



# MITSUBISHI ELECTRIC

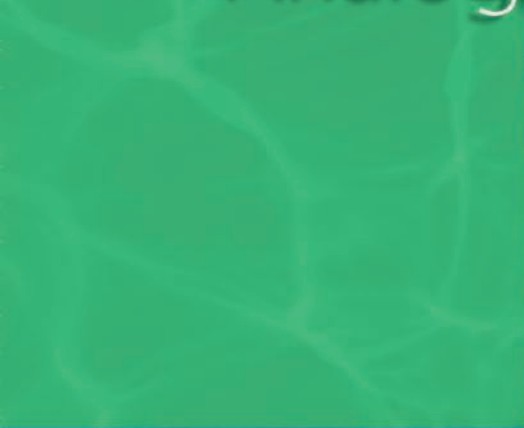
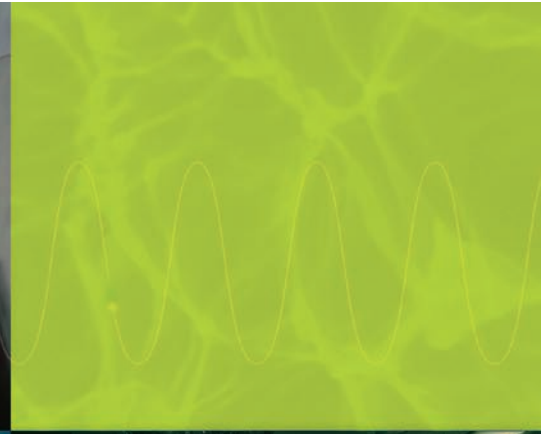
## PROGRAMMABLE LOGIC CONTROLLERS

*Changes for the Better*

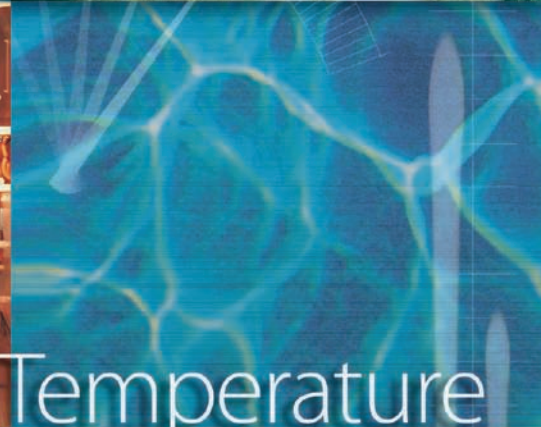
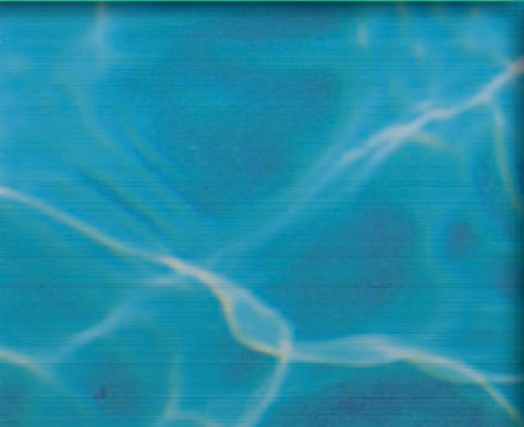
# FX Analog Family



Analog



Digital



Temperature

Mitsubishi Electric Corporation Himeji Works is a factory certified for ISO14001 (standards for environmental management systems) and ISO9001(standards for quality assurance management systems)



# FX3U Analog Platform – A new

With the arrival of the new FX3U comes a new range of analog products that have been designed to enhance user functionality, system performance and ease of set-up. These new products surpass previous analog solutions and create a new benchmark for analog control in a cost effective manner.

In order to respond to the most diverse of analog problems, two product ranges have been developed. The FX3U Special Adapters deliver advanced solutions in an easy to use manner, saving the user from the frustration of complex setup routines. Whereas the FX3U Special Function Blocks provide an ideal answer to the toughest of high speed problems combining high accuracy with high speed.

The FX3U analog range delivers a straightforward concept that delivers advanced solutions in a simple and easy to use package.



## What is Analog Control?

Analog control is used in a broad range of industries. In simple terms, it enables a discrete signal to provide control within a PLC system. Basic examples of analog control include collection of sensory data from fluid levels and control of a motor's speed. System's can be developed and configured to each user's needs and requirements.

