FLX 3402 – 8DI-4AI-2DO Extension Card

INSTALLATION GUIDE

IG-0030-00 1.3 en-US ENGLISH

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1 Preface

1.1 About This Document

This document describes the hardware of the FLX 3402 – 8DI-4AI-2DO extension card which belongs to the Ewon Flexy family.

The Ewon Flexy family is a range of modular industrial gateway/router and as its name *Ewon Flexy* suggests, it has been designed to enable numerous different combinations of base units with extension cards.

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

1.2 Document History

Version	Date	Description
1.0	2016-07-13	First release
1.1	2016-07-27	Changed: Update of the Legal References
1.2	2018-02-16	Changed: Output Relay Changed: General layout
1.3	2019-09-03	Changed: *Safety, Environmental & Regulatory Information, p. 5* Changed: *Ewon Flexy Extension Card Environmental Conditions, p. 12*
1.4	2023-05-11	Changed: Certifications

1.3 Related Documents

Document	Author	Document ID
Ewon Flexy	HMS	IG-0014-00
FLX 3401 – 8DI-4AI-2DO Extension Card	HMS	IG-0018-00
Ewon Flexy 205	HMS	IG-0028-00

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 Introduction

The present Installation Guide describes the hardware of the FLX 3402 – 8DI-4AI-2DO extension card of the Ewon Flexy family.

This guide concerns the 8DI-4AI-2DO extension card produced since July 2016.

- Part number is ***FLX3402_00/S0***
- Serial number must be higher than ***0854-1627-0001-27***

For information about the 8DI-4AI-2DO extension card produced before July 2016, please refer to FLX 3401 – 8DI-4AI-2DO Extension Card from the Related Documents, p. 3.

The minimum firmware version required for the FLX 3402 is 11.2s0.

The FLX 3402 has the same properties the FLX 3401 offers but has furthermore the possibility to measure 4-20mA & 0-10 VDC signals.

The present Installation Guide is focusing on an extension card which, as such, needs to be inserted in a Flexy base unit to work.
The base units have their individual Installation Guide. For more details about the base units, please refer to the *Related Documents, p. 3*.

The present guide addresses shortly how the extension cards can be integrated in the base units as we give some recommendations to mount them (refer to *Plug the FLX 3402 into the Base Unit, p. 13*).

Though being referred as "Digital Outputs" (DO), these 2 outputs are actually "Normally Open" (NO) relays.

3 Safety, Environmental & Regulatory Information

3.1 Scope

The present heading addresses Safety, Environmental & Regulatory Information about the FLX 3402 – 8DI-4AI-2DO extension card.

This extension card belongs to the same compliance frame than the base units. In the present case of a telecommunication extension card, additional directives, standards and instructions apply.

3.2 ESD Damage Prevention

> **!** Always use ESD precautions when handling extension cards and / or opened base unit as they contain parts and assemblies susceptible to be damaged by electrostatic discharge (ESD).

The extension card described in this document is a module exposing both sides of an electronic printed circuit board. Therefore, it is packed in an antistatic ESD bag. In order to avoid ESD damage, the product must be handled with the necessary precaution including:

- Grounded ESD protective work surface
- Personnel grounding

3.3 Applicable Directives, Standards and Compliances

The extension card described in the present Installation Guide belongs to class A Information Technology Equipment (ITE). In a domestic environment this product may cause radio interference in which case the user may be required to take appropriate measures.

3.3.1 Applicable European Directives

The FLX 3402 – 8DI-4AI-2DO extension card is in conformity with the following EC directives:

- RoHS Directive 2011/65/EU
- EMC Directive 2014/30/EU

3.3.2 Applicable Safety Standards

The FLX 3402 is in conformity with the following safety standards:

- IEC / EN 60950-1
- UL 60950-1
- CSA-C22.2 No 60950-1-07
- EN IEC 62368-1:2020 + A11:2020
- UL 62368-1 Third Edition, revised October 22, 2021
- CAN/CSA C22.2 No. 62368-1: 19 Third Edition, revised October 22, 2021

3.3.3 FCC Compliance

The FLX 3402 complies with Part 15 of the FCC Rules. Operating is subject to the following two conditions:

- This product may not cause harmful interference
- This product must accept any interference received, including interference that may cause undesired operation.

