Properties.' Under the 'Attribute' tab, verify the 'Optimized block access' is not checked. Choosing optimized block access permits the TIA Portal compiler to rearrange data to optimize space on the PLC. When using the alarm generator, however, the Macro utilizes data block position to determine address, so non-optimized blocks need to be used for correct functionality.



8. Alarm Naming Conventions

This section discusses how automated alarms are generated and how text will be created for the HMI. Alarm text will be created using the comments contained in the Data Block.

8.1. Macro Alarm String Creation

The Excel macro will generate the alarm based on the following parameters:

1. For alarms not in a User Defined Type or Struct, the alarm string will be the Boolean comment string.
2. For alarms in a single or nested User Defined Types and/or Structs, the comment for each User Defined Type and/or Struct will be a prefix for the alarm.

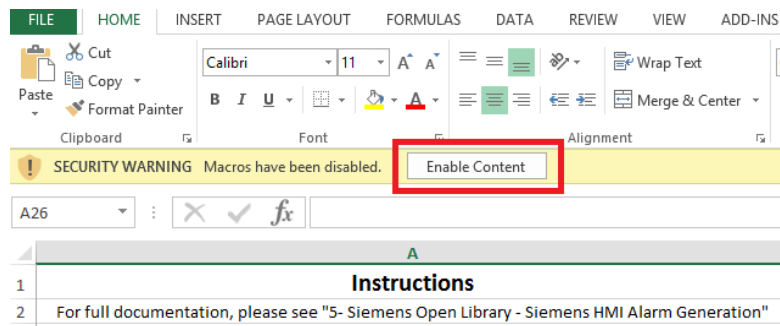
dbErrors_WaterSystem									
	Name	Data type	Offset	Start value	Retain	Accessible f...	Visible in ...	Setpoint	Comment
1	Static								
2	SOL_MainWater	"udtError_Valve"				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Main Water Valve
3	VFD_WaterPump	"udtError_VFD"				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Main Water Pump
4	MotorProtectorTripped	Bool		false		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Motor protector tripped
5	LocalDisconnectOff	Bool		false		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Motor disconnect off
6	ClutchTripped	Bool		false		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Clutch tripped
7	NoContactorFeedback	Bool		false		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		No feedback from motor contactor
8	ContactorStillOn	Bool		false		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Contactor still on
9	NoSignalForward	Bool		false		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		No signal forward from VFD
10	NoSignalReverse	Bool		false		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		No signal reverse from VFD
11	MotorNotStopped	Bool		false		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Motor doesn't stop

ID	Name	Alarm text [en-US], Alarm text	FieldInfo [A]	Class	Trigger tag	Trigger bit	Acknov
1	Discret Main Water Valve - Home position feedback not active		<No value>	Errors	dbErrors_WaterSystem	8	<No val
2	Discret Main Water Valve - Work position feedback not active		<No value>	Errors	dbErrors_WaterSystem	9	<No val
3	Discret Main Water Valve - Home position feedback still active		<No value>	Errors	dbErrors_WaterSystem	10	<No val
4	Discret Main Water Valve - Work position feedback still active		<No value>	Errors	dbErrors_WaterSystem	11	<No val
5	Discret Main Water Pump - Motor protector tripped		<No value>	Errors	dbErrors_WaterSystem	24	<No val
6	Discret Main Water Pump - Motor disconnect off		<No value>	Errors	dbErrors_WaterSystem	25	<No val
7	Discret Main Water Pump - Clutch tripped		<No value>	Errors	dbErrors_WaterSystem	26	<No val
8	Discret Main Water Pump - No feedback from motor contactor		<No value>	Errors	dbErrors_WaterSystem	27	<No val
9	Discret Main Water Pump - Contactor still on		<No value>	Errors	dbErrors_WaterSystem	28	<No val
10	Discret Main Water Pump - No signal forward from VFD		<No value>	Errors	dbErrors_WaterSystem	29	<No val
11	Discret Main Water Pump - No signal reverse from VFD		<No value>	Errors	dbErrors_WaterSystem	30	<No val
12	Discret Main Water Pump - Motor doesn't stop		<No value>	Errors	dbErrors_WaterSystem	31	<No val

