A1. Analog Input Module

This chapter describes the specifications and operation modes of the analog input modules F3AD08-4R, F3AD08-5R and F3AD08-6R.

Models F3AD08-4R, F3AD08-5R and F3AD08-6R are 8-channel analog-to-digital conversion input modules. The main features of these models are:

- Super-high conversion speed of 50 µs per point
- A single module can accommodate eight input points.
- 16-bit A/D converters enable high-resolution analog to digital conversion.
- Easy-to-use features such as scaling and filtering.
- Model F3AD08-4R is designed for current input; Model F3AD08-5R is designed for voltage input; while model F3AD08-6R allows each channel to be independently configured for voltage input or current input. Other than input type, the three models have the same specifications.
- The input signal range is selectable from any of the following ranges: voltage input 0 to 5V, 1 to 5V, -10 to 10V or 0 to 10 VDC, current input 0 to 20mA DC or 4 to 20 mA DC.
- The functional specifications of F3AD08-5R and F3AD08-6R are downward compatible with F3AD08-1R and F3AD08-1V so migration to these models does not require rewriting of user applications.

Special module instructions in ladder, as well as BASIC statements are provided for implementing analog input-output using F3AD08-4R, F3AD08-5R and F3AD08-6R modules.

A1.1 Module Specifications

■ Functional Specifications

Table A1.1 Functional Specifications

Item	Specifications		
	F3AD08-4R	F3AD08-5R	F3AD08-6R
Number of inputs	8 differential inputs		
Absolute maximum rating	18 V DC or 25 mA DC maximum -18 V DC or -25 mA DC minimum		
Input signal range[*1]	Current signal only 0 to 20mADC (-1.0 to 21.0 mADC) 4 to 20mADC (-1.0 to 21.0 mADC)	Voltage signal only 0 to 5 VDC (-0.25 to 5.25 VDC) 1 to 5 VDC (-0.25 to 5.25 VDC) -10 to 10 VDC (-11.0 to 11.0 VDC) 0 to 10 VDC (-0.5 to 10.5 VDC)	Voltage signal or current signal 0 to 5 VDC (-0.25 to 5.25 VDC) 1 to 5 VDC (-0.25 to 5.25 VDC) -10 to 10 VDC (-11.0 to 11.0 VDC) 0 to 10 VDC (-0.5 to 10.5 VDC) 0 to 20mADC (-1.0 to 21.0 mADC) 4 to 20mADC (-1.0 to 21.0 mADC)
Allowable common-mode voltage	±6 VDC max. (0 to 5 VDC, 1 to 5 VDC, 0 to 20mA DC, 4 to 20mA DC) ±1 VDC max. (-10 to 10 VDC, 0 to 10 VDC)		
Isolation method	Across input terminals and internal circuit: Photocoupler isolation Across input terminals: Not isolated		
Withstanding voltage	500 V DC for one minute		
Input resistance	250Ω	1M Ω min. [*2]	1M Ω min. when configured for voltage input[*2] 250 Ω when configured for current input
Maximum Resolution [*3] (16-bit A/D conversion)	0.4 mV for 0 to 5 VDC, 1 to 5 VDC or 0 to 10 VDC input signal range 0.5 mV for -10 to 10 VDC input signal range 1.6 µA for 0 to 20mA DC or 4 to 20mA DC input signal range		
Overall accuracy	23±2ºC: ± 0.1% (full scale) 0 to 55ºC: ± 0.2% (full scale)[*4]		
Conversion period [*5]	50 µs, 100 µs, 250 µs, 500 µs, 1 ms, 16.6 ms, 20 ms, 100 ms per channel Configurable on module basis		
Scaling	Upper and lower limit values can be set to any value between -20,000 and 20,000.		
Offset	Offset value can be set to any value between -5000 and 5000		
Filter	First-order lag low-pass filter or moving average computation can be enabled or disabled for individual channels [*6 *7]		
Hold data	Supports recording of peak values and trough values		
Self diagnosis	Hardware self-diagnosis during operation Over-range input detection		
Current consumption	210 mA (5 V DC)		
External connection	18-point terminal block, M3.5 screws		
External dimensions	28.9 (W) × 100 (H) × 106.1 (D) mm [*8]		
Weight	200 g		
Ambient operating temperature	0 to 55ºC		
Ambient operating humidity	10 to 90% RH (non-condensing)		
Ambient operating atmosphere	Must be free of corrosive gases or heavy dust.		
Ambient storage temperature	-20 to 75ºC		
Ambient storage humidity	10 to 90% RH (non-condensing)		

*1: Conversion results are valid within the selected input signal range.
The default input signal range is 0 to 20mADC for F3AD08-4R, and -10 to 10 VDC for F3AD08-5R and F3AD08-6R

*2: The input resistance is about 2 MΩ for channels where the input terminal IN□- is not connected to the AG terminal.