3.3.4 Certifications

The FLX 3402 has been certified by authorized bodies:

- UL Certificate of Compliance (COC) # E350576-20230306
- CB certificate # DK-133387-UL

These certificates can be downloaded as PDF files on the Ewon support web site: www.ewon.biz/support

4 Hardware Description

4.1 Mechanical Layout and Interfaces

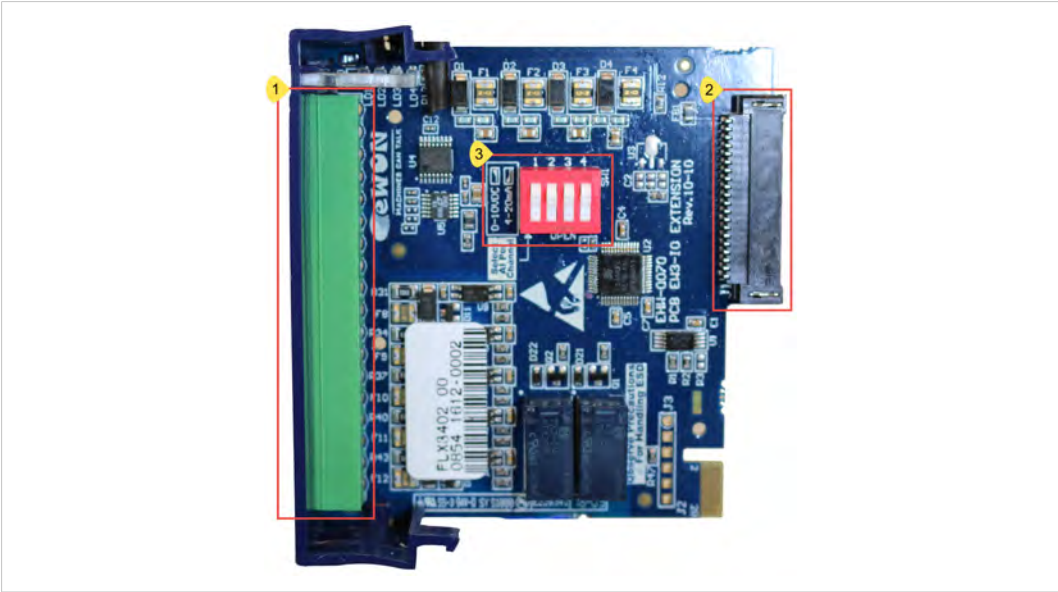


Fig. 1 Mechanical layout and interfaces

1	IO mating connector 18 screw terminals
2	Back-plane connector
3	Dip Switch analogue input voltage selector

4.2 Extension Card Label

4.2.1 Label Location and Included Information

The identification label of the extension cards is placed on the solder side of the PCB.

The different parts of the label are described below:

Label	Description
PN	Part Number (see syntax table below)
SN	Serial Number in the form: **MMMM-YYWW-SSSS-PP** • MMMM : MTID (product related) • YYWW : Year and week • SSSS : Sequential manufacturing order • PP : Product type
Marks	CE, UL... certification number and logos if applicable

Fig. 2 FLX 3402 label

4.2.2 Part Number Structure for Extension Cards

FLYXXXX_00/S				
FL	FL is the prefix for the extensions of the Ewon Flexy family	Only FL (constant)		
Y	1 alphabetic sign (CAP) Defines the slots of the base module in which the extension card can be inserted.	A	2 first slots only	●●○○
		B	2 last slots only	○○●●
		X	Any slots	●●●●
		C	Any slots. Available for Flexy 205 only.	○○○○
XXXX_00	The extension card type. The suffix _00 is used for software options.			
/S	The suffix might have an optional “/” character It might also be blank or include “S” character => Indicates compliance with the UL/IEC/EN 60950 standard.			

