MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

YOKOGAWA

SAI143-H63/PRP S3

HART ANALOG INPUT MODULE

Used with the applicable ProSafe-RS FIO configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: Yokogawa SAI143-H63-PRP S3

General Specifications

Analog I/O Modules (for FIO)

ProSafe-RS

GS 32Q06K30-31E

■ GENERAL

This GS describes the hardware specifications of the analog I/O modules that can be mounted on the safety node unit and the safety control unit.

■ STANDARD SPECIFICATIONS

● **Current Input Module**

This module inputs 4 to 20 mA signals from the field.

The SAI143 can be made dual redundant.

Item	Specifications
Model	SAI143 (*1)
Number of input channels	16 channels, module isolation (*5)
Rated input range	4 to 20 mA
Permissible input range	0 to 25 mA
Input impedance during Power-ON	$250\ \Omega + \frac{\text{Voltage drop in the input protection circuit inside the module}}{\text{Current value}}$ (*6)
Input impedance during Power-OFF	500 kΩ minimum
Rated accuracy	SAI143-S : ±16 μA (Input range 1 to 23 mA) SAI143-H : ±16 μA (Input range 0.05 to 23 mA) (*3) (*4)
Data update frequency	40 ms
Temperature drift	±16 μA/10 °C
Transmitter power supply	16.15 V minimum (at 20 mA) 26.4 V maximum (at 0 mA) (Output current limit: 25 mA)
2/4-wire setting	Individual channel setting Changed by setting pins
Withstand voltage	1.5 kV AC between input signal and system for 1 minute (*2)
Maximum current consumption	5 V system: 320 mA, 24 V system: 550 mA
Weight	Approx. 0.34 kg (For pressure clamp terminal block or MIL cable) Approx. 0.39 kg (With signal cable interface adapter)
External connection	Pressure clamp terminal MIL cable Dedicated signal cable
Support PRM	Available (SAI143-H)
Transmitter power supply ON/OFF function (*7)	Available in 2-wire setting, for all 16 channels at the same time.

*1: No Zener barriers can be connected to this module. An isolation barrier should be used when an intrinsic safety instrumented system is used.
*2: 500 V AC when dedicated signal cable is used.
*3: ±32 μA (input range under 0.05 mA) (Style code S3 or later)
*4: Rated accuracy of style code S3 or later is ±16 μA (Input range 0.05 to 23 mA).
Rated accuracy of style code S2 or earlier is ±16 μA (Input range 1 to 23 mA).
*5: When SAI143-S□3 or SAI143-H□C is used in the ambient temperature more than 60°C, number of input channels which a user can use is restricted. Refer to “ProSafe-RS Outline of I/O Modules (for FIO)” (GS 32P06K60-01EN).
*6: The maximum voltage drop in the input protection circuit is 0.45 V. The module input impedance varies from 272.5 Ω (20 mA) to 362.5 Ω (4 mA).
*7: This function enables to reset the alarm state of Fire and Gas devices by turning off the transmitter power supplied from this module in 2-wire setting.
Supported by R4.03.00 or later and style code S4 or later.

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GS 32Q06K30-31E
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10th Edition Apr. 26, 2017 (YK)

● Analog I/O Modules for HART Communication Function

The following table shows analog I/O modules for HART communication function available to ProSafe-RS.

Model	Module	Description
SAI143-H	Analog Input module (Current input)	4 to 20 mA, 16 channels, module isolation
SAI533-H	Analog Output module (Current output)	4 to 20 mA, 8 channels, module isolation

One HART device is connectable for each channel. Each channel is equipped with a power supply function to the HART device.

Each module has only one HART modem and is communicable concurrently with only one HART device.

● 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 1: 1200 Hz ±1 %, 0: 2200 Hz ±1%
Frame length	5 to 267 bytes Contents of max. 267 bytes: Delimiter: 1 Address: 5 Command: 1 Byte count: 1 Data: 255 (includes two bytes of response code) Check byte: 1
Frame detection	3 byte header byte-count carrier (ON/OFF) 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.

