DC Input Single Alarm with Transmitter & Loop Supply

API 1040 G

DC Input

Input: ***0-100 mV to 0-200 VDC or 0-1 mA to 0-50 mA***

Outputs: ***One SPDT Relay, ±10VDC, 0-20 mA, Non-Isolated Transmitter***

- ***Built-In 4-20 mA Loop Power Supply***
- ***Field Adjustable Setpoints***
- ***High Capacity 7 Amp Relay Contacts***
- ***Input & Output LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***





2.38" 1.75" 2.75"

LIFETIME WARRANTY

Free Factory Input & Output Calibration!

Applications

- **Process Signal Retransmission with Limits**
- **Alarm and Rescale Process Signals**

Specifications

Input Range

Factory Configured—Please specify input range (see list at right)

	Minimum	Maximum
Voltage:	0-100 mVDC	0-200 VDC
Current:	0-1 mADC	0-50 mADC

System voltages should not exceed socket voltage rating

Input Impedance (Voltage)

Voltage: 200 kΩ minimum

Input Voltage Burden (Current)

1.25 VDC maximum

Input Protection, Common Mode

750 VDC or 750 VAC_p

Input Loop Power Supply

18 VDC nominal, unregulated, 25 mADC, max. ripple less than 1.5 V_{p-p}

LoopTracker

Variable brightness LEDs indicate input/output loop level and status

Output Range

Factory Configured—Please specify output range (see list above right)

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

Output Zero and Span

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

Output Linearity

Better than ±0.1% of span

Relay Output

Factory Configured—See Options for other relay configurations
One SPDT contact, High Alarm, Fail-Safe, Non-Latching Standard
7 A @ 240 VAC resistive load or 3.5 A @ 240 VAC inductive load

CAUTION: Socket voltage rating 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

Adjustable from 1.0 to 100% of span, 12 turn potentiometer

Functional Test Button

Toggles relay to opposite state and sets output to test level when pressed.
Resets relay to normal state when pressed with **HT** latching 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

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Common Input Ranges				Common Outputs	
0 to 100 mV	±100 mV	0 to 1 V	0 to 1 mA	0 to 1 V	0 to 20 mA
0 to 200 mV	±200 mV	0 to 2 V	0 to 10 mA	0 to 5 V	4 to 20 mA
0 to 500 mV	±500 mV	0 to 5 V	0 to 20 mA	1 to 5 V	
	±1 V	0 to 10 V	10 to 50 mA	0 to 10 V	
	±2 V	0 to 20 V	4 to 20 mA	±5 V	
	±5 V	0 to 50 V		±10 V	
	±10 V	0 to 100 V			

Description and Features

The **API 1040 G** accepts a DC voltage or current input and provides a visual alarm indication and an SPDT alarm relay output when the input exceeds a high alarm trip point or falls below a low alarm trip point. The **API 1040 G** also provides a linearly-transferred DC voltage or current output. The **API 1040 G** transmitter output is useful for signal scaling, or translation from current to voltage or vice-versa in applications that do not require isolation.

This module includes an unregulated 18 VDC loop excitation supply that can be used to power an external loop-powered transmitter or other passive input device eliminating the need for an additional DC loop supply. 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 1040 G** provides a single setpoint adjustment and SPDT 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.

Models, Options & Accessories

Factory Configured—Specify input range, output range, and options

API 1040 G	DC to DC non-isolated transmitter with alarm, 1 SPDT relay, HI alarm, normal action (failsafe), non-latching, with loop power supply, 115 VAC

Options—Add to end of model number

A230	Powered by 230 VAC, 50/60 Hz
D	Powered by 9-30 VDC
HT	Latching alarm with pushbutton reset
HP	Latching alarm with power-off reset
R	Reverse-acting alarms (non-failsafe)
L	Low trip (on decreasing signal)
SPR	Alarm set point retransmit, 0-1 VDC
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

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DC Input

ELECTRICAL CONNECTIONS

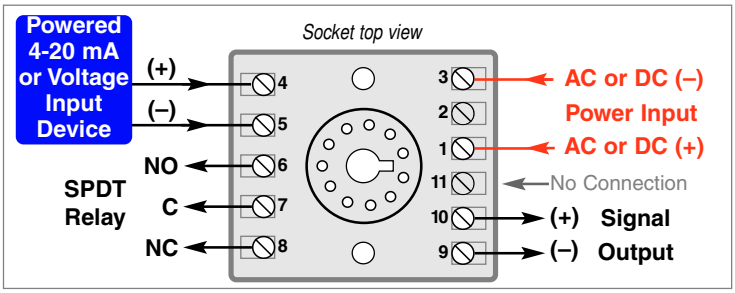
WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately.