4.3 Front Panel LEDs

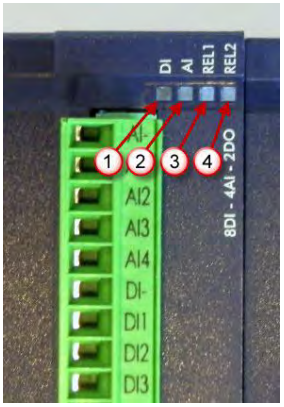


Fig. 3 Front Panel Leds

Item	Mark	Function
1	DI	Reflects a DI status change. Toggles between ON and OFF at every DI status change.
2	AI	Blinking green = Acquisition running on all AI (permanent even if no tag was configured and/or no input was wired).
3	REL1	Solid green when relay 1 is closed.
4	REL2	Solid green when relay 2 is closed.

During boot time, all 4 LEDs are off. Two simultaneous status changes on different DI will result in no LED status change.

4.4 IO Specifications

4.4.1 Analog Inputs Configuration

The 4 analog inputs can be configured to measure voltage or current.

The configuration is made by setting the dip switch selector in the needed mode.

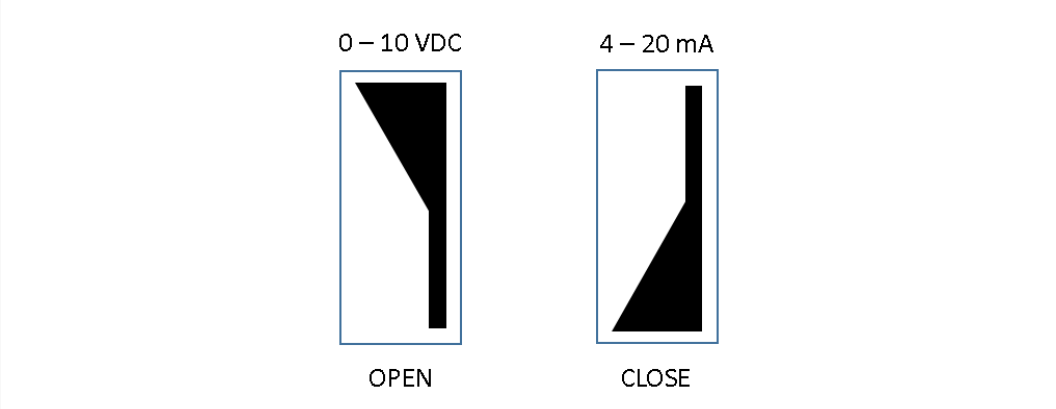
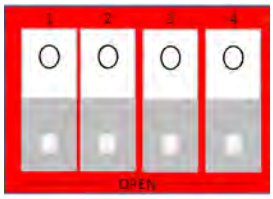
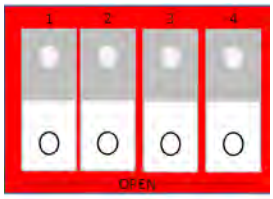
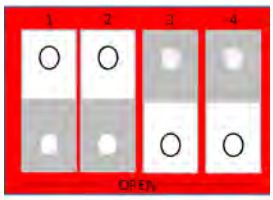


Fig. 4 Dip Switch Position for AI.

The default dip switch configuration is 0 – 10 VDC for Voltage measurement.

The dip switch has to be set while the extension board is powered off.

