Ewon Flexy & Schneider IOT Platform

Configuration for EcoStruxure™ Machine Advisor

APPLICATION NOTE
AUG-0078-00 1.0 en-US ENGLISH
Important User Information

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1 Preface

1.1 About This Document

This document explains in a few steps how the Flexy can poll data registers from a Schneider® PLC using MODBUS TCP and export it to the Schneider® IOT platform: EcoStruxure Machine Advisor Communication.

For additional related documentation and file downloads, please visit www.ewon.biz/support.

1.2 Document history

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>2019-07-24</td>
<td>First release</td>
</tr>
</tbody>
</table>

1.3 Related Documents

<table>
<thead>
<tr>
<th>Document</th>
<th>Author</th>
<th>Document ID</th>
</tr>
</thead>
</table>

1.4 Trademark Information

Ewon® is a registered trademark of HMS Industrial Networks SA. All other trademarks mentioned in this document are the property of their respective holders.
2 Objectives

The objective of this document is to explain how the Flexy can poll data registers out of a Schneider using MODBUS TCP and publish the data to the Schneider® IOT platform EcoStruxure Machine Advisor Communication.

Polling PLC data registers implies the following steps:
1. Link the Flexy with the PLC;
2. Configure the Flexy IO server;
3. Create tags in the Flexy;
4. Monitor tags;
5. Publish the tags to the Schneider® EcoStruxure Machine Advisor Communication platform.

![Ewon Flexy combined with EcoStruxure Machine Advisor](image)
3 Requirements

3.1 Hardware

To follow this guide, you need:

- A computer suitable to connect to the Ewon Flexy:
  - From a computer running a web-browser, you will configure the IO server in the Flexy to poll different types of PLC data registers.
  - You access the Flexy web server either by using (one of) its local LAN port(s) or by another type of access such as VPN IP address.

- A Schneider® PLC acting as a MODBUS TCP server.
  - Connection between the Ewon Flexy and the Schneider PLC must be done through Ethernet protocol.
  - The device will have its registers read by the tags configured in the IO server of the Flexy.

3.2 Software

3.2.1 eBuddy

The Flexy is configured through its web server. All you need is a standard web browser software such as Google Chrome® or Mozilla Firefox®.

Additionally, we suggest downloading the eBuddy utility on our website.

This utility can list all the Ewon Flexy on your network and change the default IP address of a Flexy to match your LAN IP address range. With eBuddy you can also easily upgrade the firmware of your Flexy if required.

3.2.2 Ewon Flexy Firmware

The screenshots of this guide reflect firmware version 13.3s0, but you can expect the basic principles to remain the same in earlier/later versions.

A simple way to upgrade the Flexy firmware is to use eBuddy.

3.3 IOT Platform

3.3.1 EcoStruxure™ Machine Advisor

The Schneider® IOT platform called EcoStruxure™ Machine Advisor is used to receive the data pushed by the Ewon Flexy.

3.4 PLC Protocol Compatibility

The Flexy supports, among others, standard Modicon Modbus TCP (Master/Client).

However, Modbus ASCII is not supported.
4 Implementation Steps

4.1 Link the Flexy and the PLC

1. Link the LAN interface of the Flexy with the Ethernet card of the PLC.
2. Make sure that the Flexy's LAN IP address is in the same range as the PLC IP address.

You can use eBuddy to change the Flexy's LAN IP address if it is not within the same range as the PLC.

For Ewon Flexy with configurable LAN / WAN ports such as the Flexy 205, a LAN port is indicated by a green LED and a WAN port is indicated by a red LED.

For a Flexy with permanent LAN ports such as the Flexy 201 or 101, the LAN ports are the Ethernet ports on the base unit itself.

4.2 Configure the IO Server

1. Go to the Flexy's web interface.
2. Select the **IO Servers** menu option.
3. Select the **IO Server** corresponding to your PLC type, in this case **MODBUS**.

![MODBUS IO server menu](image)
4. Define at least one **Topic** in the IO server configuration page to poll data registers out of your PLC. Topics are meant to allocate common properties to a group of tags. Properties include **Enable/Disable** polling, **Poll Rate** and optionally **Device Address**.

