User Manual

FlexiLogics® PLC

Expansion Modules for
FL004/FL004 V2 ECO Series

Table of Contents

Introduction

Thank you for purchasing FL004 Expansion Product from Renu Electronics. FlexiLogics® Series Products are versatile high-performance programmable controllers with Microsoft® Windows based configuration Software.

Variety of Digital and Analog I/O modules are available, which can be used with FL004 base PLC module. User can connect up to 8 expandable I/O modules with the base module. This combination provides maximum 142 I/O points. (14 built-ins with base module and up to 128 with expandable I/O modules)

These products are compliant to EMC directive 2014/30/EU and LVD directive 2014/35/EU.

Before you start

FlexiLogics® FL004 series products are Programmable Logic Controller, suitable for a variety of applications across various industries. However, Renu Electronics is not responsible or liable for any indirect or consequential damage resulting from the use of this product.

- The user should check and confirm the suitability of the product before using in any specific application.
- The diagrams and examples in this manual are included for illustration purpose only. Renu Electronics assume no responsibility or liability regarding actual use based on these diagrams or examples.
- Reproduction of the contents of this manual, in any form (in part or in whole), is strictly prohibited.
- Following table shows various symbols that may be used in this manual to provide information regarding safety, precautions and usage of the product:

⚠	**CAUTION**: Indicates specific precautions to be taken by user during installation, operation and maintenance of the product.
ATTENTION	**ATTENTION:** Indicates important information regarding application and functions of the product.

Safety Precautions

This section of the manual provides information which is critical regarding safety and therefore the user is advised to go through the information in detail before installing the product. User may contact Renu Electronics technical support team at support@renuelectronics.com for any specific question(s) related to safety.

⚠	**CAUTION: GENERAL PRECAUTIONS** ▪ Do not use this product for emergency stop. A separate physical switch, outside the product must be used for any emergency stop operations. ▪ Do not use the external power supply source that does not comply with the specified power requirements of the product, it may cause malfunction or permanent damage to the product. ▪ Do not attempt to open, dismantle or modify the product, doing so will void the warranty. ▪ This product is supplied as open-type equipment and it must be mounted suitably designed for specific environmental conditions. ▪ If you connect or disconnect the USB cable with power applied to this product or any other device on USB network, and electrical arc can occur, which could cause explosion in hazardous location installations. ▪ Make sure that connectors are securely tightened to properly seal the connections against leaks.

Digital Expansion Modules

Model	Digital I/P	Digital O/P	Description
FLD0800	8	0	8 Digital Inputs
FLD0008N	0	8	8 Digital Outputs (NPN)
FLD0008R	0	8	8 Digital Outputs (Relay)
FLD0808N-L	8	8	8 Digital Inputs, 8 NPN Outputs
FLD0808R-L	8	8	8 Digital Inputs, 8 Relay type Outputs Digital module
FLD01600-S1	16	0	16 Digital Inputs
FLD0016N-S1	0	16	16 Digital Outputs (NPN)

FLD0800

Product Specification

Digital Inputs	8 Normal inputs 8 points per common, Bidirectional type
Input per Channel	24VDC, 5mA
Input Impedance	5.4KΩ
Min. ON Voltage	15VDC
Max. OFF Voltage	5VDC
Input ON Response Time	2msec (it may vary depending on cycle time of PLC up to 10ms)
Input OFF Response Time	2msec (it may vary depending on cycle time of PLC up to 10ms)
Isolation	Optically isolated from the internal circuit

Power Rating

Voltage and Current Rating	3.75VDC, 80mA (supplied from base PLC)

Wiring Diagram

[Note: Closing SW1 to SW8 will turn ON respective inputs.]

FLD0008R
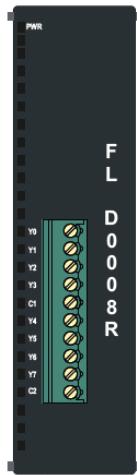
Product Specifications

Digital Outputs	8 Relay (From A) Outputs, 4 points per common
Output per Channel	230V, 2A or 24VDC, 2A
Isolation	Optically Isolated from the internal circuit
Output Capacity	2A per O/P, 8A per common for Relay type O/P
Output Response Time	About 10msec.

Power Rating

Voltage and Current Rating	3.75VDC, 80mA (supplied from base PLC)

Wiring Diagram
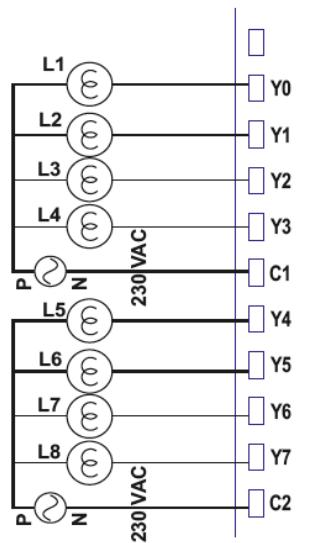
[Note: L1 to L8 are AC load.]

FLD0008N
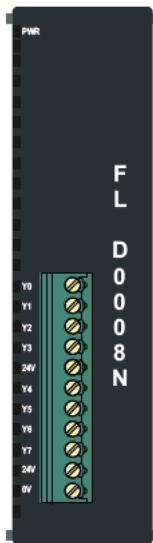
Product Specifications

Digital Outputs	8 NPN Type Transistor Outputs, 4 points per common
Output per Channel	24VDC, 500mA
Isolation	Optically Isolated from the Internal circuit
Output Capacity	500mA max
Output Response Time	OFF to ON: 60µsec. ON to OFF: 10µsec.

Power Rating

Voltage and Current Rating	3.75VDC, 80mA (supplied from base PLC)

Wiring Diagram
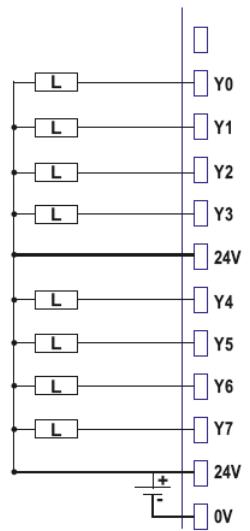
[Note: We recommended to use freewheeling diode externally for inductive load while operating digital outputs on each channel.]

FLD0808N-L
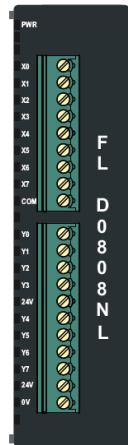
Product Specifications

Digital Inputs	8 Normal Inputs 8 points per common, Bidirectional type
Digital Outputs	8 NPN Type Transistor O/P, 4 points per common
Input per Channel	24VDC, 5mA
Input Impedance	5.4KΩ
Min. ON Voltage	15VDC
Max. OFF Voltage	5VDC
Input ON response time	2mse (it may vary depending on cycle time of PLC up to 10ms)
Input OFF response time	2msec (it may vary depending on cycle time of PLC up to 10ms)
Isolation	Optically Isolated from the internal circuit
Output Capacity	500mA Max
Output Response Time	OFF to ON: 60µsec ON to OFF: 10µsec
Output Rating	24VDC, 500mA per Output (Auxiliary power supply)

Power Rating

Voltage and Current Rating	3.75VDC, 80mA (supplied from base PLC)

Wiring Diagram

For Connecting Digital Inputs
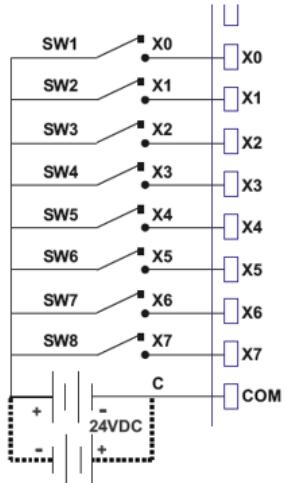
[Note: Closing SW1 to SW8 will turn ON respective inputs]
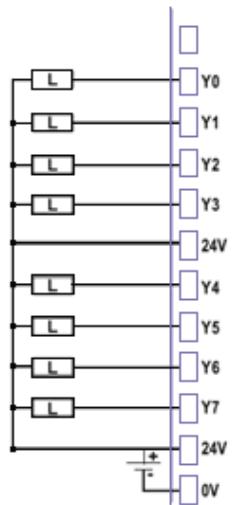
For Connecting Digital Outputs

[Note: We recommended to use freewheeling diode externally for inductive load while operating digital outputs on each channel.]