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.

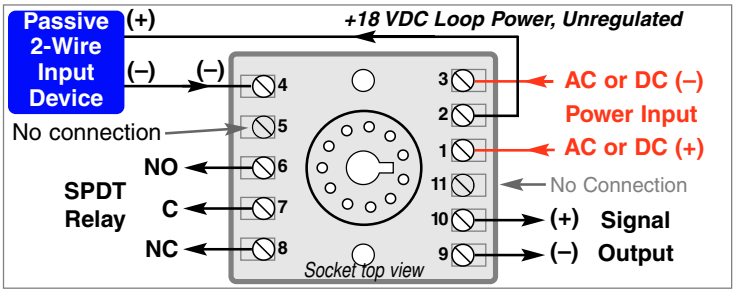
Signal Input – Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 4 and the negative (–) is applied to terminal 5.

Relay Output Terminals – Terminals 6, 7, 8 provide the appropriate connections for the desired relay operations. (NO = Normally Open, NC = Normally Closed, C = Common).

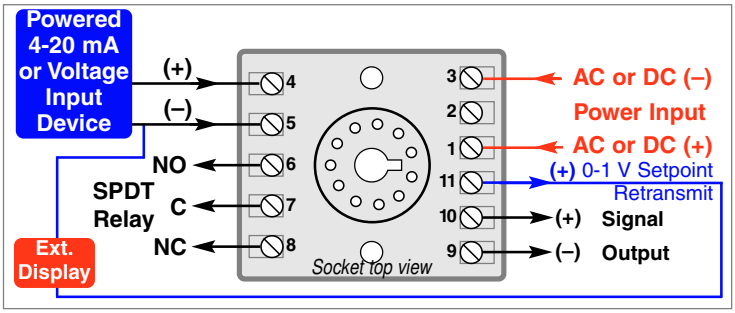
WIRING EXAMPLES



API 1040 G with Powered Current or Voltage Input



API 1040 G Using +18V Loop Power Supply



API 1040 G SPR Output Wiring Example

SETUP

The input range and alarm configuration are pre-configured at the factory as specified on your order. No input calibration is necessary.

Setpoint Control – This multi-turn potentiometer 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 – This potentiometer allows the alarm trip and reset window to be adjusted symmetrically about the setpoint from 1 to 100% of the span. This allows the operator to fine tune the point at which the alarm trips and resets. The deadband is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

Test Button – The functional Test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation without having to alter the input signal. For modules with the HT option, it also resets the latching alarm.

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

OPERATION

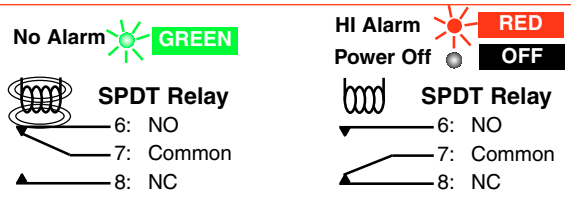
GREEN *LoopTracker*® Input LED – Provides a visual indication that a signal is being sensed by the input circuitry of the module. It indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity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

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 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.

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 Relay – 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.

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



API 1040 G Alarm States with Normal Action HI Alarm

API 1040 GHT Latching Alarm – For units with the **HT** latching alarm option, the Reset button is used to reset the alarm relay. 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 Reset pushbutton has been pressed or power to the unit has been switched off.

API 1040 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 1040 G SPR Set Point Retransmission – With the SPR option, a transmitted signal (0-1 VDC) indicates the value of the alarm setpoint.

CALIBRATION

The unit comes from the factory calibrated to customer specifications. However, the top-mounted zero, span, and setpoint controls allow recalibration of the unit if required. Calibration requires an accurate signal source and measuring equipment, such as an accurate digital voltmeter.

Set the signal source to the minimum desired input. Adjust the zero control for the minimum desired output. Set the signal source to the maximum desired input, adjust the span control for the maximum desired output. Repeat steps if necessary.

To calibrate the alarm section, set the deadband control to the minimum. Set the signal source to a reference that represents the desired trip point. Adjust the setpoint control to the point at which the relay changes state form a non-alarm to an alarm condition. The deadband will be 1.0% of span in this case.

