



# SIL-2 8-Ch Analog Input Series Thermocouple, High Level, Low Level

3107/3108/3109

## PRODUCT HIGHLIGHTS

- 8 Isolated Channels for Safety and Critical Control Applications
- Configurable Redundancy Single, Dual, Triple, Quad
- -160 dB Common Mode Noise Rejection for Thermocouple Card
- -140 dB Common Mode Noise Rejection for High Level & Low Level Card
- Calibration Channel for Accuracy Verification
- 1ms Analog SOE

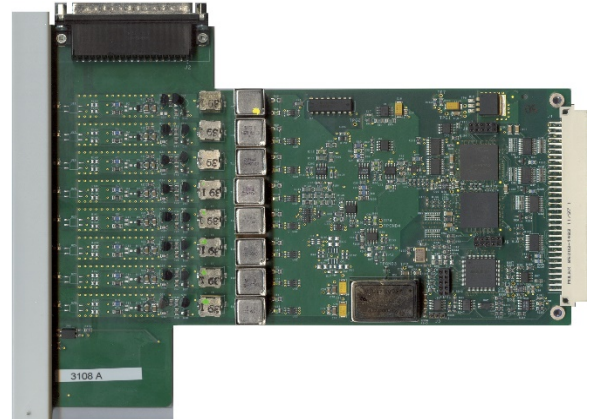
## PRODUCT OVERVIEW

The isolated 8-Channel Analog Series IO cards provide high accuracy analog inputs. This set of cards can be installed into any 3000TAS family chassis and provide measurements signals such as pressure, temperature, flow rate, position, etc.

Common mode noise can be a real problem when trying to get accurate readings of signals down to the millivolt range. RTP employs sampling transformer technology that provides channel to channel isolation and high noise immunity. The Thermocouple card (3107) can achieve -160 dB at 60 Hz of common mode noise rejection. The High Level and Low Level cards (3108 & 3109) can achieve -140 dB at 60 Hz of common mode noise rejection. At the same time, low pass filters cancel the normal mode noise, and a software filter can be used to eliminate additional noise.

The 8 channel analog input series cards are TUV approved for SIL-2 applications in a single configuration. When in a redundant configuration, they are TUV approved for SIL-3 applications.

The configurable redundancy of the 8 channel analog input series cards reduces costs as the redundant inputs are configured to your availability, integrity and system requirements. The flexible architecture allows redundant inputs to be on the same card or different cards.



3108 8-Channel High Level Analog Input Card

Those cards may be placed in the same chassis or in different chassis.

User-friendly redundant termination modules simplify the field 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.

### **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  $5 \times 10^{-5}$ . **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.**

In order to assist in the performance of root cause analysis, the 8 channel analog input cards are capable of 1millisecond time stamping of the analog input signals. The change of any input channel above or below a user defined threshold initiates the logging of a time stamped sequence-of-events (SOE) record. This provides the highest resolution for process analysis as inputs are scanned 1000 times a second.

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 solid-state temperature sensor located on the termination module is used for Cold Junction Compensation (CJC). Built in channel proof testing with Open Thermocouple Detection (OTD) is automatically performed.

The 3108, 8-Channel High-Level Analog Input card provides high accuracy measurements of 0-10 volts, +/-10 volts, or 4-20 milliamps. Each channel has a programmable guard band to define the high and low 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.

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

## Specifications

### 3107 – Thermocouple Input Card

Safety Integrity Level	SIL 2 - single configuration SIL 3 - redundant configurations.
Number of Channels	8
Thermocouple Types	B, E, J, K, N, R, S, T
Input Signals	+/-80 mV
Full Scale Value	80 mV
Multiplexer Type	8-Channel Solid State Multiplexer with individual channel transformers for complete channel-to-channel isolation.
Input Signal Guard Band	+81.2mV to +82mV or -81.2mV to -82mV
Input Impedance	Greater than 850 K $\Omega$
Input Bias Current	88 nA maximum
Maximum Input Source Impedance	1000 $\Omega$ including cables (100 $\Omega$ to maintain stated accuracy)
Common Mode Rejection	-160 dB @ 60 Hz
Analog input error (maximum error at 25 °C)	+/-0.042 % of full scale value (+/-33.6 $\mu$ V)
Analog input error (temperature coefficient)	+/-0.003% of full scale value/°C (+/-2.4 $\mu$ V/°C)
Maximum error - 0°C to 55°C Temperature Range	+/-0.132 % of full scale value (+/-106 $\mu$ V)
Digital resolution	16 bits
Scan Rate	43 sample sets per second
Isolation	600 VAC RMS or 400 VDC channel to channel and channel to field.
Input Filter characteristics – order	Second Order
Input Filter characteristics – transition frequency	-6dB @ 9Hz Double Pole (-39dB @ 60 Hz)
Maximum permanent allowed overload (no damage)	+/-25 Volts
Cold Junction Compensation (CJC)	Provided
CJC Ambient Tracking Error	+/-2.0°C maximum for a 10°C ambient step change, +/-0.2°C/min recovery.

