Polling Data from Siemens PLC

Using MPI Protocol

APPLICATION NOTE
AUG-0048-00 2.0 en-US ENGLISH
Important User Information

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# Table of Contents

1 Preface ............................................................................................................. 3  
   1.1 About This Document ................................................................. 3  
   1.2 Document history ................................................................. 3  
   1.3 Related Documents .......................................................... 3  
   1.4 Trademark Information ......................................................... 3  

2 Objectives ........................................................................................................ 4  

3 Requirements ................................................................................................... 5  
   3.1 Hardware ................................................................................. 5  
   3.2 Software .................................................................................. 5  
   3.3 PLC Protocol Compatibility .................................................. 5  

4 Implementation Steps ....................................................................................... 6  
   4.1 Link the Flexy and the PLC .................................................... 6  
   4.2 Configure the IO Server ....................................................... 6  
   4.3 Create Tags in the Flexy ....................................................... 9  
   4.4 Monitor Tags ........................................................................... 11  

5 Troubleshoot Tags in Error ............................................................................. 13  
   5.1 False Positive ........................................................................... 13  

A Siemens Tag Address Syntax ...................................................................... 15  
   A.1 Memory Types ....................................................................... 15  
   A.2 Modifiers .............................................................................. 15  
   A.3 Bit Access Modifier ............................................................ 16  
   A.4 Status Register ..................................................................... 16  

B Advanced Routing Setup .............................................................................. 17
1 Preface

1.1 About This Document

This document explains in a few steps how the Flexy can poll data registers from a Siemens PLC based on Ethernet protocol.

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>2011-12-12</td>
<td>First release</td>
</tr>
<tr>
<td>2.0</td>
<td>2019-09-04</td>
<td>Changed: General update (AUG-0048-00 is for Ethernet protocol, AUG-0081-00 is for MPI protocol)</td>
</tr>
</tbody>
</table>

1.3 Related Documents

<table>
<thead>
<tr>
<th>Document</th>
<th>Author</th>
<th>Document ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polling Data from Siemens PLC using Ethernet protocol</td>
<td>HMS</td>
<td>AUG-0048-00</td>
</tr>
<tr>
<td>Ewon Flexy Base Units</td>
<td>HMS</td>
<td>IG-0014-00</td>
</tr>
<tr>
<td>Ewon Flexy 205</td>
<td>HMS</td>
<td>IG-0028-00</td>
</tr>
<tr>
<td>FLC 3701 – MPI Extension Card</td>
<td>HMS</td>
<td>IG-0029-00</td>
</tr>
<tr>
<td>IO Servers</td>
<td>HMS</td>
<td>RG-0007-00</td>
</tr>
<tr>
<td>Flexy Family Reference Guide</td>
<td>HMS</td>
<td>RG-0008-00</td>
</tr>
</tbody>
</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 one or more Siemens PLCs using MPI protocol.

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;
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 Siemens PLC: S7-300, -400, -1200, or -1500.
  - Connection between the Ewon Flexy and the Siemens PLC must be done through MPI protocol. The MPI port could be on the base unit as in the Flexy 203 or on a Flexy extension card: FLC 3701 – MPI port (which is compatible only with the Flexy 205). For polling tags over an Ethernet connection, see “Polling Data from Siemens PLC using Ethernet protocol” from Related Documents, p. 3.
  - 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 PLC Protocol Compatibility

The table below shows the protocols that are supported by the Flexy and, for each of those protocols, which IO server you need to use inside the Ewon Flexy to connect your Siemens PLC.