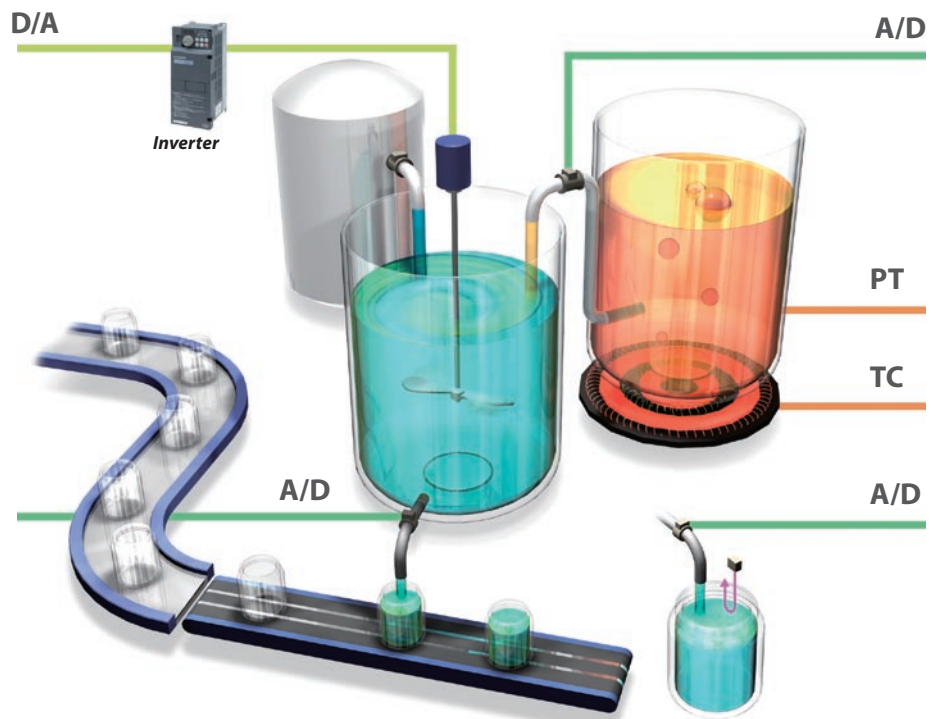


## Digital to Analog Control

A process where the PLC system converts digital signals to analog (voltage/current) signals. For example linear control for an inverter.

## Analog to Digital Control

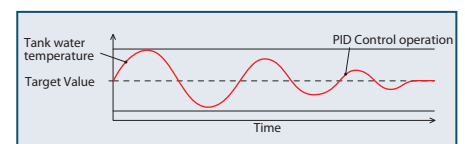
Where analog signals are captured from the outside world and are converted to a digital format so that PLC system control can be implemented.



## Temperature Input and PID Control

Temperature data can be acquired via two sensory methods – thermocouple input or PT100 sensor input.

PID control enhances system performance as it eliminates the need for continuous operator intervention. Through use of Auto-Tuning, important parameters are automatically configured to the PID function, ensuring that optimum control is achieved for a range of temperature and analog control applications.



# benchmark in Analog control

## FX3U Special Adapters

- Straightforward setup
- Cost effective
- Easy to use programming instructions
- Extremely versatile

## Main Unit

### FX3U at a glance

**I/O range :**  
Max. total 384 (with remote I/O)  
**Program memory :**  
64k steps (standard)  
**Processing speed:**  
0.065µsec/basic instruction

## FX3U Special Function Blocks

- New high speed programming instructions
- Combines high Speed with accuracy
- Integral CPUs enable independent operation from the PLC
- Perfect for high speed applications



## Special Adapters

A major design enhancement to the FX3U is the new Special Adapters. Special Adapters implement control through direct access data registers and setting bits. This means quicker set-up, easier use, and above all much higher processing speeds.

## Special Function Blocks

With Special Function Blocks, the analog to digital and digital to analog conversion takes place internally within the unit. Digital communication is then performed between the PLC and the Special Function Block.

