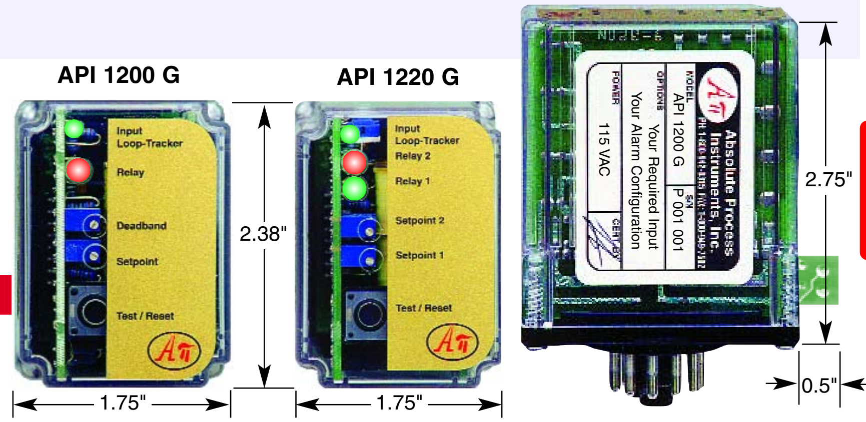
Thermocouple Alarm Trips
Field-Adjustable Setpoints

API 1200 G
API 1220 G

Input: ***Most Thermocouple Types***
Outputs: ***One DPDT Relay or Two SPDT Relays***

- ***Automatic Cold Junction Compensation***
- ***Field Adjustable Setpoints***
- ***High Capacity 7 Amp Relay Contacts***
- ***Input LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***



Temperature

Applications

- **Process Limit Backup Alarm**
- **Temperature Alarm**
- **Over, Under, Out-of-Range Alarm**

LIFETIME WARRANTY

Free Factory Input & Output Calibration!

Specifications

Thermocouple Input
Factory Configured—Please specify thermocouple type and temperature range in °F or °C

J, K, T, E, R, S, and others; most thermocouple types available

Cold-Junction Compensation
Automatic for specified thermocouple

T/C Burn-Out Protection
Upscale burnout standard
Downscale burnout optional, add option **B** to end of model number

T/C Current
Less than 1.0 µA, including burnout sense

LoopTracker
Variable brightness LED indicates input loop level and status

Relay Output
Factory Configured—See Options for other relay configurations

API 1200 G	One DPDT contact set HI alarm, normal action (failsafe), non-latching standard 7 A @ 240 VAC resistive load 3.5 A @ 240 VAC inductive load
API 1220 G	Two SPDT contacts HI/LO, normal action (failsafe), non-latching standard 7 A @ 240 VAC resistive load 3.5 A @ 240 VAC inductive load
CAUTION:	Socket contacts may limit system rating. External contact protection such as an RC snubber is recommended for inductive loads.

Setpoint
12 turn potentiometer, adjustable 0 to 100% of span

Deadband

API 1200 G	1.0 to 100% of span 12 turn potentiometer
API 1220 G	Fixed at 1% of span, standard
API 1220 GA	1.0 to 100% of span 1 turn potentiometer

Functional Test/Reset Button
Toggle relay(s) to opposite state when pressed
Resets latching relay on API 1200 G with **HT** option

Response Time
70 milliseconds typical

Ambient Temperature Range and Temperature Stability
–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

Power

Standard:	115 VAC ±10%, 50/60 Hz, 2.5 W max.
A230 option:	230 VAC ±10%, 50/60 Hz, 2.5 W max.
D option:	9-30 VDC, 2.5 W typical

Description and Features

The **API 1200 G** and **API 1220 G** are factory configured for a thermocouple input and can be ranged for virtually all thermocouple types and related temperature spans. Standard features include automatic cold junction compensation and upscale T/C burnout protection. Heavy-duty relay contacts allow the module to directly control high capacity loads.

API exclusive features include a ***LoopTracker*** LED that varies in intensity with changes in the process signal, alarm status LEDs for each alarm, and a **Functional Test Pushbutton** to toggle the relays independent of the input.

The **API 1200 G** provides a single setpoint adjustment and DPDT relay contacts. The alarm output can be factory configured for HI or LO operation, non-latching or latching, normal (fail-safe) or reverse (non-fail-safe) acting.

The **API 1220 G** contains two independent setpoints with two SPDT relay contact outputs. The alarm output can be factory configured for HI/HI, HI/LO, LO/HI or LO/LO operation, normal acting (fail-safe) or reverse acting (non-fail-safe).

Models & Options

Factory Configured—Please specify thermocouple type, temperature range in °F or °C, and options

API 1200 G	Thermocouple input alarm trip, 1 DPDT relay, HI alarm, normal action (failsafe), non-latching, 115 VAC
API 1220 G	Thermocouple input dual alarm trip, 2 SPDT relays, HI/LO, normal action (failsafe), non-latching, 115 VAC

Options—Add to end of model number

A230	Powered by 230 VAC, 50/60 Hz
D	Powered by 9-30 VDC
B	Downscale T/C protection instead of upscale
R	Reverse-acting alarms (non-failsafe)
L	Low trip (on decreasing signal) for 1200 G
HT	Latching alarm with pushbutton reset, API 1200 G only
HP	Latching alarm with power-off reset, API 1200 G only
A	Adjustable deadbands for 1220 G
HH	High/High trip for 1220 G instead of High/Low
LL	Low/Low trip for 1220 G instead of High/Low
U	Conformal coating for moisture resistance

Accessories—Order as a separate line item

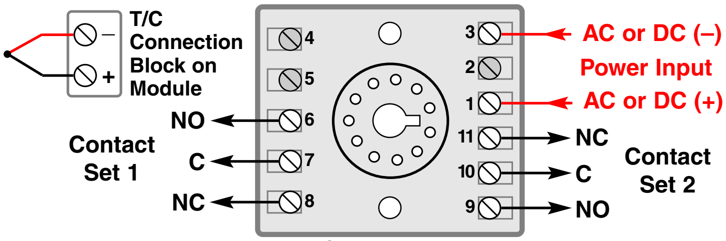
API 011	11-pin socket
API 011 FS	11-pin finger safe socket
API TK36	DIN rail, 35 mm W x 39" L, aluminum

ELECTRICAL CONNECTIONS

WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately.

Power Input Terminals – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

Thermocouple Input – The connection block is located on the side of the module. Polarity must be observed. With thermocouples, the red wire is connected to the negative (–) terminal.



Socket top view

Relay Output Terminals – Terminals 6, 7, 8 and 9, 10, 11 provide the appropriate connections for the desired relay operations. (NO = Normally Open, NC = Normally Closed, C = Common). NOTE: Although the API 1200 G has a pair of relays, these relays will energize and de-energize in unison. The API 1220 G relays operate independently.

SETUP

The thermocouple type, temperature range and alarm types are pre-configured at the factory as specified on your order. No input calibration is necessary. Contact factory for custom ranges or modifications.

Setpoint Control – This multi-turn potentiometer (one for each setpoint on the API 1220 G) allows the operator to adjust the level at which the alarm is activated. This control is adjustable from 0 to 100% of the input range.

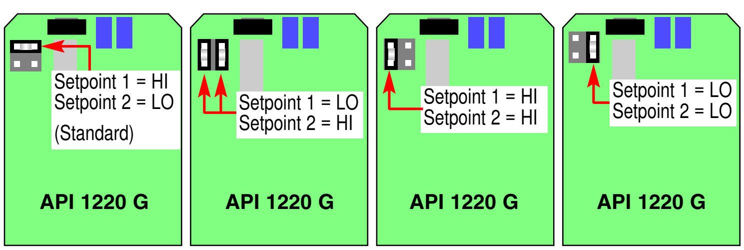
Deadband Control – The API 1200 G deadband potentiometer allows the alarm trip and reset window to be adjusted symmetrically about the setpoint from 1 to 100% of the span.

The deadband is fixed at 1% of span on the API 1220 G. The API 1220 GA with adjustable deadband option allows deadbands to be adjusted symmetrically about each setpoint from 1 to 100% of the span.

Adjustable deadband allows the operator to fine tune the point at which the alarm trips (alarm condition) and resets (non alarm condition). The deadband is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

API 1220 G Alarm Configuration – The alarm configuration of the API 1220 G is pre-configured at the factory per your order, but if a change is necessary, internal jumpers can be used to modify the alarm type as follows.

1. Unplug the module from the socket.
2. Remove the 4 screws from the module bottom and remove the plastic case.
3. Unplug the circuit board with the test button from the base.
4. Note location of jumper block at top left of circuit board next to test button.
5. Place jumpers as indicated for desired alarm operation. The standard HI/LO setting is with one jumper across the two top pins or with no jumper at all. Never place a jumper across the two bottom pins!
6. Replace board, cover, and screws.



API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

TEST BUTTON

The functional test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation and also provides the additional function of unlatching the alarm on the API 1200 GHT with the latching alarm option.

OPERATION

GREEN *LoopTracker*® Input LED – Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum to provide a quick visual picture of your process loop at all times. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring. This features greatly aid in saving time during initial start-up or troubleshooting.

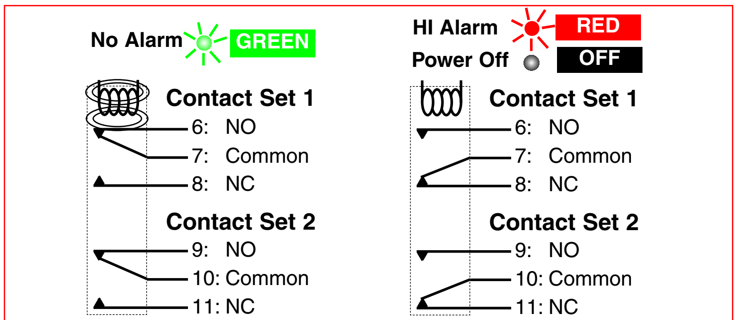
The bi-color alarm LED provides a visual indication of the alarm status. In all configurations, a GREEN LED indicates a non-alarm condition and a RED LED indicates an alarm condition.

Alarm Relays – In the normal mode of operation (failsafe), the relay coil is energized in a non-alarm condition and de-energized in an alarm condition. This will create an alarm condition if the module loses power. For a normal acting, non-latching configuration, the alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

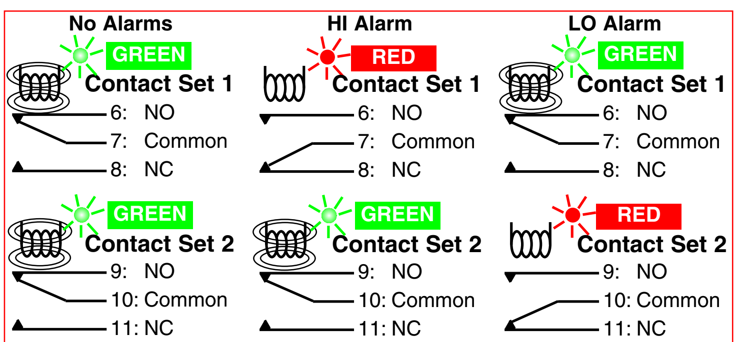
If reverse acting mode is selected (non-failsafe), the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

API 1200 GHT Latching Alarm – For units with the **HT** latching alarm option, the Test Switch is also used to reset the alarm relays. The alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the Test/Reset pushbutton has been pressed or power to the unit has been switched off.

API 1200 GHP Latching Alarm – For units with the **HP** latching alarm option, the alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the power to the unit has been switched off.



