# Yokogawa AAI543-S00 S1

## Technical Reference

Yokogawa AAI543-S00 S1 is a standard 16-channel isolated analog output module for 4 to 20 mA field loops.

### PRODUCT ROLE AND VERIFIED FEATURES

**Feature 1**

Drives sixteen independent 4 to 20 mA loops.

**Feature 2**

Provides channel isolation for every output path.

**Feature 3**

Updates output commands every 10 ms.

**Feature 4**

Supports pressure-clamp, MIL-cable and KS-cable field interfaces.

### VERIFIED DATA SNAPSHOT

| | |
|---|---|
| **Output channels** | 16 |
| **Output signal** | 4 to 20 mA DC |
| **Channel isolation** | Isolated |
| **Output update period** | 10 ms |
| **Settling time** | 60 ms |
| **Load resistance** | 0 to 750 ohms |
| **Open-circuit behavior** | Output open-circuit detection |
| **External connection** | Pressure clamp terminal, MIL cable or KS cable |

### SYSTEM RELATIONSHIP

**Ovation controller** → **Output electronics** → **Personality module** → **Analog field loop**

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# Technical profile

Verified technical values for the complete product string are arranged below for selection and engineering review.

| | |
|---|---|
| **Output channels** | 16 |
| **Output signal** | 4 to 20 mA DC |
| **Channel isolation** | Isolated |
| **Output update period** | 10 ms |
| **Settling time** | 60 ms |
| **Load resistance** | 0 to 750 ohms |
| **Open-circuit behavior** | Output open-circuit detection |
| **External connection** | Pressure clamp terminal, MIL cable or KS cable |

## SELECTION ANCHORS

- Drives sixteen independent 4 to 20 mA loops.
- Provides channel isolation for every output path.
- Updates output commands every 10 ms.
- Supports pressure-clamp, MIL-cable and KS-cable field interfaces.

**IMPORTANT NOTICE** Use the values as one matched configuration. Do not substitute a nearby ordering code without a separate check.

## CONFIGURATION CONTROL

| | |
|---|---|
| **Configuration identity** | Yokogawa AAI543-S00 S1 |
| **Technical boundary** | Apply only the functions and interfaces shown for this product or its identified system family. |
| **Selection control** | Match the complete ordering string and installed interfaces before purchase or installation. |

## ADDITIONAL ENGINEERING CHECKS

| | |
|---|---|
| **How does Yokogawa AAI543-S00 S1 report a broken output loop?** | The module provides output open-circuit detection for the affected channel. |
| **Which field interfaces can terminate Yokogawa AAI543-S00 S1?** | Pressure-clamp terminal blocks, MIL connector cabling and the dedicated KS cable arrangement are documented. |

# System role and architecture

**Ovation controller** → **Output electronics** → **Personality module** → **Analog field loop**

## APPLICATION POINTS

**Control-valve positioning**

Sends independent 4 to 20 mA commands to final control elements.

**Drive and actuator reference**

Provides current references to supported field devices.

**Redundant FIO output**

Maintains analog commands in the documented redundant module arrangement.

**Sixteen-loop cabinet retrofit**

Replaces a matched output module while retaining field terminations.

## INTEGRATION RECORD

| | |
|---|---|
| **Identity** | Record the complete marking and installed position. |
| **Mechanical interface** | Confirm mounting, support, clearance and connector engagement. |
| **Electrical interface** | Confirm signal path, shield, common and receiving-channel assignment. |
| **Configuration** | Retain the controlled channel settings and acceptance criteria. |
| **Functional evidence** | Record the expected static value, dynamic response and system status. |

AAI543-S00 S1 should be matched to the documented system position, companion hardware and retained project configuration before the channel or station is returned to control.

## ENGINEERING REVIEW QUESTIONS

| | |
|---|---|
| **How many current outputs are available on Yokogawa AAI543-S00 S1?** | The module provides sixteen analog output channels. |
| **Which command signal is generated by Yokogawa AAI543-S00 S1?** | Each channel produces a 4 to 20 mA DC output. |
| **Does Yokogawa AAI543-S00 S1 isolate its output channels?** | Yes. The AAI543 architecture provides isolated output channels. |
| **How often does Yokogawa AAI543-S00 S1 update its outputs?** | The documented output update period is 10 ms. |

# Engineering checks and acceptance

## PRODUCT PRECAUTIONS

| | |
|---|---|
| 01 | Confirm AAI543-S00 S1 and the assigned redundant position. |
| 02 | Record all sixteen loop tags and safe output requirements. |
| 03 | Place final elements in the approved manual or maintenance state. |
| 04 | Remove field power before changing terminal or cable connections. |
| 05 | Preserve polarity, shields and isolated channel conductors. |
| 06 | Inspect the terminal block and cable interface for full engagement. |
| 07 | Drive controlled output points and compare field current. |
| 08 | Confirm open-circuit diagnostics and final-element response before release. |