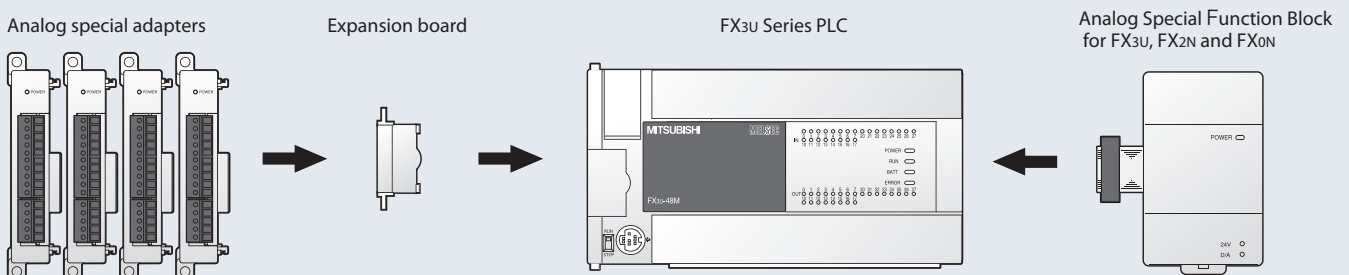
## FX3U System Configuration

### Special Adapters

- Special Adapters connect to the left side of the FX3U series PLC.
- An expansion board is required in the system to connect the special adapters.
- A combination of up to 4 analog / temperature Special Adapters can be connected to one FX3U PLC. (The FX3U can also support a further 2 network adapters and 4 positioning adapters).

### Special Function Blocks

- Special Function blocks connect to the right side of the FX3U Series PLC.
- Up to 8 Special function blocks can be connected to one FX3U PLC, where a combination of analog networking and positioning Special Function Blocks can be configured.\*
- Full compatibility with FX2N and FX0N Special Function Blocks.



\*Additional power unit may be required.

# FX Analog Family – Solutions for

Despite the growing presence of digital systems, the world continues to provide endless analog problems. Today's product lineup has come to the foreground to tackle these problems head on.

With products that provide in-built features such as direct connection to sensors, advanced digital filtering to reduce noise or direct correlation of data for simple real-time control. The FX analog family continues to provide solutions for a diverse range of needs.



## Visual Solutions

Mitsubishi Electric offers a comprehensive range of visual solutions. From simple data displays such as the FX3U-7DM, advanced Graphic Operator Terminals like the GOT1000 Series, along with a wide choice of software solutions from the MELSOFT software suite.

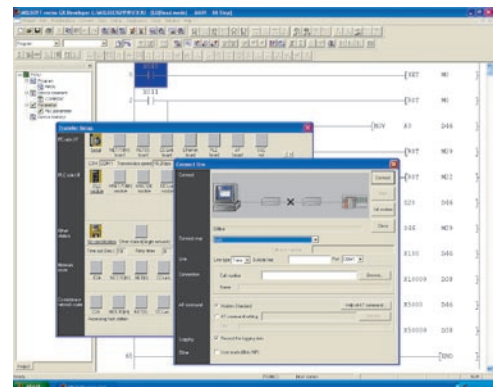


## International acceptance

Compliance with CE and UL/cUL standards enables users worldwide to put faith into the FX brand. The FX range is also certified to a variety of shipping approvals that include Lloyds, German Lloyds, American Bureau of shipping, Registro Italiano Navale, DET Norse Vetaritas and Bureau Veritas.

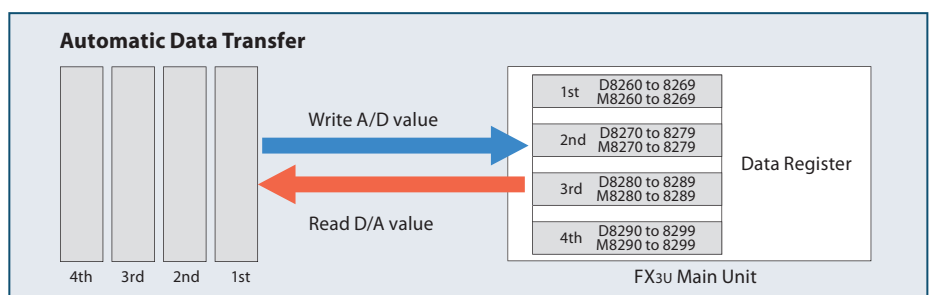
## GX Developer

GX Developer is the standard Windows based programming software for all MELSEC PLC series. Sequence programs for a range of applications are comfortably created in Ladder Logic or Instruction List. There are also several options available for monitoring, debugging and testing user code.