Example of AI Configuration	
All AI configured in 0-10 VDC for voltage measurement	
All AI configured in 4-20 mA for current measurement	
AI 1, AI 2 in 0-10 VDC; AI 3, AI 4 in 4-20 mA	

4.4.2 Connector Pin Out

Label	Description
AI-	Ground of the analog input (isolated)
AI1	Analog Input 1
AI2	Analog Input 2
AI3	Analog Input 3
AI4	Analog Input 4
DI-	Ground of the digital input (isolated)
DI1	Digital Input 1
DI2	Digital Input 2
DI3	Digital Input 3
DI4	Digital Input 4
DI5	Digital Input 5
DI6	Digital Input 6
DI7	Digital Input 7
DI8	Digital Input 8
R11	Relay 1 NO terminal 11
R14	Relay 1 NO terminal 14
R21	Relay 2 NO terminal 21
R24	Relay 2 NO terminal 24

Fig. 5 Connector Pin Out

Terminal numbers R11, R14, R22 and R24 are derived from 11 (Common) and 14 (NO) that refer to the Single Pole, Single Throw, Normally Open (SPST NO) relay terminal numbering as per standard EN 50005.

The maximal tightening torque is 0.25Nm.

4.4.3 Typical Wiring Diagram

As example, in this wiring diagram the AI dip switch is set:

- in 0-10 VDC for AI1 (dip switch selector: open)
- in 4-20 mA for AI2 (dip switch selector: close)