FLD0808R

Product Specifications

|	
Digital Outputs	8 Relay (From A) Outputs, 4 points per common
Digital Inputs	8 Normal Inputs, 8 points per common (Bidirectional type)
Input per Channel	24VDC, 5mA
Input Impedance	5.4KΩ
Input ON response time	2mse (it may vary depending on cycle time of PLC up to 10ms)
Input OFF response time	2msec (it may vary depending on cycle time of PLC up to 10ms)
Isolation	Optically Isolated from the internal circuit
Output Capacity	2A per O/P, 8A per common for Relay type O/P
Output Response Time	About 10msec.
Output per Channel	230V, 2A or 24VDC, 2A

Power Rating

|	
Voltage and Current Rating	3.75VDC, 80mA (supplied from base PLC)

Wiring Diagram

For Connecting Digital Inputs:
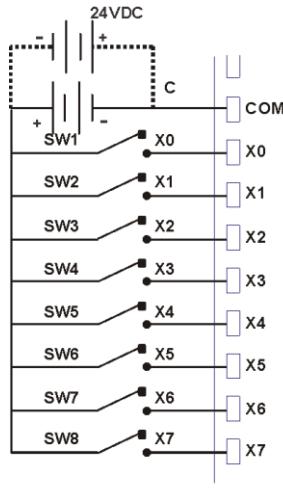
[Note: Closing Swx will turn on respective inputs.]

For Connecting Digital Outputs:
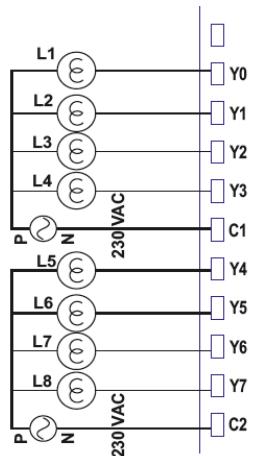
[Note: L1 to L8 are A.C. Load.]

FLD1600-S1

Product Specifications

Digital Outputs	NA
Digital Inputs	16 Normal Inputs, 8 points per common (Bidirectional type)
Input per Channel	24VDC, 5mA
Input Impedance	5.4KΩ
Input ON response time	2mse (it may vary depending on cycle time of PLC up to 10ms)
Input OFF response time	2msec (it may vary depending on cycle time of PLC up to 10ms)
Isolation	Optically Isolated from the internal circuit

Power Rating

Voltage and Current Rating	3.6VDC, 80mA (supplied from base PLC)

Wiring Diagram

For Connecting Digital Inputs:

[Note: Closing Swx will turn on respective inputs.]

FLD0016R-S1

Product Specifications

Digital Outputs	16 Relay (From A) Outputs, 4 points per common
Isolation	Optically Isolated from the internal circuit
Output Capacity	2A per O/P, 8A per common for Relay type O/P
Output Response Time	About 10msec.
Output per Channel	230V, 2A or 24VDC, 2A
Rated Load	230 /2A, 30VDC / 2A (for Relay)

Power Rating

Voltage and Current Rating	3.6VDC, 80mA (supplied from base PLC)

Wiring Diagram

For Connecting Digital Outputs:
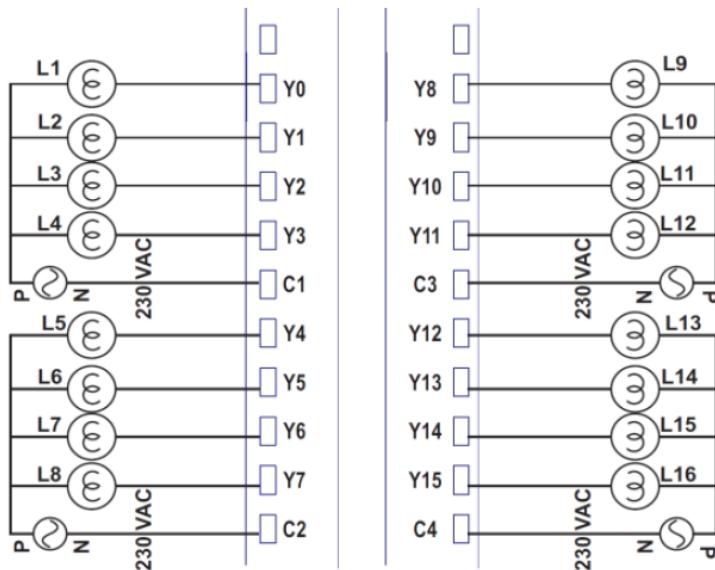
[Note: L1 to L8 are AC load.]

Analog Expansion Modules

Model	Analog I/P	Analog O/P	Description
FLA0400-14	4	0	4 Analog Inputs (0-10 VDC / 0-20mA / 4-20 mA), 14 Bit
FLA0400-16	4	0	4 Analog Inputs (0-10 VDC / 0-20mA / 4-20 mA), 16 Bit
FLA0400T	4	0	4 TC Analog Inputs (B, R, S, E, J, K, N, T)
FLA0400R	4	0	4 RTD Analog Inputs (PT100 / PT1000)
FLA0002L	0	2	2 Analog Outputs (0-10 VDC / 4-20mA), 12 Bit
FLA0004L	0	4	4 Analog Outputs (0-10 VDC / 4-20mA), 12 Bit
FLA0402L	4	2	4 Linear Inputs (0-10V / 4-20mA / 0-20mA), 16 Bit 2 Analog Outputs (0-10V / 4-20mA / 0-20mA), 12Bit
FLA0402U-12	4	2	4 Universal Inputs (0-5V / 0-10V / 0-100mV / 0-50mV / 0-20mA / 4-20mA / RTD PT-100, PT-1000 / Thermocouple - B, R, S, E, J, K, N, T) 2 Analog Outputs (0-10 V / 4-20mA), 12 Bit
FLAD0202N-S0	2	2	2 Load Cell Inputs, 2 NPN Transistor Outputs

FLA0400-14 and FLA0400-16
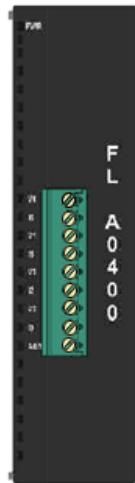
Product Specifications

Analog Inputs	4 Input channels Voltage Input: 0-10V Current Input: 4-20mA and 0-20mA
Connection Method	Removable terminals (3.81mm pitch)
Resolution	16Bit (for FLA0400-16) 14Bit (for FLA0400-14)
Accuracy	0.2% of Full Scale
Non-Linearity Input	0.04% Max
Input Impedance	470KΩ (Voltage mode) 51Ω (Current mode)
Temperature Drift	60ppm
Input Response Time	3msec. x Channels (for Voltage and Current)

Power Rating

Voltage and Current Rating	24VDC, 50mA ,1.2W (to be supplied externally)

Wiring Diagram

Voltage Mode Connection
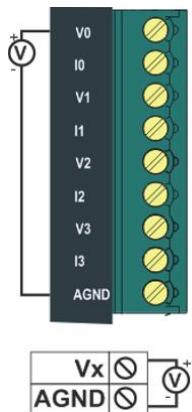
Current Mode Connection
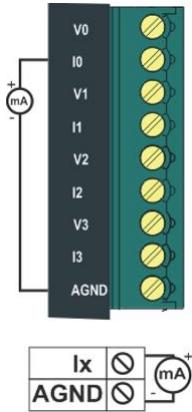
Functions

Configuration Registers

Input (XW), and configuration (MW) Register allocation:
Analog Inputs in the Analog Expansion models are accessed using XW registers. The type of input channel is configured from configuration registers MW. The analog inputs in the unit are updated in the (Input) XW registers.