## Simplified Programs with Special Adapters

The FX3U analog Special Adapters simplify program code by providing automatic transfer of data to and from the PLC. This has a major benefit for the user as Special Adapters no longer require the use of the traditional To/From instructions to configure and operate. This enables programming code to be dramatically simplified.



# diverse analog needs

## FX3U Special Analog Adapters **NEW**

The FX3U-4AD-ADP and the FX3U-4DA-ADP are equipped with 4 input / 4 output channels respectively. These analog adapters provide complete versatility, where each channels can be independently configured for either voltage or current control signals.\*



	FX3U-4AD-ADP		FX3U-4DA-ADP	
Channels	4 Inputs		4 Outputs	
Range	0 to 10V	4 to 20mA	0 to 10 V	4 to 20mA
Resolution	2.5mV	10µA	2.5mV	4µA
Digital Signal	12 bit	11 bit	12 bit	
Applicable PLC	FX3U			

## FX2N-5A - Hybrid Converter

The FX2N-5A delivers extremely high resolution combined with 4 independently configurable inputs and 1 output. Independent channel configuration enables the FX2N-5A to work harmoniously with the most diverse of analog devices.\*



	FX2N-5A				
Channels	4 Inputs				1 Output
Range	-100 to +100mV	-10 to +10 V	-20 to +20mV	4 to 20mA	-10 to +10V 0 to 20mV, 4 to 20 mA
Resolution	50µV	0.32mV	1.25µA	10µA	5mV 20µA
Digital Signal	Signed 12 bit	Signed 16 bit	Signed 15 bit		Signed 12 bit 10 bit
Applicable PLC	FX1N, FX2N, FX2NC, FX3U				

## FX3U Temperature Adapters **NEW**

For temperature sensor input, the FX3U range provides two great solutions. The versatile FX3U-4AD-TC-ADP provides the user with 4 inputs that can be configured for either J or K type thermocouples. Alternatively, the user can opt for the FX3U-4AD-PT-ADP which features four PT100 sensors per adapter.\*

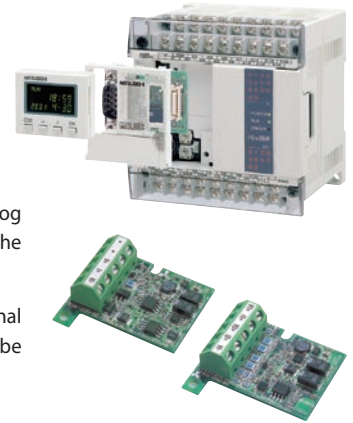


	FX3U-4AD-TC-ADP		FX3U-4AD-PT-ADP
Channels	4 Inputs (K type thermocouple)	4 Inputs (J type thermocouple)	4 Inputs (PT100 sensor)
Compensated Range	-100 to +1000°C/ -148 to +1832°F	-100 to +600°C/ -148 to +1112°F	-50 to +250°C/ -58 to +482°F
Resolution	0.4°C / 0.72°F	0.3°C / 0.54°F	0.1°C / 0.18°F
Digital Signal	-1000 to +10000 (°C) / -1480 to +18320 (°F)	-1000 to +6000 (°C) / -1480 to +11120 (°F)	-500 to +2500 (°C) / -5800 to +4820 (°F)
Applicable PLC	FX3U		

## Functional Expansion Boards

Through use of expansion boards analog control can easily be implemented via the FX1S and FX1N PLCs.

Expansion boards permit an additional 2 inputs or 1 output respectively to be integrated to the PLC.\*



	FX2N-2AD-BD		FX2N-1DA-BD	
Channels	2 Inputs		1 Output	
Range	0 to 10V	4 to 20mA	0 to 10 V	4 to 20mA
Resolution	2.5mV	8µA	2.5mV	8µA
Digital Signal	12 bit			
Applicable PLC	FX1N, FX1S			

## FX3U Special Function Blocks **NEW**

For high speed requirements the FX3U range delivers the FX3U-4AD and the FX3U-4DA. Each Special Function Block is equipped with 4 high resolution channels, where the FX3U-4AD provides 4 A/D inputs and the FX3U-4DA provides 4 D/A outputs.\*












	FX3U-4AD		FX3U-4DA	
Channels	4 Inputs		4 Outputs	
Range	-10 to +10V	-20 to +20mA, 4 to 20mA	-10 to +10 V	0 to 20mA, 4 to 20mA
Resolution	0.32mV	1.25µA	0.32mV	0.63µA
Digital Signal	Signed 16 bit	Signed 15 bit	Signed 16 bit	15 bit
Applicable PLC	FX3U			



\* For further product information see specifications table on next page or respective product manual.

