

# General Specifications

## Analog I/O Modules (for FIO)



GS 33K50F60-50E

[Release 5]

### ■ 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), ER bus node units (ANR10S and ANR10D) (\*1), and field control units (for FIO) (AFV30S, AFV30D, AFV40S, AFV40D, AFV10S, AFV10D, AFF50S, and AFF50D).*

*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.*

\*1: Field control units (AFV30□ and AFV40□) do not support ER bus node unit (ANR10□).

## ■ 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  | AAV142           | AAB141(*1) (*4)  |
| Number of input channels                |           | 16, non-isolated   | 16, non-isolated (differential input)                     | 16, non-isolated | 16, non-isolated<br>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) | -10 to 10 V DC   | Voltage input : 1 to 5 V DC (allowable common mode voltage ± 1 V or less)<br>Current input : 4 to 20 mA DC(*5) |
| Allowable input current/voltage         |           | 27 mA  | ±7.5 V  | ±13 V            | Voltage input : ±7.5 V<br>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  | 1 MΩ or larger   | Voltage input : 1 MΩ or larger<br>Current input : 290 Ω (at 20 mA) to 450 Ω (at 4 mA) (*6)                     |
|   | Power OFF | 500 kΩ or larger   | 340 kΩ or larger  | 660 kΩ or larger | Voltage input : 340 kΩ or larger<br>Current input : 500 kΩ or larger   |
| Accuracy                                |           | ±16 μA   | ±4 mV   | ±20 mV           | Voltage input : ±4 mV<br>Current input : ±16 μA  |
| Data update period                      |           | 10 ms  |   |                  |  |
| Step response time                      |           | 100 ms   |   |                  |  |
| Transmitter power supply                |           | 14.8 V or higher (at 20 mA) (*3)<br>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 μA/10 °C   | ±4 mV/10 °C   | ±20 mV/10 °C     | ±0.1 %/10 °C   |
| Maximum current consumption             |           | 310 mA (5 V DC),<br>450 mA (24 V DC)   | 350 mA (5 V DC)   | 350 mA (5 V DC)  | 480 mA (5 V DC),<br>120 mA (24 V DC)   |
| Weight                                  |           | 0.2 kg   | 0.2 kg  | 0.2 kg           | 0.3 kg   |
| External connection                     |           | Pressure clamp terminal, KS cable, MIL connector cable                                     |   |                  | KS cable   |
| HART communication (*7)                 |           | 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 FCSS – AFG30□, AFG40□, AFG8□□, AFF50□, 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:

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

\*7: When this module is installed to a ER bus node unit with HART function, the EB401 firmware must be rev. 2 or later.

● **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)  |  |   |
| <b>Number of I/O channels</b>                  |  | 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<br>When the voltage input is selected the differential input is applied.     |  |   |
| <b>I/O signal</b>                              |  | Input:<br>4 to 20 mA   | Output:<br>4 to 20 mA                     | Input: 1 to 5 V (allowable common mode voltage ±1 V or less)        | Output:<br>4 to 20 mA | Input (*7)<br>Voltage input:<br>1 to 5 V DC (allowable common mode voltage ±1 V or less)<br>Current input:<br>4 to 20 mA DC | Output:<br>4 to 20 mA  |   |
| <b>Allowable input current/voltage</b>         |  | 25 mA  | —   | ±7.5 V  | —                     | Voltage input :<br>±7.5 V<br>Current input :<br>25 mA   | —  |   |
| <b>Withstanding voltage</b>                    |  | —  |   |   |                       |   |  |   |
| <b>Input resistance</b>                        |  | <b>Power ON</b>  | 400 Ω (at 20 mA) to 1000 Ω (at 4 mA) (*2) | —   | 1 MΩ or larger        | —   | Voltage input: 1 MΩ or larger<br>Current input: 290 Ω (at 20 mA) to 450 Ω (at 4 mA) (*2) | — |
|  |  | <b>Power OFF</b>   | 500 kΩ or larger                          | —   | 340 kΩ or larger      | —   | Voltage input: 340 kΩ or larger<br>Current input: 500 kΩ or larger                       | — |
| <b>Allowable load resistance</b>               |  | —  | 0 to 750 Ω (*3)                           | —   | 0 to 750 Ω            | —   | 0 to 750 Ω (*4)  |   |
| <b>Circuit-open detection</b>                  |  | —  | Less than 0.65 mA                         | —   | Less than 0.65 mA     | —   | Less than 0.65 mA  |   |
| <b>Accuracy</b>                                |  | Input: ±16 μA  | output: ±48 μA                            | Input: ±4 mV  | output: ±48 μA        | Voltage input :<br>±4 mV<br>Current input :<br>±16 μA   | ±48 μA   |   |
| <b>Data update period</b>                      |  | 10 ms  |   |   |                       |   |  |   |
| <b>Input step response time</b>                |  | 100 ms   |   |   |                       |   |  |   |
| <b>Output step response time</b>               |  | 40 ms  |   |   |                       |   |  |   |
| <b>Transmitter power supply</b>                |  | 14.8 V or higher (at 20 mA)<br>26.4 V or less (at 0 mA) (*4) |   | —   |                       |   |  |   |
| <b>Setting of 2-wire or 4-wire transmitter</b> |  | For each channel by setting pin                              |   | —   |                       |   |  |   |
| <b>Temperature drift</b>                       |  | ±0.1 %/10 °C   |   |   |                       |   |  |   |
| <b>Maximum current consumption</b>             |  | 310 mA (5 V DC),<br>500 mA (24 V DC)                         |   | 310 mA (5 V DC),<br>250 mA (24 V DC)                                |                       | 410 mA (5 V DC),<br>290 mA (24 V DC)  |  |   |
| <b>Weight</b>                                  |  | 0.3 kg   |   |   |                       |   |  |   |
| <b>External connection</b>                     |  | Pressure clamp terminal, KS cable, MIL connector cable       |   |   |                       | KS cable  |  |   |
| <b>HART communication (*8)</b>                 |  | 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 °C by being installed in a ER bus 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 FCSs – AFG30□, AFG40□, AFG8□□, AFF50□, AFV10□, AFV30□, or AFV40□.

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

\*8: When this module is installed to a ER bus node unit with HART function, the EB401 firmware must be rev. 2 or later.

● **Voltage Output Module (Non-Isolated)**

This module provides 16 outputs of -10 to +10 V DC signal. It can be used in dual-redundant configuration.

| Items                       | Specifications   |
|-----------------------------|--|
| Model                       | AAV542   |
| Number of output channels   | 16, non-isolated                                       |
| Output signal               | -10 to 10 V  |
| Withstanding voltage        | —  |
| Allowable load resistance   | 10 kΩ or larger  |
| Accuracy                    | Larger of ±0.3 %/FS and ±12 mV                         |
| Data update period          | 10 ms  |
| Output step response time   | 40 ms  |
| Temperature drift           | Larger of ±0.1 %/10 °C and ±10 mV/10 °C                |
| Maximum current consumption | 450 mA (5 V DC)  |
| Weight                      | 0.2 kg   |
| External connection         | Pressure clamp terminal, KS cable, MIL connector cable |

● **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 (*4)                                  |                                    |
| 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) (*5) |                                    |
| 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                                  | 0.3 kg  |                                    |
| External communication                  | Pressure clamp terminal, MIL connector cable, dedicated cable (KS1)                     |                                    |
| HART communication (*3)                 | 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 this module is installed to a ER bus node unit with HART function, the EB401 firmware must be rev. 2 or later.

\*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.

