



8- Ch Analog Input Series Thermocouple, High Level, Low Level

3107/3108/3109

PRODUCT HIGHLIGHTS

- Safety and Critical Control
- Configurable Redundancy
 - Single, Dual, Triple, Quad
- 1ms Analog SOE
- High 16-bit resolution
- -160 dB CMR
- Advanced Diagnostics

PRODUCT OVERVIEW

Compliant to the following standards:
IEC61508:2010, IEC61511:2003, IEC61131-2,
IEC61131-6, NFPA72, EN-54, NFPA85, ABS

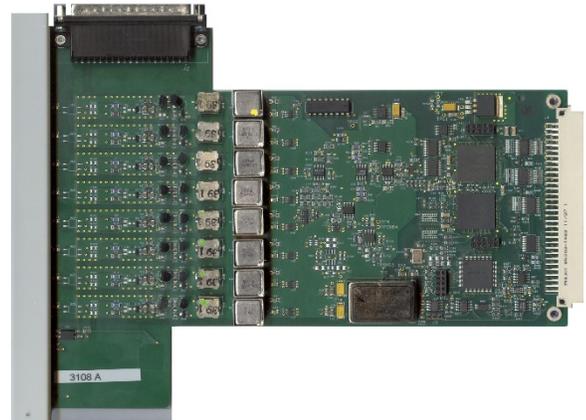
Applications: The isolated 8-Ch Analog Input Series cards are well suited for use in safety and critical control applications, power industry, process control and rotating machinery.

Benefits:

Configurable redundancy reduces costs as the redundant inputs are configured to the availability, integrity and system cost requirements. The flexible architecture allows redundant inputs to be on the same card or different cards. Those cards may be placed in the same chassis or in different chassis.

The user-friendly redundant termination module simplifies the wiring. A single sensor may be wired in parallel to redundant cards or multiple sensors may be wired to the same or multiple input cards and voted.

Advanced voting algorithms are selectable for redundant inputs without requiring additional programming in logic. All inputs are read by the chassis processors and then presented to the logic solving processors to be voted independently. Select one of 12 advanced voting algorithms. The status of the input is evaluated first then the selected algorithm is applied to produce the logical result for use as the process tag. Un-usable or faulted inputs are annunciated.



3107 8-Channel Thermocouple Card

The isolated 8-Ch Analog Series IO cards provide the highest accuracy in the harshest environments. Common mode noise is a real problem when trying to get accurate readings of signals down in the millivolts. RTP employs sampling transformer technology that provides the highest noise immunity of -160 dB at 50/60 Hz, eliminating 600 VAC RMS of common mode noise. The low pass filters cancel the normal mode noise. Finally, RTP provides a patented software filter to eliminate additional noise hence providing quick response to a process change. Precise process measurements improve process analysis and allow tighter control ultimately saving money.

RTP is the Best Technology for Your Investment,

Here's why:

The 3000 TAS is a multi-processor architecture that delivers exceptional Performance and Comprehensive Diagnostics. The results speak for themselves: A reaction time of 12 msec, true 1 msec SOE (Analog and Digital), an MBTF of greater than 50000 years an MTTFS of greater than 60000 years, and a PFDavg of 5×10^{-5} . **Compare these numbers to any other system.**

Built-in proof test diagnostics means it will never be necessary to shut down at the proof test interval. Unlimited online downloads of logic and configuration changes do not require a periodic shut down like other systems. **Compare this functionality to any other system.**

NetSuite Software: One-time price includes unlimited use of Logic Development, Alarm Manager, Data Archive and Historian and HMI without hardware or software keys. **Compare this functionality and price to all other systems.**

Finally, a Safety Instrumented System (SIS) should always take the process it protects to a safe state when it is required to do so, and it should never interfere with the operation of the process at the time. **The 3000 TAS does this better than any other system.**

Advanced Diagnostics. I/O bus checking diagnostics, card address tests and configuration tests are performed each time the chassis processor accesses the cards. All data and control transfers are performed twice, once using the actual data and then using inverted data. Both versions of the data are compared to verify that all I/O bus data bits are functioning properly on the backplane. I/O Bus slot address and control signal contention tests are also performed. Diagnostics also verify proper functionality of the A/D converter. The card has a precise voltage reference for the A/D converter. This fixed reference voltage may be monitored using the two calibration variables in NetArrays, float cal high and float cal low. This provides a way to verify correct functionality of the A/D converter. Out of tolerance readings on either the high or low calibration channels will automatically set the corresponding error bit in the integer error detection status variable of the analog input card. Further, diagnostics detect the presence of the field termination cable. If the cable connection is insecure or removed, it will result in the card being placed offline and an error message generated in the device status window. This error is also reported in the card integer error detection status variable.