# Specifications

	Expansion Board	2CH		4CH			
							
							
DA	FX1N-1DA-BD	FX2N-2DA		FX2N-4DA		FX2NC-4DA	
Output Channel	1 CH	2 CH		4 CH		4 CH	
Analog Output Range (External load resistance)	0 to 10V DC (2k to 1MΩ)      4 to 20mA (500Ω or less)	0 to 5V DC, 0 to 10V DC (2k to 1MΩ)	4 to 20mA (400Ω or less)	-10 to +10V DC (2k to 1MΩ)	0 to 20mA, 4 to 20mA (500Ω or less)	-10 to +10V DC (2k to 1MΩ)	0 to 20mA, 4 to 20mA (500Ω or less)
Resolution	2.5mV      8μA	2.5mV	4μA	5mV	20μA	5mV	20μA
Digital Input	12 bit	12 bit		Signed 12 bit	10 bit	Signed 12 bit	10 bit
Overall Accuracy *1	±1%	±1%		±1%		±0.5% (20 to 30°C), ±1.0% (0 to 55°C)	
Conversion Time	one scan time	4ms / 1 channel		2.1ms / 4 channels		2.1 ms / 4 channels	
Isolation	None	See Notes below: *3 & *4		See Notes below: *3, *4 & *6		See Notes below: *3, *4 & *6	
No. of Occupied I/O	0 points	8 I/O points		8 I/O points		8 I/O points	
Applicable PLC	FX1S / FX1N	FX1N / FX2N / FX2NC / FX3U *5		FX1N / FX2N / FX2NC / FX3U *5		FX2NC	
Certifications *2	CE	CE, UL/cUL		CE, UL/cUL		CE, UL/cUL	

	Expansion Board	2CH		4CH	
					
					

	Expansion Board	2CH		4CH		4CH	
AD	FX1N-2AD-BD	FX2N-2AD		FX2N-4AD		FX2NC-4AD	
Input Channel	2 CH	2 CH		4 CH		4 CH	
Analog Input Range (Input resistance)	0 to 10VDC (300kΩ)      4 to 20mA (250Ω)	0 to 5V DC, 0 to 10V DC (200kΩ)	4 to 20mA (250Ω)	-10 to +10 V DC (200kΩ)	-20 to +20 mA, 4 to 20mA (250Ω)	-10 to +10V DC (200kΩ)	-20 to +20mA, 4 to 20mA (250Ω)
Resolution	2.5mV      8μA	2.5mV	4μA	5mV	20μA	0.32mV	1.25μA
Digital Output	12 bit	12 bit		Signed 12 bit	Signed 11 bit	Signed 16 bit	Signed 15 bit
Overall Accuracy *1	±1%	±1%		±1%		±0.3%(20 to 30°C), ±0.5% (0 to 55°C)	±0.5%(20 to 30°C), ±1.0% (0 to 55°C)
Conversion Time	one scan time	2.5 ms / 1 channel		Normal speed: 15ms / number of used channel, High speed: 6ms / number of used channel		1ms / Number of used channel	
Isolation	None	See Notes below: *3 & *4		See Notes below: *3, *4 & *6		See Notes below: *3, *4 & *6	
No. of Occupied I/O	0 points	8 I/O points		8 I/O points		8 I/O points	
Applicable PLC	FX1S / FX1N	FX1N / FX2N / FX2NC / FX3U *5		FX1N / FX2N / FX2NC / FX3U *5		FX2NC	
Certifications *2	CE	CE, UL/cUL		CE, UL/cUL		CE, UL/cUL	

	Expansion Board	2CH		4CH	
					
					