\*5: 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   |   |
|  | <b>AAI543-□0□</b>   | <b>AAI543-□1□ (*2)</b>  |
| <b>Number of output channels</b>               | 16, isolated, standard switch-over response in redundant configuration (*3) | 16, isolated, fast switch-over response in redundant configuration (*3) |
| <b>Output signal</b>                           | 4 to 20 mA  |   |
| <b>Withstanding voltage</b>                    | Between output and system: 1500 V AC, for 1 minute (*4)                     |   |
| <b>Allowable load resistance</b>               | 0 to 750 Ω  |   |
| <b>Circuit-open detection</b>                  | Less than 0.65 mA   |   |
| <b>Accuracy</b>                                | ±48 μA  |   |
| <b>Data update period</b>                      | 10 ms   |   |
| <b>Drift due to ambient temperature change</b> | ±16 μA/10 °C  |   |
| <b>Maximum current consumption</b>             | 230 mA (5 V DC), 540 mA (24 V DC)   |   |
| <b>Weight</b>                                  | 0.4 kg  |   |
| <b>External communication</b>                  | Pressure clamp terminal, MIL connector cable, dedicated cable (KS1)         |   |
| <b>HART communication (*5)</b>                 | Available   |   |

- \*1: A dual-redundant configuration is enabled by using two identical modules with the same suffix codes.
- \*2: When AAI543-□1□ is installed in a ER bus node unit, 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-□0□ (standard switch-over response) and 2 ms for AAI543-□1□ (fast switch-over response). In case of connecting fast response type field devices, use AAI543-□1□ (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.
- \*5: When this module is installed in a ER bus node unit with HART function, the EB401 firmware must be rev. 2 or later.

● **Voltage Input Module (Isolated)**

This module is for 16 inputs of 1 to 5 V or -10 to 10 V signal. It can be used in dual-redundant configuration.

| Items  | Specifications  |              |
|--|---|--------------|
|  | Model   |              |
|  | <b>AAV144</b>   |              |
| <b>Number of input channels</b>                | 16, isolated  |              |
| <b>Input signal</b>                            | 1 to 5 V  | -10 to 10 V  |
| <b>Switching input signals</b>                 | Input signals can be set together for CH1 to CH16                           |              |
| <b>Allowable input voltage</b>                 | ±30 V   |              |
| <b>Withstanding isolated voltage</b>           | Between input and system: 1500 V AC withstanding voltage, for 1 minute (*1) |              |
| <b>Input resistance</b>                        | <b>Power ON</b>   | 1 MΩ         |
|  | <b>Power OFF</b>  | 200 kΩ       |
| <b>Accuracy</b>                                | ±4 mV   | ±20 mV       |
| <b>Data update period</b>                      | 10 ms   |              |
| <b>Drift due to ambient temperature change</b> | ±4 mV/10 °C   | ±20 mV/10 °C |
| <b>Maximum current consumption</b>             | 500 mA (5 V DC)   |              |
| <b>Weight</b>                                  | 0.2 kg  |              |
| <b>External communication</b>                  | Pressure clamp terminal, MIL connector cable, dedicated cable (KS1)         |              |

- \*1: 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.

**● Voltage Output Modules (Isolated)**

This module is for 16 outputs of -10 to 10V signal. It can be used in dual-redundant configuration.

| Items                                   | Specifications   |
|---|--|
| Model                                   | <b>AAV544</b>  |
| Number of output channels               | 16, isolated   |
| Output signal                           | -10 to 10 V  |
| Withstanding voltage                    | Between output and system: 1500 V AC withstanding voltage, for 1 minute (*1) |
| Allowable load resistance               | 5 k $\Omega$ or larger   |
| Accuracy                                | The larger of $\pm 12$ mV or $\pm 0.3$ % FS                                  |
| Data update period                      | 10 ms  |
| Drift due to ambient temperature change | The larger of $\pm 0.1$ %/10 °C or $\pm 10$ mV/10 °C                         |
| Maximum current consumption             | 860 mA (5 V DC)  |
| Weight                                  | 0.2 kg   |
| External communication                  | Pressure clamp terminal, MIL connector cable, dedicated cable (KS1)          |

\*1: 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.

● **TC/RTD Input Modules (Isolated)**

These modules receive signals from mV, thermocouple (TC), and RTD. They can be used in dual-redundant configuration.

| Items   | Specifications  |   |
|---|---|---|
|   | AAT141  | AAR181  |
| Number of input channels                                | 16, isolated (*7)   | 12, isolated  |
| Input signal  | TC: JIS C1602:1995, IEC584:1995<br>Type J, K, E, B(*1), R, S, T, N<br>mV: -100 to 150 mV, -20 to 80 mV  | RTD: JIS C1604:1997, IEC751:1995<br>Pt100 (3-wire type)(*6) |
| Switching input signals                                 | TC/mV can be set individually for CH1 to CH16.  | CH1 to CH12 are RTD inputs.                                 |
| Allowable input voltage                                 | ±5 V  | ±5 V  |
| Withstanding voltage                                    | Between input and system: 1500 V AC, for 1 minute   |   |
| Input resistance  | Power ON  | 2 MΩ or larger  |
|   | Power OFF   | 2 MΩ or larger  |
| Accuracy  | TC: ±30 μV<br>mV: ±80 μV for span (-100 to 150 mV)<br>±30 μV for span (-20 to 80 mV)                    | RTD: ±120 mΩ  |
| Allowable total resistance of signal source plus wiring | 1000 Ω or less  | 40 Ω or less (wiring resistance per wire) (*2)              |
| Effect of allowable signal source resistance (1000 Ω)   | ±20 μV(*3)  | —   |
| Reference junction compensation accuracy                | Within ±1 °C (*4) (*5)  | —   |
| Measurement current                                     | —   | RTD: 1 mA   |
| Temperature drift                                       | ±80 μV/10 °C (-100 to 150 mV input)<br>±30 μV/10 °C (TC/-20 to 80 mV input)                             | ±120 mΩ/10 °C (RTD input)                                   |
| Data update period                                      | 1 s   |   |
| Burn-out  | All channels can be set together.<br>Setting: Not available/available (UP/DOWN)<br>Detection time: 60 s |   |
| Maximum current consumption                             | 450 mA (5 V DC)   | 450 mA (5 V DC)   |
| Weight  | 0.2 kg  |   |
| External connection                                     | Pressure clamp terminal   |   |

- \*1: Type B does not carry out temperature compensation and temperature under 44 °C is not measurable.
- \*2: Wiring resistance for the signal cables of IN□A and IN□C must be identical.
- \*3: In dual-redundant configuration, it is ±40 μV.
- \*4: This figure varies depending on the installation conditions.  
When the measured temperature is below 0 °C, multiply the following coefficient (K) with the above value.

$$K = \frac{\text{Thermoelectromotive force per degree at } 0 \text{ } ^\circ\text{C}}{\text{Thermoelectromotive force per degree at measured temperature}}$$

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- \*5: The reference junction compensation accuracy varies depending on the ambient temperature of the pressure clamp terminal.

**By the Node Unit Only**

| Temperature Environment | Reference Junction Compensation Accuracy |
|-------------------------|--|
| -20 to 15 °C            | ±2 °C                                    |
| 15 to 45 °C             | ±1 °C                                    |
| 45 to 70 °C             | ±2 °C                                    |

**Installed in the Standard Cabinet**

| Temperature Environment | Reference Junction Compensation Accuracy |
|-------------------------|--|
| 0 to 50 °C              | ±2 °C                                    |

- \*6: AAR181 also supports JPt 100.
- \*7: Use a non-ground type thermocouple (TC) because AAT141 is an isolated type module. When the ground type TC is used with the module's multiple channels, it causes a temperature error due to the multi-point ground.