<table>
<thead>
<tr>
<th>PLC Family</th>
<th>MPI/ProfiBus Protocols</th>
<th>PPI Protocol (over MPI port)</th>
<th>Ethernet ISOTCP (Ethernet link)</th>
<th>Flexy IO server</th>
</tr>
</thead>
<tbody>
<tr>
<td>S7-300</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>S73&amp;400</td>
</tr>
<tr>
<td>S7-400</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>S73&amp;400</td>
</tr>
<tr>
<td>S7-1200</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>S73&amp;400</td>
</tr>
<tr>
<td>S7-200</td>
<td>No but PPI</td>
<td>Yes</td>
<td>Yes</td>
<td>S7200</td>
</tr>
</tbody>
</table>

The S7-200 family is addressed in a separate guide as it uses a different IO server and syntax. The reference for this guide is “IO Servers” from Related Documents, p. 3.
4 Implementation Steps

4.1 Link the Flexy and the PLC
1. Use the Siemens MPI “6ES7901-0BF00-0AA0” or equivalent to interconnect the Flexy with the PLC.

The pinout for the MPI port on the Flexy is available in the Installation Guides for the Flexy and for the PLC 3701 MPI port extension card. For more information, refer to Related Documents, p. 3.

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, which in this case is S73&400.

![IO server selection](image-url)
4. Set the settings of the MPI/Profibus communication in the Flexy as defined in the PLC you want to poll:
   a. Set the **Destination MPI/Profibus Node**: the identifier of the PLC MPI/Profibus Destination Address when ISOTCP is used.
   b. Set the **Protocol Type**: MPI or Profibus.
      
      As the MPI port configuration is shared by the S73&400 and the S7200 IO servers, this combo box shows also the **PPI MULTIMASTER** protocol.
      
      For the S7-200 family, refer to “IO Servers” from Related Documents, p. 3.
      
      **PPI MultiMaster** and **MPI/Profibus** are mutually exclusive. It is not possible to use the S73&400 and S7200 IO servers on the MPI port at the same time.
   c. Set the **Baudrate**: 19,2 kbps, 187,5 kbps and 1,5 Mbps...
   d. Set the **Reply Timeout**: the maximum time the Flexy waits for a valid MPI message response.
   e. Set the **MPI/Profibus Address**: the address of the Flexy on the MPI profiles network (0..126, default is 0).
   f. Select **MPI/Profibus Highest Station Address**: the highest station address polled by the Flexy (15, 31, 63 or 127...)

![S73 & 400 IO Server & Gateway settings](image)

Fig. 2 S73&400 IO server settings

5. **[Optional]** If needed, activate the **Advanced Routing**

   The S73&400 IO server features advanced routing functions. They are shown only if the relevant Enabled box is checked.
   
   For more details, refer to Advanced Routing Setup, p. 17.
6. Enable at least one **Topic** to be able to poll data registers — called tags — out of your PLC.

![Fig. 3 S73&400 IO server settings](image)

Topics are meant to allocate common properties to a group of tags.

Properties include *Enable/Disable* polling, *Poll Rate*, and *Global Device Address*.

a. Enter a valid address in the *Global Device Address* as per the table below.

<table>
<thead>
<tr>
<th>Syntax to use</th>
<th>Definitions</th>
</tr>
</thead>
</table>
| MPI,MPI address                      | **MPI address**: MPI node address of the PLC.  
Example: MPI,2  
Reach by MPI the PLC with the node address 2 |
| PROFIBUS,Profibus address            | **Profibus address**: Profibus node address of the PLC  
Example: PROFIBUS,9  
Reach by Profibus the PLC with the node address 9 |
| MPI,Subnet ID,MPI address            | When the *Advanced Routing Setup is Enabled* (see Advanced Routing Setup, p. 17), the following syntax can be applied to reach a device on the MPI network indirectly connected to the Flexy (behind one or several other PLCs):  
– **Subnet ID**: ID of the destination S7-Subnet ID.  
– **MPI address**: MPI/Profibus node address of the PLC to reach.  
Example: MPI,4859-4565,4  
Reach by MPI/Profibus the PLC with the node address 4 on the subnet with subnet ID 4859-4565 |

When entering a device address, a helper appears to indicate if the address uses a valid syntax for this IO server. An address using a valid syntax is displayed in green and an invalid syntax in red.

b. Set the **Poll rate**.