Temperature	Expansion Board	FX2N-2LC		FX2N-4AD-TC		FX2N-4AD-PT
Channel		2CH (Temperature input 2CH, Transistor output 2CH and CT input 2CH*11)		4 CH Input		4 CH Input
Input Types		Thermocouple type K, J, R, S, E, T, B, N, PL II, WRe5-26, U, and L, 3-wire platinum resistance thermometer sensor(s) Pt100, and JPt100		K type thermocouple	J type thermocouple	3-wire platinum resistance thermometer sensor(s) Pt100
Compensated range		• Type K: -100°C to +1300°C / -100°F to +2400°F • Type J: -100.0°C to +800.0°C / -100°F to +2100°F		-100 to +1200°C / -1480 to +2192°F	-100 to +600°C / -148 to +1112°F	-100 to +600°C / -148 to +1112°F
Resolution		0.1°C / 0.1°F or 1°C / 1°F		0.4°C / 0.72°F	0.3°C / 0.54°F	0.2 to 0.3°C / 0.36 to 0.54°F
Digital Output		Examples: • Type K: -100 to +1300 (°C) / -100 to +2400 (°F) • Type J: -1000 to +8000 (°C) / -100 to +2100 (°F)		-1000 to +120000 (°C) / -1480 to +21920 (°F)		-1000 to +6000 (°C) / -1480 to +11120 (°F)
Accuracy		±0.7% of range span ± 1digit *12		±(0.5% of fullscale +1°C)		±1% of full scale
Conversion Time		500ms (Sampling time)		(240ms ±2%) / Number of used channel		15ms / 1 channel
Isolation		See Notes Below: *3, *4 & *6		See Notes below: *3, *4 & *6		See Notes below: *3, *4 & *6
No. of Occupied Points		8 I/O points		8 I/O points		8 I/O points
Applicable PLC		FX1N / FX2N / FX2NC / FX3U *5		FX1N / FX2N / FX2NC / FX3U *5		FX1N / FX2N / FX2NC / FX3U *5
Notes		Control method: Two-position, PID(with auto-tuning), PI control		—		—
Certifications *2		CE, UL/cUL		CE, UL/cUL		CE, UL/cUL

Notes: (For detailed information please refer to the respective product manuals).

\*1: Percentage of full scale

\*2: For Shipping approvals consult with respective manual

\*3: A photocoupler is used to insulate the analog input or output area from the PLC.

\*4: Channels are not insulated from each other.

\*5: FX2NC-CNV-IF required for FX2NC

\*6: A DC/DC converter is used to insulate the power supply from the analog input or output.

\*7: Data updated every PLC scan time

\*8: FX3U-\*\*\*-BD required. (\*\*\*) represents "422", "232", "485", "CNV", or "USB"