● **Current Input Module and Current I/O Module (Isolated Channels)**

The current input module receives signal of 4 to 20 mA, and the current I/O module sends and receives signals of 4 to 20 mA. These modules are isolated between the field and the system as well as in between each channel. They can be used in dual-redundant configuration.

| Items                       |           | Specifications  |   |
|-----------------------------|-----------|---|---|
| Model                       |           | AAI135 (*1)   | AAI835 (*1)   |
| Number of I/O channels      |           | 8-channel input, isolated channels  | 4-channel input/4-channel output, isolated channels   |
| I/O signal                  |           | 4 to 20 mA  | Input: 4 to 20 mA<br>Output: 4 to 20 mA   |
| Allowable input current     |           | 25 mA   | 25 mA<br>—  |
| Withstanding voltage        |           | Between input and system:<br>500 V AC, for 1 minute<br>Between input channels:<br>500 V AC, for 1 minute (*2) | Between input/output and system: 500 V AC, for 1 minute<br>Between input/output channels: 500 V AC, for 1 minute (*2) |
| Input resistance            | Power ON  | 290 Ω (at 20 mA) to 450 Ω (at 4 mA) (*3)  |   |
|                             | Power OFF | 500 kΩ or larger  |   |
| Allowable load resistance   |           | —   | —<br>0 to 750 Ω (*4)  |
| Circuit-open detection      |           | —   | —<br>Less than 0.65 mA  |
| Accuracy                    |           | ±16 μA  | Input: ±16 μA<br>Output: ±48 μA   |
| Data update period          |           | 10 ms   |   |
| Transmitter power supply    |           | 15.0 V or higher (at 20 mA)<br>29.3 V or less (at 0 mA) (*5)  | 15.0 V or higher (at 20 mA)<br>29.3 V or less (at 0 mA) (*5)<br>—   |
| Temperature drift           |           | ±16 μA/10 °C  |   |
| Maximum current consumption |           | 360 mA (5 V DC), 450 mA (24 V DC)   | 360 mA (5 V DC), 450 mA (24 V DC)   |
| Weight                      |           | 0.3 kg  |   |
| External connection         |           | Pressure clamp terminal, MIL connector cable, dedicated cable (KS1)   |   |
| HART communication (*6)     |           | Available   | 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 applications.

\*2: When the ML connector cable is used, the withstanding voltage depends on the electrical specifications of the cable.

\*3: 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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\*4: When this module is used in the ambient temperature of 60 to 70 °C by being installed in a ER bus node unit that conforms to the temperature environment, the allowable load resistance is 200 to 750 Ω.

\*5: 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.

\*6: When this module is installed to a ER bus node unit with HART function, the EB401 firmware must be rev. 2 or later.



● **TC/RTD Input Modules (Isolated Channels)**

These modules receive signals from mV, thermocouple (TC), RTD, and potentiometer (POT), and they are isolated between the field and the system as well as in between each channel. They can be used in dual-redundant configuration.

| Items  |                  | Specifications  |  |
|--|------------------|---|--|
| Model  |                  | AAT145  | AAR145   |
| <b>Number of input channels</b>                                |                  | 16, isolated channels   | 16, isolated channels  |
| <b>Input signal</b>  |                  | TC: JIS C1602:1995 (*1), IEC584:1995 Type J, K, E, B (*2), R, S, T, N<br>mV: -100 to 150 mV, -20 to 80 mV                       | RTD: JIS C1604:1997 (*3), IEC751:1995 Pt100 (3-wire type)<br>POT: Total resistance 100 Ω to 10 kΩ<br>Span resistance: 50 % or larger of total resistance |
| <b>Switching input signals</b>                                 |                  | TC/mV can be set individually for CH1 to CH16.  | RTD/POT can be selected individually for CH1 to CH16.  |
| <b>Allowable input voltage</b>                                 |                  | ±5 V  | ±5 V   |
| <b>Withstanding voltage</b>                                    |                  | Between input and system: 500 V AC (for single card: 1500 V AC), For 1 minute<br>Between input channels: 200 V AC, For 1 minute |  |
| <b>Input resistance</b>  | <b>Power ON</b>  | 1 MΩ or larger  |  |
|  | <b>Power OFF</b> | 1 MΩ or larger  |  |
| <b>Accuracy</b>  |                  | ±40 μV  | RTD: ±150 mΩ<br>POT: ±0.2 %/FS   |
| <b>Allowable total resistance of signal source plus wiring</b> |                  | 1000 Ω or less  | 150 Ω or less (wiring resistance per wire) (*4)  |
| <b>Effect of allowable signal source resistance (1000 Ω)</b>   |                  | ±20 μV  | —  |
| <b>Reference junction compensation accuracy</b>                |                  | ±1 °C (*5) (6)  | —  |
| <b>Measurement current</b>                                     |                  | —   | RTD: 1 mA  |
| <b>Data update period</b>                                      |                  | 1 s   |  |
| <b>Burn-out</b>  |                  | All channels can be set together.<br>Setting: not available/available (UP/DOWN)<br>Detection time: 60 s                         |  |
| <b>Temperature drift</b>                                       |                  | ±80 μV/10 °C  | RTD: ±0.3 Ω/10 °C<br>POT: ±0.4 %/10 °C   |
| <b>Maximum current consumption</b>                             |                  | 350 mA (5 V DC)   | 350 mA (5 V DC)  |
| <b>Weight</b>  |                  | 0.3 kg  |  |
| <b>External connection</b>                                     |                  | Dedicated cable (KS1)   | Dedicated cable (KS8/AKB335)   |

- \*1: AAT145 also complies with JIS C1602:1981.
- \*2: Type B does not carry out temperature compensation and temperature under 44 °C is not measurable.
- \*3: AAR145 also complies with JIS C1604:1989 (Pt100, JPt100).
- \*4: Wiring resistance for the signal cables of IN□A and IN□C must be identical.
- \*5: This figure varies depending on the installation conditions.  
When the measured temperature is below 0 °C, multiply the following coefficient (K) with the above value.

$$K = \frac{\text{Thermoelectromotive force per degree at } 0\text{ }^{\circ}\text{C}}{\text{Thermoelectromotive force per degree at measured temperature}}$$

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- \*5: The reference junction compensation accuracy varies depending on the ambient temperature of the terminal board (AET4D).

**By the Terminal Board Only**

| Temperature Environment | Reference Junction Compensation Accuracy |
|-------------------------|--|
| -20 to 0 °C             | ±1.5 °C                                  |
| 0 to 30 °C              | ±1.0 °C                                  |
| 30 to 70 °C             | ±1.5 °C                                  |

**Installing in the Standard Cabinet**

| Temperature Environment | Reference Junction Compensation Accuracy |
|-------------------------|--|
| 0 to 30 °C              | ±1.0 °C                                  |
| 30 to 50 °C             | ±1.5 °C                                  |

● **Pulse Input Module (Isolated Channels)**

This module receives contact ON/OFF, voltage pulse, and current pulse signals. It is isolated between the field and the system as well as in between each channel, and can be used in dual-redundant configuration.

| Items                       | Specifications  |
|-----------------------------|---|
| Model                       | <b>AAP135</b>   |
| Number of input channels    | 8, isolated channels  |
| Input signal (*3)           | 2-wire type: Contact ON/OFF, voltage pulse, current pulse (possible to supply transmitter power supply)<br>3-wire type: Power-supply-type voltage pulse   |
| Input frequency             | 0 to 10 kHz (*4)  |
| Withstanding voltage        | Between input and system: 500 V AC, for 1 minute<br>Between channels: 500 V AC, for 1 minute (*1)   |
| Minimum input pulse width   | 40 μs   |
| Input signal level          | Contact input<br>Open/close levels of relay contact and transistor contact<br>Open: 100 kΩ or larger, Close: 200 Ω or less<br>Contact capacity<br>When supplying 12 V DC: 15 V DC 15 mA or higher<br>When supplying 24 V DC: 30 V DC 30 mA or higher<br>Voltage/current pulse input (Current input is converted to voltage.)<br>VH (high level): 3 to 24 V DC<br>VL (low level): -1 to 8 V DC<br>VH-VL (swing value): 3 V or higher<br>Signal source resistance: 1 kΩ or less |
| Shunt resistance            | Can be selected from none/200/500/1000 Ω.<br>(Open when power is OFF and for the standby side in a dual-redundant configuration)  |
| Pull-up resistance          | 68 kΩ (12 V DC or 24 V DC)  |
| Filter                      | Filter for eliminating chattering can be set. (*2)  |
| Data update period          | 2 ms  |
| Transmitter power supply    | Can select 24 V DC/12 V DC.<br>Limiter value 12 V DC ±10 %: 40 mA, 24 V DC ±10 %: 30 mA   |
| Maximum current consumption | 300 mA (5 V DC), 400 mA (24 V DC)   |
| Weight                      | 0.3 kg  |
| External connection         | Pressure clamp terminal, KS cable, MIL connector cable  |

- \*1: When the ML connector cable is used, the withstanding voltage depends on the electrical specifications of the cable.
- \*2: When the pulse input signal is a dry contact (e. g. mechanical relay) up to 10 Hz, chattering can be eliminated.
- \*3: Connection methods with field devices vary by the input signals. Refer to the Installation Guidance (TI 33K01J10-50E) for details.
- \*4: The input frequency is 0 to 800 Hz in between terminals B and C to receive non-voltage contact signals.