![MODBUS IO server settings](image)

5. Enable at least **Topic A** by ticking the appropriate box.

6. Enter a valid **Slave Address** and an **IP Address** for the PLC.

Even though there are only three topics, the Flexy can support polling from more than three PLCs on the same IO server.

To poll from more than three PLCs, do not specify the device address in the topic. Instead, include the device address as part of the tag address — when configuring the tag itself — as described later in this document.

7. Define the refresh rate in ms (milliseconds) inside the **Poll Rate** which is applicable to all data registers that will be associated with this topic.

The default value is 2000 ms (2 seconds).

The polling rate specified here applies to all tags associated with this topic. If you have tags that need to refresh at different rates, enable and configure multiple topics.

8. Click on **Update** to save your settings.

### 4.3 Create Tags in the Flexy

1. Select the **Values** option from the Tags menu.
2. Switch the “Mode” to Setup.

![Fig. 4 MODBUS IO server — Tag setup](image)

3. Click the **Add** button to open the tag configuration window.

4. Enter the **parameters of the tag** you want to create.

![Fig. 5 MODBUS IO server — Tag setup 2](image)

5. Enter a **Tag Name**.
   - Free text, no spaces, no symbols - , =, $, @, # etc.

6. Enter a **Description**.
   - Free text.

7. Select **MODBUS** as IO server.
8. Enter the **PLC register** in the “Address” field which will be polled from the PLC. 
As the address is entered, a tag helper appears to help properly format the tag address.

![MODBUS IO server — Tag setup 3](image)

**Example of tag address syntax**

<table>
<thead>
<tr>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>40001</td>
<td>Reading a “Holding Register” using the format “Word” at address 1.</td>
</tr>
<tr>
<td>+320500F</td>
<td>Reading an “Analog Input” using the format “Float” at address 20500.</td>
</tr>
<tr>
<td>1</td>
<td>Reading a “Coil” at address 1.</td>
</tr>
</tbody>
</table>

The register configured in the Flexy must exist in the PLC. If you enter a wrong address, the tag creation will be rejected and an error message will be displayed.

For more information on data register ID syntax, see *MODBUS Tag Address Syntax, p. 15*.

9. Enter a **Topic Name**: A, B or C.

The topic must have been configured in the IO server page (see *Configure the IO Server, p. 6*).

10. [Optional] The remaining fields are mostly left with their default value:

    - **Type**: The data type of the tag such as *Floating Point* or *Boolean*.
      
      The **Automatic** option lets the Flexy decide the format depending on the IO server register/modifier type.
    
    - **Force Read Only**: Unchecked is the default.
      
      When it is checked, users will not be able to change a value in **View** mode on the **Values** page.

    - **Ewon value**: Defaults are *1+0*.
      
      This field applies a **scale factor** and an **offset** to the raw value coming from the IO server.

      The scale factor and offset are float values. Negative values are accepted.

      \[
      \text{TAGval} = \text{IOSERVERval} \times \text{scale factor} + \text{offset.}
      \]
11. Set a **Tag group** (group A, B, C or D) to your tag.

> If you don’t set a tag group, you will not be able to configure the EcoStruxure™ Machine Advisor.

12. Click the **Add** button when your tag configuration is complete.

If everything is OK the new tag appears in the tag list.

---

**4.4 Monitor Tags**

You can change the mode to **View** to monitor tags values and their status.

---

**Fig. 7** MODBUS IO server — Tags list

You can repeat the same sequence for any other tags. If you need to create new tags that have almost the same properties as an existing tag in the list, select the source tag and click the **Add as selected** option.

All properties of the existing tag will be copied in the new tag creation wizard. It is the first selected tag that will be copied if more than one single tag is selected in the list.

---

**Fig. 8** MODBUS IO server — Monitor tags

If a tag appears in error, the Flexy displays a red icon in the Quality/Status column (heart icon). Refer to **Troubleshoot Tags Error in Flexy, p. 14** for details on errors.