Easy to maintain. The isolated analog input series cards are easy to maintain. There is no field calibration required. They are hot swappable and provide a front panel LED to indicate the status of the card. If this LED indicator is on, the card is online and communicating. Enhancements to the I/O card can be accomplished quickly and easily in the field. Card PLD updates are done as a simple file download/restart.

Online repair. The isolated analog input series cards are SIL-2 in a single configuration. However, in a redundant configuration they are SIL-3. In a redundant configuration, you may degrade to a single input card and maintain the SIL 3 rating for several weeks. Redundant configurations provide ease of replacement. There is never a need to stop the process. Replace and/or re-configure the Input card without shutting off power. The input card is hot swappable in both single and redundant configurations. Replacement of an input card is simple. Disable it, un-cable it, replace it, re-cable it and enable it. That's it!

Online modifications. If adding a new channel or new card, wire it into the redundant termination module, make the configuration change in the development software and download the new file online. This allows existing logic and IO to continue processing undisturbed while the new logic and IO is initialized.

Architecture:

The 3107 8-Channel Thermocouple card provides high accuracy thermocouple measurements. 8 different thermocouple types are supported and configurable on a per channel basis. A remote termination solid-state temperature sensor with software compensation provides Cold Junction Compensation (CJC). Built in channel proof testing with Open Thermocouple Detection (OTD) is automatically performed. A program bias current is applied to the input channel as part of the continuous proof testing. If not detected, the corresponding channel bit will be set in the integer proof test channel error status word. If an open thermocouple circuit is detected, the channel fault bit is set in the corresponding integer channel error status word.

The 3108 8-Channel High-level Analog Input card provides high accuracy of high-level voltage measurements in the +/-10 volt range and current measurements ranging +/- 20mA. Each channel has a programmable guard band to define the high and low voltage thresholds for out of range checking. Any measurement outside of the defined range will set the corresponding channel error bit in the integer channel error status word. No additional programming is required.

The 3109 8-Channel Low-level Analog Input card provides high accuracy of low-level voltage measurements in the +/-160mv range. Similar to the 3108 card, each channel has the programmable guard band for out of range checking capability.

The 3108 and 3109 analog input card sampling repetition rate of 1000 times a second allows true 1ms analog SOE. The IO channel property of the card provides a programmable field to define the SOE high and SOE low trip point values. If the input crosses the trip point, an SOE event record is stored with the tag, value and timestamp of the event in a special SOE buffer within the chassis processor.

RTP has established a widely known reputation of manufacturing robust, quality systems that meet the most rigorous standards. The isolated Analog Input Series cards are no exception. High performance, high availability and high integrity are all achieved in the extremely flexible design architecture. RTP is not your traditional system. RTP is the Technologically Advanced System.

Specifications:

3107 Thermocouple Input Card	
Electrical:	
Number of Channels	8
SIL Rating	SIL 2 - single configuration SIL 3 - in redundant configurations.
Multiplexer Type	8-Channel Solid State Multiplexer with individual transformers for complete channel-to-channel isolation.
Full Scale Input Signal Range	-80mV to + 80mV.
Guard Band Input Signal Range	+81.2mV to +82mV or -81.2mV to -82mV.
Low Pass Input Filters	-6dB@9Hz Double Pole
Input Impedance	Greater than 850 K Ω
Input Bias Current	88 nA maximum
Input Source Impedance	1000 Ω maximum including cables
Thermocouple Types Supported	All types including B, E, J, K, R, S, and T. Type B: 20 °C to 1820 °C Type E: -270 °C to 1000 °C Type J: -210 °C to 1200 °C Type K: -270 °C to 1372 °C Type N: -270 °C to 1300 °C Type R: -50 °C to 1768 °C Type S: -50 °C to 1768 °C Type T: -270 °C to 400 °C
Analog input error (maximum error at 25 °C)	+/-0.042 % of full scale
Analog input error (temperature coefficient)	+/-0.003% of full scale/°K
Maximum error over full temperature range	+/-0.132 % of full scale
Digital resolution	16 bits
Maximum permanent allowed overload (no damage)	+/-25 Volts
Cold Junction Compensation (CJC)	Provided
CJC Ambient Tracking Error	\pm 2.0°C maximum for a 10°C ambient step change, \pm 0.2°C/min recovery.
Open Transducer Detection	Method: isolated current source stimulus with software algorithm. Greater than 10,000 Ω reported as open thermocouple. Less than 9,000 Ω reported as non-open thermocouple.
Termination Modules:	5 foot cable included
3099/03-000	SIL-3 Triple Thermocouple Termination Module
3099/03-100	SIL-2 Single Thermocouple Termination Module

