



---

# SIEMENS OPEN LIBRARY

---

5 – HMI Alarm Generation  
NOVEMBER 3, 2017

---

## Contents

|   |    |
|---|----|
| Contents.....                                 | 2  |
| 1. Purpose .....                              | 3  |
| 2. Intended Use.....                          | 3  |
| 3. Revision History.....                      | 3  |
| 4. Open Library License.....                  | 3  |
| 5. Hardware and Software Compatibility .....  | 3  |
| 6. General Overview .....                     | 5  |
| 6.1. Excel Macro .....                        | 5  |
| 6.2. Alarm Special Considerations.....        | 5  |
| 7. Verify Non-Optimized Data Blocks.....      | 6  |
| 8. Alarm Naming Conventions.....              | 7  |
| 8.1. Macro Alarm String Creation .....        | 7  |
| 9. Excel Macro .....                          | 8  |
| 10. Importing Alarms to a Comfort Panel ..... | 12 |

---

## 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 |
| 1.1     | 2016-06-20 | DMC    | No Changes      |
| 1.2     | 2016-08-23 | DMC    | No Changes      |
| 1.3     | 2016-10-11 | DMC    | No Changes      |
| 2.0     | 2017-11-3  | DMC    | No Changes      |

---

## 4. Open Library License

Copyright (c) 2016 DMC, Inc.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