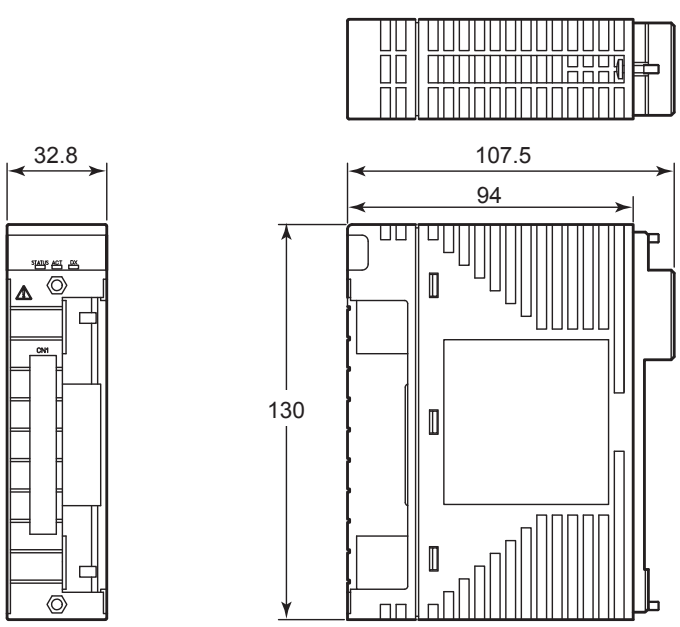
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■ EXTERNAL DIMENSIONS

● SAI143, SAV144 and SAI533 Analog Input/Output Modules

For pressure clamp and MIL cable

Unit : mm



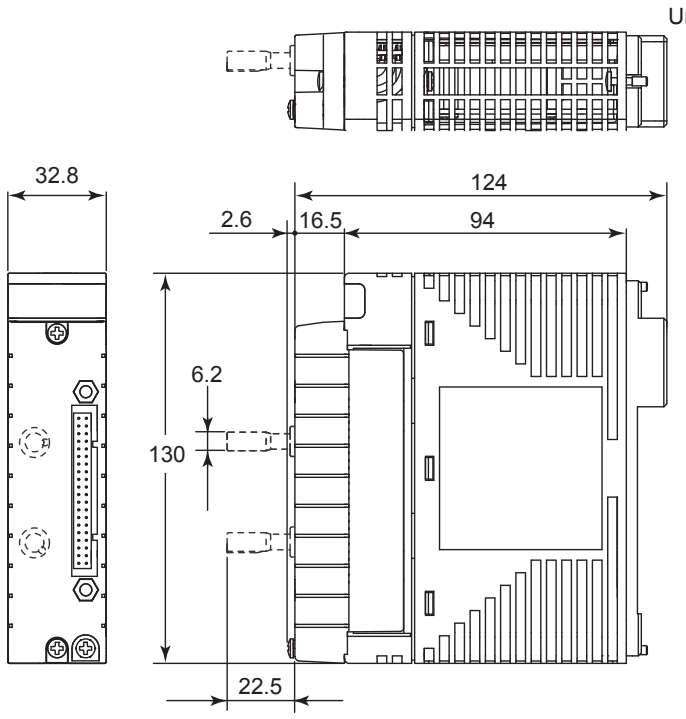
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Nominal tolerance:

Nominal tolerance is ± 0.8 mm for the dimensions of 0.5 mm or more and 120 mm or less, and the combined nominal tolerance is ± 1.5 mm.
The nominal tolerance is in accordance with JEM 1459 for the dimensions over 120 mm.

With signal cable interface adapter

Unit: mm



F02E.ai

Nominal tolerance:

Nominal tolerance is ± 0.8 mm for the dimensions of 0.5 mm or more and 120 mm or less, and the combined nominal tolerance is ± 1.5 mm.
The nominal tolerance is in accordance with JEM 1459 for the dimensions over 120 mm.

Note: Dash line expresses prevention pin of false insertion. This pin is added if option code /PRP is specified.

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■ MODEL AND SUFFIX CODES

		Description
Model	SAI143	Analog Input Module (4 to 20 mA, 16 channels, module isolation)
Suffix Codes	-S	Standard type
	-H	With HART communication [Release: R1.02.00] (*1)
	5	For pressure clamp terminal block or MIL cable with no explosion protection
	6	With signal cable interface adapter and no explosion protection (*2)
	E	For pressure clamp terminal block or MIL cable with explosion protection
	F	With signal cable interface adapter and explosion protection (*2)
	3	With ISA Standard G3 and temperature (-20 to 70 ºC)
	C	With ISA Standard G3 and high-density installation (-20 to 70 ºC) (*5)
Option Codes	/A4S00	With pressure clamp terminal block for analog [Model: STA4S-00]
	/A4S10	With pressure clamp terminal block for analog (with surge absorber) [Model: STA4S-10]
	/A4D00	With dual-redundant pressure clamp terminal block for analog (*3) [Model: STA4D-00]
	/A4D10	With dual-redundant pressure clamp terminal block for analog (with surge absorber) (*3) [Part name: STA4D-10]
	/PRP	With prevention pin of false insertion (*4)
	/CCC01	With connector cover for MIL cable (for flat ribbon cable) [Model: SCCC01]

*1: For dual-redundant pressure clamp terminal block, please do not use STA4D-□0 S1.
*2: When selecting SAI143-□6□ or -□F□, you can not choose the option code of pressure clamp terminal block and MIL cable connector.
*3: When using this module in a dual-redundant configuration, order an additional module with the same specifications but without option codes.
*4: When SAI143-□6□ or -□F□ is selected, you can choose the option code for prevention pin of false insertion.
A mechanism to prevent wrong type I/O module insertion is supported with signal cable. The signal cable used with this I/O module must have option code /SAI143.
*5: Suffix code for “With ISA Standard G3 and high-density installation” is available in case of SAI143-H□C. This is not available in case of SAI143-S.