API 1200 G with Normal Action HI Alarm



API 1220 G Alarm States with Normal Action HI/LO Alarms

Common Thermocouple Specifications

Type	Polarity & Material	Wire ID Properties	Pol./Wire Colors	Practical Temp Range	Outer Insulation	Limits of Error
J	+ Iron	Very magnetic	+ White	32 to 1336°F	Black (Ext. grade)	±4°F or ±0.8% of rdg
	– Constantan		– Red	0 to 724°C	Brown (T/C grade)	±2°F or ±0.4% of rdg
K	+ Chromel		+ Yellow	32 to 2282°F	Yellow (Ext. grade)	±4°F or ±0.8% of rdg
	– Alumel	Slightly magnetic	– Red	0 to 1250°C	Brown (T/C grade)	±2°F or ±0.4% of rdg
N	+ NICROSIL	Greater stiffness	+ Orange	32 to 2282°F	Orange (Ext. grade)	±4°F or ±0.8% of rdg
	– NISIL		– Red	0 to 1250°C	Brown (T/C grade)	±2°F or ±0.4% of rdg
T	+ Copper	Copper color	+ Blue	–299 to 700°F	Blue (Ext. grade)	±1.5°F or ±0.8% rdg, ±1% rdg <32°F
	– Constantan		– Red	–184 to 371°C	Brown (T/C grade)	±0.9°F or ±0.4% rdg, ±0.8% rdg <32°F
E	+ Chromel	Greater stiffness	+ Purple	32 to 1652°F	Purple (Ext. grade)	±3°F or ±0.5% of rdg
	– Constantan		– Red	0 to 900°C	Brown (T/C grade)	±1.8°F or ±0.4% of rdg
R	+ Pt 13%Rh	Greater stiffness	+ Black	32 to 2700°F	Green (Ext. grade)	±5°F or ±0.5% of rdg
	– Platinum		– Red	0 to 1482°C	Green (T/C grade)	±2.5°F or ±0.25% of rdg
S	+ Pt 10%Rh	Greater stiffness	+ Black	32 to 2700°F	Green (Ext. grade)	±5°F or ±0.5% of rdg
	– Platinum		– Red	0 to 1482°C	Green (T/C grade)	±2.5°F or ±0.25% of rdg

Temperature

Extend thermocouples up to 2000 feet or 100 Ohms maximum resistance.
Extension wire type must be the same type as the thermocouple type.

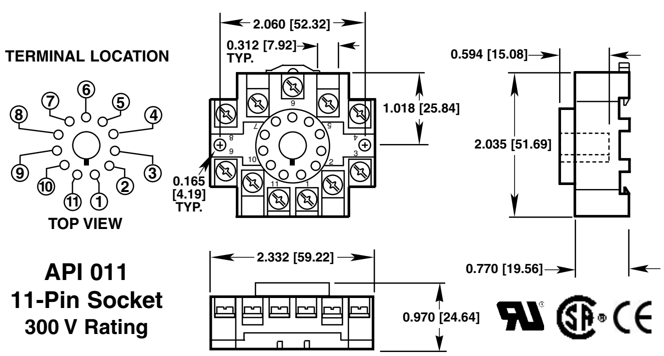
Atmosphere for exposed junction

Type **J**	Reducing
Type **K** or **N**	Clean oxidizing
Type **T**	Mildly oxidizing and reducing or with moisture
Type **E**	Vacuum, inert mildly oxidizing or reducing
Type **R** or **S**	Resists oxidation and corrosion, but contaminated by hydrogen, carbon, and metal vapors

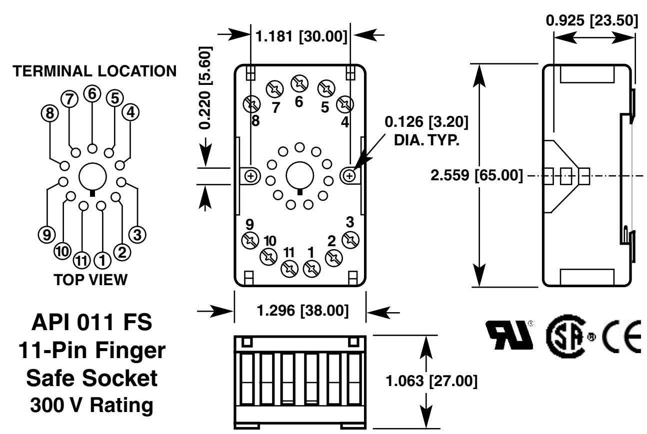
TEMPERATURE CONVERSION

°F = (°C x 9/5) + 32 °C = (°F – 32) x 5/9

API 011 and API 011 FS Sockets



API 011
11-Pin Socket
300 V Rating



API 011 FS
11-Pin Finger Safe Socket
300 V Rating

MOD-TRONIC INSTRUMENTS LIMITED
1 Delta Park Blvd #12
Brampton, ON L6T 5G1
905-457-6322 or 800-794-5883
www.mod-tronic.com

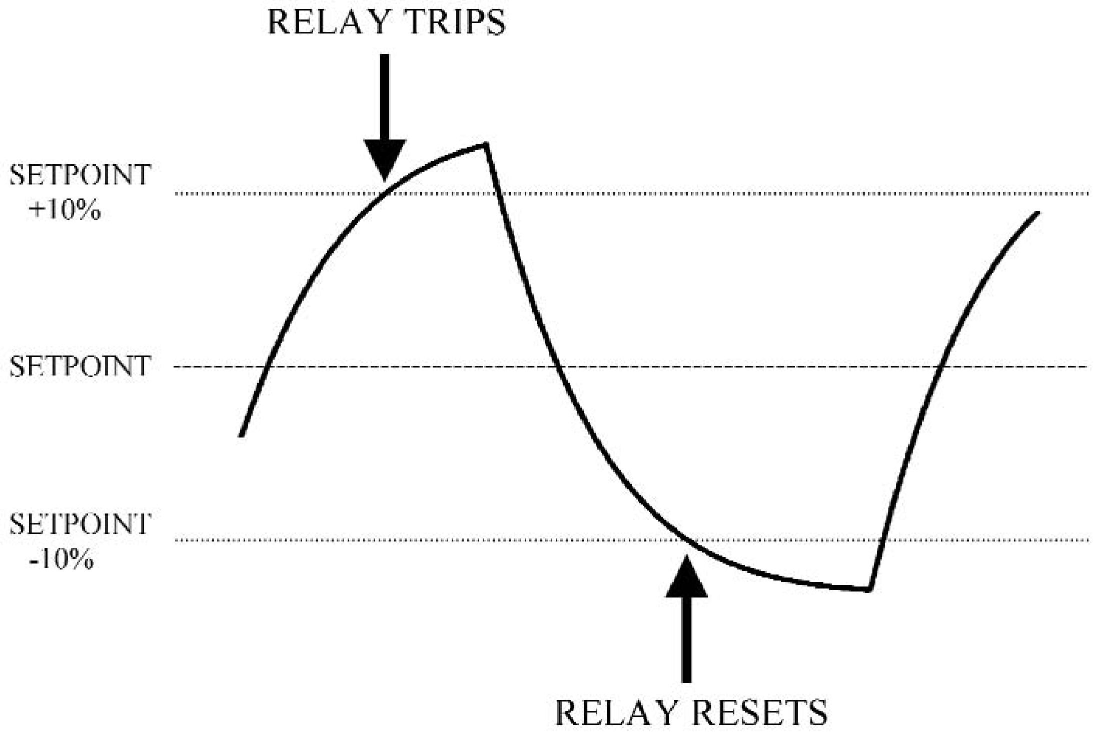
Temperature

Frequently Asked Questions

What is Deadband?

DEFINITION
Deadband is the range through which an input can be varied without initiating an observable response. Deadband is usually expressed in percent of span.

EXAMPLE
A 20% total deadband is applied to the setpoint of a monitored parameter. The relay will trip and reset to its untripped state as indicated in the following graph.



20% TOTAL DEADBAND

Can the API 1200 G provide a setpoint of 7°C and a reset point of 6°C with an overall temperature span of 0-10°C?

No. The minimum span we can operate in is a temperature difference equivalent to 5 mV of output change from the thermocouple.

For example, a type J will produce 0.000 millivolts thermoelectric voltage at 0°C and 5.268 millivolts at 100°C. Therefore, the minimum temperature span is about 100°C. For the set point at 7°C and reset point at 6°C, the thermocouple itself has enough of a variance (usually 5%) to it that its output will not be exactly the same. Therefore, we can not guarantee the repeatability of the system to trip at 7°C each time.

What is cold junction compensation and why is it necessary?

Cold junction compensation is required for accurate temperature measurement when using a thermocouple. A thermocouple junction, created whenever two dissimilar metals are connected together (such as Iron and Copper-Nickel), produces a potential difference that varies with temperature. Thermocouples generate a millivolt signal that increases in proportion to the difference in temperature between the hot and the cold junctions.

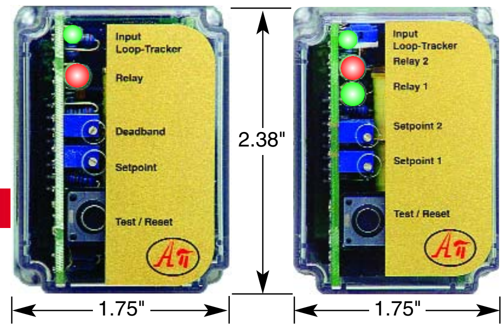
Thermocouple tables are based on a standard 0°C cold junction temperature. Instruments designed to read thermocouples have a temperature sensor at the instrument connection point designed to electronically correct the reading to the 0°C standard. A millivolt meter can't be used to accurately read a thermocouple directly since it has no 0°C compensation and any additional connections with dissimilar metals creates new thermocouple junctions adding to the error.

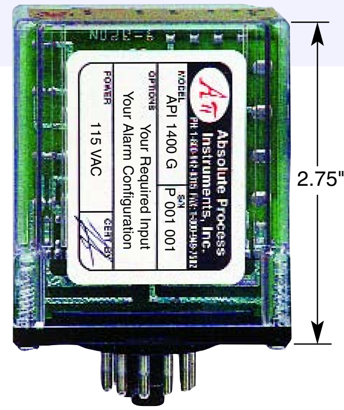
RTD or Thermistor Alarm Trips

API 1400 G
API 1420 G

Input: ***Most RTD and Thermistors***
Outputs: ***One DPDT Relay or Two SPDT Relays***

- ***Automatic Leadwire Compensation***
- ***Field Adjustable Setpoints***
- ***High Capacity 7 Amp Relay Contacts***
- ***Input LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***





Temperature

Applications

- **Process Limit Backup Alarm**
- **Temperature Alarm**
- **Over, Under, Out-of-Range Alarm**

LIFETIME WARRANTY

Free Factory Input & Output Calibration!

Specifications

Input

Factory Configured—Please specify the following

RTD: Resistance at 0°C and curve (0.00385 DIN, 0.003916 American, etc.)

Typical RTDs: 10 Ω to 2000 Ω RTDs including 100 Ω DIN, 100 Ω American, 10 Ω Cu, 1000 Ω Ni-Fe, 120 Ω Ni or special

Thermistor: Type (NTC, PTC) and temperature curve data

Temperature Range: in °F or °C. Note: 100°F (55°C) is the recommended minimum span. Consult factory if a smaller span is required.

RTD Excitation Current

10 Ω:	10 mA	100 Ω:	5 mA
1000 Ω:	0.5 mA	2000 Ω:	0.2 mA

Leadwire Compensation

Less than ±0.05% of span per 1 Ω change in leadwire resistance

LoopTracker®

Variable brightness LED indicates input loop level and status

Relay Output

Factory Configured—See Options for other relay configurations

API 1400 G One DPDT contact set
HI alarm, normal action (failsafe), non-latching standard
7 A @ 240 VAC maximum resistive load
3.5 A @ 240 VAC maximum inductive load

API 1420 G Two SPDT contacts
HI/LO, normal action (failsafe), non-latching standard
7 A @ 240 VAC maximum resistive load
3.5 A @ 240 VAC maximum inductive load

CAUTION: Socket contacts may limit system rating.
External contact protection such as an RC snubber is recommended for inductive loads.

Setpoint

12 turn potentiometer, adjustable from 0 to 100% of span

Deadband

API 1400 G	1.0 to 100% of span, 12 turn potentiometer
API 1420 G	Fixed at 1% of span
API 1420 GA	1.0 to 100% of span, 1 turn potentiometer

Functional Test/Reset Button

Toggle relay(s) to opposite state when pressed
Resets latching relay on 1400 G with **HT** option

Response Time

70 milliseconds typical

Ambient Temperature Range and Temperature Stability

–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

Power

Standard:	115 VAC ±10%, 50/60 Hz, 2.5 W max.
A230 option:	230 VAC ±10%, 50/60 Hz, 2.5 W max.
D option:	9-30 VDC, 2.5 W typical

Description and Features

The **API 1400 G** and **API 1420 G** are factory configured for a RTD or thermistor input and can be set up for virtually all RTD or thermistor types and related temperature spans. Standard features include automatic lead wire compensation for three-wire sensors. Heavy-duty relay contacts allow the module to directly control high capacity loads.

