Polling Data Registers from Siemens PLC Series S7-300, S7-400 & S7-1200

This short guide explains how to poll data registers from a Siemens Device.
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1. Objective

The objective of this document is to explain how the eWON Flexy can poll data registers out of one or more PLCs.

- Polling PLC data registers implies the following steps:
  - Linking the eWON Flexy with the PLC
  - Configuring the eWON Flexy IO Server
  - Creating tags in the eWON Flexy
  - Monitoring tags

- Note -

*Advanced explanations are indicated by this icon*
2. Hardware requirements

In order to follow this guide you’ll need:

- A PC to configure the eWON Flexy through its web interface
- A Siemens PLC (S7-300, -400 or -1200)
- An MPI extension card is required to poll using MPI or Profibus protocol.
Chapter 3
Software requirements

3. Software requirements

Software configuration:
The eWON Flexy is configured through its web interface. Which is accessible with any modern web browser as shown here below:

- Firefox 15+
- Chrome 16+
- Safari 6+
- Edge 13+
- IE 11

Additionally, we suggest you to download eBuddy companion tool available on our website: http://support.ewon.biz/

This tool allows you to list all the eWON Flexy devices on your network and execute changes such as IP address change, firmware upgrade or device recovery (if required).

Firmware Version
This guide targets devices running a firmware version 12.2 or higher.
Chapter 4
PLC protocol compatibility

4. PLC protocol compatibility

The table below shows the protocols that are supported and configurable (IO Servers) in the eWON Flexy to connect to Siemens PLC.

Connection via MPI port

<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>IO Server name</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>PPI only</td>
<td>YES</td>
<td>YES</td>
<td>S7200 (*)</td>
</tr>
</tbody>
</table>

Connection via serial port

<table>
<thead>
<tr>
<th>PLC-Family</th>
<th>MPI/Profibus protocols</th>
<th>PPI protocol (over serial link)</th>
<th>Ethernet ISOTCP (Ethernet link)</th>
<th>IO Server name</th>
</tr>
</thead>
<tbody>
<tr>
<td>S7-300</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>S73&amp;400</td>
</tr>
<tr>
<td>S7-400</td>
<td>NO</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>

- Note -

(*) Note that the S7-200 family is addressed in a separate guide (different IO Server and syntax). The reference of this guide is: AUG-049
Chapter 5
Configuring the IO Server

5. Configuring the IO Server

- Connect your PC to one of the LAN ports of the eWON Flexy
- Open the web browser and enter the IP address of the eWON Flexy
- Log into the eWON Flexy web interface
- Go to Tags menu on the left hand side
- Click on the IO Servers option and a supplementary menu will be displayed
- Select the IO Server “S73&400” inside the IO Server list

Specific to Serial connection

- **Destination Node**: Identifies the PLC MPI destination address when MPI is used
- Set the **Protocol Type**, **Baud rate**, **Parity**, **Stop Bit** and **Frame Error detection** parameters as defined in the PLC you want to connect to
- **Protocol Type**: Select protocol MPI
- **Baud Rate**: 19.2 kbps, 187.5 kbps and 1.5 Mbps
- **Reply Timeout**: The maximum time the eWON Flexy will wait for a valid MPI message response
- **Address**: The address of the eWON Flexy on the MPI profiles network (0..126, default is 0)
- **Highest Station Address**: Select between 15, 31, 63 or 127.

- **Note** -

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.
Chapter 5
Configuring the IO Server

Specific to Ethernet connection

- Set the **Protocol Type**, **Baud rate**, **Parity**, **Stop Bit** and **Frame Error detection** parameters as defined in the PLC you want to connect to.

- **Destination Node**: Identifies the PLC destination address when ISOTCP is used

- **Protocol Type**: Select protocol PROFIBUS

**Note**

If you communicate only with Ethernet-connected PLC(s) and do not use the serial link, then set the **Baud Rate** to **Disabled** and leave all other parameters in the **COM Setup** as default box shows also the PPI MULTIMASTER protocol.
**Advanced Routing Setup**: The S73&400 IO server features advanced routing functions are only shown if the relevant Enabled box is ticked. Please check the appendix.