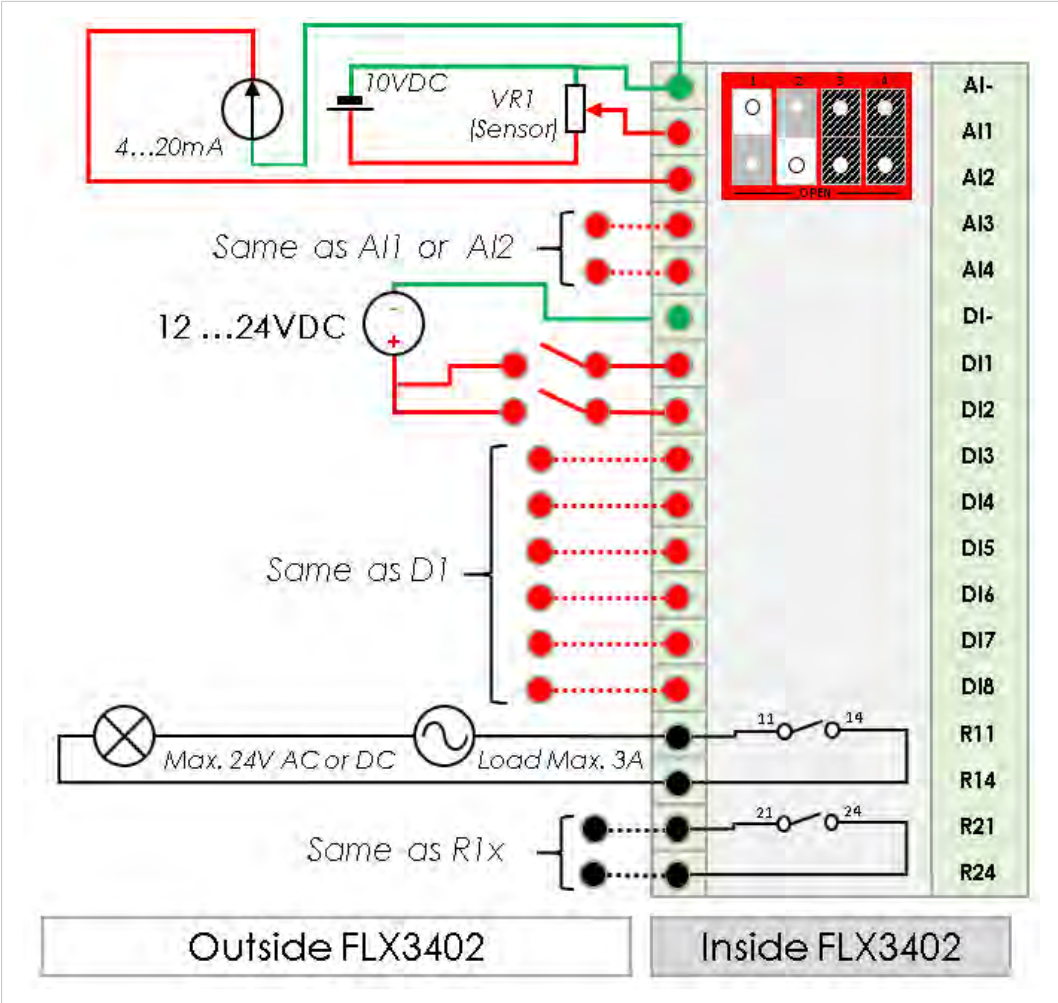


Fig. 6 **Wiring Diagram**

4.4.4 Analog Inputs (4)

Characteristic	Value
AI Terminal count	5 (4 channels + common ground)
Isolation between AI	None (common ground)
AI rated input range (based on dip switch settings, see *Analog Inputs Configuration, p. 9*)	Rated 0 to 10 VDC (max. -0.6 V to 12 VDC) Rated 4 to 20 mA (max. 0 mA to 25 mA)
AI max. input range	Over-voltage protection
AI max. input impedance	< 260R
AD converter resolution	16 bits
Sampling rate	4 sps
Max. gain error	0,40%
Input low pass filter cut-off	@ 1.3 Hz
Functional Isolation	1.5 kV

4.4.5 Digital Inputs (8)

Characteristic	Value
DI terminal count	9 (8 + common ground)
Isolation between DI	None (common ground)
DI voltage range	0 to 24 VDC
DI protection	33 VDC Max
DI OFF state input voltage range	0 to 5 VDC
DI ON state input voltage range	10 to 30 VDC
DI ON state current range	< 2 mA @ 12 VDC to < 6 mA @ 24 VDC
Functional Isolation	1.5 kV from DGND (internal isolated ground)

4.4.6 Output Relays (2)

Characteristic	Value
Terminal count	4 (2 independent outputs)
Relay type	Single Pole, Single Throw, Normally Open = SPST NO
Input voltage max.	30 VDC/VAC
Max. current (ext. source)	2A
Functional Isolation	1,5 kV

4.5 Ewon Flexy Extension Card Environmental Conditions

Characteristics	Value
Operating Temperature	-25 to +60°C
Storage temperature	-40 to +70°C
Relative humidity	10 to 95% non-condensing
Operating altitude	Up to maximum 2000m
Storage altitude	Up to maximum 3000m

5 Plug the FLX 3402 into the Base Unit

5.1 Base Unit Slot Compatibility

The FLX 3402 must be inserted in one of the “Type X” slots of the base unit.

The reference code of the extension cards includes a letter defining their compatibility:

- FL**X** xxxx: designate cards that fit into “Type X” slots.

In addition to the card reference, each type of extension card bears a visual compatibility symbol on its front panel:

Design	Slot Type	Flexy 205 Location	Flexy 10x & 20x
●●●●	Type X	Any slot	Any slot

5.1.1 Ewon Flexy 205

As the Flexy 205 has room for 2 slots, the type slot compatibility rule doesn’t apply. The FLX 3402 can be inserted in both slots.

Fig. 7 Position of the “Type X” Slots on a Flexy 205.

5.1.2 Ewon Flexy 10x & 20x

The FLX 3402 must be inserted in the “Type X” slots which means each slot possible of the Flexy 10x & 20x.

Fig. 8 Position of the "Type X" Slots on a Flexy 10x & 20x.

5.2 Extension Card Insertion

5.2.1 How to Insert into the Flexy Base Unit

Wait 30 seconds after turning off the equipment before inserting (or removing) an extension card to avoid possible damage to the base unit and the extension cards.

Remove the slot filler of the location the new card will be inserted. To do so, press on both ends of the cover, note that the hooks are off-centered.