## RELEASE EVIDENCE

| | |
|---|---|
| **Exact identity** | Product marking and intended system position agree. |
| **Interface condition** | Mounting, connectors, terminals and cable routing are secure. |
| **Signal response** | The expected static and dynamic behavior has been observed. |
| **Protection state** | Channel status, alarms and controlled bypass state are restored. |

| | |
|---|---|
| **IMPORTANT NOTICE** | Confirm the complete AAI543-S00 S1 marking, assigned system position and mating interfaces before installation. |

## APPLICATION BOUNDARIES

| | |
|---|---|
| **Control-valve positioning** | Sends independent 4 to 20 mA commands to final control elements. |
| **Drive and actuator reference** | Provides current references to supported field devices. |
| **Redundant FIO output** | Maintains analog commands in the documented redundant module arrangement. |
| **Sixteen-loop cabinet retrofit** | Replaces a matched output module while retaining field terminations. |

# Technical questions and related models

## MODEL-SPECIFIC QUESTIONS

| | |
|---|---|
| **How many current outputs are available on Yokogawa AAI543-S00 S1?** | The module provides sixteen analog output channels. |
| **Which command signal is generated by Yokogawa AAI543-S00 S1?** | Each channel produces a 4 to 20 mA DC output. |
| **Does Yokogawa AAI543-S00 S1 isolate its output channels?** | Yes. The AAI543 architecture provides isolated output channels. |
| **How often does Yokogawa AAI543-S00 S1 update its outputs?** | The documented output update period is 10 ms. |
| **What settling time applies to Yokogawa AAI543-S00 S1?** | The documented settling time is 60 ms. |
| **Which loop load can Yokogawa AAI543-S00 S1 drive?** | The published load resistance range is 0 to 750 ohms. |

## RELATED MODELS ON APTERPOWER

| | |
|---|---|
| Yokogawa EB401-50 S1 | Related product reference. Review the complete ordering string before selection. |
| Yokogawa ALF111-S50 S1 | Related product reference. Compare the required interface and system position. |
| Yokogawa ET5*B | Related product reference. Confirm the execution independently for the intended task. |

## CONFIGURATION AND SELECTION RECORD

| | |
|---|---|
| **Configuration identity** | Yokogawa AAI543-S00 S1 |
| **Technical boundary** | Apply only the functions and interfaces shown for this product or its identified system family. |
| **Selection control** | Match the complete ordering string and installed interfaces before purchase or installation. |

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## ● 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:

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

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*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 ºC 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.

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## ■ 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.

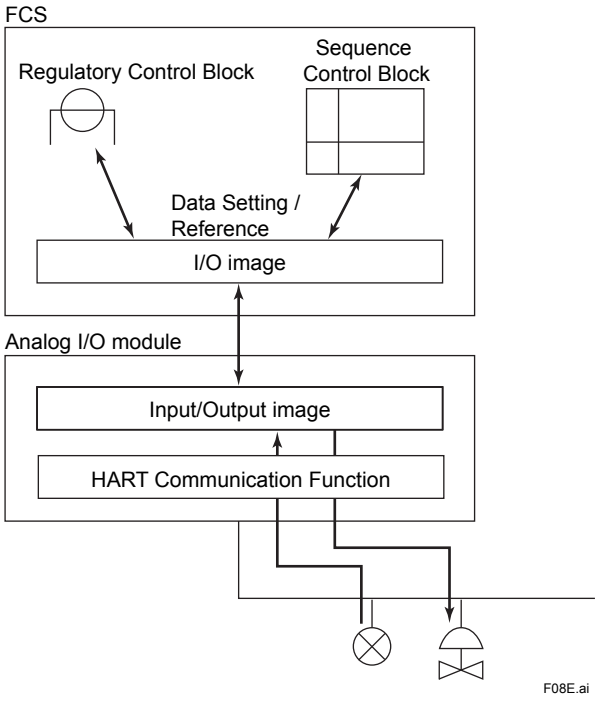
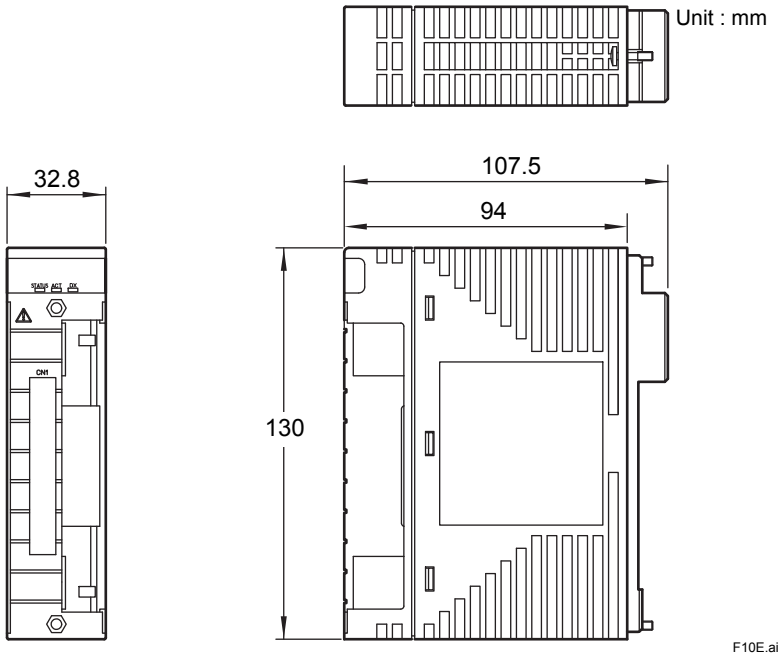