Sr. No.	Description	Register	Type
1	Analog_Input_Tpye_CH1	MWxx00	R / W
2	Analog_Input_Tpye_CH2	MWxx01	R / W
3	Analog_Input_Tpye_CH3	MWxx02	R / W
4	Analog_Input_Tpye_CH4	MWxx03	R / W
5	Analog_Input_Data_CH1	XWxx00	Read Only
6	Analog_Input_Data_CH2	XWxx02	Read Only
7	Analog_Input_Data_CH3	XWxx04	Read Only
8	Analog_Input_Data_CH4	XWxx06	Read Only

Channel Type Selection Values Table

Input Channel Type	Value
Current (0-20mA)	3
Current (4-20mA)	2
Voltage (0-10V)	1

Data output format for analog inputs for model: FLA0400-16

For, Voltage: (0-10V)

Voltage Input	Count
0V	0
2.5V	16000
5V	32000
7.5V	48000
10V	64000

For, Current: (4 to 20mA)

Current Input	Count
4mA	0
8mA	16000
12mA	32000
16mA	48000
20mA	64000

Current: (0 to 20mA)

Current Input	Count
0mA	0
5mA	16000
10mA	32000
15mA	48000
20mA	64000

Data Output format for analog inputs for model: FLA0400-A14

For Voltage: (0-10V)

Voltage Input	Count
0V	0
2.5V	4000
5V	8000
7.5V	12000
10V	16000

For, Current: (4 to 20mA)

Current Input	Count
4mA	0
8mA	4000
12mA	8000
16mA	12000
20mA	16000

Current: (0 to 20mA)

Current Input	Count
0mA	0
5mA	4000
10mA	8000
15mA	12000
20mA	16000

Analog Input Count Details for FLA0400-16, 16 Bit resolution

Input Type	Over range count	Under range count	Open circuit count
Voltage	65001	0	65001
current 0 to 20	65001	0	65001
current 4 to 20	65001	65000	65001

Analog Input Count Details for FLA0400-16, 14 Bit resolution

Input Type	Over range count	Under range count	Open circuit count
Voltage	16301	0	16301
current 0 to 20	16301	0	16301
current 4 to 20	16301	16300	16301

FLA0400T
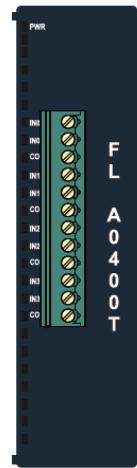
Product Specifications

Analog Inputs	Thermocouple (Type J, K, R, S and T)
Resolution	16 Bit
Input Range	B, R, S, E, J, K, N and T
Input Impedance	1MΩ
Temperature Drift	60ppm
Accuracy	0.5% @ 25^{0}C, 1% @ 60^{0}C
Response Time	3msec. x channels
Nonlinearity	0.04% Max.
Mounting	DIN Rail Mounting
Channel to Channel Isolation	NO Isolation between Channels

Power Rating

Voltage and Current Rating	24VDC(-15%,+20%), 50mA, 1.2W (to be supplied externally)

Wiring Diagram
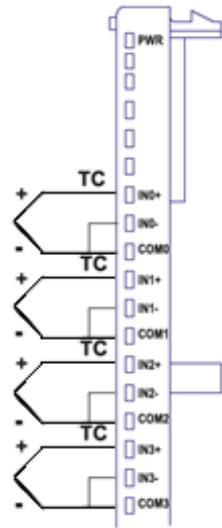
Functions

Configuration Registers

Input (XW), and configuration (MW) Register allocation:

The type of input channel is configured from configuration registers MW. The analog inputs in this unit are updated in the (Input) XW registers.

Sr. No.	Tag Name	Register	Type
1	CH0_ Analog_Input	MWxx00	R / W
2	CH1_ Analog_Input	MWxx01	R / W
3	CH2_ Analog_Input	MWxx02	R / W
4	CH3_ Analog_Input	MWxx03	R / W
5	CH0_ Input_Reg	XWxx00	Read Only
6	CH1_ Input_Reg	XWxx02	Read Only
7	CH2_ Input_Reg	XWxx04	Read Only
8	CH3_ Input_Reg	XWxx06	Read Only
9	CH0_ Input_NormalisationFactor*	MWxx06	R / W
10	CH1_ Input_NormalisationFactor*	MWxx07	R / W
11	CH2_ Input_NormalisationFactor*	MWxx08	R / W
12	CH3_ Input_NormalisationFactor*	MWxx09	R / W

[Note *: This is software filter used to average out analog input signal. The range is 1- 65535.]

Channel Type Selection Values Table

Use the following Values in the Input channel type select register to configure the corresponding channel to particular type.

Input Channel Type	Value
Thermocouple(B-type)	10
Thermocouple(R-type)	11
Thermocouple(S-type)	12
Thermocouple(E-type)	13
Thermocouple(J-type)	14
Thermocouple(K-type)	15
Thermocouple(N-type)	16
Thermocouple(T-type)	17

Thermocouple type, range and resolution table:

Input Type	Temperature Range	1bit corresponds to
J	-210 to 1200^{0}C	0.035^{0}C
K	-200 to 1373^{0}C	0.049^{0}C
E	-200 to 1000^{0}C	0.027^{0}C
R	-50 to 1769^{0}C	0.16^{0}C
S	-50 to 1769^{0}C	0.18^{0}C
B	0 to 1820^{0}C	0.25^{0}C
N	-200 to 1300^{0}C	0.056^{0}C
T	-200 to 400^{0}C	0.043^{0}C

Temperature readings

Digital count value: 10 × Actual Temp (^{0}C)
The value in the XW register is in a signed integer format thus,

E.g. If current temperature of heater is 57.8^{0}C, the digital count in the XW register will be 578.
Or If the temperature of heater is -152.4^{0}C, the digital count in the XW register will be -1524.

Analog Input Count Details for 16 Bit resolution

Input Type	Over range count	Under range count	Open circuit count
Thermocouple B TYPE	18210	0	0
Thermocouple R TYPE	17690	-510	0
Thermocouple S TYPE	17690	-510	0
Thermocouple E TYPE	10010	-2010	0
Thermocouple J TYPE	12010	-2110	0
Thermocouple K TYPE	13730	-2010	0
Thermocouple N TYPE	13010	-2010	0
Thermocouple T TYPE	4010	-2010	0

FLA0400R

Product Specifications

Analog Inputs	3 Wire RTD Sensors, Different Inputs
Resolution	16 Bit
Input Range	PT100 (α1 and α2) α1: -200 $\sim$ 850^{0}C (-328^{0}F $\sim$ 1562^{0}F) α2: -100 $\sim$ 457^{0}C (-148^{0}F $\sim$ 854^{0}F) For PT1000: -200 $\sim$ 850^{0}C (-328^{0}F $\sim$ 1562^{0}F)
Input Impedance	1MΩ
RTD Excitation Current	PT100: 1mA PT1000: 0.5mA
Temperature Drift	±5ppm per^{0}C Max.
Accuracy	a) ±1.05^{0}C @ surrounding temperature of (25^{0}C ± 5^{0}C) b) ±5.25^{0}C @ surrounding temperature of 60^{0}C
Response Time	3msec x Channels
Nonlinearity	0.08% Max
Channel to Channel Isolation	No Isolation between Channels

Power Rating

Voltage and Current Rating	24VDC(-15%,+20%),50mA ,1.2W(to be supplied externally)

Wiring Diagram

Functions

Configuration registers

Sr. No.	Tag Name	Register	Type
1	CH0 _ Analog_Input	MWxx00	R / W
2	CH1_ Analog_Input	MWxx01	R / W
3	CH2_ Analog_Input	MWxx02	R / W
4	CH3_ Analog_Input	MWxx03	R / W
5	CH0_ Input_Reg	XWxx00	Read Only
6	CH1_ Input_Reg	XWxx02	Read Only
7	CH2_ Input_Reg	XWxx04	Read Only
8	CH3_ Input_Reg	XWxx06	Read Only
9	CH0_ Input_NormalisationFactor*	MWxx06	R / W
10	CH1_ Input_NormalisationFactor*	MWxx07	R / W
11	CH2_ Input_NormalisationFactor*	MWxx08	R / W
12	CH3_ Input_NormalisationFactor*	MWxx09	R / W

[Note *: This is software filter used to average out analog input signal. The range is 1- 65535.]

Use the following values to configure the unit: 7 for PT100 $\alpha 1^0 C$
8 for PT100 $\alpha 2^0 C$
9 for PT1000 $^0 C$

Temperature readings

Digital Count Value: 10 × Actual Temp (^{0}C)

The value in the XW register is in a signed integer format thus,
E.g. If current temperature of heater is 57.8^{0}C, the digital count in the XW register will be 578.
Or If the temperature of heater is -152.4^{0}C, the digital count in the XW register will be -1524.