*3: The module uses 16-bit A/D converters internally. The maximum resolution given here is due to scaling computation.
The available input signal ranges vary with module type (see “Input Signal Range” row)

*4: Accuracy is ±1% (full scale) when drift compensation is disabled.

*5: The conversion period is configurable on module basis. It is affected by the number of channels in use (number of unskipped channels).
By default, the conversion period is 1 ms and data of each channel is updated every 8 ms (=1 ms × 8 inputs).

*6: Filtering and moving average computation cannot be used concurrently on the same channel.
The actual filter time constant value depends on the number of channels in use (number of unskipped channels) and the conversion period setting
The filter time constant is specified in units of ms.
The number of data points to be used for moving average computation can be set to any integer from 2 to 32.

*7: Filtering cannot be used when the conversion period is set to 50 µs.

*8: Dimensions excluding protrusions (for details, see external dimensions drawing)

CAUTION

Never apply any voltage (or current) exceeding the absolute maximum rating, even for a short period of time, or it may cause permanent damage to the internal circuitry, and thus failure to meet specifications.

■ Input/Output Conversion Characteristics

The following table shows the input/output conversion characteristics with no scaling for various input signal ranges. The input/output conversion characteristics show analog input values versus digital output values.

For details on scaling, see Section A3.5.

Table A1.2 Input/Output Conversion Characteristics with No Scaling

Input Signal Range	Analog Input Value	Digital Output Value	
-10 to 10 V DC range	-10 to 10 V DC	-20000 to 20000	Default input signal range for F3AD08-5R and F3AD08-6R
0 to 10 V DC range	0 to 10V DC	0 to 20000	
0 to 5 V DC range	0 to 5 V DC	0 to 10000	
1 to 5 V DC range	1 to 5 V DC	2000 to 10000	
0 to 20mA DC range	0 to 20mA DC	0 to 10000	Default input signal range for F3AD08-4R
4 to 20mA DC range	4 to 20mA DC	2000 to 10000	

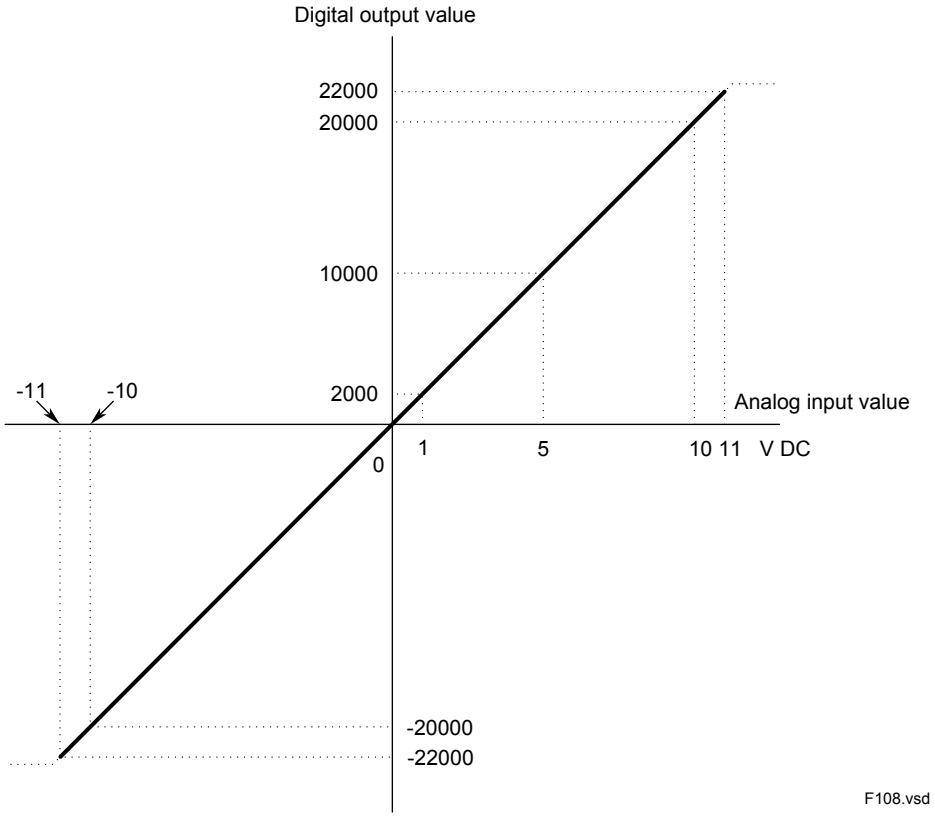

Figure A1.1 Input/Output Conversion Characteristics with No Scaling for voltage input