If a larger amount of deadband is desired, the deadband control may be increased by turning the control clockwise. The deadband is symmetrical about the setpoint; both transition points will change as deadband is increased. Also, the test button can be used at any time to toggle the relay state independent of the input and the output to verify system operation.

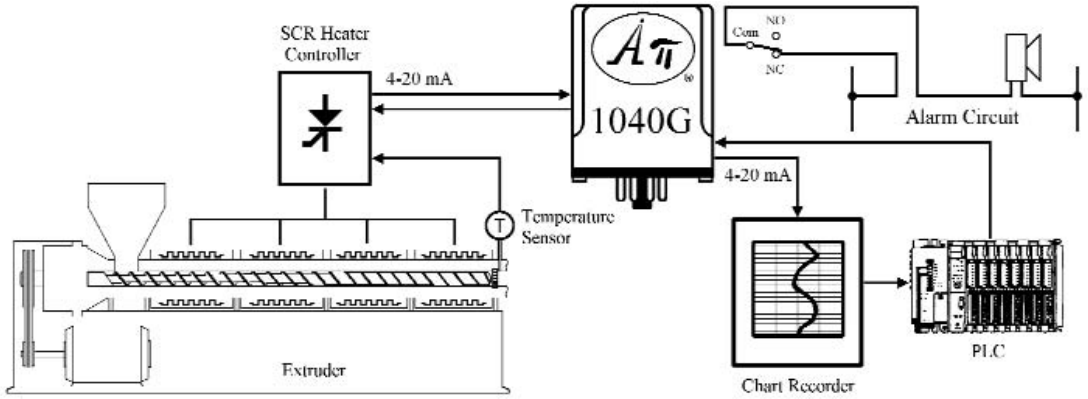
Over-Temperature Alarm with Retransmitted Temperature Signal

PROBLEM

An extruder temperature controller has a 4-20 mA output that is capable of driving only 250 ohms. The application requires enough drive for an over-temperature alarm trip (250 ohms), an analog temperature signal for a chart recorder (250 ohms) and a programmable logic controller (250 ohms) for a total required drive of 750 ohms.

SOLUTION

Use the 4-20 mA output of the controller to drive an **API 1040 G** Non-Isolated DC to Single Alarm with DC Transmitter module.



The **API 1040 G** provides a relay contact output for an over-temperature alarm in the event of SCR runaway and retransmits the temperature signal to drive the inputs of the chart recorder and the PLC. The input impedance of the **API 1040 G** is 50 ohms and its output can drive up to 1000 ohms.

Frequently Asked Questions

We have a relay alarm output and would like to adjust the set point for 5 VDC input and the reset point for 4 VDC input. How do we adjust the set point pot and the deadband pot to do this?

The deadband is the difference in the input signal between the points at which the relay energizes and de-energizes. The midpoint between the set and reset points is 4.5 VDC. Turn the deadband pot fully counterclockwise for minimum deadband. With a 4.5 VDC input signal, turn the set point pot until the relay changes state. Then, increase the the input signal to 5 VDC. Turn the deadband pot clockwise until the relay changes state.

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.

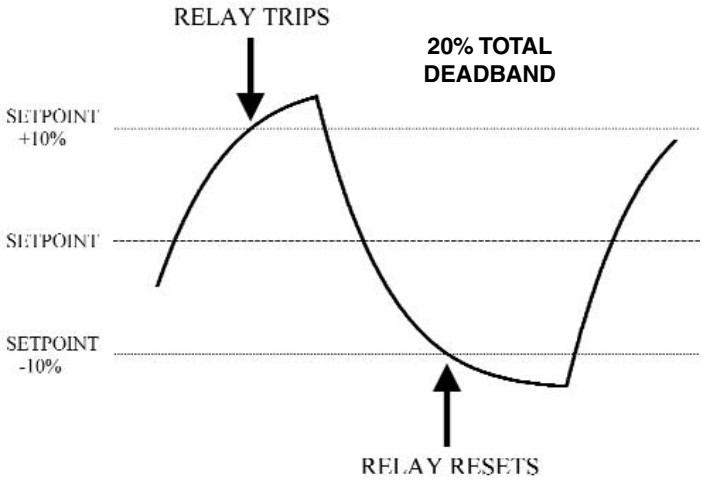
What are the relay contacts rated for in your alarm output modules for a motor load?