Analog Input Count Details for 16 Bit resolution

Input Type	Over range count	Under range count	Open circuit count
RTD alpha1	8500	-2000	0
RTD alpha2	4570	-1000	0

FLA0002L

Product Specifications

Analog Outputs	2 Output Channels Voltage Input: 0-10V (Min Load 1000Ω) Current Input: 4-20mA (Max load 500Ω)
Isolation	Isolation between Analog and Digital section. No interchannel Isolation. Power supply is isolated
Connection method	Removable terminals (3.81mm pitch)
Resolution	12 Bit
Accuracy	0.2% of Full Scale
Non-Linearity	0.04%Max
Output Reaction Time	4msec x Channels (for Voltage and Current)
Weight	180gm

Power Rating

Voltage and Current Rating	24VDC, 50mA, 1.2W (to be supplied externally)

Wiring Diagram
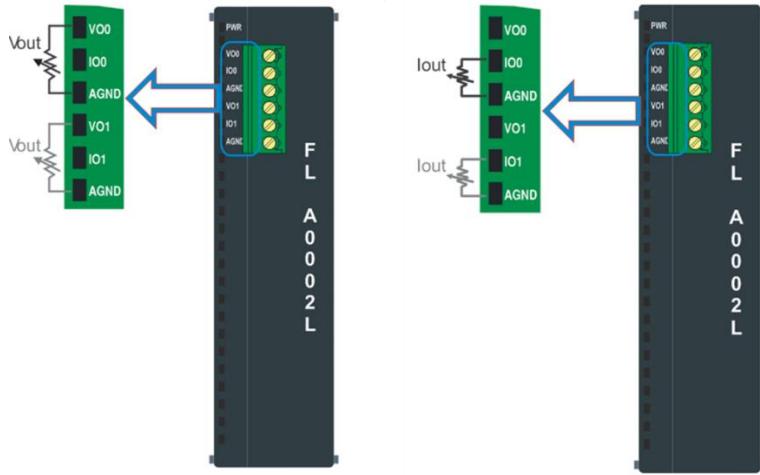
Functions

Configuration Registers

Output (YW), and configuration (MW) Register allocation:
Analog Outputs in the Analog Expansion models are accessed using MW and XW registers respectively. The type of output channel is configured from configuration registers MW.
The analog voltage/current is generated on the output terminals as per the count value written in the YW registers of base module. After writing in the channel type select registers, user must write "1" in the output conversion enabled register (MWxx20) to activate the modified channel type settings.

Sr. No.	Description	Register	Type
1	Output Channel 1 Data	YWxx00	R / W
2	Output Channel 2 Data	YWxx01	R / W
3	Output Channel 1 Type select	MWxx04	R / W
4	Output Channel 2 Type select	MWxx08	R / W
5	Output Conversion Enable	MWxx20	R / W

[Note: Above said configuration can be achieved with the help of configuration wizards also.]

Channel Type Selection Values Table

Output Channel Type	Value
Not Defined	0
Current (4-20mA)	1
Voltage (0-10V)	2

Data entry format for analog outputs

For analog output, enter the digital count for respective output register and observe the current and voltage output on multimeter. It should be as per following table.

For Voltage: (0-10V)

Voltage Output	Count
0V	0
2.5V	1024
5V	2048
7.5V	3072
10V	4095

For Current (4 to 20mA)

Current Output	Count
4mA	0
8mA	1024
12mA	2048
16mA	3072
20mA	4095

FLA0004L

Product Specifications

Analog Outputs	4 Output Channels Voltage Input: 0-10V (Min Load 1000Ω) Current Input: 4-20mA (Max Load 500Ω)
Isolation	Isolation between Analog and Digital section. No interchannel Isolation. Power Supply is Isolated
Connection method	Removable terminals (3.81mm pitch)
Resolution	12 Bit
Accuracy	0.2% of Full Scale
Non-Linearity	0.04% Max
Output Reaction Time	4msec x Channels (for Voltage and Current)
Power Supply	24VDC, 70mA
Weight	180gm
Output Rating	24VDC, 70mA

Power Rating

Voltage and Current Rating	24VDC, 70mA, 1.7W (to be supplied externally)
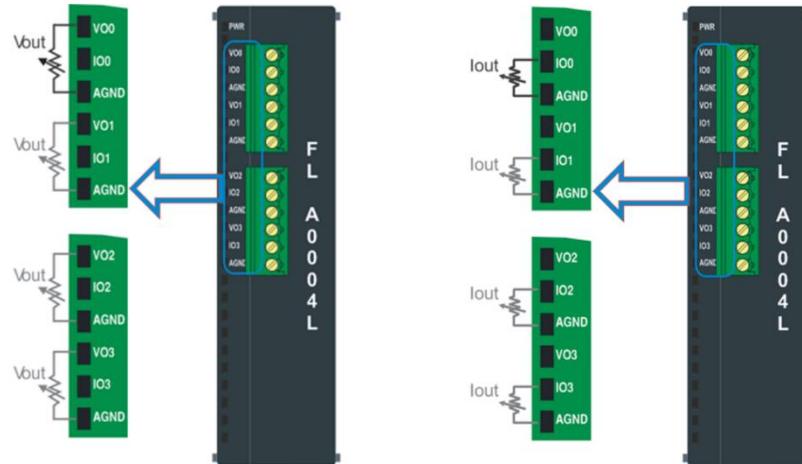
Wiring Diagram

Functions

Configuration Registers

Output (YW), and configuration (MW) Register allocation:
Analog Outputs in the Analog Expansion models are accessed using MW and YW registers respectively. The type of output channel is configured from configuration registers MW.
The analog voltage / current is generated on the output terminals as per the count value written in the YW registers of base module. After writing in the channel type select registers, user must write "1" in the output conversion enabled register (MWxx20) to activate the modified channel type settings.

Sr. No.	Description	Register	Type
1	Output Channel 1 Data	YWxx00	R / W
2	Output Channel 2 Data	YWxx01	R / W
3	Output Channel 3 Data	YWxx02	R / W
4	Output Channel 4 Data	YWxx03	R / W
5	Output Channel 1 Type select	MWxx04	R / W
6	Output Channel 2 Type select	MWxx08	R / W
7	Output Channel 3 Type select	MWxx12	R / W
8	Output Channel 4 Type select	MWxx16	R / W
9	Output Conversion Enable	MWxx20	R / W

[Note: Above said configuration can be achieved with the help of configuration wizards also.]

Channel Type Selection Values Table

Output Channel Type	Value
Not Defined	0
Current (4-20mA)	1
Voltage (0-10V)	2

Data entry format for Analog Outputs

For analog output, enter the digital count for respective output register and observe the current and voltage output on multimeter. It should be as per following table.

For Voltage: (0-10V)

Voltage Output	Count
0V	0
2.5V	1024
5V	2048
7.5V	3072
10V	4095

For Current: (4 to 20mA)

Current Output	Count
4mA	0
8mA	1024
12mA	2048
16mA	3072
20mA	4095

FLA0402U-12
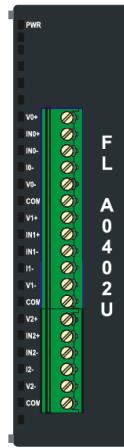
Product Specifications

Analog Inputs	4 Universal Input Channels
	Voltage Input: ((0 to 10V), (0 to 5V), (-10 to +10V))
	Current Input: ((0 to 20mA), (4 to 20mA))
	RTD PT100 (α1 and α2),
	RTD PT1000, Thermocouple (Type B, R, S, E, J, K, N, T),
	mV ((0 to 100mV), (0 to 50mV))
Analog Outputs	2 Output Channels
	Voltage 0 to 10 (Min. Load 1KΩ)
	Current 0 to 20mA and 4 to 20mA (Max. Load 500Ω)

Power Rating

Voltage and Current Rating	24VDC, 180mA, 4.4W (to be supplied externally)

Analog Inputs

Resolution	16 Bit
Input Response Time	3msec × Channels (for all types of Analog Inputs)
RTD Excitation Current	PT100: 1mA
	PT1000: 0.5mA
Input Impedance	1MΩ for Voltage, Thermocouple, mV and RTD Input
	100Ω for Current Input (with fuse)
Absolute Max Input	±30VDC, 30mA
Temperature Drift	±5ppm per ^{0}C Max.
Accuracy	±1% of Full-Scale Max.

Analog Outputs

Output Type	Analog (for Voltage and Current), Non-isolated
Resolution	12 Bit
Output Range	Voltage: 0 to 10VDC Current: 0 to 20mA and 4 to 20mA
Accuracy	±1% of Full-Scale Max.
Load	1KΩ (Min) for Voltage 500Ω (Max) for Current
Output Response Time	4msec × Channels (for Voltage and Current)
Axillary Power Supply	24VDC, 100mA Max.

