

General Specifications

Analog I/O Modules
(for FIO)



GS 33J60F60-01EN

[Release 6]

■ GENERAL

This document describes about hardware specifications of Analog I/O Modules (for FIO) to be installed in the ESB bus node units (ANB10S and ANB10D), Optical ESB bus node units (ANB11S and ANB11D), and field control units (for FIO) (AFV30S, AFV30D, AFV40S, AFV40D, AFV10S, AFV10D).

These analog I/O modules function as signal converters; by inputting field analog signals into these modules, it converts them to internal data for field control stations (FCS), or the FCS's internal data to analog signals for outputs.

■ STANDARD SPECIFICATIONS

● Current/Voltage Input Modules (Non-Isolated)

These modules provide 16 inputs of mainly 4 to 20 mA DC or 1 to 5 V DC standardized signals from 2-wire/4-wire transmitters.

They can be used in dual-redundant configuration.

Items		Specifications		
Model		AAI141 (*1)	AAV141	AAB141(*1) (*4)
Number of input channels		16, non-isolated	16, non-isolated (differential input)	16, non-isolated When the voltage input is selected the differential input is applied.
Input signal		4 to 20 mA DC	1 to 5 V DC (allowable common mode voltage ± 1 V or less)	Voltage input : 1 to 5 V DC (allowable common mode voltage ± 1 V or less) Current input : 4 to 20 mA DC(*5)
Allowable input current/voltage		27 mA	± 7.5 V	Voltage input : ± 7.5 V Current input : 25 mA
Withstanding voltage		—		
Input resistance	Power ON	400 Ω (at 20 mA) to 1000 Ω (at 4 mA) (*2)	1 M Ω or larger	Voltage input : 1 M Ω or larger Current input : 290 Ω (at 20 mA) to 450 Ω (at 4 mA) (*6)
	Power OFF	500 k Ω or larger	340 k Ω or larger	Voltage input : 340 k Ω or larger Current input : 500 k Ω or larger
Accuracy		± 16 μ A	± 4 mV	Voltage input : ± 4 mV Current input : ± 16 μ A
Data update period		10 ms		
Step response time		100 ms		
Transmitter power supply		14.8 V or higher (at 20 mA) (*3) 26.4 V or less (at 0 mA) (output current limit: 27 mA)	—	
Setting of 2-wire or 4-wire transmitter		For each channel by setting pin	—	
Drift due to ambient temperature change		± 16 μ A/10 $^{\circ}$ C	± 4 mV/10 $^{\circ}$ C	± 0.1 %/10 $^{\circ}$ C
Maximum current consumption		310 mA (5 V DC), 450 mA (24 V DC)	350 mA (5 V DC)	480 mA (5 V DC), 120 mA (24 V DC)
Weight		Approx. 0.20 kg	Approx. 0.20 kg	Approx. 0.30 kg
External connection		Pressure clamp terminal, KS cable, MIL connector cable		KS cable
HART communication		Available	—	Available (at current input)

*1: A Zener barrier is not allowed to be connected with this module. Use an isolation barrier when the module is used in intrinsically safe application.

*2: The module input resistance viewed from the terminals depends on the current strength as calculated as below:

$$250 \, \Omega + \frac{\text{voltage drop in the input protection circuit}}{\text{current value}} \quad \text{F01E.ai}$$

*3: This voltage is generated between the connecting terminals for 2-wire transmitters for this module. When calculating the minimum operating voltage for transmitters, consider to allow margins for voltage drop in external wiring.

*4: This module can be used only with the following AFV10□, AFV30□, or AFV40□.

*5: Input mode for each channel is selectable by software.

*6: The module input resistance viewed from the terminals depends on the current strength as calculated as below:

$$250 \, \Omega + \frac{\text{voltage drop in the input protection circuit}}{\text{current value}} \quad \text{F02E.ai}$$

● Current/Voltage I/O Modules (Non-Isolated)

These modules provide 8 inputs and 8 outputs to support up to 8 loops. They can be used in dual-redundant configuration.

Items		Specifications					
Model		AAI841 (*1)		AAB841 (*5)		AAB842 (*5) (*6)	
Number of I/O channels		8-channel input/8-channel output, non-isolated		8-channel input/8-channel output, non-isolated (differential input)		8-channel input/8-channel output, non-isolated When the voltage input is selected the differential input is applied.	
I/O signal		Input: 4 to 20 mA	Output: 4 to 20 mA	Input: 1 to 5 V (allowable common mode voltage ±1 V or less)	Output: 4 to 20 mA	Input (*7) Voltage input: 1 to 5 V DC (allowable common mode voltage ±1 V or less) Current input: 4 to 20 mA DC	Output: 4 to 20 mA
Allowable input current/voltage		25 mA	—	±7.5 V	—	Voltage input : ±7.5 V Current input : 25 mA	—
Withstanding voltage		—					
Input resistance	Power ON	400 Ω (at 20 mA) to 1000 Ω (at 4 mA) (*2)	—	1 MΩ or larger	—	Voltage input: 1 MΩ or larger Current input: 290 Ω (at 20 mA) to 450 Ω (at 4 mA) (*2)	—
	Power OFF	500 kΩ or larger	—	340 kΩ or larger	—	Voltage input: 340 kΩ or larger Current input: 500 kΩ or larger	—
Allowable load resistance		—	0 to 750 Ω (*3)	—	0 to 750 Ω	—	0 to 750 Ω (*4)
Circuit-open detection		—	Less than 0.65 mA	—	Less than 0.65 mA	—	Less than 0.65 mA
Accuracy		Input: ±16 μA	output: ±48 μA	Input: ±4 mV	output: ±48 μA	Voltage input : ±4 mV Current input : ±16 μA	±48 μA
Data update period		10 ms					
Input step response time		100 ms					
Output step response time		40 ms					
Transmitter power supply		14.8 V or higher (at 20 mA) 26.4 V or less (at 0 mA) (*4)		—			
Setting of 2-wire or 4-wire transmitter		For each channel by setting pin		—			
Temperature drift		±0.1 %/10 °C					
Maximum current consumption		310 mA (5 V DC), 500 mA (24 V DC)		310 mA (5 V DC), 250 mA (24 V DC)		410 mA (5 V DC), 290 mA (24 V DC)	
Weight		Approx. 0.30 kg					
External connection		Pressure clamp terminal, KS cable, MIL connector cable					KS cable
HART communication		Available		—		Available (at Current input and output)	