---

## 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.

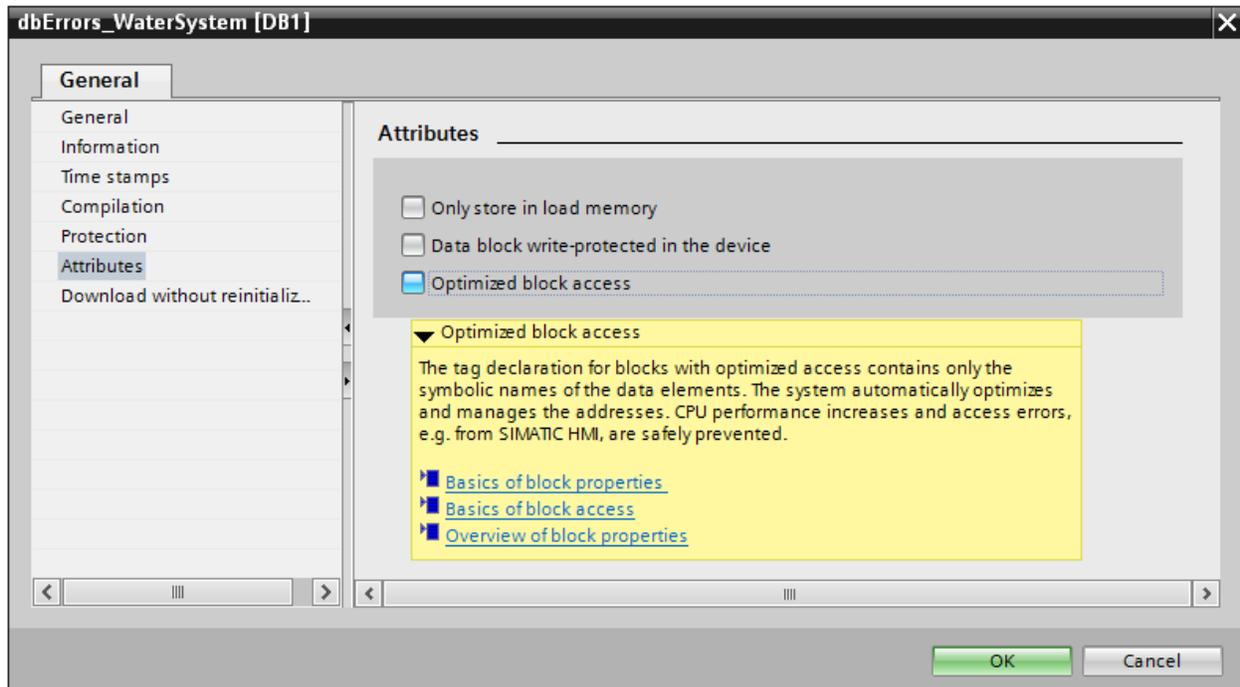
### 6.2. Alarm Special Considerations

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               |

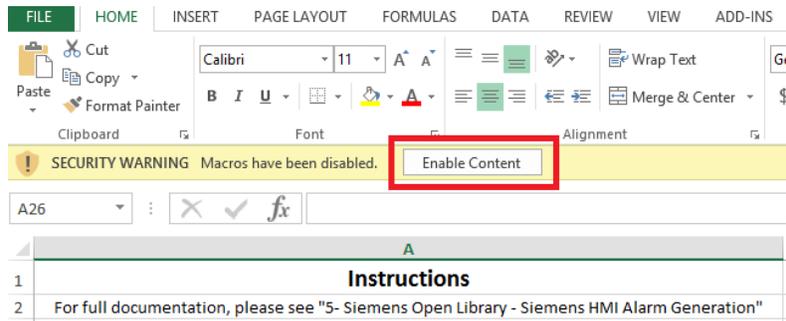
  

| ID | Name    | Alarm text [en-US], Alarm text                         | FieldInfo [A] | Class  | Trigger tag          | Trigger bit | Acknov  |
|----|---------|--|---------------|--------|----------------------|-------------|---------|
| 1  | Discret | Main Water Valve - Home position feedback not 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 |

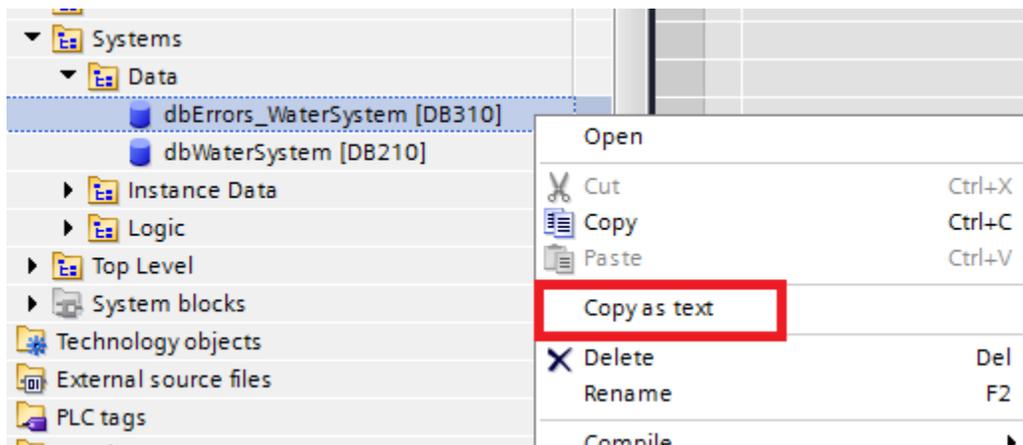
## 9. Excel Macro

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 (.xlsx) and is compatible with several open source office platforms.

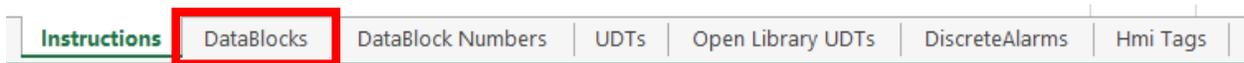
1. Open the "Open Library Alarm Generator.xlsm" document and click the "Enable Content" button, if prompted.