Wiring Diagram
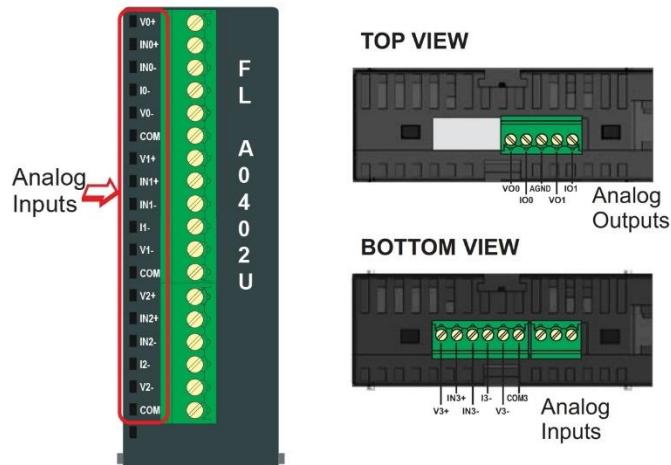
Analog Inputs Wiring Diagram
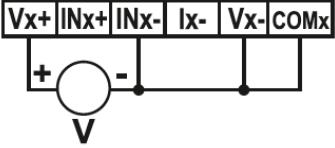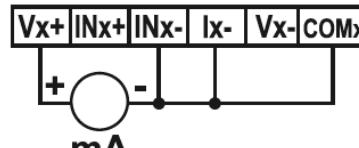
Voltage	Current
Millivolt and Thermocouple	**RTD**

Analog Output Wiring Diagram

Voltage	Current

Functions

Configuration Registers

Input(XW), Output (YW), and configuration (MW) Register allocation:
Analog Inputs and Analog Outputs in the Analog Expansion models are accessed using XW and YW registers respectively. The type of input channel is configured from configuration registers MW.
The analog inputs in this unit are updated in the (Input) XW registers.
The analog voltage / current is generated on the output terminals as per the count value written in the YW registers of base modules.

Sr. No.	Tag Name	Register	Type
1	CH0_ Analog_Input	MWxx00	R / W
2	CH1_ Analog_Input	MWxx01	R / W
3	CH2_ Analog_Input	MWxx02	R / W

4	CH3_ Analog_Input	MWxx03	R / W
5	CH0_ Analog_Output	MWxx04	R / W
6	CH1_ Analog_Output	MWxx05	R / W
7	CH0_ Input_Reg	XWxx00	Read Only
8	CH1_ Input_Reg	XWxx02	Read Only
9	CH2_ Input_Reg	XWxx04	Read Only
10	CH3_ Input_Reg	XWxx06	Read Only
11	CH0_ Input_NormalisationFactor*	MWxx06	R / W
12	CH1_ Input_NormalisationFactor*	MWxx07	R / W
13	CH2_ Input_NormalisationFactor*	MWxx08	R / W
14	CH3_ Input_NormalisationFactor*	MWxx09	R / W
15	CH0_ Output_Reg	YWxx00	R / W
16	CH1_ Output_Reg	YWxx01	R / W

[Note *: This is software filter used to average out analog input signal. The range is1- 65535.]

Channel Type Selection Values Table

Input Channel Type	Value
Not Defined	0
Mv(0-100Mv)	4
Mv(0-50Mv)	5
Ma(0-20Ma)	3
Ma(4-20Ma)	2
Voltage(0-10V)	1
Voltage(0-5V)	6
Voltage(-10 - +10V)	18
RTD PT-100(α1)	7
RTD PT-100(α2)	8
RTD PT1000	9
Thermocouple(B-Type)	10
Thermocouple(R-Type)	11
Thermocouple(S-Type)	12
Thermocouple(E-Type)	13
Thermocouple(J-Type)	14
Thermocouple(K-Type)	15
Thermocouple(N-Type)	16
Thermocouple(T-Type)	17

Output Channel Type	Value
Not Defined	0
Ma(4-20Ma)	5
Ma(0-20Ma)	6
Voltage(0-10V)	2

Data entry format for Analog Outputs

For analog output, enter the digital count for respective output register and observe the current and voltage output on multimeter. It should be as per following table.

For, Voltage Output: (0-10V)

Voltage Output	Count
0V	0
2.5V	1024
5V	2048
7.5V	3072
10V	4095

Current: (4 to 20mA)

Current Output	Count
4mA	0
8mA	1024
12mA	2048
16mA	3072
20mA	4095

Current: (0 to 20mA)

Current Output	Count
0mA	0
5mA	1024
10mA	2048
15mA	3072
20mA	4095

Data entry format for Analog Inputs

For, Voltage: (0 to10V)

Voltage Input	Count
0V	0
2.5V	16384
5V	32768
7.5V	49152
10V	65535

For, Voltage: (0 to 5V)

Voltage Input	Count
0V	0
1.25V	16384
2.5V	32768
3.75V	49152
5V	65535

For, Voltage: (-10 to +10V)

Voltage Input	Count
-10V	0
-5V	16384
0V	32768
+5V	49152
+10V	65535

For, Voltage(mV): (0 to 100mV)

mV Input	Count
0mV	0
25mV	16384
50mV	32768
75mV	49152
100mV	65535

For, Voltage(mV): (0 to mV)

mV Input	Count
0mV	0
12.5mV	16384
25mV	32768
37.5mV	49152
50mV	65535

Current: (0 to20mA)

Current Input	Count
0mA	0
5mA	16384
10mA	32768
15mA	49152
20mA	65535

Current : (4 to 20mA)

Current Input	Count
4mA	0
8mA	16384
12mA	32768
16mA	49152
20mA	65535

Thermocouple Type, Range and Resolution table

Input Type	Temperature Range	1bit corresponds to
J	-210 to 1200^{0}C	0.035^{0}C
K	-200 to 1373^{0}C	0.049^{0}C
E	-200 to 1000^{0}C	0.027^{0}C
R	-50 to 1769^{0}C	0.16^{0}C
S	-50 to 1769^{0}C	0.18^{0}C
B	0 to 1820^{0}C	0.25^{0}C
N	-200 to 1300^{0}C	0.056^{0}C
T	-200 to 400^{0}C	0.043^{0}C

RTD Type, Range and Resolution table

Input Type	Temperature Range	1 bit Corresponds to
PT100: α1 α2	 -200 to 850^{0}C -100 to 457^{0}C	 0.02^{0}C 0.02^{0}C
PT1000:	-200 to 850^{0}C	0.02^{0}C

RTD PT100 α1 Constant : 0.00385
RTD PT100 α2 Constant : 0.00392
RTD PT1000 Constant : 0.00385

The digital count value of the analog to digital conversion for the thermocouple and RTD modules is determined as follows:

Digital count value: 10 × Actual Temp (^{0}C)
The value in the XW register is in a signed integer format thus,
E.g. If current temperature of heater is 57.8^{0}C, the digital count in the XW register will be 578.
Or If the temperature of heater is -152.4^{0}C, the digital count in the XW register will be -1524.

Analog Input Count Details for 16 Bit resolution

Input Type	Over range count	Under range count	Open circuit count
mV	65535	0	0
mA	65535	0	0
V	65535	0	0
RTD alpha1	8500	-2000	0
RTD alpha2	4570	-1000	0
Thermocouple B TYPE	18210	0	0
Thermocouple R TYPE	17690	-510	0
Thermocouple S TYPE	17690	-510	0
Thermocouple E TYPE	10010	-2010	0
Thermocouple J TYPE	12010	-2110	0
Thermocouple K TYPE	13730	-2010	0
Thermocouple N TYPE	13010	-2010	0
Thermocouple T TYPE	4010	-2010	0

FLAD0202N-S0

Product Specifications

Power Consumption	35mA @10VDC (One 350Ω Load Cell)
	140mA @10VDC (Four 350Ω Load Cell)
No. of Inputs	2
Type	4 Wire Load Cell (±Exc, ±Signal, Shield)
Min. Input Sensitivity	0.3µV/Count
Input Range Selection	1mV/V, 2mV/V, 4mV/V
Max. Input Signal	48mV
Excitation Output Voltage	10VDC, ±5%
Excitation Output Current	140mA (up-to 4 units of 350Ω Load Cell can be connected in parallel)
Isolation	Isolation of 1KV between External Power Supply and Load Cell Inputs

Power Rating

Voltage and Current Rating	24VDC(-15% and +20%), 180mA, 4.4W (to be supplied externally)

Weight Measurement

Weight Conversion Methods	Moving Average, Count Average, Sampling Process, Combination of Moving and Count Average
Weight Type	Gross and Net
Weight Display Format	Grams
Tare Weight	0 to 4294967295

A/D Conversion

Conversion Method	Sigma-Delta
Resolution	24Bit
Conversion Time	2msec

Accuracy

Gain Drift	0.08% / FS @1mV/V input 0.04% / FS @2mV/V input 0.02% / FS @4mV/V input
Zero Drift	0.2µV / ^{0}C

Digital Outputs

|	
No. of Outputs	2 (Y0, Y1)
Type	NPN Transistor
Max. Load Current	0.3A @ 24VDC
Output Response Time	OFF to ON: <100µsec ON to OFF: <100µsec
Output Indication	LEDs

Status Flags

Weight Overload Flag	ON at Overload
Weight Empty Flag (zero weight)	ON at Zero Weight
Input Analog Value Exceeds	ON Above 48mVDC