Open Transducer Detection Method	Isolated current source stimulus with software algorithm. Greater than 10,000 $\Omega$ reported as open thermocouple. Less than 9,000 $\Omega$ reported as non-open thermocouple.
Backplane Power	5 V @ 500 mA 24 V @ 150 mA

## Environmental

Operating Temperature Range	-20°C to +60°C
Storage Temperature Range	-25°C to +85°C
Relative Humidity Range	10% to 95%, non-condensing

## Termination Modules

3099/23-100	Single Termination Module – 8 Channel Thermocouple
3099/03-000	Triple Redundant Termination Module – 8 Channel Thermocouple

## 3108 – High Level Analog Input Card

Safety Integrity Level	SIL 2 - single configuration SIL 3 - redundant configurations.
Number of Channels	8
Input Signals	+/-10V +/-20mA
Full Scale Value	10V 20mA
Multiplexer Type	8-Channel Differential Channels with individual channel transformers for complete channel-to-channel isolation.
Input Signal Guard Band	+10.0 to +10.1 VDC or -10.0 to -10.1 VDC
Input Impedance	Greater than 850 K $\Omega$
Input Bias Current	4.0 uA maximum
Maximum Input Source Impedance	1000 $\Omega$ including cables (100 $\Omega$ to maintain stated accuracy)
Common Mode Rejection	-140 dB @ 60 Hz
Analog input error (maximum error at 25 °C)	+/-0.070 % of full scale value – voltage measurement (+/-7 mV)
Analog input error (temperature coefficient)	+/-0.0012% of full scale value/°C – voltage measurement (+/-120 $\mu$ V/°C)
Maximum error - 0°C to 55°C Temperature Range	+/-0.106 % of full scale value – voltage measurement (+/-10.6 mV)
Analog input error (maximum error at 25 °C)	+/-0.076 % of full scale value – current measurement (+/-15.2 $\mu$ A)
Analog input error (temperature coefficient)	+/-0.0032% of full scale value/°C – current measurement (+/-0.6 $\mu$ A/°C)
Maximum error - 0°C to 55°C Temperature Range	+/-0.171 % of full scale value – current measurement (+/-34.4 $\mu$ A)
Digital resolution	16 bits
Type of Input	Differential
Scan Rate	1000 sample sets per second -010 Option: 43 sample sets per second
Input Filter characteristics – order	Second Order

Input Filter characteristics – transition frequency	-6dB@2.5kHz Double Pole -010 Option: -6dB @ 0.5 Hz Double Pole (-70dB @ 60 Hz)
Input Protection	Transformer Isolation
Isolation	600 VAC RMS or 400 VDC channel to channel and channel to field.
Common points between channels	None
Non-linearity	+/-0.025% of full scale value
Repeatability	+/-0.025% of full scale value
Hardware watchdog timer	0.68 to 1.4 seconds
Power Dissipation	9.0 Watts or 31 BTU/hr
Backplane Power	5 V @ 500 mA 24 V @ 150 mA

## Environmental

Operating Temperature Range	-20°C to +60°C
Storage Temperature Range	-25°C to +85°C
Relative Humidity Range	10% to 95%, non-condensing

## Termination Modules

3099/31-100	Single Termination Module – 8 Channel Voltage Input
3099/31-000	Triple Redundant Termination Module – 8 Channel Voltage Input
3099/11-100	Single Termination Module – 8 Channel Current Input
30999/11-000	Triple Redundant Termination Module – 8 Channel Current Input

## 3109 – Low Level Analog Input Card

Safety Integrity Level	SIL 2 - single configuration SIL 3 - redundant configurations.
Number of Channels	8
Input Signals	+/-160 mV
Full Scale Value	160 mV
Multiplexer Type	8-Channel Solid State Multiplexer with individual channel transformers for complete channel-to-channel isolation.
Input Signal Guard Band	+160mV to +161.618mV or -160mV to -161.623mV
Input Impedance	Greater than 850 K $\Omega$
Input Bias Current	90 nA maximum
Maximum Input Source Impedance	1000 $\Omega$ including cables (100 $\Omega$ to maintain stated accuracy)
Common Mode Rejection	-140 dB @ 60 Hz
Analog input error (maximum error at 25 °C)	+/-0.080 % of full scale value (+/-128 $\mu$ V)
Analog input error (temperature coefficient)	+/-0.0026% of full scale value/°C (+/-4.2 $\mu$ V/°C)
Maximum error - 0°C to 55°C Temperature Range	+/-0.160 % of full scale value (+/-256 $\mu$ V)
Digital resolution	16 bits
Type of Input	Differential