API exclusive features include a ***LoopTracker*** LED which varies in intensity with changes in the process signal, alarm status LEDs for each alarm, and a **Functional Test Pushbutton** to toggle the relays independent of the input.

The **API 1400 G** provides a single setpoint adjustment and DPDT relay contacts. The alarm output can be factory configured for HI or LO operation, non-latching or latching, normal (fail-safe) or reverse (non-fail-safe) acting.

The **API 1420 G** contains two independent setpoints with two SPDT relay contact outputs. The alarm output can be factory configured for HI/HI, HI/LO, LO/HI or LO/LO operation, normal acting (fail-safe) or reverse acting (non-fail-safe).

Models & Options

Factory Configured—Please specify RTD or thermistor type, temperature range in °F or °C, and options

API 1400 G	RTD/thermistor input alarm trip, 1 DPDT relay, HI alarm, normal action (failsafe), non-latching, 115 VAC
API 1420 G	RTD/thermistor input dual alarm trip, 2 SPDT relays, HI/LO, normal action (failsafe), non-latching, 115 VAC

Options—Add to end of model number

A230	Powered by 230 VAC, 50/60 Hz
D	Powered by 9-30 VDC
R	Reverse-acting alarms (non-failsafe)
L	Low trip (on decreasing signal) for 1400 G
HT	Latching alarm with pushbutton reset, API 1400 G only
HP	Latching alarm with power-off reset, API 1400 G only
A	Adjustable deadbands for 1420 G
HH	High/High trip for 1420 G instead of High/Low
LL	Low/Low trip for 1420 G instead of High/Low
U	Conformal coating for moisture resistance

Accessories—Order as a separate line item

API 011	11-pin socket
API 011 FS	11-pin finger safe socket
API TK36	DIN rail, 35 mm W x 39" L, aluminum

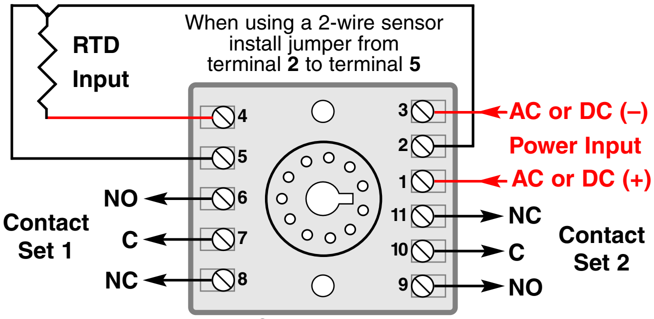
MOD-TRONIC INSTRUMENTS LIMITED
1 Delta Park Blvd #12
Brampton, ON L6T 5G1
905-457-6322 or 800-794-5883
www.mod-tronic.com

ELECTRICAL CONNECTIONS

WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately.

Power Input Terminals – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

Temperature Input – Correct wiring must be observed for 3-wire sensors. With common 3-wire RTDs, the red wire is connected to terminal 4.



Socket top view

Relay Output Terminals – Terminals 6, 7, 8 and 9, 10, 11 provide the appropriate connections for the desired relay operations. (NO = Normally Open, NC = Normally Closed, C = Common). NOTE: Although the API 1400 G has a pair of relays, these relays will energize and de-energize in unison. The API 1420 G will accommodate independent relay operations.

SETUP

The sensor type, temperature range and alarm types are pre-configured at the factory as specified on your order. No input calibration is necessary. Contact factory for custom ranges or modifications.

Setpoint Control – This multi-turn potentiometer (one for each setpoint on the API 1420 G) allows the operator to adjust the level at which the alarm is activated. This control is adjustable from 0 to 100% of the input range.

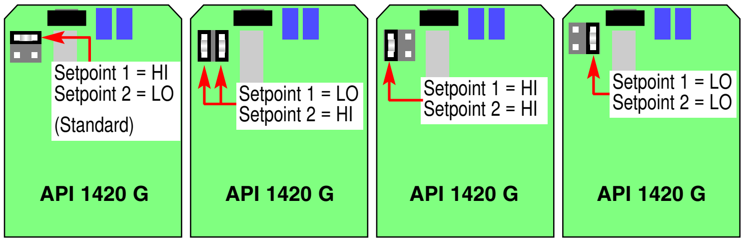
Deadband Control – The API 1400 G deadband potentiometer allows the alarm trip and reset window to be adjusted symmetrically about the setpoint from 1 to 100% of the span.

The deadband is fixed at 1% of span on the API 1420 G. The API 1420 GA with adjustable deadband option allows deadbands to be adjusted symmetrically about each setpoint from 1 to 100% of the span.

Adjustable deadband allows the operator to fine tune the point at which the alarm trips (alarm condition) and resets (non alarm condition). The deadband is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

API 1420 G Alarm Configuration – The alarm configuration of the API 1420 G is pre-configured at the factory per your order, but if a change is necessary, internal jumpers can be used to modify the alarm type as follows.

1. Unplug the module from the socket.
2. Remove the 4 screws from the module bottom and remove the plastic case.
3. Unplug the circuit board with the test button from the base.
4. Note location of jumper block at top left of circuit board next to test button.
5. Place jumpers as indicated for desired alarm operation. The standard HI/LO setting is with one jumper across the two top pins or with no jumper at all. Never place a jumper across the two bottom pins!
6. Replace board, cover, and screws.



API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

TEST BUTTON

The functional test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation and also provides the additional function of unlatching the alarm on the API 1400 GHT with the latching alarm option.

OPERATION

GREEN *LoopTracker*® Input LED – Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum to provide a quick visual picture of your process loop at all times. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring. This features greatly aid in saving time during initial start-up or troubleshooting.

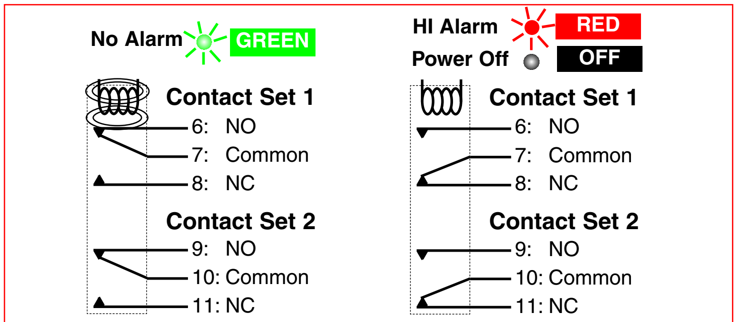
The bi-color alarm LED provides a visual indication of the alarm status. In all configurations, a GREEN LED indicates a non-alarm condition and a RED LED indicates an alarm condition.

Alarm Relays – In the normal mode of operation (failsafe), the relay coil is energized in a non-alarm condition and de-energized in an alarm condition. This will create an alarm condition if the module loses power. For a normal acting, non-latching configuration, the alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

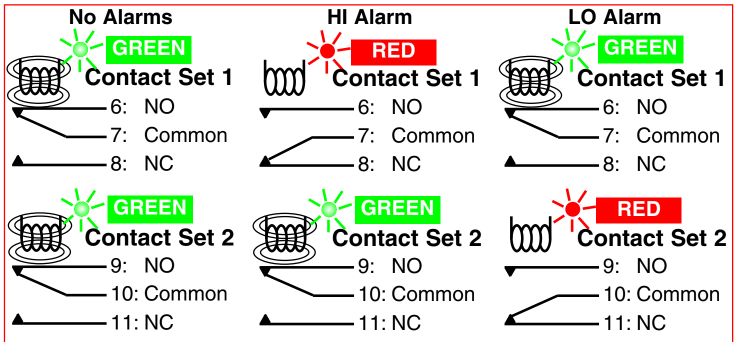
If reverse acting mode is selected (non-failsafe), the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

API 1400 GHT Latching Alarm – For units with the **HT** latching alarm option, the Test Switch is also used to reset the alarm relays. The alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the Test/Reset pushbutton has been pressed or power to the unit has been switched off.

API 1400 GHP Latching Alarm – For units with the **HP** latching alarm option, the alarm relay contacts will remain in the alarmed condition until the input signal falls below the high alarm setpoint (or above low alarm setpoint, depending on configuration) and the power to the unit has been switched off.



API 1400 G with Normal Action HI Alarm

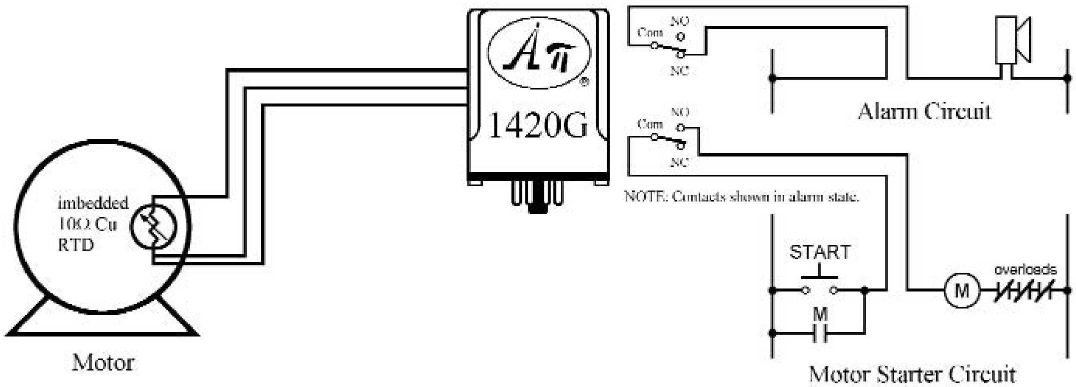


API 1420 G Alarm States with Normal Action HI/LO Alarms

Motor Overheating Alarm and Shutdown

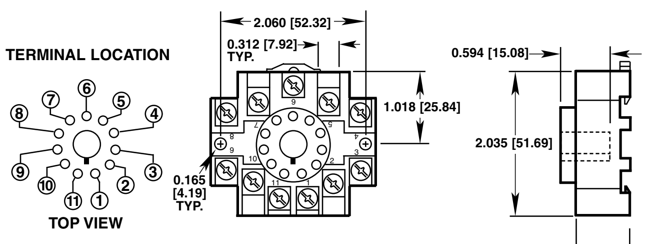
PROBLEM
A motor in a critical process is subject to overload and burnout. An alarm is to be sounded when the motor reaches its rated temperature. The motor is to be shut down if it exceeds its rated temperature by 10 degrees.

SOLUTION
A 10 ohm copper RTD commonly imbedded in many motors is connected to an **API 1420 G** RTD Input Dual Alarm Trip module which provides two independent setpoints and two independent isolated Form C (NO/NC) relay contacts. One set of these contacts is wired to an alarm or annunciator panel to alert the proper personnel of the overload condition. The other set of contacts is wired in series with the coil of the motor starter and shuts down the motor when tripped.

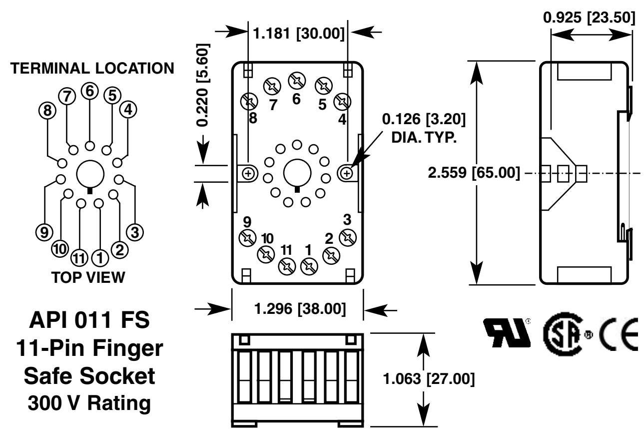


Setpoint 1 is adjusted to the rated temperature, and Setpoint 2 is adjusted to the rated temperature plus 10 degrees. The standard heavy-duty relay contacts are rated 7A @ 240 VAC and can directly control most devices.

API 011 Sockets



API 011
11-Pin Socket
300 V Rating



API 011 FS
11-Pin Finger Safe Socket
300 V Rating

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1 Delta Park Blvd #12
Brampton, ON L6T 5G1
905-457-6322 or 800-794-5883
www.mod-tronic.com

Frequently Asked Questions

1. **Do you recommend placing a fuse at the power input (115 VAC) for protection?**
   It is not required, but if desired, a ½ Amp Fast Blow fuse can be used for each module.