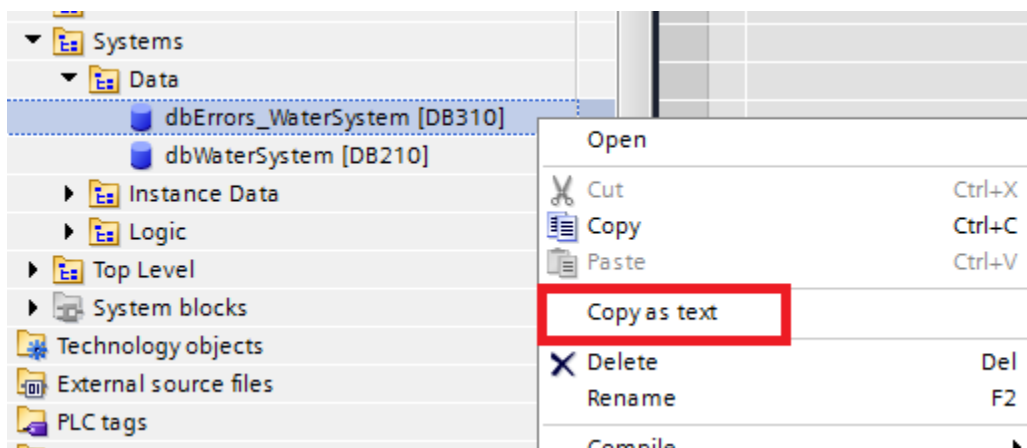
9. Excel Macro

The instructions below use an installation of Microsoft Office, specifically Microsoft Excel. However, the Open Library Alarm Generator is in a macro-enabled Open XML format (.xlsm) and is compatible with several open source office platforms.

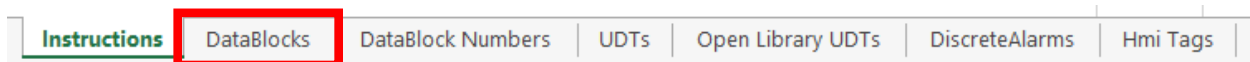
1. Open the "Open Library Alarm Generator.xlsm" document and click the "Enable Content" button, if prompted.



2. Open up the PLC project that contains the desired alarm data blocks.
3. Right click the Errors data block that contains the alarms and select "Copy as text"



4. Navigate to the DataBlocks tab in the Excel document



- Paste the copied contents into the next available row in column 'A'

A1 DATA_BLOCK "dbErrors_WaterSystem"

	A	B	C	D
1	DATA_BLOCK "dbErrors_WaterSystem"			
2	{ S7_Optimized_Access := 'FALSE' }			
3	VERSION : 0.1			
4	NON_RETAIN			
5	STRUCT			
6	SOL_MainWater : "udtError_Valve"; // Main Water Valve			
7	VFD_WaterPump : "udtError_VFD"; // Main Water Pump			
8	ANA_SteamValve : "udtError_AnalogValve"; // Analog Steam Valve			
9	PID_WaterTemperature : "udtError_PID"; // Water Temperature PID			
10	END_STRUCT;			
11				
12				
13	BEGIN			
14				
15	END_DATA_BLOCK			
16				
17				
18				
19				

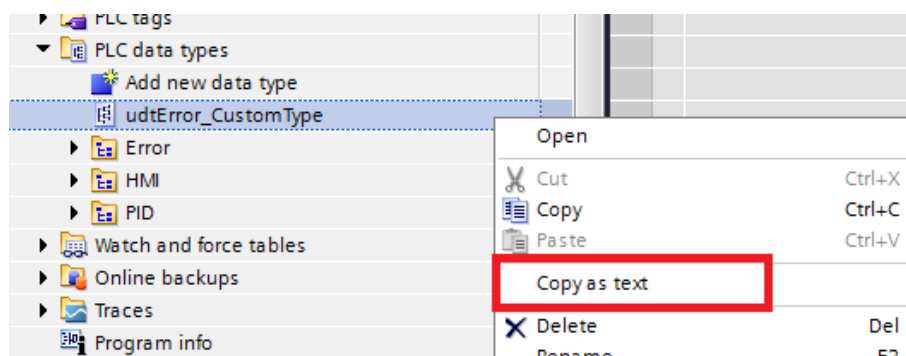
- Navigate to the DataBlock Numbers tab

Instructions	DataBlocks	DataBlock Numbers	UDTs	Open Library UDTs	DiscreteAlarms	Hmi Tags
--------------	------------	-------------------	------	-------------------	----------------	----------