The poll rate is the refresh rate in ms (milliseconds) applicable to all data registers that is included in this topic. If you leave this field blank, the default value applied will be 2000 ms (2 seconds).

If you have tags that need to refreshed at a different rates, enable and configure multiple topics.

7. 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**.
3. Click the **Add** button to open the tag configuration window.
4. Enter the **parameters of the tag** you want to create:
   a. Enter a **Tag Name**.
      Free text, no spaces, no symbols -, =, %, $, @, # etc.
   b. Enter a **Description**.
      Free text.
   c. Select **S73&400** as IO server depending on the product family of the relevant PLC.
   d. 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).
   e. 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.
      Typical examples addresses:

      | S73&400 IO server | Target                                      |
      |------------------|---------------------------------------------|
      | MW4              | the **Word** at address 4 (in bytes) in the Internal Memory. |
      | CS1              | the **Counter** number 1, read it as Signed Word.   |
      | BD2L5            | the **DWord** at address 5 (in bytes) in the Data Block 2. |
      | IB3              | the **Byte** at address 3 (in bytes) in the Discrete Inputs zone. |

      If you enter a wrong address syntax, the tag creation will be rejected and an error message will be displayed.

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

   f. **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.
5. [Optional] The remaining fields are mostly left with their default value:

- **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.
  
  \[ \text{TAGval} = \text{IOSERVERval} \times \text{scale factor} + \text{offset} \].

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

If everything is OK the new tag appears in the tag 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. Copied properties include the tag name. Since the tag name must be unique, make sure you change the name of the new tag.

It is the first selected tag that will be copied if more than one single tag is selected in the list.

### 4.4 Monitor Tags

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

![Monitor Tags](image)

This page shows the tags and their last polled values as well as alarm information and logging information for tags with alarming and logging enabled.

The page refreshes automatically at the rate set on the bottom of the page.

On this page, you can sort, filter, and search for tags to easily find specific tags.

Information about configuring additional tag features is available in the **Flexy Family Reference Guide**, see Related Documents, p. 3.

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.
3. Click the **Apply** button to update all of the edited tags.

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 Troubleshoot Tags in Error

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

![Fig. 8 Tag error](image)

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. 9 Tag error with description](image)

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. 10 S73&400 IO server — Error logs](image)

5.1 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. 11 Disable tags in error
Appendix A: Siemens Tag Address Syntax

Siemens 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>S73&amp;400</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, Global Device Address</td>
</tr>
<tr>
<td></td>
<td>ValueName</td>
</tr>
</tbody>
</table>

### A.1 Memory Types

<table>
<thead>
<tr>
<th>Memory Type</th>
<th>Description</th>
<th>Acceptable Modifiers</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBx</td>
<td>Data block number x</td>
<td>B, C, W, S, D, L, F</td>
<td>Byte offset</td>
</tr>
<tr>
<td>M</td>
<td>Internal memory</td>
<td>B, C, W, S, D, L, F</td>
<td>Byte offset</td>
</tr>
<tr>
<td>C</td>
<td>Counter</td>
<td>W, S</td>
<td>Object number</td>
</tr>
<tr>
<td>T</td>
<td>Timer</td>
<td>W, S</td>
<td>Object number</td>
</tr>
<tr>
<td>I</td>
<td>Discrete Inputs</td>
<td>B, C, W, S, D, L, F</td>
<td>Byte offset</td>
</tr>
<tr>
<td>Q</td>
<td>Discrete Outputs</td>
<td>B, C, W, S, D, L, F</td>
<td>Byte offset</td>
</tr>
<tr>
<td>PI</td>
<td>Peripheral Inputs</td>
<td>B, C, W, S, D, L, F</td>
<td>Byte offset</td>
</tr>
<tr>
<td>PQ</td>
<td>Peripheral Outputs</td>
<td>B, C, W, S, D, L, F</td>
<td>Byte offset</td>
</tr>
</tbody>
</table>

If no modifier is included, the modifier-type in bold will be used.