**Figure Process Data Flow of HART Communications**

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## ■ EXTERNAL DIMENSIONS

### ● AAI141, AAV141, AAV144, AAI841, AAB841, AAV544, AAI143, AAI543, AAI135, AAI835, AAP135, AAB141, AAB842

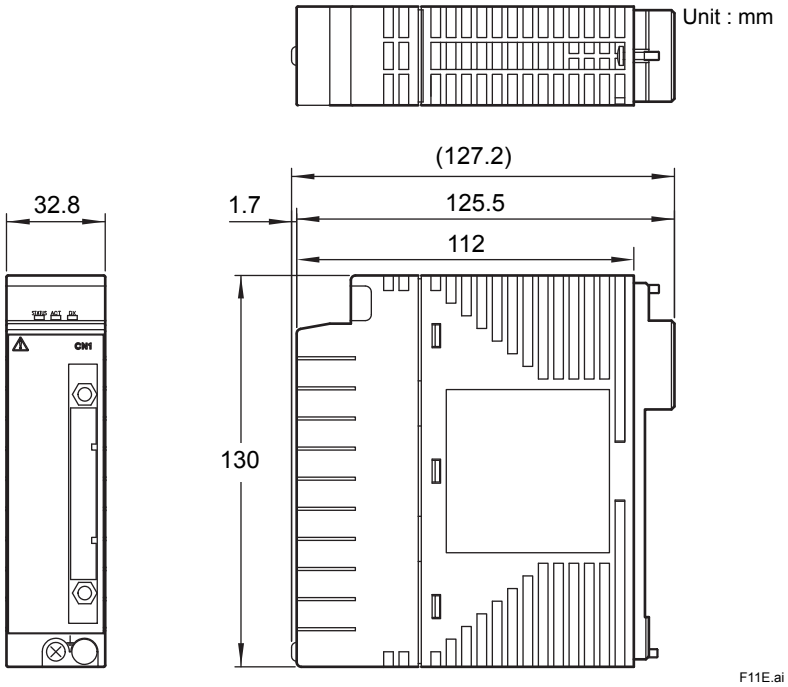



Nominal Tolerances :

When the reference dimension is over 0.5 mm and equal or less than 120 mm, its nominal tolerance is ± 0.8 mm, while its combination of nominal tolerance is ± 1.5 mm.

When the reference dimension is over 120 mm, its nominal tolerance is in accordance with JEM 1459.

### ● AAT145, AAP849




Nominal Tolerances :

When the reference dimension is over 0.5 mm and equal or less than 120 mm, its nominal tolerance is ± 0.8 mm, while its combination of nominal tolerance is ± 1.5 mm.

When the reference dimension is over 120 mm, its nominal tolerance is in accordance with JEM 1459.

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| | | Description |
|---|---|---|
| **Model** | AAI543 | Analog Output Module (4 to 20 mA, 16-channel, Isolated) |
| **Suffix Codes** | -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 |
| | 3 | With ISA Standard G3 option and temperature (-20 to 70 °C) option |
| **Option Codes** | /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 |
|---|---|---|
| **Model** | AAV144 | Analog Input Module (-10 to +10 V, 16-channel, Isolated) |
| **Suffix Codes** | -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 |
| **Option Codes** | /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 |
|---|---|---|
| **Model** | AAV544 | Analog Output Module (-10 to +10 V, 16-channel, Isolated) |
| **Suffix Codes** | -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 |
| **Option Codes** | /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] |

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