● **Pulse Input Module Compatible with PM1**

This module counts pulses by receiving 16-channel pulse train signal from pulse train input signal conditioner cards.

| Items                       | Specifications                      |
|-----------------------------|-------------------------------------|
| Model                       | <b>AAP149</b>                       |
| Number of input channels    | 16, non-isolated                    |
| Input signal                | Transistor contact (open collector) |
| Input frequency             | 0 to 6 kHz                          |
| Withstanding voltage        | –                                   |
| Pulse detection edge        | Trailing edge                       |
| Data update period          | 2 ms                                |
| Maximum current consumption | 400 mA (5 V DC)                     |
| Weight                      | 0.3 kg                              |
| External connection         | Dedicated cable (KS2)               |

● **Pulse Input Module/Analog Output Module Compatible with PAC**

This module receives 8-channel pulse train signal and outputs 4 to 20mA signal. It can be used in dual-redundant configuration.

| Items                       | Specifications                                  |                    |
|-----------------------------|---|--------------------|
| Model                       | AAP849  |                    |
| Number of I/O channels      | 8-channel input /8-channel output, non-isolated |                    |
| I/O signal                  | Input: transistor contact (open collector)      | Output: 4 to 20 mA |
| Input frequency             | 0 to 12 kHz                                     | –                  |
| Pulse detection edge        | Trailing edge                                   | –                  |
| Allowable load resistance   | –   | 0 to 750 Ω         |
| Circuit-open detection      | –   | Less than 0.65 mA  |
| Accuracy                    | –   | ±48 μA             |
| Data update period          | 1 ms  | 10 ms              |
| Output step response time   | –   | 40 ms              |
| Temperature drift           | –   | ±16 μA/10 °C       |
| Maximum current consumption | 310 mA (5 V DC), 250 mA (24 V DC)               |                    |
| Weight                      | 0.3 kg  |                    |
| External connection         | Dedicated cable (KS1)                           |                    |

■ **OPERATING ENVIRONMENT**

**Hardware Requirements**

The analog I/O modules run on the following FCS.

- AFV30S, AFV30D, AFV40S, AFV40D, AFV10S, AFV10D,
- AFS30S, AFS30D, AFS40S, AFS40D,
- AFG30S, AFG30D, AFG40S, AFG40D,
- AFG81S, AFG81D, AFG82S, AFG82D, AFG83S, AFG83D, AFG84S, AFG84D,
- AFF50S, and AFF50D

**Software Requirements**

The analog I/O modules run on the control functions of the following FCS.

- LFS1700 Control Function for Field Control Station (for AFV30□/AFV40□, Vnet/IP, and FIO):  
for AFV30□/AFV40□
- LFS1500 Control Function for Field Control Station (for AFV10□, Vnet/IP and FIO): for AFV10□
- LFS1300 Control Function for Standard Field Control Station (for V net and FIO): for AFS30□/AFS40□
- LFS1330 Control Function for Enhanced Field Control Station (for V net and FIO):  
for AFG30□/AFG40□ /AFG8□□
- LFS1350 Control Function for Compact Field Control Station (for V net and FIO): for AFF50□

**Engineering Requirements**

Works on LHS5100/LHMS5100 Standard Builder Function.

### ■ ANALOG I/O MODULE (WITH HART COMMUNICATION)

The analog I/O module (with HART communication function) connected to a transmitter or a valve positioner receives HART variable (\*1) in addition to exchange analog input/output data by 4 – 20 mA signal with field control stations (FCS). There are 8 types of analog I/O modules (with HART communication function).

\*1: HART variable can be read by HART Command #3.

There are 8 types of analog I/O modules (with HART communication function).

| Model    | Model Name  | Function   |
|----------|---|--|
| AAI141-H | Analog Input Module (Current Input)                       | 16-channel, 4 to 20 mA, non-isolated   |
| AAB141-H | Analog Input Module (Voltage/current Input)               | 16-channel, 1 to 5 V/4 to 20 mA, non-isolated  |
| AAI841-H | Analog I/O Module (Current I/O)                           | 8-channel input/8-channel output, 4 to 20 mA, non-isolated                                   |
| AAB842-H | Analog I/O Module (Voltage/current Input, Current Output) | 8-channel input/8-channel output, 1 to 5 V/4 to 20 mA input, 4 to 20 mA output, non-isolated |
| AAI135-H | Analog Input Module (Current Input)                       | 8-channel, 4 to 20 mA, isolated channels   |
| AAI835-H | Analog I/O Module (Current I/O)                           | 4-channel input/4-channel output, 4 to 20 mA, isolated channels                              |
| AAI143-H | Analog Input Module (Current Input)                       | 16-channel, 4 to 20 mA, isolated   |
| AAI543-H | Analog Output Module (Current Output)                     | 16-channel, 4 to 20 mA, isolated   |

### ● Communication with HART Devices

The analog I/O modules (with HART communication function) communicate with field devices and store analog data and HART variables in the Input/Output image area in the communication module. An FCS refers to and sets the Input/Output image by accessing the analog I/O modules (with HART communication function). The FCS utilizes the field device data via I/O terminals of the function block in the same way as other analog/digital I/O signals.

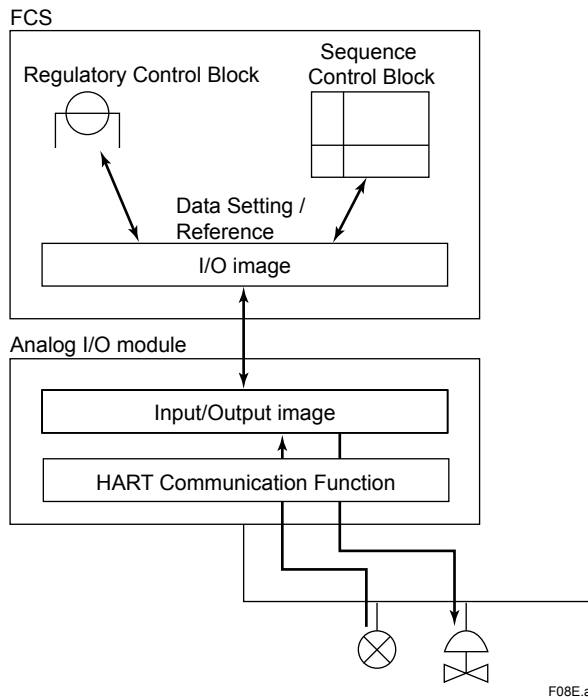


Figure Process Data Flow of HART Communications

● **HART Communication Functional Specifications**

The analog I/O modules (with HART communication function) are equipped with HART modems and enable HART communication (\*1) by directly connecting the HART devices to the modules.

No. of HART devices: Max. 16 devices/module

HART variables: Max. 32 points/module

HART variables can be treated as ordinary process input data via %Z terminal connection.

It is just for input.

HART multidrop connection (\*2): Max. 5 devices/channel

HART variables data refresh cycle time :

1 second/device (When maximum of 16 devices are connected, it is 17 seconds per ESB bus connection and 19 seconds for ER bus connection.)

Analog data refresh cycle time (\*3):

The number of ER bus node unit determines the analog data refresh cycle time in between the ER bus master interface module (EB401) and ER bus node units.

With HART communication, it takes twice as much time than without HART communication.

|   | No. of ER bus node unit |        |        |
|---|-------------------------|--------|--------|
|   | 2                       | 4      | 6      |
| Analog I/O (without HART communication) | 50 ms                   | 100 ms | 200 ms |
| Analog I/O (with HART communication)    | 100 ms                  | 200 ms | 400 ms |

\*1: HART communication refers to HART variable communication, on-demand communication, and hand held terminal (HHT) communication.

\*2: It is possible to connect only input devices. This connection does not support analog data value nor burst function.

\*3: Field control units (AFV30□ and AFV40□) do not support ER bus node unit (ANR10□).