- Add the Data Block name, number, and HMI connection name to the list

	A	B	C
1	Data Block Name	Data Block Number	HMI Connection Name (if not 'HMI_Connection_1')
2	dbErrors_WaterSystem	710	HMI_Connection
3	dbErrors_AirSystem	720	HMI_Connection
4			
5			
6			




- Repeat steps 3-7 for each Errors data block containing HMI alarms.
- If you are not using custom Error UDTs, you can skip to step 14.
- Right click the custom Error UDT and select "Copy as text"



- Navigate to the UDTs tab of the Excel document

Instructions	DataBlocks	DataBlock Numbers	UDTs	Open Library UDTs	DiscreteAlarms	Hmi Tags
--------------	------------	-------------------	------	-------------------	----------------	----------

12. Paste the copied contents into the next available of column 'A'

A1	:				TYPE "udtError_CustomType"		
					A	B	C
1					TYPE "udtError_CustomType"		
2					VERSION : 0.1		
3					STRUCT		
4					TestError : Bool; // Test error occurred		
5					END_STRUCT;		
6							
7					END_TYPE		
8							
9							
10							

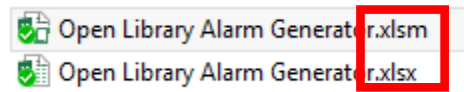
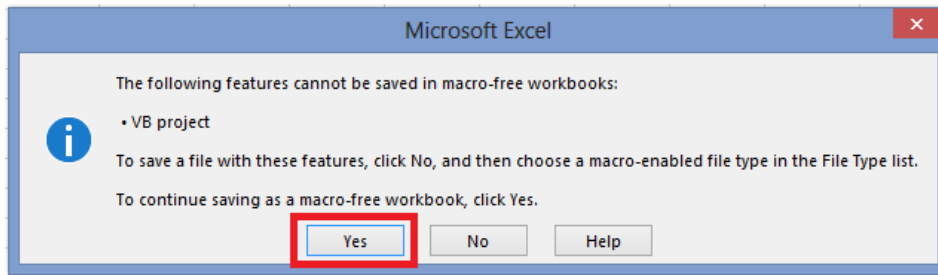
13. Repeat steps 10-12 for each custom Error UDT used in your Errors data blocks
14. Navigate back to the Instructions tab

Instructions	DataBlocks	DataBlock Numbers	UDTs	Open Library UDTs	DiscreteAlarms	Hmi Tags
--------------	------------	-------------------	------	-------------------	----------------	----------

15. Press the Generate Alarms button

A	B
<h2 style="text-align: center;">Instructions</h2> <p>For full documentation, please see "5- Siemens Open Library - Siemens HMI Alarm Generation"</p> <ol style="list-style-type: none"> 1. Open up the Siemens TIA Portal project 2. Right click your "Errors" data block and select to option "Copy as text" 3. Navigate to the "DataBlocks" tab of this workbook 4. Paste in the copied contents into the next available row of column 'A' 5. Repeat steps 2-4 for each of your "Errors" data blocks <p style="color: red;">If you do not have custom error UDTs (i.e not included in the Open Library), skip to step 10</p> <ol style="list-style-type: none"> 6. Right click your custom UDT in your Portal project and copy as text 7. Navigate to the "UDTs" tab of this workbook 8. Paste in the copied contents into the next available row of column 'A' 9. Repeat steps 6-8 for each custom UDT in your "Errors" data blocks <p>10. Press the "Generate Alarms" button below</p> <ol style="list-style-type: none"> 11. When prompted, select the "Yes" option to save the current file as a .xlsx file 12. This file may then be imported directly into the "HMI Alarms" section of a Comfort Panel <div style="border: 2px solid red; padding: 10px; text-align: center; margin: 20px auto; width: fit-content;"> <p>Generate Alarms</p> </div>	