Wiring Diagram

One Input 4 wire Load Cell Connection Diagram
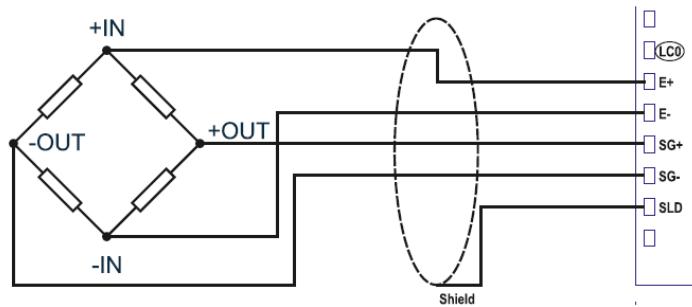
One Input 6 wire Load Cell Connection Diagram
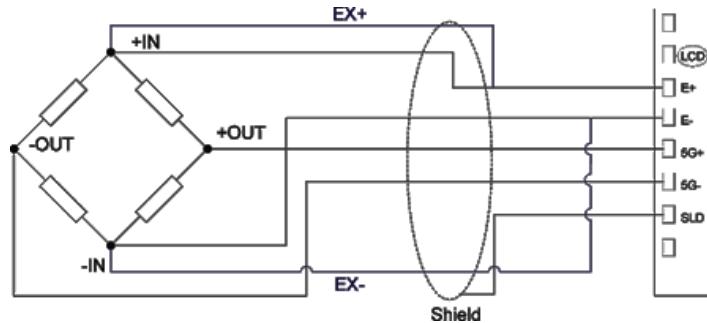
In 6 wire Load Cell short

> 1.Excitation+ and Sense+
> 2.Excitation- and Sense-

Four Load Cell Parallel Wiring Diagram
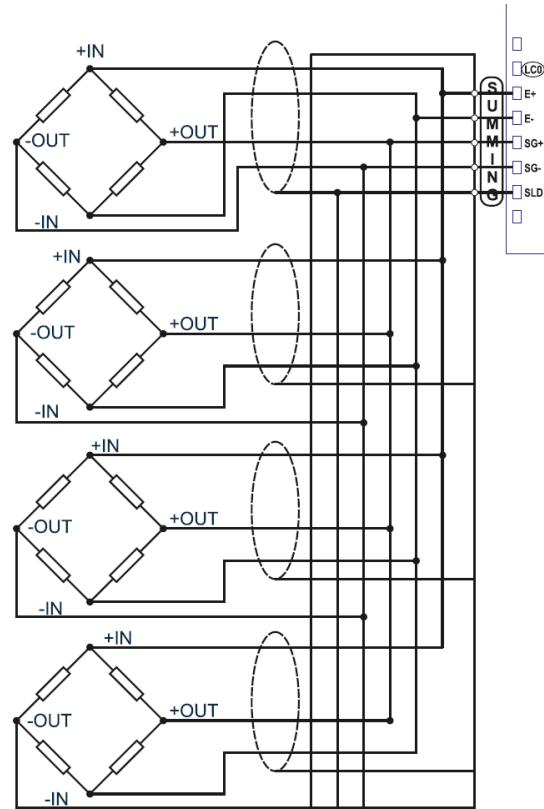
Output Wiring

NPN Type Output Wiring	PNP Type Output Wiring

Functions

Configuration registers

Tag Address	Tag Name	Details
MWxx00 / MWxx08	Slot01_Analog_Input_Range_Selection_CH1 / Slot01_Analog_Input_Range_Selection_CH2	Load Cell Type
MWxx01 / MWxx09	Slot01_Gross_OR_Net_CH1 / Slot01_Gross_OR_Net_CH2	Weight Output Format
MWxx02 / MWxx10	Slot01_Set _Point_CH1 / Slot01_Set_Point_CH2	Set Point value for digital output operation
MWxx04 / MWxx12	Slot01_Tare _Weight_CH1 / Slot01_Tare_Weight_CH2	User defined tare weight value
MWxx08 / MWxx14	Slot01_Weight_Conversion_Method_CH1 / Slot01_Weight_Conversion_Method_CH2	Weight Conversion
MWxx07 / MWxx15	Slot01_Digital_Output_Operating_Mode_CH1 / Slot01_Digital_Output_Operting_Mode_CH2	Digital Operating Mode
MWxx16 / MWxx17	Slot01_Count_Average_setting_CH1 / Slot01_Count_Average_Setting_CH2	User Defined Count to get Average Value
MWxx18 / MWxx19	Slot01_Moving_Average_Setting _CH1 / Slot01_ Moving_Average_Setting_CH2	User defined Count to get Average Value
MWxx20 / MWxx22	Slot01_Maximum_Weight_of_Loadcell_CH1 / Slot01_Maximum_Weight_of_Loadcell_CH2	Maximum Weight of Load Cell
Mxx384 / Mxx385	Slot01_Zero_Calibration_CH1 / Slot01_Zero_Calibration_CH2	To Start Zero Calibration

Configuration Register

MWxx00 / MWxx08	0 1 2	1mV/V 2mV/V 4mV/V
MWxx01 / MWxx09	0 1	Gross Weight Net Weight
MWxx08 / MWxx14	0 1 2 3	Sampling Moving Average Count Average Moving and Count
MWxx07 / MWxx15	0 1 2	Normal On above set point On below set point
MWxx16 / MWxx17	4 to 256	Count average settings
MWxx18 / MWxx19	2 to 256	Moving average settings
MWxx20 / MWxx22	0 to 4294967295	Max. Weight of Load Cell

Mxx384 / Mxx385	1	Zero Calibration Start

Tag Address	Tag Name	Status Value
Xxx001 / Xxx005	Slot01_Weight_Overload_Flag _CH1 / Slot01_Weight_Overload_Flag_CH2	When 1: Weight Overload
Xxx002 / Xxx008	Slot01_Weight_Empty_Flag_CH1 / Slot01_ Weight_Empty_Flag _CH2	When 1: Weight Empty
Xxx003 / Xxx007	Slot01_Input_AnalogValue_Exceed_Flag _CH1 / Slot01_Input_Analog_Value_Exceed_Flag_ CH2	When 1: Analog Value Exceeds Range
Xxx008 / Xxx009	Slot01_Zero_Calibration_Done _CH1 / Slot01_ Zero_Calibration_Done _CH2	When 1: Zero Calibration Done
Xxx010 / Xxx011	Slot01_Digital _Output_Status _CH1 / Slot01_ Digital _Output_Status _CH2	When 1: Output ON
XWxx01 / XWxx03	Slot01_ Weight _Value_CH1 / Slot01_ Weight _Value _CH2	0 to 4294967295 (Weight Value Output)

Tag Address	Tag Name	Status Value
Yxx000	Slot01_OutputCoil _00000	When 1: Y0 Output ON
Yxx001	Slot01_OutputCoil_00001	When 1: Y1 Output ON

Load Cell

A load cell is also referred to as a load transducer. When a load is applied to a load cell, the load cell converts the load into an electric signal and outputs the signal.

Tare Weight

Tare weight is the weight of an empty vehicle or container. By subtracting it from the gross weight (laden weight), the weight of the goods carried (the net weight) may be determined.

SPAN

SPAN is the difference between the maximum operating capacity and zero live load of a weighing system.

[Note: For more information regarding Load Cell click on below link.]

https://www.renuelectronics.com/pdfs/Load_Cell_UserManual.pdf

FLA0402L
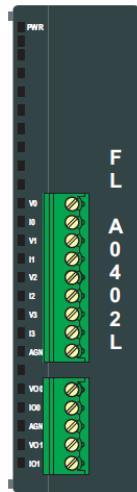
Product Specifications

|	
Analog Inputs	4 Inputs channels, Voltage Input : 0-10V, Current Input: 4-20mA and 0-20mA
Analog Outputs	2 Outputs channels, Voltage 0-10V (Min load 1000Ω), Current ((4-20mA), (0-20mA)) (Max load 500Ω)
Connection Method	Removable terminals (3.81mm pitch)
Resolution	Input: 16 Bit Output: 12 Bit
Accuracy	0.2% of Full Scale
Non-Linearity Input	0.04% Max
Input Impedance	470KΩ (Voltage mode) 51Ω (Current mode)
Temperature Drift	60ppm
Input Response Time	3msec × Channels (for Voltage and Current)
Output Response Time	4msec × Channels (for Voltage and Current)

Power Rating

Voltage and Current Rating	24VDC, 100mA, 2.4W (to be supplied externally)