---

**Fig. 9** MODBUS IO server — Tag error

You can change the value of tags that are configured as read/write (unless the box **Force Read Only** was ticked in the tag creation wizard).

To change the value of a tag:

1. Select the tag and press the **Edit Value** button, or double click its current value.
2. Enter the new value.

---

1. Copied properties include the tag name. Since the tag name must be unique, make sure you change the name of the new tag.
3. Click the **Apply** button to update all of the edited tags.

![MODBUS IO server — Edit a tag](image)

By clicking the **Apply** button, the Flexy sends the new values to the registers of the PLC. Since the value displayed in the value column is the last value read from the PLC, the new value will not appear until the next poll takes place.
5 Integration within EcoStruxure™ Machine Advisor

To push the data from the Ewon Flexy to the Schneider® EcoStruxure™ Machine Advisor, follow the procedure:

1. Log in to EcoStruxure Machine Advisor.
2. Select the Monitor tab.
3. Set up a new device with the following configuration:
   - Mode ► Connect your machine
   - Gateway ► Custom
   - Format ► Charlie
   - Transport ► MQTTs

The Generate Config is filled automatically by the platform once you set the above parameters.

4. Open, in a new browser tab, the BASIC script editor of your Ewon Flexy by browsing to Setup ► BASIC IDE.
5. Copy the script that can be retrieved from the Ewon Techforum into the “Init” section of the BASIC script editor.
6. Modify the BASIC script to integrate the information provided by the “Generated Config”:

<table>
<thead>
<tr>
<th>“Generated Config” to retrieve</th>
<th>BASIC variables to change</th>
</tr>
</thead>
<tbody>
<tr>
<td>BROKER-URL</td>
<td>BROKERURL$</td>
</tr>
<tr>
<td>USERNAME</td>
<td>USERNAME$</td>
</tr>
<tr>
<td>PASSWORD</td>
<td>PASSWORD$</td>
</tr>
<tr>
<td>CLIENT-ID</td>
<td>CLIENTID$</td>
</tr>
</tbody>
</table>

Fig. 11 Settings for EcoStruxure™ Machine Advisor
7. Modify the BASIC script to (dis-)enable the group of tags you wish to send to the EcoStruxure™ Machine Advisor platform

<table>
<thead>
<tr>
<th>BASIC variables to change</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUPA%</td>
<td>0: disabled</td>
</tr>
<tr>
<td></td>
<td>1: enabled</td>
</tr>
<tr>
<td>GROUPB%</td>
<td>0: disabled</td>
</tr>
<tr>
<td></td>
<td>1: enabled</td>
</tr>
<tr>
<td>GROUPC%</td>
<td>0: disabled</td>
</tr>
<tr>
<td></td>
<td>1: enabled</td>
</tr>
<tr>
<td>GROUPD%</td>
<td>0: disabled</td>
</tr>
<tr>
<td></td>
<td>1: enabled</td>
</tr>
</tbody>
</table>

8. [Optional] Activate the Autorun by going to Run ▶ Autorun in the top menu of the BASIC script editor. The autorun command tells the Flexy to run the BASIC scripts when the Flexy boots.

9. Run the script by switching the Script execution command.

5.1 Verification

To verify that you correctly configured your Schneider® PLC, your Flexy and EcoStruxure™ platform, follow the procedure:

1. Browse to EcoStruxure™ homepage.
2. Enter your credentials to log in.
3. Browse to MONITOR ▶ VALUES.

If your configuration is correctly set, the value of the Modbus registers sent by the Flexy should be displayed on the web page.

![Modbus registers values on EcoStruxure™ Machine Advisor](image)
6 Troubleshoot Tags Error in Flexy

A tag value displayed with a red icon in the Quality/Status column indicates that the quality for this value is considered as bad.

As long as the quality of the displayed value is good, no icon appears in this column.

More information about the nature of the problem can be obtained by placing the mouse cursor on the icon.