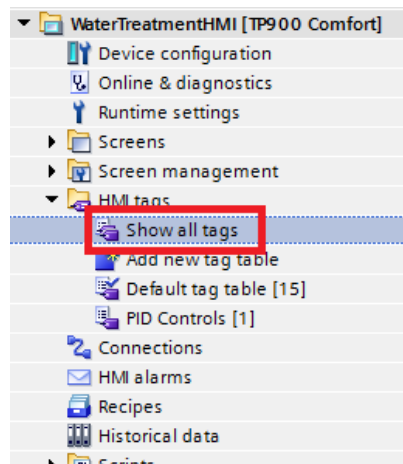
16. If you are prompted with any errors that occurred, make sure to resolve them before trying again.
17. If alarm generation was successful, Excel will prompt you to save a file without macros enabled. Select Yes. This will save a copy of the current workbook with an identical name but with an ".xlsx" file extension instead of ".xlsm". This is done so that the workbook can be imported into TIA Portal properly.



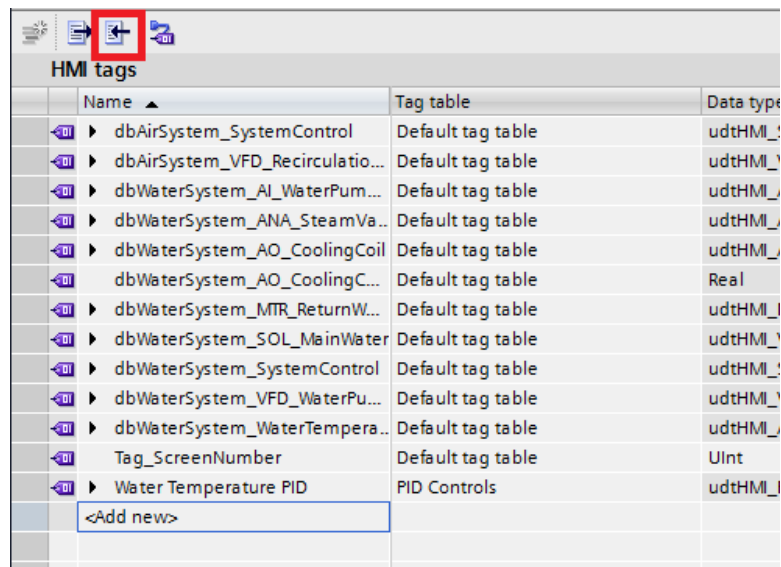
10. Importing Alarms to a Comfort Panel

Once an ".xlsx" alarm file has been created, it may be imported directly to TIA Portal. It is important to note that the file format created is compatible with WinCC Comfort panels and WinCC Advanced.

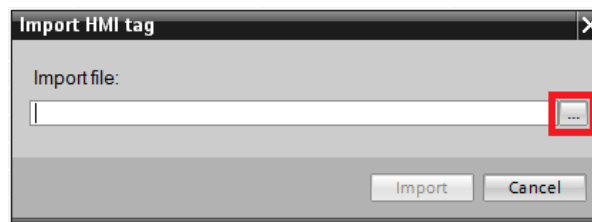
1. Open the "Show all tags" section of the Comfort Panel



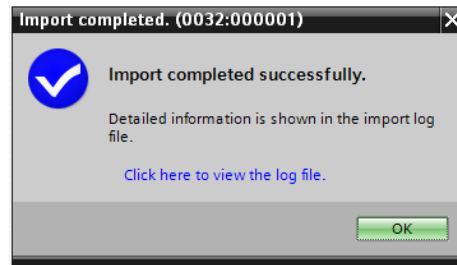
2. Press the Import button in the top left corner