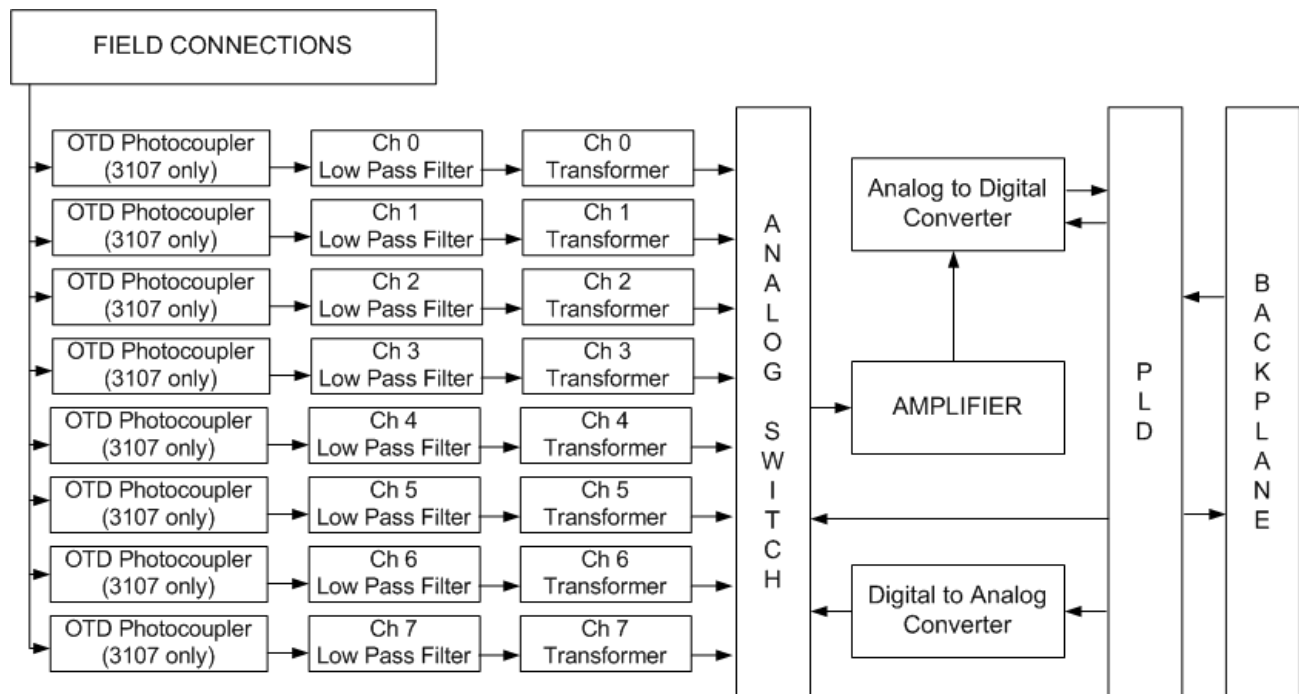
Scan Rate	1000 sample sets per second -010 Option: 43 sample sets per second
Input Filter characteristics – order	Second Order
Input Filter characteristics – transition frequency	-6dB@2.5kHz Double Pole -6dB@0.5Hz Double Pole (-70dB @ 60 Hz)
Input Protection	Transformer Isolation
Isolation	600 VAC RMS or 400 VDC channel to channel and channel to field.
Common points between channels	None
Non-linearity	+/-0.025% of full scale value
Repeatability	+/-0.025% of full scale value
Hardware watchdog timer	0.68 to 1.4 seconds
Power Dissipation	6.1 Watts or 21 BTU/hr
Backplane Power	5 V @ 500 mA 24 V @ 150 mA

## Environmental

Operating Temperature Range	-20°C to +60°C
Storage Temperature Range	-25°C to +85°C
Relative Humidity Range	10% to 95%, non-condensing

## Termination Modules

3099/31-100	Single Termination Module – 8 Channel Voltage Input
3099/31-000	Triple Redundant Termination Module – 8 Channel Voltage Input



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