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

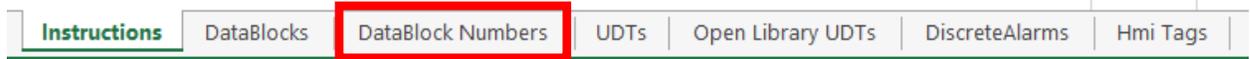


- Paste the copied contents into the next available row in column 'A'

```

DATA_BLOCK "dbErrors_WaterSystem"
{ $7_Optimized_Access := 'FALSE' }
VERSION : 0.1
NON_RETAIN
STRUCT
  SOL_MainWater : "udtError_Valve"; // Main Water Valve
  VFD_WaterPump : "udtError_VFD"; // Main Water Pump
  ANA_SteamValve : "udtError_AnalogValve"; // Analog Steam Valve
  PID_WaterTemperature : "udtError_PID"; // Water Temperature PID
END_STRUCT;
BEGIN
END_DATA_BLOCK
  
```

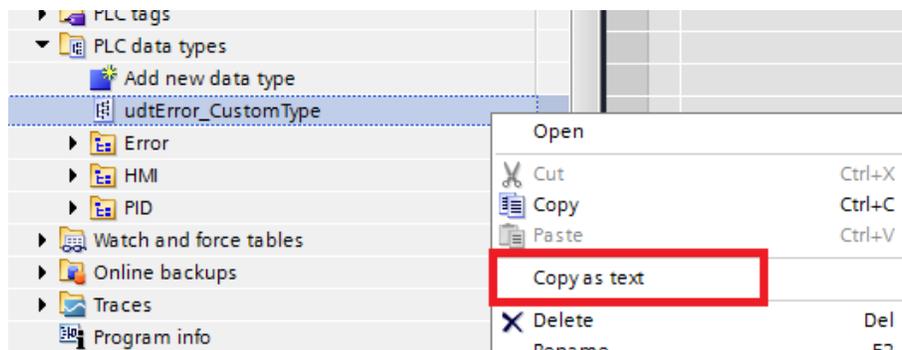
- Navigate to the DataBlock Numbers tab



- 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 |                      |                   |   |

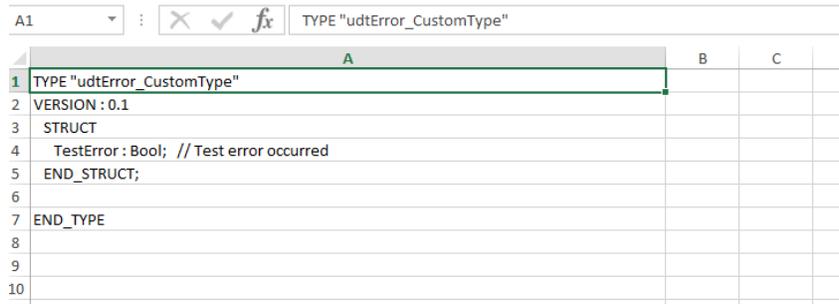
- Repeat steps 3-7 for each Errors data block containing HMI alarms.
- If you are not using custom Error UDTs, you can skip to step 14.
- Right click the custom Error UDT and select "Copy as text"