![Fig. 13 MODBUS IO server — Tag Error](image1)

To get more information about the nature of the error and the sequence of events before and after the error occurred, you can check the events appearing in the Event Log.

![Fig. 14 MODBUS IO server — Error logs](image2)

6.1 False Positive

A single tag in error (truly bad) can cause a number of other (good) tags to appear in error as well because tag requests and responses are grouped in one single envelope for communication optimization purposes. The whole group is then affected with the same error status.

During commissioning or maintenance, you may want to isolate the truly bad tag from the others. Therefore, you have to disable the polling of tags in error.

This can be done in the IO Server ➤ Global Settings parameters.

![Fig. 15 MODBUS IO server — Disable tags in error](image3)
MODBUS Tag Address Syntax

The following convention for the address syntax is in place:

IO server configuration

<table>
<thead>
<tr>
<th>IO server name</th>
<th>MODBUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic name</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Address</td>
<td>ValueName,SlaveAddress</td>
</tr>
<tr>
<td></td>
<td>ValueName,SlaveAddress,IPAddress</td>
</tr>
<tr>
<td></td>
<td>ValueName</td>
</tr>
</tbody>
</table>

The values of the address field are explained in the following sub-sections.

A.1 ValueName

The tags of the MODBUS IO server can be classified following 2 ranges of values.

The two following tables describe the different ranges of value, for each of the two standards:

First Standard

<table>
<thead>
<tr>
<th>Modbus Type</th>
<th>IO Type</th>
<th>Access</th>
<th>Register address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coil</td>
<td>Digital Output</td>
<td>R/W</td>
<td>1 ~ 9999</td>
</tr>
<tr>
<td>Contact</td>
<td>Digital Input</td>
<td>R</td>
<td>10001 ~ 19999</td>
</tr>
<tr>
<td>Input Register</td>
<td>Analog Input</td>
<td>R</td>
<td>30001 ~ 39999</td>
</tr>
<tr>
<td>Holding Register</td>
<td>Analog Output</td>
<td>R/W</td>
<td>40001 ~ 49999</td>
</tr>
<tr>
<td>Output Coil</td>
<td>Digital Output</td>
<td>W</td>
<td>50001 ~ 59999</td>
</tr>
<tr>
<td>Output Registers</td>
<td>Analog Output</td>
<td>W</td>
<td>60001 ~ 69999</td>
</tr>
</tbody>
</table>

Second Standard

<table>
<thead>
<tr>
<th>Modbus Type</th>
<th>IO Type</th>
<th>Access</th>
<th>Register address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coil</td>
<td>Digital Output</td>
<td>R/W</td>
<td>+1 ~ +65535</td>
</tr>
<tr>
<td>Contact</td>
<td>Digital Input</td>
<td>R</td>
<td>+100001 ~ +165535</td>
</tr>
<tr>
<td>Input Register</td>
<td>Analog Input</td>
<td>R</td>
<td>+300001 ~ +365535</td>
</tr>
<tr>
<td>Holding Register</td>
<td>Analog Output</td>
<td>R/W</td>
<td>+400001 ~ +465535</td>
</tr>
<tr>
<td>Output Coil</td>
<td>Digital Output</td>
<td>W</td>
<td>+500001 ~ +565535</td>
</tr>
<tr>
<td>Output Registers</td>
<td>Analog Output</td>
<td>W</td>
<td>+600001 ~ +665535</td>
</tr>
</tbody>
</table>

The second standard allows more than 9999 values in each range. Notice the “+” sign before the register value.

The two last ranges “Output Coil” & “Output Registers” are used with non-standard equipment that do not allow the reading of (some of) their values.

In this case, specifying the address in the “write only” ranges informs the Flexy that it should not read the values after setting them, which is normally done in the other cases. If those registers are read, the returned value will always be 0.

After the numerical value, the characters “F”, “L”, “I”, “D” or “W” can be used to specify how to read the value.