**Topic configuration**

To be able to poll data registers out of your PLC, you need:

- Define and enable at least one Topic in the lower part of the IO Server configuration page. Topics are meant to allocate common properties to a group of tags (properties include **Enable/Disable**, **Global Device Address**, and **Poll Rate**). Additionally there is a Tag helper as new feature as shown below:
Chapter 5
Configuring the IO Server

- **Poll Rate**, defines the refresh rate in ms (milliseconds) applicable to all data registers that will be included in this topic. If you have tags that need to be refreshed at a different rates, enable and configure multiple topics.

- Save your settings by clicking on **Update**.

**Global Device Address**

- When the Advanced Routing Setup is Enabled, the following syntax can be applied to reach a device on the MPI network indirectly connected to the eWON Flexy (behind one or several other PLCs). Please follow the below examples:

**MPI/Profibus:**

<table>
<thead>
<tr>
<th>Syntax to use</th>
<th>Global device address examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPI, MPI address</td>
<td>MPI, 2</td>
</tr>
<tr>
<td>PROFIBUS, Profibus address</td>
<td>PROFIBUS, 4</td>
</tr>
<tr>
<td>MPI, Subnet ID, MPI address</td>
<td>MPI, 4859-4565, 4 Note: Allows to reach a PLC that is not directly connected to the eWON but can be reached through an other PLC. The advanced routing must be enabled inside the eWON to achieve this. See annex for more details</td>
</tr>
</tbody>
</table>
### ISOTCP:

<table>
<thead>
<tr>
<th>Syntax to sue</th>
<th>Global device address examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISOTCP, IP address, CalledTSAP</td>
<td>ISOTCP,192.168.0.1,03.02</td>
</tr>
<tr>
<td></td>
<td>ISOTCP,192.168.0.1,03.01</td>
</tr>
</tbody>
</table>

Note: the Called-TSAP is a Siemens naming convention which identifies the communication channel and the CPU emplacement. Generally you can use following TSAP to connect the eWON to the PLC:

- For S7-300 family: 03.02 (CPU generally plugged in second slot).
- For S7-400 family, 03.0#, (where the 0# represents the slot number of the CPU)
- For the S7-1200 family: 03.01,
- For the S7-1500 family:03.??? (ask JFU)

---

**- Note -**

*For further more details please check the appendix*
Chapter 5
Configuring the IO Server

Linking the PLC with the eWON Flexy

The eWON Flexy can be connected to the PLC using either the MPI connection or the Ethernet connection supporting ISOTCP. Simultaneous PLC connections are supported (MPI & ISOTCP) as well.

MPI/Profibus link:

- Connect the PLC with the eWON Flexy using the Siemens MPI cable 6ES7901-0BF00-0AA0 or equivalent (see Appendix).
- If the MPI interface is correctly configured and connected to your MPI network, the ID numbers of the detected MPI/Profibus master devices will be displayed as shown in the graph below.

**Note**

If the message does not display any MPI address, then the MPI IO Server setup parameters are either incorrect or they have not been saved using the Update button. Please check the baud rate settings, verify that the eWON Flexy is not using a taken MPI address and make sure you click on Update to save your changes. If the message displays only one MPI address (actually the one of your eWON Flexy devices), it is likely that the Baud Rate settings are not correct or that the eWON Flexy is not properly connected to the MPI network.
ISOTCP Ethernet link:
- Connect one of the eWON Flexy LAN ports with the Ethernet port of the PLC.
- Make sure the eWON Flexy LAN IP address is in the same range as the PLC IP address. Use the eBuddy tool to change the eWON Flexy LAN IP address if it is not within the same range as the PLC.
6. Creating tags in the eWON Flexy

- On the left hand menu, under the Tags menu please select the option Value.
- Switch to Setup MODE

![Switch from:](MODE SETUP to VIEW)

- click on Add (+)

![MODE SETUP](add)

- Once the create a new Tag window opens proceed to enter the parameters of the Tag you want to create.