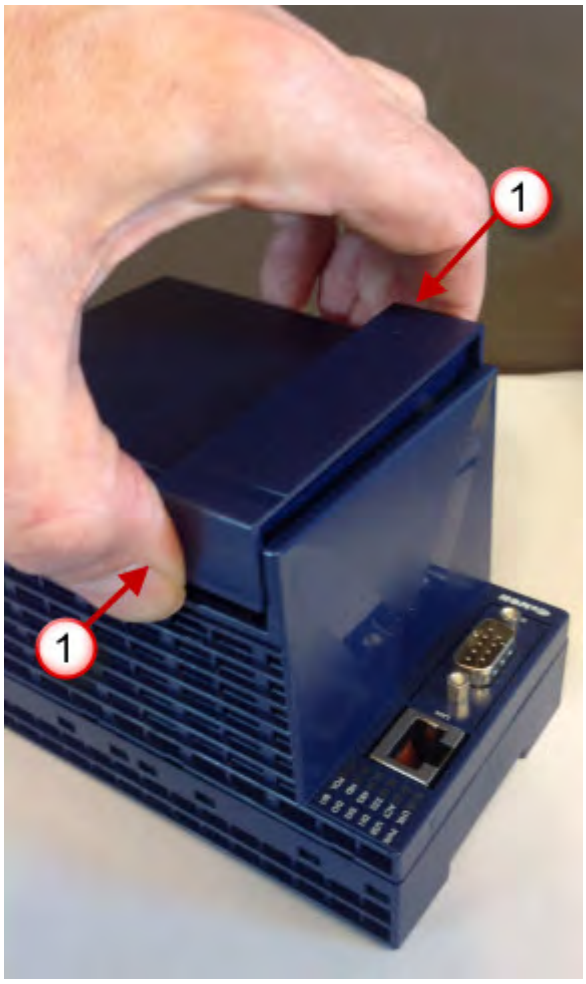


Fig. 9 Remove the slot fillers

1	Hooks to be pressed are off-centered. Press while pulling upwards

Insert the extension card carefully and slide it down until the hook clicks. Make sure the card is completely inserted.

DO NOT insist if a resistance is felt when trying to insert the card. This can occur if the extension card is inserted in a wrong slot type. In such case, check slot compatibility of the relevant extension card.

Boot the unit for the inserted extension cards to be detected. The web interface of the Flexy base unit has a diagnostic page showing the extension cards in their order of detection (from left to right).

5.2.2 Multiple FLX 3402

The Flexy firmware currently supports up to **4** FLX 3402.

The boot process of the base unit includes an automated detection of the inserted extension cards. This detection is done sequentially, slot per slot starting from the left to right.

Addressing I/O Tags

The internal tag addressing of the Flexy range always starts with the Inputs/Outputs of the base units. Remember that all base units feature 1 Digital Output and 2 Digital Inputs, those are the first ones that have to be considered when creating tags in the device.

The example below helps to understand the syntax of the I/O server tag addresses in the case of 2 I/O extension cards.

Following the left-to-right order of slots, the first card to be detected is the extension card plugged in the most left slot, then the next on its right and so on.

Removing an I/O card other than the utmost right one will result in an internal reallocation of tag addresses that may result in a mismatch between physical I/Os and their software configuration.

The software tag addresses can be *frozen* by adding the slot number in the tag definition. This prevents accidental I/O mismatch.