3108 High Level Analog Input Card Electrical:	
Number of Channels	8
SIL Rating	SIL 2 - single configuration SIL 3 - in redundant configurations.
Multiplexer Type	8 Differential Channels with individual transformers for complete channel-to-channel isolation.
Full Scale Input Signal Range	0 to ± 10 VDC
Guard Band Input Signal Range	+10.0 to +10.1 VDC or -10.0 to -10.1 VDC
Amplifier	Unity gain
Input Impedance	Greater than 850 K Ω During Sample , Greater than 10M Ω between samples
Input Bias Current	4.0 uA maximum at 1000 Sample Sets per Second.
Input Source Impedance	1000 Ω maximum including cables
Analog input error (maximum error at 25 °C)	+/-0.035% of full scale (Voltage measurement)
Analog input error (temperature coefficient)	+/-0.0006% of full scale/K
Maximum error over full temperature range	+/-0.0530% of full scale (Voltage measurement)
Analog input error (maximum error at 25 °C)	+/-0.038% of full scale (Current measurement)
Analog input error (temperature coefficient)	+/-0.0016% of full scale/K
Maximum error over full temperature range	+/-0.0855% of full scale (Current measurement)
Digital resolution	16 bits
Data format returned of the application program	Floating point value
Value of LSB	336.25uV
Maximum permanent allowed overload (no damage)	12.5 Volts
Type of input	Differential
Sample duration time (including settling time)	17.7 usec.
Sample repetition rate	1000 sample sets per second.
Input filter characteristics – order	Second order
Input filter characteristics – transition frequency	-6dB@2.5kHz Double Pole
Crosstalk between channels at d.c., a.c. 50 Hz and a.c. 60 Hz	-84 dB d.c. -84 dB a.c. 50 Hz -84 dB a.c. 60 Hz
Non-linearity	+/-0.025 % of full scale
Repeatability at fixed temperature after 10 second stabilization time	+/-0.025 % of full scale
Termination Modules:	5 foot cable included
Voltage Input: 3099/31-000 3099/31-100	SIL-3 Triple Thermocouple Termination Module SIL-2 Single Thermocouple Termination Module
Current Input: 3099/11-000 3099/11-100 External 24VDC power required (must be fused)	SIL-3 Triple Thermocouple Termination Module SIL-2 Single Thermocouple Termination Module Max 30 A fuse

3109 Low Level Analog Input Card	
Electrical:	
Number of Channels	8
SIL Rating	SIL 2 - single configuration SIL 3 - in redundant configurations.
Multiplexer Type	8-Channel Solid State Multiplexer with individual transformers for complete channel-to-channel isolation.
Full Scale Input Signal Range	-160mV to + 160mV.
Guard Band Input Signal Range	+160mV to +161.618mV or -160mV to -161.623mV.
Amplifier	Gain of 25.0002 for -160 to +160 mV signal input voltage
Input Impedance	Greater than 850 K Ω
Input Bias Current	90 nA maximum
Input Source Impedance	1000 Ω maximum including cables
Analog input error (maximum error at 25 °C)	+/-0.040% FSV
Analog input error (temperature coefficient)	+/-0.0013% of full scale/ $^{\circ}$ K
Maximum error over full temperature range	+/-0.079 % of full scale
Digital resolution	16 bits
Data format returned of the application program	Floating point value
Value of LSB	5.476 μ V
Maximum permanent allowed overload (no damage)	+/-5.0 Volts
Type of input	Differential
Sample duration time (including settling time)	17.7 usec.
Sample repetition rate	1000 sample sets per second.
Input filter characteristics – order	Second order
Input filter characteristics – transition frequency	-6B @2.5KHz
Termination Modules:	5 foot cable included
Voltage Input: 3099/31-000 3099/31-100	SIL-3 Triple Thermocouple Termination Module SIL-2 Single Thermocouple Termination Module
Common Electrical:	3107/ 3108/ 3109
Isolation	600 VAC RMS or 400 VDC channel to channel and channel to field. 1500 VAC @ 60 Hz for 60 seconds withstand.
Common Mode Voltage	600 VAC RMS or 400 VDC continuous.
Common Mode Rejection	-160dB at 60 Hz.
Common Mode Crosstalk	-150dB at 60 Hz 100 VAC.
Normal Mode Rejection	-0.0dB @ 60Hz normal mode rejection
Crosstalk between channels at d.c., a.c. 50 Hz and a.c. 60 Hz	-84 dB d.c. -84 dB a.c. 50 Hz -84 dB a.c. 60 Hz
Non-linearty	+/-0.025 % of full scale
Repeatability at fixed temperature after 10 second stabilization time	+/-0.025 % of full scale

Common Environmental:	3107/ 3108/ 3109
Temperature range:	-20°C to +60°C, operating, -25°C to +85°C, storage
Altitude:	Operation to 10,000 feet
Humidity range:	10 to 95 % relative humidity, non-condensing
Cooling:	Forced Air Cooling provided in every chassis
Common Power:	3107/ 3108/ 3109
Backplane Power	+5VDC @ 500 mA supplied by the RTP backplane
Backplane External	+24VDC @ 150 mA

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