![Identification](Tag Name: TAG01, Page: Default)

- Enter a **Tag Name** – free text, no spaces, no symbols, -, =, %, $, @, # etc
- Enter a **Description** – free text
- Select **S73&400** as IO server
- Enter **Topic Name** enter A, B or C. The topic must have been configured in the IO server page
Chapter 6
Creating tags in the eWON Flexy

- In the **Address** field, enter the register address that has to be polled from the PLC device. Additionally there is a Tag helper as new feature as shown below.

- **Type**: DataType of the tag (Automatic, Floating Point, Boolean, Integer, Dword). All tags are stored on 4 bytes. The default Automatic option lets the eWON Flexy decide the format depending on the IO Server register/modifier type.

**Note**

*If you enter a wrong address (syntax problem) the tag will be rejected and an error message will be displayed.*

![Identification and I/O Server Setup](image-url)
Creating tags in the eWON Flexy

The remaining fields are usually left with their default value:

- **Force Read Only**: Unchecked by default. When it is checked, users will not be able to change the value manually on the View Mode.

- **eWON value**: Defaults are \*1+0. 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. \[TAGval = IO\text{SERVER}val \times \text{scale factor} + \text{offset}\]

  **Note** -

  The tag remains however read/write for when used inside the embedded BASIC program.

- Click on the Add Tag button when your tag configuration is completed.
- If everything is OK, your new tag appears in the tag list:

  ![tag_list](image)

- If not, here are a couple of examples of error messages that can appear:

<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tag name empty</td>
<td>The Tag name should be written, it is a mandatory field</td>
</tr>
<tr>
<td>Invalid character name</td>
<td>Check if the name contains invalid spaces and /or characters.</td>
</tr>
<tr>
<td>Invalid IO name for Tag</td>
<td>Check the Tag address syntax</td>
</tr>
<tr>
<td>Invalid topic name for Tag</td>
<td>Check if the topic field is A, B or C.</td>
</tr>
</tbody>
</table>

- If you need to create new tags with similar properties as an existing tag in the list, select the already created tag and then click on arrow next to Add (+) and select Add as selected.
Chapter 6
Creating tags in the eWON Flexy

• Using this option, all properties of the existing tag will be copied in the new tag creation window. Copied properties include the Tag Name. Since the Tag Name must be unique, make sure you change the name of the new tag.

7. Monitoring tags

• Switch to the View Mode page to check tag values and status

Switch from:  

- Note -

Clicking on Apply sends the new value to the register of the PLC device. The value will actually be returned with the next poll. You don’t need to refresh your browser to see the new value on screen (Auto-refresh is ticked by default on the bottom of the page).
8. Troubleshooting tags in error

- A red icon displayed in the View Mode indicates that the quality of this tag value is not reliable.
- Moreover a mouse over will present you a short description about the source of the problem as shown below:

<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No communication</td>
<td>This represents no communication between the eWON Flexy and the at PLC.</td>
</tr>
<tr>
<td>Disable</td>
<td>Check if the Topic used for this Tag is enable in the selected IO Server</td>
</tr>
<tr>
<td>Unknown</td>
<td>Frequently an issue in the IO server configuration</td>
</tr>
<tr>
<td>Device error</td>
<td>Likely wrong or non existing address in the PLC device</td>
</tr>
</tbody>
</table>

- Note -

A single tag in error can cause communication errors for other Tags if they are grouped in a single read request (especially when several tags are configured with successive PLC addresses). Indeed, the PLC device will simply respond that the whole request is invalid.
• To identify what tag caused the issue, check the option 'Disable Tags in Error':

![IO Servers ➜ Global Settings ➜ Advanced Parameters]

• Do not forget to deactivate the option (and click “Init” link in S73&400 IO Server menu) once the error have been resolved.