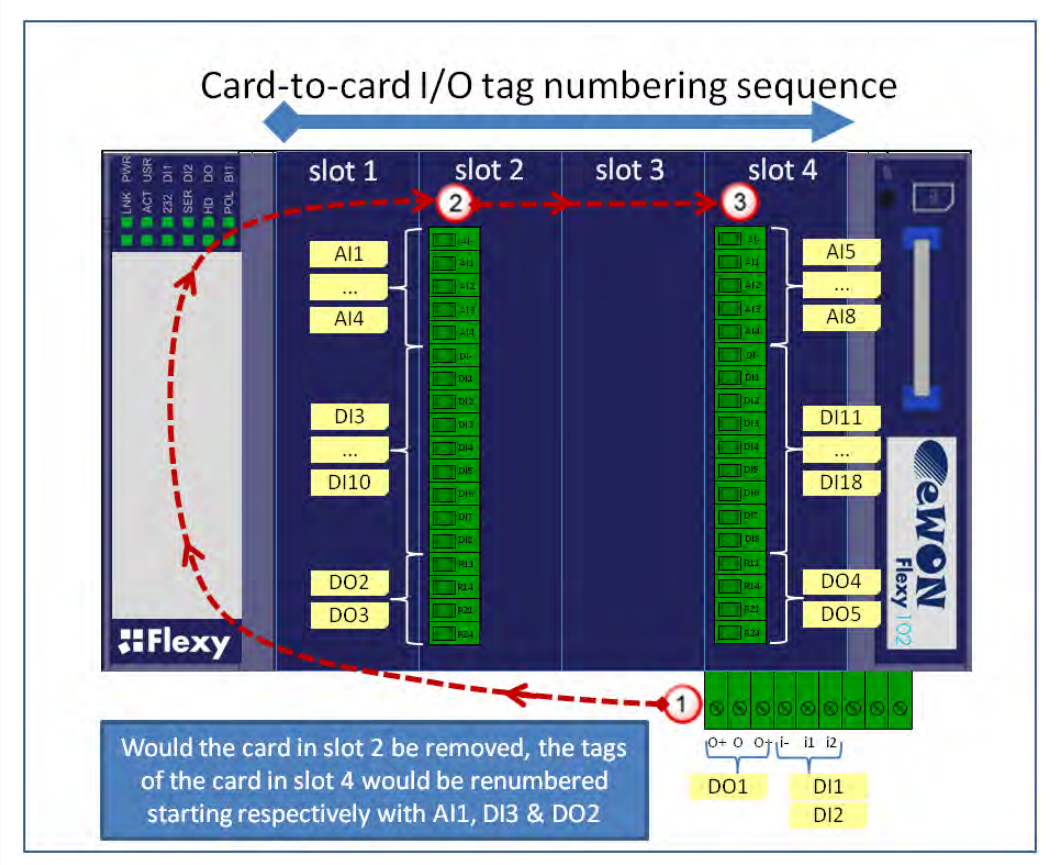


Fig. 10 **Order of the IO Tags Process.**

Slot number appends to prevent tag address mismatch

Let's take the example of an eWON Flexy featuring 2 IO cards FLX 3402 in slots #2 and #4 as shown in the picture above. The tag address for the Ewon IO server can be extended as follows:

```
ABx,Ey
```

AB	The type of IO (DI, AI, DO)
x	The order number
E	A constant prefix to the slot number
y	The slot number of the card (0 = main board, 1 = slot #1, 2 = Slot #2, etc..)

The main IO syntax and order numbering remains unchanged. In the example above, the IO server tag addresses are as follows:

Tag Syntax	Explanation
DO1,E0	Digital Output 1, main board (though E0 is not necessary in this case)
DO2	Digital Output 2, no position specified = second detected DO = first DO on first extension card detected (slot #2 most left).
DO3,E2	Digital Output 3, board in slot #2 = second DO on extension card in slot #2
DO4,E4	Digital Output 4, board in slot #4 = first DO on extension card in slot #4
DO5,E4	Digital Output 5, board in slot #4 = second DO on extension card in slot #4

Behavior if the card in slot #2 is removed

In the “View” mode of the Tag display page:

- **DO2** will appear normally as it was not frozen by a slot number append. But it can no longer reflect the status of the first DO of the board in slot #2 that was removed. DO2 now reflects the status of the first DO of the board in slot #4.
- The 3 other DOs with specified slot number E2 and E4 will all appear in error (red cross, value 0), because:
  - The address of DO3,E2 of the card in slot #2 could no longer be found, and
  - The software addresses of DO4,E4 and DO5,E4 of the card in slot #4 do no longer match with the detected order of physical addresses**.**

The error “trace” messages located in the Events page are “Invalid IO Tag name (DOx, addr. DOx,Ex)”.