2. **We are using many different types of your signal conditioners and wish to protect the inputs and outputs from short circuits and over voltage. How can we achieve this?**
   Applying a short circuit to any of the signal input terminals will not affect the modules. Exposing the signal input to high voltage will damage the unit but using a zener diode, due to its resistance value, will cause the input range to need recalibrating. Try a Varistor or TransZorb®. Do NOT under any circumstances short circuit the signal output, the unit can be damaged.

3. **Which direction do we turn the deadband potentiometer screw to give the minimum and the maximum deadband?**
   For the minimum amount (1%), turn the potentiometer screw CCW, counter-clockwise. For the maximum amount (100%), turn the potentiometer screw CW, clockwise.

4. **What are the relay contacts rated for in your alarm output modules for a motor load?**
   For inductive loads, our relay contacts are rated for 3.5 Amps Inductive at 250 VAC or 30 VDC.

Relay Protection and EMI Suppression

When using Api alarm module relays to switch inductive loads, maximum relay life and transient EMI suppression is achieved by using external protection. All external protection devices should be placed directly across the load and all leads lengths should be kept to a minimum length.

For AC inductive loads (see Figure 1), place a properly rated MOV across the load in parallel with a series RC snubber. A good RC snubber consists of a 0.1 µF polypropylene capacitor of sufficient voltage and a 47 Ohm ½ Watt carbon film resistor.

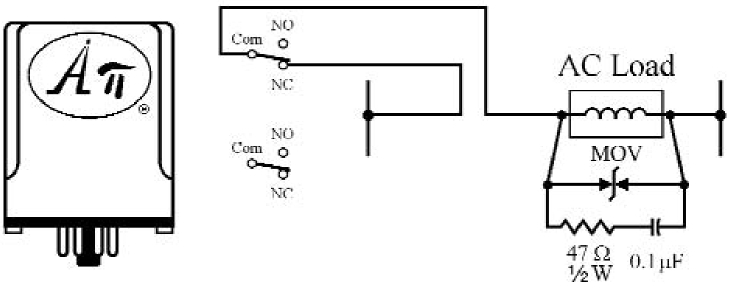

Figure 1: AC inductive loads

For DC inductive loads (see Figure 2), place a diode across the load (1N4006 recommended) being sure to observe proper polarity. Use of an RC snubber is an optional enhancement.

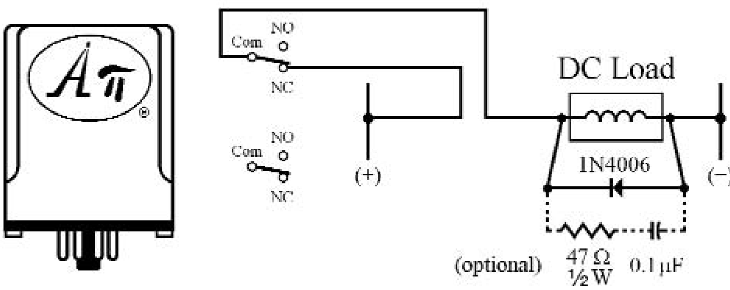

Figure 2: DC inductive loads

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Thermocouple & RTD to DC Isolator & Transmitter

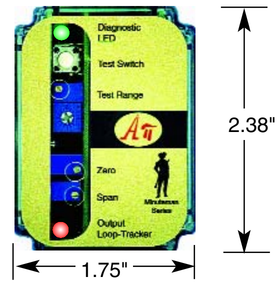
API 4000 G

Input: ***Most Thermocouple and RTD Types***
Output: ***0-1 V to ±10 VDC or 0-2 mA to 4-20 mA***

Field Selectable
One Minute Setup!

- ***Microprocessor-Based with Self Diagnostic LED***
- ***Automatic Cold Junction Compensation***
- ***Output LoopTracker® LED***
- ***Functional Test Pushbutton***
- ***2000 V Full Isolation Input/Output/Power***

LIFETIME WARRANTY



Free Factory Input & Output Calibration!

Applications

- **Isolate, Linearize, Transmit RTD or T/C Signals**
- **One Unit to Handle Most RTD and T/C Sensors!**

Specifications

Thermocouple and RTD Types
The **API 4000 G** accepts one thermocouple or one RTD input
J, K, T, E, R, S, Platinel II. Consult factory thermocouple types N or C
100 Ω DIN, 100 Ω American, 10 Ω Cu, 1000 Ω Ni-Fe, 120 Ω Ni

Cold Junction Compensation
Automatic for selected T/C

Thermocouple Burnout Protection
Upscale standard, downscale available via internal jumper

Thermocouple Current
Less than 1.0 μA

RTD Resistance
10 Ω to 1000 Ω

RTD Leadwire Compensation
Less than ±0.05% of span per 1 Ω change in leadwire resistance

RTD Excitation Current
10 Ω to 120 Ω RTD: 1.25 mA   1000 Ω RTD: 0.1 mA

Linearization
12 segment T/C digital linearization, 8 segment RTD digital linearization

LoopTracker
Variable brightness LEDs indicate input/output loop level and status
Input LED diagnostic functions–see table on back

Output Ranges

Call factory for other ranges	Minimum	Maximum	Load Factor
Voltage:	0-1 VDC	0-10 VDC	
Bipolar Voltage:	±1 VDC	±10 VDC	
Current (20 V compliance):	0-2 mADC	0-20 mADC	1000 Ω at 20 mA

Output Zero and Span
Multiturn potentiometers to compensate for load and lead variations
±12% of span adjustment range typical

Accuracy
Better than ±0.33% of span, includes temperature, linearity, hysteresis effects

Response Time
300 milliseconds

Output Linearity
Better than ±0.1% of span

Output Ripple and Noise
Less than 10 mV_{RMS}

Functional Test Button
Sets output to test level when pressed. Potentiometer factory set to approximately 50% of span, adjustable 0 to 100% of span

Isolation
2000 V_{RMS} min. Full isolation: power to input, power to output, input to output

Ambient Temperature Range
–10°C to +60°C operating

Power
Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
A230 option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.

Input Ranges

Sensor Type	°C Range	°F Range	Minimum Span
RTD 100 Ω DIN	–200 to 700°C	–250 to 1200°F	50°C or 50°F
RTD 100 Ω American	–200 to 800°C	–250 to 1300°F	50°C or 50°F
RTD 10 Ω Cu	–200 to 200°C	–250 to 500°F	100°C or 150°F
RTD 1000 Ω Ni-Fe	0 to 200°C	0 to 500°F	50°C or 50°F
RTD 120 Ω Ni	–50 to 300°C	–100 to 600°F	50°C or 50°F
T/C type J	–200 to 700°C	–250 to 1300°F	100°C or 200°F
T/C type K	–250 to 1200°C	–250 to 1300°F	100°C or 200°F
T/C type T	–200 to 400°C	–250 to 700°F	100°C or 200°F
T/C type E	–250 to 900°C	–250 to 1300°F	100°C or 150°F
T/C type R	0 to 1300°C	0 to 1300°F	450°C or 850°F
T/C type S	0 to 1300°C	0 to 1300°F	450°C or 800°F
Platinel II	0 to 1200°C	50 to 1300°F	150°C or 300°F

Description and Features

The microprocessor-based **API 4000 G** accepts either a thermocouple or RTD input and provides a linearized and isolated DC voltage or current analog output. The **API 4000 G** can be field-configured for sensor type, temperature range, output type and range via external rotary and slide switches with all set-up information on the module labels.

The **API 4000 G** uses 12-bit A/D and D/A conversion, 8-segment linearity correction and digital isolation for an overall accuracy of ±0.33%. Full 3-way (input, output, power supply) isolation makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs vary in intensity with changes in the input and output signals. The input LED also offers diagnostic functions to aid in setup. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be field-adjusted via a multiturn potentiometer. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times and the functional test pushbutton greatly aids in saving time during initial startup and/or troubleshooting.

The **API 4000 G** plugs into an industry standard 8-pin octal socket. Order sockets **API 008** or finger-safe **API 008 FS** for either DIN rail or panel mounting.

Models & Options

Call Factory For Availability. See factory ranged units or V624 Programmable Temperature Transmitter (Catalog page 219)

API 4000 G	Field rangeable temperature transmitter, 115 VAC. Free factory setup—specify input type, temperature range in °F or °C

Options—Add to end of model number

A230	Powered by 230 VAC, 50/60 Hz
B	Downscale T/C burnout protection instead of upscale
U	Conformal coating for moisture resistance

Accessories—Order as a separate line item

API 008	8-pin socket
API 008 FS	8-pin finger safe socket
API TK36	DIN rail, 35 mm W x 39" L, aluminum

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ELECTRICAL CONNECTIONS

WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket separately.

Never connect a temperature sensor to both the module socket and the thermocouple. The module will be damaged.

Power Input Terminals – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3.

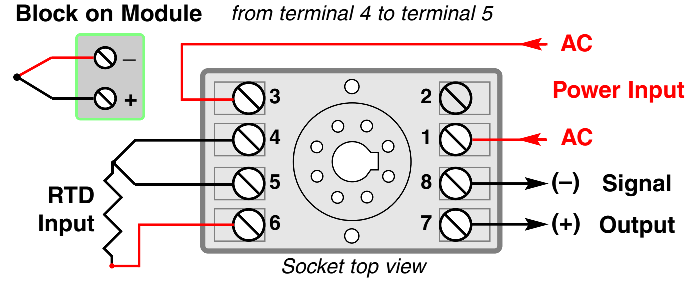
Thermocouple Input – The connection block is located on the side of the module. Polarity must be observed. With thermocouples, the red wire is connected to the negative (–) terminal.

RTD Input – The connections are made to the 8-pin socket. You may wish to check the RTD sensor with an ohmmeter before connecting since RTD wire color-coding varies. The red (or black) wire is connected to terminal 6 and the other two wires with the same color are connected to terminals 4 and 5. When using a 2-wire RTD install a jumper from terminal 4 to terminal 5.

Signal Output Terminals – Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8. Note that with current outputs the module provides power to the output loop.

T/C Connection Block on Module

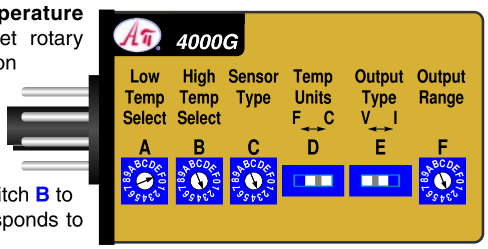
For a 2-wire RTD install a jumper from terminal 4 to terminal 5



Socket top view

RANGE SELECTION

Four rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Standard ranges are listed on the module labels and at right. Contact factory for special ranges.



1. Find the **Low Temperature** range in the table. Set rotary switch **A** to the position that corresponds to this value.
2. Find the **High Temperature** range in the table. Set rotary switch **B** to the position that corresponds to this value.
3. Find your **Sensor Type** in the table. Set rotary switch **C** to the letter or number position that corresponds to your sensor type.
4. Set **Temp Units** slide switch **D** to °**F** or °**C** depending on temperature units.
5. Set **Output Type** slide switch **E** to voltage or (**V**) current (**I**).
6. Find your **Output Range** in the table. Set rotary switch **F** to the letter or number position that corresponds to your sensor type.
7. The Zero, Span and Test Range potentiometers can now be adjusted.

CALIBRATION

Input and output ranges are listed on module labels. Custom ranges may require factory modification. Top-mounted, Zero and Span potentiometers can be used should fine-tuning of the output be necessary.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate temperature simulator, provide an input to the module equal to the minimum input required for the application.
3. Connect an accurate measurement device to the output. Adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum to produce the corresponding minimum output signal. Example: for a 4-20 mA output signal, the Zero control will allow adjustment of the 4 mA or low end of the signal.

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

CALIBRATION (Continued)

4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: for 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.

TEST BUTTON & TEST RANGE

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multi-turn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

OPERATION

The API 4000 G microprocessor reads sensor and temperature range configuration settings and electronically switches to the RTD amplifier, which includes leadwire compensation circuitry, or the thermocouple amplifier. The resulting signal is applied to a 12-bit analog-to-digital (A/D) converter. For thermocouples, the microprocessor reads the sensor temperature and compensates for the cold junction sensor in the T/C connector block. The digital temperature value is optically isolated and sent to the 12-bit digital-to-analog output circuitry. The output range and type selector switches determine the actual output generated.