*1: A Zener barrier is not allowed to be connected with this module. Use an isolation barrier when the module is used in intrinsically safe application.

*2: The module input resistance viewed from the terminals depends on the current strength as calculated as below:

$$250 \Omega + \frac{\text{voltage drop in the input protection circuit}}{\text{current value}}$$

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*3: When this module is used in the ambient temperature of 60 to 70 $^{\circ}$ C by being installed in a node unit that conforms to the temperature environment, the allowable load resistance is 200 to 750 Ω .

*4: This voltage is generated between the connecting terminals for 2-wire transmitters for this module. When calculating the minimum operating voltage for transmitters, consider to allow margins for voltage drop in external wiring.

*5: A Zener barrier is not allowed to be connected with this module for current output. Use an isolation barrier when the module is used in intrinsically safe application.

*6: A Zener barrier is not allowed to be connected with this module for current input. Use an isolation barrier when the module is used in intrinsically safe application. And this module can be used only with the following AFV10□, AFV30□, or AFV40□.

*7: Input mode for each channel is selectable by software.

● Current Input Modules (Isolated)

This module provides 16 inputs of 4 to 20 mA signal. It can be used in dual-redundant configuration.

Items		Specifications
Model		AAI143 (*1)
Number of input channels		16, isolated
Input signal		4 to 20 mA
Allowable input current		24 mA
Withstanding voltage		Between input and system: 1500 V AC, for 1 minute (*3)
Input resistance	Power ON	270 Ω (20 mA) to 350 Ω (4 mA) (*2)
	Power OFF	500 kΩ or larger
Accuracy		±16 μA
Data update period		10 ms
Transmitter power supply		19.0 V or higher (at 20 mA) 25.5 V or less (at 0 mA) (output current limit: 25 mA) (*4)
Setting of 2-wire or 4-wire transmitter		For each channel by setting pin
Drift due to ambient temperature change		±16 μA/10 °C
Maximum current consumption		230 mA (5 V DC), 540 mA (24 V DC)
Weight		Approx. 0.30 kg
External communication		Pressure clamp terminal, MIL connector cable, dedicated cable (KS1)
HART communication		Available

*1: A Zener barrier is not allowed to be connected with this module. Use an isolation barrier when the module is used in intrinsically safe application.

*2: The module input resistance viewed from the terminals depends on the current strength as calculated as below:

$$250 \, \Omega + \frac{\text{voltage drop in the input protection circuit}}{\text{current value}} \quad \text{F04E.ai}$$

*3: When the dedicated cable is used, the withstanding voltage is 500 V AC (between the input signal and the system). When the ML connector cable is used, the withstanding voltage depends on the electrical specifications of the cable.

*4: This voltage is generated between the connecting terminals for 2-wire transmitters for this module. When calculating the minimum operating voltage for transmitters, consider to allow margins for voltage drop in external wiring.

● Current Output Module (Isolated)

This module provides 16 outputs of 4 – 20 mA signal. It can be used in dual-redundant configuration. (*1)

Items		Specifications
Model		AAI543-□5□/-□E□ AAI543-□6□/-□F□ (*2)
Number of output channels		16, isolated, standard switch-over response in redundant configuration (*3) 16, isolated, fast switch-over response in redundant configuration (*3)
Output signal		4 to 20 mA
Withstanding voltage		Between output and system: 1500 V AC, for 1 minute (*4)
Allowable load resistance		0 to 750 Ω
Circuit-open detection		Less than 0.65 mA
Accuracy		±48 μA
Data update period		10 ms
Drift due to ambient temperature change		±16 μA/10 °C
Maximum current consumption		230 mA (5 V DC), 540 mA (24 V DC)
Weight		Approx. 0.40 kg
External communication		Pressure clamp terminal, MIL connector cable, dedicated cable (KS1)
HART communication		Available

*1: A dual-redundant configuration is enabled by using two identical modules with the same switch-over response (standard or fast).

*2: When AAI543-□6□/-□F□ is installed in a node unit that conforms to the temperature environment, use it in the ambient temperature within 0 to 60 °C range.

*3: When a switch over from control to stand-by module takes place in the dual-redundant configuration, the maximum period of time when the field output falls below 4 mA is 100 ms for AAI543-□5□/-□E□ (standard switch-over response) and 2 ms for AAI543-□6□/-□F□ (fast switch-over response). In case of connecting fast response type field devices, use AAI543-□6□/-□F□ (fast switch-over response) in the dual-redundant configuration.

*4: When the dedicated cable is used, the withstanding voltage is 500 V AC (between the input signal and the system). When the ML connector cable is used, the withstanding voltage depends on the electrical specifications of the cable.