*Timer* and *Counter* cannot be polled on S7-1200 series because they are addressed as an instance datablock in the PLC.

### A.2 Modifiers

<table>
<thead>
<tr>
<th>Modifier</th>
<th>Modifier Type</th>
<th>Value Range</th>
<th>Automatic Tag Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Byte</td>
<td>0...255</td>
<td>DWord</td>
</tr>
<tr>
<td>C</td>
<td>signed Byte</td>
<td>-128...127</td>
<td>Integer</td>
</tr>
<tr>
<td>W</td>
<td>Word</td>
<td>0...65535</td>
<td>DWord</td>
</tr>
<tr>
<td>S</td>
<td>signed Word</td>
<td>-32768...32767</td>
<td>Integer</td>
</tr>
<tr>
<td>D</td>
<td>DWord</td>
<td>0...4294967296 (**)</td>
<td>DWord</td>
</tr>
<tr>
<td>L</td>
<td>signed DWord</td>
<td>-2147483648... 2147483647 (**)</td>
<td>Integer</td>
</tr>
<tr>
<td>F</td>
<td>Float</td>
<td>+/- 3.4e38</td>
<td>Float</td>
</tr>
</tbody>
</table>

To avoid loss of precision due to integer to float conversion, choose the right storage *DataType* for your tag(s).

#### Examples of modifiers use for S7–300, –400 and –1200

<table>
<thead>
<tr>
<th>Address</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW4</td>
<td>the <em>Word</em> at address 4 (in bytes) in the Internal Memory.</td>
</tr>
<tr>
<td>CS1</td>
<td>the <em>Counter</em> number 1, read it as Signed Word.</td>
</tr>
<tr>
<td>BD2L5</td>
<td>the <em>DWord</em> at address 5 (in bytes) in the Data Block 2.</td>
</tr>
<tr>
<td>IB3</td>
<td>the <em>Byte</em> at address 3 (in bytes) in the Discrete Inputs zone.</td>
</tr>
</tbody>
</table>
A.3 Bit Access Modifier

In any Memory Type (excluding Counter and Timer), it is possible to access a single Bit. A $[\#x]$ must be appended to the Value Name.

As the address refers to a starting byte, the Bit index goes only from 0 to 7. No other Modifier than B is allowed.

The syntax can be used for reading Bits and for writing them as well.

**Examples**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Syntax</td>
<td>DB18B13#3</td>
</tr>
<tr>
<td></td>
<td>OK because it represents bit 3 of Byte 13 in DB 1.</td>
</tr>
<tr>
<td>Invalid Syntax</td>
<td>IW5#2</td>
</tr>
<tr>
<td></td>
<td>Wrong because there is a Modifier.</td>
</tr>
<tr>
<td></td>
<td>IS#10</td>
</tr>
<tr>
<td></td>
<td>Wrong because the Bit number is greater than 7.</td>
</tr>
</tbody>
</table>

A.4 Status Register

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

The status tag address syntax is as follows:

```
Status[Global Device Address]
```

You can define a status tag for each PLC used.

If you use the status address, the tag must be configured as an analog data type such as floating point or integer.

<table>
<thead>
<tr>
<th>Status value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Communication not initialized: Status 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>
Appendix B: Advanced Routing Setup

The **Advanced Routing Setup** feature allows you to access devices that are part of another MPI/Profinet network connected indirectly to the Flexy through another, or several other, PLCs.

**Advanced Routing Setup** items are visible when the **Enable** checkbox is checked.

Parameters set in this section remain in memory but are visually hidden and not taken into account by the firmware when the **Enable** checkbox is unchecked.

![Advanced Routing in the Flexy](image)

For more details about the **Advanced Routing** feature, please refer to “Flexy Family Reference Guide” from **Related Documents, p. 3**