GREEN LoopTracker® Input & Diagnostic LED – Provides a visual indication that a signal is being sensed by the module input circuitry. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. Failure to illuminate, or change in intensity as the process changes, may also indicate a problem with module power or signal input wiring.

This LED can also flash to give the operator feedback on the input status.

2 Flashes	Under-range condition or shorted sensor
3 Flashes	Over-range condition or open sensor
4 Flashes	Invalid sensor selection
5 Flashes	Invalid sensor range
6 Flashes	Insufficient Span
7 Flashes	Excessive low-end-to-span ratio (offset greater than the span)

RED LoopTracker output LED – Provides visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. Failure to illuminate, or change in intensity as the process changes, may also indicate a problem with module power or signal output wiring.

Switch Settings

Low Temp	A	High Temp	B	Sensor Type	C	Temp Units	D	Output Type	E	Output Range	F
–250	0	–100	0	100 Ω DIN	0	°F	F	Voltage	V	0-1 V	F
–200	1	0	1	100 Ω Amer.	1	°C	C			0-2 V	7
–100	2	50	2	10 Ω Cu	2					0-4 V	6
–50	3	100	3	1000 Ω Ni-Fe	3					0-5 V	C
0	4	200	4	120 Ω Ni	4					1-5 V	1
50	5	300	5	J T/C	5					0-8 V	5
100	6	400	6	K T/C	6					0-10 V	4
150	7	500	7	T T/C	7					2-10 V	0
200	8	600	8	E T/C	8					±5 V	3
250	9	700	9	R T/C	9					±10 V	2
300	A	800	A	S T/C	A			Current	I	0-2 mA	F
350	B	900	B	Platinel II	B					0-10 mA	C
400	C	1000	C							2-10 mA	1
450	D	1100	D							0-16 mA	5
500	E	1200	E							0-20 mA	4
550	F	1300	F							4-20 mA	0

Common Thermocouple Specifications

Type	Polarity & Material	Wire ID Properties	Pol./Wire Colors	Practical Temp Range	Outer Insulation	Limits of Error
J	+ Iron	Very magnetic	+ White	32 to 1336°F	Black (Ext. grade)	±4°F or ±0.8% of rdg
	– Constantan		– Red	0 to 724°C	Brown (T/C grade)	±2°F or ±0.4% of rdg
K	+ Chromel		+ Yellow	32 to 2282°F	Yellow (Ext. grade)	±4°F or ±0.8% of rdg
	– Alumel	Slightly magnetic	– Red	0 to 1250°C	Brown (T/C grade)	±2°F or ±0.4% of rdg
N	+ NICROSIL	Greater stiffness	+ Orange	32 to 2282°F	Orange (Ext. grade)	±4°F or ±0.8% of rdg
	– NISIL		– Red	0 to 1250°C	Brown (T/C grade)	±2°F or ±0.4% of rdg
T	+ Copper	Copper color	+ Blue	–299 to 700°F	Blue (Ext. grade)	±1.5°F or ±0.8% rdg, ±1% rdg <32°F
	– Constantan		– Red	–184 to 371°C	Brown (T/C grade)	±0.9°F or ±0.4% rdg, ±0.8% rdg <32°F
E	+ Chromel	Greater stiffness	+ Purple	32 to 1652°F	Purple (Ext. grade)	±3°F or ±0.5% of rdg
	– Constantan		– Red	0 to 900°C	Brown (T/C grade)	±1.8°F or ±0.4% of rdg
R	+ Pt 13%Rh	Greater stiffness	+ Black	32 to 2700°F	Green (Ext. grade)	±5°F or ±0.5% of rdg
	– Platinum		– Red	0 to 1482°C	Green (T/C grade)	±2.5°F or ±0.25% of rdg
S	+ Pt 10%Rh	Greater stiffness	+ Black	32 to 2700°F	Green (Ext. grade)	±5°F or ±0.5% of rdg
	– Platinum		– Red	0 to 1482°C	Green (T/C grade)	±2.5°F or ±0.25% of rdg

Extend thermocouples up to 2000 feet or 100 Ohms maximum resistance.
Extension wire type must be the same type as the thermocouple type.

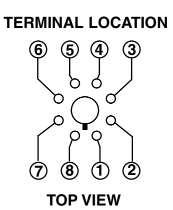
Atmosphere for exposed junction

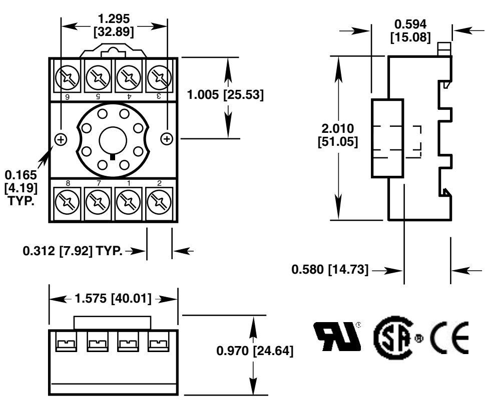
Type **J**	Reducing
Type **K** or **N**	Clean oxidizing
Type **T**	Mildly oxidizing and reducing or with moisture
Type **E**	Vacuum, inert mildly oxidizing or reducing
Type **R** or **S**	Resists oxidation and corrosion, but contaminated by hydrogen, carbon, and metal vapors

TEMPERATURE CONVERSION

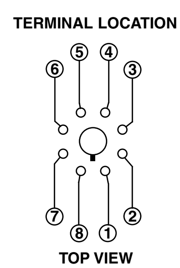
°F = (°C x 9/5) + 32 °C = (°F – 32) x 5/9

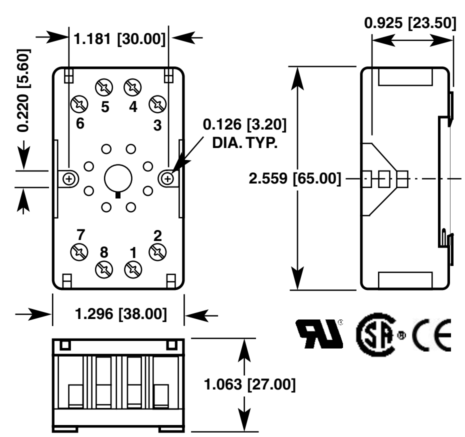
API 008 and API 008 FS Sockets





API 008
8-Pin Socket
600 V Rating





API 008 FS
8-Pin Finger Safe Socket
300 V Rating

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Temperature

Frequently Asked Questions

Will an API 4000 G work with an input temperature range of 1000 to 2000°F?

Yes, however to utilize the charts for selecting the switch positions in the field, we need to convert °F to °C. This would give 550°C to 1100°C which can be selected from the charts.

What is cold junction compensation and why is it necessary?

Cold junction compensation is required for accurate temperature measurement when using a thermocouple. A thermocouple junction, created whenever two dissimilar metals are connected together (such as Iron and Copper-Nickel), produces a potential difference that varies with temperature.

Thermocouples generate a millivolt signal that increases in proportion to the difference in temperature between the hot and the cold junctions. Thermocouple tables are based on a standard 0°C cold junction temperature.

Instruments designed to read thermocouples have a temperature sensor at the instrument connection point designed to electronically correct the reading to the 0°C standard. A millivolt meter can't be used to accurately read a thermocouple directly since it has no 0°C compensation, and any additional connections with dissimilar metals creates new thermocouple junctions adding to the error.

We have four of your API 4130 GL modules set for a K type thermocouple with an input range of 0-2000°F and an output range of 4-20 mA.

For an input of 0°C, the outputs on all 4 units are calibrated to 4 mA.

For an input of 2000°F, the outputs of all 4 units are calibrated to 20 mA.

When the input is at 1000°F, the outputs of each of the 4 units is different (11.8, 11.9 etc.). Can better performance be achieved?

The linearity specification is ±0.5% of span which is ±10°F for a range of 2000°F. For an input of 1000°F, the output can vary from 990°F to 1010°F.

Also, output span / input temp range gives (20 – 4 = 16), 16 mA / 2000°F = .008 mA per °F for the entire range. For an input of 1000°F, the output can be in the range of 11.92 mA to 12.08 mA. You are getting 11.8, 11.9 etc. which are probably the variations in the accuracy of the four thermocouples, the extension wire, the thermocouple simulator, the multimeter and the wiring connections.

If you want API to verify this with our NIST traceable simulators, just call customer service at 800-942-0315 for an RMA number. The **API 4000 G** is even more accurate which should be used for high precision applications.

Temperature Conversions and Information

From	To	Formula
Fahrenheit	Celsius	°C = (°F – 32) / 1.8
Fahrenheit	kelvin	K = (°F + 459.67) / 1.8
Fahrenheit	Rankine	°R = °F + 459.67
Fahrenheit	Réaumur	°Re = (°F – 32) / 2.25
Celsius	Fahrenheit	°F = °C × 1.8 + 32
Celsius	kelvin	K = °C + 273.15
Celsius	Rankine	°R = °C × 1.8 + 32 + 459.67
Celsius	Réaumur	°Re = °C × 0.8
kelvin	Celsius	°C = K – 273.15
kelvin	Fahrenheit	°F = K × 1.8 – 459.67
kelvin	Rankine	°R = K × 1.8
kelvin	Réaumur	°Re = (K – 273.15) × 0.8
Rankine	Celsius	°C = (°R – 32 – 459.67) / 1.8
Rankine	Fahrenheit	°F = °R – 459.67
Rankine	kelvin	K = °R / 1.8
Rankine	Réaumur	°Re = (°R – 459.67 – 32) / 2.25
Réaumur	Celsius	°C = °Re × 1.25
Réaumur	Fahrenheit	°F = °Re × 2.25 + 32
Réaumur	kelvin	K = °Re × 1.25 + 273.15
Réaumur	Rankine	°R = °Re × 2.25 + 32 + 459.67

The **Celsius** scale (°C), sometimes referred to as the "centigrade" scale, was devised by Swedish astronomer Andres Celsius (1701-1744) for scientific purposes. It has 100 degrees between the freezing point of 0 °C and boiling point of 100 °C of pure water at a standard air pressure of 29.92 inches of mercury. The term Celsius was adopted in 1948 by an international conference on weights and measures to replace the term centigrade. This is the most widely used temperature scale in the world.

The **Fahrenheit** scale (°F) is used primarily in the United States. The freezing point of water is 32 °F and the boiling point is 212 °F while measured at a standard air pressure of 29.92 inches of mercury. What then is 0 °F based on? 0 °F was the coldest temperature that Dr. Gabriel Daniel Fahrenheit (1686-1736) could create with a mixture of ice and salt. He is credited with the invention of the mercury thermometer introducing it and the °F scale in 1714. His thermometer was based on a design by Galileo.

The absolute or **kelvin** (K) scale is used primarily for scientific work. It was invented by William Thomson, also know as Lord Kelvin. The hypothetical temperature characterized by a complete absence of heat energy and the point at which molecular motion would theoretically stop is –273.15 °C or "absolute zero". The kelvin scale uses this number as 0 K with divisions being the same as the Celsius scale. Temperatures on this scale are called kelvins, thus the degree symbol is not used with the capital "K" symbol, nor is the word kelvin capitalized when referring to the temperature units.

A scale lesser-known today was created by R A F de **Réaumur** (1683-1757). He used the freezing point of water as 0 °Re and the boiling point at 80 °Re. It was used in the 18th and 19th centuries mainly in France for scientific work, but is still used today by some European wine and cheese makers.

W J M **Rankine** (1820-1872) created this scale, which was merely the kelvin scale using the Fahrenheit degree instead of the Celsius. It has been used in some scientific and thermodynamics work but is not commonly used today.

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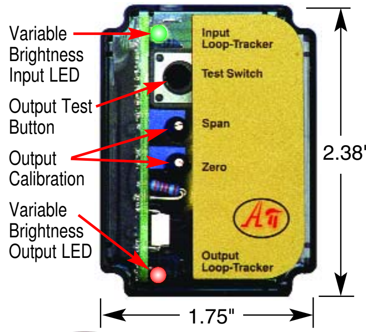
RTD to DC Transmitters

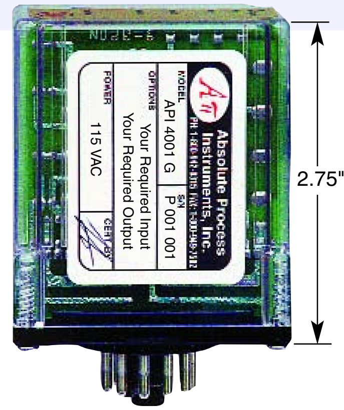
API 4001 G
API 4001 G L

Input: *Most 10 Ω to 2000 Ω RTDs*
Output: *0-1 V to ±10 VDC or 0-1 mA to 4-20 mA*

API 4001 G L: ***Isolated & Linearized***
API 4001 G: ***Non-Isolated***

- ***Automatic Leadwire Compensation***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***





LIFETIME WARRANTY

Free Factory Input & Output Calibration!