● **HART Communication Specifications**

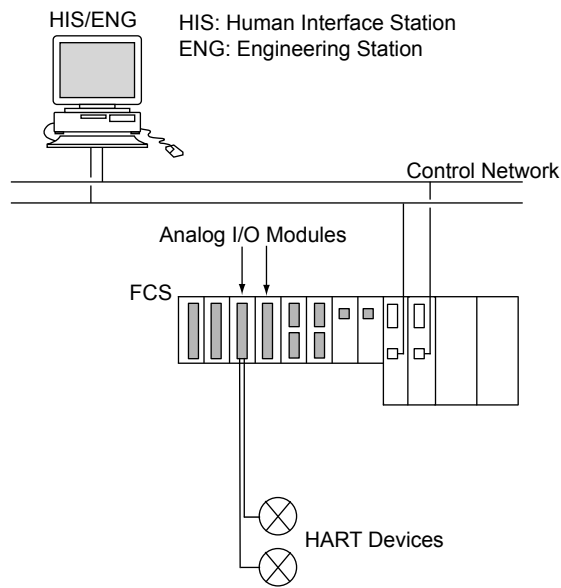
**Table HART Communication Specifications**

| Function               | Description  |
|------------------------|--|
| Communication mode     | Serial half duplex, start-stop synchronization, 1 start/ 8 bit/ odd parity/ 1 stop   |
| Applicable standard    | HART Protocol Revision 5.7 (*1)  |
| Transmission speed     | 1200 ±2 bps  |
| Modulation technique   | Binary phase-continuous FSK<br>1: 1200 Hz ±1 %, 0: 2200 Hz ±1%   |
| Frame length           | 5 to 267 bytes<br>Contents of max. 267 bytes:<br>Delimiter: 1<br>Address: 5<br>Command: 1<br>Byte count: 1<br>Data: 255 (includes two bytes of response code)<br>Check byte: 1 |
| Frame detection        | 3 byte header byte-count carrier (ON/OFF)<br>Preamble: 5 to 20 bytes   |
| Error detection coding | Longitudinal/vertical parity   |
| Response time          | Max. 28 characters (256.7 ms)  |
| No response timer      | 33 characters (305 ms) for primary, 41 characters (380 ms) for secondary   |
| Bus monitor            | 8 characters (75 ms)   |
| Response window        | 20 ms  |

\*1: The HART 5, 6, and 7 devices can be connected but applying the HART protocol 5.7 function.

● **HART Communication System Configuration**

The analog I/O modules (with HART communication function) can be configured dual-redundant by placing the two modules in the adjacent slots (odd number and even number slots) on the same node unit.

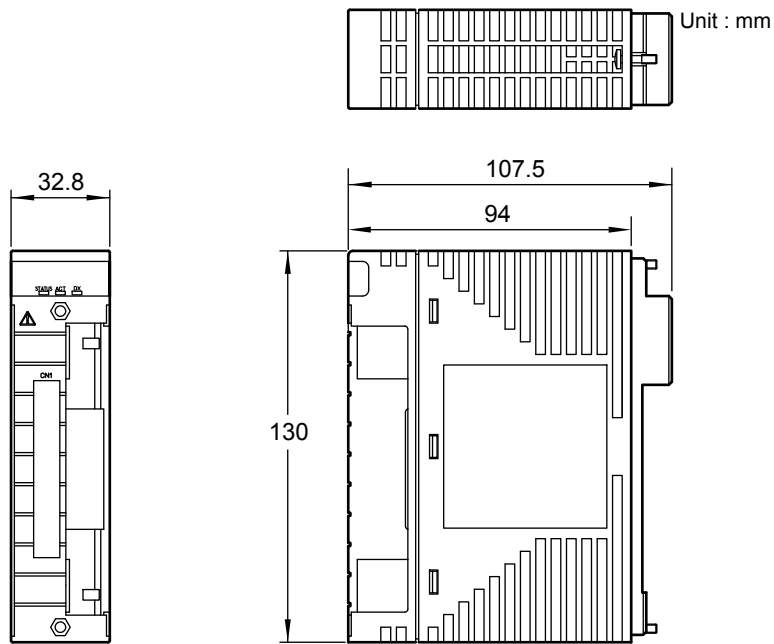


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**Figure HART Communication System Configuration (Dual-redundant)**

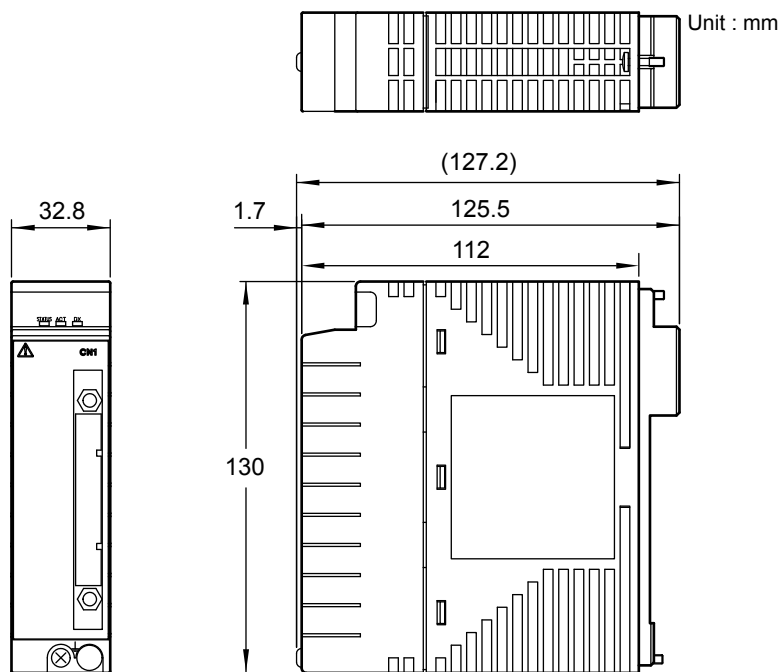
### EXTERNAL DIMENSIONS

- AAI141, AAV141, AAV142, AAV144, AAI841, AAB841, AAV542, AAV544, AAI143, AAI543, AAT141, AAR181, AAI135, AAI835, AAP135, AAB141, AAB842



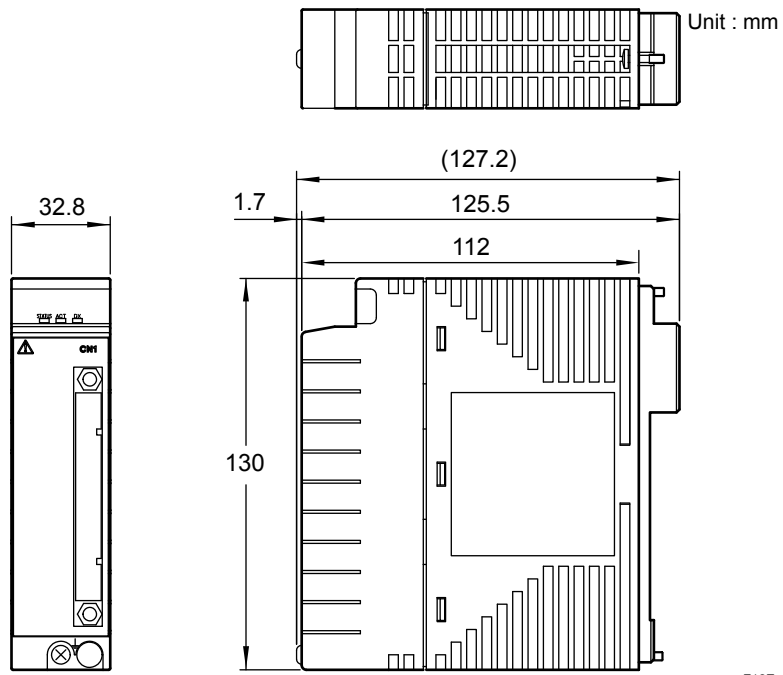
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- AAT145, AAP849