		Description
Model	SAV144	Analog input module (1 to 5 V/1 to 10 V, 16 channels, module isolation)
Suffix Codes	-S	Standard type
	5	For pressure clamp terminal block or MIL cable with no explosion protection
	6	With signal cable interface adapter and no explosion protection (*1)
	E	For pressure clamp terminal block or MIL cable with explosion protection
	F	With signal cable interface adapter and explosion protection (*1)
	3	With ISA Standard G3 and temperature (-20 to 70 ºC)
Option Codes	/A4S00	With pressure clamp terminal block for analog [Model: STA4S-00]
	/A4S10	With pressure clamp terminal block for analog (with surge absorber) [Model: STA4S-10]
	/A4D00	With dual-redundant pressure clamp terminal block for analog (*2) [Model: STA4D-00]
	/A4D10	With dual-redundant pressure clamp terminal block for analog (with surge absorber) (*2) [Part name: STA4D-10]
	/PRP	With prevention pin of false insertion (*3)
	/CCC01	With connector cover for MIL cable (for flat ribbon cable) [Model: SCCC01]

*1: When selecting SAV144-S63 or -SF3, you can not choose the option code of pressure clamp terminal block and MIL cable connector.
*2: When using this module in a dual-redundant configuration, order an additional module with the same specifications but without option codes.
*3: When SAV144-S63 or -SF3 is selected, you can choose the option code for prevention pin of false insertion.
A mechanism to prevent wrong type I/O module insertion is supported with signal cable. The signal cable used with this I/O module must have option code /SAV144.

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		Description
Model	SAT145	TC/mV Input Module (16 channels, Isolated Channels)
Suffix Codes	-S	Standard type
	6	With signal cable interface adapter and no explosion protection
	F	With signal cable interface adapter and explosion protection
	3	With ISA Standard G3 and temperature (-20 to 70 ºC)
Option Codes	/PRP	With prevention pin of false insertion

		Description
Model	SAR145	RTD Input Module (16 channels, Isolated Channels)
Suffix Codes	-S	Standard type
	6	With signal cable interface adapter and no explosion protection
	F	With signal cable interface adapter and explosion protection
	3	With ISA Standard G3 and temperature (-20 to 70 ºC)
Option Codes	/PRP	With prevention pin of false insertion

		Description
Model	SAI533	Analog Output Module (4 to 20 mA, 8 channels, module isolation)
Suffix Codes	-H	With HART communication
	5	For pressure clamp terminal block or MIL cable with no explosion protection
	6	With signal cable interface adapter and no explosion protection (*1)
	E	For pressure clamp terminal block or MIL cable with explosion protection
	F	With signal cable interface adapter and explosion protection (*1)
	3	With ISA Standard G3 and temperature (-20 to 70 ºC)
Option Codes	/A4S00	With pressure clamp terminal block for analog [Model: STA4S-00]
	/A4S10	With pressure clamp terminal block for analog (with surge absorber) [Model: STA4S-10]
	/A4D00	With dual-redundant pressure clamp terminal block for analog (*2) [Model: STA4D-00]
	/A4D10	With dual-redundant pressure clamp terminal block for analog (with surge absorber) (*2) [Model: STA4D-10]
	/PRP	With prevention pin of false insertion (*3)
	/CCC01	With connector cover for MIL cable (for flat ribbon cable) [Model: SCCC01]

*1: When selecting SAI533-H63 or -HF3, you can not choose the option code of pressure clamp terminal block and MIL cable connector.
*2: When using this module in a dual-redundant configuration, order an additional module with the same specifications but without option codes.
*3: When SAI533-H63 or -HF3 is selected, you can choose the option code for prevention pin of false insertion.
A mechanism to prevent wrong type I/O module insertion is supported with signal cable. The signal cable used with this I/O module must have option code /SAI533.

■ CONFORMITY STANDARDS

Refer to “ProSafe-RS Standards Compliant Models” (GS 32P01B60-01EN).

■ ORDERING INFORMATION

Specify the model and suffix codes.

For selecting the right products for explosion protection, please refer to TI 32S01J30-01E without fail.

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