Temperature

Applications

- **Convert and Transmit RTD Signals**
- **Interface Standard & Special RTDs to PLCs**
- **Rescale Temperature Ranges to Full 4-20 mA**

Specifications

RTD Input Type
Factory Configured—Please specify input parameters

RTD type:	10 Ω to 2000 Ω RTD, consult factory for special inputs 100 Ω DIN 0.00385 (“385”) 100 Ω American 0.003916 (“3916”) 10 Ω Cu 1000 Ω Ni-Fe 120 Ω Ni
RTD curve:	385 DIN, 3916 American, etc.
Temperature span:	In °F or °C, 100°F (55°C) is the recommended minimum span, consult factory if a smaller span is required

RTD Excitation Current

10 Ω	10 mA
100 Ω	5 mA
1000 Ω	0.5 mA
2000 Ω	0.2 mA

RTD Linearization
API 4001 G Non-linearized
API 4001 G L Linearized to better than ±0.1% of span

Leadwire Compensation
Less than ±0.05% of span per 1 Ω change in leadwire resistance

LoopTracker
Variable brightness LEDs indicate input/output loop level and status

Output Range
Factory Configured—Please specify output range

	Minimum	Maximum	Load Factor
Voltage:	0-1 VDC	0-10 VDC	
Bipolar Voltage:	±1 VDC	±10 VDC	
Current (20 V compliance):	0-2 mADC	0-20 mADC	1000 Ω at 20 mA

Consult factory for special ranges

Output Linearity
Better than ±0.1% of span

Functional Test Button
Sets output to test level when pressed
Test level factory set to approximately 50% of span

Response Time
70 milliseconds typical

Isolation
API 4001 G Isolated power supply, non-isolated input to output
API 4001 G L 2000 V_{RMS} minimum, full isolation; power to input, power to output, input to output

Ambient Temperature Range
–10°C to +60°C operating ambient

Temperature Stability
Better than ±0.04% of span per °C stability

Power

Standard:	115 VAC ±10%, 50/60 Hz, 2.5 W max.
A230 option:	230 VAC ±10%, 50/60 Hz, 2.5 W max.
D option:	9-30 VDC, 2.5 W typical

Description and Features

The **API 4001 G** and **API 4001 G L** accept an RTD input and provide a DC voltage or current output. The module power supply in both models is isolated from the input and output. The **API 4001 G** is not isolated from the RTD input to the output, nor is it linearized. It is used primarily to convert the RTD signal over narrow temperature spans where linearization and signal isolation is not an issue.

The **API 4001 G L** is isolated and linearized and provides a DC voltage or current output that is optically isolated from input to output. It is linear to the process temperature for applications requiring ground loop elimination, common mode signal rejection or noise pickup reduction.

Both models require factory configuration to a specific RTD type, temperature span (°C or °F), and corresponding DC voltage or current output. Automatic leadwire compensation is standard. Configurations for most RTD types are available. Minimum and maximum temperature spans are dependent upon the RTD type. Consult the factory to confirm your specific range requirements.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level is fixed at 50% of output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The **API 4001 G** and **API 4001 G L** plug into an industry standard 8-pin octal socket sold separately. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

Models & Options

Factory Configured—Please specify RTD type, temperature range, output range, and options

API 4001 G	RTD transmitter, non-isolated, 115 VAC powered
API 4001 G L	RTD transmitter, isolated, 115 VAC powered

Options—Add to end of model number

A230	Powered by 230 VAC, 50/60 Hz
D	Powered by 9-30 VDC
EXTSUP	Open collector output when a “sinking” output is required
M01	API 4001 G L only; Input/output reversal, such as 20-4 mA out instead of 4-20 mA
U	Conformal coating for moisture resistance

Accessories—Order as separate line item

API 008	8-pin socket
API 008 FS	8-pin finger-safe socket
API TK36	DIN rail, 35 mm W x 39" L, aluminum

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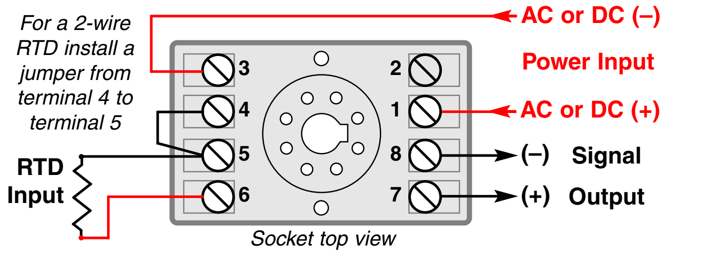
ELECTRICAL CONNECTIONS

WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket.

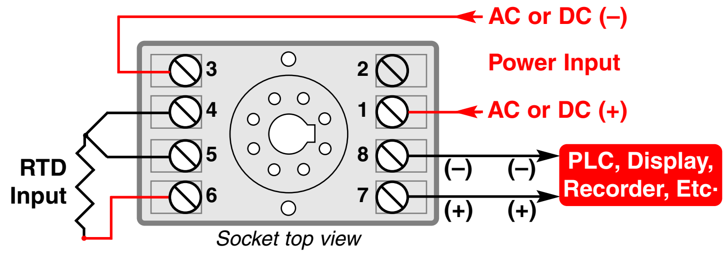
Power Input Terminals – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

RTD Input – The connections are made to the 8-pin socket. You may wish to check the RTD sensor with an ohmmeter before connecting since RTD wire color coding varies. The red (or black) wire is connected to terminal 6 and the other two wires with the same color are connected to terminals 4 and 5. When using a 2-wire RTD install a jumper from terminal 4 to terminal 5.

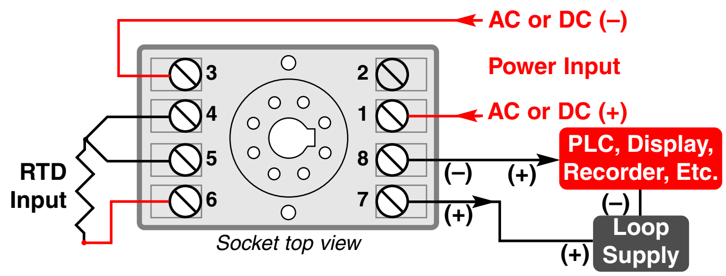
Signal Output Terminals – Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8. Note that with current outputs the module provides power to the output loop unless option **EXTSUP** was ordered for a sinking output requirement.



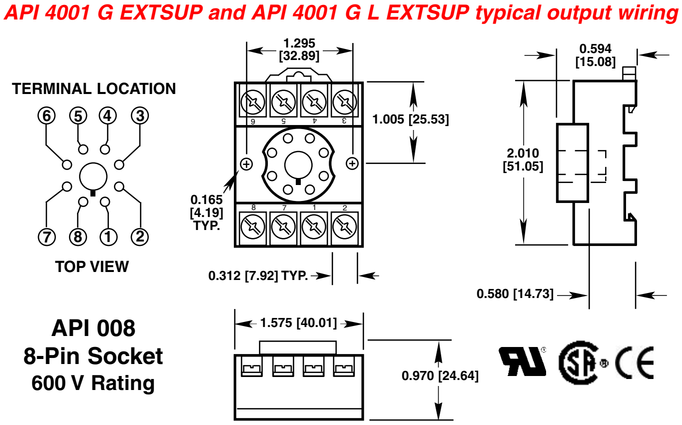
API 4001 G and API 4001 G L typical wiring with 2 wire RTD



API 4001 G and API 4001 G L typical output wiring



API 4001 G EXTSUP and API 4001 G L EXTSUP typical output wiring



API 008
8-Pin Socket
600 V Rating

CALIBRATION

The API 4001 G and API 4001 G L are factory configured to your exact input and output requirements.

Input and output ranges are listed on module labels. Input changes require factory modification. Field calibration of the input is NOT recommended and may void the warranty. Top-mounted, Zero and Span potentiometers can be used should fine-tuning of the output be necessary.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate temperature simulator, provide an input to the module equal to the minimum input required for the application.
3. Connect an accurate measurement device to the output. Adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum to produce the corresponding minimum output signal. Example: for a 4-20 mA output signal, the Zero control will allow adjustment of the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: for 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.

TEST BUTTON

The Test pushbutton provides approximately 50% output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. When released, the output will return to normal.

Example: If you are checking a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be approximately 12 mA.

OPERATION

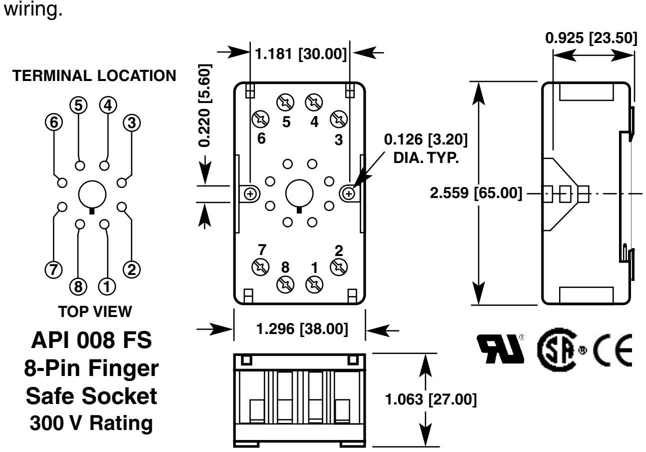
The input circuitry in both models provides a constant-current excitation source to the RTD and automatically cancels leadwire effects.

In the API 4001 G, the input from the RTD is amplified, then passed directly to the output stage and scaled to the desired output range.

In the API 4001 G L, the amplified RTD signal first passes through an optical isolator, then is passed to the output stage where it is corrected for the inherent non-linearity of the specified RTD type and scaled to the desired output range.

GREEN *LoopTracker*® Input LED – Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

The RED *LoopTracker* output LED – Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.



API 008 FS
8-Pin Finger Safe Socket
300 V Rating

Differential RTD to DC Transmitter — API 4001 G SA-B

Inputs: ***Two 100 Ω 0.00385 RTDs***
Output: ***0-1 V to ±10 VDC or 0-1 mA to 4-20 mA Non-Isolated***

- ***RTD Leadwire Compensation***
- ***RTD Linearization***
- ***Voltage or Current Output***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***

Applications

- **Monitor Heat Exchanger ΔT**
- **Convert and Transmit Δ RTD Signals**
- **Rescale Δ RTD Temperature to Full 4-20 mA**

Specifications

RTD Inputs
Two RTDs, 1 hot and 1 cold
100 Ω Platinum, 0.00385 DIN curve
3-wire preferred, 2-wire acceptable for short lead length applications

Input Differential Span
Minimum: 20°F or 10°C
Maximum: 900°F or 500°C

Input Common Mode Temperature
Entire useable range of Pt 100; –325 to 1300°F (–200 to 700°C)

Leadwire Resistance
40 Ω maximum

Leadwire Effect
Less than ±0.02% of span per Ω of leadwire resistance

LoopTracker
Variable brightness LEDs indicate input/output loop level and status

Output Range
Factory Configured—Please specify output range
Consult factory for special ranges

	Minimum	Maximum	Load Factor
Voltage:	0-1 VDC	0-10 VDC	
Bipolar Voltage:	±1 VDC	±10 VDC	
Current (20 V compliance):	0-1 mADC	0-20 mADC	1000 Ω at 20 mA

Outputs clamped not to exceed ±5% over- or under-range

Common Output Ranges	Voltage	Current
	0 to 1 V	0 to 20 mA
	0 to 5 V	4 to 20 mA
	1 to 5 V	
	0 to 10 V	
	±5 V	
	±10 V	

Output Zero and Span
Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

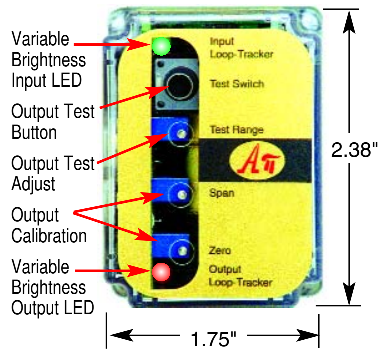
Functional Test Button
Sets output to test level when pressed. Adjustable 0-100% of span
Test level potentiometer factory set to approximately 50% of span

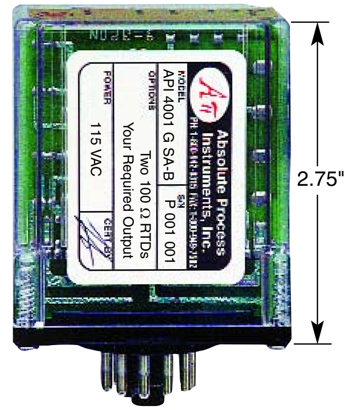
Response Time
100 milliseconds typical

Output Ripple and Noise
Less than 10 mV_{RMS}

Ambient Temperature Range and Stability
–10°C to +60°C operating ambient
Better than ±0.02% of span per °C stability

Power
Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
A230 option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
D option: 9-30 VDC, 2.5 W typical





Temperature

LIFETIME WARRANTY
Free Factory Input & Output Calibration!