		3CH Hybrid		5CH Hybrid		8CH Hybrid			
<b>FX3U-4DA</b> 4 CH		<b>FX3U-4DA-ADP</b> 4 CH		<b>FX0N-3A</b> 1 CH		<b>FX2N-5A</b> 1 CH			
-10 to +10V DC (1k to 1MΩ)	0 to 20mA, 4 to 20mA (500Ω or less)	0 to 10V DC (5k to 1MΩ)	4 to 20mA (500Ω or less)	0 to 5V DC, 0 to 10V DC (1k to 1MΩ)	4 to 20mA (500Ω or less)	-10 to +10V DC (2k to 1MΩ)	0 to 20mA, 4 to 20mA (500Ω or less)		
0.32mV	0.63μA	2.5mV	4μA	40mV	64μA	5mV	20μA		
Signed 16 bit	15 bit	12 bit		8 bit		Signed 12 bit	10 bit		
±0.5% (20 to 30°C), ±0.5% (0 to 55°C)		±0.5% (20 to 30°C), ±1.0% (0 to 55°C)		±1%		±0.5% (20 to 30°C), ±1.0% (0 to 55°C)			
1ms / 4 channels		200μs *7		3 x TO instruction time		2ms			
See Notes below: *3, *4 & *6		See Notes below: *3, *4 & *6		See below		See below			
8 I/O points		0 I/O points		See below		See below			
FX3U		FX3U *8		See below		See below			
CE, UL/cUL		CE, UL/cUL		See below		See below			
<b>FX3U-4AD</b> 4 CH		<b>FX3U-4AD-ADP</b> 4 CH		<b>FX0N-3A</b> 2 CH		<b>FX2N-5A</b> 4 CH			
-10 to +10V DC, (200kΩ)	-20 to +20mA, 4 to 20mA (250Ω)	0 to 10V DC,	4 to 20mA	0 to 5V DC, 0 to 10V DC (200kΩ)	4 to 20mA (250Ω)	-100 to +100mV DC, -10 to +10V DC (200kΩ)	-20 to +20mA, 4 to 20mA (250Ω)	-10 to +10V DC (200kΩ)	-20 to +20mA, 4 to 20mA (250Ω)
0.32mV	1.25μA	2.5mV	10μA	40mV	64μA	50μV(±100mV), 0.32mV(±10V)	1.25μA(±20mA), 10μA(4 to 20mA)	0.63mV	2.5μA(±20mA) / 2μA(4 to 20mA)
Signed 16 bit	Signed 15 bit	12 bit	11 bit	8 bit		Signed 12 bit (±100mV), Signed 16 bit (±10V)	Signed 15 bit	Signed 15 bit	Signed 14 bit
±0.3%(20 to 30°C), ±0.5% (0 to 55°C)	±0.5%(20 to 30°C), ±1.0% (0 to 55°C)	±0.5% (20 to 30°C), ±1.0% (0 to 55°C)		±1%		±0.3% (20 to 30°C), ±0.5% (0 to 55°C)	±0.5% (20 to 30°C), ±1.0% (0 to 55°C)	±0.3%(20 to 30°C), ±0.5%(0 to 55°C)	
500 μs x No. of used channels *9		200μs *7		2 x TO instruction time + FROM instruction time		1ms / Number of used channels		500μs / Number of used channels *10	
See Notes below: *3, *4 & *6		See Notes below: *3, *4 & *6		See Notes below: *3 & *4		See Notes below: *3, *4 & *6		See below	
8 I/O points		0 points		8 I/O points		8 I/O points		See below	
FX3U		FX3U *8		FX1N / FX2N / FX2NC / FX3U *5		FX1N / FX2N / FX2NC / FX3U *5		See below	
CE, UL/cUL		CE, UL/cUL		CE		CE, UL/cUL		See below	
<b>FX3U-4AD-TC-ADP</b> 4 CH Input		<b>FX3U-4AD-PT-ADP</b> 4 CH Input				<b>FX2N-8AD</b> 8 CH (also can be used as V/mA input)			
K type thermocouple	J type thermocouple	3-wire platinum resistance thermometer sensor(s) Pt100				K type thermocouple	J type thermocouple	T type thermocouple	
-100 to +1000°C / -148 to +1832°F	-100 to +600°C / -148 to +1112°F	-50 to +250°C / -58 to +482°F				-100 to +1200°C -148 to +2192°F	-100 to +600°C -148 to +1112°F	-100 to +350°C -148 to +662°F	
0.4°C / 0.72°F	0.3°C / 0.54°F	0.1°C / 0.18°F				0.1°C / 0.1°F			
-1000 to +10000 (°C) / -1480 to +18320 (°F)	-1000 to +6000 (°C) / -1480 to +11120 (°F)	-500 to +2500(°C) / -5800 to +4820(°F)				-1000 to +12000(°C) / -1480 to +21920(°F)	-1000 to +6000(°C) / -1480 to +11120(°F)	-1000 to +3500(°C) / -1480 to +6620(°F)	
±(0.5% of full scale +1°C)		±0.5% (20 to 30°C), ±1.0% (0 to 55°C)				±0.5% (0 to 55°C)		±0.7% (0 to 55°C)	
200μs *7		200μs *7				40ms / Number of used channels			
See Notes below: *3, *4 & *6		See Notes below: *3, *4 & *6				See Notes below: *3, *4 & *6			
0 points		0 points				8 I/O points			
FX3U *8		FX3U *8				FX1N / FX2N / FX2NC / FX3U *5			
—		—				—			
CE, UL/cUL		CE, UL/cUL				CE, UL/cUL			

\*9: If 1 or more channels use the digital filter(s), the time required for A/D conversion will be "5 ms x number of selected channels."