- Navigate to the UDTs tab of the Excel document

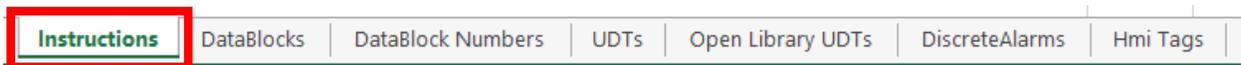


12. Paste the copied contents into the next available of column 'A'

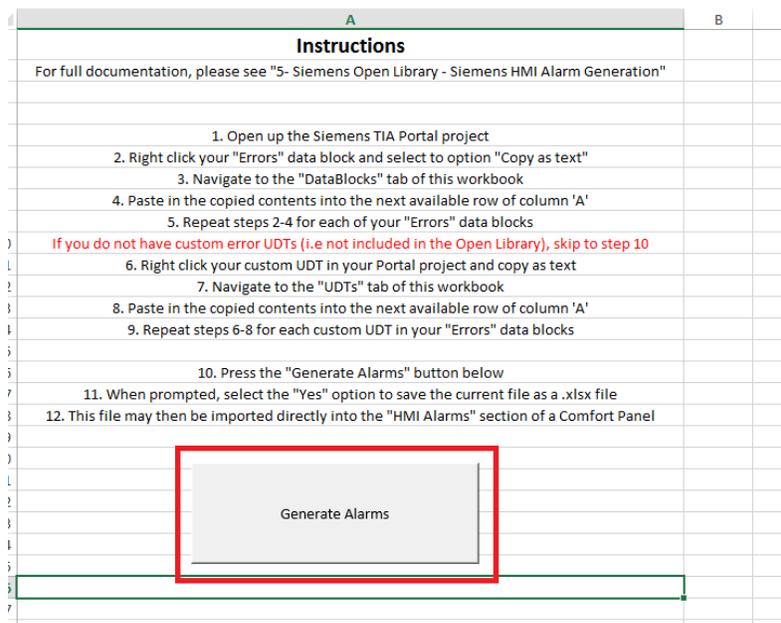


13. Repeat steps 10-12 for each custom Error UDT used in your Errors data blocks

14. Navigate back to the Instructions tab

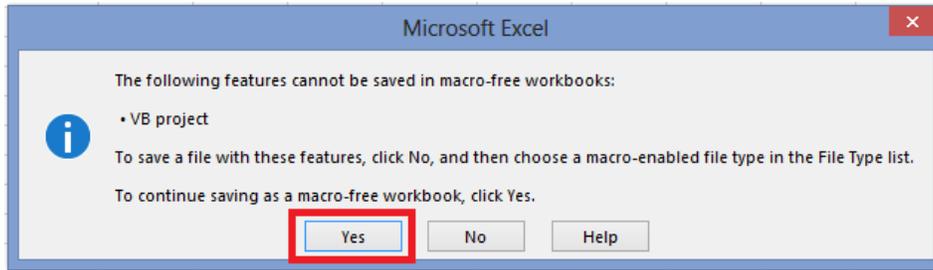


15. Press the Generate Alarms button



16. If you are prompted with any errors that occurred, make sure to resolve them before trying again.

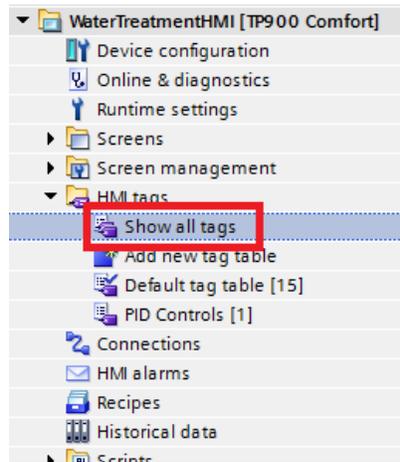
17. If alarm generation was successful, Excel will prompt you to save a file without macros enabled. Select Yes. This will save a copy of the current workbook with an identical name but with an ".xlsx" file extension instead of ".xlsm". This is done so that the workbook can be imported into TIA Portal properly.



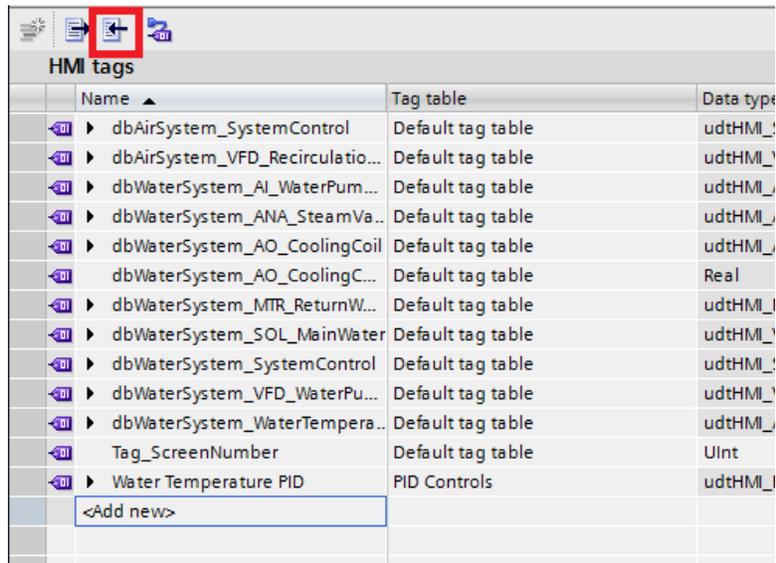
## 10. Importing Alarms to a Comfort Panel