Description and Features

The **API 4001 G SA-B** accepts two DIN curve 100 Ω platinum RTD inputs and provides a linear DC voltage or current output proportional to the difference in temperature of the two RTDs. Differential or single-ended input ranges from 20°F through 900°F (10°C through 500°C) can be accommodated.

The **API 4001 G SA-B** is factory configured to a specific RTD temperature span (°C or °F), and corresponding DC voltage or current output. 3-wire RTD leadwire compensation and linearization for accurate output over a wide temperature range is standard.

Eight common DC output ranges are standard. Consult factory for other outputs. The module power supply is isolated from the input and the output.

API exclusive features include two **LoopTracker** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times.

The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level can be field-adjusted via a multiturn potentiometer. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The **4001 G SA-B** plugs into an industry standard 11-pin socket sold separately. Sockets **API 011** and finger-safe **API 011 FS** allow either DIN rail or panel mounting.

Models & Options

Factory Configured—Please specify output range and options

API 4001 G SA-B Dual RTD input differential transmitter, 115 VAC

Options—Add to end of model number

A230	Powered by 230 VAC, 50/60 Hz
D	Powered by 9-30 VDC
U	Conformal coating for moisture resistance

Accessories—Order as separate line item

API 011	11-pin socket
API 011 FS	11-pin finger-safe socket
API TK36	DIN rail, 35 mm W x 39" L, aluminum

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Temperature

ELECTRICAL CONNECTIONS

WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket.

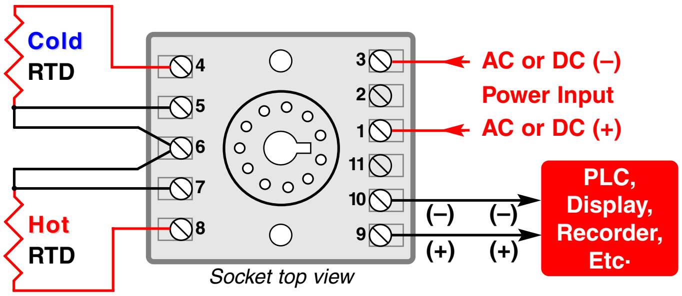
Power Input Terminals – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

RTD Input – The connections are made to the 11-pin socket. You may wish to check the RTD sensors with an ohmmeter before connecting since RTD wire color-coding varies.

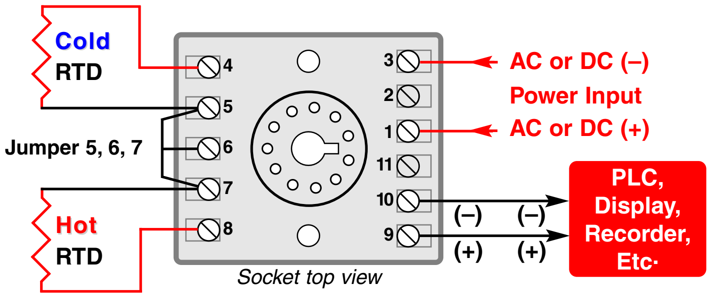
For the **Low** temperature input, the red (or black) wire is connected to terminal 4 and the other two wires with the same color are connected to terminals 5 and 6. When using a 2-wire RTD install a jumper from terminal 5 to terminal 6.

For the **High** temperature input, the red (or black) wire is connected to terminal 8 and the other two wires with the same color are connected to terminals 6 and 7. When using a 2-wire RTD install a jumper from terminal 6 to terminal 7.

Signal Output Terminals – Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 9 and the negative (–) is connected to terminal 10. Note that with current outputs the module provides power to the output loop.



API 4001 G SA-B typical wiring



API 4001 G SA-B typical wiring with 2-wire RTDs
Use only for short lead lengths!

CALIBRATION

The API 4001 G SA-B is factory calibrated to your input/output specifications.

1. Recalibration of the API 4001 G SA-B will require two accurate, matched RTD simulators, plus an accurate DC digital voltmeter, for best results.
2. Be aware that measuring small temperature differentials (20°F to 40°F or 10°C to 20°C) on large offsets such as 800°F (400°C) or more will require very precise matching (±0.1%) of RTDs for acceptable results.
3. To calibrate, connect two RTD simulators to the module input, and an accurate DC voltmeter (or milliammeter, as required) to the module output.
4. For best accuracy, calibrate the unit near the actual ambient temperatures the unit will encounter in the application.
5. Set the cold RTD simulator to the low-end differential temperature compared to the hot RTD simulator.
6. Adjust the module's zero control for the specified 0% (low end) output.
7. Set the hot RTD simulator to the high differential value.
8. Adjust the module span control for the specified high (100%) output level. The zero and span controls normally have little interaction, but adjustments may be repeated for maximum accuracy.

Finally, the Test Cal control may be set to provide the desired output when the Test Pushbutton is held depressed.

TEST BUTTON

The Test pushbutton may be set to provide the desired output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range. When released, the output will return to normal.

Turn the multi-turn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached.

Example: If you are isolating a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be a constant signal between 4 and 20 mA depending on the setting of the Test Range adjustment pot.

OPERATION

The API 4001 G SA-B excites the “hot” and “cold” RTDs with constant 5 mA current sources which are linearized for 100 Ω platinum, DIN-curve RTDs. A switched-capacitor technique is used to convert the temperature differential signal into a single-ended signal. A precision amplifier then amplifies this signal. Non-interactive zero and span controls provide a standard level signal to the output stage. The output stage is internally configured for voltage or current output and the gain is scaled to the specific user-requested limits.

GREEN *LoopTracker®* Input LED – Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

The RED *LoopTracker* Output LED – Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the red LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.

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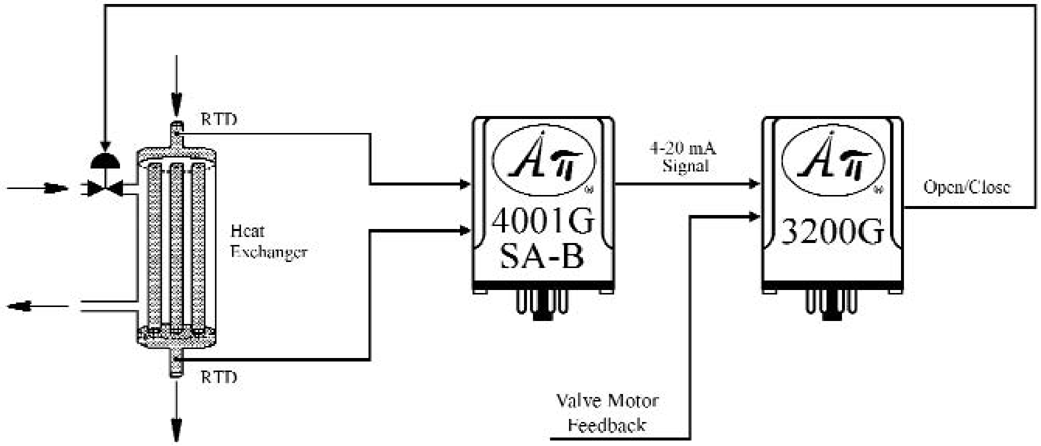
Maintaining a Constant Differential Temperature Across a Heat Exchanger

PROBLEM
A critical process requires precise control of the change in temperature of the process fluid across a heat exchanger.

SOLUTION
Install RTDs at the process fluid heat exchanger inlet and outlet and connect the RTDs to an **API 4001G SA-B** Non-Isolated Differential RTD to DC Transmitter module.

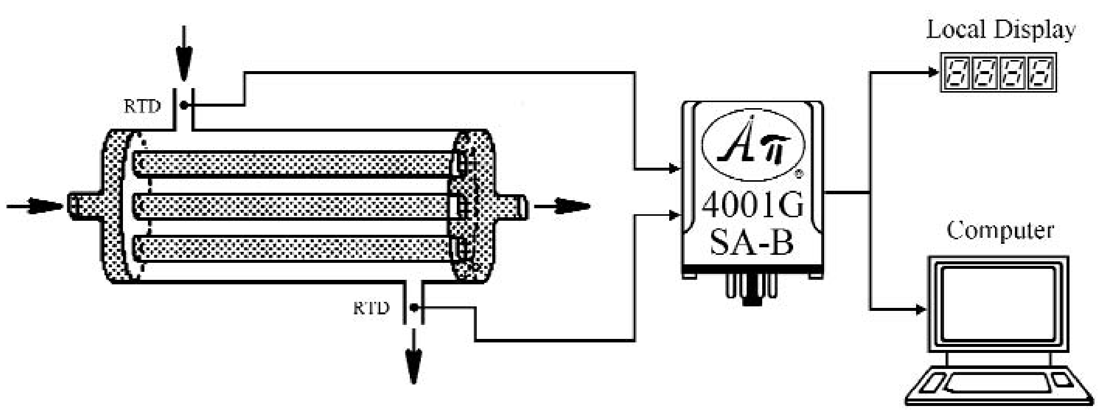


The **API 4001 G SA-B** computes the differential temperature and provides a proportional 4-20 mA output signal which is used by the **API 3200 G** Valve/Actuator Positioner/Controller module to drive the temperature control valve open or closed as necessary to maintain the required process fluid temperature differential.

Monitoring and Controlling Differential Temperature

PROBLEM
Monitor the temperature differential across a heat exchanger and provide an output signal for the process control computer and a local display.

SOLUTION
Install RTDs to measure the heat exchanger inlet and outlet temperatures and connect the RTDs to an **API 4001 G SA-B** Non-Isolated Differential RTD to DC Transmitter module.



The **API 4001 G SA-B** will directly measure the temperature differential and provide an output to drive the local display and the process control computer.

Temperature

Frequently Asked Questions – RTDs

Do you have a temperature differential unit that will measure a difference of 10° C between the two inputs?

Yes, the **API 4001 G SA-B**, but the two RTDs will require very precise matching (±0.1%) and it would be helpful to know the operating temperature point so the factory can calibrate the unit precisely.

We are using an API 4001 G with an input of 0-100°C and output of 0-20 mA. If the input runs above 100°C (say 150°C) what will the output do?

The output will go higher, maybe to 21 mA but then stop there. If the output must remain at about 20 mA and go no higher, then a special clamp circuit can be ordered.

Will an API 4000 G work with an input temperature range of 1000 to 2000°F?

Yes, however to utilize the charts for selecting the switch positions in the field, we need to convert °F to °C. This would give 550°C to 1100°C which can be selected from the charts.

For modules with a 4-20 mA output signal, what are the minimum and maximum output load resistances?

For the units with 20 V compliance, the output range is 10 to 1000 Ω.
For the units with 12 V compliance, the output range is 10 to 600 Ω.

Do you recommend placing a fuse at the power input (115 VAC) for protection?

It is not required, but if desired, a ½ Amp Fast Blow fuse can be used for each module.

We use many different types of your signal conditioners and wish to protect the inputs and outputs from short circuits and over voltage. How can we achieve this?

Applying a short circuit to any of the signal input terminals will not affect the modules. Exposing the signal input to high voltage will damage the unit but using a zener diode, due to its resistance value, will cause the input range to need recalibrating. Try a Varistor or TransZorb®. Do NOT under any circumstances short circuit the signal output, the unit can be damaged.