Wiring Diagram

Analog Input Wiring Diagram for FLA0402L

Voltage Mode Connections	Current Mode Connections

Analog Output Wiring Diagram for FLA0402L

Voltage Mode Connections	Current Mode Connections
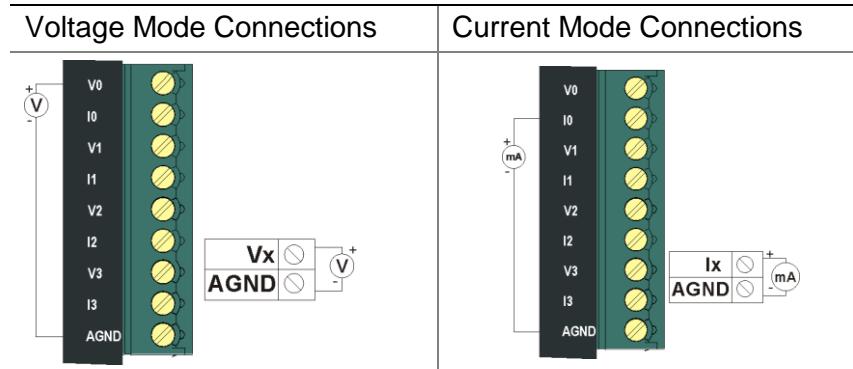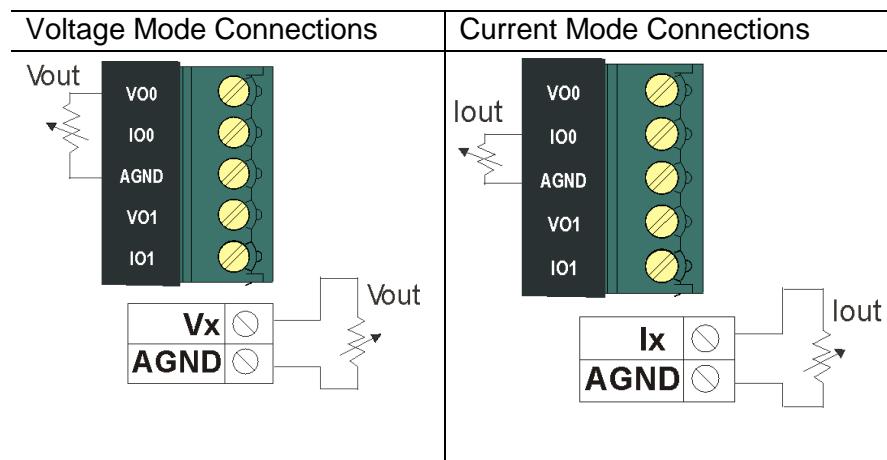
Functions

FLA0402L is an analog expansion model which works with FL series base PLCs. These devices scan all the inputs/outputs continuously and stores this information into input / output register.
Input(XW), Output(YW) and configuration(MW)

Register Allocation:

Analog Inputs in the Analog Expansion models are accessed using XW registers. The type of input channel is configured from configuration registers MW. The analog inputs in the unit are updated in the (Input) XW registers.

Sr. No.	Tag Name	Register	Type
1	Analog_Input_Type_CH1	MW××00	R/W
2	Analog_Input_Type_CH2	MW××01	R/W
3	Analog_Input_Type_CH3	MW××02	R/W
4	Analog_Input_Type_CH4	MW××03	R/W
5	Analog_Input_Data_CH1	XW××00	Read Only
6	Analog_Input_Data_CH2	XW××02	Read Only
7	Analog_Input_Data_CH3	XW××04	Read Only
8	Analog_Input_Data_CH4	XW××06	Read Only

Analog Output in the Expansion models are accessed using YW registers. The analog outputs

In the unit are updated in the (Output) YW registers.

Sr. No.	Tag Name	Register	Type
1	Analog_Output _CH1_Current_Register	YW××01	R/W
2	Analog_Output _CH1_Type	MW××04	R/W
3	Analog_Output _CH1_Voltage_Register	YW××00	R/W
4	Analog_Output _CH2_Current_Register	YW××03	R/W
5	Analog_Output _CH2_Type	MW××05	R/W
6	Analog_Output _CH2_Voltage_Register	YW××02	R/W

Channel Type Selection Values Table

Use the following values in the Input channel type select register to configure the corresponding channel to particular type.

Input Channel Type	Value
mA(0 - 20mA)	3
mA (4 - 20mA)	2
Voltage (0 - 10V)	1

Channel Type Selection Values Table

Use the following values in the Output channel type select register to configure the corresponding channel to particular type.

Output Channel Type	Value
mA(0 - 20mA)	6
mA(4 - 20mA)	5
Voltage(0 - 10V)	2

Data entry format for Analog Inputs

For Voltage: (0-10V)

Voltage Output	Count
0V	0
2.5V	16000
5V	32000
7.5V	48000
10V	64000

Current (4 to 20mA)

Current Input	Count
4mA	0
8mA	16000
12mA	32000
16mA	48000
20mA	64000

Current (0 to 20mA)

Current Output	Count
0mA	0
5mA	16000
10mA	32000
15mA	48000
20mA	64000

Data entry format for Analog Outputs

For Voltage: (0-10V)

Voltage Output	Count
0V	0
2.5V	1024
5V	2048
7.5V	3072
10V	4095

Current (4 to 20mA)

Current Input	Count
4mA	0
8mA	1024
12mA	2048
16mA	3072
20mA	4095

Current (0 to 20mA)

Current Output	Count
0mA	0
5mA	1024
10mA	2048
15mA	3072
20mA	4095

Analog Input Count Details for 16 Bit resolution

Input Type	Over range count	Under range count	Open circuit count
Voltage	65001	0	65001
Current 0 to 20	65001	0	65001
Current 4 to 20	65001	65000	65001

General Specification of FL004 Expansions

Operating Temperature	0 to 55^{0}C
Storage Temperature	-20 to 85^{0}C
Operating Humidity	10 to 90% (Non-Condensing)
Vibration	10 to 150Hz, Displacement of 0.2mm(peak) (3 mutually perpendicular axes)
Shock	490.5m/s^2, 2 half shine shocks per axis, on (3 mutually perpendicular axes)
Mechanical Dimension	100mm H x 26mm W x 70mm D
Auxiliary Power Supply	24VDC + / -15% @80mA Recommended to use Class2 External Power Supply
Weight	180gm
Mounting	DIN rail mounting

Steps For configuring Expansion Model

To configure expansion with the base model, please follow the below given steps:

1. Run "FlexiSoft" software.

2. Start "New".

3. Select product (Base PLC Model) as per hardware.

4. Click "OK". You will see "Project Configuration" window.

5. From Project Information expand IO Allocation

6. In that click on Expansion.

7. Click on Slot1 and Select the hardware Model.

8. Configure the Model details by click on Configure.

9. Select Download Configuration Setting and then OK.

10. Now Download the Program into the PLC hardware.

A below shown software screen will appear:
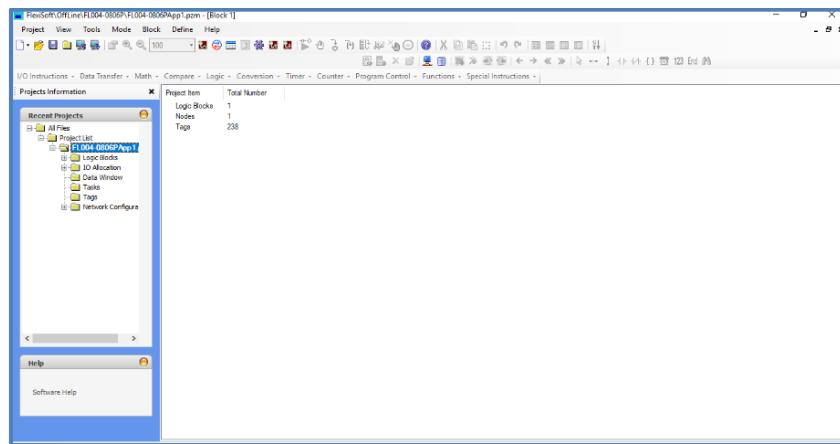
In this user interface, in the left side area "IO Allocation>>Expansion" you can add any expansion model to any slot. If you click on "Base" section, this will show you the name of the base model selected along with the address range. Once, you click on "Expansion" section a following screen will appear:
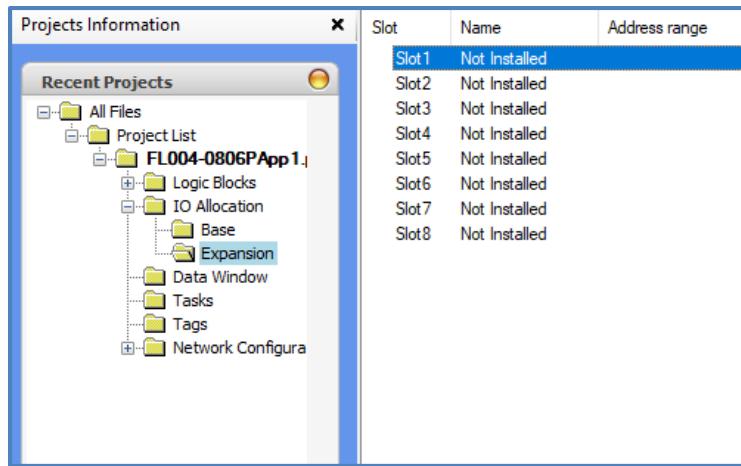
Here, select the Slot Number.