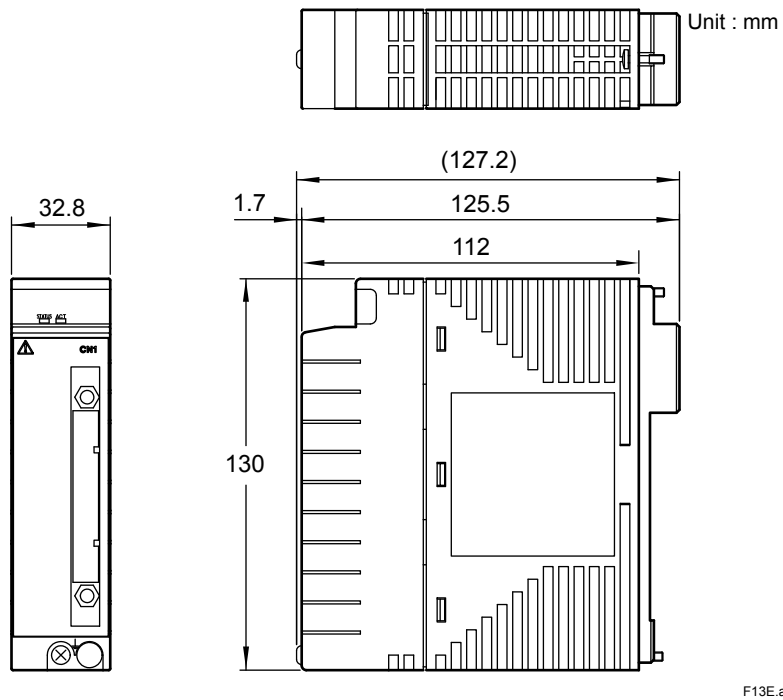


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● AAR145



● AAP149





■ MODEL AND SUFFIX CODES

|                     |        | Description   |
|---------------------|--------|---|
| <b>Model</b>        | AAI141 | Analog Input Module (4 to 20 mA, 16-channel, Non-Isolated)                            |
| <b>Suffix Codes</b> | -S     | Standard type   |
|                     | -H     | With digital communication (HART protocol)  |
|                     | 5      | With no explosion protection  |
|                     | E      | With explosion protection   |
|                     | 0      | Basic type  |
| <b>Option Codes</b> | 3      | With ISA Standard G3 option and temperature (-20 to 70 °C) option                     |
|                     | /K4A00 | With KS Cable Interface Adapter [Model: ATK4A-00]                                     |
|                     | /A4S00 | With Pressure Clamp Terminal Block for Analog [Model: ATA4S-00]                       |
|                     | /A4S10 | With Pressure Clamp Terminal Block for Analog (surge absorber) [Model: ATA4S-10]      |
|                     | /A4D00 | With Dual Pressure Clamp Terminal Block for Analog [Model: ATA4D-00]                  |
|                     | /A4D10 | With Dual Pressure Clamp Terminal Block for Analog (surge absorber) [Model: ATA4D-10] |
|                     | /CCC01 | With Connector Cover for MIL Cable [Model: ACCC01]                                    |

|                     |        | Description   |
|---------------------|--------|---|
| <b>Model</b>        | AAV141 | Analog Input Module (1 to 5 V, 16-channel, Non-Isolated)                              |
| <b>Suffix Codes</b> | -S     | Standard type   |
|                     | 5      | With no explosion protection  |
|                     | E      | With explosion protection   |
|                     | 0      | Basic type  |
|                     | 3      | With ISA Standard G3 option and temperature (-20 to 70 °C) option                     |
| <b>Option Codes</b> | /K4A00 | With KS Cable Interface Adapter [Model: ATK4A-00]                                     |
|                     | /A4S00 | With Pressure Clamp Terminal Block for Analog [Model: ATA4S-00]                       |
|                     | /A4S10 | With Pressure Clamp Terminal Block for Analog (surge absorber) [Model: ATA4S-10]      |
|                     | /A4D00 | With Dual Pressure Clamp Terminal Block for Analog [Model: ATA4D-00]                  |
|                     | /A4D10 | With Dual Pressure Clamp Terminal Block for Analog (surge absorber) [Model: ATA4D-10] |
|                     | /CCC01 | With Connector Cover for MIL Cable [Model: ACCC01]                                    |

|                     |        | Description   |
|---------------------|--------|---|
| <b>Model</b>        | AAV142 | Analog Input Module (-10 to +10 V, 16-channel, Non-Isolated)                          |
| <b>Suffix Codes</b> | -S     | Standard type   |
|                     | 5      | With no explosion protection  |
|                     | E      | With explosion protection   |
|                     | 0      | Basic type  |
|                     | 3      | With ISA Standard G3 option and temperature (-20 to 70 °C) option                     |
| <b>Option Codes</b> | /K4A00 | With KS Cable Interface Adapter [Model: ATK4A-00]                                     |
|                     | /A4S00 | With Pressure Clamp Terminal Block for Analog [Model: ATA4S-00]                       |
|                     | /A4S10 | With Pressure Clamp Terminal Block for Analog (surge absorber) [Model: ATA4S-10]      |
|                     | /A4D00 | With Dual Pressure Clamp Terminal Block for Analog [Model: ATA4D-00]                  |
|                     | /A4D10 | With Dual Pressure Clamp Terminal Block for Analog (surge absorber) [Model: ATA4D-10] |
|                     | /CCC01 | With Connector Cover for MIL Cable [Model: ACCC01]                                    |

|                     |        | Description   |
|---------------------|--------|---|
| <b>Model</b>        | AAB141 | Analog Input Module (1 to 5 V/4 to 20 mA, 16-channel, Non-Isolated) |
| <b>Suffix Codes</b> | -H     | With digital communication (HART protocol)                          |
|                     | 5      | With no explosion protection  |
|                     | E      | With explosion protection   |
|                     | 0      | Basic type  |
|                     | 3      | With ISA Standard G3 option and temperature (-20 to 70 °C) option   |
| <b>Option Codes</b> | /K4A00 | With KS Cable Interface Adapter [Model: ATK4A-00]                   |

|                     |        | Description   |
|---------------------|--------|---|
| <b>Model</b>        | AAI841 | Analog I/O Module<br>(4 to 20 mA input , 4 to 20 mA output, 8-channel input/8-channel output, Non-Isolated) |
| <b>Suffix Codes</b> | -S     | Standard type   |
|                     | -H     | With digital communication (HART protocol)  |
|                     | 5      | With no explosion protection  |
|                     | E      | With explosion protection   |
|                     | 0      | Basic type  |
| <b>Option Codes</b> | 3      | With ISA Standard G3 option and temperature (-20 to 70 °C) option   |
|                     | /K4A00 | With KS Cable Interface Adapter [Model : ATK4A-00]  |
|                     | /A4S00 | With Pressure Clamp Terminal Block for Analog [Model : ATA4S-00]  |
|                     | /A4S10 | With Pressure Clamp Terminal Block for Analog (surge absorber) [Model : ATA4S-10]                           |
|                     | /A4D00 | With Dual Pressure Clamp Terminal Block for Analog [Model : ATA4D-00]                                       |
|                     | /A4D10 | With Dual Pressure Clamp Terminal Block for Analog (surge absorber) [Model : ATA4D-10]                      |
|                     | /CCC01 | With Connector Cover for MIL Cable [Model : ACCC01]   |

|                     |        | Description   |
|---------------------|--------|---|
| <b>Model</b>        | AAB841 | Analog I/O Module (1 to 5 V input, 4 to 20 mA output, 8-channel input/8-channel output, Non-Isolated) |
| <b>Suffix Codes</b> | -S     | Standard type   |
|                     | 5      | With no explosion protection  |
|                     | E      | With explosion protection   |
|                     | 0      | Basic type  |
|                     | 3      | With ISA Standard G3 option and temperature (-20 to 70 °C) option                                     |
| <b>Option Codes</b> | /K4A00 | With KS Cable Interface Adapter [Model : ATK4A-00]  |
|                     | /M4A00 | With MAC2 Compatible Adapter [Model : ATM4A-00]   |
|                     | /V4A00 | With VM2 Compatible Adapter [Model : ATV4A-00] (*1)   |
|                     | /A4S00 | With Pressure Clamp Terminal Block for Analog [Model : ATA4S-00]                                      |
|                     | /A4S10 | With Pressure Clamp Terminal Block for Analog (surge absorber) [Model : ATA4S-10]                     |
|                     | /A4D00 | With Dual Pressure Clamp Terminal Block for Analog [Model : ATA4D-00]                                 |
|                     | /A4D10 | With Dual Pressure Clamp Terminal Block for Analog (surge absorber) [Model : ATA4D-10]                |
|                     |        | /CCC01  |