To have the DOs of the card in slot #4 responding, edit the tags and change their software addresses as follows:

- DO4,E4 to DO2,E4 and
- DO5,E4 to DO3,E4.

5.2.3 Power Requirements

> **!** The “Power Requirements” concept doesn’t apply to Flexy 205 and its inserted extension cards.

The internal power converter of the Flexy base units has been dimensioned to cover a broad range of different combinations of extension cards. Users should make sure the total power demand of the extension cards does not exceed the capabilities of the base unit. That is why the notion of “Energy Points” has been introduced.

The Installation Guide “eWON Flexy - Base Units” includes a section giving the **Available Energy Points** of each type of base unit.

The power requirements of each extension card is expressed in **Energy Demand Points.** This number is meant to check whether the balance with the **Available Energy Points** of a given base unit with extension cards is OK or not.

The Energy Demand Points of the FLX 3402 is **2**

The Installation Guide of the “eWON Flexy - Base Units” also includes examples of practical power balance calculations.

6 Powering on the Base Unit with its Extension Cards

When the base unit is powered on, it takes approximately 25 seconds for the unit to go through its self-test procedure. The slots in which the extension cards have been inserted and their type are detected during this process.

If the boot process completes normally, the following LED status should be observed:

- Base unit : **USR** LED flashing green slowly
- Extension card : None

> **!** If the **USR** LED of the base unit is flashing red, it might be because the extension card was improperly inserted (for example in a wrong slot).

7 Check Card Detection on the Embedded Web Page

The Flexy extension cards require no software configuration. They are automatically detected by the base unit when the device boots.

7.1 Connecting to the Embedded Web Server

Configure the network parameters to set the computer being used to reach the web interface on the same IP range than the LAN of the Ewon device.

Once both devices are in the same IP range, connect the PC to one of the LAN port of the Ewon device.

Open an Internet browser and access the homepage of the Ewon device by typing the LAN IP address in the URL field (the default address is http://10.0.0.53).

A dialog box will pop-up asking for credentials. Default ones are:

- login: adm
- password: adm

> **!** For security reasons, changing the default password *adm* is an absolute requirement. To change it, from the menu bar, click on ***Setup > Users*** and double click on the *adm* entry to edit and save its password.

7.2 Detected Cards Displayed in the System Page

Once connected to the embedded web pages of the Ewon device, the homepage displays the system status including detected extension cards.

To access in details the system status summary, click on ***Diagnostic > Status > System Info > System***.

8 Analog Input Measurement

8.1 Analog Input Scaling

The firmware will detect whether the dip switch is configured as current or voltage measurement.

In both cases, the range will be 0...65535

Raw Value (AI)	Voltage	Current
0	0V	0 mA
65535	10V	20mA

8.2 Real Physical Conversion Value Formula

When configuring a tag under the IO server in the “Setup” mode of the Tag page, a conversion can be applied such as: **Y = ax + b**

Y	The value of the tag displayed in the Ewon
a	The real measurement of the value
x	The slope
b	The constant term

A maximum of 6 significant digits for the value will be used by the device. The value will be automatically adapted if more digits is used in a field.

Example of Conversion

Situation: Using a temperature sensor (Min. -20°C Max +50°C) on the AI1 of an Ewon Flexy

Question: Which values need to be added in a & b?

Solution:

Formula:

- Y = ax+b
- a = (Y2-Y1) / (X2-X1)
- b = Y2X1 - Y1X2 / (X1-X2)
  If X1= 0 then b = Y1

Description	Value	Raw Value (AI)
Minimum	-20°C *(Y1)*	0 *(X1)*
Maximum	50°C *(Y2)*	65535 *(X2)*

In the example:

- a = 0,00106813
- b = -20

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