For inductive loads, our relay contacts are rated for 3.5 Amps Inductive at 250 VAC or 30 VDC.

What is Deadband?

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 graph below left.



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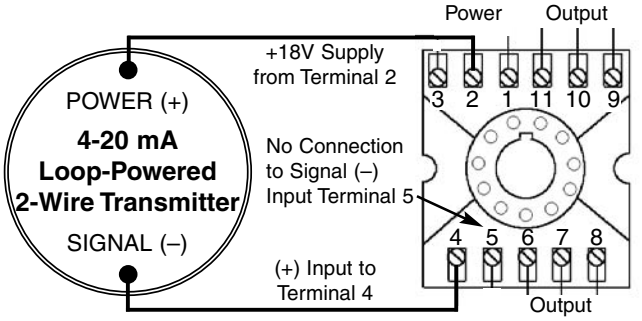
Using the Built-In 4-20 mA Loop Power Supply

Many Api modules have a built in loop power supply which can be used to power the 4-20 mA input current loop. The wiring diagrams below give examples of how a two-wire transmitter can be powered by the module's loop power supply and also provide input to the module.

When using the built-in loop power supply, there is no connection to the module's signal minus (–) input terminal. An **internal** 50 ohm resistor across the input terminals allows you to do this without any problems.

11-Pin Modules

API 1005 G
API 1025 G
API 1040 G
API 1080 G
API 1090 G



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.

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.

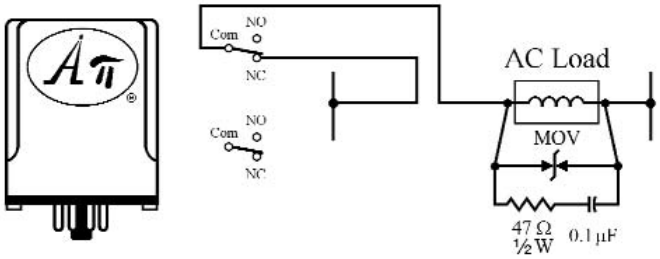


Figure 1: AC inductive loads.

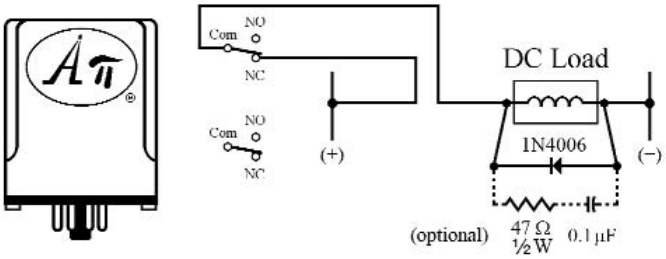
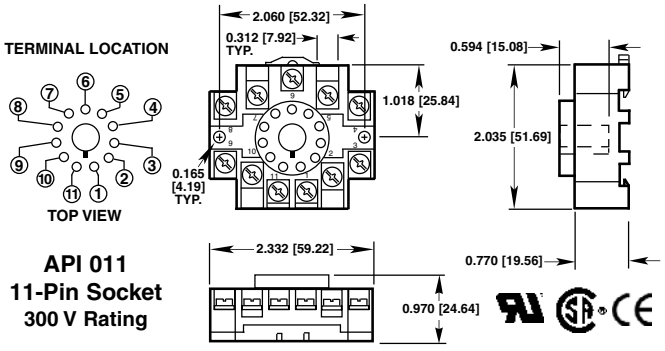
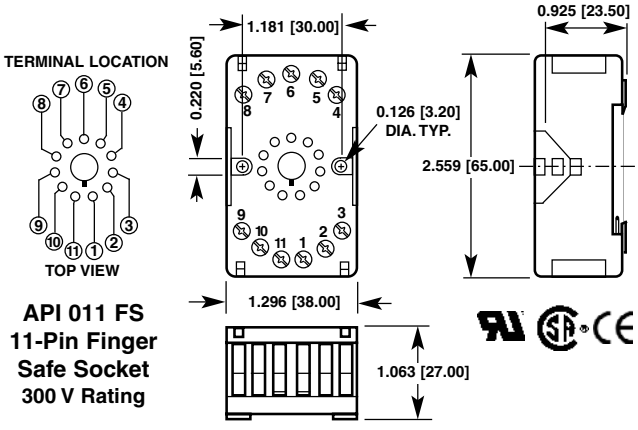


Figure 2: DC inductive loads.

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 Customer Service
800-794-5883

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