3. Browse for the generated ".xlsx" file and press the Import button



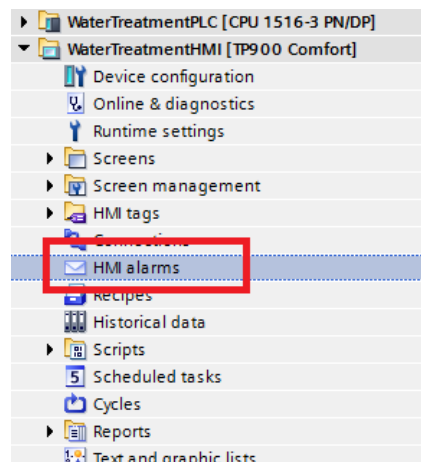
- Once completed, you will get prompted with a success dialog



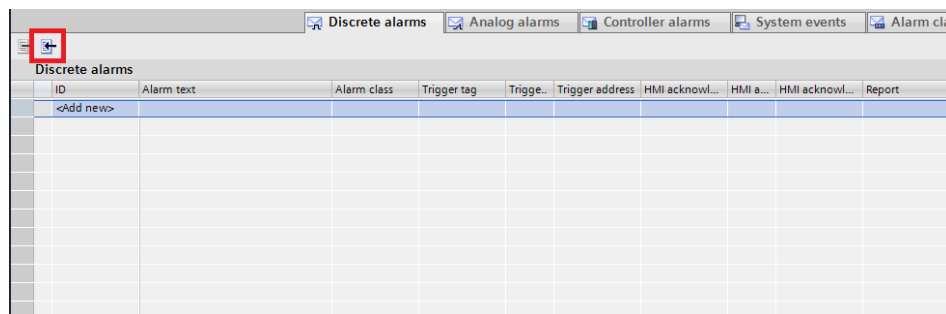
- Press Ok and check to make sure that all tags were imported correctly

<Add new>	dbErrors_AirSystem	Default tag table	Array [0..1] of Word	HMI_Connection_1	WaterTreatmentPLC	<Undefined>	%DB720.DBX0.0
<Add new>	dbErrors_WaterSystem	Default tag table	Array [0..8] of Word	HMI_Connection_1	WaterTreatmentPLC	<Undefined>	%DB710.DBX0.0

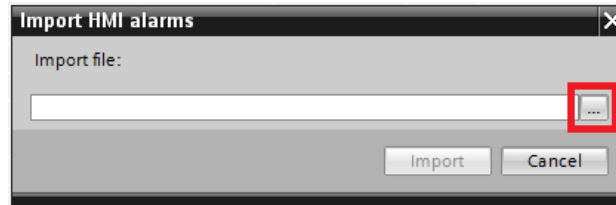
- Open the HMI Alarms section



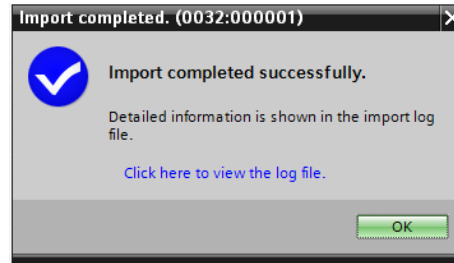
- Press the Import button in the top left corner