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



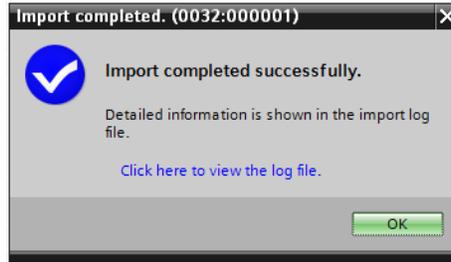
2. Press the Import button in the top left corner



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



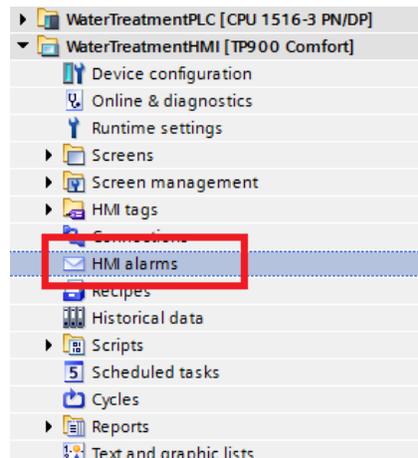
4. Once completed, you will get prompted with a success dialog



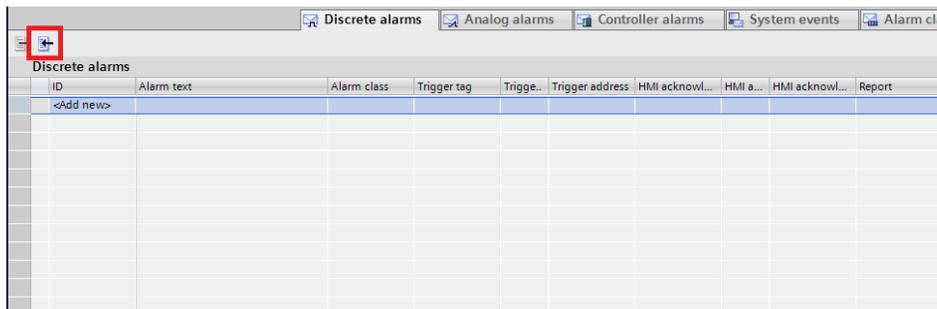
5. Press Ok and check to make sure that all tags were imported correctly

|           |                      |                   |                      |                  |                   |             |               |
|-----------|----------------------|-------------------|----------------------|------------------|-------------------|-------------|---------------|
| <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 |

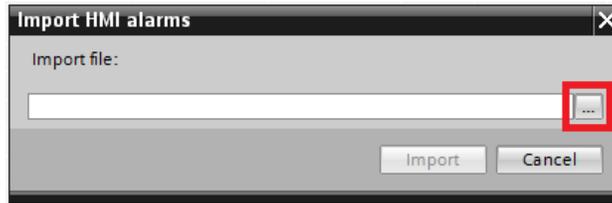
6. Open the HMI Alarms section



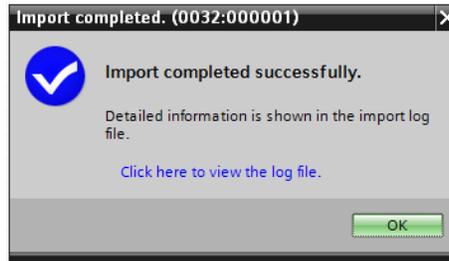
7. Press the Import button in the top left corner



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_Comp     | 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>       |                                      |             |                 |           |                 |                |          |                |     |  |