We are running a 4-20 mA signal between a chart recorder and a DCS over a distance of 5000 feet (10,000 total loop). Can we use your isolator signal conditioner for this?

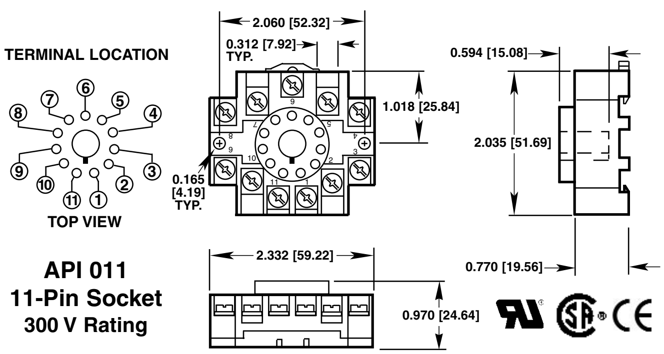
Yes, however you must select the proper gauge wire to reduce the impedance of the system

total load = impedance of the instrument + impedance of the wire

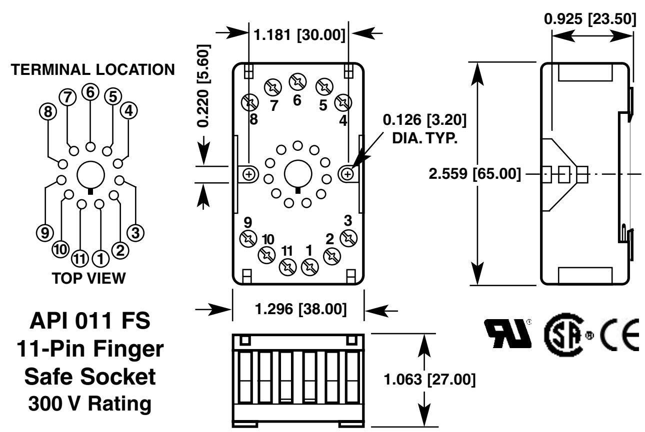
For a 4-20 mA loop, our compliance voltage is 20 V and allows a total of 1000 ohm load. Also, to prevent problems from noise, it is recommended that you use shielded, twisted pair wires.

TransZorb–Reg TM General Semiconductor

API 011 and API 011 FS Sockets



API 011
11-Pin Socket
300 V Rating



API 011 FS
11-Pin Finger Safe Socket
300 V Rating

FREE APPLICATION ASSISTANCE
Call API Customer Service
800-794-5883

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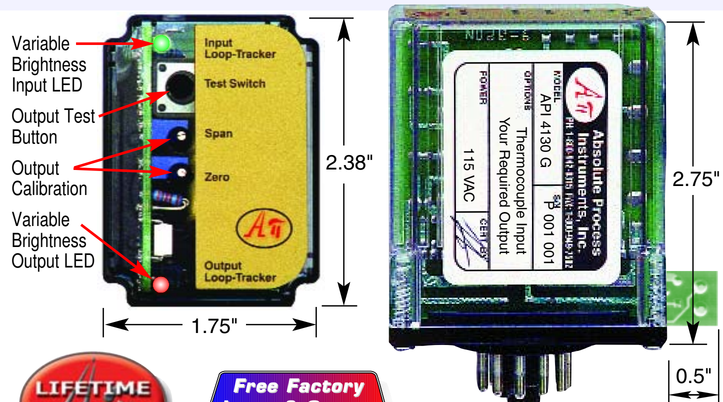
Thermocouple to DC Transmitters

API 4100 G
API 4130 GL

Input: J, K, T, E, R or S Thermocouples
Output: 0-1 V to ±10 VDC or 0-1 mA to 4-20 mA

API 4100 G: Non-Isolated
API 4130 GL: Isolated & Linearized

- **Wide Range of Thermocouple Types**
- **Automatic Cold Junction Compensation**
- **Voltage or Current Output**
- **Input and Output LoopTracker® LEDs**
- **Functional Test Pushbutton**



Temperature

Applications

- **Isolate and Transmit T/C Signals**
- **Rescale T/C Temperature Range to Full 4-20 mA**

Specifications

Thermocouple Types

Factory Configured—Please specify T/C type and temperature range
Thermocouple type: J, K, T, E, R, or S
Temperature range: °F or °C
Minimum recommended span is 5 mV
Consult factory for other T/C types

Cold-Junction Compensation

Automatic for specified thermocouple

T/C Burn-out Protection

Upscale burnout standard
Downscale burnout optional, specify option **B** on order

T/C Current

Less than 1.0 µA including burnout sense

LoopTracker

Variable brightness LEDs indicate input/output loop level and status

Output Range

Factory Configured—Please specify output range

	Minimum	Maximum
Voltage (10 mA max.):	0-1 VDC	0-10 VDC
Bipolar Voltage (±10 mA max.):	±1 VDC	±10 VDC
Current (12 V compliance):	0-1 mADC	0-20 mADC

Consult factory for special ranges

Output Linearity

API 4100 G Non-linearized
API 4130 GL Linearized to better than ±0.1% of span

Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

Functional Test Button

Sets output to test level when pressed
Factory set to approximately 50% of span

Response Time

70 milliseconds typical

Isolation

API 4130 G Non-isolated
API 4130 GL 2000 V_{RMS} minimum, full isolation; power to input, power to output, input to output

Ambient Temperature Range

–10°C to +60°C operating

Temperature Stability

Better than ±0.04% of span per °C

Power

Standard: 115 VAC ±10%, 50/60 Hz, 2.5 W max.
A230 option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
D option: 9-30 VDC, 2.5 W typical

Description and Features

The **API 4100 G** and **API 4130 GL** accept a thermocouple input and provide a DC voltage or current output. The module power supply in both models is isolated from the input and output. The non-isolated non-linearized **API 4100 G** is used primarily to convert a T/C signal over a limited temperature range where signal isolation is not required. The isolated and linearized **API 4130 GL** provides a DC voltage or current output that is optically isolated from input to output and linear to the process temperature for applications requiring ground loop elimination, common mode signal rejection, or noise pickup reduction.

Both models require factory configuration for thermocouple type, temperature span (°C or °F), and DC voltage or current output. Automatic cold-junction compensation and upscale burnout protection are standard, downscale burnout protection is optional. Minimum and maximum temperature spans are dependent upon the T/C type. Consult the factory to confirm your specific requirements.

The **API 4100 G** and **API 4130 GL** feature a thermocouple connection block on the side of the module rather than the mounting base. This allows direct temperature compensation circuitry at the T/C termination point eliminating cold junction errors commonly found when wiring through the mounting base.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Pushbutton**. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times. The functional test pushbutton provides a fixed output (independent of the input) when held depressed. The test output level is fixed at 50% of output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The **API 4100 G** and **API 4130 GL** plug into an industry standard 8-pin octal socket sold separately. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

Models & Options

Factory Configured—Specify T/C type, °F/°C range, output range, and options
API 4100 G Thermocouple transmitter, 115 VAC powered
API 4130 GL Isolated thermocouple transmitter, 115 VAC powered

Options—Add to end of model number

A230	Powered by 230 VAC, 50/60 Hz
D	Powered by 9-30 VDC
B	Downscale T/C burnout protection instead of upscale
EXTSUP	Open collector output when a “sinking” output is required
U	Conformal coating for moisture resistance

Accessories—Order as separate line item

API 008	8-pin socket
API 008 FS	8-pin finger-safe socket
API TK36	DIN rail, 35 mm W x 39" L, aluminum

MOD-TRONIC INSTRUMENTS LIMITED
1 Delta Park Blvd #12
Brampton, ON L6T 5G1
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www.mod-tronic.com

ELECTRICAL CONNECTIONS

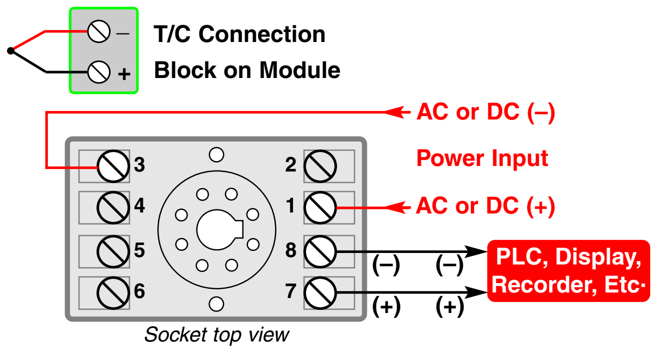
WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket separately.

Power Input Terminals – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

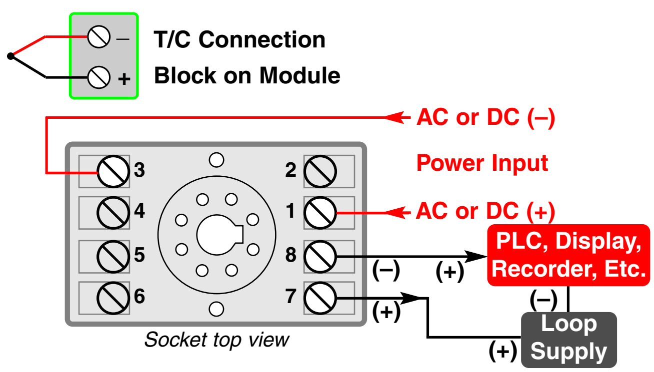
Thermocouple Input – The connection block is located on the side of the module. Polarity must be observed. With thermocouples, the red wire is connected to the negative (–) terminal.

Signal Output Terminals – Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 7 and the negative (–) is connected to terminal 8.

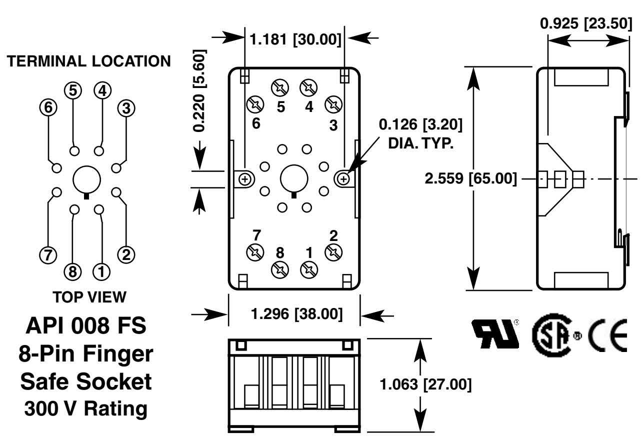
Note that with current outputs the module provides power to the output loop unless option EXTSUP was ordered for a sinking output requirement.



API 4100 G and API 4130 GL typical wiring



API 4100 G EXTSUP and API 4130 GL EXTSUP typical wiring



CALIBRATION

The API 4100 G and API 4130 GL are factory configured to your exact input and output requirements.

Input and output ranges are listed on module labels. Input changes require factory modification. Field calibration of the input is NOT recommended and may void the warranty. Top-mounted, Zero and Span potentiometers can be used should fine-tuning of the output be necessary.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate thermocouple simulator, provide an input to the module equal to the minimum input required for the application.
3. Connect an accurate measurement device to the output. Adjust the Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum to produce the corresponding minimum output signal. Example: for a 4-20 mA output signal, the Zero control will allow adjustment of the 4 mA or low end of the signal.
4. Set the input at maximum, and then adjust the Span pot for the exact maximum output desired. The Span control should only be adjusted when the input signal is at its maximum. This will produce the corresponding maximum output signal. Example: for 4-20 mA output signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.

TEST BUTTON

The Test pushbutton provides approximately 50% output when depressed. This will drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting. When released, the output will return to normal.

Example: If you are checking a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be approximately 12 mA.

OPERATION

The API 4100 G and API 4130 GL are factory configured to your exact input and output requirements. The input circuitry in both models filters the T/C input, applies the cold-junction compensation, and amplifies the low-level T/C signal.

In the API 4100 G, this amplified signal is passed directly to the output stage and scaled to the desired output range.

In the API 4130 GL, the amplified signal first passes through an optical isolator, then is passed to the output stage where it is corrected for the inherent non-linearity of the specified T/C type and scaled to the desired output range.

GREEN *LoopTracker*® Input LED – Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

The RED *LoopTracker* output LED – Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the red LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.