\*1: When using this adapter, 4 to 20 mA output (8-channel) of AAB841 varies to 1 to 5 V output.

|                     |        | Description   |
|---------------------|--------|---|
| <b>Model</b>        | AAB842 | Analog I/O Module<br>(1 to 5 V/4 to 20 mA input, 4 to 20 mA output, 8-channel input/8-channel output, Non-Isolated) |
| <b>Suffix Codes</b> | -H     | With digital communication (HART protocol)  |
|                     | 5      | With no explosion protection  |
|                     | E      | With explosion protection   |
|                     | 0      | Basic type  |
|                     | 3      | With ISA Standard G3 option and temperature (-20 to 70 °C) option   |
| <b>Option Codes</b> | /M4A00 | With MAC2 Compatible Adapter [Model : ATM4A-00]   |
|                     | /V4A00 | With VM2 Compatible Adapter [Model : ATV4A-00] (*1)   |

\*1: When using this adapter, 4 to 20 mA output (8-channel) of AAB842 varies to 1 to 5 V output.

|                     |        | Description  |
|---------------------|--------|--|
| <b>Model</b>        | AAV542 | Analog Output Module (-10 to +10 V, 16-channel, Non-Isolated)                          |
| <b>Suffix Codes</b> | -S     | Standard Type  |
|                     | 5      | With no explosion protection   |
|                     | E      | With explosion protection  |
|                     | 0      | Basic type   |
|                     | 3      | With ISA Standard G3 option and temperature (-20 to 70 °C) option                      |
| <b>Option Codes</b> | /K4A00 | With KS Cable Interface Adapter [Model : ATK4A-00]                                     |
|                     | /A4S00 | With Pressure Clamp Terminal Block for Analog [Model : ATA4S-00]                       |
|                     | /A4S10 | With Pressure Clamp Terminal Block for Analog (surge absorber) [Model : ATA4S-10]      |
|                     | /A4D00 | With Dual Pressure Clamp Terminal Block for Analog [Model : ATA4D-00]                  |
|                     | /A4D10 | With Dual Pressure Clamp Terminal Block for Analog (surge absorber) [Model : ATA4D-10] |
|                     |        | /CCC01   |

|                     |  | Description   |
|---------------------|--|---|
| <b>Model</b>        | AAI143   | Analog Input Module (4 to 20 mA, 16-channel, Isolated)                                  |
| <b>Suffix Codes</b> | -S   | Standard type   |
|                     | -H   | With digital communication (HART protocol)  |
|                     | 5  | With no explosion protection  |
|                     | E  | With explosion protection   |
|                     | 0  | Basic type  |
| <b>Option Codes</b> | 3  | With ISA Standard G3 option and temperature (-20 to 70 °C) option                       |
|                     | /K4A00   | With KS Cable Interface Adapter (For connecting AEA4D Terminal Board) [Model: ATK4A-00] |
|                     | /A4S00   | With Pressure Clamp Terminal Block [Model: ATA4S-00]                                    |
|                     | /A4S10   | With Pressure Clamp Terminal Block (surge absorber) [Model: ATA4S-10]                   |
|                     | /A4D00   | With Dual Pressure Clamp Terminal Block [Model: ATA4D-00]                               |
| /A4D10              | With Dual Pressure Clamp Terminal Block (surge absorber) [Model: ATA4D-10] |   |
| /CCC01              | With Connector Cover for MIL Cable [Model: ACCC01]                         |   |

|                     |        | Description   |
|---------------------|--------|---|
| <b>Model</b>        | AAI543 | Analog Output Module (4 to 20 mA, 16-channel, Isolated)                                   |
| <b>Suffix Codes</b> | -S     | Standard type   |
|                     | -H     | With digital communication (HART protocol)  |
|                     | 5      | Standard switch-over response in redundant configuration with no explosion protection(*1) |
|                     | 6      | Fast switch-over response in redundant configuration with no explosion protection(*2)     |
|                     | E      | Standard switch-over response in redundant configuration with explosion protection(*1)    |
|                     | F      | Fast switch-over response in redundant configuration with explosion protection(*2)        |
|                     | 0      | Basic type  |
|                     | 1      | With ISA Standard G3 option   |
| <b>Option Codes</b> | 3      | With ISA Standard G3 option and temperature (-20 to 70 °C) option                         |
|                     | /K4A00 | With KS Cable Interface Adapter (For connecting AEA4D Terminal Board) [Model: ATK4A-00]   |
|                     | /A4S00 | With Pressure Clamp Terminal Block [Model: ATA4S-00]                                      |
|                     | /A4S10 | With Pressure Clamp Terminal Block (surge absorber) [Model: ATA4S-10]                     |
|                     | /A4D00 | With Dual Pressure Clamp Terminal Block [Model: ATA4D-00]                                 |
|                     | /A4D10 | With Dual Pressure Clamp Terminal Block (surge absorber) [Model: ATA4D-10]                |
|                     | /CCC01 | With Connector Cover for MIL Cable [Model: ACCC01]  |

\*1: If "standard switch-over response in redundant configuration" is selected, "basic type" or "with ISA Standard G3 option and temperature (-20 to 70 °C) option" may be specified.

\*2: If "fast switch-over response in redundant configuration" is selected, "basic type" or "with ISA Standard G3 option" may be specified.

|                     |        | Description   |
|---------------------|--------|---|
| <b>Model</b>        | AAV144 | Analog Input Module (-10 to +10 V, 16-channel, Isolated)                              |
| <b>Suffix Codes</b> | -S     | Standard type   |
|                     | 5      | With no explosion protection  |
|                     | E      | With explosion protection   |
|                     | 0      | Basic type  |
| <b>Option Codes</b> | 3      | With ISA Standard G3 option and temperature (-20 to 70 °C) option                     |
|                     | /K4A00 | With KS Cable Interface Adapter [Model: ATK4A-00]                                     |
|                     | /A4S00 | With Pressure Clamp Terminal Block for Analog [Model: ATA4S-00]                       |
|                     | /A4S10 | With Pressure Clamp Terminal Block for Analog (surge absorber) [Model: ATA4S-10]      |
|                     | /A4D00 | With Dual Pressure Clamp Terminal Block for Analog [Model: ATA4D-00]                  |
|                     | /A4D10 | With Dual Pressure Clamp Terminal Block for Analog (surge absorber) [Model: ATA4D-10] |
|                     | /CCC01 | With Connector Cover for MIL Cable [Model: ACCC01]                                    |

|                     |        | Description  |
|---------------------|--------|--|
| <b>Model</b>        | AAV544 | Analog Output Module (-10 to +10 V, 16-channel, Isolated)                              |
| <b>Suffix Codes</b> | -S     | Standard Type  |
|                     | 5      | With no explosion protection   |
|                     | E      | With explosion protection  |
|                     | 0      | Basic type   |
|                     | 3      | With ISA Standard G3 option and temperature (-20 to 70 °C) option                      |
| <b>Option Codes</b> | /K4A00 | With KS Cable Interface Adapter [Model : ATK4A-00]                                     |
|                     | /A4S00 | With Pressure Clamp Terminal Block for Analog [Model : ATA4S-00]                       |
|                     | /A4S10 | With Pressure Clamp Terminal Block for Analog (surge absorber) [Model : ATA4S-10]      |
|                     | /A4D00 | With Dual Pressure Clamp Terminal Block for Analog [Model : ATA4D-00]                  |
|                     | /A4D10 | With Dual Pressure Clamp Terminal Block for Analog (surge absorber) [Model : ATA4D-10] |
|                     | /CCC01 | With Connector Cover for MIL Cable [Model : ACCC01]                                    |