Now after selecting Slot Number, you can declare expansion model to each slot.
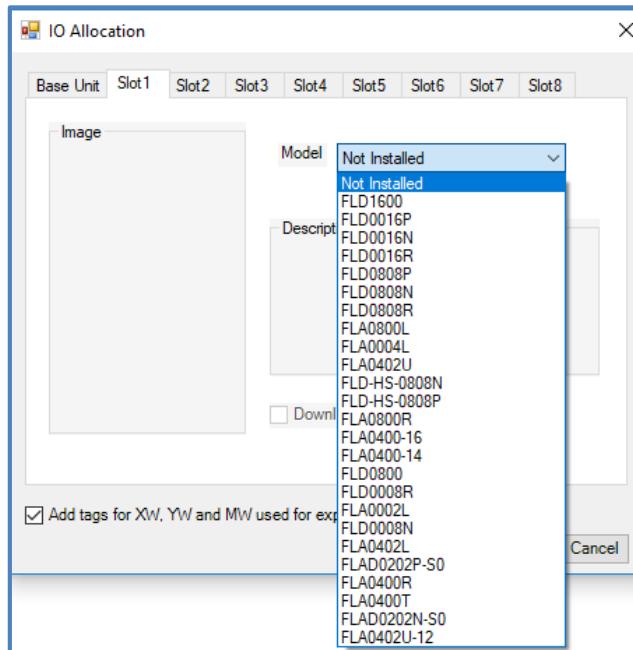

Here, I have selected FLA004L, so it will open description of the same product.
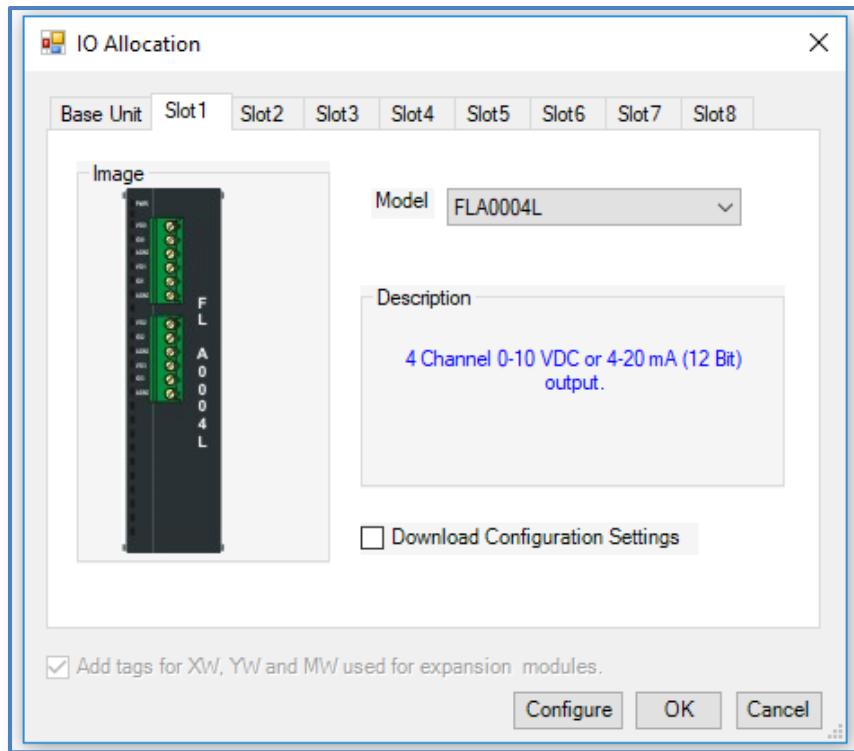
Click on the Configure, following window will appear.
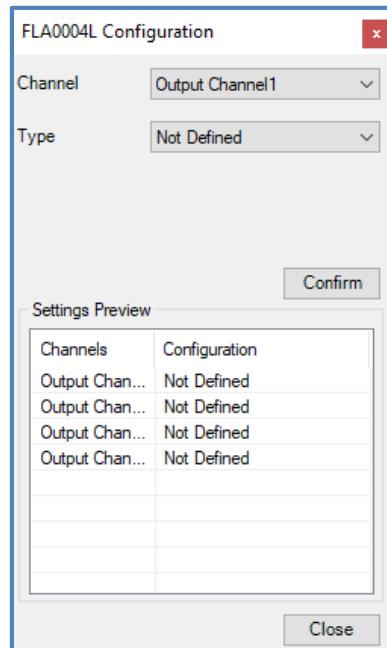
Select the Channel number and type of it (i.e. voltage or current range) in above window and then click on Confirm and close.
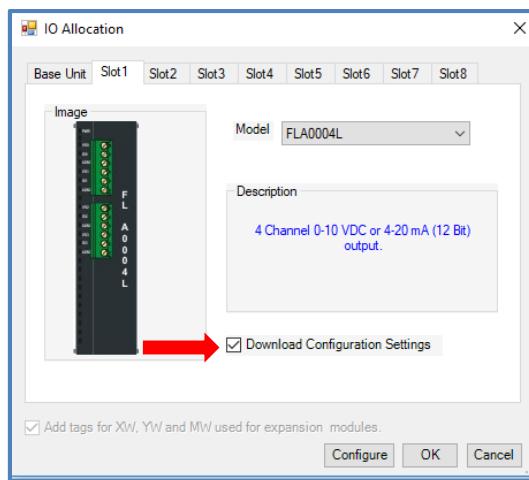
Click on the Download configuration checkbox and then OK.
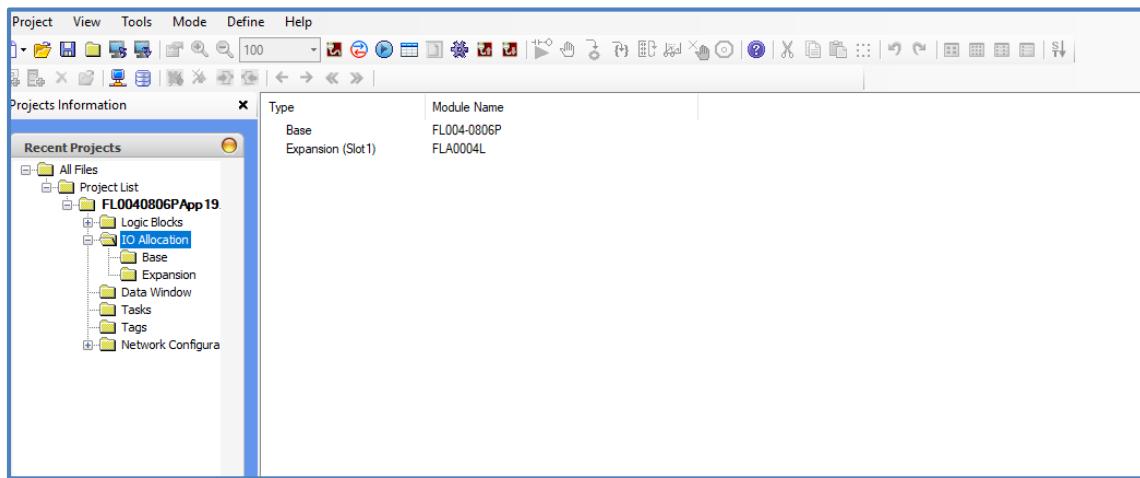
Now build a ladder application, using these tags and download the application in base model.

Revision History

Revision	Description	Date	Prepared by	Approved by
1.0	First Draft	28/12/2018	PM	AR
1.1	Part No. FLD0808N changed to FLD0808N-L	06/02/2019	PM	AR
1.2	Added new Digital Expansion models	02/07/2020	PM	AR
1.3	Updated Manual in format	04/07/2022	SN	YR

RENU Electronics Pvt. Ltd® reserves the right to change or discontinue specifications and features without prior notice.

NOTES