• To get more details about the source of the errors and the sequence of events before and after they occurred:

![IO Servers ➜ Logs ➜ Events Logs]

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>IO Server</th>
<th>Topic</th>
<th>IO Address</th>
<th>Value</th>
<th>Tag description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAG01</td>
<td>Floating po...</td>
<td>A</td>
<td>Status,MP1,1</td>
<td>0</td>
<td></td>
<td>My_first_Tag</td>
</tr>
</tbody>
</table>
Appendix A - Syntax of S7-300, 400 & 1200 tag addresses

General Tag address format

<Memory type><Modifier><Address>

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>

- Note -

If no modifier is included, the modifier-type in bold will be used. Also Timer and counters cannot be polled on S7-1200 series because they are addressed as an instance datablock in the PLC.
Appendix A - Syntax of S7-300, 400 & 1200 tag addresses

### Modifiers Type

<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>

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

### Examples:

<table>
<thead>
<tr>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW4</td>
<td>the Word at address 4 (in bytes) in the Internal Memory</td>
</tr>
<tr>
<td>CS1</td>
<td>the Counter number 1, read it as Signed Word</td>
</tr>
<tr>
<td>BD2L5</td>
<td>the DWord at address 5 (in bytes) in the Data Block 2</td>
</tr>
<tr>
<td>IB3</td>
<td>the Byte at address 3 (in bytes) in the Discrete Inputs zone</td>
</tr>
<tr>
<td>I5#2</td>
<td>the bit 2 from the Byte (read &quot;Bit access modifier&quot; note below) at address 5 in the Discrete Inputs zone</td>
</tr>
</tbody>
</table>
Appendix A - Syntax of S7-300, 400 & 1200 tag addresses

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>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB1B13#3</td>
<td>Correct, It represents bit 3 of Byte 13 in DB 1</td>
</tr>
<tr>
<td>IW5#2</td>
<td>Wrong, It is wrong because there is a Modifier</td>
</tr>
<tr>
<td>I5#10</td>
<td>Wrong, It is wrong because the Bit number is greater than 7</td>
</tr>
</tbody>
</table>

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 ValueName is composed of:

<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>

- 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.
Appendix B - called TSAP syntax

Example:

- Remote TSAP: 03.02 (channel number, rack and slot number of the CPU).

Channel number

- The first byte references the channel to be used. The number of available channels is given in your CPU manual under "Number of Static S7 Connections".
- For eWON connections use channel 3.

Rack and Slot Number of the CPU

- The second byte references the position of the CPU. By default the CPU is set in the central control module rack (rack number = 0). The slot of your CPU can be found in your STEP7 project in the Hardware Configuration.
Appendix C - MPI cable

To make an MPI/Profibus connection between the eWON Flexy and the PLC, you need:

- Standard Siemens MPI/Profibus cable or equivalent. A standard Siemens reference is 6ES7901-0BF00-0AA0. There are compatible cables available on the market but they do not necessarily have all of the same features such as switchable termination resistors.

The eWON Flexy offers a compatible, unshielded cable:

- P/N EW40912 - SUBD9/SUBD9 cable for Siemens S7, Length: 2 meter
- Max baudrate is 1.5 MBit/s.
- For higher baudrates use the Siemens Profibus cables with resistor terminations.
Appendix D - Advanced Routing Setup

Advanced Routing Setup

- It allows you to access devices that are part of another MPI/Profibus network connected indirectly to the eWON Flexy through another, or several other PLCs.
- Advanced Routing Setup items are visible when the Enable checkbox is ticked.

- Note -

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 not ticked, for your Tag(s).

Example:

- Please refer to General references guide for detailed explanations
Revision

Revision History

<table>
<thead>
<tr>
<th>Revision Level</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>15/01/2018</td>
<td>Original Document</td>
</tr>
</tbody>
</table>

Document build number: 3

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