|                     |        | Description  |
|---------------------|--------|--|
| <b>Model</b>        | AAT141 | TC/mV Input Module (16-channel, Isolated)  |
| <b>Suffix Codes</b> | -S     | Standard type  |
|                     | 5      | With no explosion protection   |
|                     | E      | With explosion protection  |
|                     | 0      | Basic type   |
|                     | 3      | With ISA Standard G3 option and temperature (-20 to 70 °C) option                              |
| <b>Option Codes</b> | /T4S00 | With Pressure Clamp Terminal Block for Thermocouple/mV [Model: ATT4S-00]                       |
|                     | /T4S10 | With Pressure Clamp Terminal Block for Thermocouple/mV (surge absorber) [Model: ATT4S-10]      |
|                     | /T4D00 | With Dual Pressure Clamp Terminal Block for Thermocouple/mV [Model: ATT4D-00]                  |
|                     | /T4D10 | With Dual Pressure Clamp Terminal Block for Thermocouple/mV (surge absorber) [Model: ATT4D-10] |
|                     | /CCC01 | With Connector Cover for MIL Cable [Model: ACCC01]   |

|                     |        | Description  |
|---------------------|--------|--|
| <b>Model</b>        | AAR181 | RTD Input Module (12-channel, Isolated)  |
| <b>Suffix Codes</b> | -S     | Standard type  |
|                     | 5      | With no explosion protection   |
|                     | E      | With explosion protection  |
|                     | 0      | Basic type   |
|                     | 3      | With ISA Standard G3 option and temperature (-20 to 70 °C) option                  |
| <b>Option Codes</b> | /R8S00 | With Pressure Clamp Terminal Block for RTD [Model: ATR8S-00]                       |
|                     | /R8S10 | With Pressure Clamp Terminal Block for RTD (surge absorber) [Model: ATR8S-10]      |
|                     | /R8D00 | With Dual Pressure Clamp Terminal Block for RTD [Model: ATR8D-00]                  |
|                     | /R8D10 | With Dual Pressure Clamp Terminal Block for RTD (surge absorber) [Model: ATR8D-10] |
|                     | /CCC01 | With Connector Cover for MIL Cable [Model: ACCC01]                                 |

|                     |        | Description  |
|---------------------|--------|--|
| <b>Model</b>        | AAI135 | Analog Input Module (4 to 20 mA, 8-channel, Isolated channels)                                 |
| <b>Suffix Codes</b> | -S     | Standard type  |
|                     | -H     | With digital communication (HART protocol)   |
|                     | 5      | With no explosion protection   |
|                     | E      | With explosion protection  |
|                     | 0      | Basic type   |
|                     | 3      | With ISA Standard G3 option and temperature (-20 to 70 °C) option                              |
| <b>Option Codes</b> | /I3A00 | With KS Cable Interface Adapter [Model: ATI3A-00]  |
|                     | /K4A00 | With KS Cable Interface Adapter [Model: ATK4A-00]  |
|                     | /I3S00 | With Pressure Clamp Terminal Block for Isolated Analog [Model: ATI3S-00]                       |
|                     | /I3S10 | With Pressure Clamp Terminal Block for Isolated Analog (surge absorber) [Model: ATI3S-10]      |
|                     | /I3D00 | With Dual Pressure Clamp Terminal Block for Isolated Analog [Model: ATI3D-00]                  |
|                     | /I3D10 | With Dual Pressure Clamp Terminal Block for Isolated Analog (surge absorber) [Model: ATI3D-10] |
|                     | /CCC01 | With Connector Cover for MIL Cable [Model: ACCC01]   |

|                     |  | Description  |
|---------------------|--|--|
| <b>Model</b>        | AAI835   | Analog I/O Module (4 to 20 mA, 4-channel input/4-channel output, Isolated channels)            |
| <b>Suffix Codes</b> | -S   | Standard type  |
|                     | -H   | With digital communication (HART protocol)   |
|                     | 5  | With no explosion protection   |
|                     | E  | With explosion protection  |
|                     | 0  | Basic type   |
| <b>Option Codes</b> | 3  | With ISA Standard G3 option and temperature (-20 to 70 °C) option                              |
|                     | /B3A00   | With KS Cable Interface Adapter [Model: ATB3A-00]  |
|                     | /K4A00   | With KS Cable Interface Adapter [Model: ATK4A-00]  |
|                     | /I3S00   | With Pressure Clamp Terminal Block for Isolated Analog [Model: ATI3S-00]                       |
|                     | /I3S10   | With Pressure Clamp Terminal Block for Isolated Analog (surge absorber) [Model: ATI3S-10]      |
|                     | /I3D00   | With Dual Pressure Clamp Terminal Block for Isolated Analog [Model: ATI3D-00]                  |
|                     | /I3D10   | With Dual Pressure Clamp Terminal Block for Isolated Analog (surge absorber) [Model: ATI3D-10] |
| /CCC01              | With Connector Cover for MIL Cable [Model: ACCC01] |  |

|                     |        | Description   |
|---------------------|--------|---|
| <b>Model</b>        | AAT145 | TC/mV Input Module (16-channel, Isolated channels)                |
| <b>Suffix Codes</b> | -S     | Standard type   |
|                     | 5      | With no explosion protection                                      |
|                     | E      | With explosion protection   |
|                     | 0      | Basic type  |
|                     | 3      | With ISA Standard G3 option and temperature (-20 to 70 °C) option |

|                     |        | Description   |
|---------------------|--------|---|
| <b>Model</b>        | AAR145 | RTD/POT Input Module (16-channel, Isolated channels)              |
| <b>Suffix Codes</b> | -S     | Standard type   |
|                     | 5      | With no explosion protection                                      |
|                     | E      | With explosion protection   |
|                     | 0      | Basic type  |
|                     | 3      | With ISA Standard G3 option and temperature (-20 to 70 °C) option |

|                     |  | Description  |
|---------------------|--|--|
| <b>Model</b>        | AAP135   | Pulse Input Module (8-channel, Pulse count, 0 to 10 kHz, Isolated channels)          |
| <b>Suffix Codes</b> | -S   | Standard type  |
|                     | 5  | With no explosion protection   |
|                     | E  | With explosion protection  |
|                     | 0  | Basic type   |
|                     | 3  | With ISA Standard G3 option and temperature (-20 to 70 °C) option                    |
| <b>Option Codes</b> | /I3A00   | With KS Cable Interface Adapter [Model: ATI3A-00]                                    |
|                     | /K4A00   | With KS Cable Interface Adapter [Model: ATK4A-00]                                    |
|                     | /I3S00   | With Pressure Clamp Terminal Block for Pulse [Model: ATI3S-00]                       |
|                     | /I3S10   | With Pressure Clamp Terminal Block for Pulse (surge absorber) [Model: ATI3S-10]      |
|                     | /I3D00   | With Dual Pressure Clamp Terminal Block for Pulse [Model: ATI3D-00]                  |
|                     | /I3D10   | With Dual Pressure Clamp Terminal Block for Pulse (surge absorber) [Model: ATI3D-10] |
| /CCC01              | With Connector Cover for MIL Cable [Model: ACCC01] |  |

|                     |        | Description   |
|---------------------|--------|---|
| <b>Model</b>        | AAP149 | Pulse Input Module PM1 compatible (16-channel, Pulse count, 0 to 6 kHz, Non-Isolated) |
| <b>Suffix Codes</b> | -S     | Standard type   |
|                     | 0      | Always 0  |
|                     | 0      | Basic type  |
|                     | 1      | With ISA Standard G3 option   |

|                     |        | Description   |
|---------------------|--------|---|
| <b>Model</b>        | AAP849 | Pulse Input Module/ Analog Output Module for compatible PAC<br>(Pulse count Input, 4 to 20 mA output, 8-channel input / 8-channel output, Non-Isolated) |
| <b>Suffix Codes</b> | -S     | Standard type   |
|                     | 0      | Always 0  |
|                     | 0      | Basic type  |
|                     | 1      | With ISA Standard G3 option   |

### ■ ORDERING INFORMATION

Specify the model and suffix codes.

For selecting the right products for explosion protection, please refer to TI 33Q01J30-01E without fail.

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