



# Mark\* VIeS Functional Safety Analog I/O Module Summary Sheet

The Mark\* VIeS Functional Safety Analog Input / Output (I/O) module provides an interface between the process analog sensors / actuators (10 analog inputs and two analog outputs) and the Mark VIeS Safety control logic. The Analog I/O module consists of two orderable parts: the Analog I/O pack and the Analog I/O terminal board. All safety Analog I/O modules use the same Analog I/O pack, IS420YAICS1B. There are two DIN-rail mounted Analog I/O terminal boards available to provide the necessary redundancy and terminal block styles. Users can select the configuration that best addresses their needs for availability and SIL level. The Analog I/O module is available in both Simplex and Triple Modular Redundant (TMR) configurations. This document discusses the Simplex Analog I/O (IS410STAIS2A) terminal board and the TMR Analog I/O (IS410TBAIS1C) terminal board.

In a TMR configuration, the controller selects the median analog input values returned by the TMR I/O pack(s) (thus rejecting a high or low out of range value) and the I/O pack electronics combine the analog outputs with a patented circuit design that rejects a bad performing I/O pack.

## Simplex Analog I/O (STAI) Terminal Board



Simplex Analog  
I/O Module

The STAI terminal board is a compact analog input terminal board that accepts 10 analog inputs and two analog outputs, and connects to the YAIC I/O pack. The 10 analog inputs accommodate two-wire, three-wire, four-wire, or externally powered transmitters. The analog outputs are configured for 0 to 20 mA. An on-board ID chip identifies the board to the I/O pack for system diagnostic purposes.

## TMR Analog I/O (TBAI) Terminal Board



TMR Analog I/O Module

The TBAI terminal board is an analog input terminal board used in TMR and Simplex configurations that supports 10 analog inputs and two outputs, and connects to the YAIC I/O pack. The 10 analog inputs accommodate two-wire, three-wire, four-wire, or externally powered transmitters. The analog outputs can be configured for 0 to 20 mA. Inputs and outputs have noise suppression circuitry to protect against surge and high frequency noise. The TBAI has three DC-37 pin connectors for three TMR I/O packs or one Simplex I/O pack.

The [Analog I/O Terminal Board with YAIC I/O Pack Specifications table](#) provides the specifications for the Analog I/O terminal boards available for use in the Mark VIeS Functional Safety System. For more information on the YAIC I/O pack and the STAI and TBAI terminal boards, refer to the *Mark VIeS Functional Safety Systems for General Market Volume II System Guide for General-purpose Applications* (GEH-6855\_Vol\_II), the chapter *YAIC Analog I/O Modules*.

### Analog I/O Terminal Board with YAIC I/O Pack Specifications

Item	Terminal Board Specification	
	IS410STAIS2A	IS410TBAIS1C
Product Name	Mark VIeS Analog I/O	Mark VIeS Analog I/O
Life-cycle Status	Active	Active
I/O Pack Redundancy	Simplex	Simplex or TMR
I/O Pack	IS420YAICS1B (qty 1) (order separately)	IS420YAICS1B (qty 3 or 1) (order separately)
Number of Channels	12 channels per module (10 AI, 2 AO)	12 channels per module (10 AI, 2 AO)
Analog Input Span	AI channel 1-8: 1 to 5 V dc, $\pm 5$ V dc, $\pm 10$ V dc, 0 to 20 mA AI channel 9-10: 0 to 20 mA, $\pm 1$ mA	AI channel 1-8: 1 to 5 dc, $\pm 5$ V dc, $\pm 10$ V dc, 0 to 20 mA AI channel 9-10: 0 to 20 mA, $\pm 1$ mA
Analog Input Converter Resolution	16-bit A/D Converter	16-bit A/D Converter
Analog Input Accuracy	0.1% of full scale over the full operating temperature range	0.1% of full scale over the full operating temperature range
Analog Input Noise Suppression	Hardware filter with single pole down break at 500 rad/sec Software filter using a two pole low pass filter, configurable for 0.75 Hz, 1.5 Hz, 3 Hz, 6 Hz, or 12 Hz.	Hardware filter with single pole down break at 500 rad/sec. Software filter using a two pole low pass filter, configurable for 0.75 Hz, 1.5 Hz, 3 Hz, 6 Hz, or 12 Hz.
Analog Input Common Mode Rejection	AC CMR 60 dB at 60 Hz, up to $\pm 5$ V common mode voltage DC CMR 80 dB with -5 to +7 V peak common mode rejection	AC CMR 60 dB at 60 Hz, up to $\pm 5$ V common mode voltage DC CMR 80 dB with -5 to +7 V peak common mode rejection
Analog Input Common Mode Voltage Range	$\pm 5$ V ( $\pm 2$ V CMR for the $\pm 10$ V inputs)	$\pm 5$ V ( $\pm 2$ V CMR for the $\pm 10$ V inputs)
Analog Output Accuracy	0.5%	0.5%
Analog Output Converter Resolution	14-bit D/A Converter	14-bit D/A Converter
Analog Output Load	800 $\Omega$ max for 0 to 20 mA output	800 $\Omega$ max for 0 to 20 mA output
Field Wiring Terminal Block	Euro style box-type terminal blocks	Barrier-type Terminal Blocks
Field Wiring	24 AWG min, 12 AWG max	22 AWG min, 12 AWG max
I/O Scan Time	Supported Controller I/O Scan rates: 10 ms, 40 ms, 80 ms, 160 ms	
Diagnostic Fault Detection	Power-up self test, continuous monitoring of internal power supplies, incorrect terminal board check, hardware limit checking based on configurable high and low levels for 4-20 mA inputs, health of D/A convert circuits, analog output current contribution monitoring, and suicide relay disconnects failed outputs in TMR configuration to allow other two I/O packs to control	
I/O Pack DC Control Power	28 V dc at 8 W control power per YAIC; up to additional 7 W depending on how much of 4-20 mA sensor power is sourced from Analog I/O terminal board	
I/O Pack DC Power Connector	Micro Mate-N-Lok receptacle (AMP 1445022-3)	
I/O Pack Construction	Aluminum case	
I/O Pack Health	Visual status LEDs, circuit health variables available to control logic	
Termination Module Dimensions (includes cover and I/O pack) (H x W x D)	17.0 x 15.7 x 15.3 cm (6.7 x 6.2 x 6.0 in)	
Safety Rated	Yes, compliant with IEC 61508	
Hazardous Locations Capability	Class 1, Div 2 / Class 2, Zone 2 / ATEX For ratings and further details, refer to the <i>Mark VIeS Functional Safety System Equipment in Hazardous Locations (HazLoc) Instruction Guide</i> (GEH-6861).	
G3 Compliant	Yes	
Ambient Operational Temperature	-40 to 70°C (-40 to 158 °F)	
Storage Temperature	-40 to 85°C (-40 to 185 °F)	
Mounting Method	DIN-rail mounted	

**Analog I/O Terminal Board with YAIC I/O Pack Specifications (continued)**

Item	Terminal Board Specification	
	IS410ST AIS2A	IS410TBAIS1C
I/O Pack Replacement Part Number	IS420YAICS1B	
Terminal Board Part Number	IS410ST AIS2A	IS410TBAIS1C
Module Cover Replacement Part Number	151X1202YE04PP01BL	151X1202YE08PP16BL



*IS420YAICS1B I/O Pack*



*IS410ST AIS2A Terminal Board*



*IS410TBAIS1C Termination Board*



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