The following table describes the different character meaning:
Appendix A: MODBUS Tag Address Syntax

<table>
<thead>
<tr>
<th>Character</th>
<th>Description</th>
<th>Automatic tag type</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>Reads 1 register considered as 16 bits unsigned integer (default is not specified).</td>
<td>DWord</td>
</tr>
<tr>
<td>I</td>
<td>Reads 1 register considered as 16 bits signed integer.</td>
<td>Integer</td>
</tr>
<tr>
<td>D</td>
<td>Reads 2 regs $R_1$, $R_2$ as a DWORD $R_1$ is Less significant, $R_2$ is most significant (32 bits, unsigned) (*)</td>
<td>DWord</td>
</tr>
<tr>
<td>E</td>
<td>Reads 2 regs $R_1$, $R_2$ as a DWORD $R_2$ is Less significant, $R_1$ is most significant (32 bits, unsigned) (*)</td>
<td>DWord</td>
</tr>
<tr>
<td>L</td>
<td>Reads 2 regs $R_1$, $R_2$ as a LONG $R_1$ is Less significant, $R_2$ is most significant (32 bits, signed) (*)</td>
<td>Integer</td>
</tr>
<tr>
<td>M</td>
<td>Reads 2 regs $R_1$, $R_2$ as a LONG $R_2$ is Less significant, $R_1$ is most significant (32 bits, signed) (*)</td>
<td>Integer</td>
</tr>
<tr>
<td>F</td>
<td>Reads 2 regs $R_1$, $R_2$ as a FLOAT $R_1$ is Less significant, $R_2$ is most significant (32 bits, signed)</td>
<td>Float</td>
</tr>
<tr>
<td>H</td>
<td>Reads 2 regs $R_1$, $R_2$ as a FLOAT $R_2$ is Less significant, $R_1$ is most significant (32 bits, signed)</td>
<td>Float</td>
</tr>
</tbody>
</table>

To avoid loss of precision of “D”, “E”, “L” or “M” due to integer to float conversion, choose the right storage DataType for your tag.

When reading a 32 bits value, two consecutive registers or coils are read and combined.

E.g.: “40001L,11” to access in Long representation the reg 1 on the slave 11.

Examples of Modbus addresses

<table>
<thead>
<tr>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>40001,10</td>
<td>access the Holding Register on address 1 from the UnitID 10</td>
</tr>
<tr>
<td>1,11</td>
<td>access the Coil on address 1 from the UnitID 11</td>
</tr>
<tr>
<td>+320234,12</td>
<td>access the Input Register on address 20234 from the UnitID 12</td>
</tr>
<tr>
<td>40001,100,10.0.0.53</td>
<td>access the Holding Register on address 1 from the UnitID 100 which IP address is 10.0.0.53</td>
</tr>
<tr>
<td>40010L,12</td>
<td>access the LONG Holding Register on address 10 (and 11) from the UnitID 12</td>
</tr>
<tr>
<td>40008F,15</td>
<td>access the FLOAT Holding Register on address 8 (and 9) from the UnitID 15</td>
</tr>
</tbody>
</table>

A.1.1 Status Tag

The status tag is a special tag returning information about the current state of the communication for a given device.

As for other tags, the status tag of an address is composed of: Status, Address.

If the address is omitted, the topic address will be used, e.g.: “status,11” points to the status of the slave 11.

You can define a status tag for each address used. If you use the status MODBUS address, the tag must be configured as analog:

<table>
<thead>
<tr>
<th>Tag value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Communication not initialized. Status is unknown. If no tag is polled on that device address, the communication status is unknown.</td>
</tr>
<tr>
<td>1</td>
<td>Communication OK</td>
</tr>
<tr>
<td>2</td>
<td>Communication NOT OK</td>
</tr>
</tbody>
</table>

A.2 Slave Address

This is the address of the slave device that you want to access.
Appendix A: MODBUS Tag Address Syntax

It is a number from 0 to 255, e.g.: 30001,11 will poll an RTU device on address 11.

A.3 IP Address

This is the IP address of the device on an Ethernet network.

It is composed of 4 numbers separated by a dot, e.g.: 30001,11,10.0.0.50 will poll a device configured with an IP address 10.0.0.50 and with Modbus slave address 11.