8. Again, browse for the generated “.xlsx” file and press the Import button



9. Once completed, you will get prompted with another success dialog



10. Press Ok and check to make sure that all alarms were imported correctly

Discrete alarms									
ID	Alarm text	Alarm class	Trigger tag	Trigge...	Trigger address	HMI acknowl...	HMI a...	HMI acknowl...	Rep
1	Main Water Valve - Home position fe	Errors	dbErrors_Wat...	8	%DB310.DBX...	<No tag>	0		
2	Main Water Valve - Work position fee	Errors	dbErrors_Wat...	9	%DB310.DBX...	<No tag>	0		
3	Main Water Valve - Home position fe	Errors	dbErrors_Wat...	10	%DB310.DBX...	<No tag>	0		
4	Main Water Valve - Work position fee	Errors	dbErrors_Wat...	11	%DB310.DBX...	<No tag>	0		
5	Main Water Pump - Motor protector ti	Errors	dbErrors_Wat...	24	%DB310.DBX...	<No tag>	0		
6	Main Water Pump - Motor disconnect	Errors	dbErrors_Wat...	25	%DB310.DBX...	<No tag>	0		
7	Main Water Pump - Clutch tripped	Errors	dbErrors_Wat...	26	%DB310.DBX...	<No tag>	0		
8	Main Water Pump - No feedback from	Errors	dbErrors_Wat...	27	%DB310.DBX...	<No tag>	0		
9	Main Water Pump - Contactor still on	Errors	dbErrors_Wat...	28	%DB310.DBX...	<No tag>	0		
10	Main Water Pump - No signal forward	Errors	dbErrors_Wat...	29	%DB310.DBX...	<No tag>	0		
11	Main Water Pump - No signal reverse	Errors	dbErrors_Wat...	30	%DB310.DBX...	<No tag>	0		
12	Main Water Pump - Motor doesn't stc	Errors	dbErrors_Wat...	31	%DB310.DBX...	<No tag>	0		
13	Main Water Pump - Max frequency rei	Errors	dbErrors_Wat...	16	%DB310.DBX...	<No tag>	0		
14	Main Water Pump - VFD overcurrent	Errors	dbErrors_Wat...	17	%DB310.DBX...	<No tag>	0		
15	Main Water Pump - Motor overload	Errors	dbErrors_Wat...	18	%DB310.DBX...	<No tag>	0		
16	Main Water Pump - VFD overload	Errors	dbErrors_Wat...	19	%DB310.DBX...	<No tag>	0		
17	Main Water Pump - VFD fault	Errors	dbErrors_Wat...	20	%DB310.DBX...	<No tag>	0		
18	Main Water Pump - No feedback from	Errors	dbErrors_Wat...	21	%DB310.DBX...	<No tag>	0		
19	Analog Steam Valve - Valve feedbac	Errors	dbErrors_Wat...	40	%DB310.DBX...	<No tag>	0		
20	Water Temperature PID - Input value	Errors	dbErrors_Wat...	56	%DB310.DBX...	<No tag>	0		
21	Water Temperature PID - InputPER va	Errors	dbErrors_Wat...	57	%DB310.DBX...	<No tag>	0		
22	Water Temperature PID - Fine tuning	Errors	dbErrors_Wat...	58	%DB310.DBX...	<No tag>	0		
23	Water Temperature PID - Pre-tuning -	Errors	dbErrors_Wat...	59	%DB310.DBX...	<No tag>	0		
24	Water Temperature PID - PID set poin	Errors	dbErrors_Wat...	60	%DB310.DBX...	<No tag>	0		
25	Water Temperature PID - Pre-tuning r	Errors	dbErrors_Wat...	61	%DB310.DBX...	<No tag>	0		
26	Water Temperature PID - Pre-tuning -	Errors	dbErrors_Wat...	62	%DB310.DBX...	<No tag>	0		
27	Water Temperature PID - Fine tuning	Errors	dbErrors_Wat...	63	%DB310.DBX...	<No tag>	0		
28	Water Temperature PID - Input value	Errors	dbErrors_Wat...	48	%DB310.DBX...	<No tag>	0		
29	Water Temperature PID - Output valu	Errors	dbErrors_Wat...	49	%DB310.DBX...	<No tag>	0		
30	Water Temperature PID - PID_Compa	Errors	dbErrors_Wat...	50	%DB310.DBX...	<No tag>	0		
31	Water Temperature PID - Set point va	Errors	dbErrors_Wat...	51	%DB310.DBX...	<No tag>	0		
32	Water Temperature PID - Manual val	Errors	dbErrors_Wat...	52	%DB310.DBX...	<No tag>	0		
33	Water Temperature PID - Substitute c	Errors	dbErrors_Wat...	53	%DB310.DBX...	<No tag>	0		
34	Water Temperature PID - Disturbance	Errors	dbErrors_Wat...	54	%DB310.DBX...	<No tag>	0		
<Add new>									