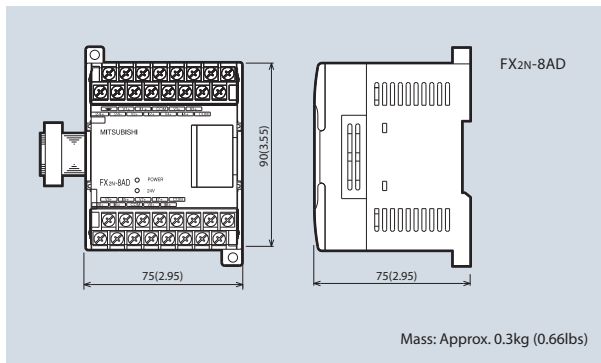
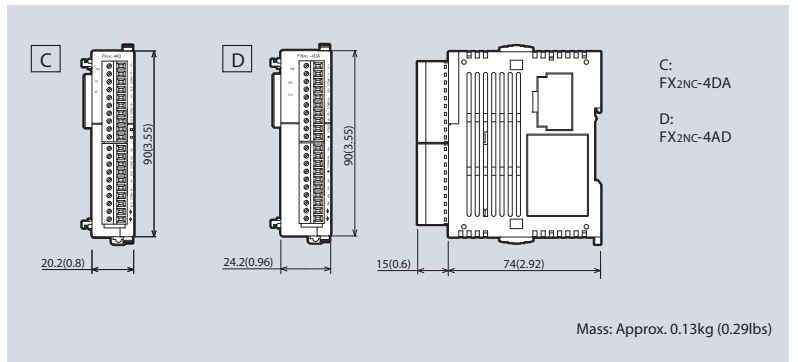
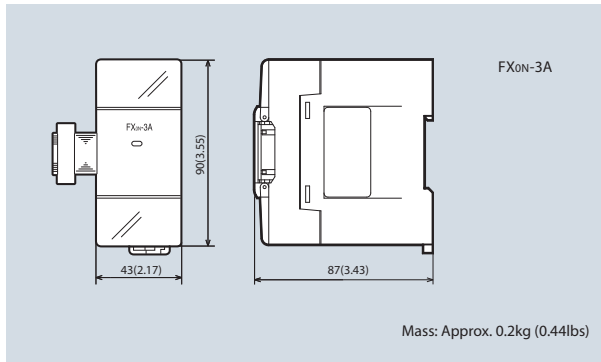
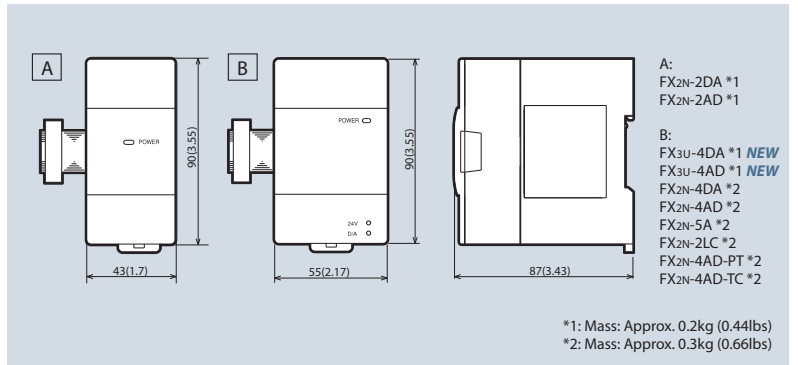
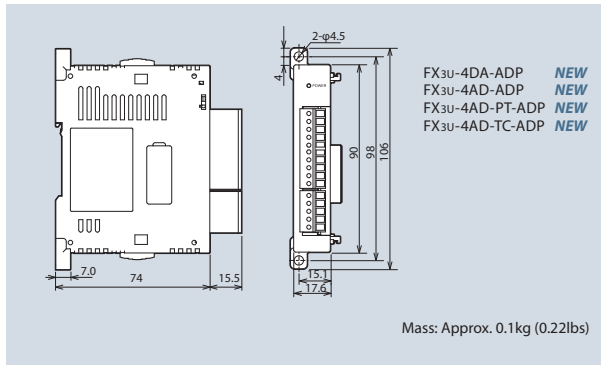
\*10: If 1 or more channels use the thermocouple input(s), the input voltage/current data conversion speed will be "1 ms x number of selected channels."


\*11: CTL-12-S36-8 or CTL-6-P-H (manufactured by U.R.D. Co., Ltd.)

\*12: Cold contact temperature compensation error Within ±1.0°C (within ±2.0°C: -100 to -150°C, within ±3.0°C: -150 to -200°C)

# Dimensions

Unit : mm (inch)



 **Safety Warning**  
 To ensure proper use of the products listed in this catalog,  
 please be sure to read the instruction manual prior to use.

 **MITSUBISHI ELECTRIC CORPORATION**  
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 HIMEJI WORKS: 840, CHIYODA CHO, HIMEJI, JAPAN